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1970 Ford Bronco - Swiss-Watch-Precision C4 Westminister Transmission Service Rebuilds Ford's Venerable Auto Box

By D. Brian Smith

Automatic transmissions are mysterious marvels of the Industrial Revolution. Every mechanical, hydraulic, electrical, vacuum-operated, and electronic component of a modern-day automatic transmission must function in perfect harmony to do its job properly. Like a Swiss watch that keeps perfect time, automatic transmissions are the precision instruments that effortlessly propel many of our custom vintage [pickups](#).

Recently, we heard of a friend's [off-road](#) misadventure. While playing in the mud with his son in their '70 Ford Bronco, Steve Shattuck lost the reverse gear in his Ford C4 Cruise-O-Matic automatic trans. We saw Steve's misfortune as a great opportunity to watch how the pros rebuild a C4. By doing so, we could convey the rebuild process and demystify these complex creations of the Industrial Age to CCT's readers via words and photos.

Manufactured 1964 through 1987, Ford's C4 has powered everything from the puny Pinto up to the burly Broncos. Because C4s are compact, well-engineered, and reliable, they back many Ford-powered Ford custom vintage pickups today. Steve selected Westminister Transmission Service (WTS) in Westminister, California, to renew and improve the C4. Owned by Joe Piraino since 1987, Joe and his talented crew have rebuilt GM, Ford, and Chrysler automatic transmissions for street, dragstrip, race, and off-road applications. Indeed, Joe has been working on transmissions at this same shop since 1977. Follow along with us, as Joe and his son Michael, a Mechanical Engineering student at Cal Poly Pomona, rebuild a C4 for off-road fun in a 351W EFI-powered '70 Ford Bronco.



From the Ford factory, Second-gear servo pistons are 2.822 inches in diameter. In addition, they're cast aluminum. WTS replaced the Second-



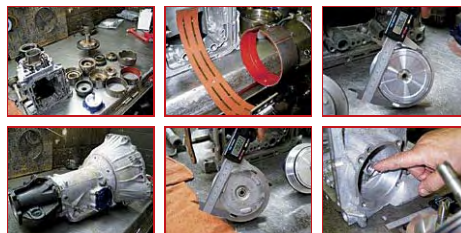
...a billet aluminum Second-gear servo piston from Sonnax Industries that is 3.052 inches in diameter. Since the servo piston is displacing hydraulic



Joe points out where the Sonnax Second-gear piston goes in the transmission case.

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Rebuilding A Ford Automatic Transmi...

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fluid, the more fluid pushed, the more hydraulic pressure. More hydraulic pressure means that more clamping force will be applied to the Second-gear band.



With repeated use, the original cast aluminum Second-gear servo piston will wear, creating a gap or air/fluid leak between the transmission- case opening and the servo piston. Leaks breed inefficiency and eventual problems.



To prevent wear and leaks, the Sonnax Industries billet-aluminum servo piston has a Teflon sleeve around the piston.



To improve clamping power by 25 percent in high gear (drive or Third gear), WTS machined the pressure plate to make room for an additional high-gear clutch plate, bringing the clutch pack total from four to five.



With good reason, TransGo Performance patented the term Shift Kit. WTS utilized TransGo Performance's Shift Kit to renew the C4's valve body (shown to the right of the Shift Kit installation manual).



By installing the heavy-duty pressure-regulator spring, included in the TransGo Shift Kit for rebuilding the valve body, mainline hydraulic pressure was increased by 15 pounds.



Since the stock three-pinion cast iron with steel pinions planetary gear was in great shape, WTS cleaned, inspected, and reemployed it.



Until mid-1972, vacuum modulators were screw-in type, as shown on the left. The vacuum modulator on the right was used in C4s from mid-1972 through 1987. The push-in type is preferable, since the component has two diaphragms available for obtaining vacuum. Obviously, engines with radical cams work better with the push-in-style vacuum modulator. Quicker shifts result. The C4 in Steve's '70 Bronco is a late-'72 unit (thankfully).



With the worn oil-pump gears in the background, Joe pointed out the worn surface on the C4's original oil pump that the gears rotated within.



From the factory, C4 oil pumps have Babbitt bushings, as shown on the left. WTS utilized a new Ford oil-pump housing and Clevite 77 Bronze bushings, as shown on the right. These Clevites are harder in composition, and therefore more durable.



As built from WTS, the oil pump is brand new, with gears from Transtar Industries, Clevite 77 Bronze bushings, and a new Ford oil pump body.



All the cleaning, refurbishing, and replacing complete, WTS was ready to assemble the much-improved C4.



For assembly, Mike nested the forward clutch drum into the direct drum.

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He next installed the front ring gear in the forward clutch drum.



So long as you don't start singing "The hip bone's connected to the leg bone," we'll indicate that he installed the front planetary gear into the front ring gear.



Mike liberally applied Lucas Oil Transmission Fix (LOTF) to all metal surfaces. WTS uses LOTF as an assembly lube--it works really well.

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To complete the first subassembly, Mike installed the sun gear, thrust washer No. 5, and the input shell (a.k.a. sun-gear shell).



Mike placed the input shaft in the just-completed subassembly.



Focusing on the output shaft, Mike installed the governor and applied assembly oil. The output shaft is comprised of governor valves and a distributor.



Mike applied LOTF to the governor distributor sleeve, since the opening would be receiving the governor-equipped output shaft, imminently.



With the trans case standing on end, Mike carefully installed the one-way clutch-equipped output shaft in the governor distributor sleeve.



As seen from the top of the trans case, he inserted the low and reverse drum into the output shaft, within the trans case.



A Tru-Arc snap ring was installed--this holds the output shaft and the low/reverse ring gears in place.



After soaking the low/reverse band in Mercon Transmission Fluid for at least 10 minutes, it was nested over the low/reverse drum.



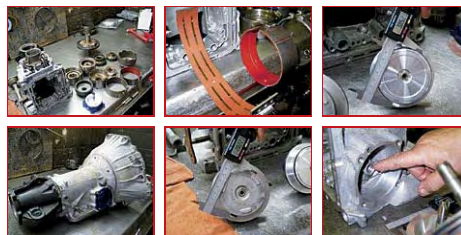
Mike installed the band struts, which will clamp the low/reverse band tight to the low/reverse drum when under hydraulic pressure. After installing the bands, he checked that they were working properly with compressed air (not shown).



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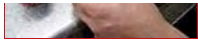
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To prevent any hydraulic transmission-fluid leakage, Gasgacinch gasket sealant was applied to the purple anodized billet- aluminum housing that houses the Sonnax Industries Second-gear servo piston, prior to fitment of the gasket.



Mike liberally applied grease to the Second-gear servo-piston sleeve, to diminish wear to the Teflon sleeve and prevent fluid leaks. He also lubed the black ring seals (not shown).



Since the Second-gear servo piston is under spring tension, both father and son Piraino installed the billet servo piston.

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Before torquing the Second-gear servo-piston housing, Mike referred to the C4 assembly manual for the proper torque specs.



Mike torqued the Second gear servo piston housing to 16-22 lb-ft, as the manual specified.



After nesting the planet carrier within the reverse ring gear and hub (circular object in background), Mike installed the throttle-valve lever onto the side of the trans case.

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Compressed air was used to test that the Second-gear-servo piston functioned properly. You can see the piston poking out where the notch is at the bottom of the trans case.



Mike installed subassembly one next. To refresh your memory, subassembly one consists of: the reverse and high clutch drum, the forward clutch and cylinder, thrust washer No. 3, the front ring gear, thrust washer No. 4, the front planet carrier, the input shell, the sun gear, and thrust washer No. 5.



After installing the intermediate band, Mike equipped the intermediate servo piston (Second-gear servo piston) and the adjusting nut with struts. He used compressed air to ensure that the intermediate band clamped properly.



In anticipation of installing the oil pump, Mike liberally applied assembly lube (LOTF).



Using a Philips screwdriver as a guide, Mike installed the oil pump. He torqued the pump's fasteners to the specified 28-40 lb-ft.



The low/reverse-band-adjustment nut can only be used once, since it has a silicone seal that gets compressed to seal upon tightening (prevents ATF from leaking past threads). Mike adjusted the low/reverse-band nut the specified three turns. The intermediate adjustment nut is shown in the foreground. It was next installed on the other side of the trans case. Its proper adjustment is 1.5 turns. Every time an auto trans is serviced, these adjustment nuts should be replaced and readjusted.



After removing the rebuilt valve body from the Ziploc bag, Joe pointed out the floating manual valve of the renewed valve body. The top notch in the floating manual valve indexes with a nub inside the transmission. In addition, the kickdown lever (throttle-valve assembly) pushes on the valve to the right of the floating manual valve. For proper installation of the valve body, both of these valves must be correctly indexed.



Before torquing the valve body to the top of the trans case, Joe tightened the bolts with a speed wrench. He used vice-grip pliers to hold the kickdown lever (throttle valve assembly) in the correct position, to correctly mate with the valve adjacent to the floating manual valve. The roller of the detent spring also must be centered on the rooster cone. As to spec, the valve body was torqued to 80-120 In. Lbs. (10 Ft. Lbs.).



For safety sake, WTS puts a magnet inside the trans oil pan. Mike tightened and torqued the oil pan over the valve body (not shown).



Joe showed how the input shaft is supposed to go into the front of the trans, just before his son installed it.



Minutes before Mike torqued the extension shaft housing to the back of the trans case, he installed the extension-shaft-housing gasket with Gasegacinch gasket sealant.



With the help of his dad, Mike torqued the bellhousing (torque-converter housing) to the front of the trans case next.



An Art Carr heavy-duty shifter reposes in front of the just finished [Ford C4 Cruise-O-Matic](#). Before WTS mates the renewed trans with the engine, they'll install a new torque converter, which they procured from Orange Coast Torque Converters in Costa Mesa, California. Thanks to Westminster Trans-mission Service and the various component manufacturers, we don't think our Bronco friend will be busting the reverse band on his newly bulletproof C4 anytime soon.

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