INSTALLATION INSTRUCTIONS FOR THE
MOTOR TRIKE HARLEY MECHANICAL REVERSE
2009 UP SIX SPEED FLH
LAST UPDATED: NOVEMBER 2016
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 2009 UP Harley Davidson six speed transmissions.

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 transmission gear oil, electrical tape, wire ties, and blue Loctite 242.
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 may 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. Carefully remove both side covers. If installing on a two wheeler, first remove both saddle bags. The quick release hardware is located inside each saddle bag. No tools are required to remove the saddle bags or side covers.

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

3.2 – Removing the Exhaust

1. Unplug the oxygen sensors from the motorcycle wire harness (leave the sensor in the head pipe). One sensor is in front of the engine. The other sensor is behind it. See Figure 1.

2. 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 and exhaust clamps. See Figure 1.

3. Remove the two mount bolts from the back of each muffler. Use a ½” socket. Then remove the clamp from the front of each muffler. Slide the muffler off the head pipe toward the back of the motorcycle.
4. Remove the fastener attaching the head pipes to the motorcycle engine near the bottom of the bike. Follow the appropriate step based on the year model of your motorcycle.

a) 2017 & Up Motorcycles: Remove the nut from the stud on the side of the engine case located in front of the clutch release cover. See Figure 2.

b) 2009-2016 Motorcycles: Remove the nut securing the exhaust to the bracket directly under the clutch release cover. See Figure 3.
Figure 2: Remove the fastener from the exhaust band clamp 2017 & up.

Figure 3: Remove the lower head pipe exhaust mount nut.
5. Loosen the exhaust clamp on the crossover pipe behind the transmission. Remove the mounting bracket that holds the cross over pipe clamp to the transmission case and remove cross over pipe. See Figure 4.

![Figure 4: Remove the cross over pipe.](image)

6. Remove the right side driver’s floor board. Use a 3/8" allen head socket and access the bolts from the inside of the frame.

7. Remove both head pipe flange nuts from the front and rear head pipe flange. Use a ½” Socket. See Figure 1.

8. Remove the front and rear head pipe from the right side of the bike as an assembly.

9. 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, and below the clutch release cover. It is hidden by the frame, but can be accessed through a hole in the sheet metal. See Figure 5.
Figure 5: Pull the drain plug for the transmission. Do NOT pull any other plugs as they will drain the engine oil.

2. Remove the bolts holding the clutch release cover in place. Leave the clutch release mechanism and cable (if equipped) in the cover. Note: on hydraulic clutch models, there is a sheet metal chrome cover hiding the clutch release cover. Once the first two bolts are removed, the chrome cover can be removed to access the remainder of the bolts. See Figure 6.

Figure 6: Remove the six clutch release cover bolts.
3. Remove the oil slinger by pulling it out and set aside for reinstallation later. See Figure 7.

![Figure 7: Oil slinger removal](image)

4. Clutch push rod removal:
   
   a. **2009-2013 Standard Clutch and 2014 Up Hydraulic 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 8.

![Figure 8: Pull out the clutch push rod with a small magnet. Remove the counter shaft and main shaft nuts.](image)
b. **2009-2013 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 9 and Figure 10. Note: Leave the clutch inspection cover off for now.

![Figure 9: Clutch inspection cover screws.](image-url)
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. See Figure 8.

**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.

6. Remove the old gasket from the transmission and/or clutch release cover and prepare the surfaces for resealing later.
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. 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 11.

![INSTALL TOOL]

Figure 11: 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.

3. Install the 27 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 three drive pins on the installation tool fit in the holes on the gear hub. See Figure 12.
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 13.

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 14.
Figure 14: Line up the guide holes in the installation tool with the threaded holes in the gear.

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 15.

Figure 15: Drill out the main shaft using the installation tool as a guide.
7. Screw in the locking pin set screws. Apply red Loctite 271 to the screws and torque to 15 ft*lbs. See Figure 16.

![Figure 16: Screw in the locking pin set screws with red Loctite 271. Torque to 15 ft*lbs.](image)

8. Install the clutch push rod: Follow the appropriate step based on the year model and type of clutch of your motorcycle.

   a) **2009-2013 Standard Clutch & 2014 Up Hydraulic 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) **2009-2013 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 10.

9. Place one of the supplied gaskets over the dowel pins located on the transmission. If the dowel pins stayed in the clutch release cover, remove them and install them back into the transmission. See Figure 17.

10. Place the reverse gear housing over the dowel pins and install the second gasket on the reverse gear housing and the corresponding dowel pins. See Figure 17.
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 to 12 ft*lbs. See Figure 17.

![Diagram showing reverse gear housing and clutch release cover installation](image)

**Figure 17:** Install the gaskets, reverse gear housing, and clutch release cover.

13. Reinstall the exhaust system. Be sure to plug in the O2 sensor connectors, tighten the flange nuts on the cylinder head, and reinstall the heat shields. See Figure 1, Figure 3, and Figure 4.

On 2017 and Up Motorcycles, install the supplied exhaust spacer or stack of seven 5/16" SAE washers under the band clamp. Note: on some bikes, you may have to unscrew the stud a few revolutions to get proper thread engagement on the nut. See Figure 18.
14. Refill the transmission with the OEM recommended gear oil. The fill plug / dipstick is located above the clutch release cover next to the engine oil fill. 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 19.
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 20.

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 21.

![Figure 21: Clutch adjuster screw and locknut](image)

4. Squeeze the clutch lever to the grip several times to set the ball ramp inside the clutch release cover.

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 19

### 4.3 – 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 position of the switch until there is approximately .030 to .060 inch gap between the switch button and the actuation arm. Tighten the switch bracket in place. See Figure 22.

![Figure 22: Reverse gear position switch.](image)

2. Route the wire harness along the bike as shown in Figure 23. Be sure to secure the wire harness away from the exhaust and any moving parts. Tie up the relays under the left side cover so they can be accessed when the side cover is removed. See Figure 24 for a harness description.
3. Locate the neutral switch in the transmission. Locate the tan wire for 2009-2013 models or the white wire for 2014 & UP models 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 25 and Figure 26.

![Figure 25: Splicing into the neutral sensor.](image)

![Figure 26: Neutral indicator switch connectors.](image)

4. Splice in the Kill Switch: Follow the appropriate step below based on the year model of your motorcycle.

a) **2009-2013 Motorcycles:** Locate the Engine Control Unit (ECU) under the seat and unplug the motorcycles wire harness from the ECU. Open the cover on the connector to access the wires. Once open, remove the zip tie holding the wire bundle to the connector. Find the white wire with black stripe going into **pin 72** 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 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. Replace the zip tie holding the wire bundle to the connector. Reinstall the connector cover and plug it back into the ECU.

See Figure 27, Figure 28, and Figure 29.
Figure 27: Unplug the wire harness form the ECU (2009-2013 models)
Figure 28: Remove the cover from the connector (2009-2013 models)

Figure 29: Splice bullet connectors into kill switch wire (2009-2013 models).
b) **2014 - 2016 Motorcycles:** Locate the Ignition Coil. It is behind the rear cylinder, below the battery box, and above the starter motor. See Figure 30. Unplug the motorcycles wire harness from the Ignition Coil. Pull the wires through the opening in the battery box and get the connector above the battery where it can be easily accessed. Find the red wire with the green stripe going into **pin A** on the connector.

Splice the reverse harness into the red/green 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 red/green wire (order is not important). Do this a few inches from the Ignition Coil 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. Reposition the wires through the bottom of the battery box and plug the connector back into the Ignition Coil.

See Figure 31.

![Ignition Coil Connector](image-url)

**Figure 30:** Ignition coil connector location (for 2014 - 2016 only).
c) **2017 & up Motorcycles:** Locate the Ignition Coil. It is behind the rear cylinder, below the battery box, and above the starter motor. See Figure 32. Unplug the motorcycles wire harness from the Ignition Coil. The connector has 3 wires and can be identified by grey, red, and green wires. Pull the wires out above the starter motor where it can be easily accessed. Find the red wire with the green stripe going into pin B on the connector (middle of 3 pins).

splice the reverse harness into the red/green 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 red/green wire (order is not important). Do this a few inches from the Ignition Coil 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. Reposition the wires above starter motor and plug the connector back into the Ignition Coil.

See Figure 33.
5. Plug the lone male bullet connector (attached to green wire) into the reverse position switch located on the back of the reverse assembly. You may need a flat blade screwdriver to press the bullet connector into the switch. See Figure 22.
6. Connect the accessory jumper harness: Follow the appropriate step below based on the year model of your motorcycle.

   a) **2009-2013 Motorcycles:** Connect the Accessory Jumper Harness to the Harley accessory connector located under the seat. The Harley accessory connector’s location varies slightly from year to year. It will be a black four pin connector and have one red with yellow striped wire, one orange wire, and one black wire. The fourth wire will be either blue or orange with a red stripe. Transfer the sealing plug from this connector and install it in the open end of the accessory jumper harness. The sealing plug is not necessary if this connector will be used to power another accessory. See Figure 34.

   b) **2014 & up Motorcycles:** Connect the Accessory Jumper Harness to the Harley tail light connector located under the seat. This harness will plug in between the main harness of the motorcycle and the rear fender harness, or trike tail light harness if equipped. On Tri Glide models, the tour trunk harness connector can be substituted for the tail light harness connector. See Figure 35.

7. Connect the female quick disconnect connector on the Accessory Jumper Harness with the red wire on the reverse harness.
8. 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.
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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