

Endurant HD Automated Transmission TRSM0950 EN-US

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SUPPORT

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Warnings and Cautions

The alert symbols, signal words (DANGER, WARNING and CAUTION) and statements throughout this manual indicate the potential severity of a situation. Ensure to read, understand and follow each statement to avoid vehicle damage, component damage, personal injury, severe injury and/or death.



DANGER: Indicates an immediate hazard. Failure to follow the indicated procedures will cause major vehicle component damage, severe injury or death.



WARNING: Indicates an immediate hazard. Failure to follow the indicated procedures may result in major vehicle component damage, severe injury or death.



CAUTION: Indicates a potential hazard. Failure to follow the indicated procedures could result in minor or moderate component damage and/or personal injury.

The NOTICE and Note statements throughout this manual provide additional details required to avoid damaging a component or incorrectly completing a repair. Ensure to read, understand and follow each statement to properly complete a repair.

NOTICE: Indicates component or property damage could result if you do not follow the indicated procedure.

Note: Indicates additional detail that will aid in the repair of a component.

While working on a vehicle:



WARNING: Do not modify transmission components or systems. Modification (altering, substituting, relocating) of transmission components may result in major vehicle component damage, severe injury or death.



WARNING: Do not modify transmission service tools. Modification (altering, substituting, relocating) of transmission service tools may result in major vehicle component damage, severe injury or death.



WARNING: Read, understand and follow each statement regarding cap screw installation and torque specification requirements. Failure to install and torque cap screws to specification may result in major vehicle component damage, severe injury or death.



WARNING: When working on vehicle components, keep body parts clear of sharp objects and pinch points. Failure

to keep clear of sharp objects and pinch points may result in severe injury or death.



WARNING: Use appropriate lifting devices and equipment when working with heavy vehicle components. Failure to do so may result in major vehicle component damage, severe injury or death.



CAUTION: Do not work on the vehicle immediately after operation. Working on a hot vehicle component could result in personal injury.

Compressed Air System



WARNING: The vehicle air system operates approximately between 60 - 140 PSI. Refer to OEM guidelines regarding vehicle system operation and service. Failure to follow OEM guidelines may result in major vehicle component damage, severe injury or death.

Before starting a vehicle:

- Sit in the driver's seat.
- Confirm vehicle parking brake is applied.
- Confirm Neutral is selected on the driver interface device.
- Ensure vehicle has adequate fuel level.
- Do not operate the vehicle if the Alternator lamp is on or if gauge indicates low voltage with the engine running.

When parking the vehicle or leaving the cab:

1. Safely come to a complete stop.
2. Continue to depress and hold service brake.
3. Select Neutral on the driver interface device.
4. Apply vehicle parking brake.



WARNING: Apply vehicle parking brake and follow vehicle manufacturer parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

5. Turn ignition key Off and allow the engine to shut down.

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

1. Safely come to a complete stop.
2. Continue to depress and hold service brake.
3. Select Neutral on the driver interface device.
4. Apply vehicle parking brake.



WARNING: Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

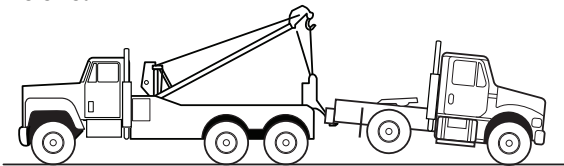
5. Chock wheels.

To avoid damage to the transmission during towing:

When towing a vehicle equipped with the Endurant HD Transmission, do not allow the output shaft of the transmission to rotate. If the vehicle is towed with the drive wheels still in contact with the road surface, the vehicle axle shafts or driveline must be removed or disconnected prior to towing vehicle.

NOTICE: Internal transmission damage can result from improper vehicle towing.

Preferred



Must remove vehicle axle shafts or driveline prior to towing



After completing a transmission service procedure, ensure to complete the Configure Transmission Control Module (TCM) and/or Transmission Service Routines when directed.

Configure Transmission Control Module (TCM)

Perform Configure Transmission Control Module (TCM) after completing the following component replacement procedures:

- Transmission assembly replacement
- MTM assembly replacement
- TCM assembly replacement

NOTICE: Failure to perform the Configure Transmission Control Module (TCM) results in incorrect vehicle and transmission component serial number information.

Transmission Service Routines

Perform Transmission Service Routines after completing the following procedures:

- Transmission removal and installation
 - Transmission assembly replacement
 - Internal transmission repair
 - Clutch removal and installation
 - MTM removal and installation
- LCA removal and installation
- TCM removal and installation

NOTICE: Failure to perform the Transmission Service Routines results in degraded transmission performance.

How to Use This Manual

This publication is divided into three sections: General Information, Service Procedures and Appendix.

General Information

This section contains basic chapters such as Transmission Overview, How to Use This Manual and Serial Tag and Model Nomenclature.

Service Procedures

To find the information you need, simply locate the procedure in the Table of Contents, turn to the page specified and follow the procedure.

The Service Procedures are divided in three sections; Removal, Disassembly/Assembly and Installation. Removal instructs how to remove the part or assembly from the transmission. Disassembly instructs how to take an assembly apart. Assembly instructs how to put together an assembly. Installation instructs how to install the part or assembly in the transmission. Not all parts have a disassembly/assembly section.

A Component Identification diagram is included at the beginning of each procedure for Removal, Disassembly/Assembly and Installation. Below the Component Identification diagram is a numerical listing for each part with the part name.

Appendix

This section contains additional details that support the service of the transmission such as service parts information, lubrication and torque specifications.

Service Kits and Parts Index

OEM and Engine Specific Transmission Kits

Description	Page
Clutch Service Kits	page 375
Input Shaft Repair Kit	page 377
Input Shaft Kits	page 380

Clutch Housing

Description	Part Number	Page
Release Yoke Assembly Kit	K-4380	page 383
Release Yoke Pivot Pin	10001949	page 383
Clutch Housing Seal Kit	K-4382	page 384
Input Shaft Cover Kit	K-4482	page 384
Input Shaft Cover Cap Screw	10001814-MP10	page 384
Upper Countershaft Cover	10001051	page 385
Upper Countershaft Cover Cap Screw	10001814-MP10	page 385
Inertia Brake Kit	K-4350	page 386
Inertia Brake Cover Cap Screw	10001813-MP6	page 387
Inertia Brake Housing	10000785	page 387
Inertia Brake Air Line Assembly	S-3204	page 387
Inertia Brake Air Line Fitting	10001240	page 387
Clutch Housing Inspection Cover	10001202	page 388
Breather	4304602	page 388
Front Snap Ring Kit	K-4359	page 388
Input Shaft Bearing Kit	K-4483-New hold	page 388
Countershaft Bearing Kit	K-4484-New	page 389
Rail B Synchronizer Small Parts Kit	K-4388	page 389
Clutch Housing Kit	K-4358	page 390

Main Housing

Description	Part Number	Page
Fluid Pressure Sensor Kit	K-4387	page 391
Plug, Fluid Pressure Sensor	4308231	page 391

Main Housing

Description	Part Number	Page
Transmission Control Module Kit	K-4398 (12-Speed)	page 391
Transmission Control Module Kit	K-4487 (11-Speed)	page 391
TCM Cover	4307675	page 392
TCM Mounting Stud	5577511-MP4	page 392
Mechatronic Transmission Module (MTM) Kit	K-4355	page 392
Linear Clutch Actuator (LCA)	K-4357	page 392
MTM Cap Screw, Long	10001222-MP4	page 393
MTM Cap Screw, Special	10001815-MP4	page 393
MTM Cap Screw	10001179-MP20	page 393
8-Bolt PTO Cover Kit	K-4385	page 393
Main Housing Kit	K-4364	page 393
Main Housing Cap Screw	10002067-MP25	page 394
Main Shaft Bearing	10000683	page 394
Countershaft Bearing Kit	K-4484-New	page 394
Main Shaft Kit	K-4366	page 395
Main Shaft Selective Washer Kit	K-4486-New	page 395
Reverse Gear	10000556	page 396
Rail C and D Sliding Clutches	10000557	page 396
Primary Driven Gear	10000898	page 396
Secondary Driven Gear	10000899	page 396
Primary Drive Gear	S-3206	page 396
Drive Gear - Front Small Parts Kit	K-4367	page 396
Drive Gear - Rear Small Parts Kit	K-4369	page 397
Upper and Lower Countershaft (Single PTO) Kit	K-4370	page 398
Upper and Lower Countershaft (Dual PTO) Kit	K-4371	page 398
Upper Lube Tube Kit	K-4384	page 399
Lower Lube Tube Kit	K-4386	page 399
Reverse Idler Kit	K-4365	page 400

Rear Housing

Description	Part Number	Page
Output Seal Kit	K-4399	page 401
Rear Bearing Cover Cap Screw	10001172-MP8	page 401
Output Yoke Retainer Bolt	10000949	page 401
Output Yoke Retainer Plate	10000950	page 402
Output Speed Sensor Kit	K-4381	page 402
Output Speed Sensor Harness Bracket Cap Screw	X-8-0625M	page 402
Output Speed Sensor Bracket	10001097	page 402
Harness Bracket	10001082	page 402
Harness Bracket Cap Screw	X-8-0625M	page 402
Rear Housing (Single PTO) Kit	K-4372	page 403
Rear Housing (Dual PTO) Kit	K-4373	page 403
Lube Tube (Dual PTO) Kit	K-4374	page 404
Rear PTO Cover (Dual PTO) Kit	K-4375	page 404
Rail E Detent Kit	K-4376	page 405
Rear Housing Cap Screw	10002067-MP25	page 405
Rear Housing Threaded Cap Screw	10001102-MP3	page 405
Range Synchronizer Assembly Kit	K-4499	page 406
Shift Rail E (and Yoke)	S-3216	page 406
Planetary Output Shaft Assembly Kit	K-4378	page 406
Pump, Single PTO	A-10001057	page 407
Pump, Dual PTO	A-10002528	page 407
Pump Cap Screw	10001412-MP20	page 407
Oil Pump/Range Spacer O-ring	10001065	page 407
Oil Pump/Ranger Spacer	10000907	page 407

Lubricant, PS-386 HD Synthetic Transmission

Description	Part Number	Page
1 Gallon Jug (4 -1 Gallon Jugs)	5564546-M4	page 407
5 Gallon Pail	5564543	page 407
55 Gallon Drum	5564544	page 407

Oil Service Procedure

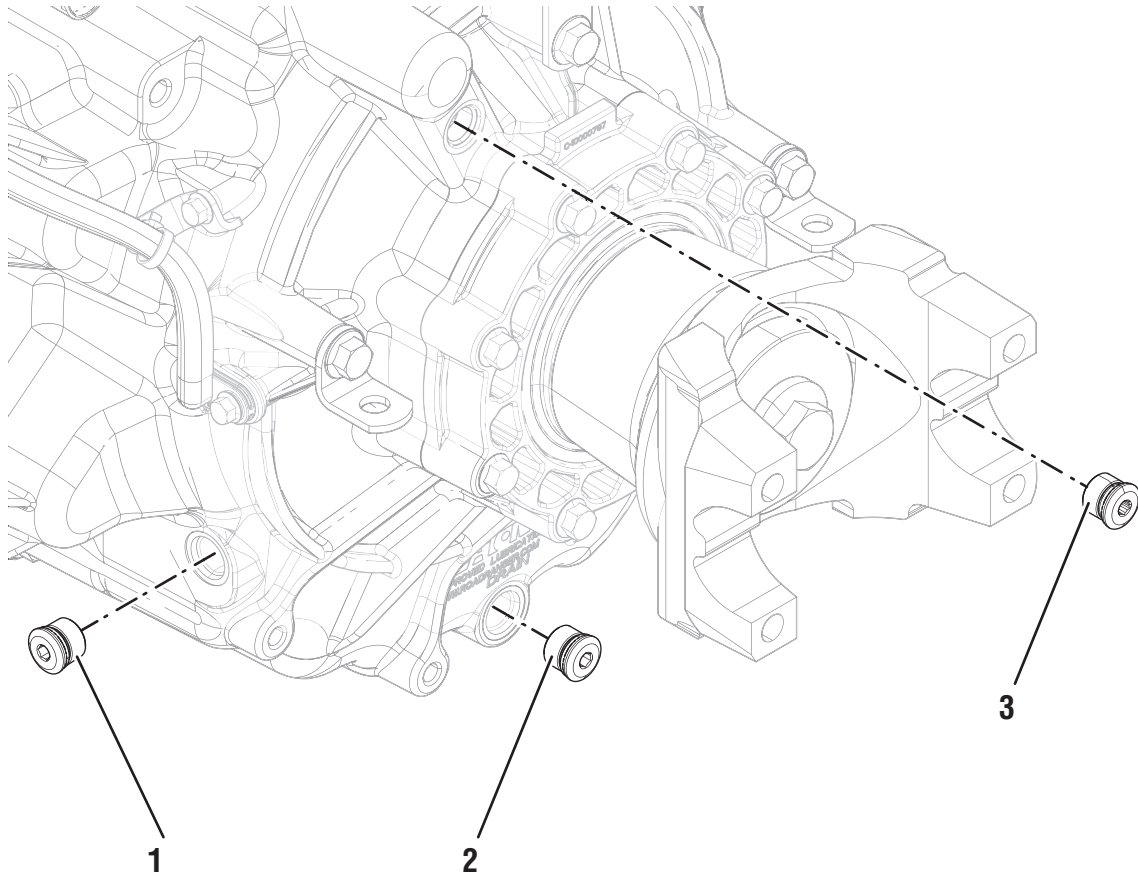
Special Instructions

Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

Special Tools

None

Component Identification



1. Oil Check Plug - 6 mm Hex
2. Oil Drain Plug - 6 mm Hex
3. Oil Fill Plug - 6 mm Hex

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

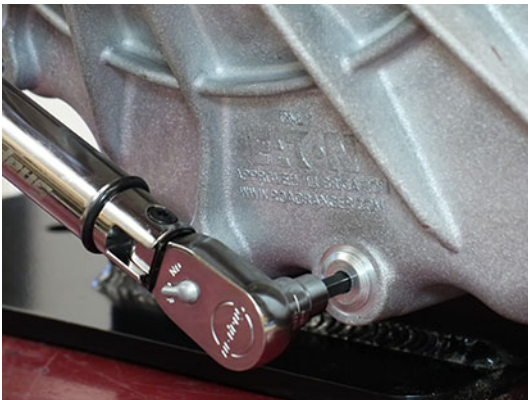
Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

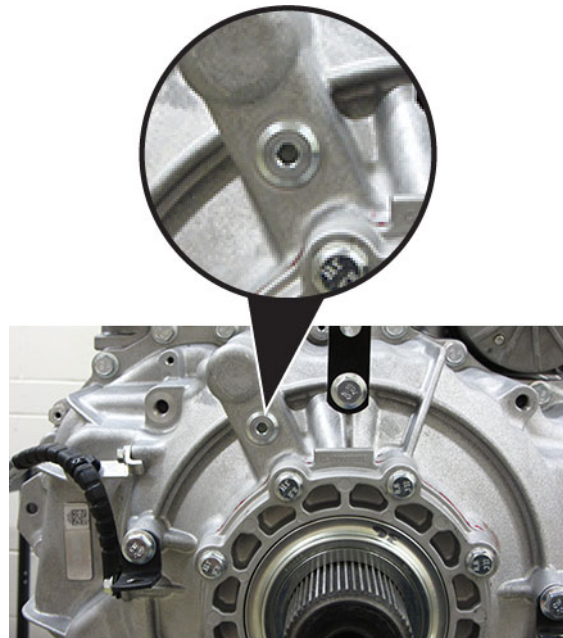
NOTICE: Do not over-torque drain plug or transmission damage may occur.



Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

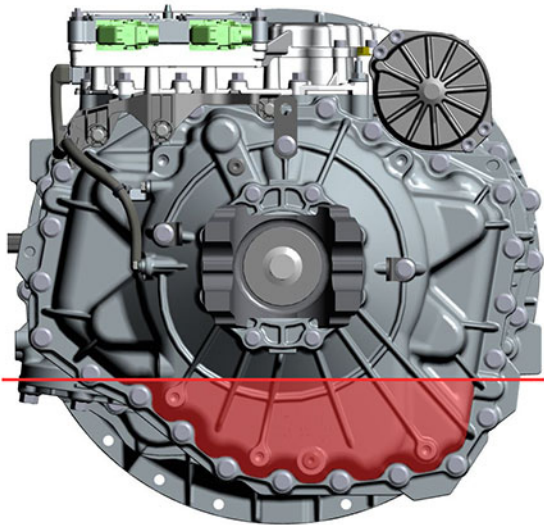
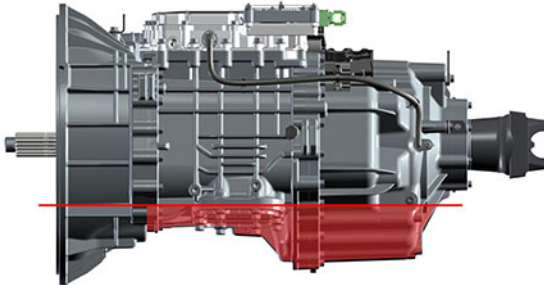


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

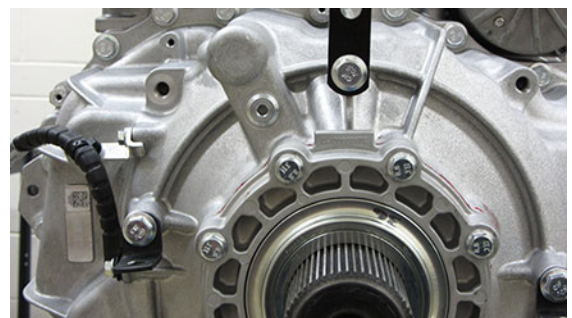
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Linear Clutch Actuator (LCA) Service Procedure

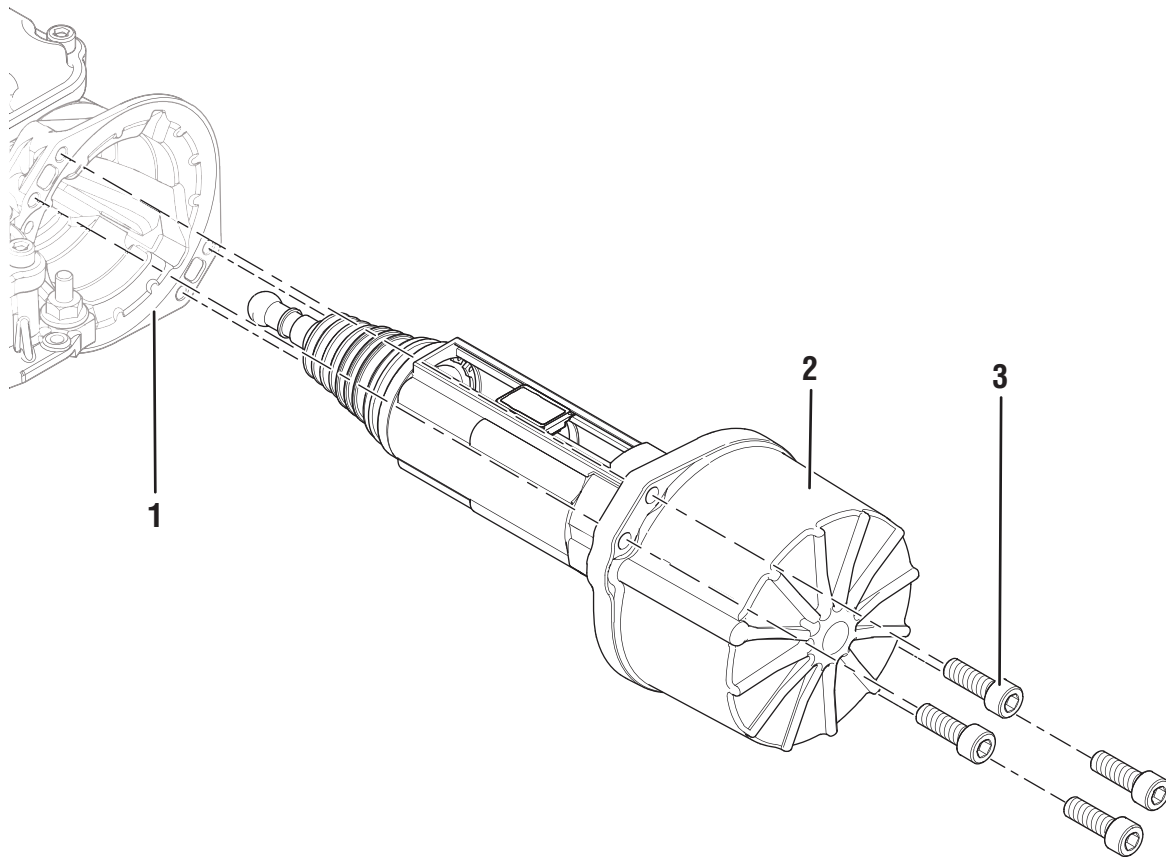
Special Instructions

- The LCA can be removed and installed with the transmission in-vehicle.
- Drain the vehicle air system.

Special Tools

None

Component Identification



1. Mechatronic Transmission Module (MTM) Housing
2. Linear Clutch Actuator (LCA)
3. LCA Cap Screws (x4) - T45 Torx

Disconnect the Transmission Control Module (TCM)

1. Disconnect the negative battery cable.

NOTICE: Leaving battery cable connected may damage TCM.

2. Disconnect the 20-Way TCM Vehicle and Body Harness Connectors from the TCM by depressing the lock tab and lifting up on the lever.

NOTICE: Do not allow contamination into the connectors on the TCM.



Remove the Linear Clutch Actuator (LCA)

1. Loosen the 4 LCA cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and MTM housing when the cap screws are loosened.



2. Remove the 4 LCA cap screws
3. Remove the LCA from the MTM.

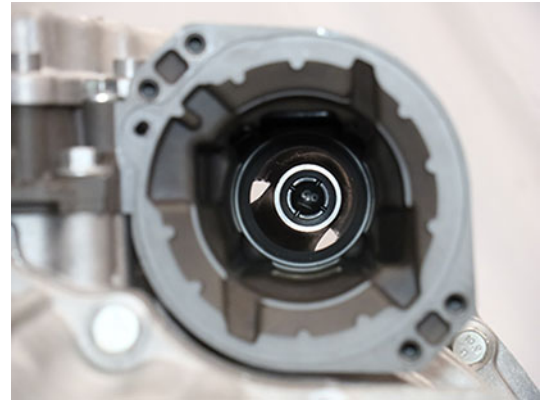
NOTICE: Ensure the key is off and 20-Way TCM Vehicle Harness is disconnected prior to removing the LCA from the MTM.

Note: LCA piston rod end is seated in the release yoke socket; pull to release rod end from socket.



4. Inspect the plastic socket insert in the release yoke through the LCA opening using a flashlight to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the release yoke assembly.



Install the Linear Clutch Actuator (LCA)

NOTICE: Ensure the key is off and 20-Way TCM Vehicle Harness is disconnected prior to installing the LCA.

Note: Linear Clutch Actuator (LCA) can be installed with transmission in-vehicle.

1. Clean all sealing surfaces on the MTM and LCA with a lint free cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Place the LCA on a clean, flat surface and push the LCA rod down until it locks to reset the LCA.

Note: A new LCA may already be in the reset position.

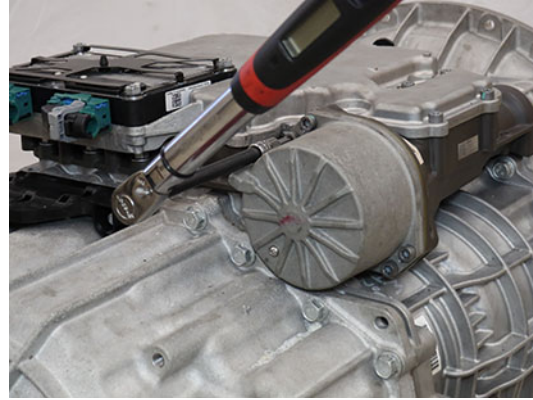


3. Insert the LCA into the MTM.



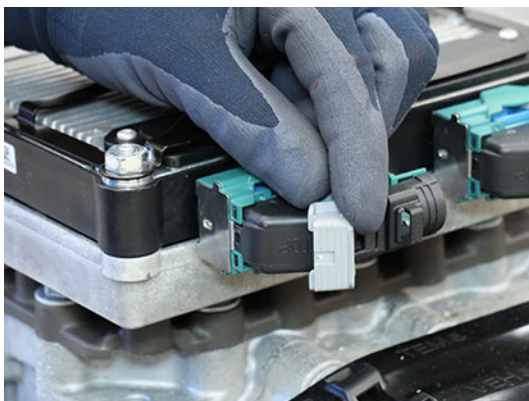
4. Install 4 LCA T45 cap screws and torque to 23-28 Nm (17-21 lb-ft) in a criss-cross pattern.

Note: If transmission is in-vehicle, go to Step 5. If transmission is out-of-vehicle, go to "Install the Release Bearing and Clutch Release Yoke" on page 72.



Connect the Transmission Control Module (TCM).

1. Connect the 20-Way TCM Vehicle and Body Harness Connector to the TCM by pressing the lever into the locked position.



2. Connect the negative battery cable.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To "Service Routines".
5. Select "Start" Clutch Calibration and follow on-screen prompts.
6. Select "Start" Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To "Fault Codes".
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select "Clear Eaton Faults" and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Transmission Control Module (TCM) Service Procedure

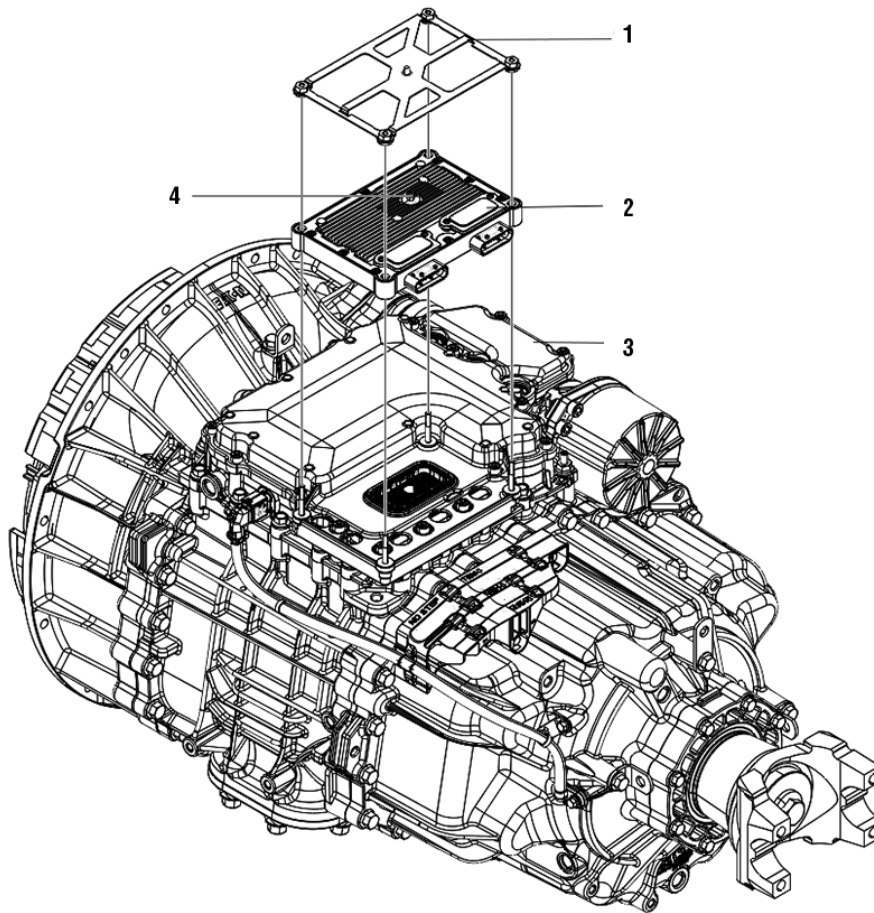
Special Instructions

- The TCM can be removed and installed with transmission in-vehicle.
- If installing a replacement transmission assembly, MTM or TCM, go to **Configure Transmission Control Module (TCM)**.
- If re-installing the original TCM, after completing TCM installation, go to **Perform Transmission Service Routines**.

Special Tools

- ServiceRanger

Component Identification



1. Transmission Control Module (TCM) Cover - 10 or 13 mm Nuts
2. Transmission Control Module (TCM)
3. Mechatronic Transmission Module (MTM)
4. Transmission Control Module (TCM) Jackscrew - 7 mm

Create a Service Activity Report

1. Key on with engine off.
2. Connect ServiceRanger and create a Service Activity Report.
3. Disconnect ServiceRanger.
4. Key off.

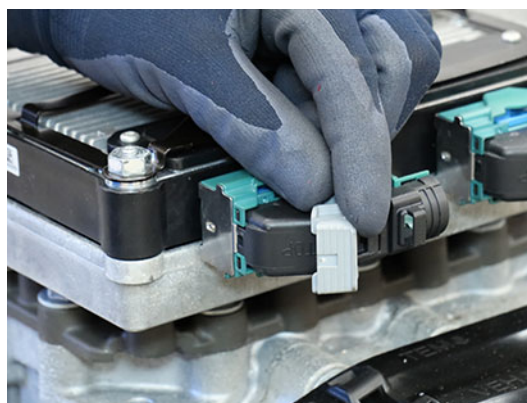
Disconnect the Transmission Control Module (TCM)

1. Disconnect the negative battery cable.

NOTICE: Leaving battery cable connected may damage TCM.

2. Disconnect the 20-Way TCM Vehicle and Body Harness Connectors from the TCM by depressing the lock tab and lifting up on the lever.

NOTICE: Do not allow contamination into the connectors on the TCM.



Remove the Transmission Control Module (TCM)

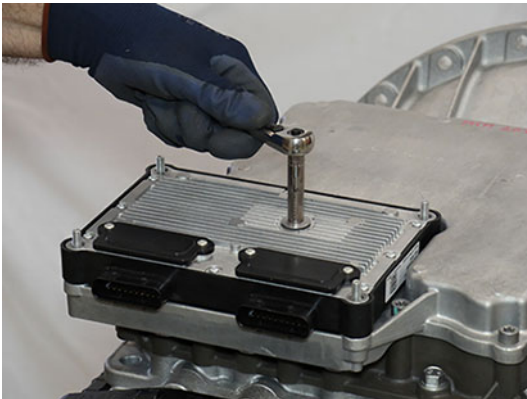
1. Unscrew the 4 TCM Cover nuts and remove TCM Cover.

Note: TCM Cover nuts are 10 or 13 mm.



2. Unscrew the TCM 7 mm Jackscrew. Lift and remove the TCM from the MTM.

NOTICE: Do not allow contamination into the connectors on the TCM or MTM.



3. Inspect the TCM Seal for damage.

NOTICE: Replace the TCM Seal if damaged.



4. If replacing the TCM, transfer the TCM Seal to the new TCM.

Install the Transmission Control Module (TCM)

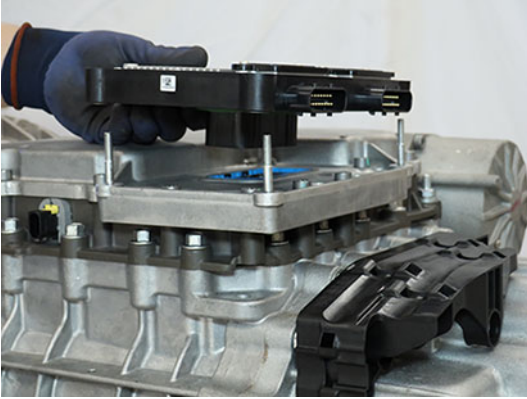
NOTICE: Do not allow contamination into the connectors on the TCM or MTM.

Note: TCM can be installed with transmission in-vehicle.

1. Install the TCM Seal on the 74-Way Harness Connector.

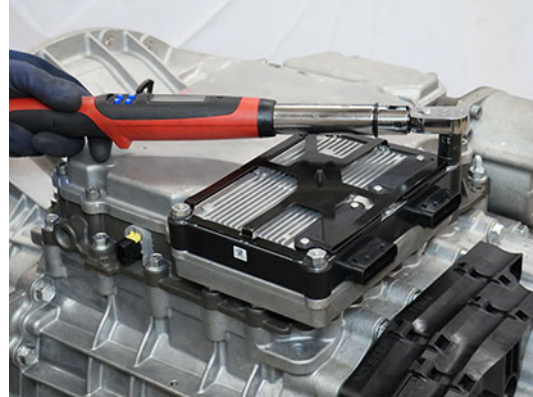


2. Align the TCM to the 74-Way Harness Connector and TCM studs, then install the TCM.

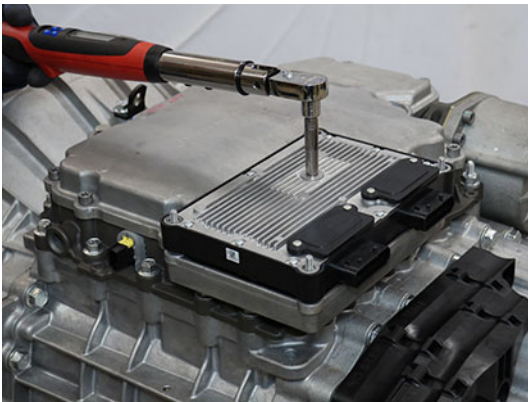


4. Install the TCM Cover over the 4 TCM studs and torque the 4 TCM Cover Nuts to 8.8-10.4 Nm (78-92 lb-in) in a criss-cross pattern.

Note: TCM Cover nuts are 10 or 13 mm.

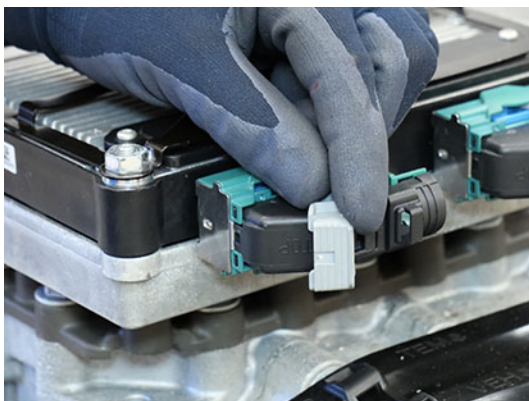
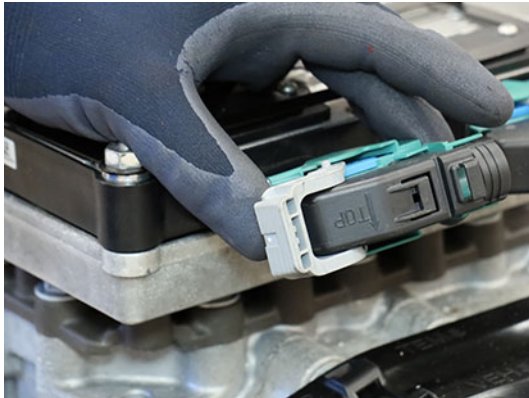


3. Torque the TCM 7 mm Jackscrew to 3.0-4.0 Nm (26.6-35.4 lb-in).



Connect the Transmission Control Module (TCM).

1. Connect the 20-Way TCM Vehicle and Body Harness Connector to the TCM by pressing the lever into the locked position.



2. Connect the negative battery cable.

Configure Transmission Control Module (TCM)

1. Key on with engine off.

Note: Vehicle display may indicate a flashing “F”, “CC”, or service transmission.
2. Connect ServiceRanger.
3. Go To “Configuration”.
4. Select “Identification”.
5. In the “Serial Number” parameter “New Value” field enter the transmission serial number.

Note: Refer to SAR, locate and enter indicated “Serial Number”, if “Unspecified” is indicated, locate and enter indicated “Original Trans Serial Number”.
6. In the “Current MTM Serial Number” parameter “New Value” field enter the MTM serial number.

Note: Refer to SAR, locate and enter indicated “Current MTM Serial Number”, if “Unspecified” is indicated locate and enter indicated “Original MTM Serial Number”.
7. Refer to the SAR and change other configuration parameter settings to match original TCM settings.
8. Select “Apply” and follow on-screen prompts.
9. Key on with engine off.
10. Connect ServiceRanger.
11. Select the “Calibration” tab.
12. Select the appropriate OEM vehicle application calibration.
13. Select “Apply” and follow on-screen prompts.
14. Key on with engine off.
15. Connect ServiceRanger.
16. Go To “Service Routines”.
17. Select “Start” Grade Sensor Calibration and follow on-screen prompts.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.

5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Transmission Service Procedure

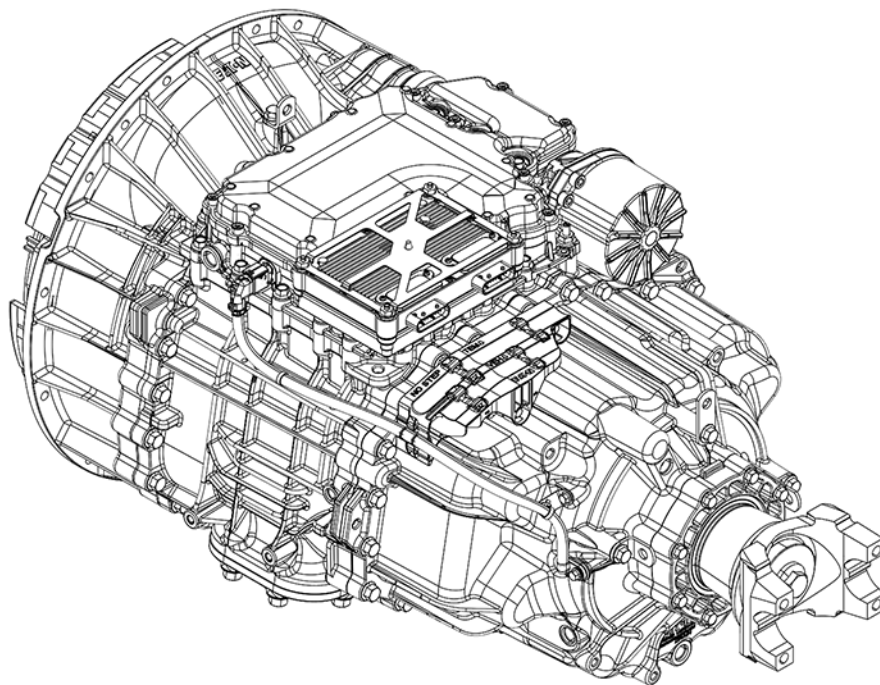
Special Instructions

Manually Vent Linear Clutch Actuator (LCA).

Special Tools

- Transmission Jack Adapter Plate (RR1067TR)
- 2 cap screws and washers (M10 x 1.5 x 30 mm, minimum class 8.8)
- ServiceRanger

Component Identification



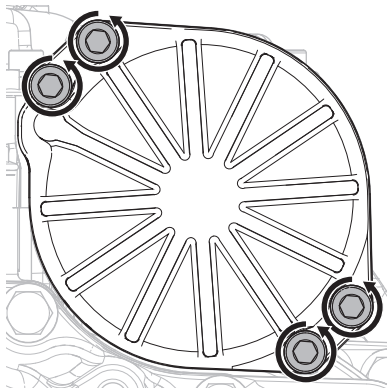
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Install the Transmission

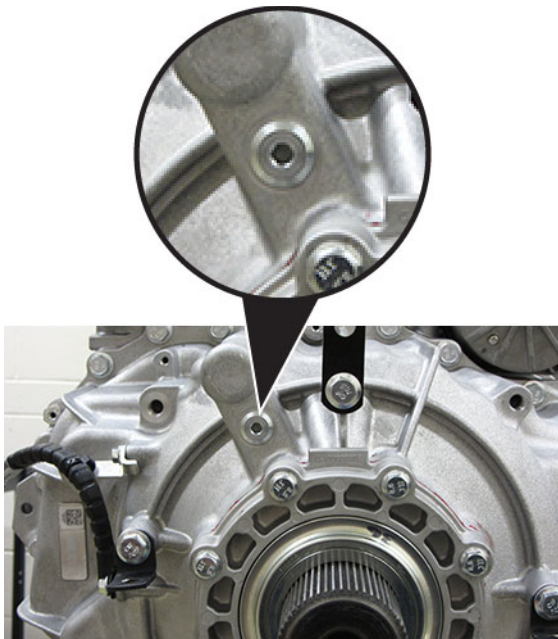
1. Refer to OEM guidelines for transmission installation.

2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

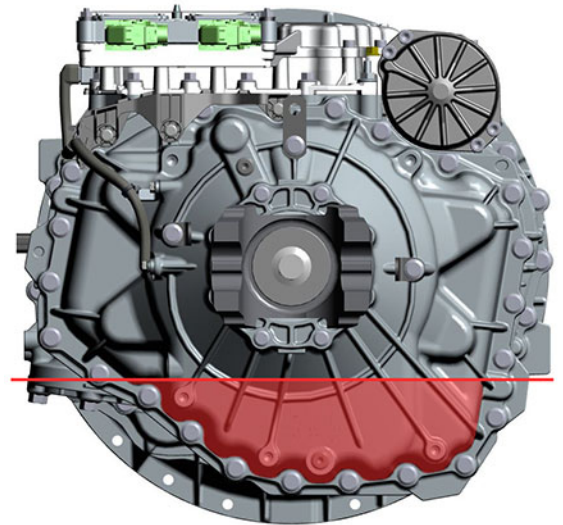
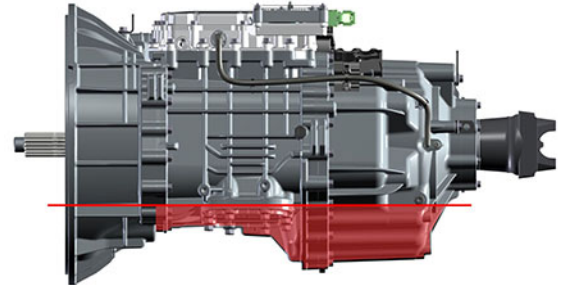


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To "Service Routines".
5. Select "Start" Clutch Calibration and follow on-screen prompts.
6. Select "Start" Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To "Fault Codes".
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select "Clear Eaton Faults" and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Clutch Service Procedure

Special Instructions

Install Clutch Alignment Shaft (RR1087TR) onto a clutch jack. Refer to clutch jack manufacturer guidelines for proper installation instructions.

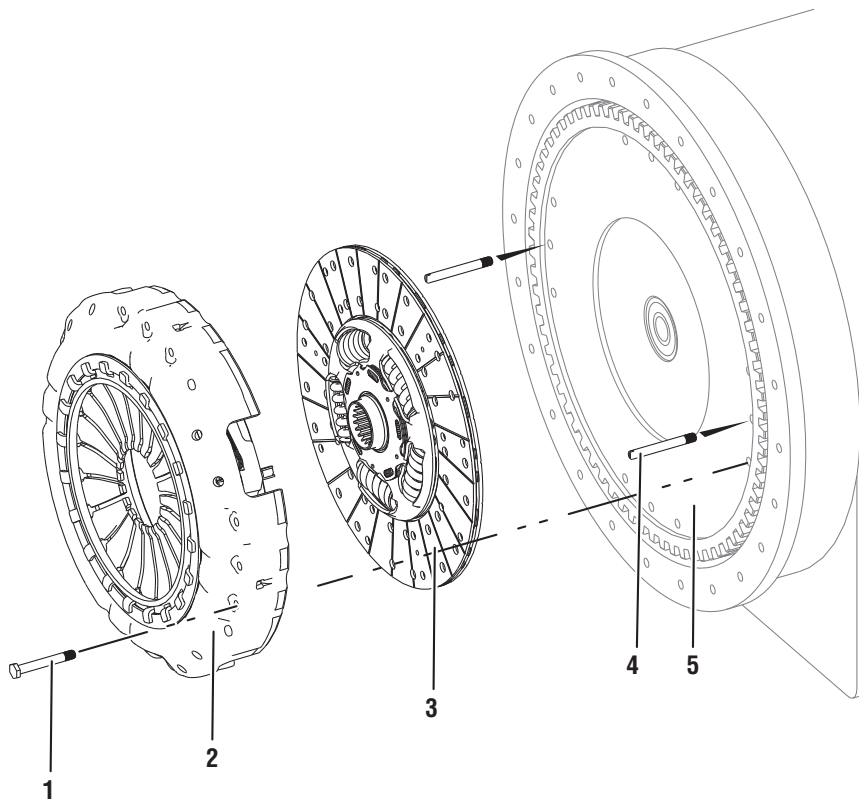


WARNING: Clutch weighs approximately 125 lbs. Failure to properly secure the Clutch Alignment Shaft to the clutch jack may result in clutch damage, severe injury or death.

Special Tools

- Clutch Installation Tool Kit (RR2000CL)
- 6 ounce (170 gram) hammer
- 3/8 inch (9.525 mm) brass pin punch (Starrett® B248E Pin Punch, Brass Drive 3/8" or equivalent)
- Input Shaft Pilot Bearing Wear Sleeve Puller (RR1062TR)
- Wear Sleeve Installer (RR1061TR)
- Snap Ring Installer (RR1061TR-1)
- Wear Sleeve Driver (RR1061TR-2)

Component Identification



1. Clutch Cover Cap Screws (x12) M10 x 1.5 x 80mm, minimum class 10.9, flange type fasteners
2. Clutch Cover

3. Driven Disc Assembly
4. Alignment Pins (x2)
5. Engine Flywheel

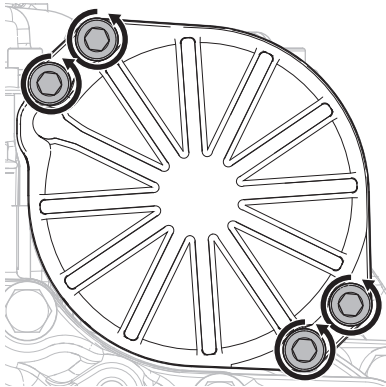
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Clutch

1. Remove the 4 center 15 mm Clutch Cover cap screws from each of the 3-bolt groups.

! **WARNING:** Clutch weighs approximately 125 lbs. Failure to properly secure the Clutch Alignment Shaft to the clutch jack may result in clutch damage, severe injury or death.



2. Install and hand tighten the 4 stand-off bolts (RR1063TR-4) in place of the removed Clutch Cover cap screws.



3. Insert the clutch jack-mounted Clutch Alignment Shaft (RR1087TR) into the clutch diaphragm spring and pilot bearing.



WARNING: Clutch weighs approximately 125 lbs. Dropping clutch may result in damage to clutch, serious injury or death.



4. Remove the 8 remaining 15 mm Clutch Cover cap screws.
NOTICE: Do not remove the 4 stand-off bolts.
5. Remove the Clutch Cover and Driven Disc from the flywheel.

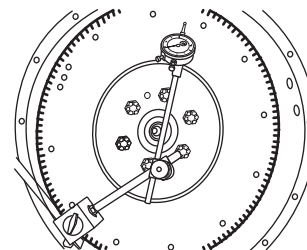
Engine Flywheel and Housing Inspection

1. Remove the pilot bearing.
2. Verify flywheel face runout.
3. Secure the dial indicator base to the flywheel housing face with the dial indicator finger in contact with the flywheel face near the outer diameter.

Note: Clean all dial indicator contact surfaces.

4. Rotate flywheel one revolution and record flywheel face runout: maximum runout is 0.008" (0.20 mm).

NOTICE: If any reading exceeds maximum runout, premature clutch wear will occur. Refer to OEM engine manufacture guidelines for repair or replacement.

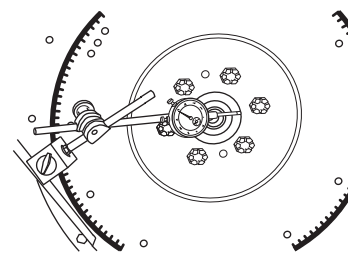


5. Verify pilot bearing bore runout.
6. Secure the dial indicator base to the flywheel housing face with the dial indicator finger in contact with the pilot bearing bore.

Note: Clean all dial indicator contact surfaces.

7. Rotate flywheel one revolution and record pilot bearing bore runout: maximum runout is 0.005" (0.13 mm).

NOTICE: If any reading exceeds maximum runout, premature clutch wear will occur. Refer to OEM engine manufacture guidelines for repair or replacement.

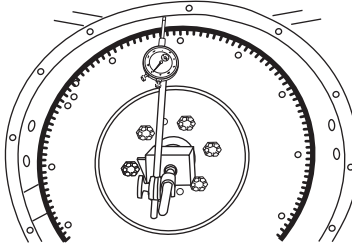


8. Verify flywheel housing inner diameter (ID) runout.
9. Secure the dial indicator base to the crankshaft with the dial indicator finger in contact with the flywheel housing ID.

Note: Clean all dial indicator contact surfaces.

10. Rotate crankshaft one revolution and record flywheel housing (ID) runout: maximum runout is 0.008" (0.20 mm).

NOTICE: If any reading exceeds maximum, runout premature clutch wear will occur, Refer to OEM engine manufacture guidelines for repair or replacement.

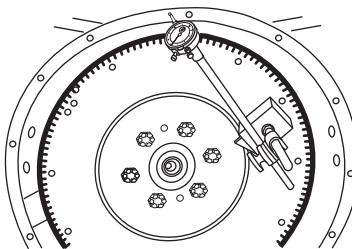


11. Verify flywheel housing face runout.
12. Secure the dial indicator base to the flywheel face near the outer diameter with the dial indicator finger in contact with the face of the flywheel housing.

Note: Clean all dial indicator contact surfaces.

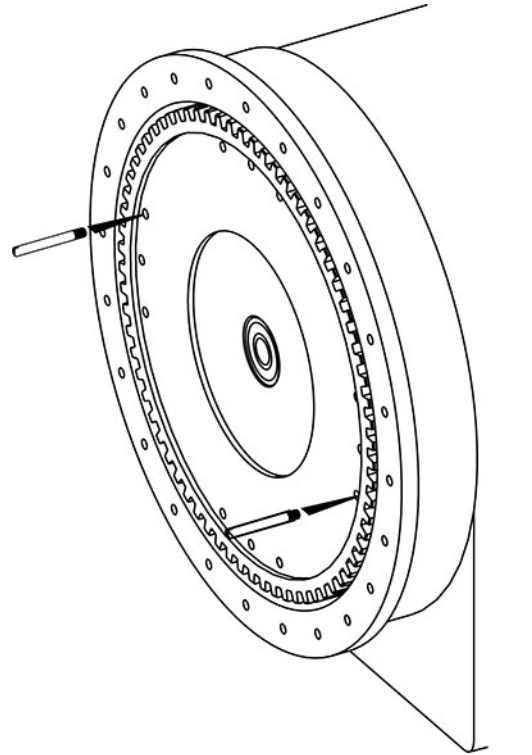
13. Rotate flywheel one revolution and record flywheel housing face runout: maximum runout is 0.008" (0.20 mm).

NOTICE: If any reading exceeds maximum, runout premature clutch wear will occur. Refer to OEM engine manufacture guidelines for repair or replacement.



2. Install 2 Alignment Pins (RR1063TR-3) into the flywheel directly across from each other, at approximately 3 and 9 o'clock.

Note: Do not install the Alignment Pins into the center threaded hole of the 3-threaded hole groups.



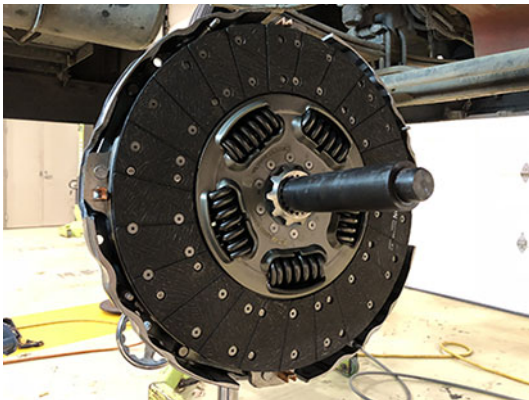
Install the Clutch


1. Install a new pilot bearing. Refer to OEM and/or engine manufacturer installation guidelines.

3. Install the Clutch Cover and Driven Disc onto the clutch jack-mounted Clutch Alignment Shaft (RR1087TR).



WARNING: Clutch weighs approximately 125 lbs. Failure to properly secure the Clutch Alignment Shaft to the clutch jack may result in clutch damage, severe injury or death.



4. Align the Clutch Cover to the flywheel Alignment Pins and insert the Clutch Alignment Shaft (RR1087TR) into the Pilot Bearing.
 5. Slide the Clutch Cover (and Driven Disc) on to the flywheel until seated and install 6 Clutch Cover cap screws finger tight.
-  **CAUTION:** Use only M10 x 1.5 x 80mm, minimum class 10.9, flange type fasteners for the Clutch Cover cap screws.
6. Remove the 2 Alignment Pins (RR1063TR-3), 4 stand-off bolts (RR1063TR-4) and straps (if equipped) from the Clutch Cover.

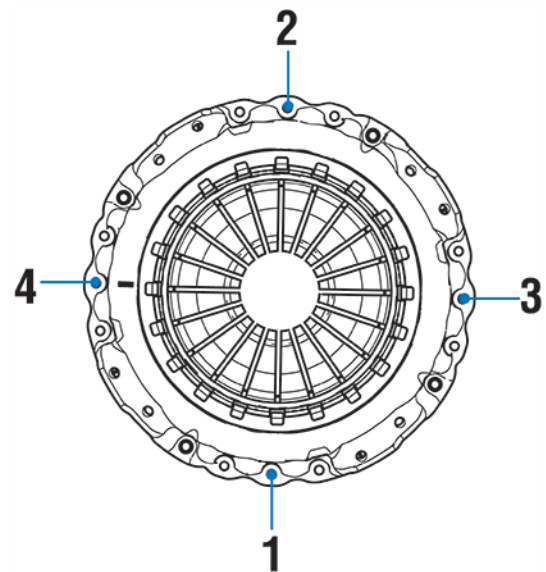
7. Install 6 remaining Clutch Cover cap screws finger tight.



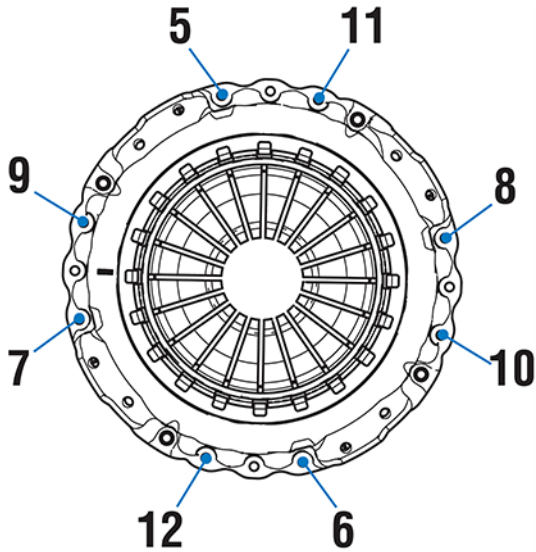
8. Torque Clutch Cover cap screws 1 through 4 to 30 Nm (23 lb-ft) as shown in the torque sequence below.



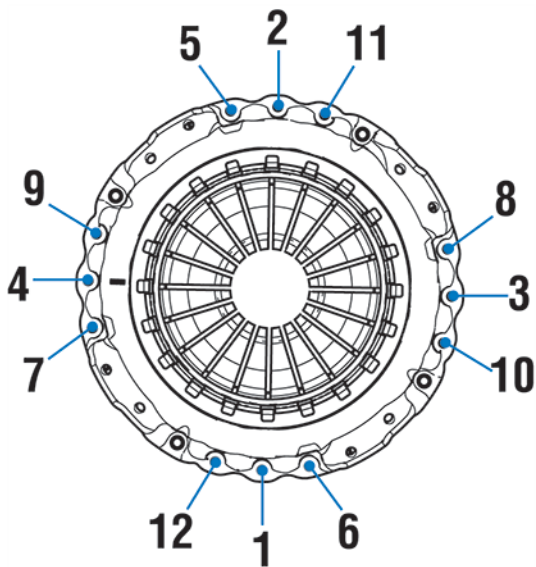
CAUTION: Reference cap screw call out images for proper torque sequence. Failure to follow the torque sequence may result in component damage.



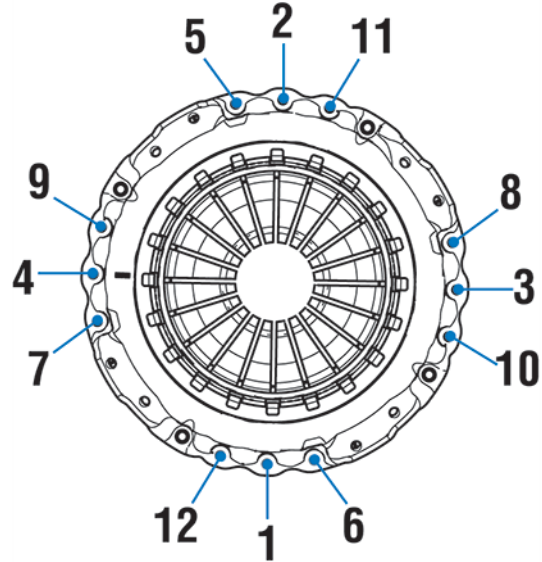
9. Torque Clutch Cover cap screws 5 through 12 to 30 Nm (23 lb-ft) as shown in the torque sequence below.



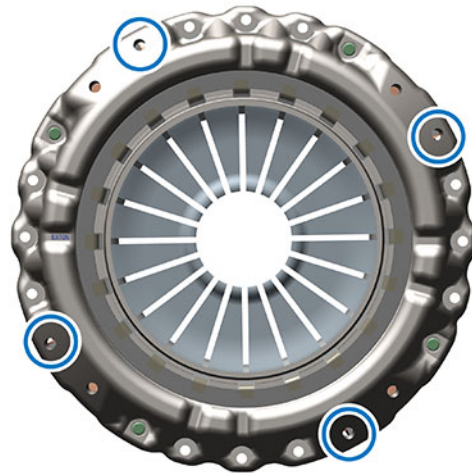
10. Torque Clutch Cover cap screws 1 through 12 to 57-67 Nm (42-50 lb-ft) as shown in the torque sequence below.



11. Re-torque Clutch Cover cap screws 1 through 12 to 57-67 Nm (42-50 lb-ft) as shown in the torque sequence below to verify clutch is fully seated to the flywheel.



12. Remove the Clutch Alignment Shaft (RR1087TR).
 13. Locate the 4 Control Fingers in the Clutch Cover.

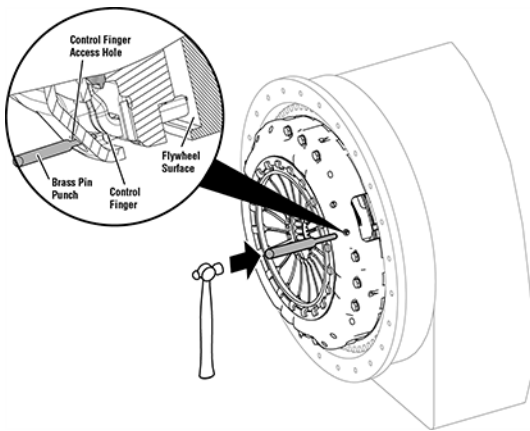


14. Use a 6 ounce (170 gram) hammer and a 3/8 inch (9.525 mm) brass pin punch and lightly tap the 4 control fingers until they contact the flywheel.



CAUTION: Keep fingers clear to avoid personal injury.

NOTICE: Only use tools specified and do not use excessive force to seat the control fingers to the flywheel. If controls fingers are damaged during installation the clutch will not properly adjust and will require replacement.



Disassemble the Input Shaft Pilot Bearing Wear Sleeve

1. Remove the Spiral Snap Ring from the input shaft with a pick.



2. Install the Input Shaft Pilot Bearing Wear Sleeve Puller (RR1062TR) over the flats on the Pilot Bearing Wear Sleeve.



3. Tighten the 13 mm jackscrew on the Input Shaft Pilot Bearing Wear Sleeve Puller (RR1062TR) to remove Wear Sleeve.



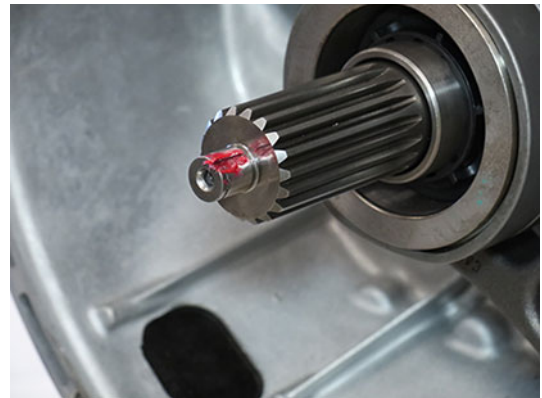
4. Remove the Wear Sleeve Alignment Pin.



Assemble the Input Shaft Pilot Bearing Wear Sleeve

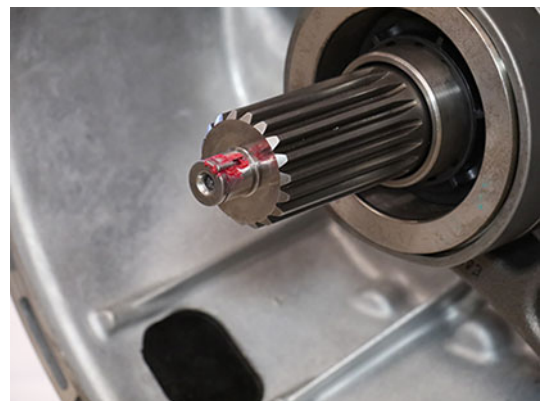
1. Clean the Pilot Bearing Wear Sleeve surfaces on the input shaft.

2. Apply grease to alignment pin groove on the input shaft to hold the Wear Sleeve Alignment Pin in place.



3. Slide the Wear Sleeve Alignment Pin into the groove on the input shaft.

NOTICE: Chamfered end of alignment pin must face forward.



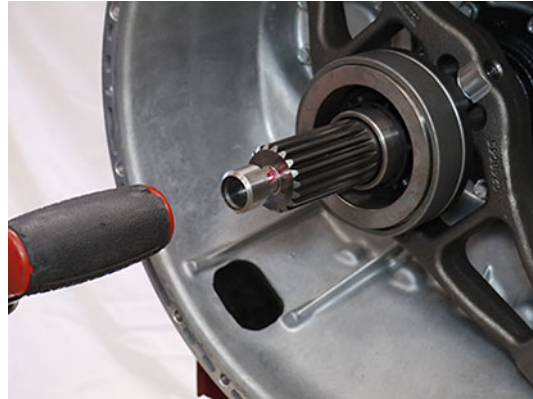
4. Align the groove in the Pilot Bearing Wear Sleeve with the Wear Sleeve Alignment Pin.



5. Hold the Pilot Bearing Wear Sleeve against the input shaft and lightly tap with a soft-faced hammer to start installation.



CAUTION: Keep fingers clear to avoid personal injury.



6. Use the Wear Sleeve Driver (RR1061TR-2) to fully seat the Pilot Bearing Wear Sleeve onto the input shaft.



7. Inspect the Pilot Bearing Wear Sleeve to ensure it is fully seated on the input shaft.

NOTICE: If there is a gap between the Pilot Bearing Wear Sleeve and the input shaft, the Wear Sleeve Alignment Pin may have moved out of the groove; remove the Pilot Bearing Wear Sleeve and re-perform assembly procedure.



9. Slide the Wear Sleeve Driver (RR1061TR-2) over the Snap Ring Installer (RR1061TR-1).



8. Install a new Spiral Snap Ring onto the Snap Ring Installer (RR1061TR-1).



10. While holding the Snap Ring Installer (RR1061TR-1) against the input shaft, slide the Wear Sleeve Driver (RR1061TR-2) forward and fully seat the Spiral Snap Ring into the snap ring groove.



6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.

Fluid Pressure Sensor (FPS) Service Procedure

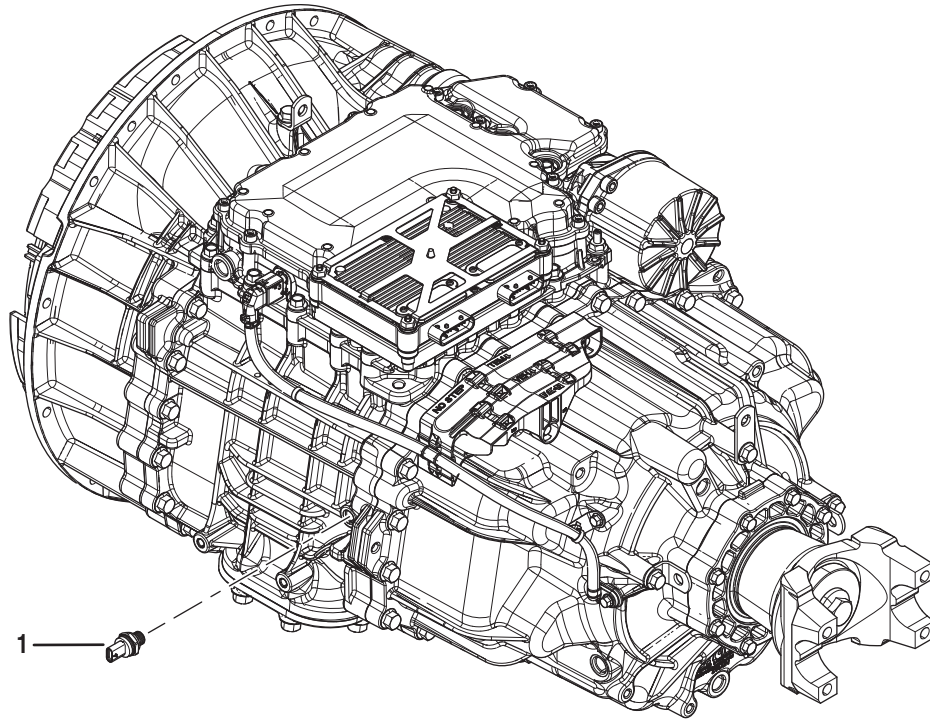
Special Instructions

The Fluid Pressure Sensor can be removed and installed with the transmission in-vehicle.

Special Tools

None

Component Identification

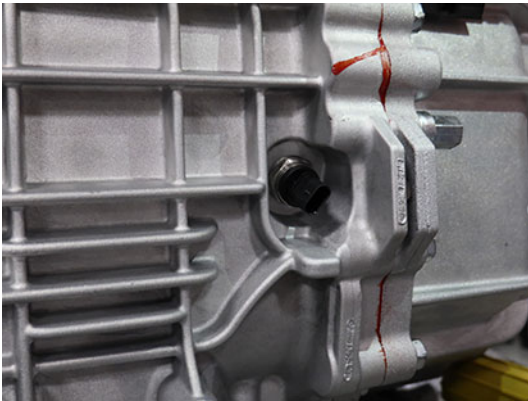


1. Fluid Pressure Sensor (x1)

Remove the Fluid Pressure Sensor (FPS)

1. Unlatch and disconnect the OEM 3-Way Transmission Fluid Pressure Sensor (FPS) Connector.

Note: There are two possible Main Housing FPS port designs. FPS removal and installation have the same procedure for both designs.



2. Remove the Transmission FPS (24 mm) threaded into the main housing.



Install the Fluid Pressure Sensor (FPS)

1. Inspect the Fluid Pressure Sensor (FPS) and O-ring for damage. If damaged, replace the FPS; O-ring is serviced with sensor.



2. Install the Transmission FPS (24 mm) into the Main Housing and torque to 19-23 Nm (14-17 lb-ft).

Note: There are two possible Main Housing FPS port designs. FPS removal and installation have the same procedure for both designs.



3. Connect and latch the OEM 3-Way Transmission FPS Connector.

Output Speed Sensor Service Procedure

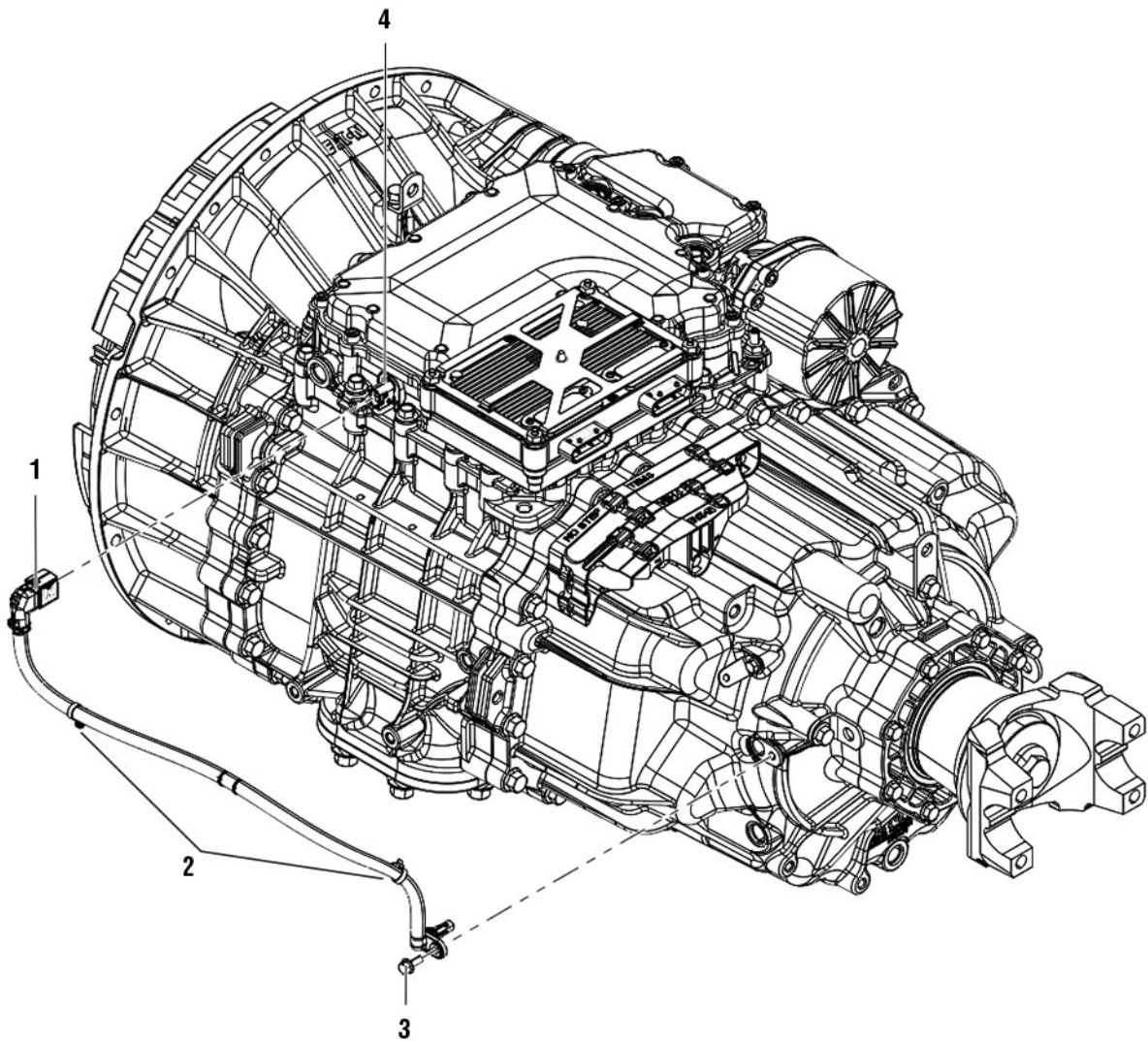
Special Instructions

None

Special Tools

None

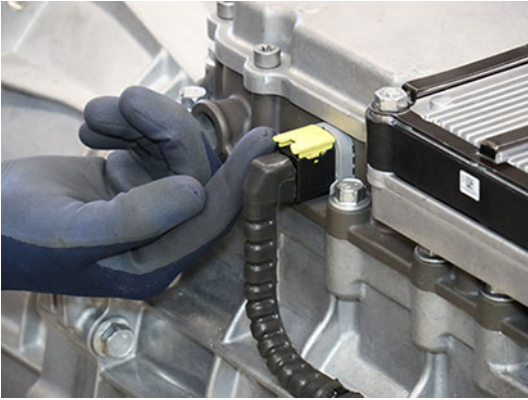
Component Identification



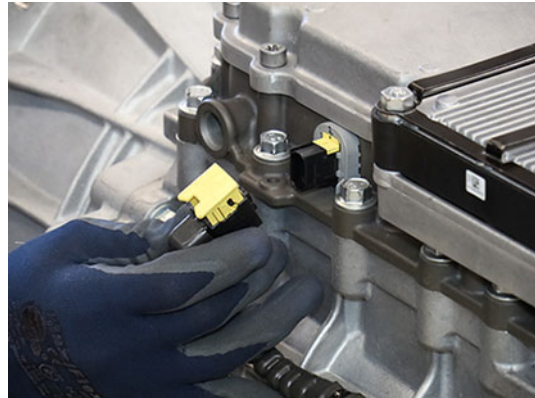
1. Output Speed Sensor Harness
2. Harness Retainers (x2)
3. Cap Screw - 10 mm
4. Output Speed Sensor Connector

Disconnect the Output Speed Sensor

1. Lift the latch on the Output Speed Sensor Harness at the Connector on the Mechatronic Transmission Module (MTM).



2. Remove the Output Speed Sensor Harness from the Connector on the MTM.



Remove the Output Speed Sensor

1. Remove the Output Speed Sensor Harness tie strap at the Harness Bracket.



- Remove the 2 harness press-in retainers from the Main Housing and bracket on Rear Housing.



- Remove the Output Speed Sensor 10 mm cap screw.



- Remove the Output Speed Sensor from the Rear Housing.

Note: The sensor may need to be twisted and pulled from the bore.



Install the Output Speed Sensor

- Clean the sensor bore.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surface.

- Apply a light coat of transmission oil to the sensor O-ring.

3. Install the Output Speed Sensor into the bore.

Note: The Sensor may need to be twisted and pushed into the bore.



5. Press the 2 harness press-in retainers into the Main Housing and the bracket on the rear housing.



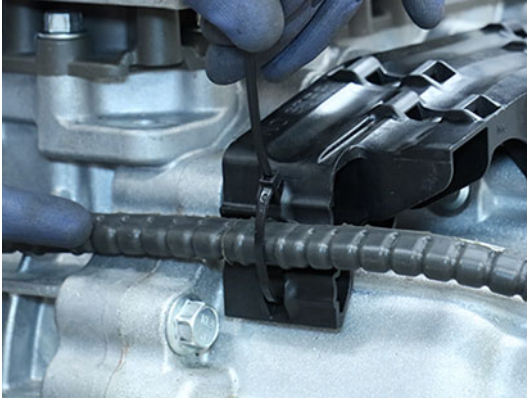
4. Install the Output Speed Sensor 10 mm cap screw and torque to 8.8-10.4 Nm (6-8 lb-ft).



6. Secure the Output Speed Sensor Harness to the Harness Bracket with a tie strap.



CAUTION: Failure to tie strap the Output Speed Sensor Harness to the Harness Bracket may result in harness damage.



Connect the Output Speed Sensor

1. Connect the Output Speed Sensor Harness to the Connector on the Mechatronic Transmission Module (MTM) and close the latch.



Mechatronic Transmission Module (MTM) Service Procedure

Special Instructions

None

Special Tools

- Mechanical Diagnostic Kit (RR2011TR)
- Gasket Sealant (Loctite 5188)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

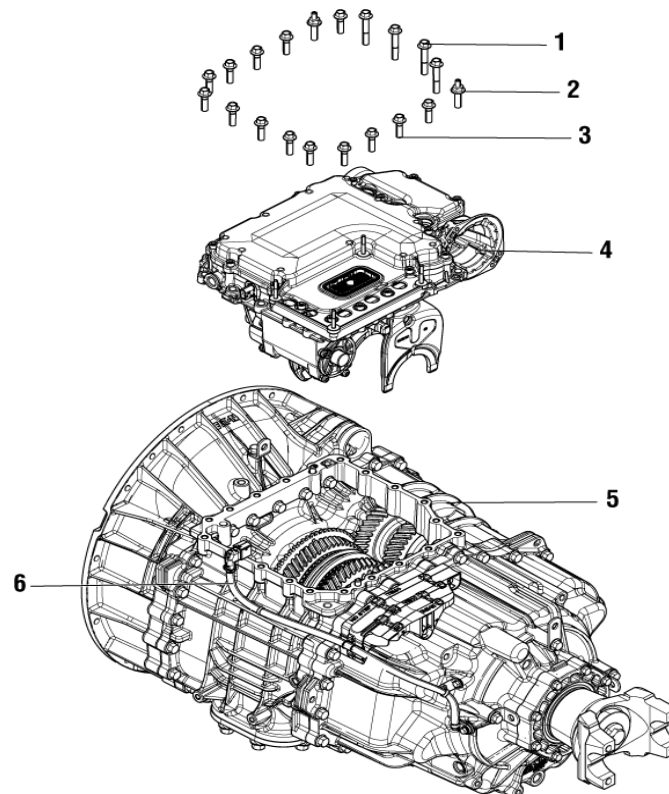


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



1. MTM Cap Screws, Long (x4) - 13 mm
2. MTM Cap Screws, Special (x2) - 15 mm
3. MTM Cap Screws (x14) - 13 mm

4. Mechatronic Transmission Module (MTM)
5. Main Housing
6. Output Speed Sensor

Create a Service Activity Report

1. Key on with engine off.
2. Connect ServiceRanger and create a Service Activity Report.
3. Disconnect ServiceRanger.
4. Key off.

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.

6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



Manually Vent Linear Clutch Actuator (LCA)

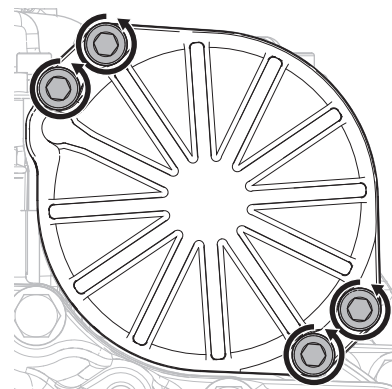
1. Key off.
2. Set vehicle parking brake and chock wheels.



WARNING: Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Remove the Transmission

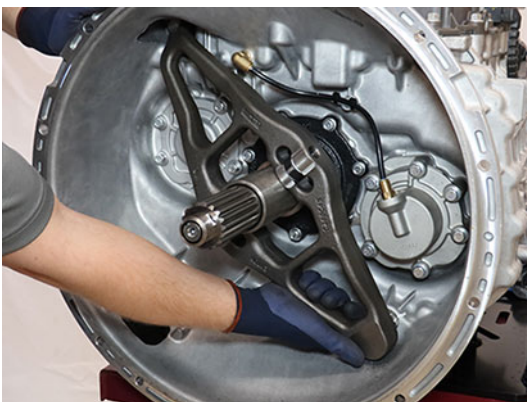
1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Release Bearing and Clutch Release Yoke

1. Remove the Release Bearing by sliding the bearing off the input shaft.



2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.



Remove the Transmission Control Module (TCM)

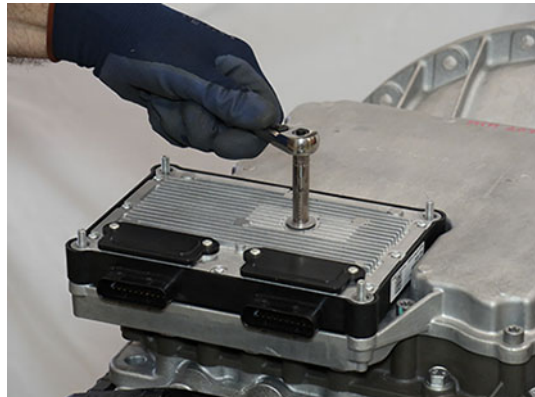
1. Unscrew the 4 TCM Cover nuts and remove TCM Cover.

Note: TCM Cover nuts are 10 or 13 mm.



2. Unscrew the TCM 7 mm Jackscrew. Lift and remove the TCM from the MTM.

NOTICE: Do not allow contamination into the connectors on the TCM or MTM.



3. Inspect the TCM Seal for damage.

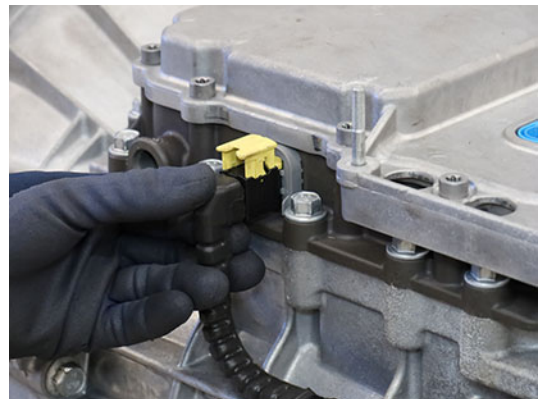
NOTICE: Replace the TCM Seal if damaged.



4. If replacing the TCM, transfer the TCM Seal to the new TCM.

Remove the Mechatronic Transmission Module (MTM)

1. Lift the latch on the Output Speed Sensor Harness at the Connector on the Mechatronic Transmission Module (MTM).



2. Remove the Output Speed Sensor Harness from the Connector on the MTM.



- Remove the 20 MTM cap screws.

Note: 13 mm (x18), 15 mm (x2).



- Separate the MTM from the Main Housing at the 2 pry points.



- Remove the MTM from the transmission housing.



CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.



Install the Mechatronic Transmission Module (MTM)

- Place the transmission in a horizontal position.

NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.

- Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

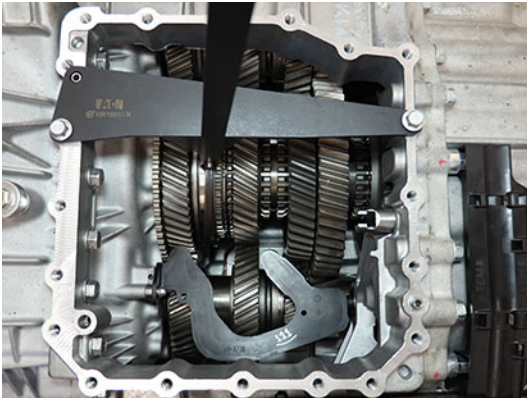
- Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

4. Install the Rail B Engagement Tool (RR1088TR) to the Main Housing and hand tighten with 2 MTM cap screws.

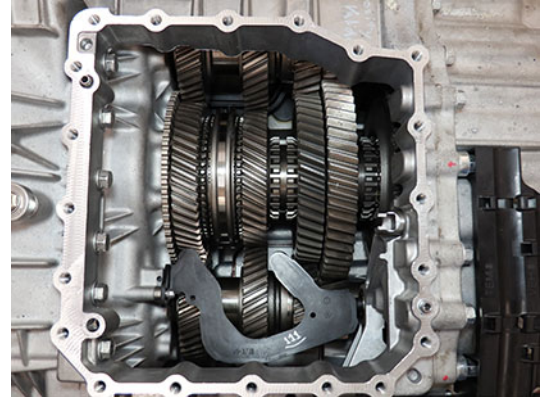


5. Shift the Rail B Synchronizer to neutral.



7. Move Rail C and Rail D sliding clutches to neutral.

NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.

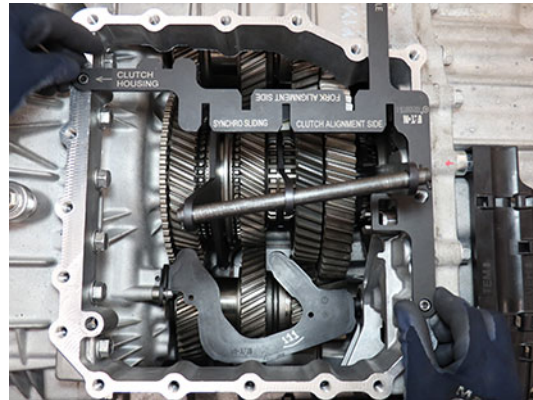
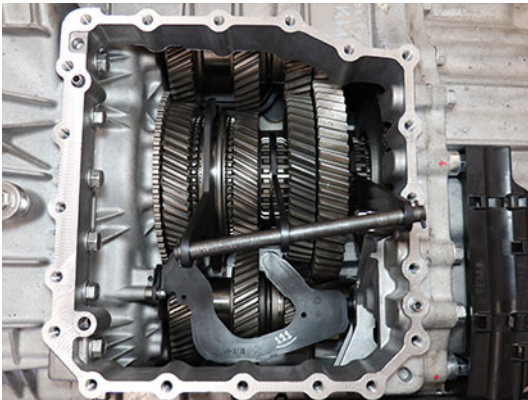
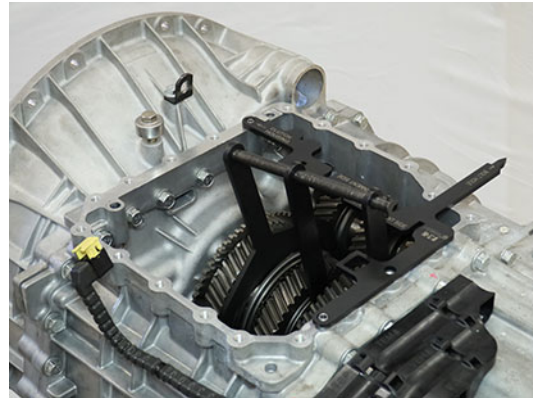


6. Remove the Rail B Engagement Tool.

8. Install the Confirm-Neutral Gauge (RR1086TR-2) into the slots of the synchronizer and sliding clutches.

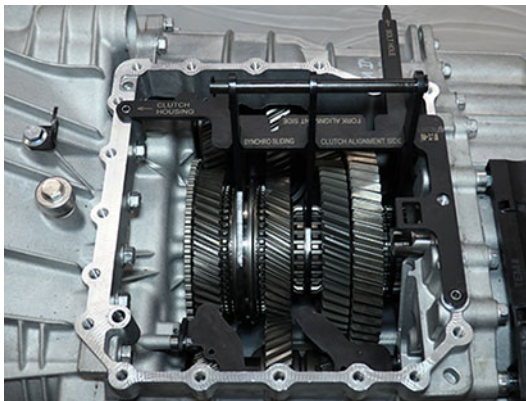


9. Install the MTM Alignment Tool (RR1086TR-1) onto the main housing.

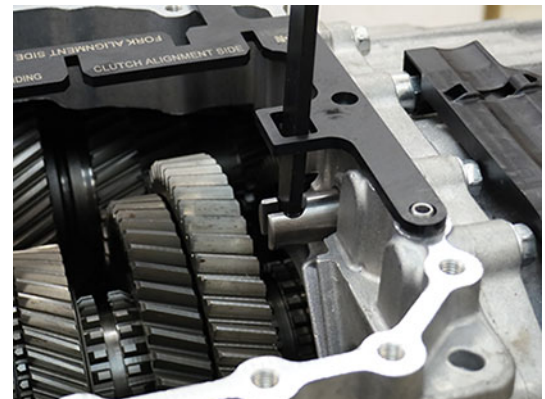
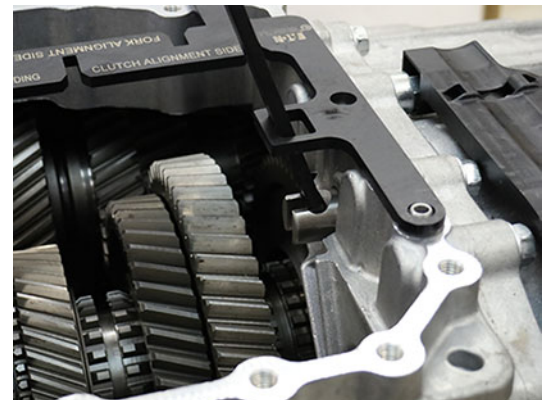
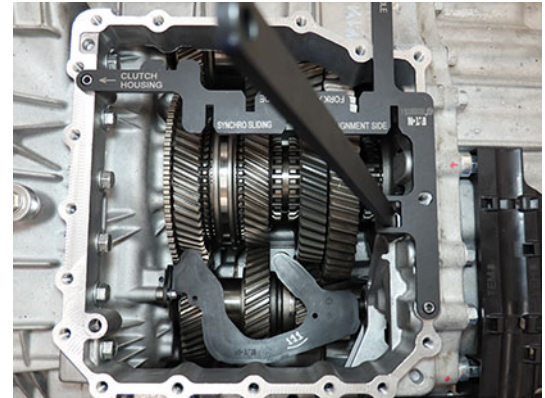


10. Verify synchronizer and sliding clutches are in neutral by sliding Confirm-Neutral Gauge into the slots of MTM Alignment Tool.

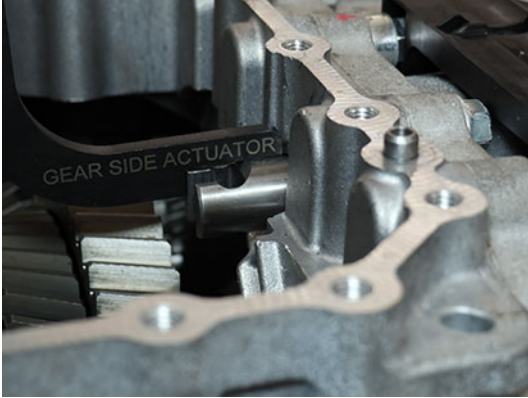
Note: If the gauge does not slide into the alignment tool slots, neutral is not achieved. Go to Step 4.



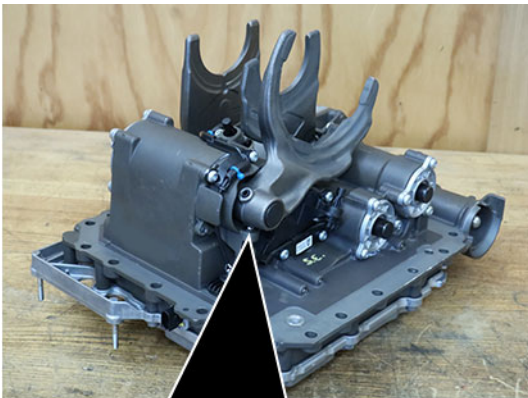
11. Using the Rail E Lever, move Rail E to neutral.



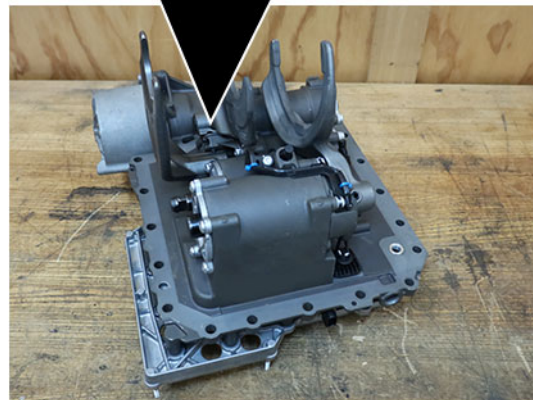
- 12.** Verify Rail E is in neutral using the Gear Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against housing with rail against notch-end of gauge.



- 13.** Move Shift Rail B in the MTM to neutral. Rail B is in neutral when the ball detent is in the notch of the Rail B yoke assembly.



- 14.** Move Shift Rails C and D in the MTM to neutral. Rails C and D are in neutral when the shift inter-lock is aligned with the notches of the rail yoke assemblies.



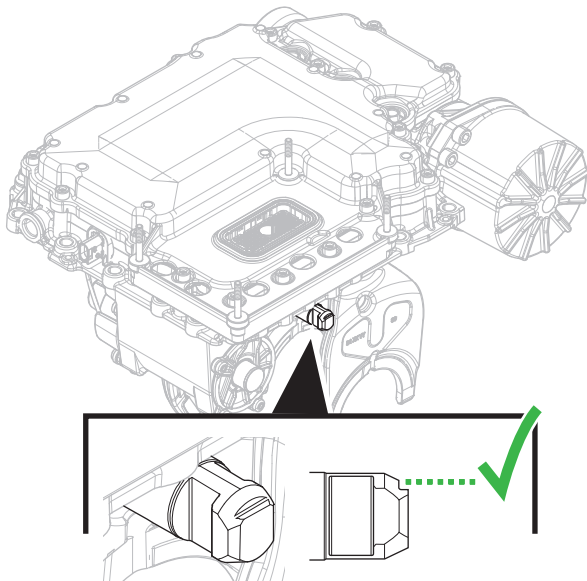
15. Verify MTM is in neutral. Install the MTM Alignment Tool (RR1086TR-1) into the bolt hole and onto Rail B, C, and D Shift Yokes.

Note: If the MTM Alignment Tool slots do not align with the 3 shift yokes, neutral has not been achieved. Go to Step 13.



16. Verify notch on Rail E is facing up.

Note: If the MTM is installed on the transmission with the notch on Rail E facing down, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

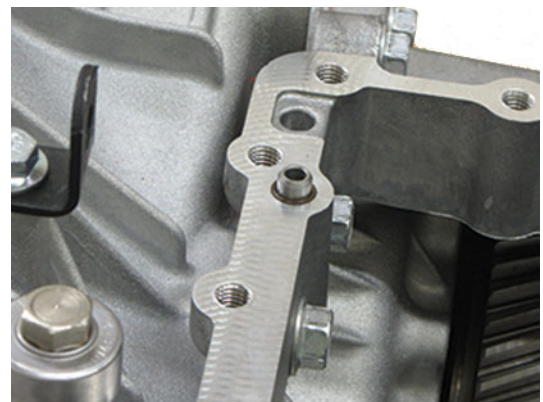


17. Verify Rail E is in neutral using the Fork Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against cover with rail against notch-end of gauge.

Note: If Rail E is not in neutral, slide rail in or out until neutral is achieved.



18. Slide O-ring over the MTM front alignment pin on the main housing until fully seated in the groove.



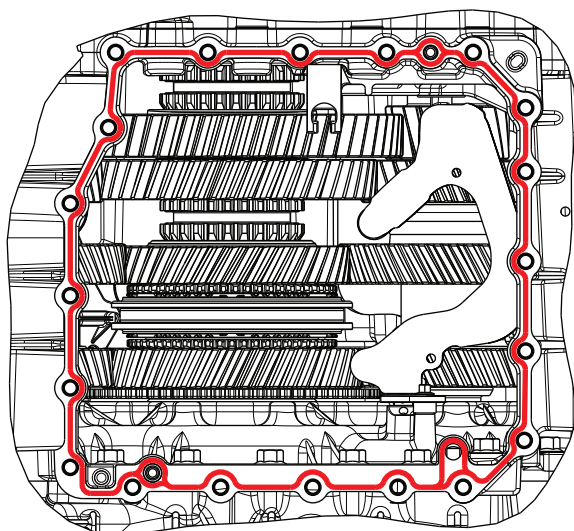
19. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

20. Apply gasket sealant with a bead width of 1.4-2.4mm (0.055-0.094 inch) to the transmission housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



21. Install MTM onto the transmission housing. Align Rail E in the MTM with the Rail E Shift Rail in the Main Housing.

CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.

NOTICE: If the MTM is installed on the transmission and Rail E in the MTM is not aligned with Rail E in the Main Housing, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

22. Install 20 MTM cap screws and torque to 44.5-51.5 Nm (33-38 lb-ft) in a criss-cross pattern.

Note: 13 mm (x18), 15 mm (x2) cap screws.



Install the Transmission Control Module (TCM)

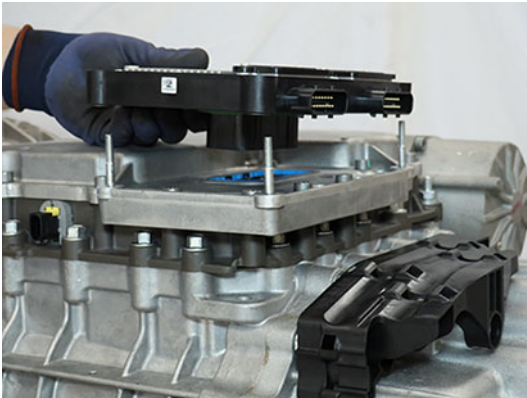
NOTICE: Do not allow contamination into the connectors on the TCM or MTM.

Note: TCM can be installed with transmission in-vehicle.

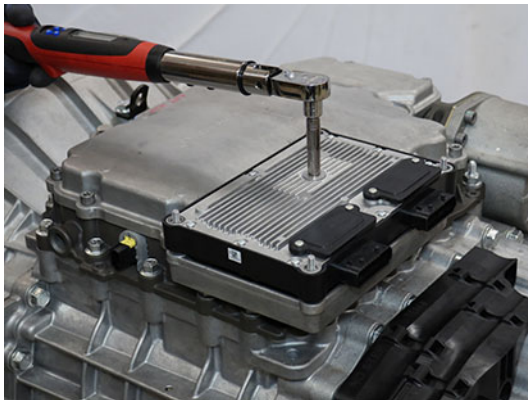
1. Install the TCM Seal on the 74-Way Harness Connector.



- Align the TCM to the 74-Way Harness Connector and TCM studs, then install the TCM.

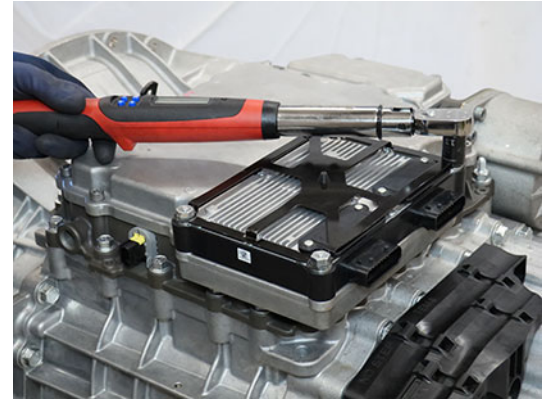


- Torque the TCM 7 mm Jackscrew to 3.0-4.0 Nm (26.6-35.4 lb-in).



- Install the TCM Cover over the 4 TCM studs and torque the 4 TCM Cover Nuts to 8.8-10.4 Nm (78-92 lb-in) in a criss-cross pattern.

Note: TCM Cover nuts are 10 or 13 mm.

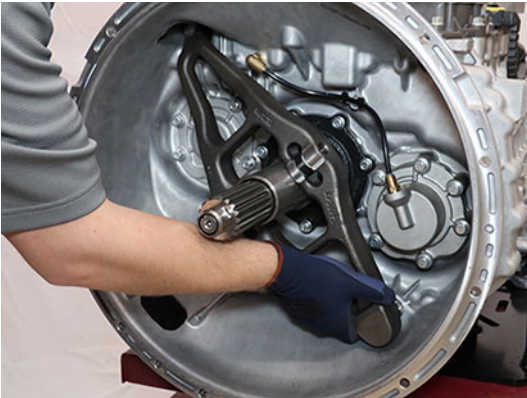


Install the Release Bearing and Clutch Release Yoke

- Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



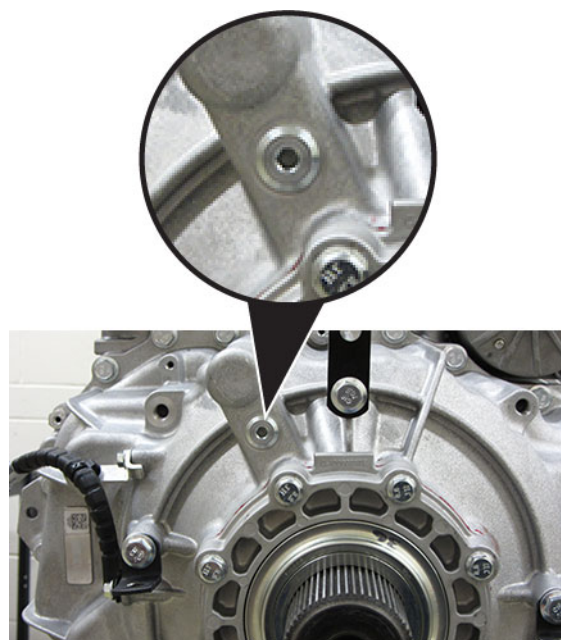
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

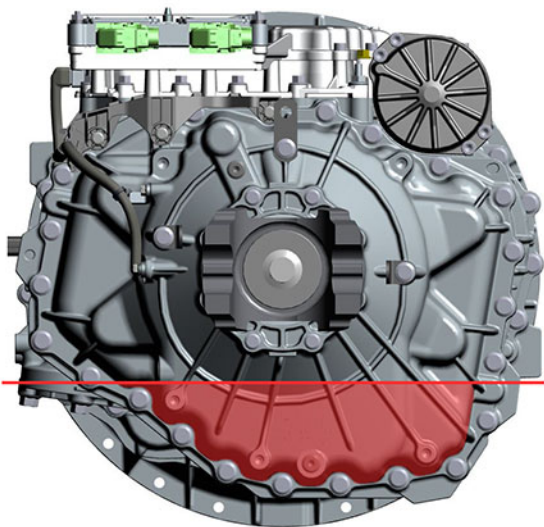
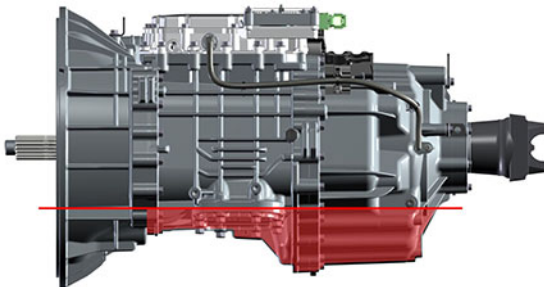


- Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



- Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



- Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
- Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

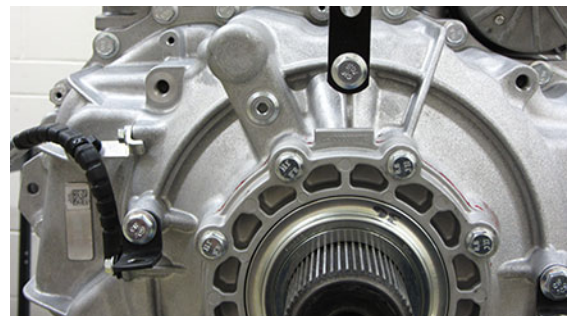
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



- Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
- Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Configure Transmission Control Module (TCM)

1. Key on with engine off.

Note: Vehicle display may indicate a flashing “F”, “CC”, or service transmission.
2. Connect ServiceRanger.
3. Go To “Configuration”.
4. Select “Identification”.
5. In the “Serial Number” parameter “New Value” field enter the transmission serial number.

Note: Refer to SAR, locate and enter indicated “Serial Number”, if “Unspecified” is indicated, locate and enter indicated “Original Trans Serial Number”.
6. In the “Current MTM Serial Number” parameter “New Value” field enter the MTM serial number.

Note: Refer to SAR, locate and enter indicated “Current MTM Serial Number”, if “Unspecified” is indicated locate and enter indicated “Original MTM Serial Number”.
7. Refer to the SAR and change other configuration parameter settings to match original TCM settings.
8. Select “Apply” and follow on-screen prompts.
9. Key on with engine off.
10. Connect ServiceRanger.
11. Select the “Calibration” tab.
12. Select the appropriate OEM vehicle application calibration.
13. Select “Apply” and follow on-screen prompts.
14. Key on with engine off.
15. Connect ServiceRanger.
16. Go To “Service Routines”.
17. Select “Start” Grade Sensor Calibration and follow on-screen prompts.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Release Bearing and Clutch Release Yoke Service Procedure

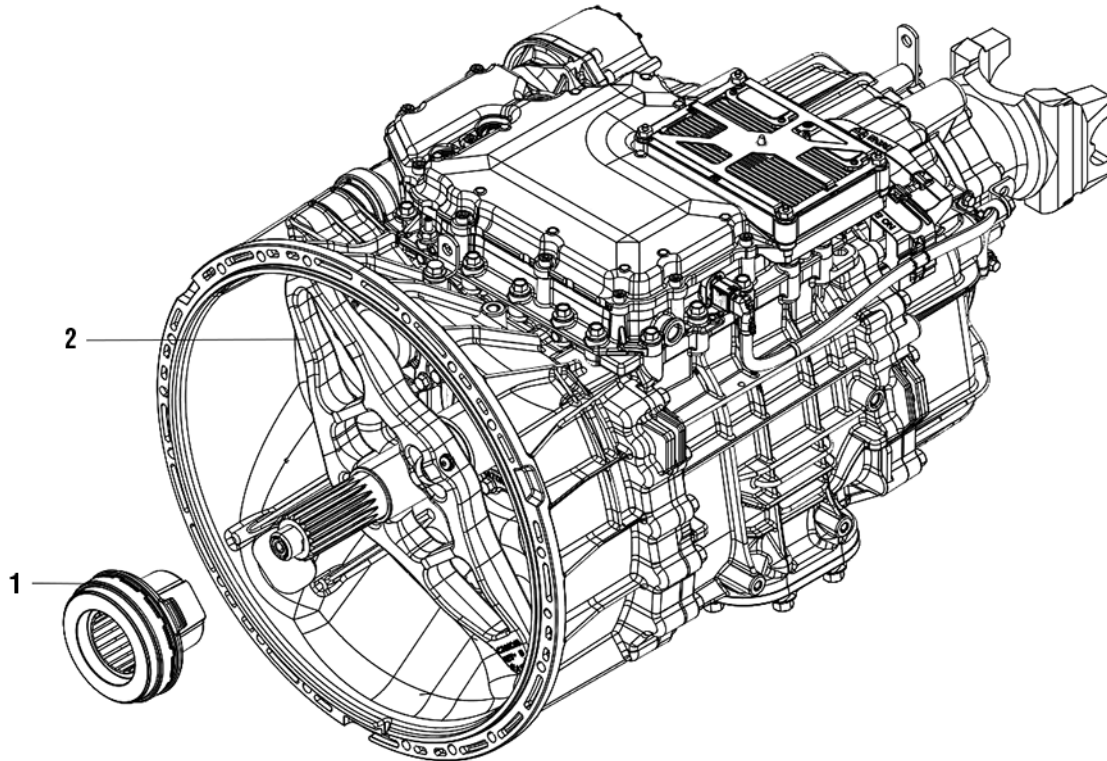
Special Instructions

None

Special Tools

None

Component Identification



1. Release Bearing
2. Clutch Release Yoke

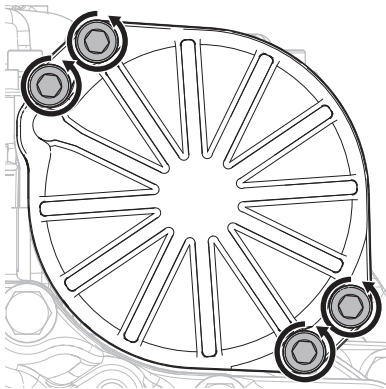
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



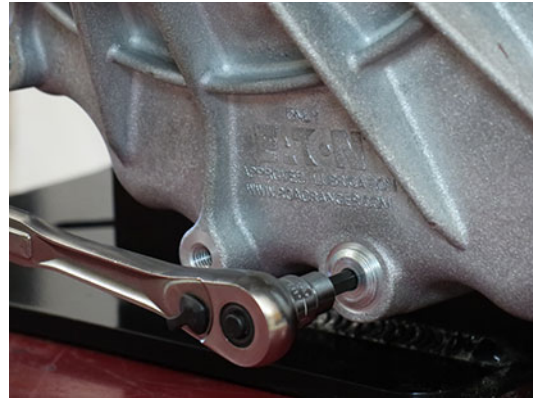
4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.

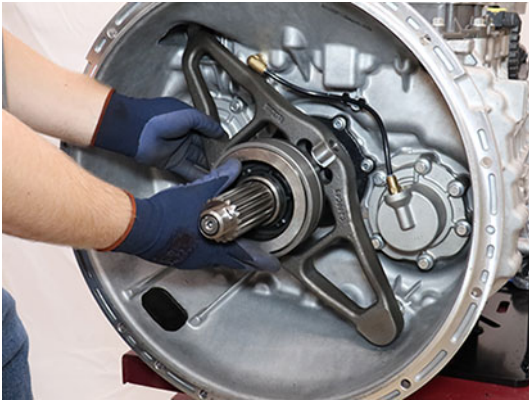


Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Release Bearing and Clutch Release Yoke

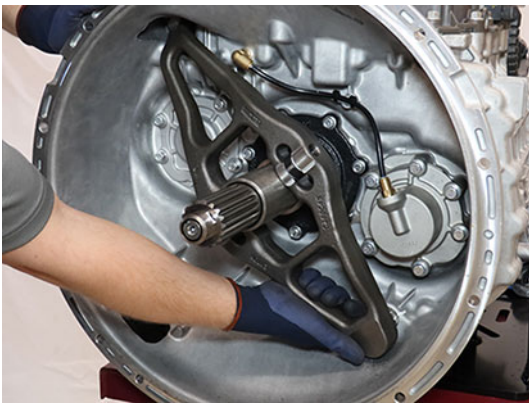
1. Remove the Release Bearing by sliding the bearing off the input shaft.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.

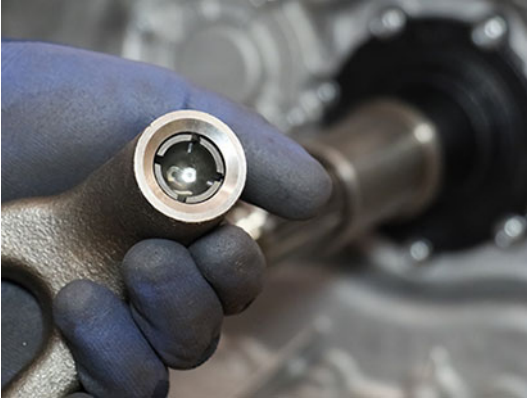


2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.

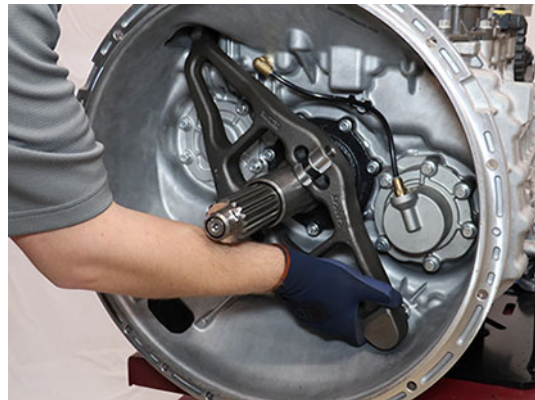


Install the Release Bearing and Clutch Release Yoke

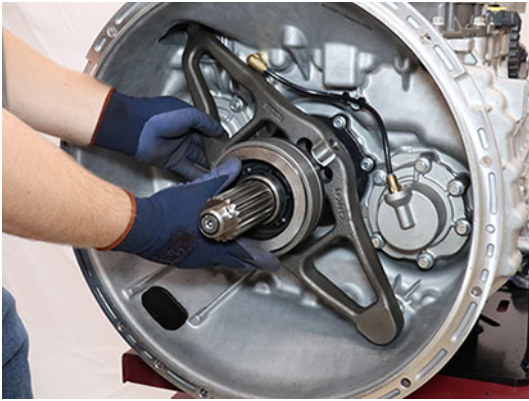
1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



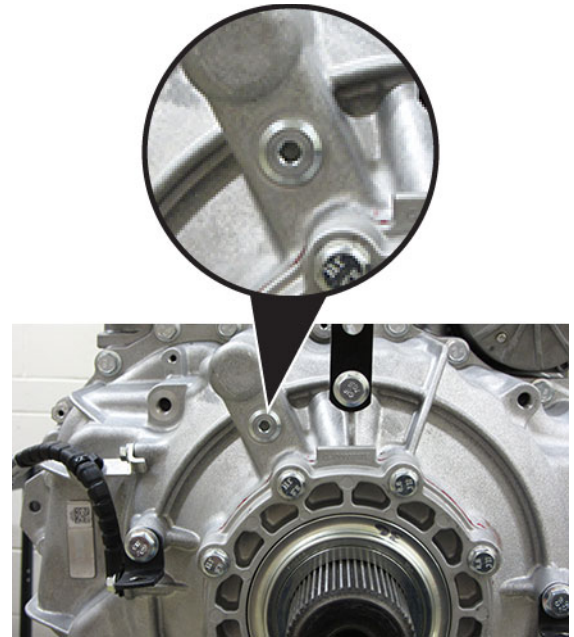
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

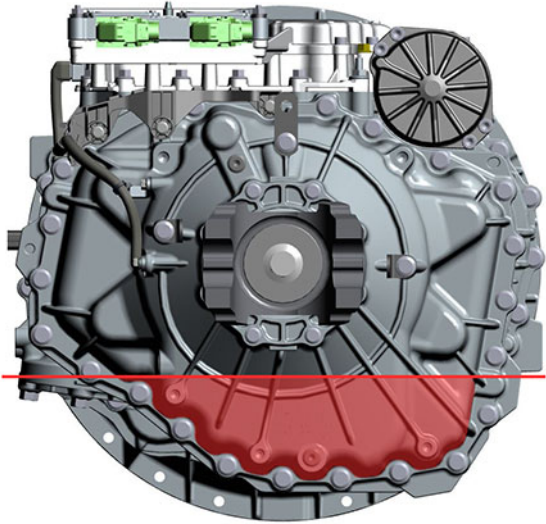
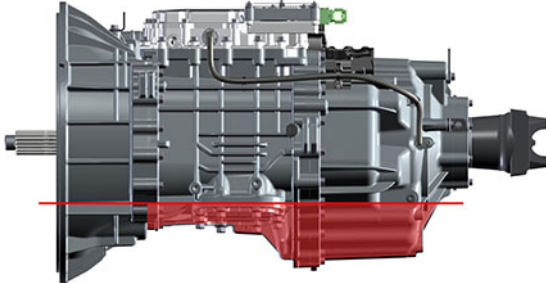


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



- Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



- Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

- Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

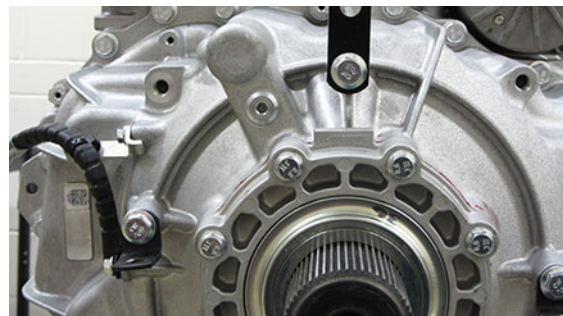
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



- Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
- Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



- Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To "Service Routines".
5. Select "Start" Clutch Calibration and follow on-screen prompts.
6. Select "Start" Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To "Fault Codes".
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select "Clear Eaton Faults" and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Upper Countershaft Cover Service Procedure

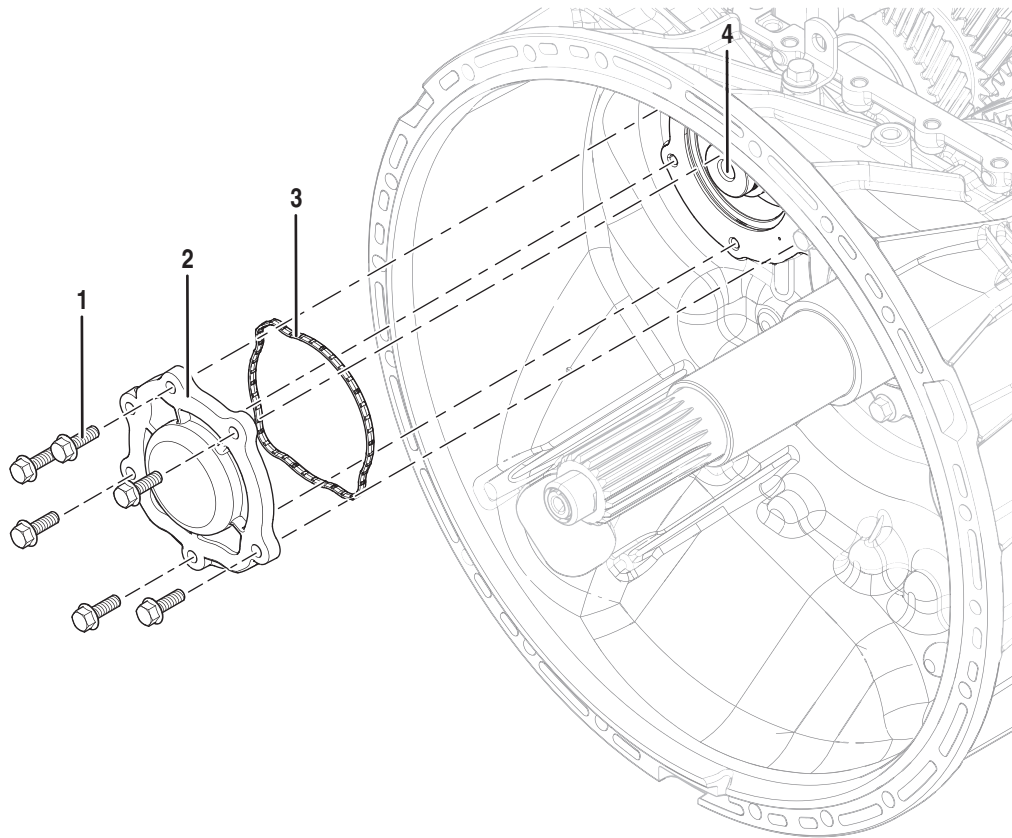
Special Instructions

None

Special Tools

None

Component Identification



1. Upper Countershaft Cover Cap Screws (x6) - 13 mm
2. Upper Countershaft Cover
3. O-ring
4. Upper Countershaft

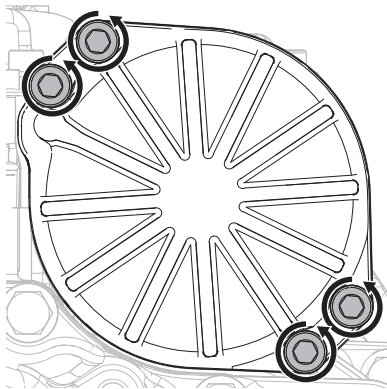
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



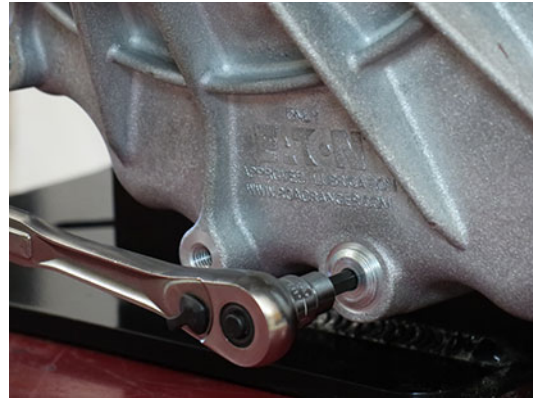
4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.

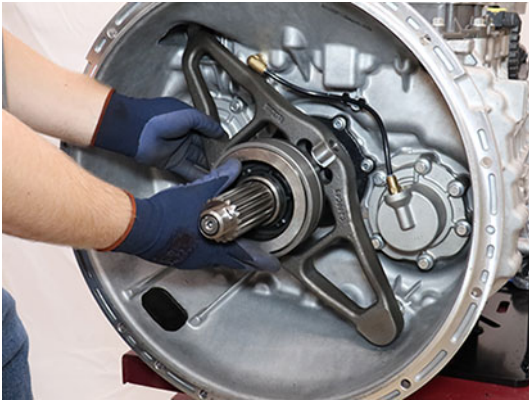


Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Release Bearing and Clutch Release Yoke

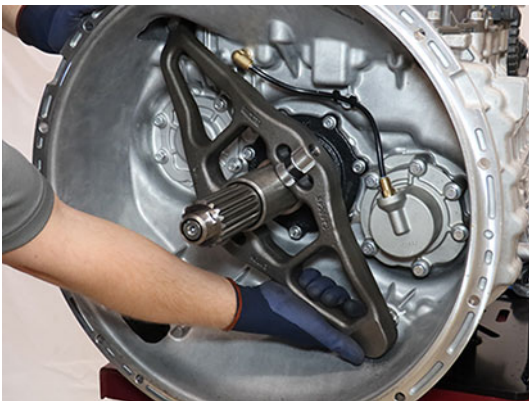
1. Remove the Release Bearing by sliding the bearing off the input shaft.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.

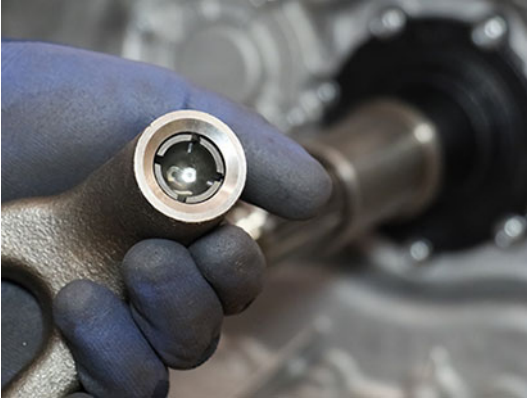


2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.



Remove the Upper Countershaft Cover

1. Remove the 6 Upper Countershaft Cover 13 mm cap screws and remove cover.



2. Remove the Upper Countershaft Cover O-ring.

NOTICE: A new Upper Countershaft Cover O-ring is required when reinstalling or an oil leak may occur.



Install the Upper Countershaft Cover

1. Clean the sealing surfaces on the clutch housing and the Upper Countershaft Cover.
2. Insert the Upper Countershaft Cover O-ring into the groove until fully seated.



3. Install the Upper Countershaft Cover to the Clutch Housing.

4. Install the six 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.

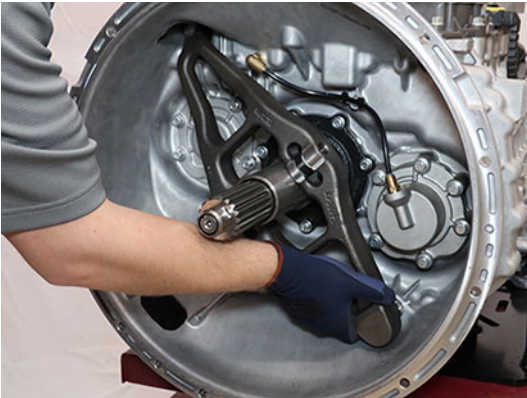


Install the Release Bearing and Clutch Release Yoke

1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



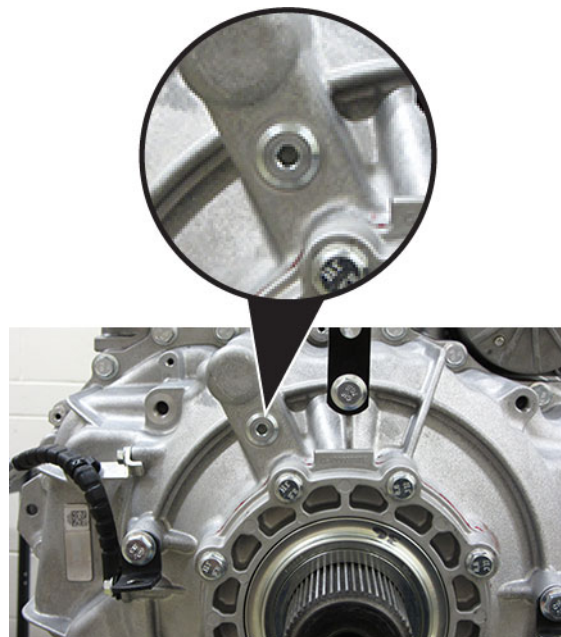
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

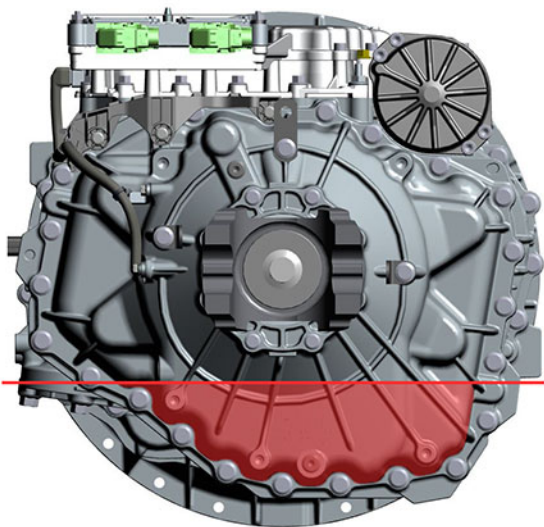
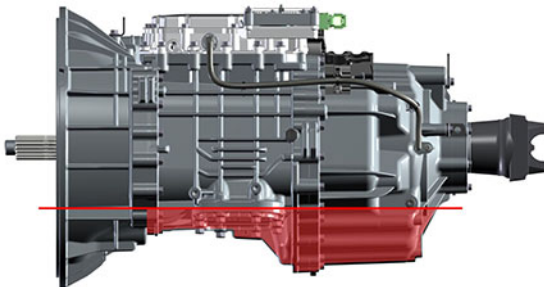


- Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



- Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



- Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
- Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

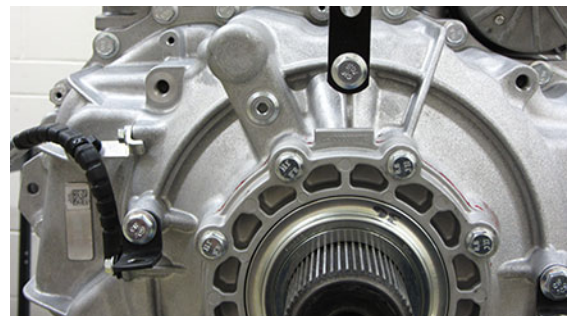
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



- Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
- Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Input Shaft Cover Service Procedure

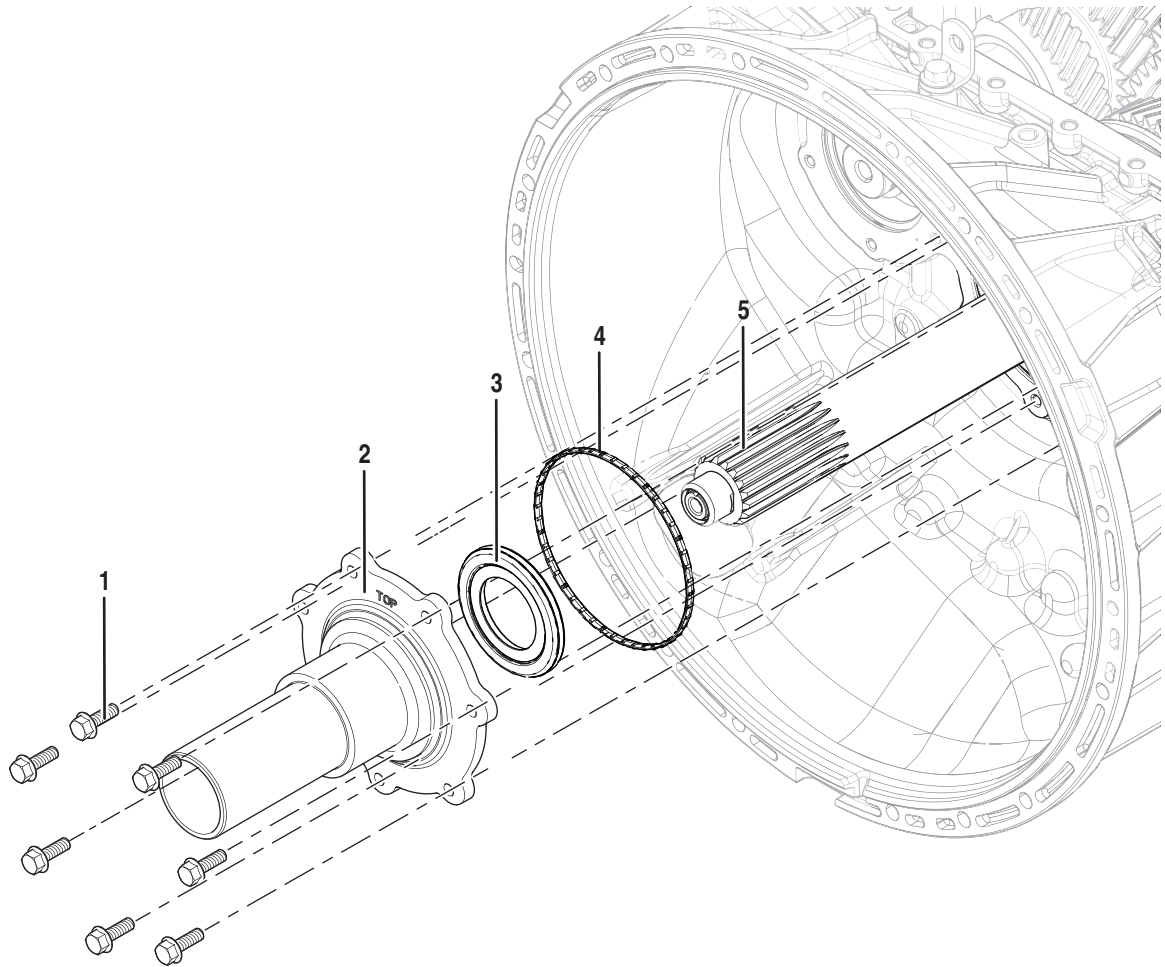
Special Instructions

None

Special Tools

None

Component Identification



1. *Input Shaft Cover Cap Screws (x7) - 13 mm*
2. *Input Shaft Cover*
3. *Seal*
4. *O-ring*
5. *Input Shaft*

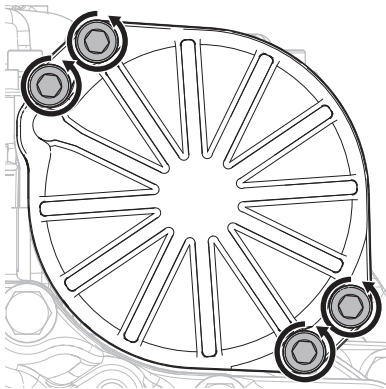
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



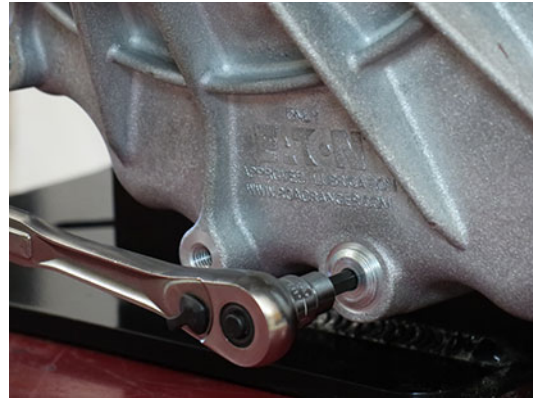
4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Release Bearing and Clutch Release Yoke

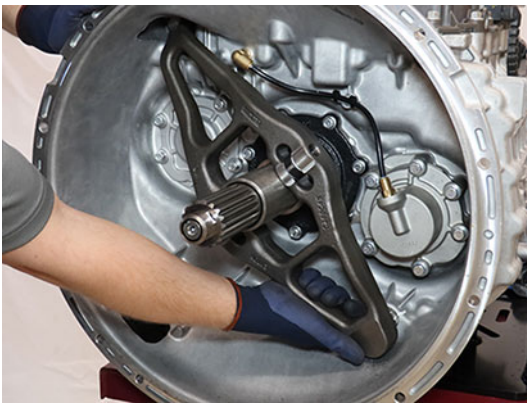
1. Remove the Release Bearing by sliding the bearing off the input shaft.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.

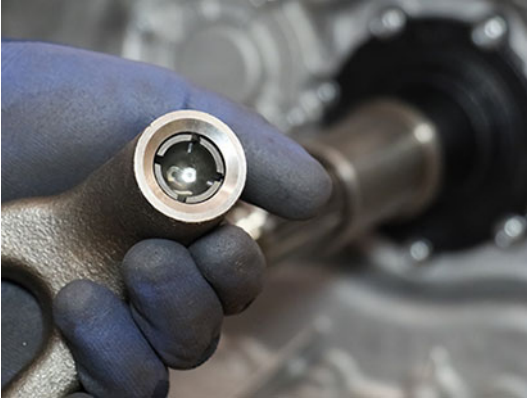


2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.



Remove the Input Shaft Cover

1. Remove the 7 Input Shaft Cover 13 mm cap screws.



2. Remove the Input Shaft Cover.



Install the Input Shaft Cover

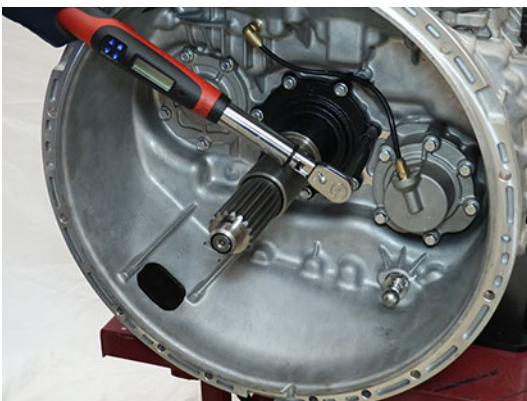
1. Clean sealing surfaces on the clutch housing and Input Shaft Cover.

- Slide the Input Shaft Cover over the Input Shaft.

Note: Align "TOP" at 12 o'clock.



- Install the 7 Input Shaft Cover 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.

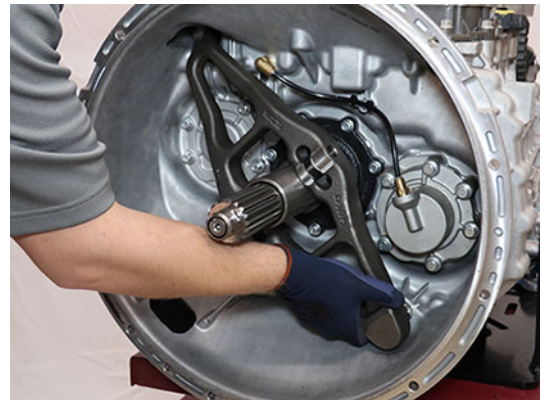


Install the Release Bearing and Clutch Release Yoke

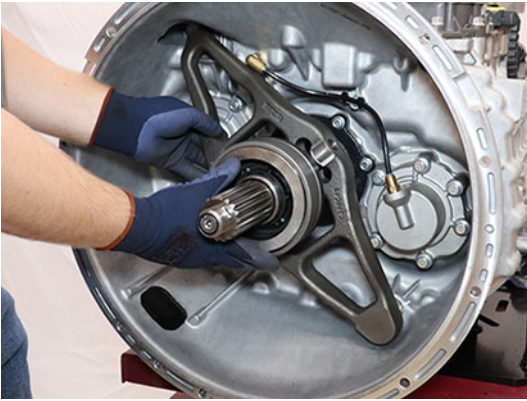
- Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



- Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



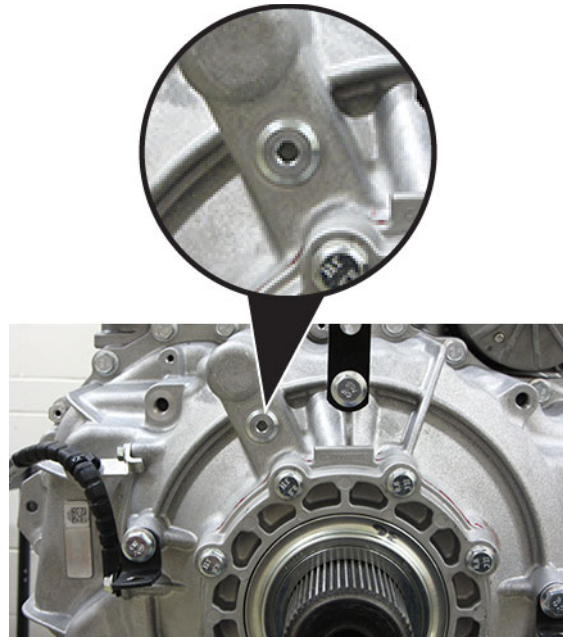
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

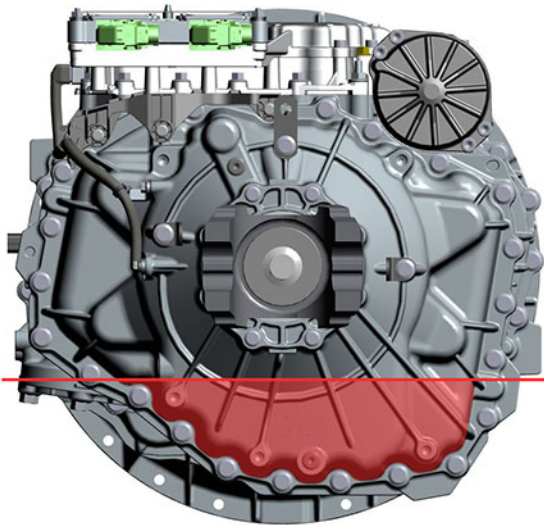
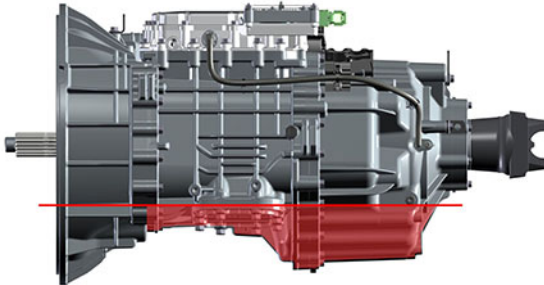


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

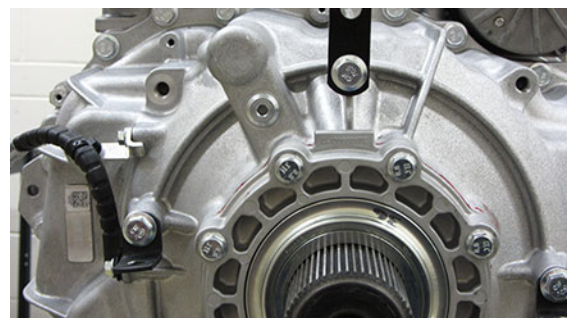
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Lower Countershaft Cover and Inertia Brake Service Procedure

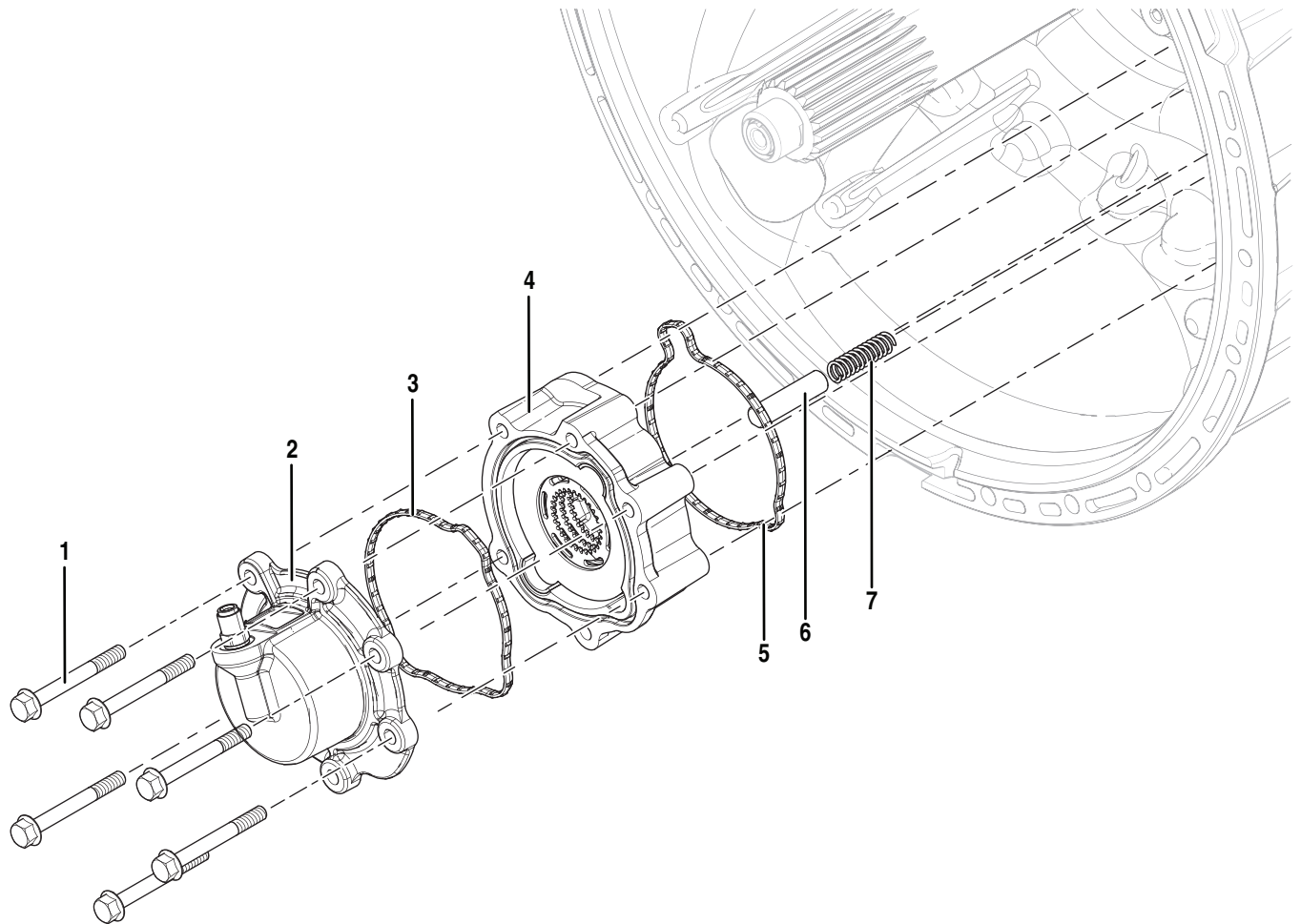
Special Instructions

None

Special Tools

None

Component Identification



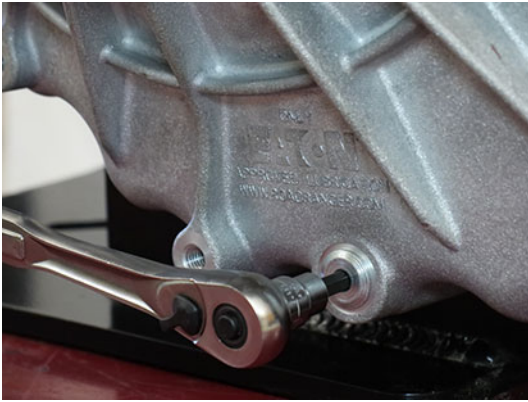
1. Inertia Brake Cover Cap Screws (x6) - 13 mm
2. Inertia Brake Cover
3. Inertia Brake Cover O-ring
4. Inertia Brake Housing
5. Inertia Brake Housing O-ring
6. Piston Pin
7. Return Spring

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

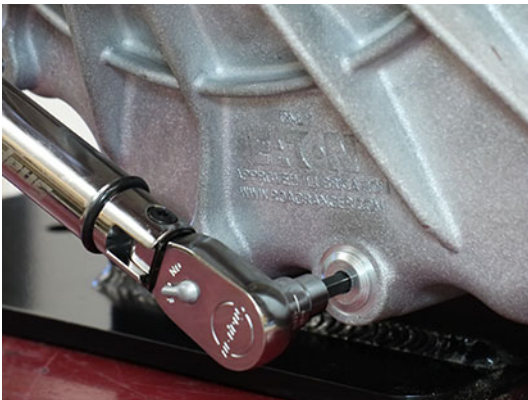
Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



Manually Vent Linear Clutch Actuator (LCA)

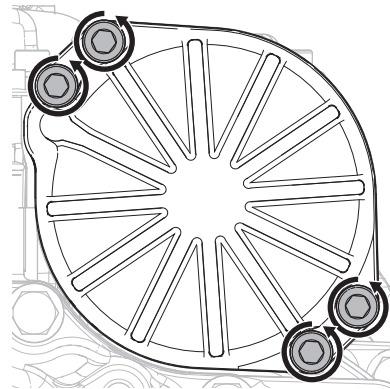
1. Key off.
2. Set vehicle parking brake and chock wheels.



WARNING: Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



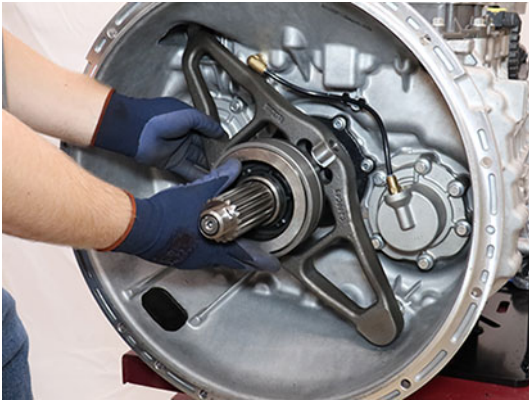
4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Release Bearing and Clutch Release Yoke

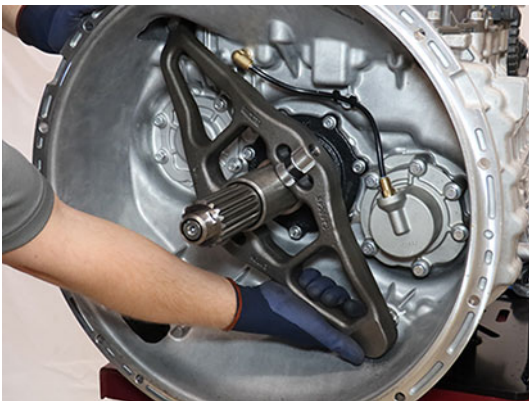
1. Remove the Release Bearing by sliding the bearing off the input shaft.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.

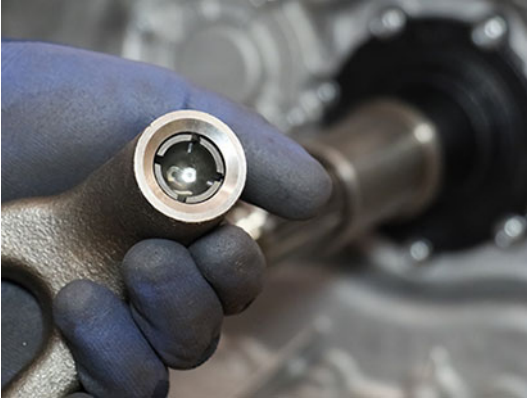


2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



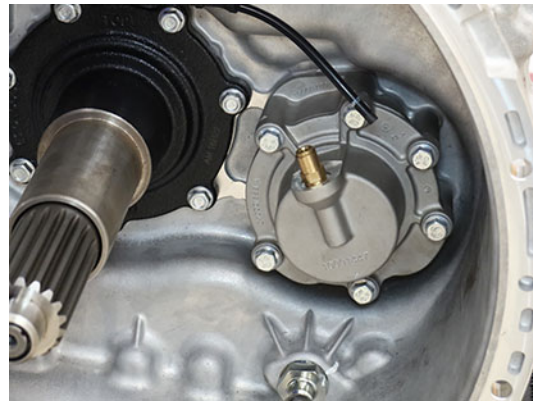
4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.



Remove the Lower Countershaft Cover and Inertia Brake

1. Depress and hold collar on air line fitting and disconnect the air line from the Inertia Brake Cover.



2. Remove the 6 Inertia Brake Cover 13 mm cap screws.



3. Remove the Inertia Brake Cover and Housing as an assembly.



5. Remove the Return Spring from the end of the lower countershaft using a magnet.



4. Remove Piston Pin from the end of the lower countershaft.



Install the Lower Countershaft Cover and Inertia Brake

1. Clean sealing surfaces on the Clutch Housing and Inertia Brake Housing.
2. Install the Inertia Brake Cover and Housing as an assembly over the Lower Countershaft, rotate the assembly to align the Friction Discs to the Lower Countershaft splines and seat the assembly to the clutch housing.



3. While holding the Inertia Brake Housing to the clutch housing, remove the Inertia Brake Cover.

NOTICE: Ensure the Friction Discs are splined to the lower countershaft and Wear Guides are fully seated.



4. Install the Return Spring into the Lower Countershaft.



5. Install the Piston Pin into the Lower Countershaft.



6. Install the Inertia Brake Cover onto the housing.



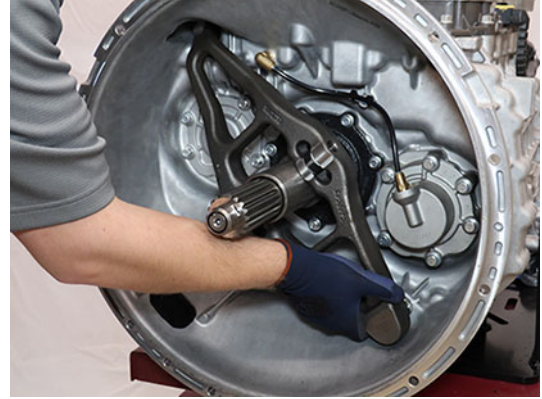
7. Install the 6 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



8. Insert air line in push-to-connect fitting on the Inertia Brake Cover.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



Install the Release Bearing and Clutch Release Yoke

1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



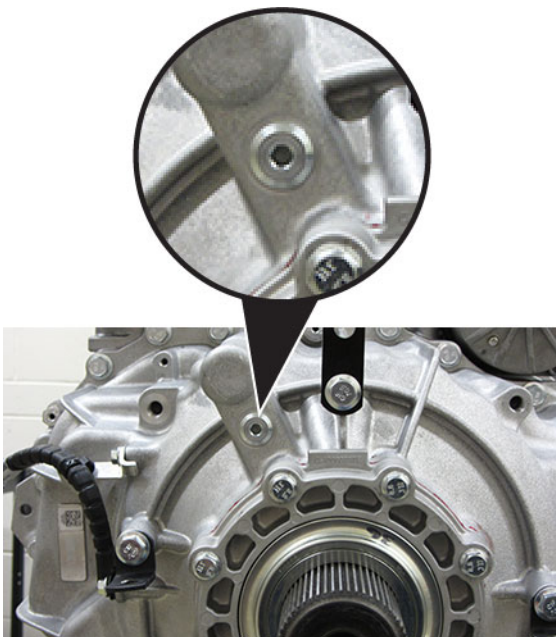
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

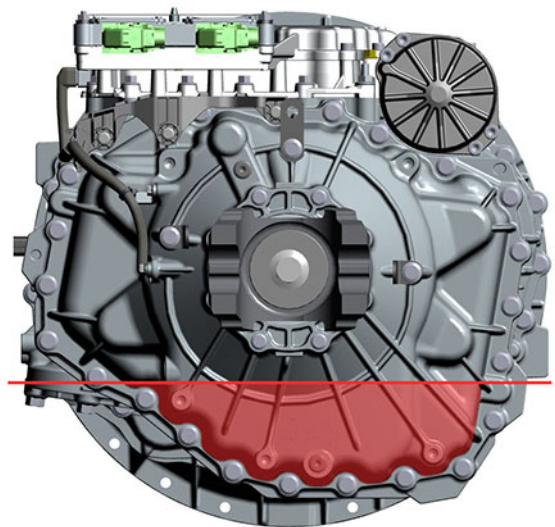
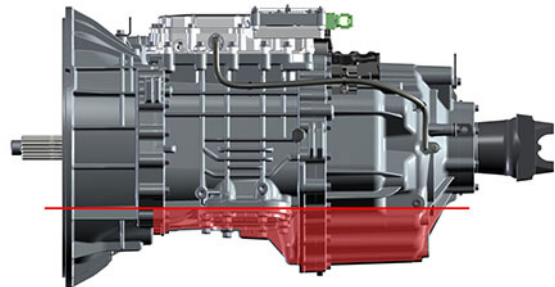


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

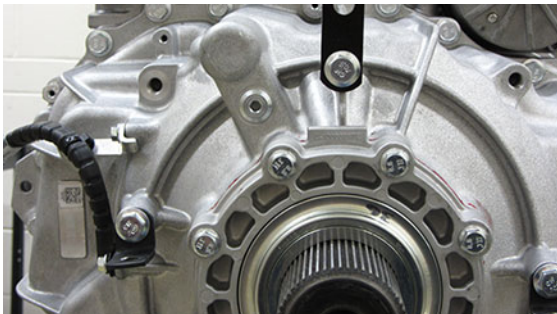
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Output Yoke Service Procedure

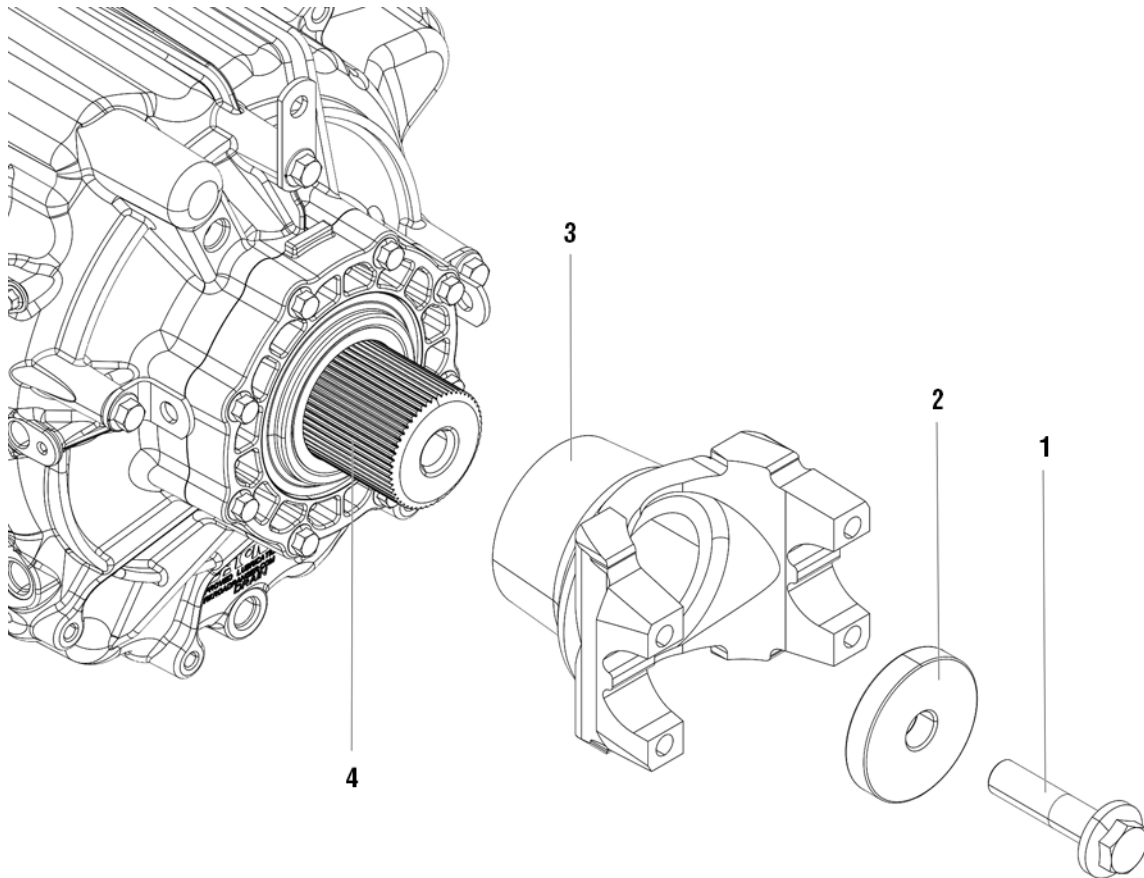
Special Instructions

None

Special Tools

None

Component Identification



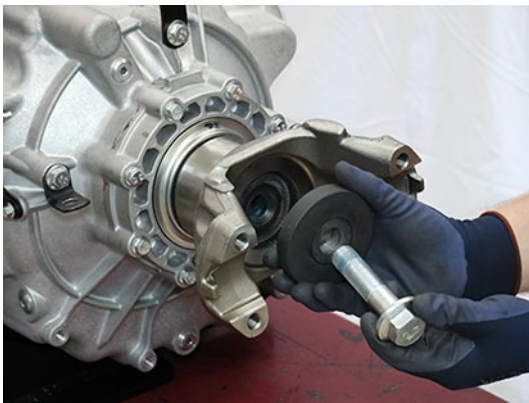
1. Retainer Bolt - 27 mm
2. Retainer Plate
3. Output Yoke
4. Output Shaft

Remove the Output Yoke

Note: Output Yoke is removable with transmission in chassis.

1. Remove the driveline. Refer to OEM guidelines for driveline removal.
2. Remove the 27 mm Retainer Bolt and Retainer Plate.

! **WARNING:** A new Retainer Bolt is required during Output Yoke installation. Failure to replace with a new Retainer Bolt may cause the bolt to loosen during operation and may result in major vehicle component damage, severe injury or death.



3. Remove the Output Yoke.

Note: An output yoke puller may be required due to spline interference fit.



Install the Output Yoke

1. Clean the mating surfaces and splines on the output shaft and Output Yoke.
2. Slide the Output Yoke over the output shaft.

Note: The Output Yoke may require to be driven on due to spline interference fit.



3. Install the Retainer Plate and a new 27 mm Retainer Bolt and torque to 617-690 Nm (455-508 lb-ft).

! **WARNING:** A new Retainer Bolt is required during Output Yoke installation. Failure to replace with a new Retainer Bolt may cause the bolt to loosen during operation and may result in major vehicle component damage, severe injury or death.



Rear Bearing Cover Service Procedure

Special Instructions

The Rear Bearing Cover can be removed and installed with the transmission in-vehicle.

Special Tools

- Gasket Sealant (Loctite 5188)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

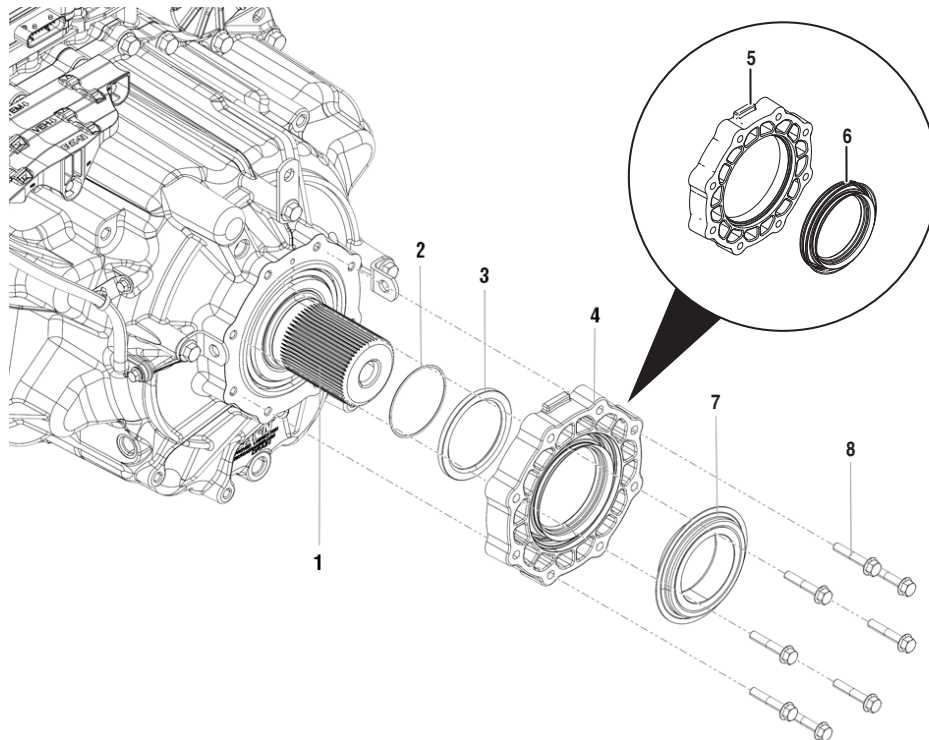


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



1. Output Shaft
2. Thrust Washer
3. O-Ring
4. Rear Bearing Cover with Output Shaft Seal pressed in

5. Rear Bearing Cover
6. Output Shaft Seal
7. Wear Sleeve and Dust Cover
8. Cap Screws (x8) - 13 mm

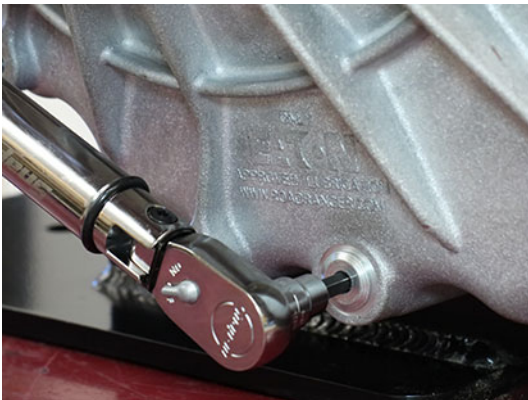
Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.
Note: If reusing oil, use a clean container free of contamination and debris.
3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



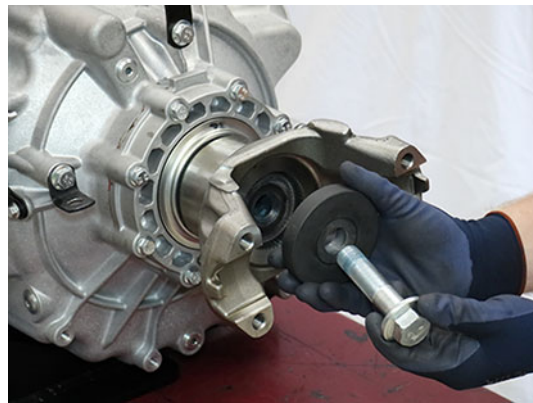
Remove the Output Yoke

Note: Output Yoke is removable with transmission in chassis.

1. Remove the driveline. Refer to OEM guidelines for driveline removal.
2. Remove the 27 mm Retainer Bolt and Retainer Plate.



WARNING: A new Retainer Bolt is required during Output Yoke installation. Failure to replace with a new Retainer Bolt may cause the bolt to loosen during operation and may result in major vehicle component damage, severe injury or death.



3. Remove the Output Yoke.

Note: An output yoke puller may be required due to spline interference fit.



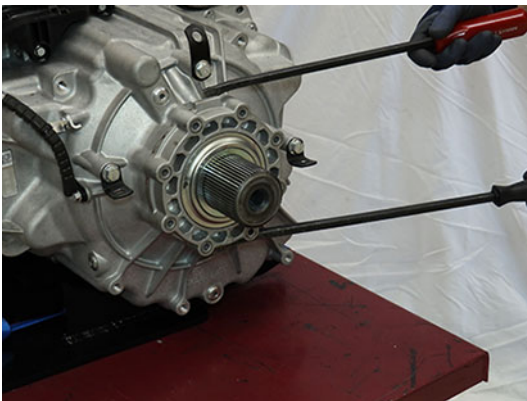
Remove the Rear Bearing Cover

1. Remove the 8 Rear Bearing Cover 13 mm Cap Screws.



2. Using a pry bar, separate the Rear Bearing Cover from the rear housing.

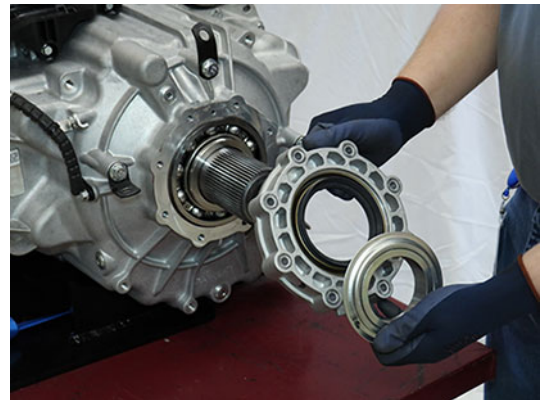
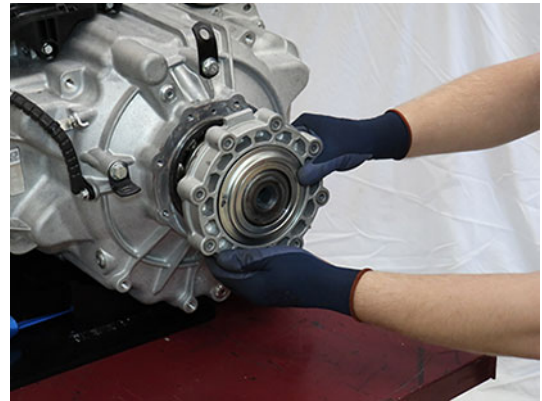
Note: Two pry points located at 12 and 6 o'clock.



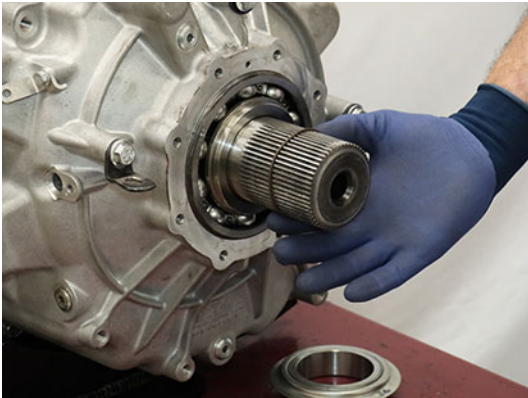
3. Remove the Rear Bearing Cover, Wear Sleeve and Dust Cover.

NOTICE: If replacing the Output Seal, a new Rear Bearing Cover is required when reinstalling or an oil leak may occur.

NOTICE: Ensure Output Shaft Seal is pressed in new Rear Bearing Cover.



4. Remove the O-ring.



5. Remove the Output Shaft Thrust Washer.



Assemble the Output Seal

1. Place the Rear Bearing Cover on a flat clean surface the pry points down.

NOTICE: A new Rear Bearing Cover is required when replacing the Output Seal to ensure no leaks occur between the cover and new seal.



2. Place the Output Seal Driver (RR1001TR-8) onto the Output Seal Driver Handle (RR1001TR-2).
3. Place the Output Seal onto the Output Seal Driver (RR1001TR-8).



4. Install the Output Seal and driver assembly into the Rear Bearing Cover and drive until the seal is seated against the cover.

NOTICE: Fully seat Output Seal into Bearing Cover.



Install the Rear Bearing Cover

1. Clean the sealing surfaces on the transmission and Rear Bearing Cover with gasket remover.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.
2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.
3. Slide the Output Shaft Thrust Washer over the output shaft and seat it against the Output Bearing.



4. Slide the O-ring over the output shaft and seat it against the Output Shaft Thrust Washer.



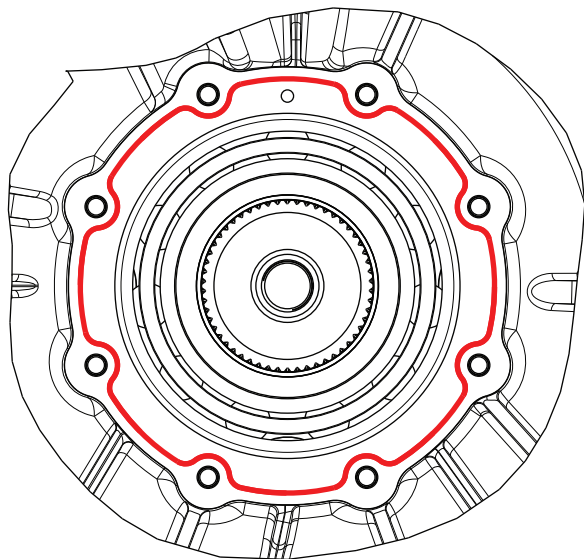
5. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

- Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to the rear housing as shown in the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



- Slide the Rear Bearing Cover over the output shaft.

Note: Align the two pry points at 12 and 6 o'clock positions.



- Install 8 Rear Bearing Cover 13 mm Cap Screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



- Slide the Wear Sleeve and Dust Cover over the output shaft.



Install the Output Yoke

- Clean the mating surfaces and splines on the output shaft and Output Yoke.

2. Slide the Output Yoke over the output shaft.

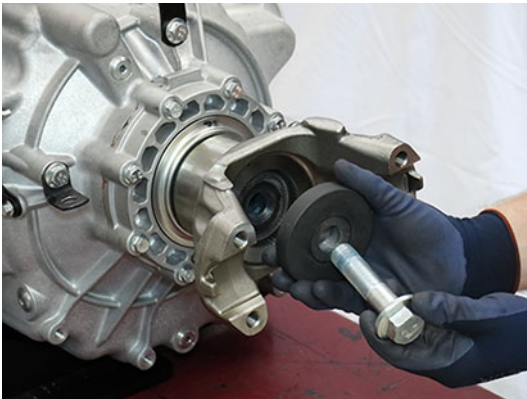
Note: The Output Yoke may require to be driven on due to spline interference fit.



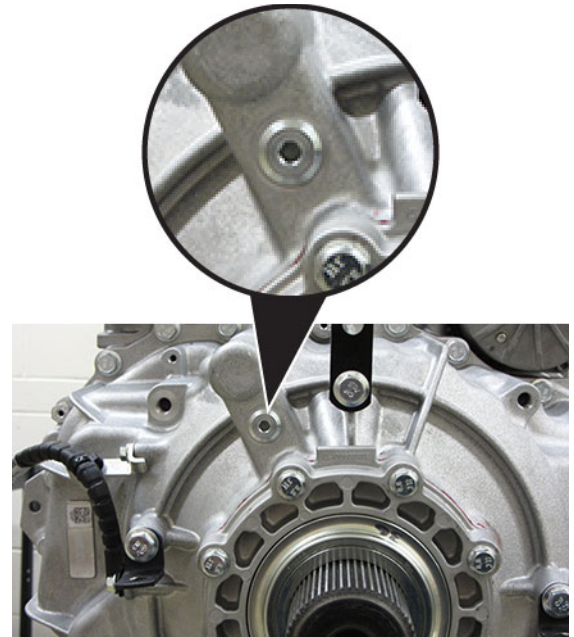
3. Install the Retainer Plate and a new 27 mm Retainer Bolt and torque to 617-690 Nm (455-508 lb-ft).



WARNING: A new Retainer Bolt is required during Output Yoke installation. Failure to replace with a new Retainer Bolt may cause the bolt to loosen during operation and may result in major vehicle component damage, severe injury or death.



1. Remove the Oil Fill Plug with a 6 mm hex key.



2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.

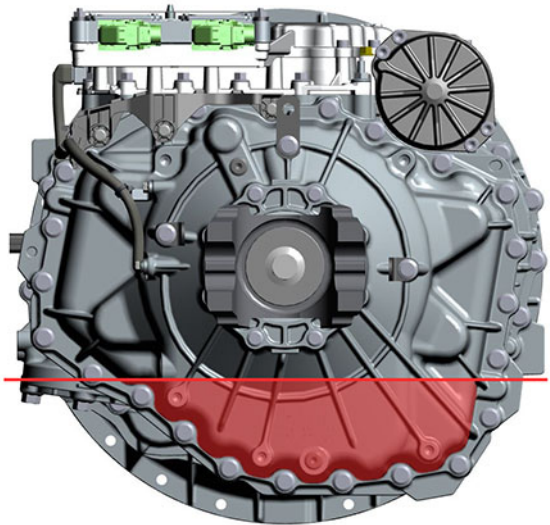
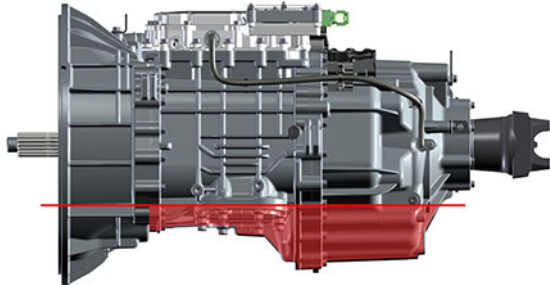


Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

- Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



- Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

- Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

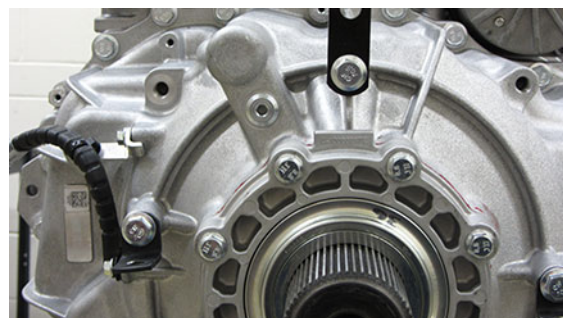
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



- Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
- Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



- Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Harness Bracket Stand Alone Service Procedure

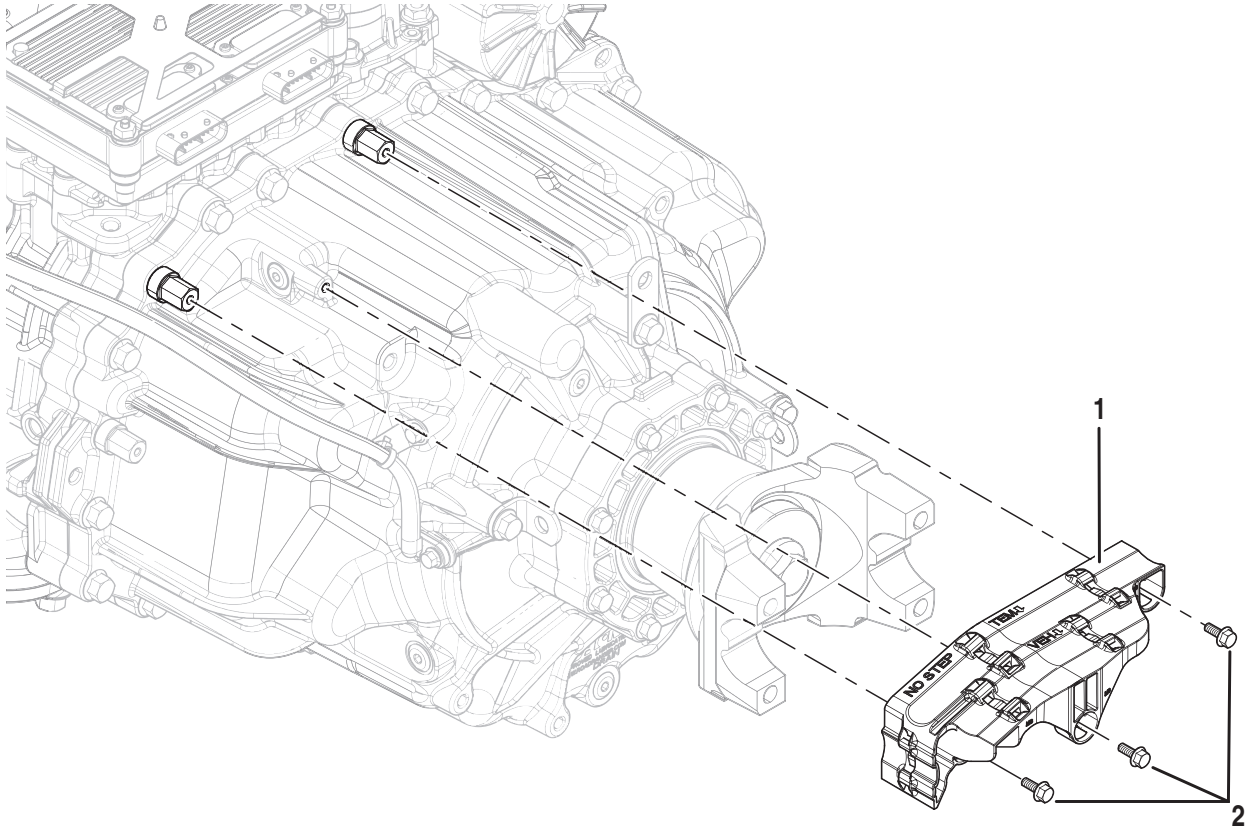
Special Instructions

The Harness Bracket can be removed and installed with the transmission in-vehicle.

Special Tools

None

Component Identification



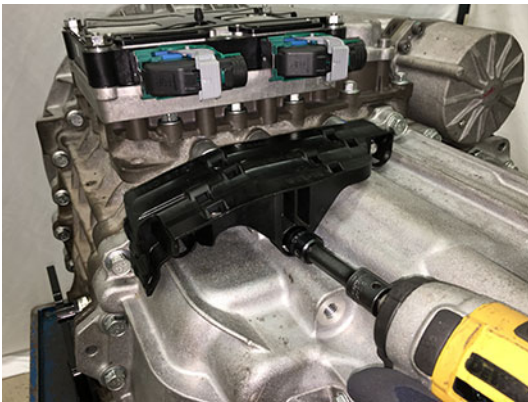
1. Harness Bracket
2. Harness Bracket Cap Screws (x3) - 10 mm

Remove the Harness Bracket

1. Remove the Output Speed Sensor Harness tie strap at the Harness Bracket.



2. Remove 3 Harness Bracket 10 mm cap screws.



3. Remove Harness Bracket.



Install the Harness Bracket

1. Install Harness Bracket.



2. Install 3 Harness Bracket 10 mm cap screws and torque to 8.8 - 10.4 Nm (6-8 lb-ft).



Rear Housing Service Procedure

Special Instructions



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing Assembly may result in major vehicle component damage, severe injury or death.

Special Tools

- Rear Housing Alignment Pins (RR1090TR)
- Gasket Sealant (Loctite 5188)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

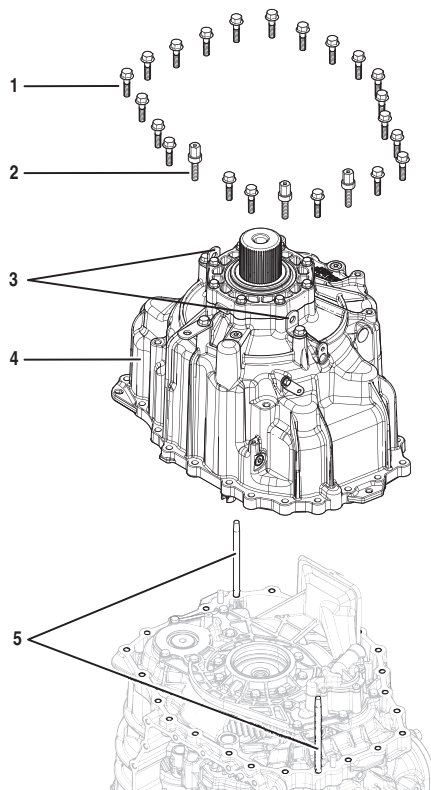


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



1. Rear Housing Cap Screws (x21) - 16 mm
2. Rear Housing Threaded Cap Screws (x3) - 16 mm
3. 90-Degree Lifting Eyes (x2)

4. Rear Housing
5. Rear Housing Alignment Pins (x2)

Create a Service Activity Report

1. Key on with engine off.
2. Connect ServiceRanger and create a Service Activity Report.
3. Disconnect ServiceRanger.
4. Key off.

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.

6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



Manually Vent Linear Clutch Actuator (LCA)

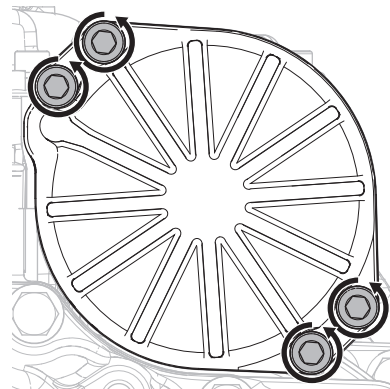
1. Key off.
2. Set vehicle parking brake and chock wheels.



WARNING: Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Transmission Control Module (TCM)

1. Unscrew the 4 TCM Cover nuts and remove TCM Cover.

Note: TCM Cover nuts are 10 or 13 mm.



2. Unscrew the TCM 7 mm Jackscrew. Lift and remove the TCM from the MTM.

NOTICE: Do not allow contamination into the connectors on the TCM or MTM.



3. Inspect the TCM Seal for damage.

NOTICE: Replace the TCM Seal if damaged.



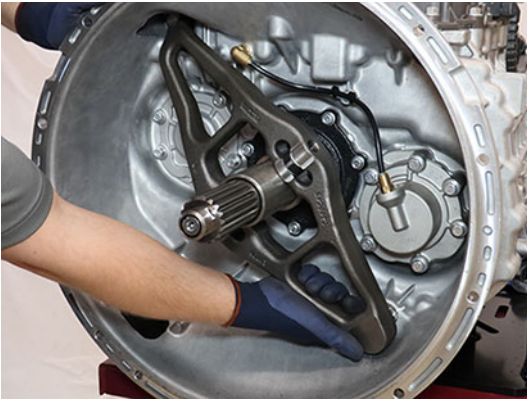
4. If replacing the TCM, transfer the TCM Seal to the new TCM.

Remove the Release Bearing and Clutch Release Yoke

1. Remove the Release Bearing by sliding the bearing off the input shaft.



2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.



Remove the Mechatronic Transmission Module (MTM)

1. Lift the latch on the Output Speed Sensor Harness at the Connector on the Mechatronic Transmission Module (MTM).



2. Remove the Output Speed Sensor Harness from the Connector on the MTM.

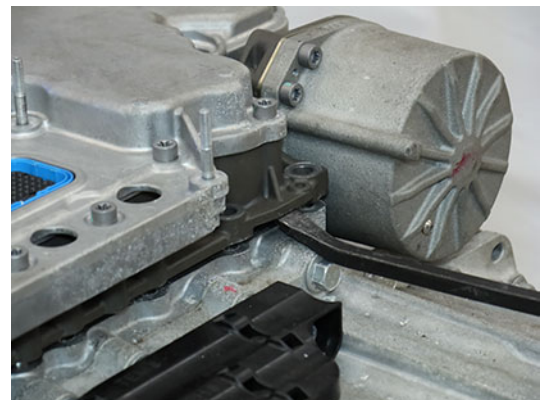


3. Remove the 20 MTM cap screws.

Note: 13 mm (x18), 15 mm (x2).



4. Separate the MTM from the Main Housing at the 2 pry points.



5. Remove the MTM from the transmission housing.

⚠ CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.



Remove the Output Speed Sensor

1. Remove the Output Speed Sensor Harness tie strap at the Harness Bracket.



2. Remove the 2 harness press-in retainers from the Main Housing and bracket on Rear Housing.



3. Remove the Output Speed Sensor 10 mm cap screw.

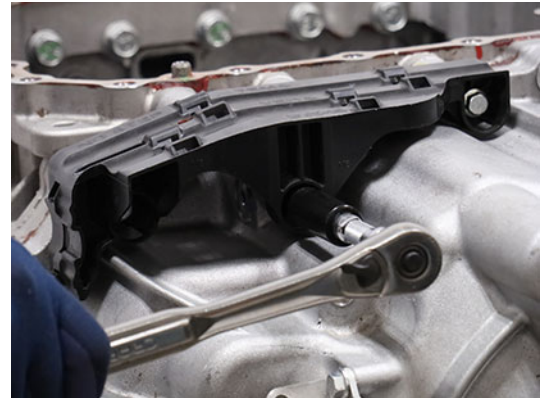


4. Remove the Output Speed Sensor from the Rear Housing.

Note: The sensor may need to be twisted and pulled from the bore.



1. Remove 3 Harness Bracket 10 mm cap screws.



2. Remove Harness Bracket.



Remove the Harness Bracket

Note: This procedure contains removing the Harness Bracket without the Mechatronic Transmission Module (MTM).

Secure Transmission (Vertical)

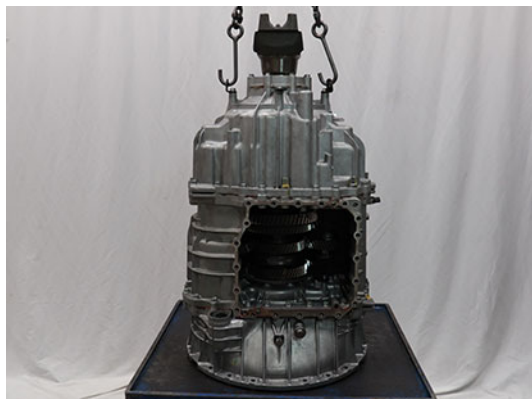
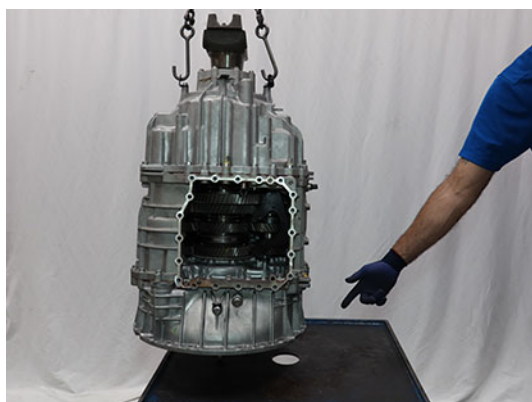
1. Place transmission in the vertical position with the front side down.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Use a surface with an opening that allows the input shaft to pass through and the clutch housing to sit flat and secure.



Remove the Rear Housing

1. At the 3 Rear Housing Threaded cap screws, apply paint marks on the Rear Housing to identify location.



2. Remove 21 Rear Housing and 3 threaded 16 mm cap screws.



3. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.

NOTICE: Failure to install alignment pins results in transmission component damage.



4. Separate the Rear Housing from the Main Housing at the 2 pry points.



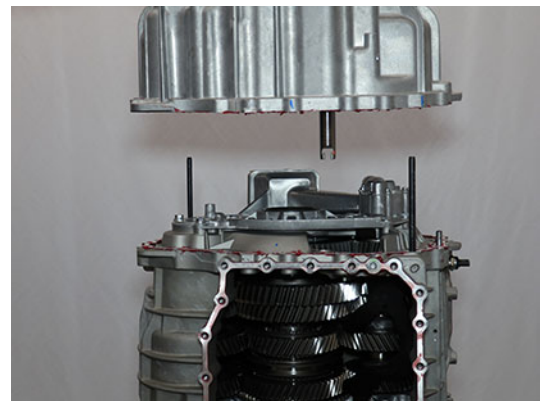
5. Lift and remove Rear Housing Assembly from Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing Assembly may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Dual PTO Transmissions are equipped with a rear PTO lube tube port on the pump and rear PTO drive splines on the Upper Countershaft.



6. Place Rear Housing Assembly on bench.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Keep fingers clear of pinch point between Rear Housing Assembly and other surfaces. Dropping Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Support the Rear Housing Assembly to prevent damage to Shift Rail E.



7. Remove the 2 Rear Housing Alignment Pins (RR1090TR) from the Main Housing.

Install the Rear Housing

1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

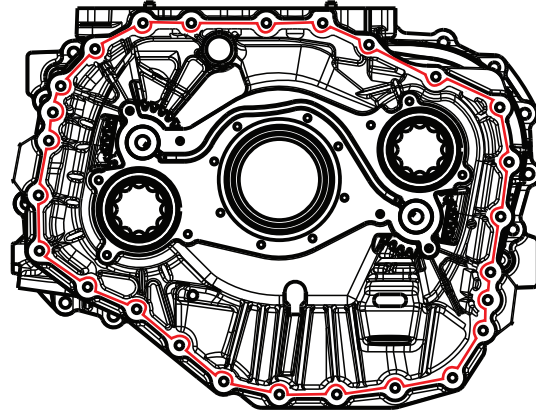
NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

3. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to the transmission Main Housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission housing may be damaged when cap screws are tightened.

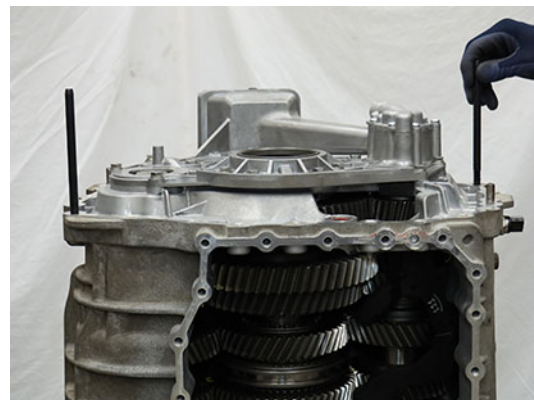
Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



4. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.



CAUTION: Failure to install alignment pins results in transmission component damage during Rear Housing Assembly installation.



- Lift and install the Rear Housing Assembly on to the Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Align the Rear Housing to the alignment pins and align Shift Rail E into the Main Housing during installation.

Note: Rotate Output Shaft to align gearing and allow Rear Housing Assembly to fully seat on Main Housing.



- Install the 3 Rear Housing Threaded 16 mm cap screws at the 3 paint mark locations.

Note: Two cap screws are used to mount the harness bracket and the third is used by the OEM for additional attachment points.



- Remove the 2 Rear Housing Alignment Pins (RR1090TR).
- Install the remaining 21 Rear Housing 16 mm cap screws and torque to 44.5 - 51.5 Nm (33-38 lb-ft) in a criss-cross pattern.



- Lift transmission horizontally onto a bench.



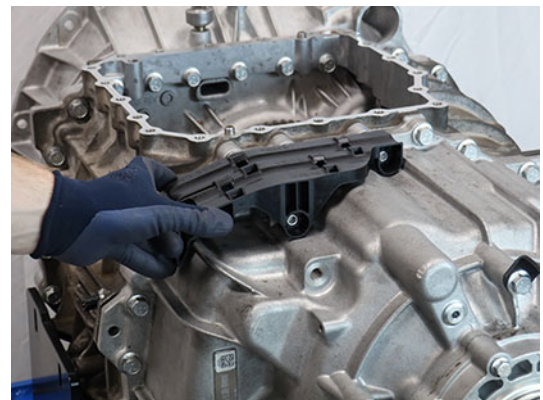
WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Install the Harness Bracket

Note: This procedure contains installing the Harness Bracket without the Mechatronic Transmission Module (MTM).

- Install Harness Bracket.



2. Install 3 Harness Bracket 10 mm cap screws and torque to 8.8 - 10.4 Nm (6-8 lb-ft).



4. Install the Output Speed Sensor 10 mm cap screw and torque to 8.8-10.4 Nm (6-8 lb-ft).



Install the Output Speed Sensor

1. Clean the sensor bore.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surface.

2. Apply a light coat of transmission oil to the sensor O-ring.

3. Install the Output Speed Sensor into the bore.

Note: The Sensor may need to be twisted and pushed into the bore.



5. Press the 2 harness press-in retainers into the Main Housing and the bracket on the rear housing.



- Secure the Output Speed Sensor Harness to the Harness Bracket with a tie strap.



CAUTION: Failure to tie strap the Output Speed Sensor Harness to the Harness Bracket may result in harness damage.



- Install the Rail B Engagement Tool (RR1088TR) to the Main Housing and hand tighten with 2 MTM cap screws.



- Shift the Rail B Synchronizer to neutral.

Install the Mechatronic Transmission Module (MTM)

- Place the transmission in a horizontal position.

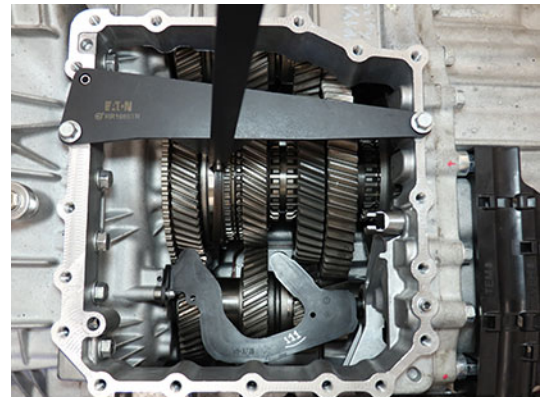
NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.

- Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

- Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.



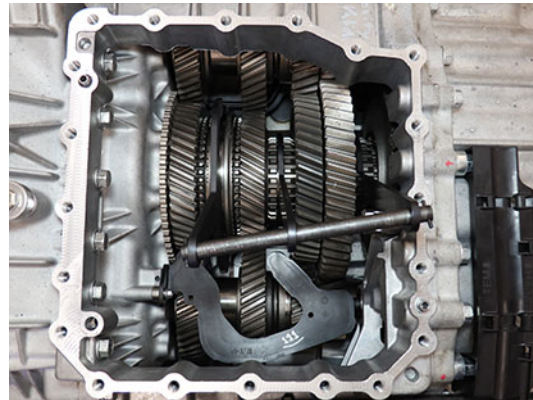
- Remove the Rail B Engagement Tool.

7. Move Rail C and Rail D sliding clutches to neutral.

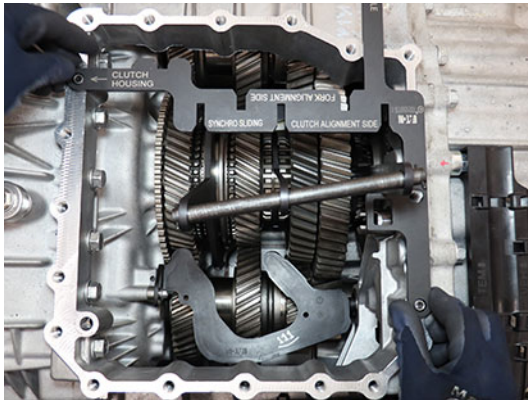
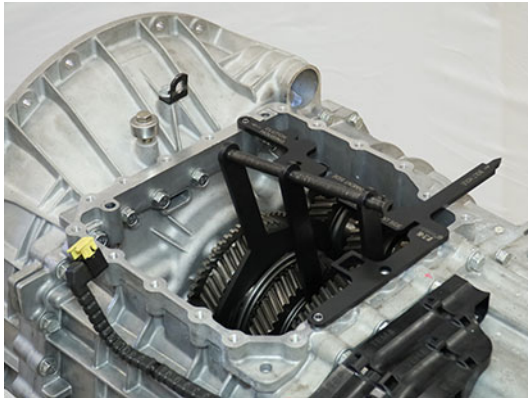
NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.



8. Install the Confirm-Neutral Gauge (RR1086TR-2) into the slots of the synchronizer and sliding clutches.

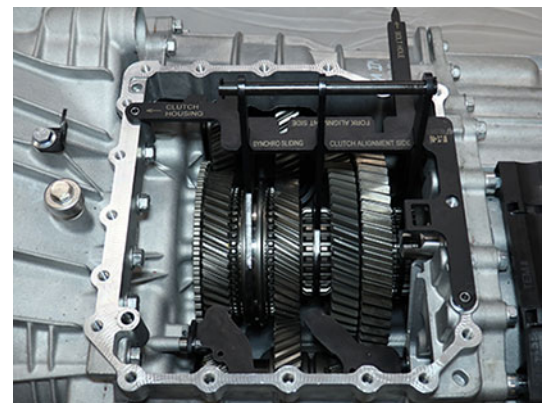


9. Install the MTM Alignment Tool (RR1086TR-1) onto the main housing.

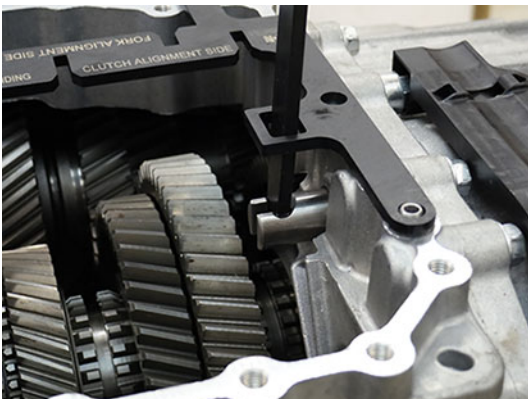
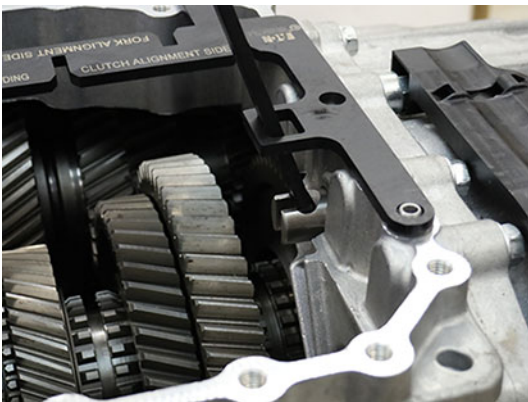
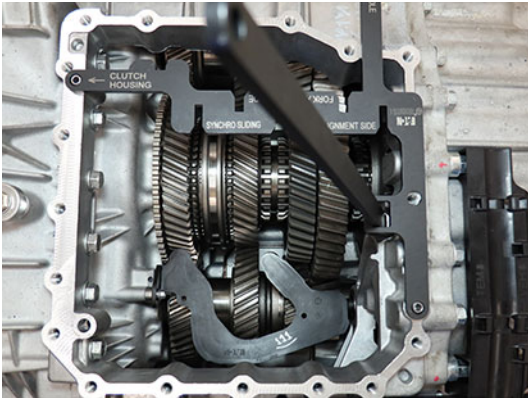


10. Verify synchronizer and sliding clutches are in neutral by sliding Confirm-Neutral Gauge into the slots of MTM Alignment Tool.

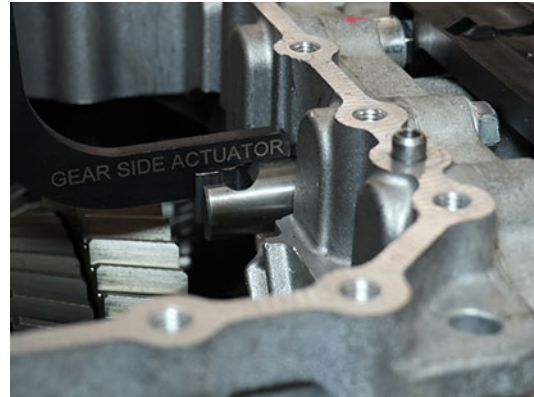
Note: If the gauge does not slide into the alignment tool slots, neutral is not achieved. Go to Step 4.



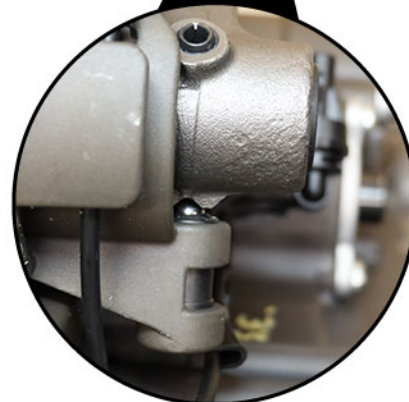
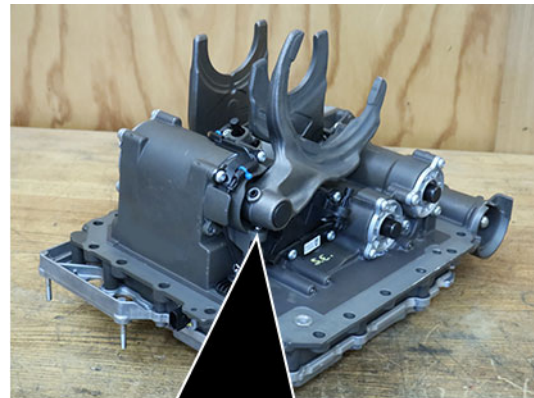
11. Using the Rail E Lever, move Rail E to neutral.



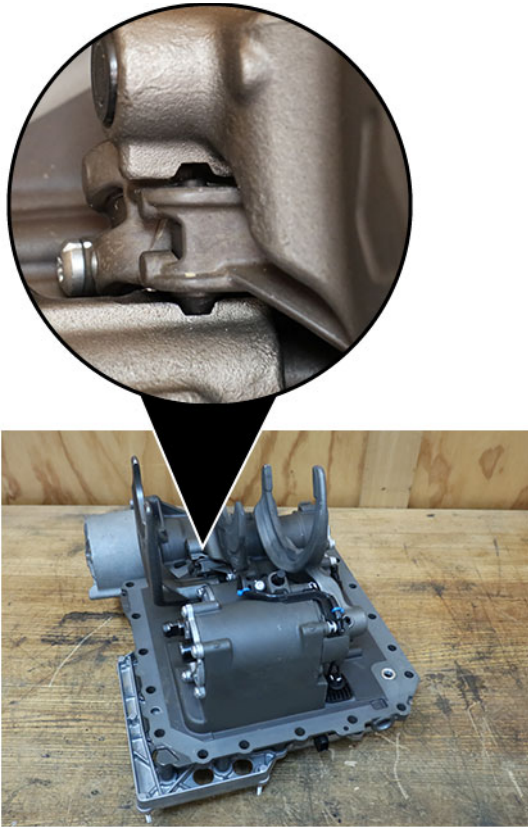
12. Verify Rail E is in neutral using the Gear Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against housing with rail against notch-end of gauge.



13. Move Shift Rail B in the MTM to neutral. Rail B is in neutral when the ball detent is in the notch of the Rail B yoke assembly.



14. Move Shift Rails C and D in the MTM to neutral. Rails C and D are in neutral when the shift inter-lock is aligned with the notches of the rail yoke assemblies.



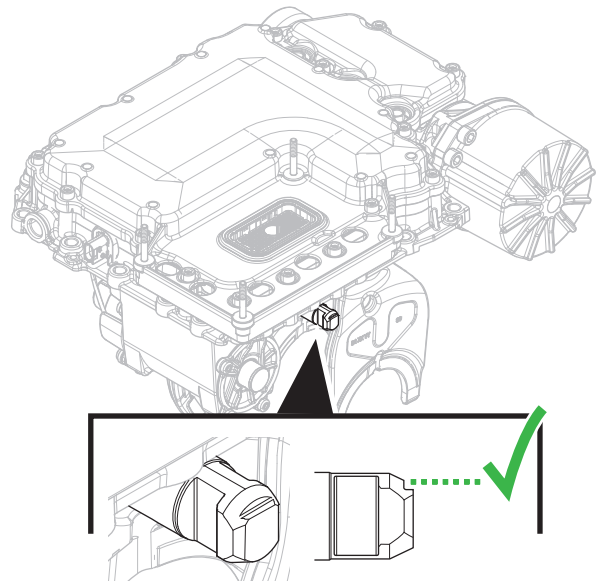
15. Verify MTM is in neutral. Install the MTM Alignment Tool (RR1086TR-1) into the bolt hole and onto Rail B, C, and D Shift Yokes.

Note: If the MTM Alignment Tool slots do not align with the 3 shift yokes, neutral has not been achieved. Go to Step 13.



16. Verify notch on Rail E is facing up.

Note: If the MTM is installed on the transmission with the notch on Rail E facing down, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

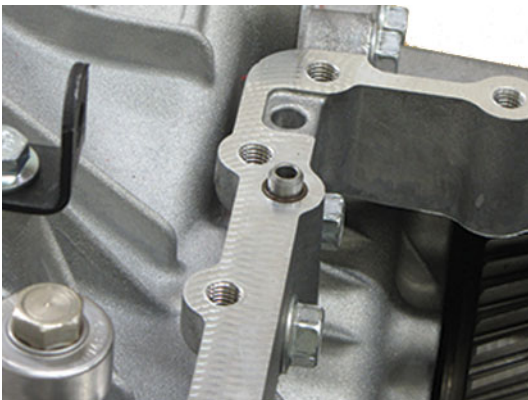


17. Verify Rail E is in neutral using the Fork Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against cover with rail against notch-end of gauge.

Note: If Rail E is not in neutral, slide rail in or out until neutral is achieved.



18. Slide O-ring over the MTM front alignment pin on the main housing until fully seated in the groove.



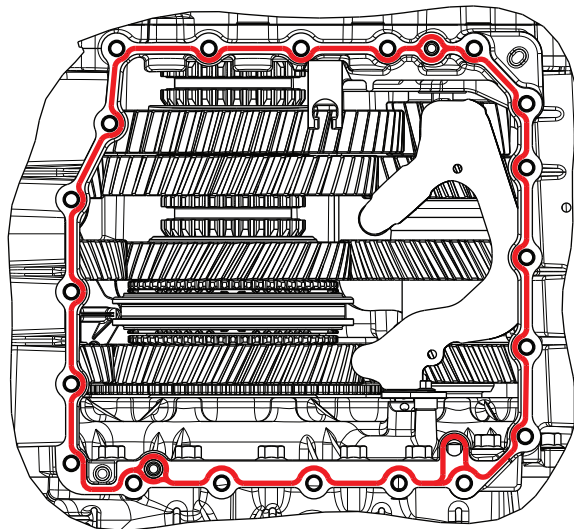
19. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

20. Apply gasket sealant with a bead width of 1.4-2.4mm (0.055-0.094 inch) to the transmission housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



21. Install MTM onto the transmission housing. Align Rail E in the MTM with the Rail E Shift Rail in the Main Housing.

CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.

NOTICE: If the MTM is installed on the transmission and Rail E in the MTM is not aligned with Rail E in the Main Housing, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

22. Install 20 MTM cap screws and torque to 44.5-51.5 Nm (33-38 lb-ft) in a criss-cross pattern.

Note: 13 mm (x18), 15 mm (x2) cap screws.

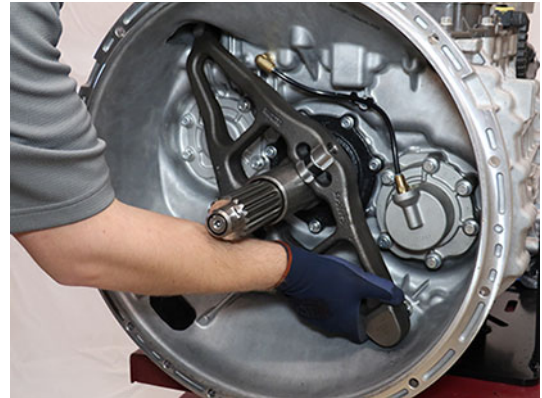


Install the Release Bearing and Clutch Release Yoke

1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



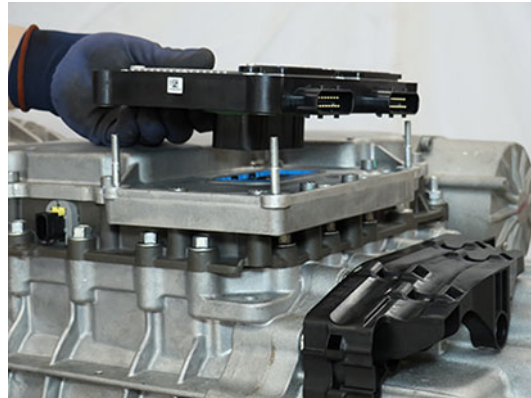
3. Slide the Release Bearing over the input shaft and into the Release Yoke.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



2. Align the TCM to the 74-Way Harness Connector and TCM studs, then install the TCM.



Install the Transmission Control Module (TCM)

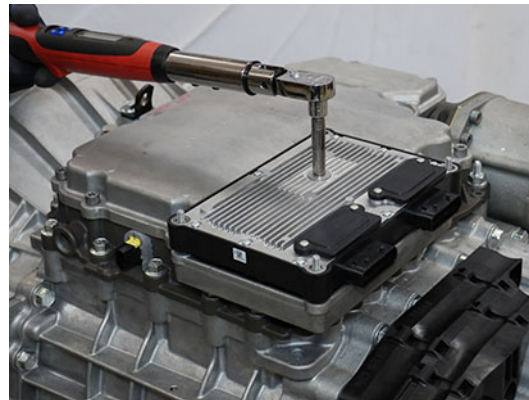
NOTICE: Do not allow contamination into the connectors on the TCM or MTM.

Note: TCM can be installed with transmission in-vehicle.

1. Install the TCM Seal on the 74-Way Harness Connector.

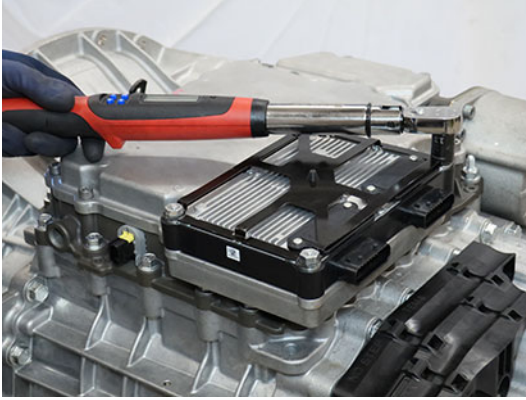


3. Torque the TCM 7 mm Jackscrew to 3.0-4.0 Nm (26.6-35.4 lb-in).



4. Install the TCM Cover over the 4 TCM studs and torque the 4 TCM Cover Nuts to 8.8-10.4 Nm (78-92 lb-in) in a criss-cross pattern.

Note: TCM Cover nuts are 10 or 13 mm.



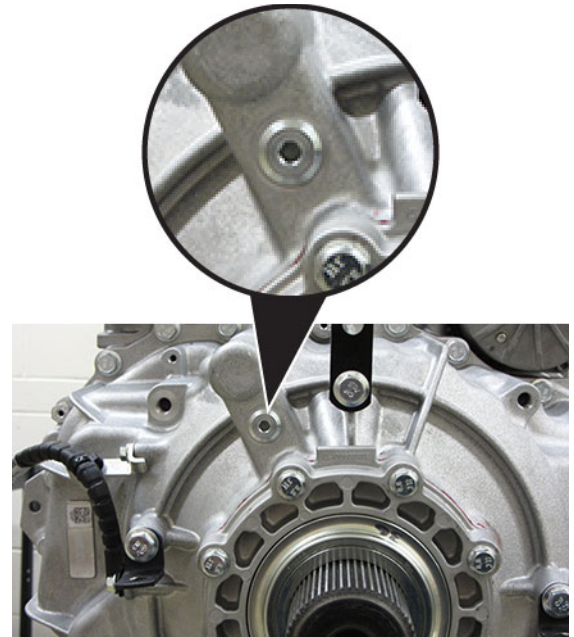
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

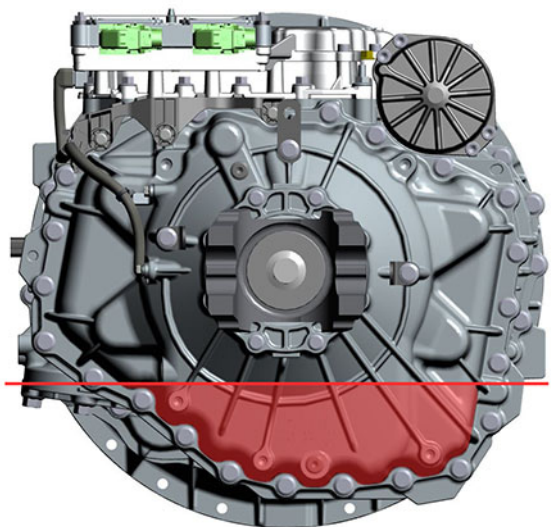
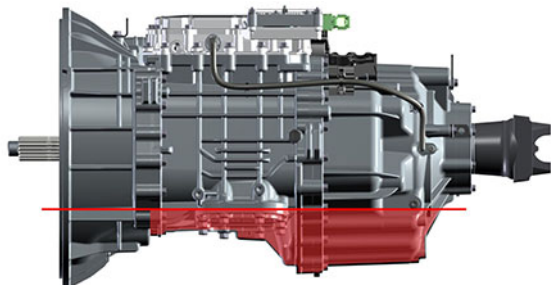


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

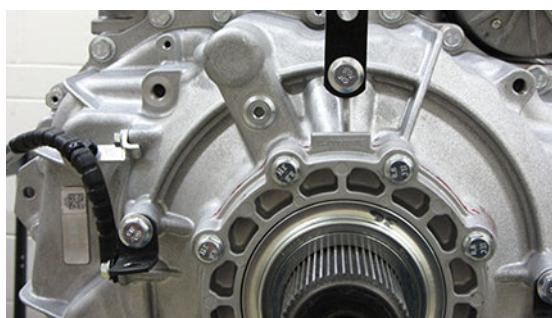
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To "Service Routines".
5. Select "Start" Clutch Calibration and follow on-screen prompts.
6. Select "Start" Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To "Fault Codes".
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select "Clear Eaton Faults" and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

4-Bolt PTO Cover Service Procedure

Special Instructions

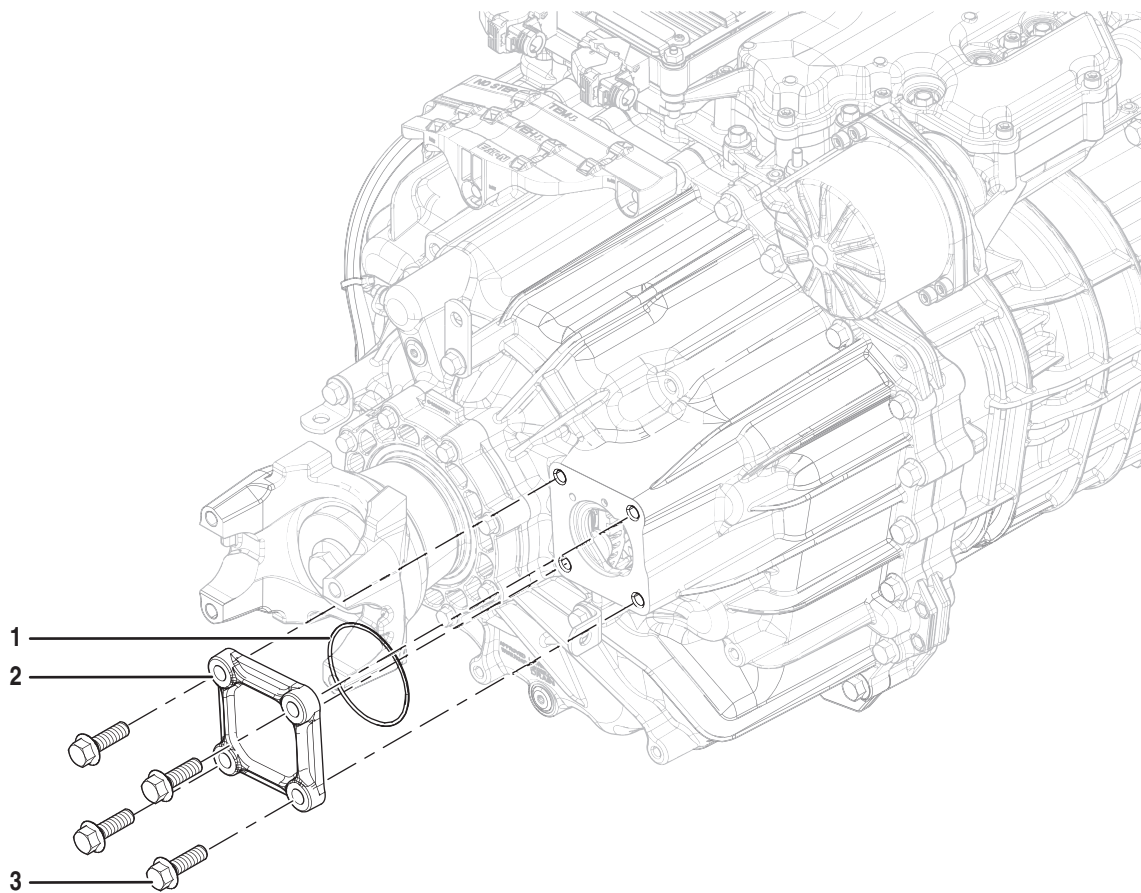
Only equipped with a Dual PTO Endurant HD transmission.

The 4-Bolt PTO Cover can be removed and installed with the transmission in-vehicle.

Special Tools

None

Component Identification



1. O-ring
2. 4-Bolt PTO Cover
3. Cap Screws (x4) - 18 mm

Remove the 4-Bolt PTO Cover

1. Remove 4 Rear PTO Cover 18 mm cap screws.



2. Using a soft-faced hammer at the 3 o'clock position, lightly tap to separate the PTO cover from the Rear Housing.



CAUTION: Keep fingers clear to avoid personal injury.



Install the 4-Bolt PTO Cover

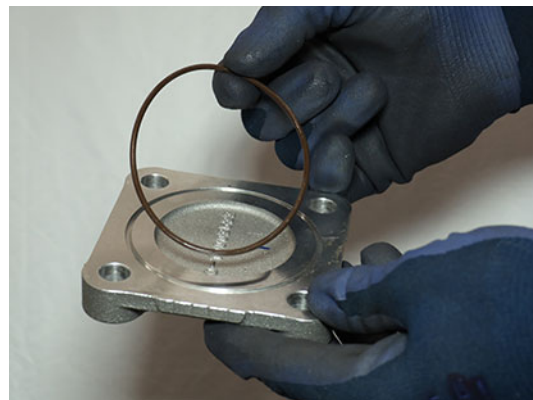
1. Clean sealing surfaces on the rear housing and 4-Bolt PTO Cover.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

3. Insert a new 4-Bolt PTO Cover O-ring into groove until fully seated.



4. Install the 4-Bolt PTO Cover onto Rear Housing with 4 18 mm cap screws and torque to 69-81 Nm (51-60 lb-ft) in a criss-cross pattern.



8-Bolt PTO Cover Service Procedure

Special Instructions

The 8-Bolt PTO Cover can be removed and installed with the transmission in-vehicle.

Special Tools

- Gasket Sealant (Loctite 5188)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

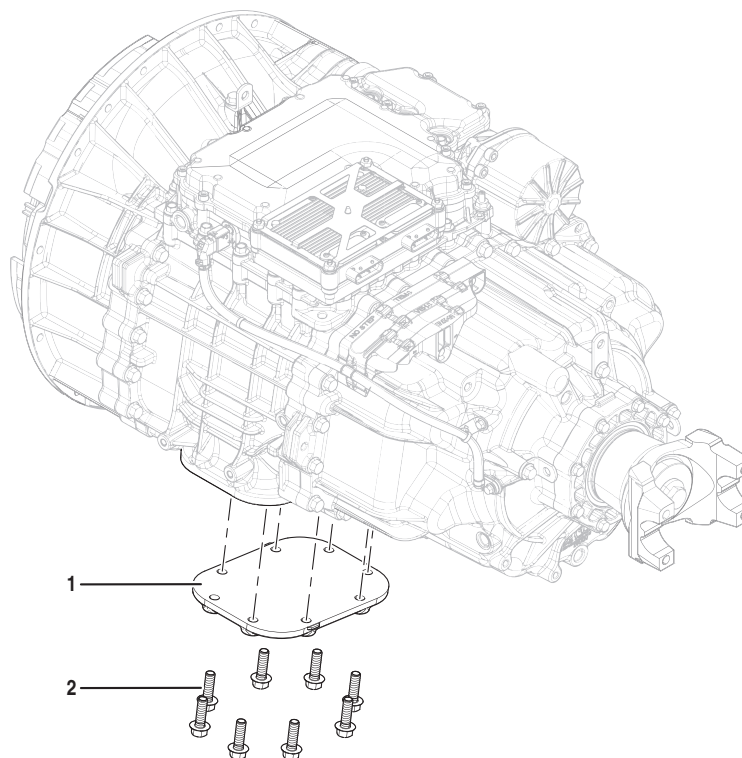


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



1. 8-Bolt PTO Cover

2. PTO Cover Cap Screws (x8) - 18 mm

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.
Note: If reusing oil, use a clean container free of contamination and debris.
3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.

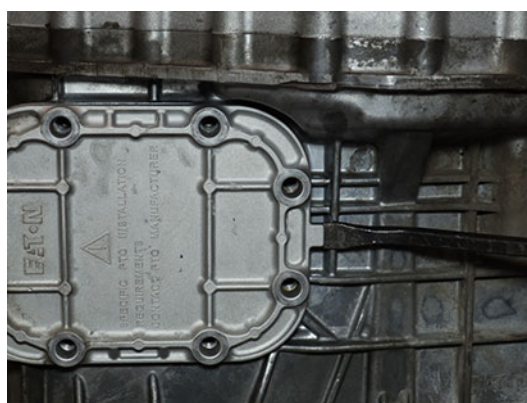
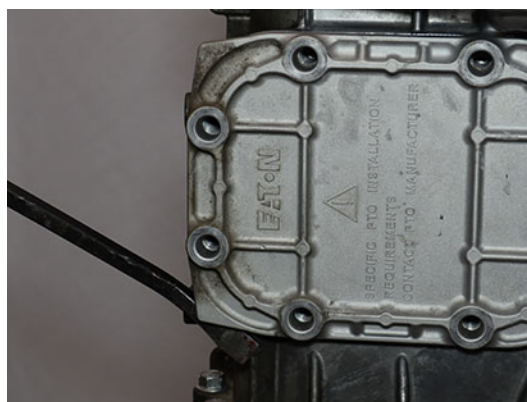


Remove the 8-Bolt PTO Cover

1. Remove 8 PTO Cover 18 mm cap screws.



2. Separate 8-Bolt PTO Cover from Main Housing at the 2 pry points.



Install the 8-Bolt PTO Cover

1. Clean the sealing surface on the transmission and 8-Bolt PTO cover with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

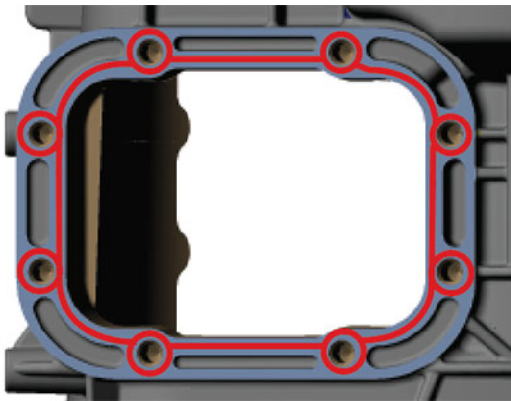
2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

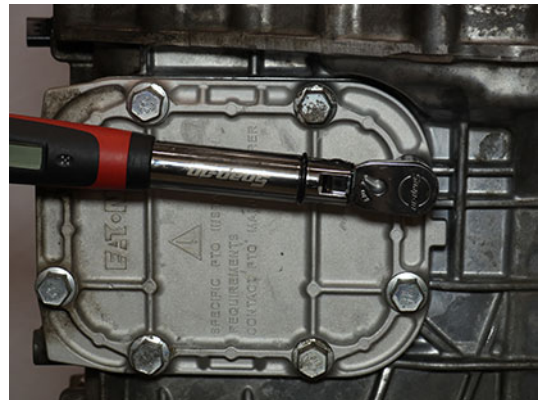
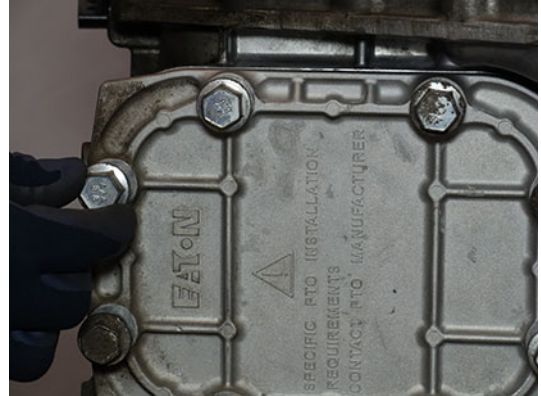
3. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to Main Housing as shown in pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



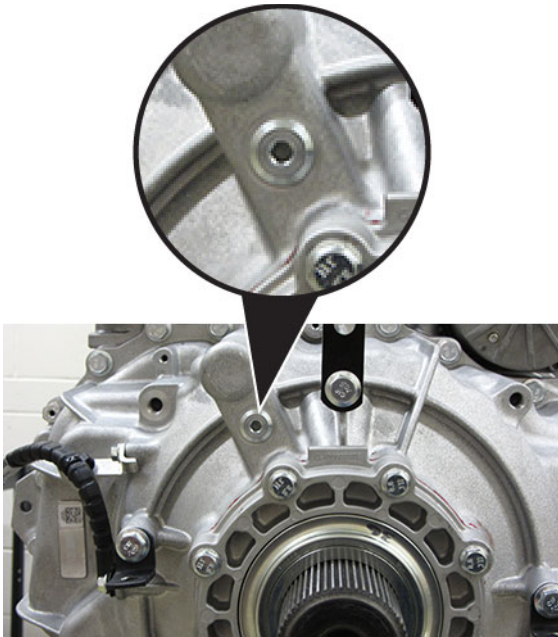
4. Install the 8-Bolt PTO Cover onto Main Housing with 8 18 mm cap screws and torque to 69-81 Nm (51-60 lb-ft) in a criss-cross pattern.



Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

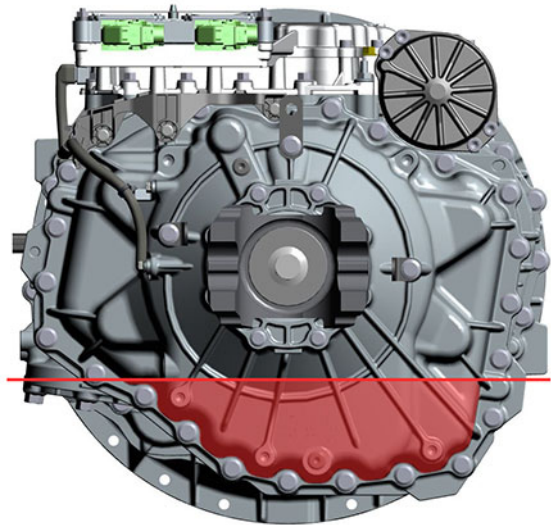
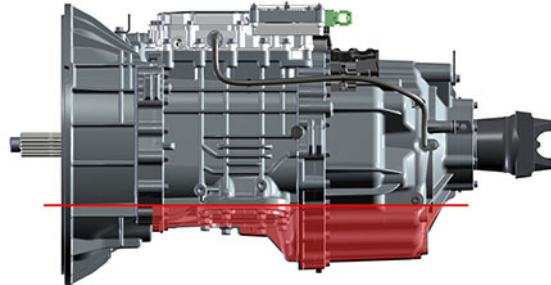


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

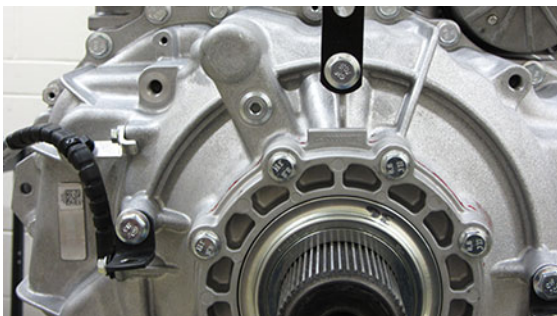
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Oil Pump Assembly Service Procedure

Special Instructions



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing Assembly may result in major vehicle component damage, severe injury or death.

Special Tools

- Rear Housing Alignment Pins (RR1090TR)
- Gasket Sealant (Loctite 5188)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

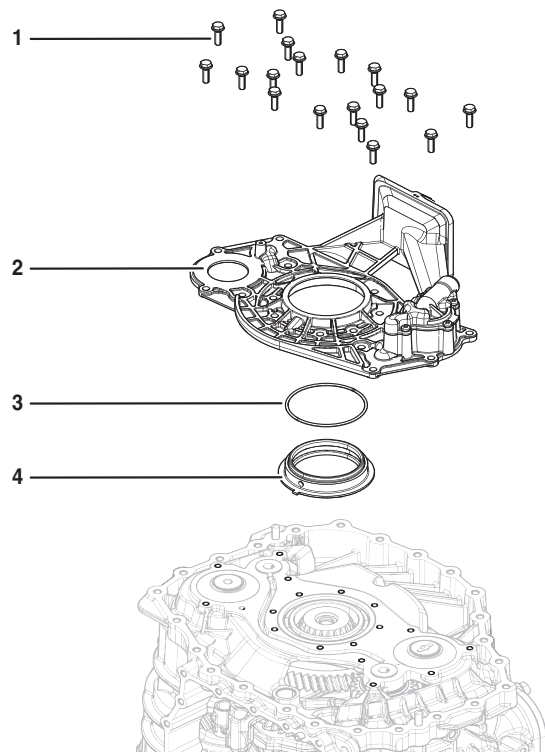


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



1. Oil Pump Assembly Cap Screws (x18) - 13 mm
2. Oil Pump Assembly

3. O-ring
4. Oil Pump/Range Spacer

Create a Service Activity Report

1. Key on with engine off.
2. Connect ServiceRanger and create a Service Activity Report.
3. Disconnect ServiceRanger.
4. Key off.

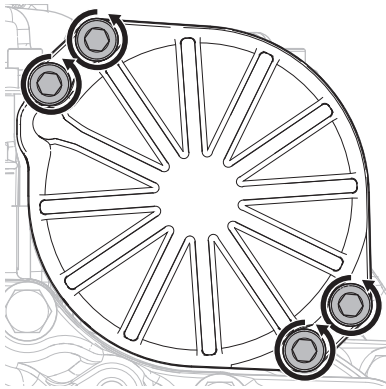
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

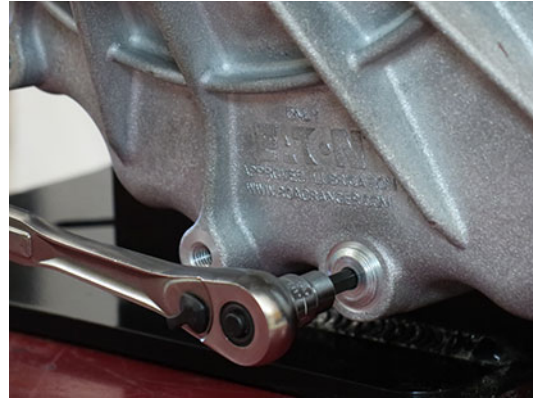
Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.

2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.

5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.

6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Transmission Control Module (TCM)

1. Unscrew the 4 TCM Cover nuts and remove TCM Cover.

Note: TCM Cover nuts are 10 or 13 mm.



2. Unscrew the TCM 7 mm Jackscrew. Lift and remove the TCM from the MTM.

NOTICE: Do not allow contamination into the connectors on the TCM or MTM.



3. Inspect the TCM Seal for damage.

NOTICE: Replace the TCM Seal if damaged.



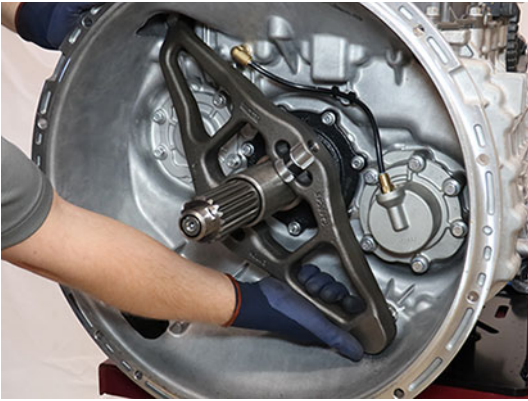
4. If replacing the TCM, transfer the TCM Seal to the new TCM.

Remove the Release Bearing and Clutch Release Yoke

1. Remove the Release Bearing by sliding the bearing off the input shaft.



2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.



Remove the Mechatronic Transmission Module (MTM)

1. Lift the latch on the Output Speed Sensor Harness at the Connector on the Mechatronic Transmission Module (MTM).



2. Remove the Output Speed Sensor Harness from the Connector on the MTM.

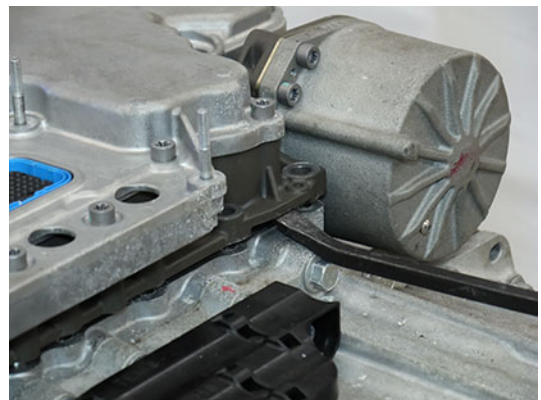


3. Remove the 20 MTM cap screws.

Note: 13 mm (x18), 15 mm (x2).



4. Separate the MTM from the Main Housing at the 2 pry points.

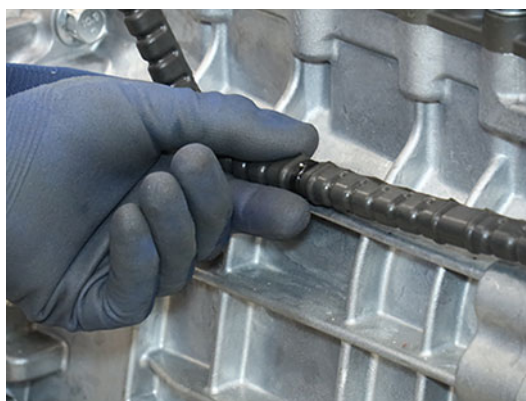


5. Remove the MTM from the transmission housing.

⚠ CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.



2. Remove the 2 harness press-in retainers from the Main Housing and bracket on Rear Housing.



Remove the Output Speed Sensor

1. Remove the Output Speed Sensor Harness tie strap at the Harness Bracket.



3. Remove the Output Speed Sensor 10 mm cap screw.



4. Remove the Output Speed Sensor from the Rear Housing.

Note: The sensor may need to be twisted and pulled from the bore.



1. Remove 3 Harness Bracket 10 mm cap screws.



2. Remove Harness Bracket.



Remove the Harness Bracket

Note: This procedure contains removing the Harness Bracket without the Mechatronic Transmission Module (MTM).

Secure Transmission (Vertical)

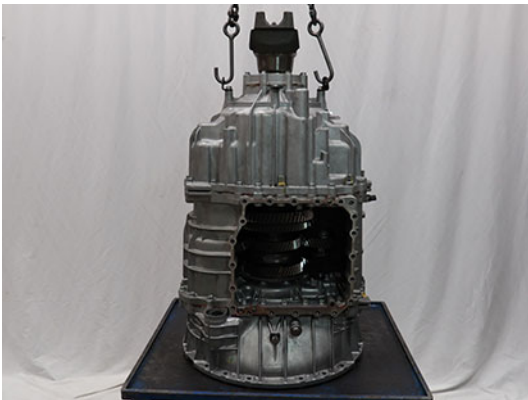
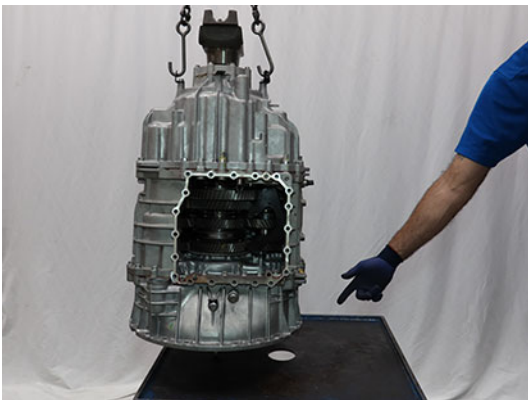
1. Place transmission in the vertical position with the front side down.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Use a surface with an opening that allows the input shaft to pass through and the clutch housing to sit flat and secure.



Remove the Rear Housing

1. At the 3 Rear Housing Threaded cap screws, apply paint marks on the Rear Housing to identify location.



2. Remove 21 Rear Housing and 3 threaded 16 mm cap screws.



3. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.

NOTICE: Failure to install alignment pins results in transmission component damage.



4. Separate the Rear Housing from the Main Housing at the 2 pry points.



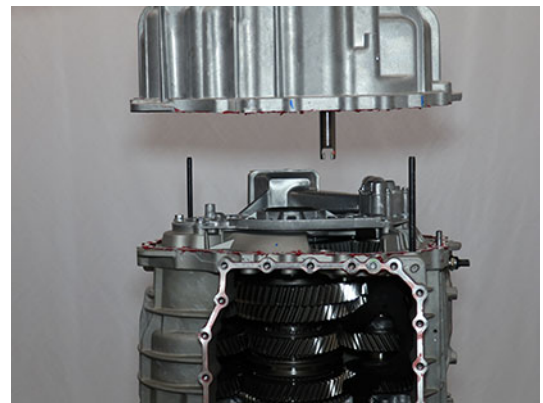
5. Lift and remove Rear Housing Assembly from Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing Assembly may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Dual PTO Transmissions are equipped with a rear PTO lube tube port on the pump and rear PTO drive splines on the Upper Countershaft.



- Place Rear Housing Assembly on bench.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Keep fingers clear of pinch point between Rear Housing Assembly and other surfaces. Dropping Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Support the Rear Housing Assembly to prevent damage to Shift Rail E.



- Remove the 2 Rear Housing Alignment Pins (RR1090TR) from the Main Housing.

Remove the Oil Pump Assembly

- Remove 18 Oil Pump Assembly 13 mm cap screws.



- Remove Oil Pump Assembly.



- Remove Oil Pump/Range Spacer with O-ring.



Install the Oil Pump Assembly

1. Install O-ring to the Oil Pump/Range Spacer.



2. Install Oil Pump/Range Spacer with O-ring and align tab with groove in Oil Pump Assembly.

NOTICE: Ensure the spacer tab is aligned with the groove and the spacer sits flush in the Oil Pump Assembly.



3. While holding the Oil Pump/Range Spacer in place, align oil pump drive key with slot on Lower Counter-shaft and install Oil Pump Assembly to Main Housing.



CAUTION: Failure to properly install the Oil Pump/Range Spacer and align the oil pump drive key results in transmission component damage during Oil Pump Assembly installation.

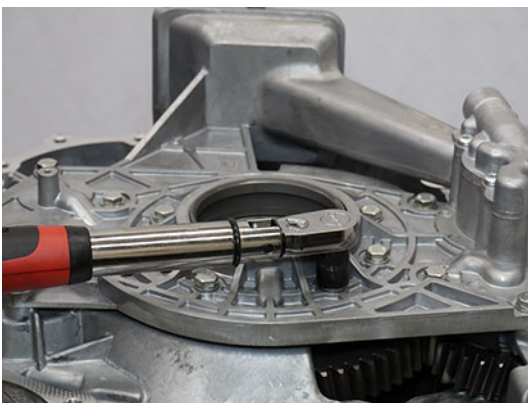
NOTICE: Ensure oil pump drive key is aligned with counter shaft drive slot during Oil Pump Assembly installation.



4. Press Oil Pump Assembly to ensure it sits flat on Main Housing sealing surface.



5. Install 18 Oil Pump Assembly 13 mm cap screws and torque to 21–23 Nm (16–18 lb–ft) in a criss-cross pattern.



Install the Rear Housing

1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

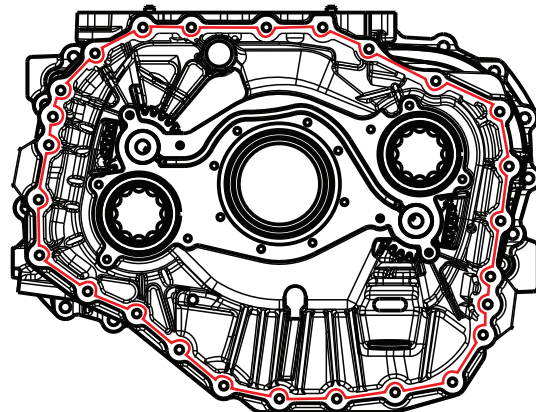
NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

3. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to the transmission Main Housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission housing may be damaged when cap screws are tightened.

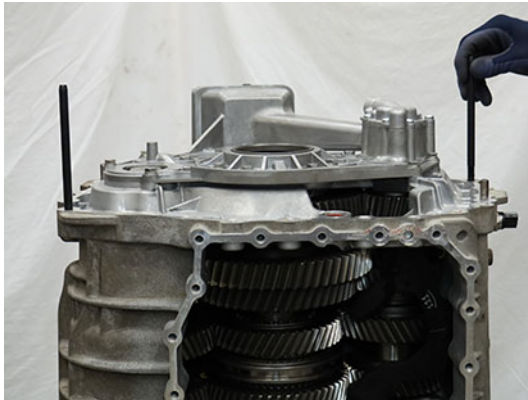
Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



4. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.



CAUTION: Failure to install alignment pins results in transmission component damage during Rear Housing Assembly installation.



6. Install the 3 Rear Housing Threaded 16 mm cap screws at the 3 paint mark locations.

Note: Two cap screws are used to mount the harness bracket and the third is used by the OEM for additional attachment points.



5. Lift and install the Rear Housing Assembly on to the Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

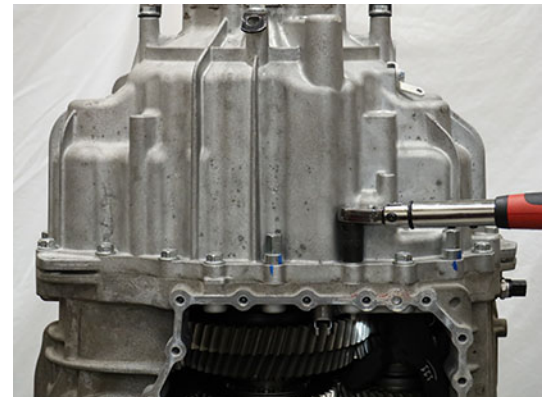
Note: Align the Rear Housing to the alignment pins and align Shift Rail E into the Main Housing during installation.

Note: Rotate Output Shaft to align gearing and allow Rear Housing Assembly to fully seat on Main Housing.



7. Remove the 2 Rear Housing Alignment Pins (RR1090TR).

8. Install the remaining 21 Rear Housing 16 mm cap screws and torque to 44.5 - 51.5 Nm (33-38 lb-ft) in a criss-cross pattern.



9. Lift transmission horizontally onto a bench.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Install the Harness Bracket

Note: This procedure contains installing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Install Harness Bracket.



2. Install 3 Harness Bracket 10 mm cap screws and torque to 8.8 - 10.4 Nm (6-8 lb-ft).



3. Install the Output Speed Sensor into the bore.

Note: The Sensor may need to be twisted and pushed into the bore.



4. Install the Output Speed Sensor 10 mm cap screw and torque to 8.8-10.4 Nm (6-8 lb-ft).



Install the Output Speed Sensor

1. Clean the sensor bore.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surface.

2. Apply a light coat of transmission oil to the sensor O-ring.

5. Press the 2 harness press-in retainers into the Main Housing and the bracket on the rear housing.



6. Secure the Output Speed Sensor Harness to the Harness Bracket with a tie strap.



CAUTION: Failure to tie strap the Output Speed Sensor Harness to the Harness Bracket may result in harness damage.



Install the Mechatronic Transmission Module (MTM)

1. Place the transmission in a horizontal position.

NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.
2. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

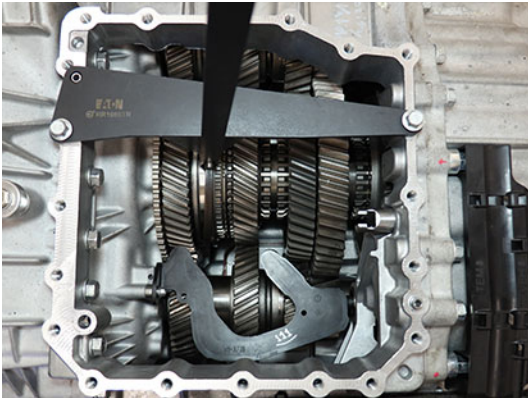
NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.
3. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

4. Install the Rail B Engagement Tool (RR1088TR) to the Main Housing and hand tighten with 2 MTM cap screws.



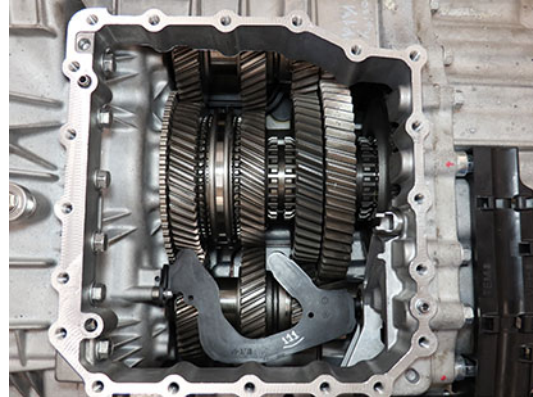
5. Shift the Rail B Synchronizer to neutral.



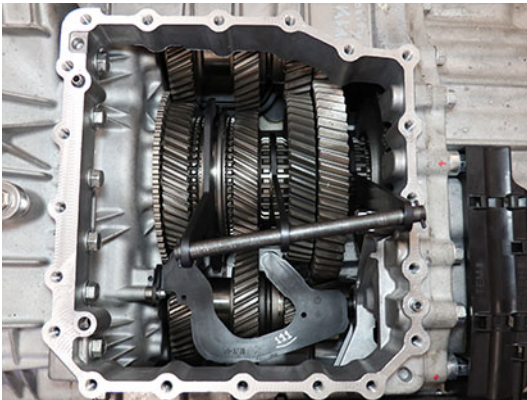
6. Remove the Rail B Engagement Tool.

7. Move Rail C and Rail D sliding clutches to neutral.

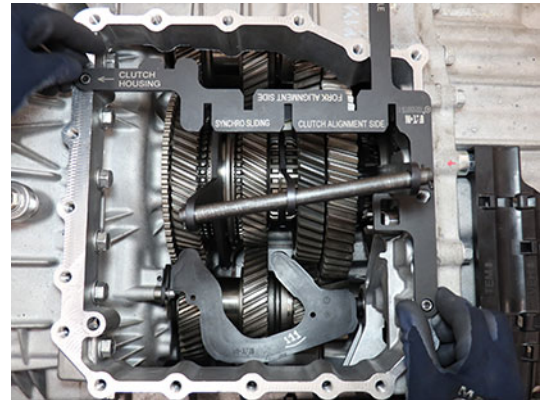
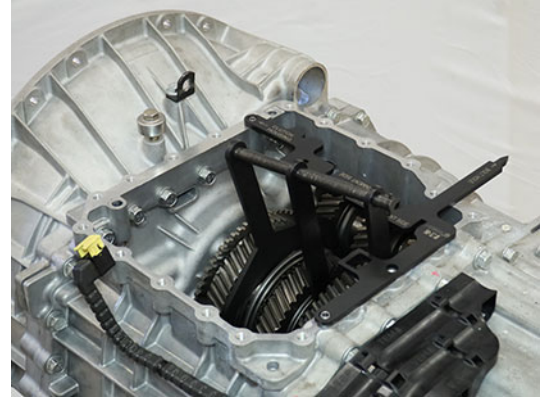
NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.



8. Install the Confirm-Neutral Gauge (RR1086TR-2) into the slots of the synchronizer and sliding clutches.

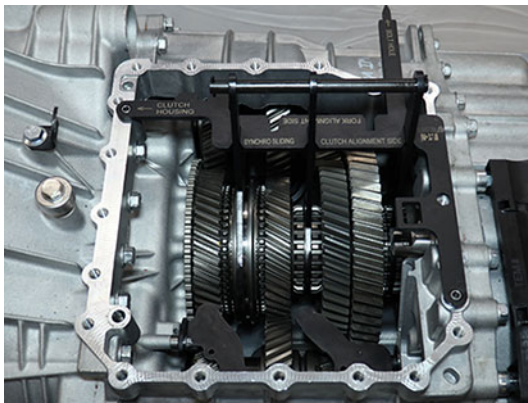


9. Install the MTM Alignment Tool (RR1086TR-1) onto the main housing.

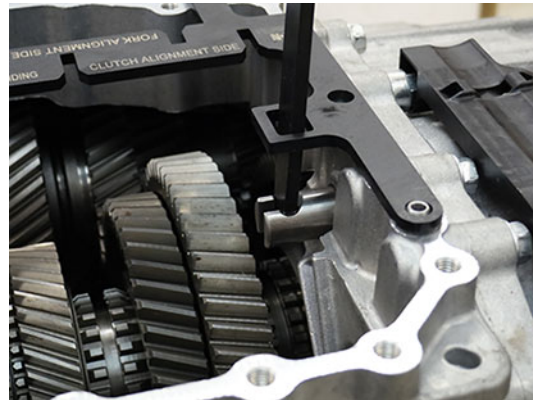
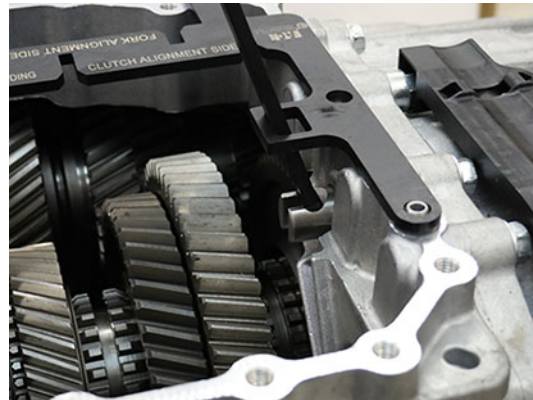
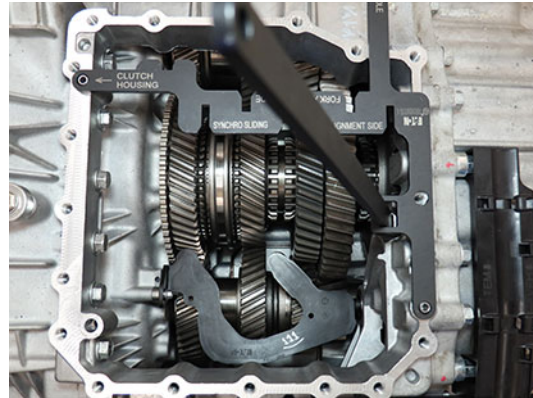


10. Verify synchronizer and sliding clutches are in neutral by sliding Confirm-Neutral Gauge into the slots of MTM Alignment Tool.

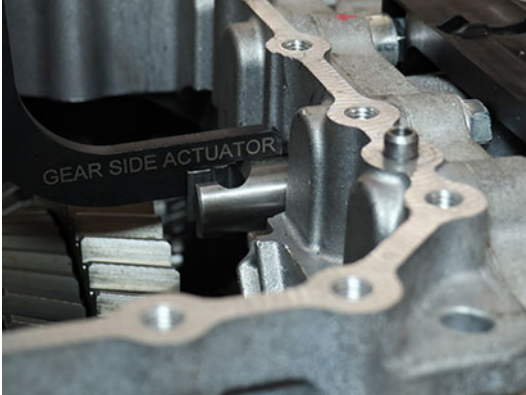
Note: If the gauge does not slide into the alignment tool slots, neutral is not achieved. Go to Step 4.



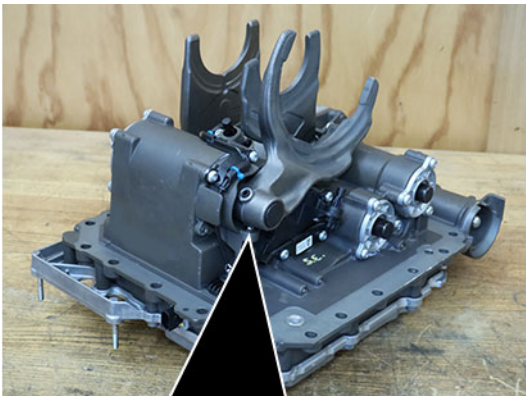
11. Using the Rail E Lever, move Rail E to neutral.



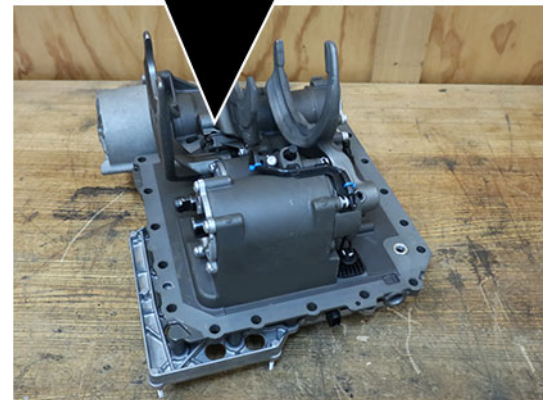
- 12.** Verify Rail E is in neutral using the Gear Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against housing with rail against notch-end of gauge.



- 13.** Move Shift Rail B in the MTM to neutral. Rail B is in neutral when the ball detent is in the notch of the Rail B yoke assembly.



- 14.** Move Shift Rails C and D in the MTM to neutral. Rails C and D are in neutral when the shift inter-lock is aligned with the notches of the rail yoke assemblies.



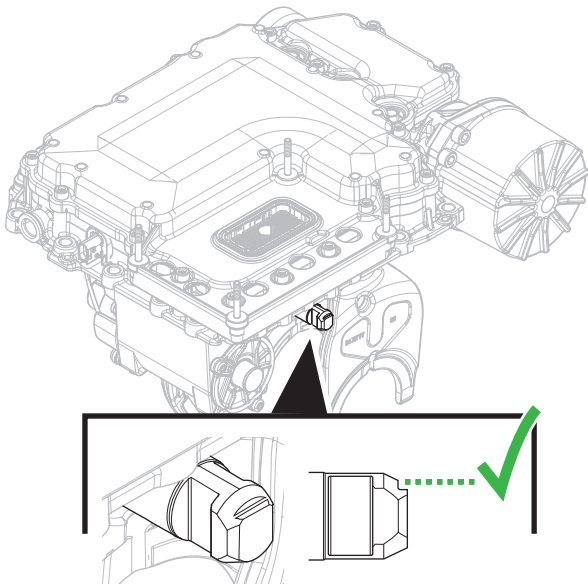
15. Verify MTM is in neutral. Install the MTM Alignment Tool (RR1086TR-1) into the bolt hole and onto Rail B, C, and D Shift Yokes.

Note: If the MTM Alignment Tool slots do not align with the 3 shift yokes, neutral has not been achieved. Go to Step 13.



16. Verify notch on Rail E is facing up.

Note: If the MTM is installed on the transmission with the notch on Rail E facing down, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

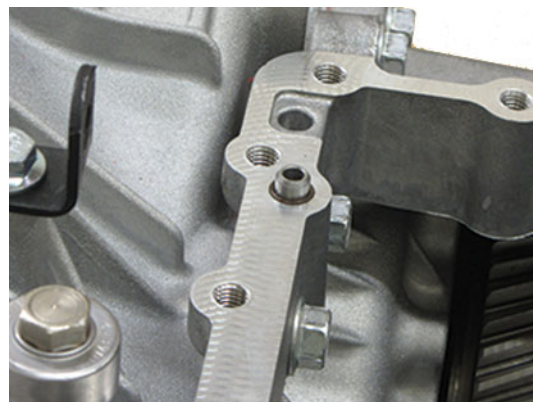


17. Verify Rail E is in neutral using the Fork Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against cover with rail against notch-end of gauge.

Note: If Rail E is not in neutral, slide rail in or out until neutral is achieved.



18. Slide O-ring over the MTM front alignment pin on the main housing until fully seated in the groove.



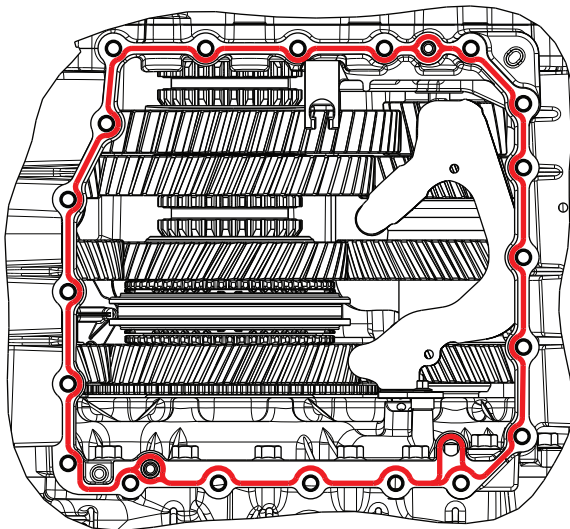
19. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

20. Apply gasket sealant with a bead width of 1.4-2.4mm (0.055-0.094 inch) to the transmission housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



21. Install MTM onto the transmission housing. Align Rail E in the MTM with the Rail E Shift Rail in the Main Housing.

CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.

NOTICE: If the MTM is installed on the transmission and Rail E in the MTM is not aligned with Rail E in the Main Housing, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

22. Install 20 MTM cap screws and torque to 44.5-51.5 Nm (33-38 lb-ft) in a criss-cross pattern.

Note: 13 mm (x18), 15 mm (x2) cap screws.



Install the Transmission Control Module (TCM)

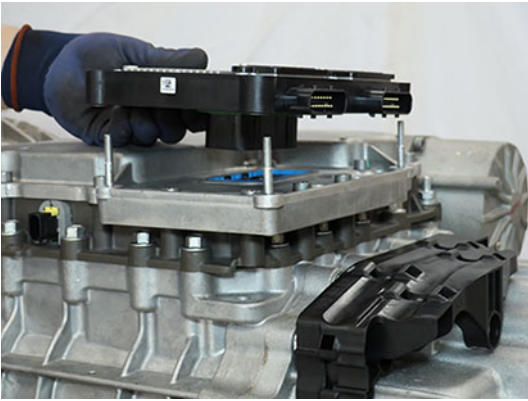
NOTICE: Do not allow contamination into the connectors on the TCM or MTM.

Note: TCM can be installed with transmission in-vehicle.

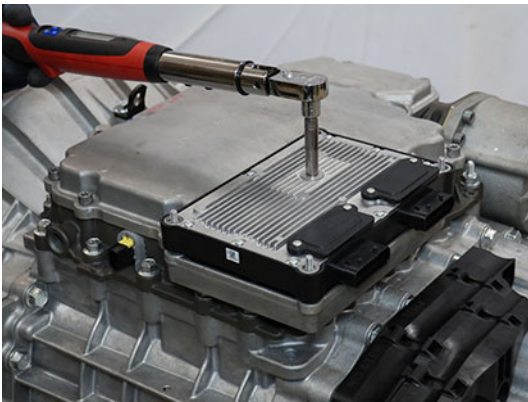
1. Install the TCM Seal on the 74-Way Harness Connector.



- Align the TCM to the 74-Way Harness Connector and TCM studs, then install the TCM.



- Torque the TCM 7 mm Jackscrew to 3.0-4.0 Nm (26.6-35.4 lb-in).



- Install the TCM Cover over the 4 TCM studs and torque the 4 TCM Cover Nuts to 8.8-10.4 Nm (78-92 lb-in) in a criss-cross pattern.

Note: TCM Cover nuts are 10 or 13 mm.

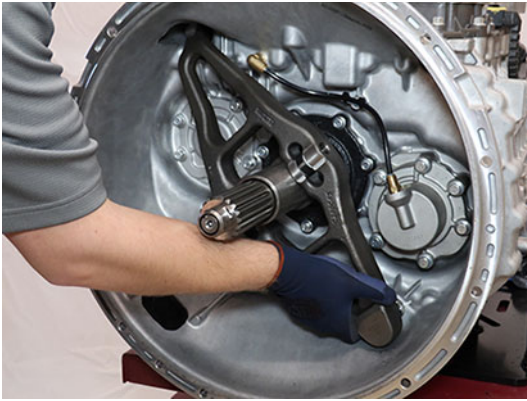


Install the Release Bearing and Clutch Release Yoke

- Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



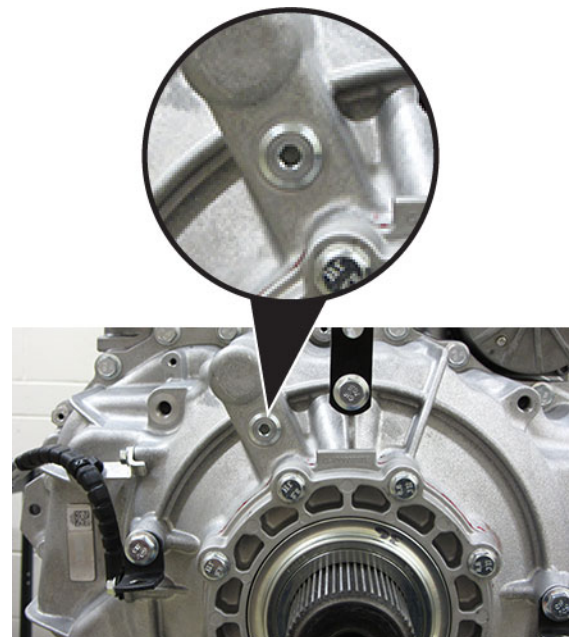
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

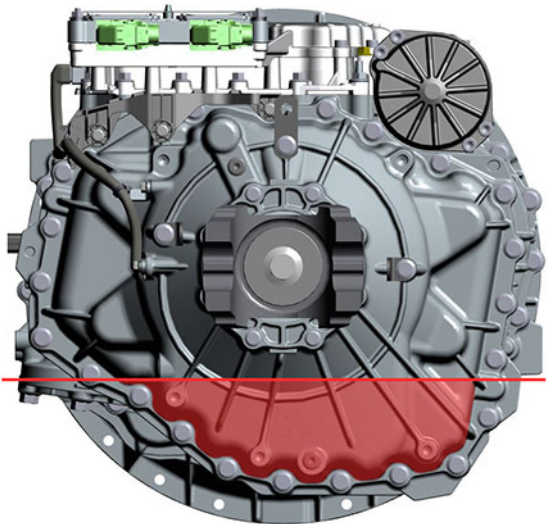
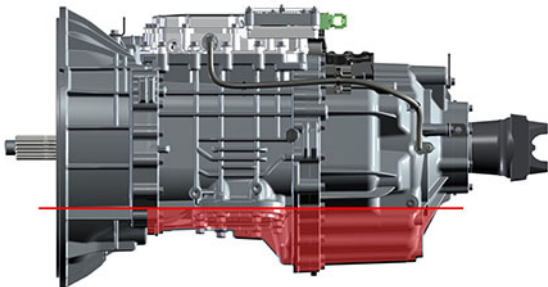


- Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



- Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



- Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
- Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

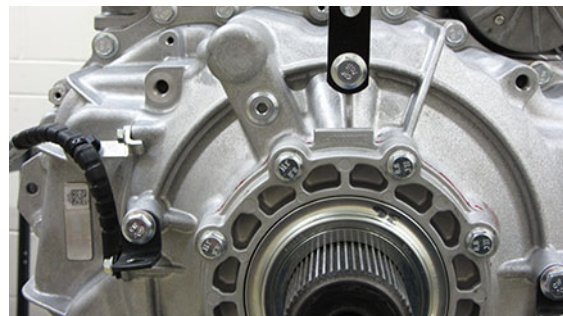
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



- Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
- Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Main Housing Service Procedure

Special Instructions

Main Shaft End-Play must be measured and adjusted after Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing or Main Shaft Bearing replacement. Perform **Main Shaft End-Play Service Procedure** to measure and adjust Main Shaft End-Play if any of the components mentioned above have been replaced.

CAUTION: Failure to measure and adjust Main Shaft End-Play could result in transmission component damage.

CAUTION: Always start Main Shaft End-Play procedure with the 6.525 mm Main Shaft Selective Washer installed. Failure to do so could result in internal component damage.

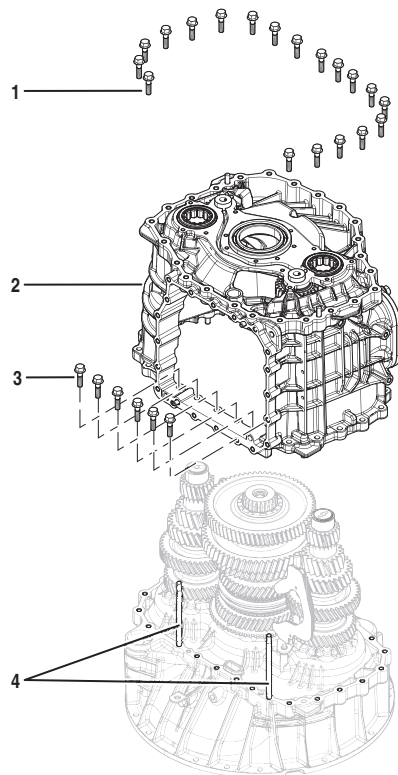
Special Tools

- Rear Housing Alignment Pins (RR1090TR)
- Upper Countershaft Pilot Tool (RR1071TR)
- Lower Countershaft Pilot Tool (RR1072TR)
- Gasket Sealant (Loctite 5188)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

DANGER: Do not handle gasket remover until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.

CAUTION: Avoid contact between gasket remover and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



1. Main Housing External Cap Screws (x19) - 16 mm
2. Main Housing

3. Main Housing Internal Cap Screws (x6) - 16 mm
4. Rear Housing Alignment Pins (RR1090TR)

Create a Service Activity Report

1. Key on with engine off.
2. Connect ServiceRanger and create a Service Activity Report.
3. Disconnect ServiceRanger.
4. Key off.

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

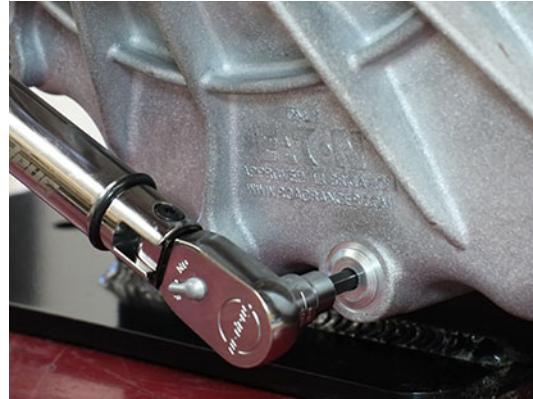
3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.

6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



Manually Vent Linear Clutch Actuator (LCA)

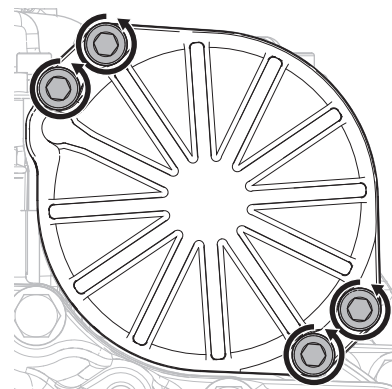
1. Key off.
2. Set vehicle parking brake and chock wheels.



WARNING: Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



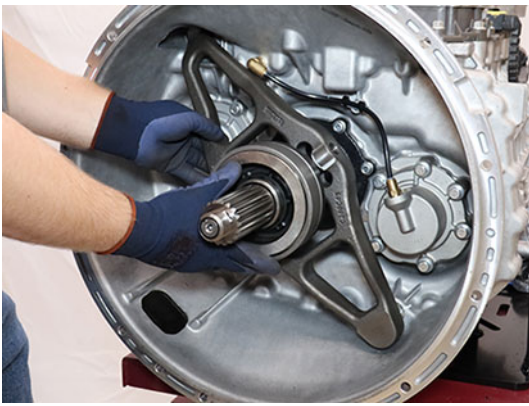
4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Remove the Transmission

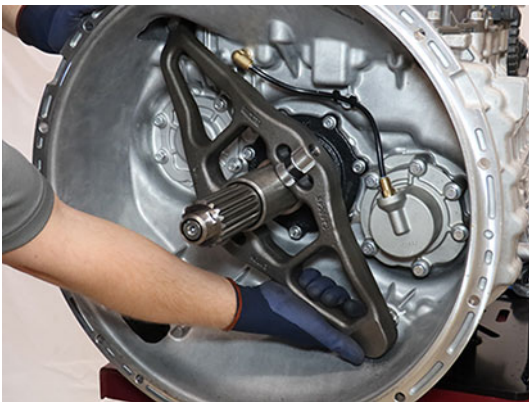
1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Release Bearing and Clutch Release Yoke

1. Remove the Release Bearing by sliding the bearing off the input shaft.



2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.

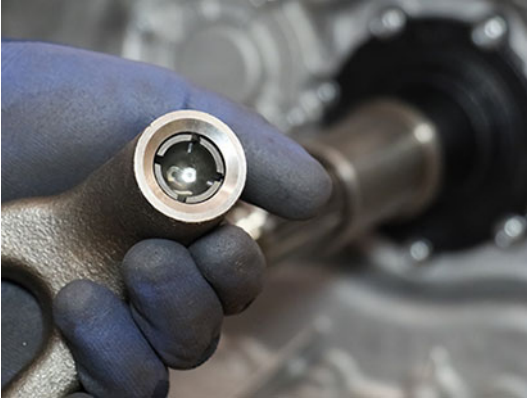


3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.



Remove the Transmission Control Module (TCM)

1. Unscrew the 4 TCM Cover nuts and remove TCM Cover.

Note: TCM Cover nuts are 10 or 13 mm.



2. Unscrew the TCM 7 mm Jackscrew. Lift and remove the TCM from the MTM.

NOTICE: Do not allow contamination into the connectors on the TCM or MTM.



3. Inspect the TCM Seal for damage.

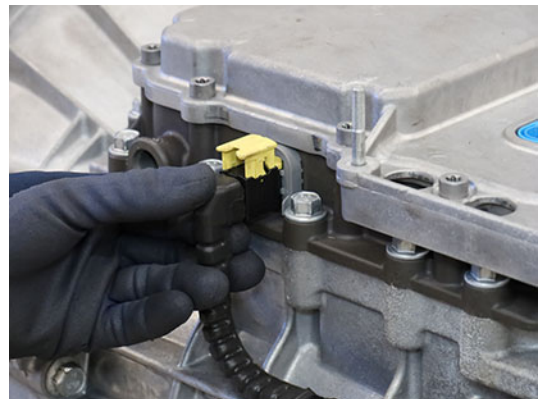
NOTICE: Replace the TCM Seal if damaged.



4. If replacing the TCM, transfer the TCM Seal to the new TCM.

Remove the Mechatronic Transmission Module (MTM)

1. Lift the latch on the Output Speed Sensor Harness at the Connector on the Mechatronic Transmission Module (MTM).

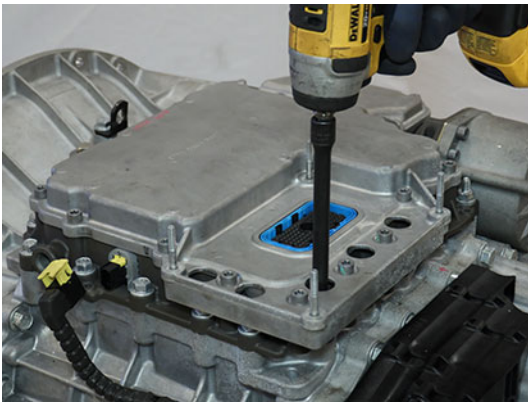


2. Remove the Output Speed Sensor Harness from the Connector on the MTM.

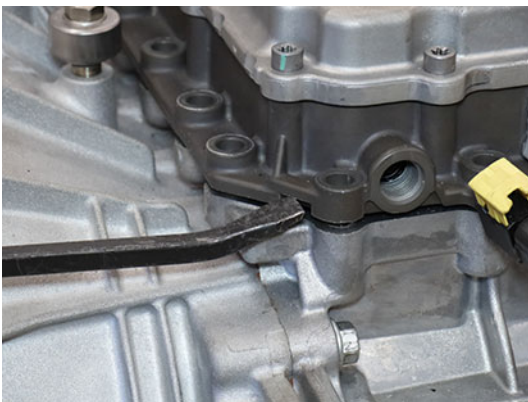
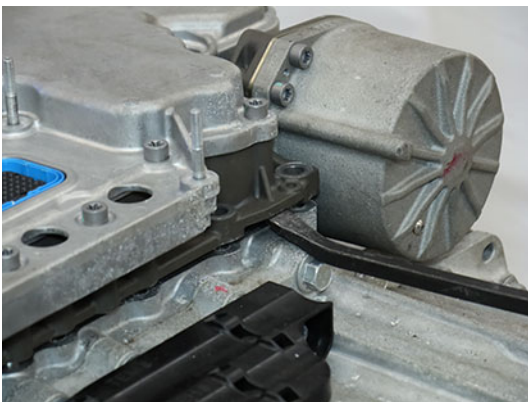


- Remove the 20 MTM cap screws.

Note: 13 mm (x18), 15 mm (x2).



- Separate the MTM from the Main Housing at the 2 pry points.



- Remove the MTM from the transmission housing.



CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.



Remove the Output Speed Sensor

- Remove the Output Speed Sensor Harness tie strap at the Harness Bracket.



2. Remove the 2 harness press-in retainers from the Main Housing and bracket on Rear Housing.



3. Remove the Output Speed Sensor 10 mm cap screw.



4. Remove the Output Speed Sensor from the Rear Housing.

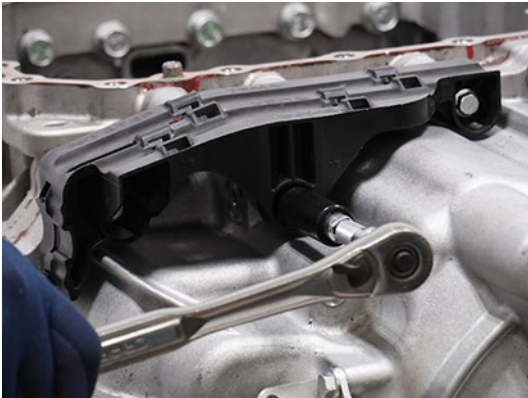
Note: The sensor may need to be twisted and pulled from the bore.



Remove the Harness Bracket

Note: This procedure contains removing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Remove 3 Harness Bracket 10 mm cap screws.



2. Remove Harness Bracket.



Secure Transmission (Vertical)

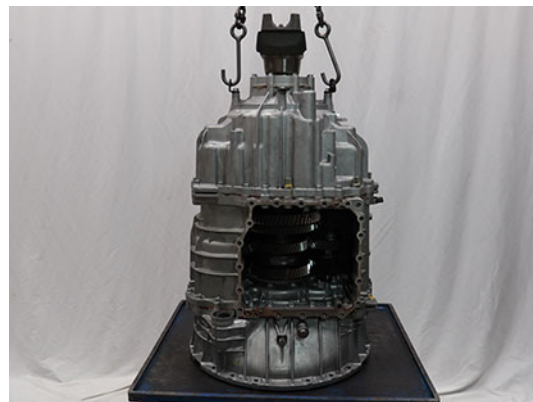
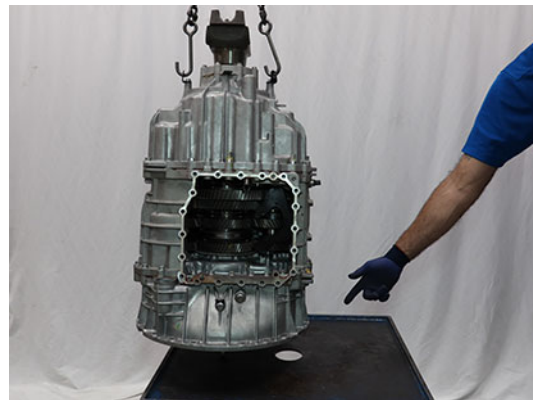
1. Place transmission in the vertical position with the front side down.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Use a surface with an opening that allows the input shaft to pass through and the clutch housing to sit flat and secure.



Remove the Rear Housing

1. At the 3 Rear Housing Threaded cap screws, apply paint marks on the Rear Housing to identify location.



2. Remove 21 Rear Housing and 3 threaded 16 mm cap screws.



3. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.

NOTICE: Failure to install alignment pins results in transmission component damage.



4. Separate the Rear Housing from the Main Housing at the 2 pry points.



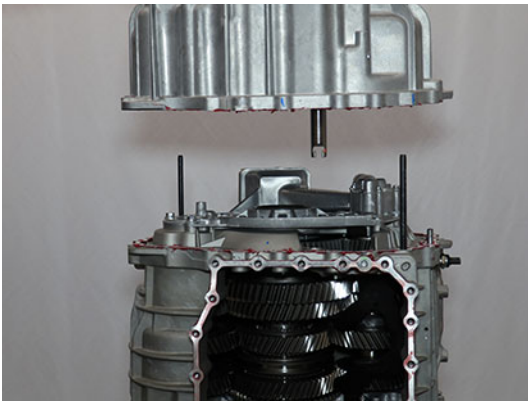
5. Lift and remove Rear Housing Assembly from Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing Assembly may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Dual PTO Transmissions are equipped with a rear PTO lube tube port on the pump and rear PTO drive splines on the Upper Countershaft.



6. Place Rear Housing Assembly on bench.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Keep fingers clear of pinch point between Rear Housing Assembly and other surfaces. Dropping Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Support the Rear Housing Assembly to prevent damage to Shift Rail E.



7. Remove the 2 Rear Housing Alignment Pins (RR1090TR) from the Main Housing.

Remove the Oil Pump Assembly

1. Remove 18 Oil Pump Assembly 13 mm cap screws.



2. Remove Oil Pump Assembly.



3. Remove Oil Pump/Range Spacer with O-ring.



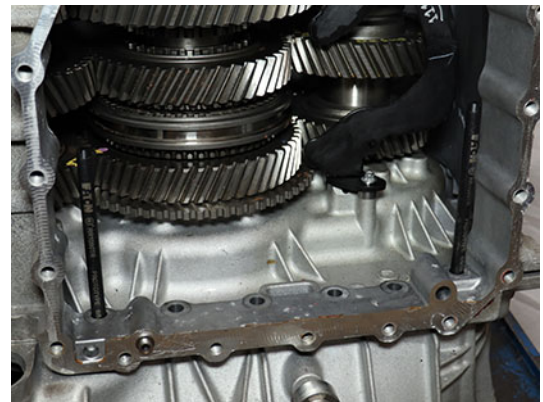
Remove Main Housing

1. Remove the 19 external and 6 internal Main Housing 16 mm cap screws.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



2. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) in the internal Main Housing cap screw outer threaded holes.



3. Remove 2 Rear Housing 90-degree Lifting Eye 15 mm cap screws from Rear Housing.



4. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



5. Separate Main Housing from Clutch Housing at the 2 pry points.

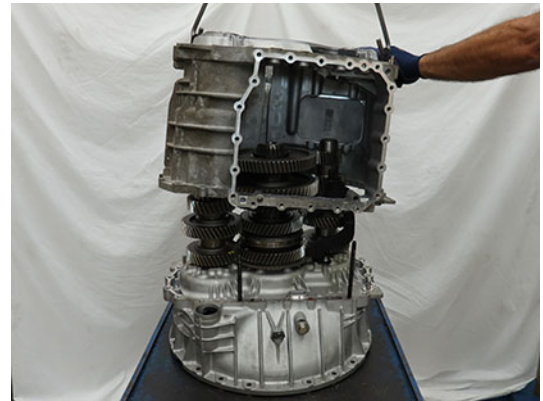


6. Lift and remove Main Housing from Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or personal injury.

NOTICE: Use an appropriate lifting device to safely lift component.



7. Remove 2 Rear Housing Alignment Pins (RR1090TR).



8. If Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing, or Main Shaft Bearing has been replaced, perform steps to **Install the Main Housing without Gasket Sealant** and measure Main Shaft End-Play. If these parts have NOT been replaced, perform steps to **Install Main Housing**.

Install the Main Housing without Gasket Sealant

1. Clean the sealing surfaces on the Clutch Housing and Main Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

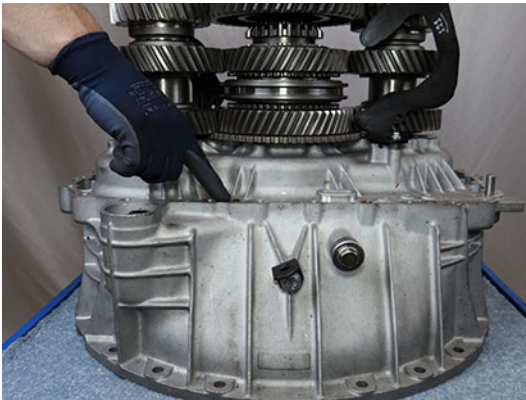
NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

3. Slide O-ring over the Clutch Housing Inertia Brake air passage alignment pin until fully seated in groove.

NOTICE: Failure to install a new o-ring could result in degraded transmission performance.



4. Install Lower Countershaft Pilot Tool (RR1071TR) onto Lower Countershaft above rear bearing race.



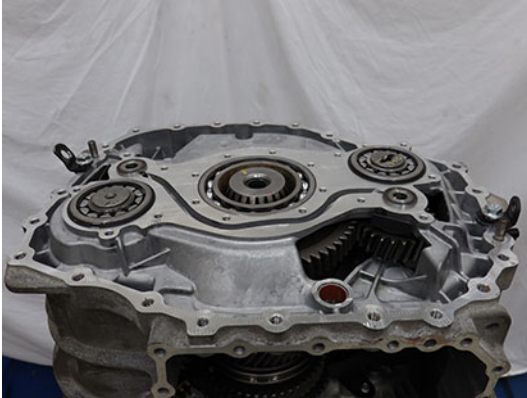
5. Install Upper Countershaft Pilot Tool (RR1072TR) onto the Upper Countershaft above rear bearing race.



6. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten Lifting Eye cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



7. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) into the Clutch Housing as shown below.



8. Lift, align and install Main Housing to Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or serious injury.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Using a flat tipped screwdriver, rotate the Reverse Idler Gears to align the gearing and allow Main Housing to fully seat onto the Clutch Housing.

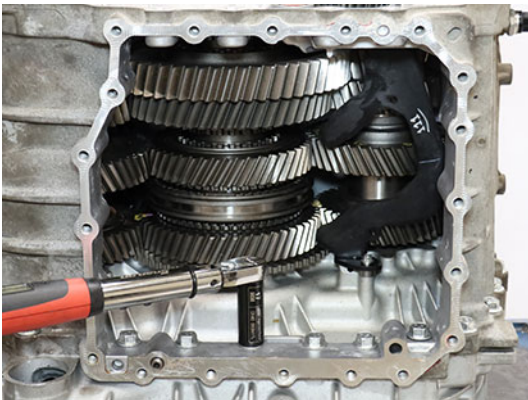


9. Remove 2 Rear Housing Alignment Pins (RR1090TR).



10. Install 19 external and 6 internal Main Housing 16 mm cap screws and torque to 44–51 Nm (33–38 lb–ft) in a criss-cross pattern.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



Measure and Adjust the Main Shaft End-Play

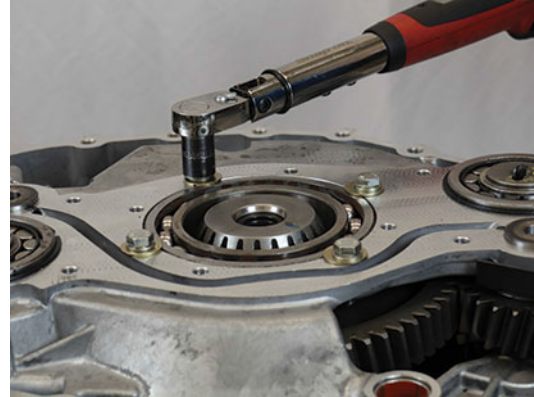
Note: The Main Shaft Selective Washer is available in 3 thicknesses: 6.525 mm (0.257 in), 6.712 mm (0.264 in) or 6.900 mm (0.272 in).

CAUTION: Ensure the Input Shaft Bearing and Main Shaft Bearing are seated in the Clutch Housing and Main Housing. Failure to fully seat bearings in housings will give an incorrect Main Shaft End-Play reading and may cause transmission component damage.

CAUTION: Ensure the 6.525 mm Main Shaft Selective Washer was installed. Only install a thicker selective washer after end-play has been measured and a thicker selective washer is required to achieve proper end-play or transmission damage may occur.

1. Install 4 Oil Pump 13 mm cap screws with flat washers (22.3 mm (0.9 in) minimum OD). Torque cap screws to 21-23 Nm (16-18 lb-ft).

Note: Flat washers are required to ensure the Main Shaft Bearing remains seated in the Main Housing during End-Play measurement.



2. Thread a Dial Indicator mounting shaft into one of the inner Oil Pump mounting holes around the Main Shaft Bearing.

Note: The Oil Pump cap screw mounting holes thread pattern: M8 x 1.25 x 30 mm.

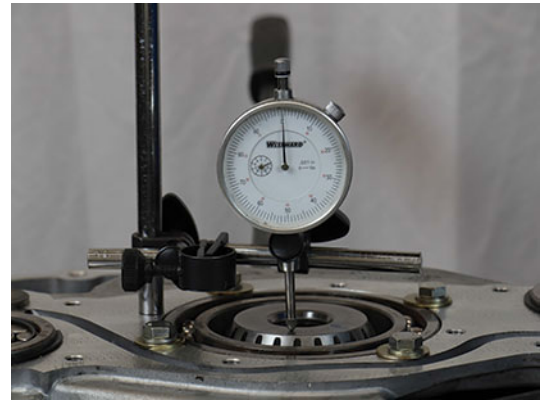


3. Mount the Dial Indicator to the shaft, set the plunger on the Main Shaft, and zero the Dial Indicator.

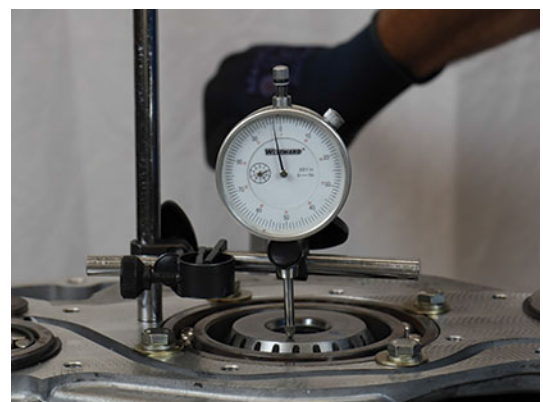
Note: Ensure that the Dial Indicator is vertical and zeroed for proper Main Shaft End-Play measurement.



5. Apply even downward pressure on Reverse Gear with both pry bars and monitor the Dial Indicator between the at-rest position of the Main Shaft and the point where no more downward movement is achieved. Record reading in table.



4. Use two pry bars and slide them between the Reverse Gear and Main Housing at the locations shown below.



Recorded End-Play

- Reference the Selective Main Shaft Washer Reference Chart and compare Recorded End-Play to reading in table.

Note: Main Shaft End-Play specification is 0.000-0.100 mm (0.000-0.004 in). The Selective Washer Chart is only valid for end-play measured with the 6.525 mm (0.257 in) selective washer installed.

- If end-play is in range, the installed Main Shaft Selective Washer, 6.525 mm (0.257 in), is correct.
- If end-play is out of range, determine the thicker ideal Main Shaft Selective Washer and record in table. Remove Main Shaft and install the Ideal Main Shaft Selective Washer.

Main Shaft Selective Washer Reference Chart

Recorded End-Play	Ideal Main Shaft Selective Washer Thickness and Part Number
0.000-0.100 mm (0.000-0.004 in)	6.525 mm (0.257 in) P/N 10000555
0.101-0.300 mm (0.005-0.011 in)	6.712 mm (0.264 in) P/N 10001759
0.301-0.550 mm (0.012-0.021 in)	6.900 mm (0.272 in) P/N 10001760

Ideal Main Shaft Selective Washer

CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

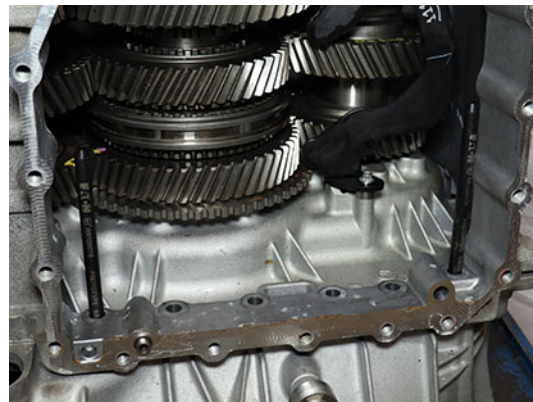
Remove Main Housing

- Remove the 19 external and 6 internal Main Housing 16 mm cap screws.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



- Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) in the internal Main Housing cap screw outer threaded holes.



3. Separate Main Housing from Clutch Housing at the 2 pry points.

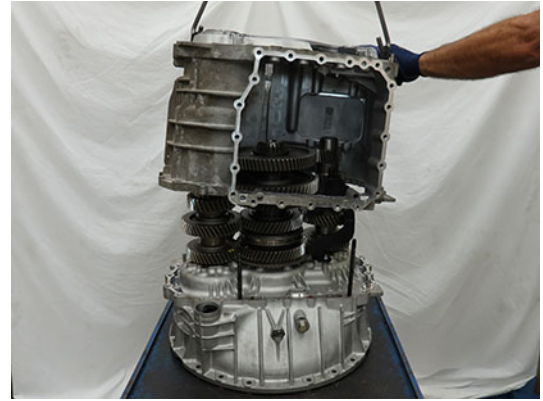


4. Lift and remove Main Housing from Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or personal injury.

NOTICE: Use an appropriate lifting device to safely lift component.



5. Remove 2 Rear Housing Alignment Pins (RR1090TR).

Note: Applying sealer when installing Main Housing to Clutch Housing should only be done after proper Main Shaft End-Play has been verified.



- Reference the Selective Main Shaft Washer Reference Chart and compare Recorded End-Play to reading in table.

Note: Main Shaft End-Play specification is 0.000-0.100 mm (0.000-0.004 in). The Selective Washer Chart is only valid for end-play measured with the 6.525 mm (0.257 in) selective washer installed.

- If end-play is in range, the installed Main Shaft Selective Washer, 6.525 mm (0.257 in), is correct.
- If end-play is out of range, determine the thicker Ideal Main Shaft Selective Washer and record in table. Remove Main Shaft and install the Ideal Main Shaft Selective Washer.

Main Shaft Selective Washer Reference Chart

Recorded End-Play	Ideal Main Shaft Selective Washer Thickness and Part Number
0.000-0.100 mm (0.000-0.004 in)	6.525 mm (0.257 in) P/N 10000555
0.101-0.300 mm (0.005-0.011 in)	6.712 mm (0.264 in) P/N 10001759
0.301-0.550 mm (0.012-0.021 in)	6.900 mm (0.272 in) P/N 10001760

Ideal Main Shaft Selective Washer

CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

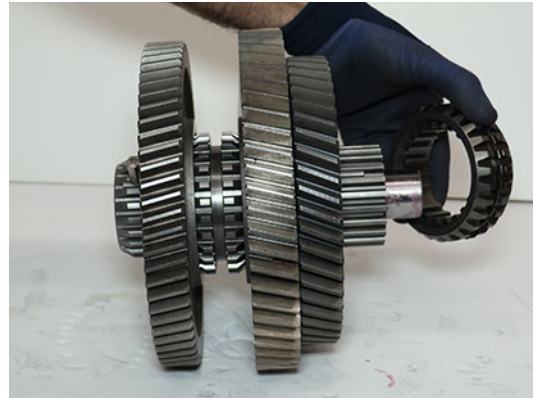
Disassemble the Main Shaft and Replace Main Shaft Selective Washer

Note: This procedure is only required if Main Shaft End-Play is out of range and a thicker Selective Washer is required.

- Place Main Shaft Assembly horizontally on a clean flat surface.

CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

- Remove Rail C Sliding Clutch.



- Place Main Shaft assembly vertically on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.



4. Remove Main Shaft Key while inserting 5/32 OD air line.



5. Rotate and remove the Main Shaft Selective Washer above Reverse Gear.

Note: The Main Shaft Selective Washer above Reverse Gear is available in 3 thicknesses; 6.525, 6.712 or 6.900 mm to control Main Shaft End-Play.



Assemble and Install the Main Shaft with Replaced Main Shaft Selective Washer

1. Install and rotate the Ideal Main Shaft Selective Washer above Reverse Gear recorded in Step 6 of the Main Shaft End-Play Service Procedure.

Note: The Main Shaft Selective Washer is available in 3 thicknesses: 6.525, 6.712 or 6.900 mm.



2. Slide the 5/32 OD air line up to align and hold washer in place.



3. Install Main Shaft Key at the same spline as the 5/32 OD air line.

Note: Insert Main Shaft Key while removing air line.

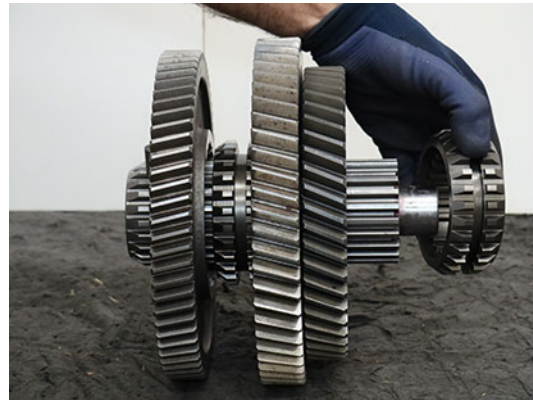
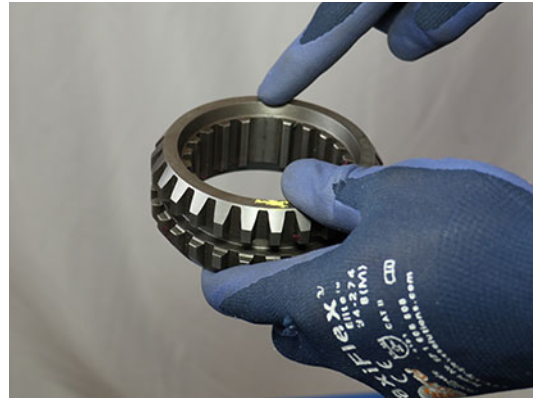


4. Install a magnet on Main Shaft Key to hold the key in place during final Main Shaft Assembly and installation into transmission.

Note: Remove magnet from Main Shaft Key after installation of Main Shaft Assembly onto transmission.



6. Install Rail C Sliding Clutch and align the double slot with Main Shaft Key.



5. Place Main Shaft Assembly horizontally on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

7. Apply transmission assembly lube to Wave Spring - Rear and install to Main Shaft.

NOTICE: Wave Spring - Rear is shorter than the Wave Spring - Front.

Note: Transmission assembly lube holds Wave Spring - Rear in place during Main Shaft Assembly installation.



8. Apply transmission assembly lube to Thrust Washer - Rear and install to Main Shaft.

Note: Transmission assembly lube holds Thrust Washer - Rear in place during Main Shaft Assembly installation.



9. Install a magnet onto the Main Shaft Key.

Note: The magnet holds the key in position during Main Shaft Assembly installation.



10. Slide and hold Rail C Sliding Clutch into Secondary Driven Gear.



11. Install Main Shaft Assembly onto Primary Drive Gear and align gearing.



CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.



12. Remove magnet from Main Shaft Key.

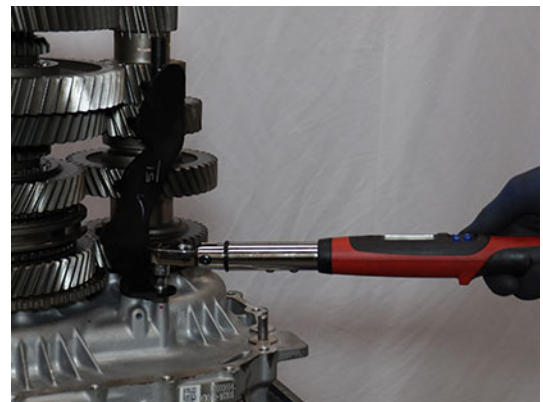
NOTICE: Ensure to remove magnet or component damage may occur during assembly.



13. If removed, install Upper Lube Tube into Clutch Housing and install 8 mm cap screw and torque to 8–10 Nm (6–13 lb-ft).



14. If removed, install Lower Lube Tube into Clutch Housing and 8 mm cap screw, torque to 8–10 Nm (6–13 lb-ft).



15. Perform steps to **Install the Main Housing without Gasket Sealant** and remeasure Main Shaft End-Play.



CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

Install Main Housing

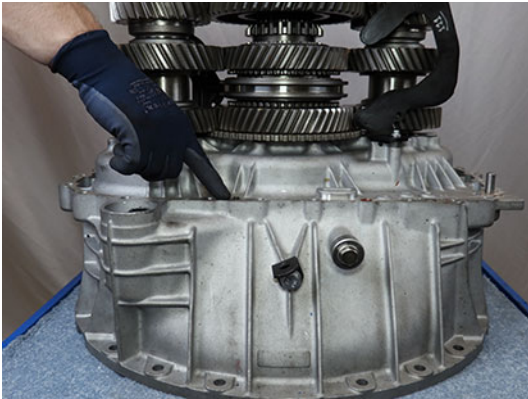
1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

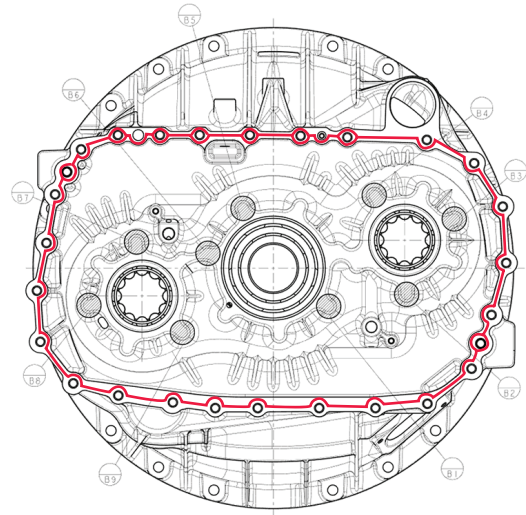
3. Slide O-ring over the Clutch Housing Inertia Brake air passage alignment pin until fully seated in groove.



4. Apply gasket sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to clutch housing as shown in pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying gasket sealant.



5. Install Lower Countershaft Pilot Tool (RR1071TR) onto Lower Countershaft above rear bearing race.



6. Install Upper Countershaft Pilot Tool (RR1072TR) onto the Upper Countershaft above rear bearing race.



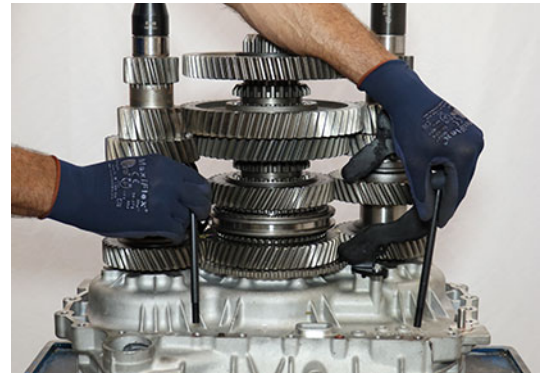
7. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten Lifting Eye cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



8. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) into the Clutch Housing as shown below.



9. Lift, align and install Main Housing to Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or serious injury.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Using a flat tipped screwdriver, rotate the Reverse Idler Gears to align the gearing and allow Main Housing to fully seat onto the Clutch Housing.



10. Remove 2 Rear Housing Alignment Pins (RR1090TR).



11. Remove 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws from Main Housing.

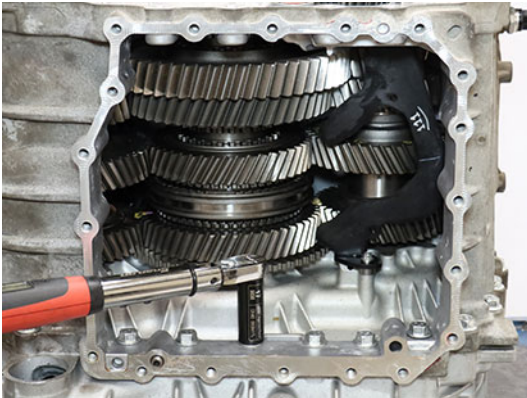


12. Re-install 2 Rear Housing 90-degree Lifting Eyes to the Rear Housing and torque to 49.6-55.5 Nm (36-40 lb-ft).



13. Install 19 external and 6 internal Main Housing 16 mm cap screws and torque to 44–51 Nm (33–38 lb–ft) in a criss-cross pattern.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



Install the Oil Pump Assembly

1. Install O-ring to the Oil Pump/Range Spacer.



2. Install Oil Pump/Range Spacer with O-ring and align tab with groove in Oil Pump Assembly.

NOTICE: Ensure the spacer tab is aligned with the groove and the spacer sits flush in the Oil Pump Assembly.



3. While holding the Oil Pump/Range Spacer in place, align oil pump drive key with slot on Lower Counter-shaft and install Oil Pump Assembly to Main Housing.



CAUTION: Failure to properly install the Oil Pump/Range Spacer and align the oil pump drive key results in transmission component damage during Oil Pump Assembly installation.

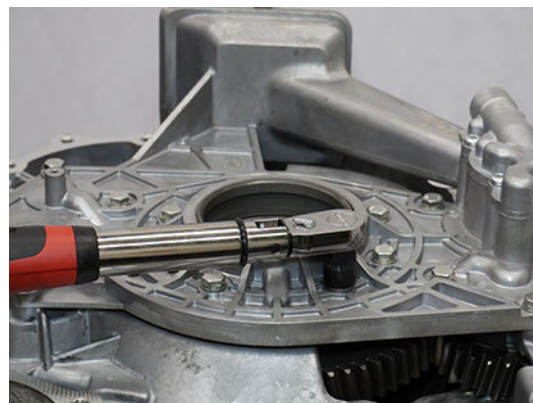
NOTICE: Ensure oil pump drive key is aligned with counter shaft drive slot during Oil Pump Assembly installation.



4. Press Oil Pump Assembly to ensure it sits flat on Main Housing sealing surface.



5. Install 18 Oil Pump Assembly 13 mm cap screws and torque to 21–23 Nm (16–18 lb–ft) in a criss-cross pattern.



Install the Rear Housing

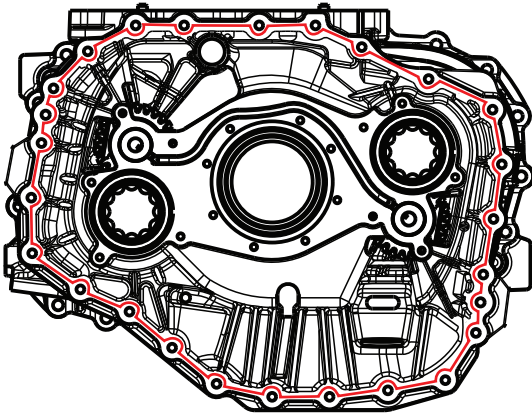
1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.
3. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to the transmission Main Housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission housing may be damaged when cap screws are tightened.

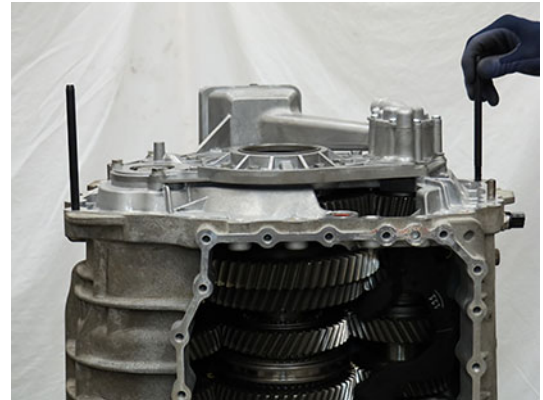
Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



4. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.



CAUTION: Failure to install alignment pins results in transmission component damage during Rear Housing Assembly installation.



5. Lift and install the Rear Housing Assembly on to the Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Align the Rear Housing to the alignment pins and align Shift Rail E into the Main Housing during installation.

Note: Rotate Output Shaft to align gearing and allow Rear Housing Assembly to fully seat on Main Housing.



6. Install the 3 Rear Housing Threaded 16 mm cap screws at the 3 paint mark locations.

Note: Two cap screws are used to mount the harness bracket and the third is used by the OEM for additional attachment points.



7. Remove the 2 Rear Housing Alignment Pins (RR1090TR).
8. Install the remaining 21 Rear Housing 16 mm cap screws and torque to 44.5 - 51.5 Nm (33-38 lb-ft) in a criss-cross pattern.



9. Lift transmission horizontally onto a bench.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Secure Transmission (Horizontal)

1. Securely place transmission in the horizontal position with the front side down.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Install the Harness Bracket

Note: This procedure contains installing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Install Harness Bracket.



2. Install 3 Harness Bracket 10 mm cap screws and torque to 8.8 - 10.4 Nm (6-8 lb-ft).



Install the Output Speed Sensor

1. Clean the sensor bore.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surface.

2. Apply a light coat of transmission oil to the sensor O-ring.
3. Install the Output Speed Sensor into the bore.

Note: The Sensor may need to be twisted and pushed into the bore.



4. Install the Output Speed Sensor 10 mm cap screw and torque to 8.8-10.4 Nm (6-8 lb-ft).



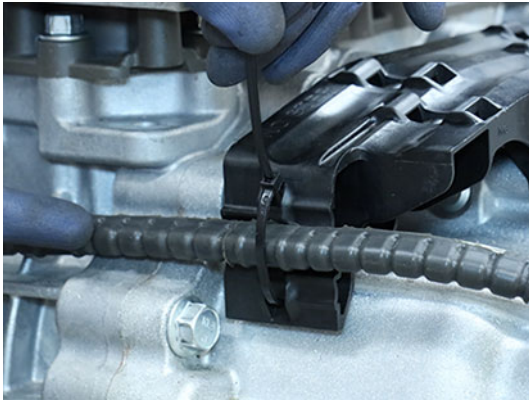
5. Press the 2 harness press-in retainers into the Main Housing and the bracket on the rear housing.



- Secure the Output Speed Sensor Harness to the Harness Bracket with a tie strap.



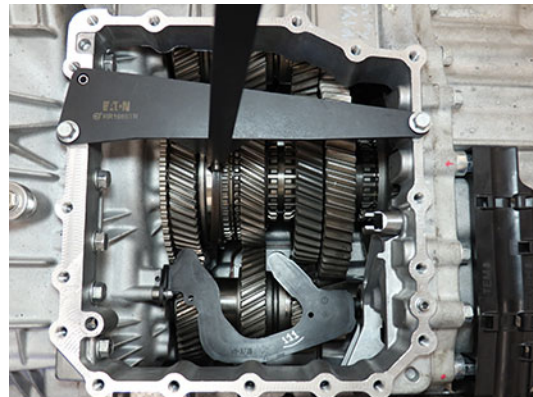
CAUTION: Failure to tie strap the Output Speed Sensor Harness to the Harness Bracket may result in harness damage.



- Install the Rail B Engagement Tool (RR1088TR) to the Main Housing and hand tighten with 2 MTM cap screws.



- Shift the Rail B Synchronizer to neutral.



- Remove the Rail B Engagement Tool.

Install the Mechatronic Transmission Module (MTM)

- Place the transmission in a horizontal position.

NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.

- Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

- Inspect threaded bolt holes for debris and clean if necessary.

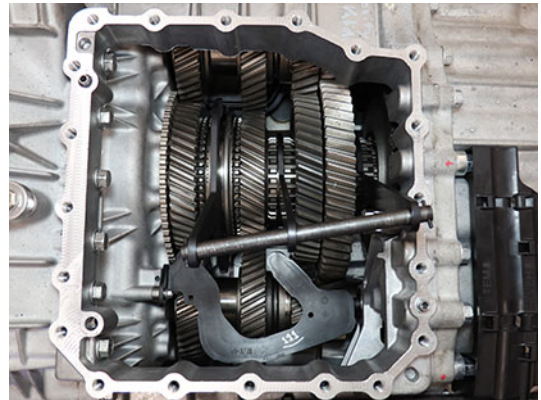
NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

7. Move Rail C and Rail D sliding clutches to neutral.

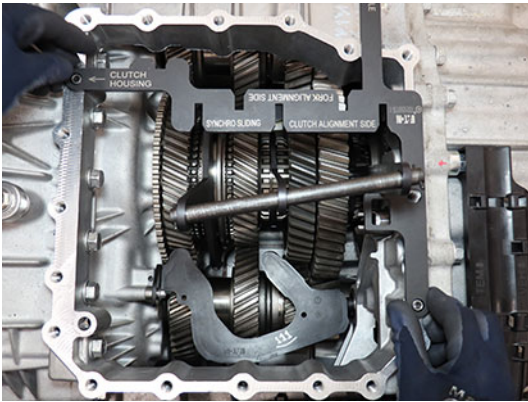
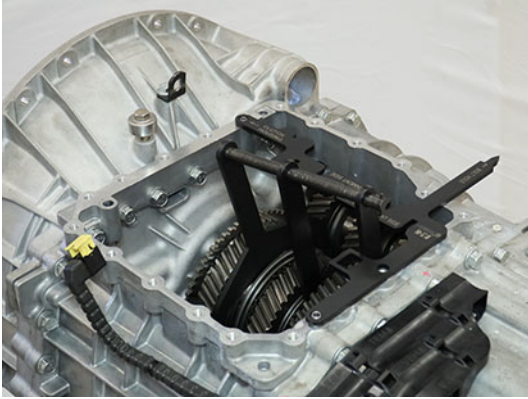
NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.



8. Install the Confirm-Neutral Gauge (RR1086TR-2) into the slots of the synchronizer and sliding clutches.

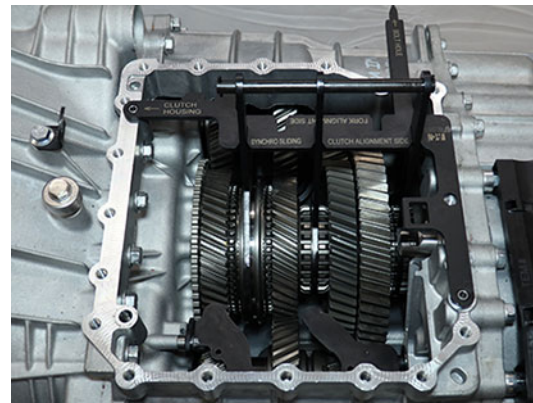
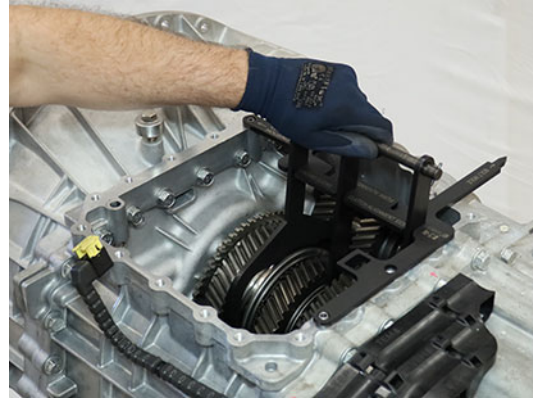


9. Install the MTM Alignment Tool (RR1086TR-1) onto the main housing.

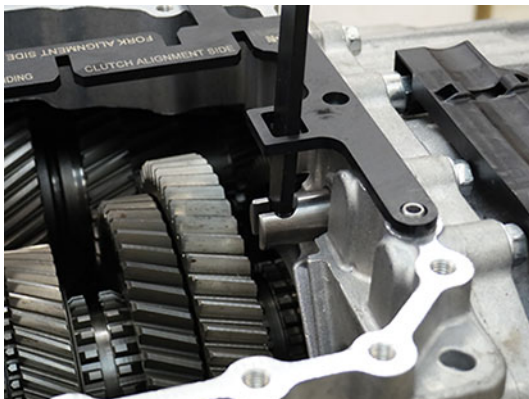
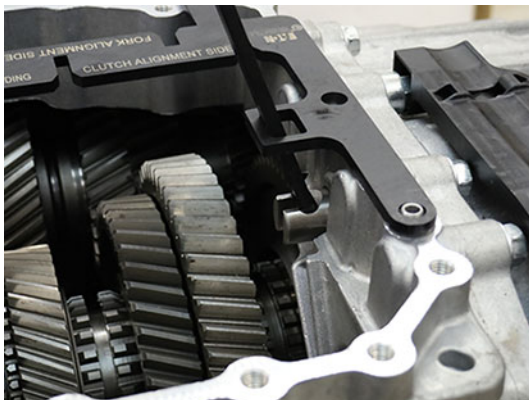
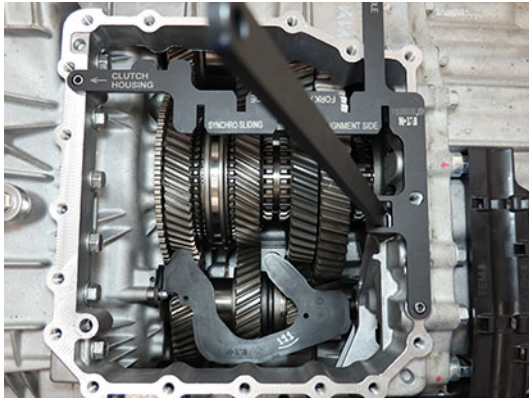


10. Verify synchronizer and sliding clutches are in neutral by sliding Confirm-Neutral Gauge into the slots of MTM Alignment Tool.

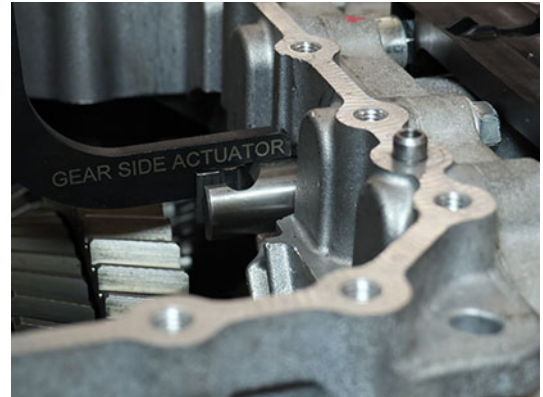
Note: If the gauge does not slide into the alignment tool slots, neutral is not achieved. Go to Step 4.



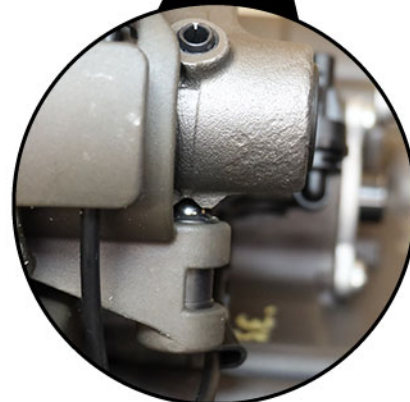
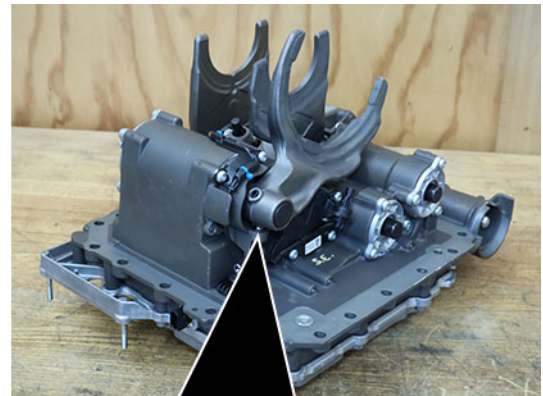
11. Using the Rail E Lever, move Rail E to neutral.



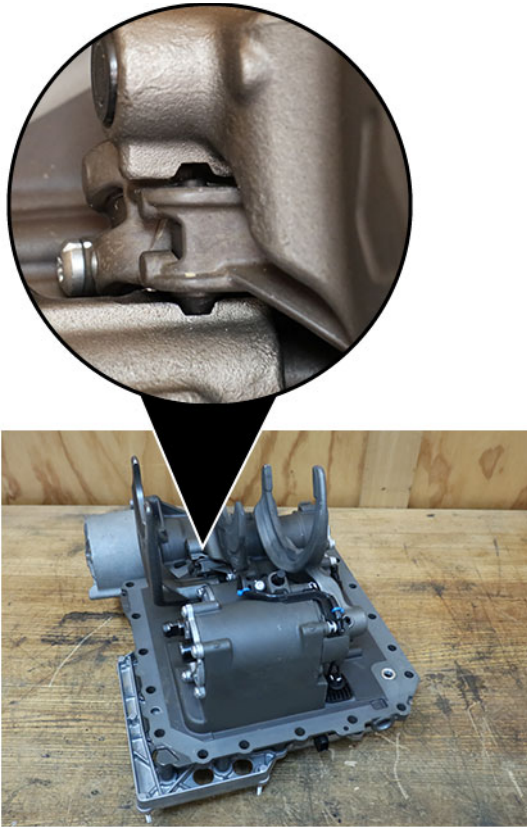
12. Verify Rail E is in neutral using the Gear Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against housing with rail against notch-end of gauge.



13. Move Shift Rail B in the MTM to neutral. Rail B is in neutral when the ball detent is in the notch of the Rail B yoke assembly.



14. Move Shift Rails C and D in the MTM to neutral. Rails C and D are in neutral when the shift inter-lock is aligned with the notches of the rail yoke assemblies.



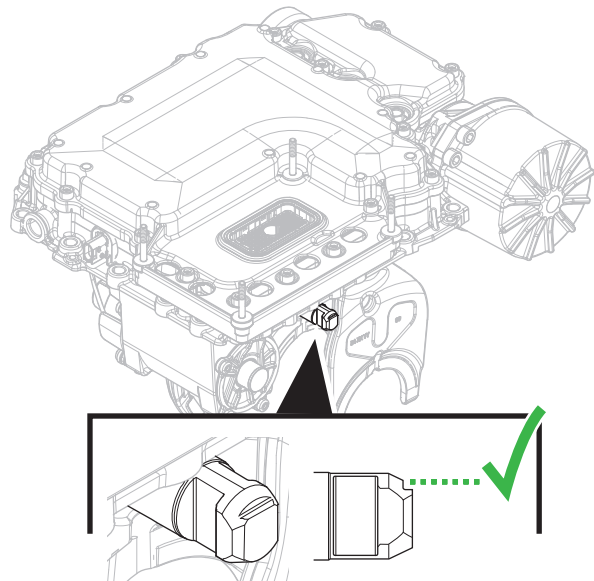
15. Verify MTM is in neutral. Install the MTM Alignment Tool (RR1086TR-1) into the bolt hole and onto Rail B, C, and D Shift Yokes.

Note: If the MTM Alignment Tool slots do not align with the 3 shift yokes, neutral has not been achieved. Go to Step 13.



16. Verify notch on Rail E is facing up.

Note: If the MTM is installed on the transmission with the notch on Rail E facing down, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

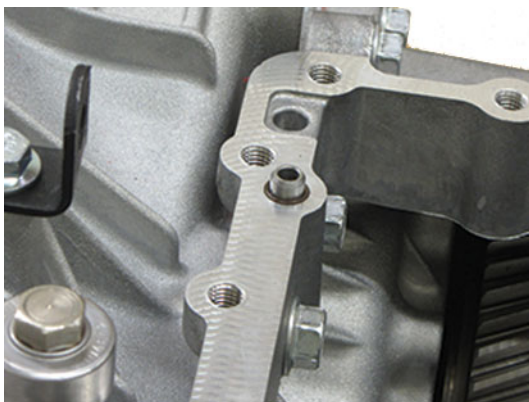


17. Verify Rail E is in neutral using the Fork Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against cover with rail against notch-end of gauge.

Note: If Rail E is not in neutral, slide rail in or out until neutral is achieved.



18. Slide O-ring over the MTM front alignment pin on the main housing until fully seated in the groove.



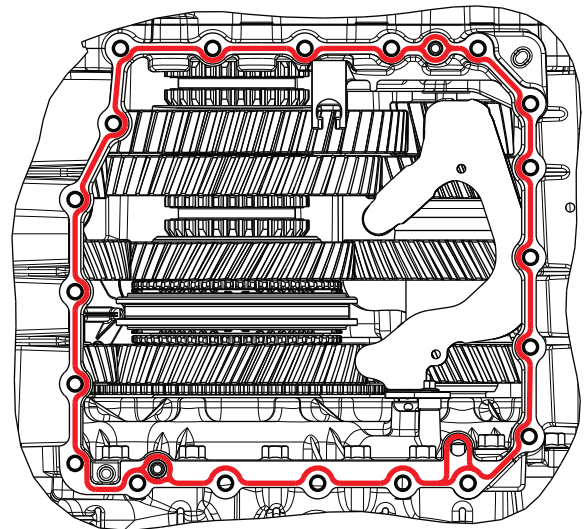
19. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

20. Apply gasket sealant with a bead width of 1.4-2.4mm (0.055-0.094 inch) to the transmission housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



21. Install MTM onto the transmission housing. Align Rail E in the MTM with the Rail E Shift Rail in the Main Housing.

CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.

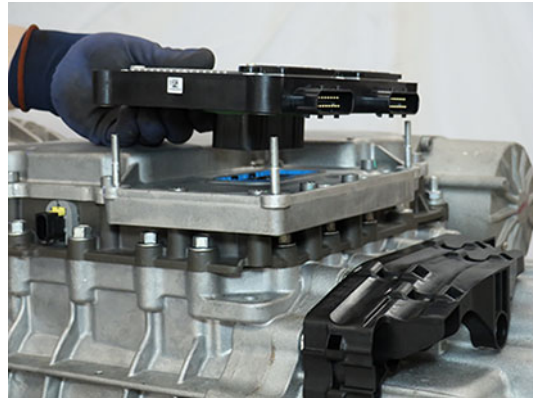
NOTICE: If the MTM is installed on the transmission and Rail E in the MTM is not aligned with Rail E in the Main Housing, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

22. Install 20 MTM cap screws and torque to 44.5-51.5 Nm (33-38 lb-ft) in a criss-cross pattern.

Note: 13 mm (x18), 15 mm (x2) cap screws.



2. Align the TCM to the 74-Way Harness Connector and TCM studs, then install the TCM.



Install the Transmission Control Module (TCM)

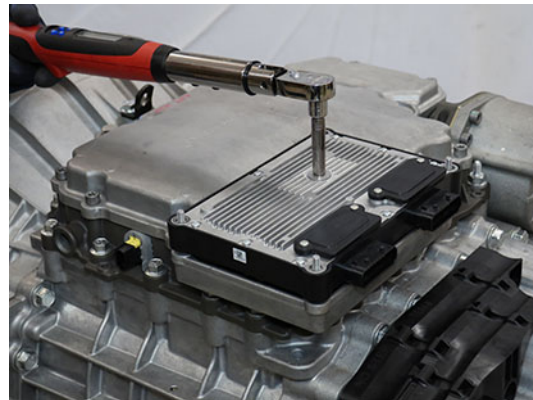
NOTICE: Do not allow contamination into the connectors on the TCM or MTM.

Note: TCM can be installed with transmission in-vehicle.

1. Install the TCM Seal on the 74-Way Harness Connector.

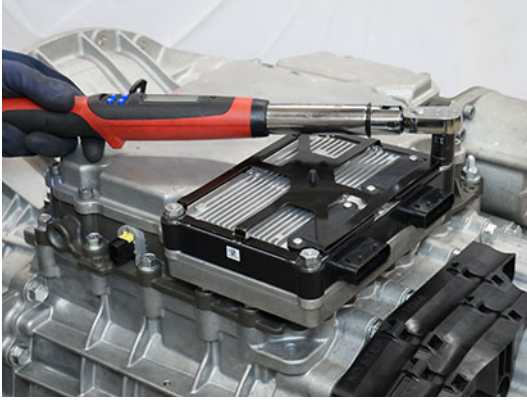


3. Torque the TCM 7 mm Jackscrew to 3.0-4.0 Nm (26.6-35.4 lb-in).



4. Install the TCM Cover over the 4 TCM studs and torque the 4 TCM Cover Nuts to 8.8-10.4 Nm (78-92 lb-in) in a criss-cross pattern.

Note: TCM Cover nuts are 10 or 13 mm.

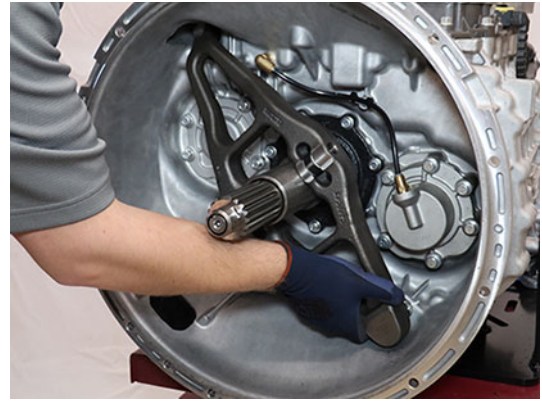


Install the Release Bearing and Clutch Release Yoke

1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



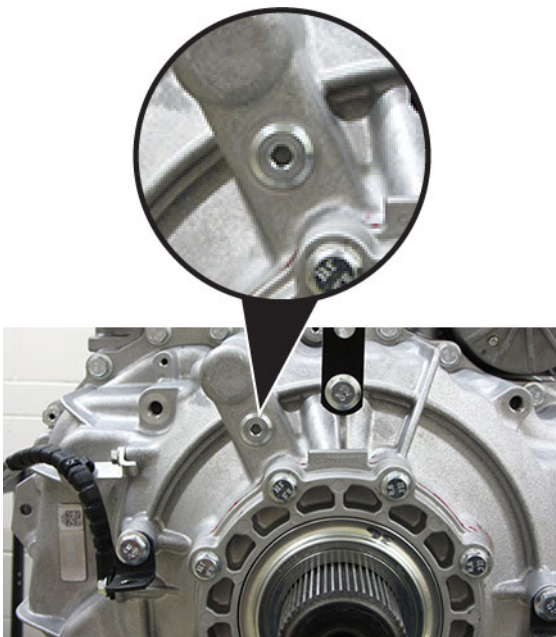
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

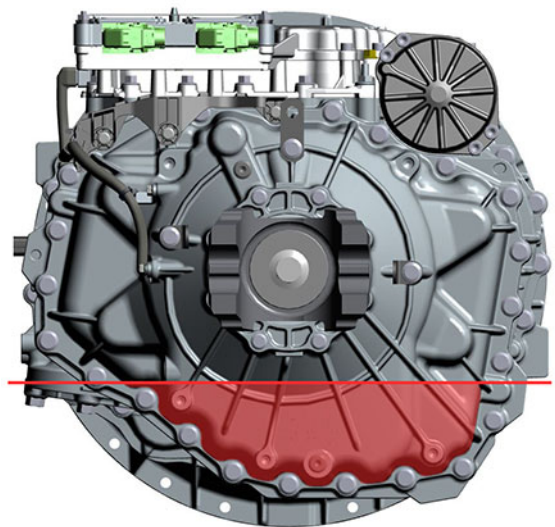
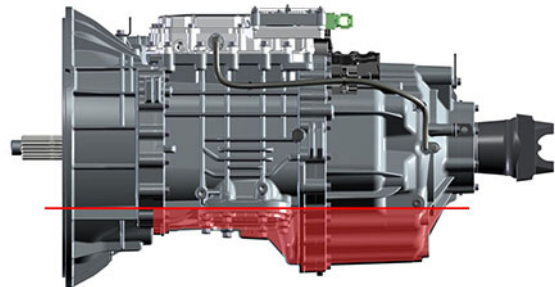


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

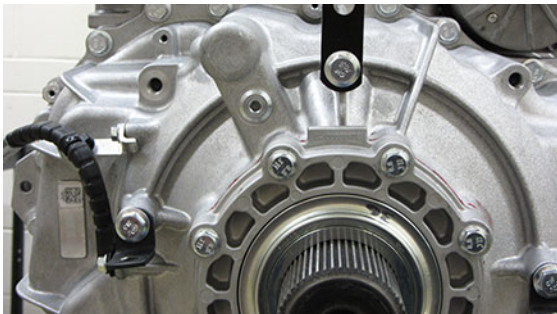
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To "Service Routines".
5. Select "Start" Clutch Calibration and follow on-screen prompts.
6. Select "Start" Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To "Fault Codes".
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select "Clear Eaton Faults" and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Main Shaft and Countershaft Service Procedure

Special Instructions

Main Shaft End-Play must be measured and adjusted after Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing or Main Shaft Bearing replacement. Perform **Main Shaft End-Play Service Procedure** to measure and adjust Main Shaft End-Play if any of the components mentioned above have been replaced.

CAUTION: Failure to measure and adjust Main Shaft End-Play could result in transmission component damage.

CAUTION: Always start Main Shaft End-Play procedure with the 6.525 mm Main Shaft Selective Washer installed. Failure to do so could result in internal component damage.

Special Tools

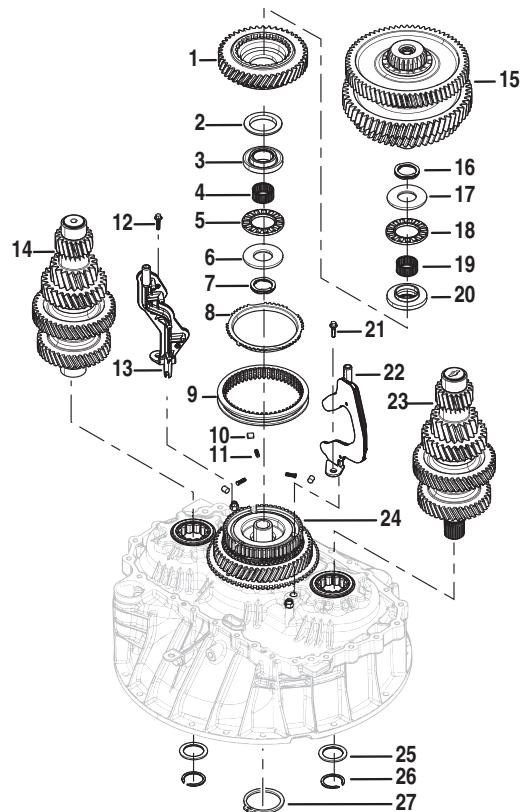
- Magnet
- Upper Countershaft Pilot Tool (RR1071TR)
- Lower Countershaft Pilot Tool (RR1072TR)
- Transmission Assembly Lube (Assemblee Goo™ - Firm Tack Green #19250 or equivalent)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.

CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification

1. Primary Drive Gear
2. Spherical Washer - Front
3. Bearing Race - Front
4. Needle Bearing - Front
5. Thrust Bearing - Front
6. Thrust Washer - Front
7. Wave Spring - Front
8. Synchronizer Ring
9. Synchronizer Sliding Sleeve
10. Synchronizer Rollers (x3)
11. Synchronizer Springs and Plungers (x3)
12. Lower Lube Tube Cap Screw - 8 mm
13. Lower Lube Tube
14. Upper Countershaft
15. Main Shaft Assembly
16. Wave Spring - Rear
17. Thrust Washer - Rear
18. Thrust Bearing - Rear
19. Needle Bearing - Rear
20. Bearing Race - Rear
21. Upper Lube Tube Cap Screw - 8 mm
22. Upper Lube Tube
23. Lower Countershaft
24. Input Shaft Assembly
25. Countershaft Flat Washers (x2)
26. Countershaft Snap Rings (x2)
27. Input Shaft Snap Ring



Create a Service Activity Report

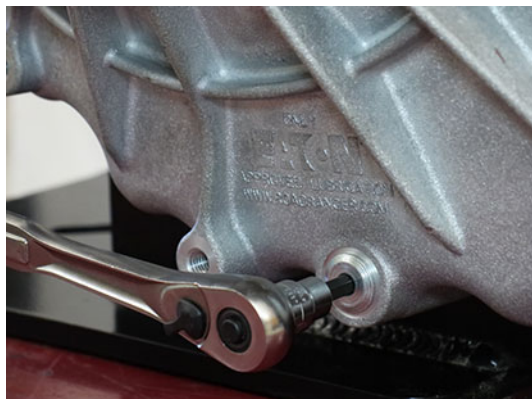
1. Key on with engine off.
2. Connect ServiceRanger and create a Service Activity Report.
3. Disconnect ServiceRanger.
4. Key off.

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.

6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



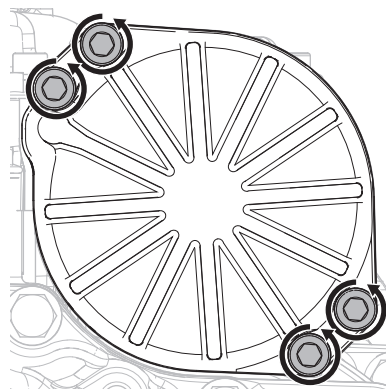
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

WARNING: Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Remove the Transmission

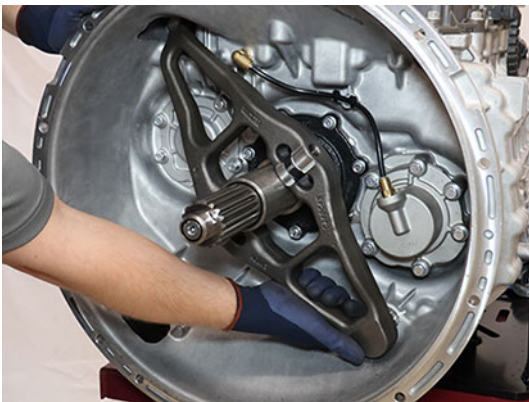
1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove the Release Bearing and Clutch Release Yoke

1. Remove the Release Bearing by sliding the bearing off the input shaft.



2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke assembly.



Remove the Upper Countershaft Cover

1. Remove the 6 Upper Countershaft Cover 13 mm cap screws and remove cover.



2. Remove the Upper Countershaft Cover O-ring.

NOTICE: A new Upper Countershaft Cover O-ring is required when reinstalling or an oil leak may occur.



Remove Upper Countershaft Snap Ring and Flat Washer

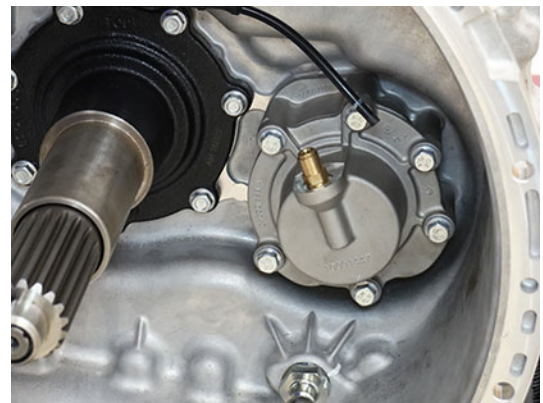
1. Remove Upper Countershaft Snap Ring and Flat Washer.

NOTICE: A new snap ring is required when reinstalling.



Remove the Lower Countershaft Cover and Inertia Brake

1. Depress and hold collar on air line fitting and disconnect the air line from the Inertia Brake Cover.



2. Remove the 6 Inertia Brake Cover 13 mm cap screws.



3. Remove the Inertia Brake Cover and Housing as an assembly.



5. Remove the Return Spring from the end of the lower countershaft using a magnet.



4. Remove Piston Pin from the end of the lower counter-
shaft.



Remove Lower Countershaft Snap Ring and Flat Washer

1. Remove Lower Countershaft Snap Ring and Flat Washer.

NOTICE: A new snap ring is required when reinstalling.



Remove the Transmission Control Module (TCM)

1. Unscrew the 4 TCM Cover nuts and remove TCM Cover.

Note: TCM Cover nuts are 10 or 13 mm.



2. Unscrew the TCM 7 mm Jackscrew. Lift and remove the TCM from the MTM.

NOTICE: Do not allow contamination into the connectors on the TCM or MTM.



3. Inspect the TCM Seal for damage.

NOTICE: Replace the TCM Seal if damaged.



4. If replacing the TCM, transfer the TCM Seal to the new TCM.

Remove the Mechatronic Transmission Module (MTM)

1. Lift the latch on the Output Speed Sensor Harness at the Connector on the Mechatronic Transmission Module (MTM).



2. Remove the Output Speed Sensor Harness from the Connector on the MTM.

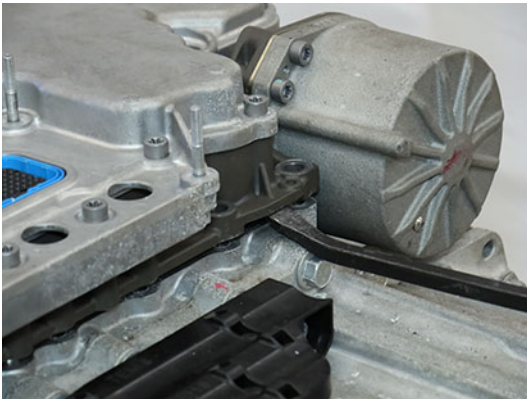


3. Remove the 20 MTM cap screws.

Note: 13 mm (x18), 15 mm (x2).



4. Separate the MTM from the Main Housing at the 2 pry points.



5. Remove the MTM from the transmission housing.

⚠ CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.



Remove the Output Speed Sensor

1. Remove the Output Speed Sensor Harness tie strap at the Harness Bracket.



2. Remove the 2 harness press-in retainers from the Main Housing and bracket on Rear Housing.



3. Remove the Output Speed Sensor 10 mm cap screw.



4. Remove the Output Speed Sensor from the Rear Housing.

Note: The sensor may need to be twisted and pulled from the bore.



Remove the Harness Bracket

Note: This procedure contains removing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Remove 3 Harness Bracket 10 mm cap screws.



2. Remove Harness Bracket.



Secure Transmission (Vertical)

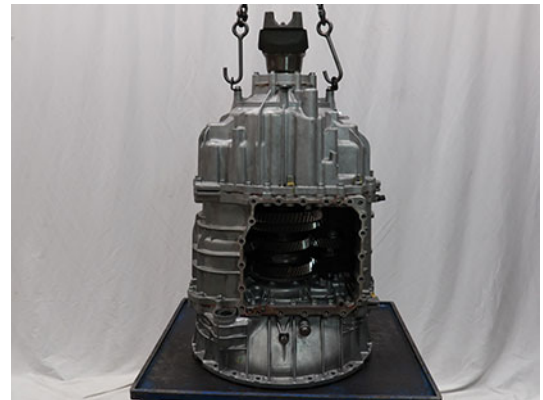
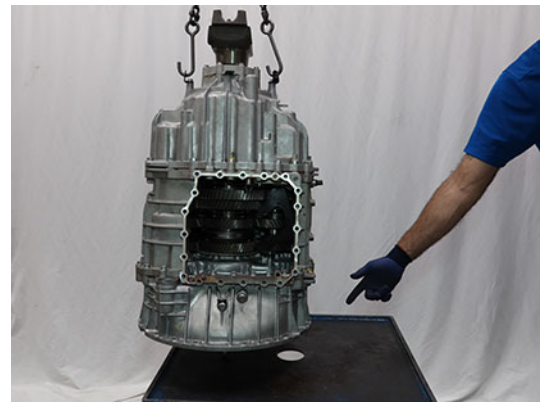
1. Place transmission in the vertical position with the front side down.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Use a surface with an opening that allows the input shaft to pass through and the clutch housing to sit flat and secure.



Remove the Rear Housing

1. At the 3 Rear Housing Threaded cap screws, apply paint marks on the Rear Housing to identify location.



2. Remove 21 Rear Housing and 3 threaded 16 mm cap screws.



3. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.

NOTICE: Failure to install alignment pins results in transmission component damage.



4. Separate the Rear Housing from the Main Housing at the 2 pry points.



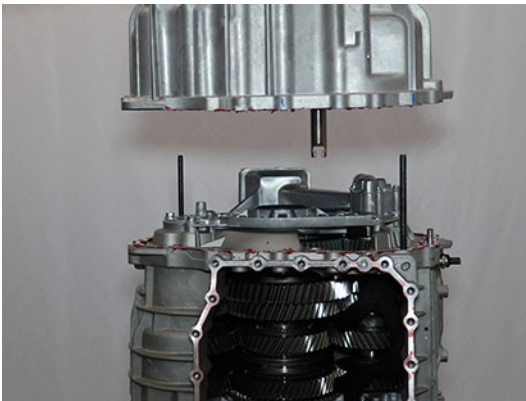
- Lift and remove Rear Housing Assembly from Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing Assembly may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Dual PTO Transmissions are equipped with a rear PTO lube tube port on the pump and rear PTO drive splines on the Upper Countershaft.



- Place Rear Housing Assembly on bench.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Keep fingers clear of pinch point between Rear Housing Assembly and other surfaces. Dropping Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Support the Rear Housing Assembly to prevent damage to Shift Rail E.



- Remove the 2 Rear Housing Alignment Pins (RR1090TR) from the Main Housing.

Remove the Oil Pump Assembly

1. Remove 18 Oil Pump Assembly 13 mm cap screws.



2. Remove Oil Pump Assembly.



3. Remove Oil Pump/Range Spacer with O-ring.



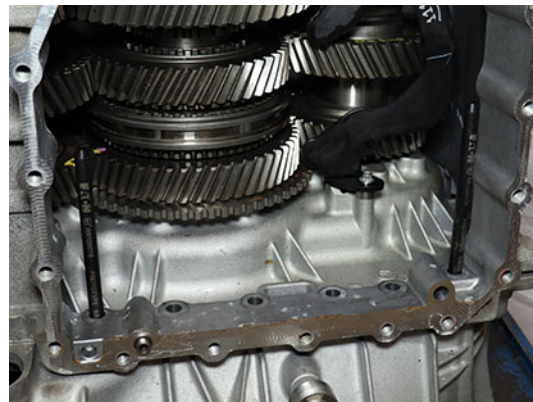
Remove Main Housing

1. Remove the 19 external and 6 internal Main Housing 16 mm cap screws.

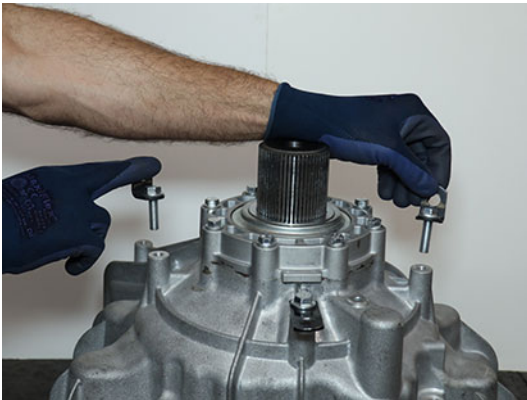
NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



2. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) in the internal Main Housing cap screw outer threaded holes.



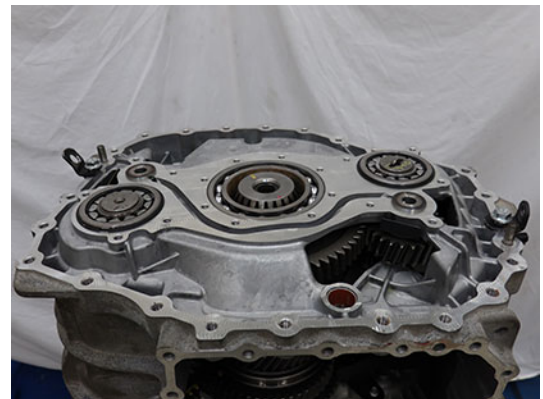
3. Remove 2 Rear Housing 90-degree Lifting Eye 15 mm cap screws from Rear Housing.



4. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



5. Separate Main Housing from Clutch Housing at the 2 pry points.



6. Lift and remove Main Housing from Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or personal injury.

NOTICE: Use an appropriate lifting device to safely lift component.



7. Remove 2 Rear Housing Alignment Pins (RR1090TR).



8. If Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing, or Main Shaft Bearing has been replaced, perform steps to **Install the Main Housing without Gasket Sealant** and measure Main Shaft End-Play. If these parts have NOT been replaced, perform steps to **Install Main Housing**.

Remove Main Shaft and Countershaft

1. Remove the Upper Lube Tube 8 mm cap screw.



2. Remove the Upper Lube Tube.



3. Remove the Lower Lube Tube 8 mm cap screw.



4. Remove the Lower Lube Tube.



5. Install a magnet onto Main Shaft Key to ensure the key stays in place during Main Shaft Removal and Installation.



6. Hold Rail C Sliding Clutch against Secondary Driven Gear and lift Main Shaft from Primary Drive Gear.

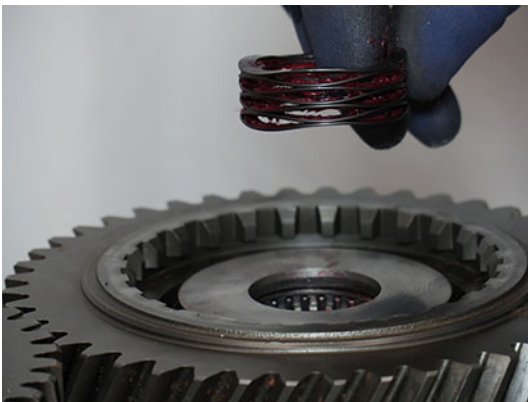


CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.

Note: Spring and Washer may remain attached to the Main Shaft during removal.



7. Remove Wave Spring - Rear.



8. Remove Thrust Washer - Rear.



9. Remove Thrust Bearing - Rear.



10. Remove Needle Bearing - Rear.



11. Remove Bearing Race - Rear.**12. Remove Primary Drive Gear.****13. Remove Lower Countershaft.**

CAUTION: Countershaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Countershaft and other surfaces. Dropping Countershaft could result in component damage and/or personal injury.

**14. Remove Upper Countershaft.**

CAUTION: Countershaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Countershaft and other surfaces. Dropping Countershaft could result in component damage and/or personal injury.



15. Remove Spherical Washer- Front.



18. Remove Thrust Bearing - Front.



16. Remove Bearing Race - Front.



19. Remove Synchronizer Ring.



17. Remove Needle Bearing - Front.



20. Slowly lift Synchronizer Sliding Sleeve up until Synchronizer Rollers are free from synchronizer assembly.

NOTICE: Rollers are under spring pressure, ensure to slowly lift sleeve so rollers do not eject from the synchronizer assembly during disassembly.



21. Remove 3 Synchronizer Rollers.



22. Remove 3 Synchronizer Plungers and Springs from Synchronizer hub.



23. Remove Thrust Washer - Front.



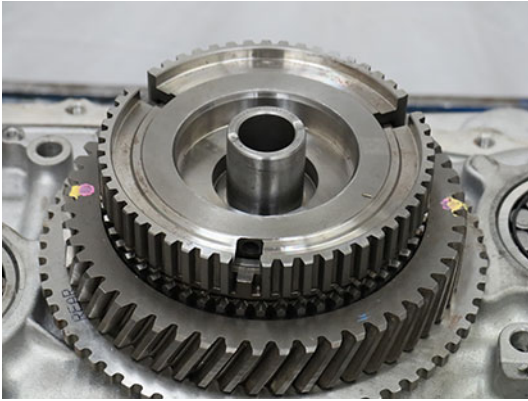
24. Remove Wave Spring - Front.



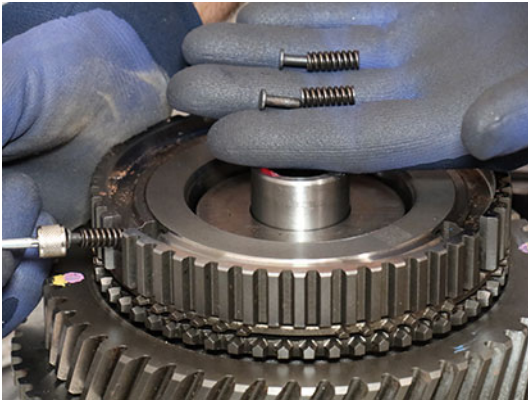
Install the Main Shaft and Countershaft

1. On the Secondary Drive Gear, apply paint marks on 2 gear teeth exactly 180-degrees across from each other, if not already marked.

Note: Paint marks are required for timing the Secondary Drive Gear to the Countershafts.



2. Install 3 springs and plungers into Synchronizer hub.



3. Install Rail B Synchronizer Sliding Sleeve with bevel facing up.

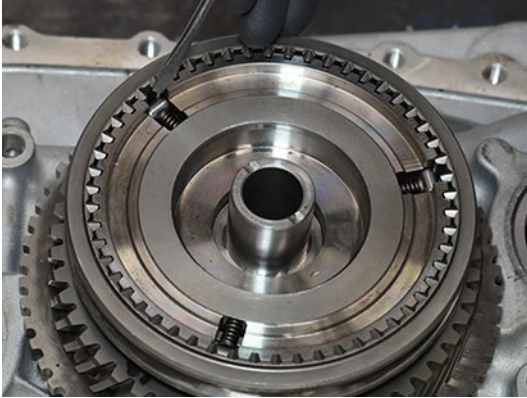
NOTICE: The tapered side of the sleeve is installed with the bevel facing up.



4. Lift and hold the Rail B Synchronizer Sliding Sleeve, install 3 rollers over the 3 springs and plungers and into the sliding sleeve groove.



5. Slowly press down the Synchronizer Sliding Sleeve to the neutral position and seat the 3 rollers evenly on the springs and plungers.



6. Install Rail B Synchronizer Ring.

Note: Align the 3 tabs on ring to the 3 openings on the hub at each spring and plunger.



7. Install Wave Spring - Front.

Note: Wave Spring - Front is taller than the Wave Spring - Rear.



8. Install Thrust Washer - Front.



9. Install Needle Bearing - Front.



10. Install Thrust Bearing - Front.**11. Install Bearing Race - Front.****12. Install Spherical Washer - Front with conical side down.****13. Install Lower Countershaft Pilot Tool (RR1071TR) to front section of Lower Countershaft.**

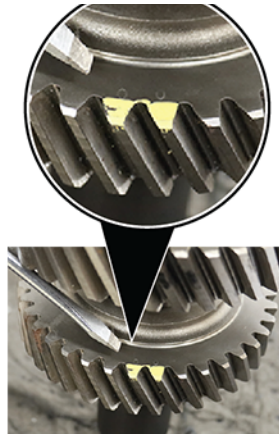
Note: Lower Countershaft has Inertia Brake Splines on the front and Oil Pump drive slot on the rear.



14. On the Lower Countershaft front drive gear, apply paint marks on the 2 gear teeth marked "0 0".

NOTICE: If the Secondary Drive Gear and countershaft front drive gears are not paint marked correctly, the gearing will not be properly timed and the Main Housing cannot be installed due to countershaft misalignment.

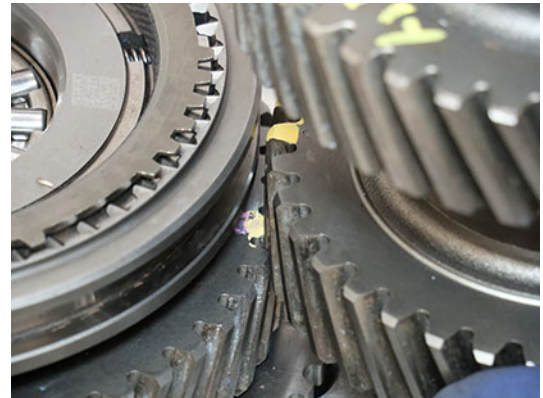
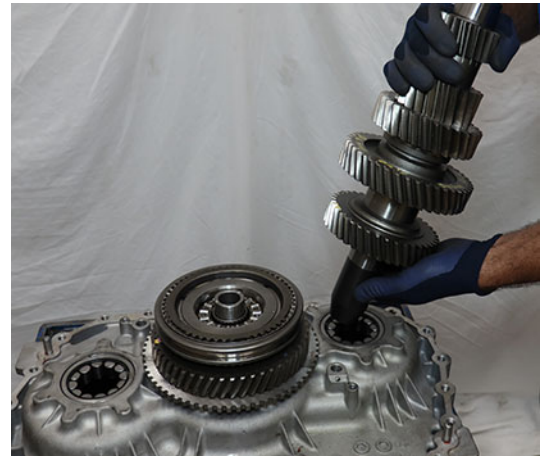
Note: Paint marks are required for timing the Secondary Drive Gear to the Countershafts.



15. Install Lower Countershaft with Countershaft Pilot Tool (RR1071TR). Ensure timing marks align with Secondary Drive Gear and Lower Countershaft front drive gear.



CAUTION: Countershaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Countershaft and other surfaces. Dropping Countershaft could result in component damage and/or personal injury.



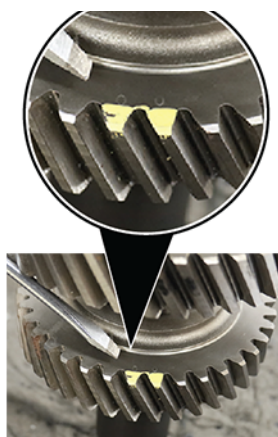
16. Install Upper Countershaft Pilot Tool (RR1072TR) to front section of Upper Countershaft.



17. On the Upper Countershaft front drive gear, apply paint marks on the 2 gear teeth marked "0 0".

NOTICE: If the Secondary Drive Gear and countershaft front drive gears are not paint marked correctly, the gearing will not be properly timed and the Main Housing cannot be installed due to countershaft misalignment.

Note: Paint marks are required for timing the Secondary Drive Gear to the Countershafts.



18. Install Upper Countershaft with Upper Countershaft Pilot Tool (RR1072TR) into bearing. Ensure timing marks align with Secondary Drive Gear and Upper Countershaft front drive gear.



CAUTION: Countershaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Countershaft and other surfaces. Dropping Countershaft could result in component damage and/or personal injury.



19. Install Primary Drive Gear with clutching teeth facing up onto Rail B Synchronizer.



22. Install Thrust Bearing - Rear.



20. Install Bearing Race - Rear.



21. Install Needle Bearing - Rear.



23. Apply transmission assembly lube to Wave Spring - Rear and install to Main Shaft.

NOTICE: Wave Spring - Rear is shorter than the Wave Spring - Front.

Note: Transmission assembly lube holds Wave Spring - Rear in place during Main Shaft Assembly installation.



24. Apply transmission assembly lube to Thrust Washer - Rear and install to Main Shaft.

Note: Transmission assembly lube holds Thrust Washer - Rear in place during Main Shaft Assembly installation.



25. Install a magnet onto the Main Shaft Key.

Note: The magnet holds the key in position during Main Shaft Assembly installation.



26. Slide and hold Rail C Sliding Clutch into Secondary Driven Gear.



27. Install Main Shaft Assembly onto Primary Drive Gear and align gearing.



CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.



28. Remove magnet from Main Shaft Key.

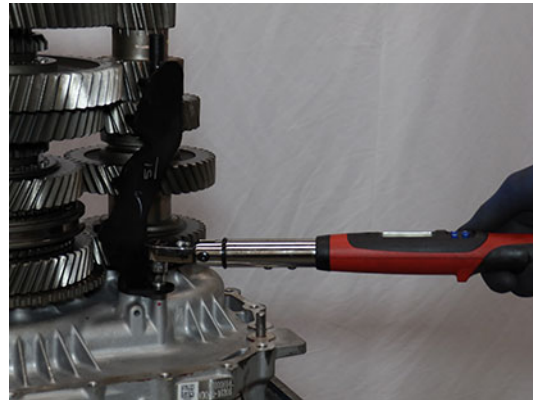
NOTICE: Ensure to remove magnet or component damage may occur during assembly.



29. Install Upper Lube Tube into Clutch Housing and install 8 mm cap screw and torque to 8–10 Nm (6–13 lb–ft).



30. Install Lower Lube Tube into Clutch Housing and 8 mm cap screw, torque to 8–10 Nm (6–13 lb–ft).



31. If Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing, or Main Shaft Bearing has been replaced, perform steps to Install the **Install the Main Housing without Gasket Sealant** before measuring and adjusting Main Shaft End-Play. If these parts have NOT been replaced, perform steps to **Install Main Housing**.

Install the Main Housing without Gasket Sealant

1. Clean the sealing surfaces on the Clutch Housing and Main Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

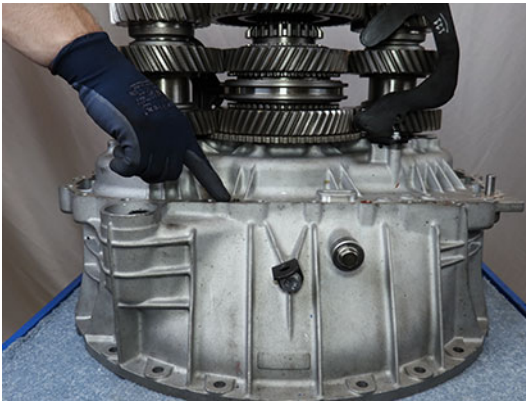
NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

3. Slide O-ring over the Clutch Housing Inertia Brake air passage alignment pin until fully seated in groove.

NOTICE: Failure to install a new o-ring could result in degraded transmission performance.



4. Install Lower Countershaft Pilot Tool (RR1071TR) onto Lower Countershaft above rear bearing race.



5. Install Upper Countershaft Pilot Tool (RR1072TR) onto the Upper Countershaft above rear bearing race.



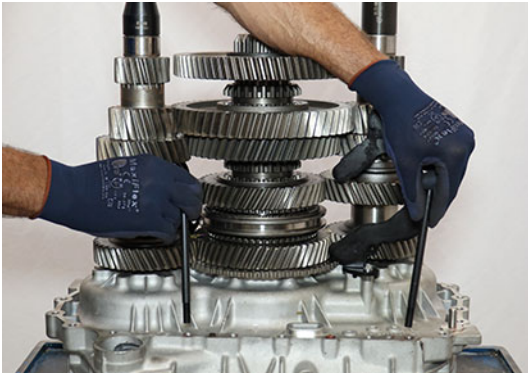
6. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten Lifting Eye cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



7. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) into the Clutch Housing as shown below.



8. Lift, align and install Main Housing to Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or serious injury.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Using a flat tipped screwdriver, rotate the Reverse Idler Gears to align the gearing and allow Main Housing to fully seat onto the Clutch Housing.

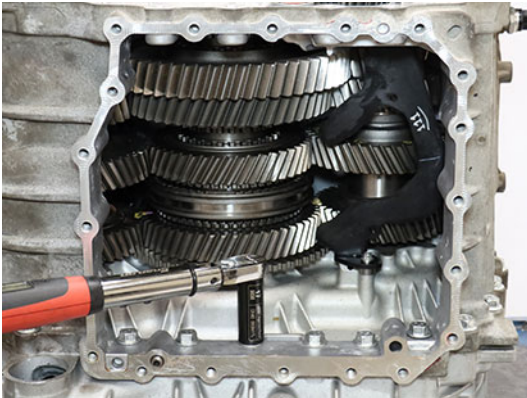


9. Remove 2 Rear Housing Alignment Pins (RR1090TR).



10. Install 19 external and 6 internal Main Housing 16 mm cap screws and torque to 44–51 Nm (33–38 lb-ft) in a criss-cross pattern.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



Measure and Adjust the Main Shaft End-Play

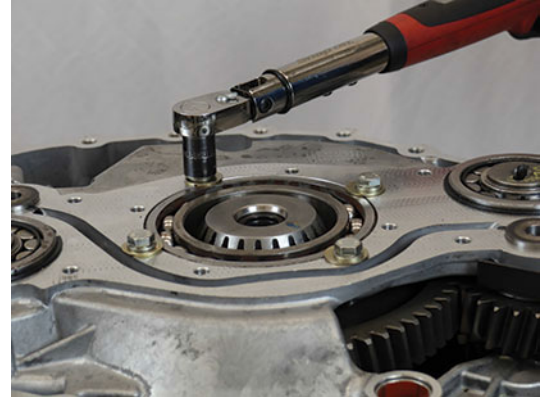
Note: The Main Shaft Selective Washer is available in 3 thicknesses: 6.525 mm (0.257 in), 6.712 mm (0.264 in) or 6.900 mm (0.272 in).

CAUTION: Ensure the Input Shaft Bearing and Main Shaft Bearing are seated in the Clutch Housing and Main Housing. Failure to fully seat bearings in housings will give an incorrect Main Shaft End-Play reading and may cause transmission component damage.

CAUTION: Ensure the 6.525 mm Main Shaft Selective Washer was installed. Only install a thicker selective washer after end-play has been measured and a thicker selective washer is required to achieve proper end-play or transmission damage may occur.

1. Install 4 Oil Pump 13 mm cap screws with flat washers (22.3 mm (0.9 in) minimum OD). Torque cap screws to 21-23 Nm (16-18 lb-ft).

Note: Flat washers are required to ensure the Main Shaft Bearing remains seated in the Main Housing during End-Play measurement.



2. Thread a Dial Indicator mounting shaft into one of the inner Oil Pump mounting holes around the Main Shaft Bearing.

Note: The Oil Pump cap screw mounting holes thread pattern: M8 x 1.25 x 30 mm.

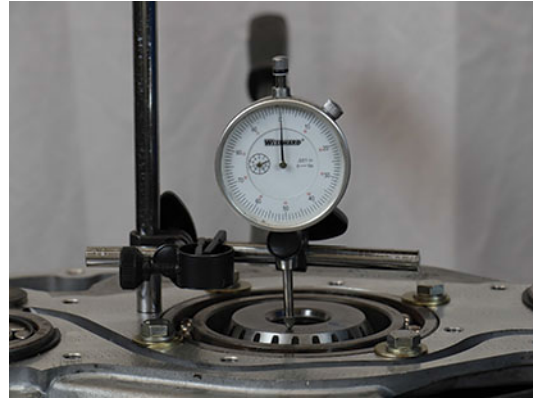


- 3. Mount the Dial Indicator to the shaft, set the plunger on the Main Shaft, and zero the Dial Indicator.

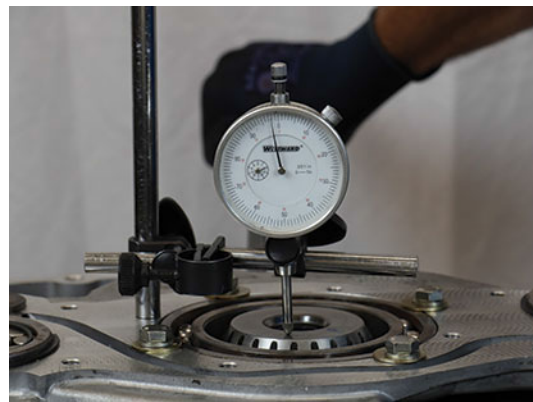
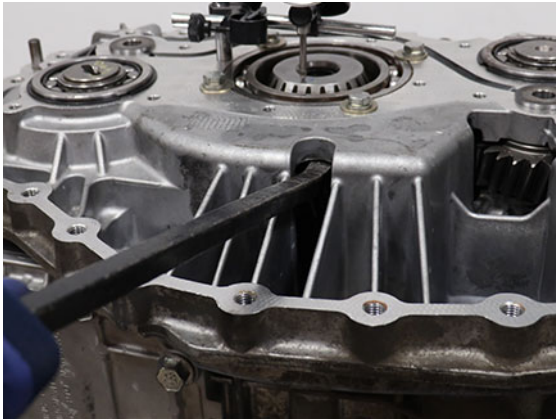
Note: Ensure that the Dial Indicator is vertical and zeroed for proper Main Shaft End-Play measurement.



- 5. Apply even downward pressure on Reverse Gear with both pry bars and monitor the Dial Indicator between the at-rest position of the Main Shaft and the point where no more downward movement is achieved. Record reading in table.



- 4. Use two pry bars and slide them between the Reverse Gear and Main Housing at the locations shown below.



Recorded End-Play

- Reference the Selective Main Shaft Washer Reference Chart and compare Recorded End-Play to reading in table.

Note: Main Shaft End-Play specification is 0.000-0.100 mm (0.000-0.004 in). The Selective Washer Chart is only valid for end-play measured with the 6.525 mm (0.257 in) selective washer installed.

- If end-play is in range, the installed Main Shaft Selective Washer, 6.525 mm (0.257 in), is correct.
- If end-play is out of range, determine the thicker ideal Main Shaft Selective Washer and record in table. Remove Main Shaft and install the Ideal Main Shaft Selective Washer.

Main Shaft Selective Washer Reference Chart

Recorded End-Play	Ideal Main Shaft Selective Washer Thickness and Part Number
0.000-0.100 mm (0.000-0.004 in)	6.525 mm (0.257 in) P/N 10000555
0.101-0.300 mm (0.005-0.011 in)	6.712 mm (0.264 in) P/N 10001759
0.301-0.550 mm (0.012-0.021 in)	6.900 mm (0.272 in) P/N 10001760

Ideal Main Shaft Selective Washer

CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

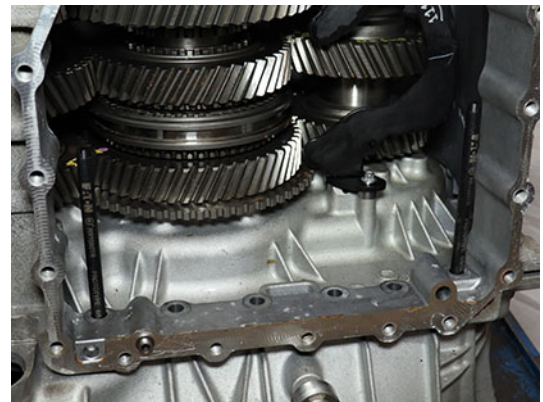
Remove Main Housing

- Remove the 19 external and 6 internal Main Housing 16 mm cap screws.

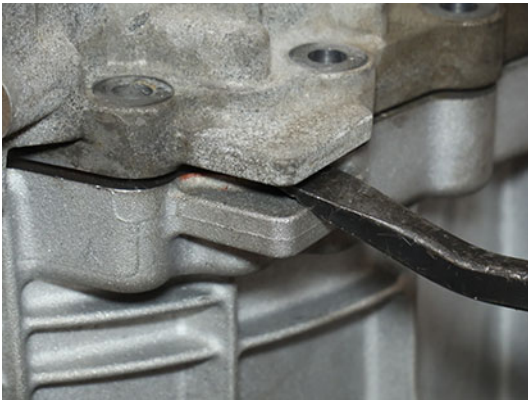
NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



- Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) in the internal Main Housing cap screw outer threaded holes.



3. Separate Main Housing from Clutch Housing at the 2 pry points.

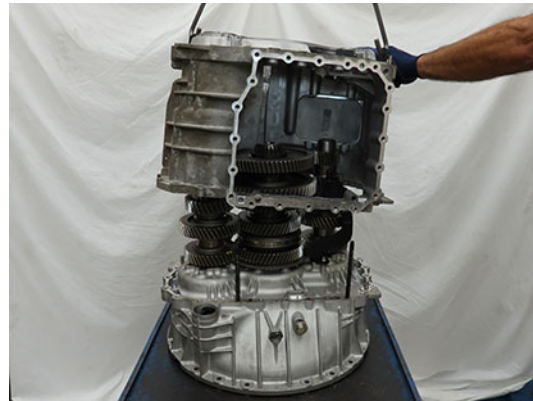


4. Lift and remove Main Housing from Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or personal injury.

NOTICE: Use an appropriate lifting device to safely lift component.



5. Remove 2 Rear Housing Alignment Pins (RR1090TR).

Note: Applying sealer when installing Main Housing to Clutch Housing should only be done after proper Main Shaft End-Play has been verified.



- Reference the Selective Main Shaft Washer Reference Chart and compare Recorded End-Play to reading in table.

Note: Main Shaft End-Play specification is 0.000-0.100 mm (0.000-0.004 in). The Selective Washer Chart is only valid for end-play measured with the 6.525 mm (0.257 in) selective washer installed.

- If end-play is in range, the installed Main Shaft Selective Washer, 6.525 mm (0.257 in), is correct.
- If end-play is out of range, determine the thicker Ideal Main Shaft Selective Washer and record in table. Remove Main Shaft and install the Ideal Main Shaft Selective Washer.

Main Shaft Selective Washer Reference Chart

Recorded End-Play	Ideal Main Shaft Selective Washer Thickness and Part Number
0.000-0.100 mm (0.000-0.004 in)	6.525 mm (0.257 in) P/N 10000555
0.101-0.300 mm (0.005-0.011 in)	6.712 mm (0.264 in) P/N 10001759
0.301-0.550 mm (0.012-0.021 in)	6.900 mm (0.272 in) P/N 10001760

Ideal Main Shaft Selective Washer

CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

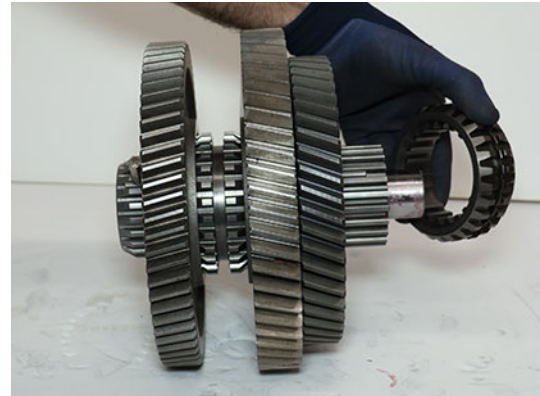
Disassemble the Main Shaft and Replace Main Shaft Selective Washer

Note: This procedure is only required if Main Shaft End-Play is out of range and a thicker Selective Washer is required.

- Place Main Shaft Assembly horizontally on a clean flat surface.

CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

- Remove Rail C Sliding Clutch.



- Place Main Shaft assembly vertically on a clean flat surface.

CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.



4. Remove Main Shaft Key while inserting 5/32 OD air line.



5. Rotate and remove the Main Shaft Selective Washer above Reverse Gear.

Note: The Main Shaft Selective Washer above Reverse Gear is available in 3 thicknesses; 6.525, 6.712 or 6.900 mm to control Main Shaft End-Play.



Assemble and Install the Main Shaft with Replaced Main Shaft Selective Washer

1. Install and rotate the Ideal Main Shaft Selective Washer above Reverse Gear recorded in Step 6 of the Main Shaft End-Play Service Procedure.

Note: The Main Shaft Selective Washer is available in 3 thicknesses: 6.525, 6.712 or 6.900 mm.



2. Slide the 5/32 OD air line up to align and hold washer in place.



3. Install Main Shaft Key at the same spline as the 5/32 OD air line.

Note: Insert Main Shaft Key while removing air line.

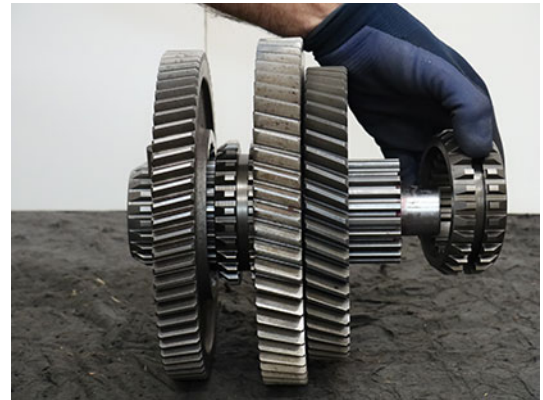
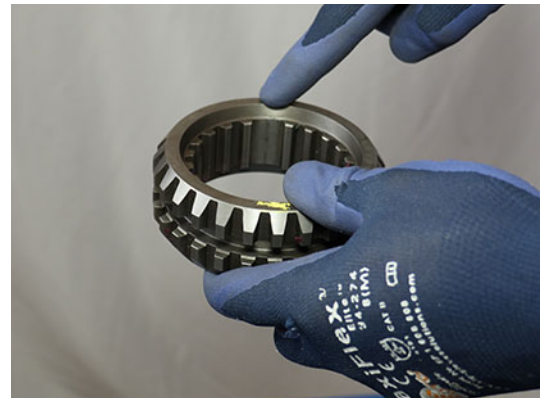


4. Install a magnet on Main Shaft Key to hold the key in place during final Main Shaft Assembly and installation into transmission.

Note: Remove magnet from Main Shaft Key after installation of Main Shaft Assembly onto transmission.



6. Install Rail C Sliding Clutch and align the double slot with Main Shaft Key.



5. Place Main Shaft Assembly horizontally on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

7. Apply transmission assembly lube to Wave Spring - Rear and install to Main Shaft.

NOTICE: Wave Spring - Rear is shorter than the Wave Spring - Front.

Note: Transmission assembly lube holds Wave Spring - Rear in place during Main Shaft Assembly installation.



8. Apply transmission assembly lube to Thrust Washer - Rear and install to Main Shaft.

Note: Transmission assembly lube holds Thrust Washer - Rear in place during Main Shaft Assembly installation.



9. Install a magnet onto the Main Shaft Key.

Note: The magnet holds the key in position during Main Shaft Assembly installation.



10. Slide and hold Rail C Sliding Clutch into Secondary Driven Gear.



11. Install Main Shaft Assembly onto Primary Drive Gear and align gearing.



CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.



12. Remove magnet from Main Shaft Key.

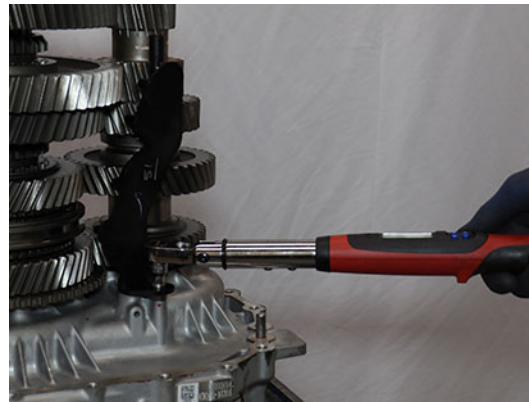
NOTICE: Ensure to remove magnet or component damage may occur during assembly.



13. If removed, install Upper Lube Tube into Clutch Housing and install 8 mm cap screw and torque to 8–10 Nm (6–13 lb–ft).



14. If removed, install Lower Lube Tube into Clutch Housing and 8 mm cap screw, torque to 8–10 Nm (6–13 lb–ft).



15. Perform steps to **Install the Main Housing without Gasket Sealant** and remeasure Main Shaft End-Play.



CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

Install Main Housing

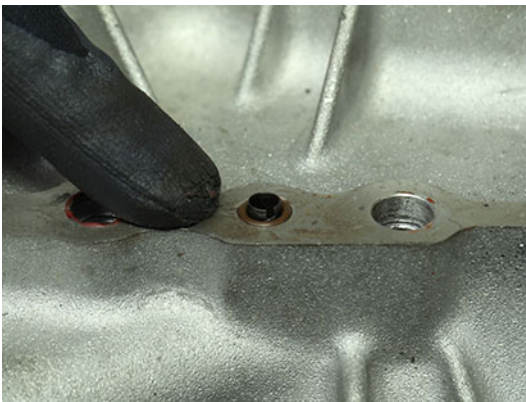
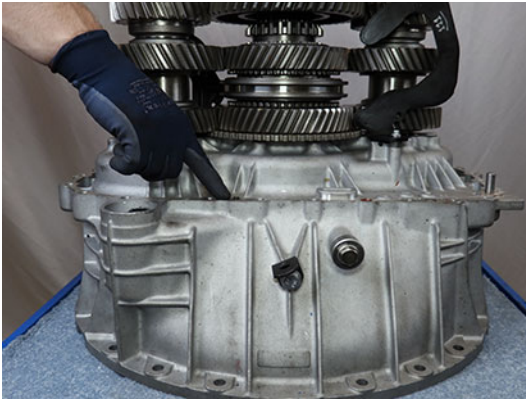
1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

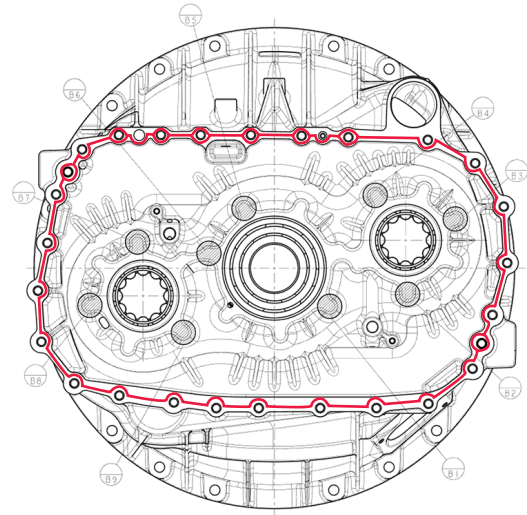
3. Slide O-ring over the Clutch Housing Inertia Brake air passage alignment pin until fully seated in groove.



4. Apply gasket sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to clutch housing as shown in pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying gasket sealant.



5. Install Lower Countershaft Pilot Tool (RR1071TR) onto Lower Countershaft above rear bearing race.



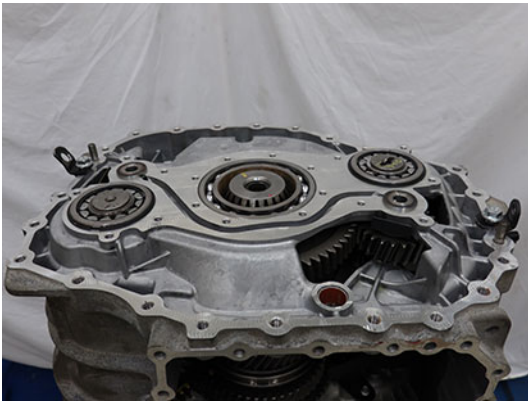
6. Install Upper Countershaft Pilot Tool (RR1072TR) onto the Upper Countershaft above rear bearing race.



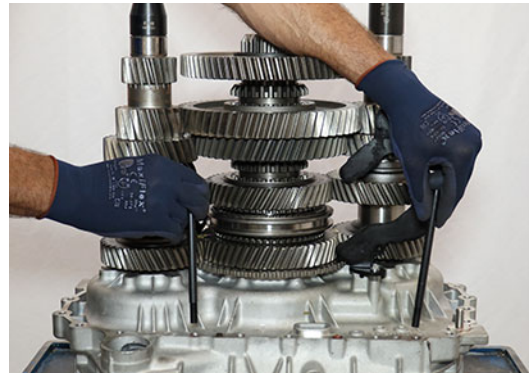
7. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten Lifting Eye cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



8. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) into the Clutch Housing as shown below.



9. Lift, align and install Main Housing to Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or serious injury.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Using a flat tipped screwdriver, rotate the Reverse Idler Gears to align the gearing and allow Main Housing to fully seat onto the Clutch Housing.



10. Remove 2 Rear Housing Alignment Pins (RR1090TR).



12. Re-install 2 Rear Housing 90-degree Lifting Eyes to the Rear Housing and torque to 49.6-55.5 Nm (36-40 lb-ft).

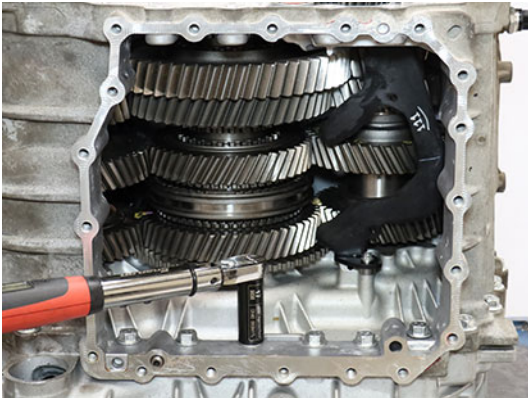


11. Remove 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws from Main Housing.



13. Install 19 external and 6 internal Main Housing 16 mm cap screws and torque to 44–51 Nm (33–38 lb–ft) in a criss-cross pattern.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



Install the Oil Pump Assembly

1. Install O-ring to the Oil Pump/Range Spacer.



2. Install Oil Pump/Range Spacer with O-ring and align tab with groove in Oil Pump Assembly.

NOTICE: Ensure the spacer tab is aligned with the groove and the spacer sits flush in the Oil Pump Assembly.



3. While holding the Oil Pump/Range Spacer in place, align oil pump drive key with slot on Lower Countershaft and install Oil Pump Assembly to Main Housing.



CAUTION: Failure to properly install the Oil Pump/Range Spacer and align the oil pump drive key results in transmission component damage during Oil Pump Assembly installation.

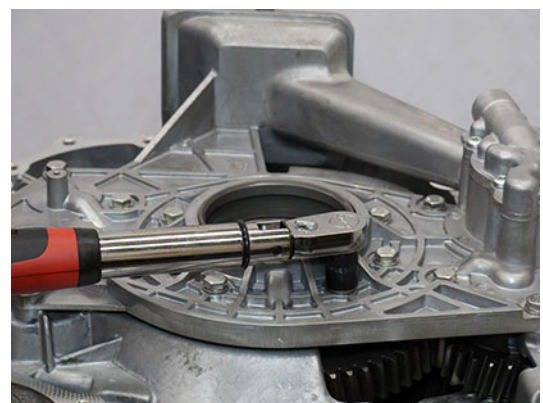
NOTICE: Ensure oil pump drive key is aligned with countershaft drive slot during Oil Pump Assembly installation.



4. Press Oil Pump Assembly to ensure it sits flat on Main Housing sealing surface.



5. Install 18 Oil Pump Assembly 13 mm cap screws and torque to 21–23 Nm (16–18 lb-ft) in a criss-cross pattern.



Install the Rear Housing

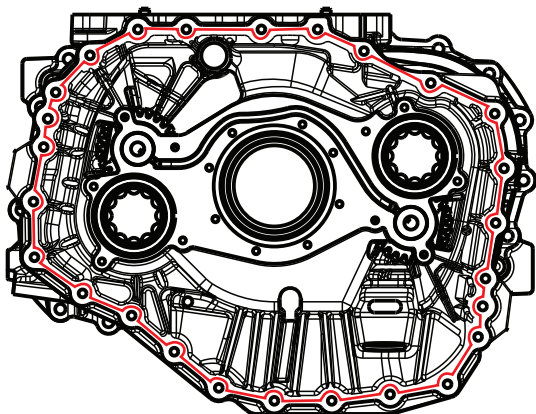
1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.
3. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to the transmission Main Housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission housing may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



4. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.



CAUTION: Failure to install alignment pins results in transmission component damage during Rear Housing Assembly installation.



5. Lift and install the Rear Housing Assembly on to the Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Align the Rear Housing to the alignment pins and align Shift Rail E into the Main Housing during installation.

Note: Rotate Output Shaft to align gearing and allow Rear Housing Assembly to fully seat on Main Housing.

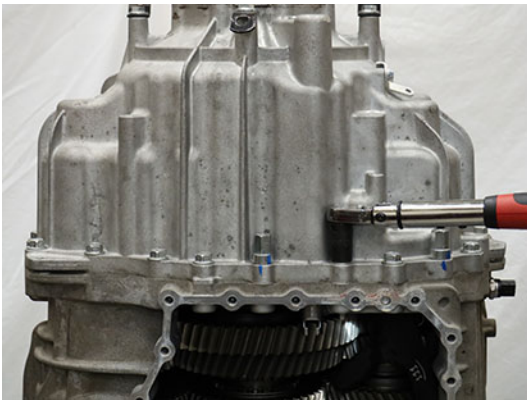


- Install the 3 Rear Housing Threaded 16 mm cap screws at the 3 paint mark locations.

Note: Two cap screws are used to mount the harness bracket and the third is used by the OEM for additional attachment points.



- Remove the 2 Rear Housing Alignment Pins (RR1090TR).
- Install the remaining 21 Rear Housing 16 mm cap screws and torque to 44.5 - 51.5 Nm (33-38 lb-ft) in a criss-cross pattern.



- Lift transmission horizontally onto a bench.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Secure Transmission (Horizontal)

- Securely place transmission in the horizontal position with the front side down.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Install Lower Countershaft Snap Ring and Flat Washer

- Install Lower Countershaft Flat Washer and Snap Ring.

NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from Countershaft and result in transmission component damage.



Install the Lower Countershaft Cover and Inertia Brake

1. Clean sealing surfaces on the Clutch Housing and Inertia Brake Housing.
2. Install the Inertia Brake Cover and Housing as an assembly over the Lower Countershaft, rotate the assembly to align the Friction Discs to the Lower Countershaft splines and seat the assembly to the clutch housing.



3. While holding the Inertia Brake Housing to the clutch housing, remove the Inertia Brake Cover.

NOTICE: Ensure the Friction Discs are splined to the lower countershaft and Wear Guides are fully seated.



4. Install the Return Spring into the Lower Countershaft.



5. Install the Piston Pin into the Lower Countershaft.



6. Install the Inertia Brake Cover onto the housing.



7. Install the 6 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



8. Insert air line in push-to-connect fitting on the Inertia Brake Cover.



Install Upper Countershaft Snap Ring and Flat Washer

1. Install Upper Countershaft Flat Washer and Snap Ring.

NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from countershaft and result in transmission component damage.



Install the Upper Countershaft Cover

1. Clean the sealing surfaces on the clutch housing and the Upper Countershaft Cover.

2. Insert the Upper Countershaft Cover O-ring into the groove until fully seated.



3. Install the Upper Countershaft Cover to the Clutch Housing.
4. Install the six 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



Install the Harness Bracket

Note: This procedure contains installing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Install Harness Bracket.



2. Install 3 Harness Bracket 10 mm cap screws and torque to 8.8 - 10.4 Nm (6-8 lb-ft).



Install the Output Speed Sensor

1. Clean the sensor bore.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surface.

2. Apply a light coat of transmission oil to the sensor O-ring.

3. Install the Output Speed Sensor into the bore.

Note: The Sensor may need to be twisted and pushed into the bore.



4. Install the Output Speed Sensor 10 mm cap screw and torque to 8.8-10.4 Nm (6-8 lb-ft).



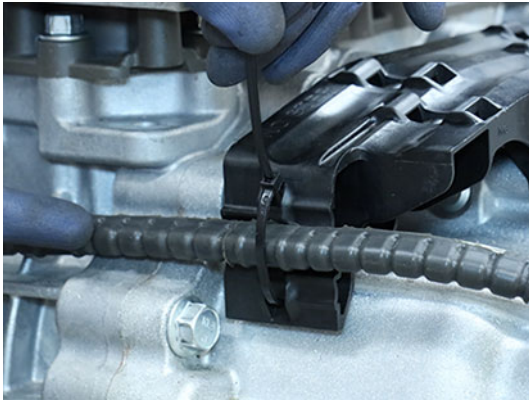
5. Press the 2 harness press-in retainers into the Main Housing and the bracket on the rear housing.



- Secure the Output Speed Sensor Harness to the Harness Bracket with a tie strap.



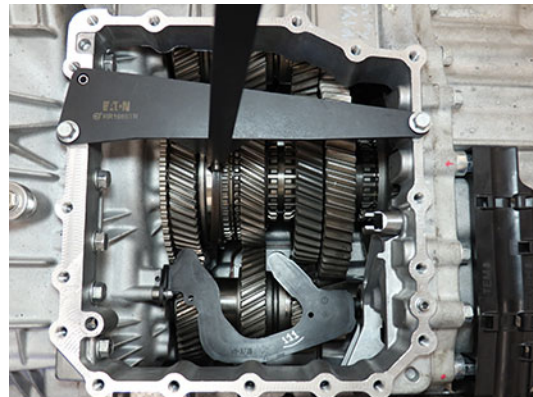
CAUTION: Failure to tie strap the Output Speed Sensor Harness to the Harness Bracket may result in harness damage.



- Install the Rail B Engagement Tool (RR1088TR) to the Main Housing and hand tighten with 2 MTM cap screws.



- Shift the Rail B Synchronizer to neutral.



- Remove the Rail B Engagement Tool.

Install the Mechatronic Transmission Module (MTM)

- Place the transmission in a horizontal position.

NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.

- Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

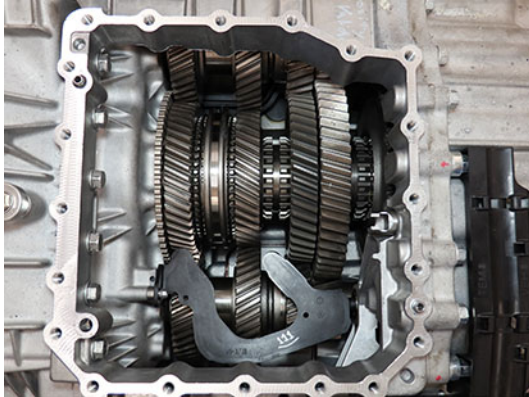
NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

- Inspect threaded bolt holes for debris and clean if necessary.

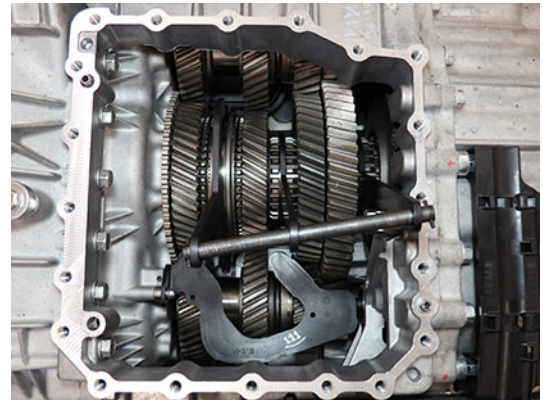
NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

7. Move Rail C and Rail D sliding clutches to neutral.

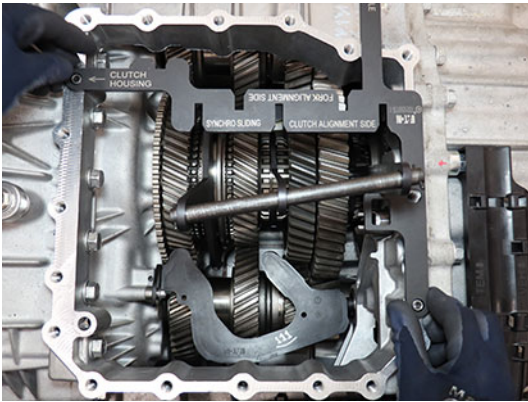
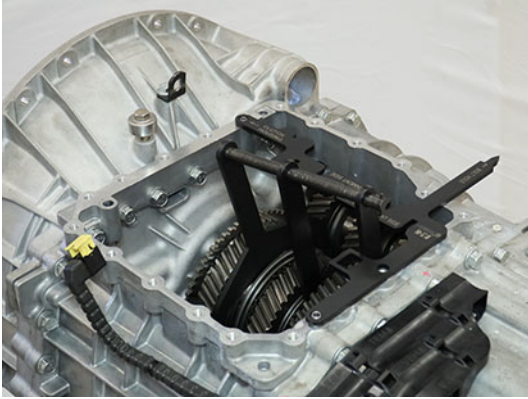
NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.



8. Install the Confirm-Neutral Gauge (RR1086TR-2) into the slots of the synchronizer and sliding clutches.

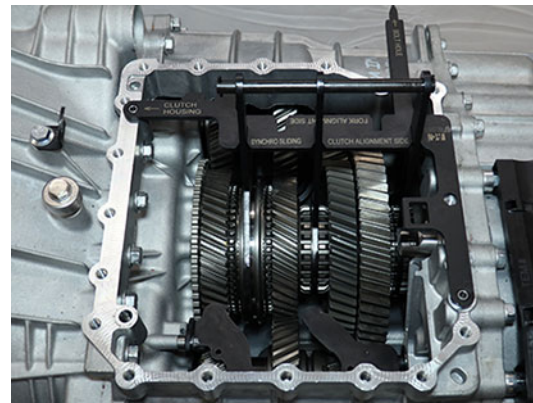
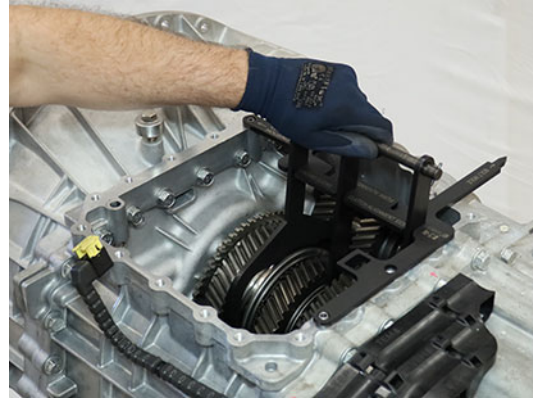


9. Install the MTM Alignment Tool (RR1086TR-1) onto the main housing.

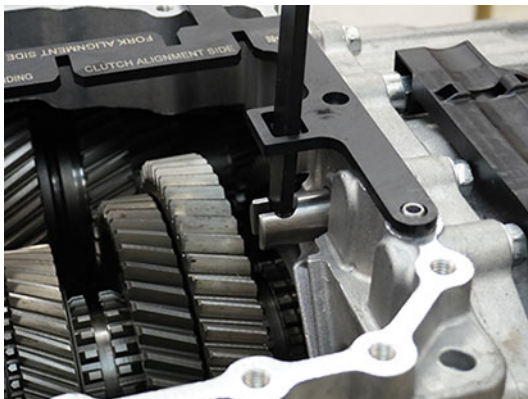
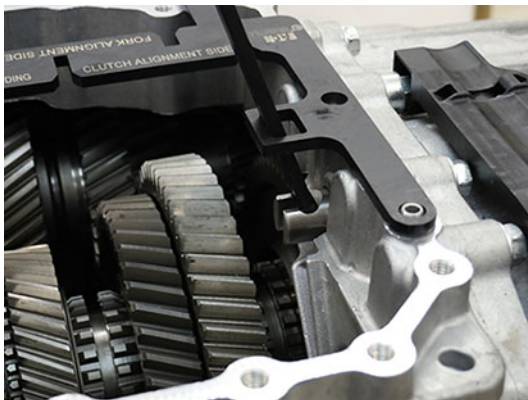
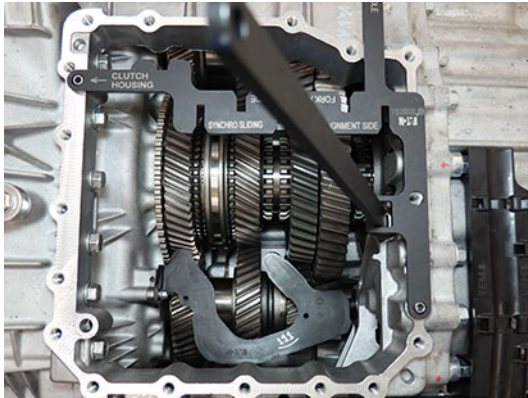


10. Verify synchronizer and sliding clutches are in neutral by sliding Confirm-Neutral Gauge into the slots of MTM Alignment Tool.

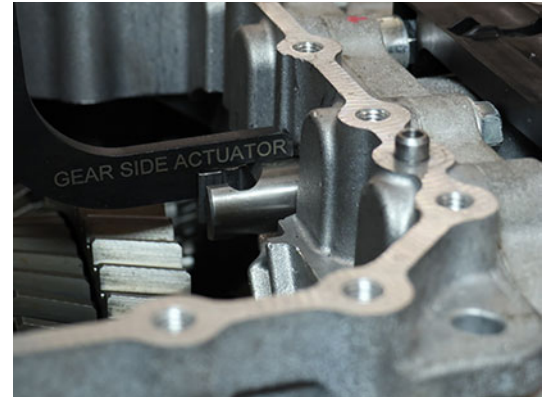
Note: If the gauge does not slide into the alignment tool slots, neutral is not achieved. Go to Step 4.



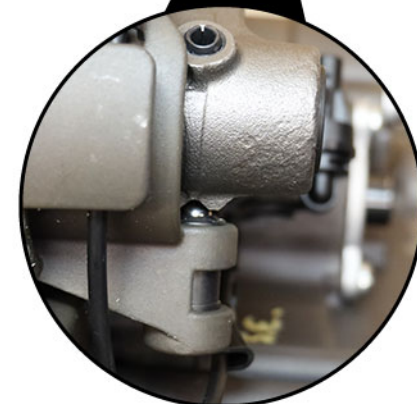
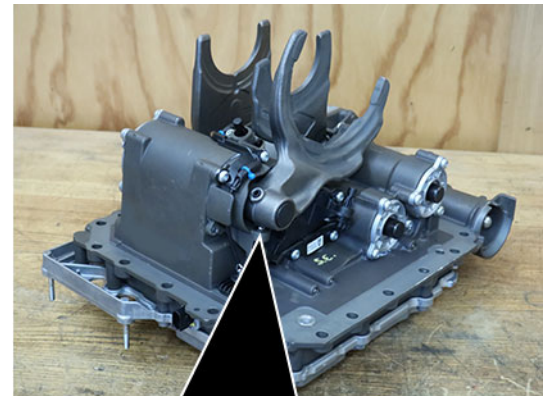
11. Using the Rail E Lever, move Rail E to neutral.



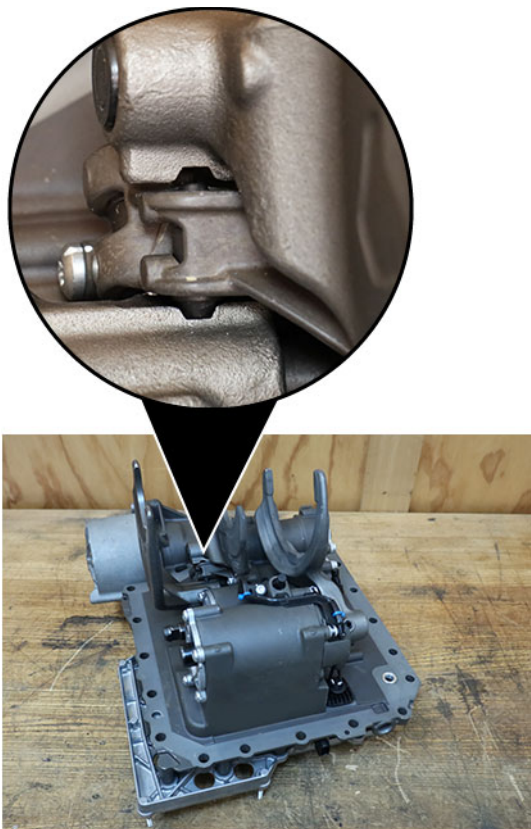
12. Verify Rail E is in neutral using the Gear Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against housing with rail against notch-end of gauge.



13. Move Shift Rail B in the MTM to neutral. Rail B is in neutral when the ball detent is in the notch of the Rail B yoke assembly.

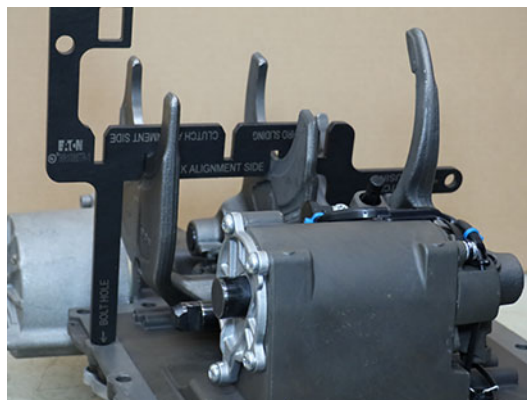


14. Move Shift Rails C and D in the MTM to neutral. Rails C and D are in neutral when the shift inter-lock is aligned with the notches of the rail yoke assemblies.



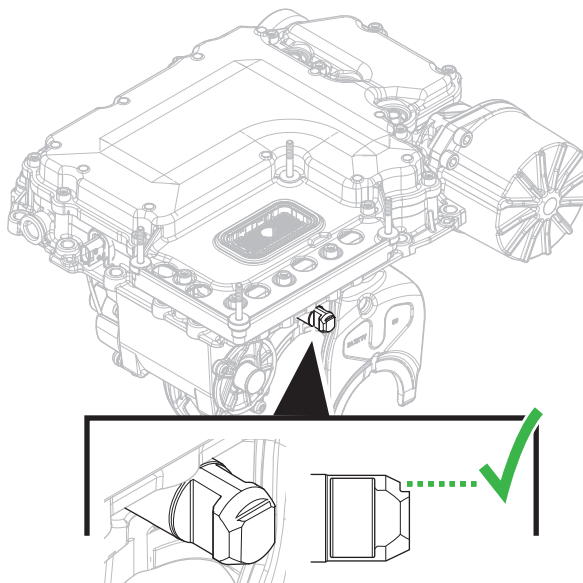
15. Verify MTM is in neutral. Install the MTM Alignment Tool (RR1086TR-1) into the bolt hole and onto Rail B, C, and D Shift Yokes.

Note: If the MTM Alignment Tool slots do not align with the 3 shift yokes, neutral has not been achieved. Go to Step 13.



16. Verify notch on Rail E is facing up.

Note: If the MTM is installed on the transmission with the notch on Rail E facing down, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

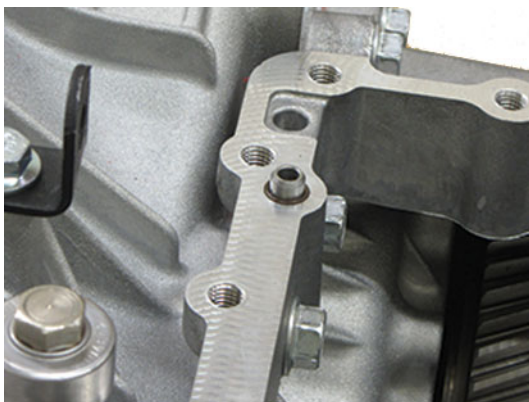


17. Verify Rail E is in neutral using the Fork Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against cover with rail against notch-end of gauge.

Note: If Rail E is not in neutral, slide rail in or out until neutral is achieved.



18. Slide O-ring over the MTM front alignment pin on the main housing until fully seated in the groove.



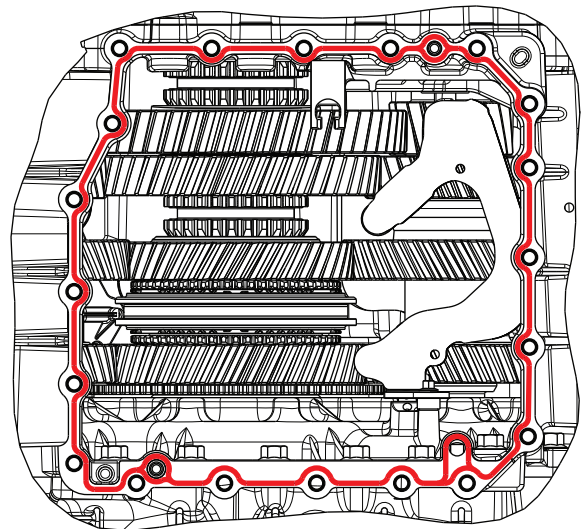
19. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

20. Apply gasket sealant with a bead width of 1.4-2.4mm (0.055-0.094 inch) to the transmission housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



21. Install MTM onto the transmission housing. Align Rail E in the MTM with the Rail E Shift Rail in the Main Housing.

CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.

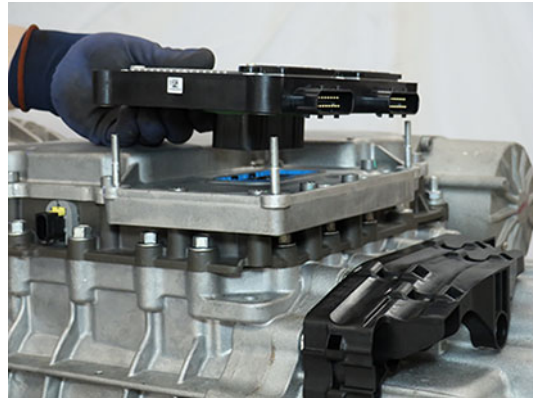
NOTICE: If the MTM is installed on the transmission and Rail E in the MTM is not aligned with Rail E in the Main Housing, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

22. Install 20 MTM cap screws and torque to 44.5-51.5 Nm (33-38 lb-ft) in a criss-cross pattern.

Note: 13 mm (x18), 15 mm (x2) cap screws.



2. Align the TCM to the 74-Way Harness Connector and TCM studs, then install the TCM.



Install the Transmission Control Module (TCM)

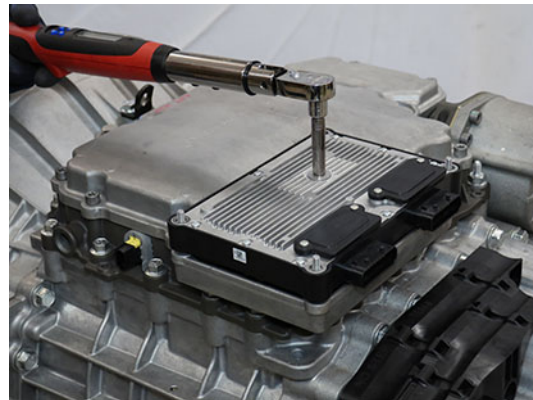
NOTICE: Do not allow contamination into the connectors on the TCM or MTM.

Note: TCM can be installed with transmission in-vehicle.

1. Install the TCM Seal on the 74-Way Harness Connector.

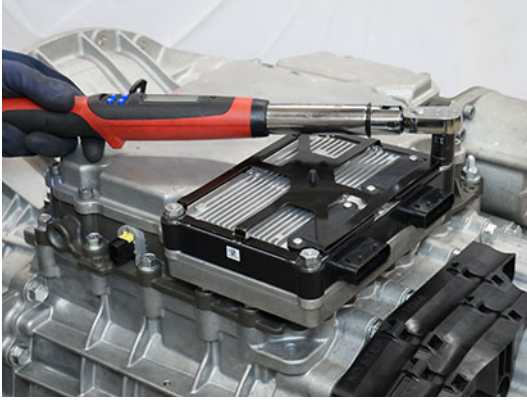


3. Torque the TCM 7 mm Jackscrew to 3.0-4.0 Nm (26.6-35.4 lb-in).



4. Install the TCM Cover over the 4 TCM studs and torque the 4 TCM Cover Nuts to 8.8-10.4 Nm (78-92 lb-in) in a criss-cross pattern.

Note: TCM Cover nuts are 10 or 13 mm.

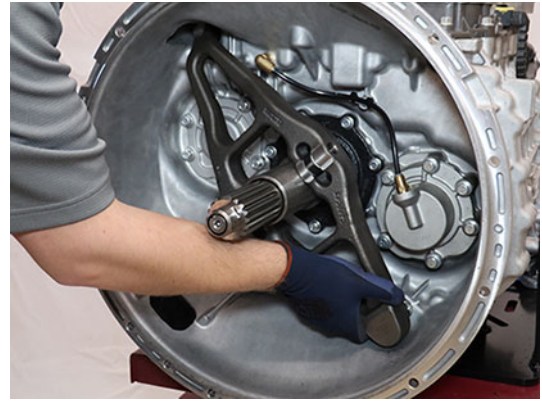


Install the Release Bearing and Clutch Release Yoke

1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



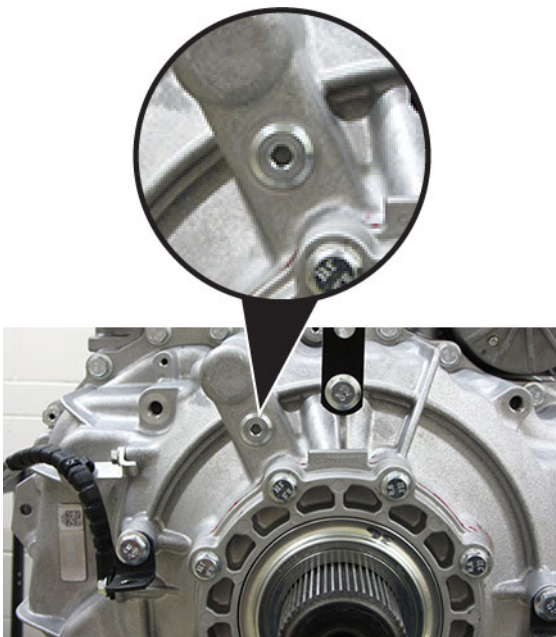
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

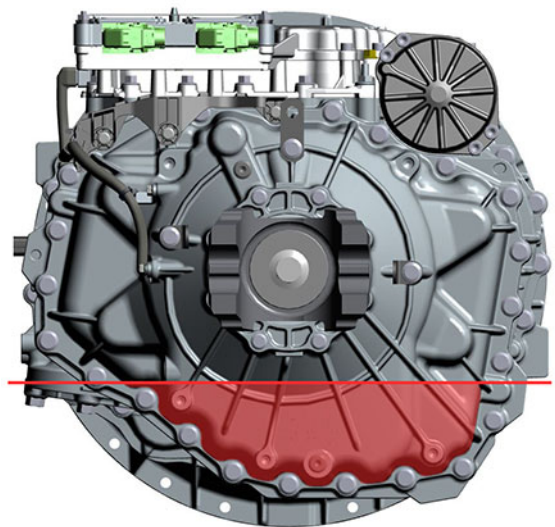
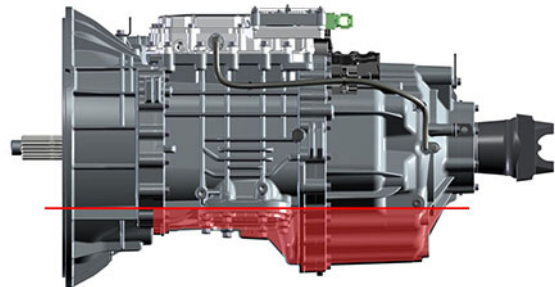


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

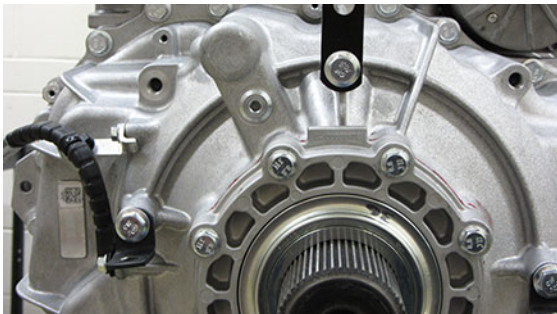
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Output Seal Assembly

Special Instructions

None

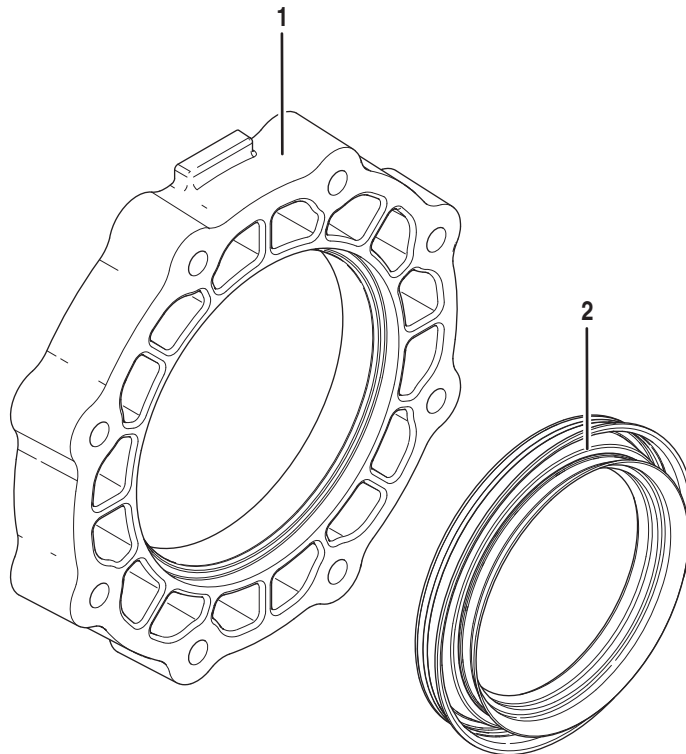
Special Tools

- Output Seal Driver (RR1001TR-8)
- Output Seal Driver Handle (RR1001TR-2)

Note: RR1001TR-2 is part of Output Seal Driver Kit (RR1001TR) and may have already been purchased to support prior transmission models.

- Plastic Scraper

Component Identification



1. Rear Bearing Cover
2. Output Shaft Seal

Assemble the Output Seal

1. Place the Rear Bearing Cover on a flat clean surface the pry points down.

NOTICE: A new Rear Bearing Cover is required when replacing the Output Seal to ensure no leaks occur between the cover and new seal.



2. Place the Output Seal Driver (RR1001TR-8) onto the Output Seal Driver Handle (RR1001TR-2).
3. Place the Output Seal onto the Output Seal Driver (RR1001TR-8).



4. Install the Output Seal and driver assembly into the Rear Bearing Cover and drive until the seal is seated against the cover.

NOTICE: Fully seat Output Seal into Bearing Cover.



Lower Countershaft Cover and Inertia Brake Disassembly/Assembly Service Procedures

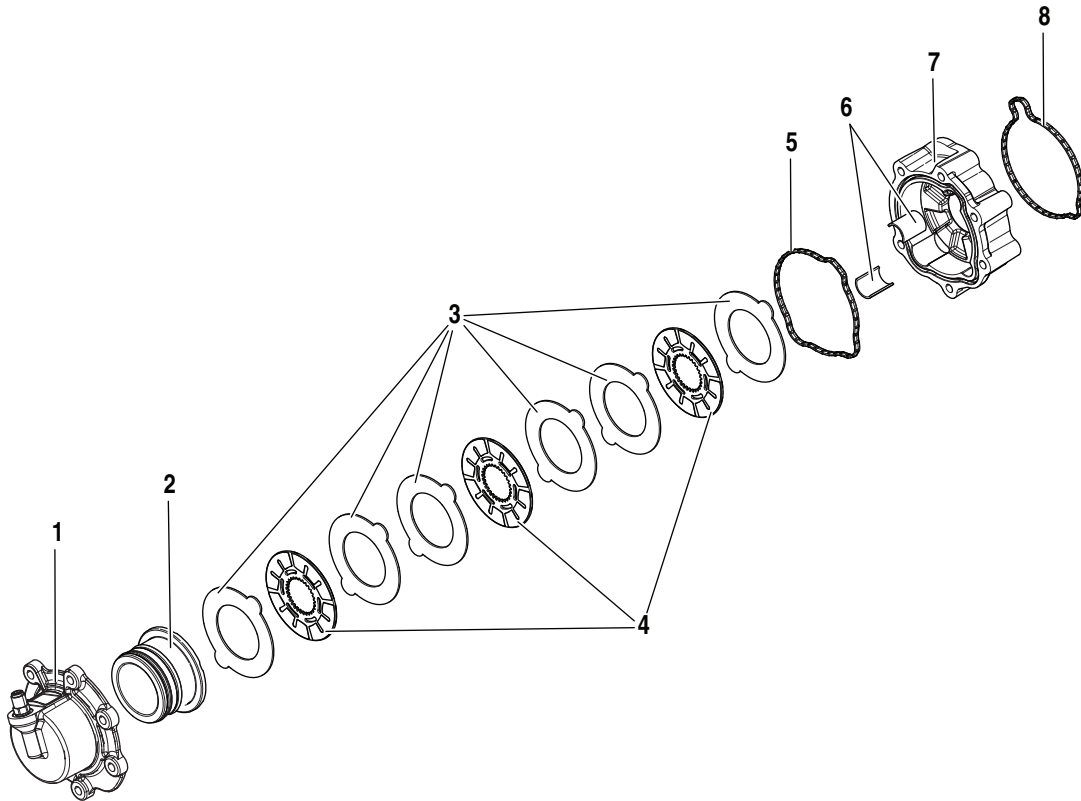
Special Instructions

None

Special Tools

None

Component Identification



1. Inertia Brake Cover
2. Inertia Brake Piston
3. Steel Discs (x6)
4. Friction Discs (x3)
5. O-ring - Front
6. Wear Guides (x2)
7. Inertia Brake Housing
8. O-ring - Rear

Disassemble the Inertia Brake

1. Remove the clutch pack from the Inertia Brake Housing.



2. Remove the 2 wear guides from the Inertia Brake Housing.



3. Remove O-ring from the front of the Inertia Brake Housing.



4. Remove O-ring from the rear of the Inertia Brake Housing.



Assemble the Inertia Brake

1. Insert the O-ring into the groove on the rear of the Inertia Brake Housing until fully seated.



2. Insert the O-ring into the groove on the front of the Inertia Brake Housing until fully seated.



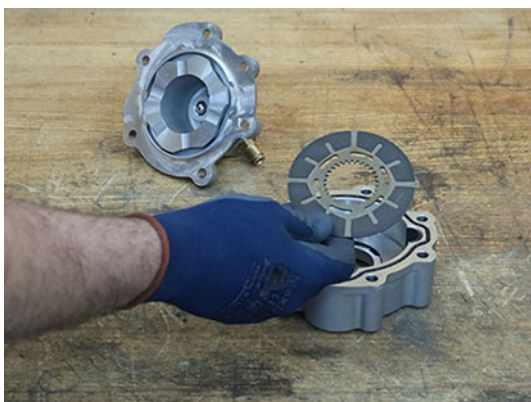
3. Install the 2 Wear Guides in the Inertia Brake Housing.



4. Install the inertia brake clutch pack in the order shown below:

- 1 Steel Disc,
- 1 Friction Disc,
- 2 Steel Discs,
- 1 Friction Disc,
- 2 Steel Discs,
- 1 Friction Disc, and
- 1 Steel Disc.

Note: Steel Discs align with Wear Guides. Friction Discs spline to the lower countershaft.



5. Place Inertia Brake Cover and Piston on the Housing. Align the bolt holes.

Input Shaft Pilot Bearing Wear Sleeve Disassembly/Assembly Service Procedures

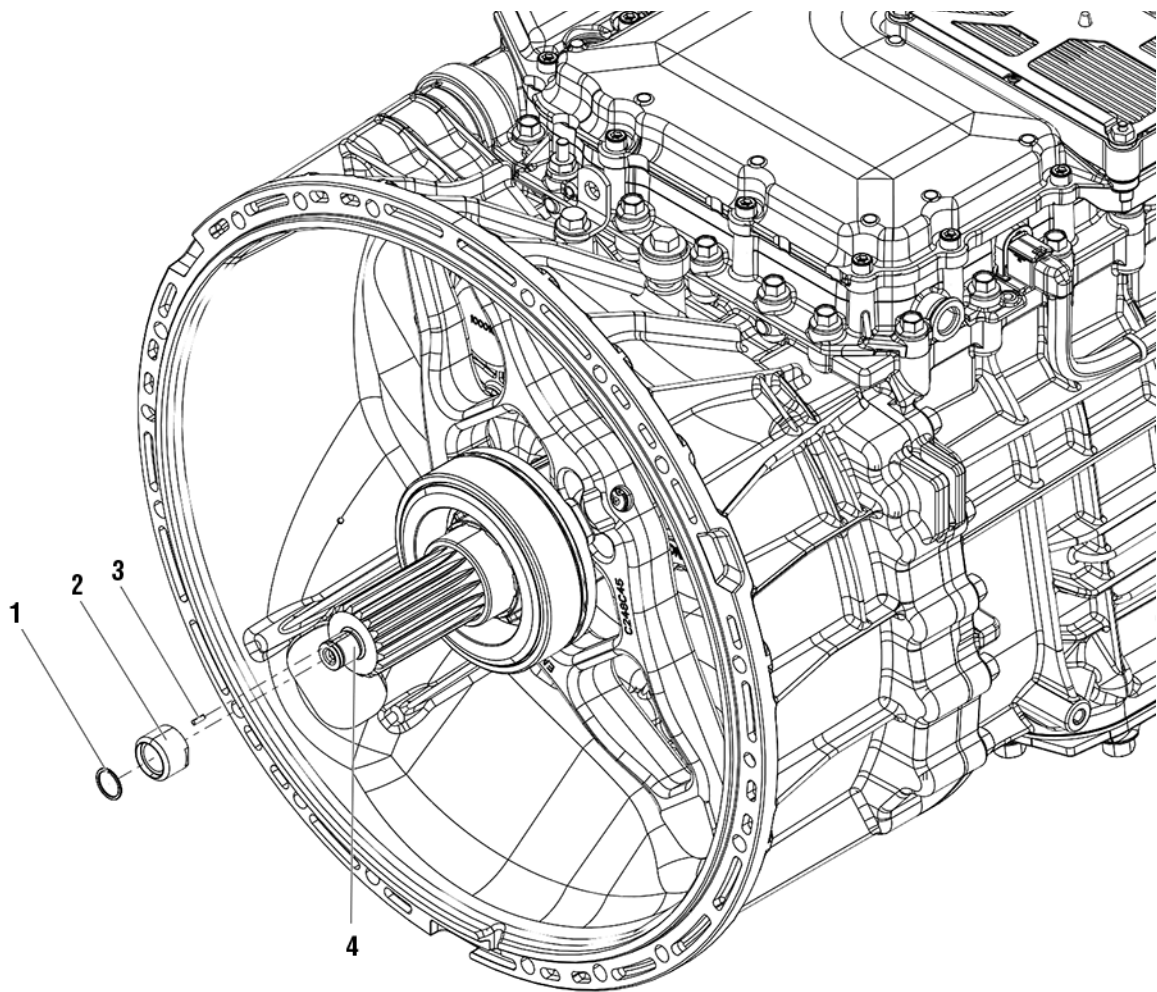
Special Instructions

None

Special Tools

- Input Shaft Pilot Bearing Wear Sleeve Puller (RR1062TR)
- Wear Sleeve Installer (RR1061TR)
- Snap Ring Installer (RR1061TR-1)
- Wear Sleeve Driver (RR1061TR-2)

Component Identification



1. Spiral Snap Ring
2. Pilot Bearing Wear Sleeve
3. Wear Sleeve Alignment Pin
4. Input Shaft

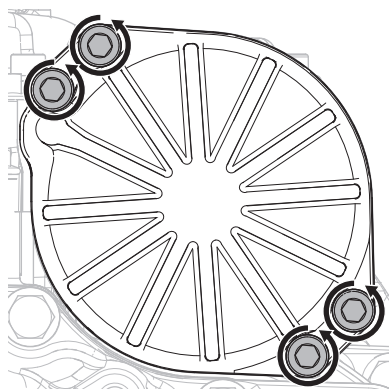
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Remove the Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Disassemble the Input Shaft Pilot Bearing Wear Sleeve

1. Remove the Spiral Snap Ring from the input shaft with a pick.



2. Install the Input Shaft Pilot Bearing Wear Sleeve Puller (RR1062TR) over the flats on the Pilot Bearing Wear Sleeve.



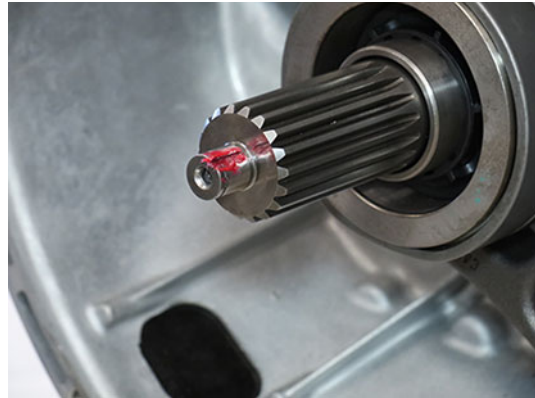
3. Tighten the 13 mm jackscrew on the Input Shaft Pilot Bearing Wear Sleeve Puller (RR1062TR) to remove Wear Sleeve.



4. Remove the Wear Sleeve Alignment Pin.

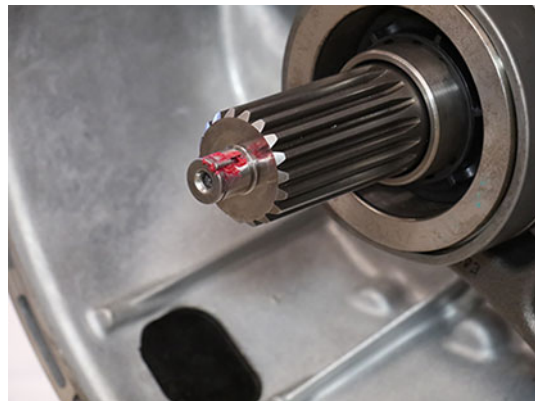


2. Apply grease to alignment pin groove on the input shaft to hold the Wear Sleeve Alignment Pin in place.



3. Slide the Wear Sleeve Alignment Pin into the groove on the input shaft.

NOTICE: Chamfered end of alignment pin must face forward.



Assemble the Input Shaft Pilot Bearing Wear Sleeve

1. Clean the Pilot Bearing Wear Sleeve surfaces on the input shaft.

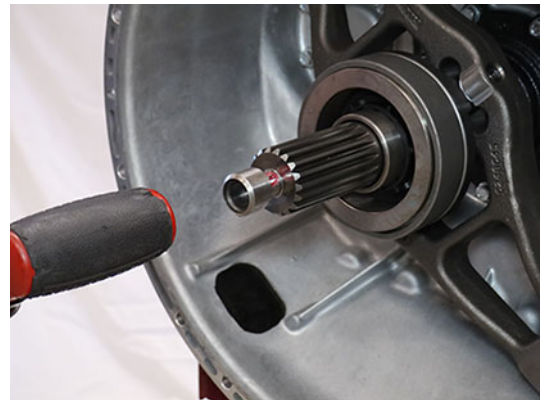
4. Align the groove in the Pilot Bearing Wear Sleeve with the Wear Sleeve Alignment Pin.



5. Hold the Pilot Bearing Wear Sleeve against the input shaft and lightly tap with a soft-faced hammer to start installation.



CAUTION: Keep fingers clear to avoid personal injury.



6. Use the Wear Sleeve Driver (RR1061TR-2) to fully seat the Pilot Bearing Wear Sleeve onto the input shaft.



7. Inspect the Pilot Bearing Wear Sleeve to ensure it is fully seated on the input shaft.

NOTICE: If there is a gap between the Pilot Bearing Wear Sleeve and the input shaft, the Wear Sleeve Alignment Pin may have moved out of the groove; remove the Pilot Bearing Wear Sleeve and re-perform assembly procedure.



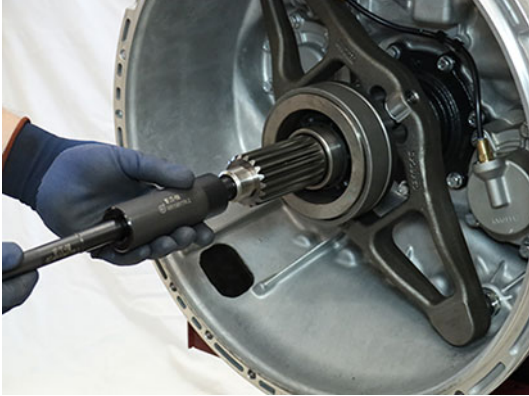
9. Slide the Wear Sleeve Driver (RR1061TR-2) over the Snap Ring Installer (RR1061TR-1).



8. Install a new Spiral Snap Ring onto the Snap Ring Installer (RR1061TR-1).



10. While holding the Snap Ring Installer (RR1061TR-1) against the input shaft, slide the Wear Sleeve Driver (RR1061TR-2) forward and fully seat the Spiral Snap Ring into the snap ring groove.



Input Shaft Cover Disassembly/Assembly Service Procedures

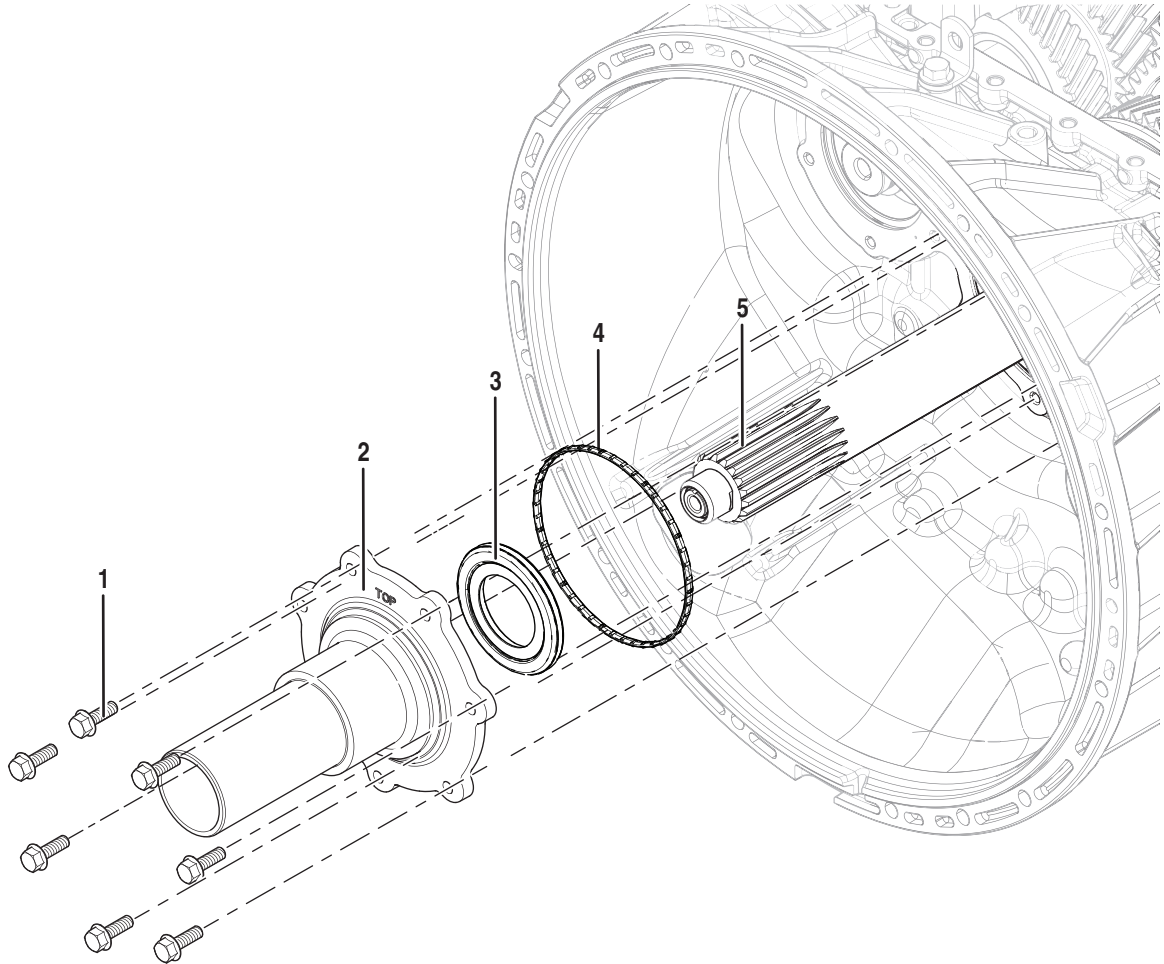
Special Instructions

None

Special Tools

- Output Shaft Installer/Input Shaft Seal Driver (RR1070TR)

Component Identification



1. Input Shaft Cover Cap Screws (x7) - 13 mm
2. Input Shaft Cover
3. Seal
4. O-ring
5. Input Shaft

Disassemble the Input Shaft Cover

1. Remove the Input Shaft Cover O-ring.



2. Place the Input Shaft Cover into a vice equipped with soft-faced jaw pads with the drain back port at the 8 o'clock position.

Note: Do not over-tighten the vice jaws.



3. Place a lint free cloth over the Input Shaft Cover.



4. Using two pry bars, lift under the Input Shaft Seal at the 12 o'clock position and remove the Input Shaft Seal from the Input Shaft Cover.



5. Clean and inspect the Input Shaft Seal bore. If seal bore is damaged, replace the Input Shaft Cover.



2. Place Output Shaft Installer/Input Shaft Seal Driver (RR1070TR) onto the Input Shaft Seal and drive until seal is seated into the cover.

Note: Fully seat Seal into Input Shaft Cover



Assemble the Input Shaft Cover

1. Place the Input Shaft Cover on a bench and place the Input Shaft Seal over the seal bore.



3. Install Input Shaft Cover O-ring.



Main Shaft Disassembly/Assembly Service Procedures

Special Instructions

Ensure to determine and install the Ideal Main Shaft Selective Washer during Main Shaft Assembly.

Note: The Main Shaft End-Play Service Procedure is required if one or more of the following parts are replaced:

- Clutch Housing
- Main Housing
- Input Shaft
- Input Shaft Bearing
- Main Shaft Bearing

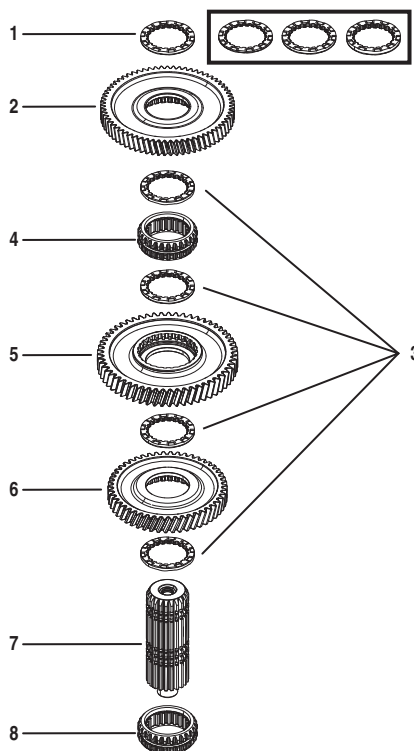


CAUTION: Failure to determine and install the Ideal Main Shaft Selective Washer results in incorrect Main Shaft End-Play resulting in transmission component damage.

Special Tools

- 5/32 OD Air Line

Component Identification



1. Main Shaft Selective Washer - 6.525 mm (0.257 in), 6.712 mm (0.264 in) or 6.900 mm (0.272 in) (x1)

2. Reverse Gear

3. Main Shaft Washer 6.525 mm (0.257 in) (x4)

4. Rail D Sliding Clutch

5. Primary Driven Gear

6. Secondary Driven Gear

7 Main Shaft Assembly

8. Rail C Sliding Clutch

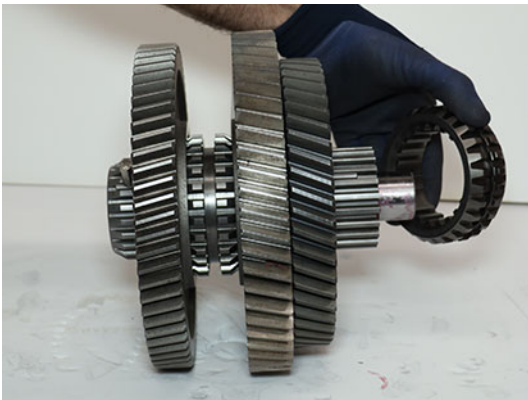
Disassemble the Main Shaft

1. Place Main Shaft Assembly horizontally on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

2. Remove Rail C Sliding Clutch.



3. Place Main Shaft assembly vertically on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.



4. Remove Main Shaft Key.



5. Rotate and remove the Main Shaft Selective Washer above Reverse Gear.



6. Measure the Main Shaft Selective Washer with a micrometer and record reading in table.

Note: The Main Shaft Selective Washer above Reverse Gear is available in 3 thicknesses, 6.525 mm (0.257 in), 6.712 mm (0.264 in) or 6.900 mm (0.272 in), to control Main Shaft End-Play. The recorded Main Shaft Selective Washer thickness is required for the Main Shaft Assembly Service Procedure. The 4 other Main Shaft Washers are 6.525 mm (0.257 in).

Note: Need image of using micrometer to measure high points on selective washer

Main Shaft Selective Washer Thickness

7. Remove Reverse Gear.



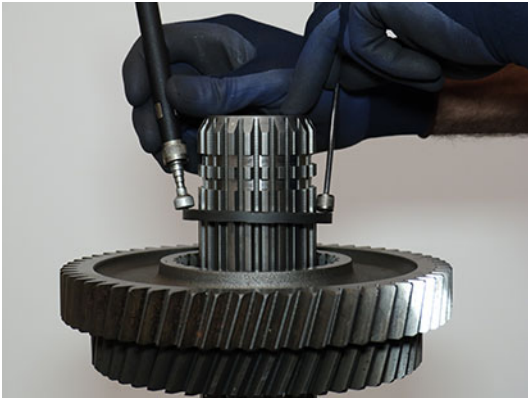
8. Rotate and remove standard Main Shaft Washer above Rail D Sliding Clutch.



9. Remove Rail D Sliding Clutch.



10. Using magnets, rotate and remove standard Main Shaft Washer above Primary Driven Gear.



12. Rotate and remove Main Shaft Washer above Secondary Driven Gear.



11. Remove Primary Driven Gear.

13. Remove Secondary Driven Gear.



14. Rotate and remove last Main Shaft Washer.



Assemble the Main Shaft

1. Place Main Shaft vertically on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.



2. Install and rotate Main Shaft Washer, 6.525 mm (0.257 in), onto Main Shaft.



3. Install a 5/32 OD air line into the main shaft spline to align and hold washer in place.



4. Install Secondary Driven Gear on Main Shaft with clutching teeth facing down.



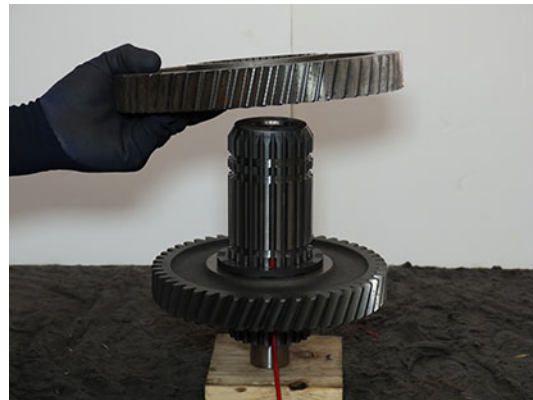
6. Slide the 5/32 OD air line up to align and hold washer in place.



5. Install and rotate Main Shaft Washer, 6.525 mm (0.257 in), above Secondary Driven Gear.



7. Install Primary Driven Gear on Main Shaft with clutching teeth facing up.

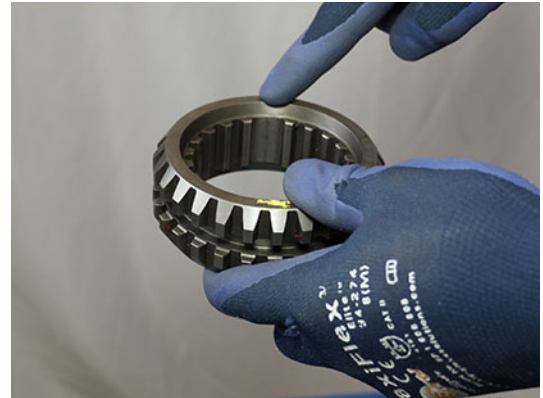


8. Using magnets, install and rotate Main Shaft Washer, 6.525 mm (0.257 in) above Primary Driven Gear.



9. Slide the 5/32 OD air line up to align and hold washer in place.

10. Install Rail D Sliding Clutch and align the double slot with the 5/32 OD air line.



11. Install and rotate Main Shaft Washer, 6.525 mm (0.257 in), above Rail D Sliding Clutch.



12. Slide the 5/32 OD air line up to align and hold washer in place.



13. Install Reverse Gear with clutching teeth facing down.



14. Determine the Ideal Main Shaft Selective Washer to install above Reverse Gear:



CAUTION: Failure to determine and install the Ideal Main Shaft Selective Washer results in incorrect Main Shaft End-Play resulting in transmission component damage.

- If one or more of the following parts were replaced: Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing or Main Shaft Bearing, install the 6.525 mm (0.257 in) Main Shaft Selective Washer.

Note: The Main Shaft End-Play Service Procedure is required.

- If NONE of the following parts were replaced: Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing, or Main Shaft Bearing, install the Main Shaft Selective Washer recorded in Step 6 of the Main Shaft Disassembly Service Procedure: 6.525 mm (0.257 in), 6.712 mm (0.264 in) or 6.900 mm (0.272 in).

Note: The Main Shaft End-play Service Procedure is NOT required.



15. Slide the 5/32 OD air line up to align and hold washer in place.



16. Install Main Shaft Key at the same spline as the 5/32 OD air line.

Note: Insert Main Shaft Key while removing air line.



17. Install a magnet on Main Shaft Key to hold the key in place during final Main Shaft Assembly and installation into transmission.

Note: Remove magnet from Main Shaft Key after installation of Main Shaft Assembly onto transmission.

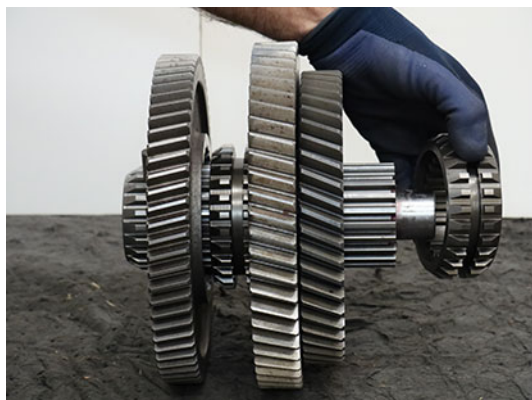
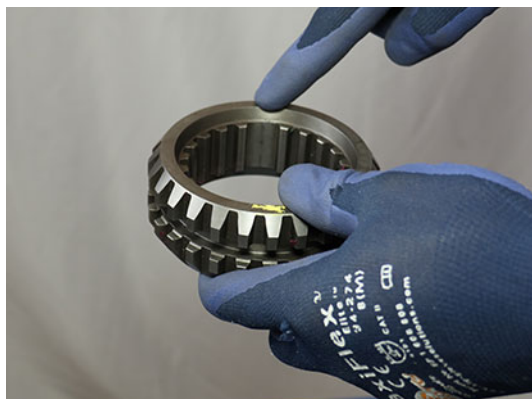


18. Place Main Shaft Assembly horizontally on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

19. Install Rail C Sliding Clutch and align the double slot with Main Shaft Key.



Input Shaft Disassembly/Assembly Service Procedures

Special Instructions

Clutch Housing is approximately 558 mm (22 inches) wide. Only perform steps to Disassemble/Assemble the Input Shaft when using a press. If the Clutch Housing is too large for the available press, perform steps to Manually Disassemble/Assemble Input Shaft with Input Shaft Press (RR1085TR).



CAUTION: A press is required for the removal and installation of the Input Shaft. Failure to use a press to remove and install the Input Shaft may result in transmission component damage.

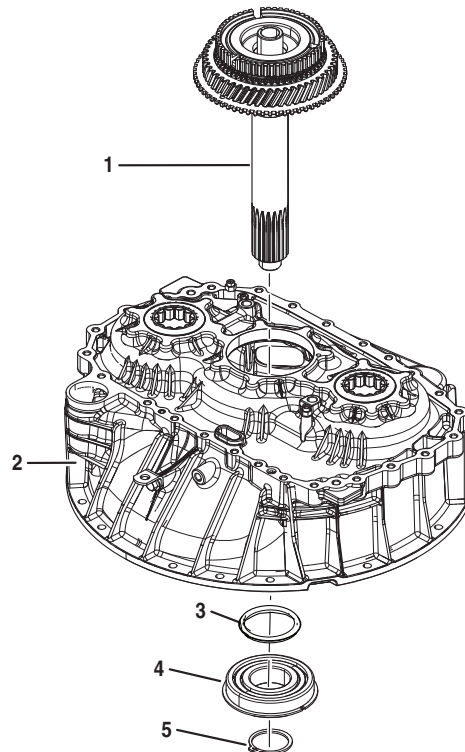
Special Tools

- Input Shaft Cup (RR1085TR-6)
- Input Shaft Stand (RR1073TR)
- Input Shaft Bearing Removal and Installation Tool (RR1075TR)
- Universal Driver Handle (OE8044-T0)

Note: If manually pressing the Input Shaft, additional tools are needed.

- Input Shaft Press (RR1085TR)
- Front Bearing Capture Plate (RR1085TR-7)
- Input Bearing Driver (RR1049TR)
- 4 (2 inch 7/16 inch Grade 8 or 50.8 mm M12 Grade 10.9) cap screws, washers and nuts

Component Identification



1. Input Shaft Assembly
2. Clutch Housing
3. Input Shaft Bearing O-ring
4. Input Shaft Bearing
5. Input Shaft Snap Ring

Disassemble the Input Shaft

1. Ensure Input Shaft Snap Ring is removed.
2. Place Clutch Housing in press with Input Shaft up.



CAUTION: Clutch Housing weighs approximately 50 lbs. Keep fingers clear of pinch points between Clutch Housing and other surfaces. Dropping Clutch Housing could result in component damage and/or personal injury.

NOTICE: A press is required for the removal and installation of the Input Shaft. Failure to use a press results in Input Shaft and/or Clutch Housing damage.

NOTICE: Support the Clutch Housing to avoid damaging the housing and sealing surface.

Note: Clutch Housing is approximately 558 mm (22 inches) wide. If the Clutch Housing is too large for the available press, perform steps to Manually Disassemble Input Shaft with Input Shaft Press (RR1085TR).



3. Place Input Shaft Cup (RR1085TR-6) on the end of the Input Shaft.



4. Press Input Shaft from Clutch Housing.

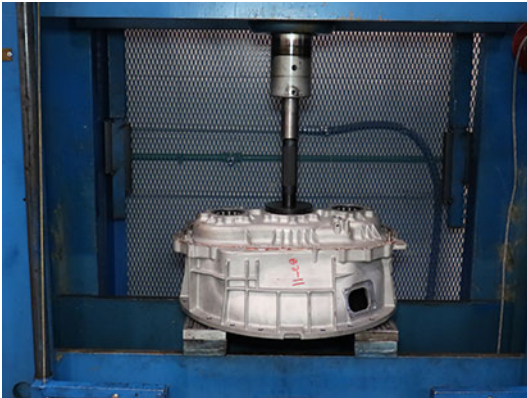


5. Place Clutch Housing in press with flywheel housing side of the Clutch Housing down.

NOTICE: Support the Clutch Housing to avoid damaging the housing.

6. Place Input Shaft Bearing Removal and Installation Tool (RR1075TR) and Universal Driver Handle (OE8044-T0) onto Input Shaft Bearing.

7. Press Input Shaft Bearing from Clutch Housing.



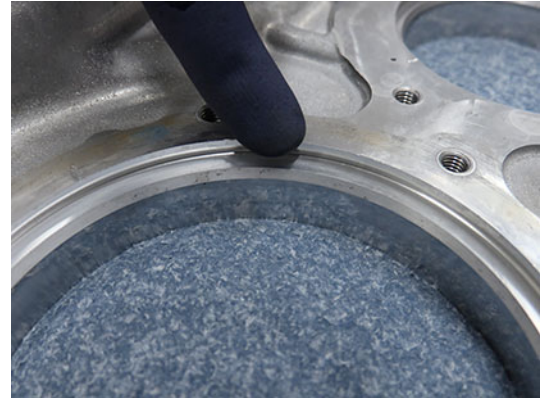
8. If present, remove Input Shaft Bearing O-ring and discard.

Note: Install a new Input Shaft Bearing O-ring when assembling Clutch Housing with chamfered bearing bores.



2. Inspect Input Shaft bearing bore for chamfered edge.

- If chamfer is present, go to Step 3.
- If chamfer is NOT present, go to Step 4.



Assemble the Input Shaft

1. Place Clutch Housing in press with flywheel housing side up.

NOTICE: Support the Clutch Housing to avoid damaging the housing and sealing surface.

3. Slide Input Shaft Bearing O-ring on Input Shaft Bearing until fully seated against snap ring.

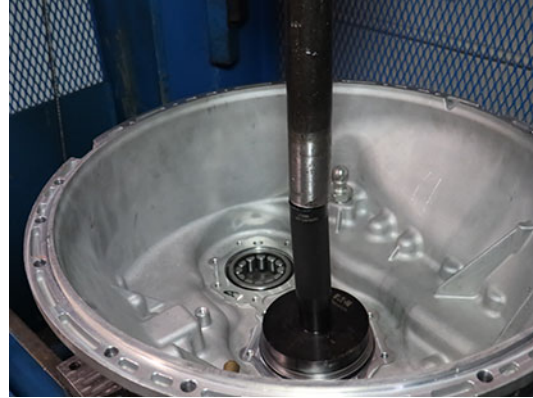
Note: Install a new Input Shaft Bearing O-ring when assembling Clutch Housing with chamfered bearing bores.



4. Place Input Shaft Bearing Removal and Installation Tool (RR1075TR) and Universal Driver Handle (OE8044-T0) onto Input Shaft Bearing.

5. Press Input Shaft Bearing into Clutch Housing.

NOTICE: Do not over press bearing into Clutch Housing. Over pressing could result in component damage.

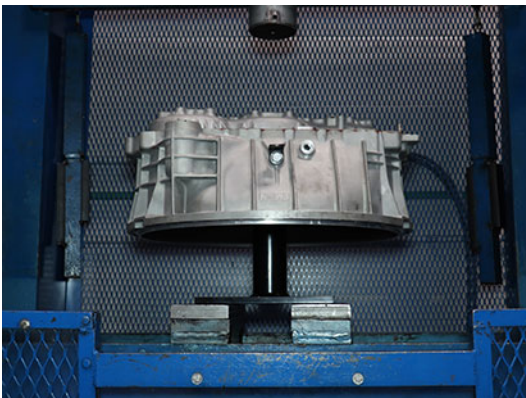
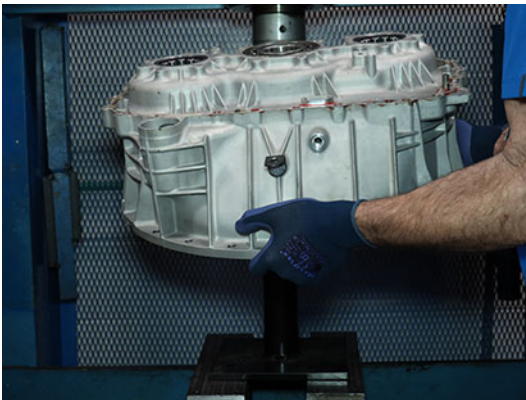


6. Verify Input Shaft Bearing is fully seated in Clutch Housing.



7. Place Clutch Housing in press with flywheel housing side of the Clutch Housing down on Input Shaft Stand (RR1073TR), supporting the Inner Bearing Race of the Input Shaft Bearing.

NOTICE: Support the Inner Bearing Race to avoid damaging the Input Shaft Bearing in the Clutch Housing.



8. Install Input Shaft into Clutch Housing.

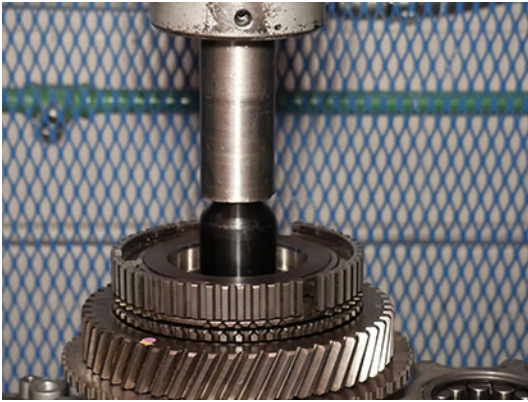


9. Place Input Shaft Cup (RR1085TR-6) on the Input Shaft.



10. Press Input Shaft into Input Shaft Bearing until fully seated.

NOTICE: Do not over press Input Shaft into Clutch Housing. Over pressing could result in component damage.



11. Install Input Shaft Snap Ring.

NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from Input Shaft and result in transmission component damage.

Note: The snap ring will not install if Input Shaft is not fully seated into Input Shaft Bearing.



Install Input Shaft Cover

1. Clean sealing surfaces on the Clutch Housing and Input Shaft Cover.

2. Slide the Input Shaft Cover over the Input Shaft.

Note: Align "TOP" at 12 o'clock.



3. Install the 7 Input Shaft Cover 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



Manually Disassemble Input Shaft with Input Shaft Press (RR1085TR)

1. Ensure Input Shaft Snap Ring is removed.
2. Place and support Clutch Housing on a bench.

Note: Allow space to press the Input Shaft out of Clutch Housing.



3. Place Input Shaft Cup (RR1085TR-6) on the end of the Input Shaft.



4. Place Input Shaft Press (RR1085TR) on the flywheel housing side of the Clutch Housing.



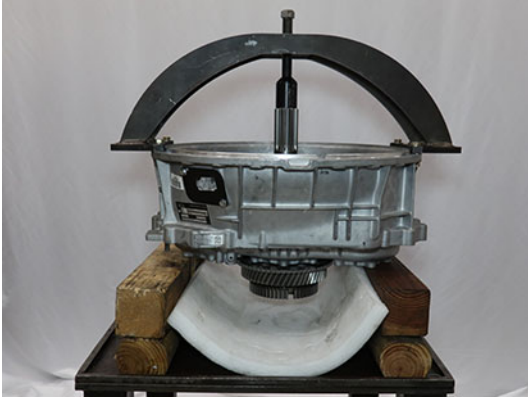
CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch point between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.



5. Install and hand tighten 4 (2 inch 7/16 inch Grade 8 or 50.8 mm M12 Grade 10.9) cap screws, washers and nuts to attach press to housing.



6. Place soft material under Input Shaft.

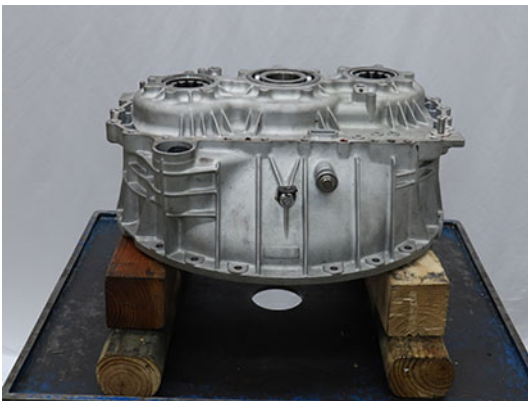


7. Rotate jack screw to press Input Shaft out of Clutch Housing.
8. Remove 4 cap screws, washers, nuts and Input Shaft Press (RR1085TR) from Clutch Housing.



CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

9. Place and support Clutch Housing on a bench.

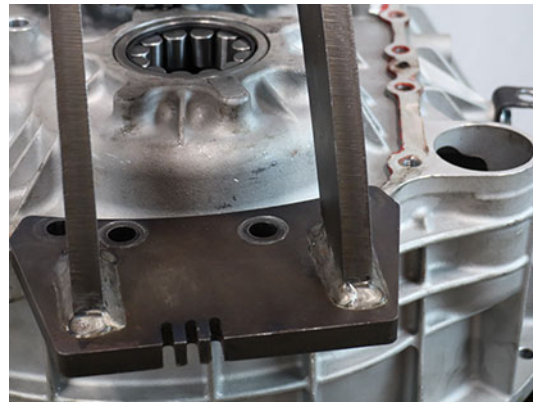


10. Install Input Shaft Press (RR1085TR) on the Main Housing side of the Clutch Housing aligning the 3 notches on the side of Linear Clutch Actuator opening.

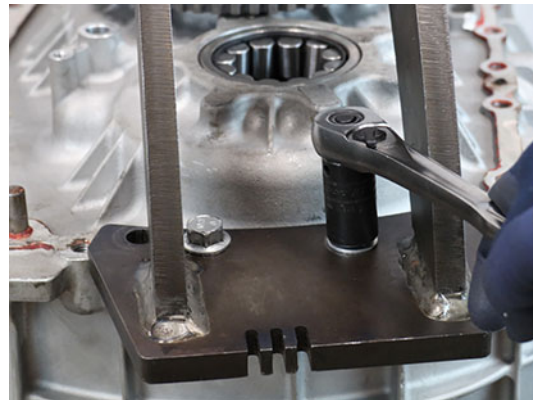


CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

NOTICE: Protect Clutch Housing to Main Housing sealing surface from damage or an oil leak may occur.



11. Install and hand tighten 4 Main Housing to Clutch Housing 16 mm cap screws in the inboard holes on each side of the press.



12. Place Input Shaft Bearing Removal and Installation Tool (RR1075TR) and Input Shaft Cup (RR1085TR-6) onto Input Shaft Bearing.



13. Rotate jack screw to press Input Shaft Bearing out of Clutch Housing.



14. If present, remove Input Shaft Bearing O-ring and discard.

Note: Install a new Input Shaft Bearing O-ring when assembling Clutch Housing with chamfered bearing bores.



15. Remove 4 cap screws, washers, nuts and Input Shaft Press (RR1085TR) from Clutch Housing.



CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

Manually Assemble Input Shaft with Input Shaft Press (RR1085TR)

1. Inspect Input Shaft bearing bore for chamfered edge.
 - If chamfer is present, go to Step 2.
 - If chamfer is NOT present, go to Step 3.



- Slide Input Shaft Bearing O-ring on Input Shaft Bearing until fully seated against snap ring.

Note: Install a new Input Shaft Bearing O-ring when assembling Clutch Housing with chamfered bearing bores.



- Place Input Shaft Press (RR1085TR) on the flywheel housing side of the Clutch Housing.

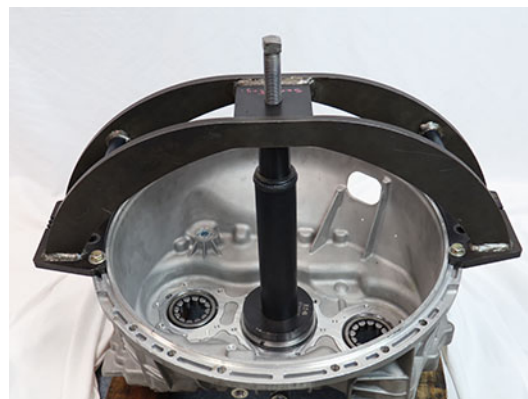


CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch point between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

- Install and hand tighten 4 (2 inch 7/16 inch Grade 8 or 50.8 mm M12 Grade 10.9) cap screws, washers and nuts to attach press to housing.



- Place Input Shaft Bearing into Clutch Housing.
- Place Input Shaft Bearing Removal and Installation Tool (RR1075TR), Input Bearing Driver (RR1049TR) and Input Shaft Cup (RR1085TR-6) onto Input Shaft Bearing.



- Rotate jack screw to press Input Shaft Bearing into Clutch Housing.

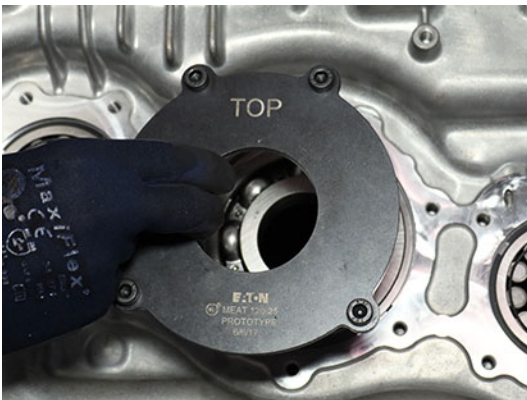
NOTICE: Do not over press bearing into Clutch Housing. Over pressing could result in component damage.

- Remove Input Shaft Bearing Removal and Installation Tool (RR1075TR), Input Bearing Driver (RR1049TR) and Input Shaft Cup (RR1085TR-6).

9. Verify Input Shaft Bearing is fully seated in Clutch Housing.



10. Install Front Bearing Capture Plate (RR1085TR-7) to the Clutch Housing using the Input Shaft Cover threaded mounting holes and hand tighten 4 plate cap screws with a 6 mm hex key.



11. Torque cap screws to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.

12. Place and support Clutch Housing on a bench.

Note: Allow space to press the Input Shaft into Clutch Housing.



13. Install Input Shaft into Clutch Housing.



14. Place Input Shaft Cup (RR1085TR-6) onto Input Shaft.

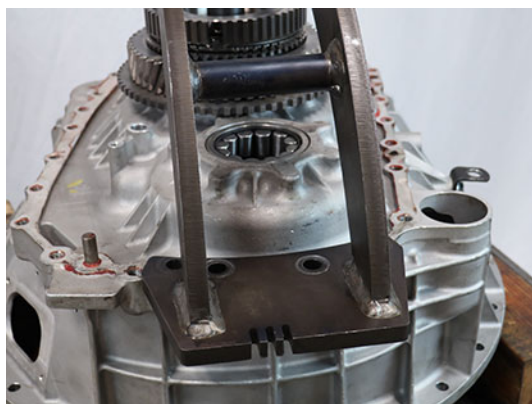


15. Install Input Shaft Press (RR1085TR) on the Main Housing side of the Clutch Housing aligning the 3 notches on the side of Linear Clutch Actuator opening.

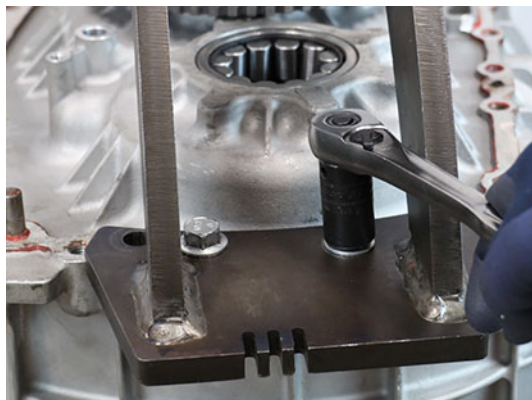


CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

NOTICE: Protect Clutch Housing to Main Housing seal- ing surface from damage or an oil leak may occur.



16. Install and hand tighten 4 Main Housing to Clutch Housing 16 mm cap screws in the inboard holes on each side of the press.



17. Rotate jack screw to press Input Shaft into Clutch Housing until fully seated.

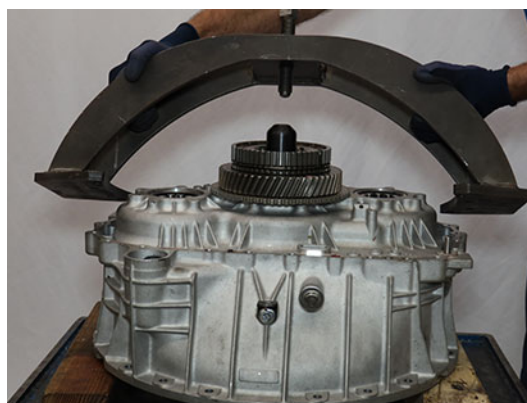
NOTICE: Do not over press Input Shaft into Clutch Housing. Over pressing could result in component damage.



18. Remove 4 cap screws, washers, nuts and Input Shaft Press (RR1085TR) from Clutch Housing.



CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.



19. Remove Front Bearing Capture Plate (RR1085TR-7) from Clutch Housing.



2. Slide the Input Shaft Cover over the Input Shaft.

Note: Align "TOP" at 12 o'clock.



20. Install Input Shaft Snap Ring.

NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from Input Shaft and result in transmission component damage.

Note: The snap ring will not install if Input Shaft is not fully seated into Input Shaft Bearing.



3. Install the 7 Input Shaft Cover 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



Install Input Shaft Cover

1. Clean sealing surfaces on the Clutch Housing and Input Shaft Cover.

Main Housing Disassembly/Assembly Service Procedures

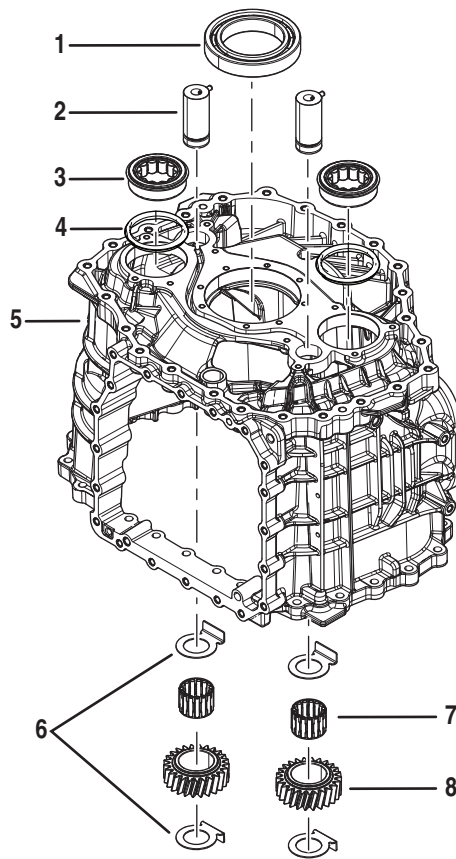
Special Instructions

None

Special Tools

- Countershaft Bearing Installer (RR1076TR)
- Main Shaft Bearing Installer (RR1077TR)
- Input Shaft Bearing Removal and Installation Tool (RR1075TR)
- Universal Driver Handle (OE8044-T0)

Component Identification



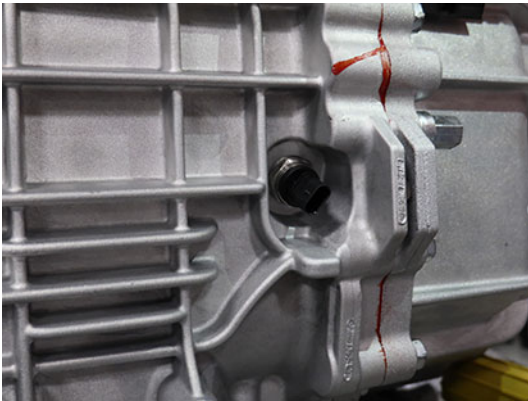
1. Main Shaft Bearing
2. Reverse Idler Gear Shaft (x2)
3. Rear Countershaft Bearings (x2)
4. Countershaft Bearing O-rings (x2) (Only use with Chamfered Bearing Bores)

5. Main Housing
6. Reverse Idler Gear Thrust Washers (x2)
7. Reverse Idler Gear Needle Bearings (x2)
8. Reverse Idler Gear (x2)

Remove the Fluid Pressure Sensor (FPS)

1. Unlatch and disconnect the OEM 3-Way Transmission Fluid Pressure Sensor (FPS) Connector.

Note: There are two possible Main Housing FPS port designs. FPS removal and installation have the same procedure for both designs.



2. Remove the Transmission FPS (24 mm) threaded into the main housing.



Disassemble the Main Housing

1. Place Main Housing vertically on a bench with the Main and Clutch Housing mating surface down.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or personal injury.

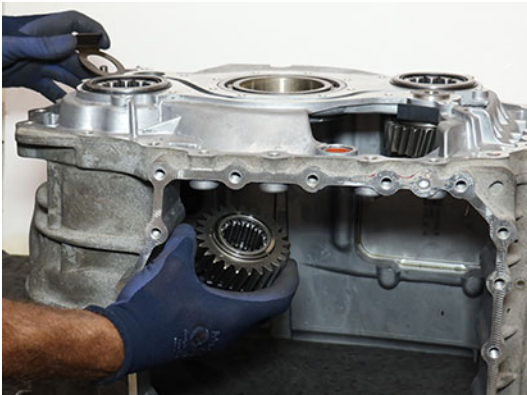
2. Remove Lower Reverse Idler Gear Shaft from Main Housing by pushing shaft up.



4. Remove Upper Reverse Idler Gear Shaft from Main Housing by pushing shaft up.



3. Remove Lower Reverse Idler Gear, washers and bearing from Main Housing.



5. Remove Upper Reverse Idler Gear, washers and bearing from Main Housing.



- Place Main Housing in press and support housing on the Oil Pump Assembly surface.

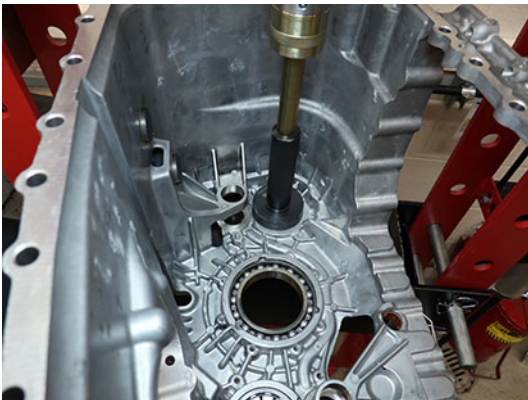


CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or personal injury.

NOTICE: Support the Main Housing to avoid damaging the housing and sealing surface.



- Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Rear Upper Countershaft Bearing.
- Press Rear Upper Countershaft Bearing out of Main Housing.

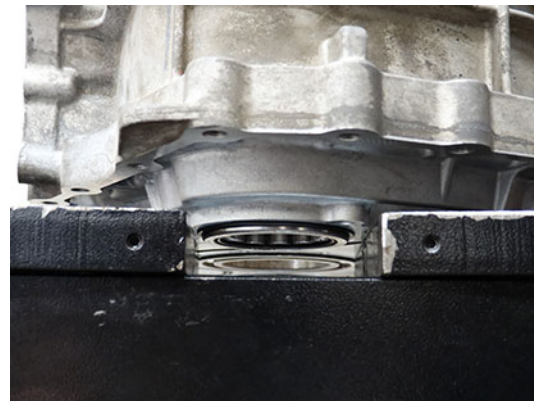


- If present, remove Countershaft Bearing O-ring and discard.

Note: Install new Countershaft Bearing O-rings when assembling Main Housing with chamfered bearing bores.



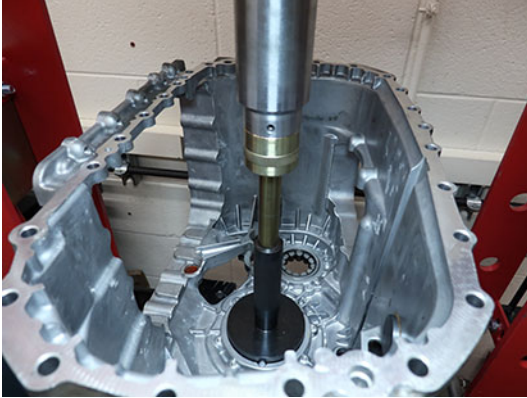
- Place Main Housing vertically in press and support housing on the Oil Pump Assembly surface.



- Place Input Shaft Bearing Removal and Installation Tool (RR1075TR) and Universal Driver Handle (OE8044-T0) onto Main Shaft Bearing.

12. Press Main Shaft Bearing out of Main Housing.

NOTICE: Support the Main Housing to avoid damaging the housing and sealing surface.



13. Place Main Housing vertically in press and support housing on Oil Pump Assembly surface.



14. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Rear Lower Countershaft Bearing.

15. Press Rear Lower Countershaft Bearing out of Main Housing.

NOTICE: Support the Main Housing to avoid damaging the housing and sealing surface.



16. If present, remove Countershaft Bearing O-ring and discard.

Note: Install new Countershaft Bearing O-rings when assembling Main Housing with chamfered bearing bores.



Assemble the Main Housing

1. Install Main Housing in press vertically with the Main and Clutch Housing mating surface down.

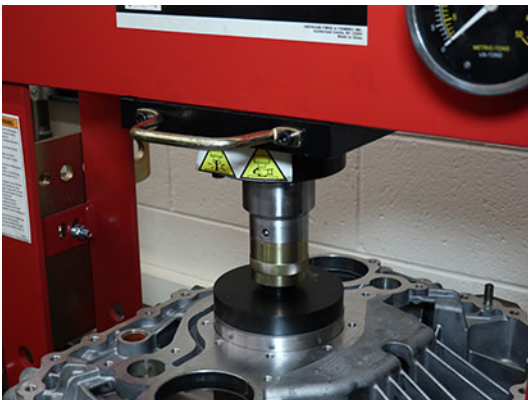
NOTICE: Ensure Main Housing is sitting flat on sealing surface to avoid damaging the housing.



2. Place Main Shaft Bearing into Main Housing.
3. Place Main Shaft Bearing Installer (RR1077TR) and Universal Driver Handle (OE8044-T0) onto Main Shaft Bearing.
4. Press Main Shaft Bearing into Main Housing.

NOTICE: Support the Main Housing to avoid damaging the housing and sealing surface.

NOTICE: Do not over press bearing into Main Housing. Over pressing could result in component damage.



5. Verify Main Shaft Bearing is fully seated into housing.



6. Inspect Rear Lower Countershaft Bearing and verify snap ring is fully seated in groove.



7. Inspect Rear Lower Countershaft bearing bore for chamfered edge.
 - If chamfer is present, go to Step 8.
 - If chamfer is NOT present, go to Step 9.



8. Slide Countershaft Bearing O-ring on Rear Lower Countershaft Bearing until fully seated against snap ring.

Note: Install new Countershaft Bearing O-rings when assembling Main Housing with chamfered bearing bores.



9. Place Rear Lower Countershaft Bearing into Main Housing.
10. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Rear Lower Countershaft Bearing.

11. Press Rear Lower Countershaft Bearing into Main Housing until fully seated.

NOTICE: Support the Main Housing to avoid damaging the housing and sealing surface.

NOTICE: Do not over press bearing into Main Housing. Over pressing could result in component damage and/or personal injury.



12. Verify Rear Lower Countershaft Bearing is fully seated into housing.

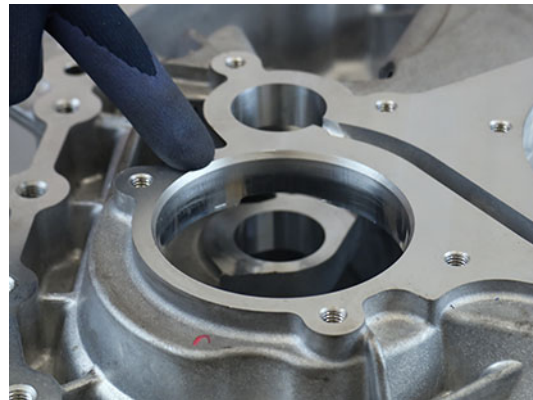


13. Inspect Rear Upper Countershaft Bearing and verify snap ring is fully seated in groove.



14. Inspect Rear Upper Countershaft bearing bore for chamfered edge.

- If chamfer is present, go to Step 15.
- If chamfer is NOT present, go to Step 16.



15. Slide Countershaft Bearing O-ring on Rear Upper Countershaft Bearing until fully seated against snap ring.

Note: Install new Countershaft Bearing O-rings when assembling Main Housings with chamfered bearing bores.



16. Place Rear Upper Countershaft Bearing into Main Housing.
17. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Rear Upper Countershaft Bearing.

18. Press Rear Upper Countershaft Bearing into Main Housing until fully seated.

NOTICE: Support the Main Housing to avoid damaging the housing and sealing surface.

NOTICE: Do not over press bearing into Main Housing. Over pressing could result in component damage and/or personal injury.



19. Verify Rear Upper Countershaft Bearing is fully seated into housing.



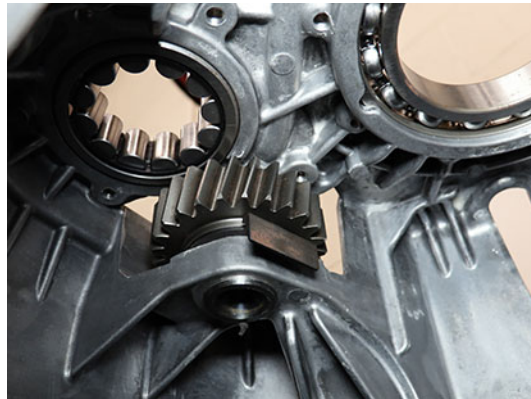
20. Install bearing into Upper Reverse Idler Gear.



21. Install and hold Upper Reverse Idler Gear upper washer into Main Housing.



22. While holding the upper washer, install Upper Reverse Idler Gear, bearing and lower washer into Main Housing.



23. Install Upper Reverse Idler Gear Shaft by pushing shaft into housing, through washers, bearing and gear.



24. Align pin with passage in housing until pin is fully seated into passage.

Note: If necessary, use a soft faced hammer to lightly tap shaft into housing.



25. Install bearing into Lower Reverse Idler Gear.



26. Install and hold Lower Reverse Idler Gear upper washer into Main Housing.



27. While holding the upper washer, install Lower Reverse Idler Gear, bearing and lower washer into Main Housing.



28. Install Lower Reverse Idler Gear Shaft by pushing shaft into housing, through washers, bearing and gear.



29. Align pin with passage in housing until pin is fully seated into passage.

Note: If necessary, use a soft faced hammer to lightly tap shaft into housing.



Install the Fluid Pressure Sensor (FPS)

1. Inspect the Fluid Pressure Sensor (FPS) and O-ring for damage. If damaged, replace the FPS; O-ring is serviced with sensor.



2. Install the Transmission FPS (24 mm) into the Main Housing and torque to 19-23 Nm (14-17 lb-ft).

Note: There are two possible Main Housing FPS port designs. FPS removal and installation have the same procedure for both designs.



3. Connect and latch the OEM 3-Way Transmission FPS Connector.

Rear Housing Disassembly/Assembly Service Procedures

Special Instructions

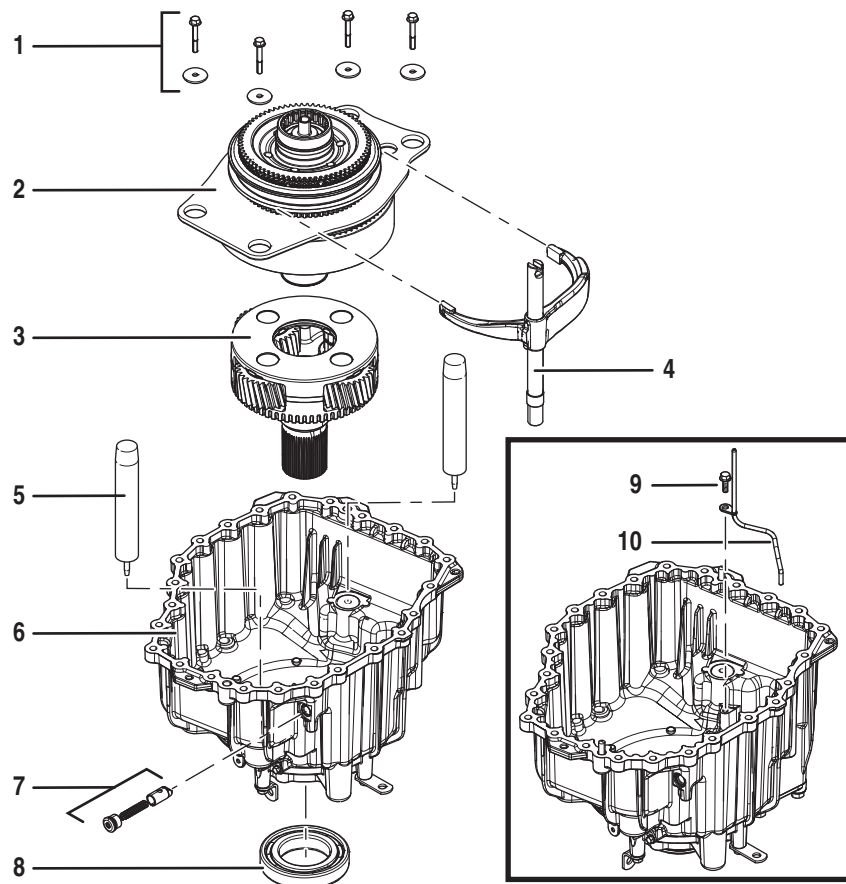


WARNING: Rear Housing weighs approximately 170 lbs. Keep fingers clear of pinch point between Rear Housing and other surfaces. Dropping Rear Housing could result in major vehicle component damage, severe injury or death.

Special Tools

- Reaction Plate Alignment Pins (RR1091TR)
- Range Assembly Removal & Installation Tool (RR1065TR)
- Rear Housing Stand (RR1069TR)
- Input Shaft Bearing Removal and Installation Tool (RR1075TR)
- Output Bearing Removal and Installation Tool (RR1089TR)
- Universal Driver Handle (OE8044-T0)

Component Identification



1. Cap Screws and Washers (x4) - 13 mm
2. Range Synchronizer Assembly
3. Planetary Output Shaft Assembly
4. Shift Rail E
5. Reaction Plate Alignment Pins (x2)

6. Rear Housing
7. Rail E Detent
8. Output Bearing
9. Cap Screw (x1) - 8 mm
10. Rear PTO Lube Tube (Dual PTO model only)

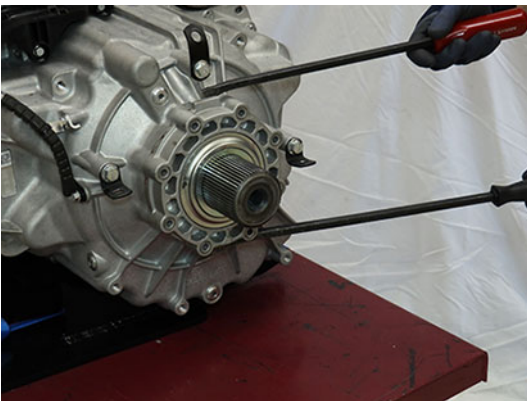
Remove the Rear Bearing Cover

1. Remove the 8 Rear Bearing Cover 13 mm Cap Screws.



2. Using a pry bar, separate the Rear Bearing Cover from the rear housing.

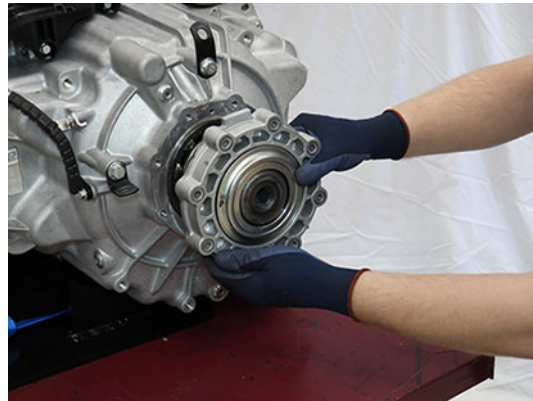
Note: Two pry points located at 12 and 6 o'clock.



3. Remove the Rear Bearing Cover, Wear Sleeve and Dust Cover.

NOTICE: If replacing the Output Seal, a new Rear Bearing Cover is required when reinstalling or an oil leak may occur.

NOTICE: Ensure Output Shaft Seal is pressed in new Rear Bearing Cover.



4. Remove the O-ring.



5. Remove the Output Shaft Thrust Washer.



Disassemble the Rear Housing

1. Place Rear Housing on Rear Housing Stand (RR1069TR).



WARNING: Rear Housing weighs approximately 170 lbs. Keep fingers clear of pinch point between Rear Housing and other surfaces. Dropping Rear Housing may result in major vehicle component damage, severe injury or death.



2. Remove Rail E Detent Plug with a 6 mm hex key.

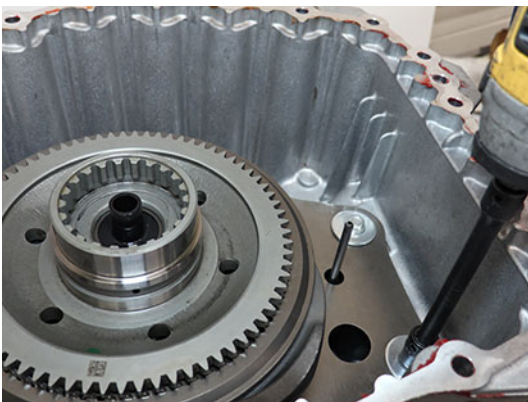
Note: Detent Plug is under spring pressure.



3. Remove the Rail E Spring and Detent using a magnet.



4. Remove 4 Reaction Plate 13 mm cap screws and washers.



5. Install 2 Reaction Plate Alignment Pins (RR1091TR) onto Reaction Plate dowels.

NOTICE: Failure to use Reaction Plate Alignment Pins (RR1091TR) results in component damage.

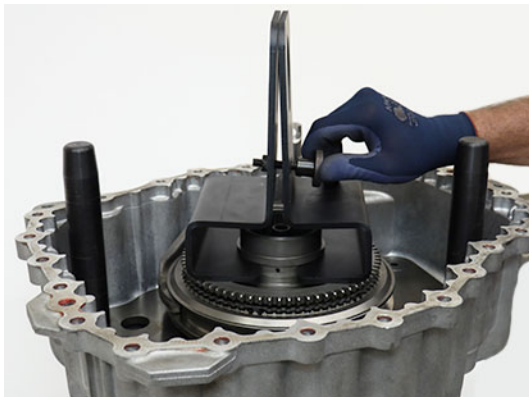


6. Install Range Assembly Removal & Installation Tool (RR1065TR) into Sun Gear groove.



CAUTION: Failure to properly secure tool could result in damage to component(s) or personal injury.

NOTICE: Fully seat tool into groove and hand tighten until tool is secure.



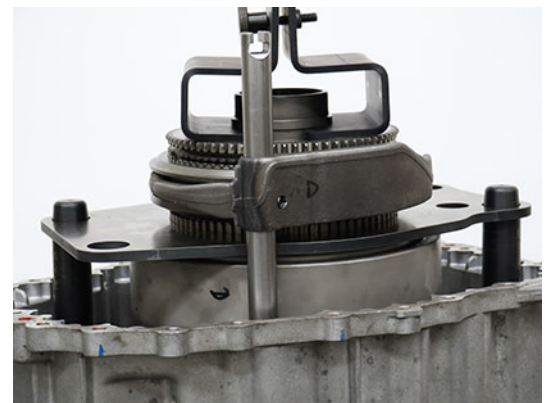
7. Lift and remove Range Synchronizer Assembly from Rear Housing.



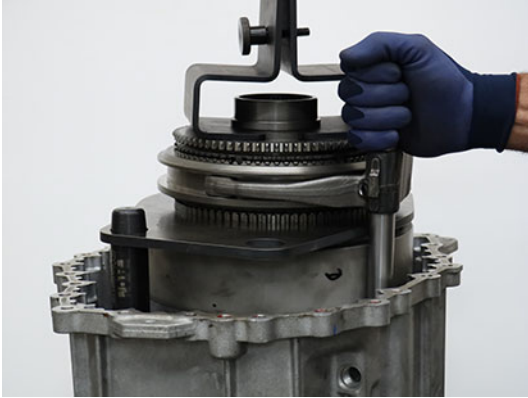
CAUTION: Range Synchronizer Assembly weighs approximately 70 lbs. Failure to properly secure and lift the assembly may result in component damage, serious injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Rotate Sun Gear to ease removal.



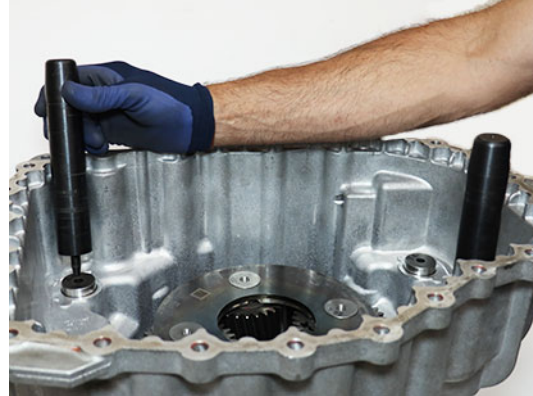
8. Hold Shift Rail E to the Range Synchronizer while removing Range Synchronizer Assembly from Rear Housing.



9. After Range Synchronizer Assembly clears the housing, remove Shift Rail E.



10. Remove Reaction Plate Alignment Pins (RR1091TR).



11. For Dual PTO transmissions, remove the Rear PTO Lube Tube 8 mm cap screw and remove tube.



12. Place Rear Housing in press with Output Shaft up.

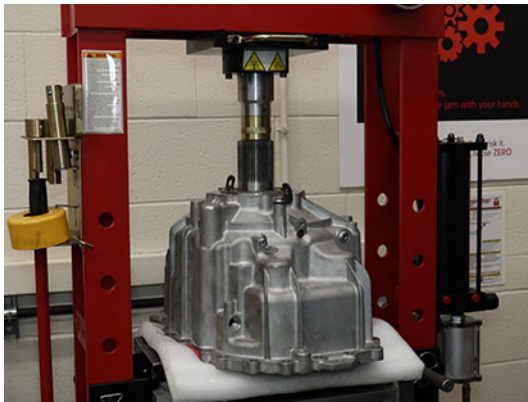


CAUTION: Rear Housing with the Planetary Output Shaft Assembly weighs approximately 60 lbs. Keep fingers clear of pinch point between Rear Housing and other surfaces. Dropping Rear Housing could result in component damage and/or personal injury.

NOTICE: Place soft material under Planetary Output Shaft Assembly to cushion removal from Rear Housing.

NOTICE: Support the Rear Housing to avoid damaging the housing and sealing surface.

13. Press Planetary Output Shaft Assembly out of Rear Housing.



14. Remove Rear Housing and Planetary Output Shaft Assembly from press.



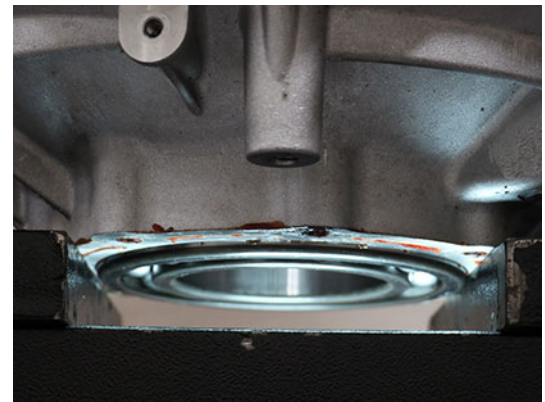
CAUTION: Rear Housing with the Planetary Output Shaft Assembly weighs approximately 60 lbs. Keep fingers clear of pinch point between Rear Housing and other surfaces. Dropping Rear Housing and Planetary Output Shaft Assembly could result in component damage and/or personal injury.

15. Install Rear Housing in press and support housing on Rear Bearing Cover sealing surface.



CAUTION: Rear Housing weighs approximately 15 lbs. Keep fingers clear of pinch point between Rear Housing and other surfaces. Dropping the Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Support the Rear Housing to avoid damaging the housing and sealing surface.



16. Place Output Bearing Removal and Installation Tool (RR1089TR) and Universal Driver Handle (OE8044-T0) onto Output Bearing.

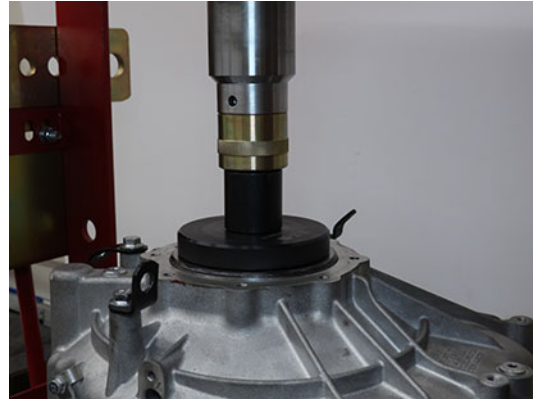


17. Press Output Bearing from Rear Housing.



3. Place Output Bearing Removal and Installation tool (RR1089TR) onto Output Bearing.

NOTICE: Do not over press bearing into Rear Housing. Over pressing could result in component damage.

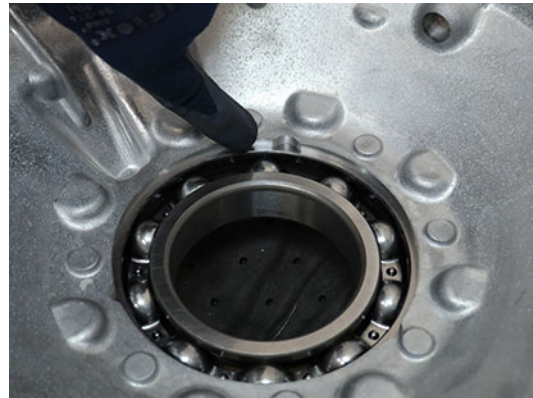


Assemble the Rear Housing

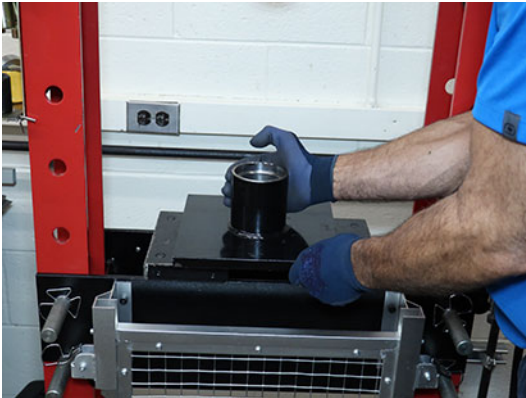
1. Place Rear Housing into press.
2. Place Output Bearing onto Rear Housing.



4. Press Output Bearing into Rear Housing.
5. Verify Output Bearing is fully seated.



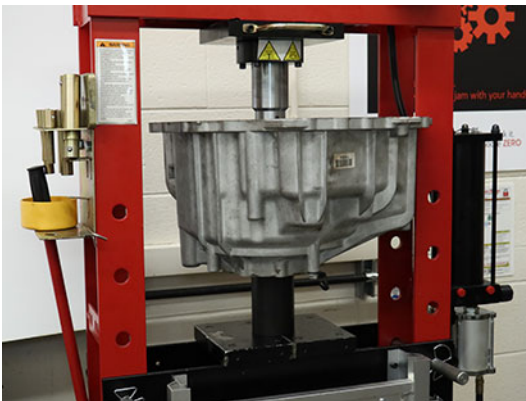
6. Place Rear Housing Stand (RR1069TR) on Press.



7. Place Rear Housing on Rear Housing Stand (RR1069TR).



CAUTION: Rear Housing weighs approximately 15 lbs. Keep fingers clear of pinch point between Rear Housing and other surfaces. Dropping Rear Housing could result in component damage and/or personal injury.



8. Place Planetary Output Shaft Assembly into Output Bearing.



CAUTION: Planetary Output Shaft Assembly weighs approximately 45 lbs. Keep fingers clear of pinch point between Planetary Output Shaft Assembly and other surfaces. Dropping Planetary Output Shaft Assembly could result in component damage and/or personal injury.



9. Place Input Shaft Bearing Removal and Installation Tool (RR1075TR) onto Planetary Output Shaft Assembly.
10. Press Planetary Output Shaft Assembly through output bearing until fully seated.



11. Remove Rear Housing from press.



CAUTION: Rear Housing with the Planetary Output Shaft Assembly weighs approximately 60 lbs. Keep fingers clear of pinch point between Rear Housing and other surfaces. Dropping Rear Housing and Planetary Output Shaft Assembly could result in component damage and/or personal injury.

12. Verify Planetary Output Shaft Assembly is fully seated in Output Bearing.



13. Place rear housing on Rear Housing Stand (RR1069TR).



14. For Dual PTO Transmissions, install Rear PTO Lube Tube and 8 mm cap screw into Rear Housing and torque to 8.8 - 10.4 Nm (6-8 lb-ft).



15. Install Reaction Plate Alignment Pins (RR1091TR) in Rear Housing.

NOTICE: Failure to use Reaction Plate Alignment Pins (RR1091TR) results in component damage.



16. Inspect plastic Oil Slinger to ensure it is locked into place by three locking tab pins.



17. Install Range Assembly Removal & Installation Tool (RR1065TR) into Sun Gear groove.



CAUTION: Failure to properly secure tool could result in component damage or personal injury.

NOTICE: Fully seat tool into groove and hand tighten until tool is secure.

18. Lift Range Synchronizer Assembly with Range Assembly Removal & Installation tool (RR1065TR).



CAUTION: Range Synchronizer Assembly weighs approximately 70 lbs. Failure to properly secure and lift the assembly may result in component damage, serious injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.



19. Install and hold Shift Rail E to Range Synchronizer Assembly.

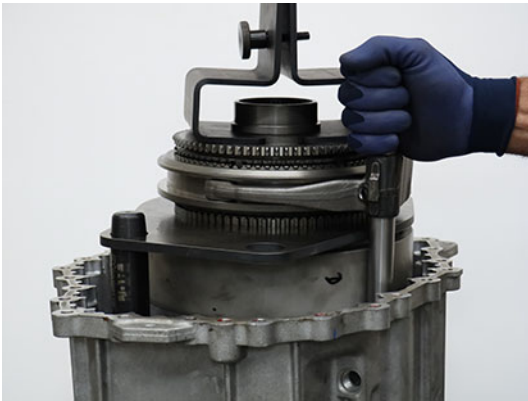
Note: Ensure the notched end of Shift Rail E is facing up.



20. Lower the Range Synchronizer Assembly and Shift Rail E into Rear Housing.

Note: Align Range Synchronizer Assembly to the Reaction Plate Alignment Pins (RR1091TR) and Shift Rail E into Rear Housing.

Note: Rotate Sun Gear to ease installation.



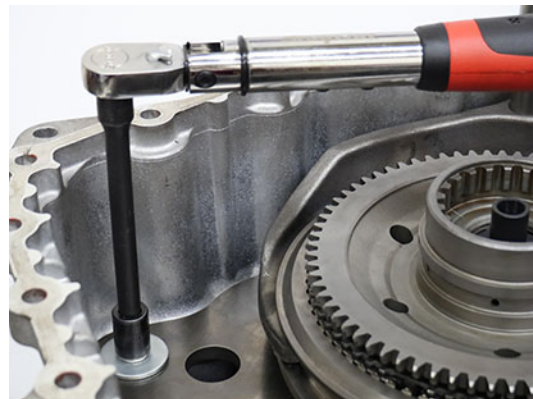
21. Remove Range Assembly Removal and Installation tool (RR1065TR).



22. Remove Reaction Plate Alignment Pins (RR1091TR).



23. Install 4 Reaction Plate cap screws and washers and torque to 21 - 25 Nm (16 - 19 lb-ft).



24. Install Rail E Detent, Spring and Plug.



25. Torque detent plug to 24.5 - 29.5 Nm (16-19 lb-ft).

NOTICE: Do not over-torque detent plug or transmission damage may occur.



Clutch Housing Disassembly/Assembly Service Procedures

Special Instructions

Clutch Housing is approximately 558 mm (22 inches) wide. Only perform steps to **Disassemble Clutch Housing** and **Assemble Clutch Housing** when using a press. If the Clutch Housing is too large for the available press, perform steps to **Disassemble Clutch Housing with Input Shaft Press (RR1085TR)** and **Assemble Clutch Housing with Input Shaft Press (RR1085TR)**.

Note: A press is required for the removal and installation of the Input Shaft. Failure to use a press could result in Input Shaft and/or Clutch Housing damage.

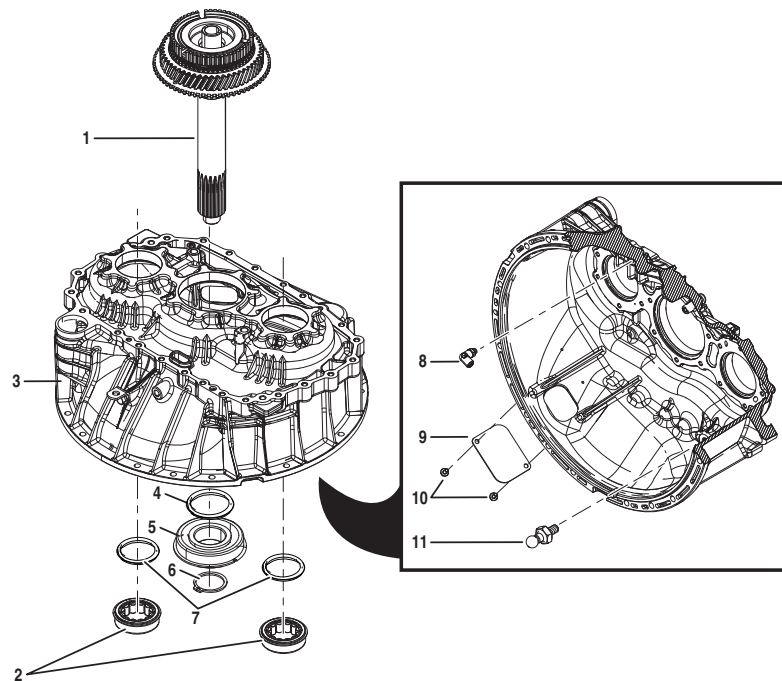
Special Tools

- Countershaft Bearing Installer (RR1076TR)
- Input Shaft Cup (RR1085TR-6)
- Front Bearing Capture Plate (RR1085TR-7)
- Input Shaft Bearing Removal and Installation Tool (RR1075TR)
- Universal Driver Handle (OE8044-T0)

Note: If manually pressing the Input Shaft, additional tools are needed:

- Input Shaft Press (RR1085TR)
- Input Bearing Driver (RR1049TR)
- 4 (2 inch 7/16 inch Grade 8 or 50.8 mm M12 Grade 10.9) cap screws, washers and nuts

Component Identification



1. Input Shaft Assembly
2. Countershaft Bearings (x2)
3. Clutch Housing
4. Input Shaft Bearing O-ring
5. Input Shaft Bearing
6. Input Shaft Snap Ring

7. Countershaft Bearing O-rings (x2) (Only use with Chamfered Bearing Bores)
8. 90-Degree Air Line Fitting
9. Inspection Cover
10. Cap Screws (x2)
11. Release Yoke Pivot Pin

Disassemble Clutch Housing

1. Ensure Input Shaft Snap Ring is removed.
2. Place Clutch Housing in press with Input Shaft up.



CAUTION: Clutch Housing weighs approximately 50 lbs. Keep fingers clear of pinch points between Clutch Housing and other surfaces. Dropping Clutch Housing could result in component damage and/or personal injury.

NOTICE: A press is required for the removal and installation of the Input Shaft. Failure to use a press results in Input Shaft and/or Clutch Housing damage.

NOTICE: Support the Clutch Housing to avoid damaging the housing and sealing surface.

Note: Clutch Housing is approximately 558 mm (22 inches) wide. If Clutch Housing is too large for the available press, perform steps to **Disassemble Clutch Housing with Input Shaft Press (RR1085TR)** and **Assemble Clutch Housing with Input Shaft Press (RR1085TR)**.



3. Place Input Shaft Cup (RR1085TR-6) on the end of the Input Shaft.



4. Press Input Shaft from Clutch Housing.



5. Mark Clutch Housing to indicate airline inlet direction with a paint mark.



6. Remove Inertia Brake 90-degree airline elbow (15 mm).



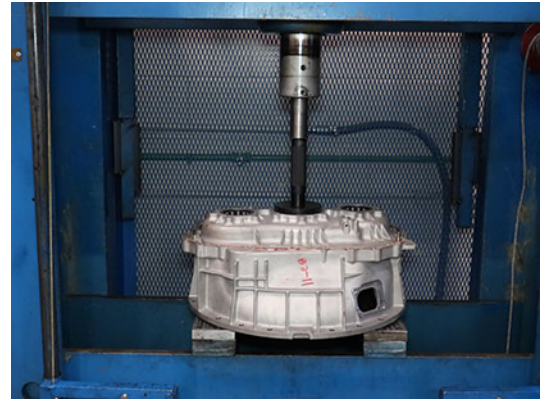
7. Remove the Release Yoke Pivot Pin (30 mm).



8. Place Clutch Housing in press with flywheel housing side of the Clutch Housing down.

NOTICE: Support the Clutch Housing to avoid damaging the housing.

9. Place Input Shaft Bearing Removal and Installation Tool (RR1075TR) and Universal Driver Handle (OE8044-T0) onto Input Shaft Bearing.



10. Press Input Shaft Bearing from Clutch Housing.

11. If present, remove Input Shaft Bearing O-ring and discard.

Note: Install a new Input Shaft Bearing O-ring when assembling Clutch Housing with chamfered bearing bores.



12. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Lower Countershaft Bearing.

13. Press Lower Countershaft Bearing from Clutch Housing.



14. If present, remove Countershaft Bearing O-ring and discard.

Note: Install new Countershaft Bearing O-rings when assembling Clutch Housing with chamfered bearing bores.



15. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Upper Countershaft Bearing.

16. Press Upper Countershaft Bearing from Clutch Housing.



17. If present, remove Countershaft Bearing O-ring and discard.

Note: Install new Countershaft Bearing O-rings when assembling Clutch Housing with chamfered bearing bores.



Assemble Clutch Housing



CAUTION: Clutch Housing (without Input Shaft) weighs approximately 40 lbs. Keep fingers clear of pinch point between Clutch Housing and other surfaces. Dropping Clutch Housing could result in component damage and/or personal injury.

1. Place Clutch Housing in press with flywheel housing side up.

2. Inspect Upper Countershaft bearing bore for chamfered edge.
 - If chamfer is present, go to Step 3.
 - If chamfer is NOT present, go to Step 4.



3. Slide Countershaft Bearing O-ring on Upper Countershaft Bearing until fully seated against snap ring.

Note: Install new Countershaft Bearing O-rings when assembling Clutch Housing with chamfered bearing bores.



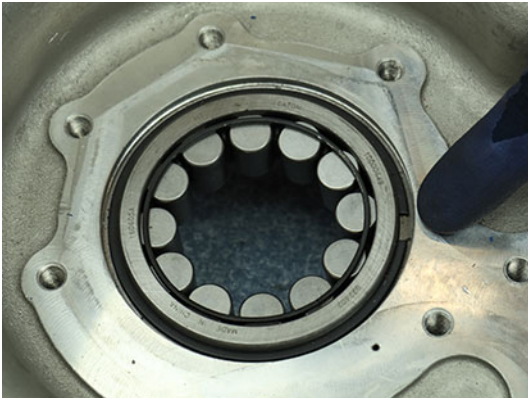
4. Place Upper Countershaft Bearing into Clutch Housing.
5. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Upper Countershaft Bearing.

6. Press Upper Countershaft Bearing into Clutch Housing.

NOTICE: Do not over press bearing into Clutch Housing. Over pressing could result in component damage.



7. Verify Upper Countershaft Bearing is fully seated in Clutch Housing.



8. Inspect Lower Countershaft bearing bore for chamfered edge.

- If chamfer is present, go to Step 9.
- If chamfer is NOT present, go to Step 10.



9. Slide Countershaft Bearing O-ring on Lower Countershaft Bearing until fully seated against snap ring.

Note: Install new Countershaft Bearing O-rings when assembling Clutch Housing with chamfered bearing bores.



10. Place Lower Countershaft Bearing into Clutch Housing.
11. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Lower Countershaft Bearing.

12. Press Lower Countershaft Bearing into Clutch Housing.

NOTICE: Do not over press bearing into Clutch Housing. Over pressing could result in component damage.



13. Verify Lower Countershaft Bearing is fully seated in Clutch Housing.



14. Inspect Input Shaft bearing bore for chamfered edge.

- If chamfer is present, go to Step 15.
- If chamfer is NOT present, go to Step 16.

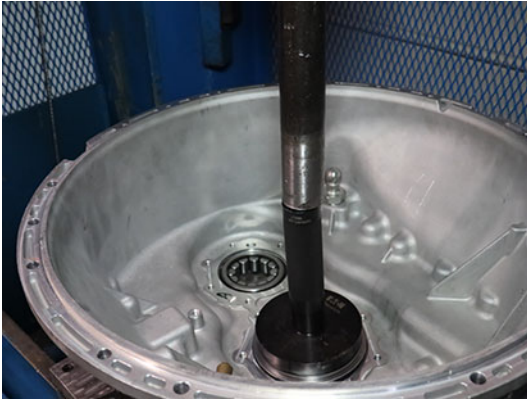
**15.** Slide Input Shaft Bearing O-ring on Input Shaft Bearing until fully seated against snap ring.

Note: Install a new Input Shaft Bearing O-ring when assembling Clutch Housing with chamfered bearing bores.

**16.** Place Input Shaft Bearing into Clutch Housing.**17.** Place Input Shaft Bearing Removal and Installation Tool (RR1075TR) and Universal Driver Handle (OE8044-T0) onto Input Shaft Bearing.

18. Press Input Shaft Bearing into Clutch Housing until fully seated.

NOTICE: Do not over press bearing into Clutch Housing. Over pressing could result in component damage.



19. Verify Input Shaft Bearing is fully seated in Clutch Housing.



20. Install and hand tighten Inertia Brake 90-degree airline elbow (15 mm) aligning airline inlet with paint mark.

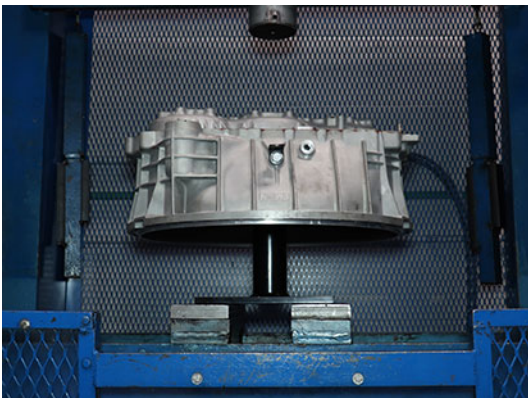
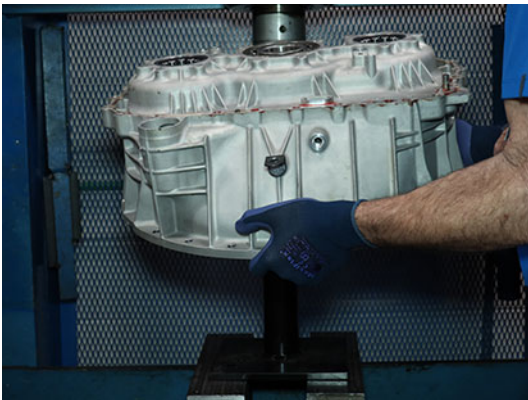


21. Install Release Yoke Pivot Pin (30 mm) and torque to 130-140 Nm (95-101 lb-ft).



22. Place Clutch Housing in press with flywheel housing side of the Clutch Housing down on Input Shaft Stand (RR1073TR), supporting the Inner Bearing Race of the Input Shaft Bearing.

NOTICE: Support the Inner Bearing Race to avoid damaging the Input Shaft Bearing in the Clutch Housing.



23. Install Input Shaft into Clutch Housing.



24. Place Input Shaft Cup (RR1085TR-6) on the Input Shaft.



25. Press Input Shaft into Input Shaft Bearing until fully seated.

NOTICE: Do not over press Input Shaft into Clutch Housing. Over pressing could result in component damage.



26. Install Input Shaft Snap Ring.

NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from Input Shaft and result in transmission component damage.

Note: The snap ring will not install if Input Shaft is not fully seated into Input Shaft Bearing.



Install Input Shaft Cover

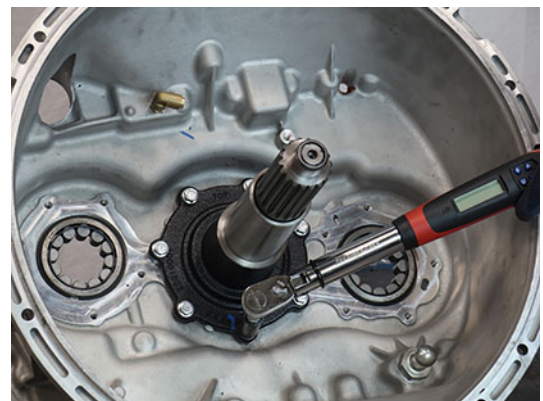
1. Clean sealing surfaces on the Clutch Housing and Input Shaft Cover.

2. Slide the Input Shaft Cover over the Input Shaft.

Note: Align "TOP" at 12 o'clock.



3. Install the 7 Input Shaft Cover 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



Disassemble Clutch Housing with Input Shaft Press (RR1085TR)

1. Ensure Input Shaft Snap Ring is removed.
2. Place and support Clutch Housing on a bench.

Note: Allow space to press the Input Shaft out of Clutch Housing.



3. Place Input Shaft Cup (RR1085TR-6) on the end of the Input Shaft.



4. Place Input Shaft Press (RR1085TR) on the flywheel housing side of the Clutch Housing.



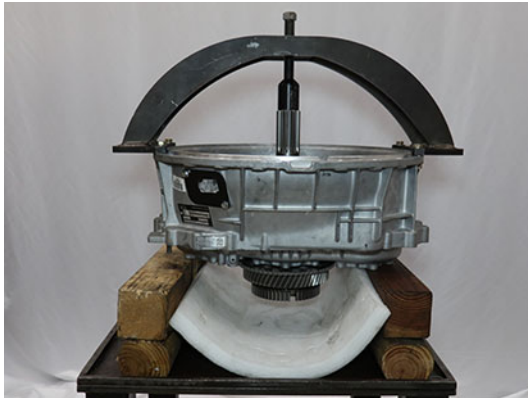
CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch point between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.



5. Install and hand tighten 4 (2 inch 7/16 inch Grade 8 or 50.8 mm M12 Grade 10.9) cap screws, washers and nuts to attach press to housing.



6. Place soft material under Input Shaft.



7. Rotate jack screw to press Input Shaft out of Clutch Housing.
8. Remove 4 cap screws, washers, nuts and Input Shaft Press (RR1085TR) from Clutch Housing.



CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

9. Mark Clutch Housing to indicate airline inlet direction with paint mark.



10. Remove Inertia Brake 90-degree airline elbow (15 mm).



11. Remove Release Yoke Pivot Pin (30 mm).



12. Place and support Clutch Housing on a bench.

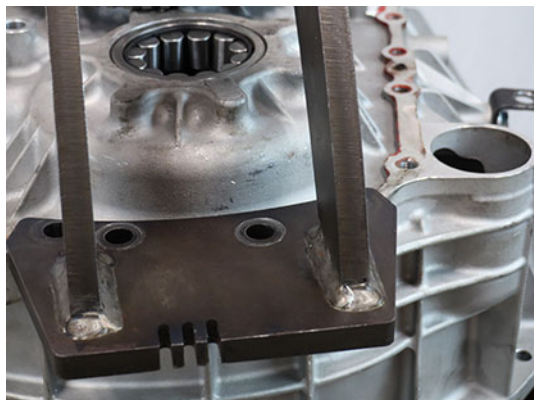


13. Install Input Shaft Press (RR1085TR) on the Main Housing side of the Clutch Housing aligning the 3 notches on the side of Linear Clutch Actuator opening.

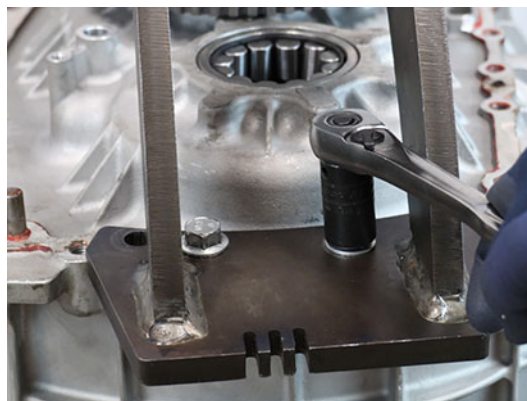


CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

NOTICE: Protect Clutch Housing to Main Housing sealing surface from damage or an oil leak may occur.



14. Install and hand tighten 4 Main Housing to Clutch Housing 16 mm cap screws in the inboard holes on each side of the press.



15. Place Input Shaft Bearing Removal and Installation Tool (RR1075TR) and Input Shaft Cup (RR1085TR-6) onto Input Shaft Bearing.



16. Rotate jack screw to press Input Shaft Bearing out of Clutch Housing.



17. If present, remove Input Shaft Bearing O-ring and discard.

Note: Install a new Input Shaft Bearing O-ring when assembling Clutch Housing with chamfered bearing bores.



18. Remove 4 cap screws, washers, nuts and Input Shaft Press (RR1085TR) from Clutch Housing



CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

19. Place Clutch Housing in press with flywheel housing side of the Clutch Housing down.

NOTICE: Support the Clutch Housing to avoid damaging the housing.

20. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Lower Countershaft Bearing.

21. Press Lower Countershaft Bearing from Clutch Housing.



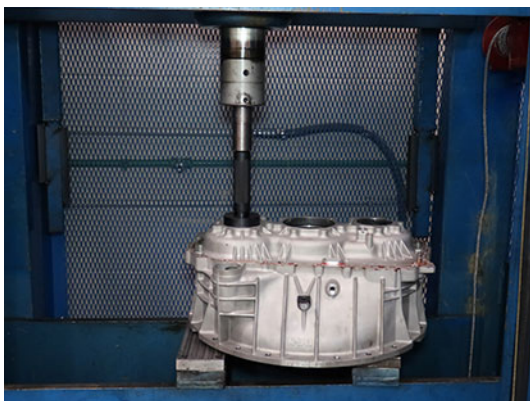
22. If present, remove Countershaft Bearing O-ring and discard.

Note: Install new Countershaft Bearing O-rings when assembling Clutch Housing with chamfered bearing bores.



23. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Upper Countershaft Bearing.

24. Press Upper Countershaft Bearing from Clutch Housing.



25. If present, remove Countershaft Bearing O-ring and discard.

Note: Install new Countershaft Bearing O-rings when assembling Clutch Housing with chamfered bearing bores.



2. Inspect Upper Countershaft bearing bore for chamfered edge
- If chamfer is present, go to Step 3.
 - If chamfer is NOT present, go to Step 4.



Assemble Clutch Housing with Input Shaft Press (RR1085TR)



CAUTION: Clutch Housing (without Input Shaft) weighs approximately 40 lbs. Keep fingers clear of pinch point between Clutch Housing and other surfaces. Dropping Clutch Housing could result in component damage and/or personal injury.

1. Place Clutch Housing in press with flywheel housing side up.

3. Slide Countershaft Bearing O-ring on Upper Countershaft Bearing until fully seated against snap ring.

Note: Install new Countershaft Bearing O-rings when assembling Clutch Housing with chamfered bearing bores.



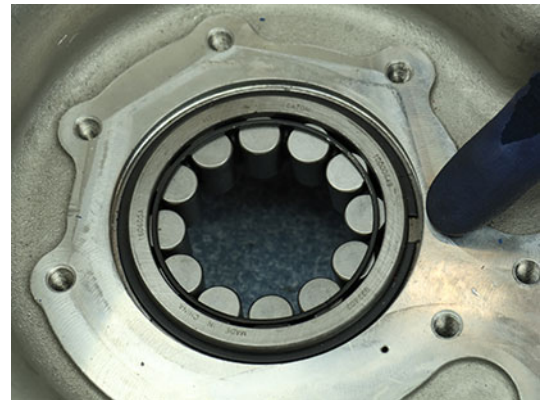
4. Place Upper Countershaft Bearing into Clutch Housing.
5. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Upper Countershaft Bearing.

6. Press Upper Countershaft Bearing into Clutch Housing.

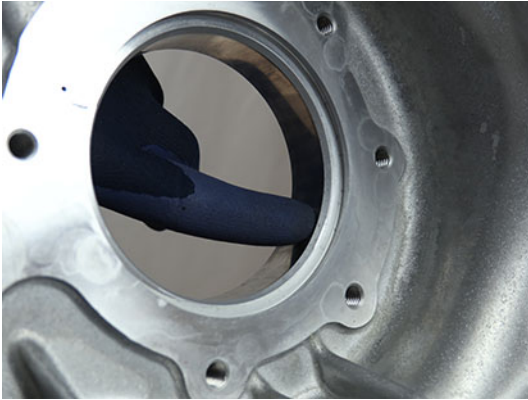
NOTICE: Do not over press bearing into Clutch Housing. Over pressing could result in component damage.



7. Verify Upper Countershaft Bearing is fully seated in Clutch Housing.



8. Inspect Lower Countershaft bearing bore for chamfered edge.
 - If chamfer is present, go to Step 9.
 - If chamfer is NOT present, go to Step 10.



9. Slide Countershaft Bearing O-ring on Lower Countershaft Bearing until fully seated against snap ring.

Note: Install new Countershaft Bearing O-rings when assembling Clutch Housing with chamfered bearing bores.



10. Place Lower Countershaft Bearing into Clutch Housing.
11. Place Countershaft Bearing Installer (RR1076TR) and Universal Driver Handle (OE8044-T0) onto Lower Countershaft Bearing.

12. Press Lower Countershaft Bearing into Clutch Housing.

NOTICE: Do not over press bearing into Clutch Housing. Over pressing could result in component damage.

**14.** Inspect Input Shaft bearing bore for chamfered edge.

- If chamfer is present, go to Step 15.
- If chamfer is NOT present, go to Step 16.

**13.** Verify Lower Countershaft Bearing is fully seated in Clutch Housing.

15. Slide Input Shaft Bearing O-ring on Input Shaft Bearing until fully seated against snap ring.

Note: Install a new Input Shaft Bearing O-ring when assembling Clutch Housing with chamfered bearing bores.



16. Place Input Shaft Press (RR1085TR) on the flywheel housing side of the Clutch Housing.



CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch point between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

17. Install and hand tighten 4 (2 inch 7/16 inch Grade 8 or 50.8 mm M12 Grade 10.9) cap screws, washers and nuts to attach press to housing.



18. Place Input Shaft Bearing into Clutch Housing.

19. Place Input Shaft Bearing Removal and Installation Tool (RR1075TR), Input Bearing Driver (RR1049TR) and Input Shaft Cup (RR1085TR-6) onto Input Shaft Bearing.



20. Rotate jack screw to press Input Shaft Bearing into Clutch Housing.

NOTICE: Do not over press bearing into Clutch Housing. Over pressing could result in component damage.

21. Remove Input Shaft Bearing Removal and Installation Tool (RR1075TR), Input Bearing Driver (RR1049TR) and Input Shaft Cup (RR1085TR-6).

22. Verify Input Shaft Bearing is fully seated in Clutch Housing.



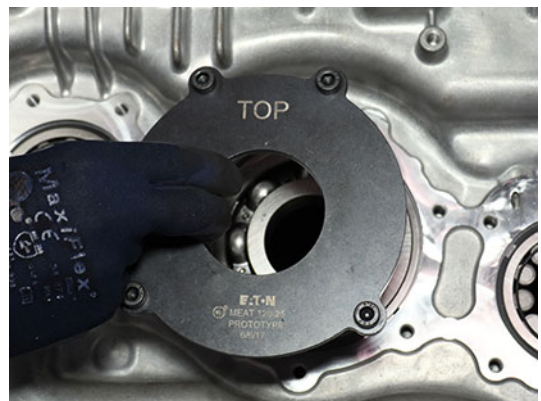
23. Install and hand tighten Inertia Brake 90-degree airline elbow (15 mm) aligning airline inlet with paint mark.



24. Install Release Yoke Pivot Pin (30 mm) and torque to 130-140 Nm (95-101 lb-ft).



25. Install Front Bearing Capture Plate (RR1085TR-7) to the Clutch Housing using the Input Shaft Cover threaded mounting holes and hand tighten 4 plate cap screws with a 6 mm hex key.



26. Torque cap screws to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.

27. Place and support Clutch Housing on a bench.

Note: Allow space to press the Input Shaft into Clutch Housing.



28. Install Input Shaft into Clutch Housing.



29. Place Input Shaft Cup (RR1085TR-6) onto Input Shaft.

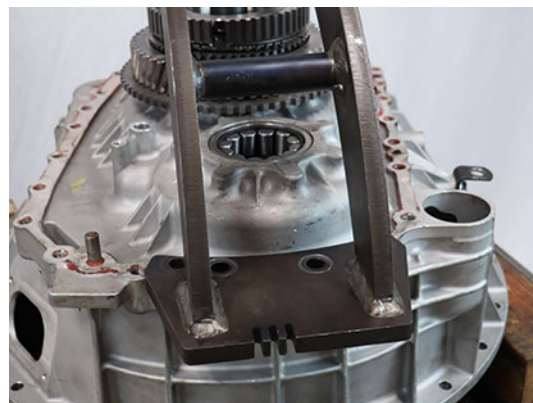


30. Install Input Shaft Press (RR1085TR) on the Main Housing side of the Clutch Housing aligning the 3 notches on the side of the Linear Clutch Actuator opening.

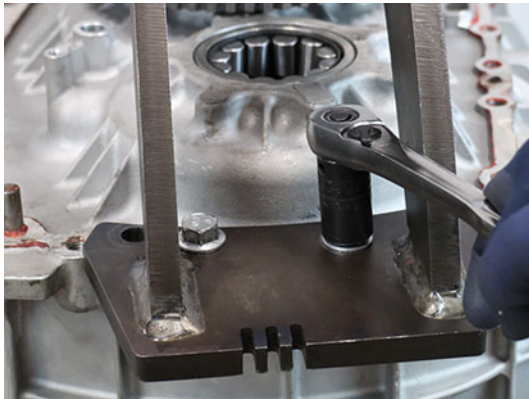


CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.

NOTICE: Protect Clutch Housing to Main Housing sealing surface from damage or an oil leak may occur.



31. Install and hand tighten 4 Main Housing to Clutch Housing 16 mm cap screws in the inboard holes on each side of the press.



32. Rotate jack screw to press Input Shaft into Clutch Housing until fully seated.

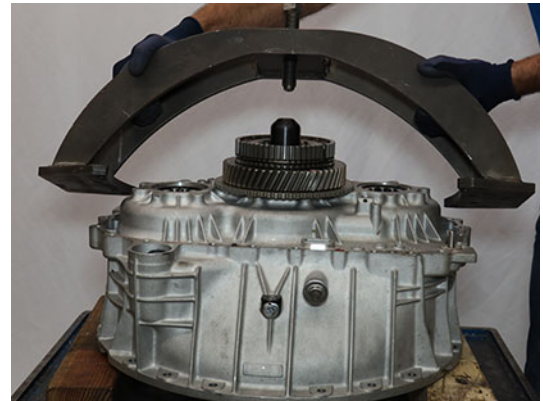
NOTICE: Do not over press Input Shaft into Clutch Housing. Over pressing could result in component damage.



33. Remove 4 cap screws, washers, nuts, and Input Shaft Press (RR1085TR) from Clutch Housing.



CAUTION: Input Shaft Press weighs approximately 30 lbs. Keep fingers clear of pinch points between Input Shaft Press and other surfaces. Dropping Input Shaft Press could result in component damage and/or personal injury.



34. Remove Front Bearing Capture Plate (RR1085TR-7) from Clutch Housing.



35. Install Input Shaft Snap Ring

NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from Input Shaft and result in transmission component damage.

Note: The snap ring will not install if Input Shaft is not fully seated into Input Shaft Bearing.



Install Input Shaft Cover

1. Clean sealing surfaces on the Clutch Housing and Input Shaft Cover.

2. Slide the Input Shaft Cover over the Input Shaft.

Note: Align "TOP" at 12 o'clock.

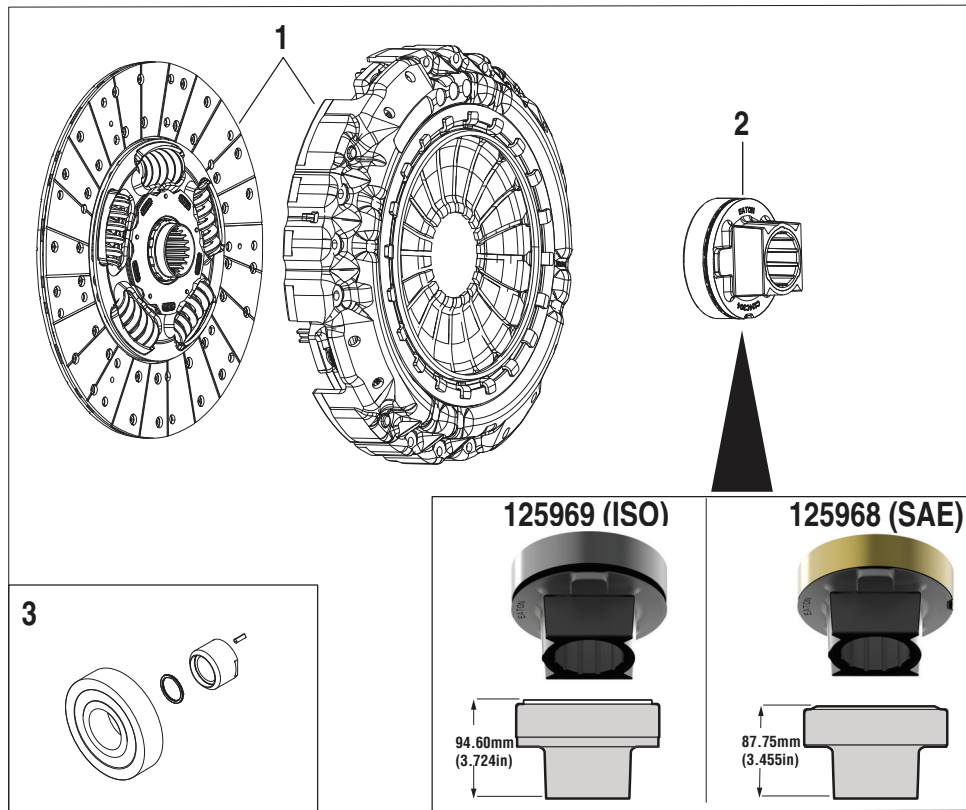


3. Install the 7 Input Shaft Cover 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



OEM and Engine Specific Kits

Clutch Service Kits



K-4379 (ISO / Standard Dampener with 260mm Flywheel Bore Engines)

- Kenworth - Cummins Engines
- Navistar A26 Engines (Will have to source Pilot Bearing 5206 series separately)
- Navistar - Cummins Engines
- PACCAR MX Engines (Source Pilot Bearing 6206 series separately)

	Description	P/N	QTY
1	Driven Disc Assembly and Clutch Cover (NSS)	105511-1 (Standard Dampener)	1
2	Release Bearing Assembly	125969	1
3	Input Shaft Repair Kit	K-4362	1

K-4488CL (ISO / Soft Rate Dampener with 260mm Flywheel Bore Engines)

Can be used to replace K-4379

- Kenworth - Cummins Engines
- Navistar A26 Engines (Source Pilot Bearing 5206 series separately)
- Navistar - Cummins Engines
- PACCAR MX Engines (Source Pilot Bearing 6206 series separately)

	Description	P/N	QTY
1	Driven Disc Assembly and Clutch Cover (NSS)	105511-5 (Soft Rate Dampener)	1
2	Release Bearing Assembly	125969	1
3	Input Shaft Repair Kit	K-4362	1

K-4494CL (SAE / Soft Rate Dampener with 260mm Flywheel Bore Opening Engines)

- Freightliner - Cummins Engines
- Western Star - Cummins Engines
- Volvo - Cummins engine

	Description	P/N	QTY
1	Driven Disc Assembly and Clutch Cover (NSS)	105511-5 (Soft Rate Dampener)	1
2	Release Bearing Assembly	125968	1
3	Input Shaft Repair Kit	K-4362	1

K-4496CL (SAE / Soft Rate Dampener with 290mm Flywheel Bore Opening Engines)

- Freightliner - Detroit Diesel Engines
- Western Star - Detroit Diesel Engines

Note: Only DD13 Engines in vehicles built October 1, 2019 through December 31, 2020.

	Description	P/N	QTY
1	Driven Disc Assembly and Clutch Cover (NSS)	105519-5 (Soft Rate Dampener)	1
2	Release Bearing Assembly	125968	1
3	Input Shaft Repair Kit	K-4485	1

K-4513CL (SAE / Soft Rate Dampener with 290mm Flywheel Bore Opening Engines)

- Freightliner - Detroit Diesel Engines
- Western Star - Detroit Diesel Engines

Note: Covers all DD engines (DD13 / DD15 built October 1, 2019 to present). Can supersede K-4496CL

	Description	P/N	QTY
1	Driven Disc Assembly and Clutch Cover (NSS)	105521-20 (Soft Rate Dampener)	1
2	Release Bearing Assembly	125968	1
3	Input Shaft Repair Kit	K-4485	1

K-4514CL / K-4514CL-PAC (SAE / PACCAR Only / Soft Rate Dampener with 290mm Flywheel Bore Opening Engines)

- PACCAR MX 11 / MX 13 Engines with 290mm Flywheel Bore Opening (Source Pilot Bearing 6206 series separately)

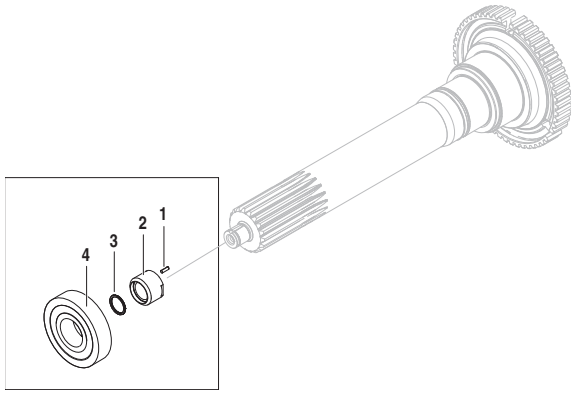
	Description	P/N	QTY
1	Driven Disc Assembly and Clutch Cover (NSS)	105521-20 (Soft Rate Dampener)	1
2	Release Bearing Assembly	125969	1
3	Input Shaft Repair Kit	K-4362	1

K-4512CL / K-4512CL-PAC (SAE / Soft Rate Dampener with 260mm Flywheel Bore Opening Engines)

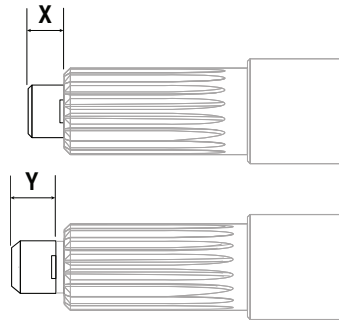
- All OEMs with Cummins CNG Engines

	Description	P/N	QTY
1	Driven Disc Assembly and Clutch Cover (NSS)	105511-7 (Soft Rate Dampener)	1
2	Release Bearing Assembly	125968	1
3	Input Shaft Repair Kit	K-4362	1

Input Shaft Repair Kit



Part Number Identification



	Measurement	Kit Part Number
X	20.50 - 20.80 mm (0.807 - 0.819 in)	K-4362
Y	24.82 - 25.12 mm (0.977 - 0.989 in)	K-4485

K-4362

- Freightliner - Cummins Engines
- Kenworth - Cummins Engines
- Navistar - A26 Engines (Source Pilot Bearing 5206 series separately)
- Navistar - Cummins Engines
- Peterbilt - Cummins Engines
- Volvo - Cummins Engines
- Western Star - Cummins Engines
- PACCAR - MX Engines (Source Pilot Bearing 6206 series separately)

	Description	Part Number	QTY
1	Wear Sleeve Alignment Pin (NSS)	10001190	1
2	Pilot Bearing Wear Sleeve (NSS)	10001335	1
3	Spiral Snap Ring (NSS)	10001444	1
4	Pilot Bearing	5566505	1

K-4485

- Freightliner - Detroit Diesel Engines
- Western Star - Detroit Diesel Engines

	Description	Part Number	QTY
1	Wear Sleeve Alignment Pin (NSS)	10001190	1
2	Pilot Bearing Wear Sleeve (NSS)	10003876	1
3	Spiral Snap Ring (NSS)	10001444	1
4	Pilot Bearing	5566505	1

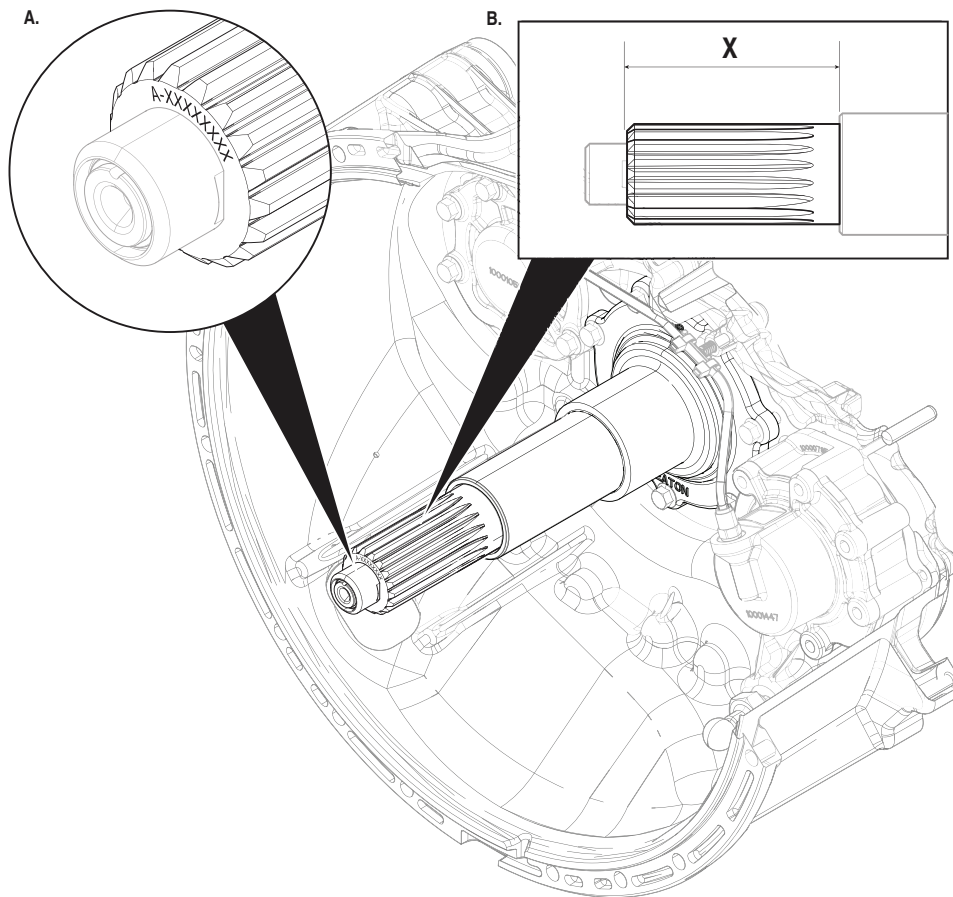
Input Shaft Kit Part Number Identification

Use the diagram below to identify the proper Input Shaft Kit for your transmission. There are two ways to determine the proper Input Shaft Kit.

1. Locate the part number on the end of the Input Shaft as shown in Diagram A. Compare the Part Number to the Kit Part Number in the table below, primary identification.
2. Measure the input shaft as shown in Diagram B. Compare the measurement (X) to the Kit Part Number in the table below, secondary identification if part number is illegible.

NOTICE: For secondary identification, the input shaft and cover must be fully assembled in the Clutch Housing.

A. Primary Identification Part Number	B. Secondary Identification Measurement		Kit Part Number
A-10001529	90.50 - 92.50 mm	3.563 - 3.642 in	K-4360 (ISO)
A-10003441	79.50 - 81.50 mm	3.130 - 3.209 in	K-4361 (SAE)
A-10003878	82.00 - 84.00 mm	3.228 - 3.307 in	K-4363 (Detroit Only)



Transmission REMAN and Service Unit

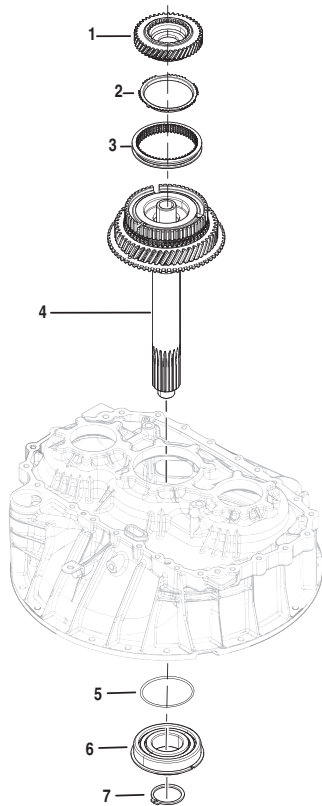
Use the diagram above to identify the proper REMAN and Service Unit for your transmission. There are two ways to determine the proper REMAN and Service Unit.

3. Primary identification is the assembly part number (A-XXXXXXXX) on the end of the Input Shaft as shown in Diagram A. Compare the Part Number to the Kit Part Number in the table below. The additional part number in the primary identification is the non assembly input shaft part number and is not visible from the outside. The input shaft part number is used internally to identify the bill of material build (BOM).
4. If the primary assembly number is illegible use the secondary measurement of the REMAN or Service Unit as shown in Diagram B. Compare the measurement (X) to the REMAN or Service Unit number in the table below.

NOTICE: For secondary identification, the input shaft and cover must be fully assembled in the Clutch Housing.

A. Primary Identification Part Number / Assembly Part Number	B. Secondary Identification Measurement	See Input Shaft Kit Part Number for Engine and Chassis Specific Applications	REMAN Service Unit (Single PTO)	Complete Service Unit (Single PTO)	Complete Service Unit (Dual PTO)
A-10001529 / 10001336	90.50 - 92.50 mm (3.563 - 3.642 in)	K-4360 (ISO)	TN-H04-12R	TA-H04-12X	TA-H04-26X
A-10003441 / 10003440	79.50 - 81.50 mm (3.130 - 3.209 in)	K-4361 (SAE)	TN-H04-31R	TA-H04-31X	
A-10003878 / 10003877	82.00 - 84.00 mm (3.228 - 3.307 in)	K-4363 (Detroit Only)	TN-H04-34R	TA-H04-34X	

Input Shaft Kits



K-4360 (ISO)

- Kenworth - Cummins Engines
- Navistar - A26 Engines
- Navistar - Cummins Engines
- Peterbilt - Cummins Engines
- PACCAR - MX engines

	Description	Part Number	QTY
1	Primary Drive Gear	S-3206	1
2	Rail B Synchronizer Ring	10002550	1
3	Rail B Synchronizer Sliding Sleeve	10001942	1
4	Input Shaft Assembly (NSS)	S-3205	1
5	Input Shaft Bearing O-Ring	10003862	1
6	Input Shaft Bearing	10000552	1
7	Input Shaft Snap Ring	10000624	1
Kit	Rail B Synchronizer Small Parts Kit	K-4388	1

Note: The Main Shaft End-Play procedure is required if the Input Shaft is replaced. One of three Main Shaft Selective Washers are required to adjust end-play, Part Numbers: 10000555, 10001759, 10001760.

K-4361 (SAE)

- Freightliner - Cummins Engines
- Freightliner - Cummins Engine
- Volvo - Cummins Engines
- Western Star - Cummins Engines
- Western Star - Cummins Engine

	Description	Part Number	QTY
1	Primary Drive Gear	S-3206	1
2	Rail B Synchronizer Ring	10002550	1
3	Rail B Synchronizer Sliding Sleeve	10001942	1
4	Input Shaft Assembly (NSS)	S-3207	1
5	Input Shaft Bearing O-Ring	10003862	1
6	Input Shaft Bearing	10000552	1
7	Input Shaft Snap Ring	10000624	1
Kit	Rail B Synchronizer Small Parts Kit	K-4388	1

Note: The Main Shaft End-Play procedure is required if the Input Shaft is replaced. One of three Main Shaft Selective Washers are required to adjust end-play, Part Numbers: 10000555, 10001759, 10001760.

K-4363 (Detroit Only)

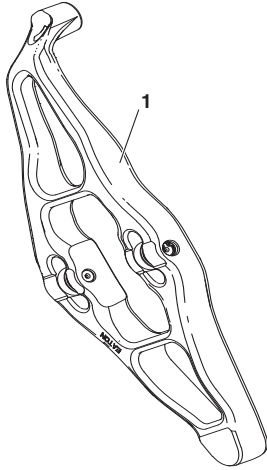
- Freightliner - Detroit Diesel Engines
- Western Star - Detroit Diesel Engines

	Description	Part Number	QTY
1	Primary Drive Gear	S-3206	1
2	Rail B Synchronizer Ring	10002550	1
3	Rail B Synchronizer Sliding Sleeve	10001942	1
4	Input Shaft Assembly (NSS)	S-3199	1
5	Input Shaft Bearing O-Ring	10003862	1
6	Input Shaft Bearing	10000552	1
7	Input Shaft Snap Ring	10000624	1
Kit	Rail B Synchronizer Small Parts Kit	K-4388	1

Note: The Main Shaft End-Play procedure is required if the Input Shaft is replaced. One of three Main Shaft Selective Washers are required to adjust end-play, Part Numbers: 10000555, 10001759, 10001760.

Clutch Housing Service Kits

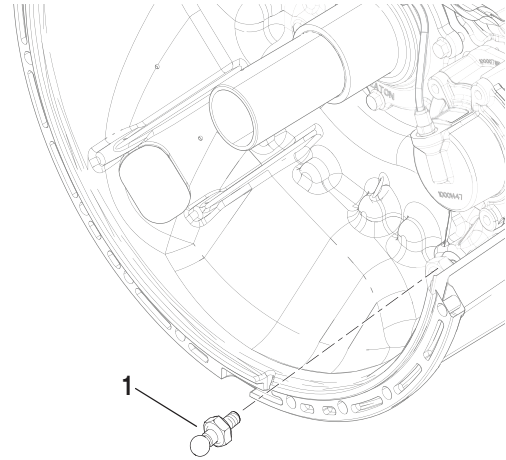
Release Yoke Assembly Kit



K-4380

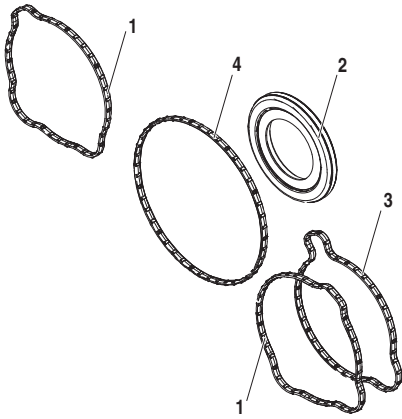
	Description	Part Number	QTY
1	Release Yoke, Clutch	125891	1

Release Yoke Pivot Pin



	Description	Part Number	QTY
1	Release Yoke Pivot Pin	10001949	1

Clutch Housing Seal Kit



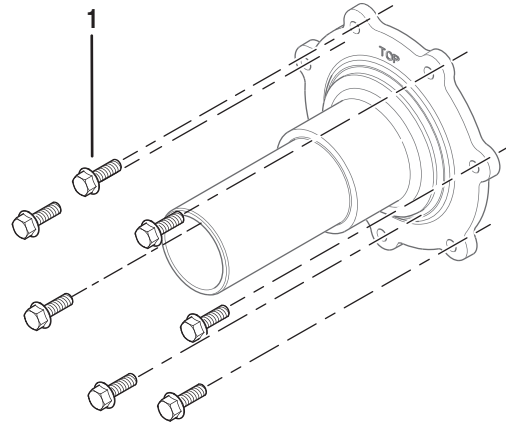
K-4482

	Description	P/N	QTY
1	Input Shaft Cover	10001053	1
2	Input Shaft Seal	4305625	1
3	Input Shaft Cover O-ring	10001578	1

K-4382

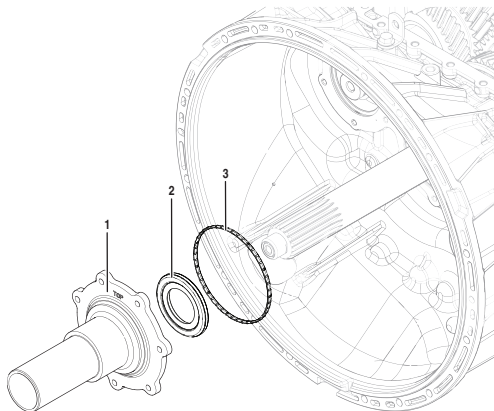
	Description	Part Number	QTY
1	Upper Countershaft Cover/Inertia Brake Housing (Front) Seal (NSS)	10001048	2
2	Input Shaft Seal (NSS)	4305625	1
3	Inertia Brake Housing (Rear) Seal (NSS)	10001049	1
4	Input Shaft Cover O-Ring (NSS)	10001578	1

Input Shaft Cover Cap Screw

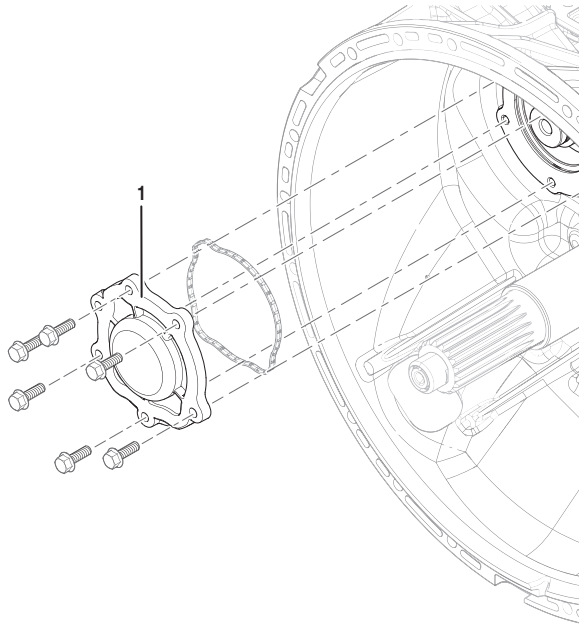


	Description	P/N	QTY
1	Input Shaft Cover Cap Screw (M8X1.25X25)	10001814-MP10	7

Input Shaft Cover Kit

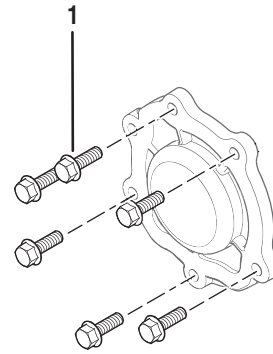


Upper Countershaft Cover



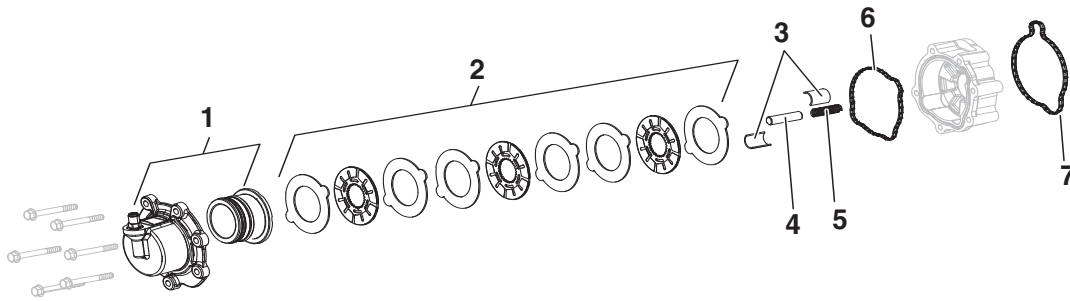
	Description	P/N	QTY
1	Upper Countershaft Cover	10001051	1

Upper Countershaft Cover Cap Screw



	Description	P/N	QTY
1	Upper Countershaft Cover Cap Screw (M8X1.25X25)	10001814-MP10	6

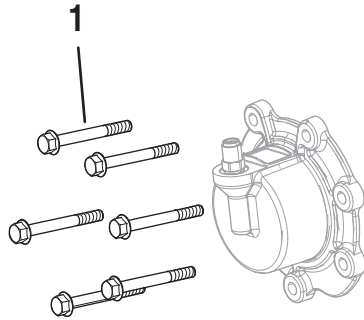
Inertia Brake Kit



K-4350

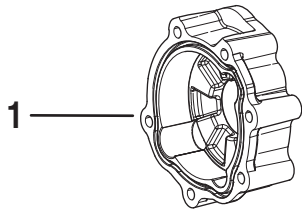
	Description	P/N	QTY		Description	P/N	Qty
1	Inertia Brake Cover and Piston (NSS)	S-3200	1	5	Inertia Brake Return Spring (NSS)	8874897	1
2	Inertia Brake Steel (6) and Friction Discs (3) (NSS)	S-3202	1	6	Inertia Brake Housing (Front) Seal (NSS)	10001048	1
3	Inertia Brake Wear Guides (NSS)	10000766	2	7	Inertia Brake Housing (Rear) Seal (NSS)	10001049	1
4	Inertia Brake Piston Pin (NSS)	10000778	1				

Inertia Brake Cover Cap Screw



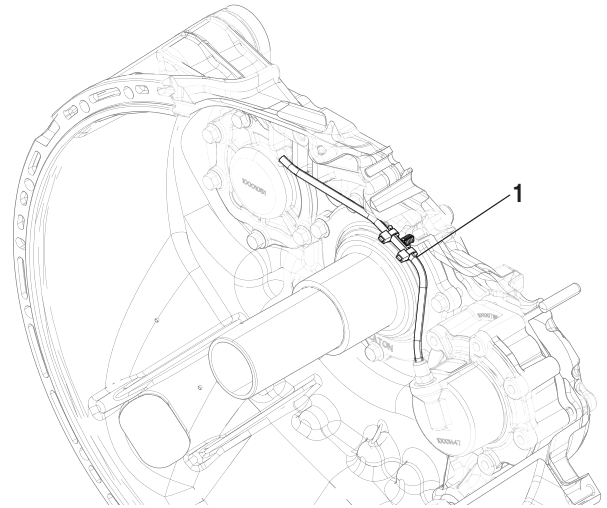
	Description	P/N	QTY
1	Inertia Brake Cover Cap Screw (M8X1.25X70)	10001813-MP6	6

Inertia Brake Housing



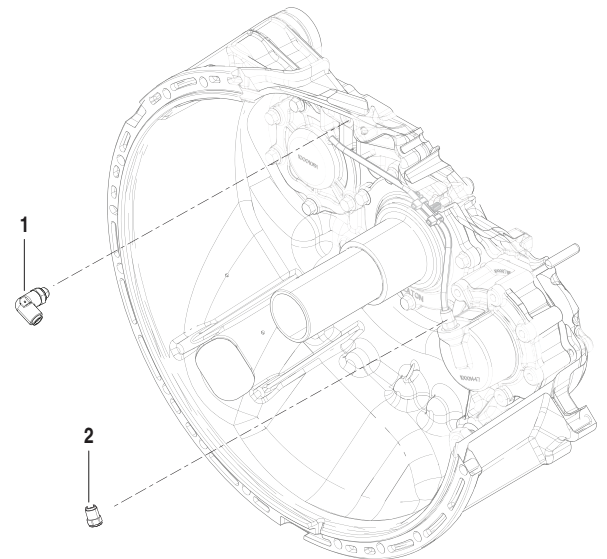
	Description	P/N	QTY
1	Inertia Brake Housing	10000785	1

Inertia Brake Air Line Assembly



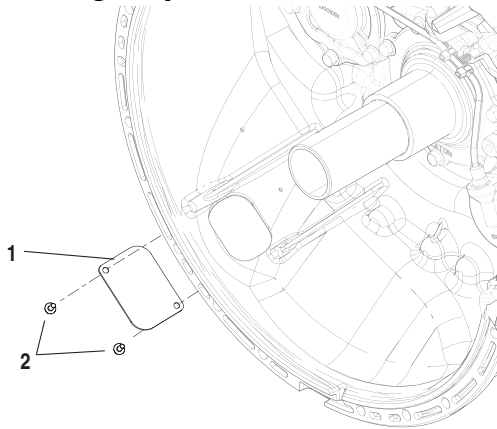
	Description	P/N	QTY
1	Inertia Brake Air Line Assembly	S-3204	1

Inertia Brake Air Line Fitting



	Description	P/N	QTY
1	Inertia Brake Air Line Swivel Fitting	10001240	1
2	Inertia Brake Air Line Straight Fitting	10001239	1

Clutch Housing Inspection Cover

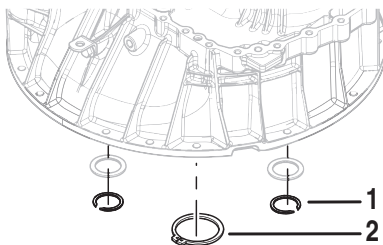


	Description	P/N	QTY
1	Clutch Housing Inspection Cover	10001202	1
2	Clutch Housing Inspection Cover Cap Screws (M6x1.0x16)	X-8-0625M	2

Breather

	Description	P/N	QTY
1	Breather	4304602	1

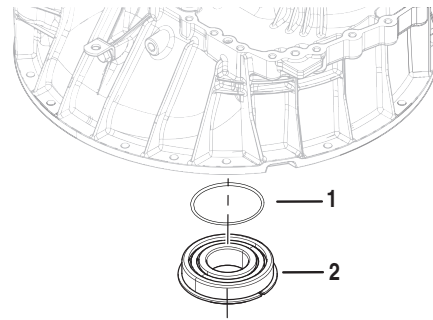
Front Snap Ring Kit



K-4359

	Description	P/N	QTY
1	Countershaft Snap Ring	4302082	2
2	Input Shaft Snap Ring	10000624	1

Input Shaft Bearing Kit

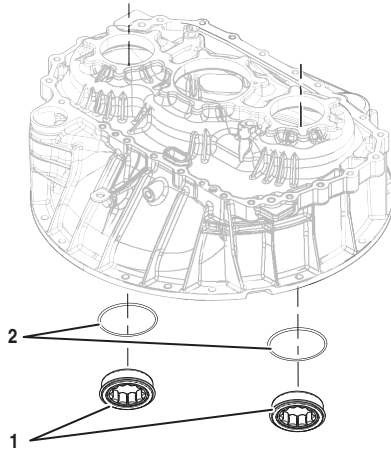


K-4483

	Description	Part Number	QTY
1	Input Shaft Bearing O-Ring	10003862	1
2	Input Shaft Ball Bearing (NSS)	10000552	1

Note: The Main Shaft End-Play procedure is required if the Input Shaft Bearing is replaced. One of three Main Shaft Selective Washers are required to adjust end-play, Part Numbers: 10000555, 10001759, 10001760.

Countershaft Bearing Kit

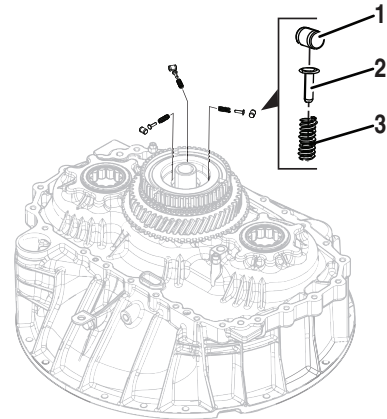


K-4484

	Description	P/N	QTY
1	Counter Shaft Bearing	10000649	2
2	Counter Shaft Bearing O-Ring	5568511	2

Note: Clutch Housing and Main Housing use the same Countershaft Bearing part numbers.

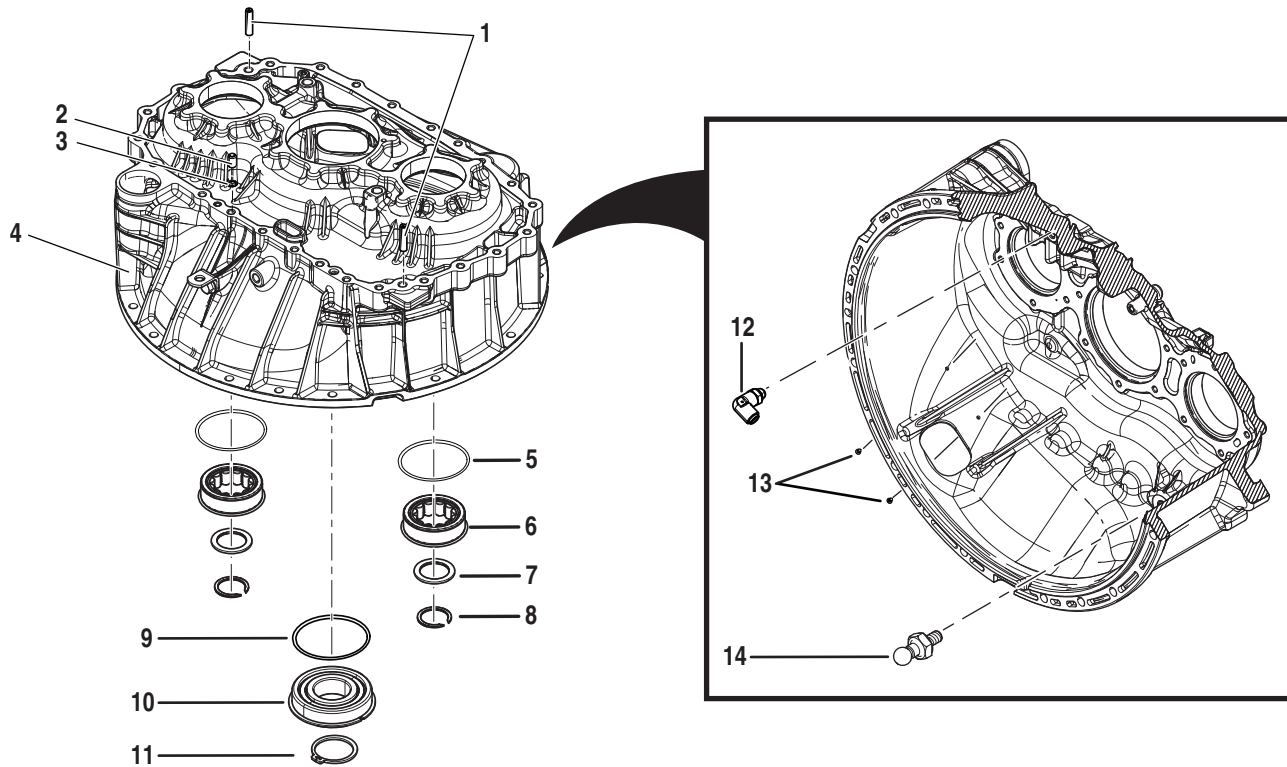
Rail B Synchronizer Small Parts Kit



K-4388

	Description	P/N	QTY
1	Rail B Synchronizer Roller (NSS)	10001959	3
2	Rail B Synchronizer Plunger (NSS)	10001711	3
3	Rail B Synchronizer Spring (NSS)	10001710	3

Clutch Housing Kit



K-4358

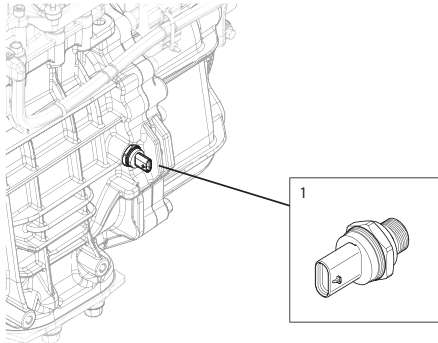
	Description	P/N	QTY		Description	Part Number	QTY
1	Main Housing to Clutch Housing Dowel Pins	5575522	2	8	Counter Shaft Snap Ring	4302082	2
2	I-Brake Main Housing to Clutch Housing Dowel	10001181	1	9	Input Shaft Bearing O-Ring*	10003862	1
3	I-Brake Main Housing to Clutch Housing O-ring	13834	1	10	Input Shaft Ball Bearing (NSS)*	10000552	1
4	Clutch Housing Assembly*	S-3203	1	11	Input Shaft Snap Ring	10000624	1
5	Countershaft Bearing O-Ring*	5568511	2	12	Inertia Brake Air Line Fitting*	10001240	1
6	Counter Shaft Bearing*	10000649	2	13	Serial Tag Rivets (NSS) (1/8x5/16)	X-13-229	2
7	Lower and Upper Counter-shaft Flat Washer	10001532	2	14	Release Yoke Pivot Pin	10001949	1

* Part of Clutch Housing Assembly, S-3203

Note: The Main Shaft End-Play procedure is required if the Clutch Housing is replaced. One of three Main Shaft Selective Washers are required to adjust end-play, Part Numbers: 10000555, 10001759, 10001760.

Main Housing Service Kits

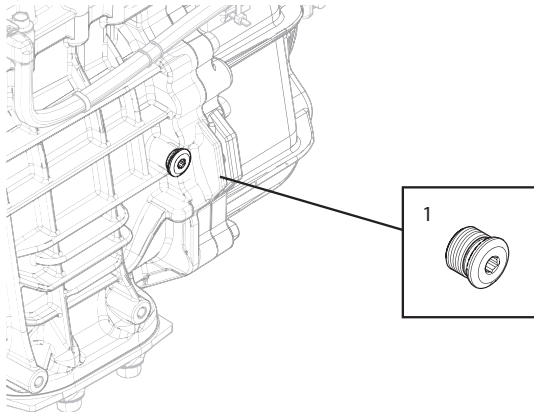
Fluid Pressure Sensor Kit



K-4387

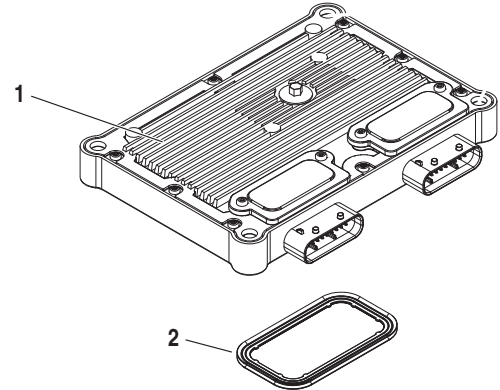
	Description	P/N	QTY
1	Fluid Pressure Sensor	10001130	1

Plug, Fluid Pressure Sensor



	Description	P/N	QTY
1	Plug, Fluid Press Sensor (M14X1.5)	4308231	1

Transmission Control Module (TCM) Kit



K-4398R (12-Speed)

- Model Number: EEO-xxF112C

	Description	P/N	QTY
1	TCM (NSS)	10001705R	1
2	TCM Seal	10001587	1

K-4487R (11-Speed)

- Model Number: EE-17F111B

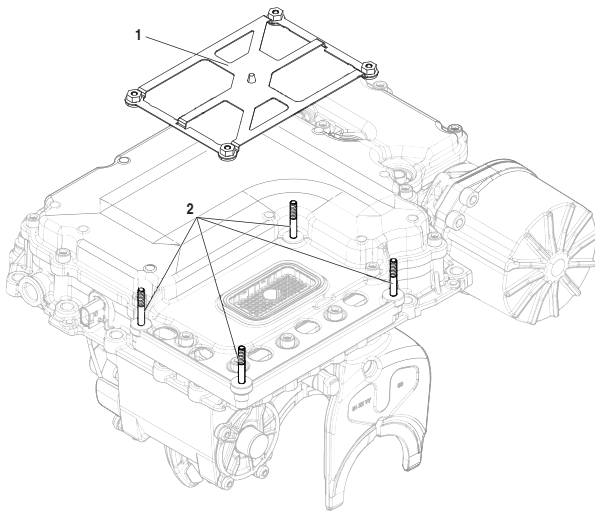
	Description	P/N	QTY
1	TCM (NSS)	10001705R	1
2	TCM Seal	10001587	1

K-4517R (12-Speed CNG)

- Model Number: EHD-14F112C-N

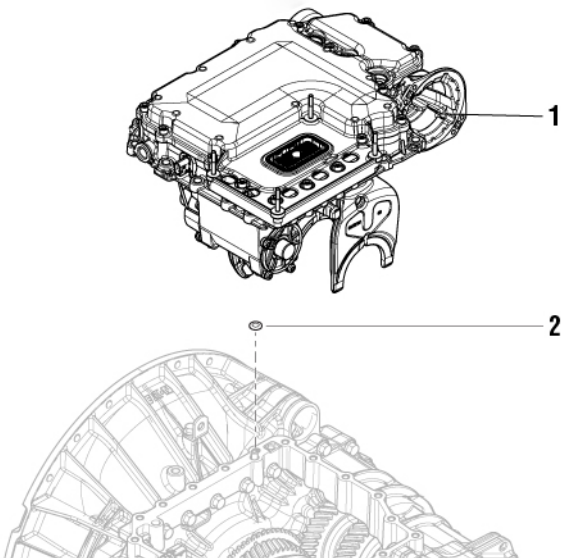
	Description	P/N	QTY
1	TCM (NSS)	10001705R	1
2	TCM Seal	10001587	1

TCM Cover and Mounting Stud



	Description	P/N	QTY
1	TCM Cover	4307675	1
2	TCM Mounting Stud (M6x50.0)	5577511-MP4	4

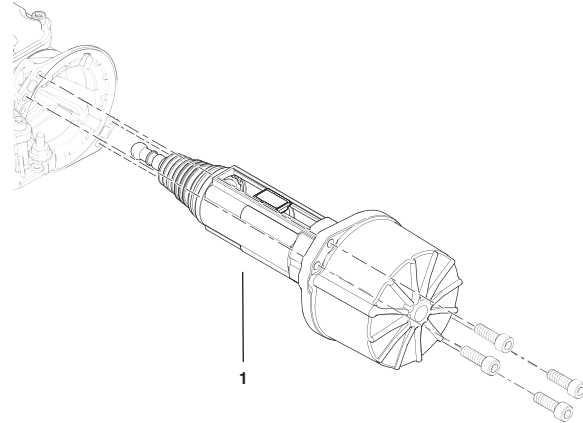
Mechatronic Transmission Module (MTM) Kit



K-4355

	Description	P/N	QTY
1	MTM (NSS)	A-10000715	1
2	I-Brake MTM to Main Housing O-ring	13653	1

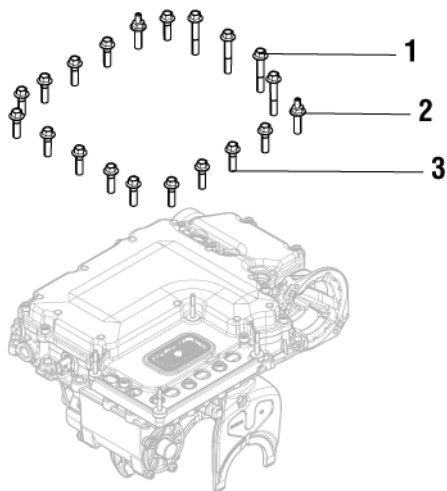
Linear Clutch Actuator (LCA) Kit



K-4357

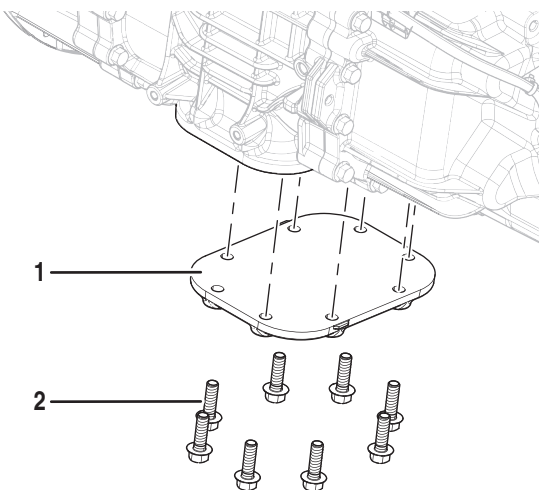
	Description	P/N	QTY
1	LCA	A-10000714	1

MTM Cap Screws



	Description	P/N	QTY
1	MTM Cap Screw, Long (M10X1.5X60)	10001222-MP4	4
2	MTM Cap Screw, Special (M10X1.5X38 & M8X1.25X13)	10001815-MP4	2
3	MTM Cap Screw (M10X1.5X35)	10001179-MP20	14

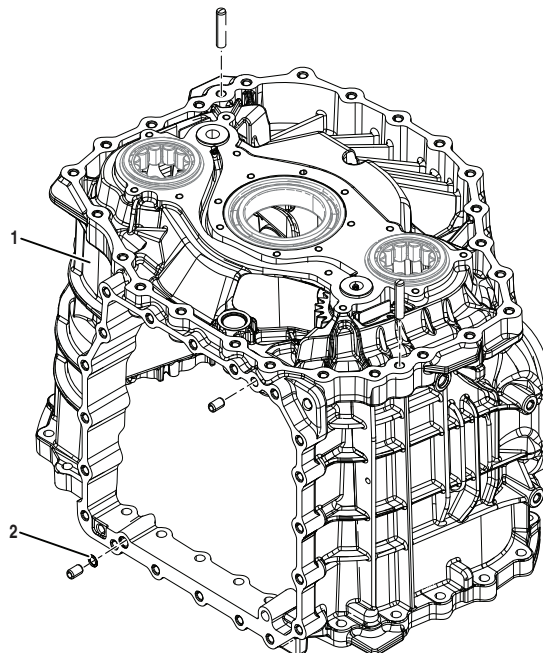
8-Bolt PTO Cover Kit



K-4385

	Description	P/N	QTY
1	8-Bolt PTO Cover	10001399	1
2	PTO Cover Cap Screws (M12x1.75x40)	10001483-MP8	8

Main Housing Kit

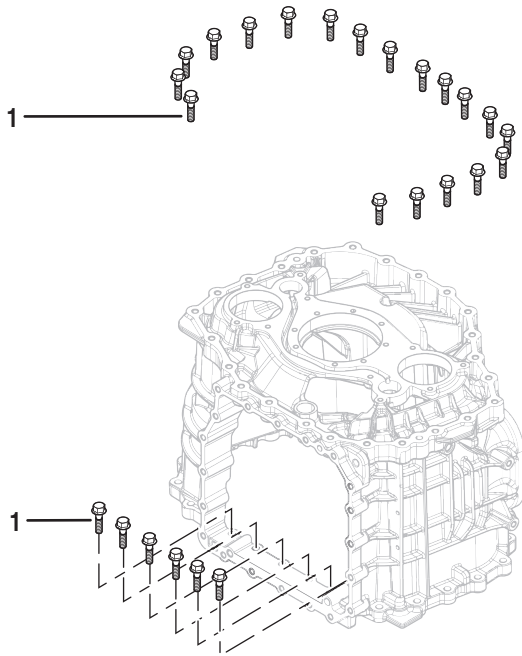


K-4364

	Description	P/N	QTY
1	Main Housing (NSS)	S-3208	1
2	I-Brake MTM to Main Housing O-ring	13653	1

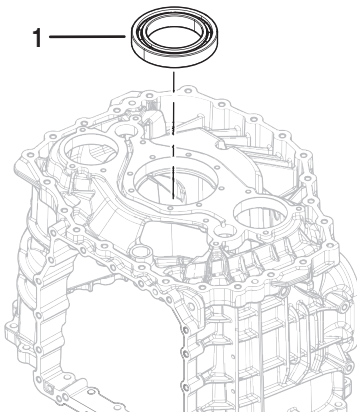
Note: The Main Shaft End-Play procedure is required if the Main Housing is replaced. One of three Main Shaft Selective Washers are required to adjust end-play, Part Numbers: 10000555, 10001759, 10001760.

Main Housing Cap Screw



	Description	P/N	QTY
1	Main Housing Cap Screws (M10x1.5x40)	10002067-MP25	25

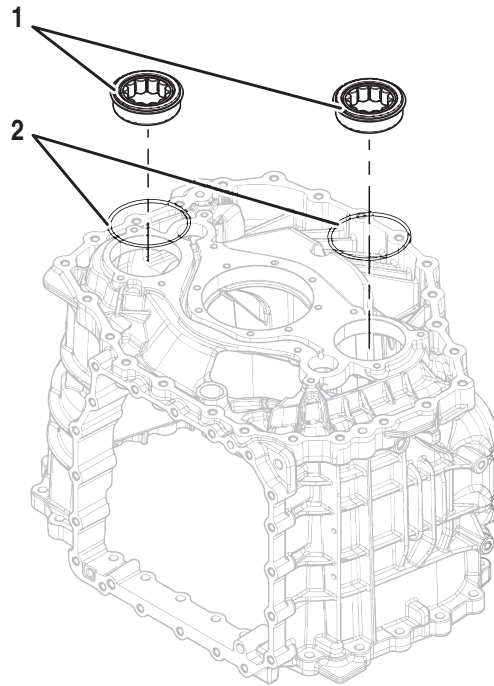
Main Shaft Bearing



	Description	P/N	QTY
1	Main Shaft Bearing	10000683	1

Note: The Main Shaft End-Play procedure is required if the Main Shaft Bearing is replaced. One of three Main Shaft Selective Washers are required to adjust end-play, Part Numbers: 10000555, 10001759, 10001760.

Countershaft Bearing Kit

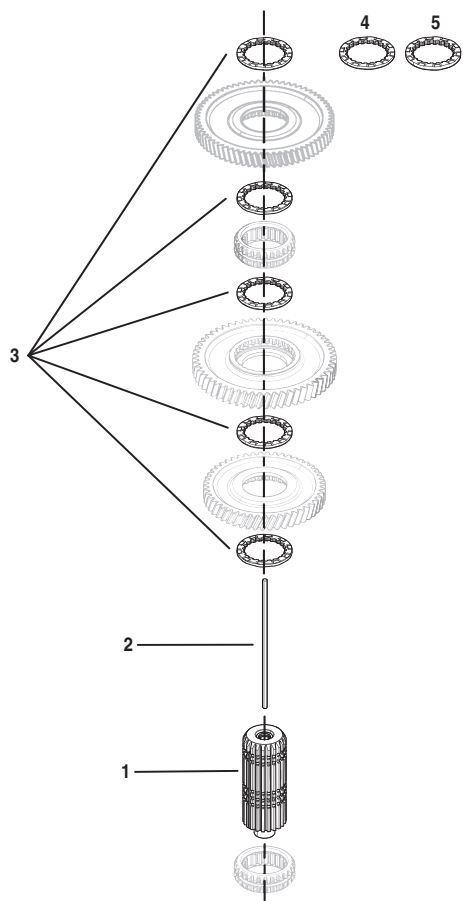


K-4484

	Description	P/N	QTY
1	Counter Shaft Bearings	10000649	2
2	Counter Shaft Bearing O-Rings	5568511	2

Note: Main Housing and Clutch Housing use the same Countershaft Bearing part numbers.

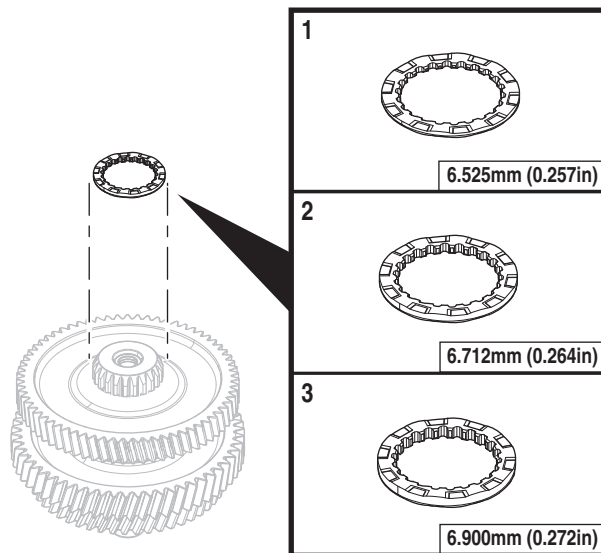
Main Shaft Kit



K-4366

	Description	P/N	QTY
1	Main Shaft (NSS)	A-10000648	1
2	Main Shaft Key	10000560	1
3	Main Shaft Washer 6.525 mm (0.257 in)	10000555	5
4	Main Shaft Selective Washer 6.712 mm (0.264 in)	10001759	1
5	Main Shaft Selective Washer 6.900mm (0.272 in)	10001760	1

Main Shaft Selective Washer Kit



K-4486

	Description	P/N	QTY
1	Main Shaft Washer 6.525 mm (0.257 in)	10000555	1
2	Main Shaft Selective Washer 6.712 mm (0.264 in)	10001759	1
3	Main Shaft Selective Washer 6.900mm (0.272 in)	10001760	1

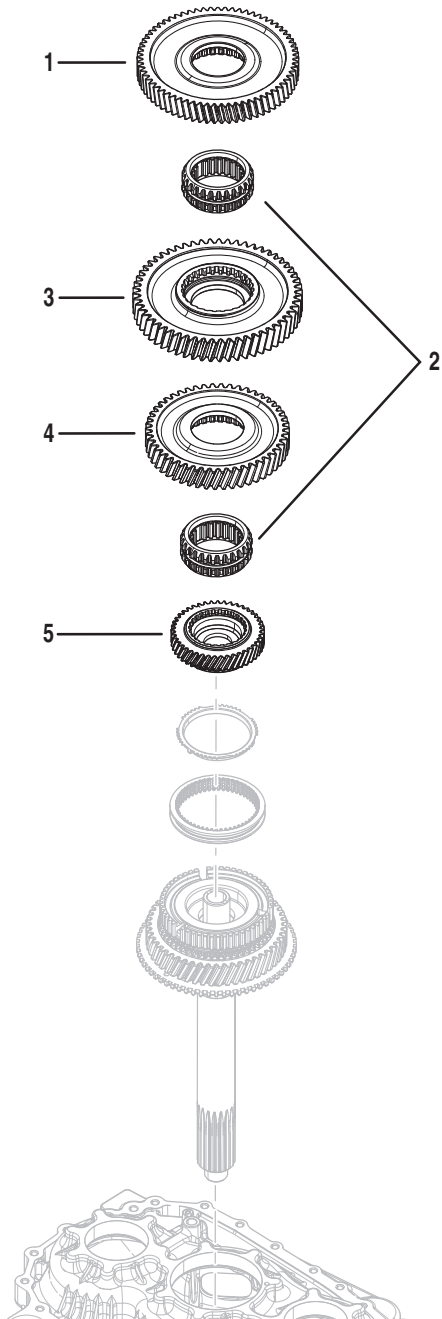
Note: The Main Shaft End-Play Service Procedure is required if one or more of the following components are replaced:

- Clutch Housing
- Main Housing
- Input Shaft
- Input Shaft Bearing
- Main Shaft Bearing



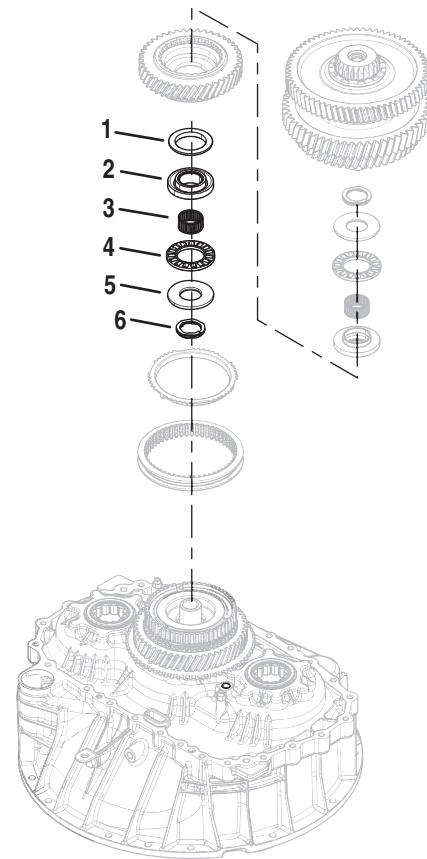
CAUTION: Failure to determine and install the ideal Main Shaft Selective Washer results in incorrect Main Shaft End-Play and transmission component damage.

Main Shaft Parts



	Description	P/N	QTY
1	Reverse Gear	10000556	1
2	Rail C and D Sliding Clutches	10000557	2
3	Primary Driven Gear	10000898	1
4	Secondary Driven Gear	10000899	1
5	Primary Drive Gear	S-3206	1

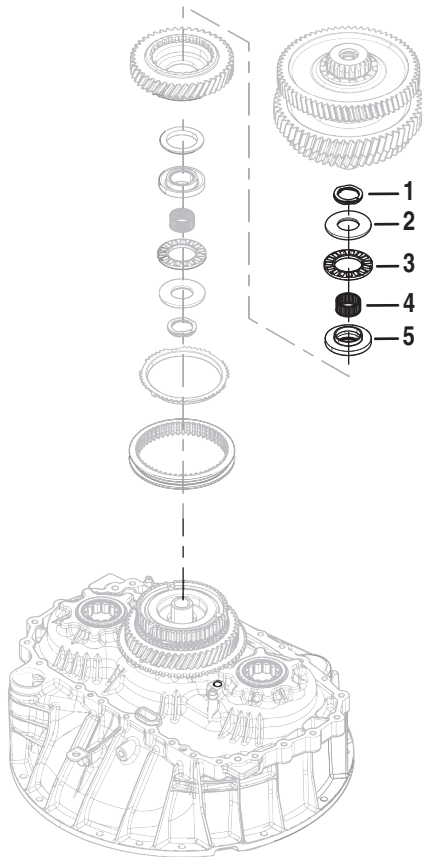
Drive Gear - Front Small Parts Kit



K-4367

	Description	P/N	QTY
1	Spherical Washer - Front	10000545	1
2	Bearing Race - Front/Rear	S-3218	1
3	Needle Bearing - Front/Rear	10001006	1
4	Thrust Bearing - Front/Rear	10001392	1
5	Thrust Washer - Front/Rear	10001393	1
6	Wave Spring - Front	10001685	1

Drive Gear - Rear Small Parts Kit



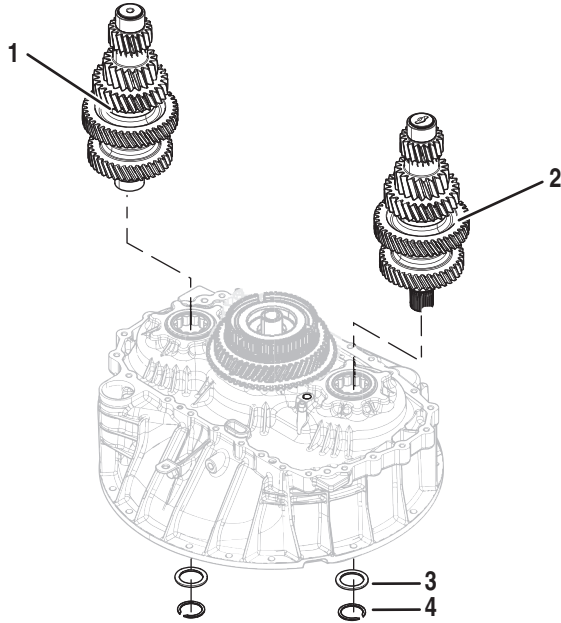
K-4369

	Description	P/N	QTY
1	Wave Spring - Rear	10000978	1
2	Thrust Washer - Front/Rear	10001393	1
3	Thrust Bearing - Front/Rear	10001392	1
4	Needle Bearing - Front/Rear	10001006	1
5	Bearing Race - Rear	S-3219	1

Upper & Lower Countershaft (Single PTO) Kit



CAUTION: Converting between a Single PTO transmission and a Dual PTO transmission voids transmission warranty and could result in transmission component damage.



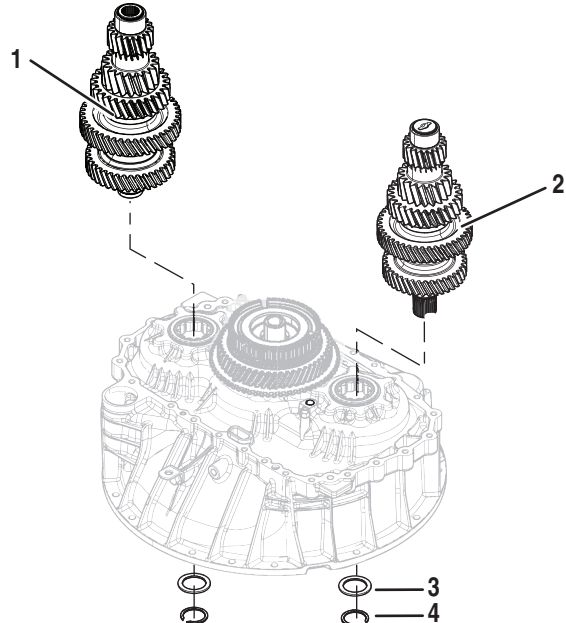
K-4370

	Description	P/N	QTY
1	Upper Countershaft	S-3211	1
2	Lower Countershaft	S-3210	1
3	Lower and Upper Countershaft Flat Washer	10001532	2
4	Lower and Upper Countershaft Snap Ring	4302082	2

Upper & Lower Countershaft (Dual PTO) Kit



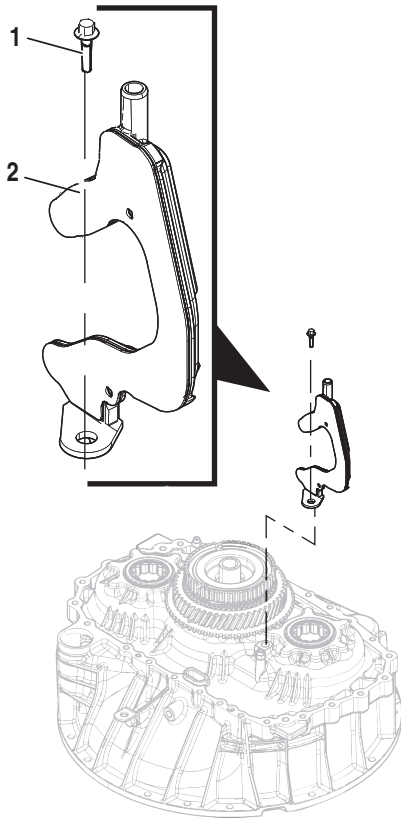
CAUTION: Converting between a Single PTO transmission and a Dual PTO transmission voids transmission warranty and could result in transmission component damage.



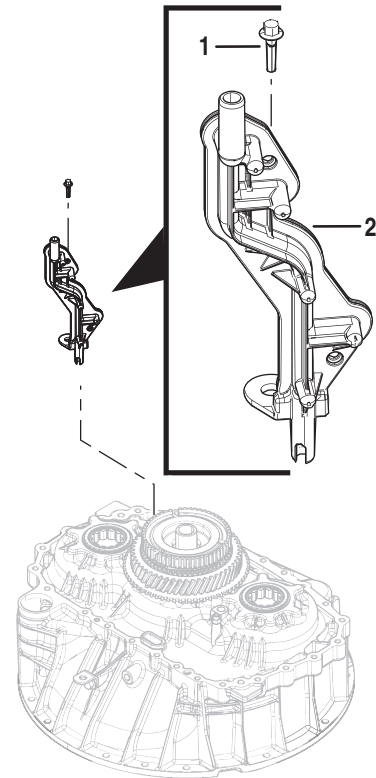
K-4371

	Description	P/N	QTY
1	Upper Countershaft	S-3212	1
2	Lower Countershaft	S-3210	1
3	Lower and Upper Countershaft Flat Washer	10001532	2
4	Lower and Upper Countershaft Snap Ring	4302082	2

Upper Lube Tube Kit



Lower Lube Tube Kit



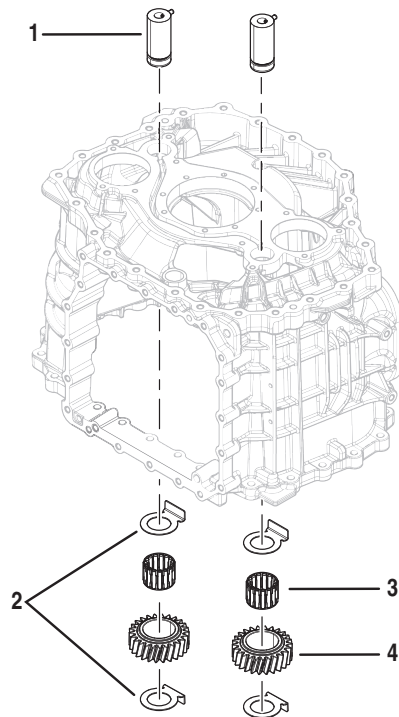
K-4384

	Description	P/N	QTY
1	Lube Tube Cap Screw (NSS)	X-8-0629M	1
2	Upper Lube Tube (NSS)	A-10001512	1

K-4386

	Description	P/N	QTY
1	Lube Tube Cap Screw (NSS)	X-8-0629M	1
2	Lower Lube Tube (NSS)	A-10001513	1

Reverse Idler Kit

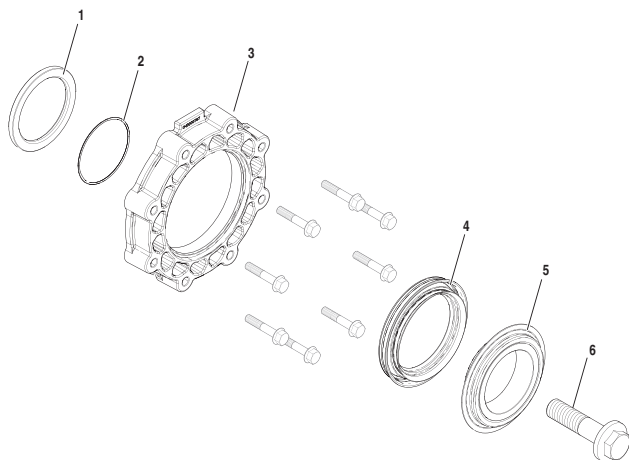


K-4365

	Description	P/N	QTY
1	Reverse Idler Shaft	S-3209	2
2	Reverse Idler Thrust Washer	10000665	4
3	Reverse Idler Gear Bearing	10001013	2
4	Reverse Idler Gear	10000664	2

Rear Housing Service Parts and Kits

Output Seal Kit

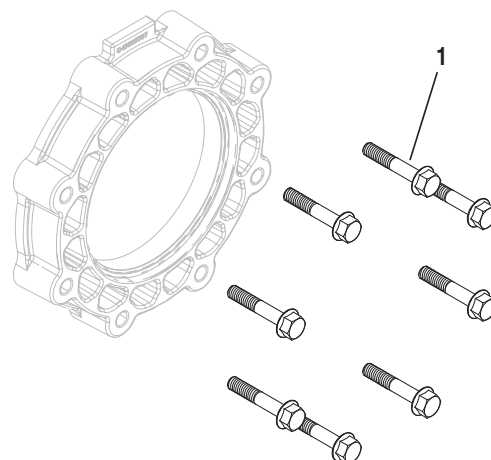


K-4399

	Description	P/N	QTY
1	Thrust Washer* (NSS)	10001089	1
2	O-ring* (NSS)	5568511	1
3	Rear Bearing Cover (NSS)	10000798	1
4	Output Shaft Seal* (NSS)	4302322	1
5	Wear Sleeve and Dust Cover* (NSS)	S-3201	1
6	Output Yoke Retainer Bolt* (M20x1.5x80)	10000949	1

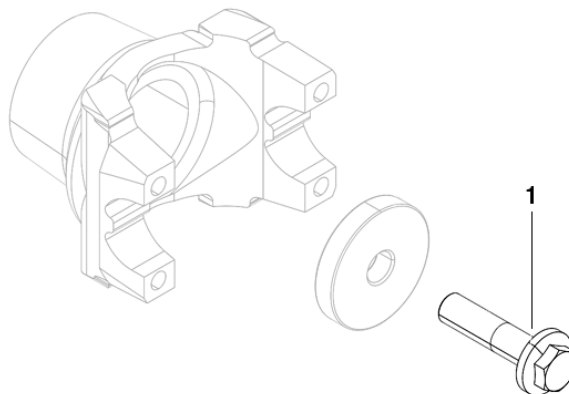
Note: *- included in K-4368, part of K-4399

Rear Bearing Cover Cap Screw



	Description	P/N	Qty
1	Rear Bearing Cover Cap Screw (M8X1.25X45)	10001172 -MP8	8

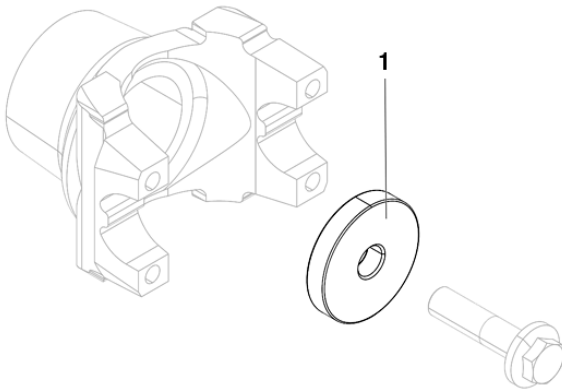
Output Yoke Retainer Bolt



WARNING: A new Retainer Bolt is required during Output Yoke installation. Failure to replace the Retainer Bolt may cause a re-used Retainer Bolt to loosen during operation and may result in major vehicle component damage, severe injury or death.

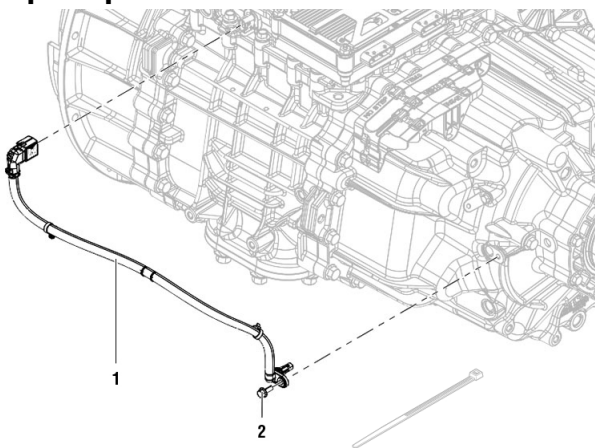
	Description	P/N	QTY
1	Output Yoke Retainer Bolt* (M20x1.5x80)	10000949	1

Output Yoke Retainer Plate



	Description	P/N	QTY
1	Retainer Plate	10000950	1

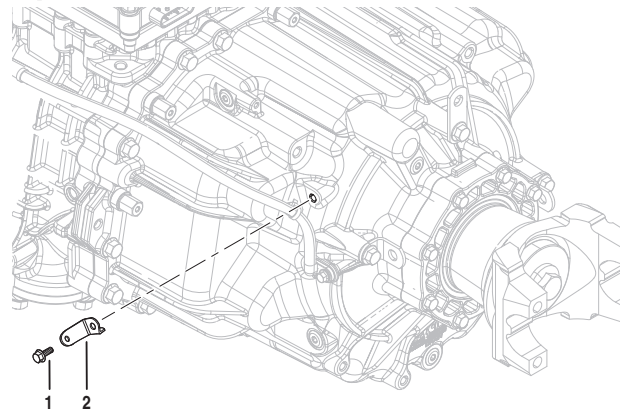
Output Speed Sensor Kit



K-4381

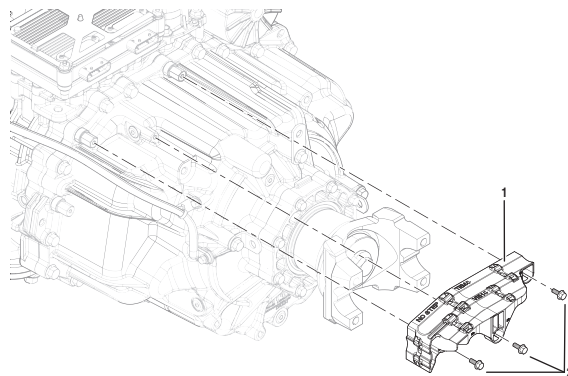
	Description	P/N	QTY
1	Output Speed Sensor Assembly (NSS)	10001792	1
2	Output Speed Sensor Cap Screw (M6x1.0x16)	X-8-0625M	1
3	Cable Tie	5559348	1

Output Speed Sensor Harness Bracket Cap Screw



	Description	P/N	QTY
1	Output Speed Sensor Harness Bracket Cap Screw (M6X1.0X16)	X-8-0625M	1
2	Output Speed Sensor Bracket	10001097	1

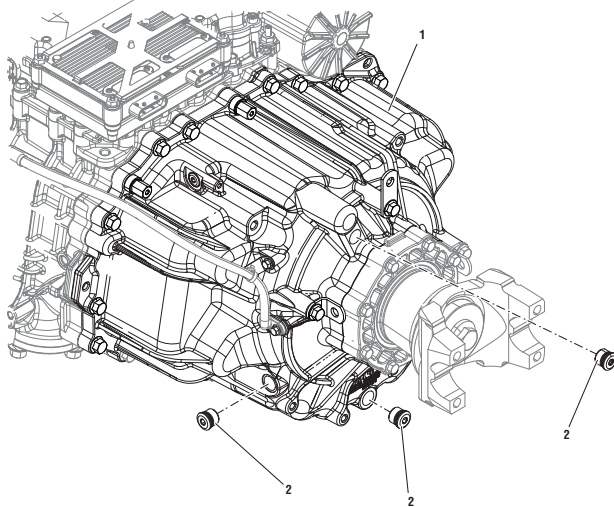
Harness Bracket Parts



	Description	P/N	QTY
1	Harness Bracket	10001082	1
2	Harness Bracket Cap Screw (M6X1.0X16)	X-8-0625M	3

Rear Housing (Single PTO) Kit

CAUTION: Converting between a Single PTO transmission and a Dual PTO transmission voids transmission warranty and could result in transmission component damage.

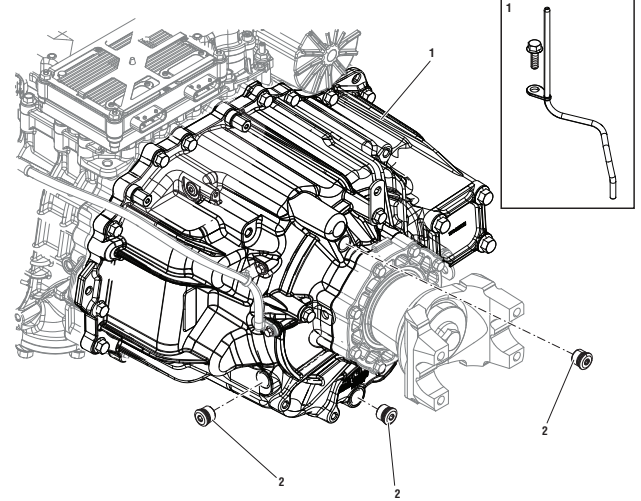


K-4372

	Description	P/N	QTY
1	Rear Housing Assembly (NSS)	S-3213	1
2	Oil Fill, Check, Drain Plug (M18x1.5)	4308230	3
Kit	Rear Bearing Cover/Output Seal Kit	K-4399	1

Rear Housing (Dual PTO) Kit

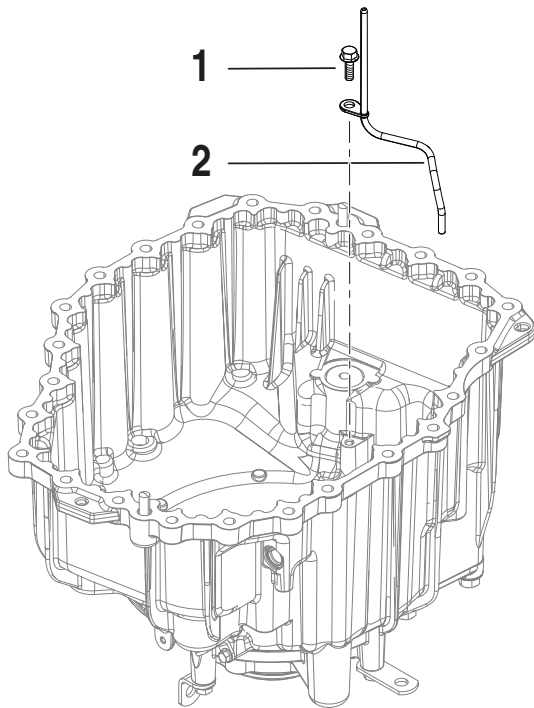
CAUTION: Converting between a Single PTO transmission and a Dual PTO transmission voids transmission warranty and could result in transmission component damage.



K-4373

	Description	P/N	QTY
1	Rear Housing Assembly and Lube Tube	S-3214	1
2	Oil Fill, Check, Drain Plug (M18x1.5)	4308230	3
Kit	Rear Bearing Cover/Output Seal Kit	K-4399	1

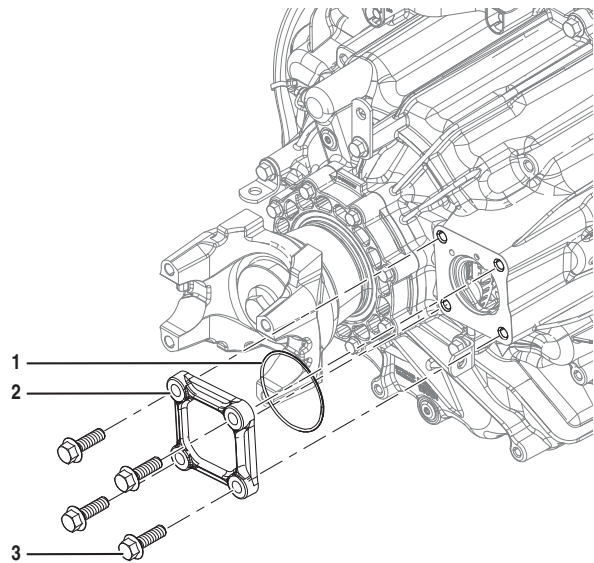
Lube Tube (Dual PTO) Kit



K-4374

	Description	P/N	QTY
1	Lube Tube (Dual PTO) Cap Screw (M8x1.25x25)	10001814	1
2	Lube Tube (Dual PTO) (NSS)	A-10002515	1

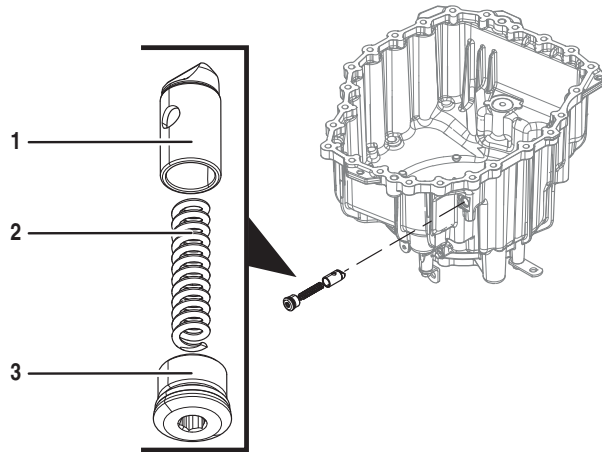
Rear PTO Cover (Dual PTO) Kit



K-4375

	Description	P/N	QTY
1	Rear PTO Cover O-ring	4307971	1
2	Rear PTO Cover (NSS)	10002521	1
3	Rear PTO Cover Cap Screw (M12x1.75x40)	10001483	4

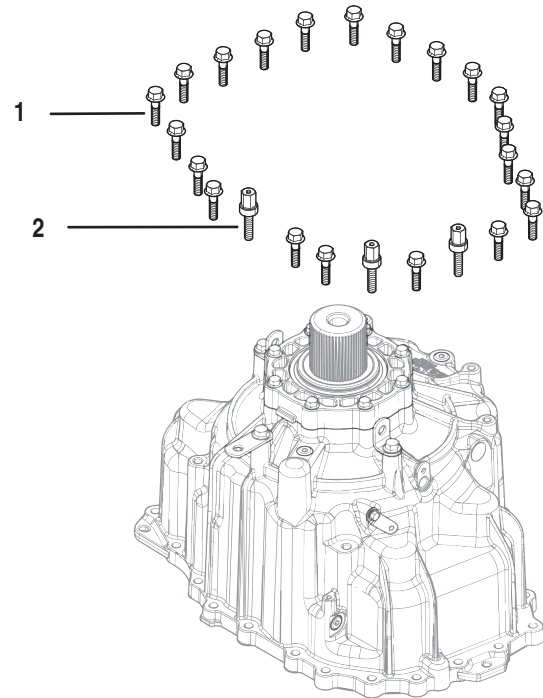
Rail E Detent Kit



K-4376

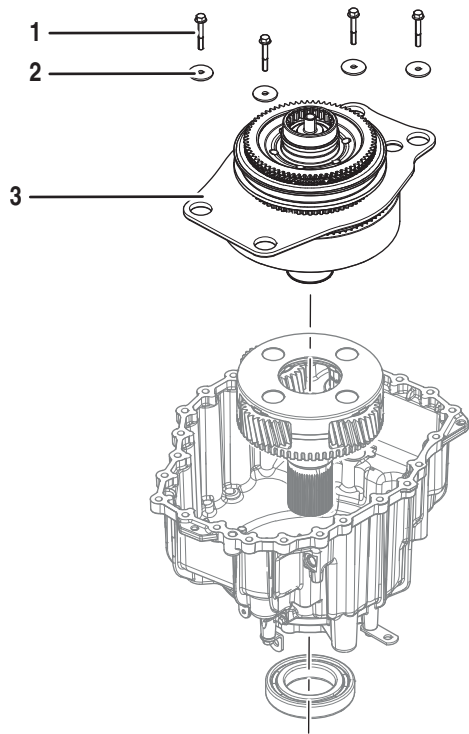
	Description	P/N	QTY
1	Rail E Detent (NSS)	4307820	1
2	Rail E Detent Spring (NSS)	10001120	1
3	Rail E Detent Plug (M18x1.5)	4308230	1

Rear Housing Cap Screws



	Description	P/N	QTY
1	Rear Housing Cap Screw (M10x1.5x40)	10002067-MP25	21
2	Rear Housing Threaded Cap Screw (M10)	10001102-MP3	3

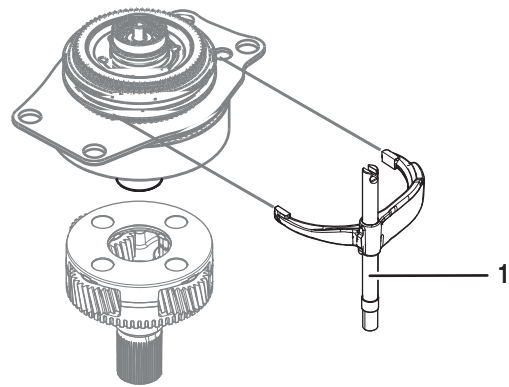
Range Synchronizer Assembly Kit



K-4499

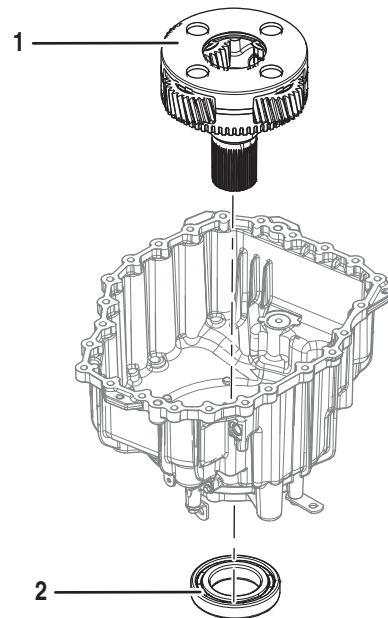
	Description	P/N	QTY
1	Range Synchronizer Cap Screw (M8x1.25x55)	10001167	4
2	Range Synchronizer Washer (M8)	10001168	4
3	Range Synchronizer Assembly (NSS)	S-3222	1

Shift Rail E (and Yoke)



	Description	P/N	QTY
1	Shift Rail E (and Yoke)	S-3216	1

Planetary Output Shaft Assembly Kit

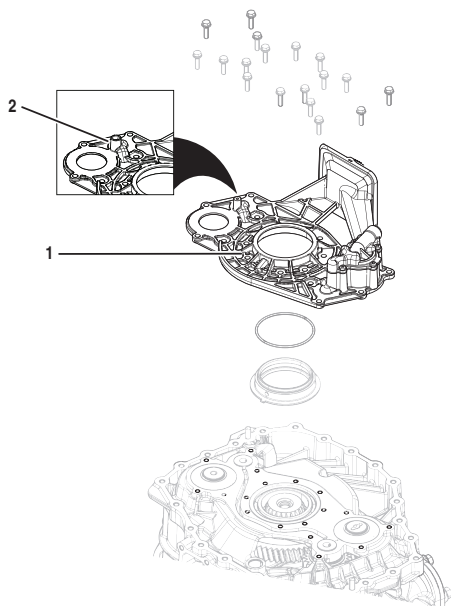


K-4378

	Description	P/N	QTY
1	Planetary Output Shaft Assembly (NSS)	S-3217	1
2	Output Bearing	10000592	1

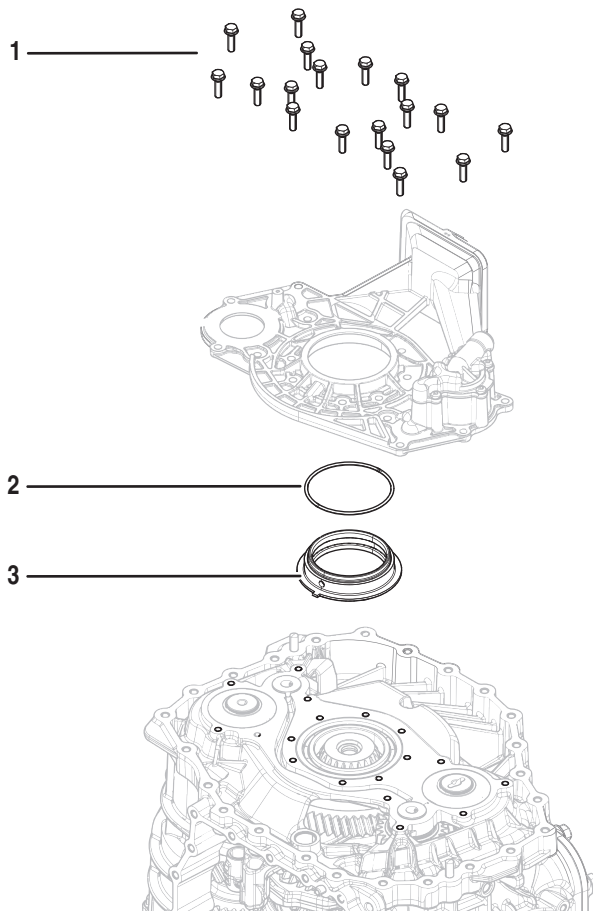
Pump Assembly

CAUTION: Converting between a Single PTO transmission and a Dual PTO transmission voids transmission warranty and could result in transmission component damage.



	Description	P/N	QTY
1	Single PTO	A-10001057	1
2	Dual PTO	A-10002528	1

Oil Pump/Range Spacer Parts



	Description	P/N	QTY
1	Pump Cap Screw (M8X1.25X30)	10001412-MP20	18
2	Oil Pump/Range Spacer O-ring	10001065	1
3	Oil Pump/Range Spacer	10000907	1

Lubricant

- PS-386 HD Synthetic Transmission Lubricant

	Description	P/N	QTY
	1 Gallon Jug	5564546-M4	4
	5 Gallon Pail	5564543	1
	55 Gallon Drum	5564544	1

Oil Level Inspection Procedure

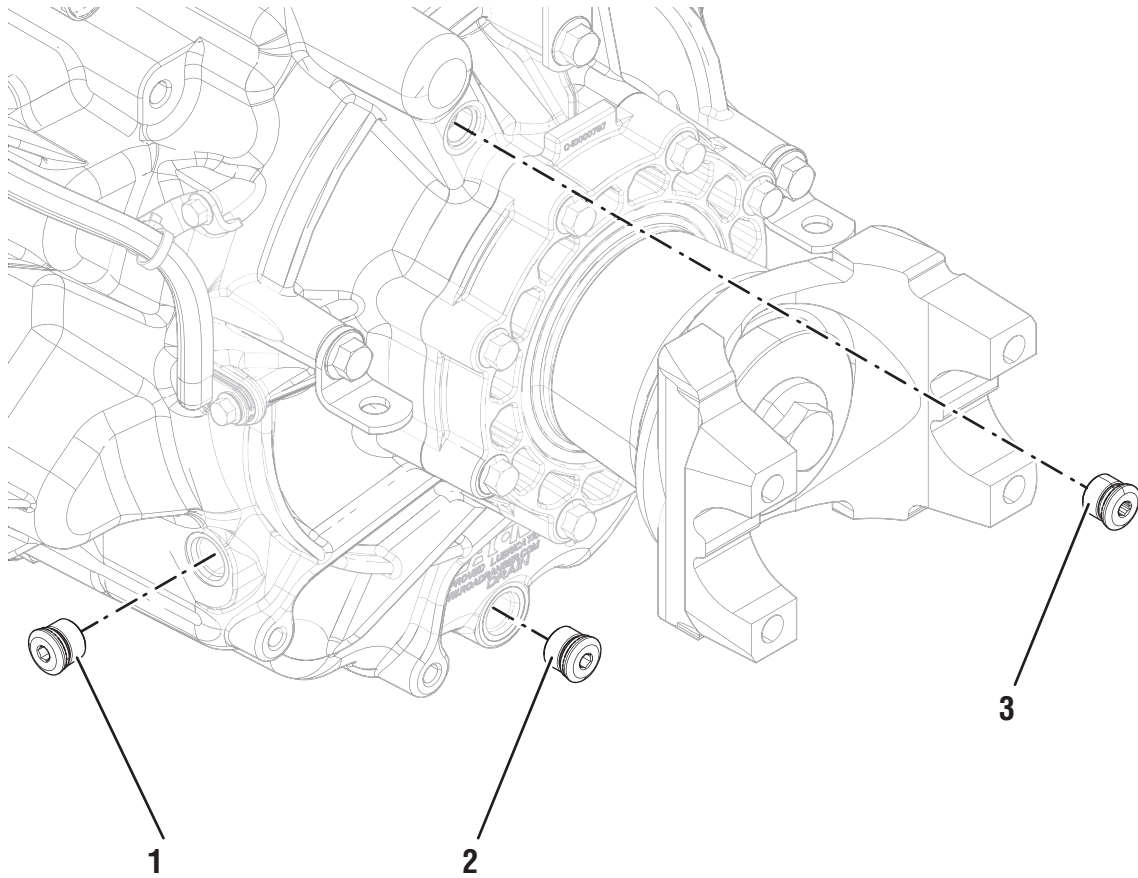
Special Instructions

None

Special Tools

None

Component Identification



1. Oil Check Plug - 6 mm Hex
2. Oil Drain Plug - 6 mm Hex
3. Oil Fill Plug - 6 mm Hex

Oil Level Inspection

1. Park vehicle in a safe area on level ground.
2. Key off.
3. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply parking brake and follow vehicle manufacturer parking instructions. Failure to follow these instructions may cause unintended vehicle movement resulting in major vehicle component damage, severe injury or death.

4. Locate the transmission Oil Check Plug on the left side of the rear housing.



5. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.
6. Oil level is correct when a small amount of oil runs out of the Oil Check Plug hole.
 - If oil level is not correct, go to Step 7.
 - If oil level is correct, go to Step 12.
7. Remove the Oil Fill Plug with a 6 mm hex key.



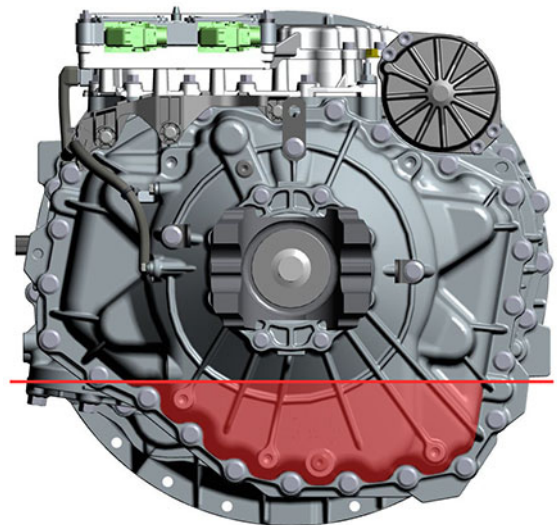
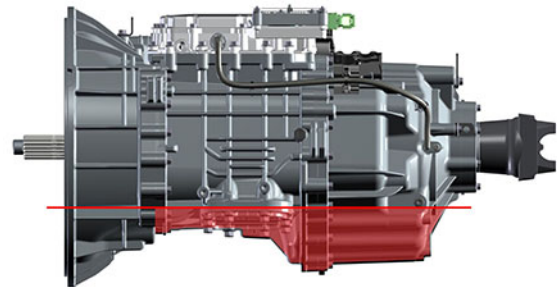
8. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



9. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

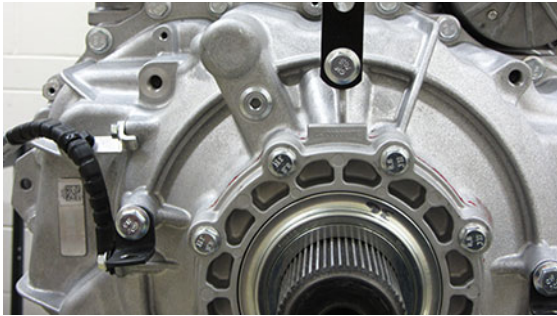
Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



10. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
11. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

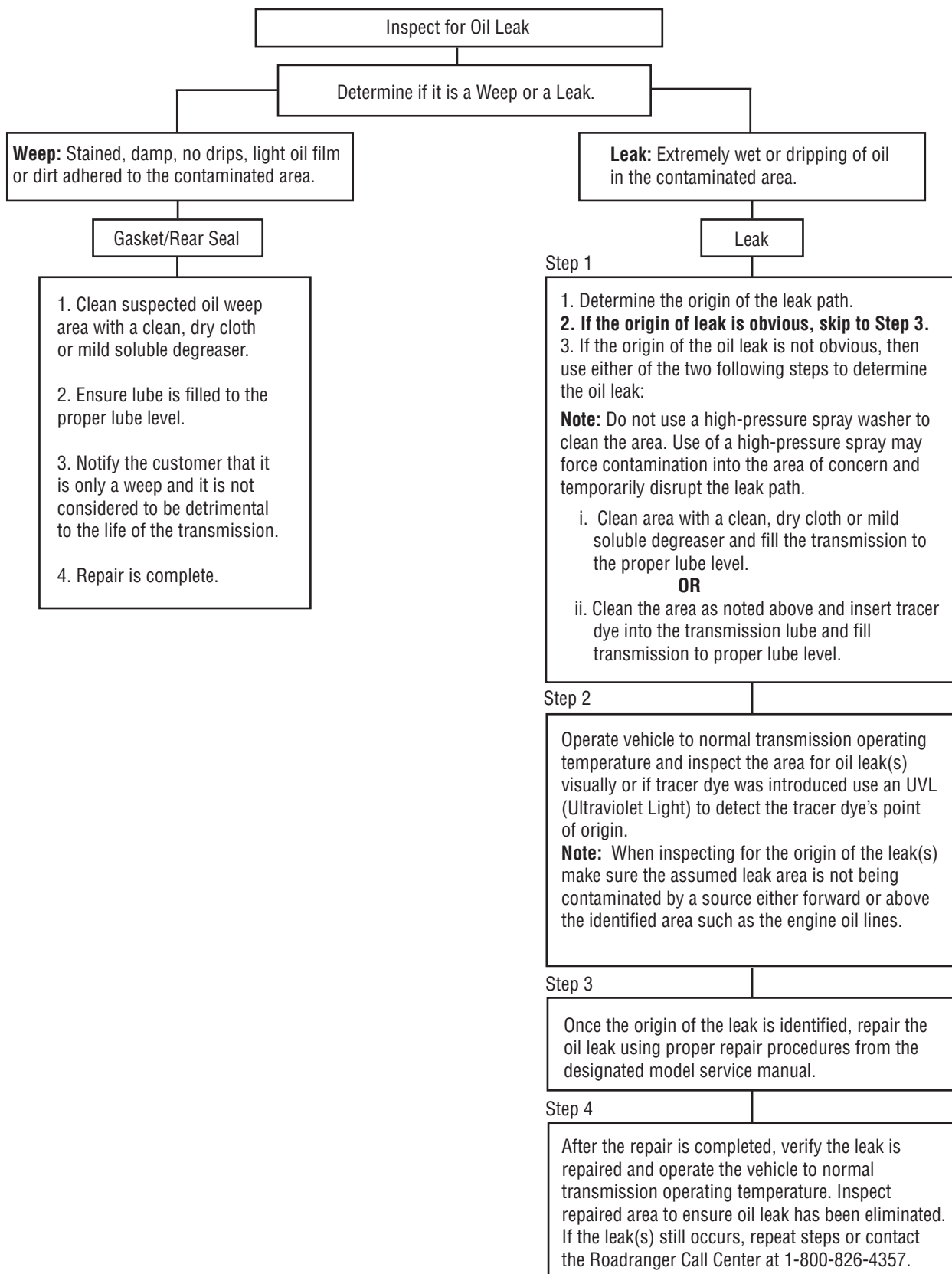


12. Inspect the Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
13. Install the Oil Check Plug and torque to 24.5–29.5 Nm (18–22 lb-ft).

NOTICE: Do not over-torque the Oil Check Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and go to Step 5.

Oil Leak Inspection Process



Lubrication Specifications

Use only Eaton approved lubricant. For information, see TCMT0021 Eaton Lubrication Product Specification Manual.

NOTICE: Failure to use the approved lubricant will affect the transmission performance and the warranty coverage.

NOTICE: Additives and/or friction modifiers are not approved. Additives of any kind will affect the transmission performance and the warranty coverage.

For a list of Eaton approved lubricant suppliers, see TCMT0020 Eaton Approved Lubricant Suppliers Lubrication Guide.

Maintenance and Lubricant Change Intervals

Transmission inspections and lubricant change intervals are outlined below.

Use only Eaton approved lubricant. For information, see TCMT0021 Eaton Lubrication Product Specification Manual.

Roadranger Specialty Tools

Transmission Jack Adapter Plate (RR1067TR)

Clutch Installation Tool Kit (RR2000CL)

- Clutch Alignment Shaft (RR1087TR)
- Alignment Pins (x2) (RR1063TR-3)
- Stand-off Bolts (x4) (RR1063TR-4)

Basic Service Repair Kit (RR2010TR)

- Input Shaft Pilot Bearing Wear Sleeve Puller (RR1062TR)
- Wear Sleeve Installer (RR1061TR-1, 2)
- Inertia Brake Piston Seal Installer (RR1074TR-1, 2)
- Output Seal Driver (RR1001TR-8)
- Countershaft Pilot Tool, Lower (RR1071TR)
- Countershaft Pilot Tool, Upper (RR1072TR)
- Range Assembly Removal and Installation Tool (RR1065TR)

Electrical Diagnostic Kit

- Eaton Breakout Box with 74-Way Eaton Diagnostic Adapter (RR1029TR)
- 3-Way Eaton Diagnostic Adapter (RR1060TR)

Mechanical Diagnostic Kit (RR2011TR)

- MTM Alignment Tool (RR1086TR-1)
- Confirm-Neutral Gauge (RR1086TR-2)
- Rail B Synchronizer Engagement Tool (RR1088TR)

Input Shaft Cup (RR1085TR-6)

Front Bearing Capture Plate (RR1085TR-7)

Input Shaft Press (RR1085TR)

Note: The input shaft is required to be pressed in and out of the clutch housing. Input Shaft Press (RR1085TR) can be purchased if the clutch housing does not properly fit the available press.

Overhaul Tool Kit (RR2012TR)

- Input Shaft Bearing Removal and Installation Tool (RR1075TR)
- Countershaft Bearing Installer (RR1076TR)
- Main Shaft Bearing Installer (RR1077TR)
- Output Shaft Installer/Input Shaft Seal Driver (RR1070TR)
- Universal Driver Handle (OE8044-T0)
- Rear Housing Stand (RR1069TR)
- Input Shaft Stand (RR1073TR)

Note: The Input Shaft Stand may have already been purchased with Overhaul Tool Kit (RR2012TR)

Overhaul Tool Kit #2 (RR2013TR)

- Rear Alignment Pins (2) (RR1090TR)
- Output Bearing Install and Removal Tool (RR1089TR)
- Reaction Plate Install and removal Tool (RR1091TR)

Output Seal Driver Kit (RR1001TR)

- Output Seal Driver Handle (RR1001TR-2)

Note: The Output Seal Driver Kit (RR1001TR) may have already been purchased to support prior transmission models.

Input Bearing Driver (RR1049TR)

Note: The Input Bearing Driver (RR1049TR) may have already been purchased in Precision Level 1 Service Kit (RR2000TR).

Note: The input Bearing Driver (RR1049TR) only needs to be purchased and used if the clutch housing does not properly fit the available press.

20-Way Eaton Diagnostic Adapter (RR1030TR)

Inspection Precautions

Before reassembling the transmission, check each part carefully for abnormal wear, excessive wear or damage to determine if the part is suitable for reuse. When replacement is necessary, use only genuine Eaton Transmission parts to assure continued performance and extended life from your unit.

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. This could lead to additional repairs and expense soon after assembly. Consideration should also be given to the unit's history, mileage, application, etc. when determining the reuse or replacement of any transmission part.

Bearings

- Wash all bearings in clean solvent. Check balls, rollers and raceways for pitting, discoloration and spalled areas.
- Replace bearings that are pitted, discolored, spalled or damaged during disassembly.
- Lubricate bearings that are not pitted, discolored, or spalled and check for axial and radial clearances.
- Replace bearings with excessive clearances.
- Check bearing fit. Bearing inner races should be tight to shaft; outer races slightly tight to slightly loose in case bore. If the bearing spins freely in the bore the case should be replaced.

Bearing Covers

- Check covers for wear from thrust of adjacent bearing. Replace covers damaged from thrust of bearing outer race.
- Check cover bores for wear. Replace those worn or oversized.

Gears

- Check gear teeth for frosting and pitting. Frosting of gear teeth faces presents no threat of transmission failure. Often in continued operation of the unit, frosted gears “heal” and do not progress to the pitting stage. In most cases, gears with light to moderate pitted teeth have considerable gear life remaining and can be reused, but gears in the advanced stage of pitting should be replaced.

- Check for gears with clutching teeth abnormally worn, tapered, or reduced in length from clashing during shifting. Replace gears found in any of these conditions.
- Check axial clearance of gears.

All Parts

- Check all parts for cracks and breaks.
- Replace damaged parts.

Oil Seals

- Check oil seals. If sealing action of a lip has been destroyed, replace seal.

O-Rings

- Check all O-rings for cracks or distortion. Replace if worn.

Reverse Idler Gear Assemblies

- Check for excessive wear from action of roller bearings.

Sliding Clutches

- Check all shift yokes and yoke slots in sliding clutches for extreme wear or discoloration from heat.
- Check engaging teeth of sliding clutches for partial engagement pattern.

Splines

- Check splines on all shafts for abnormal wear. If sliding clutch gears, companion flange, or clutch hub has wear marks in the spline sides, replace the specific shaft affected.

Synchronizer Assembly

- Check synchronizer for burrs, uneven and excessive wear at contact surface, and metal particles.
- Check blocker pins for excessive wear or looseness.
- Check synchronizer contact surfaces on the synchronizer cups for wear.

Washers

- Check surfaces of all washers. Washers scored or reduced in thickness should be replaced.

Torque Specifications

Description	Torque
TCM cover nuts - 13 mm (x4)	8.8 - 10.4 Nm (6-8 lb-ft)
74-Way Connector to TCM jack-screw - 7 mm (x1)	2 - 2.5 Nm (2-3 lb-in)
MTM to Main Housing cap screws - 15 mm (x2), 13 mm (x18)	44.5 - 51.5 Nm (33-38 lb-ft)
LCA to MTM cap screws - T45 Torx	23 - 28 Nm (17-21 lb-ft)
Output Yoke retainer cap screw - 27 mm (x1)	617 - 690 Nm (455-508 lb-ft)
Oil Fill Plug - 6 mm Hex (x1)	24.5 - 29.5 Nm (18-22 lb-ft)
Oil Check Plug - 6 mm Hex (x1)	24.5 - 29.5 Nm (18-22 lb-ft)
Oil Drain Plug - 6 mm Hex (x1)	24.5 - 29.5 Nm (18-22 lb-ft)
Rear Bearing Cover to Rear Housing cap screws - 13 mm (x8)	21 - 25 Nm (16-19 lb-ft)
Front Upper Countershaft Cover to Clutch Housing - 13 mm (x6)	21 - 25 Nm (16-19 lb-ft)
Input Shaft Cover to Clutch Housing - 13 mm (x7)	21 - 25 Nm (16-19 lb-ft)
Inertia Brake Cover to Clutch Housing - 13 mm (x6)	21 - 25 Nm (16-19 lb-ft)
Rear Housing to Main Housing cap screws - 16 mm (x22)	44.5 - 51.5 Nm (33-38 lb-ft)
PTO Cover to Main Housing cap screws - 18 mm (x8)	69 - 81 Nm (51-60 lb-ft)
Main Housing to Clutch Housing cap screws - 16 mm (x25)	44.5 - 51.5 Nm (33-38 lb-ft)
Output Speed Sensor to Rear Housing cap screws - 10 mm (x1)	8.8 - 10.4 Nm (6-8 lb-ft)
Fluid Pressure Sensor (FPS) - 24 mm Hex (x1)	26 - 30 Nm (19-22 lb-ft)

Description	Torque
Clutch to flywheel cap screws - 15 mm (x12)	53.5 - 67.7 Nm (40-50 lb-ft)
8 Bolt PTO Cover to Main Housing Cap Screws - 18 mm (x8)	69 - 81 Nm (51 - 60 lb-ft)
Rear Housing to Main Case Stubbed Cap Screws - 16 mm (x3)	44 - 51 Nm (33-38 lb-ft)
Rear Housing to Main Case Cap Screw - 16 mm (x21)	44 - 51 Nm (33-38 lb-ft)
Main Housing to Clutch Housing Cap Screws - 16mm (x25)	44 -51 Nm (33-38 lb-ft)
Upper Lube Tube Cap Screw - 8 mm (x1)	8 - 10 Nm (6-13 lb-ft)
Lower Lube Tube Cap Screw - 8 mm (x1)	8 - 10 Nm (6-13 lb-ft)
Rail E Detent Plug - Zero Leak - 6mm Hex (x1)	24 - 29 Nm (18-21 lb-ft)
Oil Pump Assembly to Main Housing Cap Screws - 13 mm (x8)	21 - 23 Nm (16-18 lb-ft)
Reaction Plate Mounting Cap Screws - 13 mm (x4)	21 - 25 Nm (16-19 lb-ft)
Release Yoke Pivot Pin - 30 mm (x1)	130 - 140 Nm (95-101 lb-ft)
4 Bolt Rear Mount PTO Cover to Rear Housing - 18 mm (x4)	69 - 81 Nm (51-60 lb-ft)
Rear Housing Lube Tube to Rear Housing (Dual PTO Transmission Only) - 8 mm (x1)	8.8 - 10.4 Nm (6-8 lb-ft)
Lifting Eye Bracket Mounting Cap Screws - 15 mm (x4)	49.6 - 55.5 Nm (36-40 lb-ft)
Rear Speed Sensor Bracket Cap Screws - 10 mm (x3)	8.8 - 10.4 Nm (6-9 lb-ft)

Handling, Inspection and Cleaning of Parts

Handling

All components of the transmission require a clean environment. If parts are not immediately reinstalled into the transmission they should be stored in a clean container and covered with a lint free cloth.

The components associated with the Mechatronic Transmission Module (MTM) must be handled with care. These components are crucial to the functionality of the transmission and should be handled in a clean environment.

Inspection and Cleaning

Inspect all transmission components with care. If any damage is found during a component inspection, replace the component and do not reuse.

NOTICE: Debris, foreign material, or moisture allowed to enter into the vehicle air system or MTM air inlet port can cause solenoids and air actuated components to malfunction.

If any component is exposed to dirt, or foreign material, clean properly with a solvent based cleaner and dry with lint free cloth before installing in the transmission.

Replacing Parts

When replacement is necessary, use only genuine Eaton Transmission parts to assure continued performance and extended life from your unit. Any replacement part that is to be used to fix the transmission must first be cleaned with a solvent based cleaner to remove debris and dried with a lint free cloth before installation.

Recycling Parts and Oil

Recycling Parts

Properly dispose of transmission components (copper, aluminum, steel or iron components) that are not reused or returned for warranty. Used transmission components should be collected and recycled at an authorized facility.

Recycling Oil

Properly dispose of transmission oil. Used transmission oil should be collected and recycled at an authorized facility.

Note: Never dispose of oil by putting it in the trash or pouring it on the ground, into sewers, or into streams or bodies of water.

Main Shaft End-Play Service Procedure

Special Instructions

Main Shaft End-Play must be measured and adjusted after Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing or Main Shaft Bearing replacement.



CAUTION: Failure to determine and install the Ideal Main Shaft Selective Washer results in incorrect Main Shaft End-Play resulting in transmission component damage.

Special Tools

- Torque Wrench
- 4 Flat Washers (22.3 mm (0.9 in) minimum OD)
- Dial Indicator
- 2 Pry Bars
- 5/32 OD Air Line
- Front Bearing Capture Plate (RR1085TR-7)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

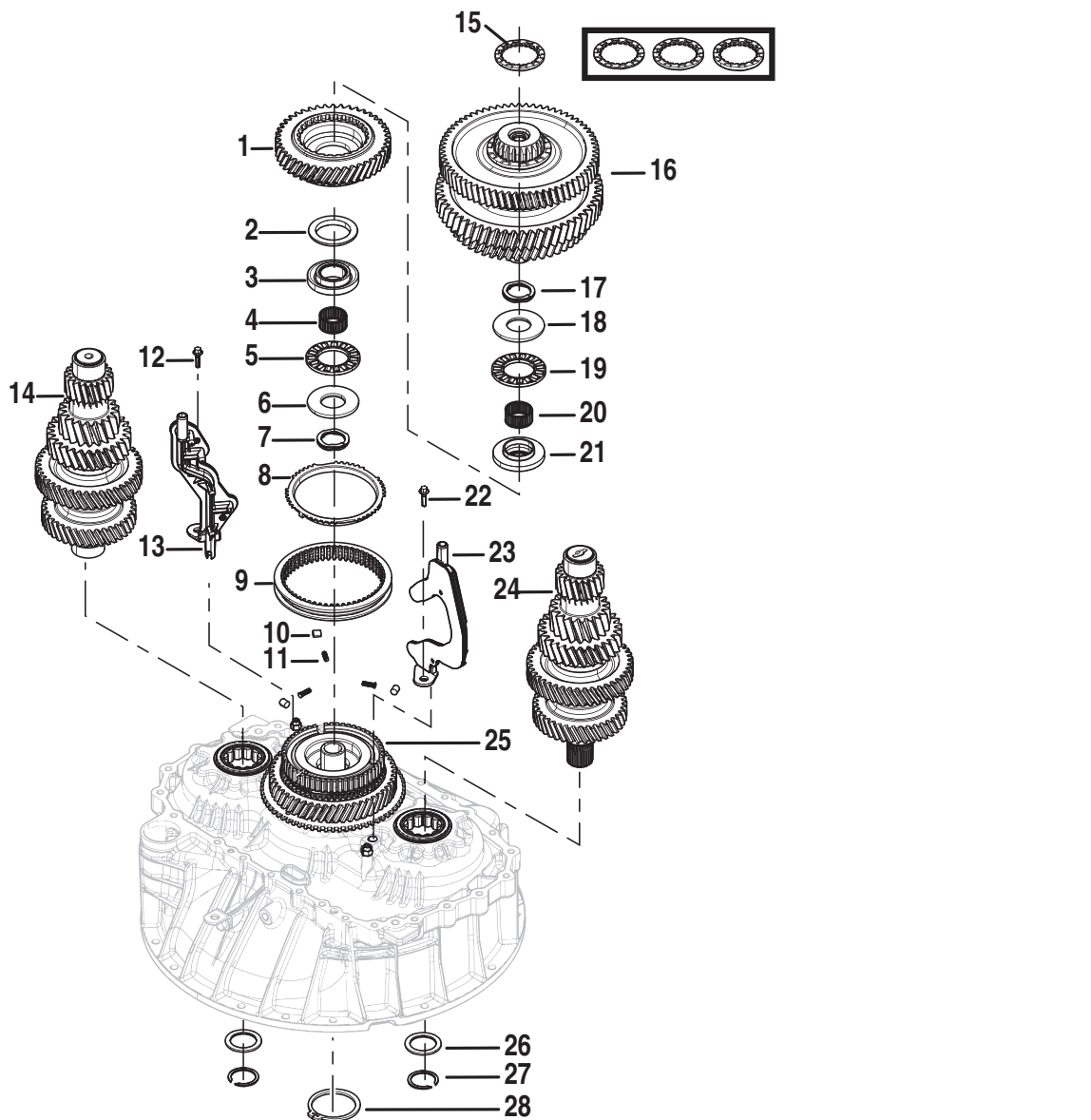


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



1. Primary Drive Gear
2. Spherical Washer - Front
3. Bearing Race - Front
4. Needle Bearing - Front
5. Thrust Bearing - Front
6. Thrust Washer - Front
7. Wave Spring - Front
8. Synchronizer Ring
9. Synchronizer Sliding Sleeve
10. Synchronizer Rollers (x3)

11. Synchronizer Springs and Plungers (x3)
12. Lower Lube Tube Cap Screw - 8 mm
13. Lower Lube Tube
14. Upper Countershaft
15. Main Shaft Selective Washer -
6.525 mm (0.257 in), 6.712 mm (0.264 in)
or 6.900 mm (0.272 in) (x1)
16. Main Shaft Assembly
17. Wave Spring - Rear
18. Thrust Washer - Rear

19. Thrust Bearing - Rear
20. Needle Bearing - Rear
21. Bearing Race - Rear
22. Upper Lube Tube Cap Screw - 8 mm
23. Upper Lube Tube
24. Lower Countershaft
25. Input Shaft Assembly
26. Countershaft Flat Washers (x2)
27. Countershaft Snap Rings (x2)
28. Input Shaft Snap Ring

Verify Components in the Clutch Housing

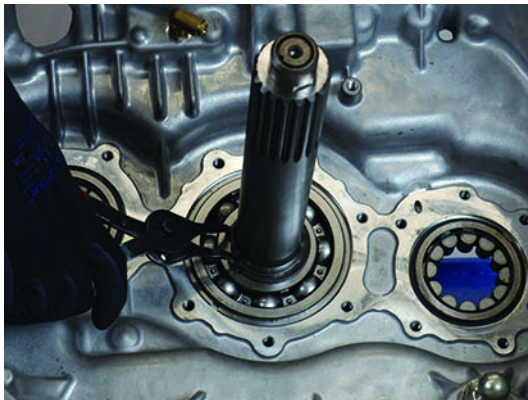


CAUTION: Clutch Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Clutch Housing and other surfaces. Dropping Clutch Housing could result in component damage and/or personal injury.

1. Verify Input Shaft Bearing is fully seated in Clutch Housing to ensure a proper Main Shaft End-Play reading.



2. Ensure Input Shaft Snap Ring is installed as instructed in the **Clutch Housing Disassembly/Assembly Service Procedures** to verify that the Input Shaft is fully seated.

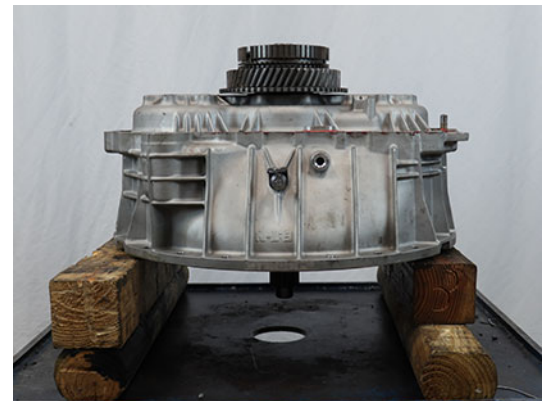


3. Remove Input Shaft Snap Ring and install Front Bearing Capture Plate (RR1085TR-7) and torque to 21-25 Nm (16-19 lb-ft).

Note: The Input Shaft Bearing must be fully seated against the bearing stop in the Clutch Housing to ensure a proper Main Shaft End-Play reading.



4. Place and support Clutch Housing on a bench.



Install the Main Shaft and Countershaft

1. On the Secondary Drive Gear, apply paint marks on 2 gear teeth exactly 180-degrees across from each other, if not already marked.

Note: Paint marks are required for timing the Secondary Drive Gear to the Countershafts.



2. Install 3 springs and plungers into Synchronizer hub.



3. Install Rail B Synchronizer Sliding Sleeve with bevel facing up.

NOTICE: The tapered side of the sleeve is installed with the bevel facing up.



4. Lift and hold the Rail B Synchronizer Sliding Sleeve, install 3 rollers over the 3 springs and plungers and into the sliding sleeve groove.



5. Slowly press down the Synchronizer Sliding Sleeve to the neutral position and seat the 3 rollers evenly on the springs and plungers.



6. Install Rail B Synchronizer Ring.

Note: Align the 3 tabs on ring to the 3 openings on the hub at each spring and plunger.



7. Install Wave Spring - Front.

Note: Wave Spring - Front is taller than the Wave Spring - Rear.



8. Install Thrust Washer - Front.



9. Install Needle Bearing - Front.



10. Install Thrust Bearing - Front.**11. Install Bearing Race - Front.****12. Install Spherical Washer - Front with conical side down.****13. Install Lower Countershaft Pilot Tool (RR1071TR) to front section of Lower Countershaft.**

Note: Lower Countershaft has Inertia Brake Splines on the front and Oil Pump drive slot on the rear.



14. On the Lower Countershaft front drive gear, apply paint marks on the 2 gear teeth marked "0 0".

NOTICE: If the Secondary Drive Gear and countershaft front drive gears are not paint marked correctly, the gearing will not be properly timed and the Main Housing cannot be installed due to countershaft misalignment.

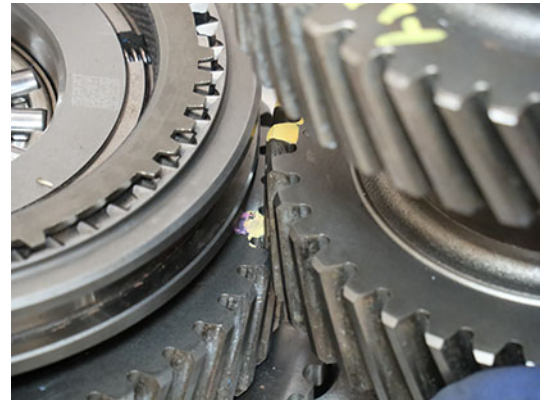
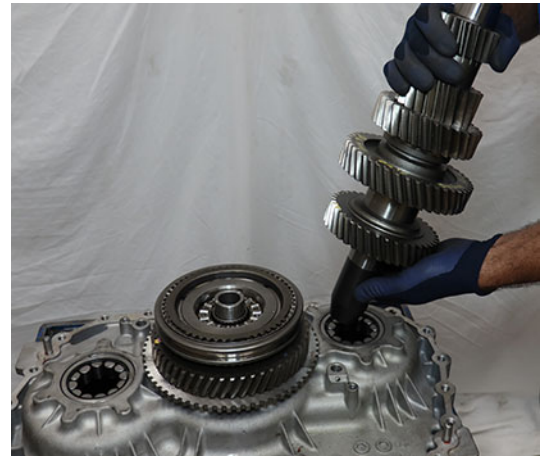
Note: Paint marks are required for timing the Secondary Drive Gear to the Countershafts.



15. Install Lower Countershaft with Countershaft Pilot Tool (RR1071TR). Ensure timing marks align with Secondary Drive Gear and Lower Countershaft front drive gear.



CAUTION: Countershaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Countershaft and other surfaces. Dropping Countershaft could result in component damage and/or personal injury.



16. Install Upper Countershaft Pilot Tool (RR1072TR) to front section of Upper Countershaft.



17. On the Upper Countershaft front drive gear, apply paint marks on the 2 gear teeth marked "0 0".

NOTICE: If the Secondary Drive Gear and countershaft front drive gears are not paint marked correctly, the gearing will not be properly timed and the Main Housing cannot be installed due to countershaft misalignment.

Note: Paint marks are required for timing the Secondary Drive Gear to the Countershafts.



18. Install Upper Countershaft with Upper Countershaft Pilot Tool (RR1072TR) into bearing. Ensure timing marks align with Secondary Drive Gear and Upper Countershaft front drive gear.



CAUTION: Countershaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Countershaft and other surfaces. Dropping Countershaft could result in component damage and/or personal injury.



19. Install Primary Drive Gear with clutching teeth facing up onto Rail B Synchronizer.



22. Install Thrust Bearing - Rear.



20. Install Bearing Race - Rear.



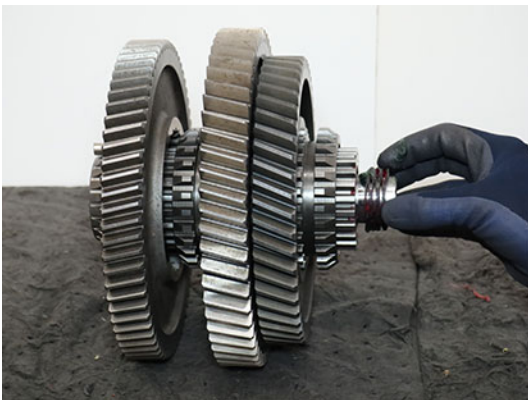
21. Install Needle Bearing - Rear.



23. Apply transmission assembly lube to Wave Spring - Rear and install to Main Shaft.

NOTICE: Wave Spring - Rear is shorter than the Wave Spring - Front.

Note: Transmission assembly lube holds Wave Spring - Rear in place during Main Shaft Assembly installation.



24. Apply transmission assembly lube to Thrust Washer - Rear and install to Main Shaft.

Note: Transmission assembly lube holds Thrust Washer - Rear in place during Main Shaft Assembly installation.



25. Install a magnet onto the Main Shaft Key.

Note: The magnet holds the key in position during Main Shaft Assembly installation.



26. Slide and hold Rail C Sliding Clutch into Secondary Driven Gear.



27. Install Main Shaft Assembly onto Primary Drive Gear and align gearing.



CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.



28. Remove magnet from Main Shaft Key.

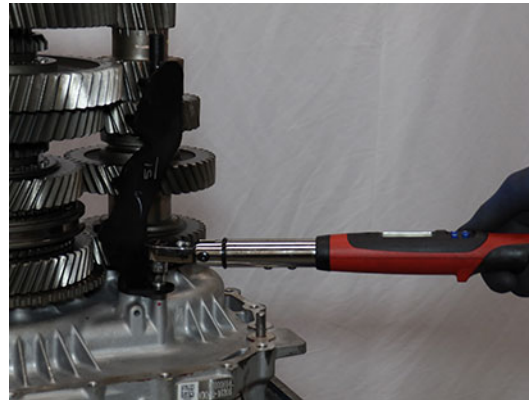
NOTICE: Ensure to remove magnet or component damage may occur during assembly.



29. Install Upper Lube Tube into Clutch Housing and install 8 mm cap screw and torque to 8–10 Nm (6–13 lb–ft).



30. Install Lower Lube Tube into Clutch Housing and 8 mm cap screw, torque to 8–10 Nm (6–13 lb–ft).



31. If Clutch Housing, Main Housing, Input Shaft, Input Shaft Bearing or Main Shaft Bearing has been replaced, perform steps to “Install the Main Housing without Gasket Sealant” on page 436 before measuring and adjusting Main Shaft End-Play. If these parts have NOT been replaced, perform “Install Main Housing” on page 453.

Install the Main Housing without Gasket Sealant

1. Clean the sealing surfaces on the Clutch Housing and Main Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

3. Slide O-ring over the Clutch Housing Inertia Brake air passage alignment pin until fully seated in groove.

NOTICE: Failure to install a new o-ring could result in degraded transmission performance.



4. Install Lower Countershaft Pilot Tool (RR1071TR) onto Lower Countershaft above rear bearing race.



5. Install Upper Countershaft Pilot Tool (RR1072TR) onto the Upper Countershaft above rear bearing race.



6. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten Lifting Eye cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



7. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) into the Clutch Housing as shown below.



8. Lift, align and install Main Housing to Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or serious injury.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Using a flat tipped screwdriver, rotate the Reverse Idler Gears to align the gearing and allow Main Housing to fully seat onto the Clutch Housing.

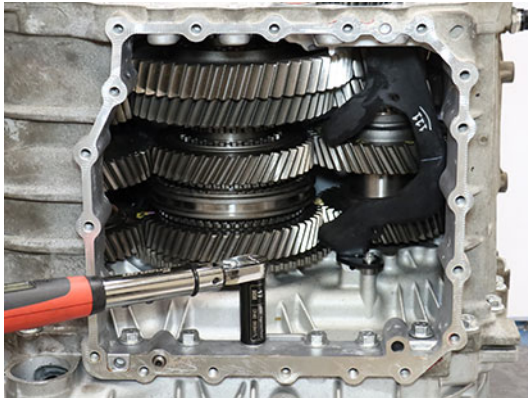


9. Remove 2 Rear Housing Alignment Pins (RR1090TR).



10. Install 19 external and 6 internal Main Housing 16 mm cap screws and torque to 44–51 Nm (33–38 lb-ft) in a criss-cross pattern.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



Measure and Adjust the Main Shaft End-Play

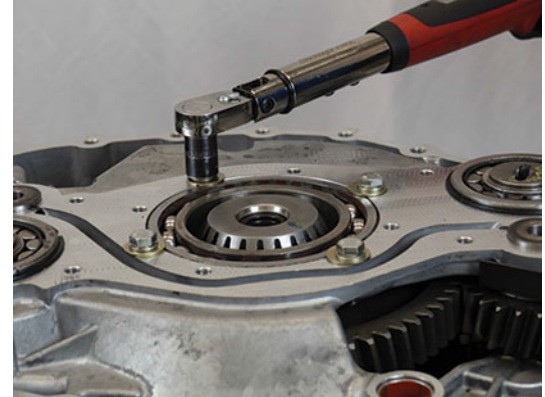
Note: The Main Shaft Selective Washer is available in 3 thicknesses: 6.525 mm (0.257 in), 6.712 mm (0.264 in) or 6.900 mm (0.272 in).

CAUTION: Ensure the Input Shaft Bearing and Main Shaft Bearing are seated in the Clutch Housing and Main Housing. Failure to fully seat bearings in housings will give an incorrect Main Shaft End-Play reading and may cause transmission component damage.

CAUTION: Ensure the 6.525 mm Main Shaft Selective Washer was installed. Only install a thicker selective washer after end-play has been measured and a thicker selective washer is required to achieve proper end-play or transmission damage may occur.

1. Install 4 Oil Pump 13 mm cap screws with flat washers (22.3 mm (0.9 in) minimum OD). Torque cap screws to 21-23 Nm (16-18 lb-ft).

Note: Flat washers are required to ensure the Main Shaft Bearing remains seated in the Main Housing during End-Play measurement.



2. Thread a Dial Indicator mounting shaft into one of the inner Oil Pump mounting holes around the Main Shaft Bearing.

Note: The Oil Pump cap screw mounting holes thread pattern: M8 x 1.25 x 30 mm.

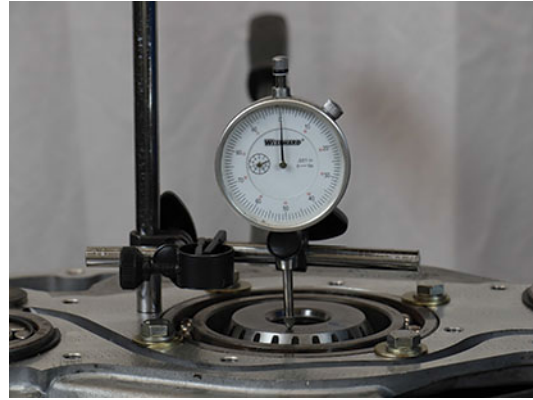


- 3. Mount the Dial Indicator to the shaft, set the plunger on the Main Shaft, and zero the Dial Indicator.

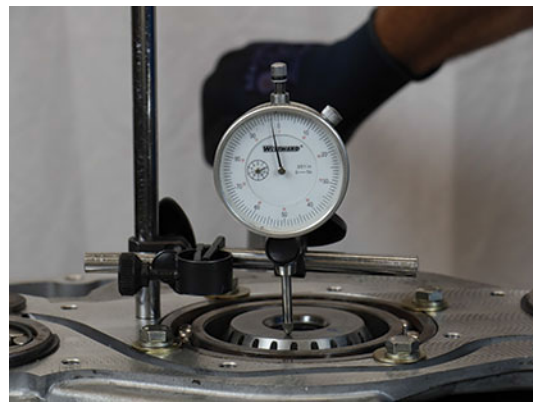
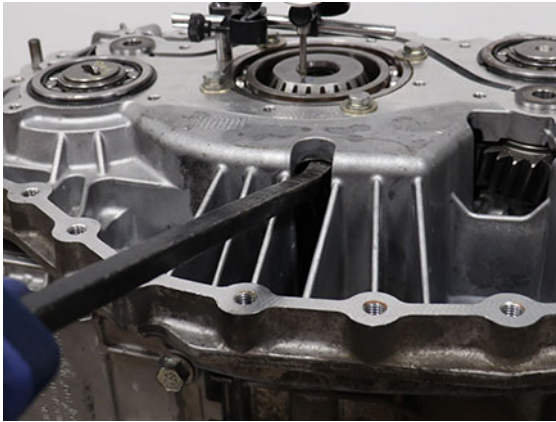
Note: Ensure that the Dial Indicator is vertical and zeroed for proper Main Shaft End-Play measurement.



- 5. Apply even downward pressure on Reverse Gear with both pry bars and monitor the Dial Indicator between the at-rest position of the Main Shaft and the point where no more downward movement is achieved. Record reading in table.



- 4. Use two pry bars and slide them between the Reverse Gear and Main Housing at the locations shown below.



Recorded End-Play

- Reference the Selective Main Shaft Washer Reference Chart and compare Recorded End-Play to reading in table.

Note: Main Shaft End-Play specification is 0.000-0.100 mm (0.000-0.004 in). The Selective Washer Chart is only valid for end-play measured with the 6.525 mm (0.257 in) selective washer installed.

- If end-play is in range, the installed Main Shaft Selective Washer, 6.525 mm (0.257 in), is correct.
- If end-play is out of range, determine the thicker ideal Main Shaft Selective Washer and record in table. Remove Main Shaft and install the Ideal Main Shaft Selective Washer.

Main Shaft Selective Washer Reference Chart

Recorded End-Play	Ideal Main Shaft Selective Washer Thickness and Part Number
0.000-0.100 mm (0.000-0.004 in)	6.525 mm (0.257 in) P/N 10000555
0.101-0.300 mm (0.005-0.011 in)	6.712 mm (0.264 in) P/N 10001759
0.301-0.550 mm (0.012-0.021 in)	6.900 mm (0.272 in) P/N 10001760

Ideal Main Shaft Selective Washer

CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

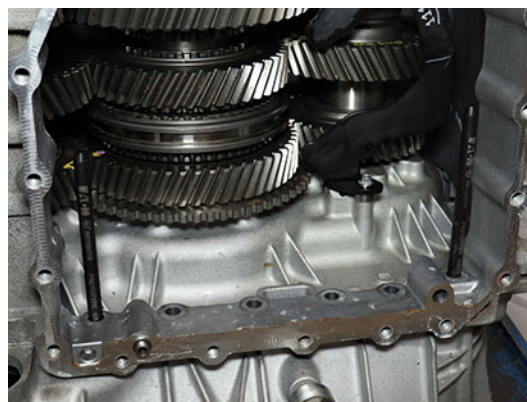
Remove Main Housing

- Remove the 19 external and 6 internal Main Housing 16 mm cap screws.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



- Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) in the internal Main Housing cap screw outer threaded holes.



3. Separate Main Housing from Clutch Housing at the 2 pry points.

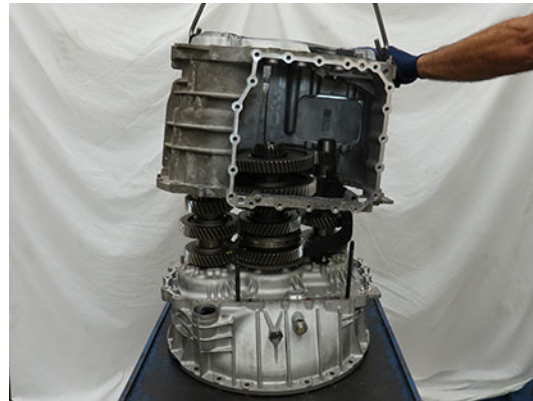


4. Lift and remove Main Housing from Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or personal injury.

NOTICE: Use an appropriate lifting device to safely lift component.



5. Remove 2 Rear Housing Alignment Pins (RR1090TR).

Note: Applying sealer when installing Main Housing to Clutch Housing should only be done after proper Main Shaft End-Play has been verified.



- Reference the Selective Main Shaft Washer Reference Chart and compare Recorded End-Play to reading in table.

Note: Main Shaft End-Play specification is 0.000-0.100 mm (0.000-0.004 in). The Selective Washer Chart is only valid for end-play measured with the 6.525 mm (0.257 in) selective washer installed.

- If end-play is in range, the installed Main Shaft Selective Washer, 6.525 mm (0.257 in), is correct.
- If end-play is out of range, determine the thicker Ideal Main Shaft Selective Washer and record in table. Remove Main Shaft and install the Ideal Main Shaft Selective Washer.

Main Shaft Selective Washer Reference Chart

Recorded End-Play	Ideal Main Shaft Selective Washer Thickness and Part Number
0.000-0.100 mm (0.000-0.004 in)	6.525 mm (0.257 in) P/N 10000555
0.101-0.300 mm (0.005-0.011 in)	6.712 mm (0.264 in) P/N 10001759
0.301-0.550 mm (0.012-0.021 in)	6.900 mm (0.272 in) P/N 10001760

Ideal Main Shaft Selective Washer

CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

Remove Main Shaft and Countershaft

- Remove the Upper Lube Tube 8 mm cap screw.



- Remove the Upper Lube Tube.



- Remove the Lower Lube Tube 8 mm cap screw.



4. Remove the Lower Lube Tube.



5. Install a magnet onto Main Shaft Key to ensure the key stays in place during Main Shaft Removal and Installation.



6. Hold Rail C Sliding Clutch against Secondary Driven Gear and lift Main Shaft from Primary Drive Gear.

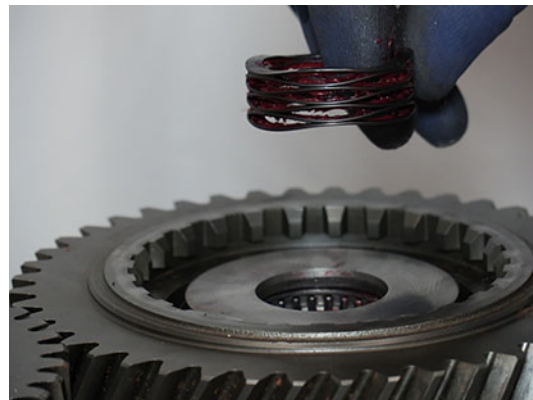


CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.

Note: Spring and Washer may remain attached to the Main Shaft during removal.



7. Remove Wave Spring - Rear.



8. Remove Thrust Washer - Rear.**11. Remove Bearing Race - Rear.****9. Remove Thrust Bearing - Rear.****12. Remove Primary Drive Gear.****10. Remove Needle Bearing - Rear.**

13. Remove Lower Countershaft.

CAUTION: Countershaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Countershaft and other surfaces. Dropping Countershaft could result in component damage and/or personal injury.

**14. Remove Upper Countershaft.**

CAUTION: Countershaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Countershaft and other surfaces. Dropping Countershaft could result in component damage and/or personal injury.

**15. Remove Spherical Washer - Front.****16. Remove Bearing Race - Front.****17. Remove Needle Bearing - Front.**

18. Remove Thrust Bearing - Front.



19. Remove Synchronizer Ring.



20. Slowly lift Synchronizer Sliding Sleeve up until Synchronizer Rollers are free from synchronizer assembly.

NOTICE: Rollers are under spring pressure, ensure to slowly lift sleeve so rollers do not eject from the synchronizer assembly during disassembly.



21. Remove 3 Synchronizer Rollers.



22. Remove 3 Synchronizer Plungers and Springs from Synchronizer hub.



23. Remove Thrust Washer - Front.



24. Remove Wave Spring - Front.



Disassemble the Main Shaft and Replace Main Shaft Selective Washer

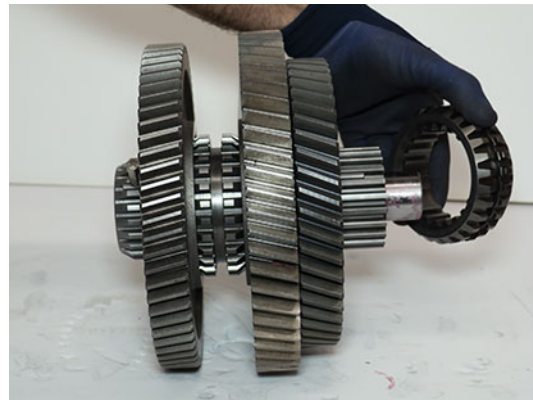
Note: This procedure is only required if Main Shaft End-Play is out of range and a thicker Selective Washer is required.

1. Place Main Shaft Assembly horizontally on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

2. Remove Rail C Sliding Clutch.



3. Place Main Shaft assembly vertically on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.



- Remove Main Shaft Key while inserting 5/32 OD air line.



- Rotate and remove the Main Shaft Selective Washer above Reverse Gear.

Note: The Main Shaft Selective Washer above Reverse Gear is available in 3 thicknesses; 6.525, 6.712 or 6.900 mm to control Main Shaft End-Play.



Assemble and Install the Main Shaft with Replaced Main Shaft Selective Washer

- Install and rotate the Ideal Main Shaft Selective Washer above Reverse Gear recorded in Step 6 of the Main Shaft End-Play Service Procedure.

Note: The Main Shaft Selective Washer is available in 3 thicknesses: 6.525, 6.712 or 6.900 mm.



- Slide the 5/32 OD air line up to align and hold washer in place.



3. Install Main Shaft Key at the same spline as the 5/32 OD air line.

Note: Insert Main Shaft Key while removing air line.

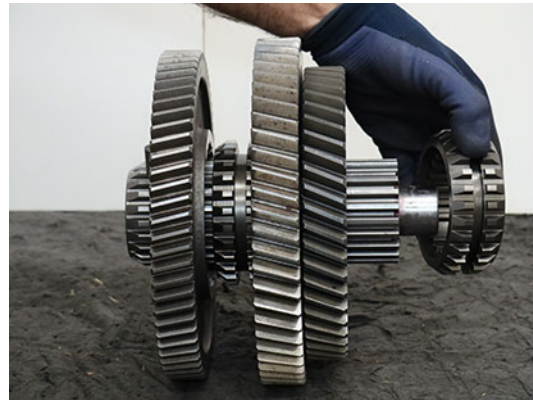
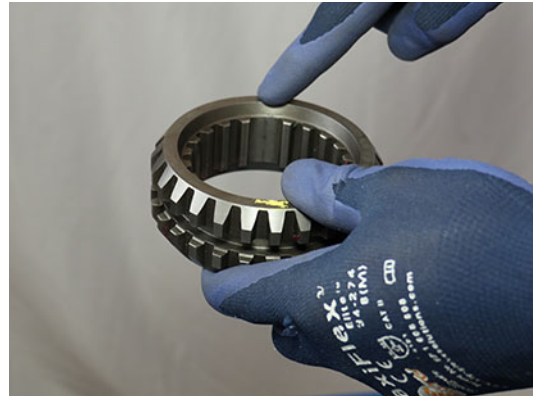


4. Install a magnet on Main Shaft Key to hold the key in place during final Main Shaft Assembly and installation into transmission.

Note: Remove magnet from Main Shaft Key after installation of Main Shaft Assembly onto transmission.



6. Install Rail C Sliding Clutch and align the double slot with Main Shaft Key.



5. Place Main Shaft Assembly horizontally on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

7. Apply transmission assembly lube to Wave Spring - Rear and install to Main Shaft.

NOTICE: Wave Spring - Rear is shorter than the Wave Spring - Front.

Note: Transmission assembly lube holds Wave Spring - Rear in place during Main Shaft Assembly installation.



8. Apply transmission assembly lube to Thrust Washer - Rear and install to Main Shaft.

Note: Transmission assembly lube holds Thrust Washer - Rear in place during Main Shaft Assembly installation.



9. Install a magnet onto the Main Shaft Key.

Note: The magnet holds the key in position during Main Shaft Assembly installation.



10. Slide and hold Rail C Sliding Clutch into Secondary Driven Gear.



11. Install Main Shaft Assembly onto Primary Drive Gear and align gearing.



CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.



12. Remove magnet from Main Shaft Key.

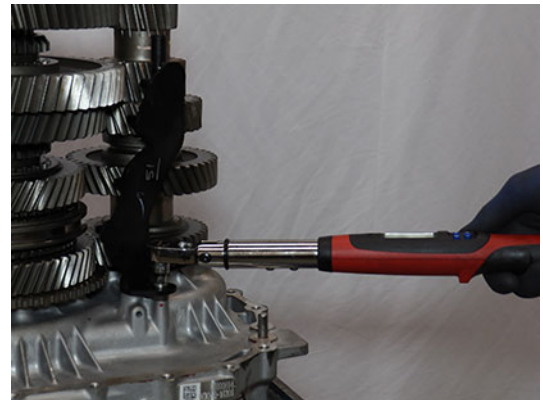
NOTICE: Ensure to remove magnet or component damage may occur during assembly.



13. If removed, install Upper Lube Tube into Clutch Housing and install 8 mm cap screw and torque to 8–10 Nm (6–13 lb-ft).



14. If removed, install Lower Lube Tube into Clutch Housing and 8 mm cap screw, torque to 8–10 Nm (6–13 lb-ft).



15. Perform steps to **Install the Main Housing without Gasket Sealant** and remeasure Main Shaft End-Play.



CAUTION: Main Shaft End-Play must be remeasured after replacing Main Shaft Selective Washer or transmission component damage may occur.

Install Main Housing

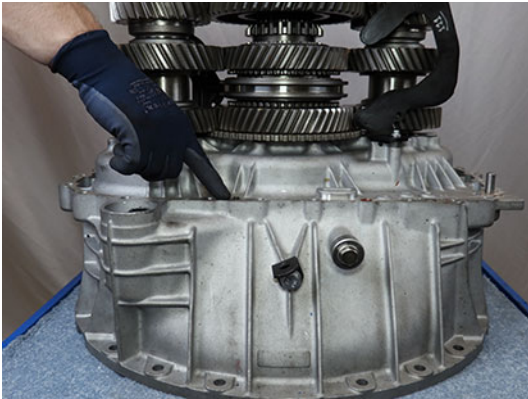
1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

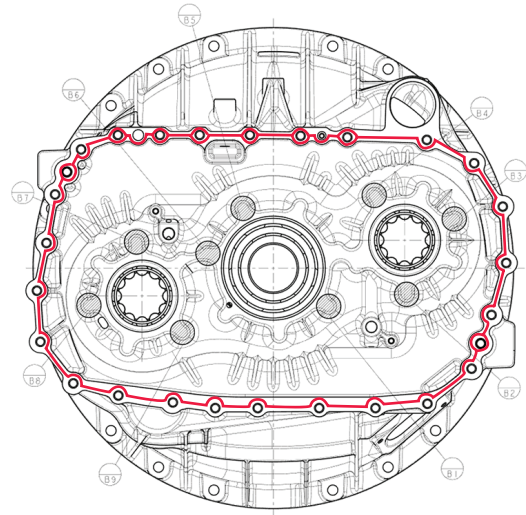
3. Slide O-ring over the Clutch Housing Inertia Brake air passage alignment pin until fully seated in groove.



4. Apply gasket sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to clutch housing as shown in pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying gasket sealant.



5. Install Lower Countershaft Pilot Tool (RR1071TR) onto Lower Countershaft above rear bearing race.



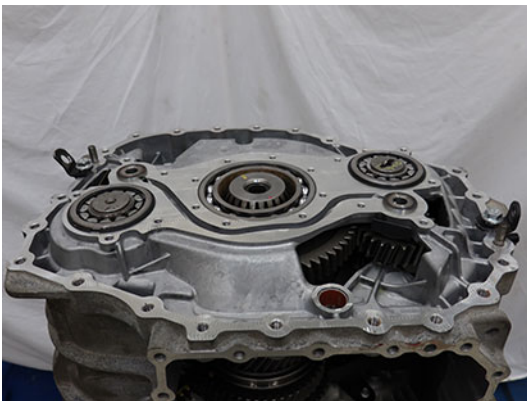
6. Install Upper Countershaft Pilot Tool (RR1072TR) onto the Upper Countershaft above rear bearing race.



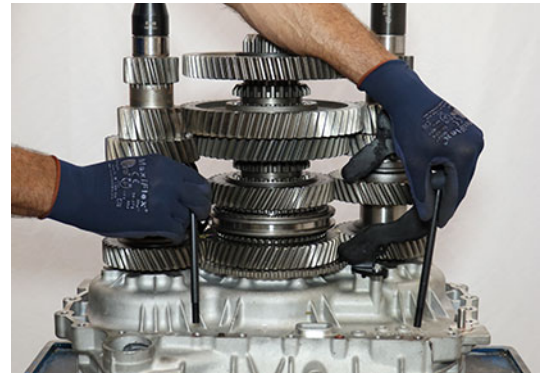
7. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten Lifting Eye cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



8. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) into the Clutch Housing as shown below.



9. Lift, align and install Main Housing to Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or serious injury.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Using a flat tipped screwdriver, rotate the Reverse Idler Gears to align the gearing and allow Main Housing to fully seat onto the Clutch Housing.



10. Remove 2 Rear Housing Alignment Pins (RR1090TR).



11. Remove 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws from Main Housing.

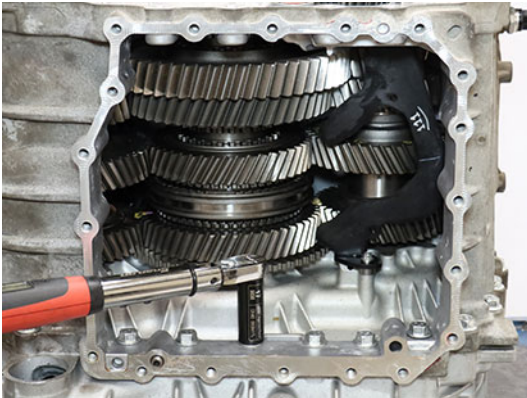


12. Re-install 2 Rear Housing 90-degree Lifting Eyes to the Rear Housing and torque to 49.6-55.5 Nm (36-40 lb-ft).



13. Install 19 external and 6 internal Main Housing 16 mm cap screws and torque to 44–51 Nm (33–38 lb–ft) in a criss-cross pattern.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



Install the Oil Pump Assembly

1. Install O-ring to the Oil Pump/Range Spacer.



2. Install Oil Pump/Range Spacer with O-ring and align tab with groove in Oil Pump Assembly.

NOTICE: Ensure the spacer tab is aligned with the groove and the spacer sits flush in the Oil Pump Assembly.



3. While holding the Oil Pump/Range Spacer in place, align oil pump drive key with slot on Lower Counter-shaft and install Oil Pump Assembly to Main Housing.



CAUTION: Failure to properly install the Oil Pump/Range Spacer and align the oil pump drive key results in transmission component damage during Oil Pump Assembly installation.

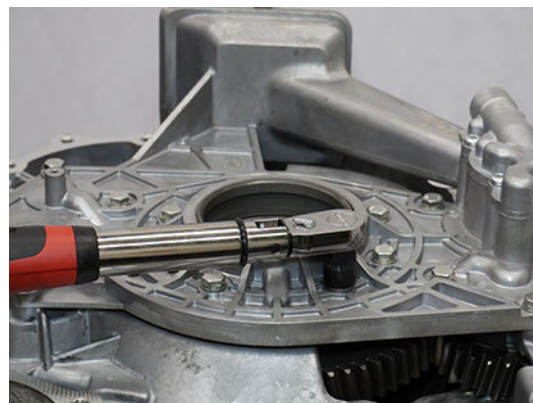
NOTICE: Ensure oil pump drive key is aligned with counter shaft drive slot during Oil Pump Assembly installation.



4. Press Oil Pump Assembly to ensure it sits flat on Main Housing sealing surface.



5. Install 18 Oil Pump Assembly 13 mm cap screws and torque to 21–23 Nm (16–18 lb–ft) in a criss-cross pattern.



Install the Rear Housing

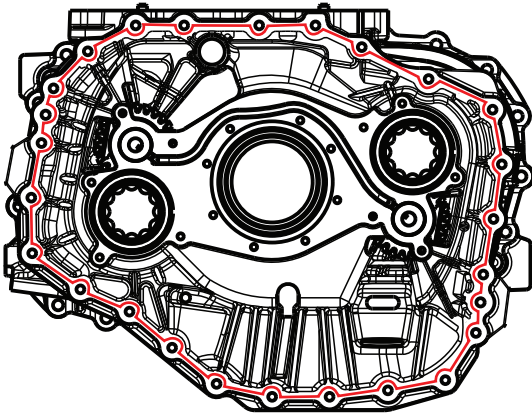
1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

2. Inspect threaded bolt holes for debris and clean if necessary.
3. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to the transmission Main Housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission housing may be damaged when cap screws are tightened.

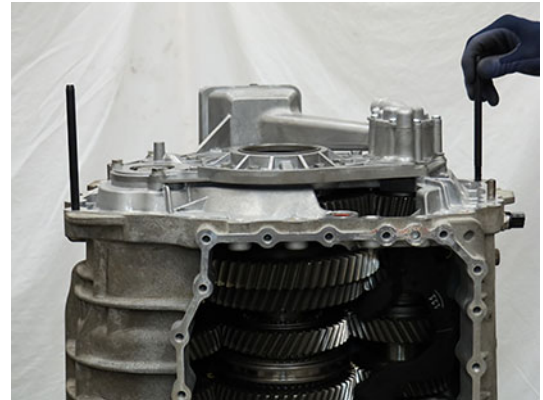
Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



4. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.



CAUTION: Failure to install alignment pins results in transmission component damage during Rear Housing Assembly installation.



5. Lift and install the Rear Housing Assembly on to the Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Align the Rear Housing to the alignment pins and align Shift Rail E into the Main Housing during installation.

Note: Rotate Output Shaft to align gearing and allow Rear Housing Assembly to fully seat on Main Housing.

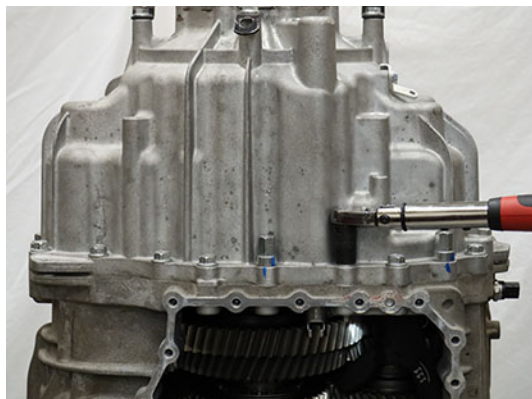


6. Install the 3 Rear Housing Threaded 16 mm cap screws at the 3 paint mark locations.

Note: Two cap screws are used to mount the harness bracket and the third is used by the OEM for additional attachment points.



7. Remove the 2 Rear Housing Alignment Pins (RR1090TR).
8. Install the remaining 21 Rear Housing 16 mm cap screws and torque to 44.5 - 51.5 Nm (33-38 lb-ft) in a criss-cross pattern.



9. Lift transmission horizontally onto a bench.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Secure Transmission (Horizontal)

1. Securely place transmission in the horizontal position with the front side down.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Install the Input Shaft Snap Ring

1. Remove Front Bearing Capture Plate (RR1085TR-7) from Clutch Housing.



2. Install Input Shaft Snap Ring.

NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from Input Shaft and result in transmission component damage.

Note: The snap ring will not install if Input Shaft is not fully seated into Input Shaft Bearing.



Install the Input Shaft Cover

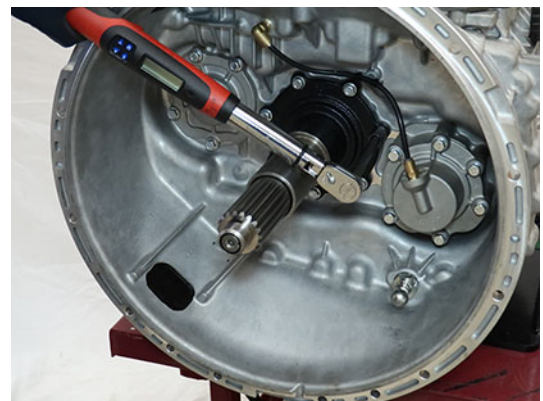
1. Clean sealing surfaces on the clutch housing and Input Shaft Cover.

2. Slide the Input Shaft Cover over the Input Shaft.

Note: Align "TOP" at 12 o'clock.



3. Install the 7 Input Shaft Cover 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



Install Lower Countershaft Snap Ring and Flat Washer

1. Install Lower Countershaft Flat Washer and Snap Ring.

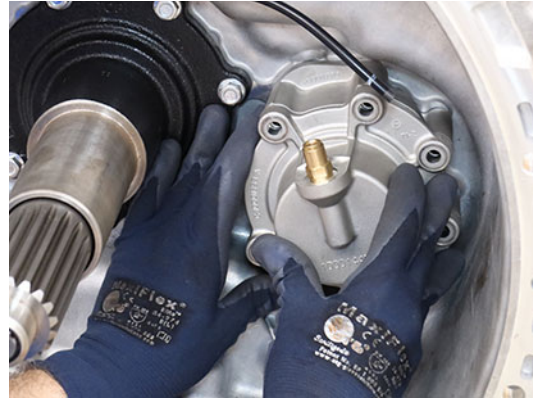
NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from Countershaft and result in transmission component damage.



Install the Lower Countershaft Cover and Inertia Brake

1. Clean sealing surfaces on the Clutch Housing and Inertia Brake Housing.

2. Install the Inertia Brake Cover and Housing as an assembly over the Lower Countershaft, rotate the assembly to align the Friction Discs to the Lower Countershaft splines and seat the assembly to the clutch housing.



3. While holding the Inertia Brake Housing to the clutch housing, remove the Inertia Brake Cover.

NOTICE: Ensure the Friction Discs are splined to the lower countershaft and Wear Guides are fully seated.



4. Install the Return Spring into the Lower Countershaft.



7. Install the 6 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



5. Install the Piston Pin into the Lower Countershaft.



8. Insert air line in push-to-connect fitting on the Inertia Brake Cover.



6. Install the Inertia Brake Cover onto the housing.



Install Upper Countershaft Snap Ring and Flat Washer

1. Install Upper Countershaft Flat Washer and Snap Ring.

NOTICE: A new snap ring is required when reinstalling. A used snap ring may detach from countershaft and result in transmission component damage.



2. Insert the Upper Countershaft Cover O-ring into the groove until fully seated.



3. Install the Upper Countershaft Cover to the Clutch Housing.
4. Install the six 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.

Install the Upper Countershaft Cover

1. Clean the sealing surfaces on the clutch housing and the Upper Countershaft Cover.



Install the Harness Bracket

Note: This procedure contains installing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Install Harness Bracket.



2. Install 3 Harness Bracket 10 mm cap screws and torque to 8.8 - 10.4 Nm (6-8 lb-ft).



3. Install the Output Speed Sensor into the bore.

Note: The Sensor may need to be twisted and pushed into the bore.



4. Install the Output Speed Sensor 10 mm cap screw and torque to 8.8-10.4 Nm (6-8 lb-ft).



Install the Output Speed Sensor

1. Clean the sensor bore.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surface.

2. Apply a light coat of transmission oil to the sensor O-ring.

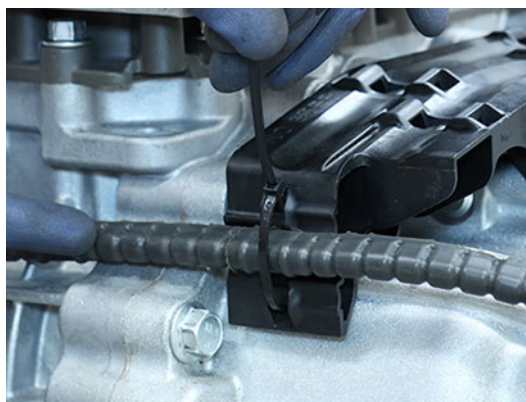
5. Press the 2 harness press-in retainers into the Main Housing and the bracket on the rear housing.



6. Secure the Output Speed Sensor Harness to the Harness Bracket with a tie strap.



CAUTION: Failure to tie strap the Output Speed Sensor Harness to the Harness Bracket may result in harness damage.



Install the Mechatronic Transmission Module (MTM)

1. Place the transmission in a horizontal position.

NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.

2. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

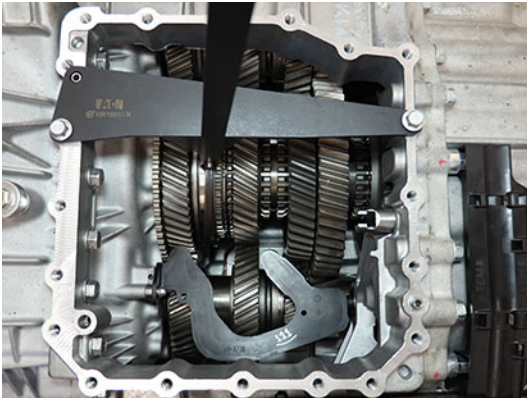
3. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

4. Install the Rail B Engagement Tool (RR1088TR) to the Main Housing and hand tighten with 2 MTM cap screws.



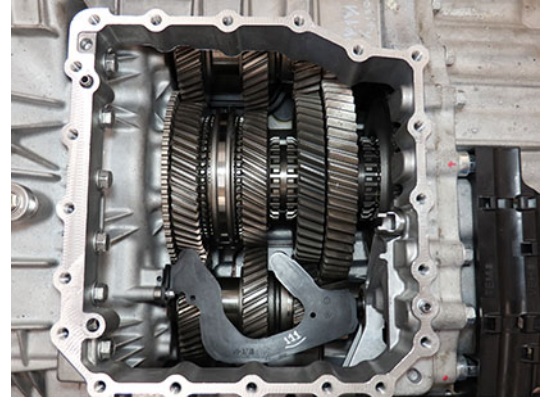
5. Shift the Rail B Synchronizer to neutral.



6. Remove the Rail B Engagement Tool.

7. Move Rail C and Rail D sliding clutches to neutral.

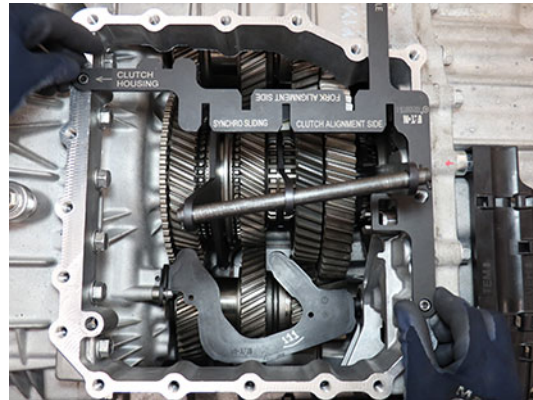
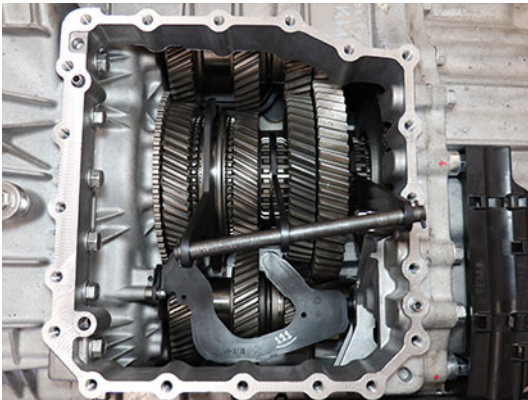
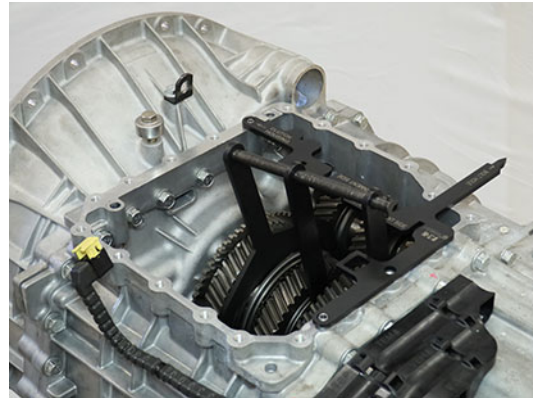
NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.



8. Install the Confirm-Neutral Gauge (RR1086TR-2) into the slots of the synchronizer and sliding clutches.

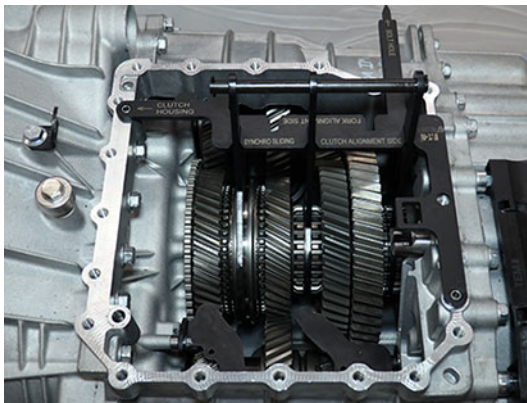


9. Install the MTM Alignment Tool (RR1086TR-1) onto the main housing.

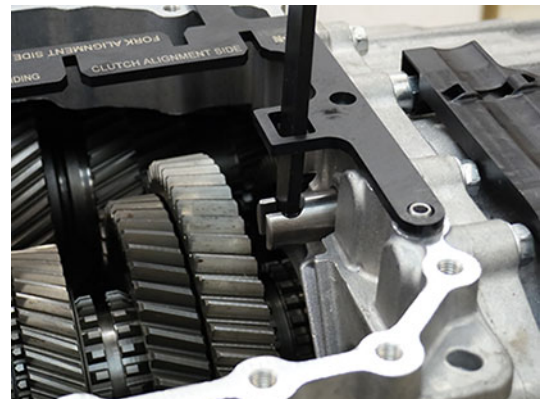
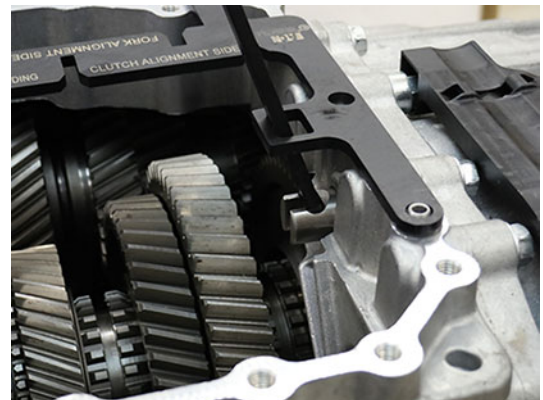
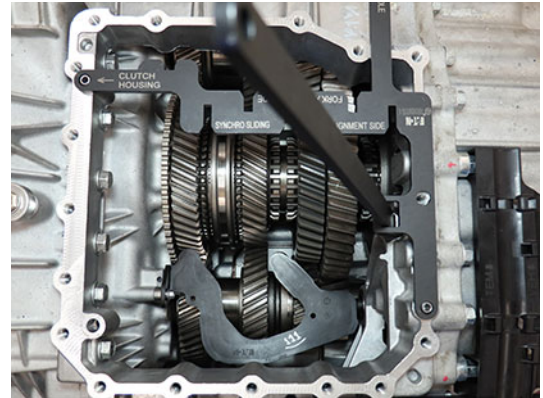


10. Verify synchronizer and sliding clutches are in neutral by sliding Confirm-Neutral Gauge into the slots of MTM Alignment Tool.

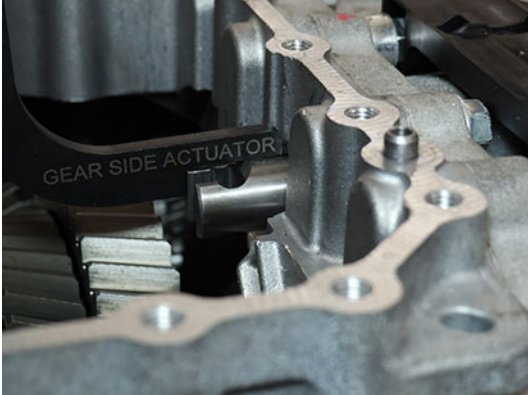
Note: If the gauge does not slide into the alignment tool slots, neutral is not achieved. Go to Step 4.



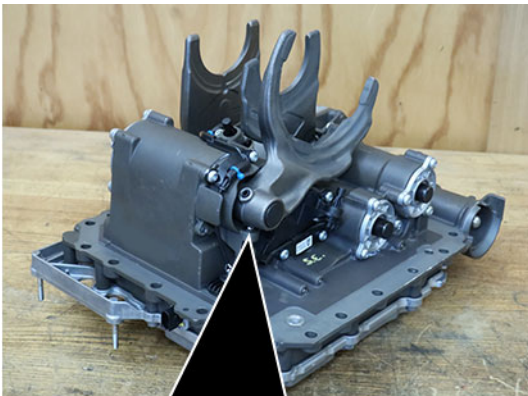
11. Using the Rail E Lever, move Rail E to neutral.



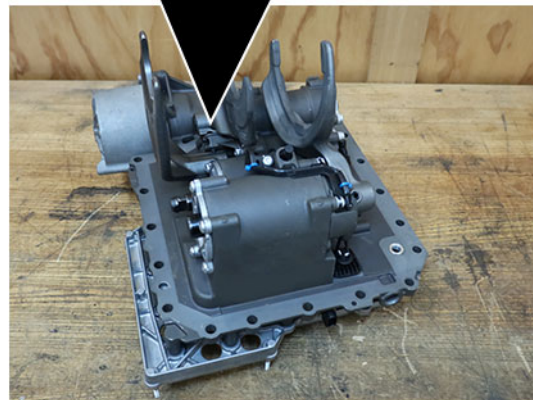
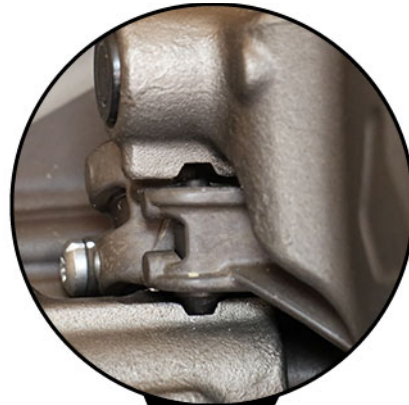
12. Verify Rail E is in neutral using the Gear Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against housing with rail against notch-end of gauge.



13. Move Shift Rail B in the MTM to neutral. Rail B is in neutral when the ball detent is in the notch of the Rail B yoke assembly.



14. Move Shift Rails C and D in the MTM to neutral. Rails C and D are in neutral when the shift inter-lock is aligned with the notches of the rail yoke assemblies.



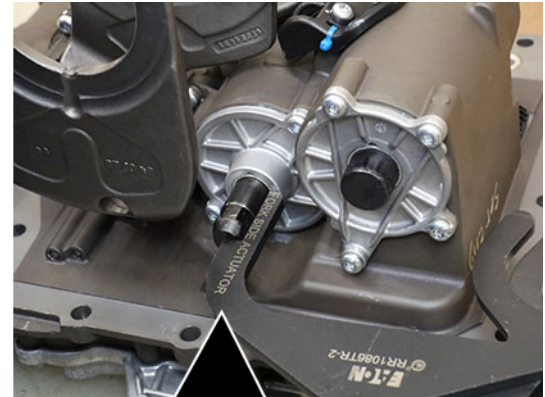
15. Verify MTM is in neutral. Install the MTM Alignment Tool (RR1086TR-1) into the bolt hole and onto Rail B, C, and D Shift Yokes.

Note: If the MTM Alignment Tool slots do not align with the 3 shift yokes, neutral has not been achieved. Go to Step 13.



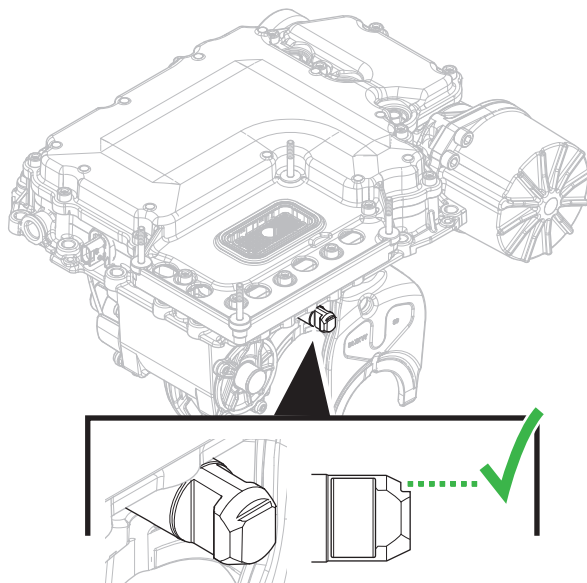
17. Verify Rail E is in neutral using the Fork Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against cover with rail against notch-end of gauge.

Note: If Rail E is not in neutral, slide rail in or out until neutral is achieved.

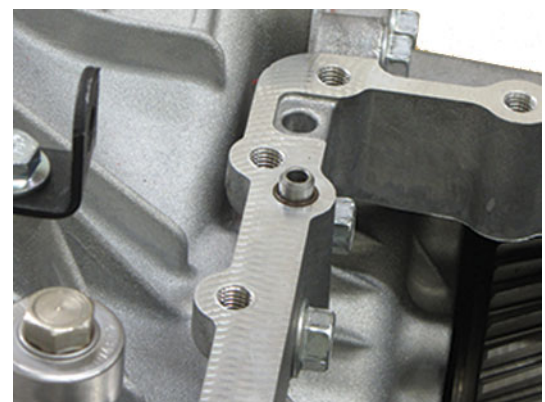


16. Verify notch on Rail E is facing up.

Note: If the MTM is installed on the transmission with the notch on Rail E facing down, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.



18. Slide O-ring over the MTM front alignment pin on the main housing until fully seated in the groove.



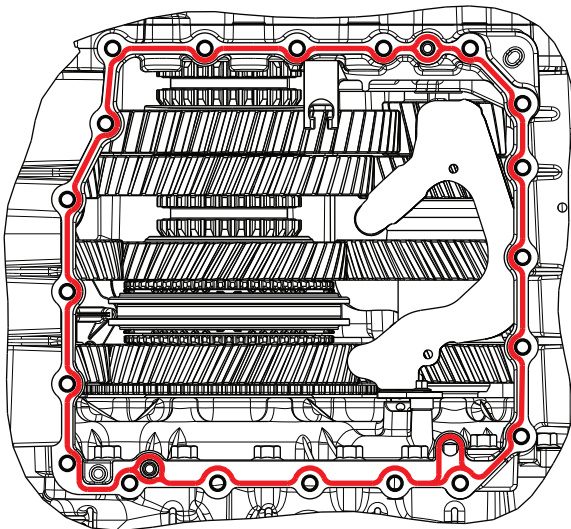
19. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

20. Apply gasket sealant with a bead width of 1.4-2.4mm (0.055-0.094 inch) to the transmission housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



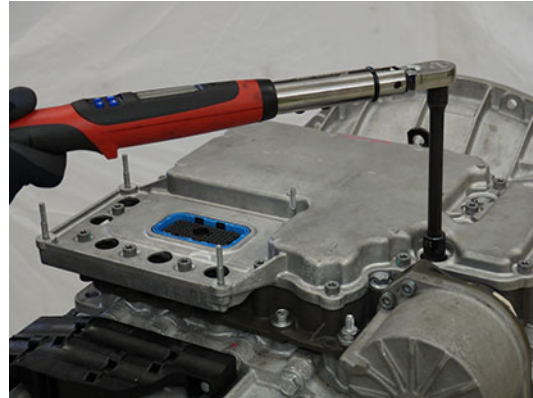
21. Install MTM onto the transmission housing. Align Rail E in the MTM with the Rail E Shift Rail in the Main Housing.

CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.

NOTICE: If the MTM is installed on the transmission and Rail E in the MTM is not aligned with Rail E in the Main Housing, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

22. Install 20 MTM cap screws and torque to 44.5-51.5 Nm (33-38 lb-ft) in a criss-cross pattern.

Note: 13 mm (x18), 15 mm (x2) cap screws.



Install the Transmission Control Module (TCM)

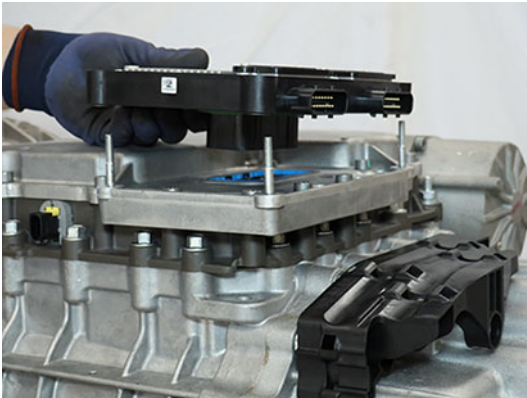
NOTICE: Do not allow contamination into the connectors on the TCM or MTM.

Note: TCM can be installed with transmission in-vehicle.

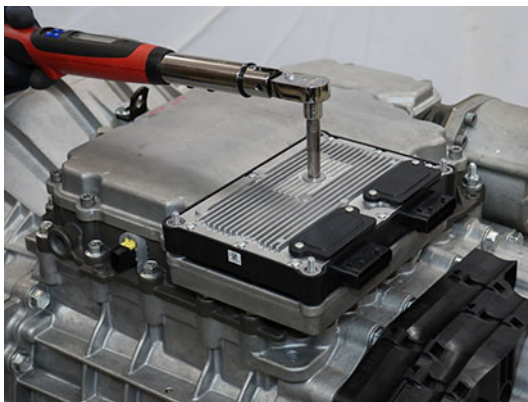
1. Install the TCM Seal on the 74-Way Harness Connector.



2. Align the TCM to the 74-Way Harness Connector and TCM studs, then install the TCM.

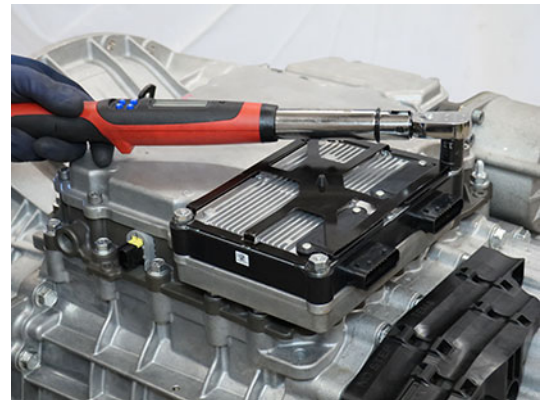


3. Torque the TCM 7 mm Jackscrew to 3.0-4.0 Nm (26.6-35.4 lb-in).



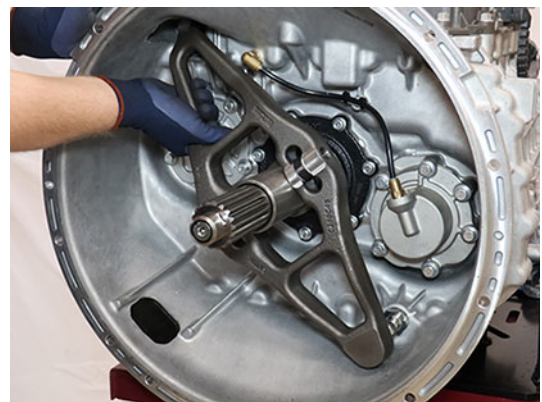
4. Install the TCM Cover over the 4 TCM studs and torque the 4 TCM Cover Nuts to 8.8-10.4 Nm (78-92 lb-in) in a criss-cross pattern.

Note: TCM Cover nuts are 10 or 13 mm.

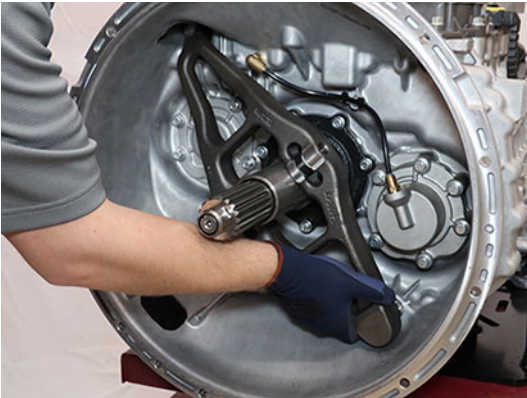


Install the Release Bearing and Clutch Release Yoke

1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



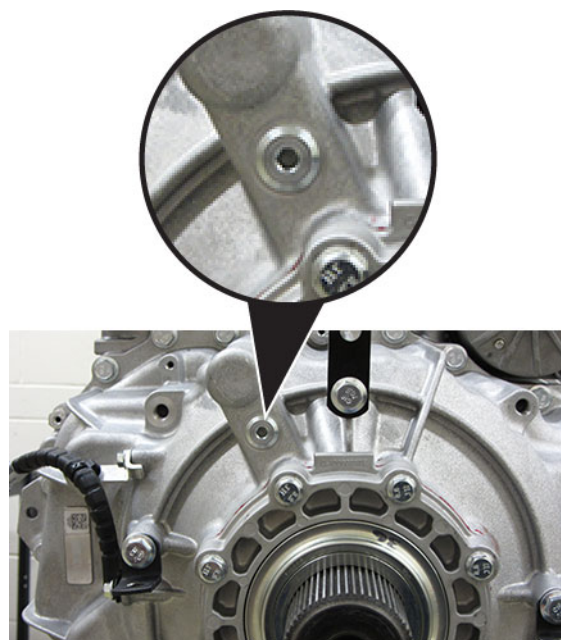
Install the Transmission

1. Refer to OEM guidelines for transmission installation.
2. Connect negative battery cable.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

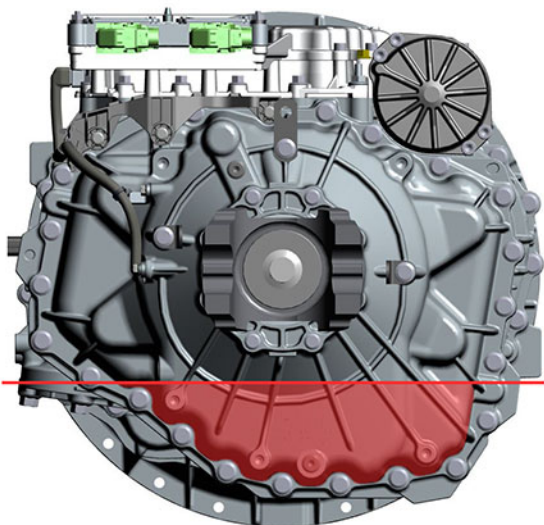
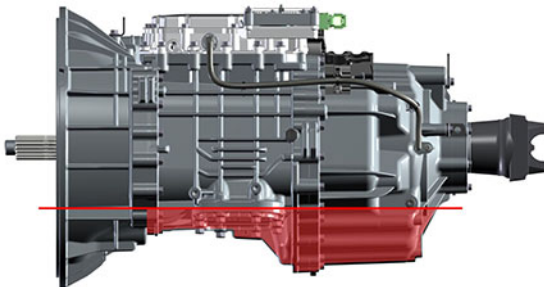


- Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



- Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



- Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
- Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

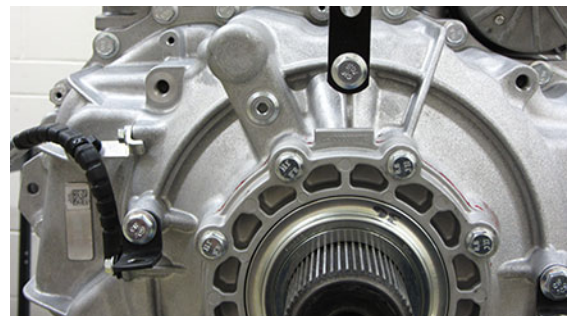
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



- Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
- Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).
 - If installing a replacement transmission assembly, go to **Configure Transmission Control Module (TCM)**.
 - If re-installing the original transmission assembly, go to **Perform Transmission Service Routines**.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

Primary Drive Gear Replacement

Special Instructions

This procedure provides instructions for replacing the Primary Drive Gear and Rail C Sliding Clutch.

- Primary Drive Gear (S-3206)
- Rail C Sliding Clutch (10000557)
- I-Brake MTM to Main Housing O-ring (13653)
- I-Brake Main Housing to Clutch Housing O-ring (13834)

Special Tools

- Rear Housing Alignment Pins (RR1090TR)
- Upper Countershaft Pilot Tool (RR1071TR)
- Lower Countershaft Pilot Tool (RR1072TR)
- Mechanical Diagnostic Kit (RR2011TR)
- Gasket Sealant (Loctite 5188)
- Transmission Assembly Lube (Lubegard® Assemblee Goo Firm Tack - Green #19250 or equivalent)
- Plastic Scraper
- Gasket Remover (Non-Chlorinated Brake Cleaner)

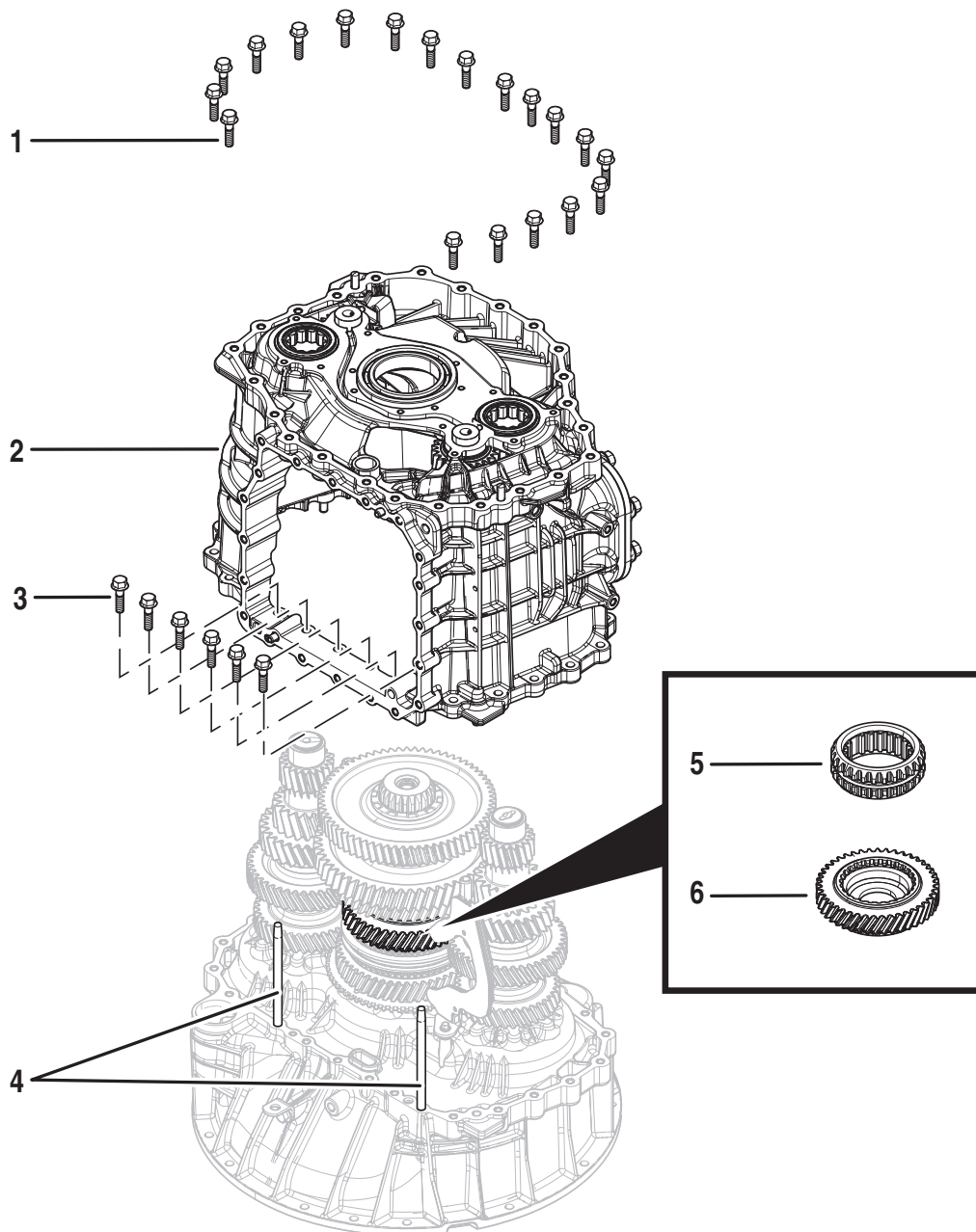


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



- 1. Main Housing External Cap Screws (x19) - 16 mm
- 2. Main Housing
- 3. Main Housing Internal Cap Screws (x6) - 16mm

- 4. Rear Housing Alignment Pins (RR 1090TR)
- 5. Rail C Sliding Clutch
- 6. Primary Drive Gear

Create a Service Activity Report

1. Key on with engine off.
2. Connect ServiceRanger and create a Service Activity Report.
3. Disconnect ServiceRanger.
4. Key off.

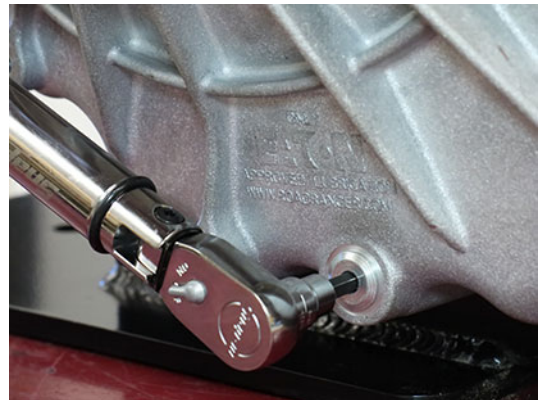
Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.
Note: If reusing oil, use a clean container free of contamination and debris.
3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



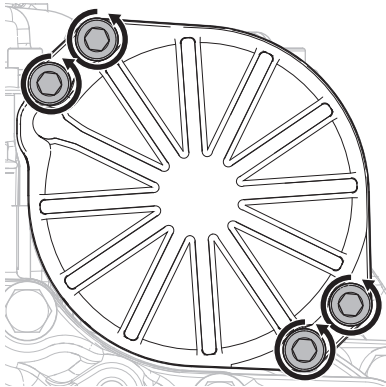
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Remove Transmission

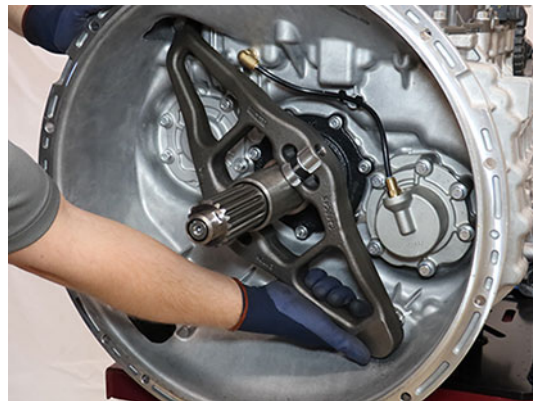
1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove Release Bearing and Clutch Release Yoke

1. Remove the Release Bearing by sliding the bearing off the input shaft.



2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.



3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.



4. Inspect the plastic socket inserts in the Clutch Release Yoke to verify none of the fingers are missing or damaged.

Note: If the plastic insert is damaged, replace the Clutch Release Yoke Assembly and the Release Yoke Pivot Pin.



Remove Transmission Control Module (TCM)

1. Unscrew the 4 TCM Cover nuts and remove TCM Cover.

Note: TCM Cover nuts are 10 or 13 mm.



2. Unscrew the TCM 7 mm Jackscrew. Lift and remove the TCM from the MTM.

NOTICE: Do not allow contamination into the connectors on the TCM or MTM.



3. Inspect the TCM Seal for damage.

NOTICE: Replace the TCM Seal if damaged.



Remove Mechatronic Transmission Module (MTM)

1. Lift the latch on the Output Speed Sensor Harness at the Connector on the Mechatronic Transmission Module (MTM).



2. Remove the Output Speed Sensor Harness from the Connector on the MTM.

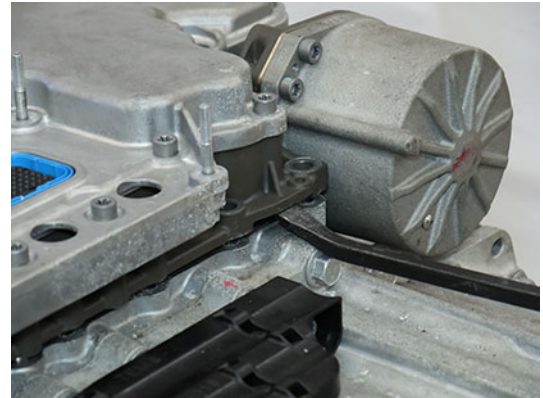


3. Remove the 20 MTM cap screws.

Note: 13 mm (x18), 15 mm (x2).



4. Separate the MTM from the Main Housing at the 2 pry points.



5. Remove the MTM from the transmission housing.

⚠ CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.



Remove Output Speed Sensor

1. Remove the Output Speed Sensor Harness tie strap at the Harness Bracket.



2. Remove the 2 harness press-in retainers from the Main Housing and bracket on Rear Housing.



3. Remove the Output Speed Sensor 10 mm cap screw.



4. Remove the Output Speed Sensor from the Rear Housing.

Note: The sensor may need to be twisted and pulled from the bore.



Remove Harness Bracket

1. Remove the Output Speed Sensor Harness tie strap at the Harness Bracket.



2. Remove 3 Harness Bracket 10 mm cap screws.



3. Remove Harness Bracket.



Secure Transmission (Vertical)

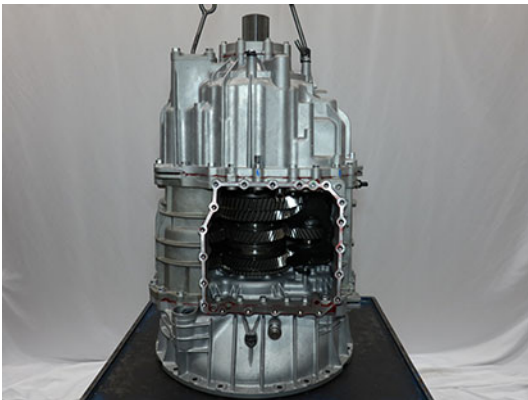
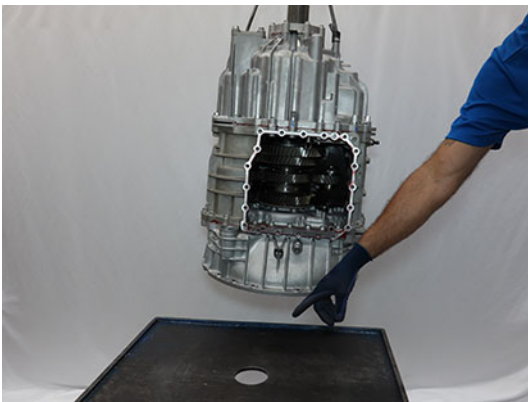
1. Place transmission in the vertical position with the front side down.



WARNING: Transmission weighs approximately 550 lbs. Keep fingers clear of pinch point between transmission and other surfaces. Dropping transmission may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Use a surface with an opening that allows the input shaft to pass through and the clutch housing to sit flat and secure.



Remove Rear Housing

1. At the 3 Rear Housing Threaded cap screws, apply paint marks on the Rear Housing to identify location.



2. Remove 21 Rear Housing and 3 threaded 16 mm cap screws.



3. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.

NOTICE: Failure to install alignment pins results in transmission component damage.



4. Separate the Rear Housing from the Main Housing at the 2 pry points.



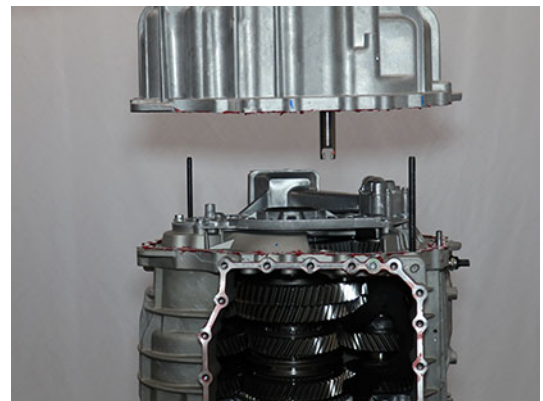
5. Lift and remove Rear Housing Assembly from Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing Assembly may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Dual PTO Transmissions are equipped with a rear PTO lube tube port on the pump and rear PTO drive splines on the Upper Countershaft.

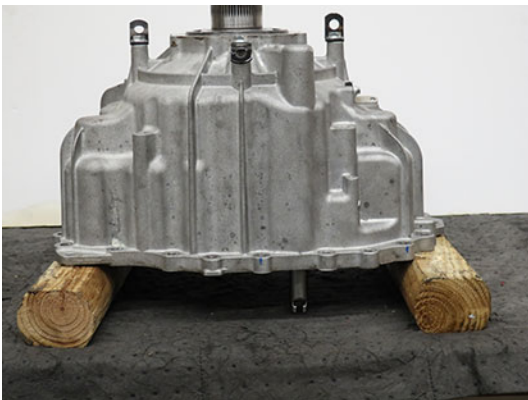


- Place Rear Housing Assembly on bench.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Keep fingers clear of pinch point between Rear Housing Assembly and other surfaces. Dropping Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Support the Rear Housing Assembly to prevent damage to Shift Rail E.



- Remove the 2 Rear Housing Alignment Pins (RR1090TR) from the Main Housing.

Remove Oil Pump Assembly

- Remove 18 Oil Pump Assembly 13 mm cap screws.



- Remove Oil Pump Assembly.



- Remove Oil Pump/Range Spacer with O-ring.



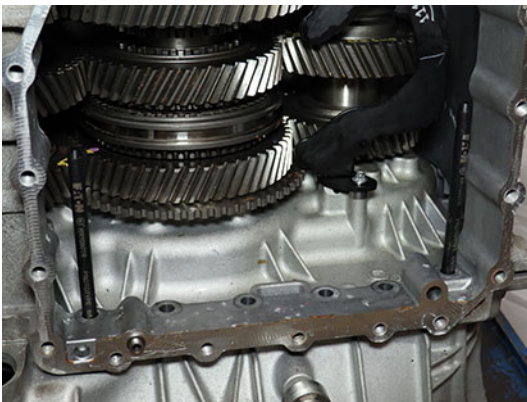
Remove Main Housing

1. Remove the 19 external and 6 internal Main Housing 16 mm cap screws.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



2. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) in the internal Main Housing cap screw outer threaded holes.



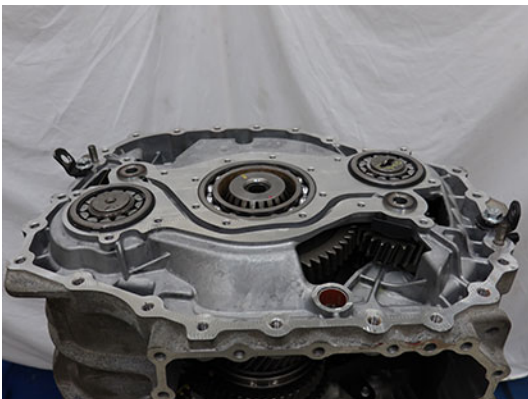
3. Remove 2 Rear Housing 90-degree Lifting Eye 15 mm cap screws from Rear Housing.



4. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



5. Separate Main Housing from Clutch Housing at the 2 pry points.

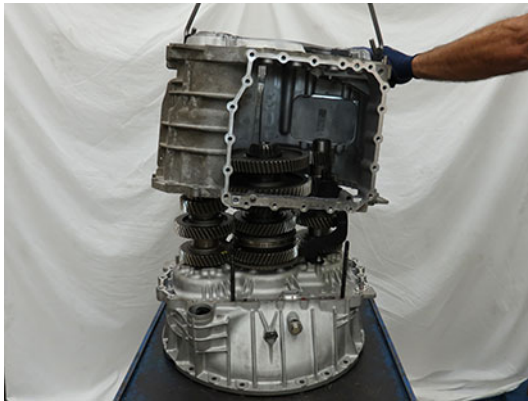


- Lift and remove Main Housing from Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or personal injury.

NOTICE: Use an appropriate lifting device to safely lift component.



- Hold Rail C Sliding Clutch against Secondary Driven Gear and lift Main Shaft from Primary Drive Gear.



CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.

Note: Spring and Washer may remain attached to the Main Shaft during removal.

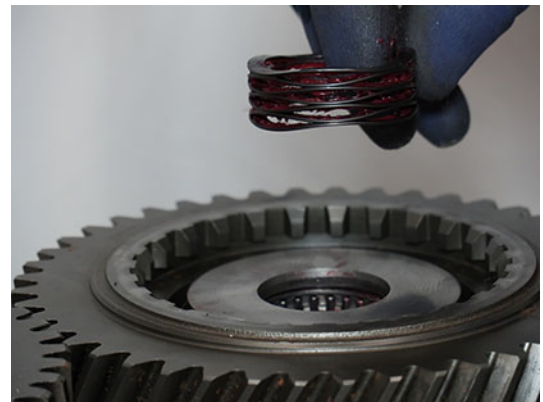


Remove Main Shaft and Countershaft

- Install a magnet onto Main Shaft Key to ensure the key stays in place during Main Shaft Removal and Installation.



- Remove Wave Spring - Rear.



4. Remove Thrust Washer - Rear.



7. Remove Bearing Race - Rear.



5. Remove Thrust Bearing - Rear.



8. Remove Primary Drive Gear.



6. Remove Needle Bearing - Rear.



Install Primary Drive Gear

1. Install new Primary Drive Gear onto Rail B Synchronizer.



2. Install Bearing Race - Rear.



3. Install Needle Bearing - Rear.



4. Install Thrust Bearing - Rear.



Remove Rail C Sliding Clutch

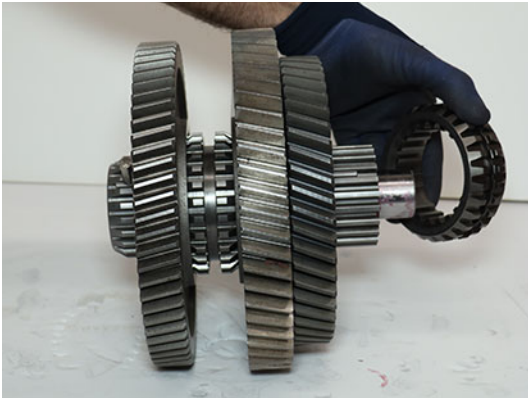
1. Place Main Shaft Assembly horizontally on a clean flat surface.



CAUTION: Secure Main Shaft Assembly while on flat surface to avoid unexpected movement. Failure to properly secure Main Shaft Assembly could result in component damage and/or personal injury.

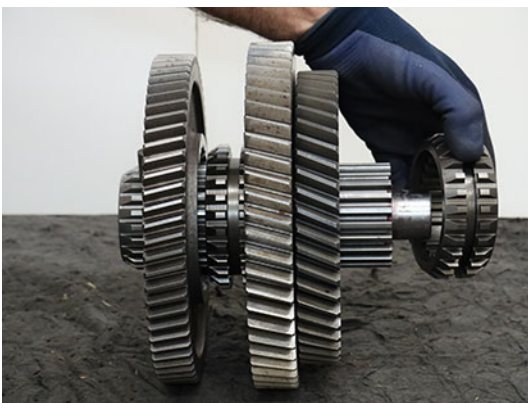
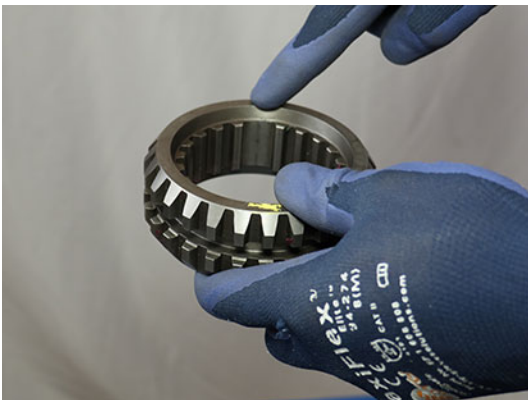
2. If necessary, remove Thrust Washer - Rear and Wave Spring - Rear.

3. Remove Rail C Sliding Clutch.



Install Rail C Sliding Clutch

1. Install new Rail C Sliding Clutch and align the double slot with Main Shaft Key.



2. Apply transmission assembly lube to Wave Spring - Rear and install to Main Shaft.

NOTICE: Wave Spring - Rear is shorter than the Wave Spring - Front.

Note: Transmission assembly lube holds Wave Spring - Rear in place during Main Shaft Assembly installation.



3. Apply transmission assembly lube to Thrust Washer - Rear and install to Main Shaft.

Note: Transmission assembly lube holds Thrust Washer - Rear in place during Main Shaft Assembly installation.



4. Install a magnet onto the Main Shaft Key.

Note: The magnet holds the key in position during Main Shaft Assembly installation.



5. Slide and hold Rail C Sliding Clutch into Secondary Driven Gear.



6. Install Main Shaft Assembly onto Primary Drive Gear and align gearing.



CAUTION: Main Shaft weighs approximately 35 lbs. Keep fingers clear of pinch point between Main Shaft and other surfaces. Dropping Main Shaft could result in component damage and/or personal injury.



7. Remove magnet from Main Shaft Key.

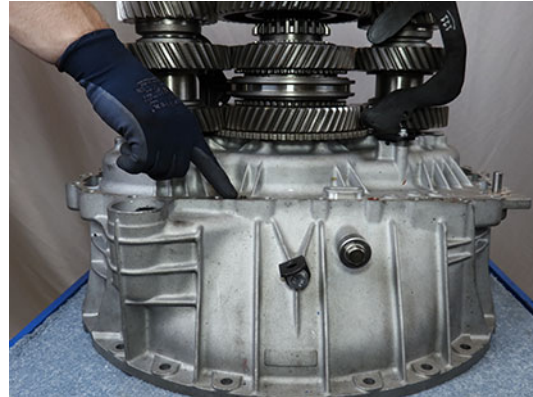
NOTICE: Ensure to remove magnet or component damage may occur during assembly.



2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

3. Slide new I-Brake Main Housing to Clutch Housing O-ring (13834) over the Clutch Housing Inertia Brake air passage alignment pin until fully seated in groove.



Install Main Housing

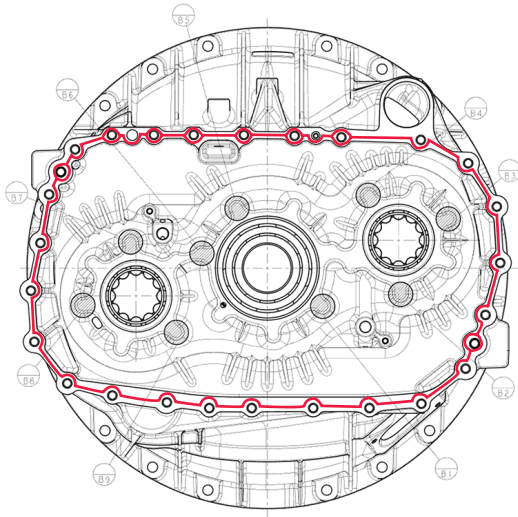
1. Clean the sealing surfaces on the Clutch Housing and Main Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

4. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to clutch housing as shown in pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



5. Install Lower Countershaft Pilot Tool (RR1071TR) onto Lower Countershaft above rear bearing race.



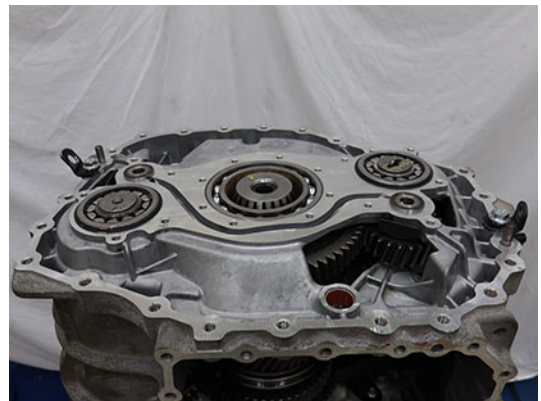
6. Install Upper Countershaft Pilot Tool (RR1072TR) onto the Upper Countershaft above rear bearing race.



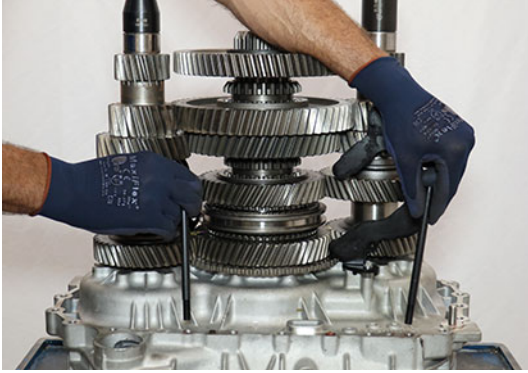
7. Install and hand tighten 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws to Main Housing.

NOTICE: Do not over tighten Lifting Eye cap screws.

Note: Install 90-degree Lifting Eyes 180-degrees apart to ensure even lifting.



8. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) into the Clutch Housing as shown below.



9. Lift, align and install Main Housing to Clutch Housing.



CAUTION: Main Housing weighs approximately 50 lbs. Keep fingers clear of pinch point between Main Housing and other surfaces. Dropping Main Housing could result in component damage and/or serious injury.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Using a flat tipped screwdriver, rotate the Reverse Idler Gears to align the gearing and allow Main Housing to fully seat onto the Clutch Housing.



10. Remove 2 Rear Housing Alignment Pins (RR1090TR).



11. Remove 2 Rear Housing 90-degree Lifting Eyes and 15 mm cap screws from Main Housing.

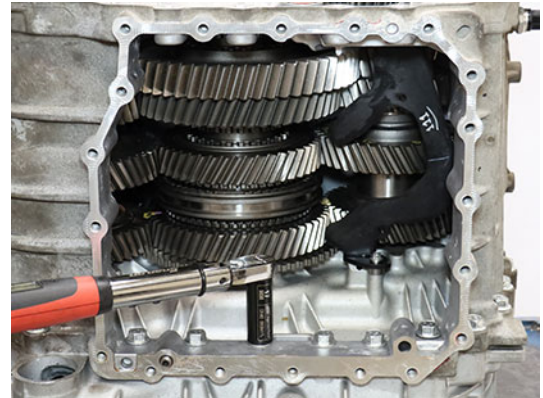


12. Re-install 2 Rear Housing 90-degree Lifting Eyes to the Rear Housing and torque to 49.6-55.5 Nm (36-40 lb-ft).



13. Install 19 external and 6 internal Main Housing 16 mm cap screws and torque to 44-51 Nm (33-38 lb-ft) in a criss-cross pattern.

NOTICE: To avoid internal transmission contamination, keep internal and external Main Housing cap screws separated.



Install Oil Pump Assembly

1. Install O-ring to the Oil Pump/Range Spacer.



2. Install Oil Pump/Range Spacer with O-ring and align tab with groove in Oil Pump Assembly.

NOTICE: Ensure the spacer tab is aligned with the groove and the spacer sits flush in the Oil Pump Assembly.



3. While holding the Oil Pump/Range Spacer in place, align oil pump drive key with slot on Lower Counter-shaft and install Oil Pump Assembly to Main Housing.



CAUTION: Failure to properly install the Oil Pump/Range Spacer and align the oil pump drive key results in transmission component damage during Oil Pump Assembly installation.

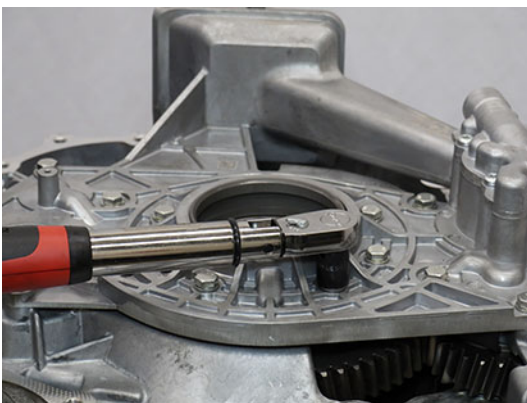
NOTICE: Ensure oil pump drive key is aligned with counter shaft drive slot during Oil Pump Assembly installation.



4. Press Oil Pump Assembly to ensure it sits flat on Main Housing sealing surface.



5. Install 18 Oil Pump Assembly 13 mm cap screws and torque to 21–23 Nm (16–18 lb–ft) in a criss-cross pattern.



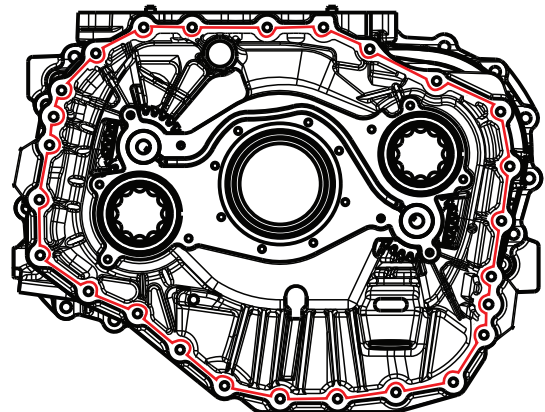
Install Rear Housing

1. Clean the sealing surfaces on the transmission Main Housing and Rear Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.
2. Inspect threaded bolt holes for debris and clean if necessary.
3. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to the transmission Main Housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission housing may be damaged when cap screws are tightened.

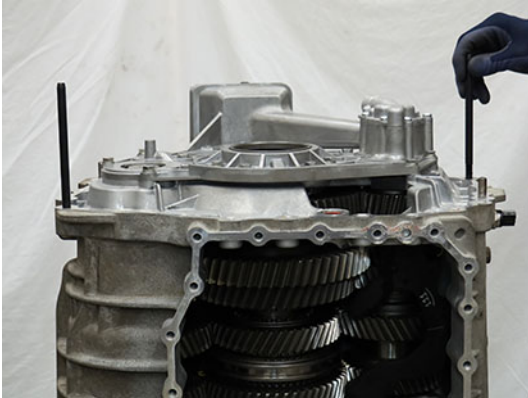
Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



4. Install and hand tighten 2 Rear Housing Alignment Pins (RR1090TR) 180-degrees apart.



CAUTION: Failure to install alignment pins results in transmission component damage during Rear Housing Assembly installation.



6. Install the 3 Rear Housing Threaded 16 mm cap screws at the 3 paint mark locations.

Note: Two cap screws are used to mount the harness bracket and the third is used by the OEM for additional attachment points.



5. Lift and install the Rear Housing Assembly on to the Main Housing.



WARNING: Rear Housing Assembly weighs approximately 170 lbs. Failure to properly secure and lift the Rear Housing may result in major vehicle component damage, severe injury or death.

NOTICE: Use an appropriate lifting device to safely lift component.

Note: Align the Rear Housing to the alignment pins and align Shift Rail E into the Main Housing during installation.

Note: Rotate Output Shaft to align gearing and allow Rear Housing Assembly to fully seat on Main Housing.



Install Harness Bracket

Note: This procedure contains installing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Install Harness Bracket



2. Install 3 Harness Bracket 10 mm cap screws and torque to 8.8-10.4 Nm (6-8 lb-ft).



Install Mechatronic Transmission Module (MTM)

1. Place the transmission in a horizontal position.

NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.

2. Clean the sealing surfaces on the transmission and Mechatronic Transmission Module (MTM) with Gasket Remover.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

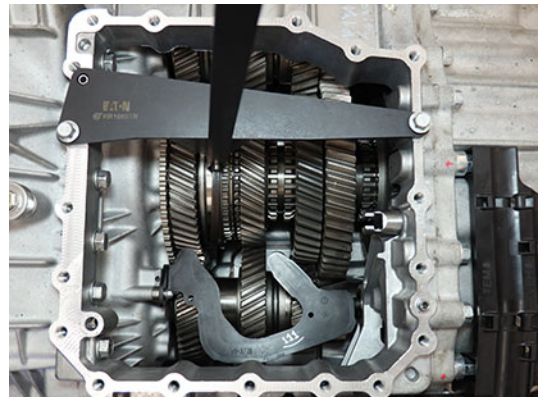
3. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

4. Install the Rail B Engagement Tool (RR1088TR) to the Main Housing and hand tighten with 2 MTM cap screws.



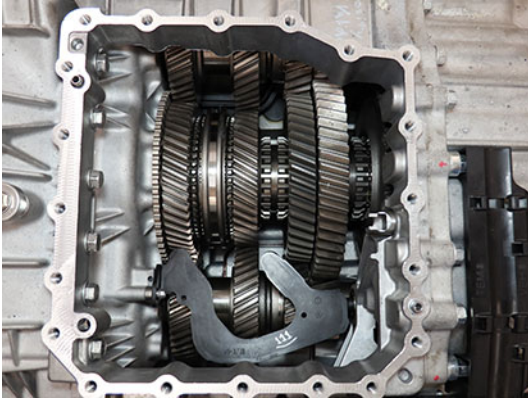
5. Shift the Rail B Synchronizer to neutral.



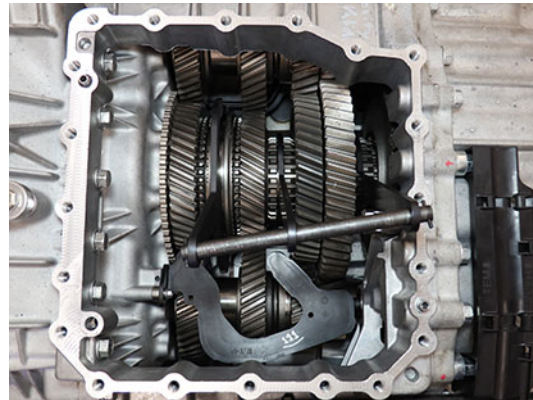
6. Remove the Rail B Engagement Tool.

7. Move Rail C and Rail D sliding clutches to neutral.

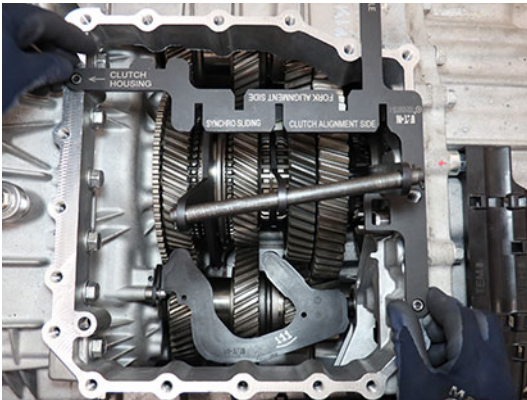
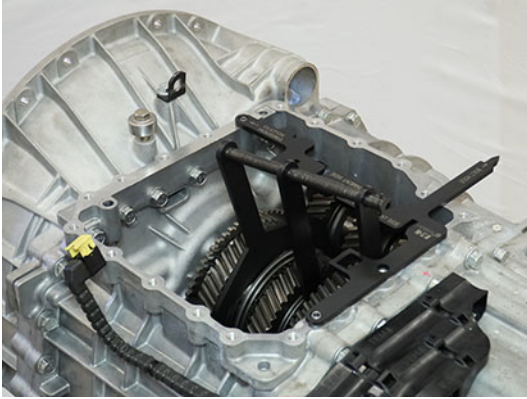
NOTICE: The transmission must be in a horizontal position prior to the MTM Installation procedure. Failure to do so causes the sliding clutches to move out of neutral and not align to the shift yokes. If the shift yokes are not aligned to the sliding clutches, position sensor fault codes set Active and the transmission will not shift out of neutral.



8. Install the Confirm-Neutral Gauge (RR1086TR-2) into the slots of the synchronizer and sliding clutches.

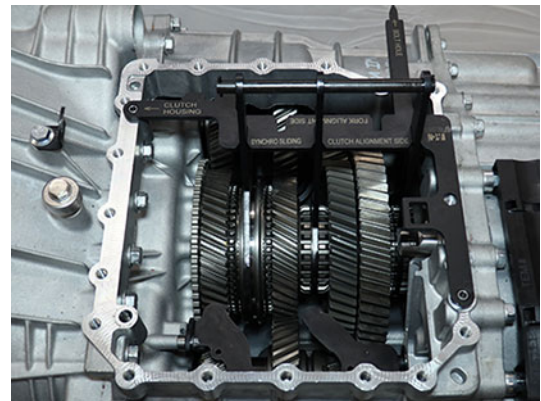


9. Install the MTM Alignment Tool (RR1086TR-1) onto the main housing.

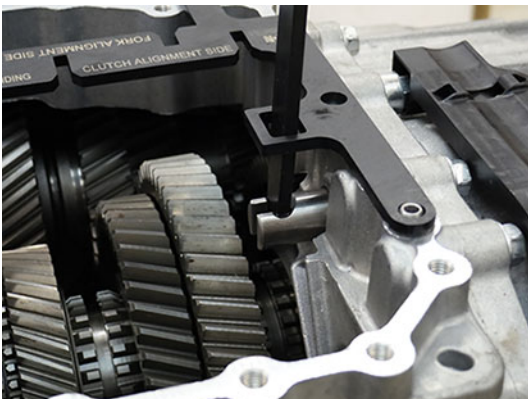
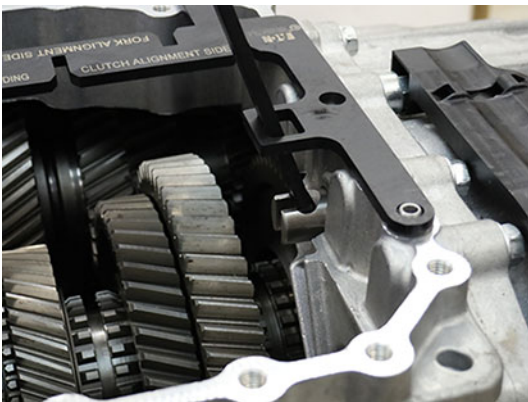
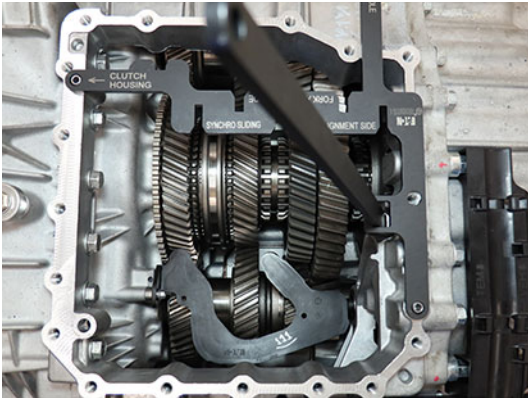


10. Verify synchronizer and sliding clutches are in neutral by sliding Confirm-Neutral Gauge into the slots of MTM Alignment Tool.

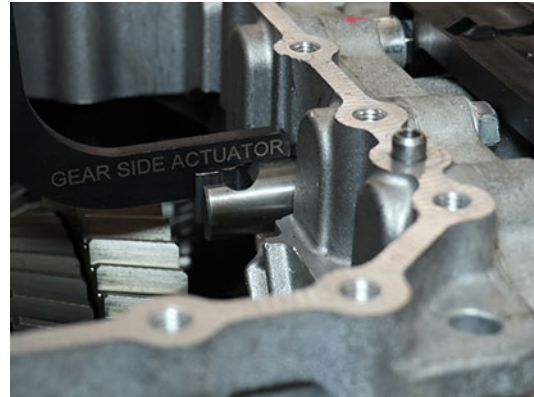
Note: If the gauge does not slide into the alignment tool slots, neutral is not achieved. Go to Step 4.



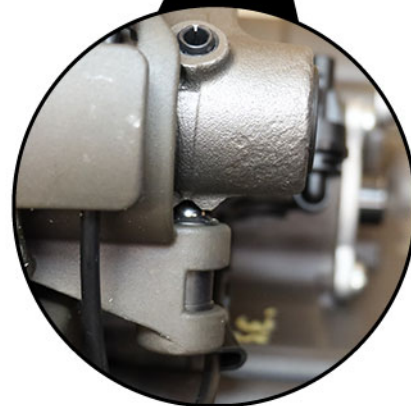
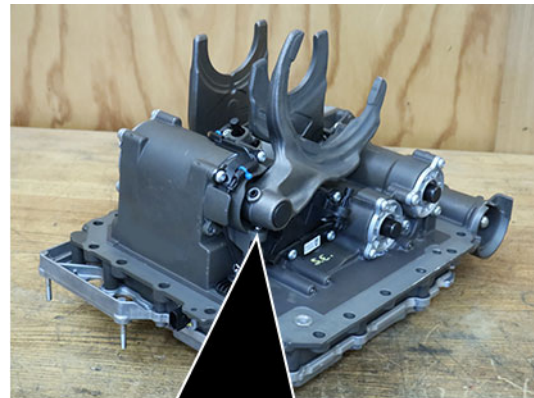
11. Using the Rail E Lever, move Rail E to neutral.



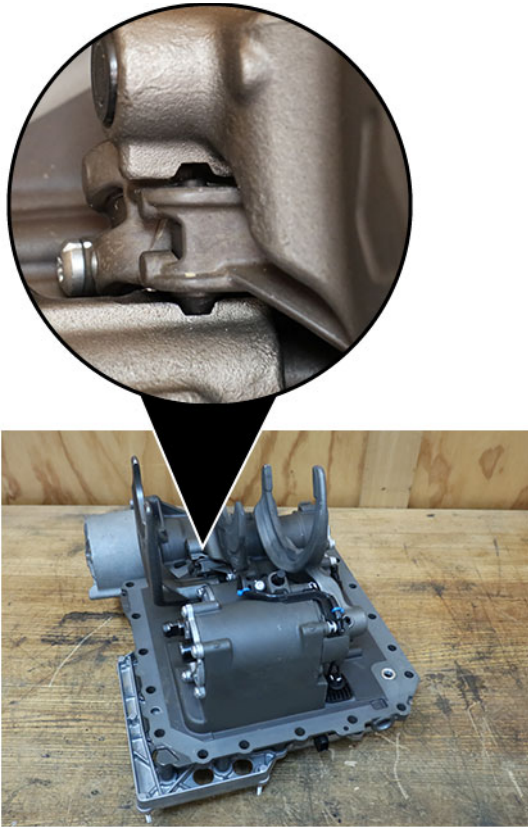
12. Verify Rail E is in neutral using the Gear Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against housing with rail against notch-end of gauge.



13. Move Shift Rail B in the MTM to neutral. Rail B is in neutral when the ball detent is in the notch of the Rail B yoke assembly.



14. Move Shift Rails C and D in the MTM to neutral. Rails C and D are in neutral when the shift inter-lock is aligned with the notches of the rail yoke assemblies.



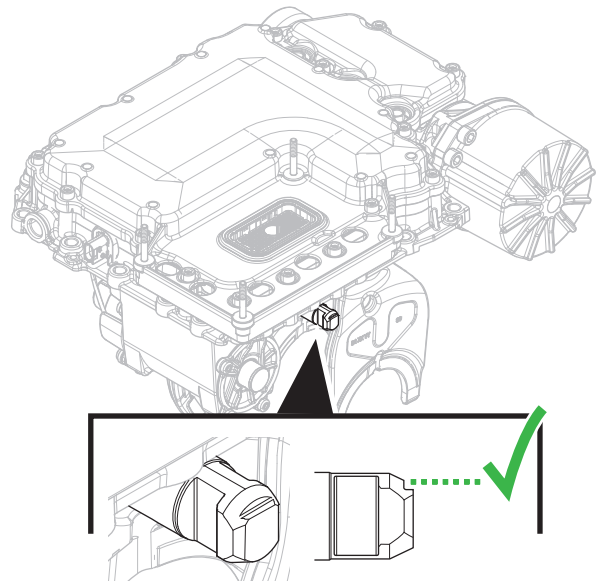
15. Verify MTM is in neutral. Install the MTM Alignment Tool (RR1086TR-1) into the bolt hole and onto Rail B, C, and D Shift Yokes.

Note: If the MTM Alignment Tool slots do not align with the 3 shift yokes, neutral has not been achieved. Go to Step 13.



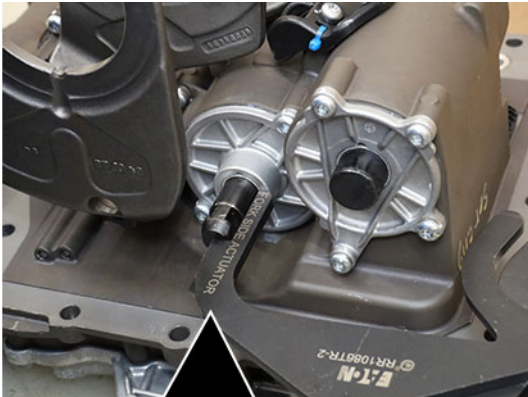
16. Verify notch on Rail E is facing up.

Note: If the MTM is installed on the transmission with the notch on Rail E facing down, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

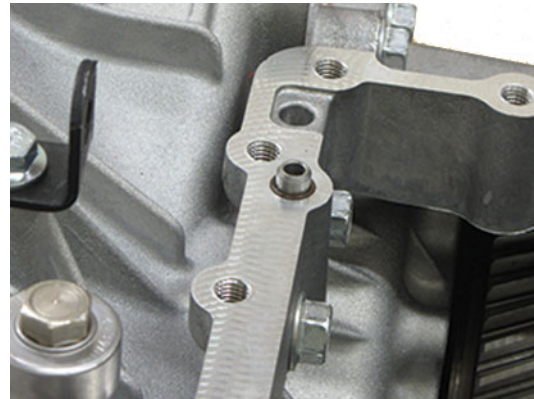


17. Verify Rail E is in neutral using the Fork Side Actuator end of the Confirm-Neutral Gauge (RR1088TR-2) at Shift Rail E. Rail E is in neutral when end of gauge rests against cover with rail against notch-end of gauge.

Note: If Rail E is not in neutral, slide rail in or out until neutral is achieved.



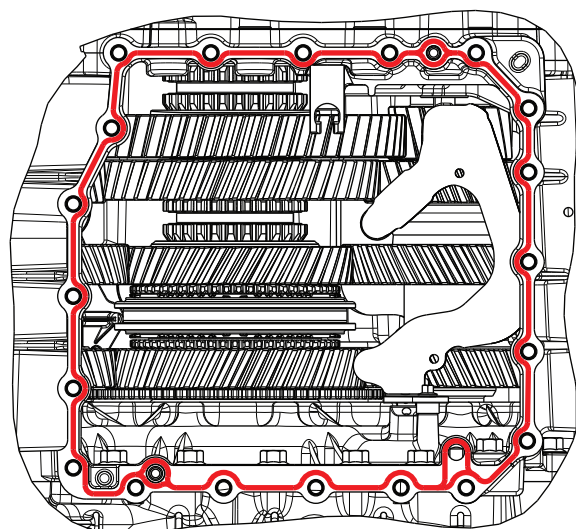
18. Slide new I-Brake MTM to Main Housing O-ring (13653) over the MTM front alignment pin on the main housing until fully seated in the groove.



19. Clean the sealing surfaces on the Main Housing and MTM Housing with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth
20. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to the transmission housing sealing surface following the pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



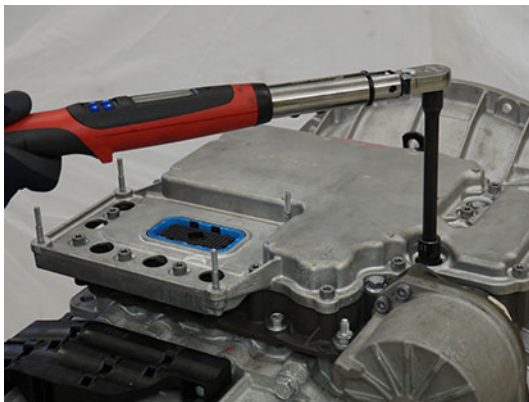
21. Install MTM onto the transmission housing. Align Rail E in the MTM with the Rail E Shift Rail in the Main Housing.

CAUTION: MTM weighs approximately 40 lbs. Keep fingers clear of pinch point between MTM and other surfaces. Dropping MTM could result in component damage and/or personal injury.

NOTICE: If the MTM is installed on the transmission and Rail E in the MTM is not aligned with Rail E in the Main Housing, Fault Code 320 (SPN 5942) sets Active and the transmission will not shift out of neutral.

22. Install 20 MTM cap screws and torque to 44.5-51.5 Nm (33-38 lb-ft) in a criss-cross pattern.

Note: 13 mm (x18), 15 mm (x2) cap screws.



Install Output Speed Sensor

1. Clean the sensor bore.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surface.

2. Apply a light coat of transmission oil to the sensor O-ring.

3. Install the Output Speed Sensor into the bore.

Note: The Sensor may need to be twisted and pushed into the bore.



4. Install the Output Speed Sensor 10 mm cap screw and torque to 8.8-10.4 Nm (6-8 lb-ft).



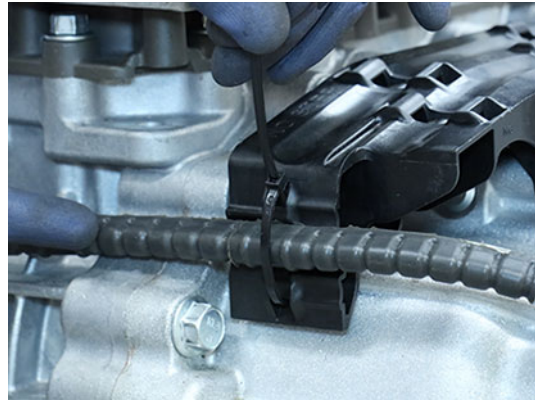
5. Press the 2 harness press-in retainers into the Main Housing and the bracket on the rear housing.



6. Secure the Output Speed Sensor Harness to the Harness Bracket with a tie strap.



CAUTION: Failure to tie strap the Output Speed Sensor Harness to the Harness Bracket may result in harness damage.



Connect Output Speed Sensor

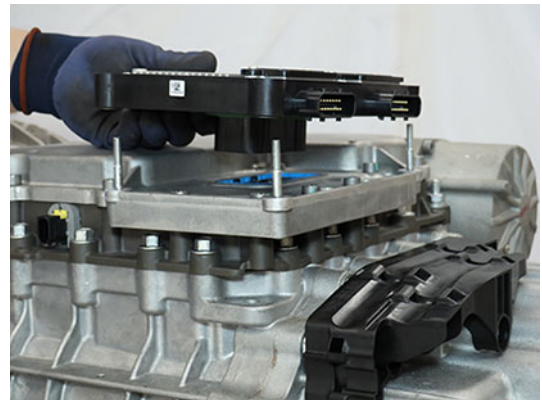
1. Connect the Output Speed Sensor Harness to the Connector on the Mechatronic Transmission Module (MTM) and close the latch.



1. Install the TCM Seal on the 74-Way Harness Connector.



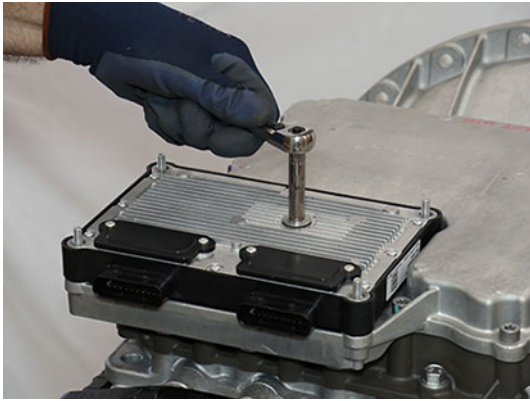
2. Align the TCM to the 74-Way Harness Connector and TCM studs and install the TCM.



Install Transmission Control Module (TCM)

NOTICE: Do not allow contamination into the connectors on the TCM or MTM.

3. Torque the TCM 7 mm Jackscrew to 3.0-4.0 Nm (26.6-35.4 lb-in).



4. Install the TCM Cover over the 4 TCM studs and torque the 4 TCM Cover Nuts to 8.8-10.4 Nm (78-92 lb-in) in a criss-cross pattern.

Note: TCM Cover nuts are 10 or 13 mm.

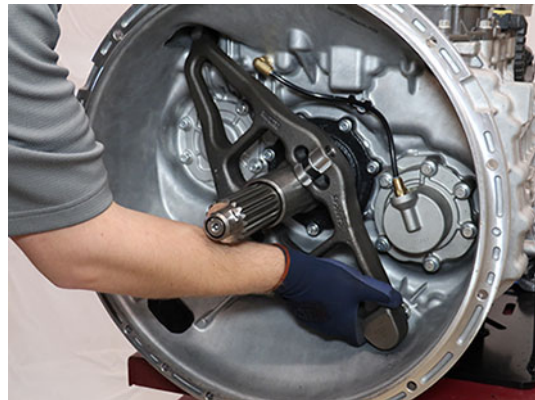


Install Release Bearing and Clutch Release Yoke

1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



3. Slide the Release Bearing over the input shaft and into the Release Yoke.



4. Push the upper end of the Release Yoke back until it locks to reset the LCA.



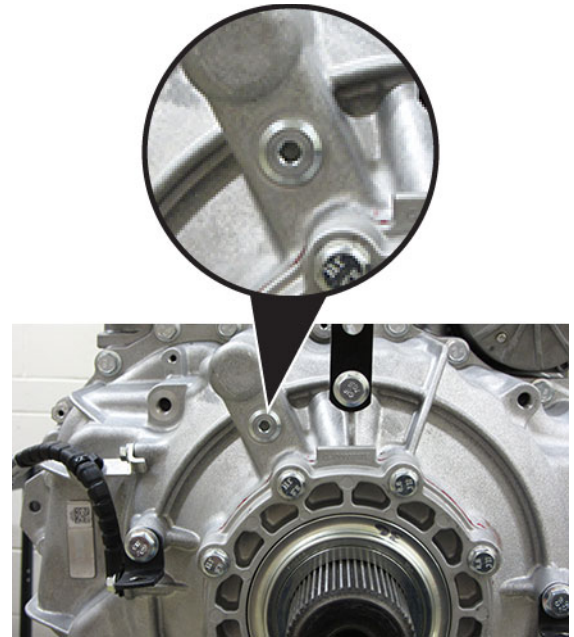
Install Transmission

1. Refer to OEM guidelines for transmission installation.

Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

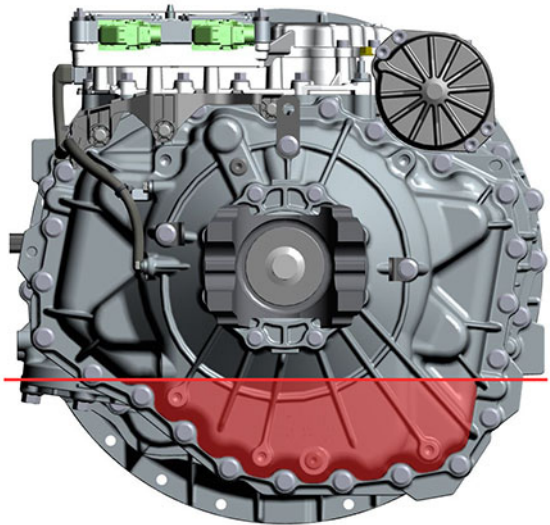
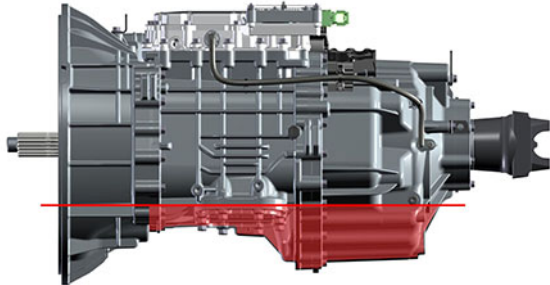


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

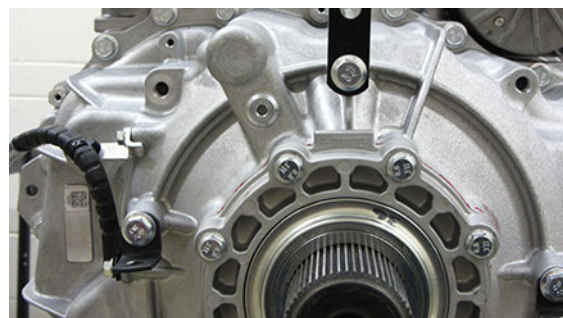
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Connect the negative battery cable.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go To "Service Routines".

5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Select “Start” Rail Calibration and follow on-screen prompts.
7. Key off and wait 1 minute.
8. After waiting 1 minute, key on with engine off.
9. Connect ServiceRanger.
10. Go To “Fault Codes”.
 - If an Active fault code sets, refer to Endurant HD Troubleshooting Guide TRTS0950.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
11. Disconnect ServiceRanger.
12. Key off.

RRMT0027 - Clutch Housing Front Cover Kit

Special Instructions

None

Special Tools

- ServiceRanger
- Transmission Assembly Lube (Lubegard® Assemblee Goo Firm Tack - Green #19250 or equivalent)

NOTICE: Only use the specified transmission assembly lube indicated above. Other types of

assembly lube or grease reduce O-ring effectiveness.

- Non-Chlorinated Brake Cleaner

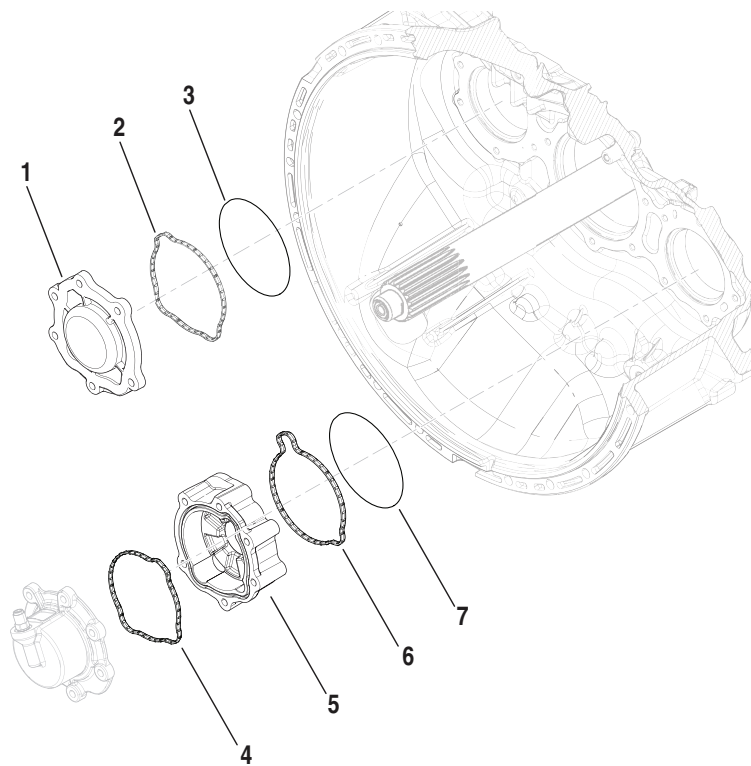


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



	Description	P/N	QTY
1	Upper Countershaft Cover	10004215	1
2, 4	Countershaft Cover/Inertia Brake Housing (Front) Seal	10001048	2
3, 7	Countershaft Cover/Inertia Brake Housing Countershaft Bearing O-ring	10004217	2
5	Inertia Brake Housing	10004216	1
6	Inertia Brake Housing (Rear) Seal	10001049	1

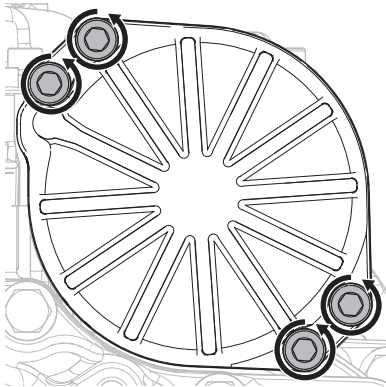
Manually Vent Linear Clutch Actuator (LCA)

1. Key off.
2. Set vehicle parking brake and chock wheels.

! **WARNING:** Apply vehicle parking brake and follow vehicle manufacture parking instructions. Failure to follow these instructions could cause unintended vehicle movement and may result in major vehicle component damage, severe injury or death.

3. Loosen the 4 Linear Clutch Actuator (LCA) cap screws 1-2 turns each with a T45 Torx.

Note: Residual air pressure in the LCA cylinder exhausts between the LCA and Mechatronic Transmission Module (MTM) housing when the cap screws are loosened.



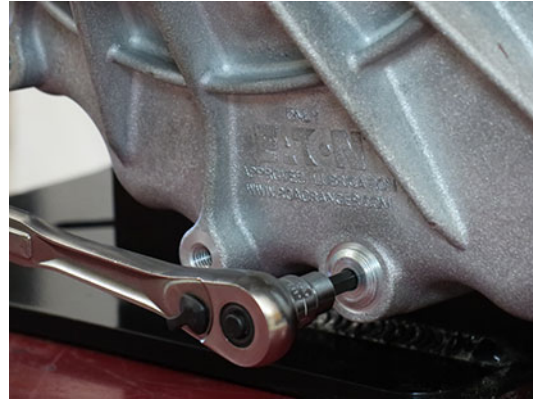
4. Tighten the 4 LCA to MTM T45 cap screws and torque to 23-27 Nm (17-21 lb-ft).

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

Note: Original oil is not to be reused.

3. Remove the Oil Drain Plug with a 6 mm hex key and drain the oil.



4. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
5. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.



Remove Transmission

1. Disconnect negative battery cable.
2. Refer to OEM guidelines for transmission removal.

Remove Release Bearing and Clutch Release Yoke

1. Remove the Release Bearing by sliding the bearing off the Input Shaft Cover.



2. Pull to free the lower Clutch Release Yoke socket from the lower pivot on the clutch housing.

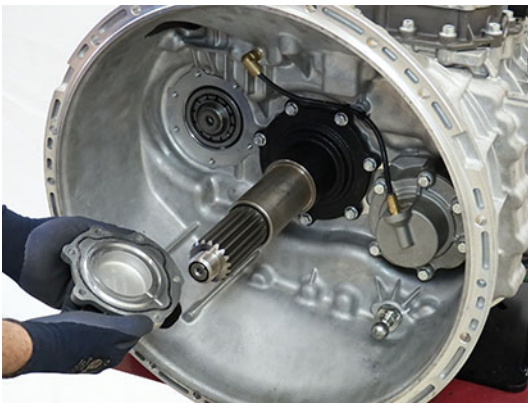


3. Pull to free the upper Clutch Release Yoke socket from the Linear Clutch Actuator (LCA) rod end.



Remove Upper Countershaft Cover

1. Remove the 6 Upper Countershaft Cover 13 mm cap screws and remove cover. The original Upper Countershaft Cover and Front Seal are not to be reused.



Install Upper Countershaft Cover Countershaft Bearing O-ring

1. Clean any residual oil from the Upper Countershaft Bearing outer diameter using Non-Chlorinated Brake Cleaner.

2. Install the Upper Countershaft Cover Countershaft Bearing O-ring (10004217) onto the Upper Countershaft Bearing.

Note: O-ring may fall out of position after installation. Ensure to clean any residual oil from the bearing and roll the O-ring on to the bearing using the tips of your fingers pushing on the inner diameter of the O-ring. If necessary, apply a small amount of transmission assembly lube at the 3, 6, 9 and 12 o'clock positions to the outer diameter of the bearing.



Install Upper Countershaft Cover

1. Clean the sealing surfaces on the clutch housing and the new Upper Countershaft Cover.

Note: The new Upper Countershaft Cover has a chamfer that is required for the bearing O-ring.



2. Install new Countershaft Cover front seal (10001048) into the groove of the new Upper Countershaft Cover (10004215) until fully seated

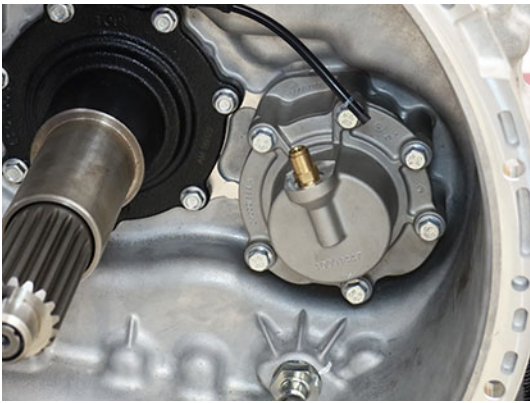


3. Install the new Upper Countershaft Cover and six 13 mm cap screws to the clutch housing and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



Remove Lower Countershaft Cover and Inertia Brake

1. Depress and hold collar on air line fitting and disconnect the air line from the Inertia Brake Cover.



2. Remove the 6 Inertia Brake Cover 13 mm cap screws.



3. Remove the Inertia Brake Cover and Housing as an assembly. The original Inertia Brake Housing and seals are not to be reused.



4. Ensure the Inertia Brake Piston Pin and Return Spring remain in the Lower Countershaft.



Disassemble Inertia Brake

1. Remove the clutch pack from the Inertia Brake Housing.



2. Remove the 2 wear guides from the Inertia Brake Housing.



Assemble Inertia Brake

1. Clean sealing surfaces on the clutch housing and the new Inertia Brake Housing.

Note: The new Inertia Brake Housing (10004216) has a chamfer on the Clutch Housing side that is required for the bearing O-ring.



2. Insert the new Inertia Brake Rear Seal (10001049) into the groove on the rear of the new Inertia Brake Housing (10004216) until fully seated.



4. Install the 2 original Wear Guides into the new Inertia Brake Housing (10004216).



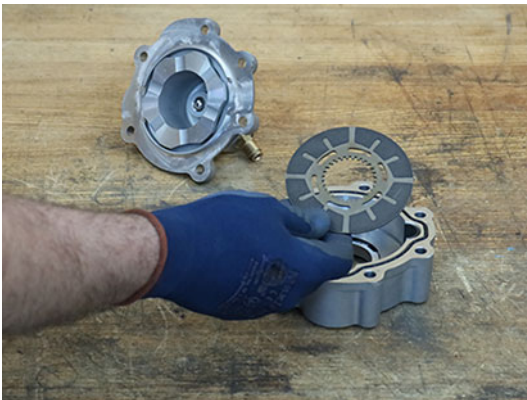
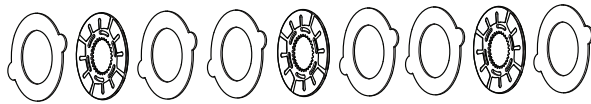
3. Insert the new Inertia Brake Housing Front Seal (10001048) into the new Inertia Brake Housing (10004216) until fully seated.



5. Install the original inertia brake clutch pack in the order shown below:

- 1 Steel Disc,
- 1 Friction Disc,
- 2 Steel Discs,
- 1 Friction Disc,
- 2 Steel Discs,
- 1 Friction Disc, and
- 1 Steel Disc.

Note: Steel Discs align with Wear Guides. Friction Discs spline to the lower countershaft.



Install Inertia Brake Housing Countershaft Bearing O-ring

1. Clean any residual oil from the Lower Countershaft Bearing outer diameter using Non-Chlorinated Brake Cleaner.
2. Install the Inertia Brake Housing Countershaft Bearing O-ring (10004217) onto the Lower Countershaft Bearing.

Note: O-ring may fall out of position after installation. Ensure to clean any residual oil from the bearing and roll the O-ring on to the bearing using the tips of your fingers pushing on the inner diameter of the O-ring. If necessary, apply a small amount of transmission assembly lube at the 3, 6, 9 and 12 o'clock positions to the outer diameter of the bearing.



6. Place Inertia Brake Cover and Piston on the Housing. Align the bolt holes.

Install Inertia Brake Cover and Housing

1. Install the Inertia Brake Cover and the new Housing as an assembly over the Lower Countershaft, rotate the assembly to align the Friction Discs to the Lower Countershaft splines and seat the assembly to the clutch housing.



2. While holding the Inertia Brake Housing to the clutch housing, remove the Inertia Brake Cover.

NOTICE: Ensure the Friction Discs are splined to the lower countershaft and Wear Guides are fully seated.



3. If removed, install the Return Spring into the Lower Countershaft.



4. If removed, install the Piston Pin into the Lower Countershaft.



5. Install the Inertia Brake Cover onto the housing.



6. Install the six 13 mm cap screws and torque to 21-25 Nm (16-19 lb-ft) in a criss-cross pattern.



7. Insert air line in push-to-connect fitting on the Inertia Brake Cover.

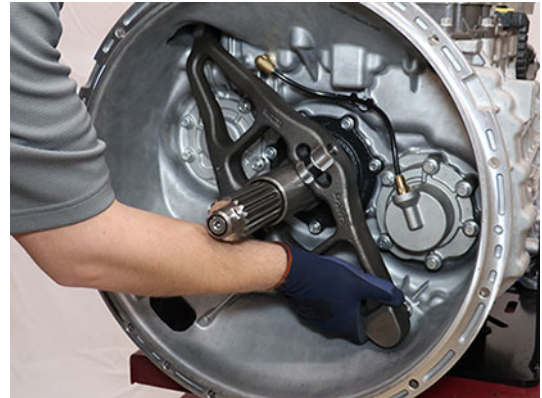


Install Release Bearing and Clutch Release Yoke

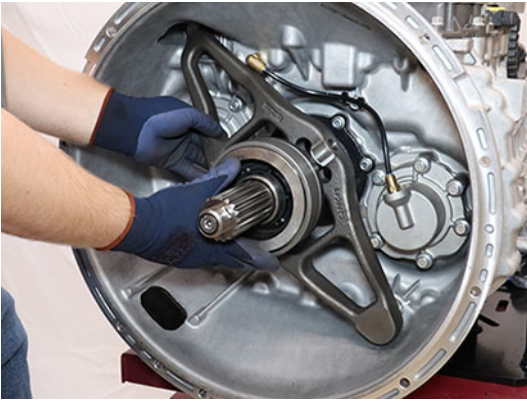
1. Install the upper Release Yoke socket over the rod end of the Linear Clutch Actuator (LCA) and press until attached.



2. Install the lower Release Yoke socket over the lower pivot on the clutch housing and press until attached.



- Slide the Release Bearing over the input shaft and into the Release Yoke.



- Push the upper end of the Release Yoke back until it locks to reset the LCA.

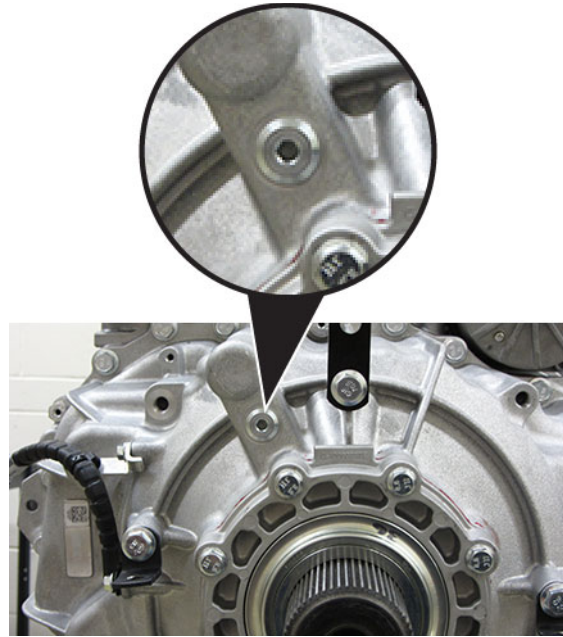


Install Transmission

- Refer to OEM guidelines for transmission installation.

Fill Oil

- Remove the Oil Fill Plug with a 6 mm hex key.

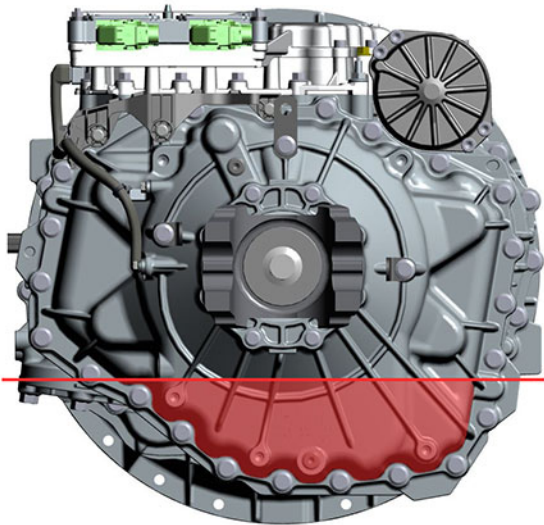
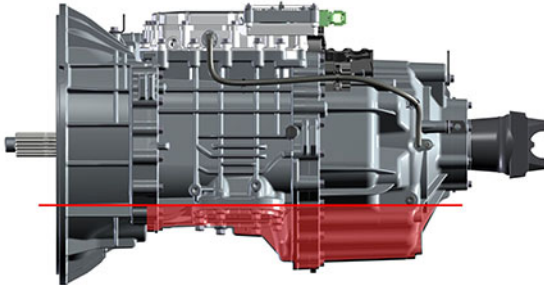


- Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.

5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

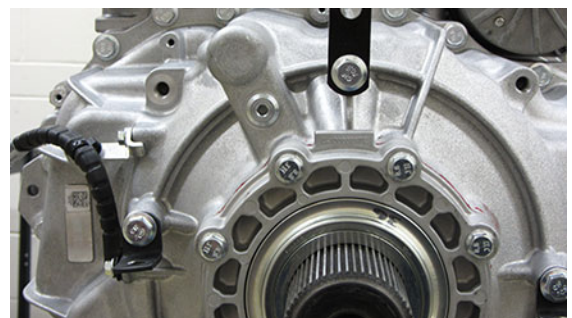
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



8. Connect negative battery cable.

Perform Transmission Service Routines

1. Key on with engine running.
2. Allow air pressure to build to governor cut-off.
3. Connect ServiceRanger.
4. Go to “Service Routines”.
5. Select “Start” Clutch Calibration and follow on-screen prompts.
6. Key off and wait 1 minute.
7. After waiting 1 minute, key on with engine off.
8. Connect ServiceRanger.
9. Go To “Fault Codes”.
 - If an Active fault code sets, refer to *Endurant Troubleshooting Guide TRTS0950*.
 - If NO Active fault codes set, select “Clear Eaton Faults” and follow on-screen prompts.
10. Disconnect ServiceRanger.
11. Key off.

Harness Bracket Service Procedure

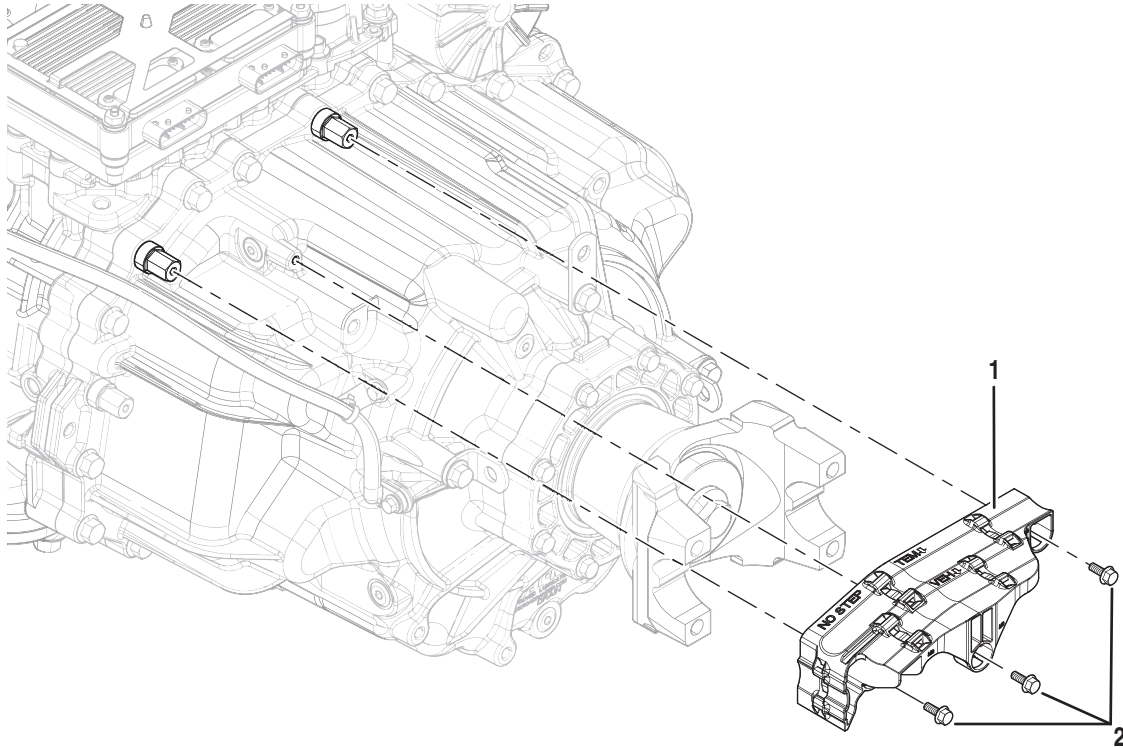
Special Instructions

The Harness Bracket can be removed and installed with the transmission in-vehicle.

Special Tools

None

Component Identification



1. Harness Bracket
2. Harness Bracket Cap Screws (x3) - 10 mm

Remove the Harness Bracket

Note: This procedure contains removing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Remove 3 Harness Bracket 10 mm cap screws.



2. Remove Harness Bracket.



Install the Harness Bracket

Note: This procedure contains installing the Harness Bracket without the Mechatronic Transmission Module (MTM).

1. Install Harness Bracket.



2. Install 3 Harness Bracket 10 mm cap screws and torque to 8.8 - 10.4 Nm (6-8 lb-ft).



Change Log

Date	Description
March 2021	Updated: OEM and Engine Specific Transmission Kits Clutch Housing Service Kits Main Housing Service Kits
August 2020	Added Appendix information for the Clutch Housing Front Cover Kit Updated Service Kits and Parts Index Updated Service Kit Rear
March 2020	Added Service Kits and Parts Index
January 2020	Updated to new format

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