

# ModTiger Engineering LLC

## TECHNICAL TIPS

### ON THE SUNBEAM TIGER

Rev 0 Dec. 05

This Tip is the Assembly procedure for installing the ModTiger Tailhousing on a new Ford Specification T5 transmission



**Fig. 1** This is the Ford Motorsport spec T5 Transmission, p/n M-7003-Z. It is Also known by it's Tremec p/n 1352-249 and has a 2.95 first gear ratio and a 0.668 OD ratio as received.

I start with a couple of **Warnings**. The orange tag states that the transmission has no oil. This is not true. It contains about a cup of gear oil from it's assembly. Even after you drain the main case, it will run out when you separate the tailhousing from the case, so be prepared or you will have a mess to deal with. You will want to let all of this oil drain out to allow oil-free surfaces to seal the main case to the new tailhousing. Secondly, this is a relatively simple disassembly-assembly procedure but requires reasonable mechanical skills and some standard hand tools to accomplish. A list of the tools required is at the end of this document. Carelessness can allow other internal components in the main T5 case to come out of position requiring further disassembly.

Disassembly begins with the removal of the shift lever. The stamped plate is sealed to the casting with RTV and will require some persuasion (see Fig 2) to pop free. This shifter will not be reused and can be set aside. Remove the plastic bushing in the cup of the shift block and save it. Next position the transmission in neutral where the shift block can roll through the H pattern. The small 3/16 hole in the shift block contains a roll pin locking the block and shift rod together. A 3/16 drift is used with a small hammer to drive this pin down about 3/4 inch until the block is free from the shift rod. The shift block also contains a spring and ball (see Fig 2A), which travels in the detents of the shift gate located in the bottom of this box.



**Fig. 2 & 2A** Tap the shifter loose using a drift. **Fig 2A** shows the Ford shift block and it's components except the roll pin which will stay in side until you drive it out for reuse in the new assembly.

Now were ready to remove the case bolts and separate the tailhousing from the main case. The hex size of these bolts is 15 mm and all but two will be reused. Save the ID tag for future re-attachmment. Note, the shift rod will stay in position as you slide the tailhousing off the Trans assembly. Remember to plan for the oil drainage.



**Fig. 3** Removing the Case Bolts with a 15 mm socket.

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**Fig. 4** Here's the transmission with the tailhousing removed. Note the protruding shift shaft and the oil stain from disassembly. Save the rubber seal on the splines, it will seal on the input yoke of the longer driveshaft supplied in the kit.

Next up is the removal of the Neutral Start Switch, see Fig 5. The new Shift Shaft has no provision to operate this switch and it will not be reused. When the switch is unscrewed, fish out the 1/8 dia rod that activates the switch (see fig 5A). Forgetting this little rod has caused at least one T5 (not mine) to jam when it was inadvertently left in the cover plate.



**Fig 5 & 5A** Don't forget me !

Now it's time to remove the bolts holding the top plate to the transmission. A 10mm socket will take care of these screws and they will all be reused. You'll need to pry upwards slightly to break the RTV seal. Find the slots in the corners of the top plate and use a thin screwdriver to pry GENTLY to break the seal. The top then slides to the right to disengage the shift linkage (see Fig. 6).



**Fig. 6** The Top Plate slides right to free itself from the internal shift linkage.



**Fig. 7** This is the working part of the Top Plate with the forks rolled to the side. You can see the 3/16 roll pin that keeps all these pieces assembled and in position. You may want to take notes and/or a digital shot of this mechanism as it will go together in different ways and only one is correct.

Next, we remove the Ford Shift Rod from this assembly by punching the roll pin down out of the mechanism and into the top. Make sure you have the roll pin exit area away from anyplace that will damage a bearing surface. This time the pin will be driven all the way out with the drift. Take care to keep the components "in position" as much as possible as it will make insertion of the MTE shift rod easier. The front of the MTE shift rod is easily identified by the hole drilled into the centerline of the shaft. Insert this drilled end forward into the rear of the Top

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A little grease on the MTE Shift Shaft will make things slide a little easier. When you have everything pretty much in line, use the 3/16 drift to line up the holes in the linkage and the shift shaft. Then use a pair of long nose pliers to hold the roll pin while you drive it back into position. It will be driven just below the surface to allow it to pass through the slots in the linkage.



*Fig. 8* Keeping things aligned as you drive this pin back into place is one of the trickier techniques during assembly. Note the vent hole in the front of the shaft. This keeps the oil from being trapped in the Top Plate front Shift Rod bushing.

The top plate is now cleaned of old RTV and temporarily reinstalled on the transmission. Guide the forks into position with the top slid to the right side. Align the shift mechanisms as require so that the top plate will glide left and into position. Install the two retaining bolts with the large shanks to align the top on the case and snug them down.

The rear of the transmission case is now cleaned of all old traces of RTV. A putty knife and sharp wood chisel are good tools to scrape this sealant off the surface without gouging the sealing face of the case. Next we do the first fit of the MTE Tailhousing onto the transmission assembly. I use a plate bolted to the front of the transmission in my machinists vise to hold the transmission firmly in the horizontal position. Guide the Tailhousing over the output shaft and allow the Shift Shaft to enter the 1 inch hole in the front shift box. Carefully move it forward as the speedo gear passes the tight spot. The tricky parts here are to keep the rear transmission bearing forward in the main case and getting the 5th gear shift rod into its blind hole in the tailhousing as you wiggle it around. Practice this a few times until you get the "feel" for this assembly. Again a little grease on the tip of the 5th gear shaft can ease this process. When the shaft slips into the blind hole, the case will move forward and allow you to put a few case bolts into position. Snug them up. Pictures would not do any good in this situation. You need to develop the "feel" for this portion of the assembly. Next you going to drill the holes in the main case that will allow

you to cut and remove one of the perimeter case bolts. If left in place, that bolt would substantially interfere with the Tiger transmission tunnel.

Now that you have the preliminary assembly completed, we're ready to drill the holes for the two 1/4-20 screws that will replace the 10mm case bolt that interferes with the tunnel. The MTE housing is pre-drilled with two #7 holes adjacent to the bolt to be removed. Find a good quality #7 drill and a drill motor that will allow it to drill through the main case, (see Fig. 9). Align the drill carefully and drill each hole until it breaks through the case.



*Fig. 9* Find an appropriate drill and drill motor that will allow you to use the existing #7 holes in the tailhousing to align the drill so that you can drill all the way through the case without "ovalizing" the guide holes.

Next you will separate the case and Tailhousing again and drill the new #7 holes, **in the transmission case**, out to 1/4" dia for bolt shank clearance, (see Fig. 10). Hold the drill alignment as best you can while enlarging these holes. Now we tap the Tailhousing to 1/4-20. I recommend a good gun tap and a block to maintain perpendicular alignment for this process. I specifically didn't tap these Tailhousing holes to allow for the best possible alignment for drilling the case holes.



*Fig. 10* Carefully re-drill the tap holes in the case to 1/4" Dia.

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Now we re-assemble the Tailhousing and the case, snugging up a few bolts again. It's time consuming, but next we run the 1/4-20 tap through the case into the tailhousing. This will clean up any minor misalignment in the holes, before we attempt to install the bolts. After blowing out the last of the chips, you should try the 1/4-20 socket head screws to make sure they will go in and pull up successfully.

With these new bolts in place, it's time to cut off the interfering bolt area. A Sawzall (or equivalent reciprocating saw) is a great tool for this application. From here the pictures tell the best story.



**Fig. 11** Start here at a slight angle to the rear but almost vertical.



**Fig. 12** Saw through the hole taking most of the ear off.



**Fig. 13** Here's our completed cut before grinding

With the bolt ear sawed off, it's time to grind the area for a smooth finish. I use a multi flap disc to make short work of stock removal. I grind down until the hole and threads essentially disappear, then blend the edges and about an inch forward on the stiffening fin, (see Fig 14). Break the edges of the case and tailhousing to reduce their sharpness.



**Fig. 14** Here's the grinding completed before breaking the edges.

Now we need to remove the Shift Gate (ref Fig. 18, pg 5) in the Ford tailhousing. There are several ways of accomplishing this task. This sintered steel piece is pressed into a blind hole. You can drill a hole from the bottom, through the counterweight flange, (see Fig 15), or you can saw a Vee removing the lower portion of the tailshaft housing, (see Fig 16). In either case, a drift is used to push the exposed Shift Gate out of the recess it's pressed into.



**Fig. 15** Here's one way of getting to the Shift Plate. Locate the approximate center, drill down through both walls and drive the Shift Plate out. The Shift Plate is VERY hard and you won't damage it with a drill bit. Alternatively, depending on tool availability, you can simply saw down to the bottom of the Plate and knock out the remaining aluminum casting with a hammer for access to the Shift Plate.

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**Fig. 16** Here's another alternative for gaining access to the Shift Gate. By sawing a vee out of the housing, you can open a slot to place a drift to drive it out.

After you have the shift Gate out of the Ford housing, you have to get it into the MTE housing. It only goes in one direction, but you need to be careful to align and press it straight into the recess. This can be quite a challenge. I have a holding fixture and a hydraulic press to do this in my shop, but I've also installed them in the field with a large hammer and block. If you going to install it this way, it will help if you sand the leading edge slightly to allow it to drop a little farther into the recess before the perimeter tangs get tight. If this transmission will be using an alternative 0.8 OD gear set, you may also need to notch (see Fig. 18) a little clearance into the bottom edge of the Shift Gate for clearance. The diameter of the output gear is very close to the edge of the gate when installed. With these modifications complete, align the Shift Gate and drive or press it until it bottoms in the recess.



**Fig. 17** This is what the bottom of the shift gate looks like after it's pressed out. The tangs are all around the perimeter of the portion that is pressed into the housing. Breaking the leading edge with a sander will allow a little easier fir into the housing recess. Make very sure that this piece presses in straight, otherwise the tailhousing can be damaged or broken.



**Fig. 18** Here you can see the notch sanded into the edge of the Gate that is close to the 0.8 OD gear. This relief is excessive for demonstration. You only need about 1/8 of an inch to assure clearance with the gear.

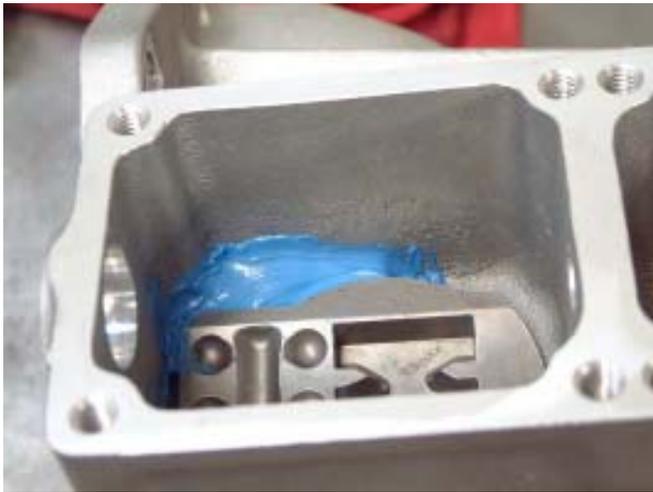
With the Shift Gate pressed in to place, the next step is to close the opening between the front shift box and the 5th gear cavity. The casting wall got too thin to maintain a closure in this area. This is done with a good glob of RTV sealant. If this opening is left open, oil flung from the rotating gears below might fill up the shift box and adversely reduce the oil level in the transmission case. RTV is used because if this plug ever came loose, it would not damage the gears.



**Fig. 19** The masking tape will give the correct shape to the bottom of the RTV plug.

I use a good masking tape to seal the inside cavity as shown above, then I fill the gap between the Shift Gate and the box wall from the top, with Ultra Blue RTV. This plug is about a 3/8" thick and will take a day to cure. After the plug is solid, remove the masking tape and a minor touch of RTV from the bottom of the cavity will make this plug permanent.

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**Fig. 20** Here's a shot of the RTV plug from the top. Keep the RTV off the surface where the ball detent will travel. This is one area where the nozzle cone that comes with the RTV package really does come in handy.

Now were ready to complete the transmission assembly. We begin this process by rechecking the sealing surfaces and removing the last traces of old sealant and any oil or grease.



**Fig. 21** This is the level of old RTV removal that I use before re-assembly.

The first piece to assemble is the top cover. I place the RTV on the transmission case. A bead equal to about 1/8 inch is plenty. Make sure the gears and top linkage are all in the neutral position. Hold the top by the protruding

Shift Shaft, lower it just off the surface, engage the shift forks in the syncro slots and slide it to the left to engage



**Fig. 22** Run the bead of RTV around the perimeter and circle the bolt holes.

When the linkage engagement allows the top to move left, align the bolt holes and install the two large shank screws to zero in on the alignment. Then install all the perimeter bolts and tighten.



**Fig. 23** You can use a 3/16 drift to shift through the gears and double check that everything is in it's correct place. Make sure you hold the output shaft rear bearing in the case while you check the functions so that the transmission internals don't come out of position.

We haven't discussed this point yet but now is the time you need to decide which of the three available speedometer drive gears you're going to want inside. The Ford spec transmission comes with a 7 tooth (yellow) gear. Both 6 tooth (black) and 8 tooth (green) drive gears are available to fit. The choice depends on the rear end ratio and tire size you want to use. I have all the gear and tire size calculations available for the 980 rev per mile Tiger speedometer. The driven gears are available in tooth counts from 16 to 21 so you can get close to optimum, but the internal drive gear does give you more selection

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Unless your going to continue immediately with Tailhousing assembly, make sure you wipe any excess RTV off the rear of the case so that it doesn't harden and interfere with the next seal.



**Fig. 24** Here's the typical application of RTV on the sealing face of the tailhousing. You don't need it around the top ring, the O-ring on the cover does the sealing in that location. A dab of grease on the O-ring makes assembly smooth.

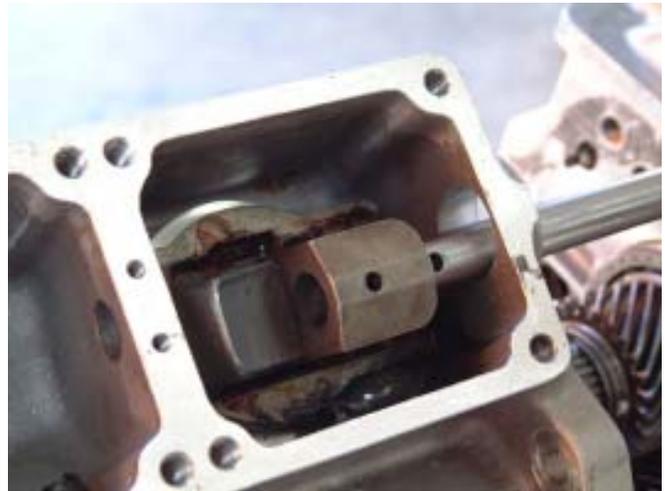
Next we apply a similiar bead of RTV on the sealing surface of the tailhousing. You can be extra liberal around the two 1/4" bolt holes. You want as much seal as you can get here.

This kit comes with two Shift Blocks shown in Fig 25. The front one has a guide tang on the bottom surface which travels and restricts motion in the H pattern in the Shift Gate at the bottom of the front box. The second Shift Block has a hole for the shift lever but has no tang on the bottom. This block fits in the rear hole. The tang has been removed to eliminate interference with the speedometer gears. **Make sure that the 3/16 roll pin is NOT in the Shift Blocks before you continue assembly.**

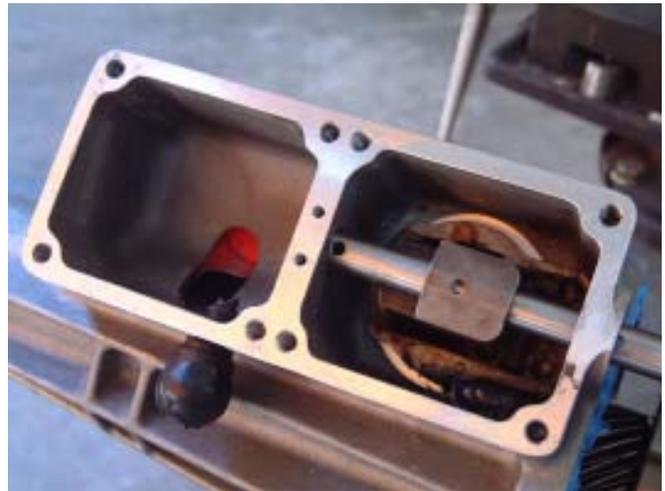


**Fig. 25** Here are the two Shift Blocks and related mechanisms supplied with the Kit. Note that the one on the right has been modified by sanding the peg off the bottom. They are displayed on the shift shaft in the correct positions. The Block with the peg goes in the forward box above the Shift Gate. The Block without the peg goes in the rear box and accepts the shift linkage.

Next you select the short Shift Block with the guide tang on the bottom and insert the detent spring into the blind cavity next to the tang. The detent and H areas of the Shift Gate is liberally greased and the detent ball is placed in the rearmost ball recess. A dab of grease is placed on the end of the Shift Shaft. The Shift Block is placed in the front shift box and placed so that the detent spring engages the ball. While pressing down on this assembly, the tail shaft and Shift Shaft are engaged. The Shift Shaft passes through the 1" dia. front hole and into the hole in the Shift Block as seen in Fig.26. As the tailhousing is moved forward, the hole between the shift boxes is engaged as seen in Fig. 27.



**Fig. 26** This now becomes a multi-tasking procedure. You have to hold the shift block and it's components in position in the front shift box as you engage the tailshaft and shift shaft with the housing.



**Fig. 27** Lots of free pieces here until the Shift Shaft enters the rear hole. Note, the two holes seen here in the center wall were eliminated in production castings.

As the tailhousing nears the rear of the transmission case, the 5th gear shaft and housing must be maneuvered until the shaft enters it's blind hole. This was done previously during preliminary assembly. When everthing is lined

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up, the case bolts can be started. The top hole under the shift box uses a socket head screw. The other bolts are reused. If a bolt enters the case interior, a coating of RTV should be applied to the threads prior to engagement. Bolt that are outside the case need no extra sealant. The threads of the two 1/4-20 bolts are then coated with RTV and screwed in to the assembly. Tighten the case bolts first and then the 1/4" bolts. Torque recommended for the case bolts is 20 to 45 ft-lbs. The 1/4" bolts should be considerably less, just snug. You can wipe off the excess RTV or wait until it sets and peel the excess.

The 3/16 drift can now be used to align the Shift Block with the hole in the Shift Shaft. It can be used as a lever to test the shifting functions. Test all 6 positions, 1-5 and reverse. When this test is successful, place the 3/16 roll pin in position and drive it through the shaft assembly until it is flush with the surface of the Shift Block. The Shift Block with the removed tang is then placed in position in the rear hole, and the second 3/16 roll pin is in-

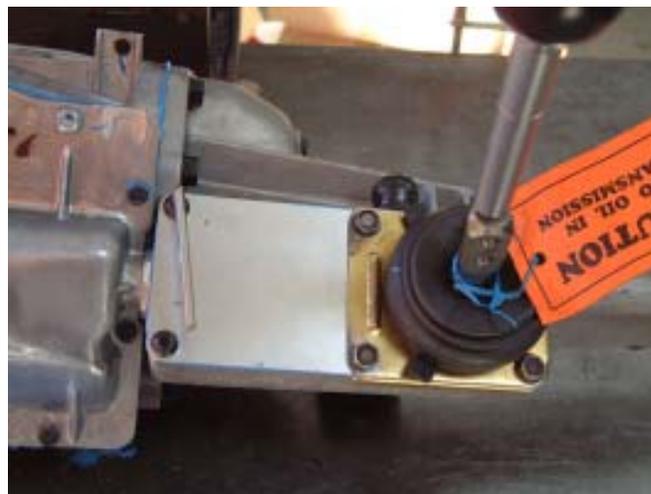


**Fig. 28** Here we have the shift box assembly complete. The vent bulb is installed and the bushing for the shift lever is greased and inserted in the rear shift block. RTV has been placed to seal this area.

Next were ready to install the vent bulb removed from the Ford Tailhousing. The hole is already drilled in the rear shift box wall. Grab the tip of the bulb with a pair of long nose pliers and pull it into the hole. Alternatively, You can install a looped tube to accomplish the venting. This would be more appropriate if you were going to use this transmission for more spirited competition such as open track.

After installing the lever bushing and sealant, were ready to close up the boxes. The thin aluminum plate is installed covering the front hole and allowing access for the shift mechanism in the rear hole. No sealant is applied to the shift mechanism at this time as it will only be used to create the seal between the thin cover and the tailhousing. Install the shift lever ball in the bushing and

lower the shifter into position. Install all 6 5/16 bolts and tighten them down.



**Fig. 29** Two 5/16 bolts hold down the front of the thin plate. The other four hex head bolts hold the shifter to the tailhousing.

While the RTV is setting up, you can install the shift lever and try shifting the transmission. The shifts should be smooth and free with no binding. After the sealant sets, the shifter mechanism can be removed.



**Fig. 30** The screw threads on the 5/8-18 set screw are coated with RTV and this screw is used to close the hole in the top cover. The threads of the 3/8 pipe plugs are similarly coated and used to seal the drain and fill holes in the tailhousing.

The transmission is ready to install at this point. I use plugs to close the openings at the tailshaft and speedometer so that I can add a quart of Mercon V ATF, and let it sit for a while to assure that there are no oil leaks. The full load of Mercon V is 2.5 quarts so you will add another quart and a half after installation. The Mercon V is strongly recommended over synthetics. They may be slippery but they also can also cause malfunction of the syncro rings, particularly on 5th gear. Don't forget to remove the shifter mechanism before you attempt to install. It won't fit with the shifter in place. Please call if you have questions or problems with this procedure.

Tom Hall

ModTiger Engineering

## Tools & Material list

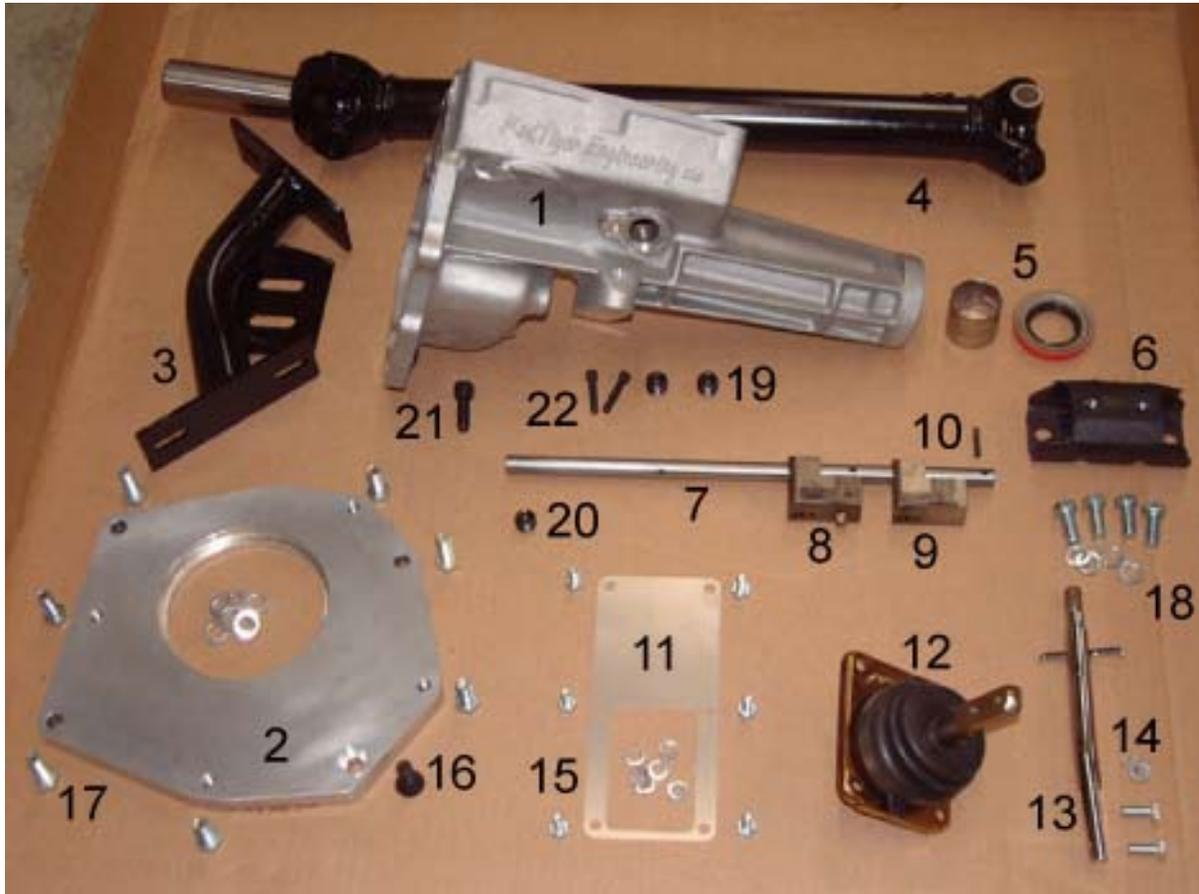
3/8 Ratchet  
1/2 or 13 mm socket  
Taper drift  
Hammer  
3/16 drift  
15mm socket  
7/8 Open end Wrench  
10 mm socket  
Gasket scraper or Chisel  
#7 Drill Bit  
1/4-20 Tap preferably Gun Tap  
Block to support Tap Vertical  
1/4 Drill Bit  
Socket to fit 1/4" tap  
8MM & 3/16 Hex Wrenches

1/4 or 3/8 Hand Drill  
Sawzall or equivalent reciprocating saw  
4" or larger Angle grinder  
Sanding Disk or Flap Disk

### Assembly Materials

RTV Silicone Sealant preferably "Ultra"  
Masking Tape  
Multi-Purpose Grease

***\*Note - you will need to develop a method similar to the one previously described to align and press the shift gate into the MTE tailhousing.***



### Kit Components

- |                            |                      |                                    |                                |
|----------------------------|----------------------|------------------------------------|--------------------------------|
| 1. MTE Custom Casting      | 7. Shift Shaft       | 13. T- Shift Handle, Short or Long | 19. 2 ea. 3/8 Pipe Plugs       |
| 2. MTE Adapter 5 or 6 bolt | 8. Front Shift Block | 14. 2 ea. 8mm Shift Handle Bolts   | 20. 5/8 -11 Neutral Start Plug |
| 3. Transmission Mount      | 9. Rear Shift Block  | 15. 6 ea. 5/16 Cover/Shifter Bolts | 21. 10mm SH Case Screw         |
| 4. Longer Driveshaft       | 10. 3/16 Roll Pin    | 16. 1 or 2 (AR) 7/16 FH Bolts      | 22. 2 ea. 1/4-20 Case Screw    |
| 5. Bushing & Seal          | 11. Cover Plate      | 17. 6 or 7 (AR) 7/16 Hex Bolts     | 23. Lock and flat washers      |
| 6. Rear Rubber Isolator    | 12. Modified Shifter | 18. 4ea. 7/16 Isolator Bolts       | (AR) As Req'd                  |