

Roadranger®



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Roadranger® Products

Lubrication Manual

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General Information

Roadranger 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, remaining maintenance procedures will not keep components functional.

We believe 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 www.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.

Standard Drain Lubricants

Transmission and Drive Axle lubricants must meet specific lubricant industry requirements. Refer to the enclosed charts to select the proper lubricant for your application.

Extended Drain Lubricants (Synthetic Lubricants)

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

Synthetic lubricants are recommended for severe duty applications and in cold climates.

It is important to use the lubricants that meet the current specifications set forth by Eaton and Dana. Look for the appropriate approval code on the container.

Transmission - Eaton Specification: PS-164 Rev 7

Drive Axle - Dana Specification: SHAES-256 Rev C

Drive Axle - Dana Specification: SHAES-429

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

To identify Genuine Roadranger Lubricants - look for the Genuine Lubricants Label on the container to ensure you have Genuine Roadranger Lubricants.



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

Introduction to Manual

This Lubrication Manual, organized by product, provides easy access to the following lube information:

- Type of lubricant
- Change intervals
- Capacities
- General lubrication procedures
- Warnings and Cautions

Note: Refer to TCMT0020, Approved Lubricant Supplier Manual, to verify approved lubrication trade name and product.

Linehaul - 500,000 Mile Extended Lube Drain Interval

The extended drain interval program applies to the Eaton transmissions and Dana axles listed below that meet the following conditions:

- Heavy Duty and Medium Duty transmissions and axles
- Line haul service (On-highway)
- Lubricant approval levels
 - Transmission - PS-164 Rev 7
 - Drive Axle - SHAES-256 Rev C
- Factory filled with lubricants approved for 500,000 mile drain cycles (US/Canada) 250,000/400,000Km (Outside US/Canada)
- Refer to charts listed in this manual for transmission and axle drain intervals when using “Extended Drain Lubricants”
- A Roadranger approved lubricant must be used to keep the extended warranty in place. The extended drain program and any extended warranty program are separate programs.

Note: For specific detail on Eaton extended warranty programs, refer to the Roadranger Warranty Guide, TCWY0900, or call 1-800-826-HELP (4357).

Note: For a complete list of Eaton and Dana “approved lubricants” for extended drain, refer to Approved Lubricant Suppliers TCMT0020.

Vocational - 180,000 Mile Lube Drain Interval

This will outline the performance requirements of lubricants intended for use in vocational Eaton transmissions and Spicer® drive axles that are allowed the 180,000 mile or three year extended drain interval. The approved lubricants may be factory installed at the truck manufacturer, or service filled up to 500 miles, and may remain in the transmission and drive axles for the 180,000 mile or three year drain interval, whichever comes first.

Lubricant approval levels

- Transmission - PS-164 Rev 7
- Axle - SHAES-429

Warnings and Cautions

⚠ WARNING

Before working on a vehicle, place transmission in neutral, set brakes, and block wheels.

Never mix engine oils and synthetic transmission oils in the same transmission. When switching between types of lubricants, all areas of each affected component must be thoroughly drained.

Do not introduce additives and friction modifiers.

Do not mix lubricants of different grades.

Do not mix mineral and synthetic lubricants.

Do not mix heavy-duty, multi-purpose lithium based (#2 grade) grease with Sodium based grease.

Vehicle Application Definitions

Line Haul (On-highway)

- High mileage operation (over 60,000 miles [96,500 Km] per year).
- On-highway or good to excellent concrete or asphalt.
- More than 30 miles [48 Km] between starting and stopping.
- 4x2, 6x2, 6x4 tractor/trailer combinations and straight trucks.
- Check fluid levels and inspect for leaks at regular PM maintenance intervals, not to exceed 12,000 miles.

Vocational

- 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.
- Heavy-Duty, off-road or specialized application type vehicles.
- 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 Lubricants

Eaton Recommends the Use of Roadranger Lubricants for Extended Drain

Use the Heavy-Duty and Medium-Duty charts, starting with transmission type, to locate the correct lubricant and change interval.

Note: For line haul and vocational definitions, see page 4.



Note: The following transmissions require PS-164 Rev 7 lubricant:

- All automated transmissions
- All electric hybrids
- All manual transmissions above 1850 lb-ft
- All FRW transmissions
- All transmissions with extended warranties

Transmission Oil Filters

Transmission filters should be changed during regular transmission lube intervals. Inspect the transmission filter for damage or corrosion during all preventative maintenance checks. Replace as necessary.

Operating Temperatures

Transmissions must not be operated at temperatures above 250°F [121°C]. Operation at temperatures above 250°F [121°C] causes loaded gear tooth temperatures to exceed 350°F [177°C] which will ultimately destroy the heat treatment of the gears. If the elevated temperature is associated with an unusual operating condition that will recur, a cooler should be added, or the capacity of the existing cooling system increased.

The following conditions in any combination can cause operating temperatures over 250°F [121°C].

- Operating consistently at high loads / slower speeds
- High ambient temperatures
- Restricted air flow around transmission
- Exhaust system too close to the transmission
- High horsepower operation
- Use of engine retarder

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" I.D. cooler lines and 8 GPM system flow at 1500 RPM. The end user is ultimately responsible for maintaining transmission lube temperatures below 250°F [121°C].

Oil Cooler Usage

Transmission Oil Coolers are:

Recommended:

- With engines of 350 H.P. and above

Required:

- With engines of 400 H.P. and above and GCW's of 90,000 lbs. [40,823 kg] or greater
- With engines 400 H.P. and above and 1400 lb-ft. [1898 N•m] or greater torque
- With engines 450 H.P. and above
- With engines 1500 lb-ft. [2033 N•m] and above

NAFTA - Transmission Lubricant and Interval List

Heavy-Duty

Product	Synthetic or Mineral	Lubricant Specification	SAE Viscosity Grade	Change Interval for Line Haul	Change Interval for Vocational
Automated and above 1,850 lb-ft. Hybrid (HEV) FRW Transmissions All Transmissions with Extended Warranty	Synthetic	PS-164 Rev 7	SAE 50	500,000 miles [800,000 Km] or 5 years	180,000 miles [288,000 Km] or 3 years (mobile applications) 2,000 hours or 5 years (stationary applications)
Mechanical	Synthetic	PS-164 Rev 7	SAE 50	500,000 miles [800,000 Km] or 5 years	180,000 miles [288,000 Km] or 3 years (mobile applications) 2,000 hours or 5 years (stationary applications)
Mechanical	Mineral	Heavy Duty Engine Oil	SAE 50 (HD Engine Oil), Mil2104H, Cat TO-4 (SAE 40 - SAE 50)	60,000 miles [96,000 Km] or 1 year	60,000 miles [96,500 Km] or 1 year (mobile applications) 500 hours or 1 year (stationary applications)

Medium-Duty

Product	Synthetic or Mineral	Lubricant Specification	SAE Viscosity Grade	Change Interval for Line Haul	Change Interval for Vocational
Automated Hybrid (HEV) All Transmissions with Extended Warranty	Synthetic	PS-164 Rev 7	SAE 50	500,000 miles [800,000 Km] or 10 years	180,000 miles [288,000 Km] or 3 years (mobile applications) 2,000 hours or 5 years (stationary applications)
ASW Clutch Module	Synthetic	Dextron VI	N/A	150,000 miles [250,000 Km] or 3 years	150,000 miles [250,000 Km] or 3 years
Mechanical All Transmissions with Extended Warranty	Synthetic	PS-164 Rev 7	SAE 50	500,000 miles [800,000 Km] or 10 years	180,000 miles [288,000 Km] or 3 years (mobile applications) 2,000 hours or 5 years (stationary applications)
Mechanical	Mineral	Heavy Duty Engine Oil	SAE 50 (HD Engine Oil), Mil2104H, Cat TO-4 (SAE 40 - SAE 50)	60,000 miles [96,500 Km] or 1 year	500 hours or 1 year

Europe - Transmission Lubricant and Interval List

Product	Transmission Torque	Service Interval	Lubricant Specification	SAE Viscosity Grade	Drain Interval		
					Line Haul	Vocational / Bus	Stationary
Hybrid	All	Extended	Eaton PS-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 3 years	N/A
Automated (UltraShift PLUS)	All	Extended	Eaton PS-164 Rev 7	SAE 50	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-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 1 year	2,000 hours or 5 years
			Standard	Eaton PS-321	N/A	120,000 Km	120,000 Km or 3 years
		MTF Gear Oil API GL-4		SAE 80W90	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-164 Rev 7	SAE 50	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. On Highway applications shall have oil drained after first 5,000 to 10,000 Km.
2. Off Highway applications shall have oil drained after first 40 hours or 2 months.

Australia - Transmission Lubricant and Interval List

Product	Transmission Torque	Service Interval	Lubricant Specification	SAE Viscosity Grade	Drain Interval
Hybrid	All	Extended	Eaton PS-164 Rev 7	SAE 50	400,000 Km
Automated (UltraShift PLUS)	All	Extended	Eaton PS-164 Rev 7	SAE 50	400,000 Km
Manual Transmission	< 1,850 lb-ft < 2,500 N•m	Extended	Eaton PS-164 Rev 7	SAE 50	400,000 Km
		Standard	Eaton PS-321	N/A	120,000 Km
			MTF Gear Oil API GL-4	SAE 80W90	100,000 Km
			Engine Oil API-CD	SAE 50	
			MIL-2104H	SAE 40	
CAT TO-4	SAE 30				
Manual Transmission	> 1,850 lb-ft > 2,500 N•m	Extended	Eaton PS-164 Rev 7	SAE 50	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 - Transmission Lubricant and Interval List

Product	GCW	Cooler Used	Service Interval	Lubricant Spec.	SAE Viscosity Grade	Drain Interval		
						Line Haul	Vocational / Bus	Stationary
Hybrid	All	No	Extended	Eaton PS-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 3 years	N/A
Automated (UltraShift PLUS)	All	Yes / No	Extended	Eaton PS-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 3 years	2,000 hours or 5 years
Manual Transmission	< 50 Ton	Yes / No	Extended	Eaton PS-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 3 years	2,000 hours or 5 years
				Standard	Eaton PS-321			
			Standard	MTF Gear Oil API GL-4	SAE 80W90	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-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 3 years	2,000 hours or 5 years
				Standard	Eaton PS-321			
			Standard	MTF Gear Oil API GL-4	SAE 80W90	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-164 Rev 7	SAE 50	400,000 Km	150,000 Km or 2 year	1,000 hours or 2 years
				Standard	Eaton PS-321	N/A	60,000 Km	60,000 Km or 1 year
			Standard	MTF Gear Oil API GL-4	SAE 80W90	50,000 Km	50,000 Km or 6 months	250 hours or 6 months
				Engine Oil API-CD	SAE 50 SAE 40 SAE 30			
				MIL-2104H				
				CAT TO-4				

India - Transmission Lubricant and Interval List

Product	Service Interval	Lubricant Specification	SAE Viscosity Grade	Drain Interval		
				Line Haul	Vocational / Bus	Stationary
Hybrid	Extended	Eaton PS-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 3 years	N/A
Automated (UltraShift PLUS)	Extended	Eaton PS-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 3 years	2,000 hours or 5 years
Manual Transmission	Extended	Eaton PS-164 Rev 7	SAE 50	800,000 Km	300,000 Km or 3 years	2,000 hours or 5 years
	Standard	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	100,000 Km	100,000 Km or 1 year	500 hours or 1 year
		Engine Oil API-CD	SAE 50			
		MIL-2104H	SAE 40			
CAT TO-4	SAE 30					

Transmission Lubrication Procedures

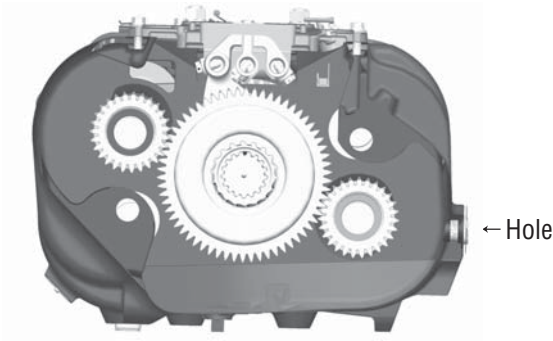
Check Transmission Oil Level

Note: Before checking level, engine must be idling in neutral for at least 2 minutes and lubricant temperature must be between 60° and 120° F [15.5° and 48.8° C].

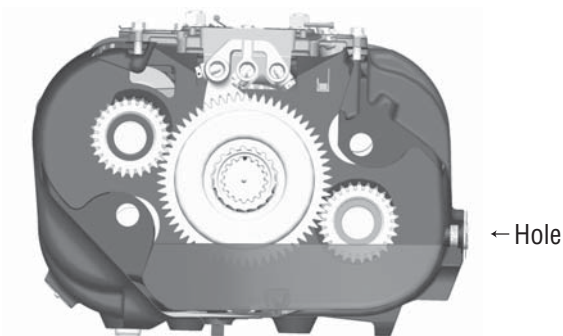
Check lubricant level using the fill hole or sightglass usually located on the right side of the transmission. Inspect oil filter for leaks, rust or damage. Replace as necessary.

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

1. Turn engine off.
2. Remove fill hole plug.
3. Lubricant must be level with the hole.



Improper Oil Level



Proper Oil Level

Note: For Ceemat Transmissions Only - The proper level is between the cold ADD mark and cold FULL mark.

Change Transmission Oil

Drain Transmission

1. Put drain pan under drain plug at the bottom of the transmission case.
2. Remove drain plug.
3. Clean and reinstall drain plug and torque as required (no sealant required).

Drain Transmission 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. Reconnect the coolant lines to the transmission, making sure lines are not crossed.

Fill Transmission

1. Remove transmission fill plug.
2. Fill with approved oil until the oil starts flowing out of the fill hole.
3. Clean and replace fill plug and torque as required.

Fill Transmission Cooler, if equipped

1. Place vehicle in neutral and start engine.
2. Release the clutch pedal so the input shaft of the transmission can rotate, allowing the pump to fill the cooler.
3. After one minute, shut the engine off and recheck the transmission oil level and top off lubricant as necessary.

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	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
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

HD Model Number	Pints	Liters
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
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

Transmission

HD Model Number	Pints	Liters
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
RTLO-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
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

HD Model Number	Pints	Liters
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
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

HD Model Number	Pints	Liters
2-A-92	12	6
20913	28	13
20918 (-AS2, -AS3)	28	13
22918 (-AS2, -AS3)	28	13
6E606B (Hybrid)	20	9
610	12	6
613	16	8
6406 (-ASX)	19.5	9
6609	12	6
6610	12	6
6613	16	8
7608LL	19.5	9
8406 (-ASX)	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
958LL	28	13
9710	26	12

HD Automated VS/PLUS		
LAS	26	12
VCS/VMS/VXP/MHP/MXP	28	13

Medium-Duty Transmission Lubricant Capacities

The Medium-Duty (MD) model numbers include the following prefixes: FS, FSO, and EH.

MD Model Number	Pints	Liters
4005	10.5	5
4205	12.5	6
5005	10.5	5
5106	18	9
5205	12.5	6
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
8E306A (Hybrid)	19.5	9
8406	19.5	9

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

MD Automated Model Number	Pints	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

Hydraulic Launch Assist (HLA) Maintenance and Inspection Intervals

Regular maintenance is important for safe and reliable operation of the HLA system. A preventive maintenance (PM) schedule should be set up as indicated below.

Component	Maintenance	Note	In Service (PDI)	Pre-trip Inspection	PM Interval (Hours)					
					300	600	1200	2400	3600	12000
Hose	Visually inspect for hose abrasion or wear				X					
	Check for low hanging or loose hose			X						
T-Case Oil	Check oil level		X				X			
	Change transfer case oil (75W-90 Synthetic, 1.9 gallons)	FE 75W-90 Synthetic								X
Sub-Frame	Visually inspect mounting frame and check for cracks in welds				X					
	Inspect mounting bolts, retorque as needed					X				
	Inspect absorbers for wear					X				
System	Inspect pump and components for leakage			X	X					
	Inspect warning labels, replace if damaged or missing						X			
	Check for driver display module function and no codes		X	X	X					
Reservoir Breather	Check breather indicator; replace if red		X	X	X	X				
	Replace breather	Part # 5998865-001						X		
Fittings	Check for loose fittings, hose and connections				X					

Transmission

Component	Maintenance	Note	In Service (PDI)	Pre-trip Inspection	PM Interval (Hours)					
					300	600	1200	2400	3600	12000
HLA System Oil	Check oil level in reservoir		X	X	X					
	Capture oil sample and analysis	Kit # 894276				X				
	Change oil)	HLA Oil (21 gal)						X		
		RRHLADR (55 gal)								
RRHLAPA (5 gal)										
Filter	Change system oil filter	Part # 6025270-001						X		
	Change secondary (POU) oil filter	Part # 5994113-001						X		
Accumulator	Check dry nitrogen pre-charge		X			X				
	Visually inspect accumulator				X					
	Replace bladder								X	
	Mark bladder service tag with in service date		X							
	Check thermal relief cap installation and condition				X	X				
Cooler	Check intake screen and fan for debris and blockage; clean as needed			X	X					

HLA High Performance Hydraulic Fluid Data Sheet

Specifically engineered to work in conjunction with the Eaton® Hydraulic Launch Assist system.

Benefits:

- All temperature performance
 - excellent cold temperature operation
 - high temperature protection
- An engineered fluid developed in conjunction with Eaton's HLA system resulting in optimal system performance including rust protection, seal and bladder compatibility, cleanliness and system durability.
- High viscosity index provides all season performance.
- Excellent shear stable viscosity modifier assures optimal viscometrics to protect equipment and minimize downtime.
- Demonstrated proof of performance through field testing.
- Product meets Eaton's performance specification for HLA system based on rigorous laboratory testing.

Roadranger High Performance Hydraulic Fluid

Product #	Package	Weight
RRHLADR	Drum	375 lbs
RRHLAPA	5 gal	35 lbs

Physical Characteristics

Characteristics	Minimum	Target	Maximum
Flash Point, C, PMCC		173	
Lbs. per U.S. Gal @ 15.6 C		7.10	
Lbs. per IMP Gal @ 15.6 C		8.53	
Pour Point, C		-45	
Specific Gravity @ 15.6C	0.832	0.852	0.872
Viscosity @ 100 C, CST	7.3	8.1	8.9
Viscosity @ 40 C, CST		42.8	

Chemical Characteristics

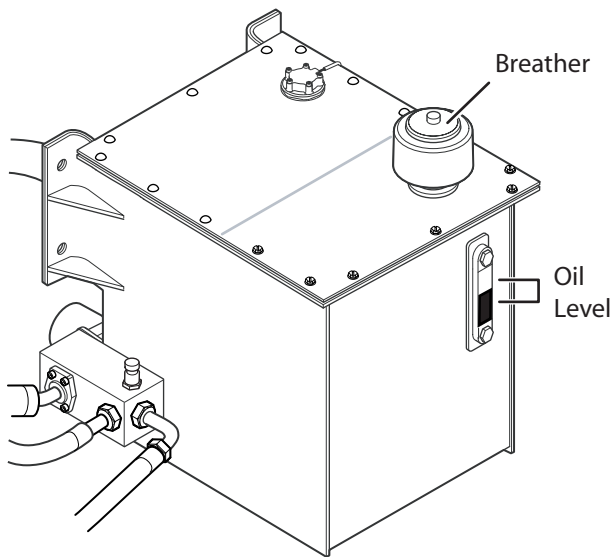
Characteristics	Minimum	Target	Maximum
Calcium	0.013	0.015	0.017
Nitrogen		0.030	
Phosphorus	0.065	0.073	0.080
Sulfated Ash		0.19	
Sulfur	0.18	0.20	0.22
Water			0.30
Zinc	0.081	0.090	0.099

HLA System Oil Regular Maintenance

Add Oil to Reservoir (Top-off Only)

Note: Only use Roadranger HLA High Performance Hydraulic Fluid. Contact Roadranger Call Center to order oil, U.S. and Canada: 800-826-4357.

1. Follow "Service and Maintenance Shutdown Procedure."
2. Use filter cart to clean oil before adding to reservoir.
3. Remove reservoir breather to access oil fill port.
4. Add oil and fill to mid-range on sight level gauge. (1" = 1 gallon of oil)



5. Replace breather on reservoir. See "Replace Reservoir Breather."
6. Recheck oil level after short period of operation.

Oil Sample Procedure

Note: Regular oil sampling in accordance with the maintenance schedule is a good practice procedure.

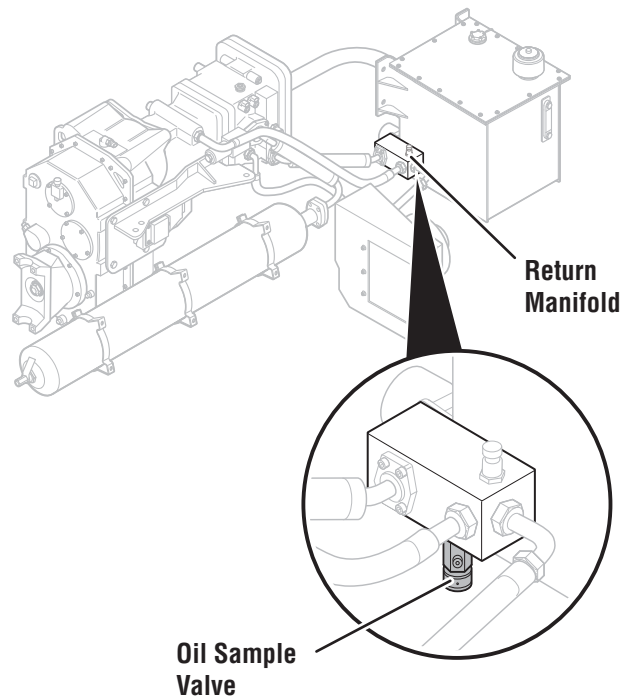
CAUTION

Oil sample valve may be hot from operation. Use thermal protection.

1. Obtain Eaton Fluid Analysis Kit (part #894276). Contact Eaton Hydraulics or your local Eaton distributor. See www.eaton.com.

Note: Do not open sample bottle until ready to fill.

2. Fill out *Test Sample Data Form* as instructed on sheet:
 - Include vehicle number/identifier, date, mileage and hours.
 - Include your contact information, phone number and e-mail address for the analysis report.
3. Ensure system is at normal operating temperature by cycling HLA system for ten cycles minimum.
4. Follow "Service and Maintenance Shutdown Procedure."
5. Place recycle pan under return manifold sample valve.



6. Clean around sample valve with parts cleaner.
7. Remove dust cover on discharge port.
8. Flush valve:
 - Turn knurled knob ¼ turn right.
 - Bleed approximately 250 ml [about 1 cup] of oil into recycle pan.
9. Place open sample bottle into oil stream and flush with oil.
10. Place sample bottle into oil stream and fill approximately ¾ full.

Note: Make sure bottle stays clean.

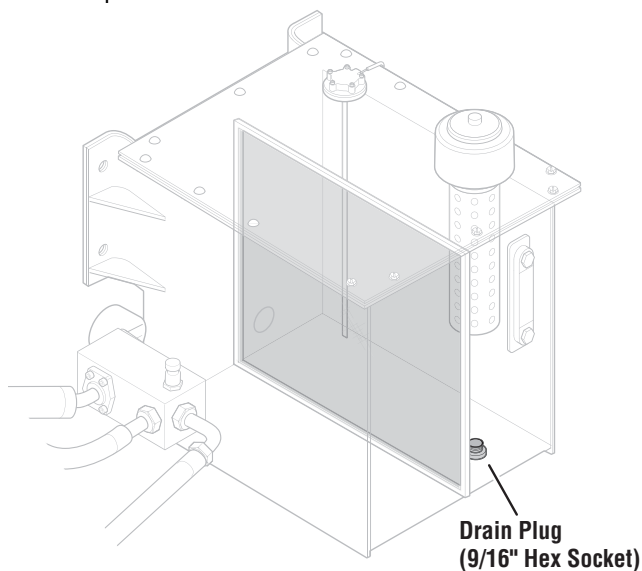
11. Cap sample bottle.
12. Release knurled knob. Valve will close automatically.
13. Replace dust cover.
14. Properly dispose of oil from recycle pan.
15. If system oil level has dropped below minimum level mark on reservoir, add Roadranger HLA High Performance Hydraulic Fluid. See "Add Oil to Reservoir."
16. Send oil sample to:

Eaton Corporation Innovation Center
Vickers Fluid Analysis Service
26201 Northwestern Hwy
Southfield, MI 48076
6. Remove filter assembly.
7. Inspect and clean inside of reservoir.
8. Check suction port and diffuser for debris; clean as needed.
9. Check magnet for debris and clean.
10. Install new filter element. See "Change Main System Filter."
11. Reassemble filter assembly.
12. Reinstall suction hose and split flange. Torque flange bolts to 85 ± 6 ft-lb. See appendix "Torque Specifications."
13. Use filter cart to fill with oil through pump case port. See "Fill HLA System Oil."
14. Fill to mid-range on sight level gauge.
15. Operate system to normal system temperature and recheck oil level. See "Check Reservoir for HLA System Oil Level."

Drain and Replace HLA System Oil (Oil Change)

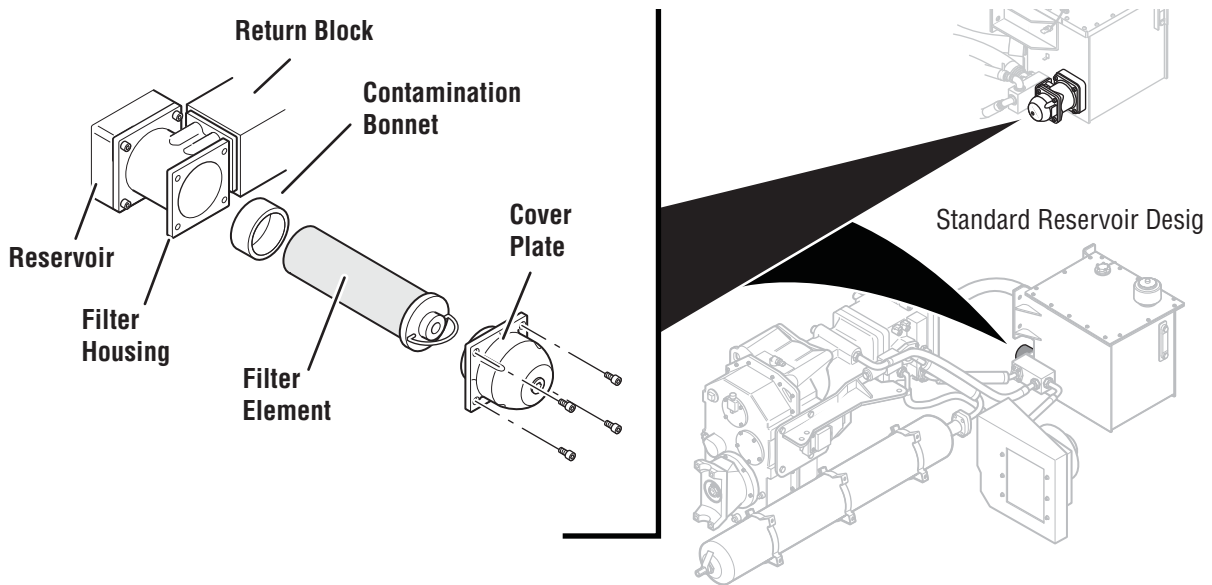
Note: System filters should be changed during any system oil drain.

1. Follow "Service and Maintenance Shutdown Procedure."
2. Verify accumulator has depressurized for 5 minutes minimum.
3. Place 25-gallon drain recycling container under reservoir.
4. Use 14mm hex socket to remove drain plug from reservoir. Allow reservoir to fully drain into recycle pan.



5. Remove suction hose split flange and support suction hose from work area.

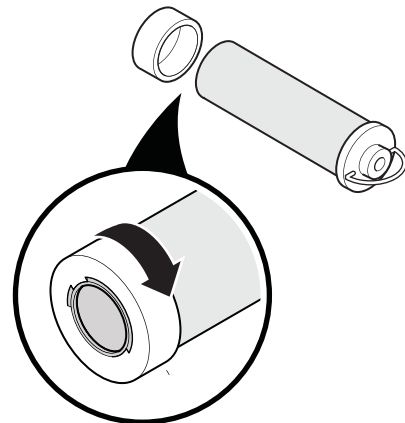
HLA System Filter Maintenance



Change Main System Filter

Note: The main filter replacement should be combined with the PM oil change. The filter is integral to the reservoir, which must be drained in order to replace the filter element.

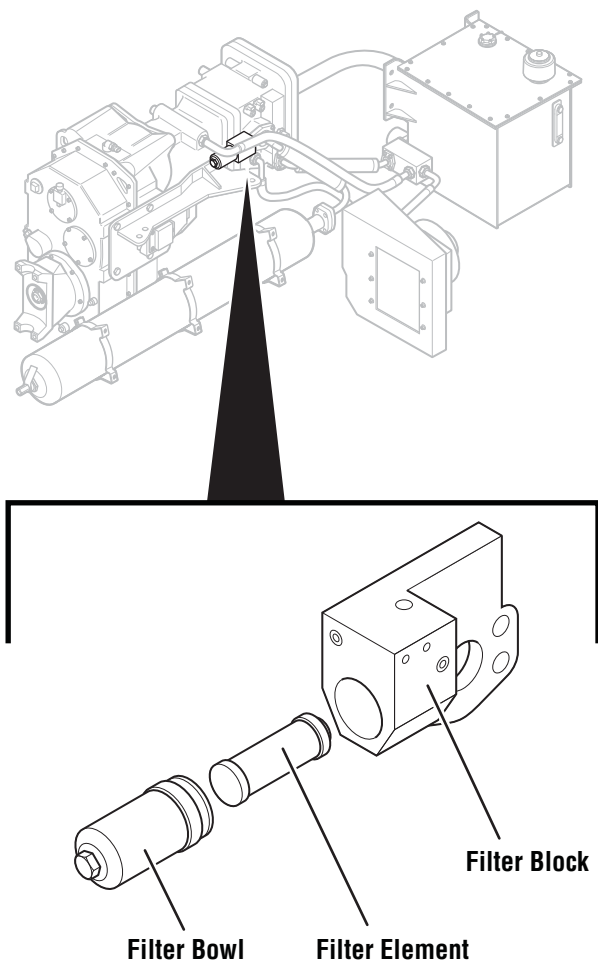
1. Follow "Service and Maintenance Shutdown Procedure."
2. Verify accumulator has depressurized for 5 minutes minimum.
3. Place 25-gallon drain recycling container under reservoir.
4. Use 14mm hex socket to remove drain plug from reservoir. Allow reservoir to fully drain into recycle pan.
5. Remove filter housing cover plate bolts.
6. Remove cover plate.
7. Use handle to pull out filter element.
8. Remove contamination bonnet and retain.
9. Clean contamination bonnet and housing. Check threads.
10. Examine sealing surfaces inside housing for damage.
11. Check O-rings on clogging indicator and cover plate. Replace parts as necessary.
12. Check magnet for debris and clean.
13. Lubricate with Roadranger HLA High Performance Hydraulic Fluid:
 - Sealing surfaces and thread on cover plate and housing
 - O-rings on cover plate and filter element
14. Fit old contamination bonnet onto new filter element by turning clockwise.
15. Insert filter element with bonnet into housing.
16. Reinstall filter housing cover plate and hand tighten cover plate bolts.



Note: Location spigot and element handle position must align.

17. Tighten bolts alternately and torque to 30 ft-lb. See appendix "Torque Specifications."
 18. Reinstall support hose and suction hose flange. Torque flange bolts to 85 ± 6 ft-lb. See appendix "Torque Specifications."
 19. Use filter cart to fill with oil through pump case port. See "Fill HLA System Oil."
 20. Fill to specified mid-range level on sight level gauge.
 21. Operate system to normal system temperature and recheck oil level. See "Check Reservoir for HLA System Oil Level."
4. Remove filter element.
 5. Clean filter bowl.
 6. Lubricate seal of new filter element.
 7. Install new filter element onto filter block.
 8. Install filter bowl. Torque bowl to 60 ± 5 ft-lb. See appendix "Torque Specifications."

Change Point of Use Filter



1. Follow "Service and Maintenance Shutdown Procedure."
2. Place drain pan under filter.
3. Use 15/16" wrench to remove filter bowl.

Drive Axle Lubricants

Dana Recommends the Use of Roadranger Lubricants for Extended Drain

Use the chart to locate the correct lubricant and change interval.

Note: For line haul and vocational definitions, see [page 3](#).

Heavy-Duty

Synthetic or Mineral	Lubricant Specification	SAE Viscosity Grade	Change Interval for Line Haul	Change Interval for Vocational
Synthetic	SHAES-256 Rev C	SAE 75W-90	500,000 miles [800,000 Km] or 5 years	N/A
Synthetic	SHAES-429	SAE 75W-90 SAE 80W-140	N/A	180,000 miles [288,000 Km] or 3 years
Mineral	SAE J2360	75W, 75W-90, 75W-140, 80W-90, 85W-140	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 1 year

Medium-Duty

Synthetic or Mineral	Lubricant Specification	SAE Viscosity Grade	Change Interval for Line Haul	Change Interval for Vocational
Synthetic	SHAES-256 Rev C	SAE 75W-90	250,000 miles [400,000 Km] or 3 years	N/A
Synthetic	SHAES-429	SAE 75W-90, SAE 80W-140	N/A	180,000 miles [288,000 Km] or 3 years
Mineral	SAE J2360	75W, 75W-90, 80W-90, 85W-140	100,000 miles [160,000 Km] or 1 year	60,000 miles [96,500 Km] or 1 year

Note: Extended warranties require the use of synthetic lubricant approved to SHAES-256 Rev C.

Drive Axle Lubricant Capacities

Single Drive Axle Lubricant Capacities

Capacities are sorted by model number. The suffixes are included when necessary.

Single Axle Model Number	Pints	Liters
S110	14	6.6
S130	13.6	6.4
S135	24	11.4
S150	24	11.4
S21-170	37	17.5
S21-170D	37	17.5
S23-170	37	17.5
S23-170D	37	17.5
S25-170	37	17.5
S25-170D	37	17.5
S23-190	37	17.5
S23-190D	37	17.5
S26-190	37	17.5
S26-190D	37	17.5
S30-190	40	18.9
S30-190D	40	18.9
S260 (SB)	54	25
15040 (P, T)	24	11.4
15040 (S)	21	9.9
17060 (A, D, S)	28	13
19050 (P, T)	33	15.6
19050 (S)	25	11.8
19055 (D, S)	34	16.1
19055 (P, T)	35	16.6
19060 (A, D, S)	28	13.2
19060 (P, T)	35	16.6
21060 (A, D, S)	28	13.2
21060 (P, T)	35	16.6
21065 (D, S)	34	16.1
21065 (P, T)	35	16.6

Single Axle Model Number	Pints	Liters
21070 (D, S)	40	18.9
21080 (A, D, S)	40	18.9
22060 (A, D, S)	28	13.2
22060 (P, T)	35	16.6
22065 (D, S)	34	16.1
22065 (P, T)	35	16.6
22080 (A, D, S)	40	18.9
23070 (D, S)	40	18.9
23070 (P, T)	39	18.5
23080 (A, D, S)	40	18.9
23080 (P, T)	41	19.4
23085 (C, D, S)	40	18.9
23085 (P, T)	41	19.4
23105 (A, D, S)	48	22.7
26080 (A, D, S)	40	18.9
26080 (P, T)	41	19.4
26085 (P, T)	41	19.4
26105 (A, D, S)	48	22.7
30055 (P)	36	17
30105 (A, D, S)	46	21.5
35055 (P)	36	17

Tandem Drive Axle Lubricant Capacities

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

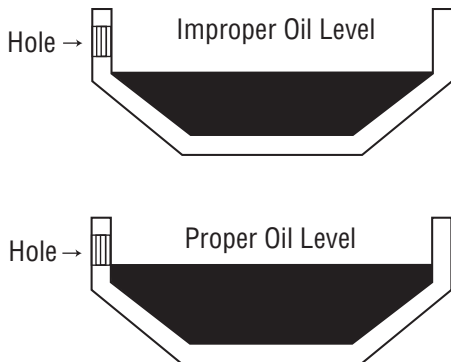
Tandem Axle Model Number	Pints	Liters
D40-170	39	18.5
R40-170	37	17.5
D46-170	39	18.5
R46-170	37	17.5
D50-170	39	18.5
R50-170	37	17.5
D52-190	42	19.9
R52-190	40	18.9
D60-190	42	19.9
R60-190	40	18.9
D52-590	42	19.9
R52-590	40	18.9
40 DDS(P), DSS(P)	40	18.9
40 DDH(P), DSH(P)	31	14.7
40 RDS, RSS	37	17.5
40 RDH, RSH	28	13.2
44 DSH(P)	31	14.7
44 RDH, RSH	28	13.2
341 DC, DP, DT(P), DS(P)	39	18.5
341 RC, RP, RS, RT	36	17
344 DA(P), DD(P), DS(P)	31	14.7
344 RS	28	13.2
402 DP, DT(P), RP, RT	34	16.1
402 DS(P)	39	18.5
402 RS	36	17
404 DA(P), DD(P), DS(P)	31	14.7
404 RA, RD, RS	28	13.2
405 DA(P), DD(P), DS(P)	31	14.7
405 RA, RD, RS	28	13.2
451 DP(P), DT(P), RP, RT	34	16.1
451 DC(P), DS(P)	39	18.5
451 RC, RS	36	17

Tandem Axle Model Number	Pints	Liters
454 DA(P), DD(P), DS(P)	31	14.7
454 RA, RD, RS	28	13.2
461 DD(P), DS(P)	43	20.3
461 DP(P), DT(P)	46	22
461 RC, RP, RT	39	18
461 RD, RS	40	18.9
462 DD(P), DS(P)	40	18.9
462 RD, RS	37	17.5
463 DD(P), DP(P), DS(P), DT(P)	40	18.9
463 RD, RP, RS	37	17.5
521 DD(P), DP(P), DS(P), DT(P)	42	19.9
521 RC, RD, RP, RS, RT	39	18.5
581 DD(P), DP(P), DS(P)	42	19.9
581 RD, RP, RS	39	18.5
601 DC(P), DD(P), DP(P)	42	20
601 RP	39	18.5
651 DP(P)	41	19.4
651 RP	37	18
652 DP(P)	41	19
652 RP	37	18

Drive Axle Lubrication Procedure

Check Drive Axle Lubricant Level

1. Remove fill hole plug, located in the axle housing cover.
2. Lubricant must be level with the hole.



3. Check housing breather. Clean if dirty and replace if damaged.

Change Drive Axle Lubricant

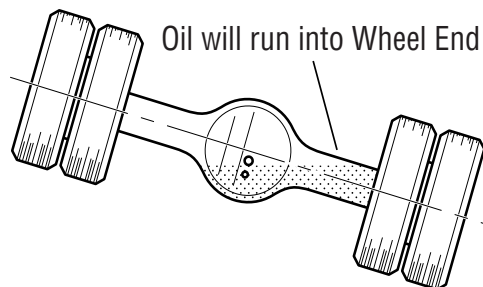
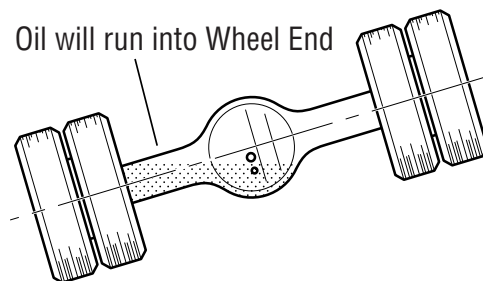
Drain Axle Sump

1. Before draining, lubricant temperature must be between 60° and 120° F [15.5° and 48.8° C].
2. Put drain pan under drain plug located on the underside of the axle housing.
3. Unscrew magnetic drain plug and drain the lubricant.
4. Inspect plug for large quantities of metal particles. If present, inspect entire unit.

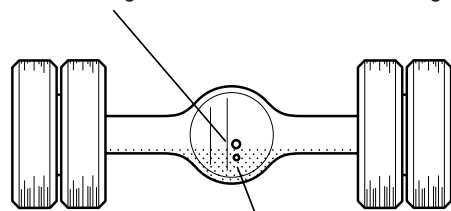
Fill Axle Sump (and Wheel Ends, if necessary)

Note: If wheel ends were removed, they must be filled with the same lubricant as the axle sump.

1. Wipe clean all internal cavities or the hubs.
2. Lubricate the wheel bearings using the same lubricant as in the housing.
Note: Do not use wheel bearing grease.
3. Fill inner hub cavities before installing onto axle housing spindles.
4. If the hub has a fill hole, add 1.5 pints [0.7 liters].
5. If hub does not have a fill hole, raise the opposite axle end 8 in. [203 mm] for at least 1 minute.
6. If the wheel ends were filled by jacking up the axle ends, recheck the main sump and top off if necessary until oil reaches the bottom of the fill hole.



Fill Housing with oil to bottom of Plug



Temperature Sensor Mounting Hole

Steer Axle Lubricants

The standard lubricants specified by the Steer Axle Product Engineering group are as follows

Note: For line haul and vocational definitions, see page 3.

Type of Lubricant System	Lubricant	SAE	Change Interval for Line Haul	Change Interval for Vocational
Wheel End	Mineral Oil	SAE 75W-90	100,000 miles [161,000 km] or 1 year	30,000 miles [48,000 km] or 6 months
Wheel End	Mineral Grease - NLGI #2	#2 grade	100,000 miles [161,000 km] or 1 year	30,000 miles [48,000 km] or 6 months
LMS-Low Lube ¹	Synthetic Oil	SAE 50 PS-164 Rev 7	250,000 miles [400,000 km] or 1 year	250,000 miles [400,000 km] or 1 year
LMS-Lube Free ¹	Synthetic Oil	SAE 50 PS-164 Rev 7	None (only needed if tear down)	None (only needed if tear down)
LMS-Low Lube ¹	Semi-Fluid Synthetic Grease	Chevron Delo SF	50,000 miles [800,000 km] or 3 years	50,000 miles [800,000 km] or 3 years
LMS-Low Lube ¹	Semi-Fluid Synthetic Grease	Mobilith SHC 007	50,000 miles [800,000 km] or 3 years	50,000 miles [800,000 km] or 3 years
King Pin Joint Grease / Tie Rod Ends	Heavy-Duty, multipurpose lithium based	#1 grade or #2 grade	25,000 miles [40,000 Km] or 6 months	Every 50 hours

¹ For easy identification, note that the Dana LMS-Low Lube brake uses a special “button head” grease fitting and the Dana LMS-Lube Free brake does not have a grease fitting.

Steer Axle Lubrication Procedure

Lubrication

Proper lubrication practices are important in maximizing the service life of your steer axle assembly.

Kingpins, Thrust Bearings and Tie Rod Ends

On-Highway Applications - Standard

Pressure lubricate every 6 months or 25,000 miles (40,000 km).

A more frequent lubrication cycle is required for axles used in on/off highway, refuse, or other severe service applications.

Use heavy-duty, multipurpose lithium base (#2 grade) grease. **Do not mix with sodium base grease.**

Note: If it is difficult to grease either the upper or lower bushing, try greasing the bushings with the vehicle jacked up and supported on axle stands to improve grease flow and help flush out contamination.

Wheel Bearings

Lubricate wheel bearings with an approved drive axle lubricant (oil bath) or heavy duty grease (grease packed) depending on the type of axle lube system. Identify the type of lubrication system on your vehicle before servicing wheel bearings. Improper lubrication can result in reduced seal life and potential damage to bearings and spindles.

Oil Bath

Lubricate wheel end assembly with a drive axle lubricant that meets MIL-L-2105D specifications. Either 80W-90 mineral based or 75W-90 synthetic lube is acceptable. Check lubricant level at each greasing interval. Maintain lube level to center-line of axle or fill line on hub cap. Always check lube level on flat ground.

CAUTION

Do not mix lubricants of different grades. Do not mix mineral and synthetic lubes. Different brands of same grade may be mixed. Do not pack bearings with grease when using an oil bath system. This practice can restrict the flow of lubricant to the wheel seal.

Grease Packed

Thoroughly clean bearings, spindle, hub cap, and hub cavity. Parts may be washed in a suitable commercial solvent. Be certain parts are free of moisture or other contaminants. Refer to vehicle and/or wheel seal manufacturer's recommendations when using grease. Fill wheel hub with grease to inside diameter of bearing cups. Fill hub cap. Grease bearing cones by forcing grease between rollers, cones, and cage.

CAUTION

Never mix oil bath and grease packed wheel ends.

LMS Bearing System

Refer to Dana Spicer information Bulletin ABIB-9606.

Clutch Lubricants

Use the chart, starting with clutch type, to locate the correct lubricant and change interval.

Note: For line haul and vocational definitions, see page 3.

Product	Lubricant	Service Interval for Line Haul	Service Interval for Vocational
Stamped Angle Spring Medium-Duty Solo™	NLGI #2 or #3 Lithium Complex Roadranger Grease EP-2	10,000 miles [16,000 Km] or 1 month	250 hours or 1 month
365 mm (see Note)	No Lubricant Needed	Not Applicable	Not Applicable
395 mm (see Note)	No Lubricant Needed	Not Applicable	Not Applicable
EverTough	NLGI #2 or #3 Lithium Complex Roadranger Grease EP-2	25,000 miles [40,000 Km] or 3 months	250 hours or 1 month
Heavy-Duty ECA Clutch Solo™ Advantage Easy Pedal™ Advantage	NLGI #2 or #3 Lithium Complex Roadranger Grease EP-2	50,000 miles [80,000 Km] or 3 months	250 hours or 1 month
Value Clutch Reman Solo Clutch Reman Easy Pedal Clutch	NLGI #2 or #3 Lithium Complex Roadranger Grease EP-2	20,000 miles [32,000 Km] or 2 months	250 hours or 1 month
DM	No Lubricant Needed	Not Applicable	Not Applicable
Pedal Shaft / Bushings	NLGI #2 Lithium Complex Roadranger Grease EP-2	At every chassis lubrication	At every chassis lubrication

Note: Grease ECA Upper Cross Shaft at vehicle preventative maintenance intervals.

It is recommended that grease meets NLGI GC-LB requirement.

Clutch Lubrication Procedure

1. If a lube tube assembly is used, remove the inspection cover to verify it is attached and functional.

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

2. Apply grease through either the lube tube or a grease fitting, and continue to apply lube to cause enough grease to purge out of the release bearing housing onto the transmission input shaft.
3. Apply extra lube onto the transmission input shaft between the release bearing housing and the clutch brake.

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

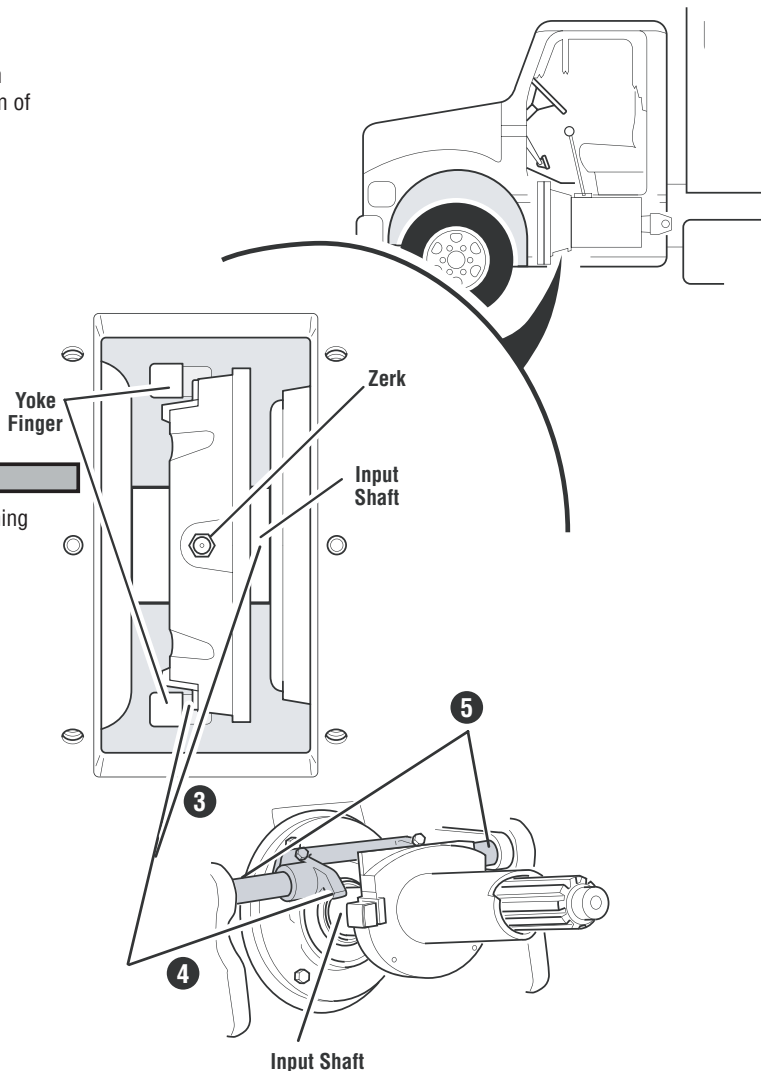
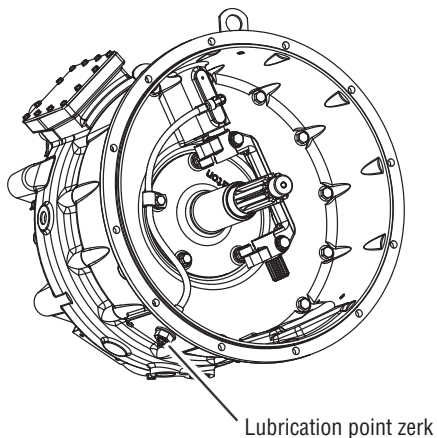
4. Apply lube to the release yoke fingers to reduce wear to the pads on the release bearing housing.
5. Apply grease to the cross shaft bushings and linkage pivot points.

NOTE: All clutches use a lithium complex grease with a minimum of 325°F (163°C) operating range meeting N.L.G.I. grade #2 or #3 specs.

NOTE: Apply ample grease that is visibly exiting the opening and contacting the transmission shaft. This will lube the clutch brake when the pedal is pressed.

CAUTION

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



IMPORTANT

Do not add lube to the input shaft splines (Never seize or grease). The discs must be free to slide.

Brake Lubricants

Use the chart to locate the correct lubricant and change interval.

Product	Lubricant	Change Interval with Zerks	Change Interval without Zerks
Brake, Standard	NLGI #2 EP Lithium	Not Applicable	50,000 miles [80,000 Km] or 3 months
Brake, LMS-Low Lube ¹	SHC 460 Synthetic	Not Applicable	1 year
Brake Adjusters, Standard	NLGI #2 EP Lithium	At chassis lubrication	Not Applicable
Brake Adjusters, Spicer Haldex Self-Adjusting	NLGI #2 or #3 EP Lithium	50,000 miles [80,000 Km] or 3 months	Not Applicable

¹ For easy identification, note that the Dana LMS-Low Lube brake uses a special “button head” grease fitting and the Dana LMS Lube Free brake does not have a grease fitting.

Brake Lubrication Procedure

CAUTION

Do not use moly-disulfide loaded grease or oil because this may shorten service life.

Do not apply excessive lubricant. It could cause damage to friction surface pads, disc brakes, boots and bellows.

Do not lubricate cam head surface or related parts that contact cam head surface. Cam head surface must remain free of oil and other contaminants.

Lubricate the following components:

- **One-Piece Roller**
Lubricate the shoe roller recess.
- **Two-Piece Roller**
Lubricate shoe roller inside dimension.
- **Roller and Anchor Pin**
Lubricate the recesses of each shoe on the ES and ED 150-4L models.
- **Camshaft Bracket**
Lubricate until grease comes out at the brake adjuster end. The seal is installed at this end with the air side in so that grease purges out.
- **Brake Adjuster**
Pressure lubricate according to manufacturer's instructions.

Driveshaft Lubrication Intervals

For assistance identifying the driveshaft model, see DSMT0100.

Spicer® Driveshaft Lubrication Intervals

Product	City	On Highway	Line Haul	On/Off Highway
10-Series (1480 thru 1810 & SPL90) Note: Slip member also requires lubrication.	5,000/8,000 miles [8,000/12,000 Km] or 3 months. (which ever comes first)	10,000/15,000 miles [16,000/24,800 Km] or 3 months. (which ever comes first)	10,000/15,000 miles [16,000/24,800 Km] or 3 months. (which ever comes first)	5,000/8,000 miles [8,000/12,000 Km] or 3 months. (which ever comes first)
Spicer Life Series Medium Duty (SPL55, 70, & 100) Booted and permanently lubricated slip member.	25,000 miles [40,000 Km] or 6 months. (which ever comes first)	25,000 miles [40,000 Km] or 6 months. (which ever comes first)	25,000 miles [40,000 Km] or 6 months. (which ever comes first)	25,000 miles [40,000 Km] or 6 months. (which ever comes first)
Spicer Life Series Heavy Duty (SPL140, 170, & 250) Standard Spicer Life Series U-Joint. Booted and permanently lubricated slip member.	25,000 miles [40,000 Km] or 6 months. (which ever comes first)	100,000 miles [160,000 Km] or 6 months. (which ever comes first)	100,000 miles [160,000 Km] or 6 months. (which ever comes first)	25,000 miles [40,000 Km] or 6 months. (which ever comes first)

Spicer Life XL™ First Lubrication Cycle¹²³

Product	City	On Highway	Line Haul	On/Off Highway
Spicer Life XL (SPL170XL & 250XL) Extended lubrication U-Joint. Booted and permanently lubricated slip member.	100,000 miles [160,000 Km] or 1 year. (which ever comes first)	350,000 miles [560,000 Km] or 3 years. (which ever comes first)	350,000 miles [560,000 Km] or 3 years. (which ever comes first)	100,000 miles [160,000 Km] or 1 year. (which ever comes first)

Spicer Life XL™ Re-Lubrication Cycle¹²³

Product	City	On Highway	Line Haul	On/Off Highway
Spicer Life XL (SPL170XL & 250XL) Extended lubrication U-Joint. Booted and permanently lubricated slip member.	25,000 miles [40,000 Km] or 6 months. (which ever comes first)	100,000 miles [160,000 Km] or 6 months. (which ever comes first)	100,000 miles [160,000 Km] or 6 months. (which ever comes first)	25,000 miles [40,000 Km] or 6 months. (which ever comes first)

Spicer Life SF™ Lubrication Cycle

Product	City	On Highway	Line Haul	On/Off Highway
Spicer Life SF (SPL170SF & 250SF) Service Free	Permanently lubricated for life of product			

¹ Spicer Life XL universal joints are best identified by the rubber seal guards (a soft, pliable “boot”) fitted to the bearing cups. Spicer Life XL universal joints have a plastic zerk cover attached prior to the required initial 350,000 mile re-lubrication. Standard Spicer Life Series universal joints have a hard plastic slinger fitted to the bearing cups.

² Spicer Driveshaft Division recommends re-lubrication with grease meeting NLGI Grade 2 specifications with an operating range of +325°F/+163°C to -10°F/-23°C.

³ After initial miles (km) or time is reached, the plastic grease zerk cover must be removed and the joints re-lubricated. Once the grease zerk cover has been removed, the “Re-Lubrication Cycle” interval must be followed.

Driveline Lubrication Procedure

⚠ WARNING

Inadequate lubrication can cause driveline failure which can result in separation of the driveline from the vehicle. A separated driveline can result in serious injury or death. In order to avoid driveline failure, including driveline separation, you must:

Among the most common causes of universal joint and slip spline failure is lack of proper lubrication. Properly sized Spicer universal joints that are adequately re-lubricated at recommended intervals will normally meet or exceed fleet operational requirements. Inadequate re-lube cycles and failure to lubricate the joints and slip spline properly not only cause joint failures, but lead to other problems such as slip spline seizures. Proper re-lubrication flushes the universal joints, thus removing abrasive contaminants from the universal joint bearings.

1. Carefully review the lubrication specifications in the manual.
2. Re-lubricate at recommended intervals.
3. Only use approved lubricants.

Spicer replacement universal joint kits contain only enough grease to provide needle bearing protection during storage. It is, therefore, necessary to completely lubricate each replacement kit prior to assembly into the driveshaft yokes. Each journal cross lube reservoir should be fully packed with a grease listed on the previous page. Each bearing assembly should also be wiped with the same grease, filling all the cavities between the rollers and applying a liberal grease coating to the bottom of each race. After the kits are installed into the driveshaft yokes and, prior to placing into service, they should be re-lubed, through the zerks, using the same grease.

Lubrication Procedure for Universal Joints

1. Use the proper lubricant to purge all four bearing seals of each universal joint. This flushes abrasive contaminants from each bearing and assures all four bearings are filled properly. Pop the seals. Spicer seals are made to be popped.
2. If any of the seals fail to purge, move the driveshaft from side-to-side while applying gun pressure. This allows greater clearance on the thrust end of the bearing that is not purging. (On two-headed zerk fittings, try greasing from the opposite lube fitting.)
3. Because of the superior sealing capability of the Spicer Seal design on the 1610, 1710, 1760, 1810, and 1880 Series, there will occasionally be one or more bearing seals of a universal joint that may not purge. Seal tension then has to be released. Bearing seals must purge to ensure adequate lubrication at all four universal joint bearings.

To Release Seal Tension:

4. On Quick Disconnect™ half round end yokes, remove the universal joint kit from the yoke and apply grease. Re-install the universal joint kit, **with new bolts**, in the yoke and torque to specifications as listed in DSSM-3264..
5. On full round closed hole yokes, loosen the bolts holding the bearing assembly that does not purge to release seal tension. It may be necessary to loosen the bearing assembly approximately 1/16" minimum. If loosening does not cause purging, remove the bearing assembly to determine cause of blockage.
6. Remove bolts and replace.

Note: The self-locking bolt design for full round yokes uses serrated bolts with lock patch and does not require a lock strap. DO NOT reuse any retaining bolt. If loosening or removal of a bolt is necessary, replace it with a new one.

Lubrication for Slip Splines

Always use a good E.P. grease meeting NLGI Grade 2 specifications on Glidecote™ and steel splines. The same lubricant used for universal joints is satisfactory for slip splines.

Re-lube splines as the interval prescribed in the “Driveline Lubricants” section. Apply grease gun pressure to lubrication zerk **until lubricant appears at pressure relief hole in welch plug** at slip yoke end of spline (Photo 1). At this point, cover pressure relief hole with finger and continue to apply pressure until grease appears at slip yoke seal (Photo 2). This will insure complete lubrication of spline.

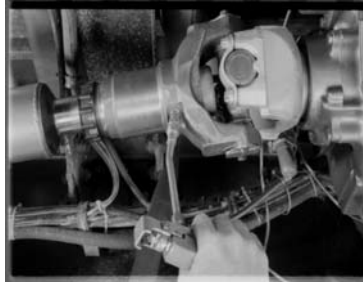


Figure 1

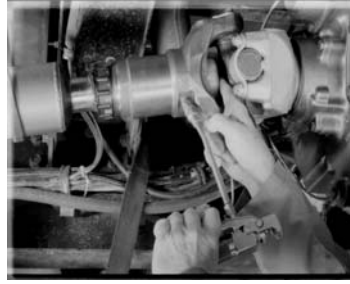


Figure 2

CAUTION

In cold winter months, activate the slip spline assembly by driving the vehicle sufficiently to cause displacement of the grease prior to its stiffening. Otherwise, the slip yoke plug may be forced out due to hydraulic pressure causing loss of grease and allowing abrasive contaminants to enter the slip spline.

Wheel End Lubricants

Use the chart to locate the correct lubricant and change interval.

Note: For line haul and vocational definitions, see page 3.

Product	Lubricant Type	SAE	Change Interval for Line Haul	Change Interval for Vocational
Drive Axle LMS	Synthetic ¹ SHAES 256 Rev C SHAES 429	SAE 75W-90, 80W-140	500,000 miles [800,000 Km] or 5 years	180,000 miles [288,000 Km] or 3 years
Drive Axle (Adjustable) ⁵	Synthetic SHAES 256 Rev C SHAES 429	SAE 75W-90, 80W-140	250,000 miles [400,000 Km] or 3 years	180,000 miles [288,000 Km] or 3 years
Drive Axle (Adjustable) ⁵	Mineral Base SAE J2360	SAE 75W-90, 75W-140, 80W-90, 85W-140	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 1 year
Steer Axle Oil Bath LMS	Synthetic ¹ SHAES 256 Rev C	SAE 75W-90	500,000 miles [800,000 Km] or 5 years	120,000 miles [193,000 Km] or 2 years
Steer Axle Oil Bath (Adjusted)	Synthetic SHAES 256 Rev C SHAES 429	SAE 75W-140, 75W-90	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 6 months
Steer Axle Oil Bath (Adjusted)	Mineral Base SAE J2360	75W, 75W-90, 80W-90, 85W-140	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 6 months
Steer Axle Semi-fluid (Adjusted)	Semi-fluid Synthetic Grease	Delo SF, Mobil SHC 007 ³	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 6 months
Steer Axle Grease Pack (Adjusted)	Heavy-Duty Multipurpose Lithium Based ³	#2 Grade	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 6 months
Trailer Axle Oil Bath LMS	Synthetic ⁴ SHAES 256 Rev C	SAE 75W-90	500,000 miles [800,000 Km] or 5 years	180,000 miles [288,000 Km] or 3 years
Trailer Axle Oil Bath (Adjusted)	Synthetic SHAES 256 Rev C SHAES 429	SAE 75W-90, 80W-140	120,000 miles [193,000 Km] or 1 year	180,000 miles [288,000 Km] or 3 years
Trailer Axle Oil Bath LMS	Mineral Base, J-2360	75W, 75W-90	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 1 year
Trailer Axle Grease LMS	Heavy-Duty Multipurpose Lithium Based ³	#2 Grade	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 6 months
Trailer Axle Grease (Adjusted)	Heavy-Duty Multipurpose Lithium Based ³	#2 Grade	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 6 months

Product	Lubricant Type	SAE	Change Interval for Line Haul	Change Interval for Vocational
Trailer Axle Semi-fluid LMS	Semi-fluid Synthetic Grease	Chevron Delo SF ⁴	500,000 miles [800,000 Km] or 5 years	120,000 miles [193,000 Km] or 2 years
Trailer Axle Semi-fluid LMS	Semi-fluid Synthetic Grease	Mobil SHC 007 ²	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 6 months
Trailer Axle Semi-fluid (Adjusted)	Semi-fluid Synthetic Grease	Delo SF, Mobil SHC 007 ²	120,000 miles [193,000 Km] or 1 year	60,000 miles [96,500 Km] or 6 months

¹ Only approved lubricant for LMS wheel ends

² Use of this grease requires a signed waiver from the customer

³ Do not mix with sodium base grease

⁴ Specified by MGM-113 as only approved lubricants for LMS trailer axles

⁵ Refer to maintenance manual for inspection and adjustment intervals

Wheel End Lubrication Procedure

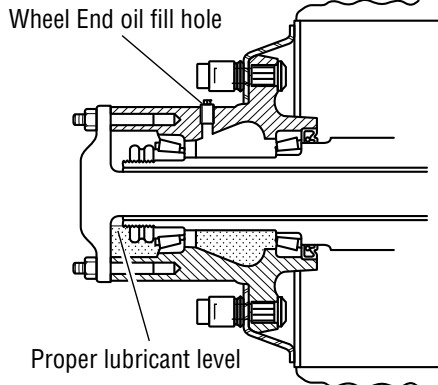
CAUTION

Before operating the axle, the wheel hub cavities and bearings must be lubricated to prevent failure.

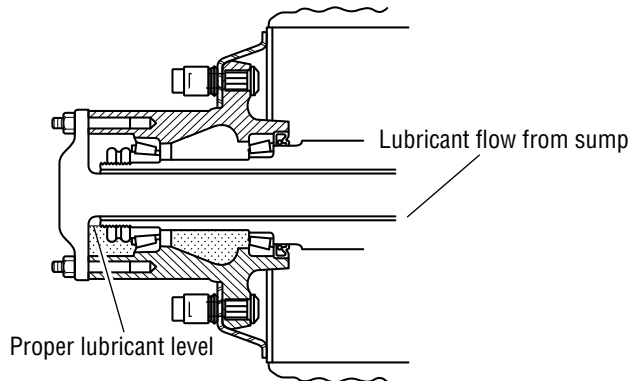
When wheel ends are serviced, follow Eaton's wheel end lubrication procedure before operating the axle.

Eaton axles may be equipped with either of two wheel end designs:

- Wheel ends with an oil fill hole



- Wheel ends without an oil fill hole

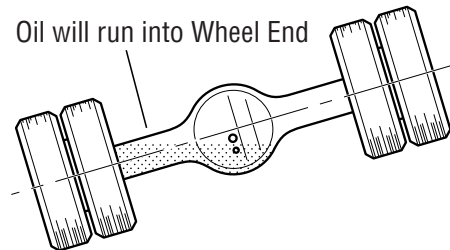


Wheel End Lubrication Procedure (with oil fill hole)

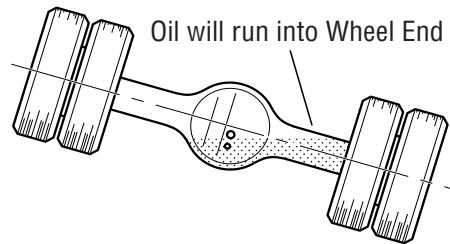
1. Rotate the wheel end hub until the oil fill hole is up.
2. Remove the oil fill plug.
3. Pour 0.5 pint [0.2 liter] of axle sump lubricant into each hub through the wheel end fill hole.
4. Install oil fill plug and tighten to specified torque.

Wheel End Lubrication Procedure (without oil fill hole)

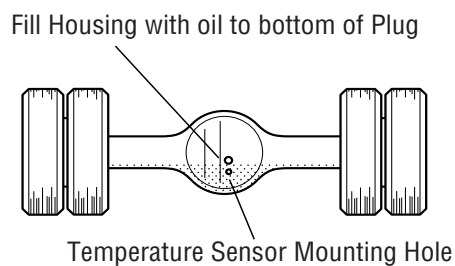
1. With axle level and wheel ends assembled, add lubricant through filler hole in axle housing cover until fluid is level with the bottom of filler hole.
2. Raise the left side of the axle 6 in. [152 mm] or more. Hold axle in this position for one minute.



3. Raise the right side of the axle 6 in. [152 mm] or more. Hold axle in this position for one minute.



4. With axle on a level surface, add lubricant through housing cover oil filler hole until fluid is level with the bottom of the hole.



Note: Axles without wheel end fill holes require approximately 2.5 pints [1.2 liters] of additional lubricant to bring the lubricant level even with the bottom of the fill hole.

Change Control Log

Last Revised Date	Description of Clarifications and Updates
04/12/12	<p><u>China - Transmission and Interval List Section:</u> Changed the Manual Transmission row, Vocational / Bus Drain Interval column, Standard section: From; "120,000 km or 1 year" - To; "60,000 km or 1 year"</p> <p>Changed the Manual Transmission row, Stationary Drain Interval column, Extended section: From; "2,000 hours or 5 years" - To; "1,000 hours or 2 years"</p> <p>Changed the Manual Transmission row, Stationary Drain Interval column, Standard section: From; "600 hours or 1 year" - To; "300 hours or 1 year"</p>
03/15/12	<p><u>China - Transmission and Interval List Section:</u> Changed the word "China" to "Asia Pacific"</p> <p><u>Clutch Lubricants Section:</u> Added Note #1</p>
11/21/11	<p><u>Clutch Lubricants Section:</u> Lubricants Table - Added Reman Colo Clutch and Reman Easy Pedal Clutch Moved the word "Complex" from in front of Roadranger Grease EP-2 to the end of NLGI #2 or #3 Lithium</p>

Change Control Log

Change Control Log

Last Revised Date	Description of Clarifications and Updates
11/03/11	<p>Added HD Automated VS/PLUS table to Transmission Lubricant Capacities section.</p> <p>Inserted HLA Maintenance and Inspection Section (reference TRSM1200).</p> <p>Inserted HLA Performance Hydraulic Fluid Data Sheet (reference TRSM1200).</p> <p>Inserted HLA System Oil Regulator Maintenance (reference TRSM1200).</p> <p><u>Drive Axle Section:</u> Added "Specification" to the Lubricant Header, and "Viscosity Grade" to the SAE section of the Drive Axle Lubricants Heavy Duty and Medium Duty Table Headers.</p> <p>Added the following Note after the Heavy Duty and Medium Duty Drive Axle Lubricants section: "Extended warranties require the use of synthetic lubricant approved to SHAES-256 Rev C."</p> <p>Removed "Quarts" and "Gallons" columns on all Drive Axle Lubricant Capacities tables.</p> <p><u>Steer Axle Section:</u> Corrected typo in "Steer Axle Lubrication Procedure"</p> <p><u>Clutch Section:</u> Removed "MP-2" and replaced with "EP-2" in the Clutch Lubricants Table under the Lubricant Column.</p> <p>Changed the Easy Pedal Advantage Service Interval for Line Hauling from "25,000 miles [40,000 Km]" to "50,000 or 3 months"</p> <p>Added Note under Clutch Lubricants Table, "It is recommended that grease meets NLGI GC-LB requirement."</p> <p><u>Driveline Section:</u> Added Spicer Life SF™ Lubrication Cycle Table to Driveline Lubrication Intervals Section.</p> <p>Removed entire sections of "Driveline Lubricants", "Steering Shafts", "Lubrication for Universal Joints", and "Lubrication for Center Bearings". (originally pages 25 and 26)</p> <p>Removed entire sections of "Torque Specifications", "Quick Disconnect (Half Round) Universal Joints" and "Serrated Bolt Design". (originally pages 29 and 30)</p> <p><u>European Lubricants - Transmission Section:</u> Removed entire section (originally page 34 thru 36)</p> <p><u>Australian Section:</u> Removed entire section (originally pages 37)</p> <p><u>China Section:</u> Removed entire section (originally pages 38)</p> <p><u>Quick Reference Section:</u> Removed entire section (originally pages 39 thru 44)</p>

Change Control Log

Last Revised Date	Description of Clarifications and Updates
05/24/11	Updated Clutch Lubricant Chart
3/03/10	Added MD DM3 volume requirements for units w/inertia brakes
3/03/10	Added ECA Clutch intervals
12/8/08	Major updates.
5/22/08	Added information to the Transmission Lubrication Procedures section ; Under "Check Transmission Oil Leve", added "Inspect oil filter for leaks, rust or damage. Replace as necessary."
8/23/07	Added Quarts and Gallons to the Lubrication Capacities sections
5/7/07	Add Rev C to all SHAES-256 Add Medium-Duty Drive Axle Lubricants Update Drive Axle Lubricant Capabilities Update Steer Axle Lubricants Update Wheel End Lubricants
10/18/06	Update Drive Axle Lubricants and Steer Axle Lubricants Add Wheel Ends Lubrication chart
8/28/06	Add new Roadranger Grease MP-2
4/13/06	Gear Box update from 3 yr/150k to 5 yr/500k

Change Control Log

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