

## The Ultimate T-5 Swap Article

There's a lot of confusion regarding the Borg & Warner T-5 and which one to use in an early Ford car. Terms like world-class & non-world class are intermingled with gear ratios and torque ratings, shifter positions and speedometer drive type. This article should help clear up many of these issues.

The confusion surrounding which T-5 is best is understandable. An extremely versatile transmission, B&W modified this tranny to suit different applications several times over its 13-year production run (1982-1995) before being acquired by Tremec and discontinued for OEM use. In truth, the confusion stems from its versatility, and that's a good thing.

Replacing an early floor-shift 3-speed requires a forward shifter location. This location is found in T-5 transmissions used in S-10, T-10, Astrovan, & Jeep transmissions.

While the T-5 was used by AMC, Ford, GM, Isuzu, Nissan, Ssang, & TVR (among others – even an agricultural sprayer!) This article will focus on three main OEM applications – Mustang, Camaro/Firebird, & S-10.

### IDENTIFYING A T-5

There is only one positive way to identify which T-5 you have and that is by using the metal tag attached to one of the tail housing bolts. The number will look like this:

13-52-XXX, where XXX is a three-digit number unique to the specific make/model application. There are several online T-5 number decoders, but one of the easiest to use is found at <http://www.5speeds.com/t5/index.html> - at the bottom you can use the drop-down menu to select your three-digit suffix and find the original application.

Contrary to popular belief, you cannot tell gear ratios by application – only by tag number and then only if you have a comprehensive chart. So if your buddy tells you to get the T5 out of an S10 with a V6 because it has better gear ratios and/or it's stronger, that's simply not always true and you must reference the tag number.

### World Class vs Non World Class

In the beginning, there was no WC/NWC discussion as all transmissions were NWC. The WC designation began in '85 with Ford using it in the 5.0 Mustang first. F-Body (Camaro/Firebird) began using WC units in '88. The S10 didn't use WC until '93. The differences between WC & NWC are principally in the bearings & synchros. Externally, there is one readily identifiable difference between WC & NWC (without having to know input sizes & spline counts) and that's the front countershaft bearing retainer. The NWC has a one-piece design that looks like a large welch/freeze plug while the WC has a two-piece design that looks like two concentric circles. Here's a pic of each (lifted from the HAMB):



*World Class Bearing Retainer*

*Non World Class Bearing*



*Retainer*

'93 and newer GM WC T-5 use the Ford case and bolt pattern, so these will not bolt up to standard Chevy bellhousings.

In general, WC is stronger than NWC, newer transmissions are stronger than older ones, and higher first gear ratios are stronger than lower. The torque ratings are guides and typically represent shock ratings. It is generally accepted that WC units can be made to live behind about 400hp as proven by the 5.0 Mustang crowd. There is no hard and fast

rule – if you hammer it, it will break.

## Input Shafts

Ford NWC & WC (except 4-cyl) units used a 1-1/16" 10-spline input shaft. The '94-95 Mustang T5 had a 0.67" longer input shaft & uses a unique bellhousing for the SN-95 platform. However, this input shaft can be swapped with an '89-93 Mustang input shaft.

GM used a two different input shafts. The input shaft used behind V8 engines (both WC & NWC) was 1-1/8" 26-spline while the input shaft destined for 4/6 cylinder engines was 1" 14-spline. The exception to that is the '93-'96 V6 F-body applications which used the 26-spline input shaft & the Ford case.

## Speedometer Drives

Early T-5 used a typical gear-driven, cable speedometer drive while many late T-5 used an electronic speedometer drive. In GM applications, the changeover is about '89. Ford used cable speedos through T-5 usage.

## WHICH T-5 TO USE

### S10

The S10 T-5 has garnered most of the attention due to its favorable shifter location. The S10, however, was a NWC unit through '92. There are two basic gearsets available in the S10 T-5:

1st – 4.03 2nd – 2.37 3rd – 1.49 4th – 1.00 5th – 0.86  
1st – 3.76 2nd – 2.18 3rd – 1.41 4th – 1.00 5th – 0.72

As a general rule of thumb, regardless of engine, ALL S10 T-5 prior to '85 received the 4.03 gear set, while ALL S10 T-5 after '86 got the 3.76 gearset. The "S10" T-5 was also available in the equivalent GMC T-truck.

The speedometer changed to electronic with the '90 model year, however, some '89 model T5 came with electronic speedos if they were equipped with the optional digital dash. These can prove problematic for swaps, but output shafts & tail housings can be swapped with cable-driven speedo models.

The Astrovan T-5 is worth mentioning. With an offset shifter which can be replaced with an S10 shifter, it makes a good candidate for swaps too. The 4-cyl vans used the 3.76 gearset, but the ratios found behind the V6 are better than the S10:

1st – 3.50 2nd – 2.14 3rd – 1.39 4th – 1.00 5th – 0.78

Tag Numbers:

S/T Truck – 4.03 Gearset – 010, 012, 013, 014, 033, 042, 043, 055, 056, 057, 058, 146

S/T Truck – 3.76 Gearset – 107, 108, 110, 136, 145, 186, 191, 192, 193, 201

Astrovan – 3.76 Gearset – 170, 180, 190

Astrovan – 3.50 Gearset – 101, 148, 149, 164, 179, 189

Mustang

Introduced in '83, the T-5 arguably gained its fame in the Mustang 5.0. The first to take the step up to WC in '85, Ford used the T-5 through the Fox-body & SN-95 chassis ending in '95. The strongest T-5 available was found in later Mustangs and available through Ford's Motorsport & SVO operations.

Available with a few different gearsets, the most common gearing was from '85 through '95:

1st – 3.35 2nd – 1.99 3rd – 1.33 4th – 1.00 5th – 0.68

The other V8 gearset used was the NWC '83-84:

1st – 2.95 2nd – 1.94 3rd – 1.34 4th – 1.00 5th – 0.62

Ford rated their T-5 anywhere from 260lb/ft to 335lb/ft depending on the application. In '89, stronger alloys were used upping the torque rating from 260lb/ft to 300lb/ft. The 310lb/ft rating belonged to the '93-94 Cobra spec T-5 and an aftermarket-only Z-spec T-5 was available with 335lb/ft.

The late-model (94-95) 3.8 V6 T-5 was rated at 265lb/ft, had the slightly longer input shaft, and had the following ratios:

1st – 3.35 2nd – 1.93 3rd – 1.29 4th – 1.00 5th – 0.73

## Tag Numbers

NWC V8 – 034, 065

3.8 V6 – 220, 236

V8 260lb/ft – 126, 165, 169, 141

V8 300lb/ft – 199, 204, 208, 246, 218, 219

Z-spec 335 – 249, 251

SVO – 200, 202

Cobra – 239, 242, 253

## GM F-Body

GM used the T-5 in F-body cars behind all engines. In general, the I4/V6 got the following ratios:

1st – 3.50 2nd – 2.14 3rd – 1.36 4th – 1.00 5th – 0.78

Although some 4-cyl cars got the 3.76 gearset as used in the S10 & a few V6 cars actually got the 4.03 gearset.

The V8 F-bodies typically got the following Gearset:

1st – 2.95 2nd – 1.94 3rd – 1.34 4th – 1.00 5th – 0.73

It's worth noting again that the '93-95 F-body V6 cars got a Ford case with a GM input shaft. There were no V8 T-5 during these years.

## Tag Numbers

V8 2.95 NWC – 028, 062, 070, 072, 157, 185

V8 2.95 WC – 159, 160, 175, 176, 195, 196

3.50 NWC – 015, 027, 061, 156

3.76 NWC – 054, 083, 158

4.03 NWC – 181

4.03 WC – 177

NWC Other (unk app/gears) – 071, 084, 150, 166, 178, 182, 183

WC Other (unk app/gears) – 197, 212, 213, 214

WC Ford Pattern – 210, 245, 247

## **ADAPTING THE T-5**

### Shifter Placement

The Mustang and F-body T-5 both have rear mounted shifters at the end of the tailshaft. These often make difficult swaps and shifter placement, particularly in early Fords, is untenable.

*L-R Early Ford Toploader, S10 T-5 w/Adapter, Mustang T-5*





The S10 T-5 is often selected due to the shifter placement (approx 7" further rearward than early Ford), but typically lacks desirable gear ratios or the increased strength of a WC unit. Because of the T-5 excellent interchangeability, the tail housing and top cover from an S10 can be swapped onto other T-5. There are a few issues when doing this.

The first is a small plastic oiling funnel found on the countershaft and retained by the tail housing. These are different from WC to NWC, but it is primarily due to changes in the tail housing casting, not an internal oiling issue. Consequently, this plastic funnel should stay with the tail housing. So, use the S10 plastic funnel when swapping an S10 tail housing onto a WC T-5.

### *T-5 Countershaft Oiling Funnels*

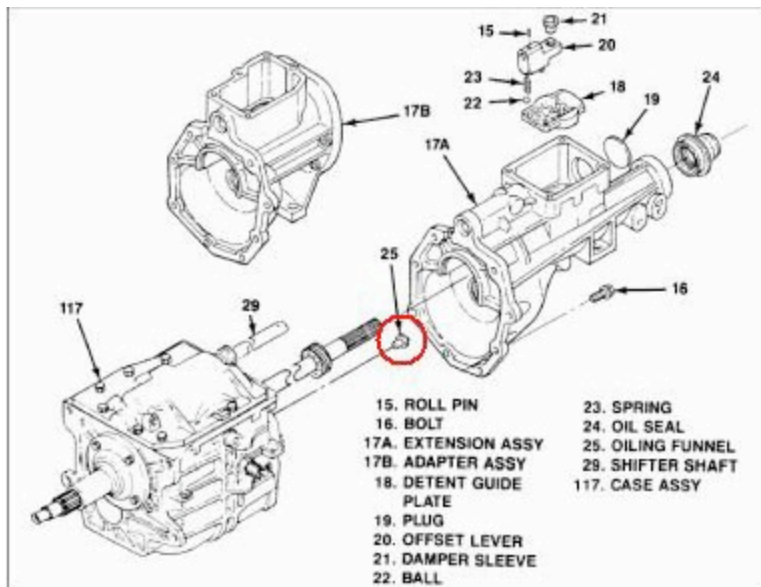


Figure 3-3. T5 WC Extension or Adapter

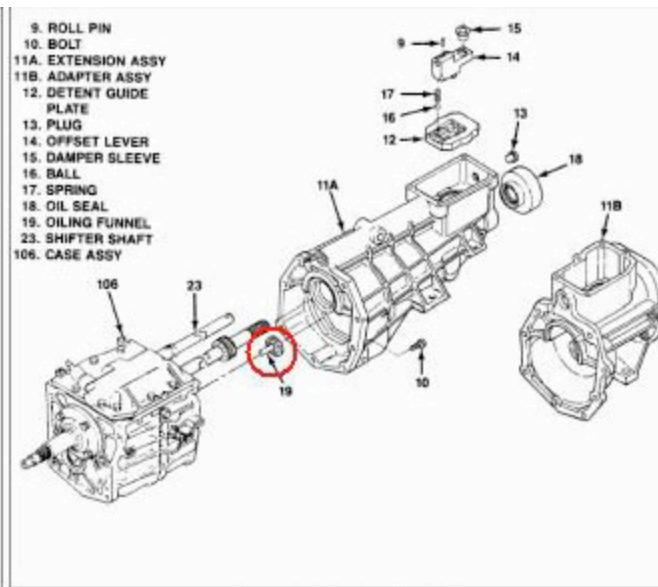


Figure 4-2. T5 STD Extension or Adapter

The second issue is that of speedometer gear. Typically, when installing an S10 tail housing and top cover onto a WC T5 from a Mustang or F-body, the speedo gear will no longer align with the driven gear mounting hole in the housing. The output shaft has a built up area where the speedo drive gear mounts with a clip. Moving the gear requires building up the output shaft with shim stock. An excellent example of how to do this is found on the inliners website at: <http://www.inliners.org/Jack/T5tech.html>

Finally, if putting an S10 tail housing onto a Ford T-5, you will probably have to change the tailshaft bushing for the Ford one. This is due to different diameters of the output shaft.

## Adapters

Adapting a GM (pre-'93) T-5 to any other GM product is pretty straightforward. Just find a

bellhousing that will accept any standard Chevy-style transmission and bolt it all up. You'll have clutch linkage to sort out, but putting the trans behind the engine is easy.

Adapting a Mustang T5 to a post-64 Ford bellhousing is pretty straightforward too. A thin, flat-plate adapter used by the early Mustang crowd is all you need. However, the easiest solution is to use the bellhousing from a late-model 5.0 Mustang – no adapters required.



*65-Up Ford Adapter*

Adapting a Mustang T5 to a '49-64 Ford bellhousing is also relatively easy. The bottom two bolts line up well, one top bolt will need to be re-drilled, and the other top bolt will likely need an ear welded onto the bellhousing to finish it all off.

When adapting a GM T5 to a Flathead Ford, there are several options. Offenhauser makes two adapters – one for the early, internal clutch linkage and one for a more modern clutch fork. Speedway sells their own version of these adapters for a little bit lower price. Cornhusker also sells a complete kit with the adapter and other items (like pilot bushing, input shaft sleeve, etc).



### *Speedway Clutch Fork GM Adapter*

Another option is to use a machined flat plate and the “hogshead” or mini-bellhousing from a '46 and up Ford truck 4-speed. Dwight Bond (eBay ID 007Dwight) in Gibbon, NE sells these for very reasonable and you'd be hard pressed to buy the material and pay for the machining for what he asks. He also has the special pilot bushing and input shave sleeve. There are also plans for the flat plate available from George Greenbaugh (eBay ID community-chest) for the hard-core do-it-yourselfers.



### *Dwight Bond Flat Plate Adapter on Hogshead*

To use the Ford pattern T-5 behind a flathead is a bit more work, but a company in New Zealand, Mac's Speed Equipment, builds this adapter. Their webpage is:

[http://www.macsspeed.com/adapters\\_2.html](http://www.macsspeed.com/adapters_2.html) I believe Vern Tardel also makes an adapter to use the Ford T-5 behind a flathead.

## **Input Shafts**

As mentioned, input shafts vary by application and there are three general sizes, Ford, Chevy V8, and small Chevy. When adapting the T-5 to a flathead, or many other early engines, the input bearing retainer where the throwout bearing rides may be too small if using the original throwout bearing. A simple sleeve-type adapter can be used and are easily made by any competent machine shop, or readily available either in kits from Speedway or Cornhusker, or separately from Dwight Bond and others.

## **Clutch Disks**

As a rule of thumb, any clutch disk that has the correct input shaft size/spline count and

correct diameter for the pressure plate will work. The Astrovan clutch disk seems to be popular when doing the flathead conversion, but check the clearance on the flywheel retaining bolts. Some clutch disks will not clear the bolt heads and cause problems later on. The very best option is to have the correct center hub installed on the flathead disk by a good clutch rebuilder.

## **Shifters**

One of the T-5 weak points is the stock shifter. There are no positive stops on the shifter itself, so it is easy to “over shift” the transmission. This can cause bending and cracking of the shift forks and is most notable when really banging the gears hard. This flexing of the shift forks will result in damage to the synchros. One of the best things you can do, especially if you like to shift hard or fast, is to use an aftermarket shifter with positive stops that are correctly adjusted in accordance with the manufacturer’s recommendations.

Shifter handles can be modified simply by cutting off the original shifter and welding on the handle of your choice to the stub. Some shifters are two-piece with a rubber isolator that can be torn off and a new handle welded on. If you use a Mustang transmission, the shifter handles merely bolt on to the stub.

## **Throwout Bearings**

Which throwout bearing to use will depend on specifics of your swap. If you’re running a flathead in an original Ford frame, it may be best to use one of the adapters that allows you to retain the stock clutch linkage and throwout bearing. This will provide the neatest

solution.

Hydraulic slave cylinders are easily adapted in both push and pull configurations and may be the best way if building from scratch or using a less common setup/swap. In this case, use a throwout bearing that will readily adapt to your linkage. In some cases, you may have to sleeve the input bearing retainer, while in others, you may use a T-5 OEM throwout bearing.

Hydraulic throwout bearings are also available, but reviews and results are decidedly mixed and they tend to be quite pricey.

## MISCELLANEOUS

### Rebuilding

The T-5 is as straight-forward as most other modern manual transmissions and require a minimum of specialized tools. Two excellent resources are available online, the Borg-Warner Technical Service Manual here: [http://www.ttcautomotive.com/English/media/pdfs\\_autogen/T-5\\_Service\\_Manual.pdf](http://www.ttcautomotive.com/English/media/pdfs_autogen/T-5_Service_Manual.pdf) and a good how-to rebuild manual here: <http://pomoforacing.com/tech/T5Rebuild2002.pdf>

Endplay is the key to any manual tranny and the T-5 is no exception. Shim packs are still available from Ford and small parts kits are available from several sources online.

### Oil

All NWC T-5 use 70WT Gear Oil or Redline MTL.

ALL WC T-5 use ATF.

Do not use gear oil in a WC T-5. Use a quality synthetic oil (regardless of which type you need to use) & change it frequently (every 15-20K). Fill to the fill plug – about 5-1/2 pints or 2-1/2 quarts.

## **Open Drive**

For a flathead conversion, you'll probably need to convert to an open drive setup. Hot Rod Works and Speedway, as well as several others, sell a conversion kit for your banjo rear. Alternatively, you can swap to a modern rear like an 8" or 9" rear. You will need to replace the torque tube with some sort of locating device if modifying your banjo – the stock radius rods simply aren't up to the task.

## **Closed Drive**

While I haven't done it yet, I am in the process of converting a Jeep T-5 transmission to accept the torque-tube and stock early Ford U-joint. This should require crossmember modification, spline adapter, flat-plate adapter to accept the bell mount, and shortening the torque-tube/driveshaft. I will post this on the HAMB when I complete it. Who knows, maybe I'll produce a kit if I'm successful!





*Jeep T-5*

## RESOURCES

The following is a list of various websites. Most are pretty good, nearly all also have errors (like I'm sure this article does too). Most errors, are errors of omission that can lead to misunderstanding or confusion, however, there are some errors of fact on many of these pages.

[http://www.vanpeltsales.com/FH\\_web/t5\\_fivespeed.htm](http://www.vanpeltsales.com/FH_web/t5_fivespeed.htm)

<http://www.flatheadv8.org/t5-swap.htm>

[http://www.moderndriveline.com/Technical\\_Bits/t5\\_history.htm](http://www.moderndriveline.com/Technical_Bits/t5_history.htm)

<http://www.jalopyjournal.com/forum/showthread.php?t=169265>

<http://www.5speeds.com/t5/index.html>

## SOURCES

Jim O'Clair, T-5 Transmission Swaps, Hemmings Muscle Machines, July 04  
Hokey Assed Message Board, <http://www.jalopyjournal.com>

Inliners International Board, <http://www.inliners.org>

POMOFO Racing, <http://pomoforacing.com/>

Transmission Technologies Corporation, <http://www.ttcautomotive.com/>

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