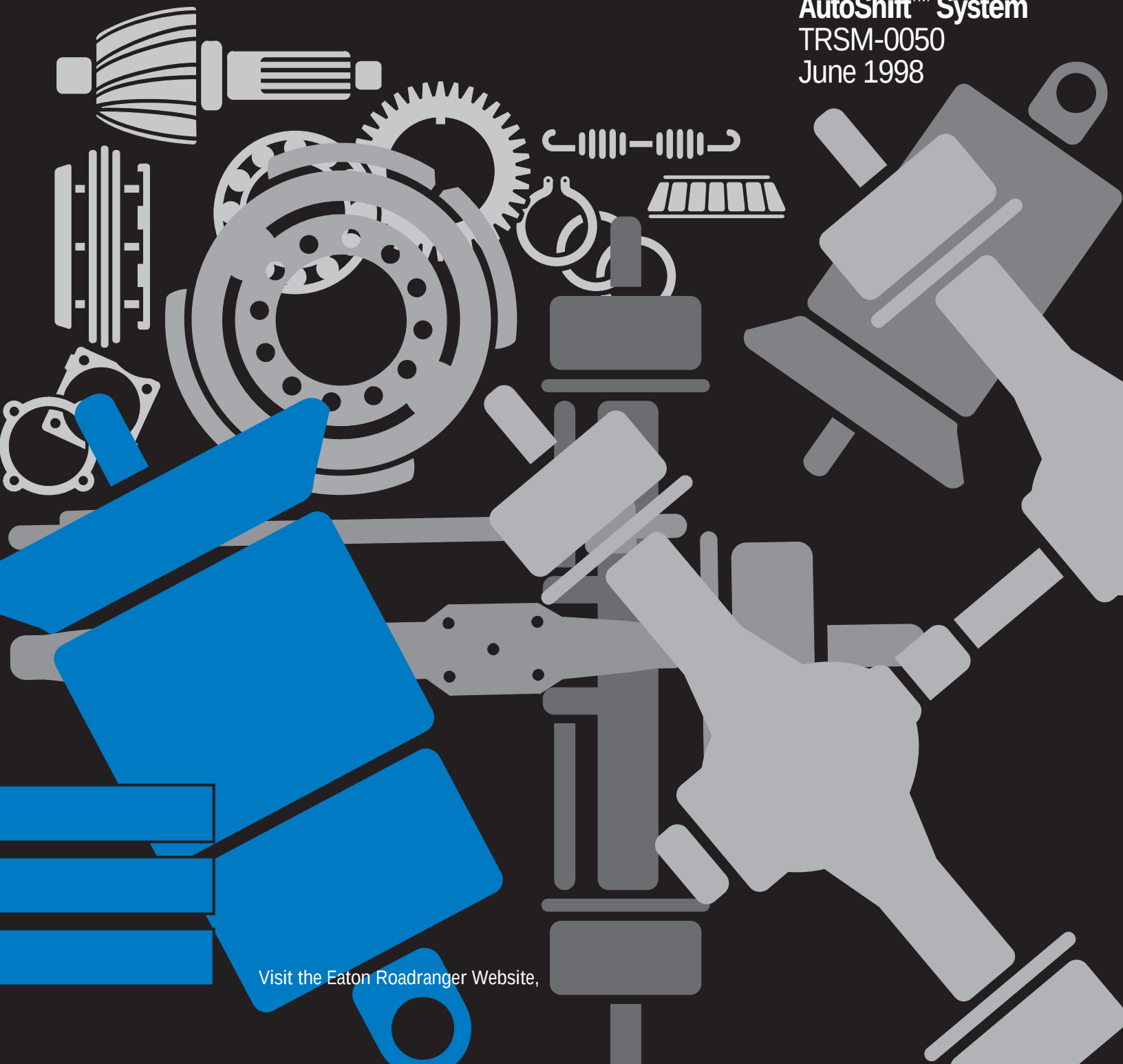
BACK / RETOUR

Eaton® Fuller®
Automated Transmissions

Service Manual

AutoSelect™ System
AutoShift™ System
TRSM-0050
June 1998



Visit the Eaton Roadranger Website,

Table of Contents

Notes, Cautions, and Warnings

WARNING: Follow the specified procedures in the indicated order to avoid personal injury.

CAUTION: Follow the specified procedures in the indicated order to avoid equipment malfunction or damage.

NOTE: Additional relevant information not covered in the service procedure.

Operational Warnings

Before starting a vehicle:

1. Sit in the driver's seat,
2. Place the Shift Lever in neutral,
3. Set the parking brake,
4. Disengage the clutch.

Before working on a vehicle or leaving the cab with the engine running:

1. Place the Shift Lever in neutral,
2. Set the parking brake,
3. Block the wheels.

Do not release the parking brake or attempt to select a gear until the air pressure is at the correct level.

When parking the vehicle or leaving the cab:

1. Place the Shift Lever in neutral,
2. Set the parking brake.

To avoid damage to the transmission during towing:

1. Place the Shift Lever in neutral,
2. Lift the drive wheels off the ground or disconnect the driveline.

Do not operate the vehicle if the alternator lamp is lit or if the gauges indicate low voltage.

Repair Warnings

When disassembling various assemblies, lay all parts on a clean bench in the same sequence as removed to simplify assembly and reduce the possibility of losing parts.

Provide a clean work area. Make sure no dirt or foreign material enter the unit during repair and assembly.

Disconnect the vehicle's battery before removing or installing electronic parts.

Since the cost of a new part is generally a small fraction of the total cost of downtime and labor, avoid reusing a questionable part that could lead to additional repairs and expense.

Use of other than recommended tools, parts, and instructions listed in this manual may place the safety of the service technician or vehicle driver in jeopardy.

The location of some components may vary with each O.E.M.

The removal and installation procedure described for each component may vary for your vehicle.

Always use genuine Eaton replacement parts. For a complete list of approved and reputable dealers, write to:

Eaton Corporation
Truck Component Marketing Headquarters
P.O. Box 4013
Kalamazoo, Mi 49003

Every effort has been made to ensure the accuracy of the information contained in this manual. However, Eaton Corporation makes no warranty, either expressed or implied, based on the information provided.

How to Use This Manual

This manual is designed to provide detailed information necessary to service and repair the Automation of Eaton® Fuller® transmissions listed on the front.

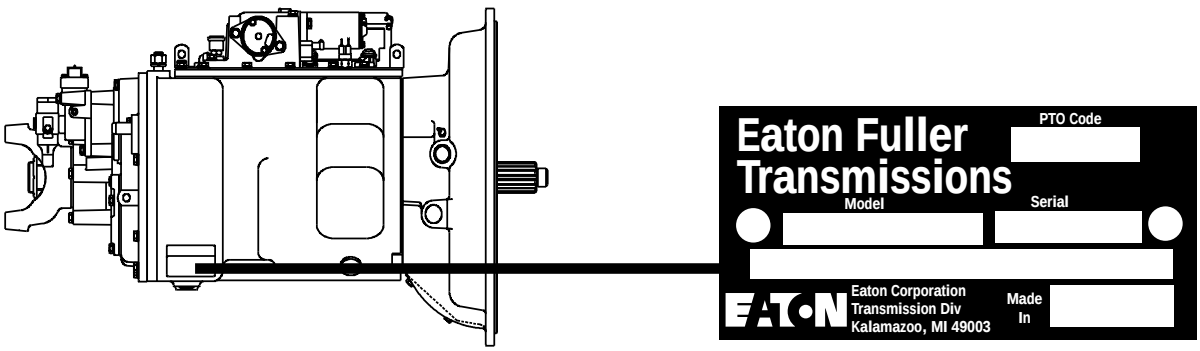
The service procedures in this manual are for transmission automation components only. To locate the information you need, simply locate the procedure in the index, turn to the page specified, and follow the procedure

To service the mechanical portion of the transmission system, refer to the model specific transmission service manual.

Serial Tag Information and Model Nomenclature

Transmission model designation and other transmission identification information are stamped on the serial tag. To identify the transmission model and serial number, locate the tag on the transmission and then locate the numbers as shown.

When calling for service assistance or parts, have the model and serial numbers handy.

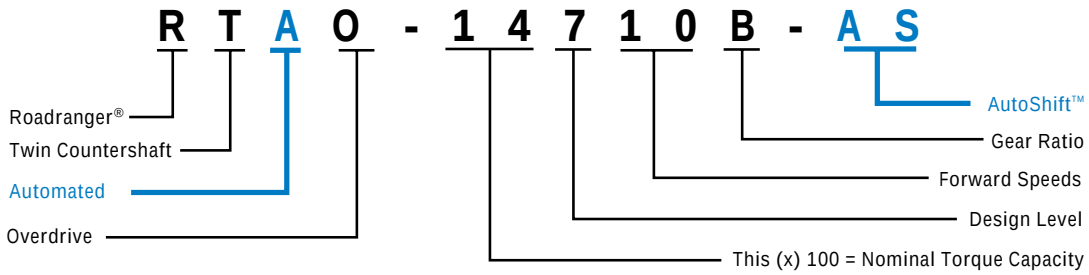


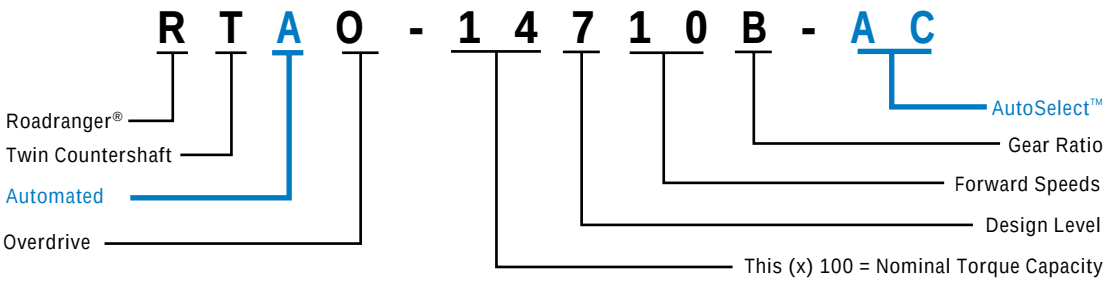
Transmission Tag and Location

Do not remove or destroy the transmission identification tag!

Model Number

The model number gives basic information about the transmission and is explained below. Use this number when calling for service assistance or replacement parts.





Serial Number

The serial number is the sequential identification number of the transmission. Before calling for service assistance, write the number down. It may be needed.

Bill of Material or Customer Number

This number may be located below the model and serial numbers. It is a reference number used by Eaton®.

1. Preventive Maintenance Overview

To keep a vehicle running properly, it is important to perform preventive maintenance on the vehicle components. This insures the vehicle and its subassemblies will operate properly throughout their useful life. To cover preventive maintenance completely, you must review the following subjects in detail.

- **Recommended Lubricants** - This section covers lubricants recommended for use in Fuller Transmissions.
- **Maintenance/Lubricant Change Intervals** - Frequency of transmission checks and lubricant changes are discussed.
- **Inspecting the Transmission** - Transmission checks required at the maintenance interval are covered.
- **Changing the Fluid** - How to change the transmission lubricant.
- **Vehicle System Effects** - Systems that can affect transmission performance and possibly cause a failure.

2. Recommended Lubricants

Where transmissions are concerned, lubrication is possibly the most important part of keeping a vehicle operating.

Synthetic Lubricants

Synthetic lubricants are required in AutoSelect/AutoShift transmissions and must be approved by Eaton Corporation. The 5/750,000 warranty requires SAE grade 50 synthetic lubricants that perform within all temperature ranges. For a list of Eaton® Roadranger® approved lubricants, order item number TCMT-0020.

3. Maintenance/Lubricant Change Intervals

Transmission inspections and lubricant changes depend on the type of lubricant used and whether the vehicle is used On- or Off-Highway.

On-Highway Synthetic Lubricant - Vehicles operated on paved roads, interstate highways, and turnpikes are designated as on-highway vehicles. Lubricant change and inspection intervals are the most generous for on-highway vehicles using synthetic lubricants.

- **PM Interval** - The PM interval for AutoSelect/AutoShift transmissions in on-highway applications is 10,000 Miles.
- **Lubricant Change Interval** - The change interval for AutoSelect/AutoShift transmissions in vehicles factory-filled with synthetics and built after March 1, 1996, is 500,000 miles (800,000 km). The change interval for vehicles built before March 1, 1996 is 250,000 miles (400,000 km).

Off-Highway Synthetic Lubricant - When operating vehicles with AutoSelect/AutoShift transmissions in off-highway applications such as coal trucks or mining vehicles, it is more important to use time rather than mileage to keep the transmission within its proper preventive maintenance schedule. Off-highway applications are divided into two categories, severe and normal. ‘Severe off-highway’ is the designation used when there is excessive dust and dirt. ‘Normal off-highway’ is for applications where dust and dirt are minimal.

- **PM Interval** - The PM interval in off-highway vehicles with AutoSelect or AutoShift transmissions is every 40 hours.
- **Lubricant Change Interval** - The lubricant must be changed in AutoSelect/AutoShift transmissions in off-highway vehicles every 500 hours in severe applications, and every 1000 hours for vehicles in normal applications.

EATON APPROVED TRANSMISSION LUBRICANTS

Type	Grade (SAE)	Ambient Temperature	Drain Interval	Note
Eaton® Roadranger® CD-50 E500^{cm} (PS-164)	50	All	250,000* (400,000)/1000 Hrs	Approved for Oil Coolers

* The first lube change may be extended to 500,000 miles (800,000 km) when a new transmission has been factory filled with a lube that is Eaton approved for 500,000 miles (800,000 km) (E-500, PS-164).

4. Transmission Inspections

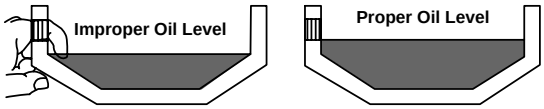
When performing preventive maintenance inspections, several items must be checked. It is important, however, to perform every item to insure the transmission meets its life expectancy. Proper PM consists of the following items:

- Check the transmission oil level
- Inspect under the vehicle for loose or missing bolts
- Check the transmission for air leaks
- Check the transmission for oil leaks
- Inspect the rear transmission seal

Oil Level

When checking the transmission oil there are two important points to know: where to check the oil and what the proper oil level is. Always be cautious when checking the transmission fluid as it may be hot.

- **Checking Location** - Check the oil at the oil fill plug located on the left side of the main transmission case.
- **Proper Lubricant Level** - The oil is at the proper level when it is even with the bottom of the fill hole. When you remove the plug to check the oil level, oil should actually seep out. Do not use your finger to feel for the oil. Even if you can touch the oil, it may not be at the proper level. In a transmission one inch of oil level equals about one gallon of oil.



Loose or Missing Bolts

While you are under the vehicle checking the oil, make a quick check for loose or missing bolts. Check all bolts on the back box, PTO covers, shift bar housing and clutch housing. Replace any missing or broken bolt with the proper bolt as called out in the illustrated parts listing. Follow the procedure defined in the manual transmission service manual when tightening any bolts.

Air Leaks

While you are under the vehicle, check for air leaks as well. The two steps when checking for an air leak are inspection and repair.

- **Audible Inspection for Leaks** - To find air leaks, simply make sure the vehicle air system has at least 90 PSI air pressure. Then, listen for leaks, making sure you do not mistake a vehicle leak for a transmission air leak.
- **Refer to Troubleshooting Procedures for Repair** - Once you find an air leak, use the troubleshooting guide to isolate the air leak to the faulty component. Of course, use common sense as well. When the leak is caused by a loose fitting, tighten it. If it is caused by a nicked line, replace it.

Lubricant Leaks

Oil leak repair is very important. An oil leak could cause a catastrophic transmission failure. Check for leaks first at the gasket surfaces, then the input shaft, and finally the rear seal.

Visual Check for Leaks at Gaskets

A visual check at each gasket insures that no leak is present. Typically a moist spot is acceptable, however drips or larger wet areas are not. Check for leaks at the rear housing, PTO, shift bar housing, shift tower, and clutch housing gasket surfaces. It is also Important to insure that the leak is indeed coming from the transmission. Make sure the oil is not being blown back from the engine or another vehicle component.

Check for Leaks Around the Input Shaft

You should also check for leaks around the input shaft. Leaks in this area could be caused by a faulty gasket, the input shaft, or pressurization of the main transmission case by the air system. If you find a leak at the input shaft, make sure the air system is not leaking into the case before looking for leaking gaskets.

Rear Seal

The rear seal is very important in maintaining oil in the transmission. If the seal is improperly installed or has failed, the transmission may experience a catastrophic failure. The two steps involved in checking the rear seal are visual inspection and leak path verification.

- **Visual Check For Leak** - Naturally, a visual inspection is necessary to determine if an oil leak is present at the rear seal. If a rear seal leak is suspected, proper isolation is necessary.
- **Verify the Leak Path** - Other leaks may give the impression the rear seal is leaking. One possible cause is the vehicle speed sensor. Any oil leak above and in front of the rear seal could cause oil to collect around the seal. Wipe the seal with a clean rag, operate the vehicle, and recheck to verify the leak path. You will find more information in the rear seal maintenance guide (TRSM-0912).

Transmission Cooler Leaks

If the vehicle is equipped with a transmission oil cooler, make sure there are no leaks at the oil cooler, hoses, and fitting of the cooler circuit. Repair any cooler leaks as necessary.

5. Transmission Fluid Change

When it is time to change the transmission oil, there are only a few steps to follow: draining and filling the transmission, draining and filling the cooler (if equipped), and changing the oil filter (if equipped). Remember to be careful when changing the transmission oil, as it may be hot.

Transmission Drain

Draining the transmission consists of removing the drain plug located on the bottom of the transmission case. Put a drain pan in place under the drain plug before removing it. Once the oil has finished draining, reinstall the drain plug and torque to 45-55 ft-lb. No sealant is required on the drain plug.

Cooler Drain

If the vehicle is equipped with a transmission cooler, you must drain the cooler as well. To drain the cooler, remove both cooler lines at the transmission and pressurize one line with 30 PSI of air pressure. This will force the oil out of the cooler. Once the cooler has drained, reconnect the coolant lines to the transmission, making sure the lines are not crossed.

Transmission Fill

Remove the transmission fill plug and fill the transmission with the desired approved oil. The transmission is full once oil starts flowing out of the fill hole. Replace the fill plug and torque to 60-70 ft-lb.

Cooler Fill

If the transmission is equipped with a cooler, the best way to fill the cooler is to place the transmission in neutral, start the vehicle, then release the clutch pedal so the input shaft of the transmission can rotate. This allows the pump to fill the cooler. Once the vehicle has run for about one minute, shut it off and recheck the transmission oil level.

Filter Change

If the transmission is equipped with a spin-on oil filter, remove and replace the filter as you would any spin-on filter. It is also necessary to remove the filter when draining the oil from the cooler. As you unscrew the filter, catch the oil that seeps out between the filter opening and the “spin-on” casting.

6. Vehicle System Effects

Some vehicle systems can affect transmission operation and possibly cause a failure. The major system that can affect AutoSelect or AutoShift is the air system.

Air System

If the air system is not given recommended preventive maintenance, it can cause transmission system problems. Although the transmission has an air filter regulator it cannot protect the transmission from contaminants indefinitely. This is why it is important to follow OEM recommendations for air system PM. It is important to regularly drain the air tanks and insure that oil is not being pumped by the air compressor into the vehicle air system. If moisture enters the transmission system, it may cause corrosion. Also, in cold climates it may freeze, preventing the shift mechanisms from operating. If allowed into the system, oil could fill the air system components causing them to lose valuable air volume, slowing or preventing movement.

Reverse Ball Switch—Remove

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Disconnect the Transmission Harness from the Reverse Ball Switch.
2. Using a 7/8" wrench, remove the Reverse Ball Switch and fiber washer from the Shift Bar Housing.

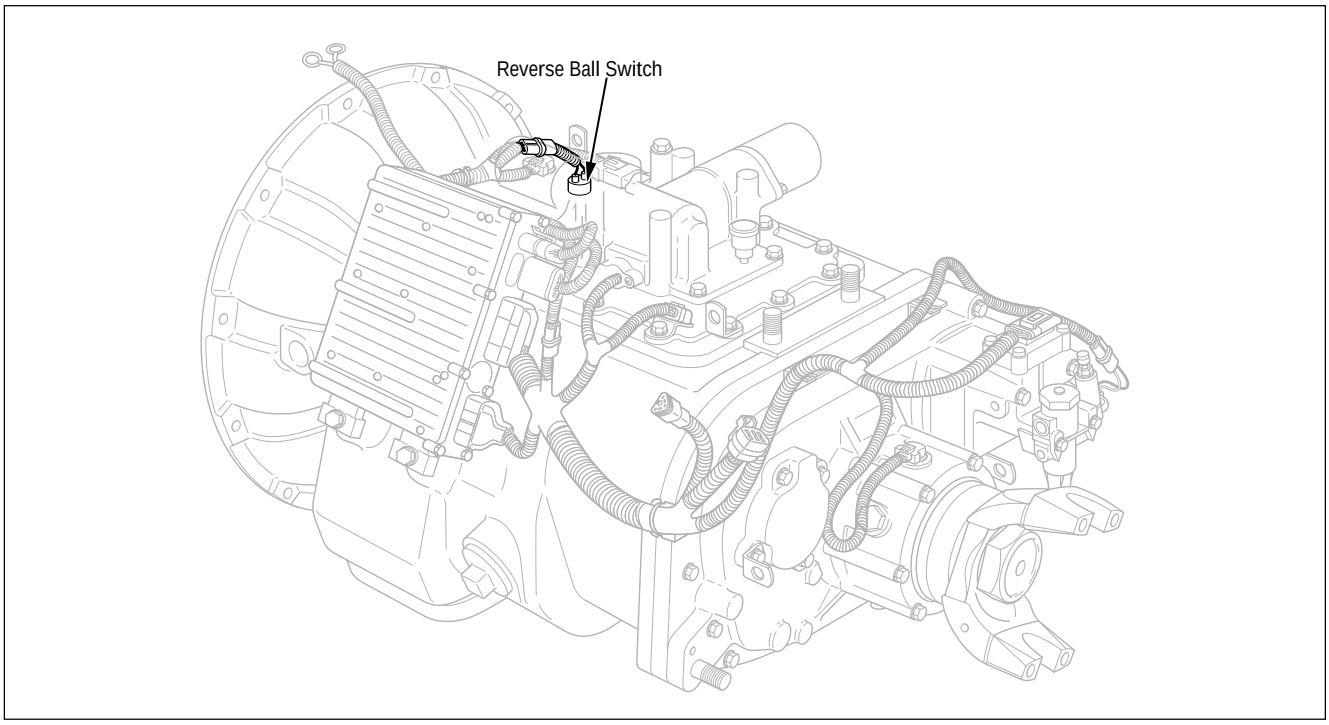


Figure 1. Reverse Ball Switch Location

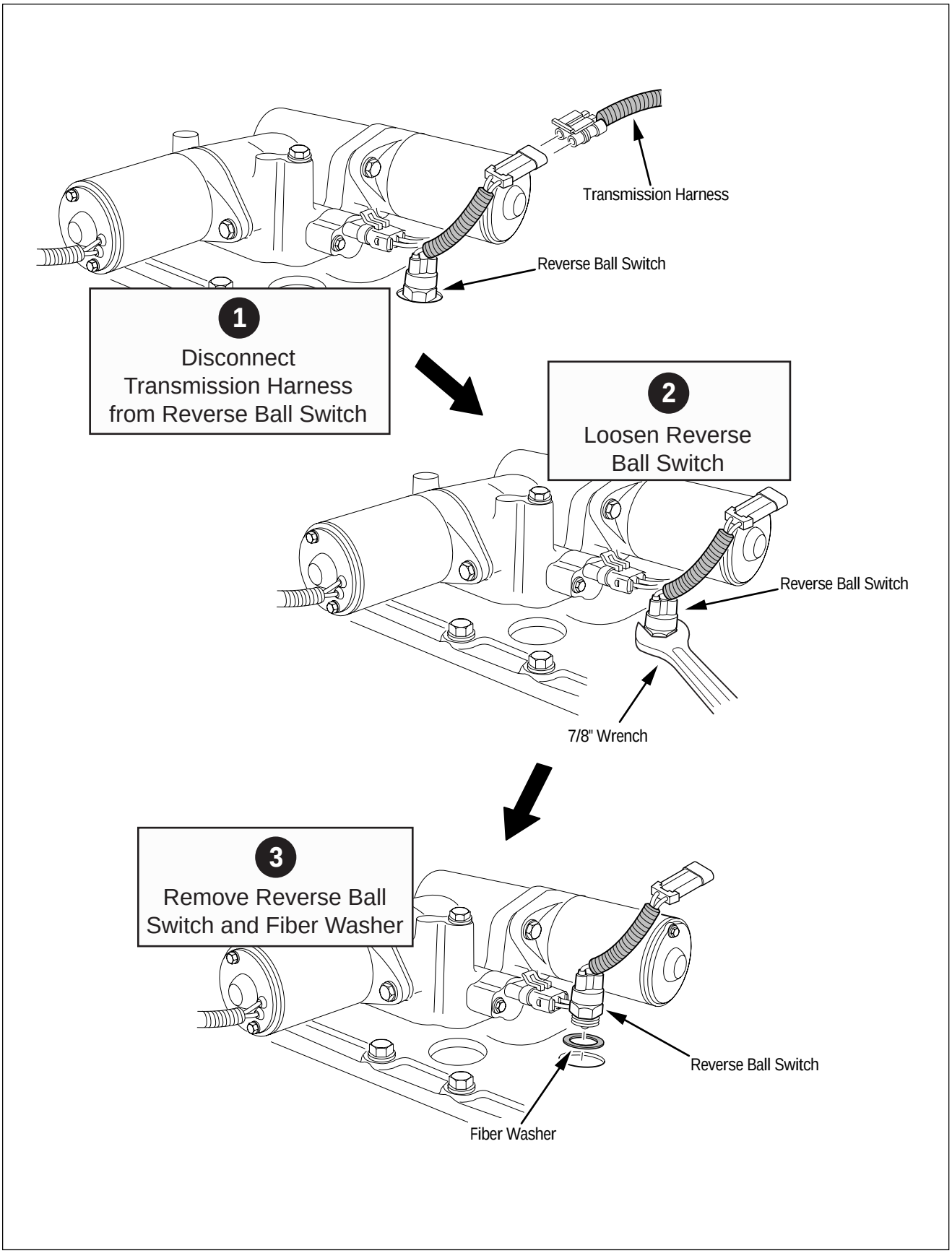


Figure 2. Reverse Ball Switch Removal

Reverse Ball Switch—Install

Special Instructions

None

Required Tools

Basic Hand Tools

Installation

1. Install a new fiber washer (included in the Reverse Ball Switch service kit) on the Reverse Ball Switch.
2. Using a 7/8" wrench, install and tighten the Reverse Ball Switch to 20-25 lb-ft (27.1-33.9 N•m).
3. Connect the Transmission Harness to the Reverse Ball Switch.

Final Check

None

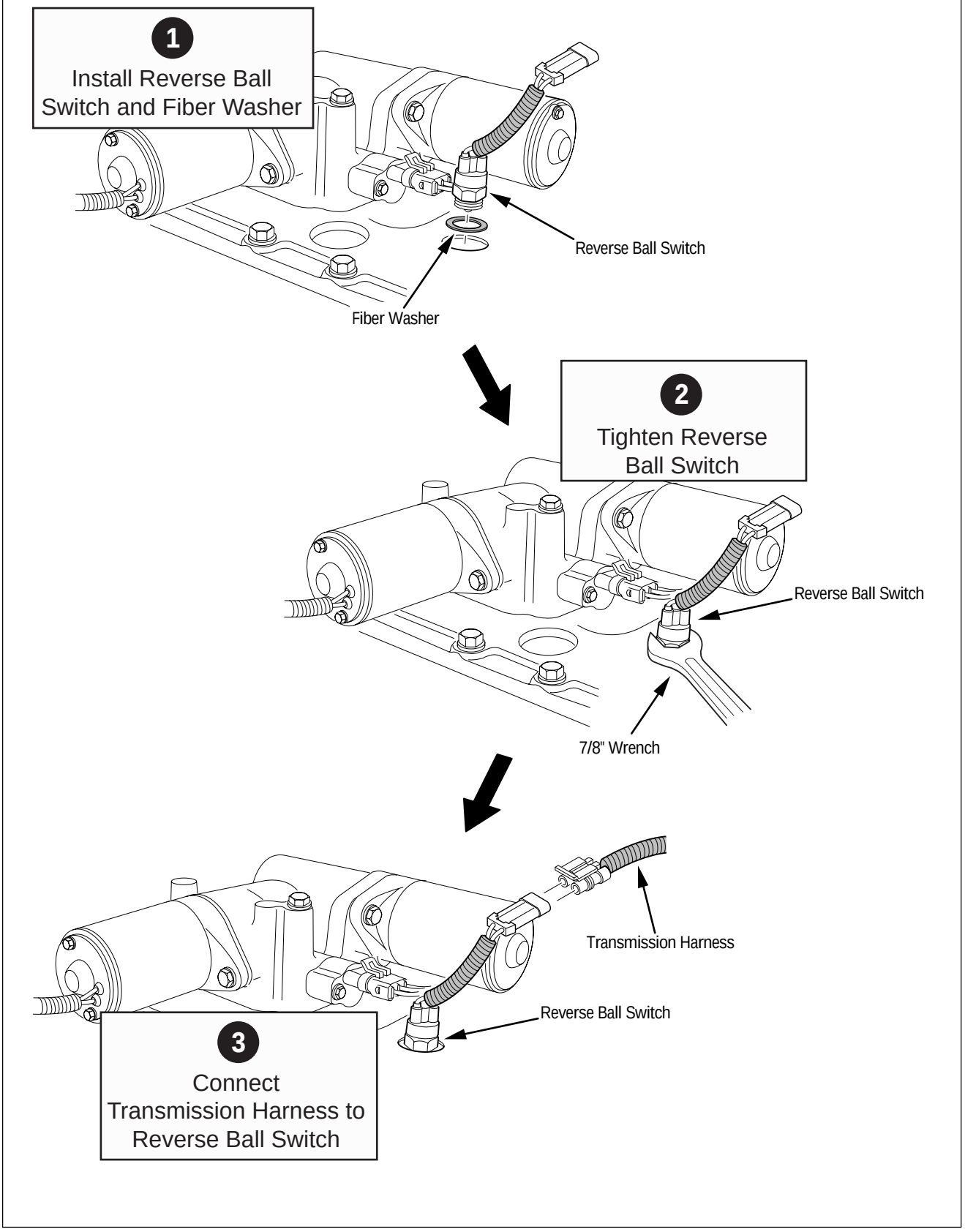


Figure 3. Reverse Ball Switch Installation

Rail Select Sensor—Remove

Special Instructions

While removing the capscrews, hold the sensor in place. Don't allow it to snap out of position.

Required Tools

Basic Hand Tools

Removal

1. Disconnect the Transmission Harness from the Rail Select Sensor.
2. Using a 5/16" wrench, remove the two (2) sensor capscrews.
3. Carefully allow the sensor to rotate (not snap) to a relaxed position. Then remove the sensor, steel sleeves and O-rings from the housing.
4. Insert your finger into the sensor bore and push the arm slightly.

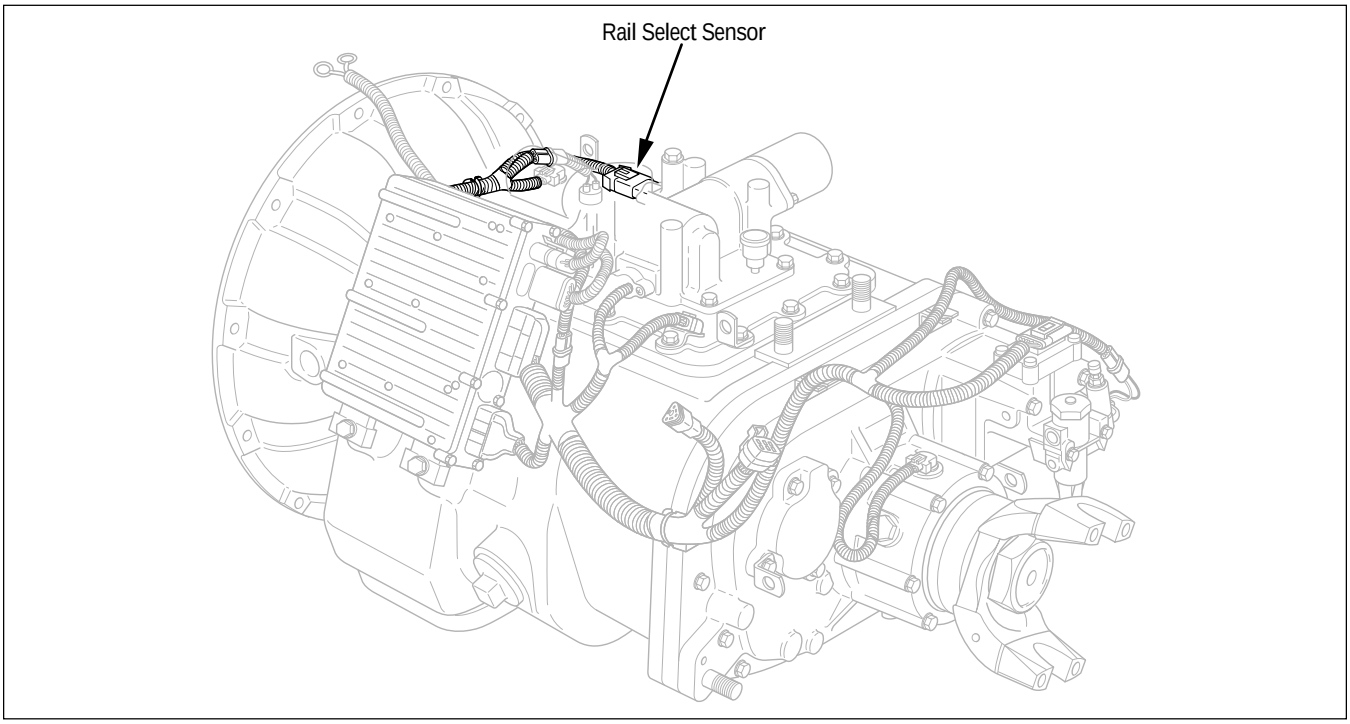


Figure 4. Rail Select Sensor Location

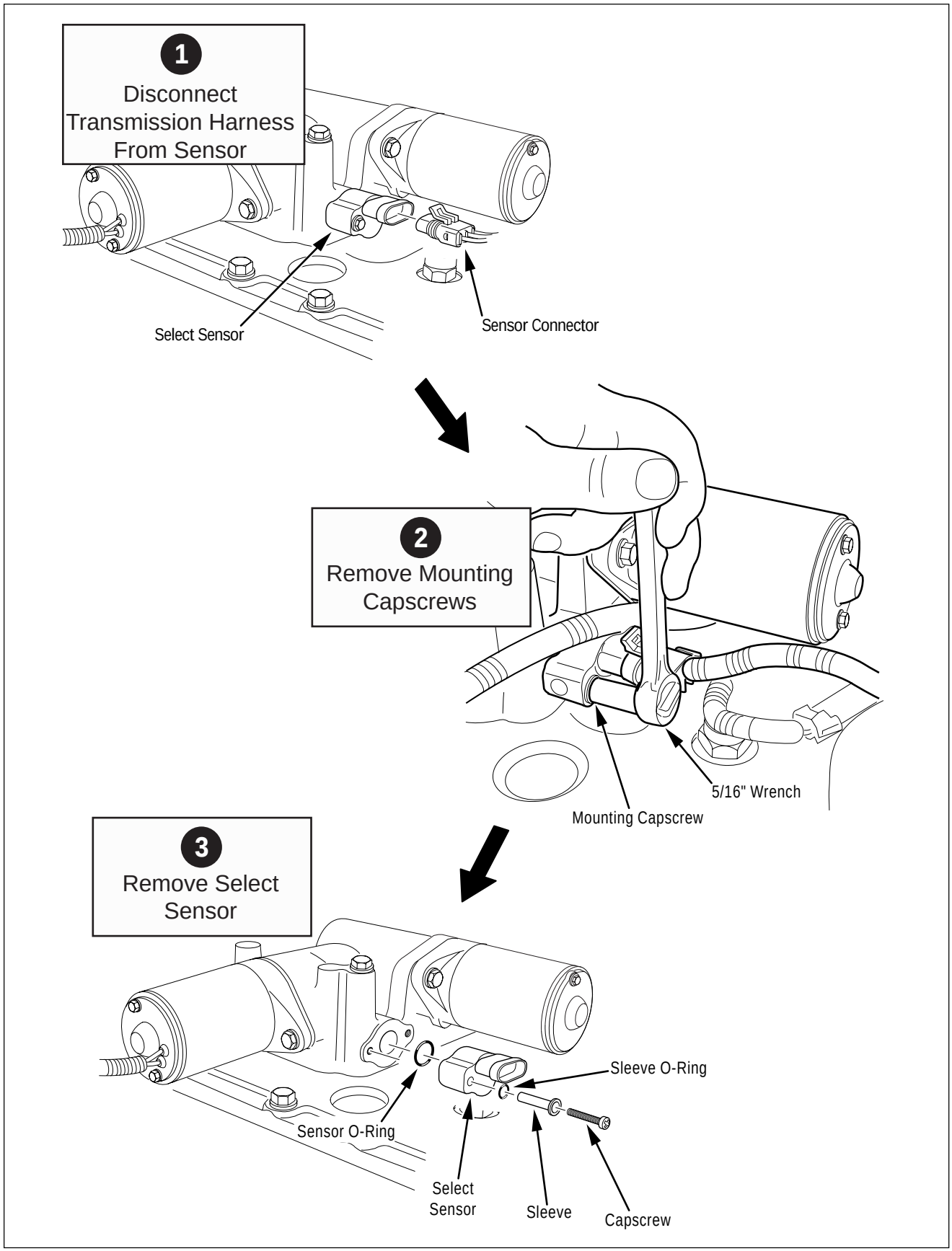


Figure 5. Rail Select Sensor Removal

Rail Select Sensor—Install

Special Instructions

Install the sensor with the connector on top.

While installing the capscrews, hold the Rail Select Sensor in place. Don't allow it to snap out of position.

Required Tools

Basic Hand Tools

Installation

1. Align the sensor's tab with the slot in the shifter housing. Then insert the Rail Sensor into its mounting location.
2. Insert the new steel sleeves, O-rings and capscrews into the sensor mounting holes.
3. Using a 5/16" wrench, install and tighten the capscrews to 21-27 lb-in (2.4-3.1 N•m).
4. Reconnect the Transmission Harness to the Rail Select Sensor.

Final Check

Make sure that the capscrews are tightened to specification.

Make sure that the sensor connections are secure.

To operate properly, the system must be calibrated as follows:

1. Turn the ignition switch to ON and allow the transmission to power up.
2. Turn the ignition switch to OFF and wait two minutes.

Important: The shifter module must be calibrated before the vehicle is placed into operation.

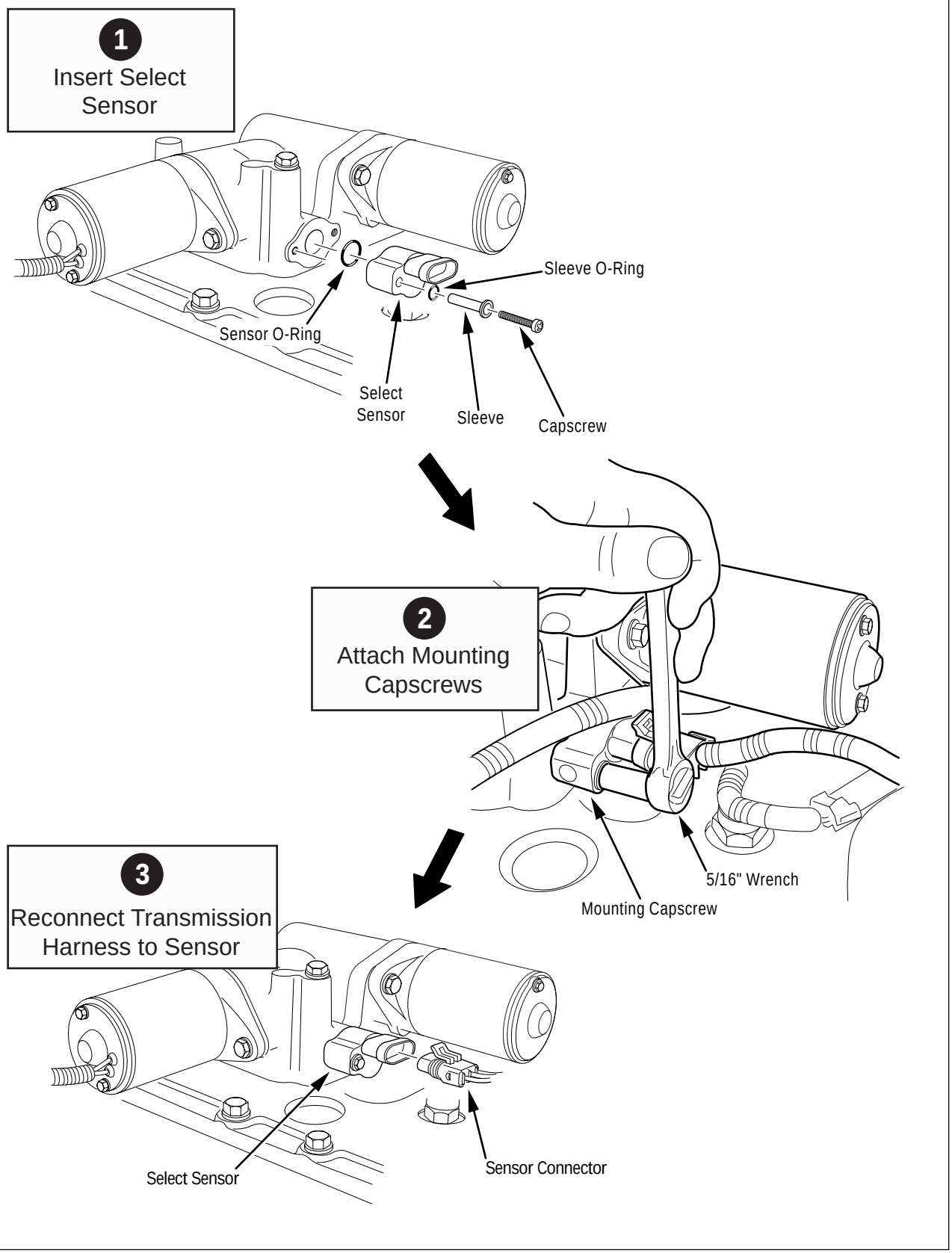


Figure 6. Rail Select Sensor Installation

Gear Select Sensor—Remove

Special Instructions

While removing the capscrews, hold the sensor in place. Don't allow it to snap out of position.

Required Tools

Basic Hand Tools

Removal

1. Remove nylon cable ties from motor wires.
2. Disconnect the Gear Select Motor from the Transmission ECU.
3. Disconnect the Rail Select Motor from the Transmission ECU.
4. Disconnect the Transmission Harness from the Gear Select Sensor and the Rail Select Sensor.
5. Using a 9/16" wrench, remove the four (4) Electric Shifter capscrews.
6. Remove the Electric Shifter assembly and gasket.
7. Turn the shifter over (upside down).
8. Using a 5/16" wrench, remove the two (2) Gear Select Sensor capscrews.
9. Carefully allow the sensor to rotate (not snap) to a relaxed position, then remove the sensor, steel sleeves and O-rings from the housing.
10. Insert your finger into the sensor bore and push the arm slightly.

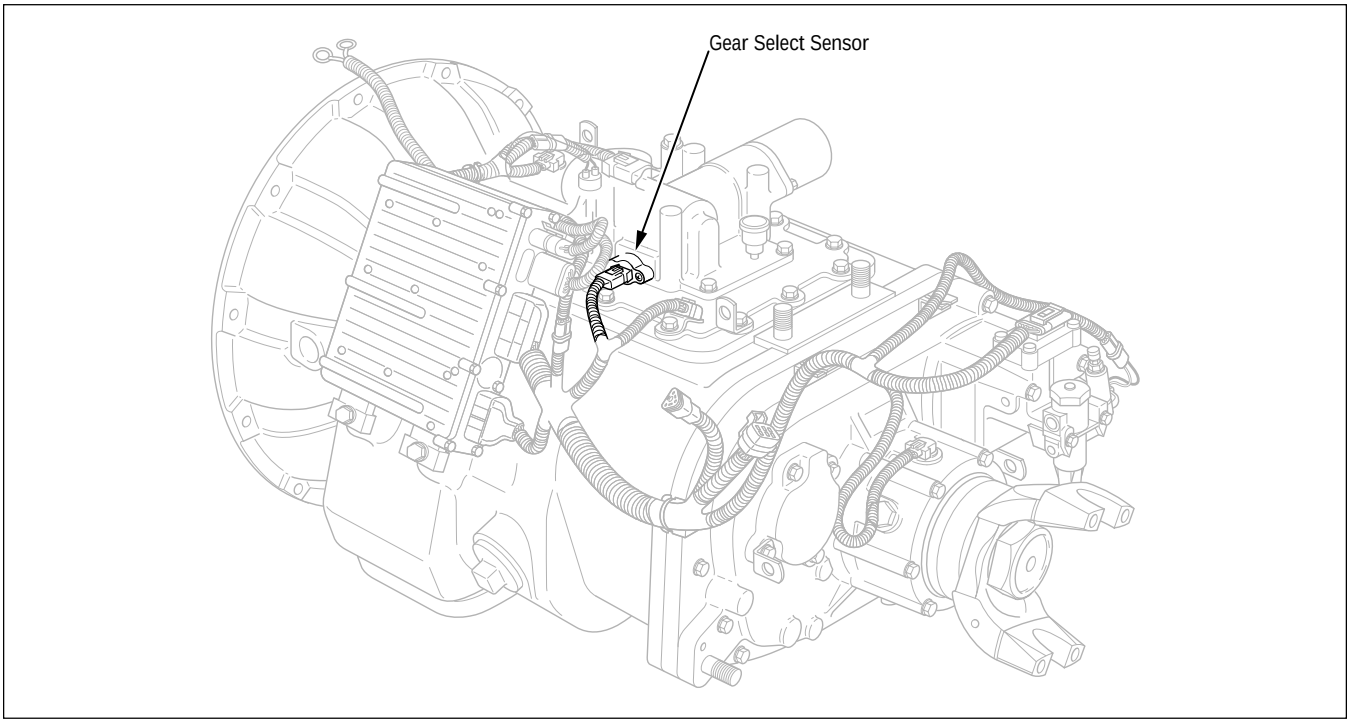


Figure 7. Gear Select Sensor Location

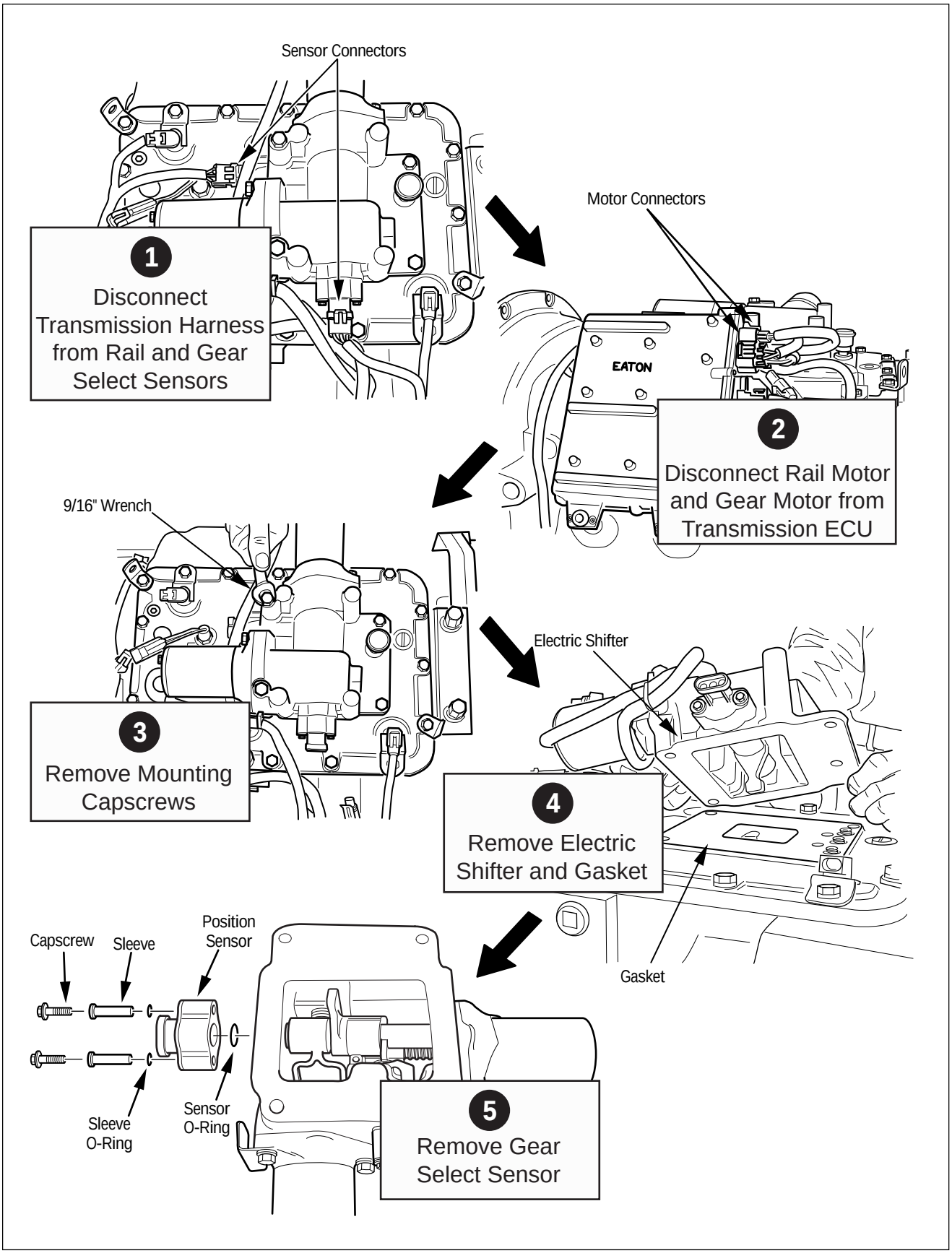


Figure 8. Gear Select Sensor Removal

Gear Select Sensor—Install

Special Instructions

Install the sensor with the connector on top.

While installing the capscrews, hold the Gear Select Sensor in place. Don't allow it to snap out of position.

Required Tools

Basic Hand Tools

Installation

1. Using a screwdriver, push and hold the Gear Select bushing inside the Shift Bar Housing toward the outside of the housing.
2. While holding the bushing in place, align the sensor tab with the slot and insert the Gear Select Sensor into the shift shaft.

Note: Install the sensor with the connector toward the top of the Shifter Housing.

3. Insert the new steel sleeves, O-rings and capscrews into the sensor mounting holes.
4. Using a 5/16" wrench, install and tighten the two (2) capscrews to 21-27 lb-in (2.4-3.1 N•m).
5. Clean and remove old gasket material from the Shift Bar Housing.
6. Position a new gasket at the Shift Bar Housing mounting location.

Note: Check to make sure that the shift blocks are in the neutral position.

7. Move the shift finger in the Electric Shifter to the center (Neutral) position.

Note: If the shift finger is not properly aligned, the Electric Shifter will not fit properly at its mounting location.

8. Position the Electric Shifter on the Shift Bar Housing.
9. Using a 9/16" wrench, install and tighten the four (4) capscrews to 35-45 lb-ft (47.5-61.0 N•m).
10. Reconnect the Transmission Harness to the Rail Select Sensor and Gear Select Sensor.
11. Reconnect the Rail Select Motor to the Transmission ECU.
12. Reconnect the Gear Select Motor to the Transmission ECU.
13. Use nylon cable ties to secure the motor wires to the transmission.

Final Check

Make sure that the capscrews are tightened to specification.

Make sure that the all connections are tight.

To operate properly, the system must be calibrated as follows:

1. Turn the ignition switch to ON and allow the transmission to power up.
2. Turn the ignition switch to OFF and wait two minutes.

Important: The shifter module must be calibrated before the vehicle is placed into operation.

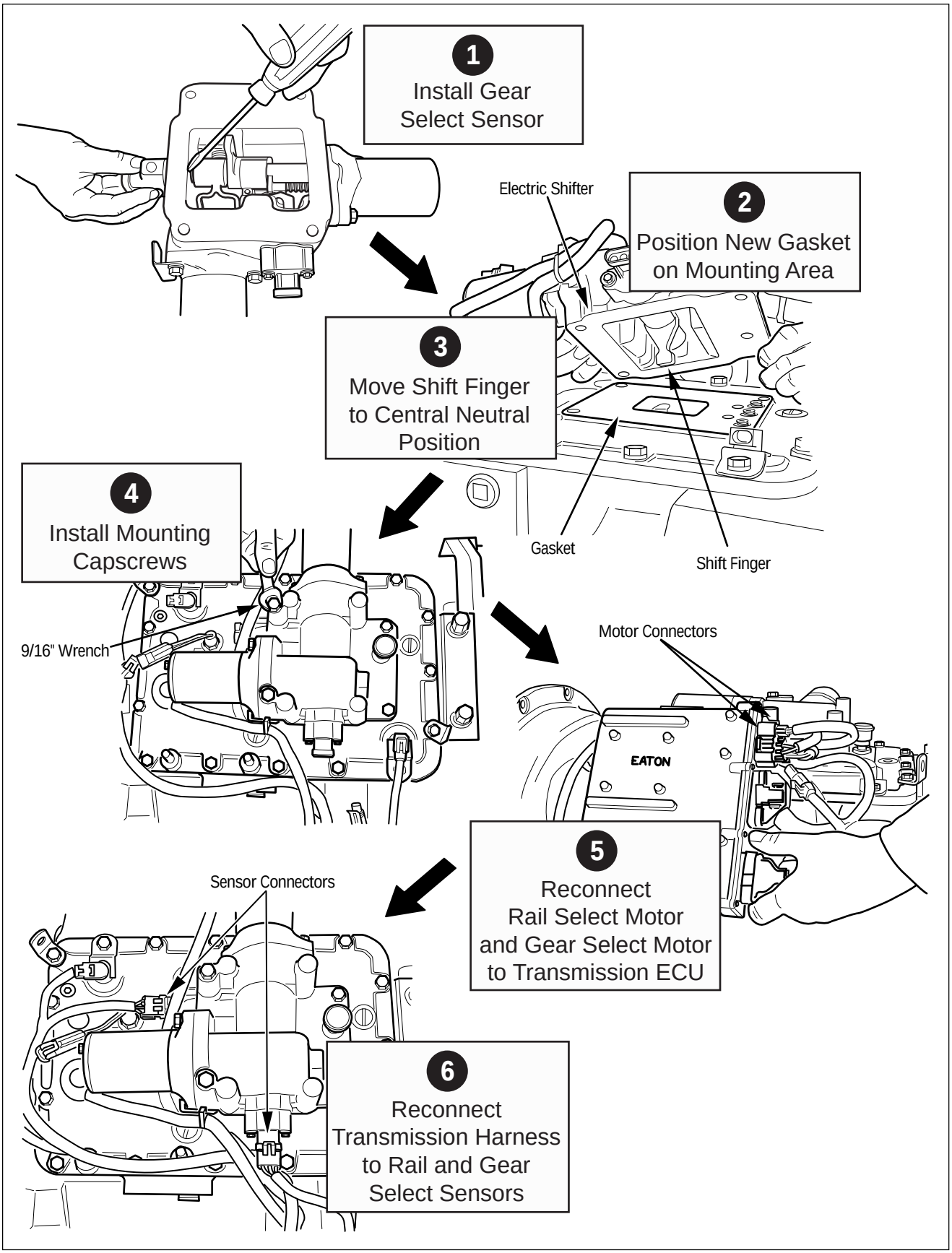


Figure 9. Gear Select Sensor Installation

Input/Main/Output Shaft Speed Sensors—Remove

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

Note: Output Shaft Speed Sensor location may vary depending on OEM design specifications. The sensor may be located at the 12 o'clock (shown in Figure 7), 10 o'clock or 6 o'clock position on the Output Shaft Housing.

1. Disconnect the Transmission Harness from the Speed Sensor.
2. Remove the rubber cap from the retaining bolt.

Note: This cap is installed during manufacturing. It is NOT necessary to replace it.

3. Using a 9/16" wrench, remove the sensor retaining bolt.
4. Remove the spring clip if so equipped.
5. Remove the Speed Sensor, with O-ring, from the transmission housing.

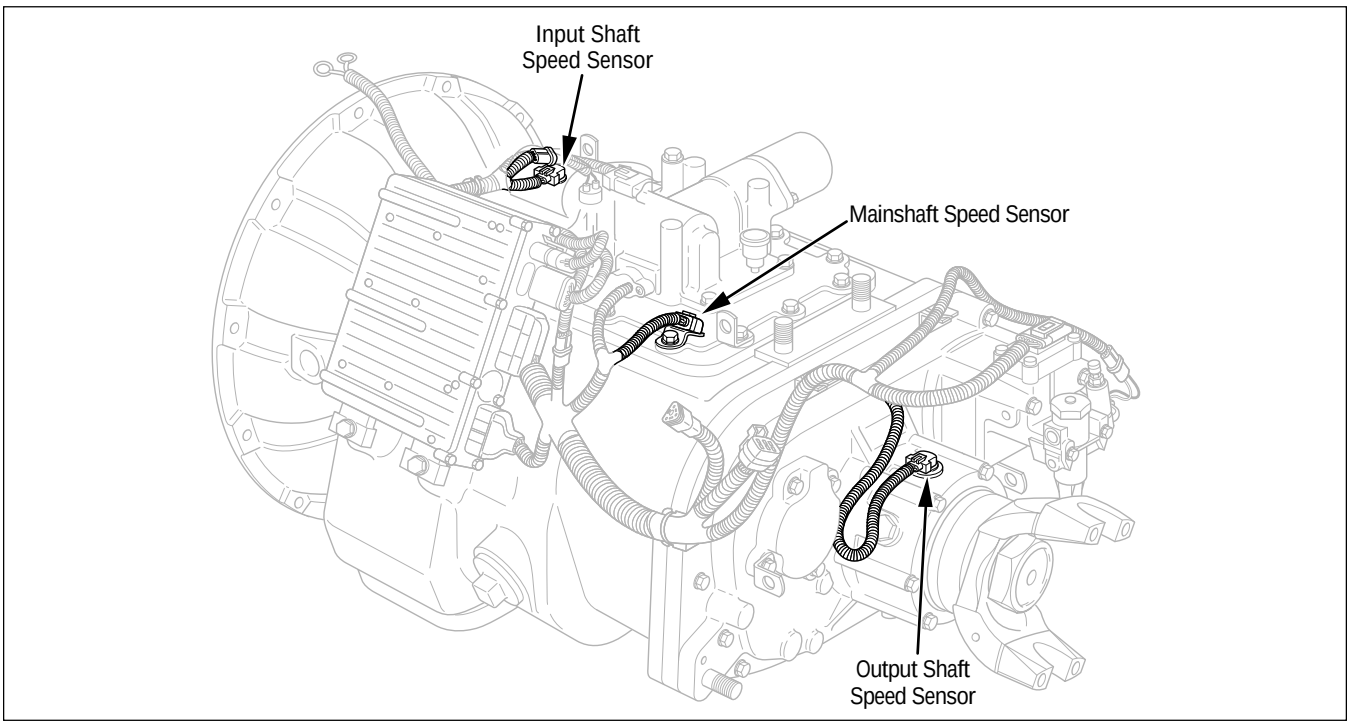


Figure 10. Input/Main/Output Shaft Speed Sensor Locations

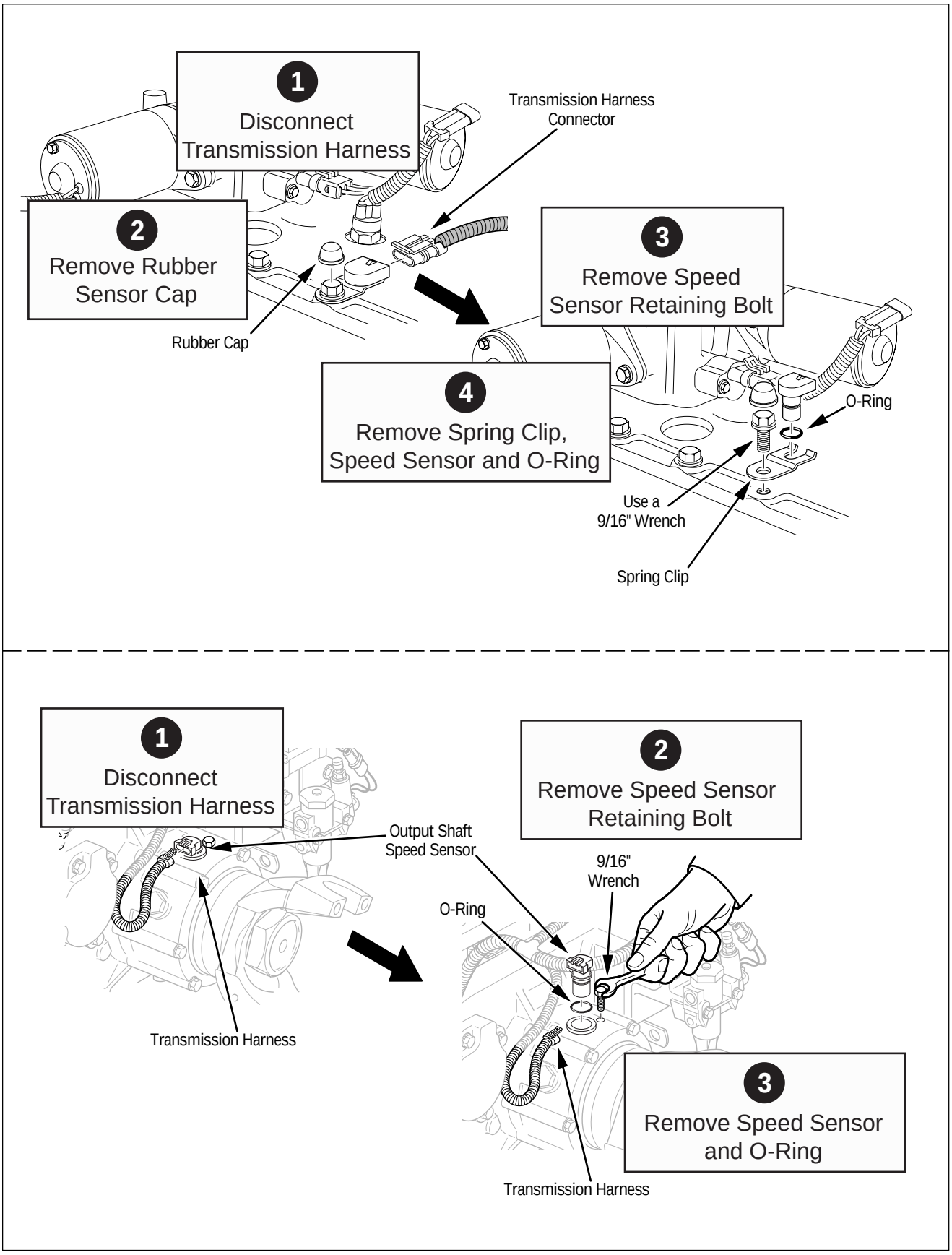


Figure 11. Input/Main/Output Speed Sensor Removal

Input/Main/Output Shaft Speed Sensors—Install

Special Instructions

Use extra care when installing the O-ring.

Lubricate the O-ring with Eaton/Fuller silicone #71214 or equivalent.

Required Tools

Basic Hand Tools

Installation

1. Using a smooth, twisting motion, fully insert the Speed Sensor in the transmission housing opening.
2. Install the spring clip if so equipped.
3. Using a 9/16" wrench, install and tighten the retaining bolt to 35-45 lb-ft (47.5-61.0 N•m).
4. Reconnect the Transmission Harness to the Speed Sensor.

Final Check

Make sure the retaining bolt is properly tightened.

Make sure the Transmission Harness is properly connected to the Speed Sensor.

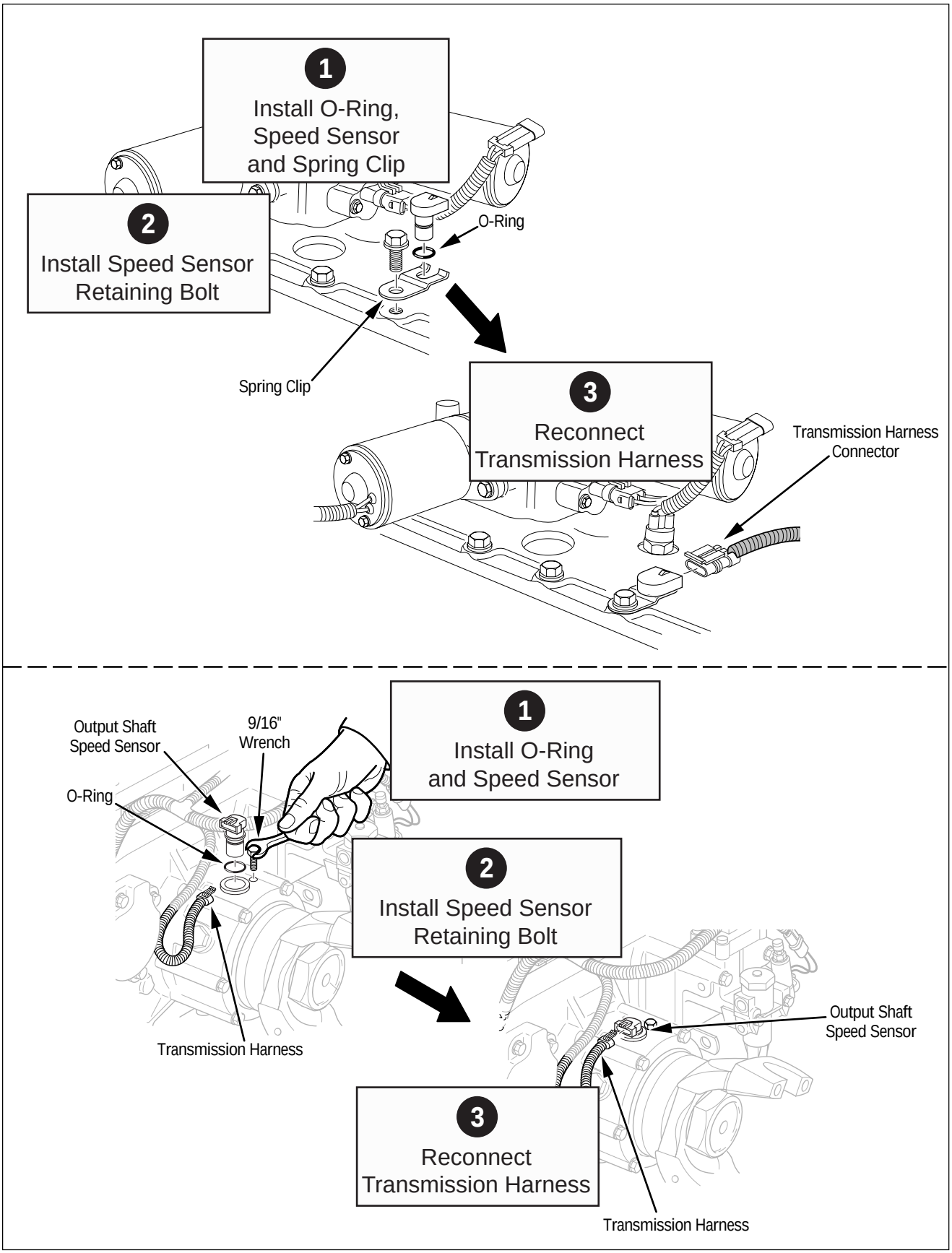


Figure 12. Input/Main/Output Speed Sensor Installation

Range Valve—Remove

Special Instructions

Do not use a hammer to loosen the Range Valve in the housing.

Required Tools

Basic Hand Tools

Removal

1. Relieve system air pressure by disconnecting vehicle air supply from the Air Filter/Regulator.
2. Disconnect the Transmission Harness from the Range Valve assembly.
3. Using a 5/16" wrench, remove the four (4) Range Valve capscrews.
4. Lift and remove the Range Valve from the transmission housing.

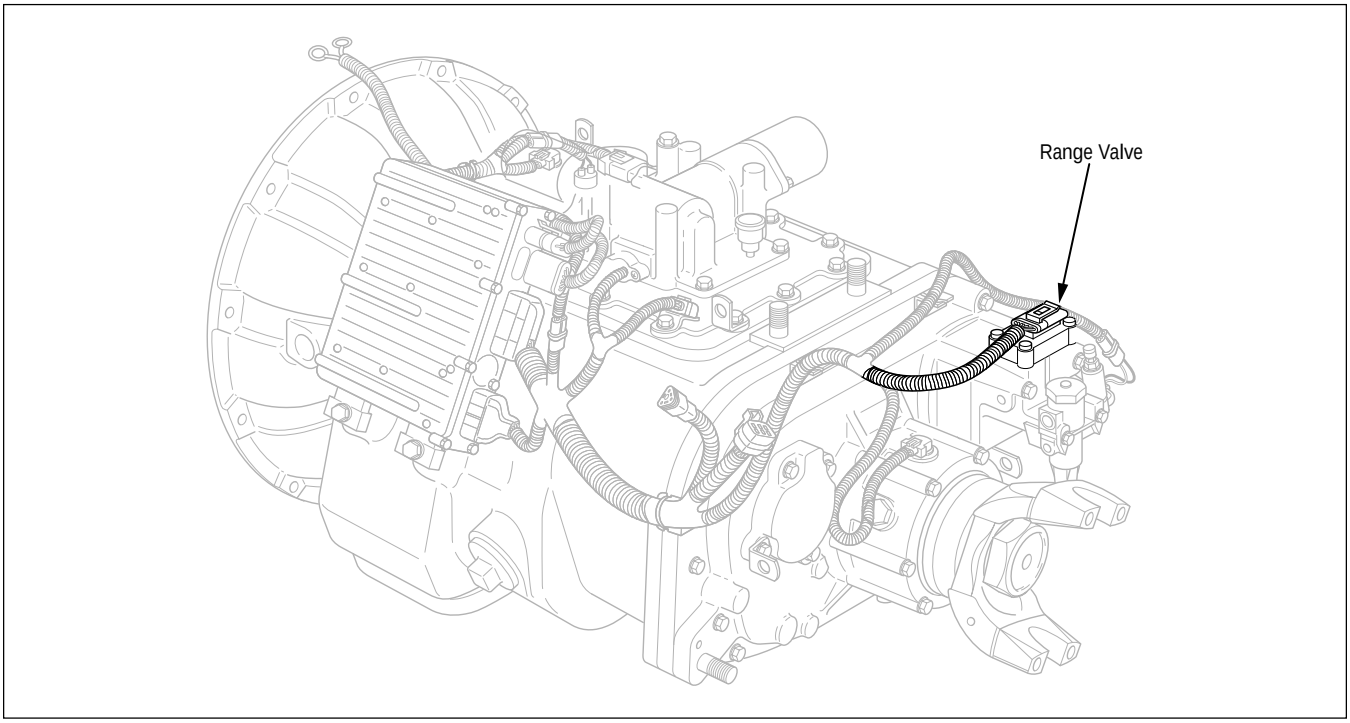


Figure 13. Range Valve Location

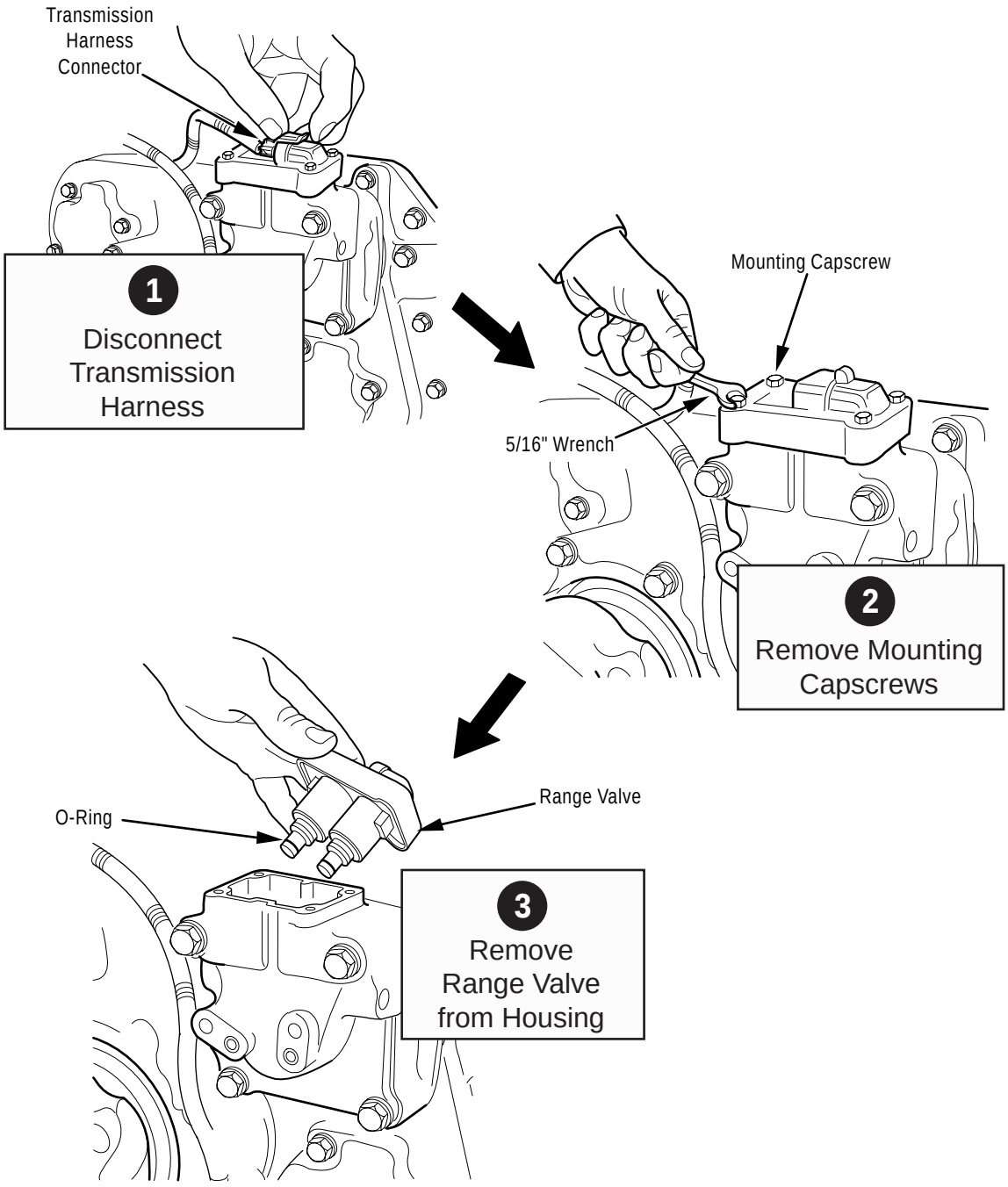


Figure 14. Range Valve Removal

Range Valve—Install

Special Instructions

Use caution when installing O-rings.

Lubricate O-rings with Eaton/Fuller silicone #71214 or equivalent.

Required Tools

Basic Hand Tools

Installation

1. Install and push the Range Valve down into the transmission housing.

Note: The valve is keyed to fit its mounting location. Take care to align the slot in the valve with the slot in the transmission housing.

2. Using a 5/16" wrench, install and tighten the four (4) capscrews to 21-27 lb-in (2.4-3.1 N•m).
3. Reconnect the Transmission Harness to the Range Valve.
4. Reconnect the air supply to the Air Filter/Regulator.

Final Check

Make sure the capscrews are properly tightened.

Make sure the Transmission Harness is connected and locked.

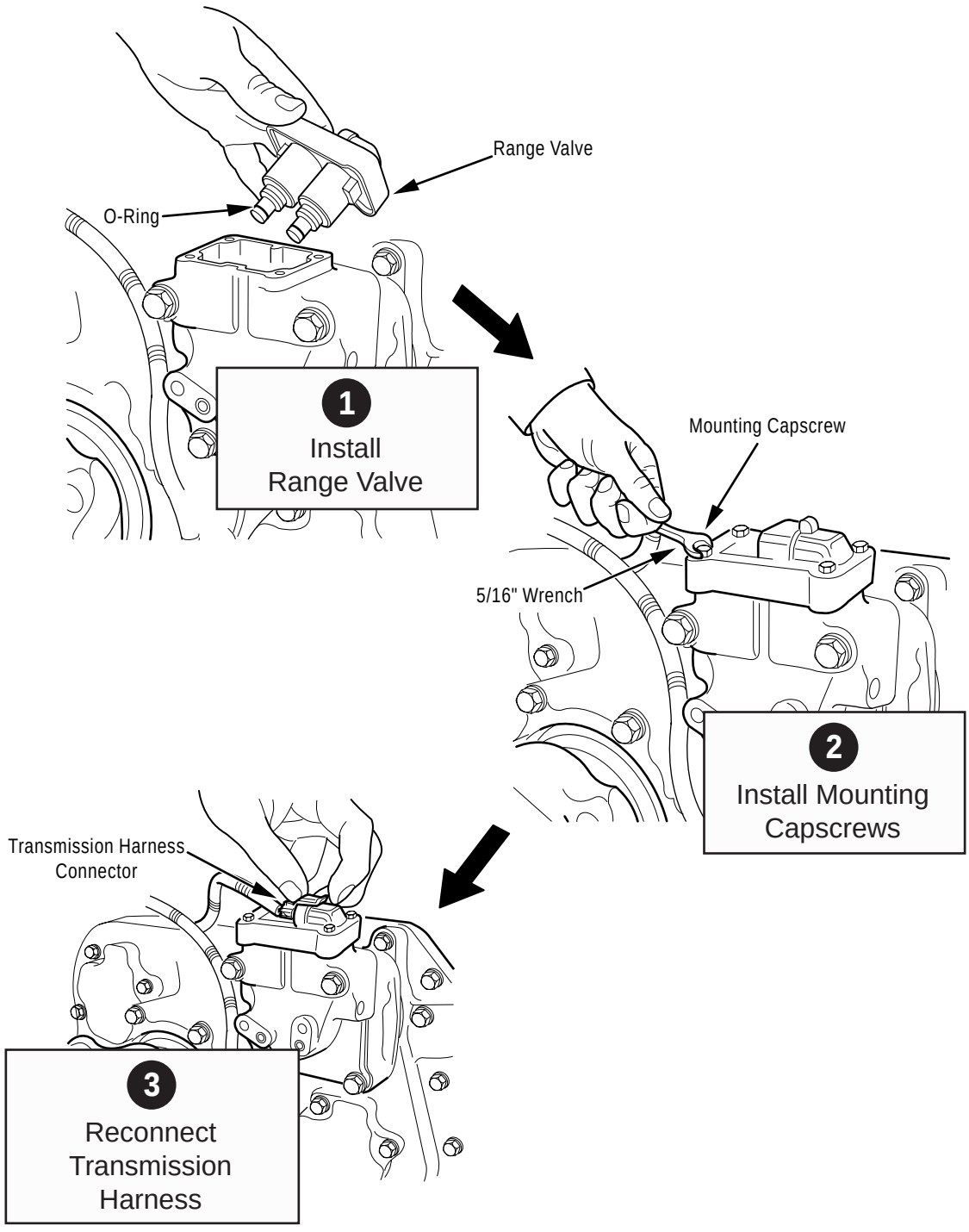


Figure 15. Range Valve Installation

Splitter Valve—Remove

Special Instructions

Do not use a hammer to loosen the Splitter Valve in the housing.

Required Tools

Basic Hand Tools

Removal

1. Relieve system air pressure by disconnecting vehicle air supply from the Air Filter/Regulator.
2. Disconnect the Transmission Harness from the Splitter Valve.
3. Using a 5/16" wrench, remove the four (4) Splitter Valve capscrews.
4. Lift and remove the Splitter Valve from the transmission housing.

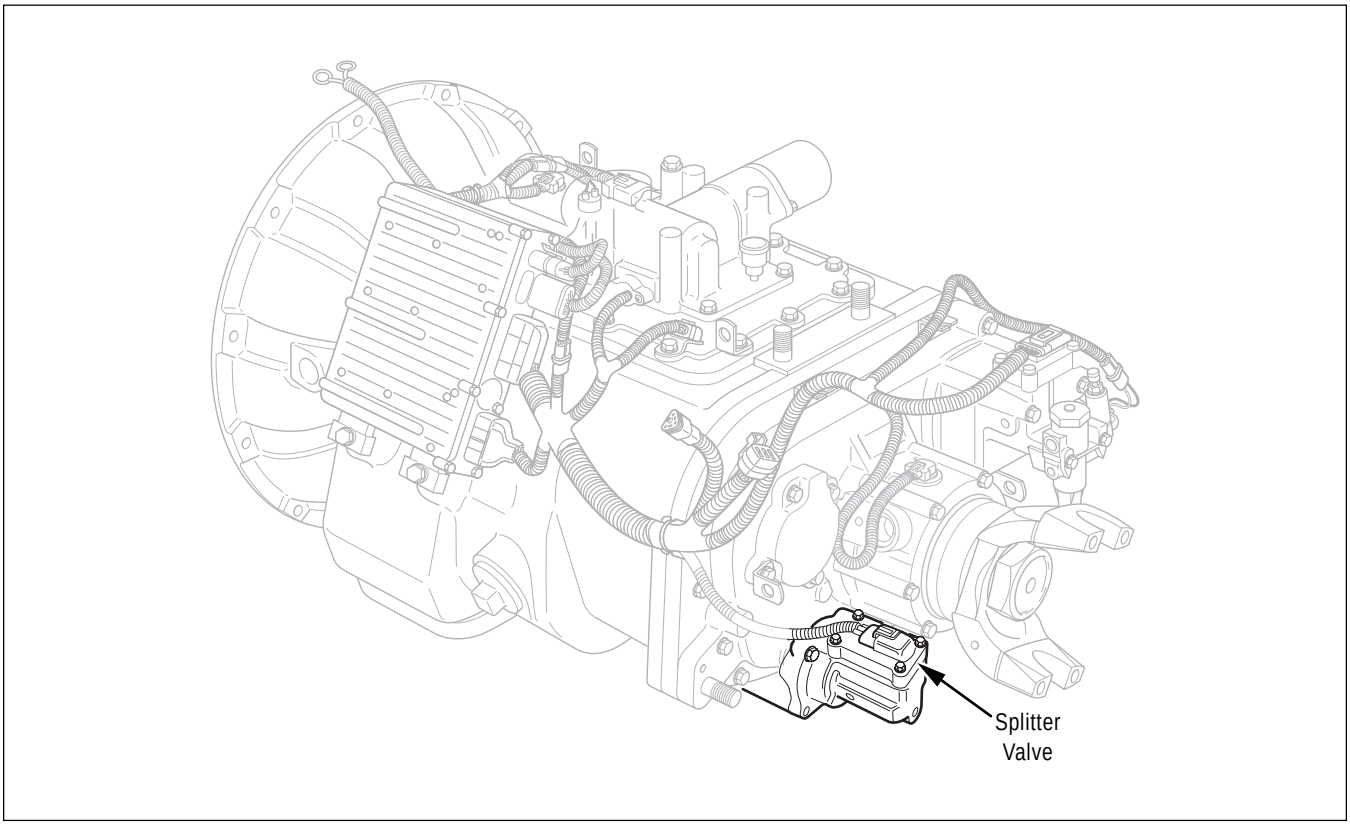


Figure 16. Splitter Valve Location

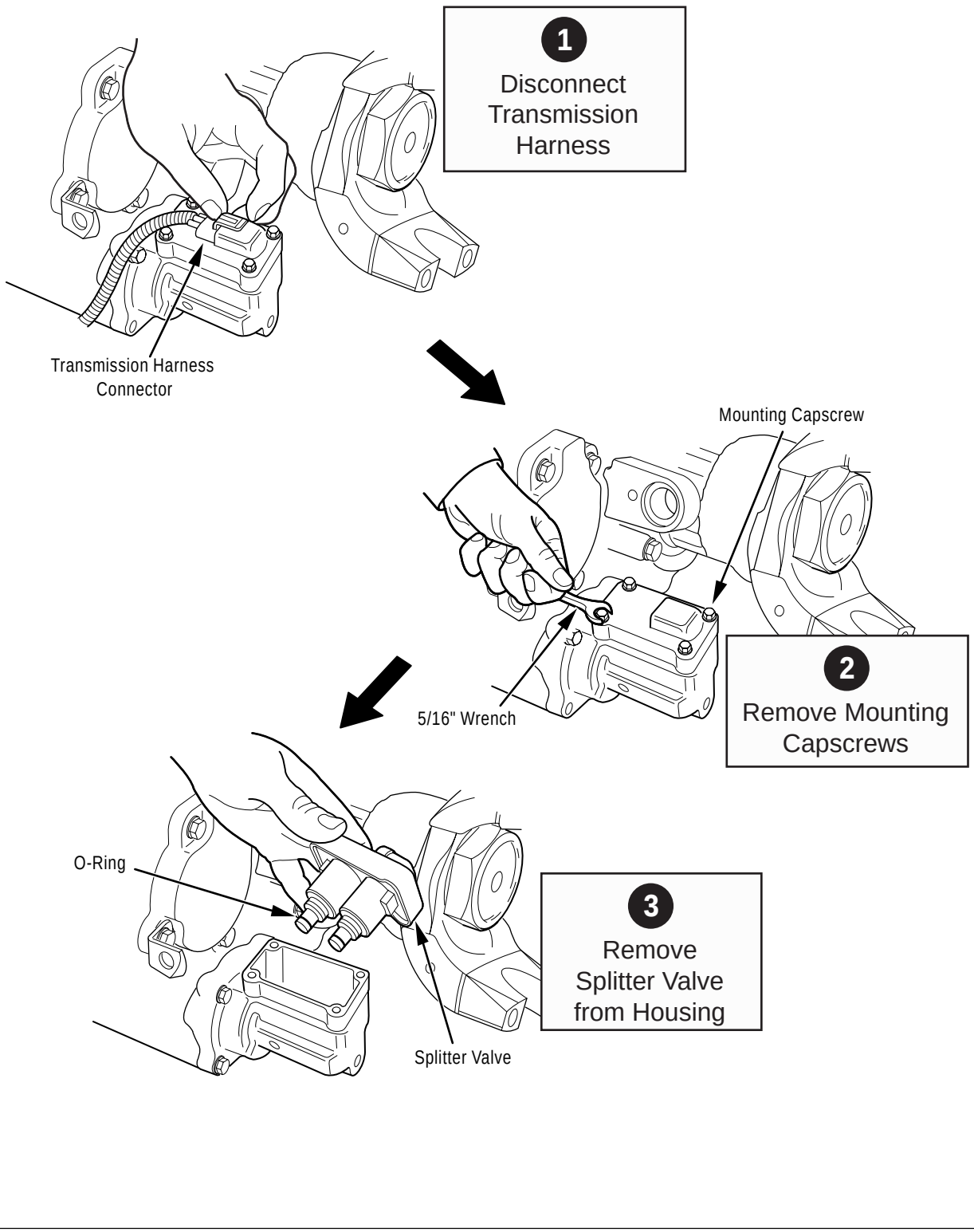


Figure 17. Splitter Valve Removal

Splitter Valve—Install

Special Instructions

Use caution when installing O-rings.

Lubricate O-rings with Eaton/Fuller silicone #71214 or equivalent.

Required Tools

Basic Hand Tools

Installation

1. Install and push the Splitter Valve down into the transmission housing.

Note: The valve is keyed to fit its mounting location. Take care to align the slot in the valve with the slot in the transmission housing.

2. Using a 5/16" wrench, install and tighten the four (4) capscrews to 21-27 lb-in (2.4-3.1 N•m).
3. Reconnect the Transmission Harness to the Splitter Valve.
4. Reconnect the air supply to the Air Filter/Regulator.

Final Check

Make sure the capscrews are properly tightened.

Make sure the Transmission Harness is connected and locked.

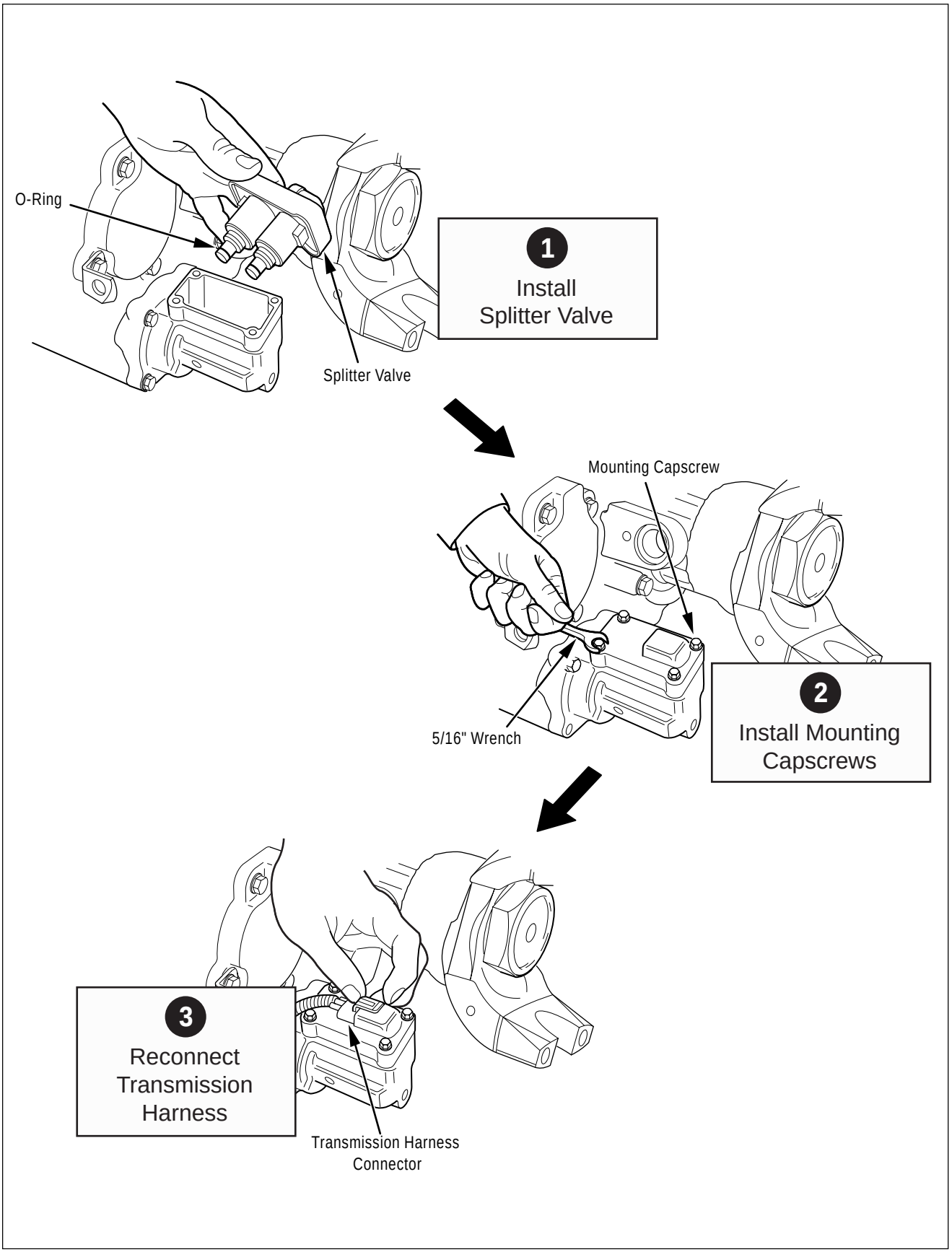


Figure 18. Splitter Valve Installation

Air Filter/Regulator—Remove

Special Instructions

The Air Filter/Regulator has two (2) O-rings located between the filter/regulator and the Range Cylinder Cover.

Required Tools

Basic Hand Tools

Removal

1. Relieve system air pressure by disconnecting vehicle air supply from the Air Filter/Regulator.
2. Using a 7/16" wrench, remove the two (2) capscrews.
3. Remove the Air Filter/Regulator assembly.
4. Remove the two (2) O-rings from the recesses in the Range Cylinder Cover.

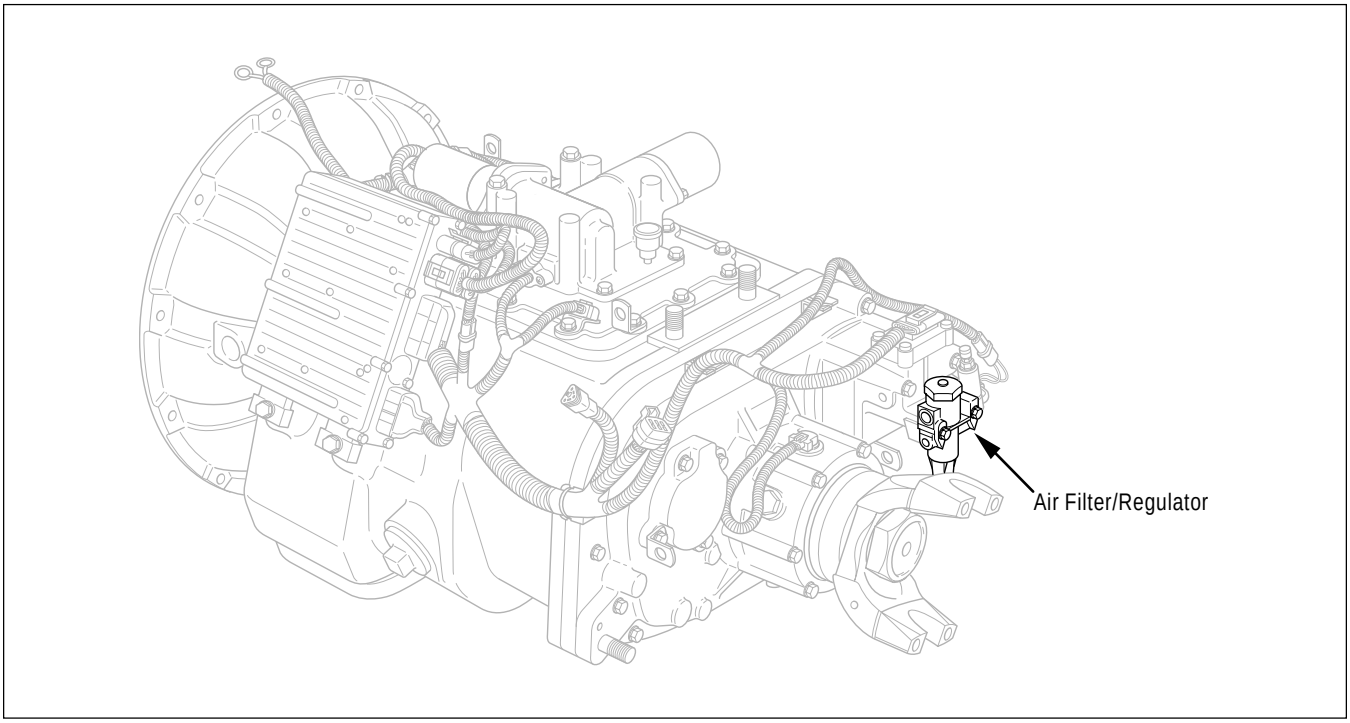


Figure 19. Air Filter/Regulator Location

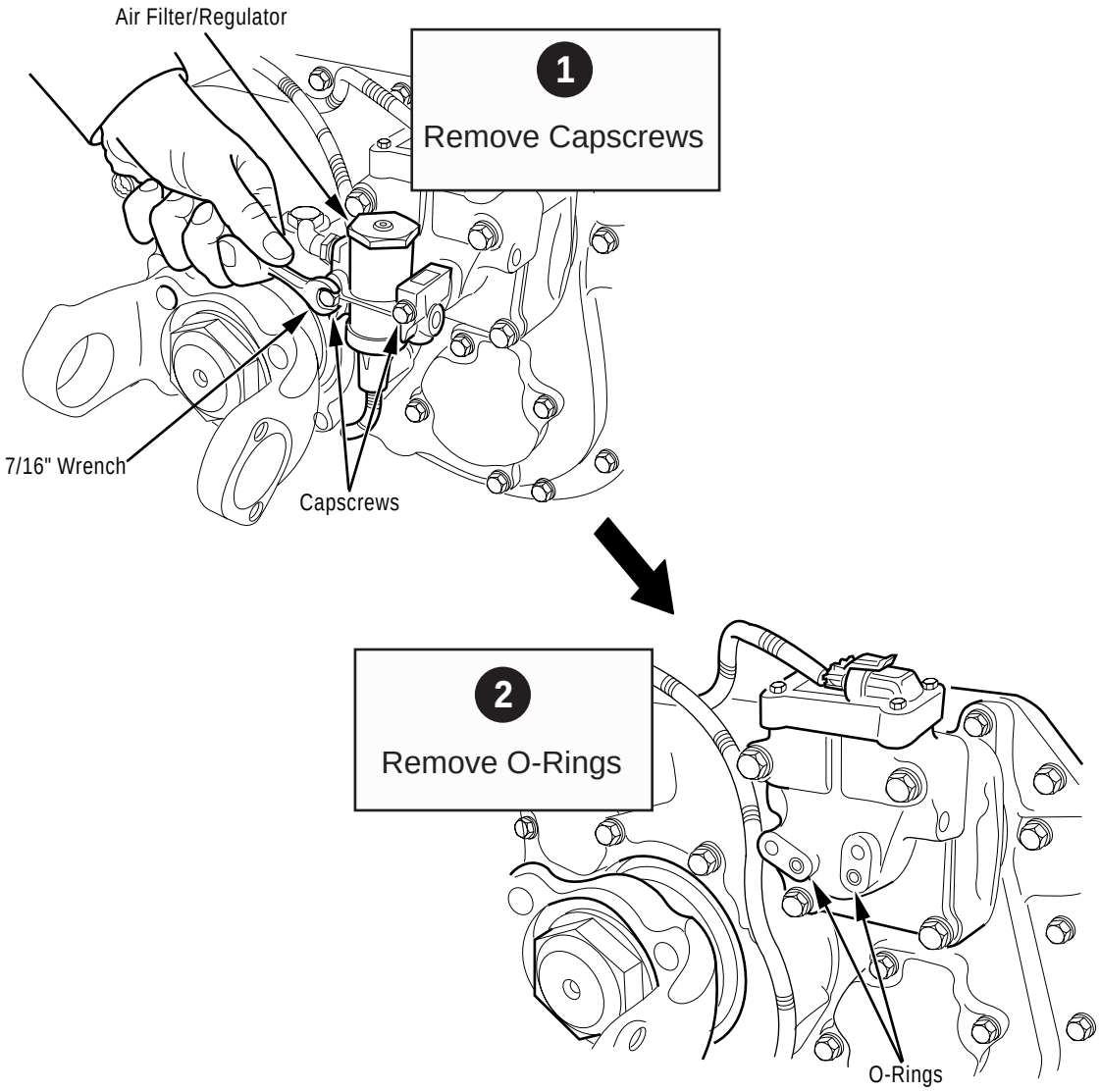


Figure 20. Air Filter/Regulator Removal

Air Filter/Regulator—Install

Special Instructions

The Air Filter/Regulator has two (2) O-rings located between the Air Filter/Regulator and the Range Cylinder Cover.

Lubricate the O-rings with Eaton/Fuller silicone #71214 or equivalent.

Required Tools

Basic Hand Tools

Installation

1. Press the O-rings into the recesses in the Range Cylinder Cover.
2. Apply Eaton/Fuller sealant #71205 or equivalent to the two (2) retaining capscrews.
3. Insert the capscrews into the Air Filter/Regulator mounting holes.
4. Position the Air Filter/Regulator over the O-rings.
5. Using a 7/16" wrench, install and tighten the two (2) capscrews to 8-12 lb-ft (10.8-16.3 N•m).
6. Reconnect the air supply to the Air Filter/Regulator.

Final Check

Make sure that the capscrews are properly tightened.

Make sure that all air supply fittings are tight.

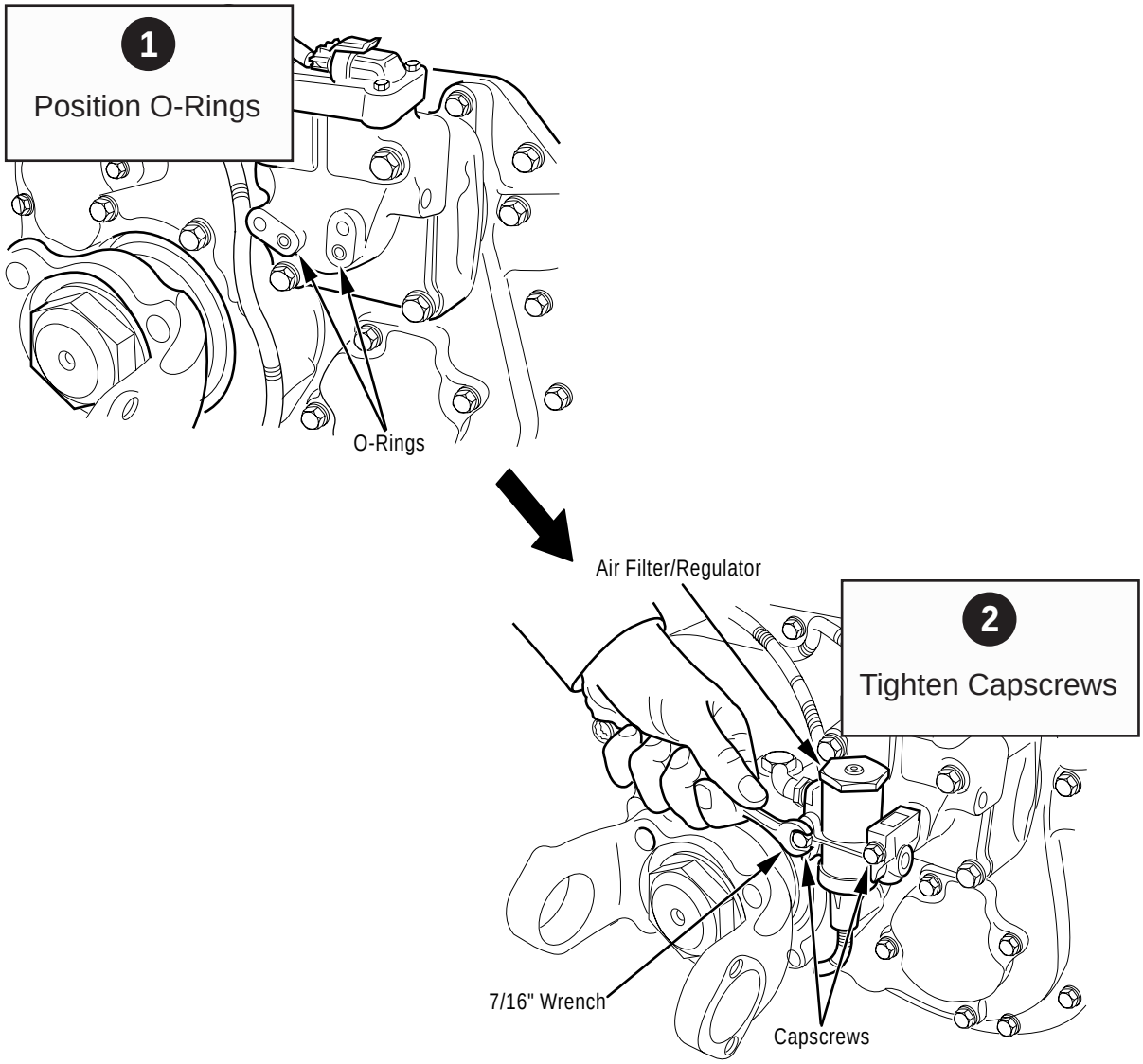


Figure 21. Air Filter/Regulator Installation

Inertia Brake Solenoid—Remove

Special Instructions

The Air Filter/Regulator must be removed before removing the Inertia Brake Solenoid. Make sure the two (2) O-rings between the Air Filter/Regulator and the Range Cylinder Cover are properly positioned during reassembly.

Disconnect the Inertia Brake Solenoid air line from the Inertia Brake before disconnecting it from the Inertia Brake Solenoid.

Required Tools

Basic Hand Tools

Removal

1. Relieve system air pressure by disconnecting vehicle air supply from the Air Filter/Regulator.
2. Disconnect the Transmission Harness from the Inertia Brake Solenoid.
3. Using a 5/8" wrench, disconnect the air line at the Inertia Brake end (swivel end).
4. Using a 3/4" wrench, disconnect the air line at the solenoid end.
5. Using a 7/16" wrench, remove the Air Filter/Regulator, with the solenoid attached, from the Range Cylinder Cover.

Note: Remove and inspect the two (2) O-rings from the recesses in the Range Cylinder Cover.

6. Remove the Inertia Brake Solenoid from the Air Filter/Regulator.
7. Using a 9/16" wrench, remove the 1/8" 90° elbow from the Inertia Brake Solenoid and save it for installation on the new solenoid.
8. Using a 7/16" wrench, remove the 1/8" pipe nipple from the Inertia Brake Solenoid and save for installation on the new solenoid.

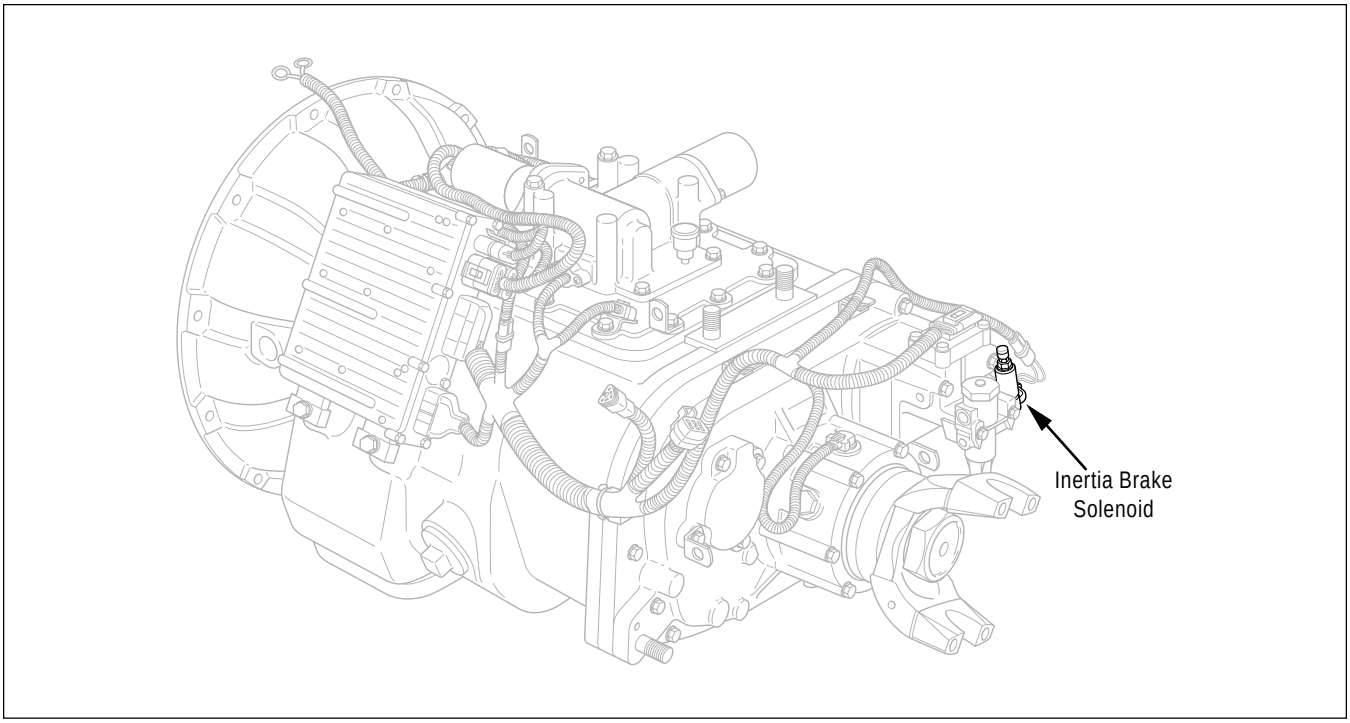


Figure 22. Inertia Brake Solenoid Location

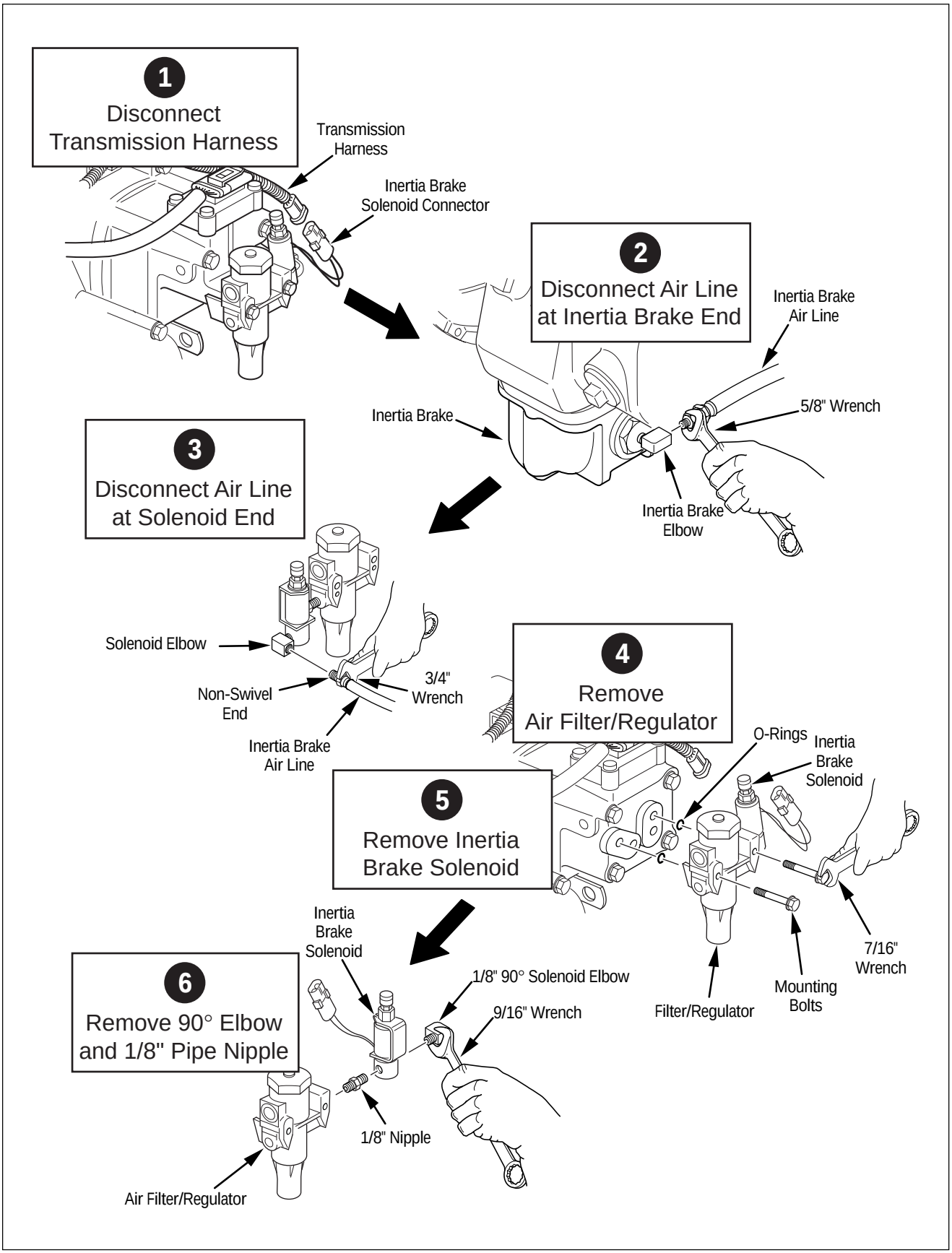


Figure 23. Inertia Brake Solenoid Removal

Inertia Brake Solenoid—Install

Special Instructions

Refer to the Air Filter/Regulator section for more information. The Air Filter/Regulator has two (2) O-rings located between the Air Filter/Regulator and the housing. Lubricate the O-rings with Eaton/Fuller silicone #71214 or equivalent. Make sure the O-rings are positioned properly during reassembly.

Apply the thread sealer (Eaton #71205) to all air connections before assembly.

Required Tools

Basic Hand Tools

Installation

1. Using a 9/16" wrench, install the 90° elbow onto the Inertia Brake Solenoid and tighten.

Note: Align the elbow to face the front of the transmission.

2. Using a 7/16" wrench, install the Inertia Brake Solenoid onto the Air Filter/Regulator with a pipe nipple and tighten.
3. Press the O-rings into the recesses in the Range Cylinder Cover.
4. Apply Eaton/Fuller sealant #71205 or equivalent to the two (2) retaining capscrews.
5. Insert the capscrews into the Air Filter/Regulator mounting holes.
6. Position the Air Filter/Regulator over the O-rings.
7. Using a 7/16" wrench, install and tighten the two (2) capscrews to 8-12 lb-ft (10.8-16.3 N•m).
8. Using a 3/4" wrench, reconnect the non-swivel end of the air line to the solenoid elbow fitting and tighten.
9. Using a 5/8" wrench, reconnect the swivel end of the air line to the Inertia Brake elbow fitting and tighten.
10. Reconnect the Transmission Harness to the Inertia Brake Solenoid.
11. Secure the air line and electrical harness as required with nylon cable ties.
12. Reconnect the air supply to the Air Filter/Regulator.

Final Check

Make sure the capscrews are properly tightened.

Make sure the air connections are tight.

Make sure the solenoid connector is properly connected to the Transmission Harness.

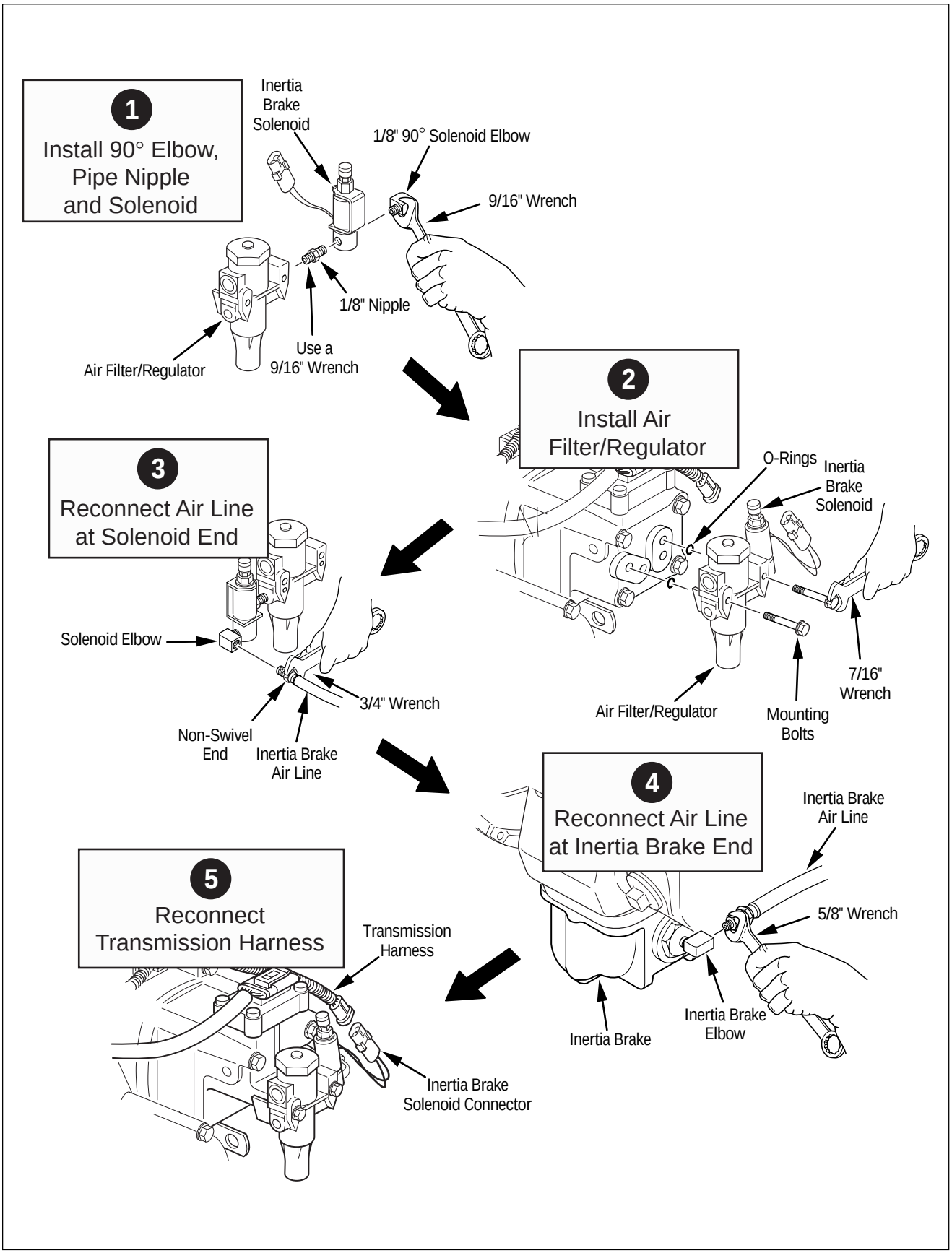


Figure 24. Inertia Brake Solenoid Installation

Inertia Brake—Remove

Special Instructions

Be sure to use sealing type washers to attach the Inertia Brake to the (eight-to-six) bolt adapter.

The Inertia Brake is mounted with two (2) longer mounting bolts (ends) and four (4) shorter mounting bolts (sides).

Required Tools

Basic Hand Tools

Removal

1. Drain the lubricant from the transmission.

Note: The Inertia Brake will still contain some lubricant.

2. Using a 5/8" wrench, disconnect the Inertia Brake air line from the 90° elbow.
3. Using a 9/16" wrench, remove the six (6) mounting bolts, with sealing washers, from the Inertia Brake.
4. Remove the Inertia Brake and gasket from the transmission.
5. Using a 9/16" wrench, remove the 90° elbow from the Inertia Brake.

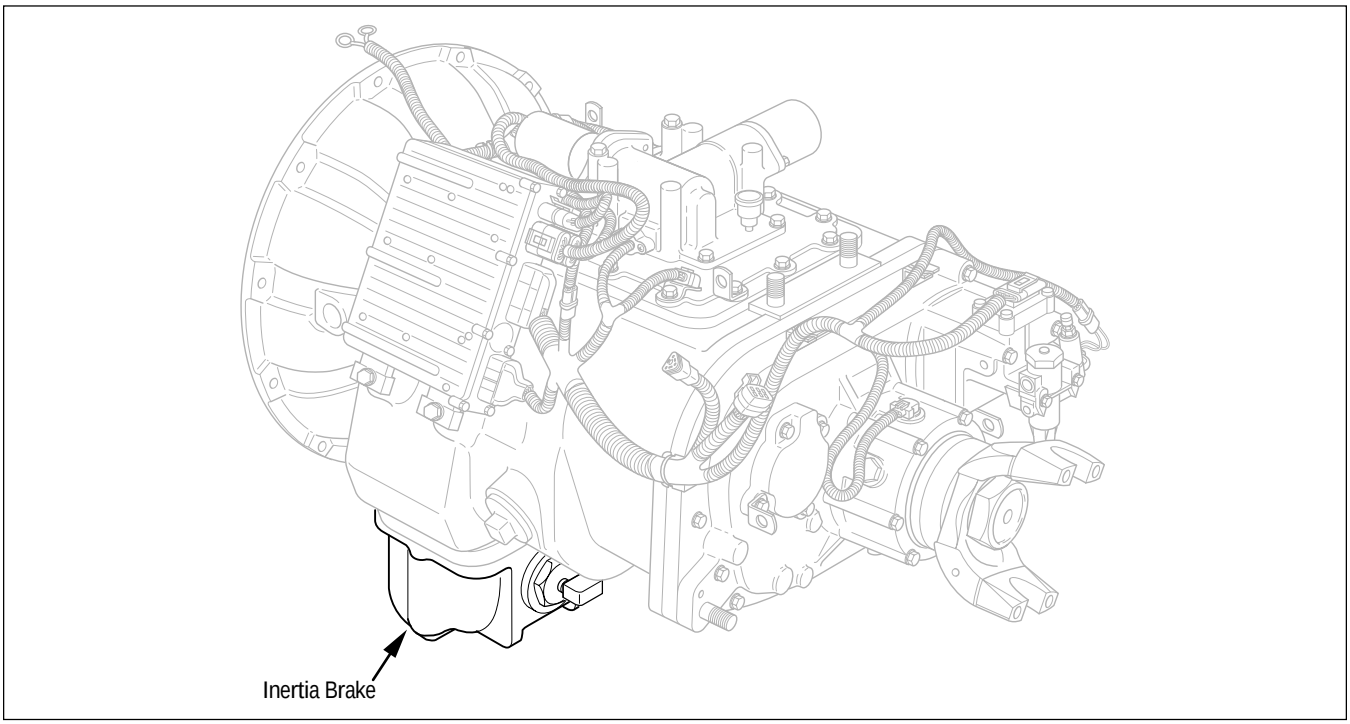


Figure 25. Inertia Brake Location

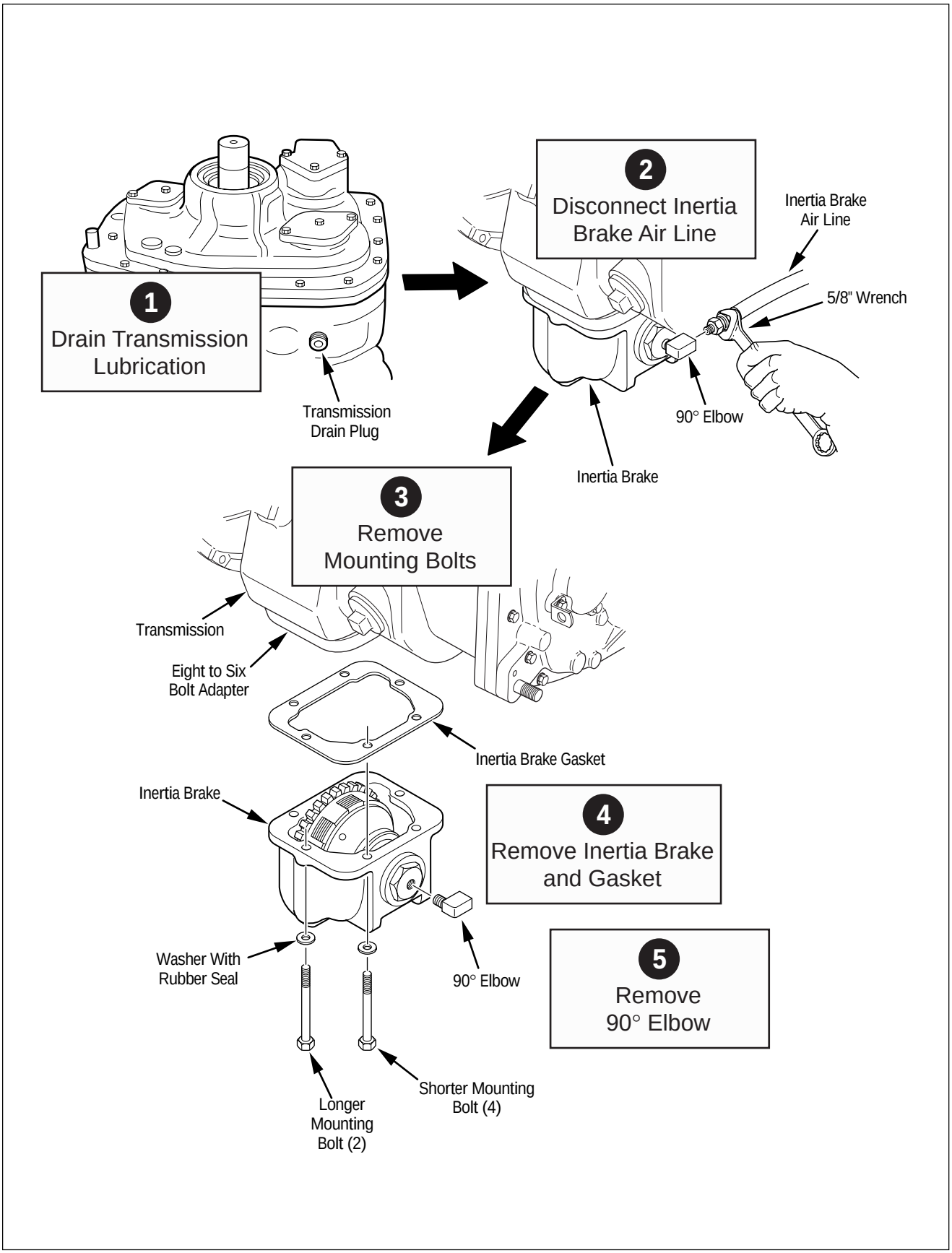


Figure 26. Inertia Brake Removal

Inertia Brake—Install

Special Instructions

Be sure to use sealing type washers on the mounting bolts.

Apply Eaton #71205 thread sealer to all air connections before assembly.

Required Tools

Basic Hand Tools

Installation

1. Clean and remove all old gasket material from the mating surfaces of the Inertia Brake and the transmission.
2. Using a 9/16" wrench, install the 90° elbow to the Inertia Brake and tighten.
3. Install the Inertia Brake being careful to align the Inertia Brake gear with the 47-tooth PTO drive gear.
4. Using a 9/16" wrench, install the four (4) shorter mounting bolts with sealing washers and two (2) longer mounting bolts with the sealing washers. Tighten mounting bolts to 35-45 lb-ft (47.5-61.0 N•m).

Note: The longer mounting bolts go on the ends of the Inertia Brake. The shorter bolts go on the sides of the Inertia Brake.

5. Using a 5/8" wrench, reconnect the air line to the 90° elbow on the Inertia Brake and tighten.
6. Using nylon cable ties, secure the air line as required.
7. Fill the transmission with lubricant.

Final Check

Make sure the mounting bolts are properly tightened.

Make sure the air fittings are properly tightened.

Make sure the transmission is properly filled with lubricant.

Check for lubricant leaks after operating the vehicle.

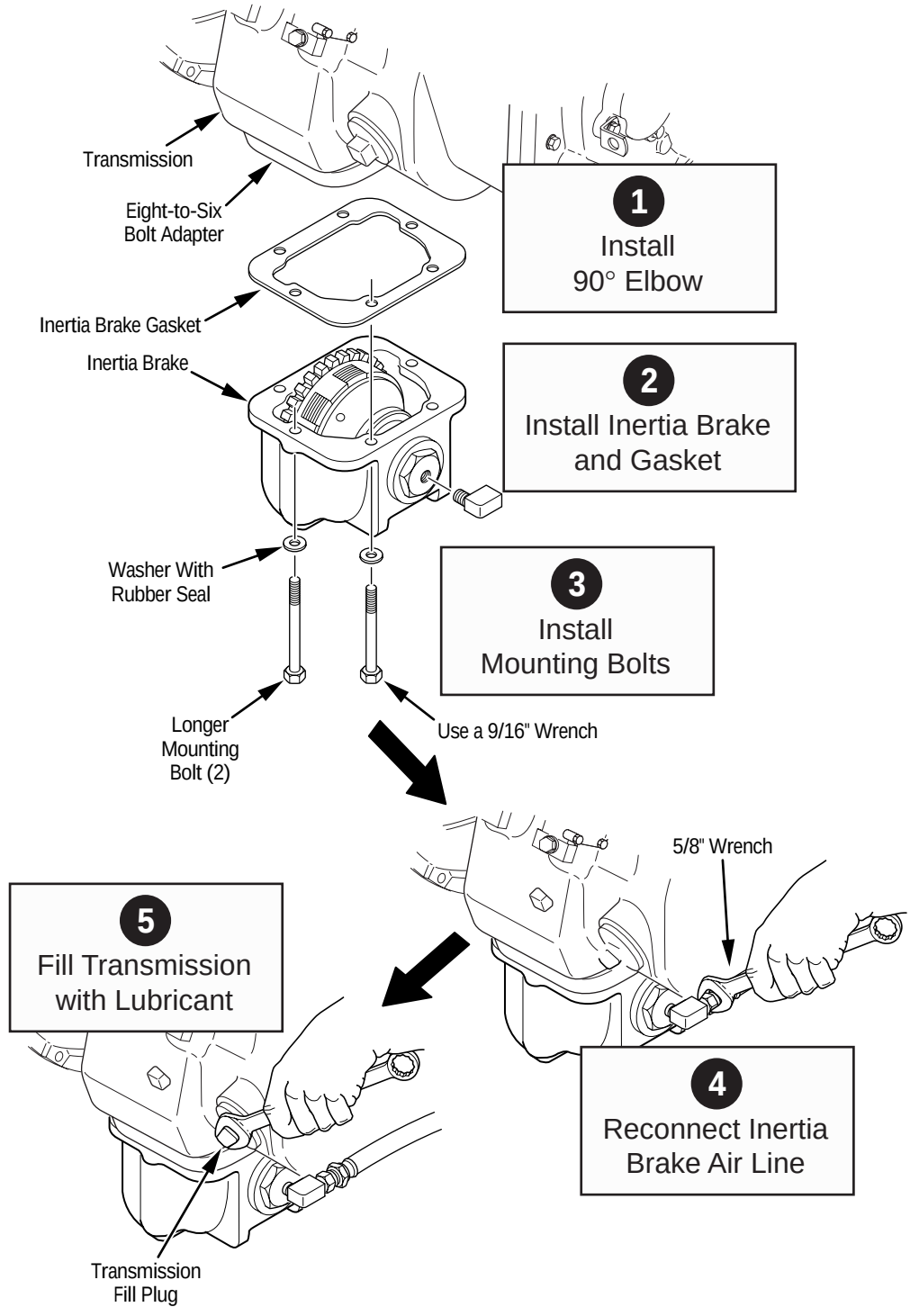


Figure 27. Inertia Brake Installation

Power Module—Remove

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Remove the two (2) 1/2" ring terminals from the starter (in the engine compartment).
2. Use a small flat-blade screwdriver to pry and disconnect the Motor Power connector from the Transmission ECU.
3. Disconnect the Logic Power connector from the Transmission Harness.
4. Using a phillips head or torx head screwdriver, remove the two (2) Power Module mounting screws.
5. Lift the Power Module assembly up and away from the transmission.

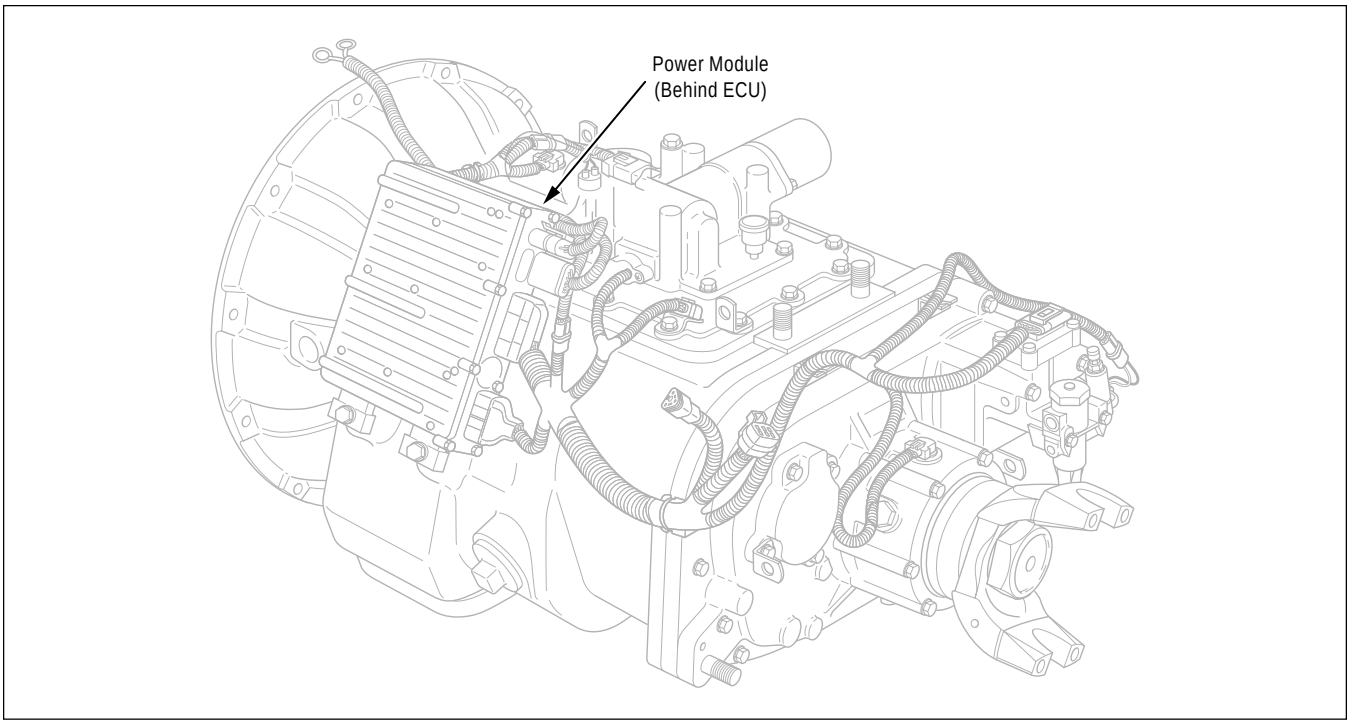


Figure 28. Power Module Location

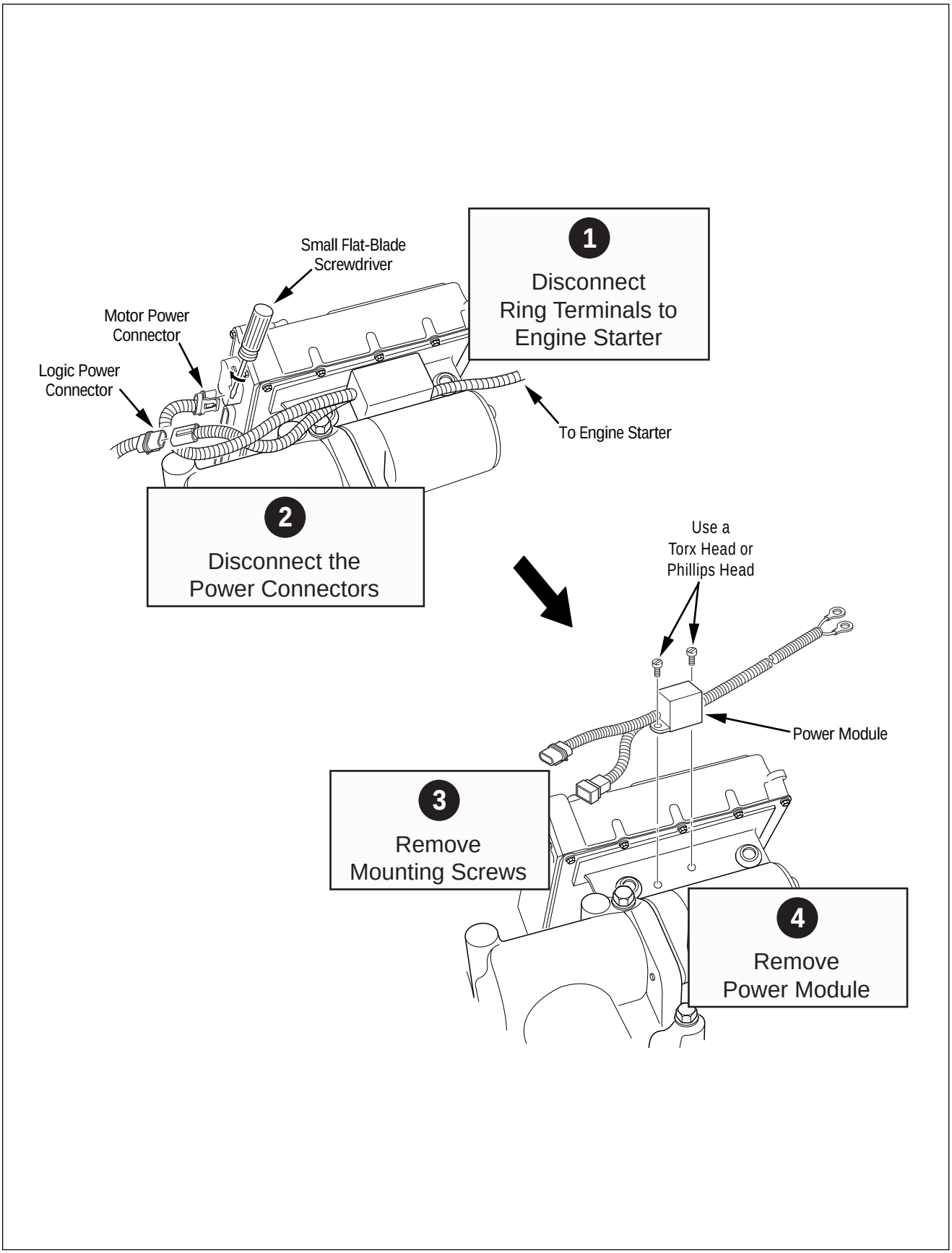


Figure 29. Power Module Removal

Power Module—Install

Special Instructions

None

Required Tools

Basic Hand Tools

Installation

1. Position the Power Module at its mounting location.
2. Use a phillips head or torx head screwdriver to install and tighten the two (2) mounting screws.
3. Reconnect the Motor Power connector to the Transmission ECU.
4. Reconnect the Logic Power connector to the Transmission Harness.
5. Reconnect the two (2) 1/2" ring terminals to the engine starter.

Note: Observe proper polarity when connecting the terminals to the starter (red for positive and black for negative).

Final Check

None

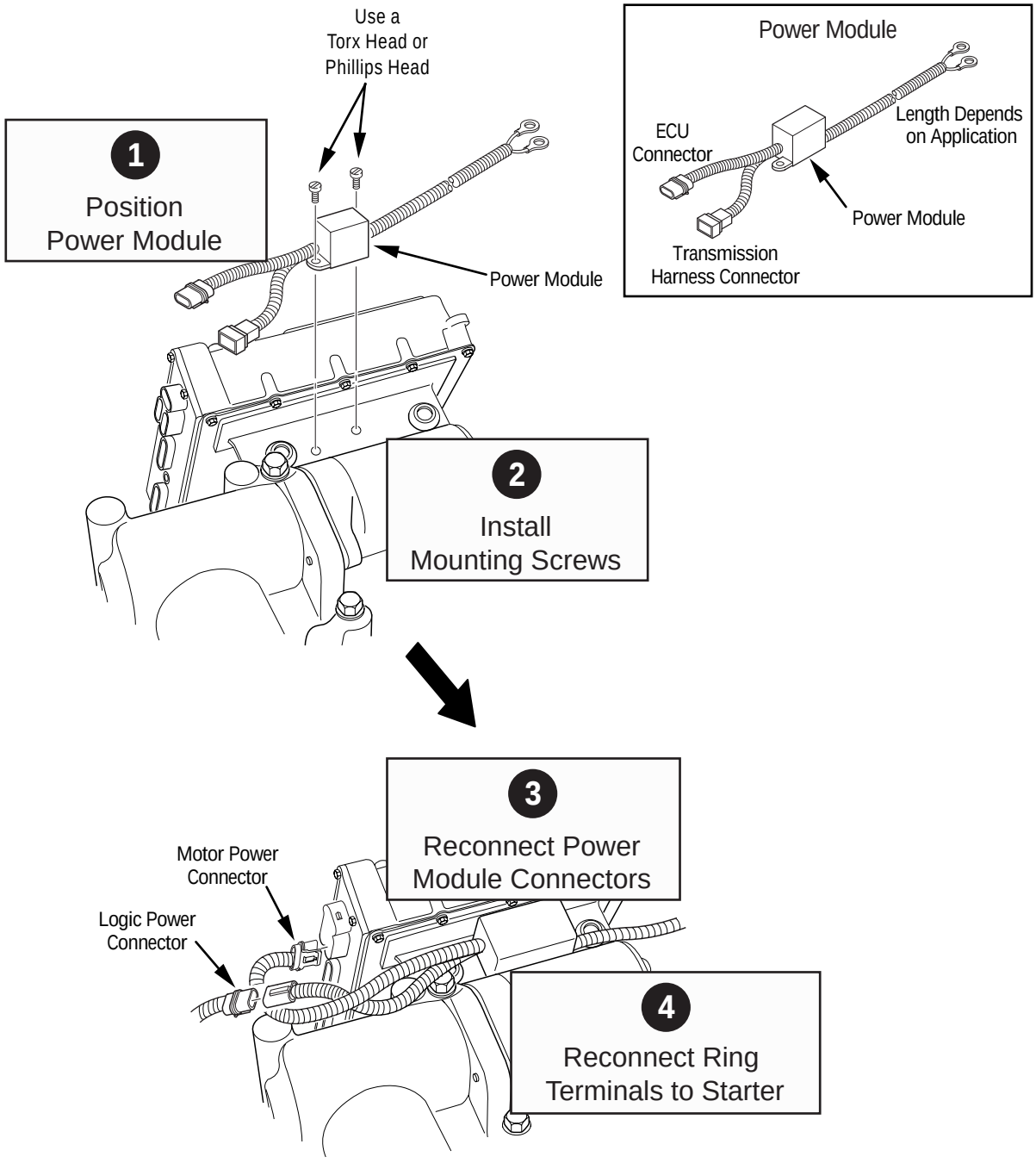


Figure 30. Power Module Installation

Electric Shifter—Remove

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Remove nylon cable ties from the motor wires.
2. Disconnect the Transmission Harness from the Rail Select Sensor and the Gear Select Sensor.
3. Disconnect the Rail Select Motor from the Transmission ECU.
4. Disconnect the Gear Select Motor from the Transmission ECU.
5. Using a 9/16" wrench, remove the four (4) capscrews.
6. Remove the Electric Shifter and gasket.

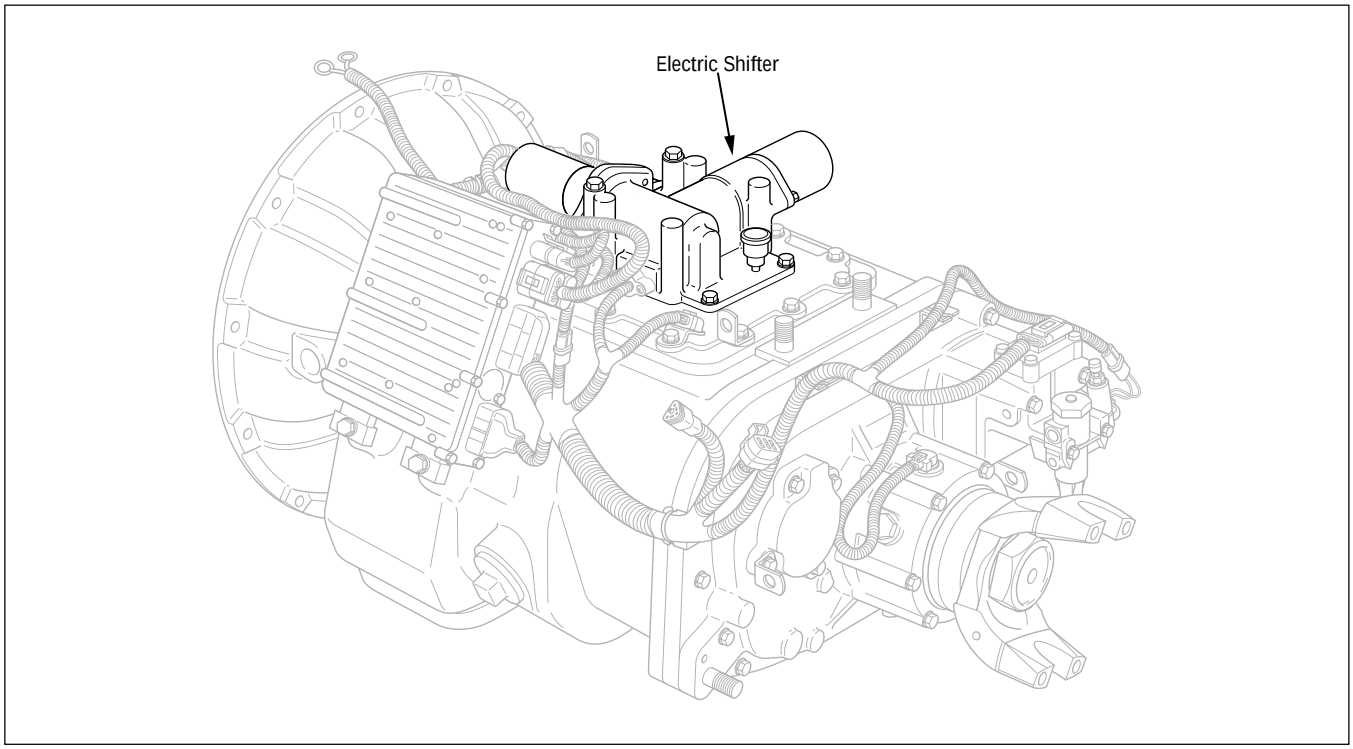


Figure 31. Electric Shifter Location

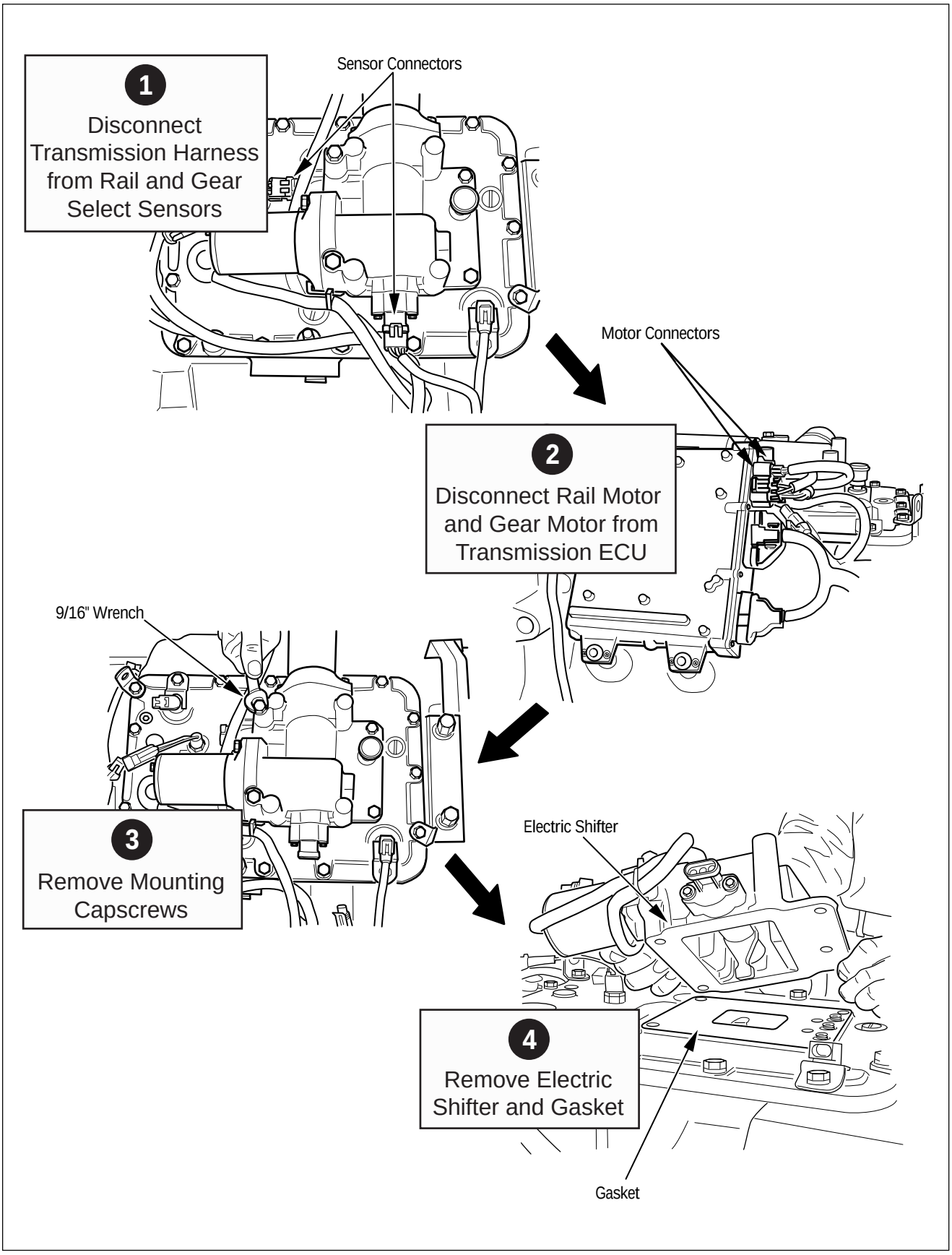


Figure 32. Electric Shifter Removal

Electric Shifter—Install

Special Instructions

Make sure the three (3) sets of detent balls and springs are installed properly in the Shift Bar Housing.

Required Tools

Basic Hand Tools

Installation

1. Clean and remove old gasket material from the Shift Bar Housing.
2. Position a new gasket at the Electric Shifter mounting location.
3. Check to ensure that the shift blocks are in the Neutral position.
4. Move the shift finger to the center (NEUTRAL) location.

Note: If the shift finger is not properly aligned, the Electric Shifter will not fit properly at its mounting location.

5. Position the Electric Shifter on the Shift Bar Housing.
6. Using a 9/16" wrench, install and tighten the capscrews to 35-45 lb-ft (47.5-61.0 N•m).
7. Reconnect the Transmission Harness to the Rail Select Sensor and Gear Select Sensor.
8. Reconnect the Rail Select Motor to the Transmission ECU.
9. Reconnect the Gear Select Motor to the Transmission ECU.
10. Using nylon cable ties, secure the motor wires to the transmission in their previous position.

Final Check

Make sure that the capscrews are tightened to specification.

Make sure all Electric Shifter connectors are securely attached.

To operate properly, the system must be calibrated as follows:

1. Turn the ignition switch to ON and allow the transmission to power up.
2. Turn the ignition switch to OFF and wait two minutes.

Important: The shifter module must be calibrated before the vehicle is placed into operation.

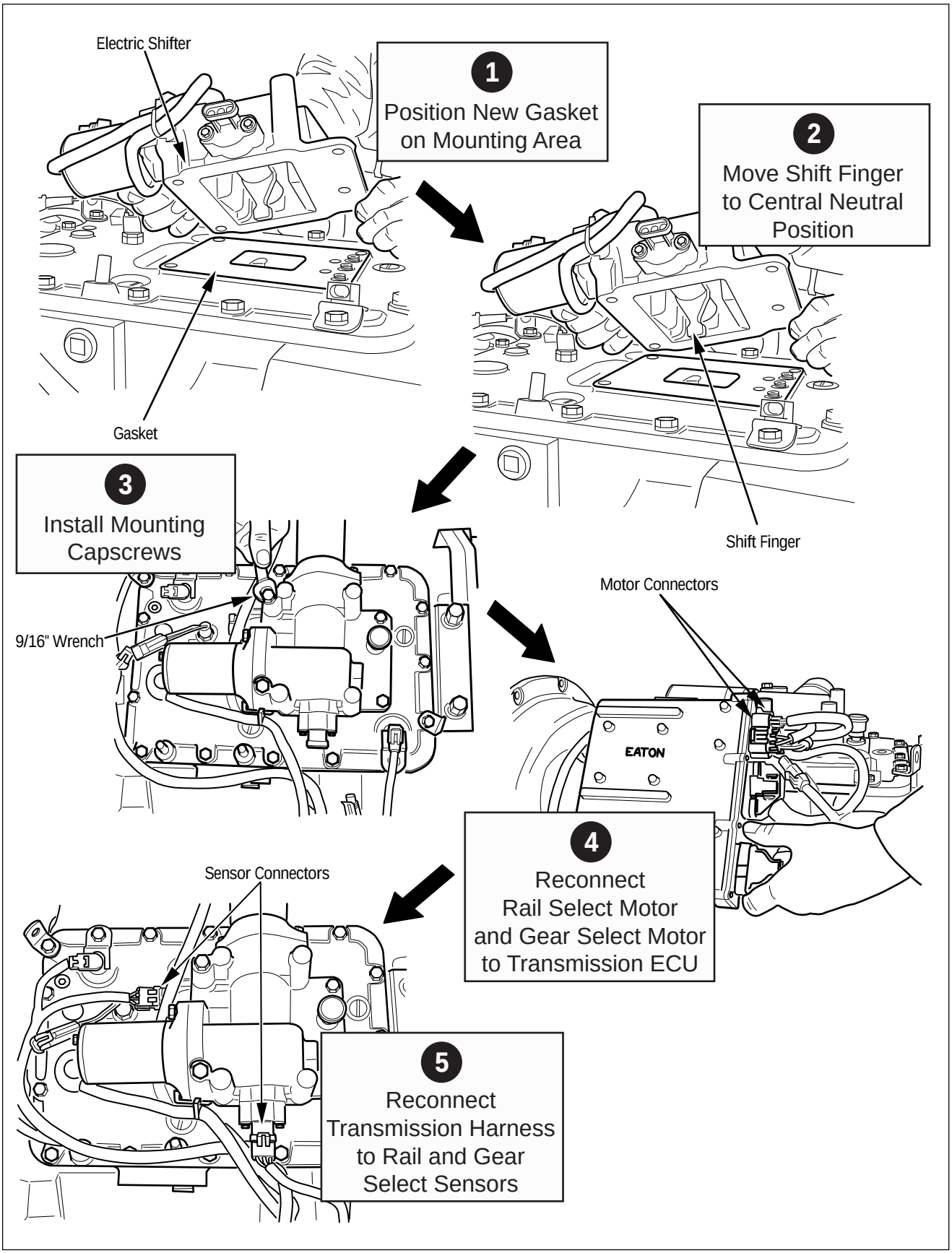


Figure 33. Electric Shifter Installation

Transmission ECU—Remove

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Disconnect the negative battery cable.
2. Remove nylon cable ties from ECU 24-way and 32-way connectors.
3. Disconnect the Gear Select Motor from the Transmission ECU.
4. Disconnect the Rail Select Motor from the Transmission ECU.
5. Use a small flat-blade screwdriver to unlock and disconnect the Motor Power connector.
6. Unlock and disconnect the Transmission ECU 32-way connector.
7. Unlock and disconnect the Transmission ECU 24-way connector.
8. Using a 1/2" wrench, remove the two (2) Transmission ECU mounting bolts.
9. Remove the Transmission ECU assembly from the locating studs.

CAUTION: When removing the Transmission ECU, take care not to bend the ECU locating bracket.

10. Using a phillips head or torx head screwdriver, remove the Power Module mounting screws.
11. Remove the Power Module and lay it on the transmission.

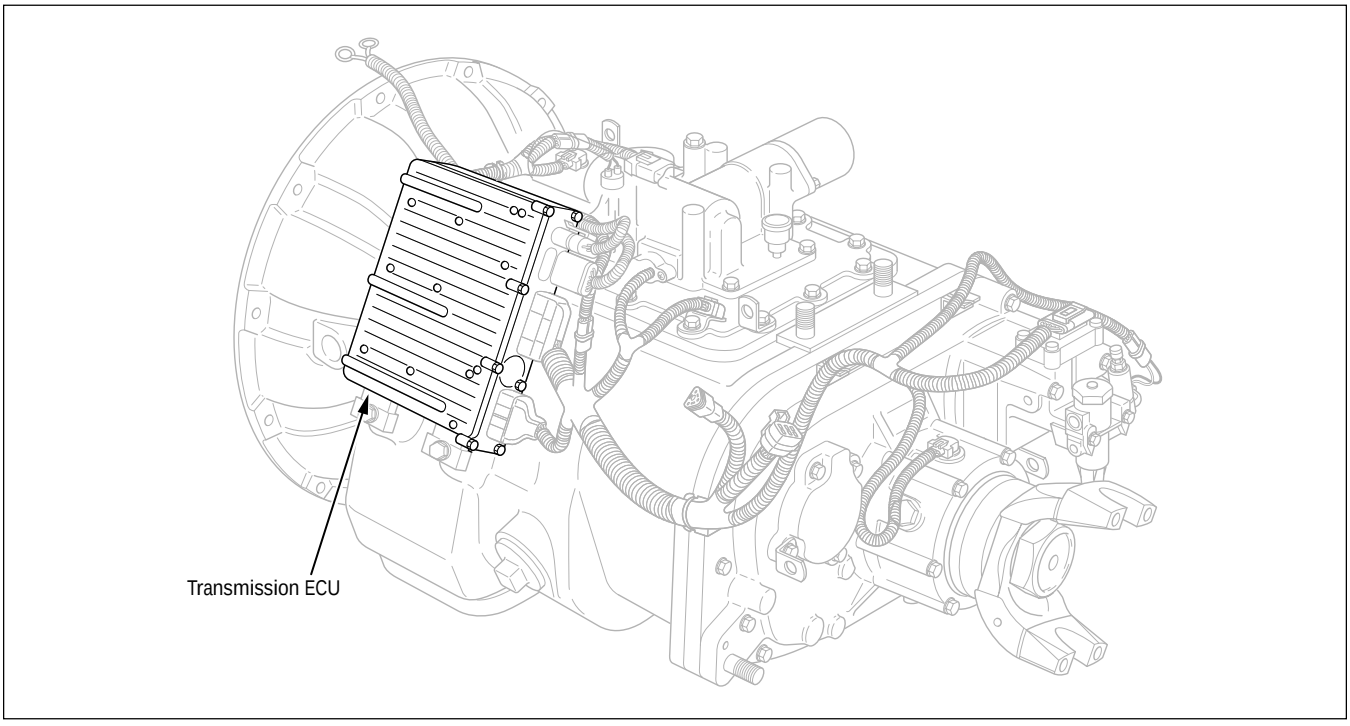


Figure 34. Transmission ECU Location

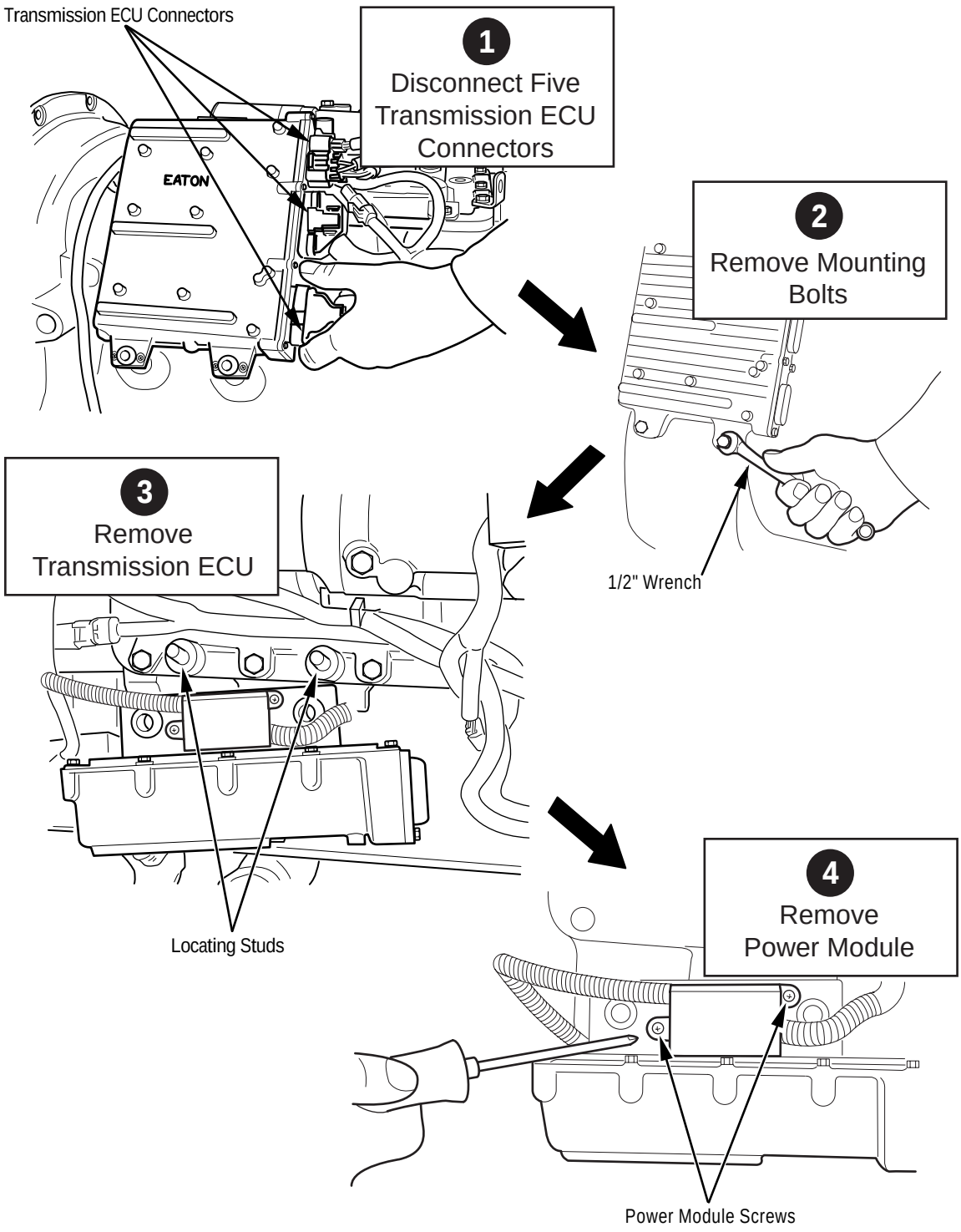


Figure 35. Transmission ECU Removal

Transmission ECU—Install

Special Instructions

Install the Power Module on the Transmission ECU before installing the Transmission ECU.

Apply lubricant to the ECU mounting bracket locating studs on the main case top.

Make sure the three (3) 2-pin packard connectors are properly located on the Transmission ECU top.

Required Tools

Basic Hand Tools

Installation

1. Position the Power Module on the Transmission ECU.
2. Using a phillips head or torx head screwdriver, install and tighten the Power Module mounting screws.
3. Position the Transmission ECU on the locating studs.

CAUTION: When attaching the Transmission ECU, take care not to bend the ECU locating bracket.

4. Using a 1/2" wrench, install and tighten the two (2) Transmission ECU mounting bolts.
5. Reconnect the Transmission ECU 24-way connector.
6. Reconnect the Transmission ECU 32-way connector.
7. Install nylon cable ties around 24-way and 32-way connectors.
8. Reconnect the Motor Power connector.
9. Reconnect the Transmission ECU to the Rail Select Motor.
10. Reconnect the Transmission ECU to the Gear Select Motor.
11. Reconnect the negative battery cable.

Final Check

Make sure the retaining capscrews are properly tightened.

Make sure all Transmission ECU connectors are properly connected and locked.

Make sure the shifter module harness connectors are properly connected.

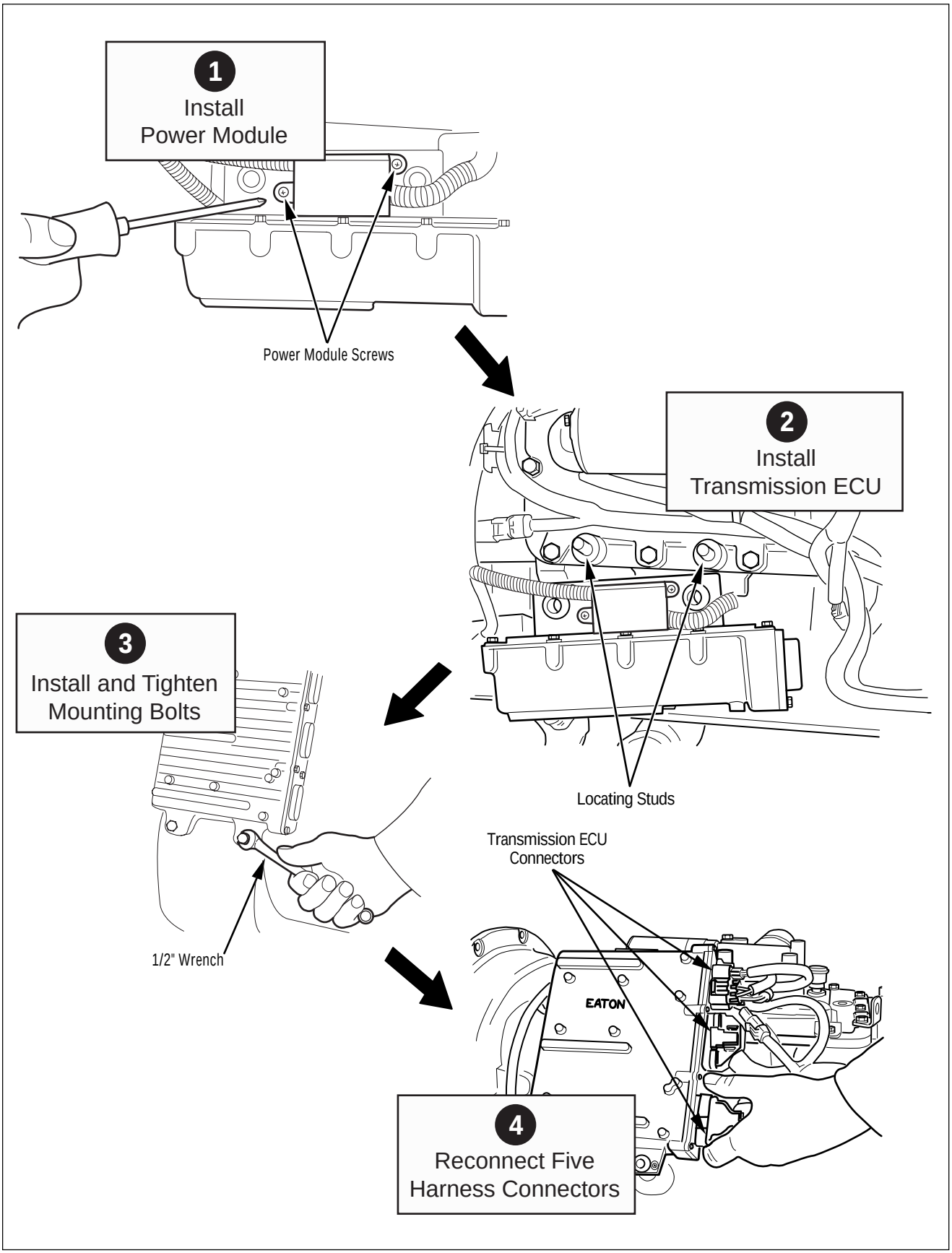


Figure 36. Transmission ECU Installation

Transmission Harness—Remove

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Remove the Transmission Harness as follows:
   - Remove nylon cable ties holding the harness and connectors in place.
   - 32-way and 24-way ECU connectors from the ECU
   - Input and Main Shaft Speed Sensors
   - Gear Select Sensor and Rail Select Sensor
   - Reverse Ball Switch
   - Logic Power from the Transmission Harness
   - Output Shaft Speed Sensor
   - Range Solenoid Valve
   - Transmission Interface connector
   - If required, disconnect the Splitter Solenoid and Inertia Brake Solenoid.
2. Remove the Transmission Harness.

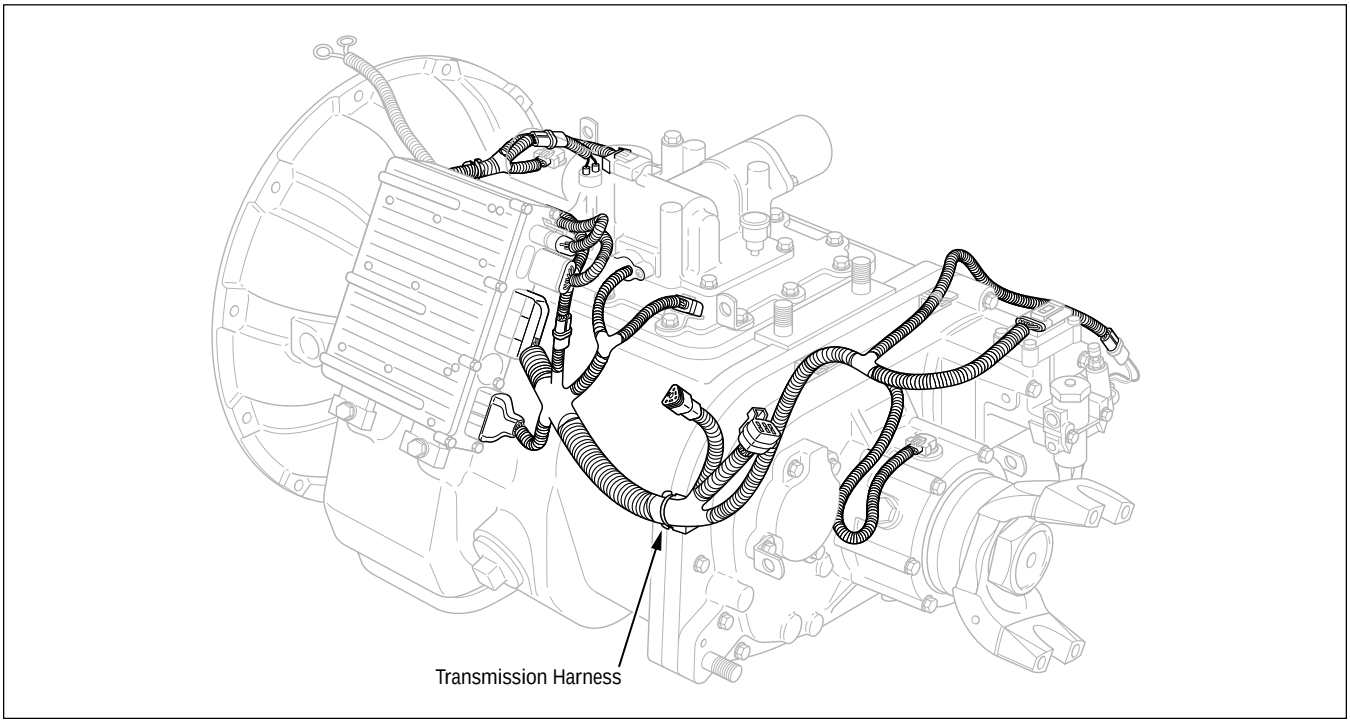


Figure 37. Transmission Harness Location

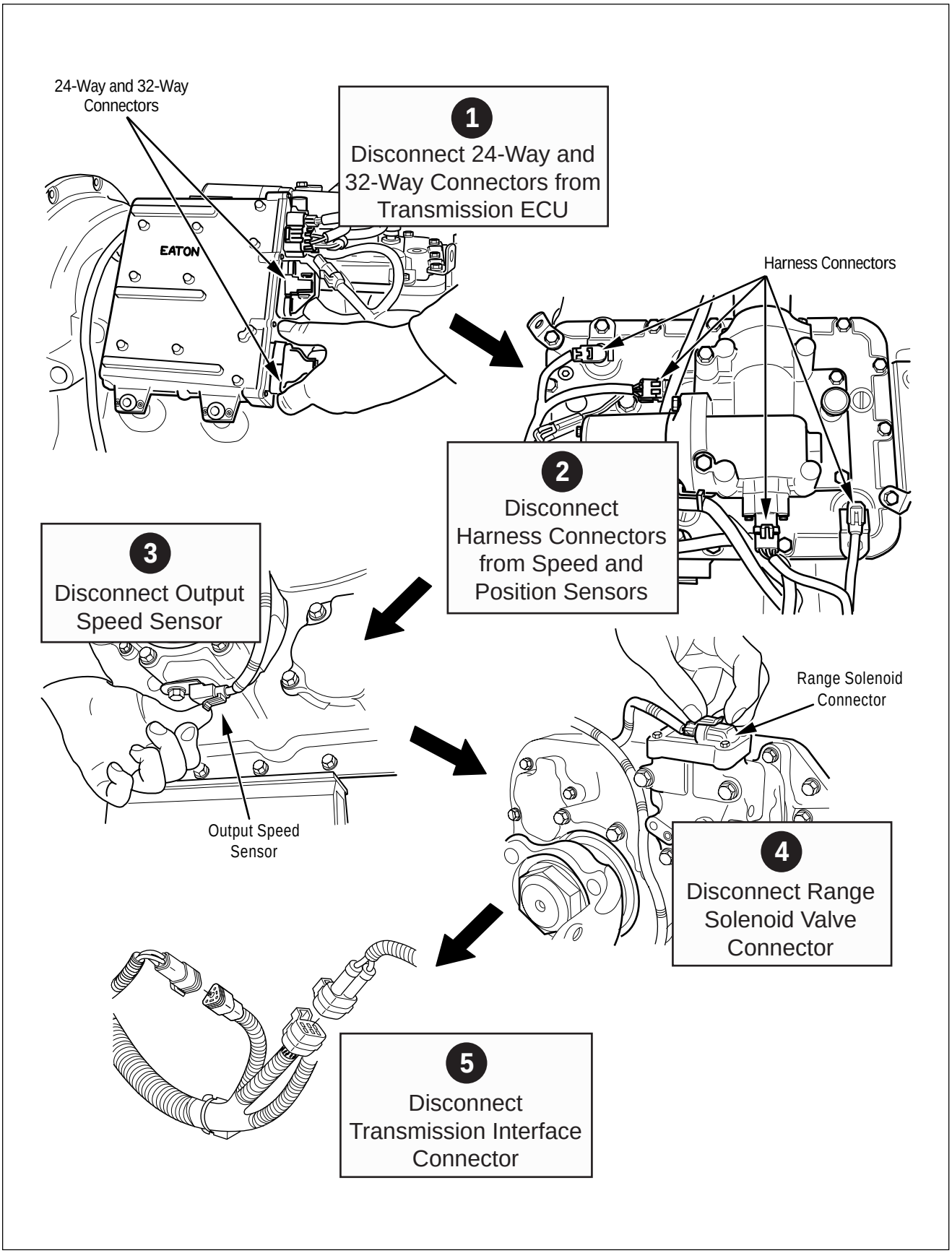


Figure 38. Transmission Harness Removal

Transmission Harness—Install

Special Instructions

Make sure the three (3) two pin packard connectors are properly located on the Transmission ECU top.

Required Tools

Basic Hand Tools

Installation

1. Route the pigtail harness that comes off the 32-way connector behind the Transmission ECU and up to the top of the transmission.
2. Reconnect and lock all Transmission Harness connectors as follows:
   - If required, reconnect the Splitter Solenoid and Inertia Brake Solenoid.
   - Transmission Interface connector
   - Range Solenoid Valve
   - Output Shaft Speed Sensor
   - Logic Power to the Transmission Harness
   - Reverse Ball Switch
   - Gear Select Sensor and Rail Select Sensor
   - Input and Main Shaft Speed Sensors
   - 32-way and 24-way ECU connectors to the Transmission ECU
3. Replace all nylon cable ties to hold the Transmission Harness and connectors in place.

Final Check

Double-check all connections to make sure they are secure.

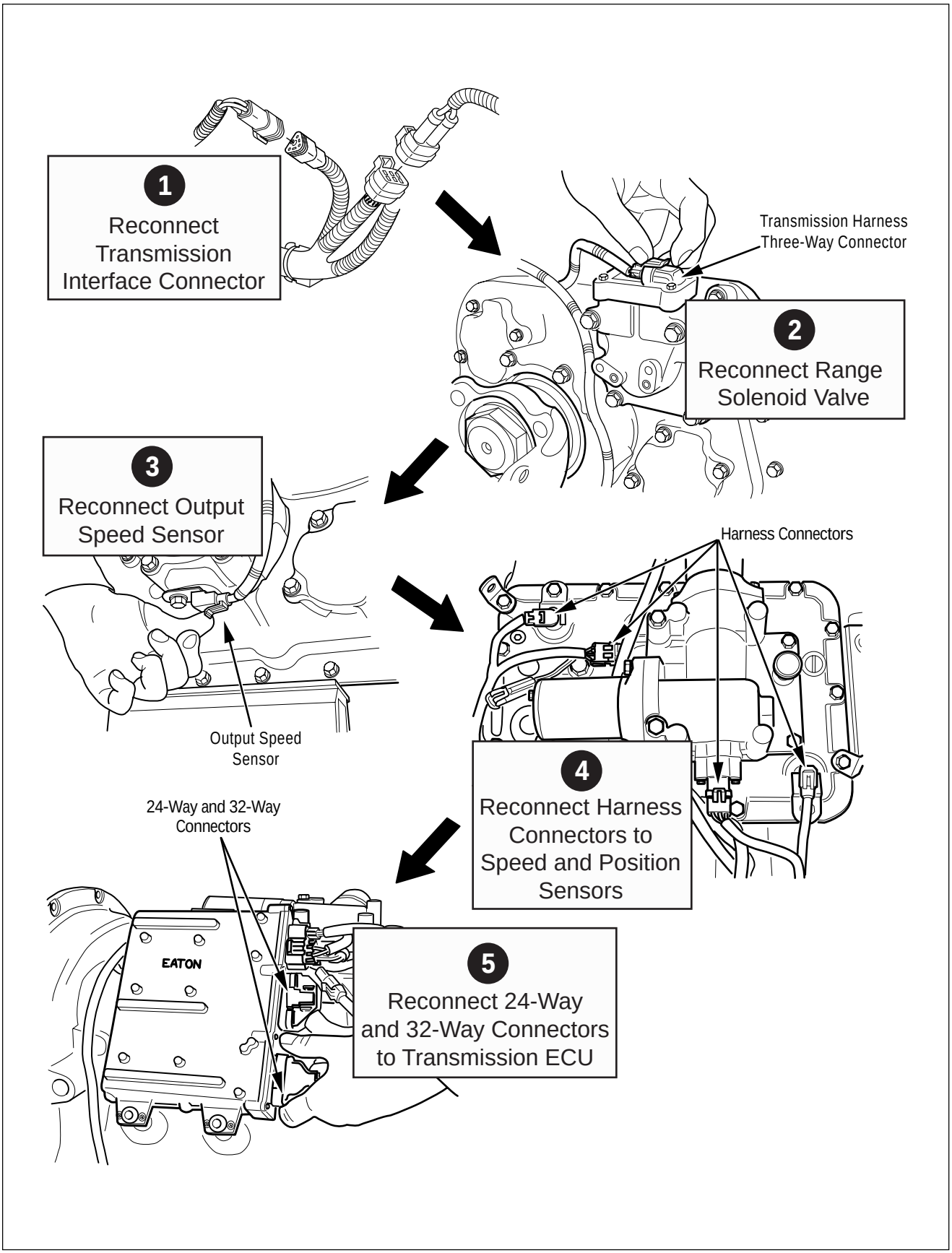


Figure 39. Transmission Harness Installation

Shift Lever—Remove

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Using a 7/16" wrench, remove the four (4) bolts (two on each side of the Shift Tower) securing the Shift Lever.
2. Lift the Shift Lever out of the Shift Tower.
3. Disconnect the 24-way connector and the 3-way Tower Harness connectors.
4. Remove the Shift Lever.

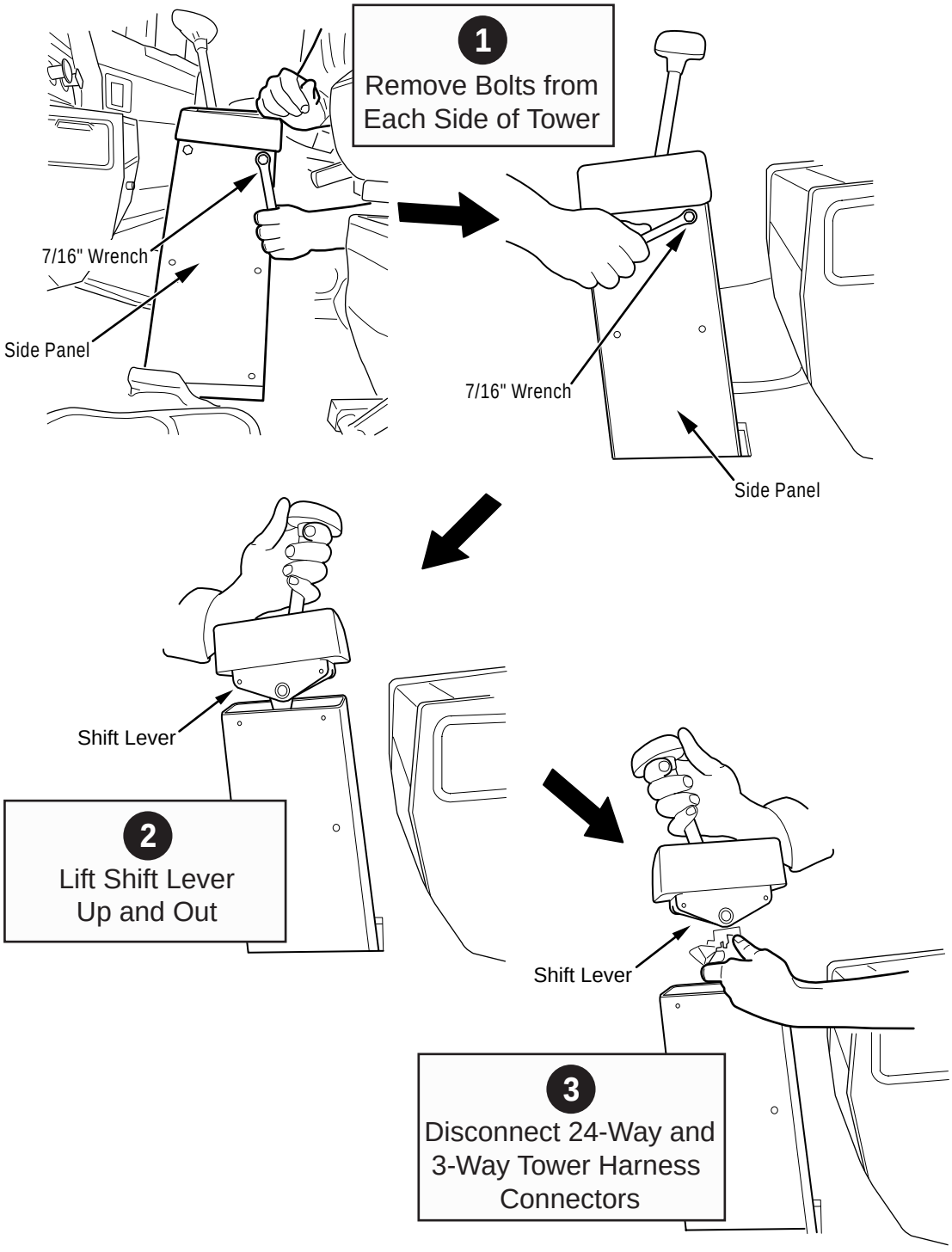


Figure 40. Shift Lever Removal

Shift Lever—Install

Special Instructions

None

Required Tools

Basic Hand Tools

Installation

1. Reconnect the 24-way and 3-way Tower Harness connectors.
2. Position the Shift Lever assembly on its mounting surface.
3. Apply blue loctite #242 to the four (4) mounting bolts.
4. Using a 7/16" wrench, install and tighten the bolts to 6-8 lb-ft (8.1-10.8 N•m).

Final Check

Make sure the mounting bolts are properly torqued.

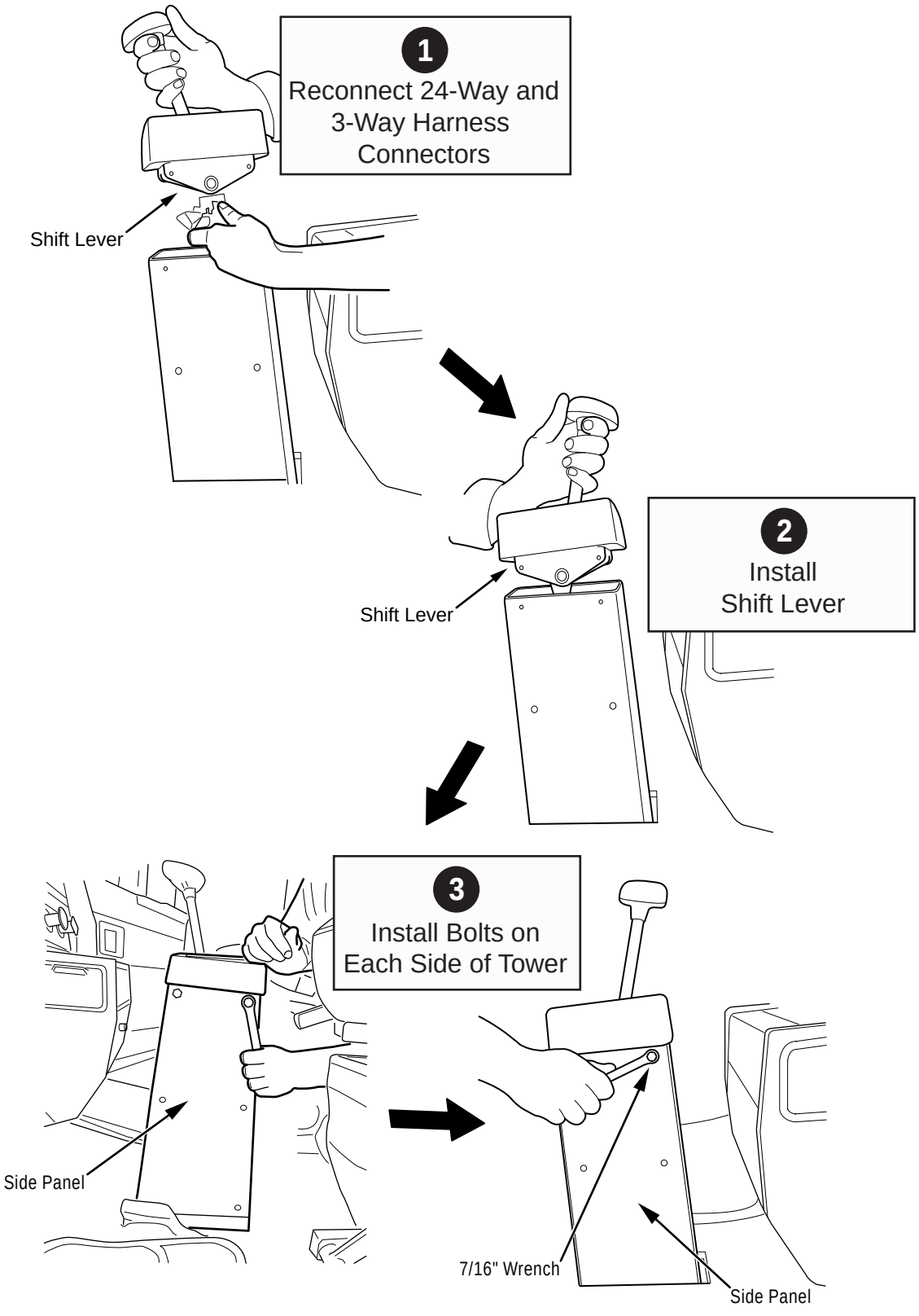


Figure 41. Shift Lever Installation

Power Relay—Remove

Special Instructions

If the Shift Tower is supplied by Eaton, the Power Relay is located inside the cab in the Shift Tower.

Required Tools

Basic Hand Tools

Removal

1. Using a 7/16" wrench, remove the two (2) Shift Lever mounting bolts from the *driver*'s side of the Shift Tower.
2. Using a phillips-head screwdriver, remove the four (4) screws that secure the *driver*-side Shift Tower side panel.
3. Remove the Shift Tower side panel.
4. Disconnect the Tower Harness from the Power Relay.
5. Using a 7/16" wrench, remove the lower-right System Manager retaining nut that secures the Power Relay.
6. Remove the Power Relay.

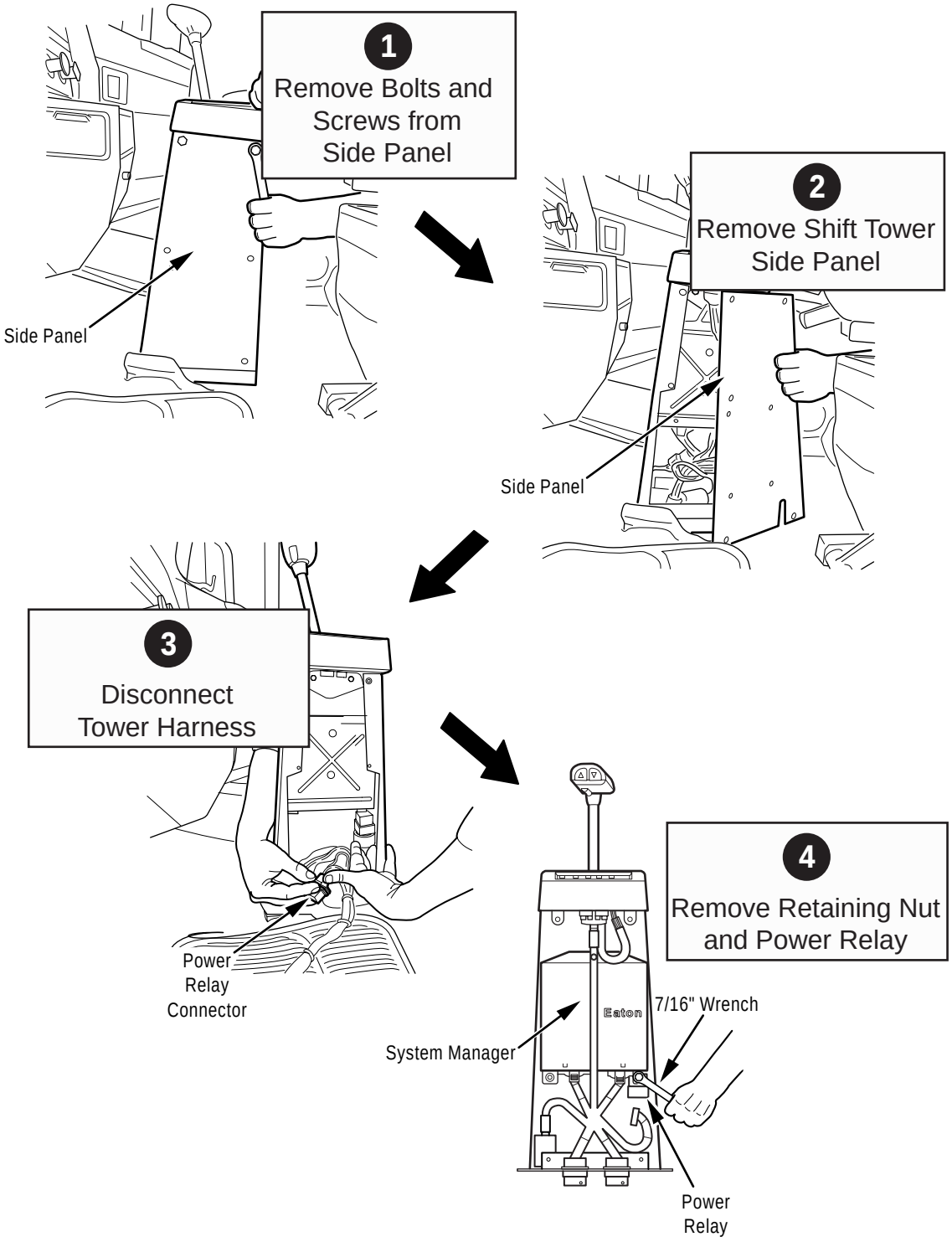


Figure 42. Power Relay Removal

Power Relay—Install

Special Instructions

None

Required Tools

Basic Hand Tools

Installation

1. Position the Power Relay over its mounting location.
2. Using a 7/16" wrench, install and tighten the System Manager mounting bolt to 10-12 lb-in (1.1-1.4 N•m).
3. Reconnect the Tower Harness to the Power Relay.
4. Position the Shift Tower side panel over its mounting location.
5. Using a phillips-head screwdriver, install and tighten the four (4) screws that secure the *driver*-side Shift Tower side panel.
6. Apply loctite #242 compound to the two (2) mounting bolts.
7. Using a 7/16" wrench, install and tighten the two (2) Shift Lever mounting bolts to 6-8 lb-ft (8.1-10.8 N•m).

Final Check

Make sure the side panel mounting bolts and screws are tightened to specification.

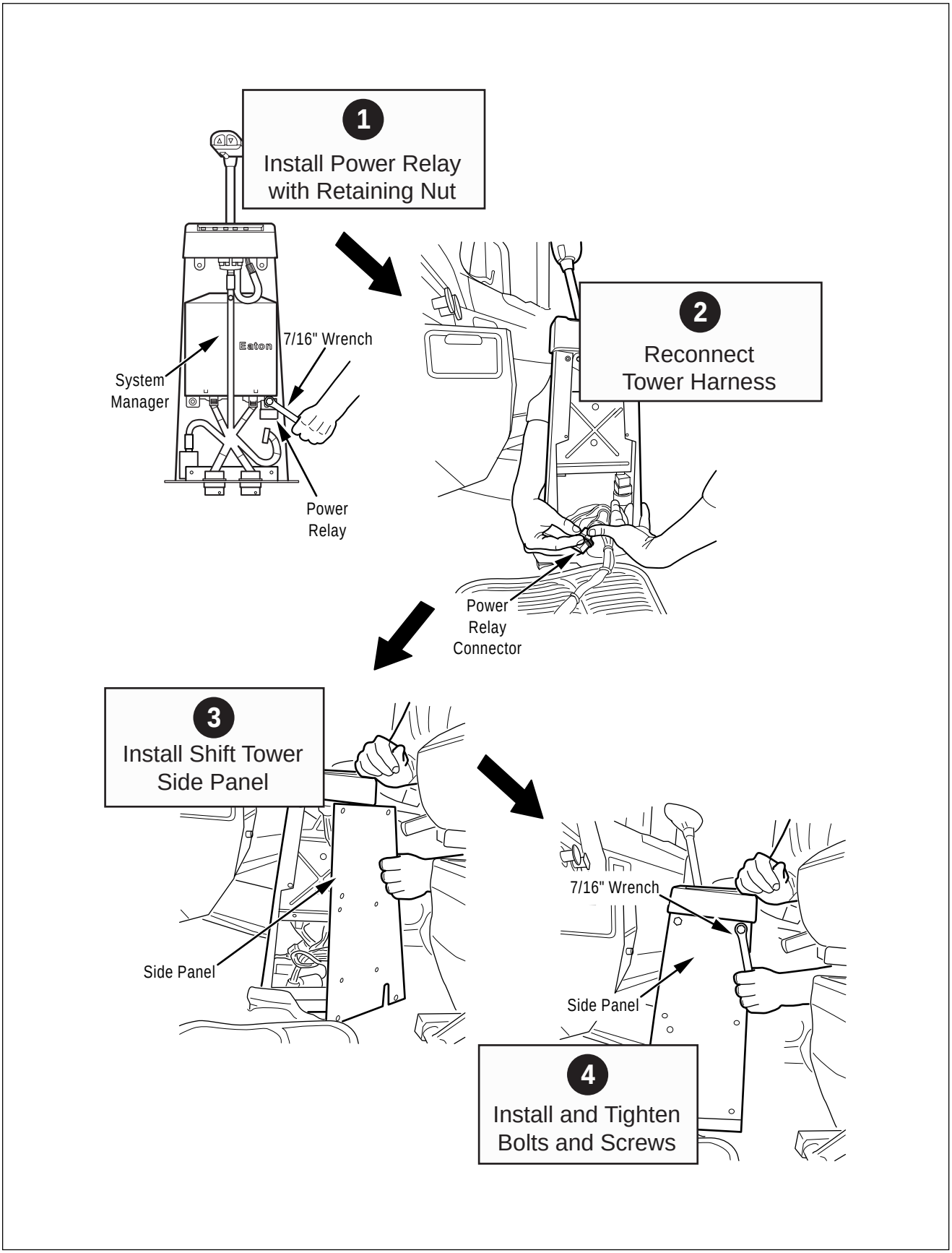


Figure 43. Power Relay Installation

System Manager—Remove

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Using a 7/16" wrench, remove the two (2) Shift Lever mounting bolts from the *driver's* side of the Shift Tower.
2. Using a phillips-head screwdriver, remove the four (4) screws that secure the *driver*-side Shift Tower side panel.
3. Remove the Shift Tower side panel.
4. Disconnect the System Manager 32-way connector.
5. Disconnect the System Manager 24-way connector.
6. Using a 7/16" wrench, remove the three (3) System Manager mounting nuts.
7. Temporarily disconnect and remove the Power Relay and set it aside.
8. Slide the System Manager down and out of the Shift Tower.

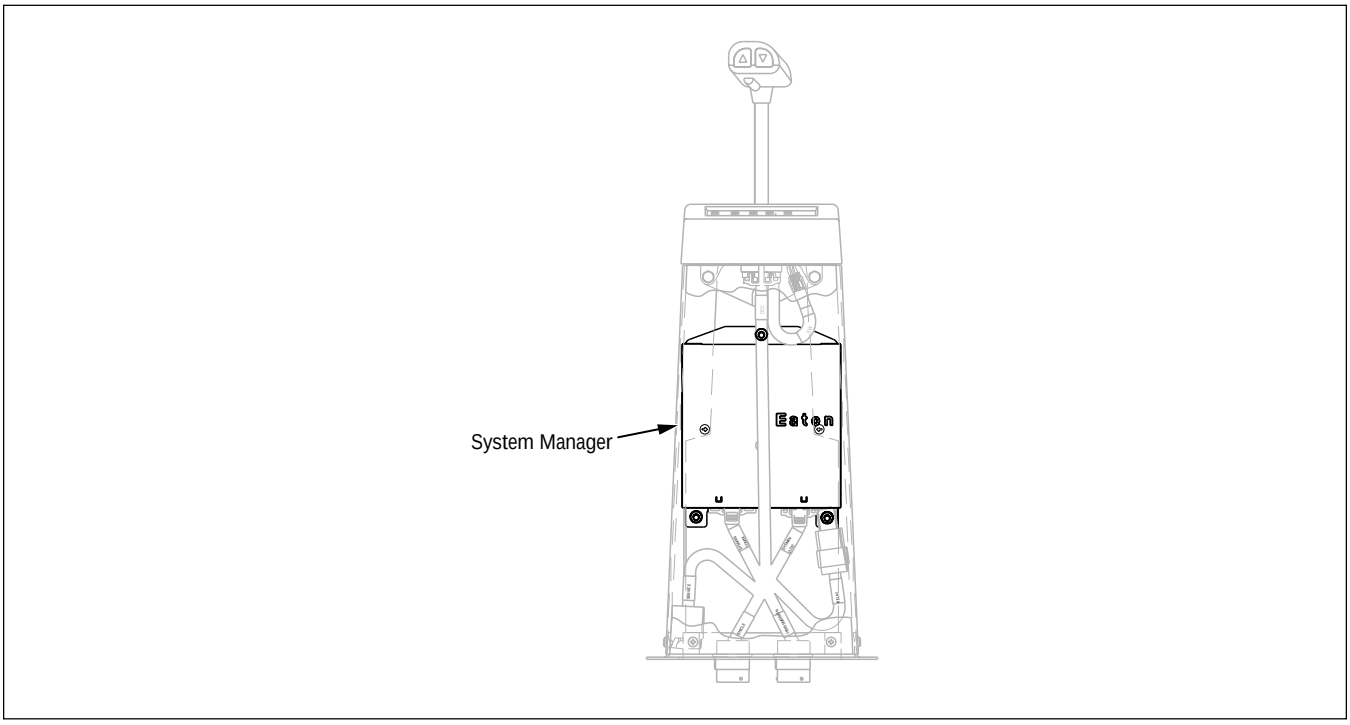


Figure 44. System Manager Location

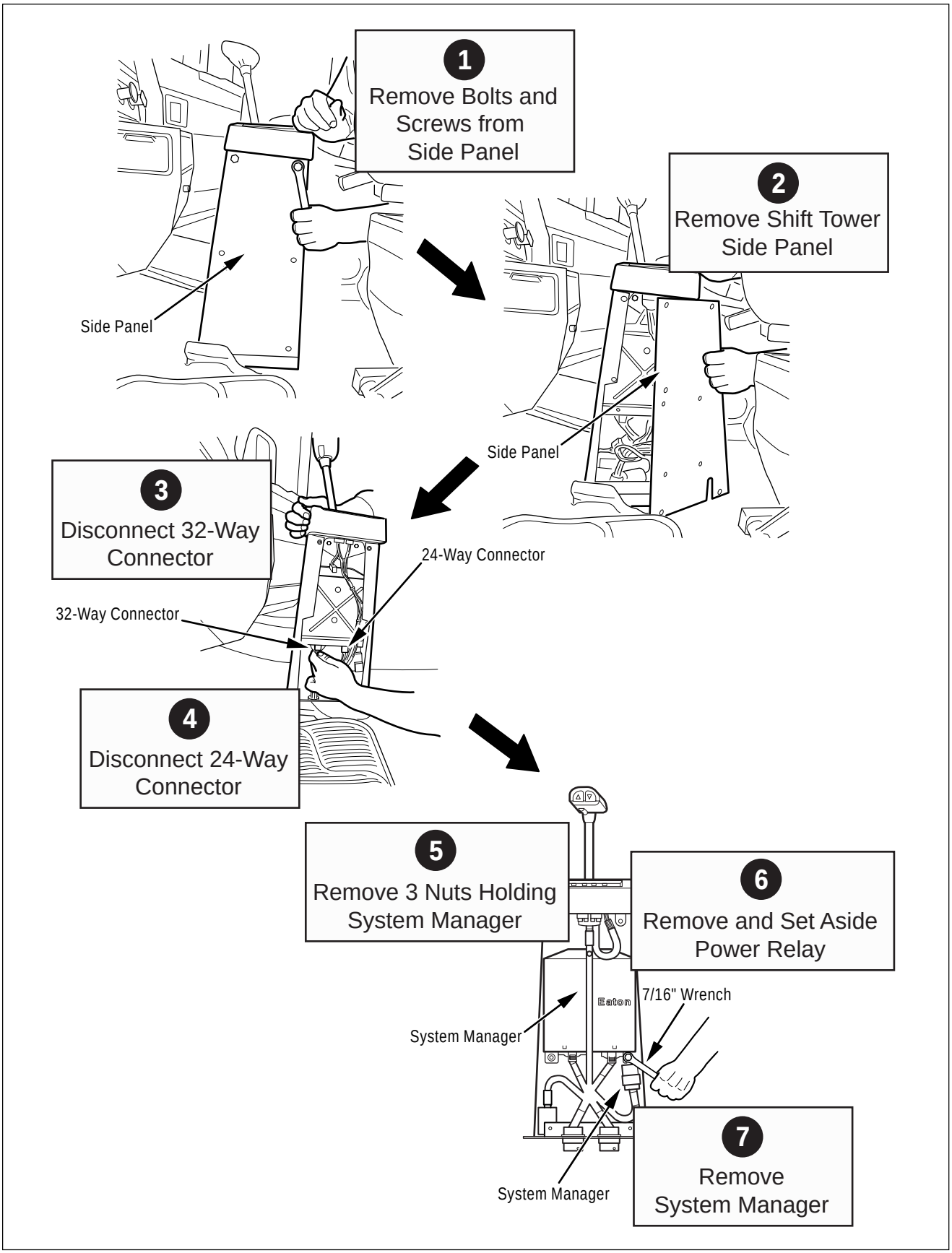


Figure 45. System Manager Removal

System Manager—Install

Special Instructions

None

Required Tools

Basic Hand Tools

Installation

1. Slide the System Manager into the Shift Tower and position it on the three (3) mounting studs.
2. Install and finger tighten two (2) of the System Manager mounting nuts.
3. Reinstall the Power Relay in its original location and finger tighten the System Manager/Power Relay mounting nut.
4. Using a 7/16" wrench, tighten the three (3) System Manager mounting nuts to 10-12 lb-in (1.1-1.4 N•m).
5. Reconnect the Tower Harness to the Power Relay.
6. Reconnect the System Manager 32-way connector.
7. Reconnect the System Manager 24-way connector.
8. Position the Shift Tower side panel over its mounting location.
9. Using a phillips-head screwdriver, install and tighten the four (4) screws that secure the *driver*-side Shift Tower side panel.
10. Apply #242 loctite to the mounting bolt threads.
11. Using a 7/16" wrench, install and tighten the two (2) Shift Lever mounting bolts to 6-8 lb-ft (8.1-10.8 N•m).

Final Check

Make sure the connectors are secure before installing the side panel.

Make sure the side panel mounting bolts and screws are tightened to specification.

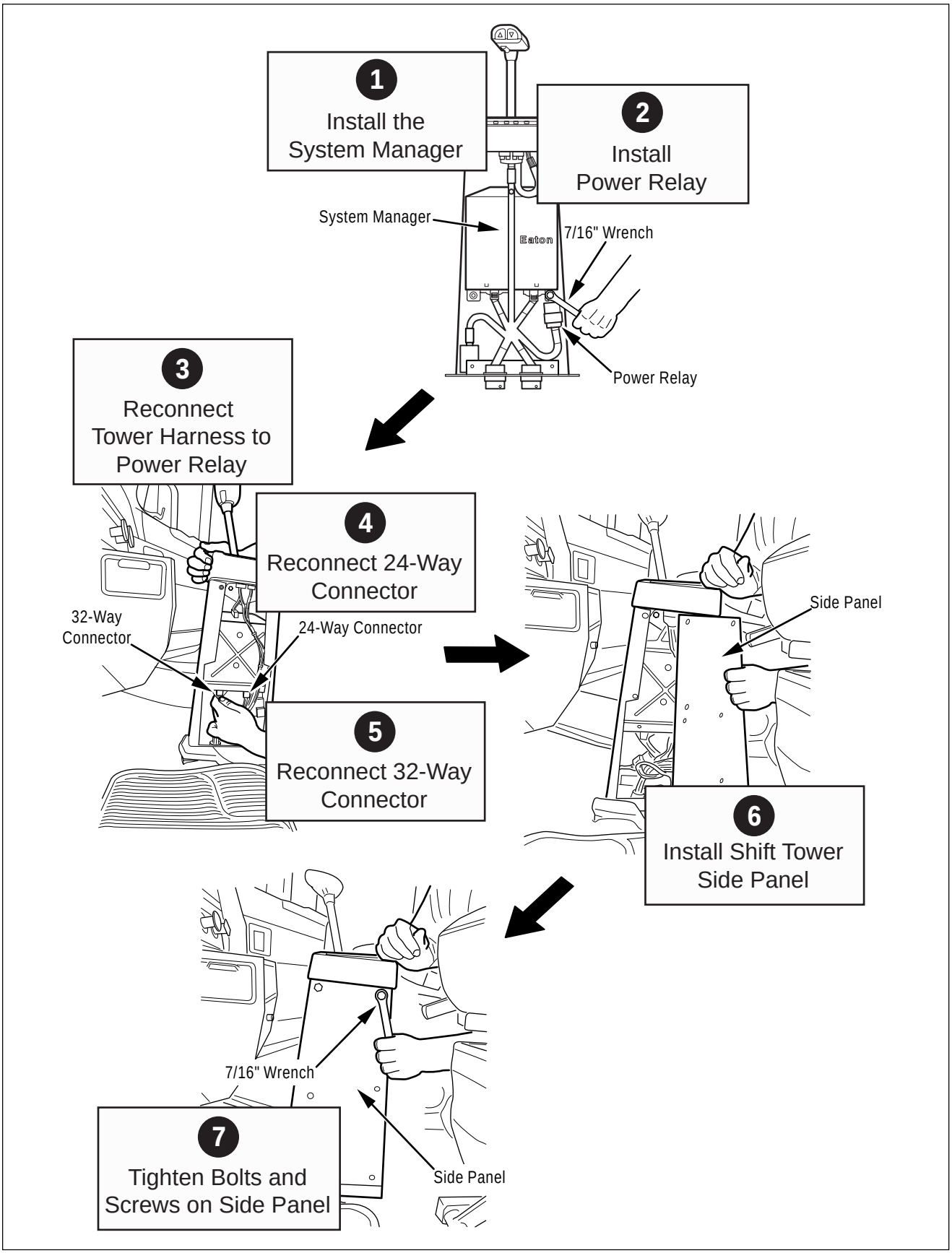


Figure 46. System Manager Installation

Tower Harness—Removal

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Using a 7/16" wrench, remove the two (2) Shift Lever mounting bolts from *driver*-side of the Shift Tower assembly.
2. Using a phillips-head screwdriver, remove the four (4) screws that secure the *driver*-side Shift Tower side panel.
3. Remove the Shift Tower side panel.
4. Disconnect the 24-way connector and 3-way connector from the Shift Lever.
5. Disconnect the System Manager 32-way connector.
6. Disconnect the System Manager 24-way connector.
7. Disconnect the Tower Harness from the Power Relay.
8. Disconnect the two (2) Tower Harness connectors from the Tower Harness sockets beneath the vehicle floorboard.
9. Using a 1-11/16" wrench, remove the two (2) washers and jam nuts from the Tower Harness sockets.

Note: The jam nuts are located under the vehicle floorboard directly above the transmission.

10. Remove the Tower Harness from the Shift Tower.

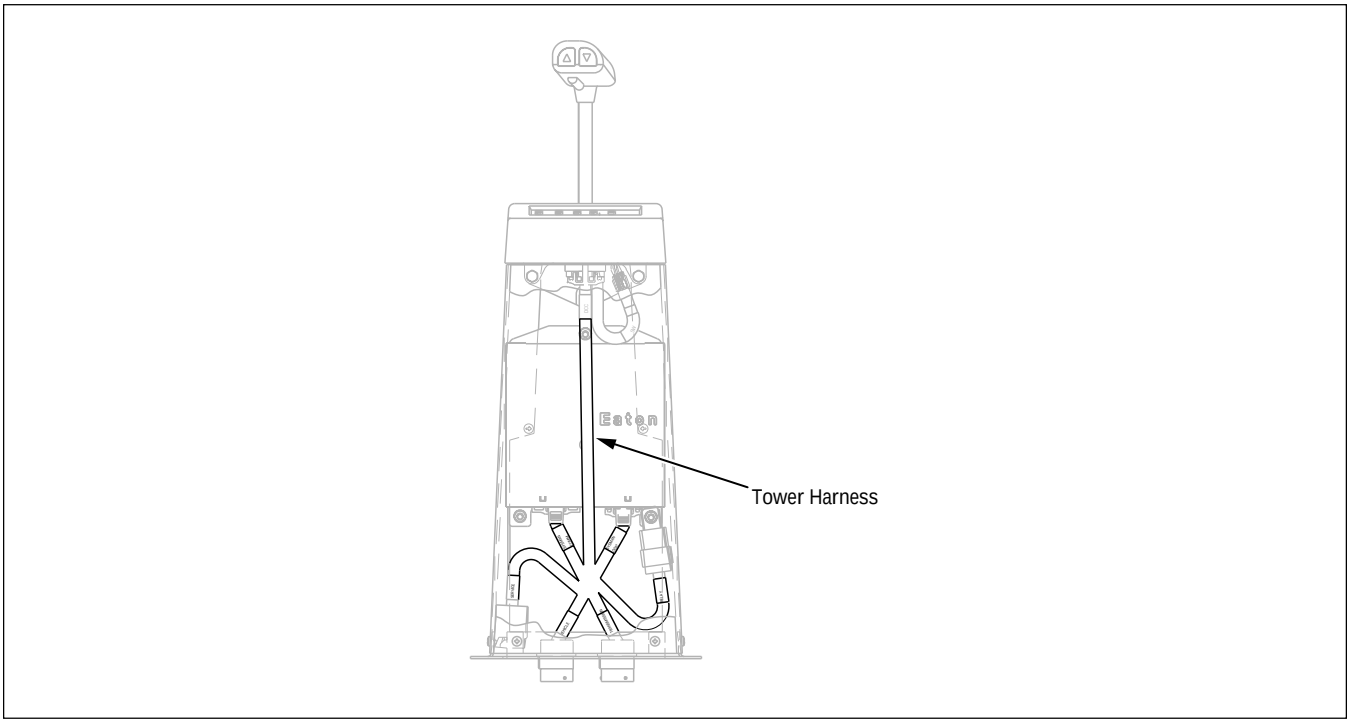


Figure 47. Tower Harness Location

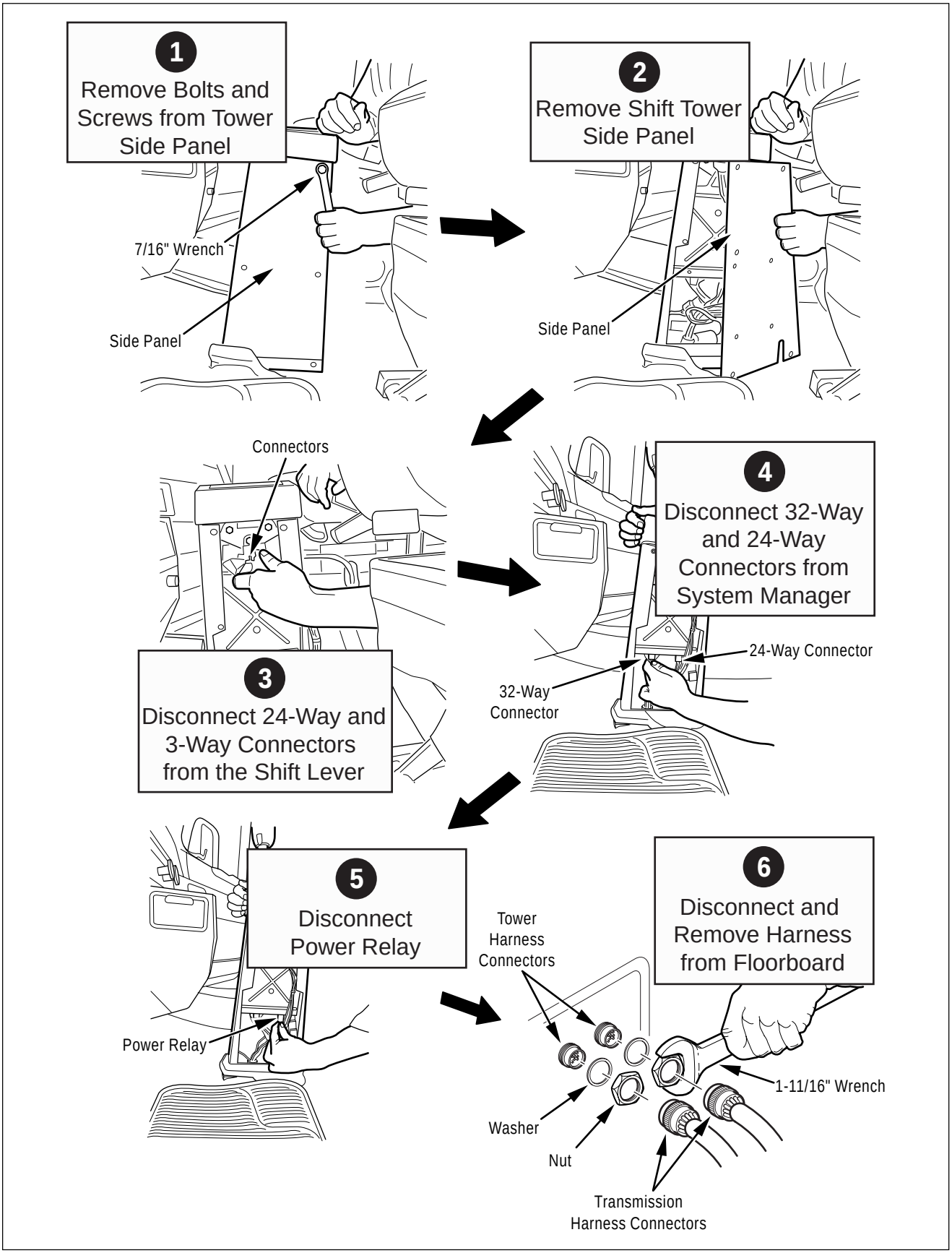


Figure 48. Tower Harness Removal

Tower Harness—Install

Special Instructions

None

Required Tools

Basic Hand Tools

Installation

1. Slide the two (2) large Tower Harness sockets down through the vehicle floorboard.

Note: The connectors are individually keyed to match the appropriate Tower Harness sockets.

2. Using a 1-11/16" socket wrench, install and tighten the washers and jam nuts to 260-280 lb-in (29.4-31.6 N•m).
3. Reconnect the two (2) Tower Harness connectors to the sockets underneath the vehicle floorboard.
4. Route the new Tower Harness from the floorboard, up into the Shift Tower assembly.
5. Reconnect the Tower Harness to the Power Relay.
6. Reconnect the System Manager 32-way connector.
7. Reconnect the System Manager 24-way connector.
8. Reconnect the 24-way connector and 3-way connector to the Shift Lever.
9. Position the Shift Tower side panel over its mounting location.
10. Using a phillips-head screwdriver, install and tighten the four (4) screws that secure the *driver*-side Shift Tower side panel.
11. Apply #242 loctite to the mounting bolt threads.
12. Using a 7/16" wrench, install the Shift Lever mounting bolts to 6-8 lb-ft (8.1-10.8 N•m).

Final Check

Make sure the connectors are secure before installing the side panel.

Make sure the side panel mounting bolts are tightened to specification.

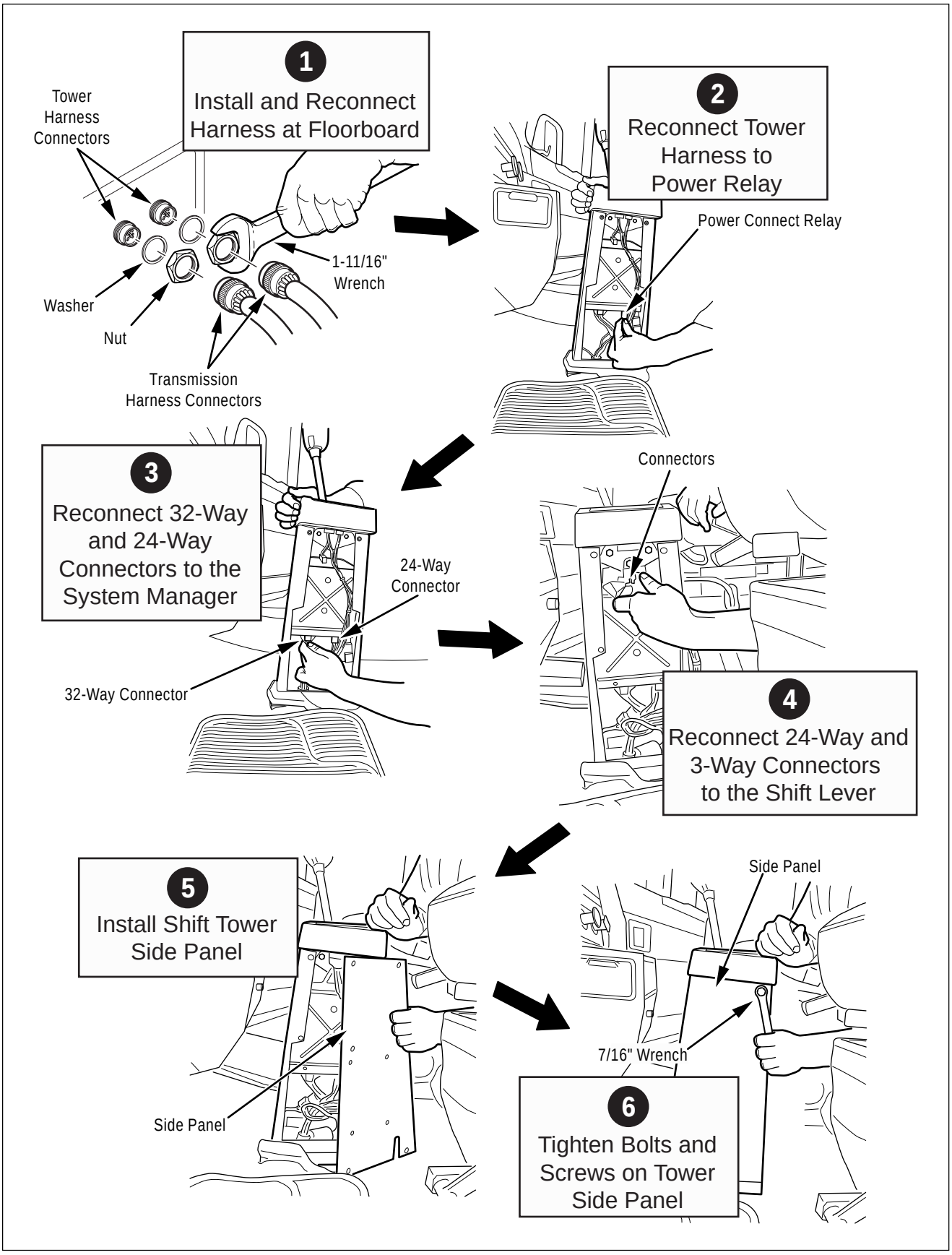


Figure 49. Tower Harness Installation

Gear Display—Remove

Special Instructions

The exact location varies depending on vehicle manufacturer.

Required Tools

Basic Hand Tools

Removal

1. Follow the recommended OEM procedure to remove the dash panel that holds the Gear Display unit.
2. Disconnect the Dash Harness from the Gear Display unit.
3. Use a small flat bladed screwdriver to depress the tabs that hold the Gear Display in the dash. Then remove the Gear Display from the dash panel.

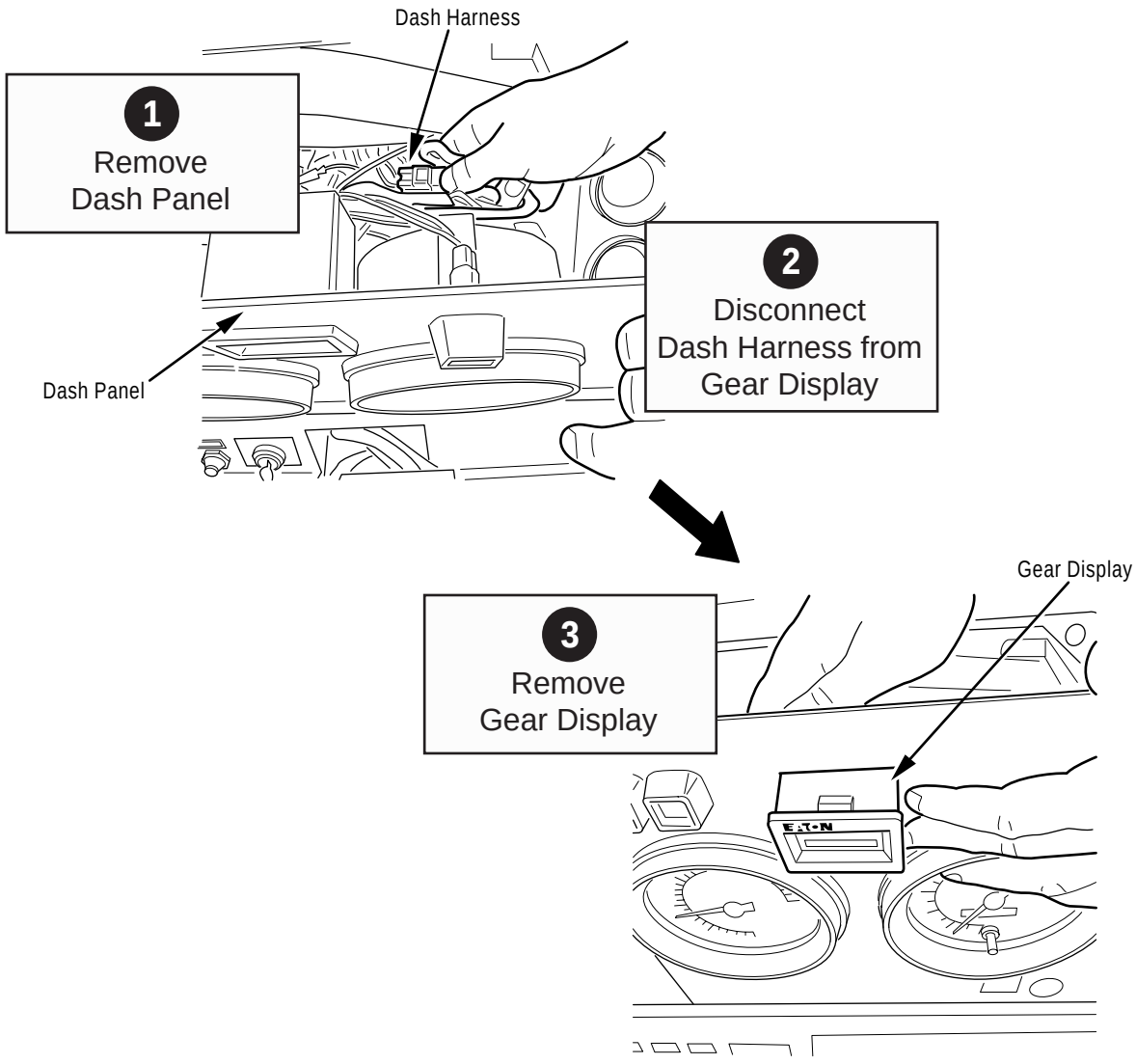


Figure 50. Gear Display Removal

Gear Display—Install

Special Instructions

None

Required Tools

Basic Hand Tools

Installation

1. Install the Gear Display unit in the dash panel.
2. Reconnect the Dash Harness to the Gear Display unit.
3. Follow the recommended OEM procedure to install the dash panel that holds the Gear Display unit.

Final Check

Make sure the OEM Dash Harness is properly connected.

Make sure the dash panel is properly installed.

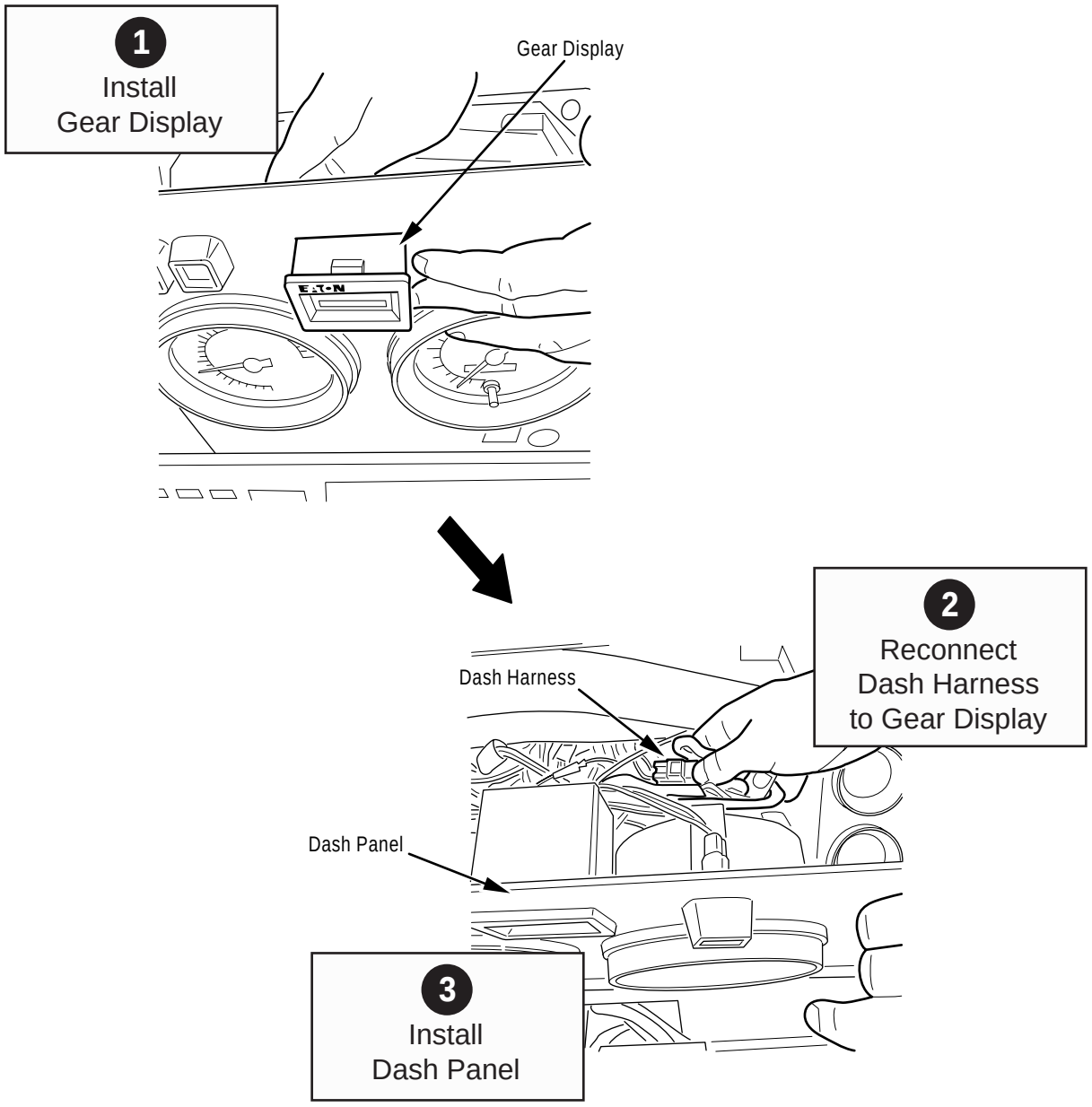


Figure 51. Gear Display Installation