INSTALLATION INSTRUCTIONS FOR THE
MOTOR TRIKE HARLEY MECHANICAL REVERSE
1999-2006 FIVE SPEED SOFTAIL
LAST UPDATED: OCTOBER 2012
AS THE INSTALLER OF THIS MECHANICAL REVERSE, YOU MUST BECOME FAMILIAR WITH PROPER OPERATION OF THE REVERSE. BEFORE YOU BEGIN THIS INSTALLATION, READ THE OPERATION INSTRUCTIONS CAREFULLY.

The Owner's Manual is included with the shipment and contains the operation instructions. It can also be found on the dealer website. Review these instructions with your customer to be sure they understand how their new reverse works.

***THE OWNER'S MANUAL MUST BE GIVEN TO THE END USE CUSTOMER AFTER COMPLETING THE INSTALLATION.***

Thank you for choosing the Motor Trike mechanical reverse system. We hope you enjoy the product and we ask that you follow these instructions very closely. Doing so will save you time and ensure that the customer’s experience with their new reverse is a positive one.

**We strongly suggest that you read the complete instructions before beginning the installation process to eliminate the possibility of performing unnecessary work.**

This reverse kit fits 1999 - 2006 Harley Davidson five speed transmissions. The oil line kit (sold separately) makes the reverse gear compatible with the 1999-2006 Softail models.

**If you do not have the proper tools to do this installation, do not attempt to perform the installation.**

Having a safe and clean environment and using the proper tools is essential for a successful installation. You must have the ability to secure the motorcycle to prevent the bike from moving or falling during the reverse installation. We strongly recommend the use of a motorcycle lift manufactured by Handy Industries. It allows you to lift the bike to a comfortable work level while maintaining a safe and stable environment. In addition to a lift, we recommend having a front tire clamp and center stand to support the bike under the center section of the frame.

**Failure to secure the vehicle during installation could result in injury up to and including death.**

**It is critical that proper eye wear, ear protection, and protective clothing is worn throughout the reverse gear installation.**

When you receive your kit, please check to ensure that all parts and hardware are included. If there are any parts missing or if you have any questions concerning the kit, call Motor Trike at 1-800-90TRIKE (800-908-7453) Mon-Fri 8am-5pm CST. Or you can email us at INFO@MOTORTRIKE.COM
Motor Trike Inc. reserves the right to change specifications, equipment, or designs at any time without notice and without incurring obligation.
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SECTION 1 – Tools Required

1.1 - Specialty Tools (Included with reverse gear kit).
- MTTR-0074 Universal Reverse Gear Installation Tool
- MTTR-0098 Reverse Gear Boring Burr

1.2 - Normal Hand Tools
- 1/4” Air Ratchet
- 3/8” Drive Ratchet
- Allen Wrench Set
- Center Stand
- Hydraulic Floor Jack
- Set of Combination Wrenches
- Set of Sockets
- Set of Allen Sockets
- 3/8" Drive Torque Wrench
- Various Ratchet Extensions
- Various Flat Head and Phillips Screw Drivers
- Brake Cleaner
- Hand Drill
- Internal Snap Ring Pliers (Hydraulic Clutch Only)
- External Snap Ring Pliers (Hydraulic Clutch Only)

In addition to the above items, you will need shop supplies such as electrical tape, wire ties, and blue Loctite 242, Loctite thread sealant 565.
SECTION 2 – Pre-Conversion Inspection

2.1 – Kit Inspection

Included in your kit is a bill of materials or pull sheet listing the parts included with the kit. The pull sheet will be your guide while reviewing your kit to ensure you have all the required parts. Review the kit as soon as you receive it.

If any of the parts are missing, damaged, or you have any questions concerning them, please call Motor Trike, Inc. at 1-800-90TRIKE (800-908-7453) Mon-Fri 8am-5pm CST.

In addition to accounting for all of the parts that you should receive with the kit, you should inspect the assembled kit. While inspecting the kit you should:

- Check that all nuts, bolts, and screws have been properly tightened and marked
- Shifter mechanism operates smoothly and locks in and out of reverse.

2.2 – Bike Inspection

Before you begin the installation, it is important to inspect the motorcycle to ensure that it is ready to accept the reverse kit. The motorcycle must be in good mechanical condition and the following parts should be inspected and accounted for:

- Straight frame that shows no signs of damage
- All engine and transmission mounts in good condition
- Factory exhaust header pipes. Many aftermarket exhaust header pipes will work with this reverse, but it is up to the installer to determine if the aftermarket header pipes will interfere with the installation or operation of the reverse.
- Leak free exhaust system. Buy any exhaust gaskets or clamps that need replacing now. Make arrangements to weld any cracks that might be in the header pipe.
- Properly operating transmission, shifter, and clutch. Drive the bike and make sure these components work correctly. You don't want to complete the installation of the reverse without knowing of a pre-existing condition. It is important to determine if any problems were created by the installation or if they were pre-existing.

Checking for these items will save you time later if something is missing, broken, or worn out.
SECTION 3 – Bike Preparation

3.1 – General Preparation

1. Secure the front tire, preferably with a front tire vise/clamp. We also suggest securing the front of the bike with ratchet straps attached to the front of your lift.

2. Remove the ¼” bolt located at the rear of the seat. Then remove the seat by pushing forward and lifting up on the rear of the seat.

3. Disconnect negative (-) cable from the battery.

3.2 – Removing the Exhaust

1. Loosen the exhaust heat shield hose clamps until the bands are completely out of the screw mechanisms, then remove the heat shields. This will allow access to the head pipe flange nuts. Remove the flange nuts from the cylinder heads. See Figure 1.

2. Remove the two bolts holding each muffler to the interconnect tube, then remove the exhaust as an assembly. See Figure 1.

Figure 1: Removing the exhaust system.
4. Inspect the exhaust gaskets in each cylinder head and replace if necessary.

3.3 – Removing the Clutch Release Cover & Transmission Parts

1. Drain the transmission oil into a suitable container. The drain plug is located under the bike, on the transmission pan. It can be accessed from under the bike with a socket and extension between the rear shocks.

2. Remove the bolts holding the clutch release cover in place. Leave the clutch release mechanism and cable in the cover. See Figure 2.

![Figure 2: Remove the six clutch release cover bolts.](image)

3. Remove the oil slinger by pulling it out and set aside for reinstallation later. See Figure 3.
4. **Clutch push rod removal:** Follow the appropriate step below based on how your bike is equipped.

   a. **Standard Clutch:** Using a small magnet, reach through the hole in the main shaft (shaft located toward the rear of the bike) and pull out the clutch push rod. You will replace the clutch push rod with the longer one provided in your kit later in the installation. See Figure 4.

![Figure 3: Oil slinger removal](image)
Figure 4: Pull out the clutch push rod with a small magnet. Remove the counter shaft and main shaft nuts.

b. **Hydraulic Clutch:** Remove the clutch inspection cover from the left side of the bike. With the cover removed, use internal snap ring pliers to remove the large snap ring. Pull out the clutch release bearing and push rod assembly. Remove the small snap ring with external snap ring pliers. Then remove the stock clutch push rod from the assembly. See Figure 5 and Figure 6. Note: Leave the clutch inspection cover off for now.

Figure 5: Clutch inspection cover screws.
5. Remove the nut from the main shaft and the countershaft. Leave the bike in 1st gear and have an assistant apply the brake while you loosen each nut. Keep track of the washer under each nut. They are necessary for proper gear alignment. See Figure 4.

**WARNING:** Do not push or pull on the main shaft or the counter shaft once the nuts are removed. Do not attempt to put the bike in neutral or shift gears until the reverse gears are in place. Doing so may dislodge components internal to the transmission.

### 3.4 – Remove the OEM Oil Lines

Note: This is a good time to change the oil filter for routine maintenance. The engine oil will have to be drained anyways so have an oil filter on hand.

**Note:** Take note of the location of each oil line on the tank as it relates to the engine. It will be important to install the new oil lines in the same sequence. If you mix up the oil lines, you will change the flow of oil through the engine causing severe damage.

1. Drain the engine oil from the oil tank into a suitable drain pan. The drain plug for the oil tank is located on a hose under the right side of the bike and behind the transmission. See Figure 7.
2. Carefully pry the chrome covers from the two oil lines near the top of the oil tank to expose the quick release retainers. You may need a small screwdriver to get behind them, but once you can get your fingers under them they will slide away from the oil tank by hand. See Figure 8.

3. Pinch the plastic quick release retainer and pull out at each oil line connection from all fittings on the engine and oil tank. If you cannot remove the oil line by pinching the retainer, you can purchase a specific tool from Harley, or you can purchase a set of plastic high pressure fuel line removal tools from your local auto parts store. Cut the band style hose clamps with a pair of snips to remove the oil line from the bottom of the oil tank. Remove the flexible rubber hose as well as the hard line. Keep a drain pan ready. There will be some oil left in the lines. See Figure 9, Figure 10, Figure 11, and Figure 12.
Figure 9: Remove the oil lines from the tank and the engine.

Figure 10: Pinch the oil line retainer and pull to remove the oil line.
Figure 11: Cut the band clamps to remove the rubber hose.

Figure 12: High pressure fuel line removal tool can be used on the retainer (optional).
4. Remove the three oil line adapters from the engine block with the appropriate size socket. Use the correct size socket to minimize damage to the chrome finish. See Figure 13.

Figure 13: Remove the oil line adapters from the engine block.
SECTION 4 – *Installation*

4.1 – *Installing the Reverse Gear Assembly*

1. Clean the threads on the main shaft and counter shaft with brake cleaner or other degreaser. Wipe the threads clean and allow the brake cleaner to dry for a few minutes before proceeding.

2. Install the 15 tooth gear on the main (rear most) shaft. Be sure to leave the OEM washer on the shaft. Apply red Loctite 271 to the threads. Use the MTTR-0074 installation tool and a 3/8" extension. Torque the gear to 75 ft*lbs with a 3/8" drive torque wrench (you may use a 1/2" drive torque wrench with a reducer if necessary). The three drive pins on the installation tool fit in-between the teeth of the gear. See Figure 14.

![Figure 14: Torque the 15 tooth gear to the main shaft using the special tool and a 3/8" drive torque wrench. Use red Loctite 271 on the threads.](image)

3. Install the 20 tooth gear on the counter (front most) shaft. Apply red Loctite 271 to the threads. Use the MTTR-0074 installation tool and a 3/8" drive extension. Torque the gear to 75 ft*lbs with a 3/8" drive torque wrench (you may use a 1/2" drive torque wrench with a reducer if necessary). The four drive pins on the installation tool fit in-between the teeth of the gear. See Figure 15.
4. Insert the supplied foam plug into the hole in the center of the main shaft gear. Leave the string hanging out of the plug so it can be removed later. See Figure 16.

5. Re-install the MTTR-0074 installation tool to the main shaft gear. Line up the 1/4" guide holes in the tool with the 5/16" - 24 holes in the gear. Rotate the tool 180 degrees if you cannot get it to line up. See Figure 17.
6. Use the 1/4" boring tool (MTTR-0098) and a power drill to bore out the main shaft. The installation tool will guide the bit so it bores out the main shaft without destroying the threads in the gear. Do not use a high speed die grinder with the boring tool. Bore the hole to a minimum of 7/8" below the face of the gear.

Clean out the metal chips with a shop-vac and compressed air. Remove the foam plug from the gear. Using the same small magnet required to pull out the clutch push rod, fish out any remaining metal chips from the center of the main shaft. See Figure 18.
7. Screw in the locking pin set screws. Apply red Loctite 271 to the screws and torque to 15 ft*lbs. See Figure 19.

Figure 19: Screw in the locking pin set screws with red Loctite 271. Torque to 15 ft*lbs.
8. **Install the clutch push rod:** Follow the appropriate step below based on how your bike is equipped.

   a. **Standard Clutch:** Slide the supplied clutch push rod through the center of the main shaft. Note that the supplied push rod is longer than the OEM push rod.

   b. **Hydraulic Clutch:** Install the clutch push rod into the clutch release bearing and reinstall the small snap ring. Note that the supplied push rod is longer than the OEM push rod. From the left side of the bike, slide the push rod through the main shaft until the bearing housing is in place. Reinstall the large snap ring. See Figure 6.

9. Place one of the supplied gaskets over the spring pins located on the transmission. If the spring pins stayed in the clutch release cover, remove them and install them back into the transmission. See Figure 20.

10. Place the reverse gear housing over the spring pins and install the second gasket on the reverse gear housing and the corresponding spring pins. See Figure 20.

11. Slide the OEM oil slinger back into the main shaft after the reverse gear housing is in place.

12. Reinstall the clutch release cover over the reverse gear housing. Use the longer supplied hardware in place of the OEM bolts. Apply blue Loctite 242 to the threads and torque to 10 ft*lbs. Install the rubber sealing washer in the location indicated in Figure 20.
13. Refill the transmission with the OEM recommended gear oil. The fill plug / dipstick is located on the clutch release cover. Use a 3/8" allen head socket to remove the plug. Use the dipstick to verify that you filled the oil to the correct level. It should hold approximately 1 qt. of oil.

4.2 – Adjusting the Clutch (standard clutch only)

1. Remove the T27 Torx screws holding the clutch inspection cover to the primary chain case on the left side of the bike. See Figure 21.
2. Slide the rubber boot off the clutch cable adjuster located on the front of the motorcycle behind the front wheel. Loosen the jam nut and turn the cable adjuster so there is a large amount of play in the clutch lever. See Figure 22.

3. Loosen the locknut on the adjuster screw under the clutch inspection cover. Take up the free play in the clutch push rod by turning the screw inward until lightly seated. Once seated, back out the adjuster screw with an allen wrench 1/2 to 1 turn. Continue holding the adjuster screw with the allen wrench and tighten the locknut. See Figure 23.
4. Squeeze the clutch lever to the grip several times to set the ball ramp.

5. Turn the cable adjuster until most of the slack is eliminated. Pull the cable sheath away from the clutch lever to check the free play. Screw the adjuster until there is 1/16" to 1/8" of free play at the lever. Once you achieve the proper free play, tighten the jam nut on the adjuster screw and slide the boot back into place.

6. Clean the clutch inspection cover seal to remove any debris and oil. Reinstall the seal and the clutch inspection cover. Reinstall the torx screws tightening in an alternating pattern. Torque the screws to between 85 and 105 in*lbs. See Figure 21

**4.3 – Flexible Oil Line Installation**

1. Install the supplied o-ring to 37º flare adapters into the engine block. The side with the o-ring screws into the block. Use the appropriate size socket to prevent damage to their finish. The largest adapter goes in the bottom location, the other two adapters are the same size. Use Loctite Pipe Sealant 565 on the o-ring side only and torque the adapters to 10 to 14 ft*lbs. See Figure 24.
2. Screw the largest oil line into the bottom adapter. Run the oil line over and behind the reverse gear and slip the other end over the tube on the bottom of the oil tank. Tighten the engine side (37° flare) to 10 to 14 ft*lbs. Tighten the hose clamp on the other end with the hose finisher in place. See Figure 25.
3. Install the other two oil lines on the adapters in the correct orientation. Torque the adapter side (37° flare) to 10 to 14 ft*lbs. Push the other end of the oil lines into the oil tank until seated. Pull on each oil line to make sure the quick release retainer is snapped in place. Slide the chrome covers in place to hide the retainer. See Figure 26 and Figure 27.
Figure 26: Install the oil lines into the engine.

Figure 27: Snap the oil lines into the tank.

Note: It is important to install the oil lines in the correct location. If you mix up the oil lines, you will change the flow of oil through the engine causing severe damage.

4. Double check the orientation of the oil lines. Verify that the short oil line in Figure 26 is the same line in Figure 27. Do the same for the long oil line. Verify
that the large diameter oil line is in the bottom adapter on the engine, and is hose clamped to the fitting on the bottom of the oil tank as shown in Figure 25.

5. Reinstall the exhaust system. Tighten the flange nuts on the cylinder head, and reinstall the heat shields. See Figure 1.

6. Fill the engine with the manufacturer recommended oil to the specified level. Start the engine and allow it idle for a few minutes. Check for oil leaks then turn off the engine. Double check the oil level and top it off if necessary.

**4.4 – Wire Harness Installation**

The wire harness included in your reverse gear kit is designed to kill the ignition anytime the motorcycle is put in reverse and any forward gear at the same time. The purpose of this feature is to prevent damage to the motorcycle by not allowing the operator to apply power to forward and reverse gears at the same time.

1. Check the switch on the back of the reverse gear assembly. The switch is depressed when the bike is out of reverse. There should be a small gap between the actuation arm and the reverse switch when the assembly is in reverse.

   If adjustments are necessary, place the reverse gear lever in the reverse position. Loosen the screws holding the switch bracket in place. Adjust the height of the switch until there is approximately .030 inch gap between the switch button and the actuation arm. Tighten the switch bracket in place. See Figure 28.
2. Route the wire harness along the bike as shown in Figure 29. Be sure to secure the wire harness away from the exhaust and any moving parts. Tie up the relays under the seat so they can be accessed when the seat is removed. See Figure 30 for a harness description.
3. Locate the neutral switch in the transmission. Locate the tan wire going into the neutral switch. Splice the reverse harness into the neutral switch. First, cut the tan wire and crimp one 1/4" female quick disconnect and one 1/4" male quick disconnect to each end (order is not important). Next, plug the corresponding tan
connector from the harness into each of the quick disconnects. See Figure 31 and Figure 32.

![Figure 31: Splicing into the neutral sensor.](image1)

![Figure 32: Neutral indicator switch connectors.](image2)

4. Follow the appropriate step based on year model equipment.

   a. **2001-2006 Fuel Injected Year Model Wiring:** Locate the Engine Control Unit (ECU) under the seat and unplug the motorcycles wire harness from the ECU. Once disconnected, remove the zip tie holding the wire bundle to the connector. Open the cover on the connector to access the wires. Find the white wire with black stripe going into pin 13 on the connector.

   Splice the reverse harness into the white/black wire. Cut back the vinyl wrap to access the wire inside the bundle above the connector. Cut the wire and crimp one male bullet connector and one female bullet connector to the white and black wire (order is not important). Do this a few inches from the ECU connecter. Plug the white wires on the reverse harness into the corresponding bullet connectors on the motorcycle harness.

   Use electric tape to adhere the wire covering back in place. Replace the zip tie holding the wire bundle to the connector. Reinstall the connector cover and plug the connector back into the ECU.

   See Figure 33, Figure 34, and Figure 35.
Figure 33: Unplug the wire harness from the ECU (2002-2006 models)

Figure 34: Open the connector cover (2002-2006 models)
b. **1999-2003 Carbureted Year Model Wiring**: Locate the ignition module under the seat. There are two connectors plugged into the module. One connector is black, the other is gray. Unplug the black connector. Once disconnected, find the white wire with black stripe going into pin 1 on the connector.

Splice the reverse harness into the white/black wire. Cut back the vinyl wrap to access the wire inside the bundle above the connector. Cut the wire and crimp one male bullet connector and one female bullet connector to the white and black wire (order is not important). Do this a few inches from the connector. Plug the white wires on the reverse harness into the corresponding bullet connectors on the motorcycle harness.

Use electric tape to adhere the wire covering back in place. Plug the connector back into the ignition module.

See Figure 36.
c. **2004-2006 Carbureted Year Model Wiring**: Locate the ignition module under the seat. Unplug the 12 pin connector. Once disconnected, find the white wire with black stripe going into pin 1 on the connector.

Splice the reverse harness into the white/black wire. Cut back the vinyl wrap to access the wire inside the bundle above the connector. Cut the wire and crimp one male bullet connector and one female bullet connector to the white and black wire (order is not important). Do this a few inches from the connector. Plug the white wires on the reverse harness into the corresponding bullet connectors on the motorcycle harness.

Use electric tape to adhere the wire covering back in place. Plug the connector back into the ignition module.
5. Plug the lone male bullet connector (attached to the green wire) into the reverse position switch located on the back of the reverse assembly. You may need a flat blade screw driver to press the bullet connector into the switch. See Figure 28.

6. Locate the tail light / rear fender connector under the seat on the motorcycle. Pin 2 of this connector is an orange wire with a white stripe. This wire is an accessory 12 volt ignition source. Tap into this wire with a 1/4" female quick disconnect and butt connector. Make sure you leave the original wire connected on both ends, and plug the red wire on the reverse harness into the 12 volt ignition source. See Figure 30 and Figure 37.

Figure 37: Tap into the 12 Volt ignition source.
7. After installing the oil lines and filling the engine and transmission with the proper oil, test the wiring harness. Place the transmission and the reverse gear in neutral and start the engine. **Grab the clutch lever and hold it against the grip. Do not let go of the clutch lever during this test.** Grab the reverse gear shifter and place the bike in reverse. Then shift the transmission into first gear. The engine should shut off immediately. If the engine does not shut off, turn it off with the handle bar switch then review all of the connections. If you cannot find the problem, contact Motor Trike customer service for assistance. Be sure to put the motorcycle back in neutral and take it out of reverse before attempting to restart the engine.

8. Follow the operating instructions (found in the reverse owner's manual) and shift the bike in and out of reverse several times. Operate the bike at slow speeds to verify that the reverse gear works as intended.
SECTION 5 – Warranty and Exclusions

5.1 – Warranty

The Motor Trike reverse gear carries a 1-year parts only warranty. The warranty date of coverage shall be determined by the date on the warranty card when received.

5.2 – Exclusions

Any modification or changes to the Motor Trike reverse kit, failure to follow instructions, and/or improper installation will void all warranties.

Misuse, abuse, accidents, unreasonable use, or acts of God will not be covered under warranty.
## SECTION 6 – Revision Log

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