Only The Strong Survive

The completely disassembled tranny. Century Transmissions will turn your weak factory 4L60E into a 10-second-capable Street/Strip unit for $1875, barring any worn components or bad electronics.

Building a 10-second-capable Century Automotive 4L60E

By Rick Jensen
Photography by the author

It is no secret that the computer-controlled 4L60E transmission, found in F-, B-, and Y-body performance GMs, is just barely strong enough to handle the stock LT1 and LS1 engines. GM has fixed many of the inherent problems in the new 4L65E, but there are a ton of 60s floating around out there. And we all know someone who, after a blower, nitrous, or a few more cubic inches, had the stock tranny go south in a big way. Strangely enough, the 60's reputation is to the point where many racers are actually swapping it out for alternate means of transmitting power to the tires. The turbo Buick's TH200-4R is a popular choice with its closer gear ratios, as is the dreadfully inefficient TH400 3-speed. Even the 4L80E trans has been considered by speed freaks who are just tired of the cracked sun shells and wasted 3-4 clutches of the 4L60E.

But its factory weakness can, in most cases, be overcome. Century Transmission, found in Richmond, Texas, has been building auto trannies for 19 years. Besides its solid 200-4R upgrades, proprietor Mike Kurtz and his team specialize in high-10-second-strong 4L60E rebuilds. We showed up one day to see a customer's tranny get built, and the folks at Century were happy to show us the parts and techniques needed to get this ill-reputed gear-changer to survive. GMHTP

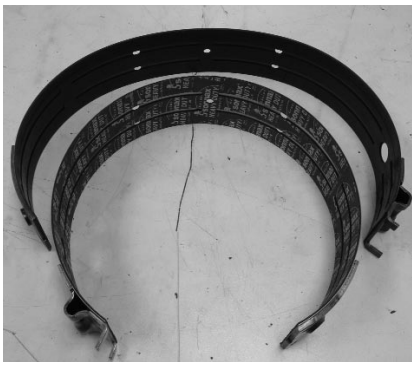
A strong trans needs strong internals. Here is the five-pinion Century Trans planetary on the left compared to a four-pinion GM planetary on the right. Century uses the five-pinion planetary to spread the load out on the carrier more, which makes it less likely to fail.

This shot shows an upgraded Century Trans Super Sun Shell on the left, a stock sun shell on the right. Century Trans has found that the thickness of the sun gear spline ring from GM can vary up to 30 thousandths, and these sun shells can crack behind even a totally stock motor! The Century shell is a GM part with a hardened sleeve used to prevent cracking around the sun gear splines. Its sleeve has to be custom-ground to each individual spline ring, then furnace brazed and black oxide coated.

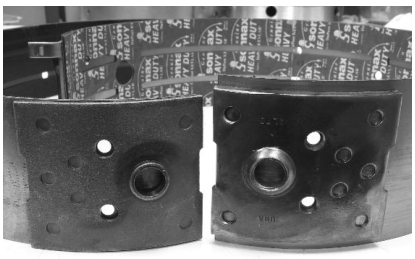
Century Trans modifies the factory low reverse inner sprag race (left) by grinding it down to make clearance for the rollerized Torrington bearing. This hardened steel unit is so hard that it can't be turned by a lathe.

A durable Torrington roller bearing (left) replaces the flimsy plastic thrust washer (right) between the sun shell and the low reverse race. This is a high thrust area, and this plastic piece is one of the first items to wear—if it does, the race grinds into the sun shell.

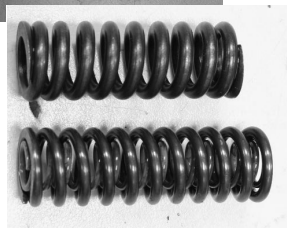
Here is the stock apply servo for second and fourth gear on the left, and a billet apply servo on the right. The billet unit has a larger apply area for a crisper band apply and 40 percent more holding power over a stock servo.



Compare the factory band with the Century Trans unit: there's a Kevlar friction lining as opposed to the factory tan paper lining. Notice the curvature of the stock band as well—do you see that mating perfectly to a round drum? Neither does Century.



A close-up of the bands reveals that Century Trans' is 3/8-inch wider, has a thicker backstrap and anchor strut, and features a reinforced anchor pin recess on the right, as compared to the GM unit on the left. The Century Trans band's thicker anchor strut allows the pin to seat deeper than the factory strut will allow, which keeps it from ripping out with the higher line pressures of a performance trans. The reinforcement around the hole also helps to keep the pin from being ripped out, and a better method of attaching the strut with rivets is used on the upgraded unit.

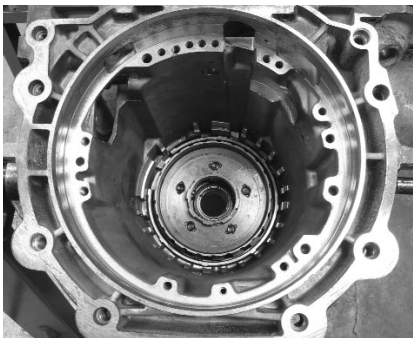


Century Trans uses a 13-vane pump (above) to replace the factory 10-vane units from pre-1998 4L60Es. A Teflon slide seal replaces the steel GM one. Also, a stronger pump slide spring is used to keep trans fluid volume high at higher rpm ranges.

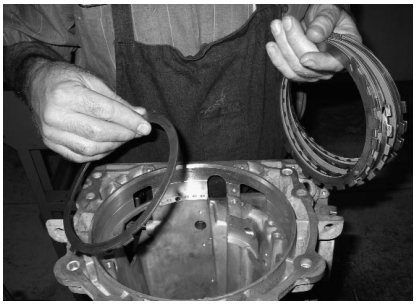
The TCC valve bleed orifice has been modified by installing an orifice cup plug in place of the two-piece OEM orifice. With the stock unit, the pin can sometimes fall through the seat, which will interfere with the lockup valve and possibly cause a non-lockup condition.

A cast GM rotor ring is on the left, with Century Trans' stronger hardened ring on the right. The hardened unit means less of a chance of the rotor vane breaking.

The input sprag, which is found inside the input drum, is upgraded from 26 segments to 29. This distributes the load from all four forward gears more evenly. The 26-segment sprag can slip the races, and when shifting to Third, this can cause a clutch-slipping effect.

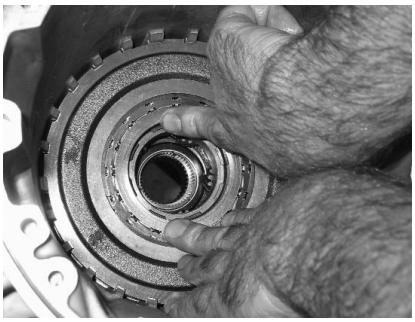


Ronnie Dorris, the head transmission tech at Century Automotive, begins the installation. After the factory ring gear goes in, the five-pinion low/reverse planetary is lowered into place and connects to the splines of the output shaft.

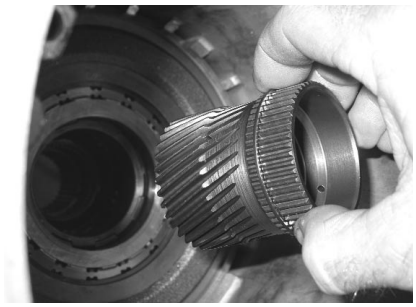


A wave (or steel cushion) goes in first, then alternating GM turbolated (with holes) steel, Borg-Warner Heavy-Duty Tan clutch five times until the last clutch is up against the center support.

An anti-rattle clip is installed, and Ronnie pre-lubes the low/reverse sprag with a mixture of Mercron-III trans fluid and JB gear oil treatment.

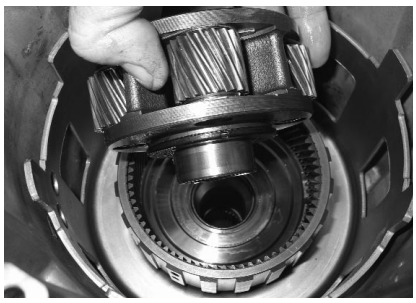


When installing the low/reverse sprag, the inner race should rotate clockwise to seat it. Next, the snap ring is installed, and Dorris uses a long-handled flat screwdriver to ensure that the ring is installed correctly. Finally, Ronnie uses compressed air to leak-check the reverse clutch operation.



Now, the factory issued sun gear is dropped in to mesh with the five-pinion planetary.

The upgraded sun shell goes in next, followed by the GM hub assembly that attaches to the front planetary ring gear.



The front planetary goes in now. Century Trans will oblige customers requesting a five-pinion front planetary, but the factory four-pinion unit hardly ever fails.

The output shaft is installed by sliding it up through the back of the tranny case bushing and using a snap ring by the five-pinion planetary to retain it.

GM's stock forward clutch springs and retainer are on the left, and the upgraded assembly is on the right. Century Trans uses stiffer springs to keep the clutch pack disengaged so it won't try to engage the clutches centrifugally at high rpm. The two-piece cage is for a later steel bonded piston.

The third and fourth gear piston release spring and retainer from Century (right) has a stronger set of springs for use with the TransGo HD2 shift kit.

Here is a comparison of stock aluminum (left) versus steel bonded overrun, 3-4, and forward pistons. The aluminum can crack in the 3-4 piston after shift kits (and the corresponding increase in line pressure), which means that all pieces will have to be replaced for reliability's sake.

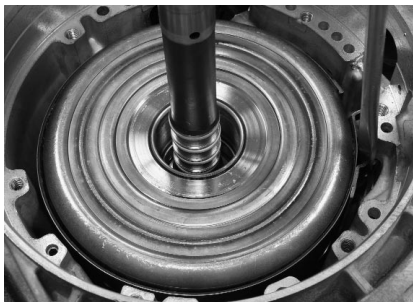
The torque converter clutch orifice on the input shaft is set up from the factory to restrict and slow down the TCC apply for good driveability. Of course, you don't want this feature for a performance car, as it results in more slippage, more heat, and worse ETs. Dorris uses a flathead screwdriver and a hammer to twist and gently remove this obstruction.

The reverse input drum piston is modified by decreasing the orifice size with a restrictor for a quicker Reverse engagement. Some 4L60Es experience a delayed Reverse engagement when the trans fluid is hot.

The sequence to assemble the forward input drum: steel, clutch, steel, clutch, pressure plate, seal, Torrington bearing, sprag assembly, wave, five steels and clutches in alternating order, then pressure plate. A smaller snap ring holds it all in place. Next in the input drum comes the 3-4 clutches, known as the weakest link in the stock tranny. The pressure plate goes in first, followed by nine Alto Red Eagle clutches and eight Koleen steels installed in alternating order. Compressed air is applied in the three clutch feed holes to verify that there aren't any leaks past the pistons and to seat the clutch packs.

After the input sun gear is installed into the tranny case, the reverse input drum is assembled next. The beveled plate goes in with the concave side down, then four sets of steels and clutches in that order are held with a snap ring. This drum is air-checked as well.

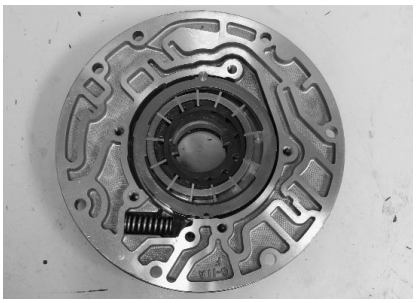
Once together, the clutch drum assemblies are dropped into place, and Ronnie uses a Vise-Grip to lightly hold the splines and rotate the unit back and forth to get all of the teeth on the clutch frictions to line up with the grooves and drop into place.



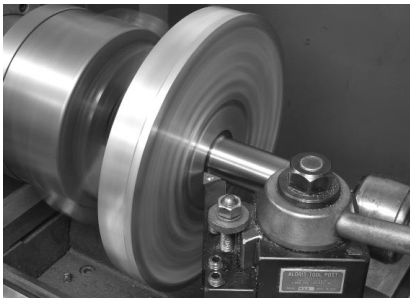
The 2 5/8-inch Kevlar band is dropped into place, and Ronnie uses a flat screwdriver on the bottom side where the pump goes in to pry up onto the reverse input drum slightly. Once the band strut falls into the case, lightly tap it with your hand to verify that it's seated.

The anchor pin goes in, then from the top you can lightly pry with a screwdriver until it seats in the band strut recess. When the pin is in correctly, it is about 1/16-inch below flush on the case.

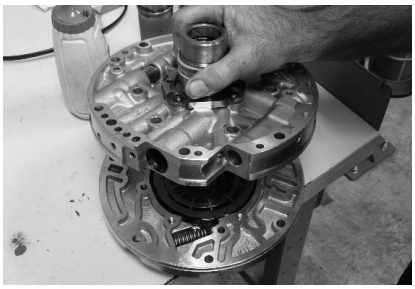
A factory 470 thousandths aluminum boost valve is on the left, a TransGo 500 thousandths steel HD2 boost valve is on the right. The hardened steel won't wear or stick like the stock unit (this can reduce line pressure and burn up the tranny). The HD2's bigger diameter will also give more line pressure, and stiffer springs help on that front too.



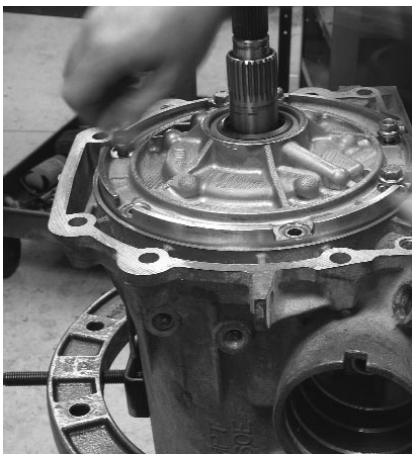
Here is the pump cover with a 13-vane pump and a bigger spring.



The stator side of the pump is machined with a carbide bit on a lathe. Two to five thousandths come off the face of the stator to make sure that it is straight and flat. This will prevent any cross leaks.

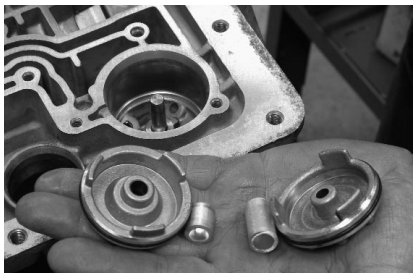


Then the pump is assembled. Once the five pump bolts are snugged up, an alignment tool comes into play. When the pump's two sides are aligned perfectly, the bolts are tightened to 15-20 lb.-ft. The thrust washer is lubed up and placed, and the O-ring follows.

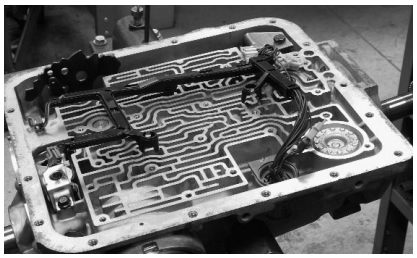


The pump is placed onto the input shaft, then seven bolts with special O-rings to prevent trans fluid leaks are torqued to 20 lb.-ft.

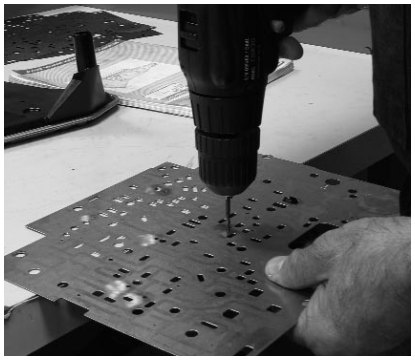
Our servo piston is assembled and installed by placing the spring in first, then pushing the servo assembly in and holding it with a snap ring. Ronnie then rotates the output shaft so he can check the servo clearance.



The accumulators are installed next. Century Trans uses the original accumulators with custom-length spacers to make the shifts firmer. The check ball is installed now.



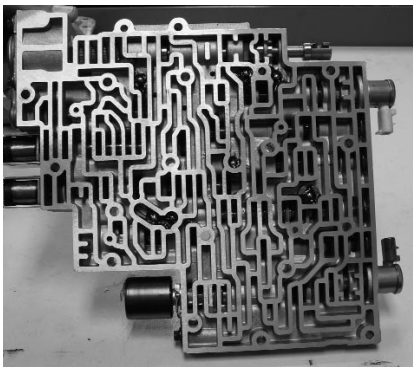
Then the TCC harness goes back into place.



The feed holes to the 2,3, and 4 circuits are enlarged to increase the fluid volume to the band servo and 3rd clutch pack. This will make the shifts firmer. The case gasket is placed down, the shift plate goes on, and the valve body gasket goes on top. If you're doing this at home, always match the old gaskets to the new one—there are three different types for the 4L60E. On the shift plate, two of the holes are tighter for alignment purposes.

If the transmission has over 50,000 miles or if it has been contaminated by a failure, Century will replace these solenoids. The two square ones are shift solenoids A and B. The two tall round ones are pulse width modulated solenoids: one controls the TCC engagement, and one controls the 3-2 downshift for a gradual engagement. The big round one is the EPC. The plate in the foreground is a sensor manifold assembly that sends trans pressure, temperature, and gear selection feedback to the ECU.

With the EPC (or variable force motor in GM-speak), a 15 Torx can be used to increase line pressure, but is usually not necessary (or recommended) unless done by a professional with a line pressure gauge.



The valve body is installed, 17 bolts are tightened down to 96 inch-pounds, and the harness connections are made. A TransGo 4L60E HD2 shift kit is utilized.

The rooster comb detent is installed with one bolt. After that, a new filter is installed, the pan goes on and you have got a 4L60E that won't cry behind a big-horse motor. If you're going with a stock-sized 12-inch converter, the trans will need between 12 and 13 quarts of fluid to top it off.

Century Trans complements its 4L60E rebuilds with custom-built, computer-balanced torque converters. They feature a custom anti-balloon billet front cover and a custom billet clutch disc, lined with a high-carbon-composite-lining, with a surface area of 40 square inches (the factory size is 22 inches). A custom billet clutch disc prevents flex under pressure, and heat-treated steel splines are used. Internally, everything is furnace-brazed and rollerized. These can be had in stall speeds from 3000-6500, and retail for $860.

SOURCE

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