

Eaton® Lubrication TCMT0021 EN-US

November 2018



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Important Eaton Transmission Lubricants Update - January 2017

Introduction of New Lubrication Specification PS-386

Eaton transmission lubricant specification PS-164rev7 has been replaced by PS-386. All applications that required the use of PS-164rev7 approved lubricants will now require the use of PS-386 approved lubricants.

OEM Production - All major OEMs have transitioned to the PS-386 approved lubricants.

Aftermarket - Eaton recognized that there was a transition period until PS-164rev7 oils were eliminated in the market. Effective January 1, 2017, warranty coverage requires PS-386. Both PS-164rev7 and PS-386 oils can be mixed. Top-offs using either fluids are permitted.

Introduction of Procision Transmission Unique Lubricant Specification PS-278

PS-278 approved lubricants are the only acceptable lubricant for the Procision transmission. Do not use PS-278 oil in other Eaton transmission models.

Introduction of Approved Lubricant Logos

To make identification of approved lubricants easier, new mandatory logos were created. All approved lubricants for PS-386 and PS-278 are required to display the approved lubricant logo on their label.



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Eaton Lubrication Philosophy

In promoting component reliability and longevity, proper lubrication is the key to a sound and effective maintenance program. Without effective lubricants at proper levels and temperatures, remaining maintenance procedures will not keep components functional.

Synthetic lubricants have proven to be superior to petroleum products and represent opportunities to promote superior maintenance and bottom line operating performance while significantly extending component service life and reliability. Certain products and applications, as noted in this manual, require the use of approved synthetic lubricants.

A list of approved lubricants and suppliers can be found at Roadranger.com in the approved Lubricant Supplier Manual, TCMT0020.

It is important to perform a daily pre-trip inspection of drivetrain components for lubricant leaks. Leaks should be brought to the attention of maintenance and immediate corrective action should be taken.

Benefits

Extended Drain synthetic lubricants offer superior thermal and oxidative stability for extended product performance and reliability. The superior performance characteristics of these lubricants enable component manufacturers to offer extended drain intervals and extended warranties. Added benefits include a more efficient drivetrain that translates into proven fuel economy savings over mineral based lubricants.

Extended Drain synthetic lubricants are advantageous in all applications and Eaton highly recommends for severe duty applications and in cold climates.

It is important to use the lubricants that are approved for the current specifications set forth by each component manufacturer. Look for the appropriate approval code on the container.

Use of lubricants meeting these specifications will ensure the highest performing lubricants for maximum performance.

To identify approved lubricants - look for the 'Eaton Approved Lubricant' label on the container.



Note: Eaton Approved Lubricant Logos mandatory use in 2015.

Note: Eaton discontinued the use of the E500 logo in 2006.

Note: Eaton and Dana Genuine Lubricants logo was discontinued in 2012.

Unapproved Lubricants - Things to Watch Out For

Unfortunately, the product labeling can be difficult to understand. Eaton recommends using only lubricants with the 'Eaton Approved Lubricant' label. Here is some common jargon to look for when determining if a lubricant is approved.

Jargon to avoid:

- Product X **meets and/or exceeds** the manufacturer's requirements of ...
- Product X is **recommended for use** where ...

What to look for:

- **Approved for/by** ...

Benefits of Using Approved Lubricants

Lubricants must meet rigorous test criteria set by the component manufacturer to ensure performance and long life. Approved lubricants are designed to work with the specific component. When improper or unapproved lubricant is used, several problems can occur.

Benefits of using approved lubricants:

- Oil formulation is tested per component manufacturer's specifications
- Reduced wear on components such as gears and bearings
- Longer life by reducing operating temperatures
- Prevention of corrosion, especially when copper coolers are used
- Excellent cold temperature performance
- Maintain extended warranty coverage

Risks from not using approved lubricants are:

- Shortened bearing life
- Seal leakage
- Reduced fuel economy
- Shortened copper cooler life
- Loss of warranty coverage



Bearing Failure



Seal Coking



Transmission Sludge



Copper Cooler Failure

Application Definitions

Line Haul (On-Highway) Service

- Line Haul is moving different types of freight in high mileage operation (over 50,000 miles (80,000 km) per year).
- Operation on road surfaces of good to excellent concrete or asphalt.
- 80% of distances are more than 30 miles (48 km) between starting and stopping, with remaining 20% within 30 miles between starting and stopping.
- Typical vehicle configurations are 4 x 2, 6 x 2, and 6 x 4 tractor/trailer combinations some straight trucks. Typical Vehicle Uses:
 - Line Haul
 - Recreational
 - Rescue
 - Fire Service
 - Transit Coach

Check fluid levels and inspect for leaks at regular PM maintenance intervals, not to exceed 12,000 miles.

Vocational Service

- Low mileage operation (under 60,000 miles (96,500 km) per year).
- Off-highway or areas of unstable or loose unimproved road surfaces.
- Less than 30 miles (48 km) between starting and stopping.
- Typical Vehicle Uses:
 - City Delivery
 - Construction
 - Heavy Haul
 - Logging
 - Mining
 - Oil Field
 - Refuse
 - School Bus
 - Intercity Bus/Coach
 - Agriculture
 - Yard Tractor

Check fluid levels and inspect for leaks every 50 hours.

Stationary

- Transmissions not used for mobile applications.
- Check fluid levels and inspect for leaks every 50 hours.

Severe Duty Service

- Consistent operation at or near maximum GCW or GVW ratings.
- Dirty or wet environments.
- Consistent operation on grades greater than 8%.

Transmission Oil Filters

Transmission oil filters are required for all 2050 lb-ft and 2250 lb-ft rated transmission models, and for all Procision™ models. Transmission filters should be changed during regular transmission lube change intervals. Inspect the transmission filter for damage or corrosion during all preventative maintenance checks. Replace as necessary.

Operating Temperatures/Cooling Requirements

Transmissions must not be operated at temperatures above 250 °F (121 °C). Operation at temperatures above 250 °F (121 °C) causes loaded gear teeth temperatures to exceed 350 °F (177 °C) which will ultimately lead to premature gear failure. If the elevated temperature is associated with an unusual operating condition that will recur, a transmission oil cooler must be added, or the capacity of an existing cooling system increased.

The following conditions, in any combination, can cause operating temperatures of over 250 °F (120 °C):

- Operating consistently at high/low speeds
- High ambient temperatures
- High horsepower operation
- Restricted airflow around transmission
- Excessive use of engine retarder
- Exhaust system proximity to transmission
- High power PTO operation for extensive periods while stationary
- High engine RPM for extensive periods

External oil coolers are available to reduce operating temperatures when the above conditions are encountered.

Eaton oil cooler systems must meet a minimum requirement of 3/4" water coolant lines and 8 GPM water coolant flow at 1500 RPM. **The end user is ultimately responsible for maintaining transmission lube temperatures below 250 °F (121 °C).** Transmission oil coolers must be used to reduce operating temperatures when the above conditions are encountered.

Oil Cooler Usage

Transmission oil coolers are recommended for:

- Engines 350 hp and above

Transmission oil coolers are required for:

- Engines 400 hp and above and 1,400 lb-ft (1498 Nm) or greater torque
- Engines 400 hp and above and a GVW/GCW over 90,000 lbs
- Engines 450 hp and above
- Engines 1500 lb-ft (2033 Nm) and above
- All Procision™ models (See TRIG0990 for more details.)

Eaton Extended Warranty Protection Plan Lubrication Requirements

- Approved extended drain lubricants are required to maintain Roadranger® Extended Warranty Protection Plans.
- For specific details about Eaton extended warranty programs, refer to the Roadranger® Warranty Guide, TCWY0900, or call 1- 800-826-HELP (4357).
- For a complete list of approved lubricants, see Roadranger.com, Lubricants - TCMT0020.

Transmission Lubrication Procedures

Each Transmission model has specific lubrication requirements. Consult the appropriate Transmission Service Manual for detailed instructions.

Transmission Oil Level Check

Note: Before checking the oil level, the engine must be idling and the transmission in neutral for at least 2 minutes. Lubricant temperature must be between 60 °F and 120 °F (15.5 °C and 48.8 °C).

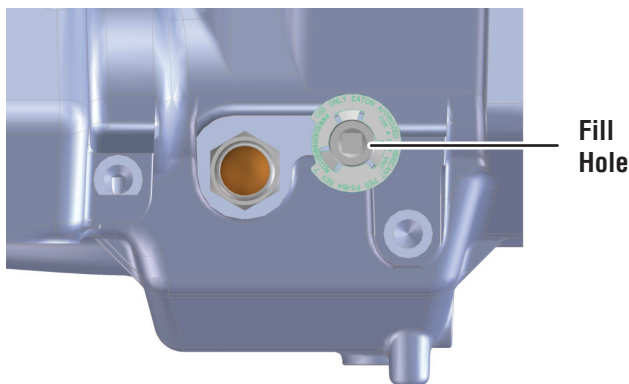
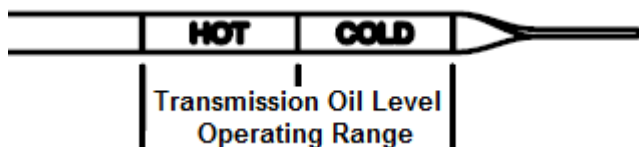
Inspect the transmission exterior for leaks. Look around the oil filter and exterior seals for damage and replace as necessary.

Check fluid levels and inspect for leaks at regular intervals, not to exceed 12,000 miles.

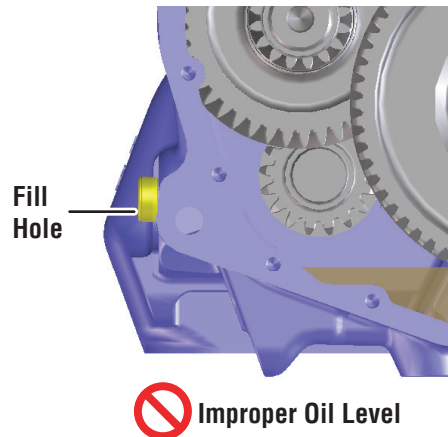
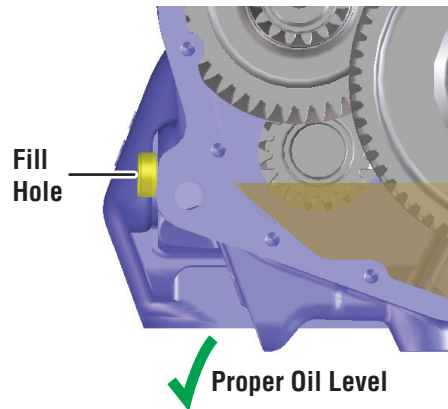
The lubricant level can be checked by the fill hole or the sight glass. They are usually located on the driver's side of the transmission.

1. Turn engine off.
2. Remove fill hole plug (or view oil level through the sight glass).
3. Lubricant must be level with the hole.

Note: For transmissions with dipsticks, the proper level is between the cold ADD mark and the cold FULL mark.



✓ Proper Oil Level with Sight Glass



Drain Transmission Oil

1. Use a drain pan under the transmission drain plug to collect oil from the bottom of the transmission.
2. Make sure the oil temperature is cool.
3. Clean around drain plug and remove plug.
4. Allow transmission oil to drain out.
5. Clean drain plug and torque as required.

Drain Transmission Oil Cooler, if equipped

1. Remove both cooler lines at the transmission.
2. Pressurize one line with 30 PSI [0.2 MPa] of air pressure to force the oil out.
3. Capture the oil in a oil drain pan from the other hose.
4. Reconnect the coolant lines to the transmission, making sure lines are not crossed.

Fill Transmission Oil

1. Remove transmission oil fill plug.
2. Make sure drain plug is properly installed.
3. Fill with approved oil until the oil starts flowing out the fill hole.
4. Clean, install, and properly and torque fill plug.

Fill Transmission Oil Cooler, if equipped

1. After filling the transmission with oil, place the vehicle in Neutral and start the engine.
2. Allow the input shaft of the transmission to rotate by releasing the clutch pedal. The oil pump will fill the cooler.
3. After one minute, shut off the engine, recheck the transmission oil level, and top off lubricant. Repeat this process until proper lubricant level is achieved.

Transmission Lubricant Capacities

Note: Capacity of transmissions equipped with PTOs or Oil Coolers are greater than capacities listed. These values are approximate. Always use the fill hole as final reference.

Heavy-Duty Transmission Lubricant Capacities

Capacities are sorted by model number only. The prefixes are included when necessary.

The Heavy-Duty (HD) chart includes the following prefixes: AT, FR, FRO, FRLO, RT, RTAO, RTL, RTLO, RTLOM, RTO, RTOM, RTOO, RTX, T, TO and TX.

| HD Model Number | Pints (US) | Liters |
|--------------------------|------------|--------|
| 1056AA | 29 | 14 |
| 10710 (-AC, -AS, -AS2) | 26 | 12 |
| 10910 (-AS3, -DM2, -DM3) | 26 | 12 |
| 1110 | 25 | 12 |
| 11109 (-AT) | 88 | 42 |
| 11210 | 23.5 | 11 |
| 11509 | 25 | 12 |
| 1157DL | 27 | 13 |
| 1157DLL | 29 | 14 |
| 11605 | 22 | 10 |
| 11606 | 26 | 12 |
| 11607 (-ASX) | 36 | 17 |

| HD Model Number | Pints (US) | Liters |
|------------------------|------------|--------|
| 11607L | 28 | 13 |
| 11607LL | 31 | 15 |
| 11608 | 26 | 12 |
| 11608LL | 29 | 14 |
| 11609 | 27 | 13 |
| 11610 | 26 | 12 |
| RTLO-11610 | 28 | 13 |
| 11610 (-T2) | 31 | 15 |
| 11613 | 29 | 14 |
| 11615 | 28 | 13 |
| 11707 (DLL, LL) | 28 | 13 |
| 11708LL | 28 | 13 |
| 11709 | 27 | 13 |
| 11709ALL | 28 | 13 |
| 11710 | 26 | 12 |
| RTL-11710 (T2) | 28 | 13 |
| 11710 (-AS) | 89 | 42 |
| 11715 | 28 | 13 |
| 11813 | 29 | 14 |
| 11908LL | 28 | 13 |
| 11909ALL | 28 | 13 |
| 1202 | 11 | 5 |
| 12210 | 23.5 | 11 |
| 12509 | 25 | 12 |
| 12510 | 25 | 12 |
| 12513 | 27 | 13 |
| 12515 | 28 | 13 |
| 12508LL | 28 | 13 |
| 12609 | 27 | 13 |
| 12610 | 28 | 13 |
| 12613 | 29 | 14 |
| 12709 | 27 | 13 |
| 12709ALL | 28 | 13 |
| 12710 (-AC, -AS, -AS2) | 26 | 12 |
| RTL-12710 | 28 | 13 |
| 12713 | 28 | 13 |

Transmission

| HD Model Number | Pints (US) | Liters |
|--------------------------|------------|--------|
| 12813 | 29 | 14 |
| 12909ALL | 28 | 13 |
| 12910 (-AS3, -DM2, -DM3) | 28 | 13 |
| 12913 | 28 | 13 |
| 13109 (-AT) | 88 | 42 |
| 13210 | 23.5 | 11 |
| 13609 | 27 | 13 |
| 13610 | 28 | 13 |
| 13613 | 29 | 14 |
| 13707 (DLL, MLL) | 28 | 13 |
| 13709 | 27 | 13 |
| 13709ALL | 28 | 13 |
| 13710 | 26 | 12 |
| RTL-13710 | 28 | 13 |
| 13710 (-AS) | 89 | 42 |
| 13813 | 29 | 14 |
| 13909ALL | 28 | 13 |
| 14109 (-AT) (Ceemat) | 88 | 42 |
| 14210 | 23.5 | 11 |
| 14607 (-ASX) | 36 | 17 |
| 14608 | 28 | 13 |
| 14608LL | 29 | 14 |
| 14609 | 27 | 13 |
| 14610 | 28 | 13 |
| 14613 | 29 | 14 |
| RTL0-14613 | 28 | 13 |
| 14615 | 30 | 14 |
| 14618 | 28 | 13 |
| 14708LL | 29 | 14 |
| 14709 | 27 | 13 |
| 14709ALL | 28 | 13 |
| 14710 (-AC, -AS, -AS2) | 26 | 12 |
| RTL-14710 | 28 | 13 |
| 14710-AS (CEEMAT®) | 89 | 42 |
| 14713 | 28 | 13 |
| 14713 (-T2) | 27 | 13 |

| HD Model Number | Pints (US) | Liters |
|--------------------------|------------|--------|
| 14715 | 28 | 13 |
| 14718 | 28 | 13 |
| 14718 (-T2) | 27 | 13 |
| 14813 | 29 | 14 |
| 14908LL | 28 | 13 |
| 14909ALL | 28 | 13 |
| 14910 (-AS3, -DM2, -DM3) | 28 | 13 |
| 14913 | 28 | 13 |
| 14915 | 28 | 13 |
| 14918 (-A2, -AS3) | 28 | 13 |
| 15210 | 23.5 | 11 |
| 15610 | 28 | 13 |
| 15613 | 29 | 14 |
| 15615 | 30 | 14 |
| 15618 | 28 | 13 |
| 15709 | 27 | 13 |
| 15710 | 26 | 12 |
| 15715 | 28 | 13 |
| 15813 | 29 | 14 |
| 15909ALL | 28 | 13 |
| 16210 | 23.5 | 11 |
| 16610 | 28 | 13 |
| 16618 | 28 | 13 |
| 16709 | 27 | 13 |
| 16710 (-AC, -AS, -AS2) | 26 | 12 |
| 16710-AS (CEEMAT®) | 89 | 42 |
| 16713 | 28 | 13 |
| 16713 (-T2) | 27 | 13 |
| 16718 | 28 | 13 |
| 16718 (-T2) | 27 | 13 |
| 16908LL | 28 | 13 |
| 16909ALL | 28 | 13 |
| 16910 (-AS3, -DM2, -DM3) | 28 | 13 |
| 16913 | 28 | 13 |
| 16913L (-DM3) | 28 | 13 |
| 16915 | 28 | 13 |

Transmission

| HD Model Number | Pints (US) | Liters |
|-------------------------|------------|--------|
| 16918 (-AS2, -AS3) | 28 | 13 |
| 17210 | 23.5 | 11 |
| 17610 | 28 | 13 |
| 18210 | 23.5 | 11 |
| 18610 | 28 | 13 |
| 18710 (-AS) | 26 | 12 |
| 18718 | 28 | 13 |
| 18910 (-AS2, -AS3) | 26 | 12 |
| 18913 (-T2) | 28 | 13 |
| 18918 (-AS2, -T2, -AS3) | 28 | 13 |
| 2-A-92 | 12 | 6 |
| 20913 | 28 | 13 |
| 20918 (-AS2, -AS3) | 28 | 13 |
| 22918 (-AS2, -AS3) | 28 | 13 |
| 610 | 12 | 6 |
| 613 | 16 | 8 |
| 6609 | 12 | 6 |
| 6610 | 12 | 6 |
| 6613 | 16 | 8 |
| 7608LL | 19.5 | 9 |
| 8607 | 36 | 17 |
| 8608L | 27 | 13 |
| 8609 | 12 | 6 |
| 8709 | 26 | 12 |
| 8908LL | 28 | 13 |
| 905 | 22 | 10 |
| 906 | 26 | 12 |
| 909 | 25 | 12 |
| 910 | 25 | 12 |
| 913 | 27 | 13 |
| 915 | 28 | 13 |
| 9508 | 25 | 12 |
| 9509 | 25 | 12 |
| 9513 | 27 | 13 |
| 955AL | 28 | 13 |
| 955ALL | 25 | 12 |

| HD Model Number | Pints (US) | Liters |
|-----------------|------------|--------|
| 958LL | 28 | 13 |
| 9710 | 26 | 12 |

| Endurant™ | | |
|-------------|----|-----|
| EEO-1XF112C | 16 | 7.5 |

| HD Automated UltraShift® PLUS (use of the following suffixes) | | |
|--|----|----|
| LAS (Linehaul) | 26 | 12 |
| VAS/VCS/VHP/VMS/VXP (Vocational) | 28 | 13 |

| Fuller Advantage® Series | | |
|-------------------------------------|----|-----|
| Automated: FAOM-1X810S-EC3 | 16 | 7.5 |
| Manual: FAO(F) / FAOM (F)-1X810C | 16 | 7.5 |

Medium-Duty Transmission Lubricant Capacities

The Medium-Duty (MD) model numbers include the following prefixes: FS, FSO, ES, ESO

| MD Model Number | Pints (US) | Liters |
|-----------------|------------|--------|
| 4005 | 10.5 | 5 |
| 4106 | 14 | 6.5 |
| 4205 | 12.5 | 6 |
| 5005 | 10.5 | 5 |
| 5106 | 18 | 9 |
| 5205 | 12.5 | 6 |
| 5206 | 14 | 6.5 |
| 5306 | 18 | 9 |
| 5406 | 19.5 | 9 |
| 6005 | 19 | 9 |
| 6105 | 19 | 9 |
| 6106 | 19 | 9 |
| 6205 | 19 | 9 |
| 6206 | 18 | 9 |
| 6305 | 19.5 | 9 |
| 6306 | 19.5 | 9 |
| 6406 | 19.5 | 9 |
| 7206 | 20 | 9 |
| 8206 | 20 | 9 |
| 8406 | 19.5 | 9 |
| 10309 | 24 | 11.5 |
| 11109 | 18 | 8.5 |
| 11209 | 18 | 8.5 |
| 12109 | 18 | 8.5 |
| 12209 | 18 | 8.5 |
| 15409 | 24 | 11.5 |
| 20409 | 24 | 11.5 |

The Medium-Duty (MD) Automated model numbers including the following prefixes: F and FO.

| MD Automated UltraShift® PLUS Model Number | Pints (US) | Liters |
|---|------------|--------|
| 5405B-DM3 | 21 | 10 |
| 5406B-DM3 | 21 | 10 |
| 5505B-DM3 | 21 | 10 |
| 5506B-DM3 | 21 | 10 |
| 6405B-DM3 | 21 | 10 |
| 6406B-DM3 | 21 | 10 |
| 6505B-DM3 | 21 | 10 |
| 6506B-DM3 | 21 | 10 |

| MD Hybrid Model Number | Pints (US) | Liters |
|------------------------|------------|--------|
| All Models | 19.5 | 9 |

| MD Procision Model Number | Pints (US) | Liters |
|---------------------------|------------|--------|
| EDCO | 25 | 12 |

Eaton Transmission Lubricant and Drain Interval Lists

NAFTA

For a list of approved Extended Service Interval Lubricant Suppliers, visit www.Roadranger.com/Lubricants to download TCMT0020.

| Product | Transmission Torque | Service Interval | Lubricant Specification | SAE Viscosity Grade | Drain Interval | | |
|--|------------------------------|----------------------|--|---------------------|--------------------------------------|------------------------------------|------------------------|
| | | | | | Line Haul | Vocational/Bus | Stationary |
| Hybrid (see Note 1) | All | Extended | PS-386 | N/A | 500,000 mi (800,000 km) or 10 years | 180,000 mi (288,000 km) or 3 years | 2,000 hours or 5 years |
| Endurant™ | All | Extended | PS-386 | N/A | 750,000 mi (1,200,000 km) or 5 years | 250,000 mi (400,000 km) or 3 years | N/A |
| Automated Heavy-Duty (UltraShift® PLUS) (Fuller Advantage®) (see Note 1) | All | Extended | PS-386 | N/A | 500,000 mi (800,000 km) or 5 years | 180,000 mi (288,000 km) or 3 years | 2,000 hours or 5 years |
| Automated Medium-Duty (UltraShift® PLUS) (see Note 1) | All | Extended | PS-386 | N/A | 500,000 mi (800,000 km) or 10 years | 180,000 mi (288,000 km) or 3 years | 2,000 hours or 5 years |
| Manual Transmission (Fuller Advantage®) (FRW Models) | All | Extended | PS-386 | N/A | 500,000 mi (800,000 km) or 5 years | 180,000 mi (288,000 km) or 3 years | 2,000 hours or 5 years |
| Manual Transmission Heavy-Duty (see Note 1) | Above 1,850 lb-ft (2,500 Nm) | Extended | PS-386 | N/A | 500,000 mi (800,000 km) or 5 years | 180,000 mi (288,000 km) or 3 years | 2,000 hours or 5 years |
| | Below 1,850 lb-ft (2,500 Nm) | Extended Standard | PS-386 | N/A | 500,000 mi (800,000 km) or 5 years | 180,000 mi (288,000 km) or 3 years | 2,000 hours or 5 years |
| | | | PS-321 | N/A | 75,000 mi (120,000 km) or 1 year | 75,000 mi (120,000 km) or 1 year | 500 hours or 1 year |
| | | | Heavy Duty Diesel Engine Oil (MIL-PRF-2104H) | SAE 50 | 60,000 mi (96,500 km) or 1 year | 60,000 mi (96,500 km) or 1 year | 500 hours or 1 year |
| | | | CAT TO-4 | SAE 40 SAE 50 | 60,000 mi (96,500 km) or 1 year | 60,000 mi (96,500 km) or 1 year | 500 hours or 1 year |
| Manual Transmission Medium-Duty (see Note 1) | All | Extended | PS-386 | N/A | 500,000 mi (800,000 km) or 10 years | 180,000 mi (288,000 km) or 3 years | 2,000 hours or 5 years |
| | | | PS-321 | N/A | 75,000 mi (120,000 km) or 1 year | 75,000 mi (120,000 km) or 1 year | 500 hours or 1 year |
| | | Standard | Heavy Duty Diesel Engine Oil (MIL-PRF-2104H) | SAE 50 | 60,000 mi (96,500 km) or 1 year | 60,000 mi (96,500 km) or 1 year | 500 hours or 1 year |
| | | | CAT TO-4 | SAE 40 SAE 50 | 60,000 mi (96,500 km) or 1 year | 60,000 mi (96,500 km) or 1 year | 500 hours or 1 year |
| | | | | | | | |
| ASW Clutch Module | All | Standard | Dexron VI | N/A | 150,000 mi (250,000 km) or 3 years | 150,000 mi (250,000 km) or 3 years | N/A |
| Procision (see Note 1) | All | Extended | PS-278 | N/A | 150,000 mi or 10 years | 150,000 mi or 10 years | N/A |

Note: 1. Transmissions with Extended Warranties or Extended Protection Plans require the Extended Service Interval lubricant to maintain warranty agreements.

Europe

For a list of approved Extended Service Interval Lubricant Suppliers, visit www.Roadranger.com/Lubricants to download TCMT0020.

| Product | Transmission Torque | Service Interval | Lubricant Specification | SAE Viscosity Grade | Drain Interval | | |
|------------------------------|------------------------------|------------------|-------------------------|----------------------------|-------------------------|-----------------------------------|----------------------------------|
| | | | | | Line Haul | Vocational/Bus | Stationary |
| Hybrid | All | Extended | Eaton PS-386 | N/A | 800,000 Km | 300,000 Km or 3 years | N/A |
| Automated (UltraShift® PLUS) | All | Extended | Eaton PS-386 | N/A | 800,000 Km | 300,000 Km or 3 years | 2,000 hours or 5 years |
| Manual Transmission | < 1,850 lb-ft < 2,500 N•m | Extended | Eaton PS-386 | N/A | 800,000 Km | 300,000 Km or 1 year | 2,000 hours or 5 years |
| | | | Eaton PS-321 | N/A | 120,000 Km | 120,000 Km or 3 years | 600 hours or 1 year |
| | | | MTF Gear Oil API GL-4 | SAE 80W90 SAE 75W90 | 100,000 Km (See Note 1) | 100,000 Km or 1 year (See Note 1) | 500 hours or 1 year (See Note 2) |
| | | | Engine Oil API-CD | SAE 50 SAE 40 SAE 30 | | | |
| | | | MIL-2104H | | | | |
| | | | CAT TO-4 | | | | |
| Manual Transmission | > 1,850 lb-ft > 2,500 N•m | Extended | Eaton PS-386 | N/A | 800,000 Km | 300,000 Km or 3 years | 2,000 hours or 5 years |

Note: Standard service interval lubricants require an initial drain prior to regular drain intervals:

1. First oil drain between 5,000-10,000 Km prior to regular drain intervals on all models except: FS(O)4106, FS(O)5206, ES11X09, ES012X09, FS(O)10309, ES(O)1X409, ES020409.
2. First oil drain at 40 hours or 2 months prior to regular drain intervals on all models except: FS(O)4106, FS(O)5206, ES11X09, ES012X09, FS(O)10309, ES(O)1X409, ES020409.

Australia

For a list of approved Extended Service Interval Lubricant Suppliers, visit www.Roadranger.com/Lubricants to download TCMT0020.

| Product | Transmission Torque | Service Interval | Lubricant Specification | SAE Viscosity Grade | Drain Interval |
|------------------------------|------------------------------|------------------|-------------------------|----------------------------|----------------|
| Hybrid | All | Extended | Eaton PS-386 | N/A | 400,000 Km |
| Automated (UltraShift® PLUS) | All | Extended | Eaton PS-386 | N/A | 400,000 Km |
| Manual Transmission | < 1,850 lb-ft < 2,500 N•m | Extended | Eaton PS-386 | N/A | 400,000 Km |
| | | Standard | Eaton PS-321 | N/A | 120,000 Km |
| | | | MTF Gear Oil API GL-4 | SAE 80W90 SAE 75W90 | 100,000 Km |
| | | | Engine Oil API-CD | SAE 50 SAE 40 SAE 30 | |
| | | | MIL-2104H | | |
| | | | CAT TO-4 | | |
| Manual Transmission | > 1,850 lb-ft > 2,500 N•m | Extended | Eaton PS-386 | N/A | 400,000 Km |

Note: Oil analysis is required to determine exact oil change interval which can vary depending on the application.

Note: Oil Changes should be taken from the center of the transmission with oil at operating temperature using a suitable syringe.

Note: Oil sampling to take place at 80,000 to 100,000 Km.

Note: DO NOT USE ADDITIVES OR FRICTION MODIFIERS.

Asia Pacific

For a list of approved Extended Service Interval Lubricant Suppliers, visit www.Roadranger.com/Lubricants to download TCMT0020.

| Product | GCW | Cooler Used | Service Interval | Lubricant Spec. | SAE Viscosity Grade | Drain Interval | | |
|------------------------------|----------|-------------|------------------|-----------------------|----------------------------|----------------|-----------------------|------------------------|
| | | | | | | Line Haul | Vocational / Bus | Stationary |
| Hybrid | All | No | Extended | Eaton PS-386 | N/A | 800,000 Km | 300,000 Km or 3 years | N/A |
| Automated (UltraShift® PLUS) | All | Yes / No | Extended | Eaton PS-386 | N/A | 800,000 Km | 300,000 Km or 3 years | 2,000 hours or 5 years |
| Manual Transmission | < 50 Ton | Yes / No | Extended | Eaton PS-386 | N/A | 800,000 Km | 300,000 Km or 3 years | 2,000 hours or 5 years |
| | | | | Eaton PS-321 | N/A | 120,000 Km | 120,000 Km or 1 year | 600 hours or 1 year |
| | | | | MTF Gear Oil API GL-4 | SAE 80W90 SAE 75W90 | 100,000 Km | 100,000 Km or 1 year | 500 hours or 1 year |
| | | | | Engine Oil API-CD | SAE 50 SAE 40 SAE 30 | | | |
| | | | | MIL-2104H | | | | |
| | | | | CAT TO-4 | | | | |
| Manual Transmission | > 50 Ton | Yes | Extended | Eaton PS-386 | N/A | 800,000 Km | 300,000 Km or 3 years | 2,000 hours or 5 years |
| | | | | Eaton PS-321 | N/A | 120,000 Km | 120,000 Km or 1 year | 600 hours or 1 year |
| | | | | MTF Gear Oil API GL-4 | SAE 80W90 SAE 75W90 | 100,000 Km | 100,000 Km or 1 year | 500 hours or 1 year |
| | | | | Engine Oil API-CD | SAE 50 SAE 40 SAE 30 | | | |
| | | | | MIL-2104H | | | | |
| | | | | CAT TO-4 | | | | |
| | | No | Extended | Eaton PS-386 | N/A | 400,000 Km | 150,000 Km or 2 year | 1,000 hours or 2 years |
| | | | | Eaton PS-321 | N/A | 60,000 Km | 60,000 Km or 1 year | 300 hours or 1 year |
| | | | | MTF Gear Oil API GL-4 | SAE 80W90 SAE 75W90 | 50,000 Km | 50,000 Km or 6 months | 250 hours or 6 months |
| | | | | Engine Oil API-CD | SAE 50 SAE 40 SAE 30 | | | |
| | | | Standard | MIL-2104H | | | | |
| | | | | CAT TO-4 | | | | |

India

For a list of approved Extended Service Interval Lubricant Suppliers, visit www.Roadranger.com/Lubricants to download TCMT0020.

| Product | Transmission Torque | Service Interval | Lubricant Specification | SAE Viscosity Grade | Drain Interval | |
|---------------------|---------------------|------------------|---|---------------------|------------------------------------|-----------------------------------|
| | | | | | On-Highway / Line Haul | Off-Highway / Vocational / Mining |
| Manual Transmission | All | Extended | PS-386 | N/A | 300,000 Km (185,000 mi) or 5 years | 2,000 hours or 3 years |
| | All | Standard | PS-321 | N/A | 120,000 Km (75,000 mi) or 1 year | 1,000 hours or 1 year |
| | | | Group II Mineral Oil using 7 wt% of Lubrizol Anglamol 6097 | SAE 80W90 | 100,000 Km (60,000 mi) or 1 year | 1,000 hours or 1 year |
| | | | Group II Mineral Oil using 7 wt% of Lubrizol Anglamol 2026 (see Note 1) | SAE 80W90 | 80,000 Km (50,000 mi) or 1 year | 1,000 hours or 1 year |
| | | | Group II Mineral Oil using 3.75 wt% of Afton HiTEC 381 and 0.3wt% of Afton HiTEC 382 (See Note 1) | | | |

Note: 1. Oil samples should be taken from the center of the transmission with oil at operating temperature using a suitable syringe.

Note: Oil sampling to take place at 20,000-30,000 Km.

Note: DO NOT USE ADDITIVES OR FRICTION MODIFIERS.

Africa and Middle East

For a list of approved Extended Service Interval Lubricant Suppliers, visit www.Roadranger.com/Lubricants to download TCMT0020.

| Product | Transmis- sion Torque | Service Interval | Lubricant Specification | SAE Viscosity Grade | Drain Interval | | | |
|--|-------------------------------|---------------------|----------------------------|----------------------------|----------------------------|--------------------------|--|--|
| | | | | | Line Haul | Vocational | Bus | Stationary |
| Hybrid | All | Extended | Eaton PS-386 | N/A | N/A | N/A | 300,000 Km or 3 years | N/A |
| Automated (UltraShift® <i>PLUS</i>) | All | Extended | Eaton PS-386 | N/A | 480,000 Km (See Note 3) | 6,500 hours or 1 year | 300,000 Km or 3 years | 2,000 hours or 5 years |
| Medium-Duty Manual Transmission | All | Extended | Eaton PS-386 | N/A | 300,000 Km | 6,500 hours or 1 year | 300,000 Km or 2 years | N/A |
| Heavy-Duty Manual Transmission FR Models RT Models | All | Extended | Eaton PS-386 | N/A | 480,000 Km (See Note 3) | 6,500 hours or 1 year | 300,000 Km or 2 years | 2,000 hours or 5 years |
| Heavy-Duty Manual Transmission FTS-10 / S10 FTS-13 / S13 | All | Extended | Eaton PS-386 | N/A | 300,000 Km (See Note 3) | 6500 hours or 1 year | 200,000 Km or 2 years | 2,000 hours or 5 years |
| Heavy-Duty Manual Transmission FR Models RT Models | < 1850 lb-ft (2500N•m) | Standard | Eaton PS-321 | N/A | 100,000 Km or 1 year | N/A | 100,000 Km or 1 year | 600 hours or 1 year |
| Heavy-Duty Manual Transmission FTS-10 / S10 FTS-13 / S13 | All | Standard | MTF Gear Oil API GL-4 | SAE 80W90 SAE 75W90 | 60,000 Km (See Note 1) | N/A | 60,000 Km or 1 year (See Note 1) | 500 hours or 1 year (See Note 2) |
| Medium-Duty Manual Transmission | | | Engine Oil API-CD | SAE 50 SAE 40 SAE 30 | | | | |
| | | | MIL-2104H | | | | | |
| | | | CAT TO-4 | | | | | |

Recommended: 20,000 km service interval, check oil level and inspect for leaks.

Note: 1. Standard service interval lubricants require an initial drain prior to regular drain intervals:

First oil drained after first 5,000 to 10,000 Km on all models except: FS(O)4106, FS(O)5206, ES11X09, ES012X09, FS(O)10309, ES(O)1X409, ES020409.

2. Standard service interval lubricants require an initial drain prior to regular drain intervals:

First oil drained after first 40 hours or 2 months on all models except: FS(O)4106, FS(O)5206, ES11X09, ES012X09, FS(O)10309, ES(O)1X409, ES020409.

3. When ambient temperatures routinely exceed 45 °C (more than 100 days per year) use Extended Drain Lubricants and:

a. Reduce drain intervals to 250,000 Km

b. -or- perform oil sample analysis at every 60,000 Km to check for lubricant oxidation.

Eaton Hydraulic Launch Assist Lubrication Requirements

Regular maintenance is important for safe and reliable operation of the Eaton HLA system. A preventative maintenance (PM) schedule should be used to ensure the longest performance.

Follow maintenance procedures as described in the HLA service manual, TRSM1200.

Lubricant Drain Interval List

| HLA System Component | Maintenance Requirement | Component | Maintenance / Drain Interval (hours) | |
|----------------------|-----------------------------|--|--------------------------------------|--------|
| | | | 2,400 | 12,000 |
| Transfer Case | Lubricant Change | Roadranger FE 75W-90 (1.9 gallons) | | X |
| HLA System Fluid | Lubricant Change | Roadranger HLA High Performance Hydraulic Fluid (21 gallons) | X | |
| HLA System Filters | Change System Oil Filter | Part # 6025270-001 | X | |
| | Change Secondary Oil Filter | Part # 5994113-001 | X | |
| Reservoir Breather | Change Breather | Part #5998865-001 | X | |

Eaton Clutch Lubrication Requirements

Failure to properly lubricate the bearing/bushing will result in bearing and bushing failures.

- Consult the appropriate Clutch Service Manual for detailed explanation of the lubrication techniques.
- Regular grease service intervals are required to purge the debris from the grease.
- If not properly maintained, the debris can become hard and prevent the flow of grease when serviced.

Pictured are examples of failures due to incompatible greases:

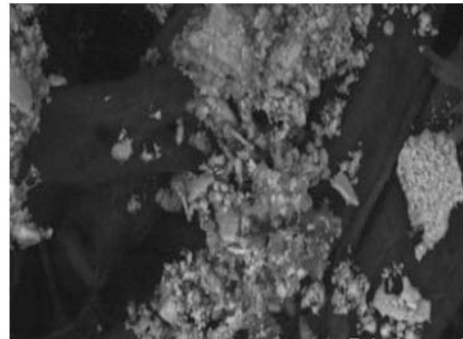
Release Bearing Failure

The photo below shows the release bearing where the majority of the grease has disappeared. This is likely due to using grease with a lower operating temperature or using an incompatible grease. When the release bearing gets hot, the grease “melts” and does not provide adequate lubrication.



Debris Close-Up

The photo below is a close-up of the debris in the grease. The debris contains hard particles, is damaging to the bearing, and will cause premature failures.



Grease Contaminated with Debris

The photo below shows a release bearing with grease that is contaminated with debris. It is very important to grease at regular service intervals to purge the debris from the bearing.



Grease Information

Greases available to the trucking industry are not created equal, and many are formulated for specific applications. Just reading the information on the label on the container may not be enough to determine if the grease used by customers for maintenance is compatible with greases used in Eaton clutch products.

What To Look For When Selecting Grease

Look for these 3 things:

1. Grade (Consistency)
2. Thickener Type (Compatibility)
3. Performance

Grade (Consistency)

The NLGI grade of grease refers to its consistency. It is measured by dropping a weighted cone into the grease per ASTM D217. The depth the cone penetrates into the grease is called the consistency. The NLGI grade refers to a range of depths the cone penetrates into the grease.

The chart below is a helpful reference to understand the consistency and appearance of a grease based on the NLGI Grade.

| NLGI Grade | Appearance | Consistency |
|------------|-----------------|-----------------------|
| 000 | Fluid | Cooking oil |
| 00 | Fluid | Applesauce |
| 0 | Very soft | Brown mustard |
| 1 | Soft | Tomato paste |
| 2 | Moderately soft | Peanut butter |
| 3 | Semi-fluid | Vegetable shortening |
| 4 | Semi-hard | Frozen yogurt |
| 5 | Hard | Smooth pate |
| 6 | Very hard | Cheddar cheese spread |

Thickener Type (Compatibility)

When greases of different thickener types are mixed, undesired results may occur. When the mixture of the greases changes the performance properties, then the two greases are considered incompatible.

Greases are considered “compatible” when these parameters don't change when mixed:

- Grade (Consistency)
- Lower Heat Resistance
- Less Shear Stability
- Decrease in Additive Performance

The use of a grease that is not compatible with the Roadranger Grease EP-2 Lithium-Complex grease can result in premature release bearing failures.

Note: Calcium Sulfonate Type Greases have been shown to be incompatible with the Roadranger Grease EP-2 Lithium Complex Type. Use of Calcium Sulfonate Type Grease will reduce the life of Eaton Clutch release bearings.

Performance

NLGI developed designations and performance descriptions for service grease categories. These categories are defined per ASTM D4950 and include the lubrication of wheel bearings and chassis components.

An “L” designation includes such things as ball joints, steering pivots, universal joints and other chassis components, and a “G” designation includes wheel bearing greases. Each class (L and G prefix) are further divided into categories based on service needs. The most demanding service category is designated by defining both classes (L and G) and the highest alphabetical nomenclature for the class. The GC-LB service category defines multi-purpose grease suitable for both chassis and bearing service applications.

The symbol below is provided from NLGI to designate the service performance quality of a grease. It is not always found on the packaging. Often, a reference to the specification is found on the product datasheet.



G - Designation is for bearings

L - Designation is for chassis components

Clutch Lubrication Procedure

1. Each Clutch model has specific lubrication requirements. **Consult the appropriate Clutch Service Manual for detailed instructions.**
2. Clutches typically need service lubrication in the following areas:

- **Release Bearing**

The release bearing is greased through a grease Zerk fitting on the clutch housing or by a grease hose extension tube. On some models, the Zerk fittings are labeled RS (release bearing) on the clutch housing case. Removal of the inspection cover is typically necessary to access the extension lube tube.

Apply grease until it purges from the release bearing housing and onto the transmission input shaft.

Note: Failed grease hoses will prevent grease from reaching the release bearing, causing premature failure.

- **Release Fork Wear Pads**

The release fork has hardened steel pads where it contacts the release bearing housing. Apply a small amount of grease to the surface of these pads.

- **Clutch Brake**

The clutch brake friction material is designed to operate with lubricant. While lubricating the release bearing, grease should purge from the

housing and contact the clutch brake. If desired, a small amount of grease could be applied to both sides of the clutch brake.

Note: Do not be concerned if excess grease gets onto the clutch brake friction surface or the LCIB friction surface. It will not affect the brake's stopping ability.

- **Cross-Shaft Bushings**

The cross shaft bushings are greased through a grease Zerk fitting on the side of the clutch housing or by a grease hose extension tube. On some models, the Zerk fittings are labeled CS (Cross shaft) on the clutch housing case. Removal of the inspection cover is typically necessary to access the extension lube tube.

Apply grease until it can be seen at the cross-shaft bushing weep hole bushings.

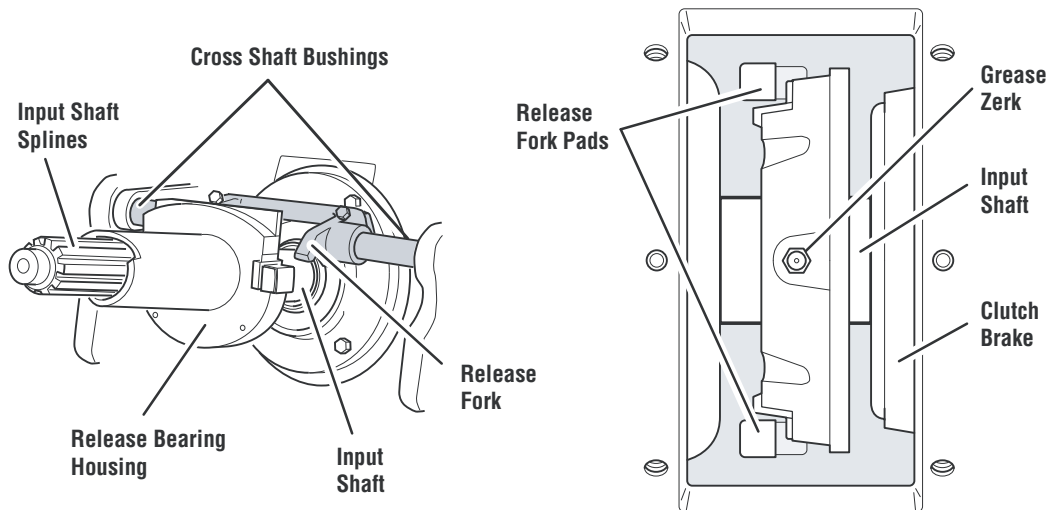
- **Clutch Control Linkage**

Refer to specific OEM requirements to lubricate the bell crank and pivot pins.

- **Pilot Bearing**

The pilot bearing inside the flywheel does not require lubrication.

Note: DO NOT apply lubricant (grease or anti-seize) to the input shaft splines. The disc must be free to slide.



Eaton Clutch Lubrication and Service Interval List

Use the chart below by selecting the Eaton Clutch product to service. The application (line haul and vocational) definitions are located earlier in this manual.

DO NOT mix other thickener type greases. It has been shown that certain Calcium Sulfonate Type greases are not compatible with Lithium Complex Type greases and cause premature bearing failures. For more information about selecting the correct grease, see “What To Look For When Selecting Grease” on page 20.

| Product | NLGI Grade | Thickener Type | Performance Rating | Grease Interval: Line Haul (see Note 2 and 3) | Grease Interval: Vocational (see Note 2 and 3) | | |
|----------------------------|---------------------|-----------------|--------------------|---|--|--|--|
| Stamped Angle Spring | NLGI #2 or #3 | Lithium Complex | NLGI GC-LB | 10,000 miles max (16,000 km) | 250 hours or 1 month | | |
| Medium-Duty Solo™ | | | | | | | |
| 430mm Endurant™ | No Lubricant Needed | | | | | | |
| 365 mm (see Note 1) | | | | | | | |
| 395 mm (see Note 1) | | | | | | | |
| EverTough | NLGI #2 or #3 | Lithium Complex | NLGI GC-LB | 25,000 miles max (40,000 km) | 250 hours or 1 month | | |
| Heavy-Duty ECA Clutch | NLGI #2 or #3 | Lithium Complex | NLGI GC-LB | 50,000 miles max (80,000 km) | 250 hours or 1 month | | |
| Solo™ Advantage | | | | | | | |
| Easy Pedal™ Advan- tage | | | | | | | |
| Value Clutch | NLGI #2 or #3 | Lithium Complex | NLGI GC-LB | 20,000 miles max (32,000 km) | 250 hours or 1 month | | |
| Reman Solo Clutch | | | | | | | |
| Reman Easy Pedal Clutch | | | | | | | |
| DM | No Lubricant Needed | | | | | | |
| Pedal Shaft /Bushings | NLGI #2 | Lithium Complex | NLGI GC-LB | At every chassis lubrication | At every chassis lubrication | | |

Note: 1. Grease the ECA Cross Shaft at vehicle chassis lubrication maintenance intervals.
 2. Frequent lubrication of the release bearing is required for severe-duty cycles.
 3. If the vehicle has been out of service for an extended period of time, lubrication of the clutch release bearing and clutch linkage is required prior to returning to service.

Change Control Log

| Date | Description |
|----------------|---|
| November 2018 | Added Endurant Vocational/Bus intervals. |
| October 2017 | Added Endurant table to <i>Heavy Duty Transmission Lubricant Capacities</i> Added Endurant to <i>Eaton Transmission and Lubricant Drain Interval List - NAFTA</i> Corrected PS-386 SAE Viscosity Grade on <i>Eaton Transmission and Lubricant/Drain Interval List - NAFTA</i> table under Manual Transmission Medium-Duty product line Added 430mm Endurant to <i>Eaton Clutch Lubrication and Service Interval List</i> |
| January 2017 | Updated for PS-386 replacement of PS-164rev7 effective January 1, 2017. |
| January 2016 | Added ES and ESO models to <i>Medium Duty Transmission Lubricant Capacities</i> , model numbers: 4106, 5206, 10309, 11109, 11209, 12109, 12209, 15409, 20409. Updated <i>Eaton Transmission Lubricant and Drain Interval Lists for Europe and Africa and Middle East</i> tables (Notes 1 and 2). |
| October 2015 | Corrected Manual Transmission, Heavy-Duty with Below 1,850 lb-ft (2,500 Nm) PS-386 Stationary Drain Interval to 2,000 hours or 5 years in <i>Eaton Transmission Lubricant and Drain Interval Lists for NAFTA</i> table. |
| September 2015 | Added <i>Important Update</i> section to front of manual. |
| | Added Procision table to <i>Medium-Duty Transmission Lubricant Capacities</i> . |
| | Added Procision table to <i>Eaton Transmission Lubricant and Drain Interval Lists for NAFTA</i> . |
| June 2015 | Added new product specifications PS-386 and PS-278. PS-164 rev7 obsolete. |
| | Added Procision to <i>Eaton Transmission Lubricant and Drain Interval Lists for NAFTA</i> |
| | Removed <i>Hydraulic Launch Assist (HLA) Hight Performance Fluid, Roadranger Grease EP-2, Roadranger Synthetic Gear Axle Lubricants</i> |
| October 2013 | Added Fuller Advantage® Series to <i>Transmission Lubrication Capacities</i> and <i>Eaton Transmission Lubricant and Drain Interval Lists for NAFTA</i> |
| | Updated <i>Eaton Transmission Lubricant and Drain Interval Lists for India</i> |
| | Added Fuller SAE Viscosity Grade 75W90 under products with 80W90 to <i>Eaton Transmission Lubricant and Drain Interval Lists for Europe, Australia, Asia Pacific, Africa and Middle East</i> . |
| | Updated images for <i>Proper and Improper Fill Level with Fill Plug</i> and added image of <i>Proper Oil Level with Sight Glass</i> |
| July 2013 | Updated <i>Eaton Clutch Lubrication and Service Interval List</i> |
| June 2013 | New product specification manual for Roadranger Lubricant Products |

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