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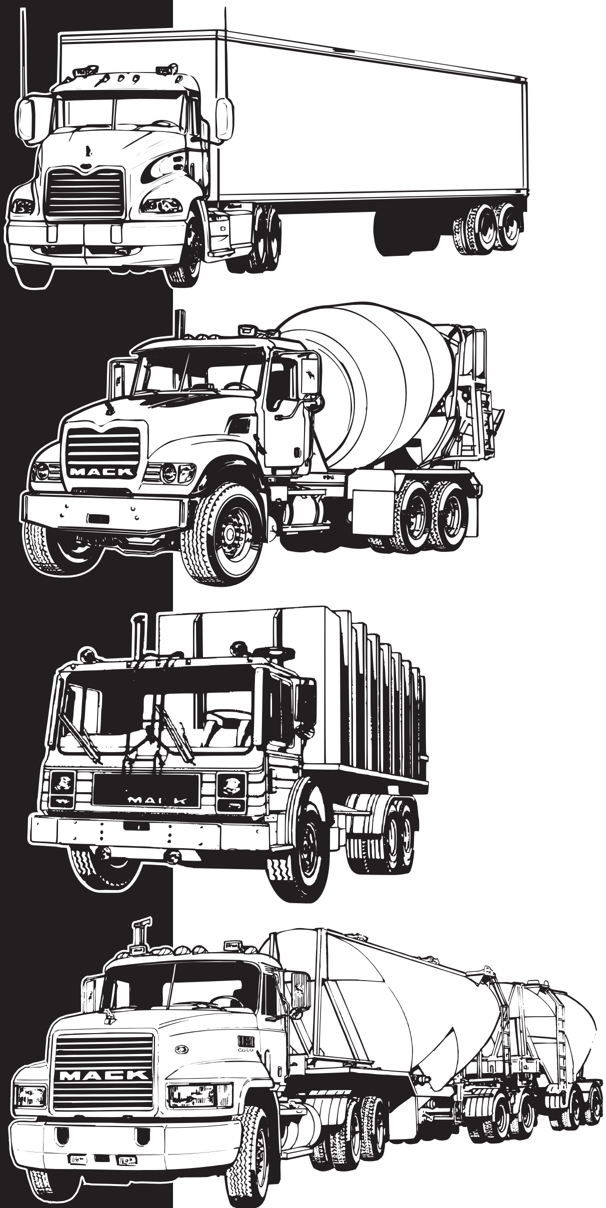

TS49407
JULY 2007
(SUPERSEDES
JUNE 2007)

MAINTENANCE AND LUBRICATION

FOR MACK® DIESEL POWERED TRUCKS

CALIFORNIA PROPOSITION 65 WARNING

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

CALIFORNIA PROPOSITION 65 WARNING

Battery posts, terminals and other related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and other reproductive harm.

Batteries also contain other chemicals known to the State of California to cause cancer.

Wash hands after handling.

TS49407 MAINTENANCE AND LUBRICATION FOR MACK® DIESEL POWERED TRUCKS

The information supplied in this manual is not all-inclusive, and cannot take into account all unique situations.

The engine oil/filter and gear oil change intervals outlined in this manual pertain to components manufactured by Mack Trucks, Inc. For information concerning engine oil/filter and gear oil change intervals for vendor components, refer to the specific vendor component service literature.

The information, specifications and illustrations in this publication are based on information that was current at the time of publication, and are subject to change without prior notification.

(Revised July 2007,
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(Revised July 2007,
Supersedes June 2007)

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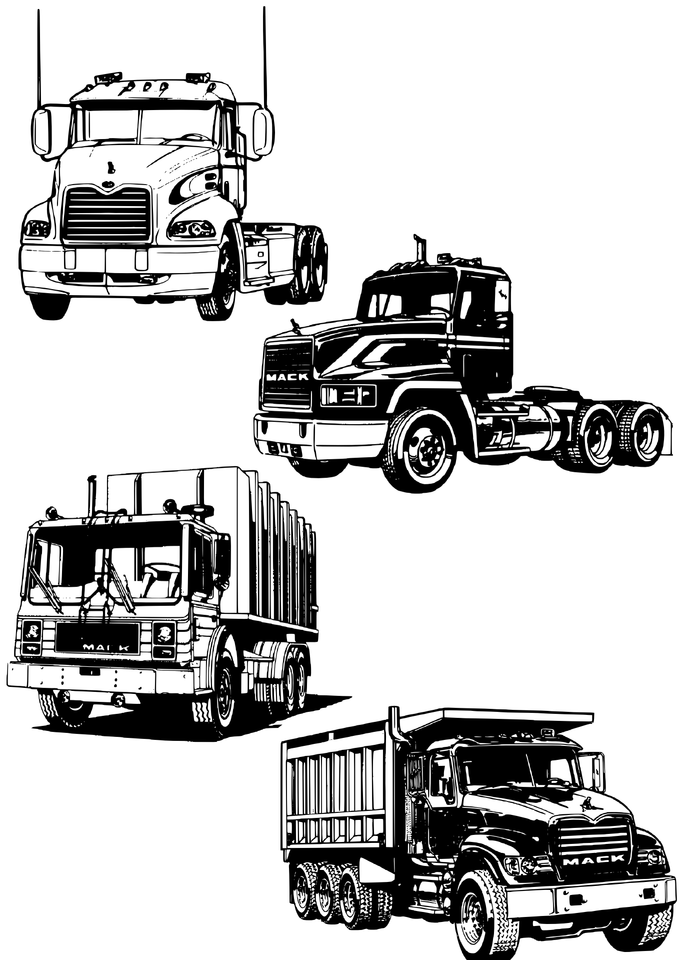

Figure 1 — Mack Model Chassis

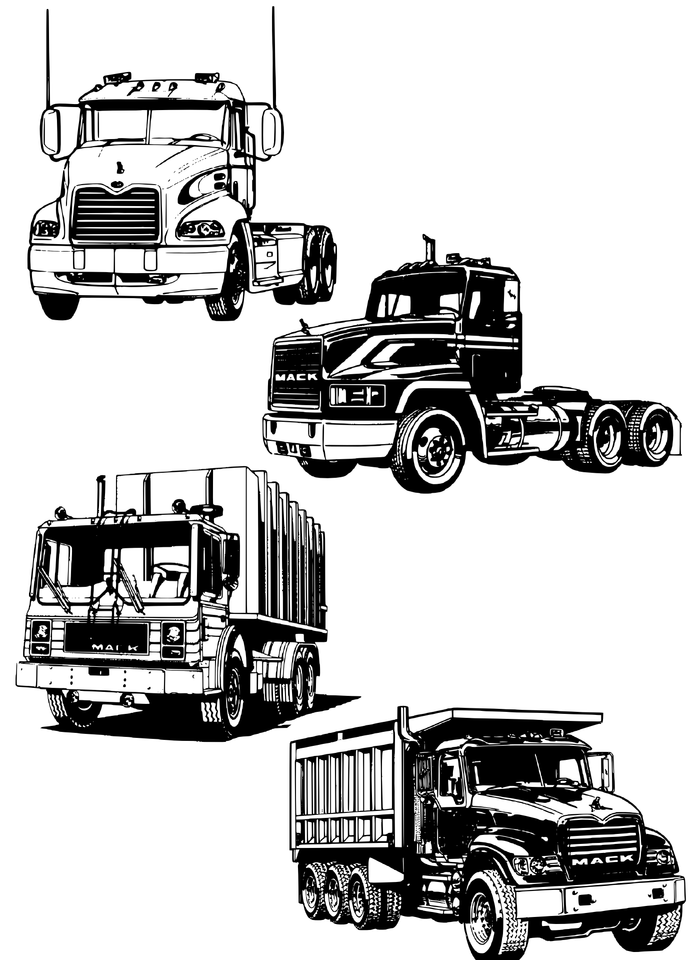
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Figure 1 — Mack Model Chassis

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INTRODUCTION

Preventive maintenance is vital to the life of your new MACK truck. This manual explains the proper preventive maintenance and lubrication procedures which should be used on all MACK Class 8 chassis.

The MACK Preventive Maintenance and Lubrication program outlined in this manual is designed to ensure a long and productive life from your truck. The program is divided into four maintenance schedules, each addressing items which require periodic inspections to ensure efficient, reliable and trouble-free operation. To allow flexibility in developing a maintenance routine suitable to your operating requirements, maintenance intervals in this manual are arranged in miles/kilometers, hours or days of operation. Maintenance instructions, specifications and capacities are outlined for quick and easy reference. The service manager at your MACK distributor will be happy to assist in customizing a maintenance program tailored to your operating requirements.

Following the MACK Preventive Maintenance Program is highly recommended to all operators of MACK vehicles because it is the key to lower operating costs both in time and money. The bottom line to a well-run maintenance program is less downtime and increased profitability.

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SAFETY INFORMATION

MACK cannot anticipate every possible occurrence which may involve a potential hazard. An accident can be avoided by recognizing potentially hazardous situations before an accident occurs. Correctly performed service procedures are critical to technician safety and the consequent safe, reliable operation of the vehicle.

Do not perform any service procedures or lubrications until this manual has been read and understood.

Some service procedures may require the use of special tools designed for a specific purpose. These tools must be used in the manner described in the instructions. Anyone using a procedure or tool not recommended in this manual must realize he is jeopardizing his safety and the safe operation of the vehicle. Individuals deviating from the instructions set forth in this manual assume all risks of personal injury or damage to equipment.

MAKE SAFETY FIRST . . .

. . . AND MAKE IT LAST

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iv

ADVISORY LABELS

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DANGER

Danger *indicates an unsafe practice that could result in death or serious personal injury. Serious personal injury is considered to be permanent injury from which full recovery is NOT expected, resulting in a change in life style.*

WARNING

***Warning* indicates an unsafe practice that could result in personal injury. Personal injury means that the injury is of a temporary nature and that full recovery is expected.**

CAUTION

Caution *indicates an unsafe practice that could result in damage to the product.*

NOTE

Note indicates a procedure, practice, or condition that must be followed in order for the vehicle or component to function in the manner intended.

SERVICE HINT

A helpful suggestion that will make it quicker and/or easier to perform a procedure, while possibly reducing service cost.

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Figure 2 — ASE Certification

ADVISORY LABELS

ASE
CERTIFIED
WE SUPPORT
VOLUNTARY TECHNICIAN
CERTIFICATION THROUGH
National Institute for
AUTOMOTIVE SERVICE
EXCELLENCE
000133a

Figure 2 — ASE Certification

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3

DIESEL PARTICULATE FILTERS

Your new MACK chassis is equipped with a 2007 emission compliant engine and an exhaust aftertreatment system known as a Diesel Particulate Filter (DPF), which reduces soot and particulate emissions into the atmosphere. Vehicles equipped with a Diesel Particulate Filter require the use of EO-O Premium Plus (or VDS-4) specification high performance diesel engine oil and Ultra Low Sulfur Diesel (ULSD) fuel.

⚠ CAUTION

Use of diesel fuel other than ULSD and engine oils other than EO-O Premium Plus (or VDS-4), will adversely affect performance, efficiency and durability of the DPF system and the engine, to the point where the engine may not run at all. Manufacturer's warranties will also be rendered void due to usage of improper fuel. Unapproved fuel additives (including engine oil) are NOT permitted.

Mack Trucks, Inc. offers two different types of DPF systems:

- Catalyzed DPF (passive/active regeneration)
- Non-catalyzed DPF (active regeneration)

as well as two different mounting styles:

- MACK Vertical Back-of-Cab DPF (both catalyzed and non-catalyzed)
- MACK-Cap DPF, which is a space saving unit that is mounted inside the frame (catalyzed only)

The Diesel Particulate Filter takes the place of the standard muffler. Soot and other particulate matter is collected by a filter inside the unit where it is eventually oxidized using a regeneration process that is either Passive/Active (catalyzed DPF) or Active (non-catalyzed DPF). With the passive/active regeneration process, soot is collected in the filter and oxidized as the vehicle is in operation. An oxidation catalyst raises the exhaust temperature to approximately 260°C (500°F), the temperature at which the chemical reaction takes place to oxidize the soot. When soot loading in the filter reaches a point where it can no longer be oxidized passively, fuel is injected into the system to raise the temperature inside the filter to approximately 625°C (1157°F), the temperature at which active regeneration takes place.

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DPF systems using the active-only (non-catalyzed) process do not have an oxidation catalyst. Regeneration takes place after a certain number of engine operating hours, and begins when an air/fuel mixture is injected into the thermal regenerator and raises the temperature inside the unit to the point where the soot oxidation takes place.

The type of DPF system (passive/active or active-only) is based on vehicle application. In general, DPF systems using passive/active (catalyzed) regeneration are used in highway and certain vocational applications. Active-only (non-catalyzed) DPF systems are for vehicles used mainly in refuse collection applications.

⚠ CAUTION

When active regeneration occurs (with either system), the temperature of the exhaust will be elevated. DO NOT park the vehicle with the exhaust outlet under low hanging overhead flammable objects such as trees, awnings, etc., that could be damaged by elevated exhaust temperatures.

When active regeneration occurs, an indicator lamp on the instrument panel will illuminate to alert the operator. A DPF switch allows the vehicle to either stop or start active regeneration. (Certain conditions must be met, however, before an active regeneration can be manually started.) Refer to the applicable vehicle operator's manual for a complete description of DPF indicator lamp and switch functions.

⚠ CAUTION

If the vehicle is in a location that may be hazardous when an active regeneration begins (i.e., in close proximity to flammable materials or gases), the regeneration should be stopped by pushing the DPF switch to the "Stop Regeneration" position.

If an active regeneration is stopped by the vehicle operator, it should be initiated at a later time when the vehicle is in a safe location. However, if an active regeneration is stopped too many times, the vehicle must be taken to a MACK service facility. The service facility will use a service tool to manually initiate the regeneration.

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Diesel Particulate Filter Maintenance

Maintenance requirements for the DPF systems are as follows:

- For the non-catalyzed DPF, the ignition electrodes and injection nozzle cleaning interval is 161 000 km/100,000 miles or 2,400 hours, whichever occurs first.
- For the catalyzed DPF, the Aftertreatment Hydrocarbon Injector (AHI) must be cleaned at each 240 000 km/150,000 mile or 4,500 hour interval, whichever occurs first.
- For both catalyzed and non-catalyzed systems, the ash cleaning interval is 400 000 km/250,000 miles or 4,500 hours, whichever occurs first.

Diesel Particulate Filter Precautions

Diesel particulate filters and related components cannot be moved or altered from the OEM installation in any fashion.

- Moving or altering the DPF or related components will result in emission system malfunction or failure.
- Altering the emissions system is prohibited by the Environmental Protection Agency (EPA).
- Dealers and/or upfitters (body builders/installers) are not authorized to alter or modify the emissions system or any of the emissions-related components.

For heated dump bodies, exhaust flow cannot be diverted from the exhaust system ahead of the DPF system. For vehicles that will be used with a heated dump body, exhaust flow must come from the DPF outlet, and exhaust back pressure specifications (18 kPa [2.6 psi] for MACK MP7 engines and 21 kPa [3.1 psi] for MACK MP8 engines) cannot be exceeded. The ONLY diesel particulate filter that is approved for heated dump body applications is the MACK-Cap DPF system. The MACK-Cap DPF is a space saver unit that is mounted inside the frame, as opposed to the vertical back-of-cab DPF unit. The vertical back-of-cab DPF unit is NOT approved for use with heated dump body applications.

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6

VEHICLE BREAK-IN

To get the most from your new MACK truck, and to ensure many years of reliable, trouble-free operation, the following “break-in” procedures are recommended.

During first 5000 km (3000 miles)

✓ After the first 200 km (125 miles), retorque the wheel nuts using an accurately calibrated torque wrench. Recheck this torque again after 800 km (500 miles).

✓ Check engine oil and coolant level frequently.

✓ Check brake and clutch adjustment per recommended schedules and adjust as needed.

✓ Observe instruments often and shut down as soon as possible at first sign of any abnormal readings.

✓ Check for leaks, loose fasteners, unusual noises, etc., and correct as necessary.

✓ Check spring clip torque (U-bolts). (Reyco suspensions: also check equalizer nut torque.)

✓ At the end of the first 1610 km (1000 miles) of service, check the U-bolt torque on all MACK air suspensions (including MAXAIR™ 40/40A and MAXLITE™ 20–40).

At the end of first 5000 km (3000 miles) or before 6500 km (4000 miles) or 3 to 4 months (whichever comes first)

✓ Retorque spring clips (U-bolts). (Reyco suspensions: Retorque spring clips and equalizer nuts.)

✓ Auxiliary axles

- Check wheel bearing lubricant and add GO-J oil as required.
- Lubricate king pins (steerable axles).
- Lubricate tie rod ends.

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At the first A inspection interval

- ✓ Check front and rear axle alignment and adjust if out of specification.
- ✓ Check steering knuckle to axle beam clearance on MACK FA(W) front axles.

Initial Valve Lash and Unit Injector Pre-Load Check and Adjustment

For both highway and vocational usage, an initial valve lash and unit injector pre-load check and adjustment must be performed at the first 200 000 km (125,000 miles), 3,400 hours or 12 months of service, whichever occurs first.

Your new truck has been quality built, inspected, lubricated and adjusted at the MACK Trucks Assembly Plant. Occasionally, however, an air, oil or coolant leak may develop. Quick action to correct these minor items will prevent a major repair later. Take your truck to the nearest MACK service center as soon as any abnormal condition becomes evident.

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NOTE

Refer to table on page 17 and table on page 20 for the recommended lubrication change intervals applicable to the following items:

- Gear oils — transmission, rear axle carrier(s), front drive axle carrier, transfer case, flywheel PTO
- Engine oil, oil filters, fuel filters

It is important that lubricants, coolants, diesel fuel, etc., meeting proper specifications be used in your MACK chassis. (Refer to SPECIFICATIONS AND CAPACITIES.)

When checking oil levels, the vehicle must be parked on level ground, and the units at normal operating temperature. Components must be filled to the correct level. DO NOT OVERFILL.

The oil and filter change intervals in this manual pertain to components manufactured by Mack Trucks, Inc. For information concerning oil and oil filter change intervals for vendor components, refer to the specific vendor component service literature.

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DAILY INSPECTION

Driver's Daily Inspection

Before beginning the day's operation, make a "walk around" inspection of your truck. The following checklist provides an aid in making a thorough inspection and ensures no item will be overlooked. Make sure any problem is corrected before using the vehicle.

⚠ DANGER

To avoid serious injury, DO NOT step on fuel tanks, battery boxes, frame, etc. Step only on areas where adequate slip resistance surfaces and handholds are provided.

GENERAL APPEARANCE

☑ Check the overall condition of the vehicle. Look for signs of leaking fuel, oil or coolant.

☑ Check to see if the chassis is leaning (flat tires, broken springs, etc.).

☑ Review the previous chassis inspection sheets. Make sure any reported defects were corrected.

RAISE THE HOOD/TILT THE CAB

☑ Check the windshield washer reservoir. Add washer solvent if necessary.

Radiator

☑ Check the coolant level and add a mixture between 40%–60% of antifreeze/quality water, if necessary.

☑ Check for coolant leaks.

☑ Check the condition of radiator and heater hoses.

☑ Clean debris from grille area.

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☑ Check the condition of radiator and heater hoses.

☑ Clean debris from grille area.

10

Engine

- ☑ Check crankcase oil level and add recommended engine oil, if necessary.
- ☑ Check condition of all engine drive belts.
- ☑ Check for oil, fuel and air leaks.
- ☑ Check engine and chassis wiring harnesses for frayed or broken wires.

Steering System

- ☑ Check power steering fluid level and add recommended fluid, if necessary.
- ☑ Check security of steering gear, pitman arm and drag link.
- ☑ Check steering shaft U-joints for tightness, cracks and damage.

CLOSE HOOD/LOWER CAB; SECURE LATCHES

Cab Exterior

- ☑ Check condition of wheels and tires. Inspect each tire for cuts, leaks, punctures, bulges, abnormal wear and tire match.
- ☑ Check rims for damage and wheel nut tightness. Rust streaks around wheel nut ball seats are an indication of looseness.
- ☑ Check tire pressure while tires are cold.
- ☑ Check oil level of oil-lubricated front wheel bearings. Add oil, if necessary.
- ☑ Check brake system components.
- ☑ Check electrolyte level in battery and add distilled water, if necessary. If the battery is a maintenance-free type, check state of charge indicator. Check the battery cables for condition, chafing and proper routing.
- ☑ Check condition of fuel tanks and fuel hoses, connectors and pipes.

DAILY INSPECTION

Engine

- ☑ Check crankcase oil level and add recommended engine oil, if necessary.
- ☑ Check condition of all engine drive belts.
- ☑ Check for oil, fuel and air leaks.
- ☑ Check engine and chassis wiring harnesses for frayed or broken wires.

Steering System

- ☑ Check power steering fluid level and add recommended fluid, if necessary.
- ☑ Check security of steering gear, pitman arm and drag link.
- ☑ Check steering shaft U-joints for tightness, cracks and damage.

CLOSE HOOD/LOWER CAB; SECURE LATCHES

Cab Exterior

- ☑ Check condition of wheels and tires. Inspect each tire for cuts, leaks, punctures, bulges, abnormal wear and tire match.
- ☑ Check rims for damage and wheel nut tightness. Rust streaks around wheel nut ball seats are an indication of looseness.
- ☑ Check tire pressure while tires are cold.
- ☑ Check oil level of oil-lubricated front wheel bearings. Add oil, if necessary.
- ☑ Check brake system components.
- ☑ Check electrolyte level in battery and add distilled water, if necessary. If the battery is a maintenance-free type, check state of charge indicator. Check the battery cables for condition, chafing and proper routing.
- ☑ Check condition of fuel tanks and fuel hoses, connectors and pipes.

11

☑ *Inspect air intake for secure mounting, leaks, or damage. Replace air cleaner element if indicator locks in the red zone or dash-mounted gauge indicates maximum inlet restriction of 510 mm (20 inches) [MACK] or 635 mm (25 inches) [Cummins] of water for applicable engine (see table on page 113).* **Gaseous Emission Control Maintenance.**

☑ Clean headlamps, exterior windows and mirrors. Check windshield and mirrors for cracks. Check operation of all lamps and inspect lenses. Repair any non-operating lamps and replace any broken lenses.

CLIMB INTO CAB

Cab Interior

☑ Clean interior windows and dash gauges.

☑ Check seatbelts for security and damage.

☑ Secure any loose items found in the cab.

☑ Check emergency equipment and warning devices.

☑ Adjust driver's seat and sideview mirrors.

☑ Check clutch pedal free-play.

Start the Engine

☑ Listen for any unusual noises.

☑ Make sure the alarms shut off when oil pressure, air pressure, etc., reach normal operating range.

☑ Check operation of horns (both air and electric), windshield wipers and washers, heater and defroster, back-up alarm, and, if so equipped, heated mirrors.

☑ Check operation of service brakes.

☑ Check application of parking brakes.

DAILY INSPECTION

☑ *Inspect air intake for secure mounting, leaks, or damage. Replace air cleaner element if indicator locks in the red zone or dash-mounted gauge indicates maximum inlet restriction of 510 mm (20 inches) [MACK] or 635 mm (25 inches) [Cummins] of water for applicable engine (see table on page 113).* **Gaseous Emission Control Maintenance.**

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☑ Check application of parking brakes.

12

☑ Observe instruments and verify readings.

— **Air pressure gauge** — Low air buzzer should shut off at 483 ± 34 kPa (70 ± 5 psi). Operating range is 724 kPa (105 psi) minimum to 931 kPa (135 psi) maximum.

— **Engine oil pressure gauge — MACK MP Engine:** 275.8 to 413.9 kPa (40 to 60 psi) at idle, and 275.8 to 620 kPa (40 to 90 psi) at governed speed.

— **Engine oil temperature gauge — MACK MP Engine:** 100°C to 115°C (212°F to 239°F).

NOTE

Engine oil pressures and temperatures are for MACK diesel engines only. Consult specific engine operating manual if equipped with an engine other than MACK.

— **Voltmeter** — With switch ON and engine OFF, indicates condition of battery. With engine running, indicates condition of charging system.

— **Coolant temperature gauge** — Normal operating temperature for MACK MP engines is between 77°C and 104°C (170°F and 220°F).

END OF THE DAY

☑ Apply parking brakes, block tires and drain water that may have accumulated in the air reservoirs.

☑ Drain water from fuel separator, if equipped.

☑ Check for fuel, oil and coolant leaks.

DAILY INSPECTION

☑ Observe instruments and verify readings.

— **Air pressure gauge** — Low air buzzer should shut off at 483 ± 34 kPa (70 ± 5 psi). Operating range is 724 kPa (105 psi) minimum to 931 kPa (135 psi) maximum.

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☑ Drain water from fuel separator, if equipped.

☑ Check for fuel, oil and coolant leaks.

13

PREVENTIVE MAINTENANCE PROGRAM

MACK Preventive Maintenance and Lubrication Program

Your MACK chassis was designed and built with performance, durability and productivity in mind. The MACK Preventive Maintenance and Lubrication program was developed to maintain your chassis and keep it running the way it was designed to run. Preventive maintenance, not breakdown maintenance, is the key to many years of trouble-free operation.

The MACK Preventive Maintenance and Lubrication program consists of mechanical inspections, lubrication and oil, filter and coolant conditioner change intervals designed to maintain vehicle efficiency and prevent mechanical failure.

Developing your maintenance program is not all that complicated, simply choose the maintenance category that best fits your highway or vocational operation.

NOTE

The following maintenance categories and interval charts are the standard maintenance and lubrication intervals for a MACK chassis.

PREVENTIVE MAINTENANCE PROGRAM

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NOTE

The following maintenance categories and interval charts are the standard maintenance and lubrication intervals for a MACK chassis.

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For ease of planning, maintenance and lubrication schedules are based on mileage/kilometers or days/hours of operation. The service manager at your MACK dealer will be happy to assist in tailoring a maintenance program for your particular operating requirements.

NOTE

It is extremely important that engine oil be changed at the specified oil change intervals as outlined in the charts found on pages 17 and 20.

To gain maximum benefit from the MACK Preventive Maintenance Program, Mack Trucks, Inc. recommends the following:

1. **Oil and fuel filters must meet MACK specifications and should be changed within specified intervals.**
2. **MACK specification EO-O PREMIUM PLUS diesel engine oil is mandatory.**
3. **MACK specification Grade 2D Ultra Low Sulfur Diesel (ULSD) fuel must be used.**
4. **MACK factory specifications must be maintained.**

⚠ *CAUTION*

Diesel engines used in 2007 and later model year vehicles are designed to operate with Ultra Low Sulfur Diesel (ULSD) fuel only. Usage of improper diesel fuel will reduce engine efficiency and durability, permanently damage advanced emission control devices, reduce fuel economy and possibly prevent the engine from running. Manufacturer’s warranties may be voided due to usage of improper fuel, and using low sulfur in 2007 and later diesel-powered cars, trucks and buses violates Federal emissions laws and is punishable with civil penalties.

PREVENTIVE MAINTENANCE PROGRAM

For ease of planning, maintenance and lubrication schedules are based on mileage/kilometers or days/hours of operation. The service manager at your MACK dealer will be happy to assist in tailoring a maintenance program for your particular operating requirements.

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NOTE

Certain chassis vocations may require more frequent service intervals. When developing a maintenance program, review chassis operating conditions and adjust the service intervals as required. At each maintenance and lubrication interval, look at the condition of chassis lubrication points, condition of components, etc., and adjust your service intervals accordingly.

A lubricant analysis program performed by a reputable laboratory is the most effective method of determining lubricant change intervals. Mack Trucks, Inc., supports the Maxigard/2 Oil Analysis Program which is conducted by Analysts, Inc. Test kits are available through MACK Parts System. Part Nos. for the various test kits are as follows:

- **4549-PMXBB** — Tests spectrochemical, LEM (to determine soot levels), fuel dilution, viscosity and neutralization (known as TBN), uses a plastic bellows-type container for collecting the oil sample
- **4549-PMXBJ** — Tests spectrochemical, LEM (to determine soot levels), fuel dilution, viscosity and neutralization (known as TBN), uses a jar for collecting the oil sample

For additional information, contact Analysts, Inc. at 1-800-655-4473, or visit their website at **www.analystsinc.com**.

Alter the maintenance program to meet your needs, but never exceed MACK-recommended intervals.

PREVENTIVE MAINTENANCE PROGRAM

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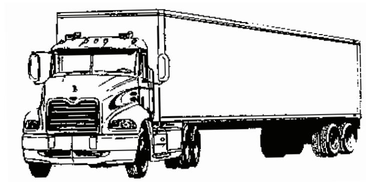
Maintenance Intervals (Highway Chassis)

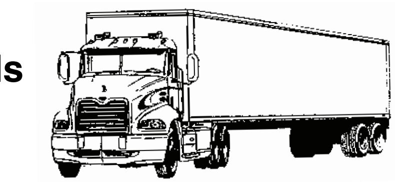


MP7 AND MP8 ENGINE MAINTENANCE		
	MEDIUM HIGHWAY USAGE **Total Fuel Consumption Less than 39 L/km (Greater than 6.0 MPG)**	**HEAVY HIGHWAY USAGE** **Total Fuel Consumption Less than 50 L/km (Greater than 4.7 MPG)**
Oil and Filter Change (includes fuel filters) **Note: If idle time is greater than 25% of total vehicle usage, use the next lower drain interval.**	56 000 km/ **35,000 miles**	40 000 km/ **25,000 miles**
Air Filter	At maximum restriction as indicated on gauge, or 12 months, whichever occurs first	
Coolant Conditioner (used with traditional coolants requiring Supplemental Coolant Additive [SCA])	80 000 km/**50,000 miles** (the coolant conditioner may be changed at each oil and filter change interval)	
Coolant Filter (used with extended-life coolants which do not require SCA)	240 000 km/**150,000 miles*** or 12 months*	
Coolant	Traditional — (fully formulated) 500 000 km/ **300,000 miles*** or 24 months*	
	Extended-Life — 1 000 000 km/**600,000 miles*** or 48 months*	
Valve Lash and Unit Injector Pre-Load Check and Adjustment	Initial — 200 000 km/**125,000 miles*** or 12 months* Regular — 400 000 km/**250,000 miles*** or 24 months*	
Belts (Fan and Accessory)	500 000 km/**300,000 miles*** or maximum of 36 months*	
Ash Cleaning (Catalyzed Diesel Particulate Filter [DPF])	400 000 km/**250,000 miles*** or 4,500 hours*	
Aftertreatment Hydrocarbon Injector (AHI) Service	240 000 km/**150,000 miles*** or 4,500 hours*	

*Whichever occurs first.

PREVENTIVE MAINTENANCE PROGRAM

Maintenance Intervals (Highway Chassis)



MP7 AND MP8 ENGINE MAINTENANCE
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Air Filter | At maximum restriction as indicated on gauge, or 12 months, whichever occurs first
Coolant Conditioner (used with traditional coolants requiring Supplemental Coolant Additive [SCA]) | 80 000 km/50,000 miles (the coolant conditioner may be changed at each oil and filter change interval)
Coolant Filter (used with extended-life coolants which do not require SCA) | 240 000 km/150,000 miles* or 12 months*
Coolant | Traditional — (fully formulated) 500 000 km/ 300,000 miles* or 24 months* | Extended-Life — 1 000 000 km/600,000 miles* or 48 months*
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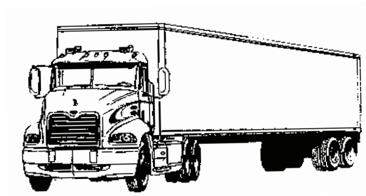
17

Maintenance Intervals (Highway Chassis)

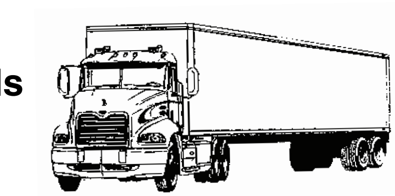


CHASSIS MAINTENANCE AND LUBRICATION		
	MEDIUM HIGHWAY USAGE **Total Fuel Consumption Less than 39 L/km (Greater than 6.0 MPG)**	**HEAVY HIGHWAY USAGE** **Total Fuel Consumption Less than 50 L/km (Greater than 4.7 MPG)**
A Inspection	26 000 km/ **17,500 miles**	20 000 km/ **12,500 miles**
B Inspection	56 000 km/ **35,000 miles**	40 000 km/ **25,000 miles**
C Inspection	112 000 km/ **70,000 miles**	80 000 km/ **50,000 miles**
D Inspection	225 000 km/ **140,000 miles**	161 000 km/ **100,000 miles**
Chassis Lubrication (Note 1)	26 000 km/ **17,500 miles**	20 000 km/ **12,500 miles**
Gear Oil Change (Note 2)	402 000 km/**250,000 miles*** or 2 years*	

*Whichever occurs first.

PREVENTIVE MAINTENANCE PROGRAM

Maintenance Intervals (Highway Chassis)



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Chassis Lubrication (Note 1)	26 000 km/ 17,500 miles	20 000 km/ 12,500 miles
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N O T E

Certain chassis vocations may require more frequent service intervals. When developing a maintenance program, review chassis operating conditions and adjust the service intervals as required. At each maintenance and lubrication interval, look at the condition of chassis lubrication points, condition of components, etc., and adjust your service intervals accordingly. Using a lubricant analysis program performed by a reputable laboratory is the most effective method of determining lubricant change intervals. Alter the maintenance program to meet your needs, but never exceed MACK recommended intervals.

PREVENTIVE MAINTENANCE PROGRAM

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Maintenance Intervals (Vocational Chassis)

MP7 AND MP8 ENGINE MAINTENANCE		
	SEVERE VOCATIONAL USAGE **Total Fuel Consumption Less than 64 MPG (Greater than 3.7 MPG)**	**VERY SEVERE VOCATIONAL USAGE** **Total Fuel Consumption Less than 120 L/km (Greater than 2.0 MPG)**
Oil and Filter Change (includes fuel filters) **Note: If idle time is greater than 25% of total vehicle usage, use the next lower drain interval.**	24 000 km/**15,000 miles***, 450 hours* or 6 months maximum*	16 000 km/**10,000 miles***, 300 hours* or 6 months maximum*
Air Filter	At maximum restriction as indicated on gauge, or 12 months, whichever occurs first	
Coolant Conditioner (used with traditional coolants requiring Supplemental Coolant Additive [SCA])	80 000 km/**50,000 miles*** or 6 months*	
Coolant Filter (used with extended-life coolants which do not require SCA)	240 000 km/**150,000 miles*** or 12 months*	
Coolant	Traditional — (fully formulated) 500 000 km/ **300,000 miles*** or 24 months*	
	Extended-Life — 1 000 000 km/**600,000 miles*** or 48 months*	

PREVENTIVE MAINTENANCE PROGRAM

Maintenance Intervals (Vocational Chassis)

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Coolant	Traditional — (fully formulated) 500 000 km/ **300,000 miles*** or 24 months*	
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20

Maintenance Intervals (Vocational Chassis)

MP7 AND MP8 ENGINE MAINTENANCE		
	SEVERE VOCATIONAL USAGE **Total Fuel Consumption Less than 64 MPG (Greater than 3.7 MPG)**	**VERY SEVERE VOCATIONAL USAGE** **Total Fuel Consumption Less than 120 L/km (Greater than 2.0 MPG)**
Valve Lash and Unit Injector Pre-Load Check and Adjustment	Initial — 200 000 km/**125,000 miles*** or 12 months* Regular — 400 000 km/**250,000 miles*** or 24 months*	
Belts (Fan and Accessory)	240 000 km/**150,000 miles*** or maximum of 12 months*	
Ash Cleaning (Catalyzed and Non-Catalyzed Diesel Particulate Filter [DPF])	400 000 km/**250,000 miles*** or 4,500 hours*	
Aftertreatment Hydrocarbon Injector (AHI) cleaning (catalyzed only)	240 000 km/**150,000 miles*** or 4,500 hours*	
Electrode and Injection Nozzle Service (non-catalyzed DPF only)	161 000 km/**100,000 miles*** or 2,400 hours*	

*Whichever occurs first.

PREVENTIVE MAINTENANCE PROGRAM

Maintenance Intervals (Vocational Chassis)

MP7 AND MP8 ENGINE MAINTENANCE		
	SEVERE VOCATIONAL USAGE **Total Fuel Consumption Less than 64 MPG (Greater than 3.7 MPG)**	**VERY SEVERE VOCATIONAL USAGE** **Total Fuel Consumption Less than 120 L/km (Greater than 2.0 MPG)**
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Aftertreatment Hydrocarbon Injector (AHI) cleaning (catalyzed only)	240 000 km/**150,000 miles*** or 4,500 hours*	
Electrode and Injection Nozzle Service (non-catalyzed DPF only)	161 000 km/**100,000 miles*** or 2,400 hours*	

*Whichever occurs first.

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Maintenance Intervals (Vocational Chassis)

CHASSIS MAINTENANCE AND LUBRICATION		
	SEVERE VOCATIONAL USAGE **Total Fuel Consumption Less than 64 L/km (Greater than 3.7 MPG)**	**VERY SEVERE VOCATIONAL USAGE** **Total Fuel Consumption Less than 120 L/km (Greater than 2.0 MPG)**
A Inspection	12 000 km/ **7,500 miles*** or 225 hours*	8 000 km/ **5,000 miles*** or 150 hours*
B Inspection	24 000 km/ **15,000 miles*** or 450 hours*	16 000 km/ **10,000 miles*** or 300 hours*
C Inspection	48 000 km/ **30,000 miles*** or 900 hours*	32 000 km/ **20,000 miles*** or 600 hours*
D Inspection	96 000 km/ **60,000 miles*** or 1,800 hours*	64 000 km/ **40,000 miles*** or 1,200 hours*
Chassis Lubrication (Note 1)	12 000 km/ **7,500 miles** or 225 hours*	8 000 km/ **5,000 miles*** or 150 hours*
Gear Oil Change (Note 2)	64 000 km/**40,000 miles*** 1 year* or 1,200 hours	

*Whichever occurs first.

PREVENTIVE MAINTENANCE PROGRAM

Maintenance Intervals (Vocational Chassis)

CHASSIS MAINTENANCE AND LUBRICATION
SEVERE VOCATIONAL USAGE Total Fuel Consumption Less than 64 L/km (Greater than 3.7 MPG)
VERY SEVERE VOCATIONAL USAGE Total Fuel Consumption Less than 120 L/km (Greater than 2.0 MPG)
A Inspection 12 000 km/ 7,500 miles* or 225 hours* 8 000 km/ 5,000 miles* or 150 hours*
B Inspection 24 000 km/ 15,000 miles* or 450 hours* 16 000 km/ 10,000 miles* or 300 hours*
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D Inspection 96 000 km/ 60,000 miles* or 1,800 hours* 64 000 km/ 40,000 miles* or 1,200 hours*
Chassis Lubrication (Note 1) 12 000 km/ 7,500 miles or 225 hours* 8 000 km/ 5,000 miles* or 150 hours*
Gear Oil Change (Note 2) 64 000 km/40,000 miles* 1 year* or 1,200 hours

*Whichever occurs first.

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NOTES TABLE

Note 1: Lubricate the clutch release bearing at each recommended chassis lubrication interval (refer to the interval charts on pages 17 through 20).

Lubricate the driveshaft (Spicer® and ArvinMeritor™) at the following intervals:

Spicer Life™ SPL-170 and SPL-250 Driveshaft — U-Joint Lubrication

- Highway Usage: Every 161 000 km (100,000 miles) or 6 months*
- Vocational Usage:
  - — Severe Vocational Usage: 32 000 km (20,000 miles) or 180 days*
  - — Very Severe Vocational Usage: 375 hours or 90 days*

* Whichever occurs first.

PREVENTIVE MAINTENANCE PROGRAM

NOTES TABLE

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- Highway Usage: Every 161 000 km (100,000 miles) or 6 months*
- Vocational Usage:
  - — Severe Vocational Usage: 32 000 km (20,000 miles) or 180 days*
  - — Very Severe Vocational Usage: 375 hours or 90 days*

* Whichever occurs first.

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Spicer Life™ SPL-170XL and SPL-250XL Driveshaft — U-Joint Lubrication

Spicer Life™ XL series driveshafts are equipped with “extended-lubrication” U-joints. These U-joints are easily identified by the blue plastic cover in the center of the U-joint cross where the grease fitting is usually located. The XL U-joints must be lubricated initially at the following intervals:

- Highway Chassis: 560 000 km (350,000 miles) or 3 years*
- Vocational Chassis (includes city driving and on/off highway: 161 000 km (100,000 miles) or 1 year*

* Whichever occurs first.

Following the initial lubrication outlined above, Spicer Life™ XL series U-joints must be lubricated at the following intervals:

- Highway Chassis: 161 000 km (100,000 miles) or 6 months*
- Vocational Chassis:
  - — Severe Service: 32 000 km (20,000 miles) or 180 days*
  - — Extra Severe Service: 375 hours or 90 days*

* Whichever occurs first.

NOTE

The slip-joints used with Spicer Life™ driveshafts are “Lubed for Life,” and protected by a bellows. Lubrication of these slip-joints is not required and the bellows must not be disturbed.

ArvinMeritor™ RPL20 and RPL25 Permalube™ Series Driveshafts

The U-joints and slip joints on the RPL20 and RPL25 series driveshafts are permanently lubricated and sealed. Lubrication at regular intervals is not required during the life of the driveshaft.

PREVENTIVE MAINTENANCE PROGRAM

Spicer Life™ SPL-170XL and SPL-250XL Driveshaft — U-Joint Lubrication

Spicer Life™ XL series driveshafts are equipped with “extended-lubrication” U-joints. These U-joints are easily identified by the blue plastic cover in the center of the U-joint cross where the grease fitting is usually located. The XL U-joints must be lubricated initially at the following intervals:

- Highway Chassis: 560 000 km (350,000 miles) or 3 years*
- Vocational Chassis (includes city driving and on/off highway: 161 000 km (100,000 miles) or 1 year*

* Whichever occurs first.

Following the initial lubrication outlined above, Spicer Life™ XL series U-joints must be lubricated at the following intervals:

- Highway Chassis: 161 000 km (100,000 miles) or 6 months*
- Vocational Chassis:
  - — Severe Service: 32 000 km (20,000 miles) or 180 days*
  - — Extra Severe Service: 375 hours or 90 days*

* Whichever occurs first.

NOTE

The slip-joints used with Spicer Life™ driveshafts are “Lubed for Life,” and protected by a bellows. Lubrication of these slip-joints is not required and the bellows must not be disturbed.

ArvinMeritor™ RPL20 and RPL25 Permalube™ Series Driveshafts

The U-joints and slip joints on the RPL20 and RPL25 series driveshafts are permanently lubricated and sealed. Lubrication at regular intervals is not required during the life of the driveshaft.

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ArvinMeritor™ 92N Permalube™ Wing-Style Driveshafts

The U-joints used on the 92N Permalube™ Wing-Style Driveshafts are permanently lubricated and sealed. Lubrication at regular intervals is not required during the life of the driveshaft. The slip joints, however, must be lubricated at each specified chassis lubrication interval. Refer to the preventive maintenance schedules found on pages 17 and 20.

Note 2: An extended service drain interval of 804 600 km (500,000 miles) or 3 years, whichever occurs first, for Highway type operations is permissible for MACK geared drivetrain components (Transmissions and Carriers) IF MACK-specific GO-J PLUS Gear Lubricant is used. For Vocational operations, an extended drain interval of 128 800 km (80,000 miles), 1 year or 1,200 hours, whichever occurs first, is permissible if GO-J PLUS Gear Lubricant is used. An SAE 40 or 50 grade transmission oil, TO-A PLUS, is also available for use in all MACK transmissions. Extended drain intervals for transmissions using TO-A PLUS are 804 600 km (500,000 miles) or 3 years, whichever occurs first, for Highway operations, and 128 800 km (80,000 miles), 1 year or 1,200 hours, whichever occurs first, for Vocational operations.

NOTE

If a MACK axle and/or transmission were initially filled with GO-J PLUS gear lubricant and later “topped-off” with greater than 1-1/2 quarts of GO-J specification gear lubricant, the drain interval is reduced to the GO-J limits (2 years or 402 300 km [250,000 miles]).

PREVENTIVE MAINTENANCE PROGRAM

ArvinMeritor™ 92N Permalube™ Wing-Style Driveshafts

The U-joints used on the 92N Permalube™ Wing-Style Driveshafts are permanently lubricated and sealed. Lubrication at regular intervals is not required during the life of the driveshaft. The slip joints, however, must be lubricated at each specified chassis lubrication interval. Refer to the preventive maintenance schedules found on pages 17 and 20.

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For chassis equipped with Eaton® Fuller® transmissions and Eaton® drive axles, Eaton-specified extended drain interval lubricants (E250 and E500) are available. E250 has a 400 000 km (250,000-mile) drain interval requirement and E500 has an 800 000 km (500,000-mile) drain interval requirement whether these lubricants were “factory filled” or “service filled.” For a list of Eaton-approved extended drain interval lubricants, contact an Eaton® service representative, or visit the Eaton website at www.eaton.com.

Note that transmission and drive axle lubricants for Eaton components are different. Be sure the proper lubricant is being used in the component.

“Service fill” is defined as anytime a component is drained and re-filled with lubricant. This applies whether an approved extended drain interval lubricant is drained and the component is refilled with an approved extended drain interval lubricant, or a petroleum-based lubricant is drained and the component is refilled with an extended drain interval lubricant. “Factory fill” is defined as when the component is filled with lubricant at the assembly plant.

If an Eaton® Fuller® transmission or Eaton drive axle is “factory filled” with a petroleum-based lubricant, and it is desired to change to an approved extended drain interval lubricant, it is recommended that this be done within the first 8 000 km (5,000 miles) of service. If this cannot be done, it is important that seals be checked for leaks, and they be replaced if they are leaking. Seal performance can be jeopardized if an approved extended drain lubricant is used as a “service fill” for a component that has been “factory filled” with a petroleum-base lubricant.

NOTE

Oil changes, filter changes and chassis lubrication intervals listed in this publication are specifically for chassis equipped with MACK components. For oil and filter change information concerning vendor components (transmissions, axles, etc.), consult the specific vendor component service literature.

PREVENTIVE MAINTENANCE PROGRAM

For chassis equipped with Eaton® Fuller® transmissions and Eaton® drive axles, Eaton-specified extended drain interval lubricants (E250 and E500) are available. E250 has a 400 000 km (250,000-mile) drain interval requirement and E500 has an 800 000 km (500,000-mile) drain interval requirement whether these lubricants were “factory filled” or “service filled.” For a list of Eaton-approved extended drain interval lubricants, contact an Eaton® service representative, or visit the Eaton website at www.eaton.com.

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26

Preventive Maintenance Inspection Instructions

The MACK Preventive Maintenance Program is arranged in easy-to-follow steps. Inspections are arranged in A, B, C, D order:

“A” is a light inspection.

“B” is a more detailed check.

“C” is a more extensive inspection and adjustment.

“D” is a comprehensive inspection and adjustment.

“L” is a chassis lubrication.

Perform a road test before each inspection to determine the road worthiness of the vehicle and isolate any specific problems.

Preventive maintenance inspection worksheets A, B, C and D are available through your MACK dealer, and provide a convenient means of keeping track of the maintenance procedures.

NOTE

Form No. TS491 A & B covers schedules A and B.
Form No. TS491 C & D covers schedules C and D.

Order a supply now so you will have them when needed.

For specific questions concerning service, maintenance and lubrication procedures not covered in this manual, or for components not manufactured by Mack Trucks, Inc., refer to the appropriate section of the operator’s manual, service manual or vendor service publications, or consult your MACK dealer.

After performing the operations as listed and noting any adjustments, repairs and replacements on the applicable inspection form, the completed form should be signed by the technician and foreman (or inspector) and filed in the chassis folder.

PREVENTIVE MAINTENANCE PROGRAM

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27

NOISE EMISSION CONTROL

Noise Emission Information

Specific maintenance procedures performed at regularly scheduled intervals are necessary for maintaining noise emissions within acceptable limits throughout the life of the vehicle. This manual includes written instructions pertaining to maintenance items which are required to maintain the efficiency of the noise emission control systems.

Explanations of maintenance items for noise emission-related components are outlined in “CHASSIS INSPECTION” on page 36, along with schedules at which each item must be serviced. Noise emission-related maintenance items are noted as such for easy reference. The Preventive Maintenance Schedule charts outline the MACK recommended time or mileage intervals between service schedules.

Mack Trucks, Inc. recommends that copies of all work orders, invoices and other pertinent information relating to vehicle maintenance be kept on file for later reference. A service log can be found at the end of this manual that provides a convenient place for maintaining a record of service work performed on the chassis. Service records, along with this manual, should be passed along to subsequent owners of the vehicle.

The following information concerning noise emission control systems requirements is provided to familiarize the ultimate purchaser of this vehicle with his responsibilities as the owner, as well as the responsibilities of Mack Trucks, Inc. as the manufacturer.

NOISE EMISSION CONTROL

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The following information concerning noise emission control systems requirements is provided to familiarize the ultimate purchaser of this vehicle with his responsibilities as the owner, as well as the responsibilities of Mack Trucks, Inc. as the manufacturer.

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Noise Emission Control Systems

United States Environmental Protection Agency (EPA) regulations require that vehicle manufacturers provide written instructions for the proper maintenance, use and repair of the vehicle to the ultimate purchaser to provide reasonable assurance of the elimination or minimization of noise emission degradation throughout the life of the vehicle. This manual covers items of maintenance which are necessary to maintain noise emission control efficiency.

Tampering with Noise Control Systems is Prohibited

Among those acts presumed to constitute tampering are those acts listed below:

- Removal, or rendering inoperative, of any exhaust components, including mufflers, heavy or double-wall exhaust tubing, flexible tubing or exhaust pipe clamping.
- Removal, or rendering inoperative, of the temperature-modulated cooling fan system.
- Removal of the cooling fan shroud.
- Removal, or rendering inoperative, of the air cleaner or air intake in-line silencer.
- Removal of the sound deadening material from the hood or cab tunnel.
- Removal, or rendering inoperative, of the engine speed governor so as to allow engine speed to exceed the manufacturer’s specifications.
- Removal of splash shields located inside the wheel housings.
- Removal of engine block shields.
- Removal of engine crankcase shields or insulation.
- Removal of insulated rocker arm covers.
- Removal of transmission noise shields.

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- Removal of splash shields located inside the wheel housings.
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- Removal of engine crankcase shields or insulation.
- Removal of insulated rocker arm covers.
- Removal of transmission noise shields.

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Vehicle Identification Number (VIN) and Model Year Designation

U.S. and Canadian motor-vehicle safety standards require that each chassis manufactured by Mack Trucks, Inc. be identified by a 17-character Vehicle Identification Number (VIN). The VIN can be found at several locations on the chassis. Refer to the Operator's Handbook for exact locations.

The 10th digit of the Vehicle Identification Number identifies the chassis model year. Listed below is a sample VIN with the model year designation highlighted, along with a chart explaining the model year code.

SAMPLE VIN —

1M2N178Y47A012345

MODEL YEAR

YEAR	CODE
2005	5
2006	6
2007	7
2008	8

MODEL YEAR CODE

000104h

Figure 3 — Sample VIN and Model Year Code

NOISE EMISSION CONTROL

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YEAR	CODE
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2008	8

MODEL YEAR CODE

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Figure 3 — Sample VIN and Model Year Code

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ROAD TEST

Before proceeding with the chassis inspections, a road test should be performed to determine the road worthiness of the vehicle and to isolate any specific problems.

ENGINE:	Inspection Schedule
Check operation of engine alarm(s) and shutdown system. The alarms should operate when the key switch is turned ON, before the engine is started, and should shut off when oil pressure, air pressure, etc., reach operating range. The electronic malfunction lamp should turn off approximately two seconds after the engine starts. If the alarms fail to function in this test or other malfunctions are noted, repair as necessary.	**A, B, C, D**
Check the operation of the starter drive mechanism (positive action, no unusual noises).	**A, B, C, D**
Check for rough idling, misfiring, bearing noises, piston slap and knock.	**A, B, C, D**
Check for unusual exhaust. Note the color and intensity of the smoke.	**A, B, C, D**
Record oil pressure kPa (psi) at idle and governed speeds (engine at operating temperature).	**A, B, C, D**
Check voltmeter and record maximum voltage reading.	**A, B, C, D**
Check and record engine coolant temperature in degrees C° (F°) after engine has achieved operating temperature.	**A, B, C, D**
If the engine is equipped with an engine oil temperature gauge, check and record the oil temperature in degrees C° (F°) after the engine has achieved operating temperature.	**A, B, C, D**

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Check for rough idling, misfiring, bearing noises, piston slap and knock. A, B, C, D

Check for unusual exhaust. Note the color and intensity of the smoke. A, B, C, D

Record oil pressure kPa (psi) at idle and governed speeds (engine at operating temperature). A, B, C, D

Check voltmeter and record maximum voltage reading. A, B, C, D

Check and record engine coolant temperature in degrees C° (F°) after engine has achieved operating temperature. A, B, C, D

If the engine is equipped with an engine oil temperature gauge, check and record the oil temperature in degrees C° (F°) after the engine has achieved operating temperature. A, B, C, D

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ENGINE: *(continued)*	Inspection Schedule
Check tachometer operation throughout engine speed range. Note any unsteady pointer operation.	**A, B, C, D**
Check speedometer operation while driving vehicle. Note accuracy and any unsteady pointer operation.	**A, B, C, D**
Check operation of exhaust pyrometer.	**A, B, C, D**

AIR COMPRESSOR:

Check for proper operation. Build-up time of air pressure from 586 to 690 kPa (85 to 100 psi) should not exceed 25 seconds with engine running at maximum governed no-load speed. Rapidly cycle brake treadle valve until reservoir pressure drops below 724 kPa (105 psi). Note and record pressure at which governor cuts in.	**A, B, C, D**
Governor should cutout when reservoir pressure reaches 862–931 kPa (125–135 psi). Note and record pressure at which the governor cuts out. Check operation of low air pressure indicators, both low air pressure indicator light and audible low-air buzzer.	**A, B, C, D**

CLUTCH:

Check clutch pedal free travel. Do not allow less than 1/2 inch of free travel. Adjust to specifications, if necessary. *(See "CLUTCH ADJUSTMENT" on page 247.)*	**A, B, C, D**
Check clutch release when chassis is stopped and the engine is running at low idle. Verify proper clutch brake operation. Increased pedal effort should be felt approximately 6.35–9.53 mm (1/4 to 3/8 inch) from end of clutch pedal travel when pedal is depressed fully.	**A, B, C, D**

ROAD TEST

ENGINE: (continued) — Inspection Schedule

Check tachometer operation throughout engine speed range. Note any unsteady pointer operation. A, B, C, D

Check speedometer operation while driving vehicle. Note accuracy and any unsteady pointer operation. A, B, C, D

Check operation of exhaust pyrometer. A, B, C, D

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STEERING:	Inspection Schedule
Check for *bind* in steering — *Bind* may be caused by inadequate lubrication or worn steering or steering axle components.	**A, B, C, D**
Check for excessive *free play* in steering — *Free play* may be caused by excessive steering gear backlash or loose steering linkage.	**A, B, C, D**
Check for *wander* — *Wander* may be caused by insufficient or unequal caster, camber, inadequate lubrication or excessively worn steering or axle components.	**A, B, C, D**
Check for *shimmy* in steering — *Shimmy* may be caused by unbalanced or out-of-round tires, wheels or brake drums, looseness in steering system, unequal front tire pressure (especially with radial tires).	**A, B, C, D**
Check operation of power steering pump for lack of, or erratic, power assist.	**A, B, C, D**

BRAKES:	
Check for unusual noise during brake operation. Squeal may be caused by glazed lining or lining which is worn to rivets. Chatter may be caused by worn parts.	**A, B, C, D**
Check for pull. Pull may be caused by grease on the linings, worn brake linings and brake drums, misadjustment or malfunctioning self-adjusters.	**A, B, C, D**
Check for drag. Drag may be caused by misadjustment, broken return springs, loose wheel bearings or by malfunctioning brake camshafts.	**A, B, C, D**

ROAD TEST

STEERING:	Inspection Schedule
Check for *bind* in steering — *Bind* may be caused by inadequate lubrication or worn steering or steering axle components.	**A, B, C, D**
Check for excessive *free play* in steering — *Free play* may be caused by excessive steering gear backlash or loose steering linkage.	**A, B, C, D**
Check for *wander* — *Wander* may be caused by insufficient or unequal caster, camber, inadequate lubrication or excessively worn steering or axle components.	**A, B, C, D**
Check for *shimmy* in steering — *Shimmy* may be caused by unbalanced or out-of-round tires, wheels or brake drums, looseness in steering system, unequal front tire pressure (especially with radial tires).	**A, B, C, D**
Check operation of power steering pump for lack of, or erratic, power assist.	**A, B, C, D**

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Check for pull. Pull may be caused by grease on the linings, worn brake linings and brake drums, misadjustment or malfunctioning self-adjusters.	**A, B, C, D**
Check for drag. Drag may be caused by misadjustment, broken return springs, loose wheel bearings or by malfunctioning brake camshafts.	**A, B, C, D**

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PARKING BRAKES:	**Inspection Schedule**
Check application and holding ability of spring brakes. Make sure the warning light indicates spring brake application. Release and reapply the spring brakes.	**A, B, C, D**

HEATER/DEFROSTER:	
Check operation: Proper fan speed control. No excessive noises. Proper temperature output.	**A, B, C, D**

AIR CONDITIONER:	
Check operation. Proper fan speed control. No excessive noises. Proper temperature output.	**A, B, C, D**

TRANSMISSION/AUX TRANS./TRANSFER CASE/FLYWHEEL PTO:

Shifting should take place quickly and quietly. If hang-up or clashing occurs, repair or adjustment is necessary.	**A, B, C, D**
Check lever operation noting any difficult movement or binding which would indicate the need to check the linkage. Check for indications of restricted motion in the linkage which could result in partial gear engagement and transmission damage.	**A, B, C, D**
Check for bearing and gear noises, or excessive vibration at various road speeds.	**A, B, C, D**

ROAD TEST

PARKING BRAKES: Inspection Schedule
Check application and holding ability of spring brakes. Make sure the warning light indicates spring brake application. Release and reapply the spring brakes. A, B, C, D

HEATER/DEFROSTER:
Check operation: A, B, C, D
Proper fan speed control.
No excessive noises.
Proper temperature output.

AIR CONDITIONER:
Check operation. A, B, C, D
Proper fan speed control.
No excessive noises.
Proper temperature output.

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Shifting should take place quickly and quietly. If hang-up or clashing occurs, repair or adjustment is necessary. A, B, C, D
Check lever operation noting any difficult movement or binding which would indicate the need to check the linkage. Check for indications of restricted motion in the linkage which could result in partial gear engagement and transmission damage. A, B, C, D
Check for bearing and gear noises, or excessive vibration at various road speeds. A, B, C, D

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CARRIER:	Inspection Schedule
Check for noise or vibration under drive and coast conditions.	**A, B, C, D**

PROPELLER SHAFT:	
Check for noise or vibration at various road speeds.	**A, B, C, D**

ENGINE BRAKE:	
Turn the engine brake switch on. Marked deceleration should be noted when the foot is removed from the accelerator pedal.	**A, B, C, D**

⚠ DANGER

Testing the engine brake when the vehicle is lightly loaded, particularly when operating on wet or slippery roads, requires extreme caution. Using an engine brake under these conditions may cause the vehicle to skid.

ROAD TEST

CARRIER: Inspection Schedule

Check for noise or vibration under drive and coast conditions. A, B, C, D

PROPELLER SHAFT:

Check for noise or vibration at various road speeds. A, B, C, D

ENGINE BRAKE:

Turn the engine brake switch on. Marked deceleration should be noted when the foot is removed from the accelerator pedal. A, B, C, D

DANGER

Testing the engine brake when the vehicle is lightly loaded, particularly when operating on wet or slippery roads, requires extreme caution. Using an engine brake under these conditions may cause the vehicle to skid.

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CHASSIS INSPECTION

CAB:	Inspection Schedule
Inspect condition of mirrors and cab glass.	**A, B, C, D**
Check operation of horns (air and electric).	**A, B, C, D**
Clean the floor mats and clean any debris from around the treadle valve.	**A, B, C, D**
Observe operation of windshield wipers, making sure they operate in each speed. Check condition and travel of blades.	**A, B, C, D**
Check operation of windshield washers. Make sure the washer reservoir is filled with fluid.	**A, B, C, D**
Check operation and condition of back-up lights, tail lights, brake lights, turn signals, hazard warning flasher, marker lights, headlights (adjust high and low beams, if necessary) and instrument panel lights.	**A, B, C, D**
Lubricate the treadle valve and make sure it is securely mounted.	**B, C, D**
Check the engine cover for cracks or broken-out sections. ***Noise Emission Control Maintenance.***	**B, C, D**
Check condition and operation of seats and seatbelts, doors and latches, hood and latches.	**C, D**

CHASSIS INSPECTION

CHASSIS INSPECTION

CAB:	Inspection Schedule
Inspect condition of mirrors and cab glass.	**A, B, C, D**
Check operation of horns (air and electric).	**A, B, C, D**
Clean the floor mats and clean any debris from around the treadle valve.	**A, B, C, D**
Observe operation of windshield wipers, making sure they operate in each speed. Check condition and travel of blades.	**A, B, C, D**
Check operation of windshield washers. Make sure the washer reservoir is filled with fluid.	**A, B, C, D**
Check operation and condition of back-up lights, tail lights, brake lights, turn signals, hazard warning flasher, marker lights, headlights (adjust high and low beams, if necessary) and instrument panel lights.	**A, B, C, D**
Lubricate the treadle valve and make sure it is securely mounted.	**B, C, D**
Check the engine cover for cracks or broken-out sections. ***Noise Emission Control Maintenance.***	**B, C, D**
Check condition and operation of seats and seatbelts, doors and latches, hood and latches.	**C, D**

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CAB: *(continued)*	**Inspection Schedule**
Check condition of steel/fiberglass body panels, bumpers and steps. Check torque of chassis fairing fasteners. Two different types of M8 x 1.25 fasteners are used on the fairings, torque values are as follows:	**C, D**

- Pan head Torx® drive, M8 x 1.25 — 5.4 N•m (48 lb-in)
- Flanged hex head capscrew, M8 x 1.25 — 10.9 N•m (96 lb-in)

NOTE

The above torque values are for applications where the head of the fastener contacts the fiberglass fairing. The M8 x 1.25 Torx® drive pan head screw is also used in certain locations where the head of the screw contacts a metal bracket. In those applications, the pan head screw is tightened to 25.8 N•m (19 lb-ft).

Check the condition of the cab mounting. Inspect and adjust cab rear mounting (air-suspended cabs) as required. On LE and MR models, check the anti-vibration pads on the cab mount V-brackets for wear. Replace any pads that are worn or missing. Also check alignment of the cab mount V-blocks and adjust as required. (Refer to "CAB MOUNT MAINTENANCE — LEU AND MRU MODELS" on page 240.)	**C, D**
Check the condition of the sound-absorbing material that is affixed to the hood and/or cab. Check for tears and for suitable attachment. Excessive dirt can be removed with a mild soap and water solution. ***Noise Emission Control Maintenance.***	**C, D**

CHASSIS INSPECTION

CAB: *(continued)*	**Inspection Schedule**
Check condition of steel/fiberglass body panels, bumpers and steps. Check torque of chassis fairing fasteners. Two different types of M8 x 1.25 fasteners are used on the fairings, torque values are as follows:	**C, D**

- Pan head Torx® drive, M8 x 1.25 — 5.4 N•m (48 lb-in)
- Flanged hex head capscrew, M8 x 1.25 — 10.9 N•m (96 lb-in)

NOTE

The above torque values are for applications where the head of the fastener contacts the fiberglass fairing. The M8 x 1.25 Torx® drive pan head screw is also used in certain locations where the head of the screw contacts a metal bracket. In those applications, the pan head screw is tightened to 25.8 N•m (19 lb-ft).

Check the condition of the cab mounting. Inspect and adjust cab rear mounting (air-suspended cabs) as required. On LE and MR models, check the anti-vibration pads on the cab mount V-brackets for wear. Replace any pads that are worn or missing. Also check alignment of the cab mount V-blocks and adjust as required. (Refer to "CAB MOUNT MAINTENANCE — LEU AND MRU MODELS" on page 240.)	**C, D**
Check the condition of the sound-absorbing material that is affixed to the hood and/or cab. Check for tears and for suitable attachment. Excessive dirt can be removed with a mild soap and water solution. ***Noise Emission Control Maintenance.***	**C, D**

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CAB: *(continued)*	Inspection Schedule
Check the splash shields that are located inside the wheel housings. Look for tears or broken-out sections. ***Noise Emission Control Maintenance.***	**C, D**
Check operation of window regulators.	**C, D**
V-MAC:	
Check for any faults which may be logged into the V-MAC system. Refer to the applicable V-MAC® Operator’s Manual or the V-MAC® Service Manual for complete troubleshooting procedures and fault diagnosis.	**A, B, C, D**
TILT CAB:	
Check cab tilt pump reservoir fluid level. Add fluid, if necessary. (See “LUBRICANT SPECIFICATIONS” on page 267.)	**B, C, D**
Check operation and condition of tilt mechanism, latches, safety prop, hinges and brackets.	**B, C, D**
Check anti-vibration pads on frame-mounted V-brackets and replace if missing or damaged.	**C, D**
Check and adjust (as required) cab rear mounting alignment.	**C, D**

CHASSIS INSPECTION

CAB: *(continued)*	Inspection Schedule
Check the splash shields that are located inside the wheel housings. Look for tears or broken-out sections. ***Noise Emission Control Maintenance.***	**C, D**
Check operation of window regulators.	**C, D**
V-MAC:	
Check for any faults which may be logged into the V-MAC system. Refer to the applicable V-MAC® Operator’s Manual or the V-MAC® Service Manual for complete troubleshooting procedures and fault diagnosis.	**A, B, C, D**
TILT CAB:	
Check cab tilt pump reservoir fluid level. Add fluid, if necessary. (See “LUBRICANT SPECIFICATIONS” on page 267.)	**B, C, D**
Check operation and condition of tilt mechanism, latches, safety prop, hinges and brackets.	**B, C, D**
Check anti-vibration pads on frame-mounted V-brackets and replace if missing or damaged.	**C, D**
Check and adjust (as required) cab rear mounting alignment.	**C, D**

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BATTERY:	Inspection Schedule
If equipped with low maintenance-type battery with removable plastic caps, check that the electrolyte level is a minimum of 9.5 mm (3/8 inch) above plates. Add distilled or good drinking water (no mineral water), if necessary. On maintenance-free batteries with flush-type cover, check state-of-charge indicator.	**A, B, C, D**
Clean battery terminals with solution of baking soda or household ammonia. Flush with clear water and dry. Tighten terminals. Coat terminals with light film of non-metallic grease.	**B, C, D**
Check condition and routing of the battery cables. Make sure there is no possibility of chafing and/or shorting.	**B, C, D**
For low maintenance-type batteries, test the electrolyte with a hydrometer: 1.250–1.280 battery OK — less than 1.250, remove battery and recharge. Check with high discharge rate cell tester.	**C, D**
Remove batteries. Clean top and case. Make sure case is not cracked. Clean, paint and tighten battery hold-down arrangement.	**C, D**

CHASSIS INSPECTION

BATTERY:	Inspection Schedule
If equipped with low maintenance-type battery with removable plastic caps, check that the electrolyte level is a minimum of 9.5 mm (3/8 inch) above plates. Add distilled or good drinking water (no mineral water), if necessary. On maintenance-free batteries with flush-type cover, check state-of-charge indicator.	**A, B, C, D**
Clean battery terminals with solution of baking soda or household ammonia. Flush with clear water and dry. Tighten terminals. Coat terminals with light film of non-metallic grease.	**B, C, D**
Check condition and routing of the battery cables. Make sure there is no possibility of chafing and/or shorting.	**B, C, D**
For low maintenance-type batteries, test the electrolyte with a hydrometer: 1.250–1.280 battery OK — less than 1.250, remove battery and recharge. Check with high discharge rate cell tester.	**C, D**
Remove batteries. Clean top and case. Make sure case is not cracked. Clean, paint and tighten battery hold-down arrangement.	**C, D**

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STARTER:	Inspection Schedule
Check tightness of the starter mounting bolts and the nuts that secure the cables to both the starter solenoid and the starter motor. Torque specifications are as follows: • Starter mounting bolts — 260 N•m (192 lb-ft) • Starter cable nut (1/2 x 13) — 26 N•m (270 lb-in) • Starter relay nuts (#10-32) — 2.6 N•m (23 lb-in)	**C, D**

CAUTION

Disconnect the batteries by disconnecting the negative battery first, then the positive cable before checking the tightness of the starter and starter solenoid cable nuts.

AIR STARTER:	
Clean the strainer which is in line to the control valve.	**C, D**
Check air starting system for leakage (should not exceed 14 kPa [2 psi] per hour from 897 kPa [130 psi]).	**C, D**
Remove safety valve and test; should open at 1034 kPa (150 psi). Check pressure regulator; should open at 655 kPa (95 psi).	**C, D**
Check operation of control valve. Check operation of check valve by reducing main air reservoir pressure.	**C, D**
Check air starter reservoir mounting.	**C, D**

CHASSIS INSPECTION

STARTER: Inspection Schedule

Check tightness of the starter mounting bolts and the nuts that secure the cables to both the starter solenoid and the starter motor. Torque specifications are as follows: C, D

• Starter mounting bolts — 260 N•m (192 lb-ft)
• Starter cable nut (1/2 x 13) — 26 N•m (270 lb-in)
• Starter relay nuts (#10-32) — 2.6 N•m (23 lb-in)

CAUTION

Disconnect the batteries by disconnecting the negative battery first, then the positive cable before checking the tightness of the starter and starter solenoid cable nuts.

AIR STARTER:

Clean the strainer which is in line to the control valve. C, D

Check air starting system for leakage (should not exceed 14 kPa [2 psi] per hour from 897 kPa [130 psi]). C, D

Remove safety valve and test; should open at 1034 kPa (150 psi). Check pressure regulator; should open at 655 kPa (95 psi). C, D

Check operation of control valve. Check operation of check valve by reducing main air reservoir pressure. C, D

Check air starter reservoir mounting. C, D

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AIR SYSTEM:	Inspection Schedule
Inspect the air system for leaks by fully pressurizing the system, releasing the parking brakes and observing any pressure drop as indicated by the dashboard air pressure gauge. Pressure drop should be less than 2 psi per minute for a truck, or less than 3 psi per minute for a tractor and trailer combination. Make a full treadle application and again check for leaks by observing the air pressure gauge. Pressure drop should not exceed 3 psi per minute for a truck, or 4 psi per minute for a tractor and trailer combination.	**A, B, C, D**
With air reservoirs fully charged, drain reservoirs slowly and completely. Spring brakes should apply automatically when air pressure decreases to 276 kPa (40 psi).	**A, B, C, D**
Check alcohol evaporator reservoir level (if so equipped). Add fluid, if necessary. (Use only 188 proof methanol alcohol.) Check that the connections are tight.	**A, B, C, D**
Check air dryer for proper operation. Consult the air dryer manufacturer's service literature for recommended service intervals and procedures.	**B, C, D**
Check the condition of all brake hoses. Check for interference and/or chafing.	**B, C, D**
Check mounting of air reservoirs.	**C, D**
Perform dual circuit brake test. (Refer to "Dual Circuit Brake System Function Test" on page 232.)	**C, D**

CHASSIS INSPECTION

AIR SYSTEM:	Inspection Schedule
Inspect the air system for leaks by fully pressurizing the system, releasing the parking brakes and observing any pressure drop as indicated by the dashboard air pressure gauge. Pressure drop should be less than 2 psi per minute for a truck, or less than 3 psi per minute for a tractor and trailer combination. Make a full treadle application and again check for leaks by observing the air pressure gauge. Pressure drop should not exceed 3 psi per minute for a truck, or 4 psi per minute for a tractor and trailer combination.	**A, B, C, D**
With air reservoirs fully charged, drain reservoirs slowly and completely. Spring brakes should apply automatically when air pressure decreases to 276 kPa (40 psi).	**A, B, C, D**
Check alcohol evaporator reservoir level (if so equipped). Add fluid, if necessary. (Use only 188 proof methanol alcohol.) Check that the connections are tight.	**A, B, C, D**
Check air dryer for proper operation. Consult the air dryer manufacturer's service literature for recommended service intervals and procedures.	**B, C, D**
Check the condition of all brake hoses. Check for interference and/or chafing.	**B, C, D**
Check mounting of air reservoirs.	**C, D**
Perform dual circuit brake test. (Refer to "Dual Circuit Brake System Function Test" on page 232.)	**C, D**

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Service air system components:

⚠ WARNING

To prevent possible injury, chock wheels and drain air brake system completely before performing any maintenance on air brake system components.

Governor	Inspection Schedule
Check governor cut-in/cutout operation and test for excessive leakage. Replace, if necessary.	**A, B, C, D**

Low Pressure Indicator Double Check Valve and Stoplamp Switch	
Check lamps and electrical connections.	**B, C, D**
Check operation and test for excessive leakage. Replace if necessary.	**B, C, D**

Trailer Supply Valve Tractor Parking Brake Control Valve Parking Control Valve Trailer Control Valve	
Check operation of valves and test for excessive leakage. Replace, if necessary.	**B, C, D**

CHASSIS INSPECTION

Service air system components:

⚠ WARNING

To prevent possible injury, chock wheels and drain air brake system completely before performing any maintenance on air brake system components.

Governor — Inspection Schedule
Check governor cut-in/cutout operation and test for excessive leakage. Replace, if necessary. — A, B, C, D

Low Pressure Indicator
Double Check Valve and Stoplamp Switch
Check lamps and electrical connections. — B, C, D
Check operation and test for excessive leakage. Replace if necessary. — B, C, D

Trailer Supply Valve
Tractor Parking Brake Control Valve
Parking Control Valve
Trailer Control Valve
Check operation of valves and test for excessive leakage. Replace, if necessary. — B, C, D

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Check Valve **Double Check Valve**	**Inspection Schedule**
Check operation of valves and test for excessive leakage. Replace, if necessary.	**B, C, D**

Treadle Valve **Quick Release Valve** **Ratio Valve** **Pressure Protection Valve** **Tractor Protection Valve** **Spring Brake Control Valve** **Relay Valve**	
Check operation of valves and test for excessive leakage. Replace, if necessary.	**B, C, D**

COOLING SYSTEM:

Check the cooling system for leaks.	**A, B, C, D**
Check the coolant level in the radiator, recovery tank or surge tank. Refer to “COOLING SYSTEM” on page 91 for information. Add coolant, if necessary. Mack Trucks, Inc. recommends a coolant mixture between 40% – 60% of antifreeze/quality water. Do not exceed a 60% concentration of antifreeze.	**A, B, C, D**

NOTE

At each oil and filter change interval, test the coolant and add supplemental coolant additive (SCA) packets or change the coolant conditioner as required. Refer to “Coolant Conditioning” on page 100 for detailed information.

CHASSIS INSPECTION

Check Valve
Double Check Valve — Inspection Schedule

Check operation of valves and test for excessive leakage. Replace, if necessary. B, C, D

Treadle Valve
Quick Release Valve
Ratio Valve
Pressure Protection Valve
Tractor Protection Valve
Spring Brake Control Valve
Relay Valve

Check operation of valves and test for excessive leakage. Replace, if necessary. B, C, D

COOLING SYSTEM:

Check the cooling system for leaks. A, B, C, D

Check the coolant level in the radiator, recovery tank or surge tank. Refer to “COOLING SYSTEM” on page 91 for information. Add coolant, if necessary. Mack Trucks, Inc. recommends a coolant mixture between 40% – 60% of antifreeze/quality water. Do not exceed a 60% concentration of antifreeze. A, B, C, D

NOTE

At each oil and filter change interval, test the coolant and add supplemental coolant additive (SCA) packets or change the coolant conditioner as required. Refer to “Coolant Conditioning” on page 100 for detailed information.

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COOLING SYSTEM: *(continued)*	Inspection Schedule
Check inside the radiator for corrosion. (See "Cooling System Corrosion" on page 103.)	**A, B, C, D**
Check and record degree of antifreeze protection. Add antifreeze to obtain required protection level for anticipated ambient temperatures.	**C, D**
Check condition of hoses and clamps. Check for leaks and tighten all hose clamps. ***Gaseous Emission Control Maintenance.***	**A, B, C, D**
Inspect radiator cap gasket. Pressure-test cap. MACK MP engines use a 16-lb. pressure cap.	**C, D**
Using compressed air delivered from the rear of the radiator, clean the core fins and tubes. ***Gaseous Emission Control Maintenance.***	**C, D**
Clean any debris that may have accumulated between the radiator core, charge air cooler core and the air conditioner condenser core.	**C, D**
Check condition and security of the radiator mounts.	**C, D**
Inspect the cooling fan shroud for tears or broken-out sections. Also check for proper alignment between the fan and the shroud. ***Noise Emission Control Maintenance.***	**C, D**
Inspect the electronically controlled viscous fan drive for leakage, and make sure it is securely mounted. With the engine stopped (cold engine) turn the fan by hand to ensure the drive is not seized. Inspect the air-controlled fan clutch (if so equipped) for proper operation. Check the fan for bent, cracked or broken blades and replace as necessary. ***Noise Emission Control Maintenance.***	**C, D**

CHASSIS INSPECTION

COOLING SYSTEM: *(continued)*	Inspection Schedule
Check inside the radiator for corrosion. (See "Cooling System Corrosion" on page 103.)	**A, B, C, D**
Check and record degree of antifreeze protection. Add antifreeze to obtain required protection level for anticipated ambient temperatures.	**C, D**
Check condition of hoses and clamps. Check for leaks and tighten all hose clamps. ***Gaseous Emission Control Maintenance.***	**A, B, C, D**
Inspect radiator cap gasket. Pressure-test cap. MACK MP engines use a 16-lb. pressure cap.	**C, D**
Using compressed air delivered from the rear of the radiator, clean the core fins and tubes. ***Gaseous Emission Control Maintenance.***	**C, D**
Clean any debris that may have accumulated between the radiator core, charge air cooler core and the air conditioner condenser core.	**C, D**
Check condition and security of the radiator mounts.	**C, D**
Inspect the cooling fan shroud for tears or broken-out sections. Also check for proper alignment between the fan and the shroud. ***Noise Emission Control Maintenance.***	**C, D**
Inspect the electronically controlled viscous fan drive for leakage, and make sure it is securely mounted. With the engine stopped (cold engine) turn the fan by hand to ensure the drive is not seized. Inspect the air-controlled fan clutch (if so equipped) for proper operation. Check the fan for bent, cracked or broken blades and replace as necessary. ***Noise Emission Control Maintenance.***	**C, D**

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ALTERNATOR:	Inspection Schedule
Make sure alternator is securely mounted. Tighten the alternator mounting hardware to the following specifications: • Alternator top mounting bolt — 81–95 N•m (60–70 lb-ft) • Alternator adjusting link bolt — 81–95 N•m (60–70 lb-ft) • Alternator lower mounting bolt — 81–95 N•m (60–70 lb-ft) • Alternator mounting bracket-to-block — 82–92 N•m (61–68 lb-ft)	**B, C, D**
Inspect alternator connections.	**C, D**
EXTERNAL REGULATOR:	
Check mounting and connections.	**C, D**

CHASSIS INSPECTION

ALTERNATOR:	Inspection Schedule
Make sure alternator is securely mounted. Tighten the alternator mounting hardware to the following specifications: • Alternator top mounting bolt — 81–95 N•m (60–70 lb-ft) • Alternator adjusting link bolt — 81–95 N•m (60–70 lb-ft) • Alternator lower mounting bolt — 81–95 N•m (60–70 lb-ft) • Alternator mounting bracket-to-block — 82–92 N•m (61–68 lb-ft)	**B, C, D**
Inspect alternator connections.	**C, D**
EXTERNAL REGULATOR:	
Check mounting and connections.	**C, D**

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BELTS:	Inspection Schedule
Check condition of all drive belts. Replace any frayed, cracked, worn or oil-soaked belts.	**A, B, C, D**
If the engine is not equipped with an automatic tensioner, use a tension gauge to check and adjust belt tension.	**A, B, C, D**

NOTE

On engines equipped with an automatic belt tensioner, belt tension cannot be checked. If the belt is loose, check the condition of the automatic belt tensioner and replace as necessary.

Using a straight edge, check the alignment of all belt pulleys.	**B, C, D**
Check condition of the automatic belt tensioner. (Refer to “Automatic Belt Tensioner Maintenance” on page 87.)	**D**

CHASSIS INSPECTION

BELTS:	Inspection Schedule
Check condition of all drive belts. Replace any frayed, cracked, worn or oil-soaked belts.	**A, B, C, D**
If the engine is not equipped with an automatic tensioner, use a tension gauge to check and adjust belt tension.	**A, B, C, D**

NOTE

On engines equipped with an automatic belt tensioner, belt tension cannot be checked. If the belt is loose, check the condition of the automatic belt tensioner and replace as necessary.

Using a straight edge, check the alignment of all belt pulleys.	**B, C, D**
Check condition of the automatic belt tensioner. (Refer to “Automatic Belt Tensioner Maintenance” on page 87.)	**D**

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ENGINE:	Inspection Schedule
Check engine oil level. Add oil, if necessary. (See “LUBRICANT SPECIFICATIONS” on page 267.)	**A, B, C, D**
Inspect engine for any leakage of fuel, oil, coolant, air or exhaust. Correct as required.	**A, B, C, D**

NOTE

Information outlining fuel injection nozzle maintenance, fuel filter changes and engine oil and oil filter changes is given in the SPECIFIC MAINTENANCE section of this manual.

EGR System — **A, B, C, D**

- **Wire Harnesses/Connectors** — *Inspect protective coatings on wire harnesses and connectors, especially heat resistant coverings (reflective and/or insulated). Make sure all protective coverings are returned to their original positions if disturbed. Repair or replace defective parts as required.* ***Gaseous Emission Control Maintenance.***
- **EGR Tubes and Hoses** — *Inspect connecting tubes and hoses for signs of leakage or chafing. Replace and/or repair defective parts as required.* ***Gaseous Emission Control Maintenance.***

Check viscous-type vibration dampers for dents and leakage.	**C, D**
Inspect front and rear engine mount insulators for deterioration. If metal members come in contact, replace insulator.	**C, D**

CHASSIS INSPECTION

ENGINE: Inspection Schedule

Check engine oil level. Add oil, if necessary. (See “LUBRICANT SPECIFICATIONS” on page 267.) A, B, C, D

Inspect engine for any leakage of fuel, oil, coolant, air or exhaust. Correct as required. A, B, C, D

NOTE

Information outlining fuel injection nozzle maintenance, fuel filter changes and engine oil and oil filter changes is given in the SPECIFIC MAINTENANCE section of this manual.

EGR System A, B, C, D

- Wire Harnesses/Connectors — Inspect protective coatings on wire harnesses and connectors, especially heat resistant coverings (reflective and/or insulated). Make sure all protective coverings are returned to their original positions if disturbed. Repair or replace defective parts as required. Gaseous Emission Control Maintenance.
- EGR Tubes and Hoses — Inspect connecting tubes and hoses for signs of leakage or chafing. Replace and/or repair defective parts as required. Gaseous Emission Control Maintenance.

Check viscous-type vibration dampers for dents and leakage. C, D

Inspect front and rear engine mount insulators for deterioration. If metal members come in contact, replace insulator. C, D

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AIR CLEANER:	Inspection Schedule
Replace the element with a MACK-approved element according to MACK recommendations when the indicator locks in the red zone, or the gauge indicates 20 or 25 inches of water for applicable engine. Refer to "AIR CLEANER MAINTENANCE" on page 113 for a listing of inlet restriction per engine model. Reset indicator after element change. The air filter element should be replaced yearly, even if maximum restriction has not been reached. ***Gaseous Emission Control Maintenance.***	**A, B, C, D**

ENGINE AIR INDUCTION SYSTEM:

Inspect condition of all hoses, pipes, ducts, tubing, elbow connections and inline intake silencers. Check for alignment, leakage, engagement and possible interference. Replace any items having cracks or holes. ***Noise & Gaseous Emission Control Maintenance.***	**A, B, C, D**
Inspect all clamps, brackets and fasteners. Torque all hose clamps. (See "HOSE CLAMP TORQUES" on page 110.) ***Noise Emission Control Maintenance.***	**A, B, C, D**
Check all turbocharger connections for tightness and leaks. Repair as necessary.	**A, B, C, D**

NOTE

Additional turbocharger maintenance procedures are given under "TURBOCHARGERS" on page 117.

CHASSIS INSPECTION

AIR CLEANER: Inspection Schedule

Replace the element with a MACK-approved element according to MACK recommendations when the indicator locks in the red zone, or the gauge indicates 20 or 25 inches of water for applicable engine. Refer to "AIR CLEANER MAINTENANCE" on page 113 for a listing of inlet restriction per engine model. Reset indicator after element change. The air filter element should be replaced yearly, even if maximum restriction has not been reached. Gaseous Emission Control Maintenance. A, B, C, D

ENGINE AIR INDUCTION SYSTEM:

Inspect condition of all hoses, pipes, ducts, tubing, elbow connections and inline intake silencers. Check for alignment, leakage, engagement and possible interference. Replace any items having cracks or holes. Noise & Gaseous Emission Control Maintenance. A, B, C, D

Inspect all clamps, brackets and fasteners. Torque all hose clamps. (See "HOSE CLAMP TORQUES" on page 110.) Noise Emission Control Maintenance. A, B, C, D

Check all turbocharger connections for tightness and leaks. Repair as necessary. A, B, C, D

NOTE

Additional turbocharger maintenance procedures are given under "TURBOCHARGERS" on page 117.

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CHASSIS-MOUNTED CHARGE AIR COOLERS:	Inspection Schedule
Check all air ducts and gasket connections. Torque hose clamps to specifications. Refer to “HOSE CLAMP TORQUES” on page 110. ***Gaseous Emission Control Maintenance.***	**A, B, C, D**
Check charge air cooler core fins for external damage, debris or salt corrosion. Use a firm bristle brush to remove corrosion, and compressed air to clean debris from the core. ***Gaseous Emission Control Maintenance.***	**C, D**
Check for cracks in the welds that join the side tanks to the core, and check the mounting brackets for security and condition. Torque mounts to 41 N•m (30 lb-ft). **Gaseous Emission Control Maintenance.**	**C, D**
FUEL SYSTEM:	
Check nozzle lines for leaks and clamps for tightness. Be sure lines do not rub.	**C, D**

CHASSIS INSPECTION

CHASSIS-MOUNTED CHARGE AIR COOLERS: Inspection Schedule

Check all air ducts and gasket connections. Torque hose clamps to specifications. Refer to “HOSE CLAMP TORQUES” on page 110. Gaseous Emission Control Maintenance. A, B, C, D

Check charge air cooler core fins for external damage, debris or salt corrosion. Use a firm bristle brush to remove corrosion, and compressed air to clean debris from the core. Gaseous Emission Control Maintenance. C, D

Check for cracks in the welds that join the side tanks to the core, and check the mounting brackets for security and condition. Torque mounts to 41 N•m (30 lb-ft). Gaseous Emission Control Maintenance. C, D

FUEL SYSTEM:

Check nozzle lines for leaks and clamps for tightness. Be sure lines do not rub. C, D

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FUEL TANKS:	Inspection Schedule
Check filler cap and gasket for proper sealing.	**B, C, D**
Check for plugged or obstructed fuel tank vents.	**C, D**
Inspect the fuel tank mounting and fuel line clamps.	**C, D**

NOTE

The fuel tank caps on some MACK diesel powered chassis are vented. Should the cap be lost or damaged in any way, it must be replaced with a MACK approved vented cap only. Using any other type of cap may result in fuel tank damage and/or poor engine performance.

Certain other MACK chassis have vented fuel tanks and do not use vented fuel tank caps.

Do not fill the fuel tanks to more than 95% of liquid capacity.

CHASSIS INSPECTION

FUEL TANKS: Inspection Schedule

Check filler cap and gasket for proper sealing. B, C, D

Check for plugged or obstructed fuel tank vents. C, D

Inspect the fuel tank mounting and fuel line clamps. C, D

NOTE

The fuel tank caps on some MACK diesel powered chassis are vented. Should the cap be lost or damaged in any way, it must be replaced with a MACK approved vented cap only. Using any other type of cap may result in fuel tank damage and/or poor engine performance.

Certain other MACK chassis have vented fuel tanks and do not use vented fuel tank caps.

Do not fill the fuel tanks to more than 95% of liquid capacity.

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DIESEL PARTICULATE FILTER/EXHAUST SYSTEM:	Inspection Schedule
Inspect the exhaust system for leaks at the seams, and the inlet and outlet connections. Also check for holes in the muffler body. Replace as necessary. ***Noise Emission Control Maintenance.***	**A, B, C, D**
Inspect the exhaust system tubing for holes, including all flexible pipes, and check for exhaust gas leakage at all connections. Replace as necessary. ***Noise Emission Control Maintenance.***	**A, B, C, D**
Check for gasket leakage at the exhaust manifold and at the turbocharger connections. ***Noise Emission Control Maintenance.***	**A, B, C, D**
Inspect the condition of all exhaust system clamps. Tighten or replace as required. ***Noise Emission Control Maintenance.***	**B, C, D**

CHASSIS INSPECTION

DIESEL PARTICULATE FILTER/EXHAUST SYSTEM: Inspection Schedule

Inspect the exhaust system for leaks at the seams, and the inlet and outlet connections. Also check for holes in the muffler body. Replace as necessary. ***Noise Emission Control Maintenance.*** **A, B, C, D**

Inspect the exhaust system tubing for holes, including all flexible pipes, and check for exhaust gas leakage at all connections. Replace as necessary. ***Noise Emission Control Maintenance.*** **A, B, C, D**

Check for gasket leakage at the exhaust manifold and at the turbocharger connections. ***Noise Emission Control Maintenance.*** **A, B, C, D**

Inspect the condition of all exhaust system clamps. Tighten or replace as required. ***Noise Emission Control Maintenance.*** **B, C, D**

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DIESEL PARTICULATE FILTER/EXHAUST SYSTEM: *(continued)*	Inspection Schedule
Check the condition of all exhaust system supports and brackets. Repair or replace as necessary. ***Noise Emission Control Maintenance.***	**B, C, D**

NOTE

The ash cleaning interval for both catalyzed and non-catalyzed DPF systems is 400 000 km/ 250,000 miles or 4,500 hours, whichever occurs first.

NOTE

For catalyzed DPF systems, the aftertreatment hydrocarbon injector (AHI) must be cleaned at each 240 000 km/150,000 mile or 4,500 hour interval, whichever occurs first.

NOTE

For the non-catalyzed DPF system, clean the ignition electrodes and the injection nozzle at each 161 000 km/100,000 mile or 2,400 hour interval, whichever occurs first.

CHASSIS INSPECTION

DIESEL PARTICULATE FILTER/EXHAUST SYSTEM: (continued) Inspection Schedule
Check the condition of all exhaust system supports and brackets. Repair or replace as necessary. Noise Emission Control Maintenance. B, C, D

NOTE
The ash cleaning interval for both catalyzed and non-catalyzed DPF systems is 400 000 km/ 250,000 miles or 4,500 hours, whichever occurs first.

NOTE
For catalyzed DPF systems, the aftertreatment hydrocarbon injector (AHI) must be cleaned at each 240 000 km/150,000 mile or 4,500 hour interval, whichever occurs first.

NOTE
For the non-catalyzed DPF system, clean the ignition electrodes and the injection nozzle at each 161 000 km/100,000 mile or 2,400 hour interval, whichever occurs first.

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CLUTCH:	Inspection Schedule
Inspect linkage for wear.	**C, D**
Check clutch pedal free travel. DO NOT allow less than 12.7 mm (1/2 inch) of free travel. If not within specifications, adjust as necessary. (See “CLUTCH ADJUSTMENT” on page 247.)	**C, D**

STEERING GEAR:	
Perform a static shake test to check for wear and/or looseness in the steering linkage (steering shaft U-joints and yokes, drag link ends and cross steer tube ends). Refer to “FRONT AXLE STATIC SHAKE TEST” on page 182.	**A, B, C, D**
Inspect the condition of the steering gear mounting brackets, and check the tightness of all the fasteners. Inspect the steering gear for leaks.	**A, B, C, D**
Check the torque of the steering shaft pinch bolts. Replace any corroded pinch bolts or nuts.	**C, D**

POWER STEERING:	
Check for leakage in the hoses, pump, steering gear and reservoir.	**A, B, C, D**
Check fluid level in reservoir and add fluid, if necessary.	**A, B, C, D**
Check relief stop settings.	**C, D**
Change power steering fluid and filter. Refer to “Power Steering Fluid Change” on page 155 for more information.	**D**

CHASSIS INSPECTION

CLUTCH:	Inspection Schedule
Inspect linkage for wear.	**C, D**
Check clutch pedal free travel. DO NOT allow less than 12.7 mm (1/2 inch) of free travel. If not within specifications, adjust as necessary. (See “CLUTCH ADJUSTMENT” on page 247.)	**C, D**

STEERING GEAR:	
Perform a static shake test to check for wear and/or looseness in the steering linkage (steering shaft U-joints and yokes, drag link ends and cross steer tube ends). Refer to “FRONT AXLE STATIC SHAKE TEST” on page 182.	**A, B, C, D**
Inspect the condition of the steering gear mounting brackets, and check the tightness of all the fasteners. Inspect the steering gear for leaks.	**A, B, C, D**
Check the torque of the steering shaft pinch bolts. Replace any corroded pinch bolts or nuts.	**C, D**

POWER STEERING:	
Check for leakage in the hoses, pump, steering gear and reservoir.	**A, B, C, D**
Check fluid level in reservoir and add fluid, if necessary.	**A, B, C, D**
Check relief stop settings.	**C, D**
Change power steering fluid and filter. Refer to “Power Steering Fluid Change” on page 155 for more information.	**D**

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Axle Alignment:

NOTE

For information concerning factors that influence tire wear, tire rotation, driving habits, tire loading, tire inspection, tire selection and inflation pressures, refer to “Factors That Influence Tire Wear” on page 224.

NOTE

At the first A inspection interval, front and rear axle alignment must be checked and adjusted if out of specification. Thereafter, front axle alignment should be checked and adjusted at each C and D interval, and rear axle alignment should be checked and adjusted at each D interval.

STEERING AXLE ALIGNMENT:	Inspection Schedule
Under normal use, toe may change and occasional adjustment is recommended to optimize tire wear and handling. Check toe and adjust if out of specification. If driver reports indicate need, or irregular tire wear is present, check caster and adjust if out of specification.	C, D

CHASSIS INSPECTION

Axle Alignment:

NOTE

For information concerning factors that influence tire wear, tire rotation, driving habits, tire loading, tire inspection, tire selection and inflation pressures, refer to “Factors That Influence Tire Wear” on page 224.

NOTE

At the first A inspection interval, front and rear axle alignment must be checked and adjusted if out of specification. Thereafter, front axle alignment should be checked and adjusted at each C and D interval, and rear axle alignment should be checked and adjusted at each D interval.

STEERING AXLE ALIGNMENT: Inspection Schedule

Under normal use, toe may change and occasional adjustment is recommended to optimize tire wear and handling. Check toe and adjust if out of specification. If driver reports indicate need, or irregular tire wear is present, check caster and adjust if out of specification. C, D

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REAR AXLE(S) ALIGNMENT:	**Inspection Schedule**
If the vehicle is equipped with one of the following adjustable rear suspensions, MACK AL, AL II, MaxAir™ 40/40A, MaxLite™ 20–40, MaxLite™ 20–40 EZ, ST, Chalmers, Hendrickson Bar Pin, Neway or Reyco, check axle alignment and adjust as required.	**D**

NOTE

If the vehicle is equipped with one of the following non-adjustable suspensions, MACK SS, SW or Hendrickson straight pin, tires should be monitored for signs of irregular wear. Tire rotation is recommended to optimize tire life and achieve even wear. The suspension should be monitored for signs of component wear.

Before checking axle alignment on non-adjustable suspensions, a thorough inspection of all components that require maintenance must be performed. Any component in need of replacement or maintenance must be repaired prior to performing an axle alignment. Refer to the *Frame, Axle and Suspension Service and Total Vehicle Alignment*, 14-103, for proper repair/replacement of suspension components.

FRONT DRIVE AXLE:

Check carrier lube level. Add oil, if necessary.	**C, D**

CHASSIS INSPECTION

REAR AXLE(S) ALIGNMENT: Inspection Schedule

If the vehicle is equipped with one of the following adjustable rear suspensions, MACK AL, AL II, MaxAir™ 40/40A, MaxLite™ 20–40, MaxLite™ 20–40 EZ, ST, Chalmers, Hendrickson Bar Pin, Neway or Reyco, check axle alignment and adjust as required. D

NOTE

If the vehicle is equipped with one of the following non-adjustable suspensions, MACK SS, SW or Hendrickson straight pin, tires should be monitored for signs of irregular wear. Tire rotation is recommended to optimize tire life and achieve even wear. The suspension should be monitored for signs of component wear.

Before checking axle alignment on non-adjustable suspensions, a thorough inspection of all components that require maintenance must be performed. Any component in need of replacement or maintenance must be repaired prior to performing an axle alignment. Refer to the Frame, Axle and Suspension Service and Total Vehicle Alignment, 14-103, for proper repair/replacement of suspension components.

FRONT DRIVE AXLE:

Check carrier lube level. Add oil, if necessary. C, D

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FRONT AXLE AND SUSPENSION:	Inspection Schedule
Perform a static shake test to check for broken spring leaves, particularly in the area of the spring leaf wrapper. Refer to “FRONT AXLE STATIC SHAKE TEST” on page 182.	**A, B, C, D**
Check for broken spring leaves.	**A, B, C, D**
Check for wheel seal leaks.	**A, B, C, D**
Check oil-lubricated wheel bearing lube level. Add oil, if necessary.	**A, B, C, D**

NOTE

Chassis with front driving axles may have oil- or grease-lubricated front wheel bearings. Consult the specific axle manufacturer’s service literature for service procedures and lubrication recommendations.

Check for wear in the kingpins, bushings and bearings by jacking up the front axle and moving the wheel in and out at the top and bottom.	**C, D**

NOTE

On MACK FA(W) front axles only, check steering knuckle to front axle beam clearance, and adjust if necessary at the first A inspection interval. Thereafter, this check must be performed at each C and D inspection.

Check steering knuckle to front axle beam clearance and adjust, if necessary (MACK FA[W] front axles only).	**C, D**

CHASSIS INSPECTION

FRONT AXLE AND SUSPENSION: Inspection Schedule

Perform a static shake test to check for broken spring leaves, particularly in the area of the spring leaf wrapper. Refer to “FRONT AXLE STATIC SHAKE TEST” on page 182. A, B, C, D

Check for broken spring leaves. A, B, C, D

Check for wheel seal leaks. A, B, C, D

Check oil-lubricated wheel bearing lube level. Add oil, if necessary. A, B, C, D

NOTE

Chassis with front driving axles may have oil- or grease-lubricated front wheel bearings. Consult the specific axle manufacturer’s service literature for service procedures and lubrication recommendations.

Check for wear in the kingpins, bushings and bearings by jacking up the front axle and moving the wheel in and out at the top and bottom. C, D

NOTE

On MACK FA(W) front axles only, check steering knuckle to front axle beam clearance, and adjust if necessary at the first A inspection interval. Thereafter, this check must be performed at each C and D inspection.

Check steering knuckle to front axle beam clearance and adjust, if necessary (MACK FA[W] front axles only). C, D

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FRONT AXLE AND SUSPENSION: *(continued)*	**Inspection Schedule**
Inspect condition of front axle beam and tie rod ends.	**C, D**
Inspect steering knuckles for cracks. Pay particular attention to the areas of the steering lever boss, cross steering tube boss and the lower king pin boss. Refer to “STEERING KNUCKLE INSPECTION” on page 179 for procedures.	**C, D**
Inspect shock absorbers for control, binding or leaks; insulators and mountings for wear, deterioration or breakage.	**C, D**
Check for broken center bolts, shifted axle, loose or damaged rebound bumper, spring clips, shackles, spring cap or hanger brackets.	**C, D**
Torque spring clips (U-bolts). (See “SPRING CLIP (U-BOLT) TORQUE” on page 183.)	**C, D**
Remove all wheels.	**D**
Check wheel bearing end play — unitized hubs on MACK FXL axles.	**D**
Clean and inspect wheel bearings.	**D**

NOTE

For chassis equipped with unitized wheel hubs, the hubs are sealed and lubricated for life. Do not disassemble and attempt to repair a unitized wheel hub. Refer to the specific manufacturer’s service literature for detailed information.

Repack grease-type wheel bearings.	**D**
Inspect condition of brake lining/disc pads.	**D**
Measure and record brake lining thickness.	**D**

CHASSIS INSPECTION

FRONT AXLE AND SUSPENSION: (continued) Inspection Schedule
Inspect condition of front axle beam and tie rod ends. C, D
Inspect steering knuckles for cracks. Pay particular attention to the areas of the steering lever boss, cross steering tube boss and the lower king pin boss. Refer to “STEERING KNUCKLE INSPECTION” on page 179 for procedures. C, D
Inspect shock absorbers for control, binding or leaks; insulators and mountings for wear, deterioration or breakage. C, D
Check for broken center bolts, shifted axle, loose or damaged rebound bumper, spring clips, shackles, spring cap or hanger brackets. C, D
Torque spring clips (U-bolts). (See “SPRING CLIP (U-BOLT) TORQUE” on page 183.) C, D
Remove all wheels. D
Check wheel bearing end play — unitized hubs on MACK FXL axles. D
Clean and inspect wheel bearings. D
NOTE
For chassis equipped with unitized wheel hubs, the hubs are sealed and lubricated for life. Do not disassemble and attempt to repair a unitized wheel hub. Refer to the specific manufacturer’s service literature for detailed information.
Repack grease-type wheel bearings. D
Inspect condition of brake lining/disc pads. D
Measure and record brake lining thickness. D

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FRONT AXLE AND SUSPENSION: *(continued)*	**Inspection Schedule**
Inspect, measure and record drum/rotor wear in mm (inches). Compare measurement with dimension cast into the drum/rotor.	**D**
Inspect brake spiders, mounting bolts and/or disc calipers.	**D**
Inspect brake shoes.	**D**
Inspect brake cams and bushings (cam brakes).	**D**
Replace wheel bearing lube seals.	**D**
Reinstall wheels and adjust bearings.	**D**
Fill oil-type wheel bearings to specified level. (See “LUBRICANT SPECIFICATIONS” on page 267.)	**D**

⚠ WARNING

It is extremely important to use a retaining method when working on all spring brake chambers. The spring is under heavy compression and can expand rapidly with great force and cause injury.

Check brake air chambers for leakage. Make several brake applications and observe that push rods respond quickly and with no indications of binding. Refer to the *Air and Brake System Service Manual*, 16-104, for more detailed maintenance information.	**A, B, C, D**
Measure push rod travel. Stroke should be as short as possible without allowing the brakes to drag. Adjust manual slack adjusters as necessary. Automatic slack adjusters should not require periodic adjustments. Refer to the *Air and Brake System Service Manual*, 16-104, for more detailed information.	**A, B, C, D**

CHASSIS INSPECTION

FRONT AXLE AND SUSPENSION: *(continued)*	**Inspection Schedule**
Inspect, measure and record drum/rotor wear in mm (inches). Compare measurement with dimension cast into the drum/rotor.	**D**
Inspect brake spiders, mounting bolts and/or disc calipers.	**D**
Inspect brake shoes.	**D**
Inspect brake cams and bushings (cam brakes).	**D**
Replace wheel bearing lube seals.	**D**
Reinstall wheels and adjust bearings.	**D**
Fill oil-type wheel bearings to specified level. (See “LUBRICANT SPECIFICATIONS” on page 267.)	**D**

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TRANSMISSION/AUX. TRANS. TRANSFER CASE/FLYWHEEL PTO:	Inspection Schedule
Inspect for leaks at seals, covers and plugs.	**A, B, C, D**
Check lube level. Add oil, if necessary. (See table on page 268 for recommended lubricants and capacities. For lubricant change procedures, refer to “Transmissions” on page 161.)	**A, B, C, D**
Check condition and tightness of all mounts.	**A, B, C, D**
Inspect all linkages for wear, binding and full engagement in all gears.	**C, D**
Inspect and clean breathers.	**C, D**
Change air filter on air-shifted transmissions.	**C, D**
Service select air valve on air-shifted transmissions.	**C, D**
Service air shift cover on air-shifted transmissions.	**C, D**
Service range shift valve on T300 series transmissions.	**C, D**

PROPELLER SHAFTS:

Check tightness of the universal joints. Check for leaks.	**A, B, C, D**
Inspect yokes or flanges for tightness.	**A, B, C, D**
Inspect splines for wear or seizure. Arrows at splined joints must be in alignment with each other to avoid vibration.	**C, D**

DRIVELINE RETARDER:

Inspect rotor air gap and adjust as required.	**D**

CHASSIS INSPECTION

TRANSMISSION/AUX. TRANS. TRANSFER CASE/FLYWHEEL PTO:	Inspection Schedule
Inspect for leaks at seals, covers and plugs.	**A, B, C, D**
Check lube level. Add oil, if necessary. (See table on page 268 for recommended lubricants and capacities. For lubricant change procedures, refer to “Transmissions” on page 161.)	**A, B, C, D**
Check condition and tightness of all mounts.	**A, B, C, D**
Inspect all linkages for wear, binding and full engagement in all gears.	**C, D**
Inspect and clean breathers.	**C, D**
Change air filter on air-shifted transmissions.	**C, D**
Service select air valve on air-shifted transmissions.	**C, D**
Service air shift cover on air-shifted transmissions.	**C, D**
Service range shift valve on T300 series transmissions.	**C, D**

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Inspect yokes or flanges for tightness.	**A, B, C, D**
Inspect splines for wear or seizure. Arrows at splined joints must be in alignment with each other to avoid vibration.	**C, D**

DRIVELINE RETARDER:

Inspect rotor air gap and adjust as required.	**D**

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CENTER BEARING:	Inspection Schedule
Inspect bearing for wear. Check for loose hanger bolts, deteriorated or worn insulator or cracked support.	**A, B, C, D**

REAR AXLE AND SUSPENSION:	
Check for broken spring leaves.	**A, B, C, D**
Check for wheel seal leaks.	**A, B, C, D**
Check shock absorbers for leakage and damage. Replace if the shock absorber body is damaged, if the dust tube or end mounts are cracked or if leaking is evident. Also, check the upper and lower bushings for wear, deterioration or deformation and replace as necessary.	**A, B, C, D**
Check condition of spring and trunnion insulators.	**B, C, D**
Inspect axle housing(s) for leakage or cracks.	**C, D**
Remove and clean all magnetic plugs in carrier and power divider. Clean magnetic strips and oil trough.	**C, D**
Check torque rods for damage. Check torque rod ball joints for wear or deterioration. Check rubber-bushed torque rods for unequal rubber exposure, cracked or ruptured rubber bushings, off-center pins or expanded mounting pin holes.	**C, D**
Check for broken center bolts, and loose or damaged rebound clips, cap retainers, shackles and brackets.	**C, D**

CHASSIS INSPECTION

CENTER BEARING:	Inspection Schedule
Inspect bearing for wear. Check for loose hanger bolts, deteriorated or worn insulator or cracked support.	**A, B, C, D**

REAR AXLE AND SUSPENSION:	
Check for broken spring leaves.	**A, B, C, D**
Check for wheel seal leaks.	**A, B, C, D**
Check shock absorbers for leakage and damage. Replace if the shock absorber body is damaged, if the dust tube or end mounts are cracked or if leaking is evident. Also, check the upper and lower bushings for wear, deterioration or deformation and replace as necessary.	**A, B, C, D**
Check condition of spring and trunnion insulators.	**B, C, D**
Inspect axle housing(s) for leakage or cracks.	**C, D**
Remove and clean all magnetic plugs in carrier and power divider. Clean magnetic strips and oil trough.	**C, D**
Check torque rods for damage. Check torque rod ball joints for wear or deterioration. Check rubber-bushed torque rods for unequal rubber exposure, cracked or ruptured rubber bushings, off-center pins or expanded mounting pin holes.	**C, D**
Check for broken center bolts, and loose or damaged rebound clips, cap retainers, shackles and brackets.	**C, D**

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REAR AXLE AND SUSPENSION: *(continued)*	Inspection Schedule
Torque spring clips (U-bolts) (spring and walking beam suspensions).	**C, D**

NOTE

On chassis equipped with Reyco suspensions, check and adjust torque of the spring clips (U-bolts), equalizer nuts, torque arm bolts (at the hangers and axle seats), and torque arm tube clamp nuts at each B, C, and D inspection interval.

ALL MACK AIR SUSPENSIONS — In addition to the other suspension items outlined in this section, the following items must be performed on MACK air suspensions.

Check U-bolt locknut torque.	**A, B, C, D**
Check main support member fastener torque: AL — Support member to air spring lower mounting bracket. AL II — Support member to cross channel section. MaxLite™ 20–40 and MaxLite™ 20–40 EZ — Support member to crossbeam.	**A, B, C, D**
Check air springs for cracks, gouges, distortion, bulges and/or chafing and replace as necessary. If an air spring requires replacement, inspect other areas of the suspension for potential problems.	**C, D**
Check air suspension air lines for leaks.	**C, D**
Check torque of other fasteners as outlined on “OTHER FASTENERS” on page 189.	**D**
Check functionality of height-control valve. Measure and adjust ride height as necessary.	**D**
Remove all wheels.	**D**

CHASSIS INSPECTION

REAR AXLE AND SUSPENSION: *(continued)*	Inspection Schedule
Torque spring clips (U-bolts) (spring and walking beam suspensions).	**C, D**

NOTE

On chassis equipped with Reyco suspensions, check and adjust torque of the spring clips (U-bolts), equalizer nuts, torque arm bolts (at the hangers and axle seats), and torque arm tube clamp nuts at each B, C, and D inspection interval.

ALL MACK AIR SUSPENSIONS — In addition to the other suspension items outlined in this section, the following items must be performed on MACK air suspensions.

Check U-bolt locknut torque.	**A, B, C, D**
Check main support member fastener torque: AL — Support member to air spring lower mounting bracket. AL II — Support member to cross channel section. MaxLite™ 20–40 and MaxLite™ 20–40 EZ — Support member to crossbeam.	**A, B, C, D**
Check air springs for cracks, gouges, distortion, bulges and/or chafing and replace as necessary. If an air spring requires replacement, inspect other areas of the suspension for potential problems.	**C, D**
Check air suspension air lines for leaks.	**C, D**
Check torque of other fasteners as outlined on “OTHER FASTENERS” on page 189.	**D**
Check functionality of height-control valve. Measure and adjust ride height as necessary.	**D**
Remove all wheels.	**D**

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REAR AXLE AND SUSPENSION: *(continued)*	Inspection Schedule
Clean and inspect wheel bearings.	**D**

N O T E

For chassis equipped with unitized wheel hubs, the hubs are sealed and lubricated for life. Do not disassemble and attempt to repair a unitized wheel hub. Refer to the specific manufacturer's service literature for detailed information.

Repack grease-type wheel bearings.	**D**
Inspect condition of brake lining/disc pads.	**D**
Measure and record brake lining thickness.	**D**
Inspect, measure and record drum/rotor wear in mm (inches). Compare measurements with dimension cast into the drum or rotor.	**D**
Inspect condition of brake spiders, mounting bolts and disc calipers.	**D**
Inspect condition of brake shoes. Check lining for flaking, etc.	**D**
Inspect brake cams and bushings (cam brakes).	**D**
Replace wheel bearing seals.	**D**
Fill rear axle to specified level. (See "LUBRICANT SPECIFICATIONS" on page 267.)	**D**

W A R N I N G

It is extremely important to use a retaining method when working on all spring brake chambers. The spring is under heavy compression and can expand rapidly with great force and cause injury.

CHASSIS INSPECTION

REAR AXLE AND SUSPENSION: *(continued)*	Inspection Schedule
Clean and inspect wheel bearings.	**D**

N O T E

For chassis equipped with unitized wheel hubs, the hubs are sealed and lubricated for life. Do not disassemble and attempt to repair a unitized wheel hub. Refer to the specific manufacturer's service literature for detailed information.

Repack grease-type wheel bearings.	**D**
Inspect condition of brake lining/disc pads.	**D**
Measure and record brake lining thickness.	**D**
Inspect, measure and record drum/rotor wear in mm (inches). Compare measurements with dimension cast into the drum or rotor.	**D**
Inspect condition of brake spiders, mounting bolts and disc calipers.	**D**
Inspect condition of brake shoes. Check lining for flaking, etc.	**D**
Inspect brake cams and bushings (cam brakes).	**D**
Replace wheel bearing seals.	**D**
Fill rear axle to specified level. (See "LUBRICANT SPECIFICATIONS" on page 267.)	**D**

W A R N I N G

It is extremely important to use a retaining method when working on all spring brake chambers. The spring is under heavy compression and can expand rapidly with great force and cause injury.

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REAR AXLE AND SUSPENSION: *(continued)*	Inspection Schedule
Check brake air chambers for leakage. Make several brake applications and observe that push rods respond quickly and with no indications of binding. Refer to the *Air and Brake System Service Manual*, 16-104, for more detailed maintenance information.	**A, B, C, D**
Measure push rod travel. Stroke should be as short as possible without allowing the brakes to drag. Adjust manual slack adjusters as necessary. Automatic slack adjusters should not require periodic adjustments. Refer to the *Air and Brake System Service Manual*, 16-104, for more detailed information.	**A, B, C, D**

CARRIER/CARRIERS:

Inspect for leaks.	**A, B, C, D**
Check carrier(s) lube level. Add required gear oil, if necessary.	**A, B, C, D**
Check carrier mounting. Check and re-torque hidden capscrews (refer to "CARRIER CAPSCREW TORQUE" on page 180).	**C, D**
Remove and clean carrier breather.	**D**

CHASSIS INSPECTION

REAR AXLE AND SUSPENSION: *(continued)*	Inspection Schedule
Check brake air chambers for leakage. Make several brake applications and observe that push rods respond quickly and with no indications of binding. Refer to the *Air and Brake System Service Manual*, 16-104, for more detailed maintenance information.	**A, B, C, D**
Measure push rod travel. Stroke should be as short as possible without allowing the brakes to drag. Adjust manual slack adjusters as necessary. Automatic slack adjusters should not require periodic adjustments. Refer to the *Air and Brake System Service Manual*, 16-104, for more detailed information.	**A, B, C, D**

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Inspect for leaks.	**A, B, C, D**
Check carrier(s) lube level. Add required gear oil, if necessary.	**A, B, C, D**
Check carrier mounting. Check and re-torque hidden capscrews (refer to "CARRIER CAPSCREW TORQUE" on page 180).	**C, D**
Remove and clean carrier breather.	**D**

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AUXILIARY AXLES:

Check wheel bearing lube level and check wheel seals for leakage. Add oil and repair wheel seals as required.	**A, B, C, D**
Check condition of tires, tread depth, wear pattern and correct inflation pressure (while tires are cold).	**A, B, C, D**
Check condition of wheels, rims, wheel studs and nuts. Replace if damaged. Tighten wheel nuts to specifications.	**A, B, C, D**
Lubricate king pins and tie rod ends (steerable axles).	**A, B, C, D**
Check torque of pivot bolts.	**A, B, C, D**
Check operation of suspension air bag relay valve(s), up/down solenoid valve(s), lift control valve(s), pressure protection valve(s), lift air bag quick release valve(s), brake system relay valve(s) and brake system quick release valve(s) (if so equipped).	**B, C, D**
Check king pins and bushings for wear.	**C, D**
Check the suspension and lift air bags for cracks, gouges, distortion, bulges and/or chafing and replace as necessary. If an air bag requires replacement, inspect other areas of the axle assembly for potential problems.	**C, D**
Clean, inspect and lubricate wheel bearings.	**D**
Check fastener torque (air spring bolts [top and bottom] and tie rod clamp bolt).	**D**

CHASSIS INSPECTION

AUXILIARY AXLES:

Check wheel bearing lube level and check wheel seals for leakage. Add oil and repair wheel seals as required. A, B, C, D
Check condition of tires, tread depth, wear pattern and correct inflation pressure (while tires are cold). A, B, C, D
Check condition of wheels, rims, wheel studs and nuts. Replace if damaged. Tighten wheel nuts to specifications. A, B, C, D
Lubricate king pins and tie rod ends (steerable axles). A, B, C, D
Check torque of pivot bolts. A, B, C, D
Check operation of suspension air bag relay valve(s), up/down solenoid valve(s), lift control valve(s), pressure protection valve(s), lift air bag quick release valve(s), brake system relay valve(s) and brake system quick release valve(s) (if so equipped). B, C, D
Check king pins and bushings for wear. C, D
Check the suspension and lift air bags for cracks, gouges, distortion, bulges and/or chafing and replace as necessary. If an air bag requires replacement, inspect other areas of the axle assembly for potential problems. C, D
Clean, inspect and lubricate wheel bearings. D
Check fastener torque (air spring bolts [top and bottom] and tie rod clamp bolt). D

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TIRES:	Inspection Schedule
Check condition of tires and proper tire match.	**A, B, C, D**
Check tread depth, wear pattern and correct inflation pressure (while tires are cold).	**A, B, C, D**
Report any case of uneven or unusual tire wear. Remove and replace any damaged tires.	**A, B, C, D**
Check for proper function of central tire inflation system (if equipped).	**A, B, C, D**

WHEELS/RIMS:

Check condition of wheels, rims, wheel studs and nuts. Replace if damaged.	**A, B, C, D**
Torque wheel nuts (rim lug nuts on spoke wheels; wheel lug nuts [inner and outer when applicable] on disc wheels).	**A, B, C, D**
Torque chain clearance spacers if the chassis is so equipped. See “Chain Clearance Spacers” on page 222.	**A, B, C, D**

REAR AXLE FLANGE:

Torque axle flange nuts to specifications.	**A, B, C, D**

CHASSIS INSPECTION

TIRES:	Inspection Schedule
Check condition of tires and proper tire match.	**A, B, C, D**
Check tread depth, wear pattern and correct inflation pressure (while tires are cold).	**A, B, C, D**
Report any case of uneven or unusual tire wear. Remove and replace any damaged tires.	**A, B, C, D**
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Check condition of wheels, rims, wheel studs and nuts. Replace if damaged.	**A, B, C, D**
Torque wheel nuts (rim lug nuts on spoke wheels; wheel lug nuts [inner and outer when applicable] on disc wheels).	**A, B, C, D**
Torque chain clearance spacers if the chassis is so equipped. See “Chain Clearance Spacers” on page 222.	**A, B, C, D**

REAR AXLE FLANGE:

Torque axle flange nuts to specifications.	**A, B, C, D**

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FRAME:	Inspection Schedule
Clean frame and crossmembers.	**C, D**
Inspect side rails, crossmembers and brackets for looseness, cracks or fretting.	**C, D**
Inspect spring brackets and crossmember Huck bolts or bolts.	**C, D**

TRAILER CORD:

Inspect condition of the trailer cord. Look for chafing, missing or loose clamps, bad routing or loose connections.	**A, B, C, D**

TRAILER HOSES:

Check that the trailer hoses do not rub against the cab, frame or any other chassis components. Reroute or clamp as required. Inspect glad hands for defects that may affect sealing.	**A, B, C, D**

FIFTH WHEEL:

Check fifth wheel mounting, brackets, latching device, body mounts, sills, fastener and sliding mechanism for cracks or fretting. Torque mounting bolts. Instructions vary according to make, follow manufacturer's instructions.	**A, B, C, D**

CHASSIS INSPECTION

FRAME: Inspection Schedule

Clean frame and crossmembers. C, D

Inspect side rails, crossmembers and brackets for looseness, cracks or fretting. C, D

Inspect spring brackets and crossmember Huck bolts or bolts. C, D

TRAILER CORD:

Inspect condition of the trailer cord. Look for chafing, missing or loose clamps, bad routing or loose connections. A, B, C, D

TRAILER HOSES:

Check that the trailer hoses do not rub against the cab, frame or any other chassis components. Reroute or clamp as required. Inspect glad hands for defects that may affect sealing. A, B, C, D

FIFTH WHEEL:

Check fifth wheel mounting, brackets, latching device, body mounts, sills, fastener and sliding mechanism for cracks or fretting. Torque mounting bolts. Instructions vary according to make, follow manufacturer's instructions. A, B, C, D

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PTO/HOIST:	Inspection Schedule
Check reservoir fluid level. Add oil, if necessary. Refer to manufacturer's service literature for lubricant specifications.	**A, B, C, D**
Check operation of controls, PTO and hoist.	**A, B, C, D**
Inspect condition of mountings, hinges, brackets, linkages and hydraulic units.	**B, C, D**

SAFETY EQUIPMENT:

Check pressure on fire extinguisher gauge. Dial should indicate pressure in OK zone.	**A, B, C, D**
On chassis in interstate commerce, check for ICC kit containing flags, reflectors, fuses, etc.	**A, B, C, D**

FLAPS:

Check condition and mounting of flaps. Replace, if necessary.	**A, B, C, D**

CHASSIS INSPECTION

PTO/HOIST: Inspection Schedule

Check reservoir fluid level. Add oil, if necessary. Refer to manufacturer's service literature for lubricant specifications. A, B, C, D

Check operation of controls, PTO and hoist. A, B, C, D

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SPECIFIC MAINTENANCE

FOR COMPONENTS NOT MANUFACTURED

BY MACK TRUCKS

CONSULT VENDOR SERVICE PUBLICATIONS

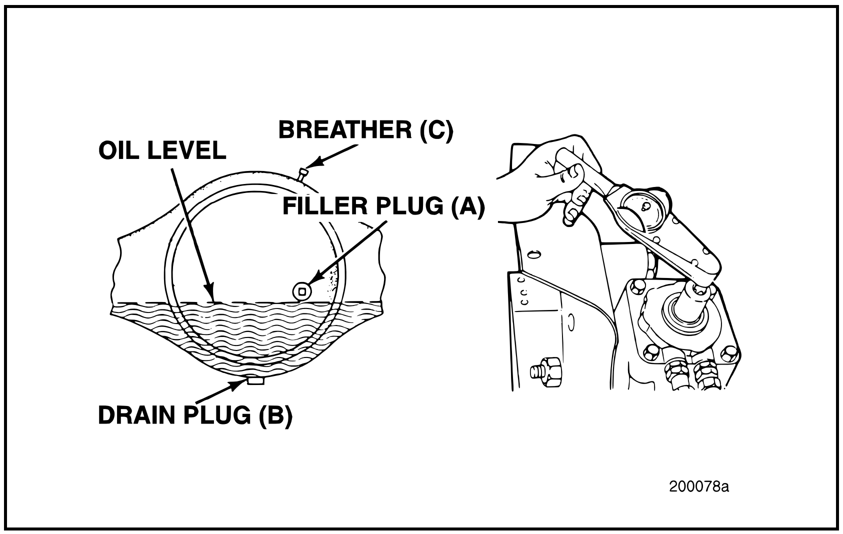

Figure 4 — Specific Maintenance

SPECIFIC MAINTENANCE

SPECIFIC MAINTENANCE

FOR COMPONENTS NOT MANUFACTURED

BY MACK TRUCKS

CONSULT VENDOR SERVICE PUBLICATIONS

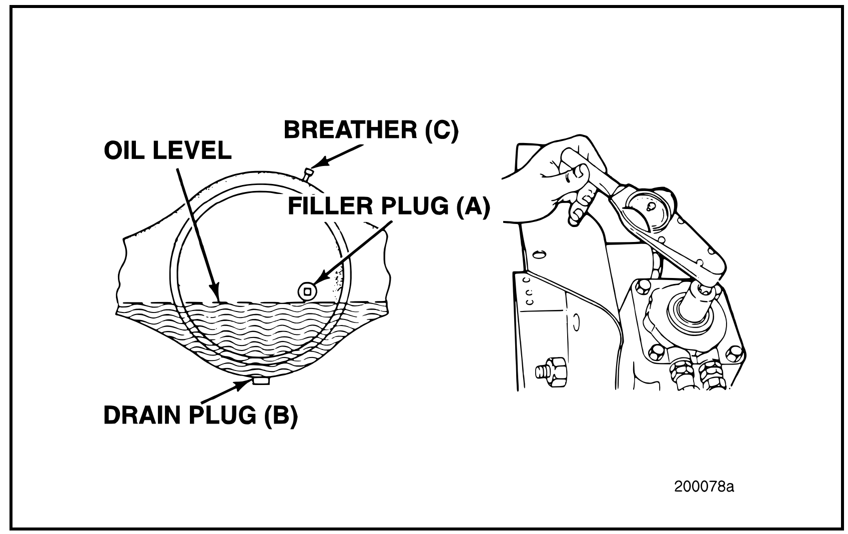

Figure 4 — Specific Maintenance

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SPECIFIC MAINTENANCE

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FASTENER SIZES, TYPES AND GRADES

Fastener Sizes and Types

The first and most important fact that the technician must know about a fastener is whether it is a U.S. (Inch System) or a metric thread. Next is the size of the fastener, which is usually determined by the diameter of the shank, the length of the fastener, which is usually measured from the bottom of the head to the end of the thread, and the pitch of the threads.

The pitch of U.S. (Inch System) fasteners is measured by determining the number of threads per inch. The two pitches commonly used in vehicles are coarse threads, officially called Unified National Coarse (UNC), and fine threads, officially called Unified National Fine (UNF).

The pitch of metric fasteners is measured by determining the number of threads per millimeter. For example, a bolt with 0.8 pitch would have 125 threads in a 100 millimeter section (100 mm divided by 125 threads equals 0.8), and a bolt with 1.0 pitch would have 100 threads in a 100 millimeter section. Pitch may be measured directly using a ruler and counting the threads. Also, thread pitch gauges are available for both U.S. and metric threads, which makes it easy to check the pitch of a fastener.

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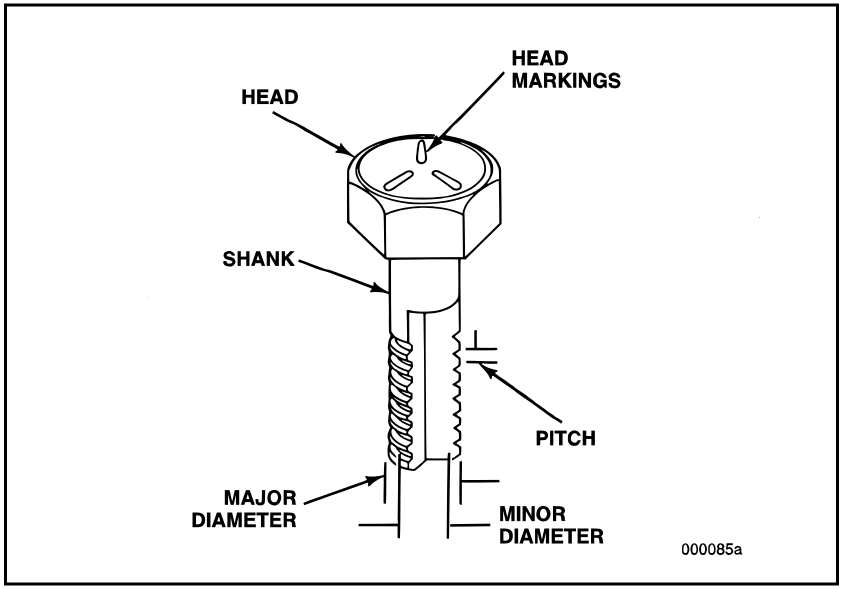

Figure 5 — Fastener Identification

FASTENER SIZES, TYPES AND GRADES

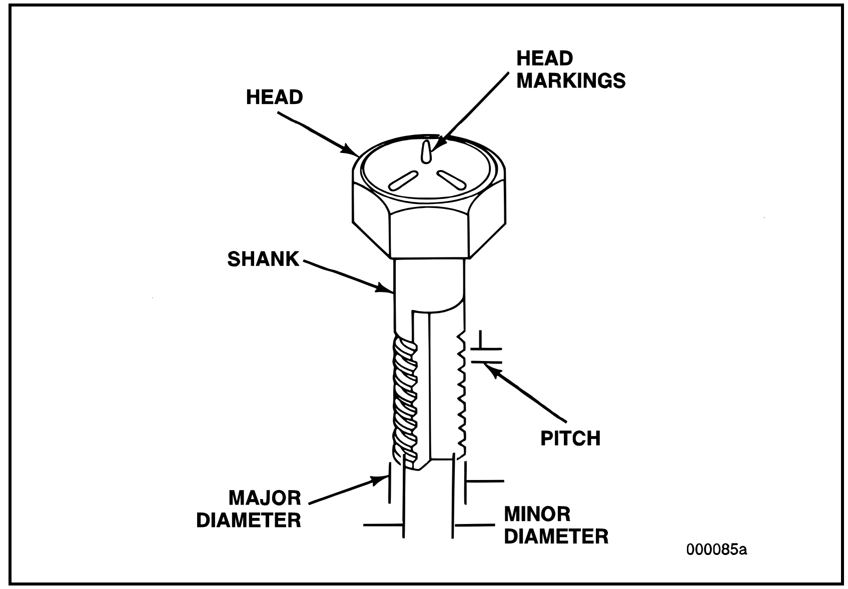

Figure 5 — Fastener Identification

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Fastener Grades

A fastener must be strong enough to do the intended job. U.S. and metric systems both separate their fasteners into grades according to strength and quality. In the U.S. system, slash marks are used on bolt heads to indicate grade. SAE Grade 1 and 2 use no slash marks. These “hardware grades” are used only in the least demanding applications. SAE Grade 5 uses three slash marks on the head. These are most commonly used for vehicle applications. SAE Grade 8 uses six slash marks on the head. These high strength bolts are used where conditions require very high torque.

Locknuts are also divided into grades called A, B and C. Grade A locknuts are intended for use with SAE Grade 1 and 2 bolts, and the nuts are not marked for identification. Grade B locknuts are intended for use with SAE Grade 5 bolts and are marked either with the letter “B” or three equally spaced symbols (dot, line, letter or other character). Grade C locknuts are intended for use with SAE Grade 8 bolts and are marked with either the letter “C” or six equally spaced symbols (dot, line, letter or other character). Another marking alternative is having notches cut circumferentially into each of the six corners of the locknut at approximately mid-height, one row of notches for Grade B and two rows for Grade C.

Metric threaded fasteners are also separated into grades according to strength and quality. Bolts commonly used in vehicles are metric Class 8.8, metric Class 9.8, and metric Class 10.9. These metric bolts are identified by the class number stamped on the head of the bolt. Metric nuts commonly used are Class 9 and Class 10. The metric nuts also have the class number stamped on them for easy identification.

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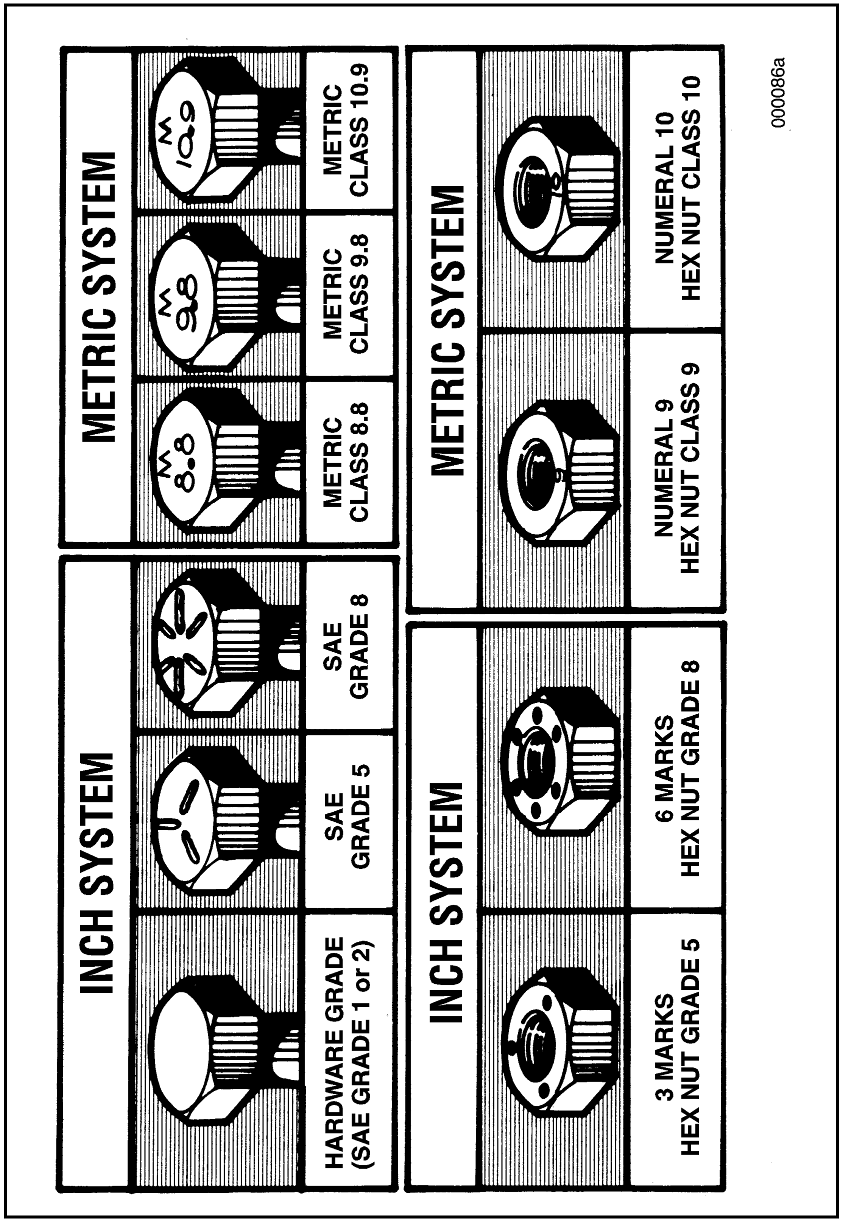

Figure 6 — Fastener Grades

FASTENER SIZES, TYPES AND GRADES

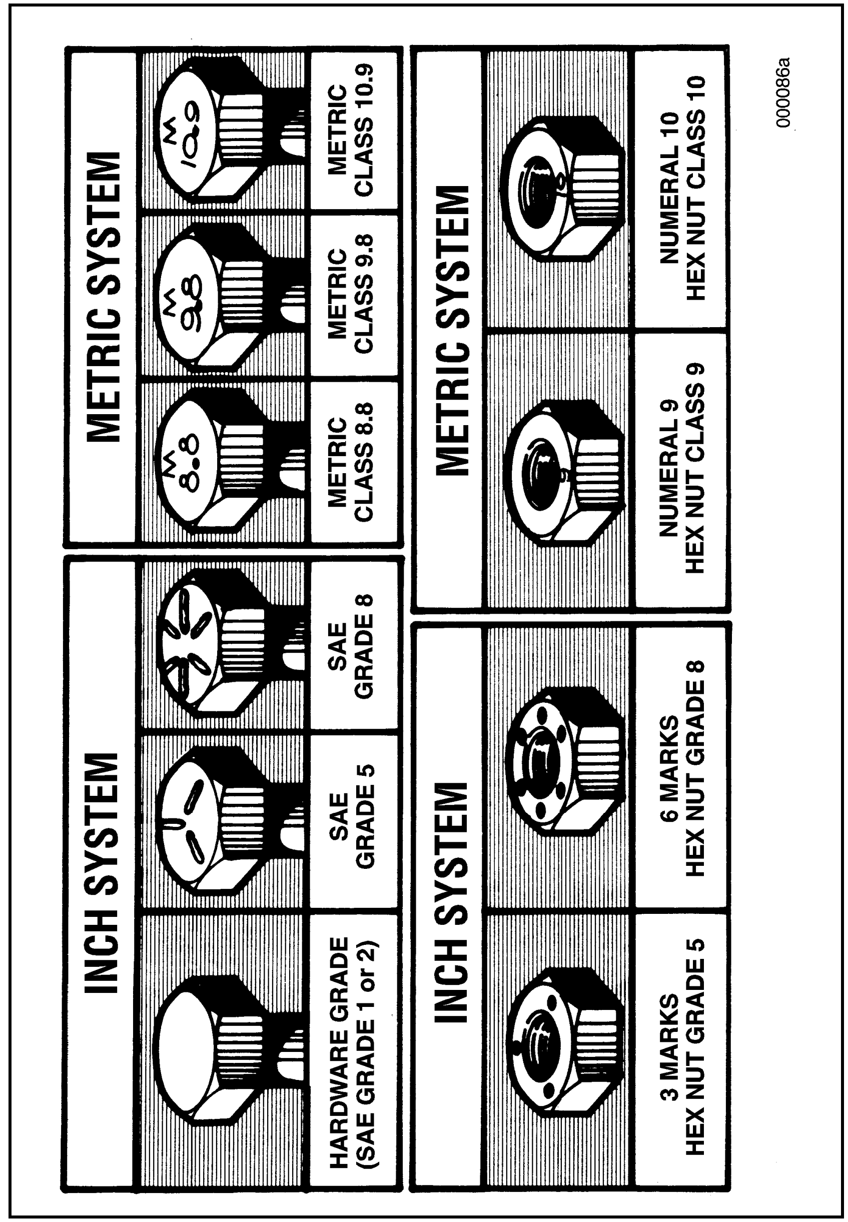
Figure 6 — Fastener Grades

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WARNING

Potential external/internal thread mismatch conditions may occur with certain metric thread/inch thread fastener combinations, and with fastener combinations involving incompatible metric fastener systems. A given thread mismatch can result in thread stripping and/or assembly weakness leading to potential service failure, thereby rendering a vehicle non-operational and/or unsafe for operation.

The specific external/internal thread combinations from which such problems can result are identified and set forth below as thread combinations which must not be utilized in service.

Incompatible Metric vs. Metric Fastener Systems

Potential external/internal thread mismatch can result from use of fasteners from incompatible metric fastener systems. The resulting condition of faulty thread engagement typically produces thread stripping and/or assembly weakness leading to possible service failure.

Domestically procured MACK models may use metric fasteners derived from differing metric fastener systems. It is therefore imperative to identify and use only those fasteners designated for use with the respective vehicle being serviced. Refer to fastener information provided in the applicable vehicle service manual.

Inch Thread vs. Metric Thread Fastener Combinations Contributing to Thread Stripping

The following combinations of inch and metric screws and nuts (or tapped holes) can be given a finger start (at least two full turns), but will strip if fully assembled.

FASTENER SIZES, TYPES AND GRADES

WARNING

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INCH THREAD VS. METRIC THREAD FASTENER COMBINATIONS CONTRIBUTING TO THREAD STRIPPING

INCH SCREWS		METRIC NUTS	
4-40		M3 x 0.5	
5/16-18		M8 x 1.25	
*5/16-24		M8 x 1.25	
3/8-16		*M10 x 1.25	
*3/8-24	M10 x 1.5	*M10 x 1.25	*M10 x 1.0
7/16-14		*M12 x 1.25	
*7/16-20		M12 x 1.75	*M12 x 1.5
*1/2-20		M14 x 2	
*5/8-18		*M16 x 1.5	
*7/8-14		M24 x 3	
*1-12		M27 x 3	
METRIC SCREWS		**INCH NUTS**	
M3 x 0.5		5-40	
M6 x 1.0		1/4-20	
M6 x 1.0		*1/4-28	
*M8 x 1.0		*5/16-24	
M10 x 1.5		7/16-14	
*M10 x 1.25		7/16-14	
*M10 x 1.0		7/16-14	
M12 x 1.75		1/2-13	
M12 x 1.75		*1/2-20	
*M12 x 1.5		1/2-13	
*M12 x 1.5		*1/2-20	
*M12 x 1.25		1/2-13	
M14 x 2		9/16-12	
*M14 x 1.5		*9/16-18	
*M16 x 1.5		*5/8-18	
*M24 x 2		1-8	

* Fine Thread

FASTENER SIZES, TYPES AND GRADES

INCH THREAD VS. METRIC THREAD FASTENER COMBINATIONS CONTRIBUTING TO THREAD STRIPPING

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7/16-14		*M12 x 1.25	
*7/16-20		M12 x 1.75	*M12 x 1.5
*1/2-20		M14 x 2	
*5/8-18		*M16 x 1.5	
*7/8-14		M24 x 3	
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METRIC SCREWS		**INCH NUTS**	
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M6 x 1.0		1/4-20	
M6 x 1.0		*1/4-28	
*M8 x 1.0		*5/16-24	
M10 x 1.5		7/16-14	
*M10 x 1.25		7/16-14	
*M10 x 1.0		7/16-14	
M12 x 1.75		1/2-13	
M12 x 1.75		*1/2-20	
*M12 x 1.5		1/2-13	
*M12 x 1.5		*1/2-20	
*M12 x 1.25		1/2-13	
M14 x 2		9/16-12	
*M14 x 1.5		*9/16-18	
*M16 x 1.5		*5/8-18	
*M24 x 2		1-8	

* Fine Thread

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Inch Thread vs. Metric Thread Fastener Combinations Contributing to Assembly Weakness

The following combinations of inch and metric screws and nuts (or tapped holes) can be fully assembled, but the resultant assembly will be 25% to 60% weaker than required. Service failure of the assembly is probable.

FASTENER SIZES, TYPES AND GRADES

Inch Thread vs. Metric Thread Fastener Combinations Contributing to Assembly Weakness

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INCH THREAD VS. METRIC THREAD FASTENER COMBINATIONS CONTRIBUTING TO ASSEMBLY WEAKNESS

INCH SCREWS	METRIC NUTS
*4-48	M3 x 0.5
5-40	M3.5 x 0.6
6-40	M3.5 x 0.6
*8-36	M4 x 0.7
*10-32	M5 x 0.8
12-24	M6 x 1.0
*1/4-28	M7 x 1.0
3/8-16	M10 x 1.5
7/16-14	M12 x 1.75
1/2-13	M14 x 2
3/4-10	M20 x 2.5
*3/4-16	*M20 x 1.5
7/8-9	M24 x 3

METRIC SCREWS	INCH NUTS
M3 x 0.5	*5-44
M3.5 x 0.6	*6-40
M4 x 0.7	8-32
M4 x 0.7	*8-36
M5 x 0.8	*10-32
M5 x 0.8	12-24
M5 x 0.8	*12-28
*M12 x 1.25	*1/2-20
M18 x 2.5	3/4-10
*M18 x 1.5	*3/4-16
M24 x 3	1-8
M24 x 2	*1-12

* Fine Thread

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*M12 x 1.25	*1/2-20
M18 x 2.5	3/4-10
*M18 x 1.5	*3/4-16
M24 x 3	1-8
M24 x 2	*1-12

* Fine Thread

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DRIVE BELTS

Poly V-belts and automatic belt tensioners are used on MACK MP7 and MP8 engines for both the main drive and accessory drive belts. Condition of the automatic belt tensioners should be checked as outlined in this manual, at each A, B, C and D inspection intervals.

Drive Belt Replacement Intervals

Replacement intervals for both the fan and accessory drive belts are as follows:

Fan Drive Belts —

- **Highway Usage:** 500 000 km/300,000 miles or a maximum of 36 months, whichever occurs first
- **Vocational Usage:** 240 000 km/150,000 miles or a maximum of 12 months, whichever occurs first

Accessory Drive Belts —

- **Highway Usage:** 500 000 km/300,000 miles or a maximum of 36 months, whichever occurs first
- **Vocational Usage:** 240 000 km/150,000 miles or a maximum of 12 months, whichever occurs first

NOTE

If belts squeak or squeal, clean with hydraulic brake fluid or an approved cleaning fluid. Replace belts that are severely worn or frayed.

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Accessory Drive Belts —

- Highway Usage: 500 000 km/300,000 miles or a maximum of 36 months, whichever occurs first
- Vocational Usage: 240 000 km/150,000 miles or a maximum of 12 months, whichever occurs first

NOTE

If belts squeak or squeal, clean with hydraulic brake fluid or an approved cleaning fluid. Replace belts that are severely worn or frayed.

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RIB CRACKING

An in-service poly V-belt will go through several phases of cracking during its life. After an extended time in service, minor rib cracks may appear, usually one or two cracks per inch. This cracking is normal.

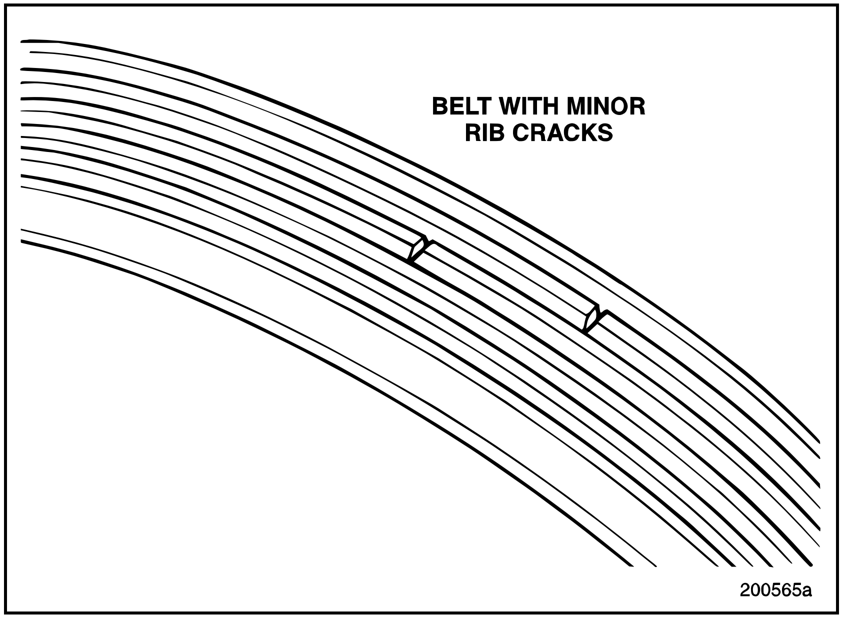

Figure 7 — Belt with Minor Rib Cracks

DRIVE BELTS

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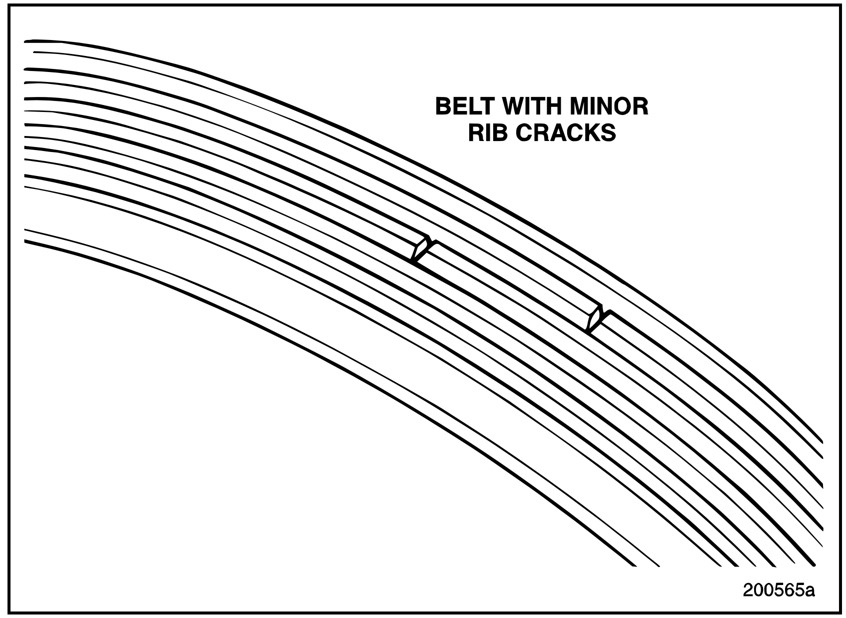

Figure 7 — Belt with Minor Rib Cracks

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Belts should not be replaced unless the ribs exhibit severe multiple cracking as shown below. Multiple cracking will lead to rib chunking.

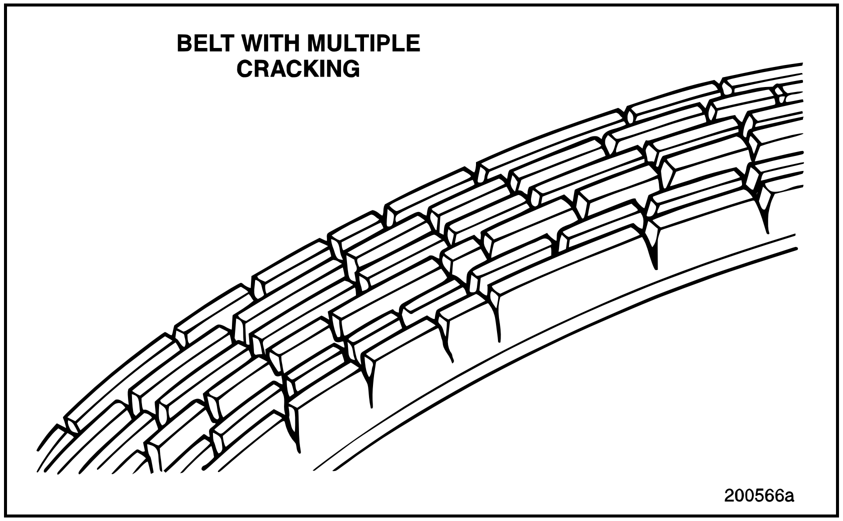

Figure 8 — Belt with Multiple Cracking

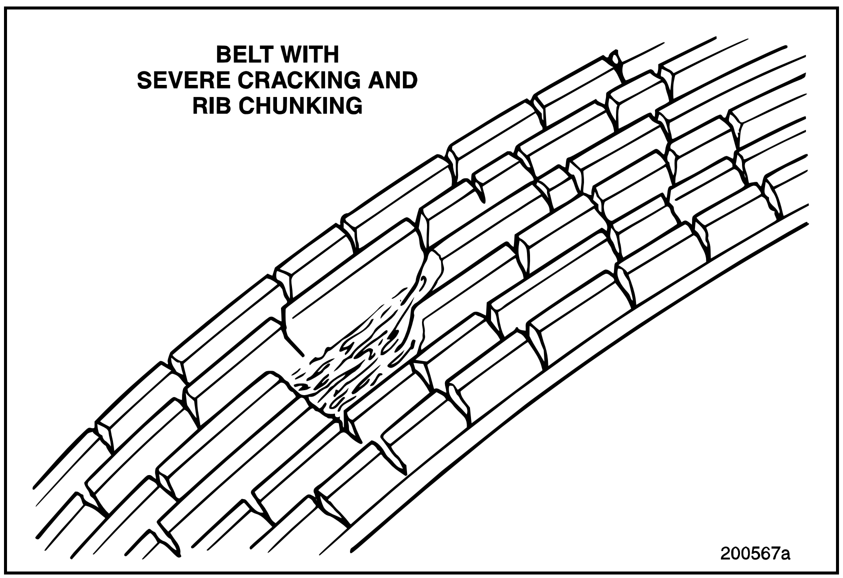

Figure 9 — Belt with Severe Cracking and Rib Chunking

DRIVE BELTS

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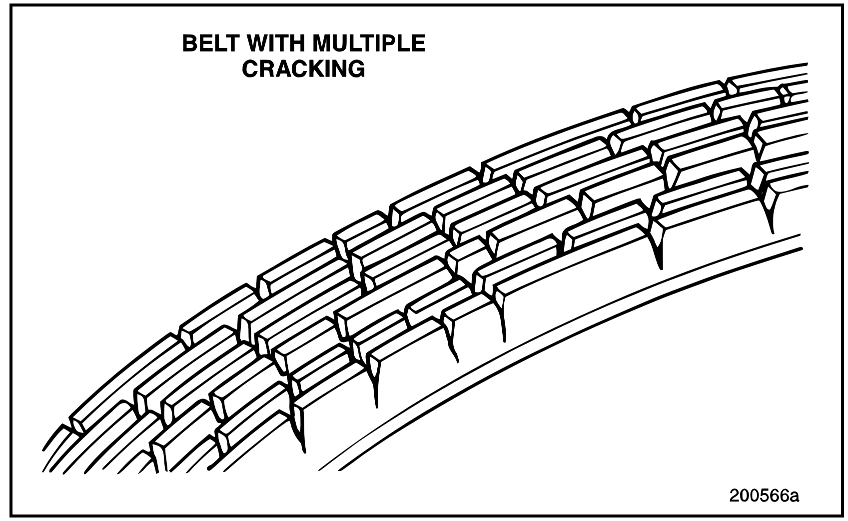

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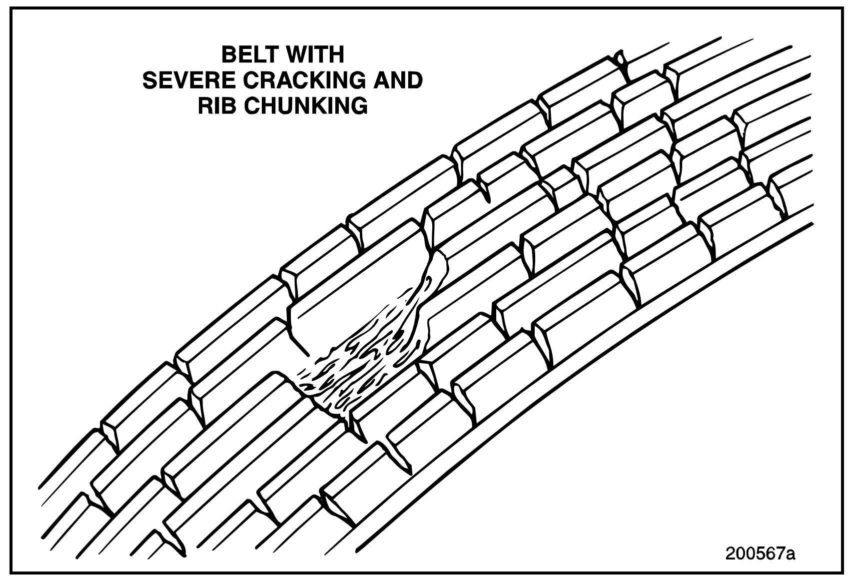

Figure 9 — Belt with Severe Cracking and Rib Chunking

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RIB SIDEWALL GLAZING

When the belt ribs appear to have a shiny surface that is hard and brittle, it is usually an indication of belt slippage. This is attributed to inadequate tension and/or extreme temperature. Both these conditions will lead to severe cracking and belt failure, often with little advance warning. If this occurs, locate the cause and correct before installing a new belt.

BELT WEAR

Accelerated wear on any part of the belt (fabric backing, tensile cord or rib rubber) is a concern and should be investigated for cause, and corrected before installing a new belt.

Possible Causes of Accelerated Belt Wear

- Drive Misalignment — Belt performance will be adversely affected when misalignment exceeds 1/16 inch for every 12 inches of belt span.
- Belt Length — Must be correct.
- Environmental Conditions — Temperature, exposure to engine fluids, etc.
- Abrasive Materials — Small stones, metal shavings, etc.

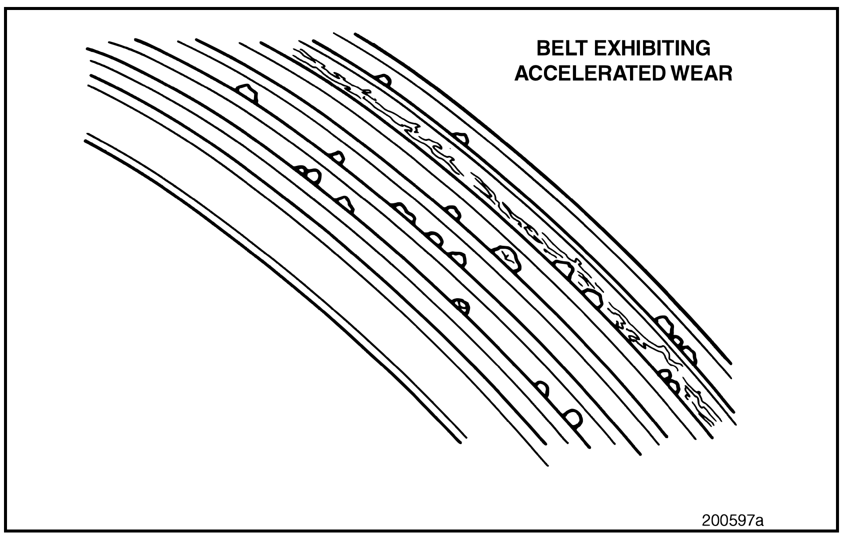

Figure 10 — Belt Exhibiting Accelerated Wear

DRIVE BELTS

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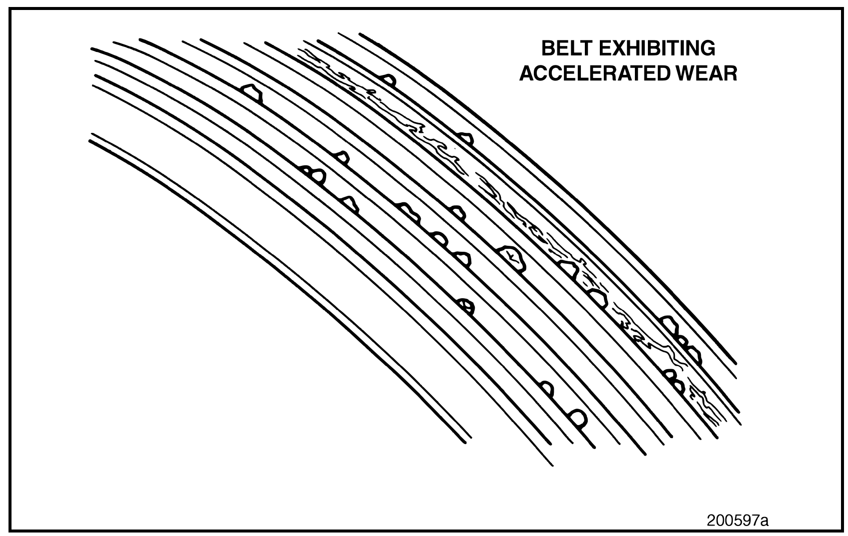

Figure 10 — Belt Exhibiting Accelerated Wear

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FOREIGN OBJECTS

Any object protruding in the path of the belt drive and contacting the belt will cause damage and eventual failure. Locate the object before installing a new belt. (See Figure 11.)

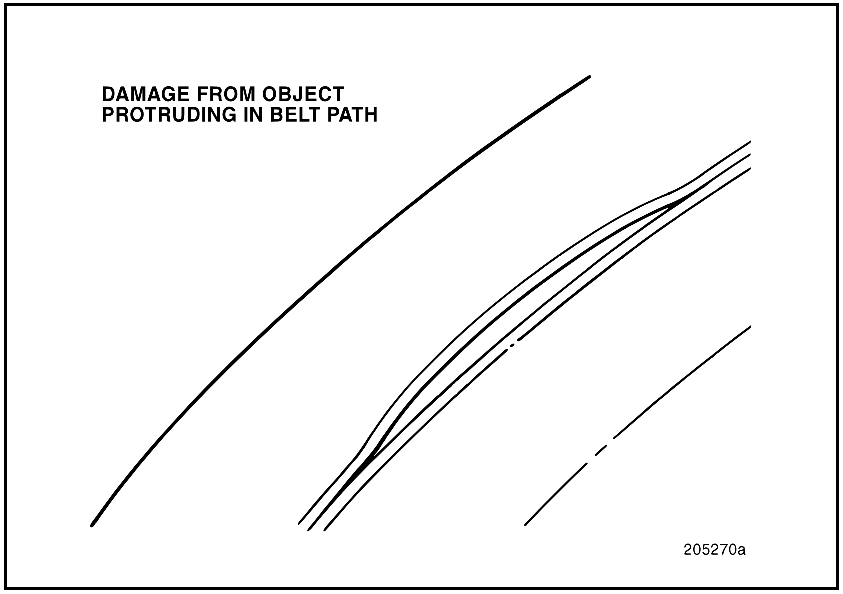

Figure 11 — Damage from Object Protruding in Belt Path

DRIVE BELTS

FOREIGN OBJECTS

Any object protruding in the path of the belt drive and contacting the belt will cause damage and eventual failure. Locate the object before installing a new belt. (See Figure 11.)

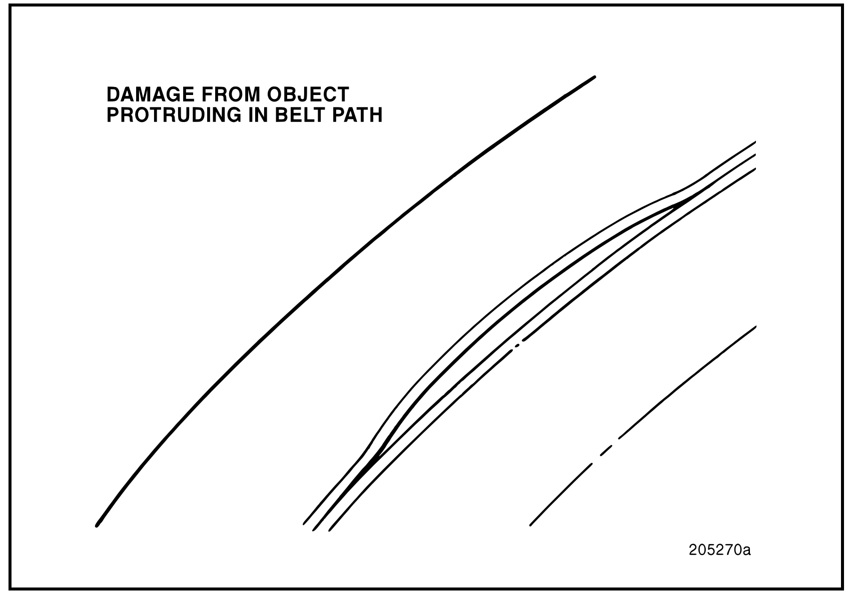

Figure 11 — Damage from Object Protruding in Belt Path

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NOISE, VIBRATION AND HARSHNESS (NVH)

Poly V-belt drive systems were designed to prevent Noise, Vibration and Harshness (NVH) problems. Field problems, however, which may be related to NVH causes occasionally occur.

Possible Causes

Insufficient belt tension may create a high-pitched howl (squeal) or rasping sound during engine acceleration or deceleration.

Misalignment may cause a chirping noise, especially at, or near, idle speed. Rigid bracketing of accessories is a must for reasonably vibration-free belt spans. Some span vibration is to be expected during the range of engine speed and accessory loading.

WARNING

Failure to follow recommended application information and recommended procedures for installation, care maintenance and storage of belts may result in failure to perform properly and may result in damage to property and serious bodily injury. Make sure the belt selected for any application is recommended for that service.

DRIVE BELTS

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DRIVE BELT INSTALLATION

To install a poly V-belt, swing the automatic tensioner to the full sprung position (fully toward the install stop), then place the belt over the pulleys. Slowly return the automatic tensioner back to its original position. Do not allow the tensioner to snap against the stops. For proper belt routing, refer to the following belt routing diagrams. Before installing the new belt, ensure that the pulley grooves are clean and free of debris.

Certain GU and CXU model chassis equipped MP7 engines utilize a 10-rib belt on 12-rib pulleys. When replacing the belt, the belt must be installed against the rear face of the pulley (edge of pulley closest to the engine) as shown in the illustration below.

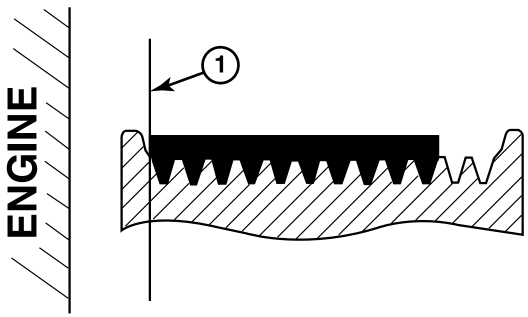

Figure 12 — 10-Rib Belt Installation on 12-Rib Pulley

1. Install 10-rib belt against rear edge of 12-rib pulley.

DRIVE BELTS

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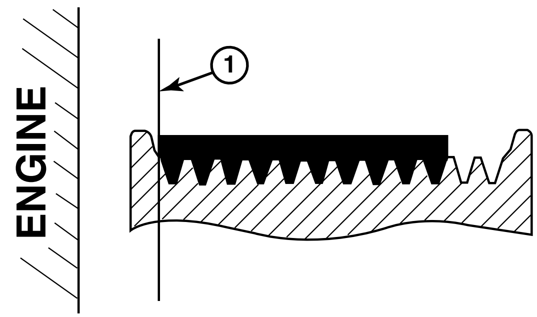

Figure 12 — 10-Rib Belt Installation on 12-Rib Pulley

1. Install 10-rib belt against rear edge of 12-rib pulley.

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Drive Belt Routing — MACK MP7 and MP8 engines, all models.

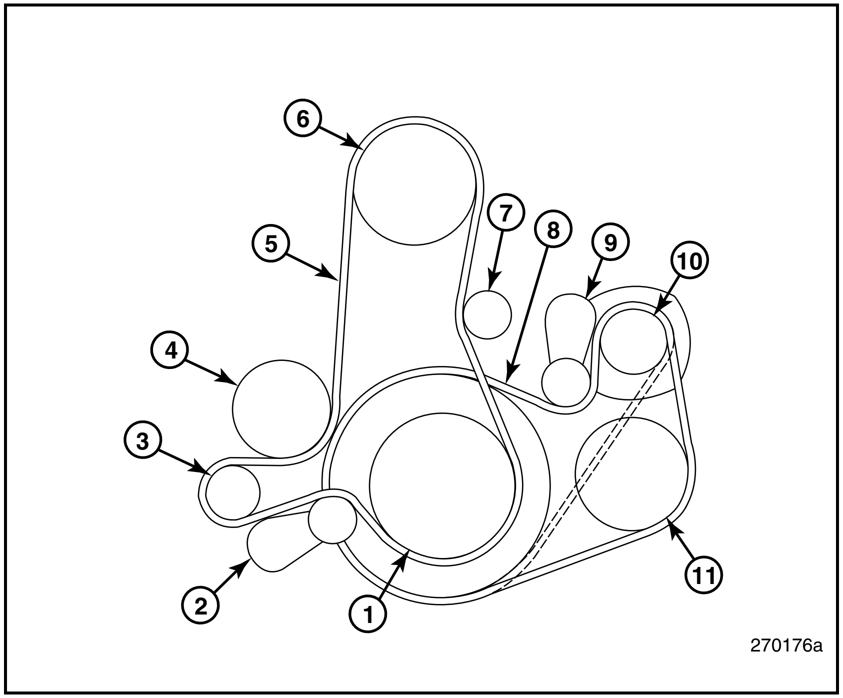

Figure 13 — Drive Belt Routing — MP7 and MP8 Engines

1. Crankshaft Pulley	7. Idler Pulley (when applicable)
2. Automatic Tensioner	8. Accessory Drive Belt
3. Idler Pulley	9. Automatic Tensioner
4. Water Pump	10. Alternator
5. Main Drive Belt	11. Air Conditioner Compressor (if equipped)
6. Fan Drive	

DRIVE BELTS

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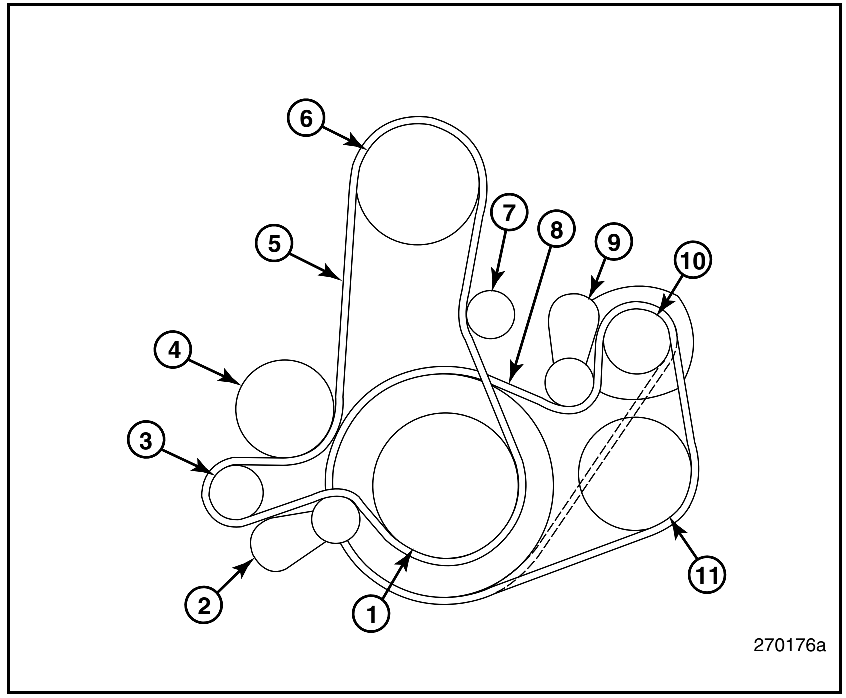

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5. Main Drive Belt	11. Air Conditioner Compressor (if equipped)
6. Fan Drive	

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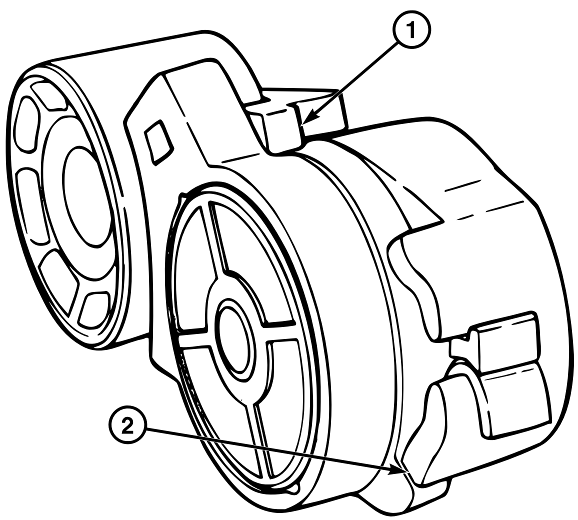
Automatic Belt Tensioner Maintenance

The automatic belt tensioner is designed to maintain proper belt tension throughout the life of the tensioner. The belt tensioner cannot be adjusted or repaired. At each D inspection interval or once per year, whichever occurs first, check the following:

- With the belt on the drive, check the following:
  — Check to see if the tensioner is resting against the install stop or the free-arm stop. If the tensioner is resting against either stop, the tensioner must be replaced.



267588a

Figure 14 — Tensioner Install Stop and Free-Arm Stop (Main Drive Belt Tensioner Shown)

1. Install Stop	2. Free-Arm Stop

DRIVE BELTS

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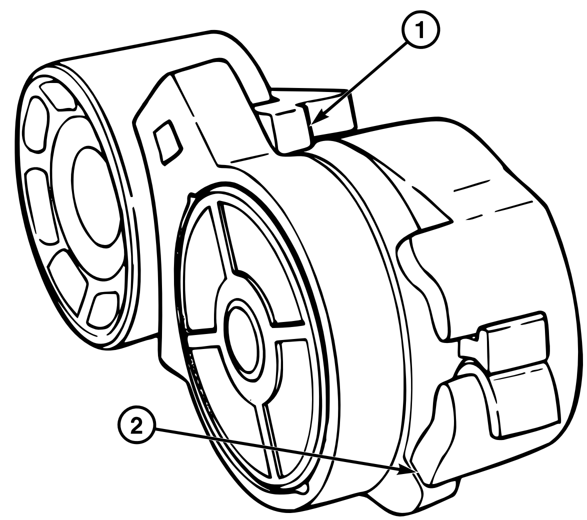

267588a

Figure 14 — Tensioner Install Stop and Free-Arm Stop (Main Drive Belt Tensioner Shown)

1. Install Stop | 2. Free-Arm Stop

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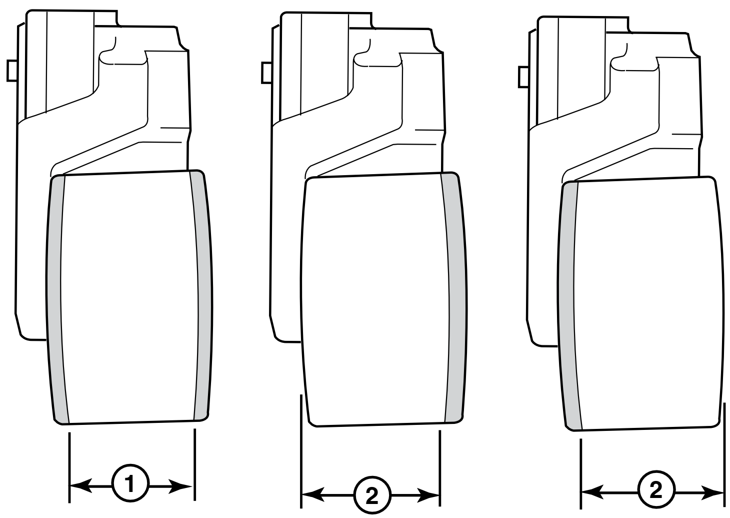
— On main drive belt tensioners, check belt tracking. If the belt is tracking all the way to one side of the tensioner pulley (either the front- or back-side), replace the tensioner. Belt tracking can be determined by looking at the witness mark (the shiny area on the pulley where the belt rides). The witness mark should be approximately the same width of the belt.



267589b

Figure 15 — Main Drive Belt Tensioner Belt Tracking Witness Mark

1. Acceptable (Witness Mark Approximately Same Width as Belt)	2. Not Acceptable (Witness Mark Tracking Off Edge of Pulley)

DRIVE BELTS

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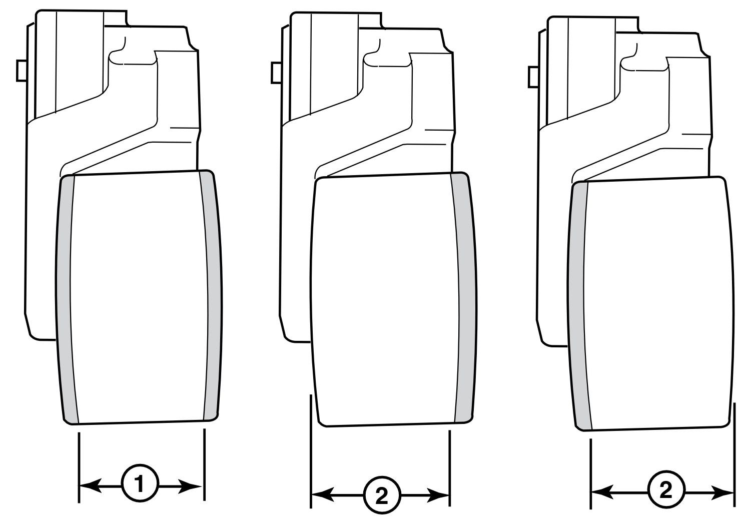

267589b

Figure 15 — Main Drive Belt Tensioner Belt Tracking Witness Mark

1. Acceptable (Witness Mark Approximately Same Width as Belt)	2. Not Acceptable (Witness Mark Tracking Off Edge of Pulley)

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- Remove the belt by using a 3/8 inch breaker bar to pull the tensioner back to the install stop. Slowly return the tensioner to the free-arm stop.
- With the belt removed, use the breaker bar to slowly pull the tensioner from the free-arm stop to the install stop and then slowly releasing it back to the free-arm stop. Any excessive roughness or hesitancy noticed while performing this check indicates that the tensioner must be replaced.
- Check for metal-to-metal contact as follows:
  - — Check for contact between the arm and the spring case. Replace if metal-to-metal contact is seen.

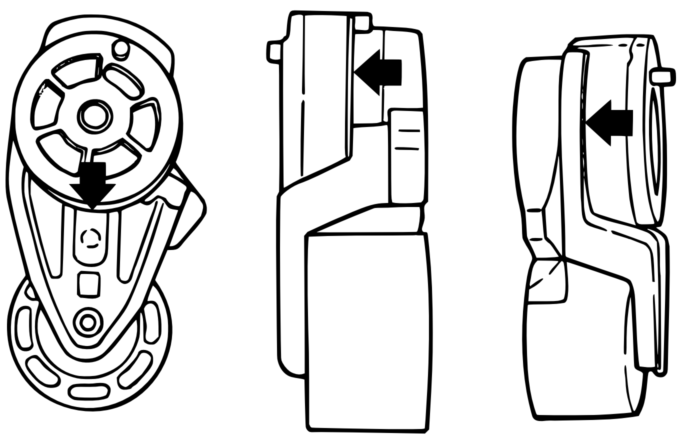

Figure 16 — Checking for Contact Between Arm and Spring Case

DRIVE BELTS

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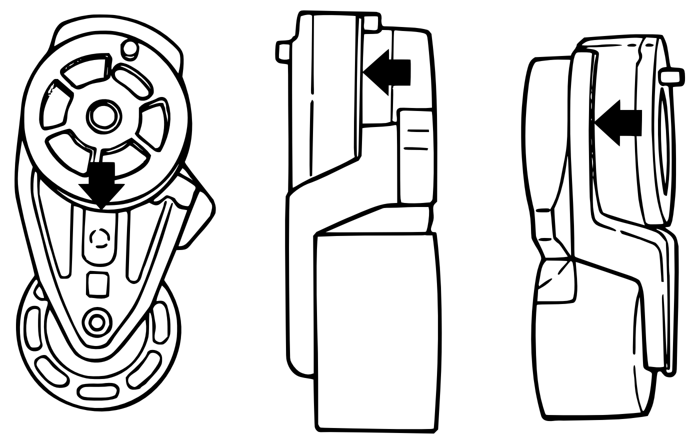

Figure 16 — Checking for Contact Between Arm and Spring Case

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— Check for metal-to-metal contact between the arm and the end cap. Replace if contact is seen.

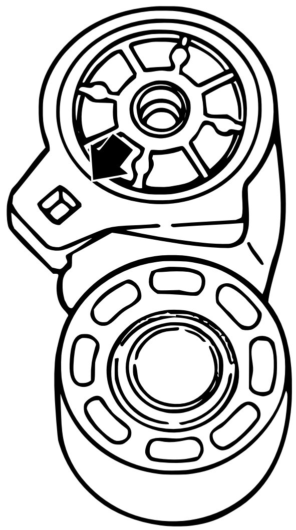


Figure 17 — Checking for Contact Between Arm and End Cap

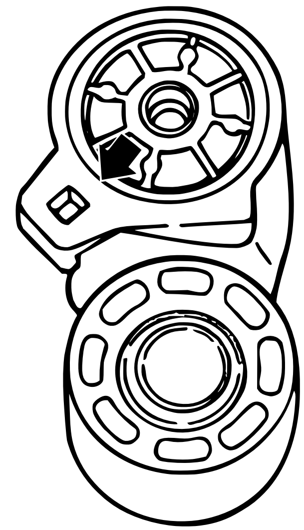
- Check for cracks in the tensioner body or for broken stops on the spring case. If either is seen, replace the tensioner.
- Reinstall the belt making sure that the belt is properly seated in the grooves of ALL pulleys.

⚠ CAUTION

If an automatic belt tensioner must be replaced, make sure that the proper tensioner is used. Tensioner spring tension varies by engine and chassis model. Do not substitute one tensioner part number for another, as drive belt failure can result.

DRIVE BELTS

— Check for metal-to-metal contact between the arm and the end cap. Replace if contact is seen.


267591a

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COOLING SYSTEM

The cooling system plays an important role in overall engine performance by keeping the engine within the normal operating temperature range — hot enough for efficient combustion, and cool enough to prevent engine damage caused by overheating. Good preventive maintenance practices, along with monitoring cooling system performance, go a long way in preventing engine damage that could result from cooling system problems. The maintenance items and tests outlined in this section should be performed at the intervals specified to ensure optimum performance from the cooling system.

Surge Tank/Radiator Pressure Cap

At every C and D inspection, check the condition of the surge tank/radiator cap gasket. Also, pressure-test the cap using a suitable cooling system and radiator cap tester. Radiator cap pressure specifications are as follows:

- **MP8 Engines** — 16-lb. pressure cap
- **MP7 Engines** — 16-lb. pressure cap

Thermostat

Check thermostat operation, particularly during cold weather, to make sure the thermostat closes fully, does not allow any leakage and does not open too soon. Also, the thermostat seal should be checked for leakage. A faulty thermostat and/or coolant leaking past the thermostat can cause engine overcooling and insufficient cab heat.

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91

Coolant Mixture

The coolant mixture should be tested to ensure that the coolant is maintained at the proper level of protection. A proper coolant mixture, which is essential to the cooling system, contains the following:

- **Quality Water** — Water meeting the minimum acceptable specifications listed in the following table, must be used in the cooling system.

Property	Limit	ASTM Test Method
Chloride (Cl), gr/gal (ppm)	2.4 (40) max.	D512b, D512d, D4327
Sulfate (SO4), gr/gal (ppm)	5.9 (100) max.	D516b, D516d, D4327
Total Hardness, gr/gal (ppm)	10 (170) max.	D1126b
Total Solids, gr/gal (ppm)	20 (340)	D1293

Water tests can be performed by any reputable testing laboratory. If water meeting the above specifications is not available, use de-ionized or distilled water rather than ordinary tap water to minimize the adverse effects of minerals in the water.

- **Antifreeze** — Heavy-duty diesel engine ethylene glycol- or propylene glycol-based coolant must be used in the cooling system. The standard factory-fill coolant is a 40/60 mixture of ethylene glycol-based coolant/quality water. Refer to "ANTIFREEZE SPECIFICATIONS" on page 284 for antifreeze specifications.

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CAUTION

Heavy-duty coolant is required, regardless if the coolant being used is ethylene glycol, propylene glycol or organic acid technology (OAT). DO NOT use high-silicate automotive types of coolant, as these coolants are not compatible with the supplemental coolant additives used in heavy-duty coolants. Use of high-silicate automotive types of coolant can cause radiator plugging, resulting in engine damage.

- **Supplemental Coolant Additives (SCAs)** — Supplemental Coolant Additives are chemicals added to the coolant mixture that maintain nitrite and pH levels within a specific range. SCAs protect against corrosion, pitting and cavitation erosion.

STANDARD FACTORY-FILL COOLANT

The standard factory-fill coolant is a fuchsia (pinkish/purple), pre-charged ethylene glycol-based product. A pre-charged coolant is one that contains an initial charge of SCAs so that the nitrite concentration is quickly brought up to the proper level. However, the SCA package depletes over time, making it necessary to add additional SCAs during the life of the coolant.

OPTIONAL COOLANTS

Optional MACK-approved coolants are also available at the factory. These optional coolants include propylene glycol-based and extended-life coolants. **It is the vehicle owner's responsibility to know the type of coolant used in the cooling system and understand the manufacturer's recommended service procedures**.

NOTE

Texaco Extended-Life coolants are approved for use in MACK diesel engines.

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NOTE

Fuchsia-colored coolants are NOT extended-life coolants.

TRADITIONAL COOLANTS VS. EXTENDED-LIFE COOLANTS

Traditional coolants are ethylene or propylene glycol-based coolants that require the periodic addition of SCAs during the life of the coolant so that the level of protection is maintained.

The extended-life coolant currently approved for use in MACK engines is an ethylene glycol-based coolant that uses Organic Acid Technology (OAT) to protect against corrosion, cavitation erosion and pitting. Organic acid coolants use a combination of carboxylate inhibitors in place of the traditional SCA package. These inhibitors deplete much more slowly than the SCA package used in traditional coolants, eliminating the need for routine testing of the coolant. Extended-life coolants require an annual check for contamination only.

CAUTION

Do not use a coolant conditioner containing the supplemental coolant additive (SCA) package on engines in which the cooling system is filled with an extended-life coolant. A coolant filter (part No. 20575545, which is a conditioner canister without the SCA package) is available through the MACK Parts System for MP7 and MP8 engines when extended-life coolants are used.

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Cooling System Top-Off

Always use MACK-approved coolants when topping-off the cooling system. Always top-off with a coolant meeting the same specifications as the coolant already in the system.

NOTE

The color of the standard factory-fill coolant is fuchsia (a pinkish/purple shade) or some variation of this color depending upon the mix. This standard factory-fill coolant is compatible with all other MACK-approved traditional ethylene glycol-based coolants.

The color of Texaco and ROTELLA™ Extended-Life coolants is red. The color of traditional propylene glycol is green.

Fuchsia-colored coolants are NOT extended-life coolants.

Currently, there are no industry standards for coolant color, so the color of a coolant is not an accurate indication of the type of coolant. Always be sure of the type of coolant used in the cooling system before topping-off.

TRADITIONAL FULLY-FORMULATED ETHYLENE-GLYCOL AND PROPYLENE-GLYCOL COOLANTS

Because of the difference in freeze points between ethylene glycol and propylene glycol, these two types of coolants should not be mixed. Cooling systems filled with ethylene glycol should be topped-off with ethylene glycol. Cooling systems filled with propylene glycol should be topped off with propylene glycol.

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EXTENDED-LIFE COOLANTS

Although the currently approved extended-life coolants are compatible with traditional coolants, mixing the two is NOT recommended, as the extended-life capabilities will be compromised. If an extended-life coolant is not available, the cooling system may be topped-off with a traditional antifreeze or quality water. If water is used, freeze protection must be checked and adjusted as soon as possible. If traditional coolant is used, a mixture no greater than 15% traditional coolant to 85% extended-life coolant is permissible. Mixtures containing greater than 15% traditional coolant will shorten the service interval. In this case, the cooling system should either be drained, flushed and refilled with fresh extended-life coolant, or the coolant should be treated as a traditional coolant, and traditional coolant maintenance practices (testing nitrite level and adding SCAs as required) should be followed.

Coolant Change Intervals

⚠ DANGER

Coolant is toxic. Keep coolant out of reach of children and pets.

Handling and disposing of used coolant is subject to federal, state and local regulations. Always dispose of used coolant in an environmentally safe manner, such as at an authorized waste disposal facility. When in doubt, contact the local authorities of the Environmental Protection Agency (EPA) for guidance as to proper handling and disposing of used antifreeze.

⚠ WARNING

Avoid prolonged or repeated skin contact with used antifreeze, as such contact can result in skin disorders or other bodily injury. Always wash thoroughly after contact with used antifreeze.

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TRADITIONAL ETHYLENE-GLYCOL AND PROPYLENE-GLYCOL COOLANTS

The change interval outlined in the following table is for traditional ethylene glycol- or propylene glycol-based coolants used in all MACK diesel engines:

All Operating Conditions		
Kilometers (Miles)*	**Hours***	**Months***
500 000 (300,000)	6,000	24

* Whichever occurs first.

EXTENDED-LIFE COOLANTS

Standard Extended-Life Coolant Change Interval

The change interval outlined in the following table is the standard change interval for extended-life coolants used in all MACK diesel engines:

All Operating Conditions		
Kilometers (Miles)*	**Hours***	**Months***
1 000 000 (600,000)	12,000	48

* Whichever occurs first.

Coolant Tests

The coolant mixture must be properly maintained to provide maximum freeze protection, along with protection against corrosion, cavitation erosion and pitting. The following coolant tests should be performed to ensure that the coolant is providing maximum protection.

COOLING SYSTEM

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All Operating Conditions
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The coolant mixture must be properly maintained to provide maximum freeze protection, along with protection against corrosion, cavitation erosion and pitting. The following coolant tests should be performed to ensure that the coolant is providing maximum protection.

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FREEZE PROTECTION

Coolant freeze protection should be checked twice per year, at each C and D inspection interval. A mixture between 40%–60% of antifreeze and quality water is required.

NOTE

Ethylene-glycol or propylene-glycol concentrations greater than 60% are not recommended. With mixtures above 60%, cooling performance degrades.

A refractometer should be used to measure freeze protection. A refractometer that measures both ethylene-glycol and propylene-glycol concentrations is available from SPX Kent-Moore. Tool part No. J 23688 measures ethylene/propylene-glycol concentration in degrees Fahrenheit and tool part No. J 26568 measures ethylene/propylene-glycol concentration in degrees Centigrade.

NITRITE LEVEL

To ensure that the coolant is properly maintained (neither overcharged, nor undercharged), coolant nitrite level must be checked at each oil change interval, prior to changing the coolant conditioner. Test strips (part No. 7046-3001M) are available through your MACK dealer. Nitrite level should be maintained between 1200 to 4000 ppm.

CAUTION

The coolant should be checked with a test strip prior to adding antifreeze/quality water solution to the cooling system and before changing the coolant conditioner. Low concentrations of SCAs will result in cavitation erosion, pitting and eventual engine failure. High concentrations of SCAs will lead to sludge build-up and overheating.

COOLING SYSTEM

FREEZE PROTECTION

Coolant freeze protection should be checked twice per year, at each C and D inspection interval. A mixture between 40%–60% of antifreeze and quality water is required.

NOTE

Ethylene-glycol or propylene-glycol concentrations greater than 60% are not recommended. With mixtures above 60%, cooling performance degrades.

A refractometer should be used to measure freeze protection. A refractometer that measures both ethylene-glycol and propylene-glycol concentrations is available from SPX Kent-Moore. Tool part No. J 23688 measures ethylene/propylene-glycol concentration in degrees Fahrenheit and tool part No. J 26568 measures ethylene/propylene-glycol concentration in degrees Centigrade.

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NOTE

Testing coolant nitrite level is not required with Texaco or ROTELLA™ Extended-Life coolants.

COOLANT pH LEVEL

Coolant pH level is a measure of coolant corrosiveness. For best results, pH should be maintained between 8.5–10.5 for traditional coolants, and between 7.0–10.0 for extended-life coolants. The coolant pH level should be tested at each oil change interval. If coolant pH is outside these ranges, the cooling system must be drained and refilled with fresh coolant. Coolant pH above the specified range attacks aluminum, copper and other non-ferrous materials in the cooling system. Coolants with pH below the specified range may attack ferrous materials. A coolant pH electronic tester (tool part No. J 41660) is available from SPX Kent-Moore. Additionally, test strip part No. 7046-3001M can be used to check coolant pH levels. These strips are available from your MACK dealer.

ORGANIC ACID CONCENTRATION (EXTENDED-LIFE COOLANTS)

To ensure that the extended-life coolant has not been contaminated with traditional coolant, the coolant mixture should be tested every 161 000 km (100,000 miles), 2000 hours or once per year (D inspection interval), whichever occurs first. Test strips are available for this purpose. The test is a pass/fail type that indicates whether or not the coolant is contaminated. If the test indicates contamination, the cooling system should be drained, flushed and refilled with fresh extended-life coolant. The test strips can be ordered directly from Chevron Texaco by calling 800-822-5823. Order part No. CPS 900546, Extended-Life Coolant dilution test kit.

NOTE

Do not use the nitrite test strips used for testing the nitrite level of traditional coolants to test extended-life coolants.

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Coolant Conditioning

The coolant mixture in a wet sleeve diesel engine must be properly maintained to provide maximum engine block and cylinder sleeve protection. Engine coolant must contain a proper mixture of quality water, recommended antifreeze and supplemental coolant additives (SCA) so that maximum freeze and boil point protection, and protection against cavitation erosion is provided.

The spin-on coolant conditioner contains the SCA package inside the canister so that a fresh charge of SCA is added to the cooling system each time the coolant conditioner is changed. Changing the coolant conditioner at the recommended maintenance intervals protects against cavitation erosion damage which can occur to the cylinder block and cylinder sleeves. Always test the coolant nitrite level to ensure that the coolant is being properly maintained prior to adding antifreeze/quality water to the cooling system, or before changing the coolant conditioner.

NOTE

A coolant filter (part No. 20575545) that contains a filter but no additive package is available for MP7 and MP8 engines when extended-life coolants are used.

NOTE

Do not use extended-life coolants in engines equipped with a coolant conditioner. Testing coolant nitrite level is not required with extended-life coolants.

NOTE

For chassis equipped with Cummins engines, refer to the Cummins Engine Operation and Maintenance Manual for information concerning coolant conditioning.

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100

COOLANT CONDITIONER CHANGE

On MACK MP7 and MP8 engines, the coolant conditioner is located on the lower right-hand side of the engine. Replacement procedures are the same for both engines.

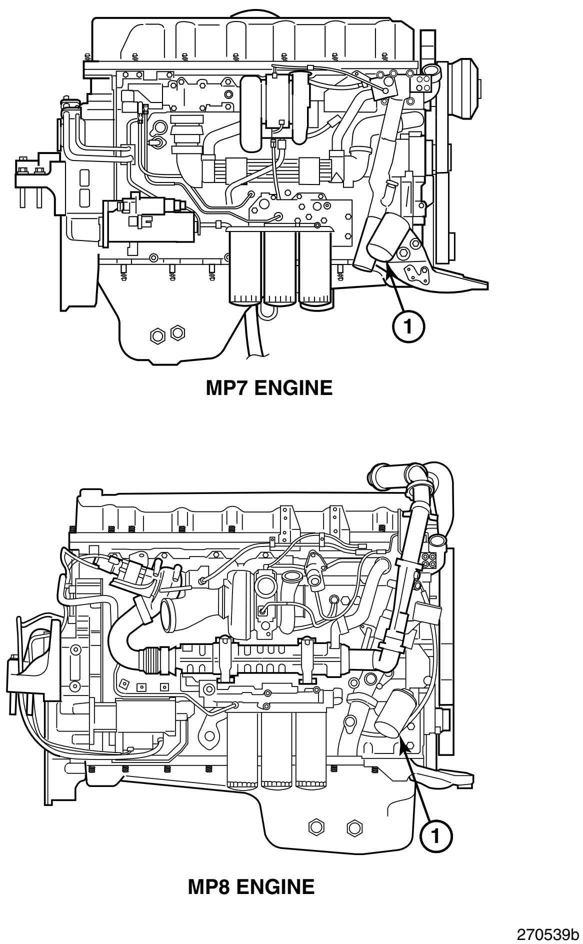

Figure 18 — Coolant Conditioner Locations

1. Coolant Conditioner

COOLING SYSTEM

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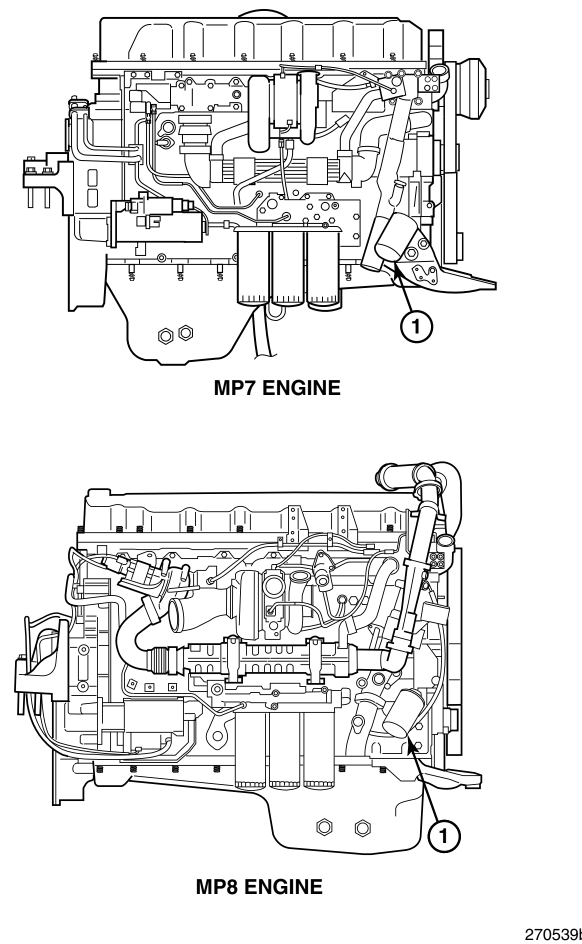

Figure 18 — Coolant Conditioner Locations

1. Coolant Conditioner

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⚠ WARNING

Avoid injury. Shut the engine off and allow the cooling system to cool before removing the pressure cap. Turn the cap to the first stop, but do not depress. Allow any residual pressure to dissipate. After pressure completely dissipates, press the cap downward and continue turning to remove.

The coolant conditioner is replaced as follows:

1. Rotate the shut-off valve (refer to the following illustration) counterclockwise.

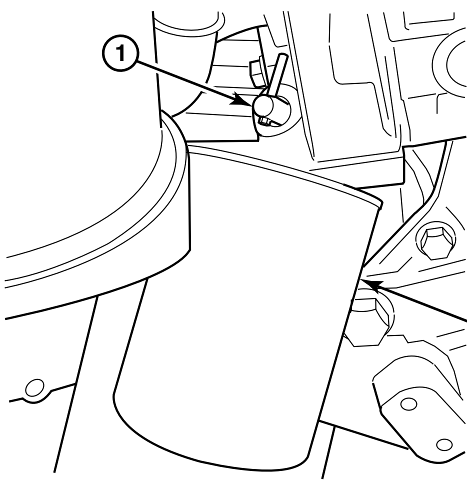

Figure 19

1. Shut-Off Valve	2. Coolant Conditioner

2. Place a suitable container below the coolant filter area to catch any spilled coolant.
3. Using a suitable filter wrench (J 48061, or equivalent), remove the coolant conditioner filter element and discard.

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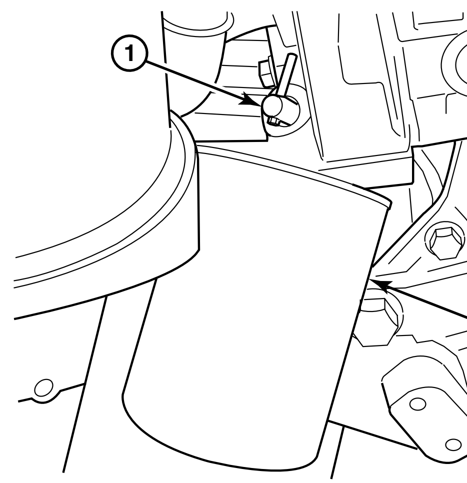

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4. Clean the coolant conditioner mounting surface.
5. Apply a light film of engine oil to the sealing gasket of the **new** coolant conditioner element.
6. Install the filter element on the coolant conditioner base assembly. Tighten the filter element 1/2 to 3/4 turn after the gasket contacts the base.
7. Rotate the shut-off valve clockwise.
8. Replenish the cooling system with the proper type and mixture of coolant.

Cooling System Corrosion

At each A, B, C and D inspection interval, check inside the radiator for signs of corrosion which may be present around the radiator tube ends. A limited view inside the radiator may be gained by removing the upper radiator hose, after first draining enough coolant from the system to bring the level below the top radiator tank. On radiators that have a radiator cap, it is only necessary to remove the cap to look inside the radiator. If corrosion is present, add 3.8 liters (one gallon) of Penray® 2001 On-Line Cooling System Cleaner to the cooling system and operate the vehicle for approximately 40 000 km (25,000 miles). After 40 000 km (25,000 miles), drain and flush the cooling system. Refill the system with fresh coolant, then change the spin-on coolant conditioner.

Fan Arrangement Safety Precautions

WARNING

Keep clear of fan when engine is running. Fan may start to rotate at high speed without warning.

WARNING

Misuse, misapplication or modification of radiator cooling fans can result in serious personal injury and property damage. Basic safety precautions, including the following, should always be followed.

COOLING SYSTEM

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1. DO NOT operate the engine with a defective fan drive, or with a fan which has been bent, mutilated, modified or damaged. Continued operation could result in serious failure resulting in injury or property damage.
2. If there is evidence of fan drive malfunction or exterior damage to the drive or fan, remove and replace both items. Field repair involving disassembly of an air sensing viscous fan drive or an electronically modulated fan drive can be dangerous and is not recommended. Contact your nearest MACK distributor.
3. Replace the fan if there appears to be any indication of damage to the fan.
4. Never attempt to restrict fan blade rotation during engine operation. Serious personal injury, property damage or damage to the fan drive could result.
5. DO NOT operate the engine if the fan strikes against any engine component while in operation.
6. Never operate an air sensing viscous fan with a fully closed winterfront. The winterfront center panel must be kept fully open. Do not use cardboard or other similar improvised restrictions.
7. Have the fan and fan drive inspected by a qualified mechanic if it has been exposed to excessively high temperatures (about 121°C [250°F]), and it contains any plastic or rubber components.
8. DO NOT rebalance the fan. If balancing is necessary, contact your nearest MACK dealer.
9. Perform all required maintenance on the fan drive assembly.
10. Ensure that all bolts attaching the fan to the drive are tightened to the specified torque.
11. Install the fan only on an engine that has been approved for such a fan. (Check the engine manufacturer's part list.) Likewise, install a subassembly to which the fan is attached only if approved or specified for use on the engine.
12. DO NOT modify or substitute any parts of the engine unless in accordance with the engine manufacturer's instructions. Take special care not to make modifications that increase the operating speed of the fan.

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COLD WEATHER OPERATION

Cold weather operations place added demands on a diesel engine. Heavy-duty diesel engines are designed to operate at optimum efficiency when running loaded at, or very near, normal operating temperature where efficient combustion takes place. When operating unloaded, lightly loaded (stop-and-go operations, PTO operations or periods of extended engine idling), or in cold weather conditions, normal operating temperature may not be achieved or maintained. The incomplete combustion of fuel will result in oil dilution, “slobbering” from the exhaust, carbon and/or varnish build-up on the valves and oil thickening and sludge formation may result. In severe instances, heavy deposits of varnish can cause sticking valves which can result in bent valves, bent push rods or similar types of valve train component failure.

At cold weather start-up, and during periods of extended idling, a fast idle speed of 1200 rpm must be used to provide and maintain a minimum coolant temperature of 77°C (170°F). In addition, the cold weather accessories described in this manual may be needed based upon the anticipated ambient temperatures.

NOTE

If the vehicle is kept outside during cold temperatures, and cold weather start-up and warm-up to normal operating temperature is difficult, a cylinder block heater is recommended.

During cold weather operations, it is important that coolant system maintenance be performed regularly, and that thermostat operation be checked to make sure it closes fully, does not allow any leakage and does not open too soon. The thermostat seal should also be checked for leakage. Coolant leaking past the thermostat will cause over-cooling.

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105

Ether and Cold Weather Starting

Use of ether or other similar starting aids in the MACK MP series of engines is strictly prohibited. This applies to all MACK MP engines whether or not the engine is equipped with the cold weather electric pre-heater option.

For cold weather starting, the only acceptable starting aid is the electric pre-heater option. This option is a factory-installed electric grid element which is located inside the intake manifold and heats the intake air at cold start-up.

DANGER

Spraying ether or similar starting aids into the air cleaner of an engine equipped with an electric pre-heater could result in a fire or explosion, causing severe personal injury or death.

CAUTION

Use of ether or similar starting aids in MACK US07 emission compliant and later engines which are not equipped with the cold weather pre-heater option is also prohibited.

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Cold Weather Accessories

Cold weather operations place an added demand on a diesel engine. The following chart outlines the various accessories available that are designed to maximize engine reliability when operating in cold weather.

Component	CXU	CHU	GU7	GU8	MRU	LEU
Dual-Inlet Air Cleaner	X	X	X	X	NA	NA
Inside/Outside Air	X	X	X	X	NA	NA
Engine Heater	X	X	X	X	X	X
Fuel Heater	X	X	X	X	X	X

WINTERFRONTS

CAUTION

Winterfronts are NOT recommended, but may be used during very cold weather when sustained temperatures are below –25°C (–13°F).

CAUTION

If a winterfront must be used, use only a winterfront designed for the specific chassis. Restricted airflow through the charge air cooler can cause higher exhaust temperatures, power loss, excessive fan usage, reduced fuel economy and possible engine damage. The use of any other type of device, such as a radiator cover, cardboard or similar material, is not approved by Mack Trucks, Inc.

If a winterfront is used, a MACK-approved pyrometer MUST also be installed and closely monitored while the engine is in operation. DO NOT exceed the temperature limit shown on the pyrometer. If exhaust temperature becomes too high, open the winterfront, downshift or reduce engine power.

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ENGINE ENCLOSURE/BELLY TARP

A belly tarp is a canvas enclosure that is installed along the bottom of the engine and helps retain heat within the engine compartment. Belly tarps are generally used at colder ambient temperatures when a winterfront alone is not sufficient and may be fabricated from a piece of canvas of sufficient size to completely cover the underside of the engine compartment. The canvas tarp is then secured to the chassis with rubber straps, or “Bungie Cords.” Make sure that the tarp does not obstruct the engine breather, interfere with any linkages or contact any part of the exhaust system.

DUAL-INLET AIR CLEANER

A dual-inlet air cleaner (part No. 2MD4138M) for CXU, CHU, GU7 and GU8 model vehicles is available from your local MACK dealer. This type of air cleaner has a second air inlet located above the turbocharger/exhaust pipe to provide a means of heating the intake air during cold weather operations. The air inlet is covered with a manually operated sliding door. When operating in cold weather, loosen the four wing nuts that secure the door, then slide the door to the opened position. Secure the sliding door in the opened position by tightening the wing nuts. Refer to the chart at the end of this section for the suggested temperature ranges as to when the air cleaner sliding door should be closed, and when it should be opened.

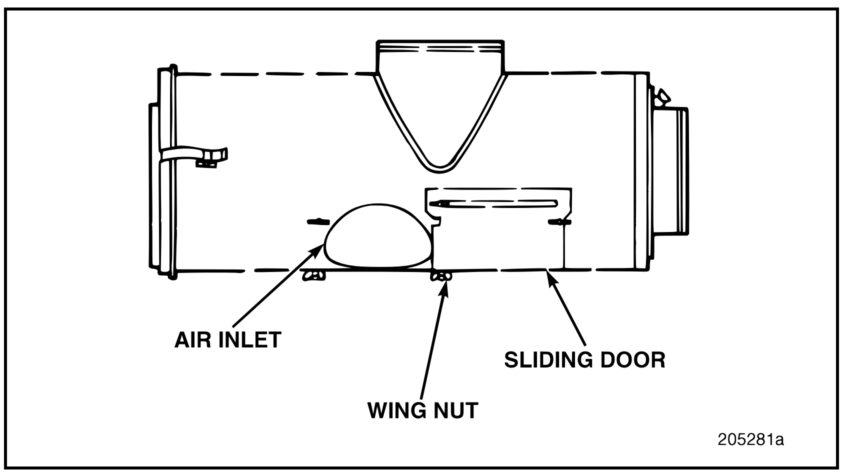

Figure 20 — Dual-Inlet Air Cleaner

COLD WEATHER OPERATION

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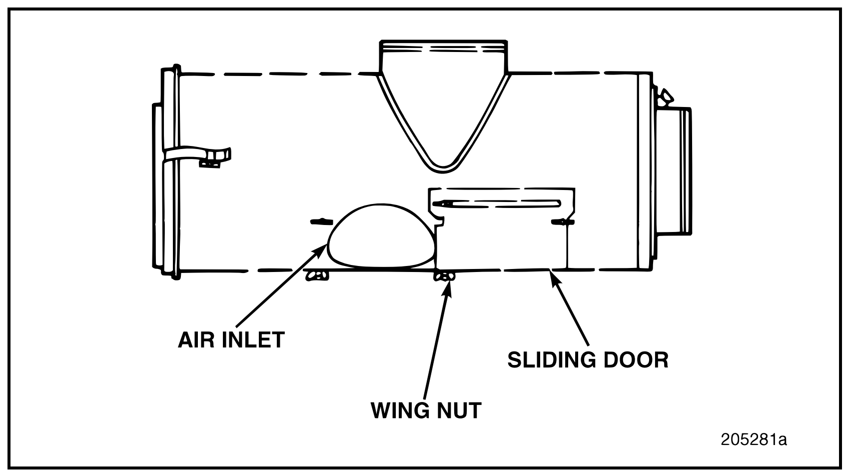

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COLD-WEATHER ACCESSORY USAGE

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HOSE CLAMP TORQUES

System	N•m (Lb-in)
Coolant System	3.1 (27.5)
Oil Return System	3.1 (27.5)
EGR System	
• Hi-torque V-band clamps	12 (110)
Air Inlet System:	
Pressurized hoses*	
• Spring-loaded T-bolt hose clamps	8.5 (75)
• Hi-torque V-band clamps	8.0 (70)
Non-pressurized hoses**	
• Standard hose clamps	4.2 (37.5)
• Spring-loaded T-bolt hose clamps	5.7 (50)
• High-torque heavy-duty worm clamps	9 (80)

* Includes all clamps installed between the turbocharger outlet and the inlet manifold, charge air cooler and inlet manifold connecting hose.

** Includes all hoses between the air cleaner and the turbocharger inlet.

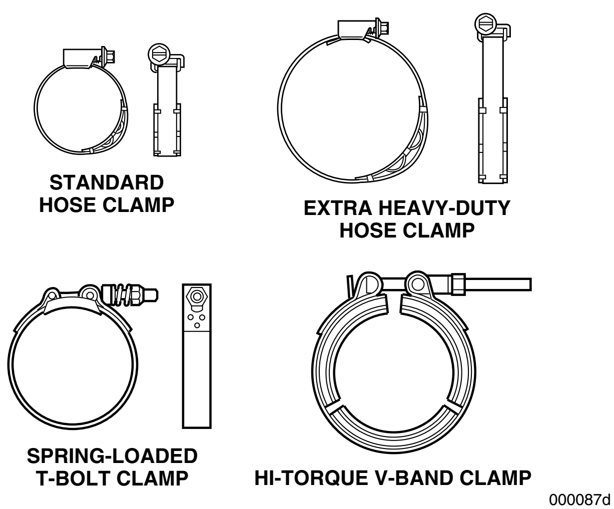

Figure 21 — Hose Clamp Types

HOSE CLAMP TORQUES

HOSE CLAMP TORQUES

System	N•m (Lb-in)
Coolant System	3.1 (27.5)
Oil Return System	3.1 (27.5)
EGR System	
• Hi-torque V-band clamps	12 (110)
Air Inlet System:	
Pressurized hoses*	
• Spring-loaded T-bolt hose clamps	8.5 (75)
• Hi-torque V-band clamps	8.0 (70)
Non-pressurized hoses**	
• Standard hose clamps	4.2 (37.5)
• Spring-loaded T-bolt hose clamps	5.7 (50)
• High-torque heavy-duty worm clamps	9 (80)

* Includes all clamps installed between the turbocharger outlet and the inlet manifold, charge air cooler and inlet manifold connecting hose.

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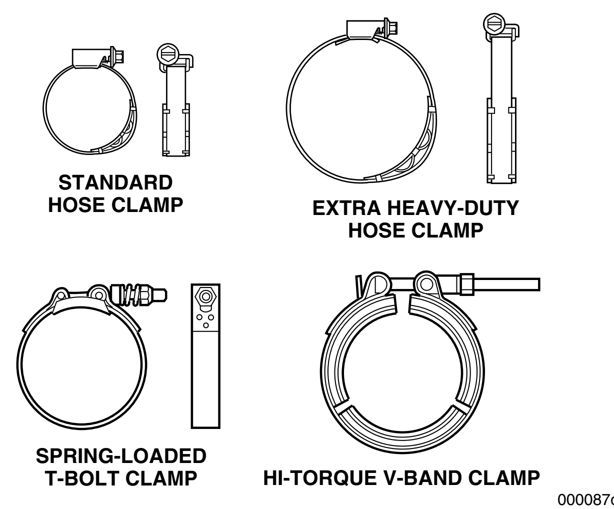

Figure 21 — Hose Clamp Types

110

AIR CONDITIONER MAINTENANCE

Periodic Inspections

To ensure proper air conditioner operation, the following procedures should be performed at each A, B, C and D inspection interval.

1. Inspect evaporator core (and heater core if a combination unit) for obstructions, and use compressed air to remove any debris that may be found.

CAUTION

Use care to prevent damaging the blower wheel blades.

2. Inspect condenser unit and remove any debris with compressed air. Tighten any loose fasteners.
3. Inspect the compressor. Check for loose or broken wires, and tighten nuts and bolts on compressor mounting bracket and clutch.
4. Check compressor drive belt tension and adjust, if necessary. (Refer to “DRIVE BELTS” on page 79.)
5. Inspect refrigerant hoses for abrasion or wear, and check all connections for leaks.
6. Check condensation drain hose leading from the evaporator and make sure it is not kinked or otherwise restricted.
7. Start the engine, turn the air conditioner ON and listen for any unusual noise coming from the compressor. The compressor clutch should rotate when the thermostatic switch is turned ON, and should not rotate when the switch is turned OFF.
8. Check the receiver/dryer service indicator. The normal color of the service indicator is blue. Replace the receiver/dryer when the service indicator color changes to pink. Refer to the service instruction label found on the receiver/dryer.
9. Determine if system is fully charged. Refer to Air Conditioning Service literature for proper procedures.

AIR CONDITIONER MAINTENANCE

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9. Determine if system is fully charged. Refer to Air Conditioning Service literature for proper procedures.

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10. Check for proper blower speed control.
11. Determine satisfactory air conditioner performance by measuring the air temperature at the vent nearest to the evaporator. Acceptable air temperature at this location is a thermometer reading below 4.4°C (40°F) with ambient air temperature around 21°C (70°F).

NOTE

For specific information concerning air conditioning maintenance and service procedures, refer to the manufacturer's service manual.

CAUTION

MACK model chassis are factory-filled with the environmentally safe refrigerant R134a. This refrigerant is not a direct replacement for R12 refrigerant and must only be used in systems designed for its use. DO NOT use R134a in a system already charged with, or designed to use, R12. Conversely, DO NOT use R12 in a system already charged with, or designed to use, R134a.

AIR CONDITIONER MAINTENANCE

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AIR CLEANER MAINTENANCE

The air cleaner prevents dust, dirt and other harmful contaminants from entering the engine through the air intake system. Maximum engine protection can only be achieved through regularly scheduled maintenance practices that include periodic air intake system inspections and air filter element changes.

The most efficient method of determining air filter element change intervals is by regularly checking the air filter restriction gauge, which may either be mounted directly to the air cleaner canister, on the air cleaner outlet tube or inside the cab. The restriction gauge measures the amount of restriction in the air filter element. Some chassis may have a dash-mounted dial-type restriction gauge which measures filter restriction in mm/inches of water.

Change the air filter element in accordance with the procedures as outlined, when the restriction gauge red signal locks in full view, or the dash-mounted gauge indicates inlet restriction as follows:

DASH-MOUNTED GAUGE INLET RESTRICTION INDICATION

Engine	Millimeters Water/kPa
MP7 and MP8	510 mm (20″)/5 kPa

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113

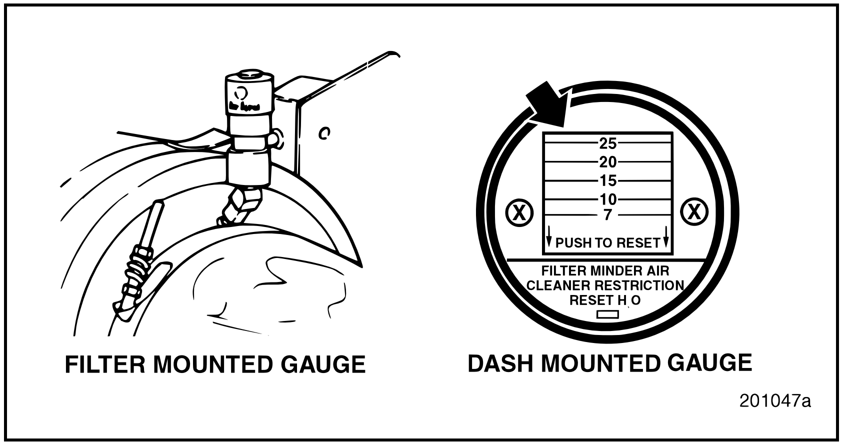


Figure 22 — Air Filter Restriction Gauge

Damage to the air filter element, such as holes in the filter medium, will give an inaccurate restriction reading. Therefore, even if maximum restriction is not indicated, the air filter element should be changed yearly or at 160 000-km (100,000-mile) intervals, whichever comes first.

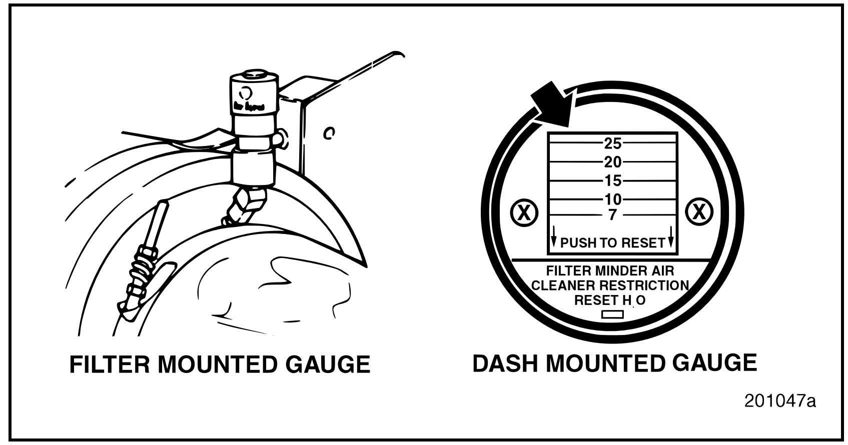
When replacing the air filter element, or whenever the air inlet system has been disassembled, inspect the inlet air ducts between the air cleaner canister outlet and the turbocharger inlet as follows:

- Inspect the rubber elbows for cracks, splitting and/or holes. Rubber components must be flexible so that they conform to the plastic ducts and ensure a tight seal.
- Inspect plastic ducts for cracks and/or holes.
- Ensure that all hose clamps are properly installed and tightened to specifications. Refer to “HOSE CLAMP TORQUES” on page 110.
- Make sure the plastic ducts do not rub against any components such as air conditioning hoses, wire harnesses, etc.

To properly install a new filter element:

1. Wipe the air cleaner housing clean.
2. Remove the filter element(s).

AIR CLEANER MAINTENANCE



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To properly install a new filter element:

1. Wipe the air cleaner housing clean.
2. Remove the filter element(s).

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3. Inspect sealing areas for “dirt tracks” which would indicate that dust has leaked past the seal. If dirt tracks are found, the cause must be determined and corrected.
4. Thoroughly clean the inside of the air cleaner canister with a damp cloth or vacuum cleaner.
5. If equipped with a metal canister, inspect inside the canister for rust. If rust is present:
   a. Remove the air cleaner canister from the chassis.
   b. Remove all loose rust with a wire brush or a coarse Scotch Brite® pad.
   c. Sand with 180–240 grit wet or dry sand paper.
   d. Thoroughly wash the area with PPG DX-440®, DX-436®, DX-437® or equivalent, wax and grease remover and wipe dry.
   e. Prime immediately with PPG DEP-351® epoxy primer.
   f. Reinstall the air cleaner canister.
6. Inspect the sealing areas of the housing for damage. Repair or replace as necessary.
7. Use MACK-approved replacement elements and gaskets. Make sure the new elements and gaskets are not damaged. Be sure to use new gaskets each time the element is changed. Install the cover and, depending upon cover configuration, tighten as follows:
   - Air cleaner with large wing nut in center of cover — hand-tighten wing nut.
   - Air cleaner with three thumb screws around outer edge of cover — hand-tighten thumb screws.
   - Air cleaner with retaining nuts around outer edge of cover — tighten retaining nuts between 11–14 N•m (8–10 lb-ft).

AIR CLEANER MAINTENANCE

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NOTE

DO NOT attempt to clean the air filter element with compressed air, as this could damage the filter medium and possibly result in severe engine damage.

Figure 23 — Replacement Parts and Filters

AIR CLEANER MAINTENANCE

NOTE

DO NOT attempt to clean the air filter element with compressed air, as this could damage the filter medium and possibly result in severe engine damage.


FOR BEST RESULTS...
USE GENUINE
Mack
REPLACEMENT PARTS AND FILTERS
000111a

Figure 23 — Replacement Parts and Filters

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TURBOCHARGERS

Turbochargers are lubricated by oil from the engine. Scheduled engine oil changes take care of any periodic service requirements.

Because a turbocharger operates at such high speeds, lubrication at start-up and shutdown is of primary importance.

When the engine is started, idle for three minutes to allow the oil pressure to build. Accelerating the engine to top rpm immediately after starting may damage the turbocharger.

Likewise, when preparing to shut down, idle the engine for three minutes to ensure that the turbocharger is rotating slowly. This idling period dissipates heat and prevents possible turbocharger damage.

At each 240 000 km/150,000 miles or 4500-hour interval (whichever occurs first), thoroughly clean the outside of the turbocharger. Pay particular attention to the areas of the large intake and exhaust pipe connections. Remove the air intake and exhaust pipes from the turbocharger.

CAUTION

Prior to inspecting the turbocharger, disconnect the batteries by disconnecting the negative cables first, then the positive cables. Do this to prevent the engine from being started while inspecting the turbocharger.

CAUTION

DO NOT allow any debris or foreign material to enter the turbocharger openings or connecting pipes.

Inspect both housings and the wheel blades for signs of excessive dirt buildup or oil leakage from the bearing housing. Turn the wheel blades with the fingers while pushing in various directions to check for wheel-to-housing rub. If rubbing or a severe buildup of dirt exists, replace the turbocharger.

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After completing the inspection, reinstall the air intake and exhaust pipes.

The engine turbocharger operates at very high speed, temperatures and pressure. Turbo bearing lubrication is critical, particularly for a newly installed turbo or one which has not been operated for a period of time and all oil has drained from the bearing and shaft surfaces. To avoid turbocharger bearing failure, the following instructions are recommended:

- Start the engine at least every 30 days to ensure turbo bearing lubrication. Operate engine at low idle for at least three minutes before increasing RPM or driving the vehicle.
- If the engine has not been run for more than 30 days, turbo pre-lube procedure is necessary:
    1. Remove turbo air intake duct and oil line connection at turbo.
    2. Fill oil inlet fitting to overflow with clean engine oil.
    3. Using fingers at compressor wheel, carefully spin and wiggle the turbo shaft to distribute the oil over all bearing surfaces.
    4. Reconnect air intake duct and again fill turbo oil port to overflow, connect oil line and start engine.
    5. Operate engine at low idle for at least three minutes before increasing RPM or driving the vehicle.

TURBOCHARGERS

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DIESEL PARTICULATE FILTER (DPF)

Ash Cleaning Interval

For both catalyzed and non-catalyzed DPF systems, ash must be cleaned from the filter by using an approved cleaning system at each 400 000 km/250,000 mile or 4,500 hours, whichever occurs first.

Aftertreatment Hydrocarbon Injector

For catalyzed DPF systems, the Aftertreatment Hydrocarbon Injector (AHI) must be removed and cleaned with a suitable solvent at each 240 000 km/150,000 mile or 4,500 hour interval. For instructions on removing, cleaning and reinstalling the AHI, refer to the applicable service manual.

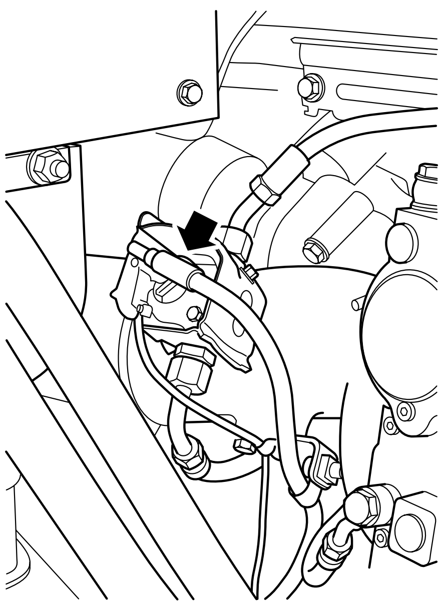

Figure 24 — Aftertreatment Hydrocarbon Injector (AHI)

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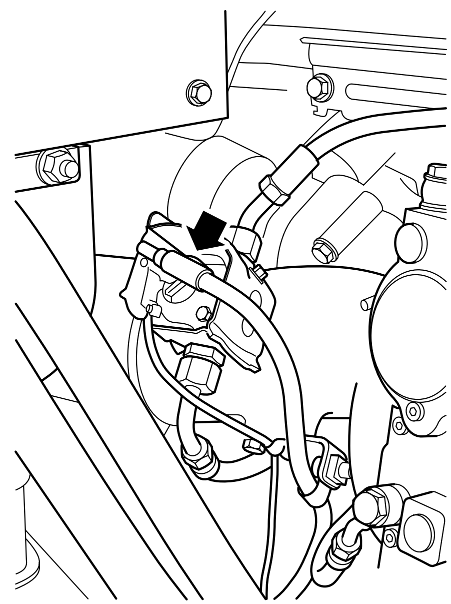
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Figure 24 — Aftertreatment Hydrocarbon Injector (AHI)

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On the non-catalyzed DPF system, clean or replace (as required) the ignition electrodes and the injection nozzle at each 161 000 km/ 100,000 mile or 2,400 hour interval, whichever occurs first. The electrodes and nozzle are located at the bottom of the DPF unit.

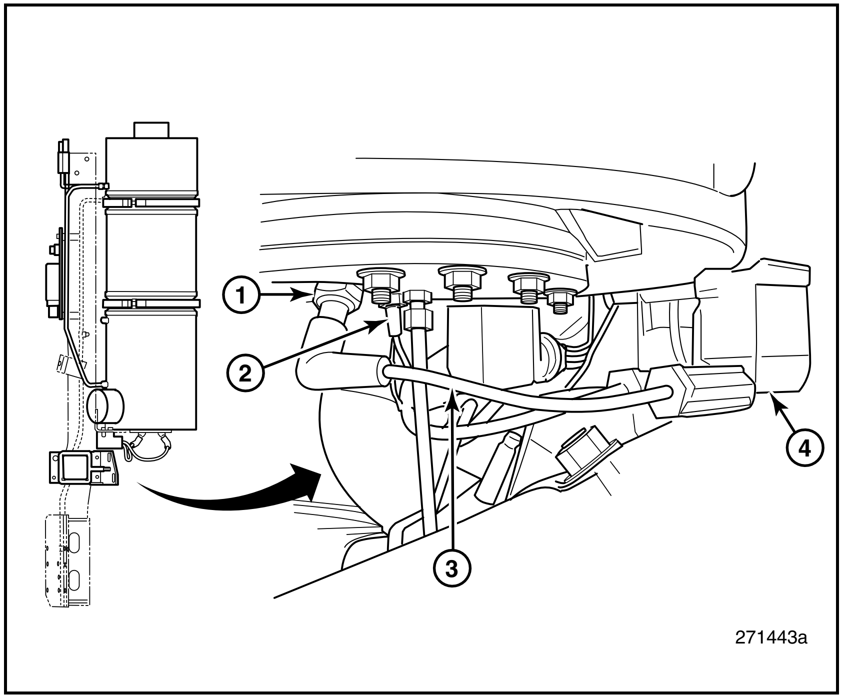

Figure 25 — Ignition Electrodes and Injection Nozzle — Non-Catalyzed DPF System

1. Ignition Electrode 2. Injection Nozzle	3. Ignition Cables 4. Ignition Coil

⚠ WARNING

Allow the exhaust system to cool before performing any maintenance on the DPF system.

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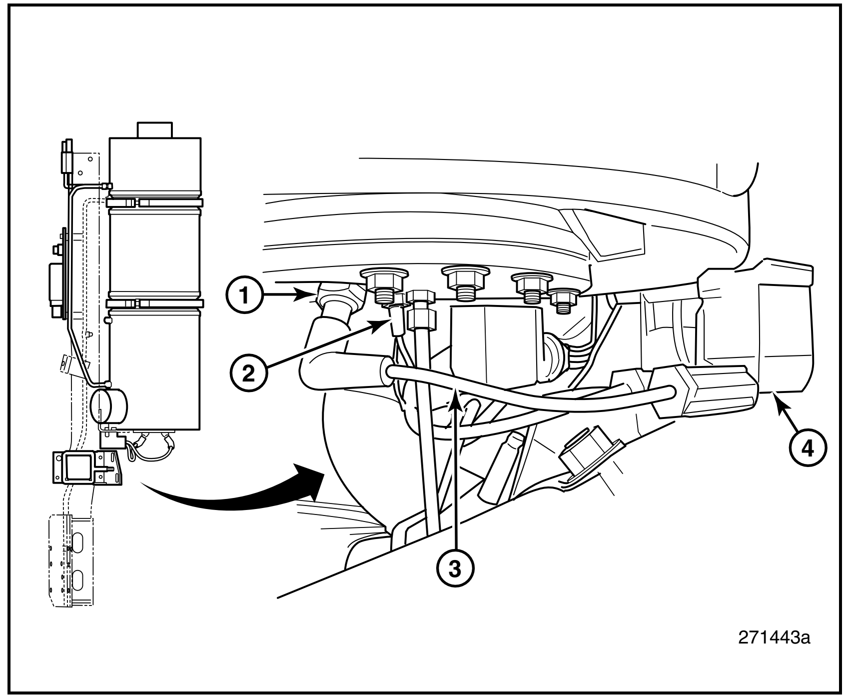

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1. Ignition Electrode 2. Injection Nozzle	3. Ignition Cables 4. Ignition Coil

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Allow the exhaust system to cool before performing any maintenance on the DPF system.

120

⚠ CAUTION

DO NOT use compressed air to remove ash from the filter or housing. Ash removal must be performed per the applicable service literature. Dispose of the ash in accordance with all state and local regulations.

⚠ CAUTION

Failure to use the mandatory Ultra Low Sulfur Diesel (ULSD) fuel and the ’07 Low Ash Diesel Engine oil will result in major damage to and failure of the DPF unit, very poor engine performance, and the engine may not run at all. If premature failure of the DPF is found to have resulted from failure to use the mandatory ULSD fuel and/or ’07 Low Ash Oil, warranty will be denied.

NOTE

Diesel Particulate Filters and their components cannot be moved or altered from the OEM installation in any fashion.

- Moving or altering the DPF unit or its components will result in emission system malfunction or failure.
- Altering the emissions control system is prohibited by the Environmental Protection Agency (EPA).
- Dealers and/or body builders are NOT authorized to alter or modify the emissions control system or any of the emissions related components.
- Turbo-unloaders are NOT to be used on chassis equipped with diesel particulate filters.

DIESEL PARTICULATE FILTER (DPF)

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DO NOT use compressed air to remove ash from the filter or housing. Ash removal must be performed per the applicable service literature. Dispose of the ash in accordance with all state and local regulations.

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CMCAC

The Chassis-Mounted Charge Air Cooling (CMCAC) system requires the following maintenance procedures at the recommended intervals.

Daily Maintenance

Using a firm bristle brush and soapy water, remove all bugs, leaves and other debris from the frontal area.

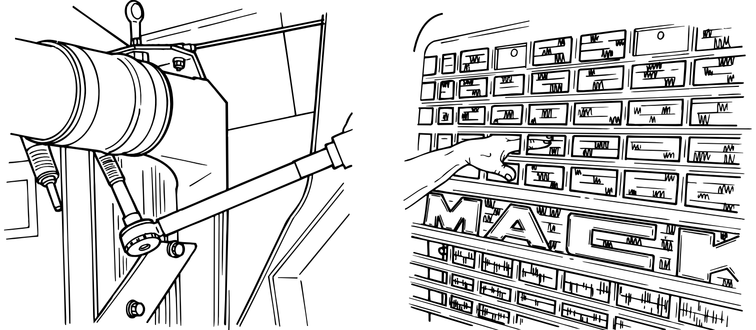

Figure 26 — Charge Air Cooler Maintenance

NOTE

Clean any debris that may accumulate between the radiator core, charge air cooler core and the air conditioner condenser core.

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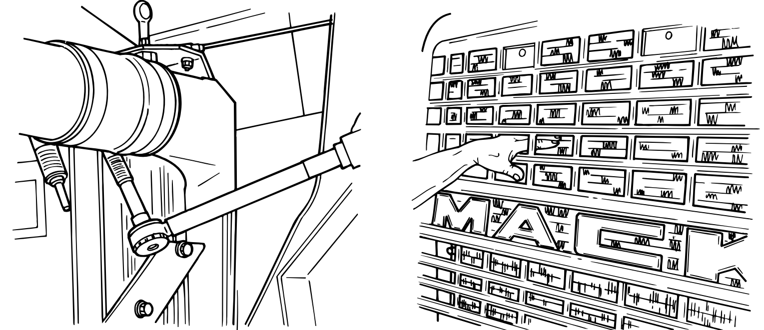

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NOTE

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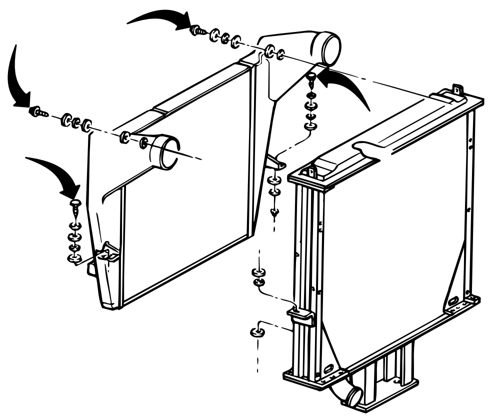
EVERY C AND D INSPECTION



CHECK WELDS JOINING SIDE TANKS TO CORE FOR CRACKS AND MOUNTING BRACKETS FOR SECURITY AND CONDITION. TORQUE THE MOUNTS TO 41 N•m (30 LB-FT).

201050b

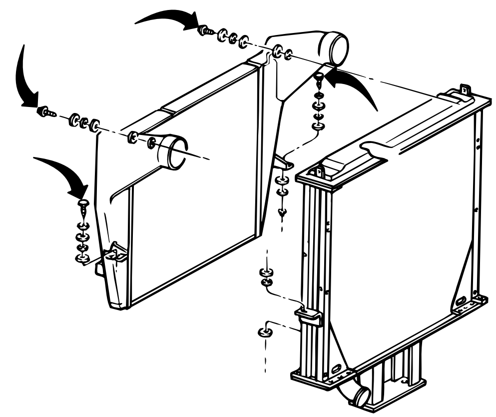
Figure 27 — Charge Air Cooler Maintenance

NOTE

On CX models, checking torque of the radiator-to-charge air cooler mounting bolts is not necessary.

CMCAC

EVERY C AND D INSPECTION



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201050b

Figure 27 — Charge Air Cooler Maintenance

NOTE

On CX models, checking torque of the radiator-to-charge air cooler mounting bolts is not necessary.

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FUEL SYSTEM

NOTE

General field practice is to prime the fuel filters before installation. This practice can allow dirt to enter the outlet port of the filter if caution is not used. Use filtered fuel only when priming the filter. Prime through the series of small holes on the top of the filter. DO NOT prime the filter through the center hold.

Fuel Filters — MACK MP Engines

MACK MP engines utilize a spin-on primary and secondary fuel filters. Both filters are located on the right-hand side of the engine.

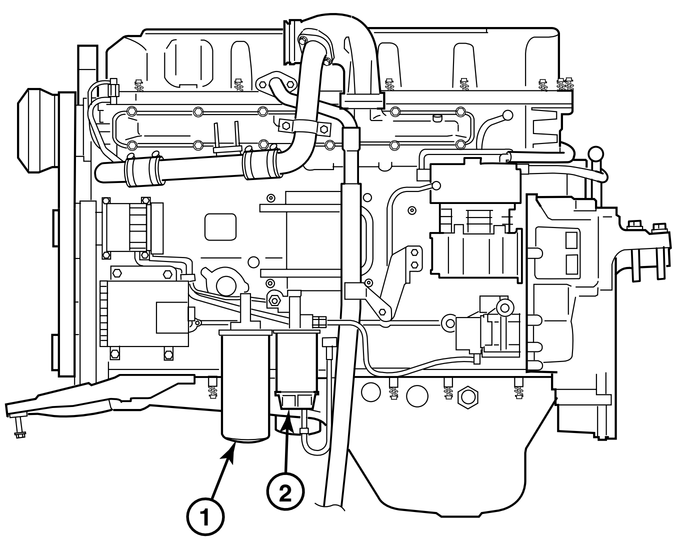

Figure 28 — Fuel Filters — MACK MP Engine

1. Secondary Fuel Filter	2. Primary Fuel Filter

FUEL SYSTEM

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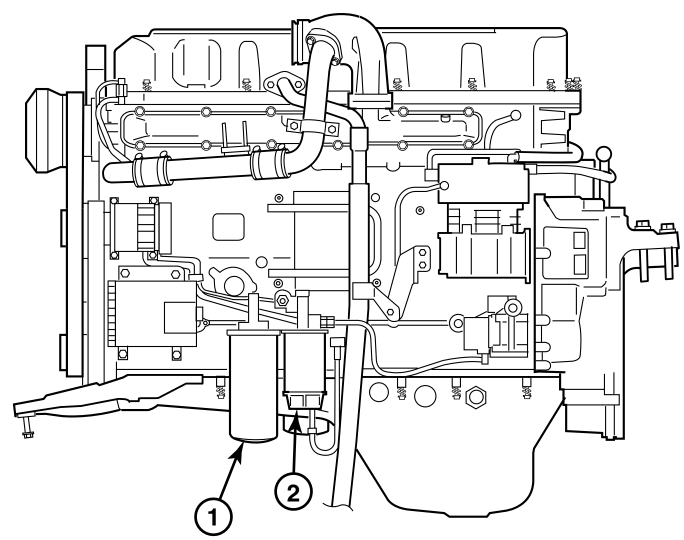

Figure 28 — Fuel Filters — MACK MP Engine

1. Secondary Fuel Filter | 2. Primary Fuel Filter

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The primary fuel filter on MACK MP engines incorporates a plastic water separator bowl. Additionally, the plastic bowl includes a water-in-fuel sensor. A warning lamp on the instrument panel illuminates when water is detected in the fuel. Refer to “Fuel/Water Separator” section.

NOTE

There are optional fuel filter systems (such as Davco, Conmet®, etc.) available for MACK MP engines. These fuel filter systems use a single remote-mounted filter, eliminating the spin-on primary and secondary filters. For service information concerning these filters, refer to the specific fuel filter manufacturer’s service literature.

FUEL SYSTEM

The primary fuel filter on MACK MP engines incorporates a plastic water separator bowl. Additionally, the plastic bowl includes a water-in-fuel sensor. A warning lamp on the instrument panel illuminates when water is detected in the fuel. Refer to “Fuel/Water Separator” section.

NOTE

There are optional fuel filter systems (such as Davco, Conmet®, etc.) available for MACK MP engines. These fuel filter systems use a single remote-mounted filter, eliminating the spin-on primary and secondary filters. For service information concerning these filters, refer to the specific fuel filter manufacturer’s service literature.

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Primary Fuel Filter Replacement Procedures — MACK MP Engines

At each specified oil and filter change interval, change the primary fuel filter as follows:

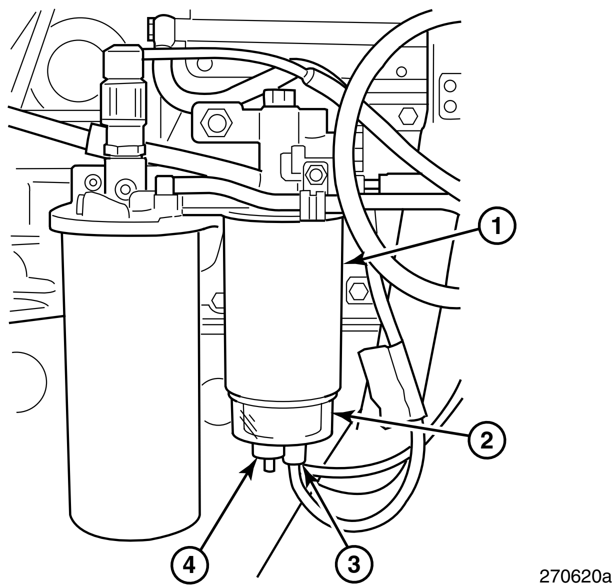


Figure 29 — MACK MP Primary Fuel Filter

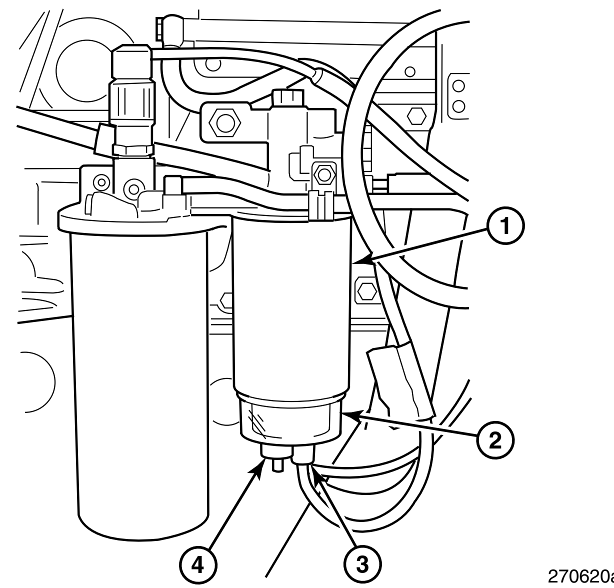
1. Primary Filter 2. Water Separator Bowl	3. Water-in-Fuel Sensor Harness 4. Drain Assembly

1. Thoroughly wash the area around the fuel filter and mounting adapter mating area with a suitable solvent and blow dry with compressed air.
2. Disconnect the water-in-fuel sensor harness connector from the plastic water separator bowl.
3. Using tool J 24783, remove the primary filter.

FUEL SYSTEM

Primary Fuel Filter Replacement Procedures — MACK MP Engines

At each specified oil and filter change interval, change the primary fuel filter as follows: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1. Primary Filter
2. Water Separator Bowl
3. Water-in-Fuel Sensor Harness
4. Drain Assembly

1. Thoroughly wash the area around the fuel filter and mounting adapter mating area with a suitable solvent and blow dry with compressed air.
2. Disconnect the water-in-fuel sensor harness connector from the plastic water separator bowl.
3. Using tool J 24783, remove the primary filter.

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4. While holding the filter above a suitable container, open the drain valve on the plastic water separator bowl and allow the fuel in the bowl to drain. Dispose of the drained fuel in an environmentally safe manner.
5. Unscrew the plastic separator bowl from the bottom of the spin-on primary filter cartridge.
6. Apply a thin film of clean engine oil to the water separator bowl O-ring on the bottom of the **new** primary filter cartridge.
7. Install the plastic water separator bowl to the primary filter cartridge, and tighten the bowl by hand 1/4 to 1/2 turn after the bowl contacts the O-ring.
8. Apply a thin film of clean engine oil to the sealing gasket of the **new** filter cartridge.
9. Prime the filter by pouring clean filter fuel through the series of small holes at the top of the filter to the installation fill line. DO NOT prime the filter through the center hole. Use care to avoid dirt entering the center hole of the filter.
10. Install the **new** filter and tighten an additional 1/2 to 3/4 turn by hand after the gasket contacts the base.
11. Reconnect the water-in-fuel sensor harness connector.
12. Prime the engine as required prior to starting the engine (refer to “Priming the Fuel System — MACK MP Engines” on page 129).
13. Start the engine and check for leaks.

FUEL SYSTEM

4. While holding the filter above a suitable container, open the drain valve on the plastic water separator bowl and allow the fuel in the bowl to drain. Dispose of the drained fuel in an environmentally safe manner.
5. Unscrew the plastic separator bowl from the bottom of the spin-on primary filter cartridge.
6. Apply a thin film of clean engine oil to the water separator bowl O-ring on the bottom of the **new** primary filter cartridge.
7. Install the plastic water separator bowl to the primary filter cartridge, and tighten the bowl by hand 1/4 to 1/2 turn after the bowl contacts the O-ring.
8. Apply a thin film of clean engine oil to the sealing gasket of the **new** filter cartridge.
9. Prime the filter by pouring clean filter fuel through the series of small holes at the top of the filter to the installation fill line. DO NOT prime the filter through the center hole. Use care to avoid dirt entering the center hole of the filter.
10. Install the **new** filter and tighten an additional 1/2 to 3/4 turn by hand after the gasket contacts the base.
11. Reconnect the water-in-fuel sensor harness connector.
12. Prime the engine as required prior to starting the engine (refer to “Priming the Fuel System — MACK MP Engines” on page 129).
13. Start the engine and check for leaks.

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Secondary Fuel Filter Replacement Procedures

At each specified oil and filter change interval, change the secondary fuel filter as follows:

NOTE

Because of ice buildup in the fuel system or fuel waxing which can clog fuel filters, it may be necessary to reduce the time or mileage interval between fuel filter changes during extremely cold weather.

To install a new filter:

1. Thoroughly wash the area around the fuel filter and mounting adaptor mating area with a suitable solvent and blow dry with compressed air.
2. Using tool J 24783, remove the old filters.
3. Apply a thin film of clean engine oil to the sealing gasket of the new filters.
4. Prime the filter by pouring clean filtered fuel through the series of small holes at the top of the filter. DO NOT prime the filter through the center hole. Use care to avoid dirt entering the center hole of the filter.
5. Install the **new** filters and tighten an additional 3/4 to 1 turn by hand after the gasket contacts the base.
6. Prime the engine as required prior to starting the engine (refer to “Priming the Fuel System — MACK MP Engines” on page 129).
7. Start the engine and check for leaks.

FUEL SYSTEM

Secondary Fuel Filter Replacement Procedures

At each specified oil and filter change interval, change the secondary fuel filter as follows:

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1. Thoroughly wash the area around the fuel filter and mounting adaptor mating area with a suitable solvent and blow dry with compressed air.
2. Using tool J 24783, remove the old filters.
3. Apply a thin film of clean engine oil to the sealing gasket of the new filters.
4. Prime the filter by pouring clean filtered fuel through the series of small holes at the top of the filter. DO NOT prime the filter through the center hole. Use care to avoid dirt entering the center hole of the filter.
5. Install the new filters and tighten an additional 3/4 to 1 turn by hand after the gasket contacts the base.
6. Prime the engine as required prior to starting the engine (refer to “Priming the Fuel System — MACK MP Engines” on page 129).
7. Start the engine and check for leaks.

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Priming the Fuel System — MACK MP Engines

On MACK MP engines, the priming pump is located on the primary fuel filter mounting adapter. Prime the fuel system as follows:

DANGER

Before working on or inspecting a vehicle, apply the parking brakes, place the transmission in neutral and block the wheels to prevent the vehicle from moving. Failure to do so can result in unexpected vehicle movement and cause severe personal injury or death.

DANGER

To avoid potential fire hazard, do not service any part of the fuel system while smoking, or in the presence of flames, sparks or hot surfaces. Do not service the fuel system while the engine is running. Failure to follow these precautions can result in a fire. To guard against burns from direct contact with hot fuel, wear adequate protective clothing (face shield, heavy gloves, apron, etc.) when working on a hot engine.

WARNING

DO NOT work near the fan while the engine is running. The engine fan can engage at any time without warning, resulting in serious injury. Before turning the ignition on, make sure that no one is near the fan.

FUEL SYSTEM

Priming the Fuel System — MACK MP Engines

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Before working on or inspecting a vehicle, apply the parking brakes, place the transmission in neutral and block the wheels to prevent the vehicle from moving. Failure to do so can result in unexpected vehicle movement and cause severe personal injury or death.

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WARNING

DO NOT work near the fan while the engine is running. The engine fan can engage at any time without warning, resulting in serious injury. Before turning the ignition on, make sure that no one is near the fan.

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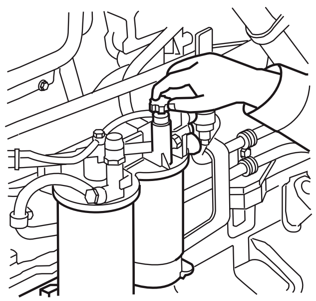
NOTE

There are NO bleed nipples that must be opened in order to prime the fuel system.

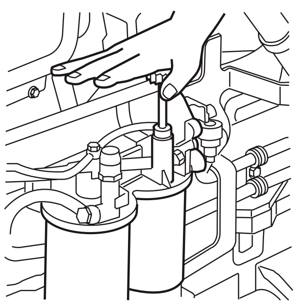
1. Unlock the primer pump handle by pushing the handle downward and then turning it counterclockwise.



270986a

Figure 30 — Unlocking Fuel System Primer Pump Handle

2. Operate the pump handle until pumping effort increases.



270987a

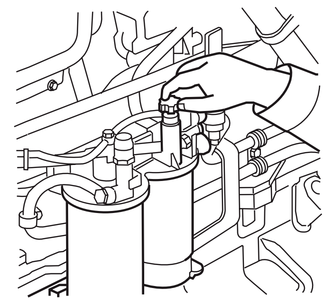
Figure 31 — Pumping Hand Primer Pump

FUEL SYSTEM

NOTE

There are NO bleed nipples that must be opened in order to prime the fuel system.

1. Unlock the primer pump handle by pushing the handle downward and then turning it counterclockwise.



270986a

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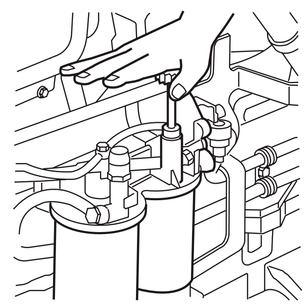

270987a

Figure 31 — Pumping Hand Primer Pump

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NOTE

With a fuel system that is completely empty, 200 or more strokes of the pump may be necessary to properly prime the system.

3. When the fuel system is primed, lock the primer pump handle by pushing it fully into the housing and turning it clockwise.
4. Start the engine and run it at 1000 rpm for approximately 5 minutes to purge any remaining air from the system.

NOTE

If the engine does not start after performing the above priming procedure, contact your local MACK dealer for assistance.

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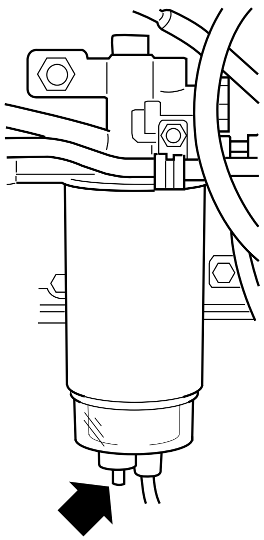
NOTE

If the engine does not start after performing the above priming procedure, contact your local MACK dealer for assistance.

131

Fuel/Water Separator — MACK MP Engines

The primary fuel filter on MACK MP engines includes a plastic water separator bowl with an integral water-in-fuel sensor and a drain assembly. A warning lamp on the instrument panel illuminates when water is detected in the fuel. When the lamp illuminates, drain the water from the separator by opening the drain valve and allowing the water to drain from the bowl into a suitable container. When fuel begins to drain, close the valve and tighten to 0.655 N•m (5 lb-in). Dispose of the drained water/fuel in an environmentally safe manner.



270618a

Figure 32 — Water Separator Drain Valve — MACK MP Engines

NOTE

DO NOT drain the water separator bowl while the engine is running.

FUEL SYSTEM

Fuel/Water Separator — MACK MP Engines

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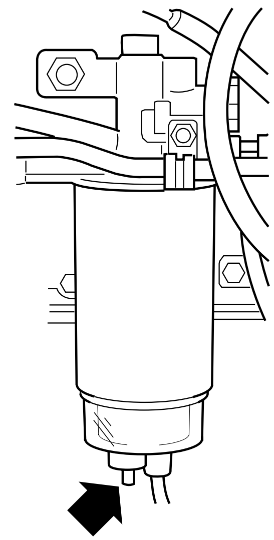

270618a

Figure 32 — Water Separator Drain Valve — MACK MP Engines

NOTE

DO NOT drain the water separator bowl while the engine is running.

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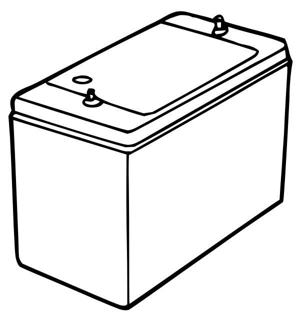
ELECTRICAL SYSTEM

Batteries

A maintenance-free battery does not require the addition of water for its normal expected life. Typical features include heavy-duty construction and a wrought lead-calcium grid to resist vibration, shock, overcharge, heat and thermal runaway. Nevertheless, these batteries are vulnerable to the ravages of cold weather operation if totally ignored.



700517a

Figure 33 — Battery

Be sure that the batteries used in a particular vehicle are rated for the specified Cold Cranking Amperes (CCAs) necessary to ensure reliable cold weather starts. This is important, since even well-maintained batteries chilled to –18°C (0°F) may temporarily be capable of providing only 40% of their rated capacity at 27°C (80°F).

Keep the terminals clean to prevent formation of power-robbing corrosion.

In winter, to avoid freezing the electrolyte, the battery must be fully charged. A fully discharged battery will freeze solid at –5°C (23°F) and possibly sustain permanent damage.

Before the onset of cold weather, be sure to protect this vital component by monitoring its condition as well as inspecting the charging and starting systems.

ELECTRICAL SYSTEM

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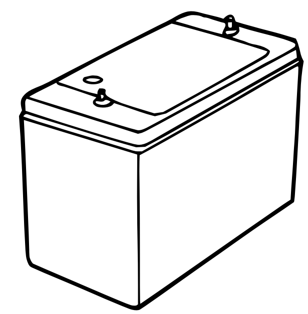

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133

Battery Warmer

A battery warmer can be added to raise the temperature of the battery core and facilitate quick starting in cold weather.

Battery Condition

The first procedure when testing a battery is to check for external damage such as a cracked case, loose or corroded terminals, or signs of excessive gassing or overcharging.

A battery must be fully charged before a load test is performed. Test the battery with a hydrometer to determine the level of charge.

On maintenance-free batteries equipped with a built-in hydrometer (eye), the battery condition is interpreted as follows:

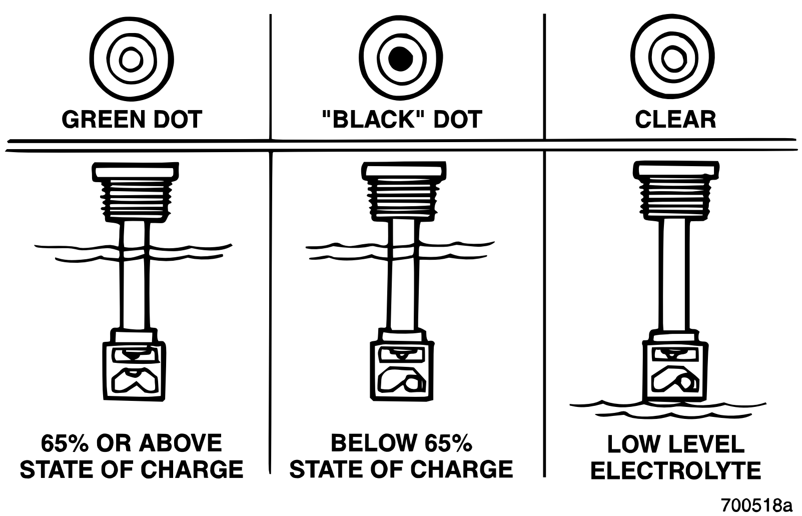

Figure 34 — Battery Condition

ELECTRICAL SYSTEM

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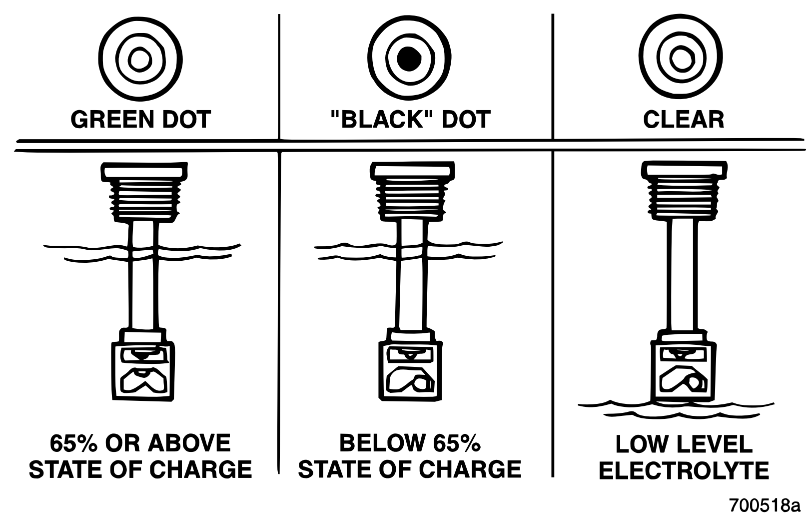

Figure 34 — Battery Condition

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- **Green dot visible** — Any green appearance should be interpreted as a green dot and means that the battery is at or above a 65% state of charge and is ready for use or testing. This does *not* automatically mean that the battery is in good condition.
- **Dark — green dot not visible (black dot)** — This indicates that the battery is below a 65% state of charge and must be charged before testing. A black dot does *not* mean that the battery is automatically bad.
- **Clear or light yellow** — This means that the electrolyte level is below the level of the built-in hydrometer, which may have been caused by tipping of the battery, a cracked case, or overcharging. This battery should be replaced.

ELECTRICAL SYSTEM

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135

Charging

Charging should be conducted carefully under controlled conditions. Never charge a frozen battery. If a frozen battery is suspected, thaw it in a warm area for several hours before charging.

The following chart shows the normal charging times necessary to reach a full charge at 26°C (80°F). In colder temperatures, the necessary charging time may increase.

Open Circuit Voltage	Battery Specific Gravity*	State of Charge	Charging Time to Full Charge at 80°F**					
			at 60 amps	at 50 amps	at 40 amps	at 30 amps	at 20 amps	at 10 amps
12.6	1.265	100%	**Full Charge**					
12.4	1.225	75%	15 min.	20 min.	27 min.	35 min.	48 min.	90 min.
12.2	1.190	50%	35 min.	45 min.	55 min.	75 min.	95 min.	180 min.
12.0	1.155	25%	50 min.	65 min.	85 min.	115 min.	145 min.	280 min.
11.8	1.120	0%	65 min.	85 min.	110 min.	150 min.	195 min.	370 min.

* Correct for temperature.

** If colder, it will take longer.

ELECTRICAL SYSTEM

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12.0	1.155	25%	50 min.	65 min.	85 min.	115 min.	145 min.	280 min.
11.8	1.120	0%	65 min.	85 min.	110 min.	150 min.	195 min.	370 min.

* Correct for temperature.

** If colder, it will take longer.

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COMPLETELY DISCHARGED BATTERIES

Extremely cold or completely discharged batteries may not initially show a charge since the electrolyte is nearly pure water and, therefore, a poor conductor. As the acid level in the electrolyte increases during charging, the charging current will also increase. Use the following procedure when charging a completely discharged battery:

1. Measure the voltage at the battery terminals. If it is below 10 volts, current will be very low and may not show up on many battery charger ammeters.
2. Set the charger on the high setting.
3. Some chargers have a polarity protection feature which prevents accidental reversal of the charger leads. A completely discharged battery will not have enough voltage to override this feature, making it appear that the battery will not accept a charge. Check the charger manufacturer's instructions on how to bypass this feature.
4. Once the battery starts to accept a charge, the charging rate will rise very rapidly. Carefully monitor the ammeter to prevent too-high a charging rate.
5. Proceed to charge battery at one-tenth of its rated capacity for one-half hour.

   Example: For battery rated at 64 amps, charge at 6.4 amp setting ($64A \times 1/10 = 6.4A$) for one-half hour.

NOTE

Batteries with very low voltage (below 11.6 volts) or those that do not initially accept a charge are not necessarily defective. Batteries that have been discharged for long periods of time may be heavily sulfated or hydrated (containing lead shorts that cause the battery to self-discharge). To accept a charge, batteries with either of these conditions may require a longer charging time or a very high initial charge.

ELECTRICAL SYSTEM

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Use the following chart to determine the time required for the battery to begin accepting a measurable charge. (If the battery has not started to accept a charge after the specified time, it should be replaced.)

Charger Voltage	Hours
16.0 or more	Up to 4
14.0 to 15.9	Up to 8
13.9 or less	Up to 16

Load Test

A battery must be fully charged before performing a load test. To load-test a battery that is fully charged, proceed as follows:

1. Connect a load tester and voltmeter across the battery terminals.
2. Apply a load so that a figure of 300 amps is obtained for 15 seconds to remove the battery surface charge.
3. Wait 60 seconds to let the battery recover and then apply the proper test load to the battery to determine its condition. To get the proper load, use half the cranking performance rating. Read the voltage after 15 seconds. Remember that the minimum voltage varies according to temperature. Consult the following chart for the proper specification. If the battery voltage does not fall below the minimum test voltage after 15 seconds, the battery is acceptable for use.

ELECTRICAL SYSTEM

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Load Test Temperature Correction		
	Temperature	
Minimum Voltage	°C	°F
9.6	21	70
9.5	16	60
9.4	10	50
9.3	4	40
9.1	–1	30
8.9	–7	20
8.7	–12	10
8.5	–18	0

ELECTRICAL SYSTEM

Load Test Temperature Correction		
	Temperature	
Minimum Voltage	°C	°F
9.6	21	70
9.5	16	60
9.4	10	50
9.3	4	40
9.1	–1	30
8.9	–7	20
8.7	–12	10
8.5	–18	0

139

Precautions When Installing Electrical Equipment

Connecting electrically powered or electrically controlled equipment to a vehicle may cause interference with other vehicle electrical or electronic equipment (such as ABS systems, Rollover Stability Systems, etc.). The amount of interference depends upon the operating frequency of any new signals and the degree to which transient signals are coupled to the vehicle system.

NOTE

Whenever new electrical equipment is installed, it is the obligation of the installer to ensure that the new equipment does not interfere with the proper operation of all other electrical systems on the vehicle.

If new electrical equipment is installed, a vehicle checkout procedure should be performed.

1. Perform the checkout procedure under the following conditions:
   - Engine running
   - Brake system air pressure in operating range
   - Vehicle stationary
   - Brake pedal fully depressed
2. Operate the new equipment under all starting, running and sutdown conditions.
3. Listen for signs of air exhausting from the ABS modulator valves (which is an indication of an interference condition).
4. Correct all interference conditions before operating the vehicle.

ELECTRICAL SYSTEM

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2. Operate the new equipment under all starting, running and sutdown conditions.
3. Listen for signs of air exhausting from the ABS modulator valves (which is an indication of an interference condition).
4. Correct all interference conditions before operating the vehicle.

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NOTE

The center pin of the standard seven-pin trailer electrical connector has been standardized as the dedicated connection for uninterrupted power for trailer ABS. This pin is always hot when the tractor ignition is turned on.

DANGER

Some trailers manufactured prior to the trailer ABS regulations may use the center pin to power certain trailer auxiliary equipment. The possibility exists that this auxiliary equipment may be unexpectedly activated by the truck or tractor electrical system, resulting in personal injury or damage to equipment. Caution must be used when connecting the trailer electrical connector to ensure that power to the center pin will not unintentionally activate any trailer auxiliary equipment.

MACK ROAD STABILITY ADVANTAGE

The MACK Road Stability Advantage (RSA) is an available option on certain MACK highway tractors and straight trucks. The RSA system, which is based on the Bendix® ABS-6 Advanced with ESP® (Electronic Stability Program) System, aids the operator in maintaining control of the vehicle during jackknife or rollover events by applying select brakes and reducing engine power as required by the specific situation. This system is integral with the anti-lock brake system and uses the standard ABS components (such as wheel speed sensors and modulator valves). Additionally, a steering angle sensor and a yaw rate/lateral acceleration sensor package provides information concerning vehicle movement to the electronic control unit.

ELECTRICAL SYSTEM

NOTE

The center pin of the standard seven-pin trailer electrical connector has been standardized as the dedicated connection for uninterrupted power for trailer ABS. This pin is always hot when the tractor ignition is turned on.

DANGER

Some trailers manufactured prior to the trailer ABS regulations may use the center pin to power certain trailer auxiliary equipment. The possibility exists that this auxiliary equipment may be unexpectedly activated by the truck or tractor electrical system, resulting in personal injury or damage to equipment. Caution must be used when connecting the trailer electrical connector to ensure that power to the center pin will not unintentionally activate any trailer auxiliary equipment.

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141

Before delivery to the end user, a "parameter set" tuned for the specific vehicle and the VIN for the chassis are loaded into the ABS electronic control unit. This ensures optimal performance of the MACK RSA system for the specific vehicle.

Alterations and modifications to an RSA-equipped vehicle, such as wheel base changes (either lengthening or shortening), the addition of an auxiliary lift axle or the removal of a factory-installed lift axle, or major body changes, such as conversion of a tractor to a truck or an axle, suspension or steering system component modification, are NOT allowed, as these changes will adversely affect performance of the road stability system. Should such changes be unavoidable, the system must be disabled by having a qualified technician replace the Bendix® Advanced EC-60™ (ABS control unit with ESP®) with a Bendix® Premium EC-60™ ECU (ABS control unit without ESP®).

⚠ DANGER

Failure to disable the RSA system on a vehicle that has been modified or altered will result in serious vehicle braking and performance issues, including unnecessary system interventions. These interventions could lead to a loss of vehicle control.

In addition to disabling the system, any cab labels, such as warning and caution labels relating to the Bendix® ABS-6 Advanced with ESP® system located on the sun visor must be removed, and notations must be made in the operator's manuals so that the vehicle operator has a clear understanding as to which ABS options are installed on the vehicle.

The location of the yaw rate/lateral acceleration sensor must not be altered.

ELECTRICAL SYSTEM

Before delivery to the end user, a "parameter set" tuned for the specific vehicle and the VIN for the chassis are loaded into the ABS electronic control unit. This ensures optimal performance of the MACK RSA system for the specific vehicle.

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The location of the yaw rate/lateral acceleration sensor must not be altered.

142

Aftermarket steering wheels must not be used. Only OEM-supplied replacement steering wheels should be used. During any procedure that involves removal and reinstallation or replacement of the OEM steering wheel, care must be used not to crush or damage the steering angle sensor which is mounted on the steering column.

The following changes MUST NOT be made to an “as-built” RSA-equipped vehicle:

- Changes to maximum steering angle (to the left or right)
- Changes to steer axle and/or drive axle track width
- Changing front and/or rear brake drums to drums having a different flange thickness (thus changing the track width of the vehicle)

The ABS with ESP® ECU requires a precise rolling circumference ratio between the front steer axle and the rear drive axles for optimum performance of the system. For this reason, the system continuously calculates the precise ratio and stores the information in the ECU memory.

CAUTION

Effectiveness of the RSA system relies on the accuracy of the reported vehicle speed. If major changes to tire sizes are made, such that changes to the vehicle speedometer/odometer settings are required, the ABS with ESP® ECU must be reprogrammed with the new values by a qualified technician.

ELECTRICAL SYSTEM

Aftermarket steering wheels must not be used. Only OEM-supplied replacement steering wheels should be used. During any procedure that involves removal and reinstallation or replacement of the OEM steering wheel, care must be used not to crush or damage the steering angle sensor which is mounted on the steering column.

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LUBRICATION

Gear Oil Change Interval (Transmissions and Carriers)

All Highway Chassis	
Kilometers (Miles)*	**Time***
402 000 km (250,000 miles)	2 years

*Whichever occurs first.

NOTE

An extended drain interval of 804 600 km/ 500,000 milesor three years, whichever occurs first, is permissible for MACK-geared components used in highway chassis provided MACK specification GO-J PLUS gear lubricant is used. Otherwise, gear lubricant must be changed at the two-year, 402 300 km/ 250,000 mile interval, whichever occurs first.

LUBRICATION

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All Highway Chassis
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NOTE

An extended drain interval of 804 600 km/ 500,000 milesor three years, whichever occurs first, is permissible for MACK-geared components used in highway chassis provided MACK specification GO-J PLUS gear lubricant is used. Otherwise, gear lubricant must be changed at the two-year, 402 300 km/ 250,000 mile interval, whichever occurs first.

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All Vocational Chassis	
Kilometers (Miles)*	**Time***
64 000 km (40,000 miles)	1 year/1200 hours

*Whichever occurs first.

NOTE

An extended drain interval of 128 800 km/ 80,000 miles, one year or 1,200 hours, whichever occurs first, is permissible for MACK-geared components used in vocational chassis provided that MACK specification GO-J PLUS gear lubricant is used. Otherwise, gear lubricant must be changed at the one-year, 1200-hour or 64 000 km/40,000 mile interval, whichever occurs first.

NOTE

An SAE 50 grade synthetic transmission oil, TO-A PLUS, is available for use in MACK transmissions as an extended drain interval lubricant. TO-A PLUS is for use in transmissions only, and not to be used in any other geared components. Drain intervals for TO-A PLUS transmission lubricant are 804 600 km/ 500,000 miles or three years (whichever occurs first) for highway applications, and 128 800 km/ 80,000 miles, one year or 1,200 hours (whichever occurs first) for vocational applications.

LUBRICATION

All Vocational Chassis	
Kilometers (Miles)*	**Time***
64 000 km (40,000 miles)	1 year/1200 hours

*Whichever occurs first.

NOTE

An extended drain interval of 128 800 km/ 80,000 miles, one year or 1,200 hours, whichever occurs first, is permissible for MACK-geared components used in vocational chassis provided that MACK specification GO-J PLUS gear lubricant is used. Otherwise, gear lubricant must be changed at the one-year, 1200-hour or 64 000 km/40,000 mile interval, whichever occurs first.

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Driveshaft Lubrication

The following information pertains to lubrication intervals for Spicer Life™ SPL-170, SPL-250, SPL-170XL and SPL-250XL driveshafts and ArvinMeritor™ RPL20 and RPL25 Permalube™ series and 92N Permalube™ wing-style driveshafts. For all other driveshafts, use the regular chassis lubrication intervals as outlined.

SPICER LIFE™ SPL-170 AND SPL-250 DRIVESHAFT — U-JOINT LUBRICATION

Spicer Life™ SPL-170 and SPL-250 driveshaft U-joints must be lubricated at the following intervals:

- Highway Chassis: Every 161 000 km (100,000 miles) or 6 months*
- Vocational Chassis:
  - Severe Service: every 600 hours, 32 000 km (20,000 miles) or 180 days*
  - Extra Severe Service: every 375 hours, 19 000 km (12,000 miles) or 90 days*

* Whichever occurs first.

NOTE

Slip-joints used with the SPL-170 and SPL-250 series driveshafts are “lubed for life” and protected by a bellows. Lubrication of these slip-joints is not required and the bellows must not be disturbed.

LUBRICATION

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  - Severe Service: every 600 hours, 32 000 km (20,000 miles) or 180 days*
  - Extra Severe Service: every 375 hours, 19 000 km (12,000 miles) or 90 days*

* Whichever occurs first.

NOTE

Slip-joints used with the SPL-170 and SPL-250 series driveshafts are “lubed for life” and protected by a bellows. Lubrication of these slip-joints is not required and the bellows must not be disturbed.

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SPICER LIFE™ SPL-170XL AND SPL-250XL DRIVESHAFT — U-JOINT LUBRICATION

Spicer Life™ XL series driveshafts are equipped with "extended-lubrication" U-joints. These U-joints are easily identified by the blue plastic cover in the center of the U-joint cross where the grease fitting is usually located. The XL U-joints must be lubricated initially at the following intervals:

- Highway Chassis: 560 000 km (350,000 miles) or 3 years*
- Vocational Chassis (includes city driving and on/off highway): 161 000 km (100,000 miles) or 1 year*

* Whichever occurs first.

After the initial lubrication outlined above, Spicer Life™ XL series driveshafts must be lubricated at the following intervals:

- Highway Chassis: 161 000 km (100,000 miles) or 6 months*
- Vocational Chassis:
  - — Severe Service: 600 hours, 32 000 km (20,000 miles) or 180 days*
  - — Extra Severe Service: 375 hours, 19 000 km (12,000 miles) or 90 days*

* Whichever occurs first.

NOTE

Slip-joints used with the SPL-170XL and SPL-250XL series driveshafts are "lubed for life" and protected by a bellows. Lubrication of these slip-joints is not required and the bellows must not be disturbed.

LUBRICATION

SPICER LIFE™ SPL-170XL AND SPL-250XL DRIVESHAFT — U-JOINT LUBRICATION

Spicer Life™ XL series driveshafts are equipped with "extended-lubrication" U-joints. These U-joints are easily identified by the blue plastic cover in the center of the U-joint cross where the grease fitting is usually located. The XL U-joints must be lubricated initially at the following intervals:

- Highway Chassis: 560 000 km (350,000 miles) or 3 years*
- Vocational Chassis (includes city driving and on/off highway): 161 000 km (100,000 miles) or 1 year*

* Whichever occurs first.

After the initial lubrication outlined above, Spicer Life™ XL series driveshafts must be lubricated at the following intervals:

- Highway Chassis: 161 000 km (100,000 miles) or 6 months*
- Vocational Chassis:
  - — Severe Service: 600 hours, 32 000 km (20,000 miles) or 180 days*
  - — Extra Severe Service: 375 hours, 19 000 km (12,000 miles) or 90 days*

* Whichever occurs first.

NOTE

Slip-joints used with the SPL-170XL and SPL-250XL series driveshafts are "lubed for life" and protected by a bellows. Lubrication of these slip-joints is not required and the bellows must not be disturbed.

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ARVINMERITOR™ RPL20 AND RPL25 PERMALUBE™ SERIES DRIVESHAFTS

The U-joints and slip-joints on the RPL20 and RPL25 series driveshafts are permanently lubricated and sealed. Lubrication at regular intervals is not required during the life of the driveshaft.

ARVINMERITOR™ 92N PERMALUBE™ WING-STYLE DRIVESHAFTS

The U-joints used on the 92N Permalube™ wing-style driveshafts are permanently lubricated and sealed. Lubrication at regular intervals is not required for the life of the driveshaft. The slip-joints, however, must be lubricated at each specified chassis lubrication interval.

Clutch Release Bearing Lubrication

The clutch release bearing must be lubricated at each chassis lubrication interval.

To ensure proper lubrication:

- Check that the lube tube assembly (if equipped) is intact.
- Apply grease to fitting until grease can be seen coming from the back of the release bearing.
- It is recommended that grease be purged from the release bearing during lubrication of the bearing.
- Apply grease to the release bearing yoke shaft, one fitting on each side of the transmission.

Recommended lubricant is NLGI No. 2EP grease.

LUBRICATION

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The U-joints and slip-joints on the RPL20 and RPL25 series driveshafts are permanently lubricated and sealed. Lubrication at regular intervals is not required during the life of the driveshaft.

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Clutch Release Bearing Lubrication

The clutch release bearing must be lubricated at each chassis lubrication interval.

To ensure proper lubrication:

- Check that the lube tube assembly (if equipped) is intact.
- Apply grease to fitting until grease can be seen coming from the back of the release bearing.
- It is recommended that grease be purged from the release bearing during lubrication of the bearing.
- Apply grease to the release bearing yoke shaft, one fitting on each side of the transmission.

Recommended lubricant is NLGI No. 2EP grease.

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RELEASE BEARING PADS:

Apply a small amount of recommended grease between the release bearing pads and the clutch release fork when lubricating the clutch release bearing.

RELEASE BEARING LUBE TUBE (IF EQUIPPED):

Lube tubes should be pre-lubed before installation. This is to remove air from the lube tube system to ensure lubricant is delivered to the release bearing during initial installation.

NOTE

Your new MACK truck has been prepared for delivery by your MACK Service Center. After delivery, oil change, filter change, and chassis lubrication intervals become your sole responsibility.

It is important that components be filled with lubricants meeting the specifications as given in “LUBRICANT SPECIFICATIONS” on page 267.

When checking oil levels, the vehicle must be parked on level ground and the units at normal operating temperature. Components must be filled to the correct level. DO NOT OVERFILL.

The oil and filter change intervals outlined in this manual pertain to MACK components. For information concerning oil and oil filter change intervals for vendor components, refer to the specific vendor component service literature.

LUBRICATION

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Apply a small amount of recommended grease between the release bearing pads and the clutch release fork when lubricating the clutch release bearing.

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Figure 35 — Bulldog Lubricants

LUBRICATION


PROTECT YOUR INVESTMENT
Bulldog
Bulldog Grease
USE BULLDOG LUBRICANTS
000088b

Figure 35 — Bulldog Lubricants

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Oil and Filter Change — MACK MP Engines

Run the engine until normal operating temperature is reached, then shut off and drain the oil before the engine cools.

Thoroughly clean the area around the filters before removing.

Using tool J 24783, remove the spin-on filters.

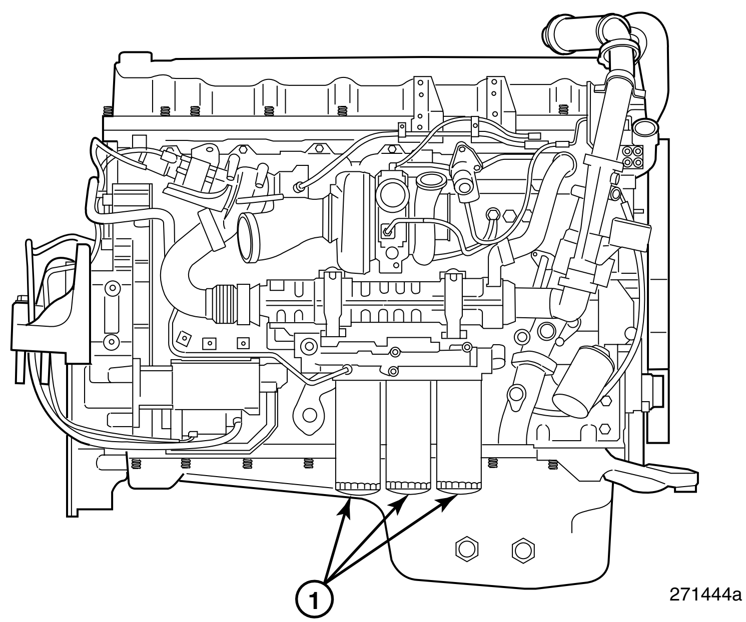

Figure 36 — Spin-On Oil Filters

1. Spin-On Oil Filters

Prefill each new oil filter with 1.9 liters (2 quarts) of the recommended engine oil. DO NOT allow any contaminants to enter the filters while prefilling.

Apply a thin film of engine oil to the sealing gasket of the new filters.

LUBRICATION

Oil and Filter Change — MACK MP Engines

Run the engine until normal operating temperature is reached, then shut off and drain the oil before the engine cools.

Thoroughly clean the area around the filters before removing.

Using tool J 24783, remove the spin-on filters.

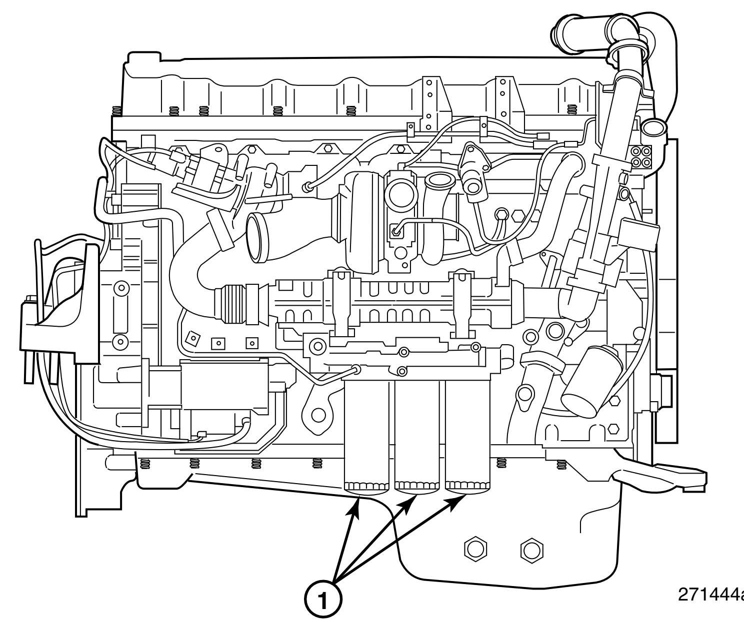

Figure 36 — Spin-On Oil Filters

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Prefill each new oil filter with 1.9 liters (2 quarts) of the recommended engine oil. DO NOT allow any contaminants to enter the filters while prefilling.

Apply a thin film of engine oil to the sealing gasket of the new filters.

151

Install the filters and tighten an additional 3/4 to 1 turn after the gasket contacts the base.

Fill the engine with the recommended engine oil (refer to "LUBRICANTS AND CAPACITIES" on page 288).

Check oil level and add oil as required.

CAUTION

The spin-on oil filters must be pre-filled at installation (refer to "Oil and Filter Change — MACK MP Engines" on page 151).

NOTE

Check engine oil level prior to starting the engine. Oil level checks performed immediately after engine shut down will result in an inaccurate dipstick reading.

Start the engine and check for leaks.

LUBRICATION

Install the filters and tighten an additional 3/4 to 1 turn after the gasket contacts the base.

Fill the engine with the recommended engine oil (refer to "LUBRICANTS AND CAPACITIES" on page 288).

Check oil level and add oil as required.

CAUTION

The spin-on oil filters must be pre-filled at installation (refer to "Oil and Filter Change — MACK MP Engines" on page 151).

NOTE

Check engine oil level prior to starting the engine. Oil level checks performed immediately after engine shut down will result in an inaccurate dipstick reading.

Start the engine and check for leaks.

152

Oil Level Check

Check engine oil level with the vehicle parked on level ground. The best time to check oil level is while the engine is COLD (prior to starting at the beginning of the work day, or after the vehicle has sat approximately 2 hours). At normal operating temperature (engine oil temperature above 79.4°C [175°F]), oil level can be checked 15 minutes after shut down.

CAUTION

Failure to wait a sufficient amount of time (2 hours if engine oil temperature is below 79.4°C [175°F]) or 15 minutes if oil temperature is above 79.4°C [175°F]) will result in an inaccurate dipstick reading.

Fill to the correct level. DO NOT OVERFILL.

Oil level must be between the add and full lines on the dipstick as shown in Figure 37.

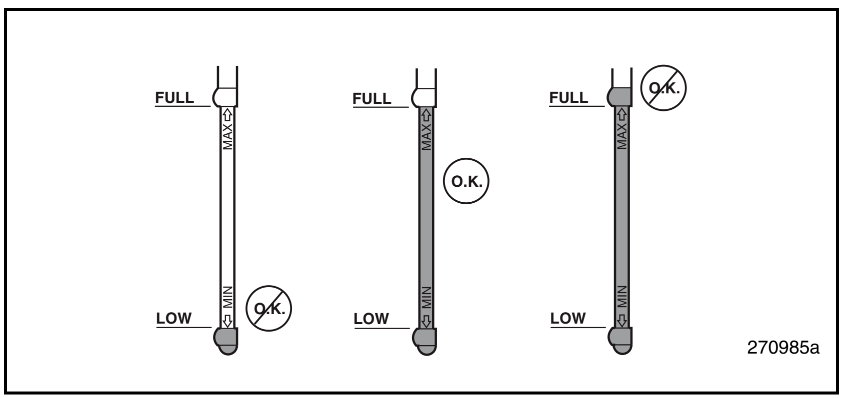

Figure 37 — Dipstick Oil Level Check

LUBRICATION

Oil Level Check

Check engine oil level with the vehicle parked on level ground. The best time to check oil level is while the engine is COLD (prior to starting at the beginning of the work day, or after the vehicle has sat approximately 2 hours). At normal operating temperature (engine oil temperature above 79.4°C [175°F]), oil level can be checked 15 minutes after shut down.

CAUTION

Failure to wait a sufficient amount of time (2 hours if engine oil temperature is below 79.4°C [175°F]) or 15 minutes if oil temperature is above 79.4°C [175°F]) will result in an inaccurate dipstick reading.

Fill to the correct level. DO NOT OVERFILL.

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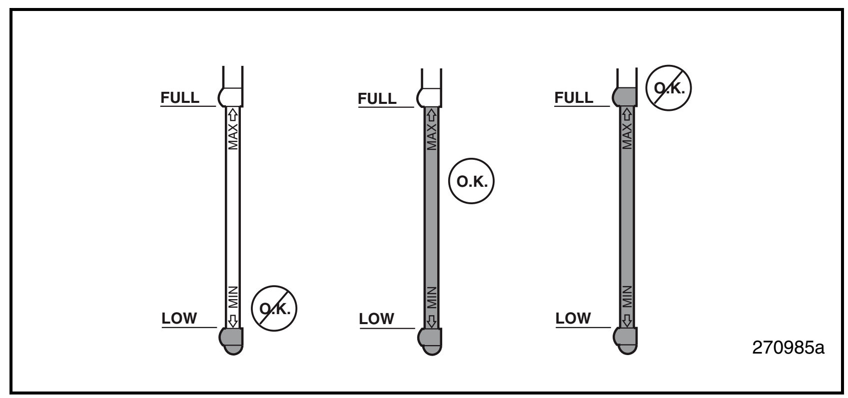

Figure 37 — Dipstick Oil Level Check

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Dipstick and oil fill locations are shown in the illustrations below. On conventional cabs, the oil fill tube and dipstick are located on the left-hand side of the engine.

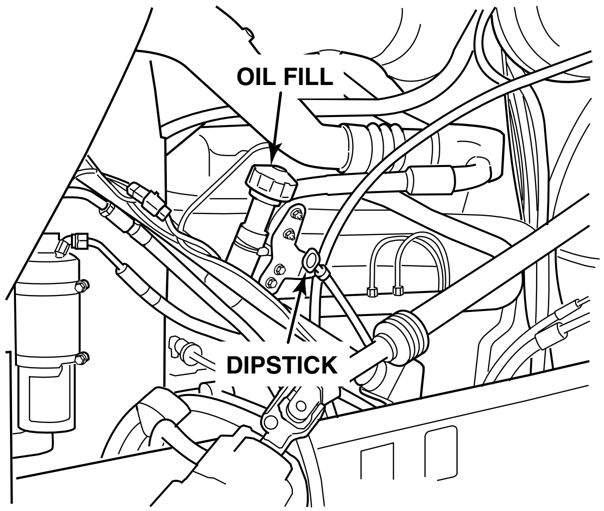

Figure 38 — Conventional Cabs Oil Fill and Dipstick Location

LUBRICATION

Dipstick and oil fill locations are shown in the illustrations below. On conventional cabs, the oil fill tube and dipstick are located on the left-hand side of the engine.

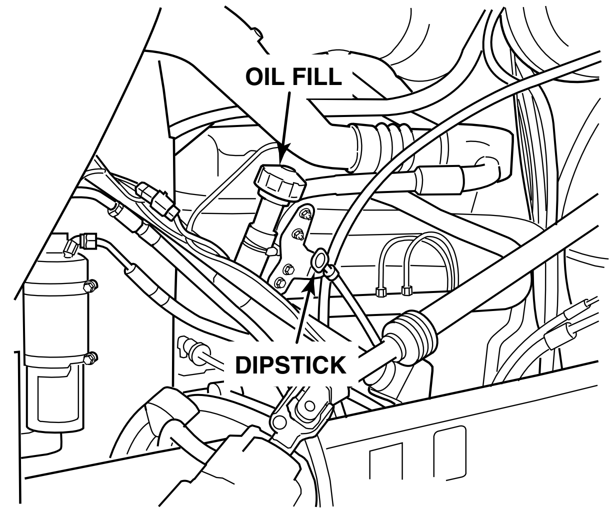

Figure 38 — Conventional Cabs Oil Fill and Dipstick Location

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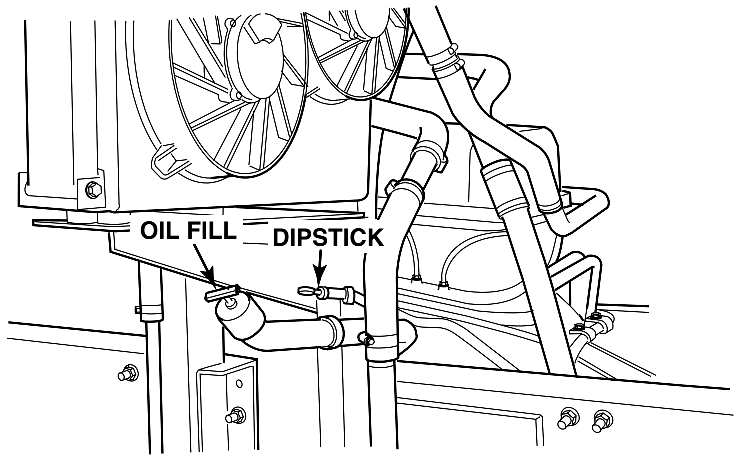

Figure 39 — Cab Forward Chassis Oil Fill and Dipstick Location

Power Steering Fluid Change

NOTE

Beginning December 2005, Mack Trucks, Inc. began phasing DEXRON® III into production as the factory fill for the power steering system. Vehicles utilizing DEXRON®-type automatic transmission fluid in the power steering system are identified by the label affixed to the power steering reservoir. When adding fluid to the power steering system, always check the label on the side of the reservoir and be sure to use the correct fluid.

LUBRICATION

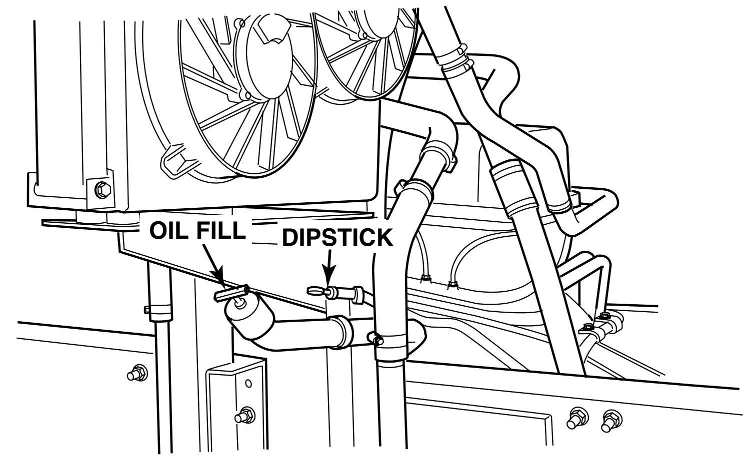

Figure 39 — Cab Forward Chassis Oil Fill and Dipstick Location

Power Steering Fluid Change

NOTE

Beginning December 2005, Mack Trucks, Inc. began phasing DEXRON® III into production as the factory fill for the power steering system. Vehicles utilizing DEXRON®-type automatic transmission fluid in the power steering system are identified by the label affixed to the power steering reservoir. When adding fluid to the power steering system, always check the label on the side of the reservoir and be sure to use the correct fluid.

155

Change the power steering fluid and filter once per year (D inspection interval) for vehicles operating in highway operations, and twice per year (C and D inspection intervals) for chassis operating in vocational operations. Refill the power steering system with the same type of fluid originally used in the system. Refer to the label on the side of the power steering reservoir for the correct fluid. Refer to “STEERING SYSTEM LUBRICANTS AND CAPACITIES” on page 295.

CAUTION

To avoid dirt from entering the steering system after the lines have been disconnected, clean around all fittings and both hose connections at the power steering gear. Also clean around the reservoir cover.

Run the vehicle until the engine reaches normal operating temperature, then shut off the engine.

Disconnect the pressure and return lines at the steering gear and allow the power steering reservoir and hoses to drain into a suitable container.

Jack up the front end of the vehicle so the wheels can be steered manually. Steer several times from left to right steering stops to pump the remaining fluid out of the system.

Replace the steering system filter element. Before reinstalling the element, clean the inside of the reservoir with a clean cloth. Reconnect the pressure and return lines, then refill the reservoir with the recommended fluid. Refer to the label on the side of the reservoir for the correct fluid.

LUBRICATION

Change the power steering fluid and filter once per year (D inspection interval) for vehicles operating in highway operations, and twice per year (C and D inspection intervals) for chassis operating in vocational operations. Refill the power steering system with the same type of fluid originally used in the system. Refer to the label on the side of the power steering reservoir for the correct fluid. Refer to “STEERING SYSTEM LUBRICANTS AND CAPACITIES” on page 295.

CAUTION

To avoid dirt from entering the steering system after the lines have been disconnected, clean around all fittings and both hose connections at the power steering gear. Also clean around the reservoir cover.

Run the vehicle until the engine reaches normal operating temperature, then shut off the engine.

Disconnect the pressure and return lines at the steering gear and allow the power steering reservoir and hoses to drain into a suitable container.

Jack up the front end of the vehicle so the wheels can be steered manually. Steer several times from left to right steering stops to pump the remaining fluid out of the system.

Replace the steering system filter element. Before reinstalling the element, clean the inside of the reservoir with a clean cloth. Reconnect the pressure and return lines, then refill the reservoir with the recommended fluid. Refer to the label on the side of the reservoir for the correct fluid.

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STEERING GEAR BLEED PROCEDURES — TRW 92 SERIES STEERING GEARS

For chassis equipped with TRW 92 series steering gears (i.e., 392, 492, etc.), bleed air from the steering system by lowering the chassis to the ground, starting the engine and steering the wheels several times from left to right steering stops.

CAUTION

Make sure the reservoir does not run dry during the purging operation as air may be drawn into the system.

STEERING GEAR BLEED PROCEDURES — SHEPPARD M90 AND M100 STEERING GEARS

For chassis equipped with Sheppard M90 or M100 steering gears, bleed air from the system as follows:

NOTE

Beginning approximately August 2002, an auto-bleed feature was incorporated into Sheppard M90 and M100 steering gears. To bleed the air from these steering gears, it is only necessary to start the engine and fully steer the wheels several times from the left to right steering stops. For Sheppard steering gears without the auto-bleed feature, it is VERY IMPORTANT that the steering gear be bled as described in the following procedures. Manual-bleed M90, M100 and M110 steering gears are identified by the bleeder screw located in the steering gear housing, above the pitman arm shaft. Steering gears with the auto-bleed feature will not have a bleeder screw, and can also be identified by the word “Auto” cast into the housing.

LUBRICATION

STEERING GEAR BLEED PROCEDURES — TRW 92 SERIES STEERING GEARS

For chassis equipped with TRW 92 series steering gears (i.e., 392, 492, etc.), bleed air from the steering system by lowering the chassis to the ground, starting the engine and steering the wheels several times from left to right steering stops.

CAUTION

Make sure the reservoir does not run dry during the purging operation as air may be drawn into the system.

STEERING GEAR BLEED PROCEDURES — SHEPPARD M90 AND M100 STEERING GEARS

For chassis equipped with Sheppard M90 or M100 steering gears, bleed air from the system as follows:

NOTE

Beginning approximately August 2002, an auto-bleed feature was incorporated into Sheppard M90 and M100 steering gears. To bleed the air from these steering gears, it is only necessary to start the engine and fully steer the wheels several times from the left to right steering stops. For Sheppard steering gears without the auto-bleed feature, it is VERY IMPORTANT that the steering gear be bled as described in the following procedures. Manual-bleed M90, M100 and M110 steering gears are identified by the bleeder screw located in the steering gear housing, above the pitman arm shaft. Steering gears with the auto-bleed feature will not have a bleeder screw, and can also be identified by the word “Auto” cast into the housing.

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1. With the wheels on the ground, start the engine and turn the steering wheel to a full left turn.
2. Locate the bleeder screw in the steering gear. The bleeder screw is located in the steering gear housing, above the pitman arm shaft.

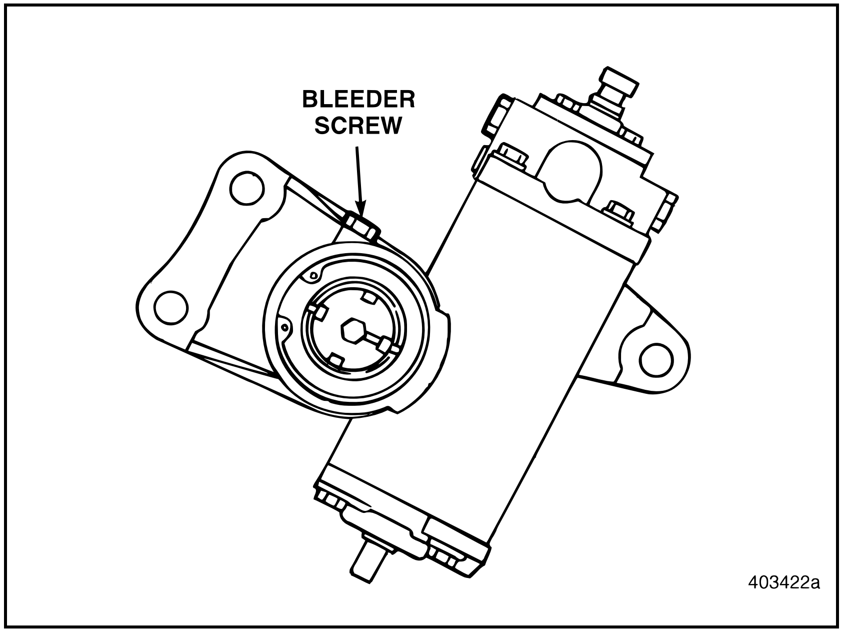

Figure 40 — Sheppard M90 Steering Gear Bleeder Screw Location

LUBRICATION

1. With the wheels on the ground, start the engine and turn the steering wheel to a full left turn.
2. Locate the bleeder screw in the steering gear. The bleeder screw is located in the steering gear housing, above the pitman arm shaft.

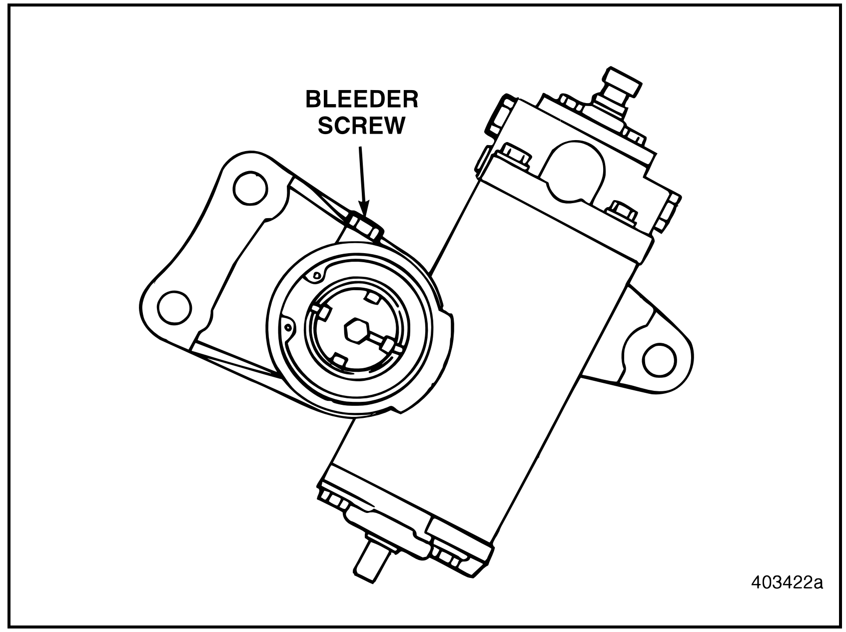

Figure 40 — Sheppard M90 Steering Gear Bleeder Screw Location

158

3. Using a 1/8″ Allen wrench, open the bleeder screw 2–3 turns.
4. Turn the steering wheel to a full right turn.
5. Close the bleeder screw when the wheels are turned fully to the right.

NOTE

Turning the wheels to a full right turn with the bleeder screw open forces air under pressure from the system. DO NOT steer the wheels to the left with the bleeder screw open as this will draw air back into the system.

6. Repeat the above procedures 2–3 times until a smooth stream of oil flows from the bleeder screw. A smooth stream of oil indicates that all the air has been purged from the system.

⚠ CAUTION

Make sure the reservoir does not run dry during the purging operation as air may be drawn into the system.

LUBRICATION

3. Using a 1/8″ Allen wrench, open the bleeder screw 2–3 turns.
4. Turn the steering wheel to a full right turn.
5. Close the bleeder screw when the wheels are turned fully to the right.

NOTE

Turning the wheels to a full right turn with the bleeder screw open forces air under pressure from the system. DO NOT steer the wheels to the left with the bleeder screw open as this will draw air back into the system.

6. Repeat the above procedures 2–3 times until a smooth stream of oil flows from the bleeder screw. A smooth stream of oil indicates that all the air has been purged from the system.

⚠ CAUTION

Make sure the reservoir does not run dry during the purging operation as air may be drawn into the system.

159

Geared Components (Transmission and Carriers)

Add oil or drain and refill while units are hot. Fill to level of filler plug hole. **DO NOT** overfill. See "LUBRICANT SPECIFICATIONS" on page 267.

When the oil level in any geared unit (transmission, carrier, etc.) is checked, oil must either be seen or felt to be level with the filler plug hole. If oil can only be felt by reaching the finger down into the unit, the oil level is insufficient.

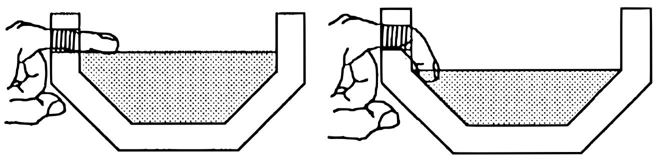

Figure 41 — Oil Level Check

WARNING

Take care not to burn hands when checking oil level on hot geared units.

LUBRICATION

Geared Components (Transmission and Carriers)

Add oil or drain and refill while units are hot. Fill to level of filler plug hole. DO NOT overfill. See "LUBRICANT SPECIFICATIONS" on page 267.

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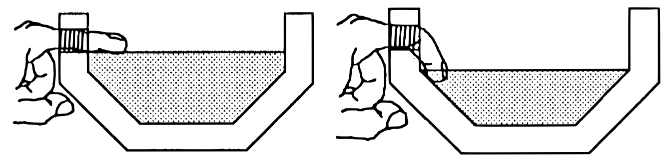


Figure 41 — Oil Level Check

WARNING

Take care not to burn hands when checking oil level on hot geared units.

160

Transmissions

Remove and clean the magnetic drain plug and the magnetic oil filter plug (if equipped). Also clean the trough located inside the area from where the magnetic filter plug was removed. After the oil has drained, reinstall the plugs. Remove the fill plug and fill the transmission with enough of the recommended lubricant (see “LUBRICANT SPECIFICATIONS” on page 267) to bring the level to the bottom of the filler plug hole. Reinstall the filler plug.

Remove the breather(s). Clean with a suitable, nonflammable solvent; check for obstructions, and reinstall.

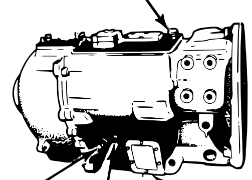


Figure 42 — Fill Plug, Drain Plug, Magnetic Filter Plug and Breather Locations

Do not overtighten the fill plug. Tighten the fill plug as follows:

- Tapered pipe plug finger-tighten first, then tighten an additional 3/4 to 1 turn (not to exceed 75 N•m [55 lb-ft]) with a wrench.
- O-ring boss-style plug tighten to 41–48 N•m (30–35 lb-ft).

⚠ CAUTION

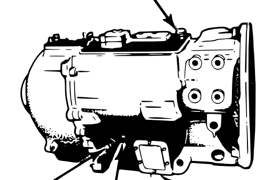
DO NOT exceed 48 N•m (35 lb-ft) as the plug can seize, resulting in damage to the transmission case when attempting to remove the plug at a later time.

LUBRICATION

Transmissions

Remove and clean the magnetic drain plug and the magnetic oil filter plug (if equipped). Also clean the trough located inside the area from where the magnetic filter plug was removed. After the oil has drained, reinstall the plugs. Remove the fill plug and fill the transmission with enough of the recommended lubricant (see “LUBRICANT SPECIFICATIONS” on page 267) to bring the level to the bottom of the filler plug hole. Reinstall the filler plug.

Remove the breather(s). Clean with a suitable, nonflammable solvent; check for obstructions, and reinstall.



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- O-ring boss-style plug tighten to 41–48 N•m (30–35 lb-ft).

⚠ CAUTION

DO NOT exceed 48 N•m (35 lb-ft) as the plug can seize, resulting in damage to the transmission case when attempting to remove the plug at a later time.

161

Range Shift Valve Filter (Range Shifted Transmissions)

At each C and D inspection interval, remove and clean or replace the range shift valve filter as follows:

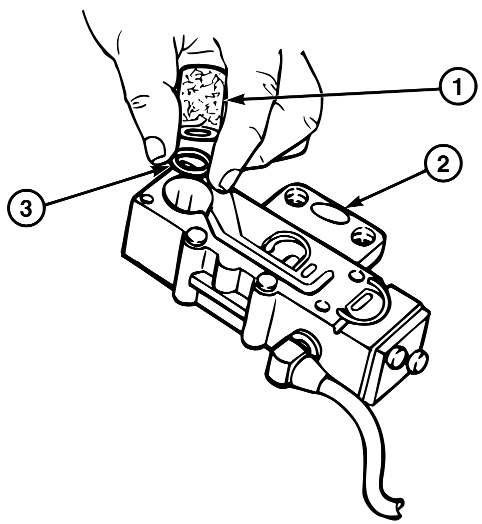

Figure 43 — Range Shift Valve Cover Spring and Filter

1. Filter 2. Valve Housing	3. Filter O-Ring

1. Remove the four top cover screws from the valve.
2. Separate the cover from the valve housing.
3. Remove the filter and filter O-ring.
4. Clean (or replace, if necessary) the filter with a suitable, non-flammable solvent, then dry the filter with clean, dry compressed air.
5. Apply Mobile Grease No. 28 sparingly to the filter O-ring.

LUBRICATION

Range Shift Valve Filter (Range Shifted Transmissions)

At each C and D inspection interval, remove and clean or replace the range shift valve filter as follows:

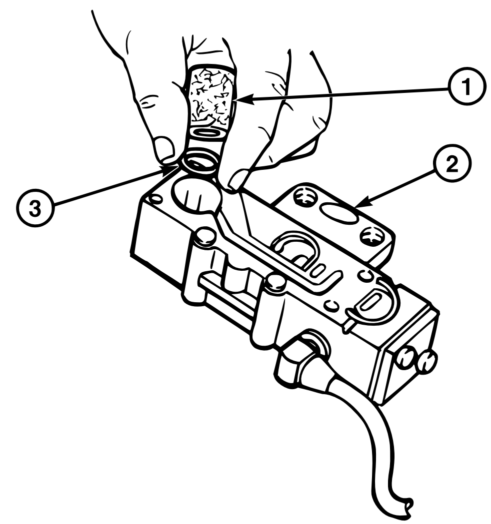

Figure 43 — Range Shift Valve Cover Spring and Filter

1. Filter
2. Valve Housing
3. Filter O-Ring

1. Remove the four top cover screws from the valve.
2. Separate the cover from the valve housing.
3. Remove the filter and filter O-ring.
4. Clean (or replace, if necessary) the filter with a suitable, non-flammable solvent, then dry the filter with clean, dry compressed air.
5. Apply Mobile Grease No. 28 sparingly to the filter O-ring.

162

NOTE

Do not over-lubricate the O-ring, as this may result in filter restriction. Make sure that the O-ring is only lightly lubricated.

6. Install the O-ring and the filter into the filter bore of the housing. Set the filter on top of the O-ring and make sure the O-ring is properly seated.
7. Apply Mobile Grease No. 28 sparingly to the top cover seal, then install the seal into the groove in the top cover, making sure all portions of the seal are properly located. (If the top cover seal is damaged in any way, it must be replaced.)
8. Install the top cover and the four cover screws. Tighten the screws to 3.4–4.5 N•m (30–40 lb-in).

Eaton® Fuller® Transmissions

The transmission oil fill plug used on Eaton® Fuller® transmissions incorporates an O-ring seal. This plug requires the use of a 1/2-inch internal square drive tool for removal and reinstallation. Thread sealant is not required when installing the plug, and the plug must be tightened to 57 N•m (42 lb-ft).

LUBRICATION

NOTE

Do not over-lubricate the O-ring, as this may result in filter restriction. Make sure that the O-ring is only lightly lubricated.

6. Install the O-ring and the filter into the filter bore of the housing. Set the filter on top of the O-ring and make sure the O-ring is properly seated.
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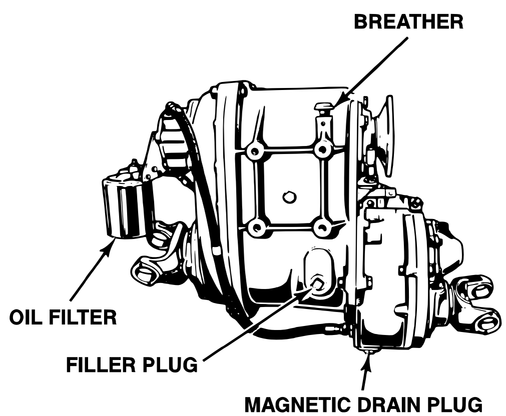
163

Transfer Case

With the transfer case at operating temperature, remove the magnetic drain plug and drain the oil. Clean and reinstall the plug. Remove the breather, clean with a suitable, nonflammable solvent, check for obstructions, and reinstall. Remove the filler plug and fill the transfer case with enough of the recommended oil to bring the level to the bottom of the filler plug hole. Reinstall the filler plug.



TRANSFER CASE

300151a

Figure 44 — Transfer Case

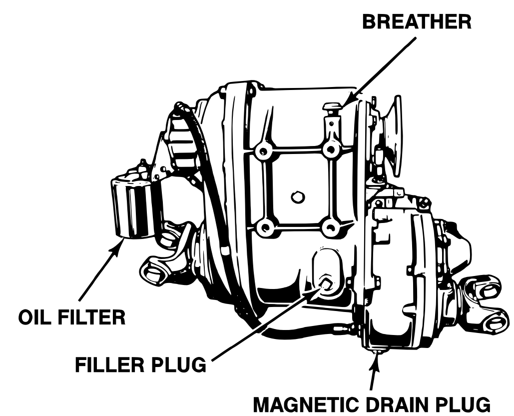
N O T E

On transfer cases equipped with an optional PTO, change the oil filter when the oil is changed. The transfer case shown in the illustration above is equipped with an optional PTO. Transfer cases that are not equipped with a PTO do not have an oil filter, and have a shorter hose that runs from the main shaft cover to the countershaft cover.

LUBRICATION

Transfer Case

With the transfer case at operating temperature, remove the magnetic drain plug and drain the oil. Clean and reinstall the plug. Remove the breather, clean with a suitable, nonflammable solvent, check for obstructions, and reinstall. Remove the filler plug and fill the transfer case with enough of the recommended oil to bring the level to the bottom of the filler plug hole. Reinstall the filler plug.



TRANSFER CASE

300151a

Figure 44 — Transfer Case

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164

Rear Engine Power Take-Off (REPTO)

The REPTO unit is lubricated by oil from the engine. Scheduled engine oil changes take care of any periodic service requirements.

Transmission, Auxiliary Transmission, Transfer Case Linkages

At each oil change interval, put two drops of engine oil on the movable connections of the linkages for the transmission, auxiliary transmission and transfer case.

Rear Axles

Add oil or drain and refill while axles are hot. Fill to the level of the filler plug hole. **DO NOT** overfill. See “Gear Oils” on page 268.

Rear axles with front-mounted carriers — With the axle at operating temperature, remove the magnetic drain plug and drain the oil from the axle housing. Clean and reinstall the plug. Remove the filler plug and fill the axle housing with enough of the recommended oil to bring the level to the bottom of the filler plug hole. Reinstall the plug.

Rear axles with top-mounted carriers — With the axle(s) at operating temperature, remove the magnetic drain plugs from the interaxle power divider on the front carrier (if so equipped), the carrier bevel gear compartment(s), and the axle housing(s), and allow the oil to drain. Clean and reinstall the plugs. Refer to “Magnetic Strips and Oil Troughs” on page 167 for information concerning the magnetic strips and oil trough cleaning procedures. Remove the filler plug from the interaxle power divider (if equipped) and add one pint (1.5 pints for CRD200 carriers) of the recommended oil. Reinstall the filler plug. Remove the filler plugs from the bevel gear compartment(s) and fill with the recommended oil until level with the bottom of the filler plug hole. Reinstall the filler plug(s). Remove the filler plugs from the axle housing(s) and fill with enough of the recommended oil until level with the bottom of the filler plug hole. Reinstall the filler plug(s). If the axle is equipped with an elbow fitting in the axle housing fill plug hole, the easiest method of filling the housing is by removing the breather fitting from the right-hand side of the carrier and the fill plug from the elbow fitting. Fill the housing through the breather hole until the oil runs out the elbow fitting. Reinstall the fill plug and the breather fitting.

LUBRICATION

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Rear axles with front-mounted carriers — With the axle at operating temperature, remove the magnetic drain plug and drain the oil from the axle housing. Clean and reinstall the plug. Remove the filler plug and fill the axle housing with enough of the recommended oil to bring the level to the bottom of the filler plug hole. Reinstall the plug.

Rear axles with top-mounted carriers — With the axle(s) at operating temperature, remove the magnetic drain plugs from the interaxle power divider on the front carrier (if so equipped), the carrier bevel gear compartment(s), and the axle housing(s), and allow the oil to drain. Clean and reinstall the plugs. Refer to “Magnetic Strips and Oil Troughs” on page 167 for information concerning the magnetic strips and oil trough cleaning procedures. Remove the filler plug from the interaxle power divider (if equipped) and add one pint (1.5 pints for CRD200 carriers) of the recommended oil. Reinstall the filler plug. Remove the filler plugs from the bevel gear compartment(s) and fill with the recommended oil until level with the bottom of the filler plug hole. Reinstall the filler plug(s). Remove the filler plugs from the axle housing(s) and fill with enough of the recommended oil until level with the bottom of the filler plug hole. Reinstall the filler plug(s). If the axle is equipped with an elbow fitting in the axle housing fill plug hole, the easiest method of filling the housing is by removing the breather fitting from the right-hand side of the carrier and the fill plug from the elbow fitting. Fill the housing through the breather hole until the oil runs out the elbow fitting. Reinstall the fill plug and the breather fitting.

165

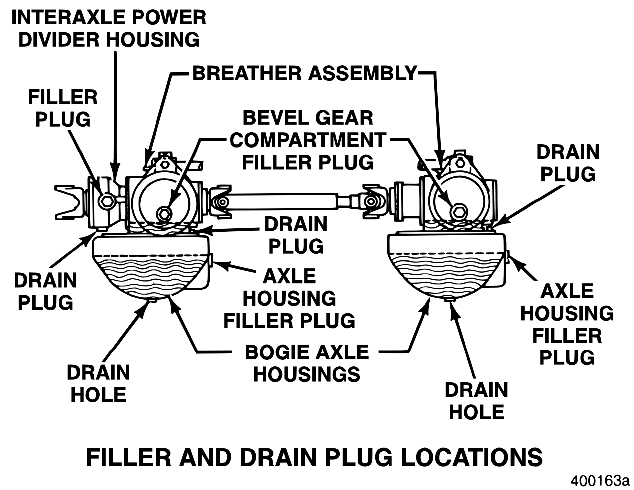


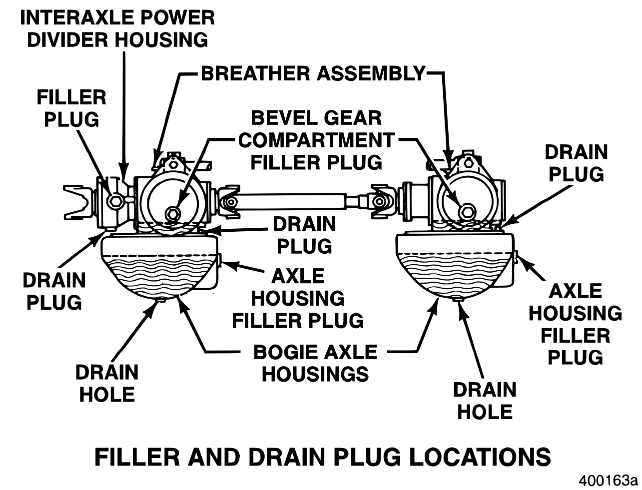
Figure 45 — Filler and Drain Plug Locations

When checking oil level in rear axles having top-mounted carriers, check after the vehicle has been operated, the oil is hot and the chassis is parked on level ground. Check the oil level by removing the fill/level plugs from the axle housings and the bevel gear compartments. The level is correct when oil runs out of the fill plug hole in the axle housing, and slightly below the fill plug hole in the bevel gear compartment. On axle housings with an elbow fitting in the axle housing fill plug hole, oil level must be to the top of the elbow fitting. If the level in the axle housing is low, add oil to the axle housing and the bevel gear compartment until level with the bottom of the fill plug holes. DO NOT add oil if the level in the axle housing is sufficient. Reinstall the plugs.

NOTE

It is not necessary to check oil level in the interaxle power divider. If oil level in the carrier is sufficient, level in the interaxle power divider will also be sufficient.

LUBRICATION



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NOTE

It is not necessary to check oil level in the interaxle power divider. If oil level in the carrier is sufficient, level in the interaxle power divider will also be sufficient.

166

Interwheel Power Divider

For rear axles equipped with interwheel power dividers, a friction-modifier additive, Bulldog® Power Divider Top Treat (part No. 9853-PDT1), is available to prevent power divider snapping or binding. If power divider snapping or binding is experienced, this additive should be added at each rear axle gear oil change. One container (20 fl.oz.) is required for each carrier. Bulldog® Power Divider Top Treat is available from your local MACK dealer.

Magnetic Strips and Oil Troughs

An oil trough with magnetic strips is attached to the inside of the bevel gear compartment cover. The outside of the cover contains the notice "Internal Magnetic Strips and Oil Trough Require Periodic Cleaning." Clean the oil trough and magnetic strips each time the oil is changed or when the cover is removed.

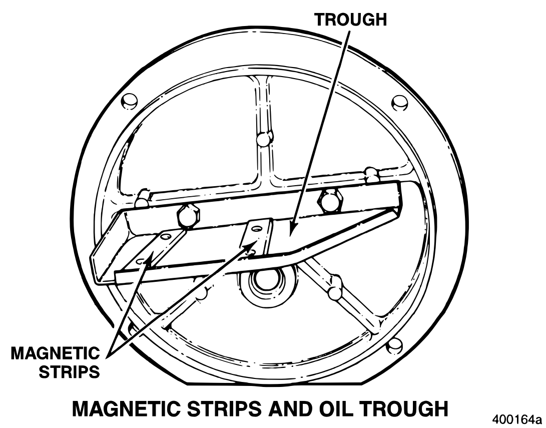

Figure 46 — Magnetic Strips and Oil Trough

N O T E

Whenever the cover is removed from the bevel gear compartment, check the cover mating surface. If signs of corrosion or erosion are evident, the cover must be replaced.

LUBRICATION

Interwheel Power Divider

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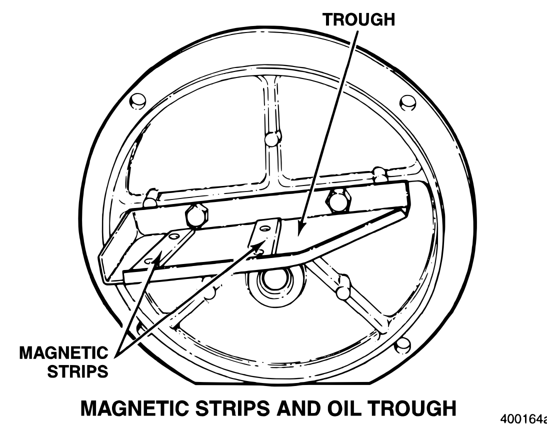

Figure 46 — Magnetic Strips and Oil Trough

N O T E

Whenever the cover is removed from the bevel gear compartment, check the cover mating surface. If signs of corrosion or erosion are evident, the cover must be replaced.

167

Carrier Housing Breathers

Remove the carrier housing breather(s) each time the rear axle(s) oil is changed. Clean the breather(s) in a suitable, nonflammable solvent and check for obstructions. Blow dry with compressed air, then reinstall.

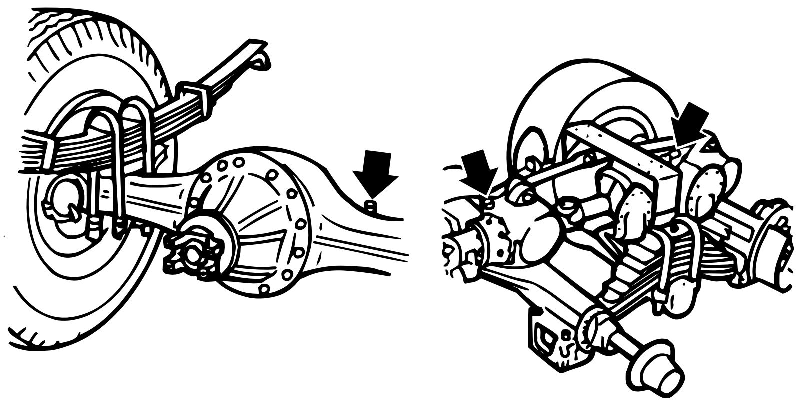

Figure 47 — Carrier Housing Breathers

Wheel Bearing Lubrication

The wheel bearings on standard MACK front non-driving axles may be either oil-lubricated, grease-lubricated or semi-fluid grease-lubricated.

LUBRICATION

Carrier Housing Breathers

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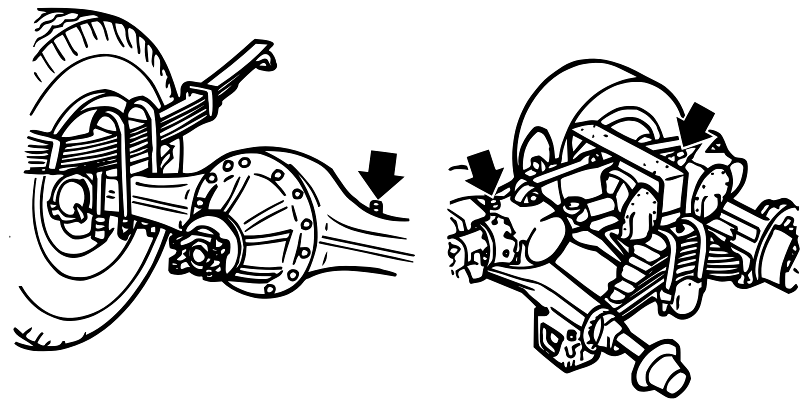


CARRIER HOUSING BREATHER (SINGLE REAR AXLE)
CARRIER HOUSING BREATHERS (BOGIE — ONE BREATHER EACH CARRIER)
400386a

Figure 47 — Carrier Housing Breathers

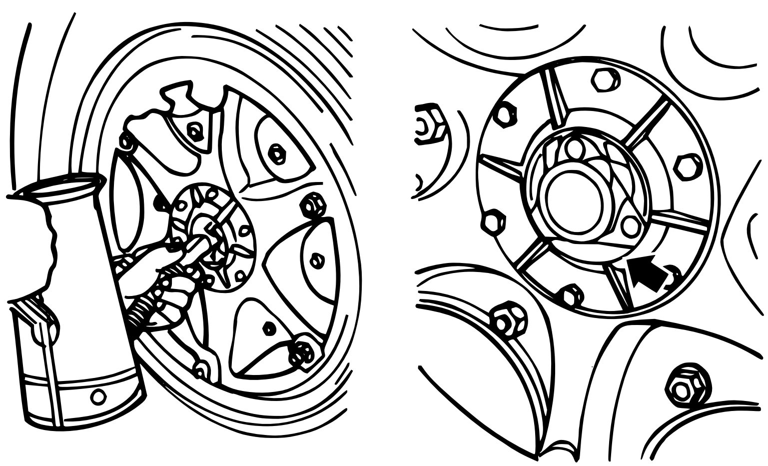
Wheel Bearing Lubrication

The wheel bearings on standard MACK front non-driving axles may be either oil-lubricated, grease-lubricated or semi-fluid grease-lubricated.

168

OIL-LUBRICATED FRONT WHEEL BEARINGS

Front axles having oil-lubricated wheel bearings are identified by the transparent plastic hubcap which is inscribed with a mark to indicate the proper oil level. The cap in the center of the transparent window can be removed when it becomes necessary to add oil. Check the oil level regularly, at the daily pre-trip inspection. Add the recommended oil (refer to “Gear Oils” on page 268) when necessary. Oil-lubricated front wheel bearings must be removed, cleaned and inspected at each D inspection interval.



FILLING FRONT AXLE

PROPER OIL LEVEL

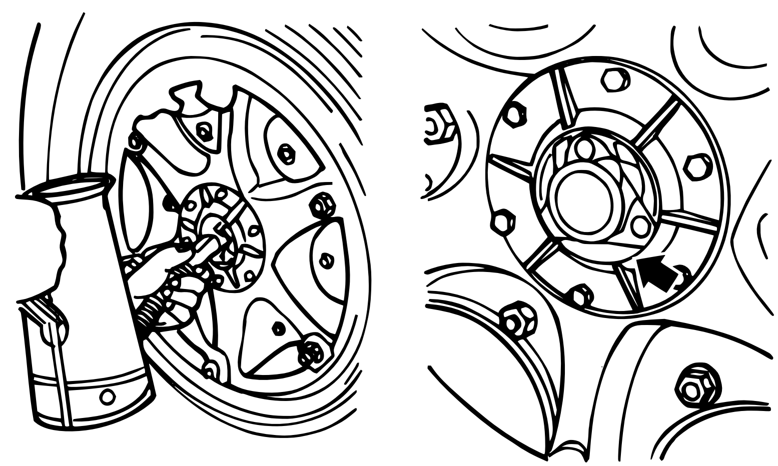
400387a

Figure 48 — Front Axle Hub

LUBRICATION

OIL-LUBRICATED FRONT WHEEL BEARINGS

Front axles having oil-lubricated wheel bearings are identified by the transparent plastic hubcap which is inscribed with a mark to indicate the proper oil level. The cap in the center of the transparent window can be removed when it becomes necessary to add oil. Check the oil level regularly, at the daily pre-trip inspection. Add the recommended oil (refer to “Gear Oils” on page 268) when necessary. Oil-lubricated front wheel bearings must be removed, cleaned and inspected at each D inspection interval.



FILLING FRONT AXLE

PROPER OIL LEVEL

400387a

Figure 48 — Front Axle Hub

169

GREASE-LUBRICATED FRONT WHEEL BEARINGS

The hubcap on front axles having grease-lubricated front wheel bearings may be either a metal cap or a transparent window. Grease-lubricated wheel bearings must be removed, cleaned and repacked with grease at each D inspection interval.

SEMI-FLUID GREASE-LUBRICATED FRONT WHEEL BEARINGS

Front axles with semi-fluid grease-lubricated wheel bearings also have a hubcap with a transparent window and a vent cap in the center. The center vent cap is not to be removed to add oil to the hub assembly. Semi-fluid grease-lubricated wheel bearings must be removed, cleaned and re-lubricated at each D inspection interval.

UNITIZED WHEEL HUBS

Unitized wheel hubs (with pre-set wheel bearings) are sealed and lubricated for life. Disassembly of the hub to clean and lubricate the wheel bearings is not necessary, and doing so may void the manufacturer's warranty. Additionally, wheel bearing adjustments are not necessary with unitized hubs. Consult the wheel hub manufacturer's service literature for additional service information.

For ArvinMeritor™ unitized hub assemblies, the following inspections must be performed at the intervals listed below:

Detailed Inspection

- After the initial 321 800 km (200,000 miles) of operation.
- After every additional 321 800 km (200,000 miles) of operation thereafter.

Basic Inspection

- At each 80 467 km (50,000 mile) interval following the initial 321 800 km (200,000 miles) of operation or at the most frequent preventive maintenance interval (C and D Inspections).

LUBRICATION

GREASE-LUBRICATED FRONT WHEEL BEARINGS

The hubcap on front axles having grease-lubricated front wheel bearings may be either a metal cap or a transparent window. Grease-lubricated wheel bearings must be removed, cleaned and repacked with grease at each D inspection interval.

SEMI-FLUID GREASE-LUBRICATED FRONT WHEEL BEARINGS

Front axles with semi-fluid grease-lubricated wheel bearings also have a hubcap with a transparent window and a vent cap in the center. The center vent cap is not to be removed to add oil to the hub assembly. Semi-fluid grease-lubricated wheel bearings must be removed, cleaned and re-lubricated at each D inspection interval.

UNITIZED WHEEL HUBS

Unitized wheel hubs (with pre-set wheel bearings) are sealed and lubricated for life. Disassembly of the hub to clean and lubricate the wheel bearings is not necessary, and doing so may void the manufacturer's warranty. Additionally, wheel bearing adjustments are not necessary with unitized hubs. Consult the wheel hub manufacturer's service literature for additional service information.

For ArvinMeritor™ unitized hub assemblies, the following inspections must be performed at the intervals listed below:

Detailed Inspection

- After the initial 321 800 km (200,000 miles) of operation.
- After every additional 321 800 km (200,000 miles) of operation thereafter.

Basic Inspection

- At each 80 467 km (50,000 mile) interval following the initial 321 800 km (200,000 miles) of operation or at the most frequent preventive maintenance interval (C and D Inspections).

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For detailed instructions on performing the Detailed and Basic Inspections, refer to the ArvinMeritor™ service publication, *Maintenance Manual 2, Front Non-driving Steering Axles*. This manual can be obtained by visiting Literature on Demand on the ArvinMeritor web site at *www.meritorhvs.com*.

FRONT DRIVING AXLES

Wheel bearings on front driving axles may be oil- or grease-lubricated. Consult the specific axle manufacturer's service publications for lubrication recommendations, specifications and procedures.

REAR WHEEL BEARINGS

Rear wheel bearings are lubricated by oil from the carrier and require no periodic inspection of lubricant level at the wheel bearings. Rear wheel bearings must be removed, cleaned and inspected at each D inspection interval.

KING PIN UPPER BEARING LU182BRICATION

Lubricate the upper king pin bearing with the vehicle on the ground. Apply MG-C grease to the upper bearing grease fitting until grease purges from the joint between the upper steering knuckle and the upper portion of the axle eyelet.

NOTE

The upper king pin cover on MACK FXL18 and FXL20 front axles has two grease fittings. It is only necessary to apply grease to one of the fittings.

KING PIN LOWER BEARING LUBRICATION

Lubricate the king pin lower bearing with the front of the vehicle raised off the ground and supported on jackstands of adequate capacity to support the weight of the vehicle. Apply MG-C grease to the lower bushing grease fitting until grease purges from the joint between the lower steering knuckle and the lower portion of the axle eyelet.

LUBRICATION

For detailed instructions on performing the Detailed and Basic Inspections, refer to the ArvinMeritor™ service publication, *Maintenance Manual 2, Front Non-driving Steering Axles*. This manual can be obtained by visiting Literature on Demand on the ArvinMeritor web site at *www.meritorhvs.com*.

FRONT DRIVING AXLES

Wheel bearings on front driving axles may be oil- or grease-lubricated. Consult the specific axle manufacturer's service publications for lubrication recommendations, specifications and procedures.

REAR WHEEL BEARINGS

Rear wheel bearings are lubricated by oil from the carrier and require no periodic inspection of lubricant level at the wheel bearings. Rear wheel bearings must be removed, cleaned and inspected at each D inspection interval.

KING PIN UPPER BEARING LU182BRICATION

Lubricate the upper king pin bearing with the vehicle on the ground. Apply MG-C grease to the upper bearing grease fitting until grease purges from the joint between the upper steering knuckle and the upper portion of the axle eyelet.

NOTE

The upper king pin cover on MACK FXL18 and FXL20 front axles has two grease fittings. It is only necessary to apply grease to one of the fittings.

KING PIN LOWER BEARING LUBRICATION

Lubricate the king pin lower bearing with the front of the vehicle raised off the ground and supported on jackstands of adequate capacity to support the weight of the vehicle. Apply MG-C grease to the lower bushing grease fitting until grease purges from the joint between the lower steering knuckle and the lower portion of the axle eyelet.

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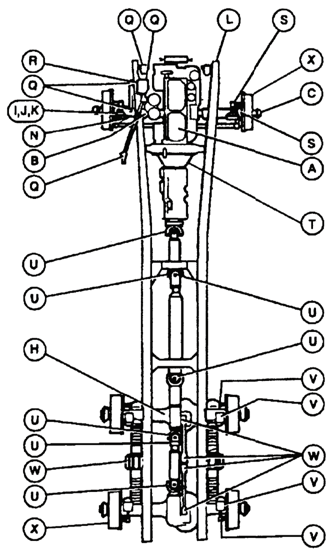
Lubrication Chart

MACK CHASSIS
PREVENTIVE MAINTENANCE SCHEDULE
LUBRICATION CHART

ACTION TAKEN	KEY	ITEM
✔	A	ENGINE CRANKCASE
✔	B	POWER STEERING RESERVOIR
✔	C	FRONT WHEEL BEARINGS
✔	D	**FRONT DRIVE AXLE**
	E	FLYWHEEL PTO
	F	TRANSMISSION
	G	TRANSFER CASE
	H	REAR AXLE
➝		FRONT DRIVE AXLE
	I	SLIDING SPLINES
	I	UNIVERSALS
	J,K	KING PINS*
	J,K	UNIVERSALS (CARDANS)*
➝	L	CAB/HOOD HINGES
▶	M	SHUTTERS
	N	ACCELERATOR HINGE PIN
	N	BRAKE TREADLE HINGE PIN
▶	N	BRAKE VALVE PLUNGER
➝	O	SHIFT LINKAGE
	P	CAB TILT RESERVOIR
➝	Q	SPRING PINS*
	Q	SHACKLES*
	Q	DRAG LINK
	Q	STEERING UNIVERSALS
	Q	SLIP YOKE
	Q	PURGE FITTING
➝	R	STEERING GEAR ADAPTER BUSHING
➝	S	FRONT SLACK ADJUSTER*
	S	FRONT BRAKE CAMSHAFT*
	S	STEERING KNUCKLE PINS*
	S	CROSS STEERING TUBE SOCKETS*
➝	T	CLUTCH RELEASE SHAFT*
	T	CLUTCH RELEASE BEARING
➝	U	PROP SHAFT UNIVERSALS
	U	PROP SHAFT SLIDING SPLINE†
➝	V	REAR BRAKE CAMSHAFT*
	V	REAR SLACK ADJUSTERS*
	V	SPRING PINS*
	W	TORQUE ROD BALL STUDS
	W	SPRING TRUNNION*
⊸	X	SPEEDOMETER ADAPTOR (mech.)
⚙	X	MAXI-MISER
⊸	Y	TACHOMETER ADAPTOR (mech.)

* Indicates lubrication on both sides of vehicle.
†Do not lubricate sliding splines on Spicer life™ driveshafts



NOTE
Clean all fittings with non-flammable solvent and wipe clean with a rag before applying grease gun.

NOTE
For lubricant specifications, refer to LUBRICANTS AND SPECIFICATIONS section of this manual.

ACTION TAKEN CODES	
✔	Check Level. Add Lubricant if Necessary
➝	Lubricate Fitting
▶	Lubricate Surfaces
⊸	Remove, Clean, Repack Adapter
⚙	Remove, Clean, Reinstall

000089b

Figure 49 — Mack Chassis Lubrication Chart

LUBRICATION
Lubrication Chart
MACK CHASSIS
PREVENTIVE MAINTENANCE SCHEDULE
LUBRICATION CHART
(table, diagram, notes and action taken codes repeated)
000089b
Figure 49 — Mack Chassis Lubrication Chart
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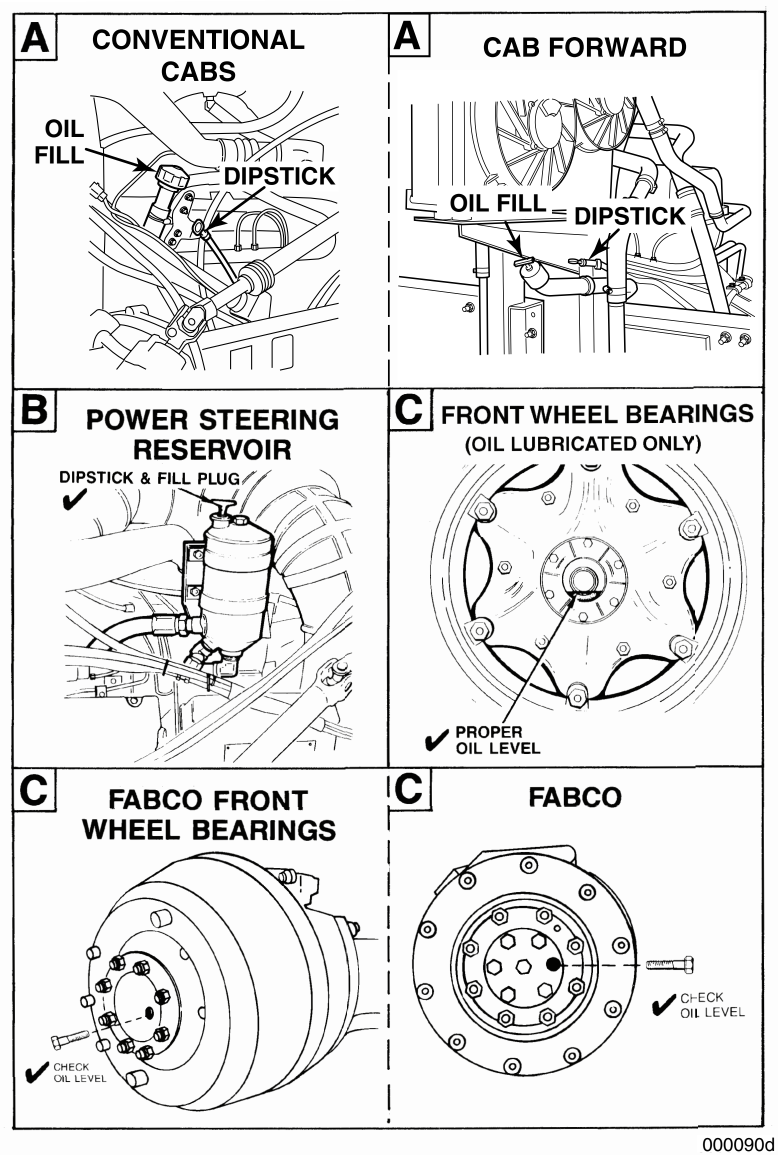

Figure 50 — A–C Key References

LUBRICATION

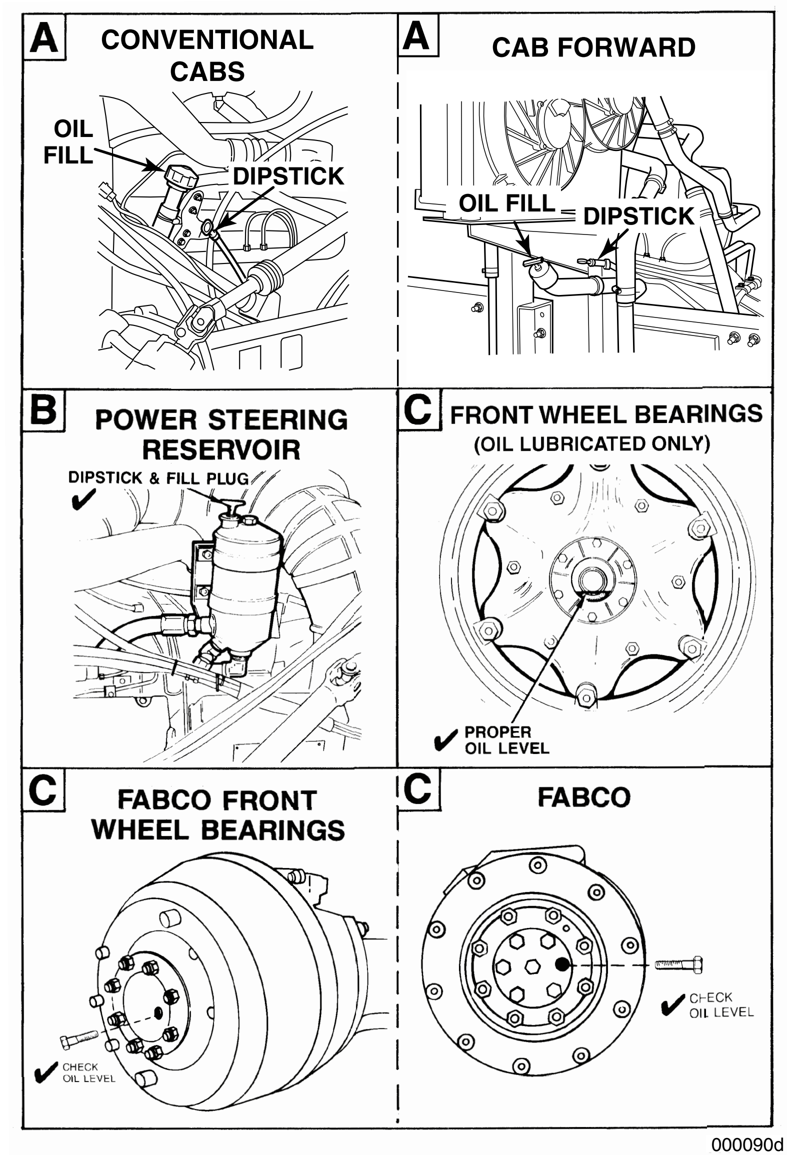
Figure 50 — A–C Key References

173

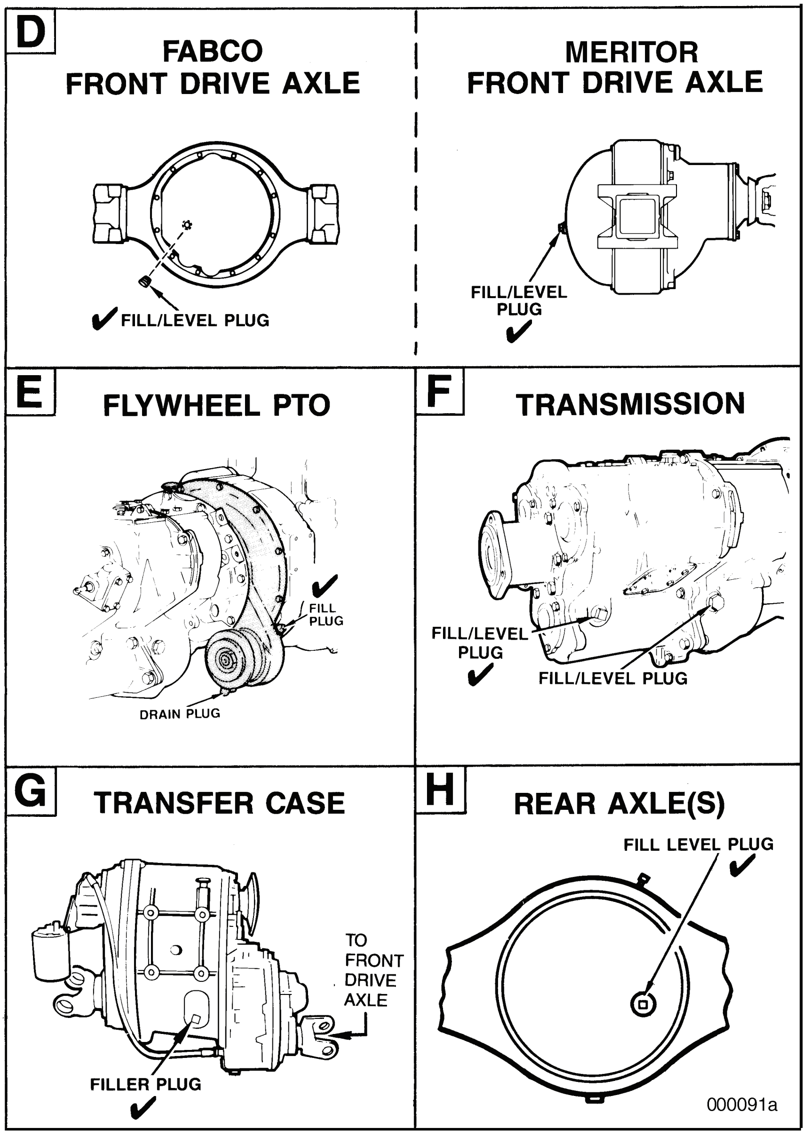

Figure 51 — D–H Key References

LUBRICATION

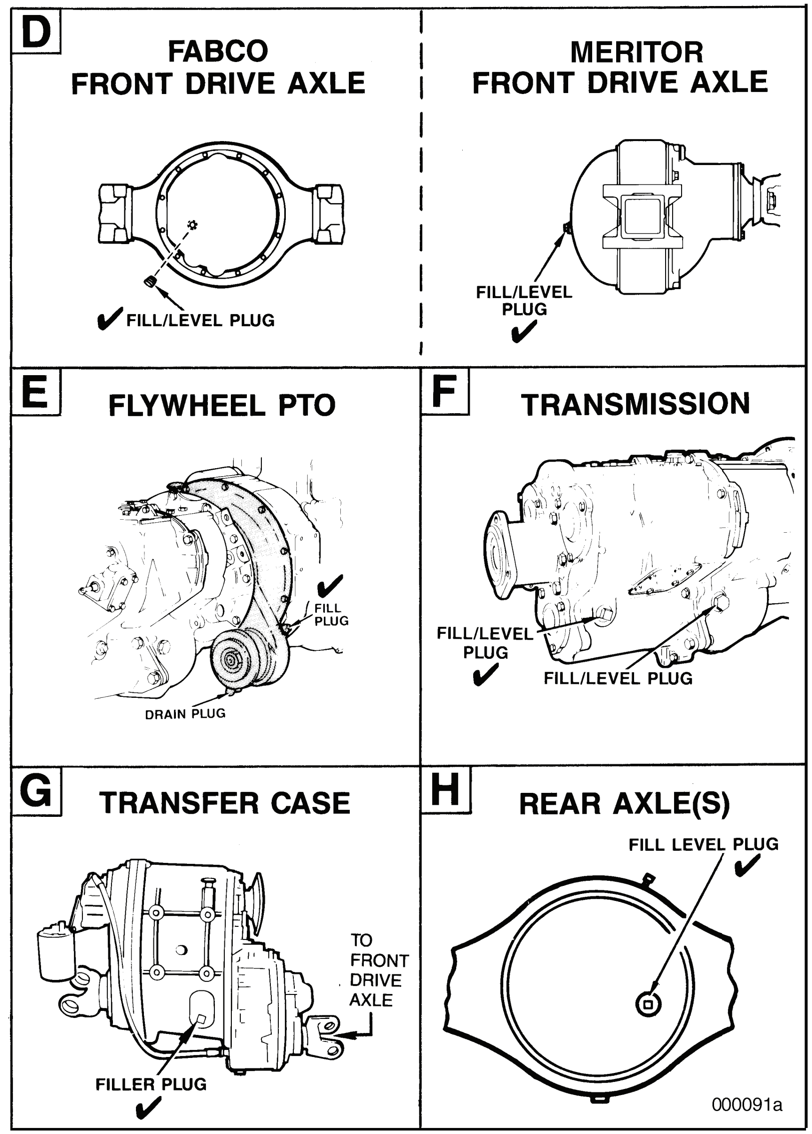

Figure 51 — D–H Key References

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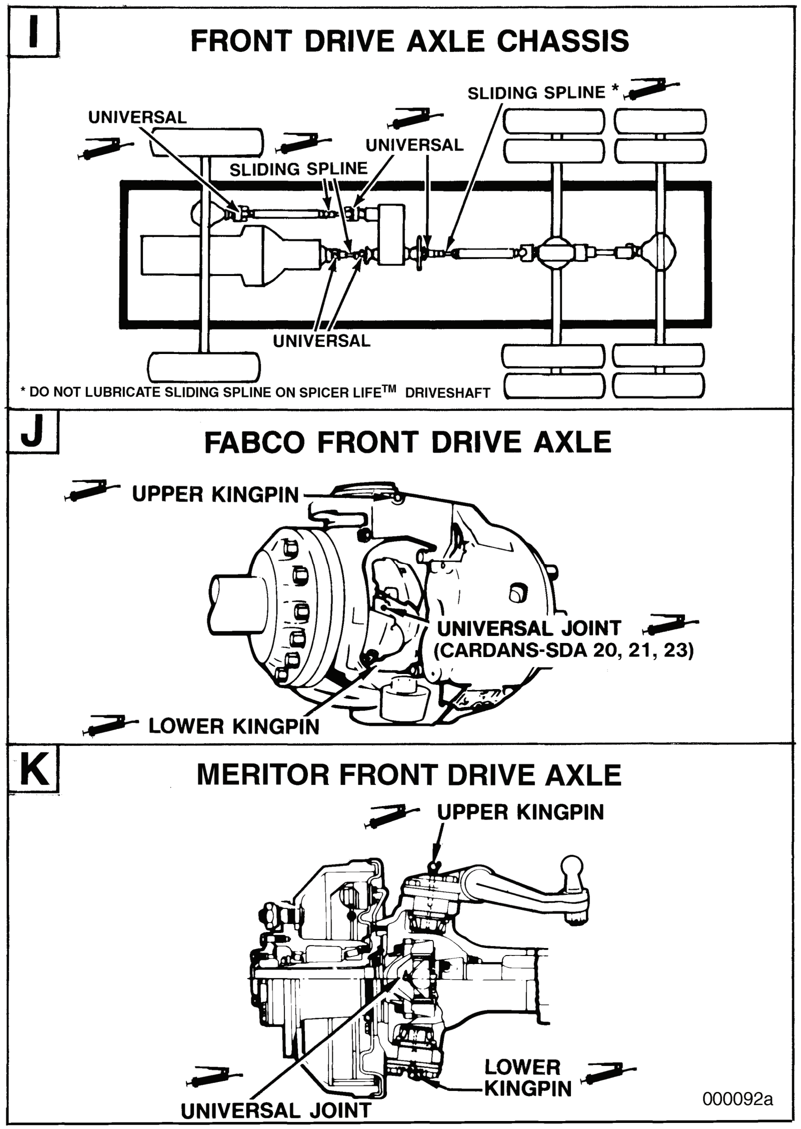

Figure 52 — I–K Key References

LUBRICATION

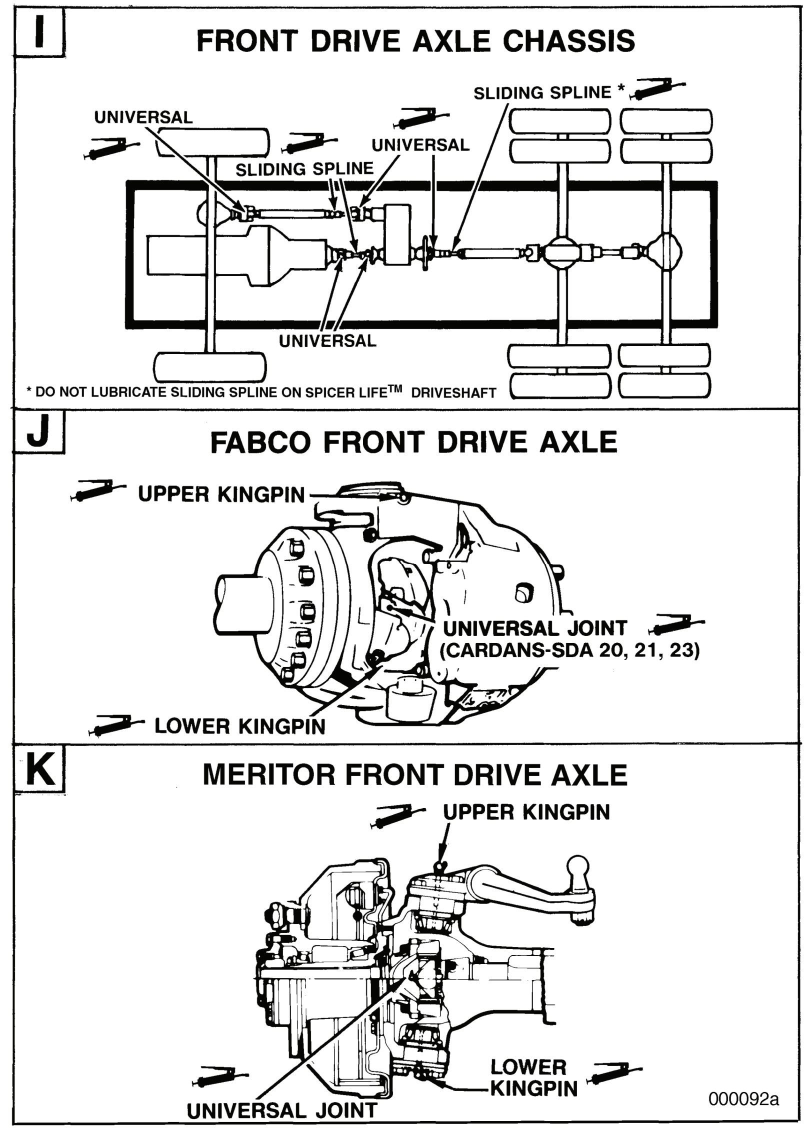

Figure 52 — I–K Key References

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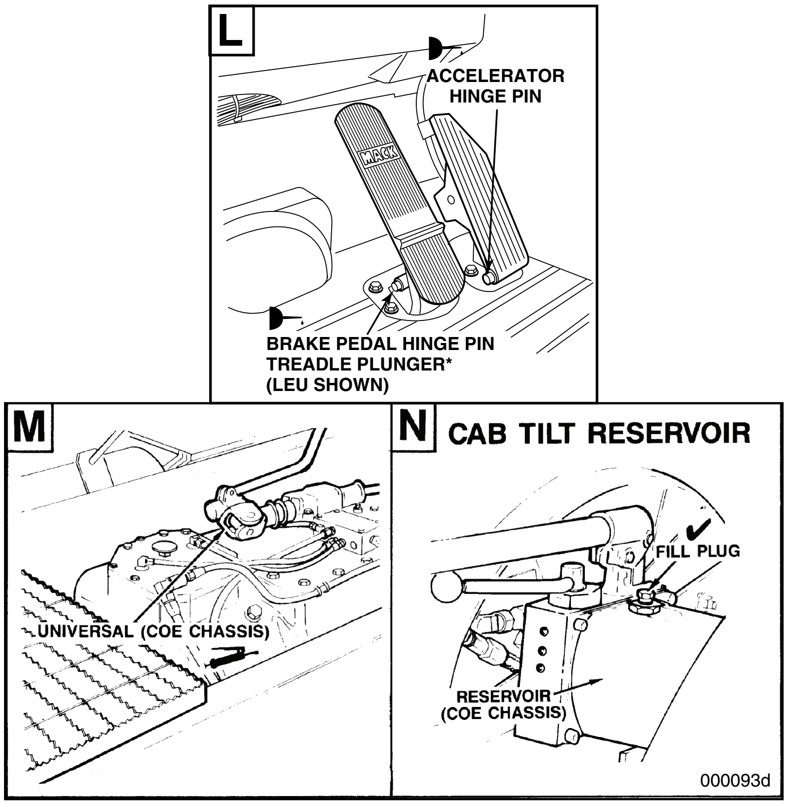
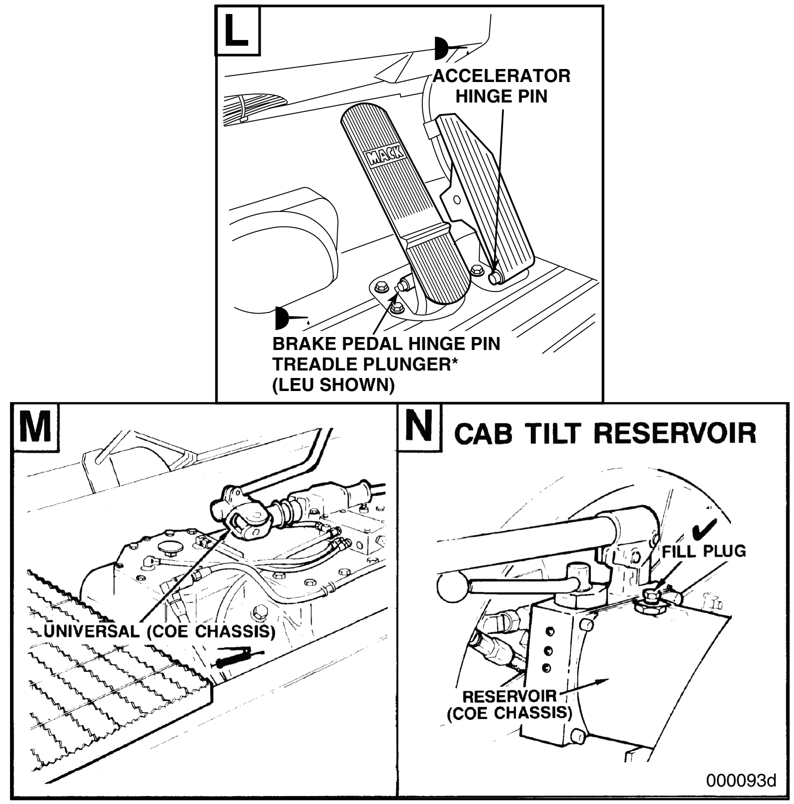


*Use MG-C Grease.

Figure 53 — L–N Key References

LUBRICATION



*Use MG-C Grease.

Figure 53 — L–N Key References

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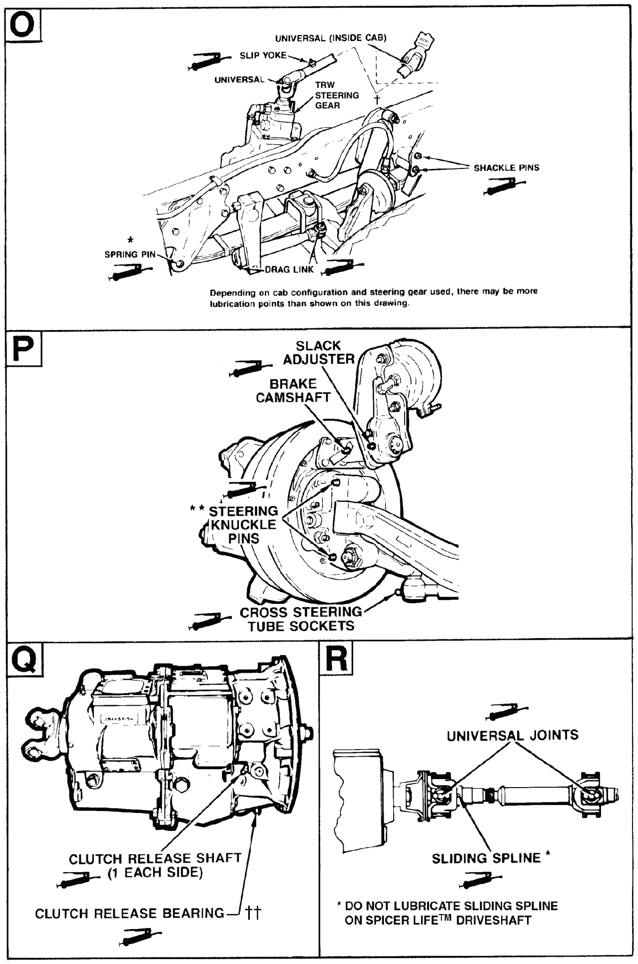
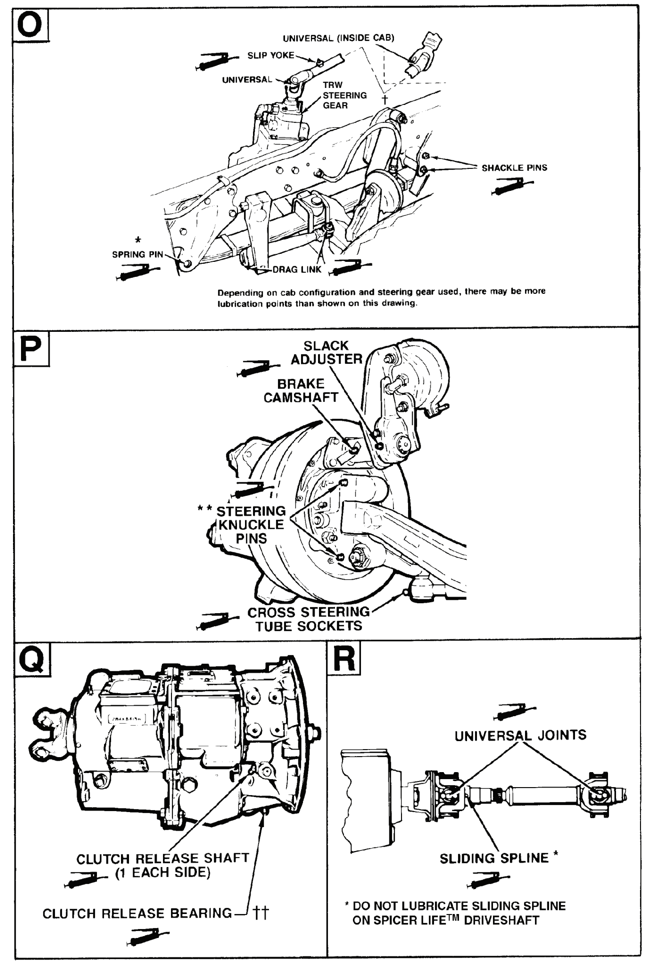


* The front suspensions on CHU model chassis utilize Elastomeric bushings and do not require lubrication.
** Lubricate upper knuckle pin bearings with vehicle on ground, lower pin bushing with vehicle raised.
† On TRW TAS steering gears, apply MGC to the fitting on the trunnion side of the steering gear near the output shaft. Use a hand type grease gun only.
†† Remove inspection cover to access release bearing grease fitting.

000094d

Figure 54 — O–R Key References

LUBRICATION



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** Lubricate upper knuckle pin bearings with vehicle on ground, lower pin bushing with vehicle raised.
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000094d

Figure 54 — O–R Key References

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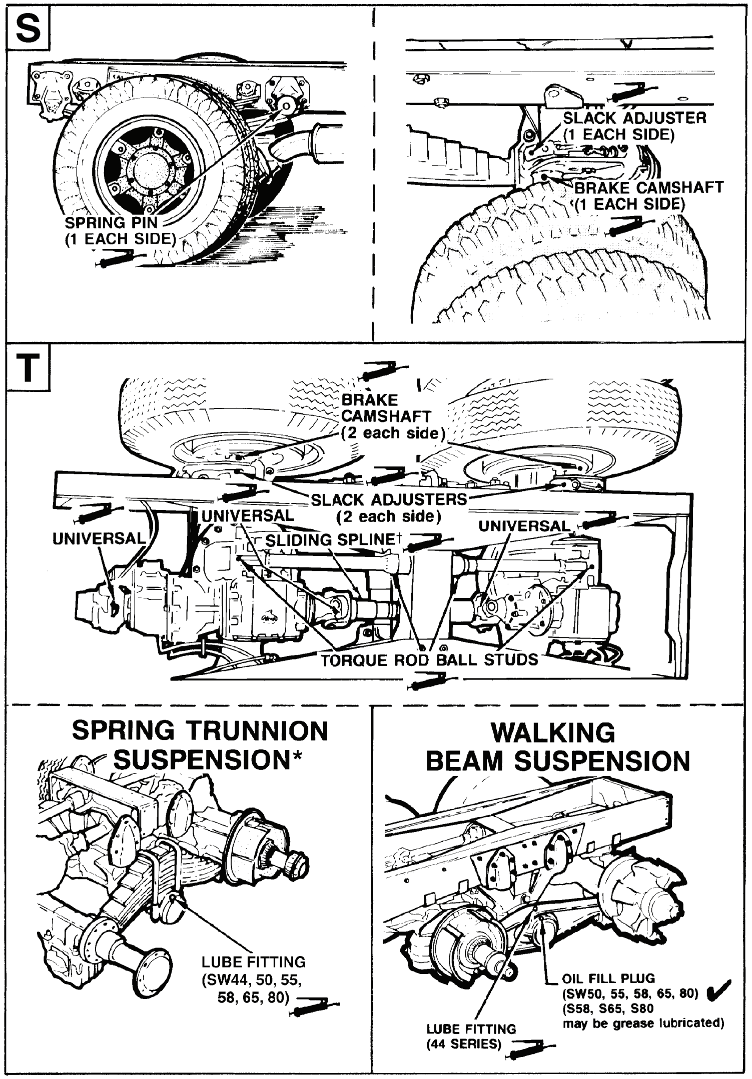


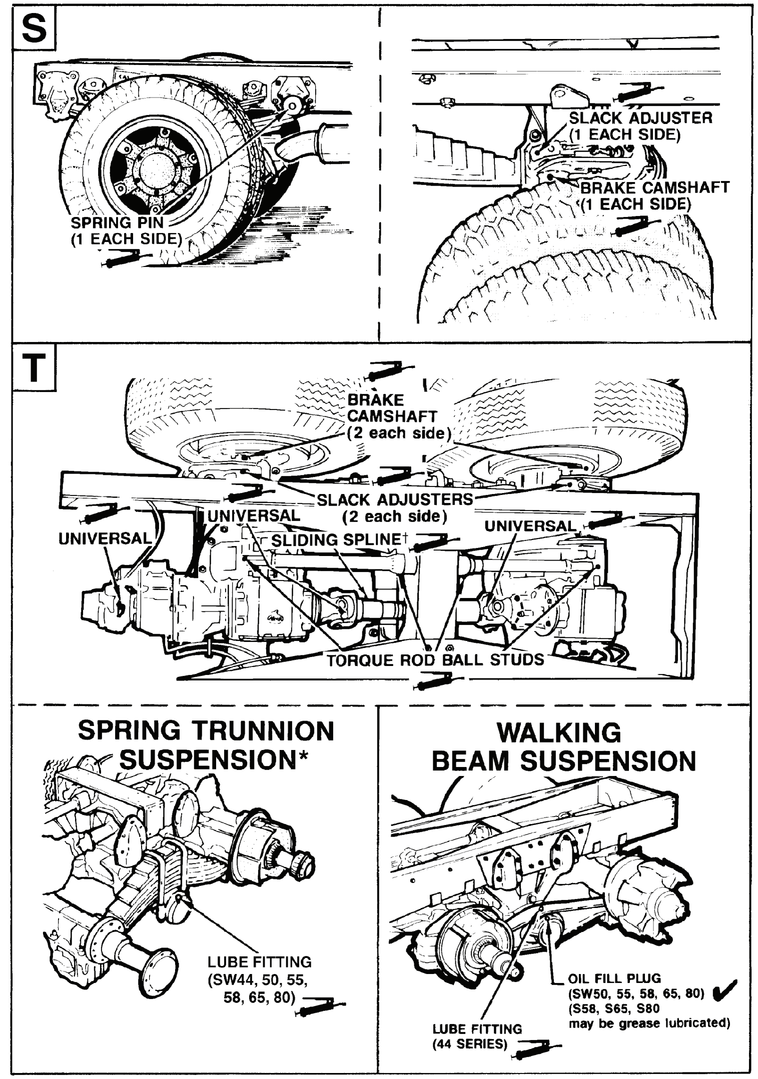
*When greasing trunnion, raise chassis slightly, just enough to take weight off trunnion, to ensure grease fully penetrates cavity.

†Do not lubricate sliding spline on Spicer Life™ driveshafts.

000095d

Figure 55 — S–T Key References

LUBRICATION



*When greasing trunnion, raise chassis slightly, just enough to take weight off trunnion, to ensure grease fully penetrates cavity.

†Do not lubricate sliding spline on Spicer Life™ driveshafts.

000095d

Figure 55 — S–T Key References

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STEERING KNUCKLE INSPECTION

At each C and D inspection interval, steam clean and inspect each steering knuckle for cracks. Pay particular attention to the areas of the steering lever boss, cross-steering tube boss and the king pin lower boss. If cracks are noticed, consult your local MACK dealer.

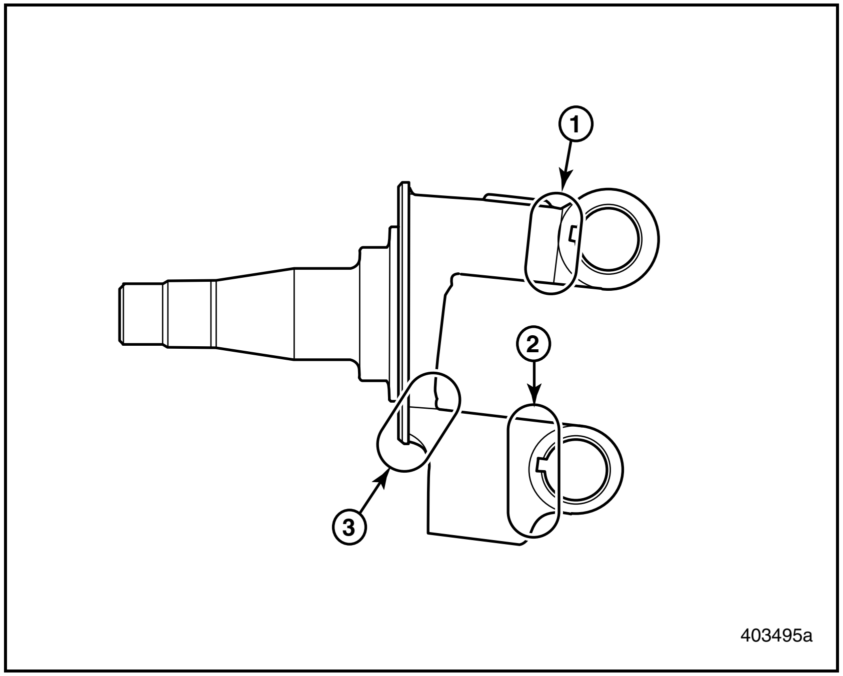

Figure 56 — Inspect Steering Knuckle

1. Steering Lever Boss 2. Cross-Steering Tube Boss	3. King Pin Lower Boss

STEERING KNUCKLE INSPECTION

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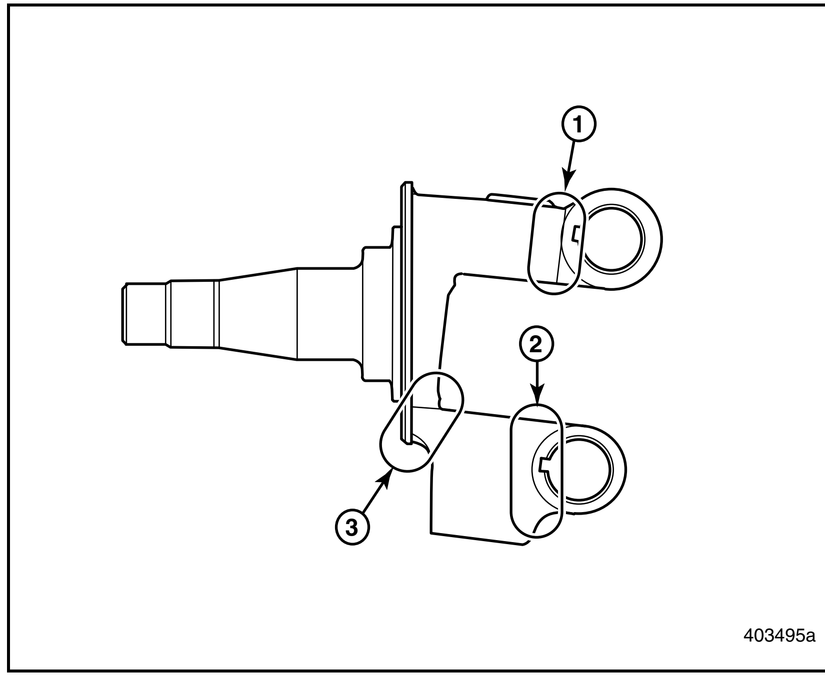

Figure 56 — Inspect Steering Knuckle

1. Steering Lever Boss 2. Cross-Steering Tube Boss	3. King Pin Lower Boss

179

CARRIER CAPSCREW TORQUE

At each C and D inspection interval, check and adjust the torque of the capscrews that secure the top-mounted carrier to the axle housing. On certain carrier assemblies, two of the capscrews are located inside the bevel gear compartment where they are not visible.

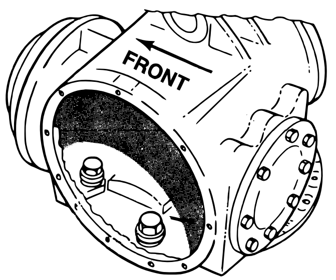

Figure 57 — Carrier Capscrews

The following carrier assemblies have capscrews located inside the bevel gear compartment:

CRD(L)92(1), CRDLP92(1), CRDPC92(1), CRD(L)93(1), CRD112, CRDPC112(1), CRD113(1), CRDP95(1), CRD96(1), CRD200

To gain access to these “hidden” capscrews, drain the bevel gear compartment, and remove the cover. After checking the torque (refer to table on page 181), reinstall the cover and fill the bevel gear compartment with enough of the recommended oil to bring the level to the bottom of the filler plug hole. (See “Gear Oils” on page 268.)

NOTE

Whenever the cover is removed from the bevel gear compartment, check the cover mating surface. If signs of corrosion or erosion are evident, the cover must be replaced.

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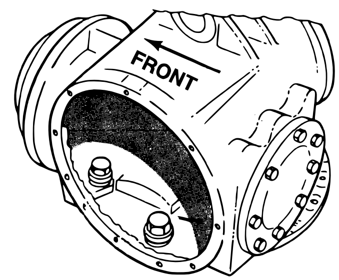

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NOTE

Whenever the cover is removed from the bevel gear compartment, check the cover mating surface. If signs of corrosion or erosion are evident, the cover must be replaced.

180

CAPSCREW TORQUE SPECIFICATIONS

Carrier	Torque N•m (Lb-ft)
92/93 Series	179–201 (132–148)
112/113 Series	179–201 (132–148)
95/96 Series	645–716 (476–528)
200 Series	179–201 (132–148)

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Carrier	Torque N•m (Lb-ft)
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95/96 Series	645–716 (476–528)
200 Series	179–201 (132–148)

181

FRONT AXLE STATIC SHAKE TEST

At each A, B, C and D inspection interval, perform a static shake test to check for looseness in the front axle springs and the steering system. To perform this test, apply the parking brakes and run the engine at an idle. With an assistant moving the steering wheel back and forth, check the front springs for looseness at the attachment points. Any movement of the spring indicates that the spring leaf may be broken, possibly at the spring eye wrapper, or the bronze bushing may be worn. If movement is detected, clean and inspect the spring leaf, wrapper and bronze bushing. Worn bushings must be replaced. If the spring wrapper is broken, the spring leaf must be replaced.

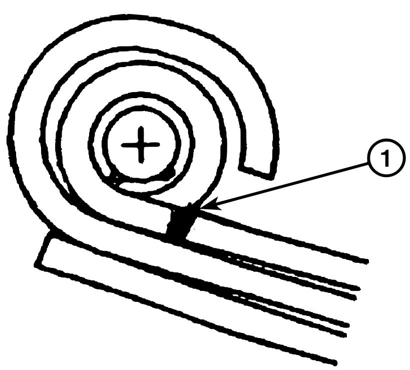

Figure 58 — Spring Eye Wrapper

1. Check this area of spring wrapper leaf for potential cracks.

While performing the shake test, also check the complete steering system (i.e., steering gear mounting, pitman arm, drag link, cross steering tube, steering levers, etc.) for looseness. If any looseness is seen in the steering system, the cause must be investigated and corrected.

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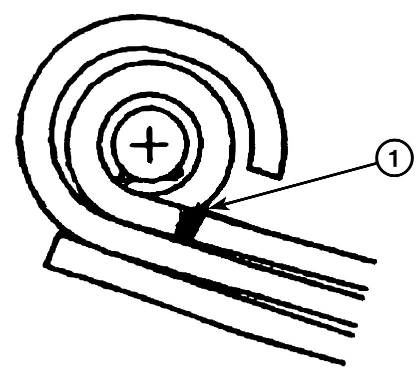

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182

SPRING CLIP (U-BOLT) TORQUE

WARNING

Proper spring clip torque must be maintained for safe operation of the vehicle. Loose or improperly torqued spring clips may adversely affect the driver's steering control of the vehicle.

NOTE

Always use an accurately calibrated torque wrench to torque the spring clips.

CAUTION

After any repair operation that involved the removal and reinstallation of a spring, the spring clips must be retorqued after a minimum of one day and a maximum of one week or 5 000 km/3,000 miles of service.

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183

MACK Tandem Suspensions

Spring clips must be retorqued during the first 5 000 km/3,000 miles or 3–4 months (whichever comes first). After the initial break-in period, retorque the spring clips at every C and D inspection interval.

ST34 and ST38 suspensions do not require retorquing at the end of the initial break-in period. Retorque these spring clips at every C and D inspection.

Vendor Tandem Suspensions

Hendrickson	Retorque spring clips at C and D inspection intervals per vendor specifications.
Neway	Retorque all fasteners in the suspension and the frame brackets at first 5 000 km/3,000 miles and thereafter at C and D inspection intervals per vendor specifications.
Reyco	Retorque spring clips and equalizer nuts at first 1 600 km/1,000 miles per vendor specifications. At B, C and D inspection intervals, retorque spring clips, equalizer nuts, torque arm bolts (at hangers and axle seats), and torque arm tube clamp nuts per vendor specifications.

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Front (Steering) Axle and Single Rear Axle

Retorque the spring clips on the front (steering) axle and the single rear axle at the first 5 000 km/3,000 miles, and thereafter at every C and D inspection interval.

SPRING CLIP NUT TORQUE CHART (FRONT AND REAR AXLES)

Spring Clip Diameter mm [Inches]	Spring Clip Nut Torque N•m (Lb-ft)
15.9 [0.625 (5/8)]	271–305 (200–225)
19.0 [0.750 (3/4)]	434–461 (320–340)
22.2 [0.875 (7/8)] with flat top	542–610 (400–450)
22.2 [0.875 (7/8)] with circular top	678–746 (500–550)
25.4 [1.000 (1)]	1085–1193 (800–880)
28.6 [1.125 (1-1/8)]	1423–1558 (1050–1150)
31.8 [1.250 (1-1/4)]	1897–2033 (1400–1500)

SPRING CLIP (U-BOLT) TORQUE

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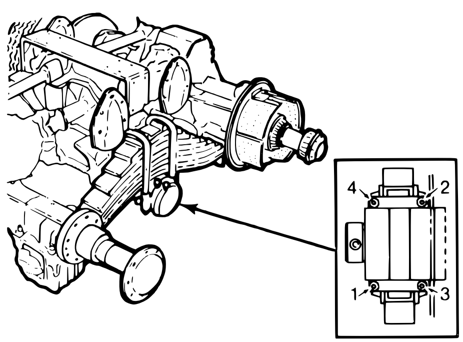
25.4 [1.000 (1)]	1085–1193 (800–880)
28.6 [1.125 (1-1/8)]	1423–1558 (1050–1150)
31.8 [1.250 (1-1/4)]	1897–2033 (1400–1500)

185

Spring Clip (U-Bolt) Torque Procedure

When installing spring clip nuts on either the front or rear springs, the spring clip threads must first be lubricated with NEVER-SIEZE™. NEVER-SIEZE™ must also be applied to the special washers, if so equipped, to remove the frictional drag on the nuts. Use the following recommended tightening sequence to torque the spring clips. Torque requirements are the same for either type of lubricant.

1. Tighten all spring clips until they are snug.
2. Tighten nuts, using the sequence shown below, to approximately one third of the recommended torque. Refer to table on page 185 for proper torque requirements.
3. Repeat tightening the nuts, using the same sequence, gradually increasing the torque through a second, third and fourth stage until the final recommended torque is achieved.



RECOMMENDED TIGHTENING SEQUENCE OF SPRING CLIP (U-BOLT) NUTS

100019a

Figure 59 — Recommended Spring Clip Nut Tightening Sequence

SPRING CLIP (U-BOLT) TORQUE

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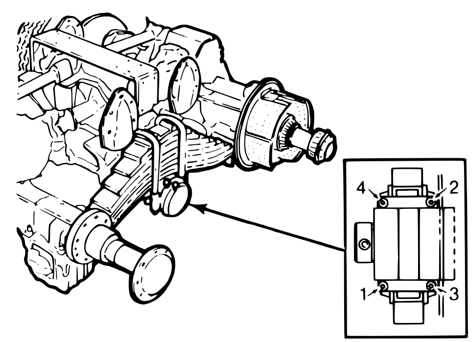

RECOMMENDED TIGHTENING SEQUENCE OF SPRING CLIP (U-BOLT) NUTS

100019a

Figure 59 — Recommended Spring Clip Nut Tightening Sequence

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MACK AIR SUSPENSIONS

At each C and D inspection interval, check the air springs for cracks, gouges, distortion, bulges and/or chafing and replace as necessary. If an air spring requires replacement, there is a high likelihood that a problem with another area of the suspension exists. Inspect the suspension and repair as required. Also at each C and D inspection interval, use a solution of soap and water to check the air suspension air system for leaks. Check the system for leaks with the vehicle loaded and the air system at normal operating pressure (governor cut-out).

Torque Requirements

NOTE

Following any repair that requires the removal and reinstallation of the spring clips (U-bolts) on AL, AL II, AL-401LH, MAXAIR 40/40A (AL-405), MAXLITE™ 20–40 and MAXLITE™ 20–40 EZ, the spring clips must be retorqued after the first 1 160 km (1,000 miles) of service, and thereafter at each specified maintenance interval according to the suspension model as outlined below. Refer to the *MACK Air Suspension and Repair Manual,* 14-101, *MAXAIR 40 (AL-405) Air Suspension and Repair Manual,* 14-102, or the MAXLITE™ 20–40 EZ Rear Air Suspension, 14-104, for additional information.

MACK AIR SUSPENSIONS

MACK AIR SUSPENSIONS

At each C and D inspection interval, check the air springs for cracks, gouges, distortion, bulges and/or chafing and replace as necessary. If an air spring requires replacement, there is a high likelihood that a problem with another area of the suspension exists. Inspect the suspension and repair as required. Also at each C and D inspection interval, use a solution of soap and water to check the air suspension air system for leaks. Check the system for leaks with the vehicle loaded and the air system at normal operating pressure (governor cut-out).

Torque Requirements

NOTE

Following any repair that requires the removal and reinstallation of the spring clips (U-bolts) on AL, AL II, AL-401LH, MAXAIR 40/40A (AL-405), MAXLITE™ 20–40 and MAXLITE™ 20–40 EZ, the spring clips must be retorqued after the first 1 160 km (1,000 miles) of service, and thereafter at each specified maintenance interval according to the suspension model as outlined below. Refer to the MACK Air Suspension and Repair Manual, 14-101, MAXAIR 40 (AL-405) Air Suspension and Repair Manual, 14-102, or the MAXLITE™ 20–40 EZ Rear Air Suspension, 14-104, for additional information.

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SPRING CLIP RETORQUE — ALL MACK AIR SUSPENSIONS

At the end of the initial break-in period (1 610 km [1,000 miles]), retorque the spring clips (U-bolts) on all chassis equipped with MACK air suspensions (including MAXAIR™ 40/40A and MAXLITE™ 20–40 suspensions). Thereafter, spring clips must be retorqued at each A, B, C and D inspection interval on all chassis equipped with AL, AL II, AL-401LH and MAXLITE™ 20–40 suspensions. There is no spring clip retorque requirement at any specific service interval (other than at the end of the initial break-in period) for chassis equipped with the MAXAIR™ 40/40A suspension.

- **AL, AL II and AL-401LH** — 542–610 N•m (400–450 lb-ft)

NOTE

On chassis equipped with AL-401LH and either Eaton or ArvinMeritor rear axles, 3/4-inch diameter U-bolts are used. Torque these U-bolts to 353–434 N•m (260–320 lb-ft).

- **MAXAIR™ 40/40A** — 475–542 N•m (350–400 lb-ft)
- **MAXLITE™ 20–40 and 20–40 EZ** — 500–650 N•m (369–479 lb-ft)

MAIN SUPPORT MEMBER LOCKNUTS

At the end of the initial break-in period (1 610 km [1,000 miles]), and thereafter at each A, B, C and D interval, retorque the main support member locknuts on AL, AL II and AL-401LH suspensions as follows:

- **AL** — Main support member to air spring lower mounting bracket — 353–434 N•m (260–320 lb-ft)
- **AL II and AL-401LH** — Main support member to cross channel section — 353–434 N•m (260–320 lb-ft)
- **MAXLITE™ 20–40** — Main support member to crossbeam — 85–125 N•m (62–92 lb-ft)

MACK AIR SUSPENSIONS

SPRING CLIP RETORQUE — ALL MACK AIR SUSPENSIONS

At the end of the initial break-in period (1 610 km [1,000 miles]), retorque the spring clips (U-bolts) on all chassis equipped with MACK air suspensions (including MAXAIR™ 40/40A and MAXLITE™ 20–40 suspensions). Thereafter, spring clips must be retorqued at each A, B, C and D inspection interval on all chassis equipped with AL, AL II, AL-401LH and MAXLITE™ 20–40 suspensions. There is no spring clip retorque requirement at any specific service interval (other than at the end of the initial break-in period) for chassis equipped with the MAXAIR™ 40/40A suspension.

- AL, AL II and AL-401LH — 542–610 N•m (400–450 lb-ft)

NOTE

On chassis equipped with AL-401LH and either Eaton or ArvinMeritor rear axles, 3/4-inch diameter U-bolts are used. Torque these U-bolts to 353–434 N•m (260–320 lb-ft).

- MAXAIR™ 40/40A — 475–542 N•m (350–400 lb-ft)
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MAIN SUPPORT MEMBER LOCKNUTS

At the end of the initial break-in period (1 610 km [1,000 miles]), and thereafter at each A, B, C and D interval, retorque the main support member locknuts on AL, AL II and AL-401LH suspensions as follows:

- AL — Main support member to air spring lower mounting bracket — 353–434 N•m (260–320 lb-ft)
- AL II and AL-401LH — Main support member to cross channel section — 353–434 N•m (260–320 lb-ft)
- MAXLITE™ 20–40 — Main support member to crossbeam — 85–125 N•m (62–92 lb-ft)

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OTHER FASTENERS

At each D inspection interval, check the torque of the following fasteners (refer to the *MACK Air Suspension Service and Repair Manual*, 14-101, *MAXAIR™ 40 (AL-405) Air Suspension Service and Repair Manual*, 14-102, or the MAXLITE™ 20–40 Rear Air Suspension Service Manual, 14-104, for additional information).

MACK AL Air Suspensions	
Fastener	**Torque N•m (lb-ft)**
Air Spring-to-Frame Bracket — Inboard	68–95 (50–70)
Air Spring-to-Frame Bracket — Outboard	27–41 (20–30)
Air Spring-to-Lower Mounting Bracket (Cross Tube)	27–41 (20–30)
Longitudinal Torque Rod Bar Pin	203–278 (150–205)
Transverse Torque Rod, Frame Side, Straddle-Type Mount	237–271 (175–200)
Transverse Torque Rod, Axle Side, Straddle-Type Mount	237–271 (175–200)
Transverse Torque Rod, Axle-Side, Taper Ball Socket	542–610 (400–450)
Frame Bracket Rebound Roller Bolt	68–95 (50–70)
Shock Absorber, Top and Bottom Nuts	68–95 (50–70)

MACK AIR SUSPENSIONS

OTHER FASTENERS

At each D inspection interval, check the torque of the following fasteners (refer to the *MACK Air Suspension Service and Repair Manual*, 14-101, *MAXAIR™ 40 (AL-405) Air Suspension Service and Repair Manual*, 14-102, or the MAXLITE™ 20–40 Rear Air Suspension Service Manual, 14-104, for additional information).

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Fastener	**Torque N•m (lb-ft)**
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Air Spring-to-Lower Mounting Bracket (Cross Tube)	27–41 (20–30)
Longitudinal Torque Rod Bar Pin	203–278 (150–205)
Transverse Torque Rod, Frame Side, Straddle-Type Mount	237–271 (175–200)
Transverse Torque Rod, Axle Side, Straddle-Type Mount	237–271 (175–200)
Transverse Torque Rod, Axle-Side, Taper Ball Socket	542–610 (400–450)
Frame Bracket Rebound Roller Bolt	68–95 (50–70)
Shock Absorber, Top and Bottom Nuts	68–95 (50–70)

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MACK AL II and AL-401LH Air Suspensions	
Fastener	**Torque N•m (lb-ft)**
Air Spring-to-Frame Bracket — Outboard	27–41 (20–30)
Air Spring-to-Lower Mounting Bracket (Cross Channel)	27–41 (20–30)
Longitudinal Torque Rod Bar Pin	203–278 (150–205)
Transverse Torque Rod, Frame Side, Straddle-Type Mount	237–271 (175–200)
Transverse Torque Rod, Axle Side, Straddle-Type Mount	237–271 (175–200)
Frame Bracket Rebound Roller Bolt	68–95 (50–70)
Shock Absorber, Top and Bottom Nuts (AL II only)	122–149 (90–110)
Shock Absorber, Top Nut (AL-401LH only)	122–149 (90–110)
Shock Absorber, Bottom Stud Nut (AL-401LH only)	68–95 (50–70)

MAXLITE™ 20–40 and 20–40 EZ Air Suspensions	
Fastener	**Torque N•m (lb-ft)**
Air Spring Upper Bracket-to-Frame	167–233 (124-172)
Air Spring-to-Upper Bracket	50 (37)
Air Spring-to-Crossbeam	50 (37)
Transverse Torque Rod-to-Axle Housing	270–370 (199–273)
Transverse Torque Rod-to-Frame Bracket	270–370 (199–273)
Shock Absorber-to-Bracket Bolts (Upper and Lower)	230–320 (170–236)

MACK AIR SUSPENSIONS

MACK AL II and AL-401LH Air Suspensions	
Fastener	**Torque N•m (lb-ft)**
Air Spring-to-Frame Bracket — Outboard	27–41 (20–30)
Air Spring-to-Lower Mounting Bracket (Cross Channel)	27–41 (20–30)
Longitudinal Torque Rod Bar Pin	203–278 (150–205)
Transverse Torque Rod, Frame Side, Straddle-Type Mount	237–271 (175–200)
Transverse Torque Rod, Axle Side, Straddle-Type Mount	237–271 (175–200)
Frame Bracket Rebound Roller Bolt	68–95 (50–70)
Shock Absorber, Top and Bottom Nuts (AL II only)	122–149 (90–110)
Shock Absorber, Top Nut (AL-401LH only)	122–149 (90–110)
Shock Absorber, Bottom Stud Nut (AL-401LH only)	68–95 (50–70)

MAXLITE™ 20–40 and 20–40 EZ Air Suspensions	
Fastener	**Torque N•m (lb-ft)**
Air Spring Upper Bracket-to-Frame	167–233 (124-172)
Air Spring-to-Upper Bracket	50 (37)
Air Spring-to-Crossbeam	50 (37)
Transverse Torque Rod-to-Axle Housing	270–370 (199–273)
Transverse Torque Rod-to-Frame Bracket	270–370 (199–273)
Shock Absorber-to-Bracket Bolts (Upper and Lower)	230–320 (170–236)

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Air Suspension Control Switch

The air suspension control switch located on the dashboard is used to exhaust the air from the air suspension air bags when coupling and uncoupling a trailer, or when raising and lowering a dump body. The air bags must be reinflated before the vehicle is operated.

NOTE

On trucks equipped with a dump body, always exhaust the air from the air bags before raising the body to prevent damaging the bags and to improve chassis stability while dumping a load. Reinflate the air bags after lowering the dump body.

NOTE

Do NOT operate a vehicle with air exhausted from the air suspension air bags, as damage to the chassis driveline will result. Always reinflate the air bags after coupling or uncoupling a trailer, or after lowering a dump body.

Height Control Valve

At each D inspection interval, check functionality of the height control valve. Refer to the *MACK AL and AL II Air Suspension Service and Repair Manual*, 14-101, *MAXAIR™ 40 (AL-405) Air Suspension Service and Repair Manual*, 14-102, or the MAXLITE™ 20–40 Rear Air Suspension Service Manual, 14-104, for additional information.

Ride Height — MACK AI, AL II and MAXAIR™ 40/40A Air Suspensions

Air suspensions function best when the ride height is properly adjusted. Check ride height and adjust, if necessary, at each D inspection interval.

MACK AIR SUSPENSIONS

Air Suspension Control Switch

The air suspension control switch located on the dashboard is used to exhaust the air from the air suspension air bags when coupling and uncoupling a trailer, or when raising and lowering a dump body. The air bags must be reinflated before the vehicle is operated.

NOTE

On trucks equipped with a dump body, always exhaust the air from the air bags before raising the body to prevent damaging the bags and to improve chassis stability while dumping a load. Reinflate the air bags after lowering the dump body.

NOTE

Do NOT operate a vehicle with air exhausted from the air suspension air bags, as damage to the chassis driveline will result. Always reinflate the air bags after coupling or uncoupling a trailer, or after lowering a dump body.

Height Control Valve

At each D inspection interval, check functionality of the height control valve. Refer to the MACK AL and AL II Air Suspension Service and Repair Manual, 14-101, MAXAIR™ 40 (AL-405) Air Suspension Service and Repair Manual, 14-102, or the MAXLITE™ 20–40 Rear Air Suspension Service Manual, 14-104, for additional information.

Ride Height — MACK AI, AL II and MAXAIR™ 40/40A Air Suspensions

Air suspensions function best when the ride height is properly adjusted. Check ride height and adjust, if necessary, at each D inspection interval.

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NOTE

Driveline universal joint operating angles are affected by variations in ride height. Failure to maintain the proper ride height setting is likely to lead to driveline vibration, and subsequent drivetrain durability problems.

Ride height is measured from the bottom of the frame rail to the bottom of the main support member. For the AL, AL II and AL-401LH, this dimension must be 108 ± 3 mm (4.25 ± 0.125 inch) as shown in the following illustration.

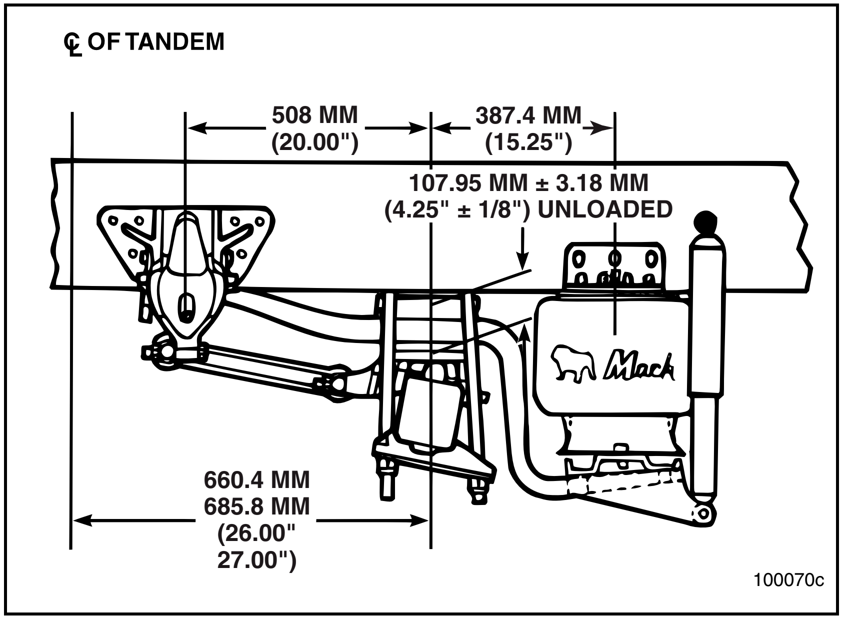

Figure 60 — AL, AL II and AL-401LH Ride Height Dimension

This dimension is the most important measurement when adjusting ride height. A gauge is available from Hendrickson Truck Suspension Systems to facilitate checking this dimension. The part number for this gauge is as follows:

- Hendrickson part No. 45745-050 — AL, Al II, AL-401LH

MACK AIR SUSPENSIONS

NOTE

Driveline universal joint operating angles are affected by variations in ride height. Failure to maintain the proper ride height setting is likely to lead to driveline vibration, and subsequent drivetrain durability problems.

Ride height is measured from the bottom of the frame rail to the bottom of the main support member. For the AL, AL II and AL-401LH, this dimension must be 108 ± 3 mm (4.25 ± 0.125 inch) as shown in the following illustration.

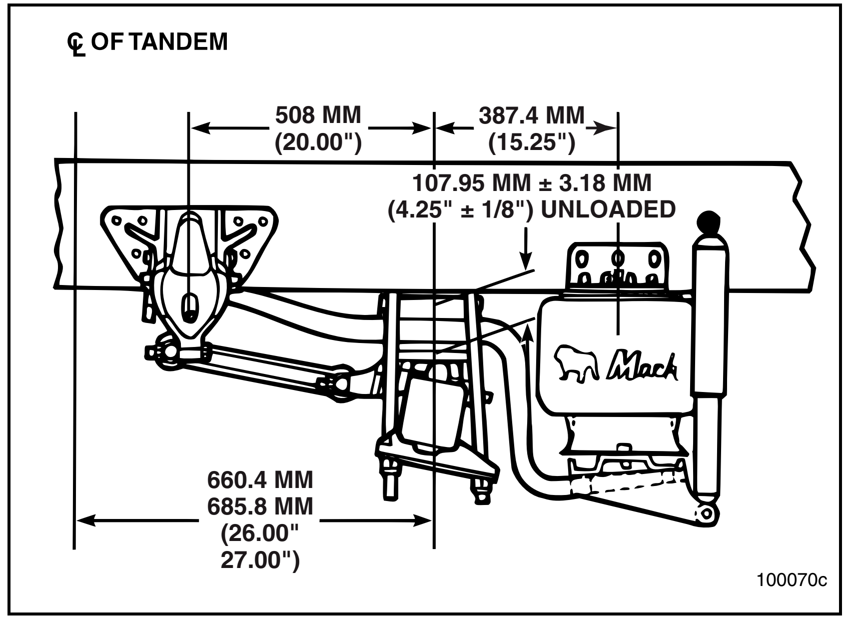

Figure 60 — AL, AL II and AL-401LH Ride Height Dimension

This dimension is the most important measurement when adjusting ride height. A gauge is available from Hendrickson Truck Suspension Systems to facilitate checking this dimension. The part number for this gauge is as follows:

- Hendrickson part No. 45745-050 — AL, Al II, AL-401LH

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Ride height dimensions for the MAXAIR™ 40 suspension depends on suspension version. To determine the suspension version, look for an “X” located on the spring clip (U-bolt) top cap.

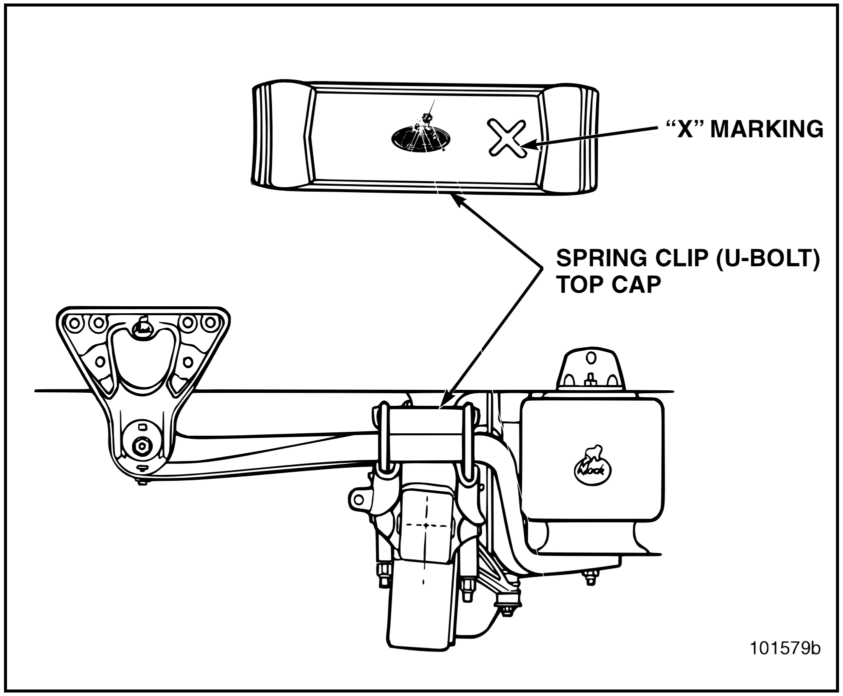

Figure 61 — MAXAIR™ 40 Spring Clip Top Cap “X” Marking

Ride height is measured from the bottom of the frame rail to the bottom of the main support member as shown in the illustration below. Depending on suspension version, the ride height dimension is as follows:

- If an “X” is present, ride height must be adjusted to 123.8 mm ± 3.2 mm (4-7/8″ ± 1/8″) (unloaded).
- If there is no “X” present, ride height must be adjusted to 133.4 mm ± 3.2 mm (5-1/4″ ± 1/8″) (unloaded).

MACK AIR SUSPENSIONS

Ride height dimensions for the MAXAIR™ 40 suspension depends on suspension version. To determine the suspension version, look for an “X” located on the spring clip (U-bolt) top cap.

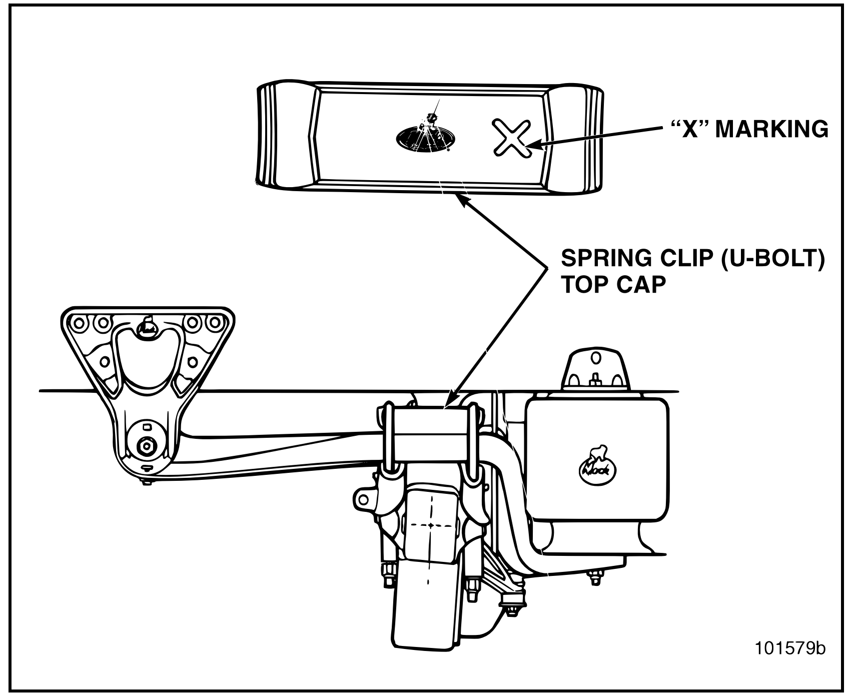

Figure 61 — MAXAIR™ 40 Spring Clip Top Cap “X” Marking

Ride height is measured from the bottom of the frame rail to the bottom of the main support member as shown in the illustration below. Depending on suspension version, the ride height dimension is as follows:

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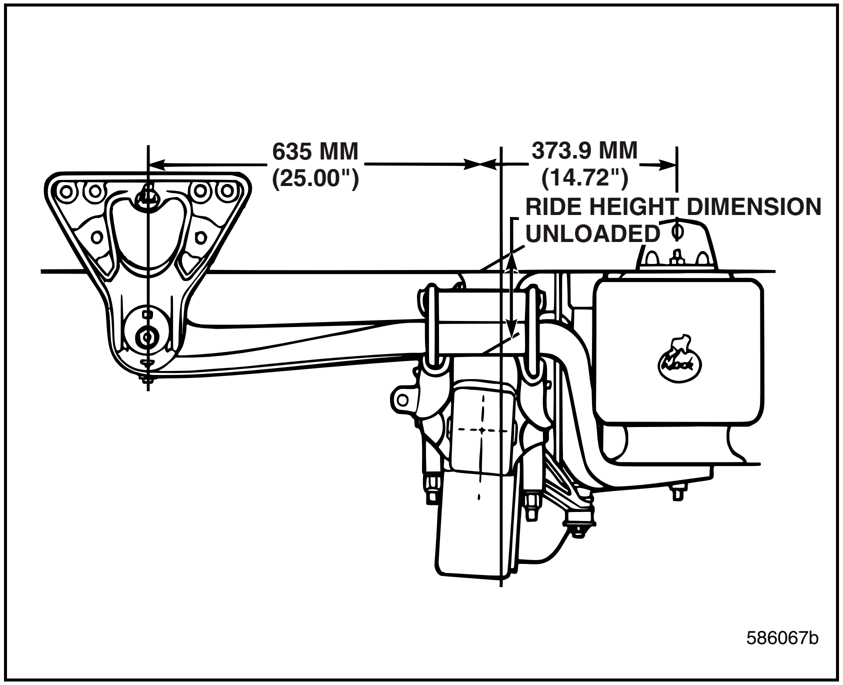

Figure 62 — MAXAIR™ 40 Ride Height Measurement

MACK AIR SUSPENSIONS

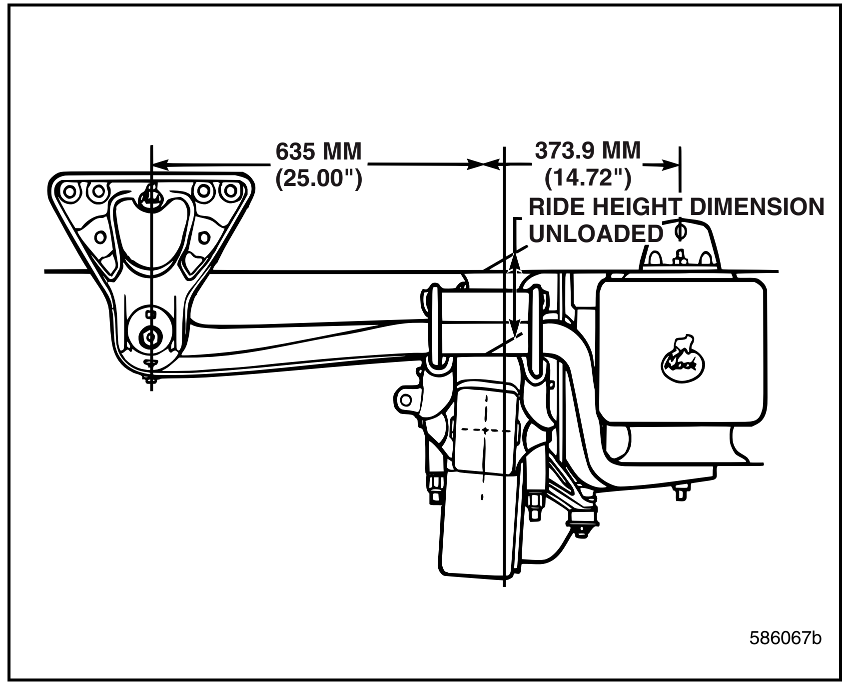

Figure 62 — MAXAIR™ 40 Ride Height Measurement

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⚠ CAUTION

It is critical to identify the suspension version to determine the ride height setting before making any ride height adjustments. Setting the ride height to the incorrect dimension could result in driveline damage, and such damage is not covered under warranty.

This dimension is the most important measurement when adjusting ride height. Gauges are available from Hendrickson Truck Suspension Systems to facilitate checking this dimension. Part numbers for these gauges are as follows:

- Hendrickson gauge part No. 45745-127 — MAXAIR™ 40/40A suspension on chassis manufactured prior to 3/1/01 with a ride height setting of 123.8 mm ± 3.2 mm (4-7/8″ ± 1/8″)
- Hendrickson gauge part No. 45745-164C — MAXAIR™ 40/40A suspension on chassis manufactured 3/19/01 and later (spring clip caps marked with an “X”) with a ride height setting of 123.8 mm ± 3.2 mm (4-7/8″ ± 1/8″)

MACK AIR SUSPENSIONS

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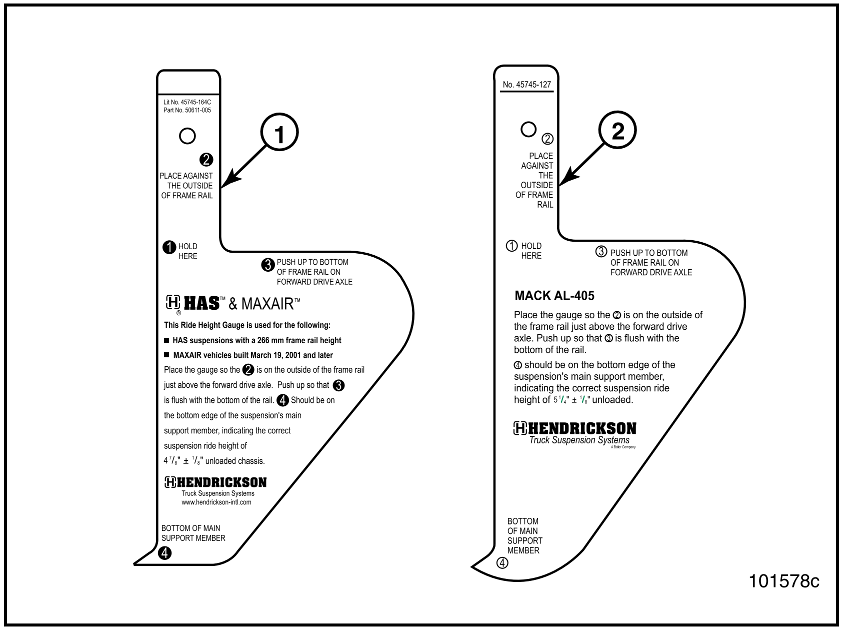

Figure 63 — MAXAIR™ 40 Ride Height Gauge 45745-164C and 45745-127

1. Gauge Part No. 45745-164C for Chassis Equipped with MaxAir™ 40 Suspension Manufactured 3/19/01 and Later (Spring Clip Caps Marked with “X”).	2. Gauge Part No. 45745-127 for Chassis Equipped with MaxAir™ 40 Suspension Manufactured Prior to 3/19/01.

MACK AIR SUSPENSIONS

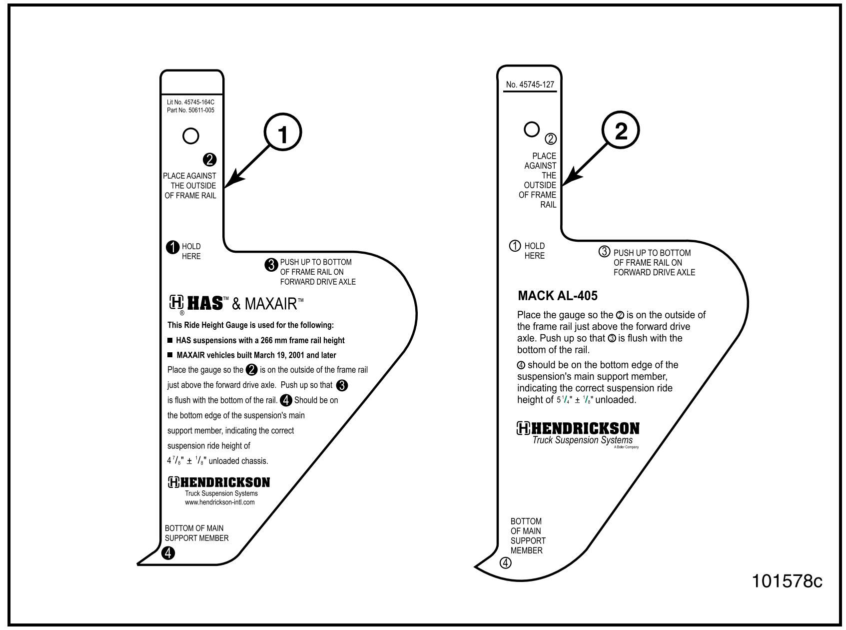

Figure 63 — MAXAIR™ 40 Ride Height Gauge 45745-164C and 45745-127

1. Gauge Part No. 45745-164C for Chassis Equipped with MaxAir™ 40 Suspension Manufactured 3/19/01 and Later (Spring Clip Caps Marked with “X”).	2. Gauge Part No. 45745-127 for Chassis Equipped with MaxAir™ 40 Suspension Manufactured Prior to 3/19/01.

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Ride height must be measured on the axle to which the height-control valve linkage is attached. In most applications, this is usually on the left-hand side of the vehicle, at the front-rear axle location. On tandem axle assemblies, frame slope may cause the ride height to vary from the specified dimension on the axle which does not have a height-control valve. Ride height should be set when the vehicle is unloaded and parked on a level surface. Prior to checking or setting ride height, drive the vehicle forward and backward a few feet several times, and bring the vehicle to a stop without using the brakes. Chock the wheels to prevent the vehicle from moving, and do not set the parking brakes. With the air system fully pressurized, use the air suspension control inside the cab to exhaust, then reinflate the air suspension. Wait until airflow to the suspension has stopped, then check ride height.

On MACK AL, AL II and MAXAIR™ 40/40A air suspensions, changes to ride height are made by adjusting the height-control valve linkage. The following different height-control valve and linkage configurations are used on MACK chassis:

- Height-control valve linkage with rubber rod ends
- Height-control valve linkage with threaded rod ends
- Height-control valve with adjustable arm

Ride height adjustment is different for each valve/linkage configuration. Adjustment procedures are outlined in the following text.

On chassis equipped with height-control valve linkage having rubber rod ends, loosen the hose clamp at the bottom rod end, then slide the rod end up or down on the linkage rod to achieve the specified ride height. Retighten the hose clamp when the adjustment is complete.

MACK AIR SUSPENSIONS

Ride height must be measured on the axle to which the height-control valve linkage is attached. In most applications, this is usually on the left-hand side of the vehicle, at the front-rear axle location. On tandem axle assemblies, frame slope may cause the ride height to vary from the specified dimension on the axle which does not have a height-control valve. Ride height should be set when the vehicle is unloaded and parked on a level surface. Prior to checking or setting ride height, drive the vehicle forward and backward a few feet several times, and bring the vehicle to a stop without using the brakes. Chock the wheels to prevent the vehicle from moving, and do not set the parking brakes. With the air system fully pressurized, use the air suspension control inside the cab to exhaust, then reinflate the air suspension. Wait until airflow to the suspension has stopped, then check ride height.

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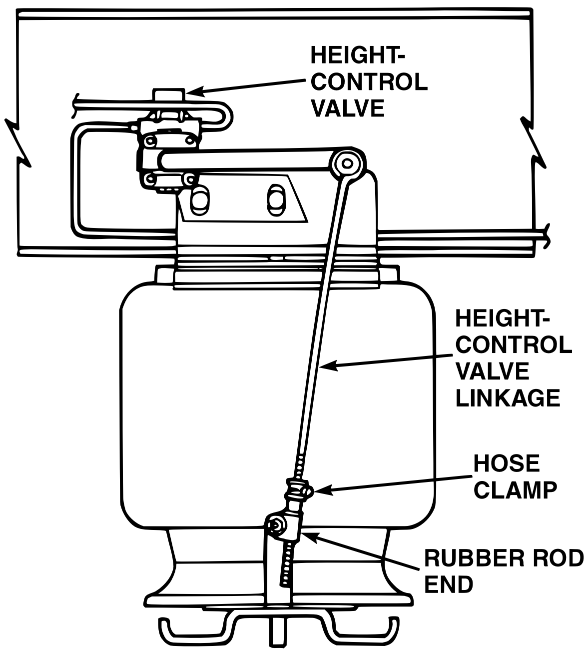

Figure 64 — Height-Control Valve Linkage with Rubber Rod Ends (Except AL-405)

MACK AIR SUSPENSIONS

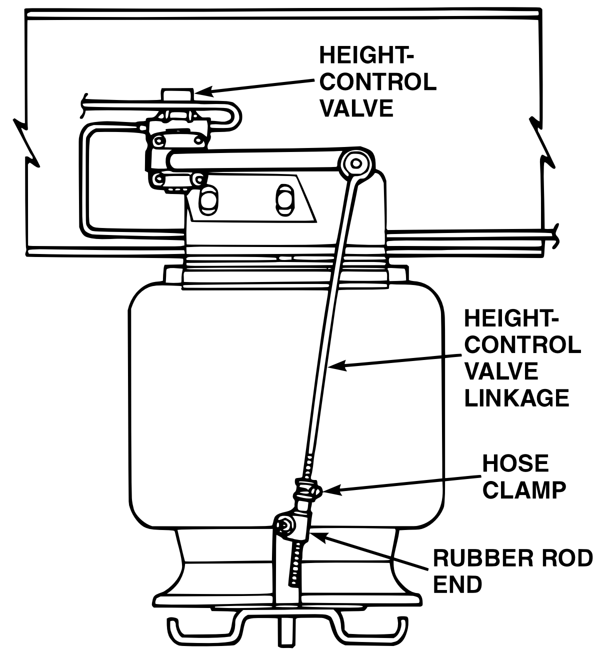

Figure 64 — Height-Control Valve Linkage with Rubber Rod Ends (Except AL-405)

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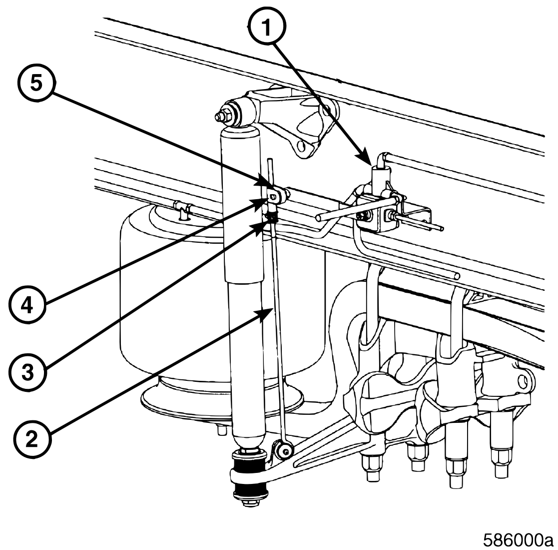

Figure 65 — Height-Control Valve with Rubber Rod Ends (AL-405)

1. Height-Control Valve 2. Linkage Rod 3. Clamp	4. Extension Arm Rubber Joint 5. Extension Arm Locknuts (11–17 N•m) [100–150 lb-in]

MACK AIR SUSPENSIONS

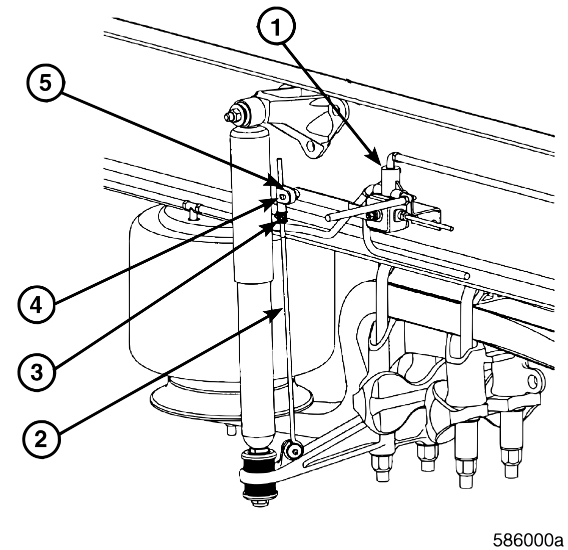

Figure 65 — Height-Control Valve with Rubber Rod Ends (AL-405)

1. Height-Control Valve 2. Linkage Rod 3. Clamp	4. Extension Arm Rubber Joint 5. Extension Arm Locknuts (11–17 N•m) [100–150 lb-in]

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On chassis equipped with a height-control valve linkage having threaded rod ends, disconnect the linkage from the bracket on the cross channel. Loosen the jam nut, then turn the rod end to achieve the specified ride height. Reattach the linkage to the bracket on the cross channel and torque all linkage fasteners (jam nut and attachment hardware) to 11–17 N•m (100–150 lb-in).

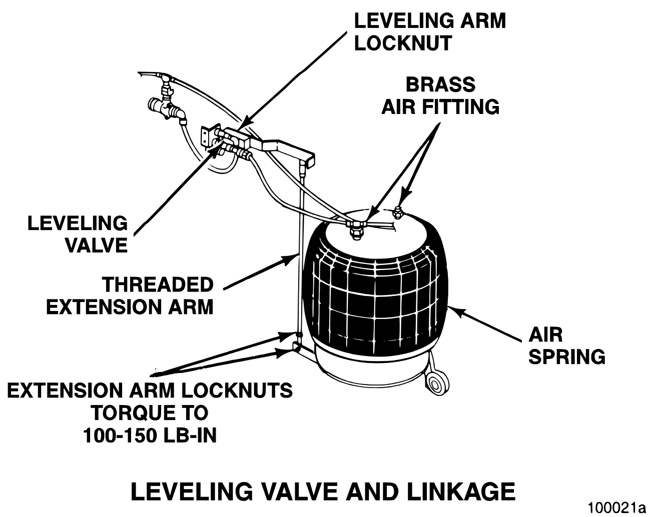

Figure 66 — Height-Control Valve and Linkage

MACK AIR SUSPENSIONS

On chassis equipped with a height-control valve linkage having threaded rod ends, disconnect the linkage from the bracket on the cross channel. Loosen the jam nut, then turn the rod end to achieve the specified ride height. Reattach the linkage to the bracket on the cross channel and torque all linkage fasteners (jam nut and attachment hardware) to 11–17 N•m (100–150 lb-in).

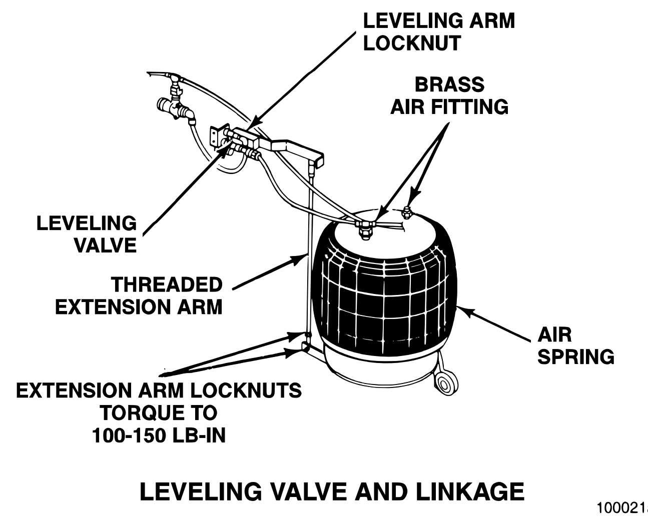

Figure 66 — Height-Control Valve and Linkage

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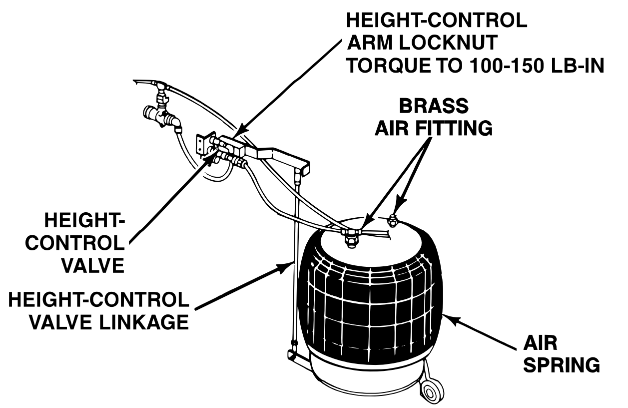
On chassis equipped with a height-control valve that has an adjustable arm, the valve has a stud that passes through an elongated hole in the arm. The arm is secured with a locknut. To adjust ride height on these chassis, loosen the control arm locknut and reposition the arm to achieve the specified ride height. Retorque the arm locknut to 11–17 N•m (100–150 lb-in).



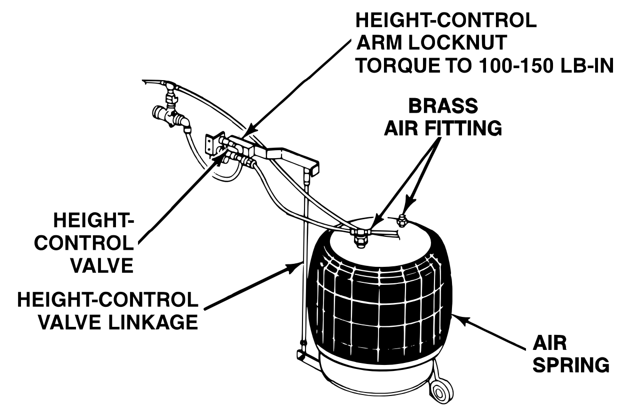
HEIGHT-CONTROL VALVE WITH ADJUSTABLE ARM

100550a

Figure 67 — Height-Control Valve with Adjustable Arm

MACK AIR SUSPENSIONS

On chassis equipped with a height-control valve that has an adjustable arm, the valve has a stud that passes through an elongated hole in the arm. The arm is secured with a locknut. To adjust ride height on these chassis, loosen the control arm locknut and reposition the arm to achieve the specified ride height. Retorque the arm locknut to 11–17 N•m (100–150 lb-in).



HEIGHT-CONTROL VALVE WITH ADJUSTABLE ARM

100550a

Figure 67 — Height-Control Valve with Adjustable Arm

201

In addition to the adjustable height-control valve linkages, the height-control valve on most chassis is adjustable by moving the entire valve assembly so that ride height can be fine-tuned. On these chassis, one hole in the valve mounting bracket is elongated to allow for adjustment. To fine-tune ride height, loosen the locknuts on the valve mounting studs slightly, then rotate the entire valve assembly to achieve the specified ride height. Retorque the valve mounting locknuts to 6–11 N•m (50–100 lb-in).

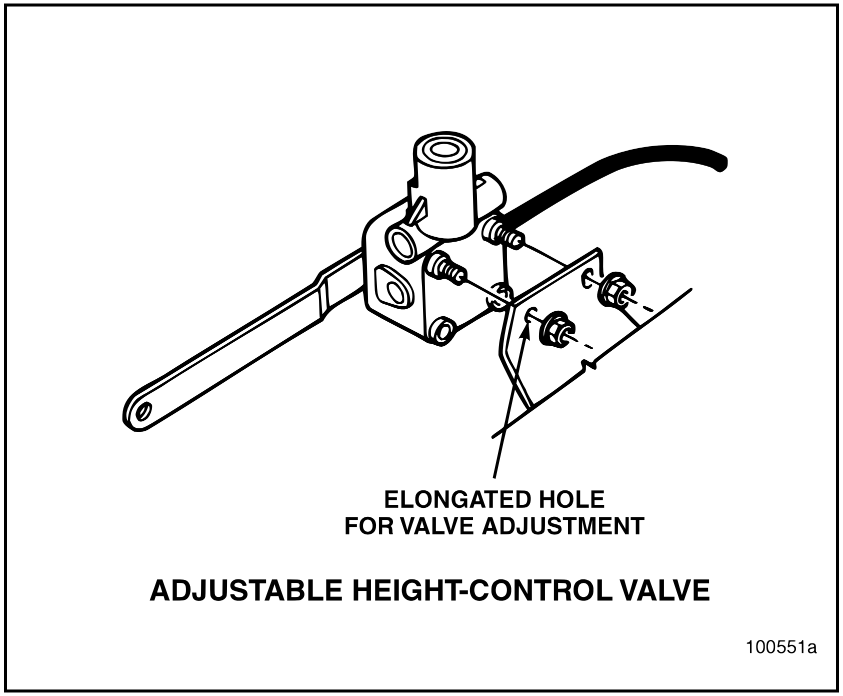


Figure 68 — Adjustable Height-Control Valve

After ride height adjustments are complete, exhaust and reinflate the suspension. Wait until airflow to the suspension has stopped, then recheck the ride height.

MACK AIR SUSPENSIONS

In addition to the adjustable height-control valve linkages, the height-control valve on most chassis is adjustable by moving the entire valve assembly so that ride height can be fine-tuned. On these chassis, one hole in the valve mounting bracket is elongated to allow for adjustment. To fine-tune ride height, loosen the locknuts on the valve mounting studs slightly, then rotate the entire valve assembly to achieve the specified ride height. Retorque the valve mounting locknuts to 6–11 N•m (50–100 lb-in).

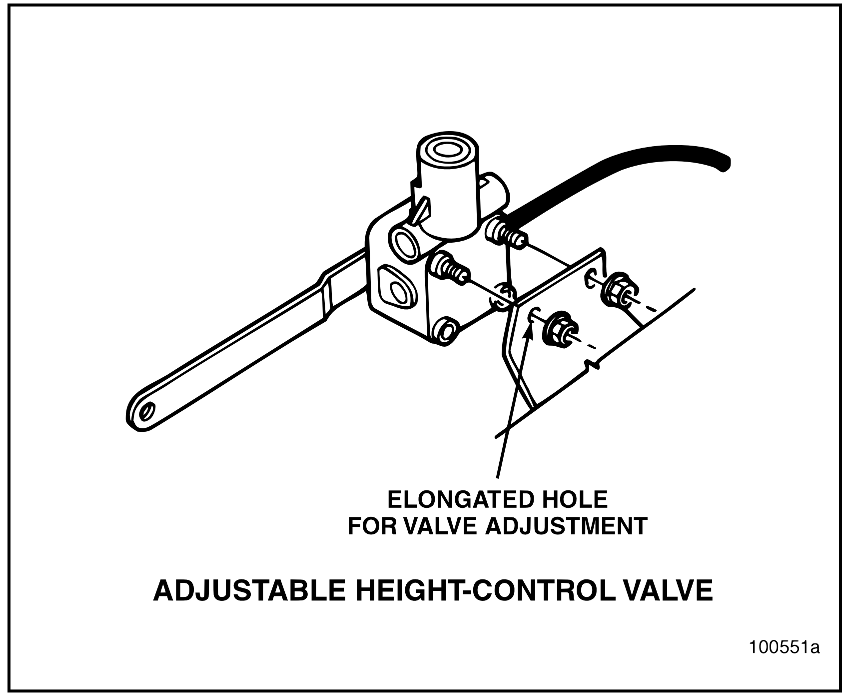


Figure 68 — Adjustable Height-Control Valve

After ride height adjustments are complete, exhaust and reinflate the suspension. Wait until airflow to the suspension has stopped, then recheck the ride height.

202

Ride Height — MaxLite™ 20–40 and 20–40 EZ Air Suspensions

Air suspensions function best when the ride height is properly adjusted. Check ride height and adjust, if necessary, at each D inspection interval.

NOTE

Driveline universal joint operating angles are affected by variations in ride height. Failure to maintain the proper ride height setting is likely to lead to driveline vibration and subsequent drivetrain durability problems.

On the MaxLite™ 20–40 and 20–40 EZ air suspensions, ride height is set to 216 mm (8.5 inches). This dimension is measured from the top of the left-hand axle stop to the top center of the axle housing on the front-rear axle using ride height gauge part No. TS89604.

MACK AIR SUSPENSIONS

Ride Height — MaxLite™ 20–40 and 20–40 EZ Air Suspensions

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203

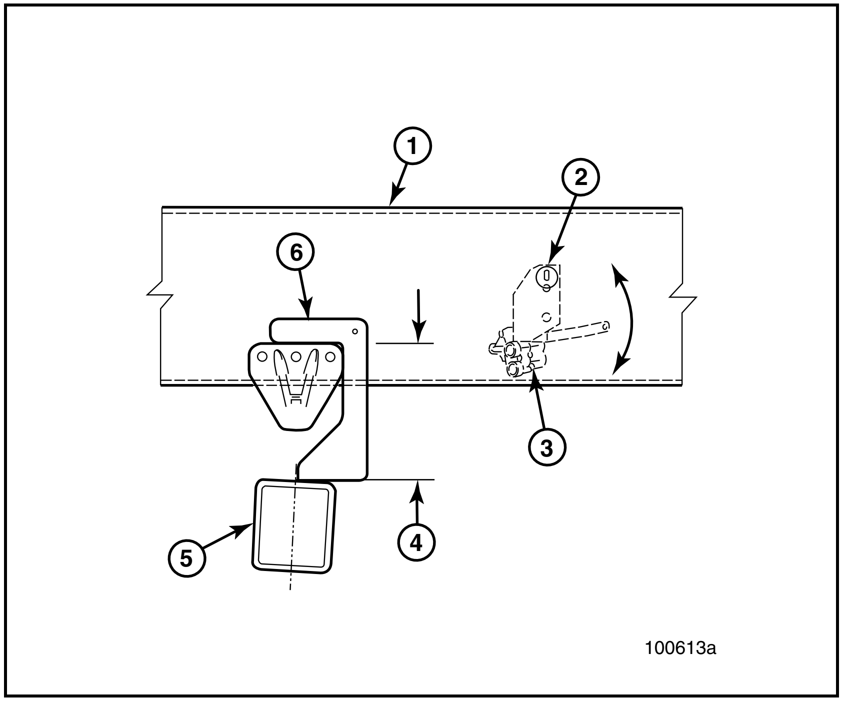

Figure 69 — Ride Height Measurement

1. LH Frame Rail	4. Ride Height Dimension
2. Adjustment Access Hole	5. Axle Housing
3. Height Control Valve	6. Ride Height Gauge (TS89604)

MACK AIR SUSPENSIONS

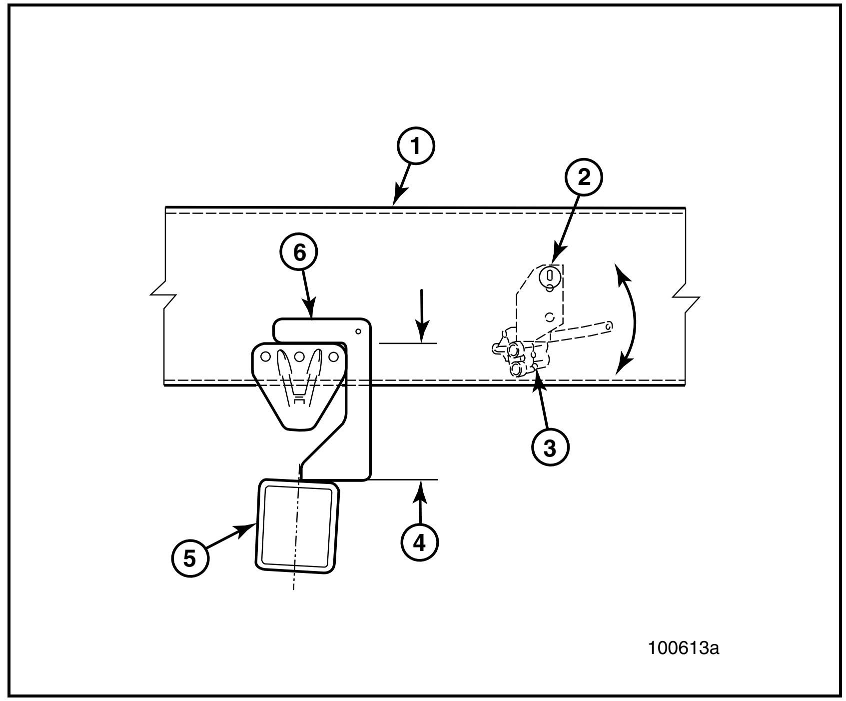

Figure 69 — Ride Height Measurement

1. LH Frame Rail	4. Ride Height Dimension
2. Adjustment Access Hole	5. Axle Housing
3. Height Control Valve	6. Ride Height Gauge (TS89604)

204

Ride height must be checked and adjusted when the vehicle is uploaded and parked on a level surface. Prior to checking or adjusting ride height, perform the following:

- Be sure the front steer axle and rear drive axle tires are properly inflated.
- Center the suspension by driving the vehicle back and forth twice without using the service brakes to bring the vehicle to a stop.
- Do not apply the parking brakes.
- Place blocks under the front wheels to prevent the vehicle from moving.
- Make sure the front wheels are pointing straight ahead.
- Make sure the transmission is in neutral.

Measure ride height as follows:

1. Completely exhaust the air pressure from the suspension.

⚠ DANGER

Stay clear of the chassis when air pressure from the suspension is being exhausted. The chassis can drop quickly, which can cause serious injury or death to anyone underneath the vehicle.

2. Start the engine and use the suspension switch in the cab to inflate the suspension.
3. Shut the engine off, then use the ride height gauge (part No. TS89604) to measure ride height. Ride height should be 216 mm (8.5 inches) as indicated by the gauge.

MACK AIR SUSPENSIONS

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3. Shut the engine off, then use the ride height gauge (part No. TS89604) to measure ride height. Ride height should be 216 mm (8.5 inches) as indicated by the gauge.

205

If ride height is not within specifications, adjust as follows:

NOTE

Ride height must be adjusted with the vehicle unloaded, parked on a level surface, transmission in neutral and the front wheels blocked to prevent the vehicle from moving.

1. Loosen the height control valve bracket mounting bolt so that the bracket is free to pivot about the bolt.
2. Insert the adjustment socket (tool No. J 44544) through the access hole located in the frame.

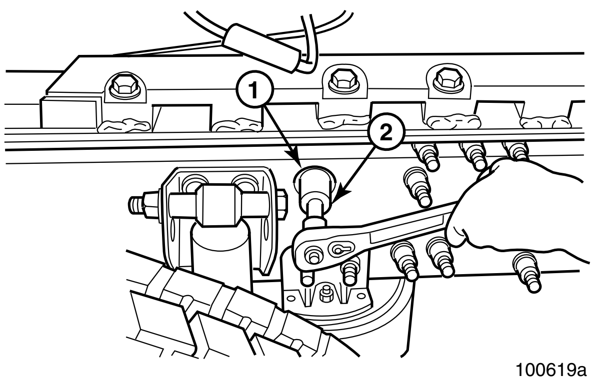

Figure 70 — Adjusting Ride Height

1. Access Hole (LH Frame Rail)	2. Adjustment Socket J 44544

MACK AIR SUSPENSIONS

If ride height is not within specifications, adjust as follows:

NOTE

Ride height must be adjusted with the vehicle unloaded, parked on a level surface, transmission in neutral and the front wheels blocked to prevent the vehicle from moving.

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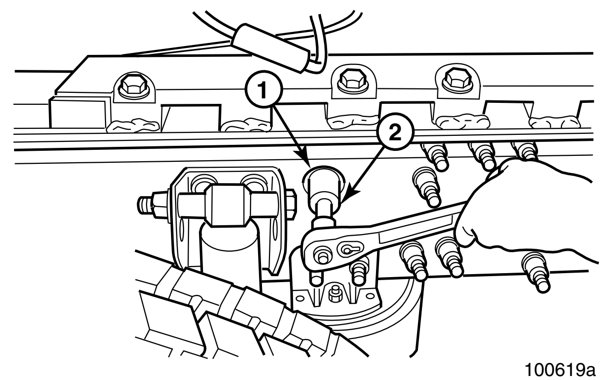

Figure 70 — Adjusting Ride Height

1. Access Hole (LH Frame Rail) | 2. Adjustment Socket J 44544

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3. Adjust ride height by rotating the valve and bracket as follows:
   - Rotate clockwise to raise ride height.
   - Rotate counterclockwise to lower ride height.
4. Once proper ride height is obtained, tighten the height control valve mounting bracket bolt to 50 N•m (37 lb-ft).
5. Remove the adjustment socket from the frame, and then exhaust and reinflate the suspension. Wait until airflow to the suspension has stopped, then recheck ride height. Readjust as necessary.

MACK AIR SUSPENSIONS

3. Adjust ride height by rotating the valve and bracket as follows:
   - Rotate clockwise to raise ride height.
   - Rotate counterclockwise to lower ride height.
4. Once proper ride height is obtained, tighten the height control valve mounting bracket bolt to 50 N•m (37 lb-ft).
5. Remove the adjustment socket from the frame, and then exhaust and reinflate the suspension. Wait until airflow to the suspension has stopped, then recheck ride height. Readjust as necessary.

207

AXLE ALIGNMENT

NOTE

For vehicles equipped with the MACK RSA (Road Stability Advantage) program (Bendix® ABS-6 Advanced with ESP® [Electronic Stability Program]), any adjustments to vehicle alignment requires recalibration of the steering angle sensor. For information, refer to the Bendix® Service Data Sheet (SD-13-4869). This data sheet can be obtained by visiting the Bendix® website at *www.bendix.com*.

NOTE

Jack up the front end and shake the wheels horizontally. Wheel bearing end play must be within 0.025 to 0.13 mm (0.001 to 0.005 inch). Check all steering linkage components for excessive looseness. These steps must be taken so as not to introduce errors into geometry readings when checking toe-in, camber and caster. Also check for proper tire pressure.

Check axle alignment at first A inspection interval, thereafter at each C and D inspection for front axles and each D inspection for rear axles.

AXLE ALIGNMENT

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Check axle alignment at first A inspection interval, thereafter at each C and D inspection for front axles and each D inspection for rear axles.

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TOE-IN SPECIFICATIONS*

MACK non-driving front axles: FAW 12, 14.3, FA(W) 18, 20, FA23 and FXL 12, 14.6, 18, 20, 23	1/16″ ± 1/32″ (.06″ ± .03″) or 0°4’ ± .0°2’ (0°2’ to 0°6’) or .07° ± .035° (.035° to .11°) or 1.5 mm/m ± .75 mm/m
ArvinMeritor™, Eaton/Dana non-driving front axles	1/16″ ± 1/32″ (.06″ ± .03″) or 0°4′ ± 0°2’ (0°2′ to 0°6′) or .07° ± .035° (.035° to .11°) or 1.5 mm/m ± .75 mm/m
ArvinMeritor™ and Marmon-Herrington front driving axles	1/16″ ± 1/16″ (.06″ ± .06″) or 0°4′ ± 0°4′ (0° to 0°8′) or .07° ± .07° (0° to .14°) or 1.5 mm/m ± 1.5 mm/m
AIRTEK® 12.5K, 13.2K and 14.6K non-driving front axle with air suspension	1/16″ +0″/ -1/16″ (.06″ +0″/ -.06″) or 0°4′ +0°/ -0°4’ (0°4’ to 0°0’) or .07° +0°/ -.07° or 1.5 mm/m +0 mm/m -1.5 mm/m

* Set toe toward zero side of specification on vehicles equipped with steel belted radial tires or vehicles with lightly loaded front axles.

TOE-OUT SPECIFICATIONS*

Note: Toe-out * FABCO Front Driving Axles (SDA1800, 2100, 2300)	1/16″ ± 1/16″ (.06″ ± .06″) or 0°4′ ± 0°4′ (0° to 0°8′) or .07° ± .07° (0° to .14°) or 1.5 mm/m ± 1.5 mm/m

* HUNTER and JOSAM alignment equipment measurements indicating toe-out will be expressed as a negative number, i.e., –.07° for HUNTER, –1.5 mm/m for JOSAM.

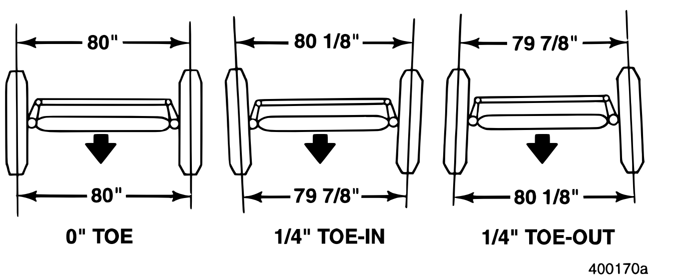

Figure 71 — Toe Measurements

AXLE ALIGNMENT

TOE-IN SPECIFICATIONS*

MACK non-driving front axles: FAW 12, 14.3, FA(W) 18, 20, FA23 and FXL 12, 14.6, 18, 20, 23 | 1/16″ ± 1/32″ (.06″ ± .03″) or 0°4’ ± .0°2’ (0°2’ to 0°6’) or .07° ± .035° (.035° to .11°) or 1.5 mm/m ± .75 mm/m
ArvinMeritor™, Eaton/Dana non-driving front axles | 1/16″ ± 1/32″ (.06″ ± .03″) or 0°4′ ± 0°2’ (0°2′ to 0°6′) or .07° ± .035° (.035° to .11°) or 1.5 mm/m ± .75 mm/m
ArvinMeritor™ and Marmon-Herrington front driving axles | 1/16″ ± 1/16″ (.06″ ± .06″) or 0°4′ ± 0°4′ (0° to 0°8′) or .07° ± .07° (0° to .14°) or 1.5 mm/m ± 1.5 mm/m
AIRTEK® 12.5K, 13.2K and 14.6K non-driving front axle with air suspension | 1/16″ +0″/ -1/16″ (.06″ +0″/ -.06″) or 0°4′ +0°/ -0°4’ (0°4’ to 0°0’) or .07° +0°/ -.07° or 1.5 mm/m +0 mm/m -1.5 mm/m

* Set toe toward zero side of specification on vehicles equipped with steel belted radial tires or vehicles with lightly loaded front axles.

TOE-OUT SPECIFICATIONS*

Note: Toe-out * FABCO Front Driving Axles (SDA1800, 2100, 2300) | 1/16″ ± 1/16″ (.06″ ± .06″) or 0°4′ ± 0°4′ (0° to 0°8′) or .07° ± .07° (0° to .14°) or 1.5 mm/m ± 1.5 mm/m

* HUNTER and JOSAM alignment equipment measurements indicating toe-out will be expressed as a negative number, i.e., –.07° for HUNTER, –1.5 mm/m for JOSAM.

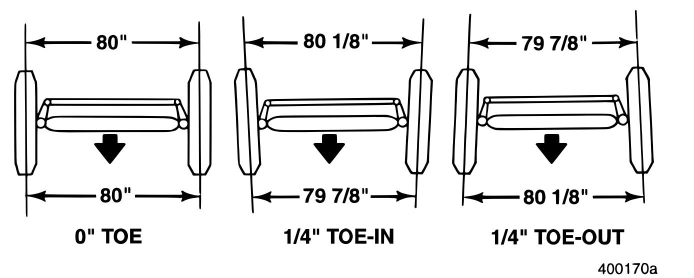

Figure 71 — Toe Measurements

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CAMBER SPECIFICATIONS

MACK non-driving front axles:	
FAW 12, 14.3	0° ± 7/16° (0° ± .43°)
FA(W) 18, 20	1/4° ± 7/16° (.25° ± .43°)
FA23	3/4° ± 7/16° (.75° ± .43°)
FXL 12, 14.6, 18, 20, 23	1/4° ± 7/16° (.25° ± .43°)
AIRTEK® 12.5, 13.2 and 14.6 Front Axles:	
Left side camber	0° ± 1/2° (0° ± .5°)
Right side camber	0° ± 1/2° (0° ± .5°)
Cross Camber	0° to maximum 1°
Dana non-driving front axles:	
E-1202I	
Left side camber	1/8° ± 7/16° (.13° ± .43°)
Right side camber	–1/8° ± 7/16° (–.13° ± .43°)
ArvinMeritor™ non-driving front axles	–0°41′ to 0°11′ –.69° to .19° –11/16° to 3/16°
Driving front axles:	
ArvinMeritor™	0° to 1/2° (0° to .5°)
FABCO (SDA1800, 2100, 2300)	1/4° to 3/4° (.25° to .75°)
Marmon-Herrington (MT23)	13/32° to 39/64° (.4° to .6°)

All measurements must be taken with the vehicle in the unloaded condition.

Specifications for vehicles built prior to 1993 may be different. See previously published information, or alignment equipment manufacturer’s charts for specifications on older vehicles.

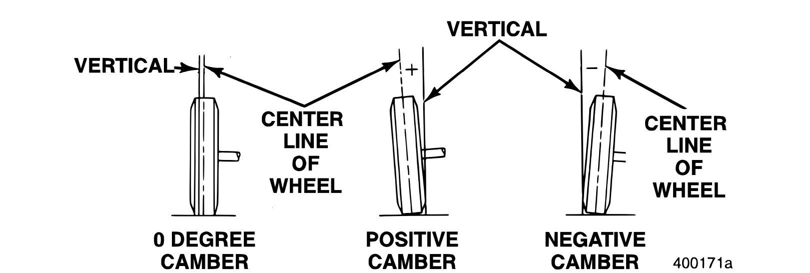

Figure 72 — Camber Angles

AXLE ALIGNMENT

CAMBER SPECIFICATIONS

MACK non-driving front axles: | FAW 12, 14.3 | 0° ± 7/16° (0° ± .43°) | FA(W) 18, 20 | 1/4° ± 7/16° (.25° ± .43°) | FA23 | 3/4° ± 7/16° (.75° ± .43°) | FXL 12, 14.6, 18, 20, 23 | 1/4° ± 7/16° (.25° ± .43°) | AIRTEK® 12.5, 13.2 and 14.6 Front Axles: | Left side camber | 0° ± 1/2° (0° ± .5°) | Right side camber | 0° ± 1/2° (0° ± .5°) | Cross Camber | 0° to maximum 1° | Dana non-driving front axles: | E-1202I | Left side camber | 1/8° ± 7/16° (.13° ± .43°) | Right side camber | –1/8° ± 7/16° (–.13° ± .43°) | ArvinMeritor™ non-driving front axles | –0°41′ to 0°11′ | –.69° to .19° | –11/16° to 3/16° | Driving front axles: | ArvinMeritor™ | 0° to 1/2° (0° to .5°) | FABCO (SDA1800, 2100, 2300) | 1/4° to 3/4° (.25° to .75°) | Marmon-Herrington (MT23) | 13/32° to 39/64° (.4° to .6°)

All measurements must be taken with the vehicle in the unloaded condition.

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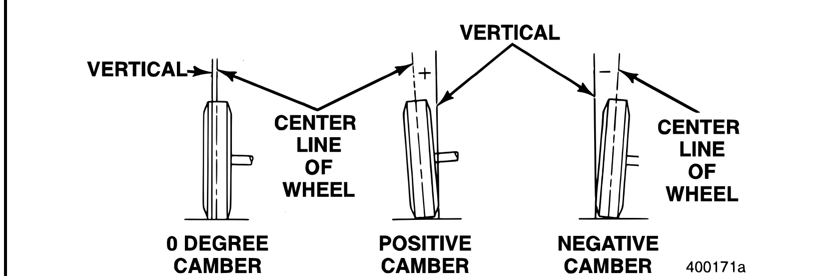

Figure 72 — Camber Angles

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CASTER SPECIFICATIONS

Single non-driving front axle:	
MRU, LEU	4° to 6°
CXU, CHU, GU7, GU8	3° to 5°
Single front driving axle:	
All (except Marmon-Herrington (MT23))	3°30′ to 5°30′ (3.5° to 5.5°)
Marmon-Herrington (MT23)	2°30′ to 4°30′ (2.5° to 4.5°)
Two front axles:	
Front drive axle	3°30′ to 5°30′ (3.5° to 5.5°)
Front non-driving front axle	4° to 6°
Rear non-driving front axle	4°30′ to 6°30′ (4.5° to 6.5°)
AIRTEK® 12, 13.2, 14.6	
Left Side	3.75° +1°/–0.5°
Right Side	3.75° +1°/–0.5°
Cross Caster	0° to maximum 1.5°

All measurements must be taken with the vehicle in the unloaded condition, and the steering axle and drive axle(s) on a level surface.

RH and LH caster readings must not vary more than 0°30′ (.5°).

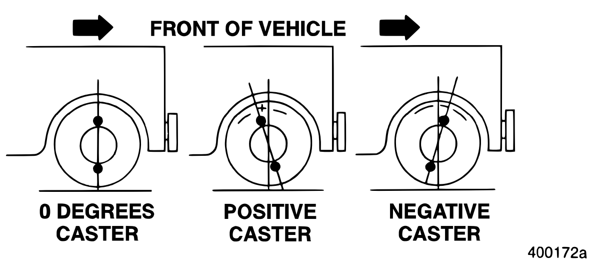

Figure 73 — Caster Angles

AXLE ALIGNMENT

CASTER SPECIFICATIONS

Single non-driving front axle:	
MRU, LEU	4° to 6°
CXU, CHU, GU7, GU8	3° to 5°
Single front driving axle:	
All (except Marmon-Herrington (MT23))	3°30′ to 5°30′ (3.5° to 5.5°)
Marmon-Herrington (MT23)	2°30′ to 4°30′ (2.5° to 4.5°)
Two front axles:	
Front drive axle	3°30′ to 5°30′ (3.5° to 5.5°)
Front non-driving front axle	4° to 6°
Rear non-driving front axle	4°30′ to 6°30′ (4.5° to 6.5°)
AIRTEK® 12, 13.2, 14.6	
Left Side	3.75° +1°/–0.5°
Right Side	3.75° +1°/–0.5°
Cross Caster	0° to maximum 1.5°

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RH and LH caster readings must not vary more than 0°30′ (.5°).

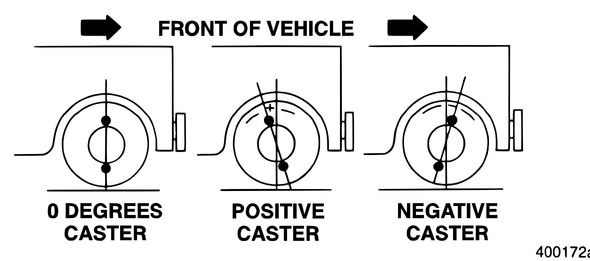

Figure 73 — Caster Angles

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Rear Drive Axle Alignment Specifications

THRUST

Adjustable Suspensions	0″ ± 1/8″ (0″ ± .125″) 0° ± .08° 0 mm/m ± 1.4 mm/m
Non-adjustable	0″ ± 1/4″ (0″ ± .25″) 0° ± .16° 0 mm/m ± 2.8 mm/m

Specifications are for Thrust Angles on Rear Drive Axles

SCRUB (Parallelism)

Adjustable Suspensions	0° ± 1/8″ (0″ ± .125″) 0° ± .08° 0 mm/m ± 1.4 mm/m
Non-adjustable Suspensions	0″ ± 1/4″ (0″ ± .25″) 0° ± .16° 0 mm/m ± 2.8 mm/m

Specifications are for Scrub (Parallelism) on Rear Drive Axles

AXLE ALIGNMENT

Rear Drive Axle Alignment Specifications

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Adjustable Suspensions — 0″ ± 1/8″ (0″ ± .125″) 0° ± .08° 0 mm/m ± 1.4 mm/m
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Non-adjustable Suspensions — 0″ ± 1/4″ (0″ ± .25″) 0° ± .16° 0 mm/m ± 2.8 mm/m

Specifications are for Scrub (Parallelism) on Rear Drive Axles

212

AUXILIARY AXLES

At each A, B, C and D inspection interval, check pivot bolt torque on both steerable and non-steerable liftable axles. Torque specification is 610 N•m (450 lb-ft).

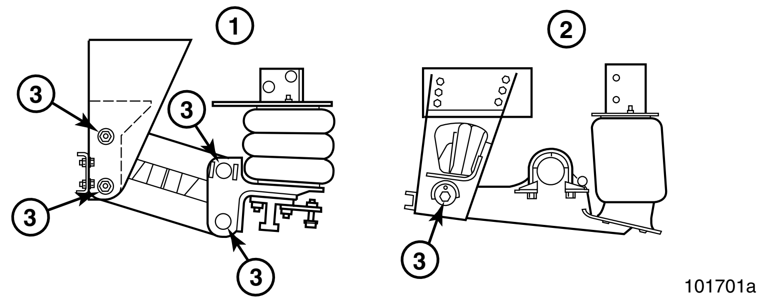

Figure 74 — Liftable Axle Pivot Bolts

1. Steerable Axle 2. Non-steerable Axle	3. Pivot Bolts

On steerable auxiliary axles, check the king pins and bushings for wear at each C and D inspection interval. Procedures are as follows:

1. Fully raise the axle and support the axle beam at the outer ends to eliminate any rocking motion.
2. Have an assistant fully apply the service brakes. This will eliminate any motion of the wheel assembly relative to the steering knuckle.
3. Position the tip of a dial indicator on the sidewall of the tire at a location 444.5 mm (17-1/2″) below the centerline of the hub.
4. Zero the dial indicator, and then rock the tire in and out at the top while noting the reading on the dial indicator.
5. Readings greater than 3.175 mm (0.125 in.) indicate king pin bushing wear. Replace king pins and bushings as required.

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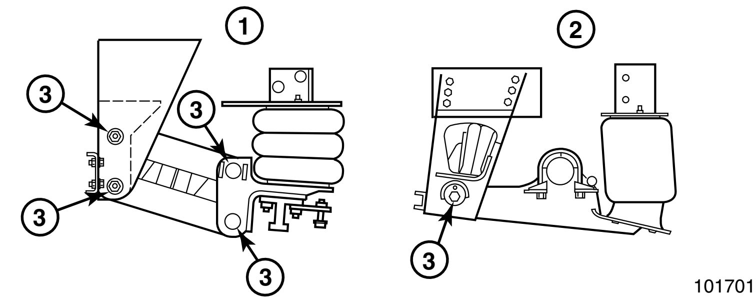

Figure 74 — Liftable Axle Pivot Bolts

1. Steerable Axle
2. Non-steerable Axle
3. Pivot Bolts

On steerable auxiliary axles, check the king pins and bushings for wear at each C and D inspection interval. Procedures are as follows:

1. Fully raise the axle and support the axle beam at the outer ends to eliminate any rocking motion.
2. Have an assistant fully apply the service brakes. This will eliminate any motion of the wheel assembly relative to the steering knuckle.
3. Position the tip of a dial indicator on the sidewall of the tire at a location 444.5 mm (17-1/2″) below the centerline of the hub.
4. Zero the dial indicator, and then rock the tire in and out at the top while noting the reading on the dial indicator.
5. Readings greater than 3.175 mm (0.125 in.) indicate king pin bushing wear. Replace king pins and bushings as required.

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At each D inspection interval, check the torque of the following fasteners:

Fastener Description	mm (Inch) Fastener Size	Torque Specification N•m (lb-ft)
Suspension Air Bag (bottom)	8.5 (3/8)	34 (25)
Suspension Air Bag (top)	12.7 (1/2)	34 (25)
Suspension Air Bag (top)	19 (3/4)	61 (45)
Tie Rod Clamp Bolt	12.7 (1/2)	68 (50)

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Suspension Air Bag (top)	19 (3/4)	61 (45)
Tie Rod Clamp Bolt	12.7 (1/2)	68 (50)

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WHEEL TORQUE PROCEDURES

Spoke Wheels

Tighten the wheel nuts in the sequence shown below. When replacing tire and rim assemblies, tighten lightly the first time and hold runout to under 3.2 mm (1/8 inch). Tighten nuts a quarter turn at a time, in sequence, to the torques listed below and recheck.

It is recommended that final nut tightening be done with a torque wrench. If an air impact wrench is used, periodic checks should be made with a torque wrench to ensure the accuracy and condition of the air wrench. The torque of the air impact wrench also depends upon the air line pressure from which it is operated.

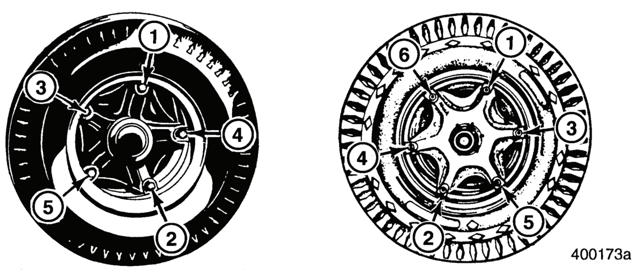

Figure 75 — Spoke Wheel Nut Tightening Sequence

WHEEL TORQUE PROCEDURES

WHEEL TORQUE PROCEDURES

Spoke Wheels

Tighten the wheel nuts in the sequence shown below. When replacing tire and rim assemblies, tighten lightly the first time and hold runout to under 3.2 mm (1/8 inch). Tighten nuts a quarter turn at a time, in sequence, to the torques listed below and recheck.

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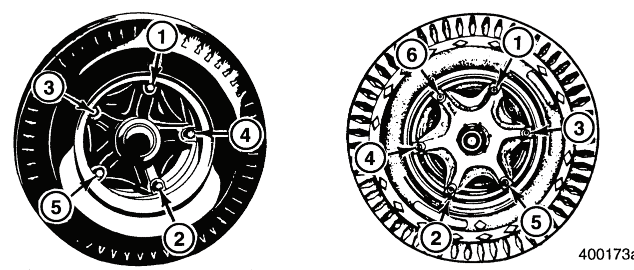

Figure 75 — Spoke Wheel Nut Tightening Sequence

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SPOKE WHEEL TORQUE SPECIFICATIONS

Description	Stud Nut Size	Torque N•m (Lb-ft)*
Front Wheel Clamp Stud Nuts	5/8″-11 UNC	165–183 (122–135)
Front Wheel Clamp Stud Nuts (except FA18 and FA20 Series Axles)	3/4″-10 UNC	237–305 (175–225)
Front Wheel Clamp Stud Nuts (FA[W]18 and FA[W]20 Series Axles)	3/4″-10 UNC	325–353 (240–260)
Rear Wheel Clamp Stud Nuts	3/4″-10 UNC	237–305 (175–225)

* Threads must be dry.

See following note.

NOTE

Before installation of the wheel assemblies, thoroughly clean the brake drum, hub and rim assembly surfaces (particularly in the case of hub piloted wheels). After any procedure that requires the removal and reinstallation of the wheel assemblies, retorque the wheel nuts during the first 80–161 km (50–100 miles) of use.

WHEEL TORQUE PROCEDURES

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216

Disc Wheels (Stud Piloted Ball Seat)

Single Disc Wheels (Stud Piloted Ball Seat) — Tighten the wheel nuts in the sequence shown below to the specified torque value given in table on page 222.

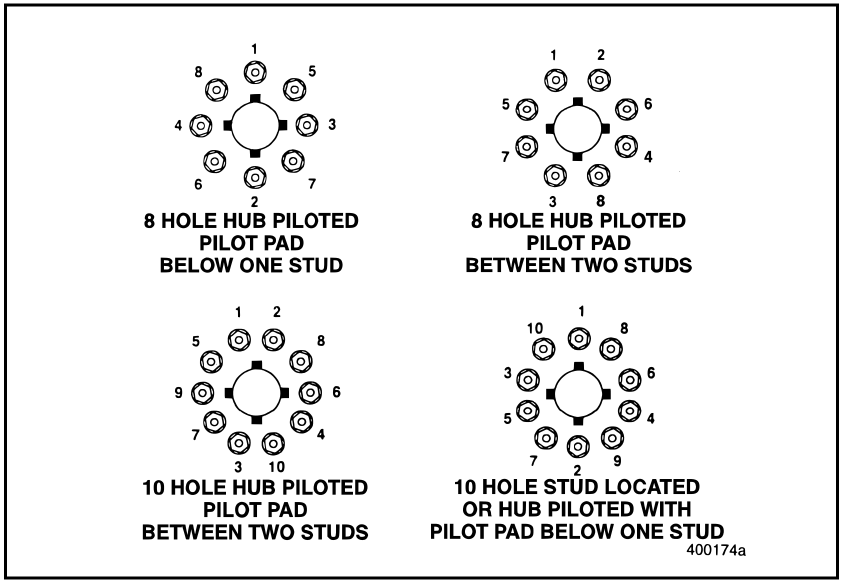

Figure 76 — Disc Wheels with Stud Piloted Ball Seat Tightening Sequence

Dual Disc Wheels (Stud Piloted Ball Seat) — Loosen outer wheel nuts first, then tighten the inner nuts in sequence shown (Figure 76) to the specified torque value given in table on page 222. After inner nuts are tightened, tighten outer wheel nuts, in sequence, to the specified torque value.

When installing wheels, tighten wheel nuts lightly first, then tighten a quarter turn at a time, in sequence, to the specified torque and recheck. When installing dual wheels, install the inner wheel first. Use the above procedure to tighten the inner wheel nuts. After the inner wheels have been installed, use the same procedure to install the outer wheels.

WHEEL TORQUE PROCEDURES

Disc Wheels (Stud Piloted Ball Seat)

Single Disc Wheels (Stud Piloted Ball Seat) — Tighten the wheel nuts in the sequence shown below to the specified torque value given in table on page 222.

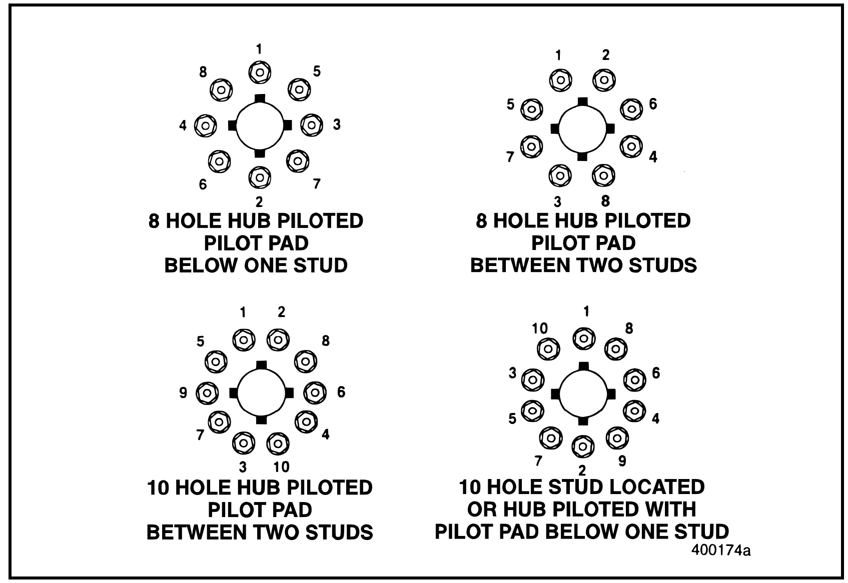

Figure 76 — Disc Wheels with Stud Piloted Ball Seat Tightening Sequence

Dual Disc Wheels (Stud Piloted Ball Seat) — Loosen outer wheel nuts first, then tighten the inner nuts in sequence shown (Figure 76) to the specified torque value given in table on page 222. After inner nuts are tightened, tighten outer wheel nuts, in sequence, to the specified torque value.

When installing wheels, tighten wheel nuts lightly first, then tighten a quarter turn at a time, in sequence, to the specified torque and recheck. When installing dual wheels, install the inner wheel first. Use the above procedure to tighten the inner wheel nuts. After the inner wheels have been installed, use the same procedure to install the outer wheels.

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Disc Wheels (Hub Piloted)

Single and Dual Disc Wheels — Mounting faces of the hub, flange mounting surfaces of the wheels and mounting surfaces of the flange nuts should be clean and free of any foreign material or excess paint. The hub pilot pads should also be free of paint. To prevent corrosion, anti-sieze compound may be applied to the hub pilot pads. Primer and paint thickness on critical mounting surfaces of each wheel should not total more than 0.0762 mm (0.003-inch) maximum. The hub and drum critical mounting surfaces should not be painted.

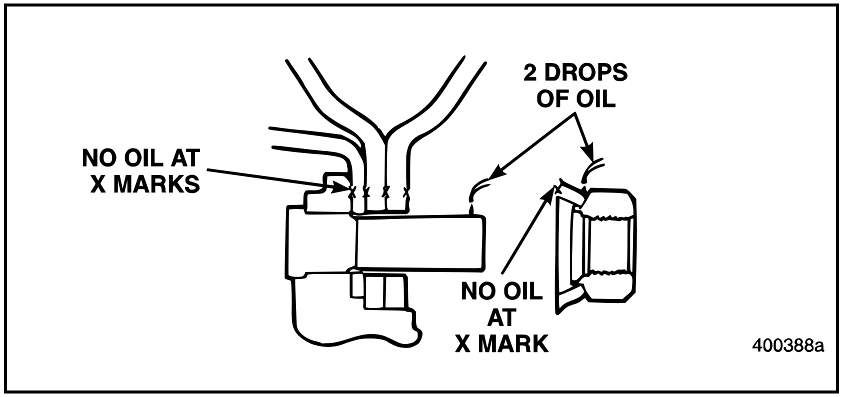

Figure 77 — Flanged Nut Installation

When installing flanged nuts, apply two drops of oil on the leading threads of each stud, and if the flange nuts have been used before, apply two drops of oil to the junction of the nut and flange of each flange nut. DO NOT get oil between the flange and the wheel.

WHEEL TORQUE PROCEDURES

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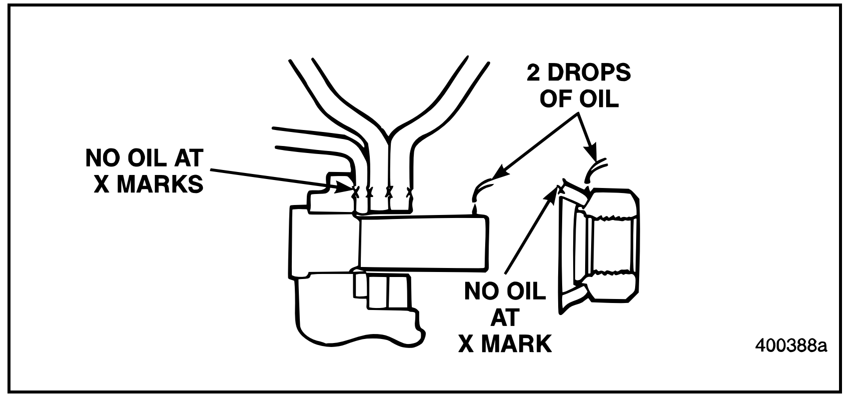

Figure 77 — Flanged Nut Installation

When installing flanged nuts, apply two drops of oil on the leading threads of each stud, and if the flange nuts have been used before, apply two drops of oil to the junction of the nut and flange of each flange nut. DO NOT get oil between the flange and the wheel.

218

To install hub piloted wheels:

1. Locate one of the hub pilot pads at the 12 o'clock position.

NOTE

Before mounting the wheels, be sure the drum is properly positioned on the raised step of the pilot pad.

2. With the wheel(s) square to the hub, mount the wheel(s) as far back on the pilot pad as possible. Be careful not to scrape the stud threads when installing the wheel(s). Install the flange nuts and hand-tighten.
3. Starting at the top stud position, partially torque the nuts in the sequence as shown in the illustration Figure 76.
4. Using the same sequence, torque the flange nuts to the final torque as given in table on page 222.

CAUTION

DO NOT use cone locknuts on stud located wheels, or ball-seat type nuts on hub piloted wheels. Sufficient contact surface between the nut and wheel will not be obtained, which may result in wheel loss.

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DO NOT use cone locknuts on stud located wheels, or ball-seat type nuts on hub piloted wheels. Sufficient contact surface between the nut and wheel will not be obtained, which may result in wheel loss.

219

Retorquing Hub Piloted Wheels

Hub piloted wheels must be retorqued during the first 80–161 km (50–100 miles) following any procedure that requires the removal and reinstallation of the wheel assemblies. Always retorque the flange nuts when the components are at ambient temperature.

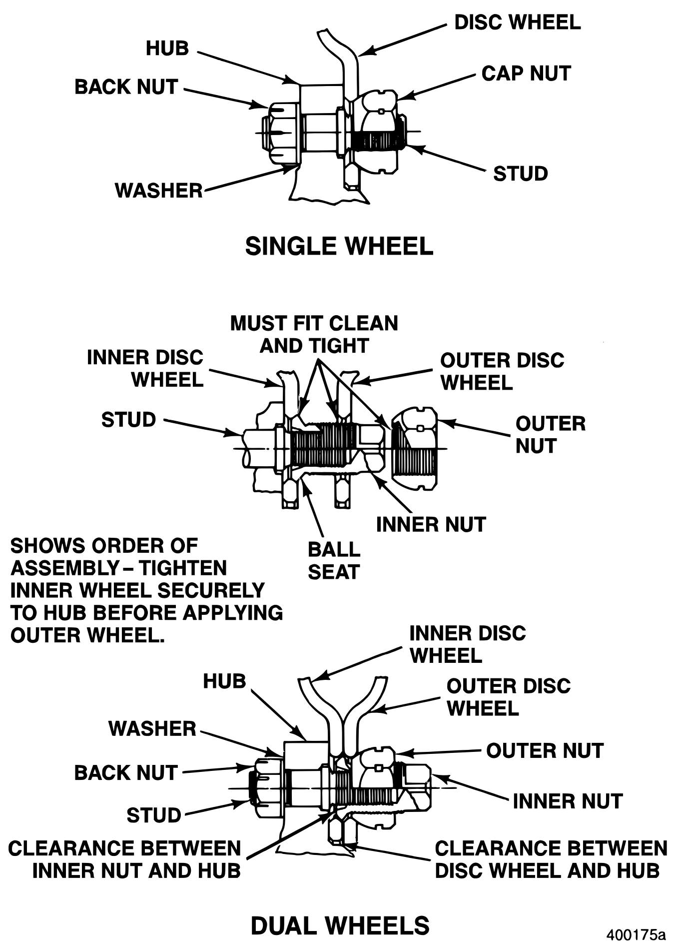

Figure 78 — Disc Wheel Assembly (Stud Piloted Ball Seat)

WHEEL TORQUE PROCEDURES

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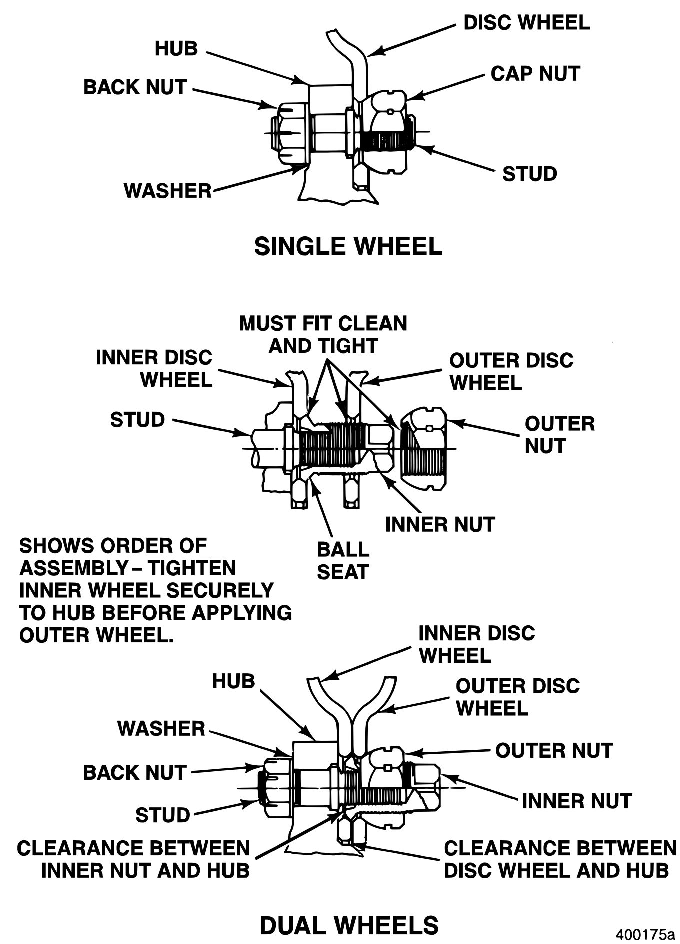

Figure 78 — Disc Wheel Assembly (Stud Piloted Ball Seat)

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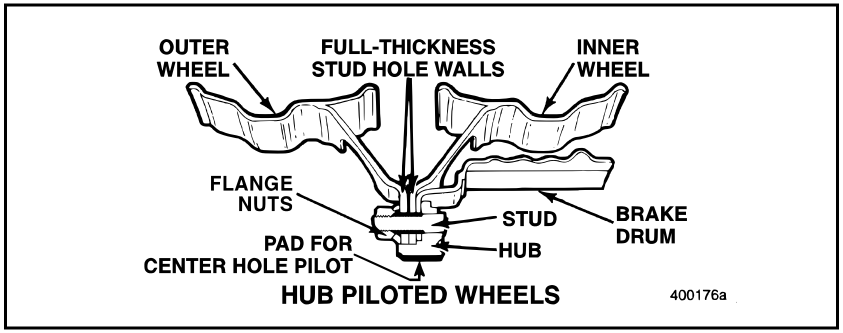
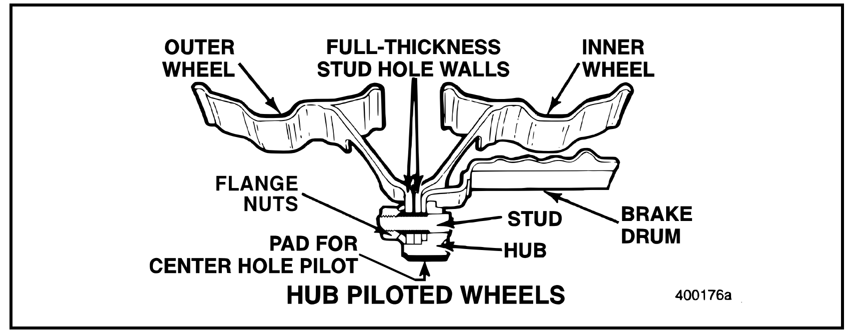


Figure 79 — Hub Piloted Wheels

It is recommended that final nut tightening be done with a torque wrench. If an air impact wrench is used, periodic checks should be made with a torque wrench to ensure the accuracy and condition of the air wrench. The torque of the air impact wrench also depends upon the air line pressure from which it is operated.

WHEEL TORQUE PROCEDURES



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221

WHEEL NUT TORQUE SPECIFICATIONS

Description	Stud Nut Size and Type	Torque N•m (Lb-ft)*
Cap Nuts — Single (front) or inner and outer (rear) with shoulder or head-type studs	3/4″-16 UNF shoulder	610–678 (450–500)
	1-1/8″-16 UNF shoulder (3/4″ backnut)	610–678 (450–500)
	1-1/8″-16 UNF shoulder (7/8″ or 1″ backnut)	881–1017 (650–750)
	1-1/8″-16 UNF head	610–678 (450–500)
	15/16″-12 UNF shoulder or head	1017–1220 (750–900)
	1-5/16″-12 UNF shoulder or head	1017–1220 (750–900)
Backnut (inner end of wheel stud: shoulder-type studs with threads on both ends)	3/4″-16 UNF 7/8″-14 UNF 1″-14 UNF	237–271 (175–200) 237–339 (175–250) 237–407 (175–300)
Flange nuts for hub piloted wheels	M22 x 1.5 (metric threads)	610–678 (450–500)**

* Threads must be dry.

** If the wheels have been removed, apply a small amount of oil to the lead threads of the stud and between the nut body and flange of the cone locknut when reinstalling. Avoid getting oil on the face of the nut, wheels or tires.

Chain Clearance Spacers

Some chassis may be equipped with rear axle chain clearance spacers to provide additional clearance between the dual rear wheels and rear suspension components if tire chains are to be used. The spacer shown in the illustration below is used on chassis that are equipped with disc wheels. This type of spacer bolts to the hub assembly, and, depending upon rear wheel size and configuration, one or two spacers may be used. On chassis equipped with spoke wheels, different configuration chain clearance spacers are used. These spacers slide over, but are not bolted to, the hub assembly.

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222

On those chassis having chain spacers bolted to the hub assembly, mounting nut torque should be checked at each A, B, C and D inspection interval. Wheel removal is necessary when mounting nut torque is checked. Also, if the chassis uses two spacers, it is necessary to remove the outer spacer to check the inner spacer nut torque.

Using the tightening sequence illustrated below, torque the chain spacer mounting nuts to a value of 610–678 N•m (450–500 lb-ft).

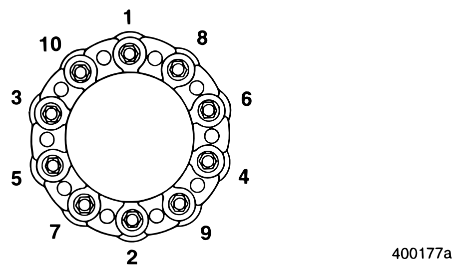

Figure 80 — Wheel Nut Tightening Sequence with Chain Clearance Spacers

NOTE

After any procedure that requires the removal and reinstallation of the wheel assemblies, retorque the wheel nuts during the first 80–161 km (50–100 miles) of use.

It is recommended that final nut tightening be done with a torque wrench. If an air impact wrench is used, periodic checks should be made with a torque wrench to ensure the accuracy and condition of the air wrench. The torque of the air impact wrench also depends upon the air line pressure from which it is operated.

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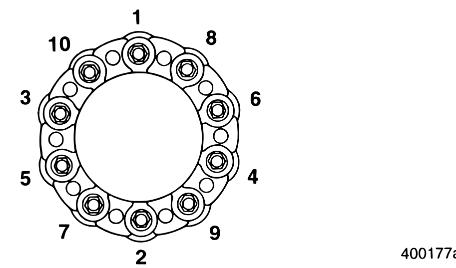

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TIRE INFORMATION

Tire Inspection

Inspect tires daily, and look for bulges, cuts, penetrations, uneven wear and/or oil contamination. If any damage is found, the tire must be thoroughly inspected by a qualified tire inspector and repaired or replaced immediately, at his discretion.

If uneven tire wear is found, a thorough inspection of the chassis, inspecting those items that influence tire wear, should be performed. Chassis inspection and alignment must be performed by a qualified technician.

Factors That Influence Tire Wear

The following factors will influence tire wear, affecting both wear rate and uneven tire wear:

- Tire Pressure and Loading
- King Pin Play
- Toe Adjustment
- Axle Alignment
- Tire Selection and Matching
- Turning Angle
- Wheel Balance
- Shock Absorbers
- Wheel Runout, Radial and Lateral
- Vocation (How the Chassis Is Used)
- Tire Condition/Damage
- Spring Pin Play
- Oil Contamination
- Torque Rod Play
- Tire Mounting

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- Tire Mounting

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- Fifth Wheel Setting
- Tie Rod End Play
- Wheel Bearing Play
- Lack of Lubrication on Fifth Wheel Top Plate

Oil Contamination of Tires

Oil contamination will soften rubber and eventually destroy the tire. Ensure that oil leakage does not occur by inspecting the following areas regularly:

- Engine oil seals
- Transmission oil seals
- Axle hub seals
- Drive axle seals
- Oil filters and oil lines

Tire Selection

Select the proper tire for the vehicle vocation and axle position. Tire selection should be matched to the manufacturer's application guidelines. Consult a qualified tire specialist for proper tire selection.

The overall ratio of an axle is affected by the number of revolutions the tires make in a mile, and will change if tire size, make, ply type and tread design are changed. Particularly on all-wheel-drive vehicles using the MACK TC(S) 15/25 transfer case, overall ratio match between the front and rear axles must be maintained or damage to the front drive axle, driveline or transfer case may result. Unless replacement tires are identical to the originals, consult your MACK distributor or service facility to select replacements that will maintain ratio match within acceptable limits.

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Tire Inflation

Proper tire inflation pressures ensure maximum mileage and overall tire performance. Consult the specific tire manufacturer's books for correct inflation pressures per load, or refer to the vehicle safety certification label.

WARNING

Never operate a vehicle with underinflated (or overloaded) tires, as this condition will cause excessive heat build-up which can result in sudden tire destruction, property damage and personal injury.

Tire Rotation

Radial tires should be rotated only when necessary. If the tires are wearing evenly, there is no need to rotate. If irregular wear becomes apparent, or if wear rate on the tires is perceptively different (from axle to axle or left side to right side of vehicle), then the tires should be rotated in such a manner as to alleviate the condition.

NOTE

Some tires have tread that is uni-directional; consult manufacturer product information. Other than these specific tires, there is no restriction on criss-cross rotation or reversing direction.

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Tire Wear and Driving Habits

All tires will wear out faster when subject to high speeds, as well as hard cornering, rapid starts, sudden stops, frequent turning at high turning angles, and frequent driving on surfaces which are in poor condition. Surfaces with holes and rocks or other objects can damage tires and cause axle misalignment.

Tire Loading

Consult the tire manufacturer's data book for complete information on the allowable loads for your tires. Load capacity may vary with inflation pressure, and the speed at which the tire will be used. Tires which are loaded beyond their maximum allowable loads will build up excessive heat that will result in rapid wear and/or sudden tire destruction.

CAUTION

For additional tire information (i.e., high-speed limits, inflation pressures, etc.), consult the product information available through the specific tire manufacturer.

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TIRE SERVICING

⚠ DANGER

Safety precautions must be taken when handling truck tires. Particularly when servicing multi-piece wheel rims, proper safety precautions must be observed. Failure to comply with the following procedures may result in serious injury or death.

When removing tire and wheel assemblies or rim and wheel assemblies from the vehicle, set the spring brakes and chock the wheels which are not being removed. Use a heavy-duty jack to raise the vehicle.

Instruct all tire and rim handling personnel on how to mount tires safely.

Completely deflate the tires by removing the valve core before disassembling the tire from the rim.

Use proper tools to mount and demount the tires.

Use approved rust-retarding compounds to keep rims clean and free from rust and corrosion.

Use the correct size rim for the specified tire.

Avoid rim damage when changing the tires.

Examine the inside of the tire before mounting. Dry thoroughly if any moisture is found.

Use proper tubes and flaps with radial tires.

Use the correct tire lubricant sparingly, especially in radial tire application, to minimize the possibility of fluid entering the tire.

Install the side or lock ring splits directly opposite (180 degrees) the valve stem slot.

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DANGER

Failure to follow proper safety precautions when servicing multi-piece wheel rims may result in serious injury or death.

DO NOT over-inflate the tires.

DO NOT overload the rims.

DO NOT remove the tire from the rim before completely deflating.

DO NOT attempt to correct seating of the side and lock rings by hammering while the tire is inflated. DEFLATE THE TIRE FIRST.

DO NOT use corroded, damaged or distorted rims, rings or trim parts.

DO NOT fail to identify different makes of similar clamps; paint each make a different color.

DO NOT use petroleum oil or grease on tire beads or rims. They will ruin the tires.

DO NOT use mismatched side and lock rings.

DO NOT inflate the tires before all side and lock rings are in place.

DO NOT inflate the tire unless it is placed in a safety cage or a portable lock ring guard.

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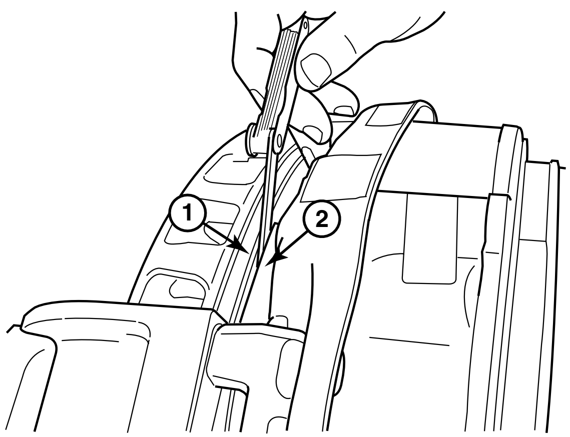
DRIVELINE RETARDER

At each D inspection, the driveline retarder coil-to-rotor air gap should be measured and adjusted as required. If the coil-to-rotor air gap is too small, contact between moving and non-moving components can cause damage. If the air gap is too large, performance and efficiency of the driveline retarder will be reduced. Measure the coil-to-rotor air gap as follows:

1. At the inner rotor, use a thickness gauge to determine the air gap between the coil pole shoe and the rotor.



403628a

Figure 81 — Measuring Air Gap

1. Inner Rotor	2. Coil Pole Shoe Plate

2. Measure the gap at locations A, B, C and D, equally spaced (every other coil) around the rotor.

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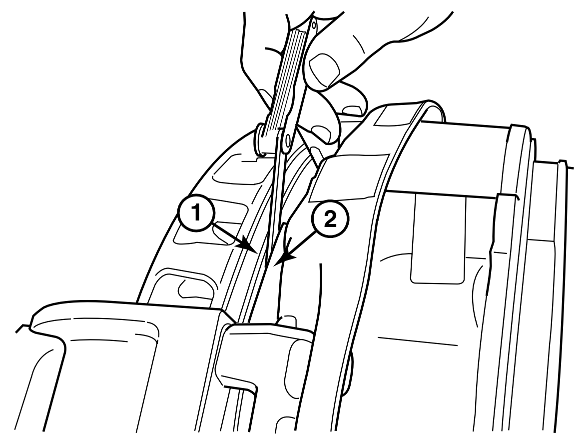

403628a

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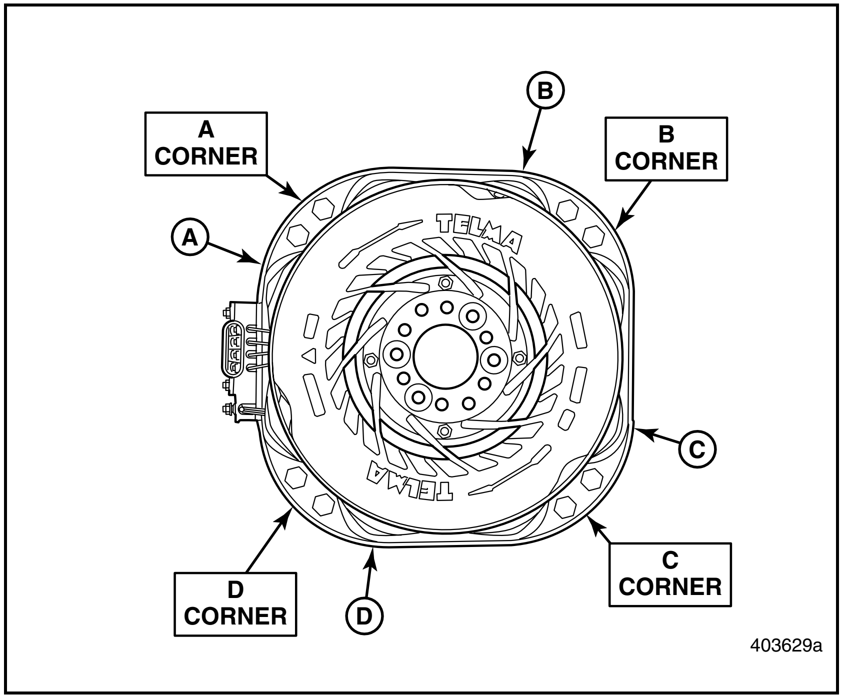
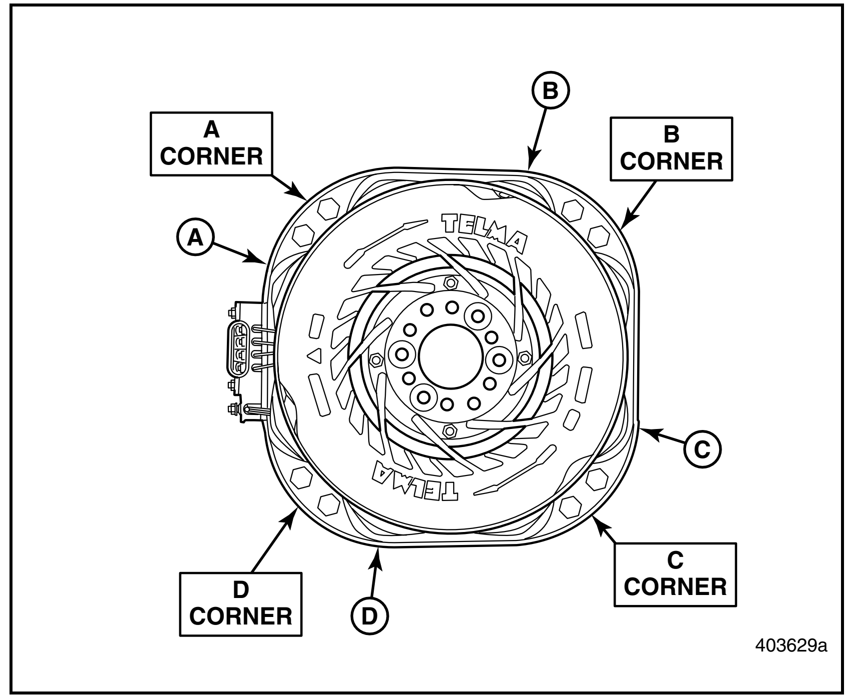


Figure 82 — Measure Air Gap at Four Locations

3. Measurements should be within the 1.397–1.499 mm (0.055–0.059 inch) range. Calculate the average air gap from the measurements taken at the four coils (locations A, B, C and D). The result will be the amount of shim thickness that must be added or removed to bring air gap within the specified range.
4. Repeat the above procedures for the four coil locations at the outer rotor.

For procedures on adding or removing shims, refer to the *Driveline Retarder Service Manual*, 13-901.

DRIVELINE RETARDER



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For procedures on adding or removing shims, refer to the *Driveline Retarder Service Manual*, 13-901.

231

AIR BRAKE SYSTEM

Dual Circuit Brake System Function Test

The following Dual Circuit Brake System Function Test should be performed at each C and D inspection interval, or after any air system service procedures that involve disconnecting and reconnecting air lines where incorrect reconnection, such as the treadle valve, is a possibility.

1. Block the wheels to prevent the vehicle from moving.
2. Start the engine and build air system pressure to governor cutout.
3. Stop the engine.
4. Completely drain one air reservoir.
5. Release the parking brakes.
6. Apply and hold the treadle valve.
7. Have an assistant check for proper results by observing the movement of the slack adjusters as indicated below:

   TRUCK:

   - The brakes on the rear drive axle(s) should always apply as indicated by movement of the slack adjuster.
   - The low-air warning buzzer and warning lamp should activate for at least two of the tests.

   TRACTOR:

   - The brakes on either the steering axle or the rear drive axle(s) should always apply as indicated by movement of the slack adjuster.
   - The low-air warning buzzer and warning lamp should activate for at least two of the tests.
8. Repeat the above procedures for the remaining air reservoirs (do not include air reservoirs for air starter if so equipped).

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232

Long Stroke Chambers

Prior to 1/27/97, type 24 long stroke brake chambers were standard equipment on 34,000 to 44,000 lbs. rear axle suspensions, with type 30 brake chambers as an available option. After 1/27/97, type 30 brake chambers became the standard chamber on 34,000 to 44,000 lbs. rear axle suspensions.

The long stroke concept provides increased stroke to reduce adjustment frequency, improved service chamber power, increased spring force for parking, and the use of smaller chambers while still developing adequate braking force.

There is a difference in diaphragm configuration between the long stroke and standard chambers. The diaphragm used in the long stroke chamber has a depth of 38.8 mm (1.53 inches), while the standard diaphragm has a depth of 31.8 mm (1.25 inches). Stroke length is 63.5 mm (2.50 inches) for long stroke chambers and 57.2 mm (2.25 inches) for the standard stroke chambers.

The standard stroke diaphragm must not be installed in the long stroke chamber. To prevent confusion and/or mismatch of parts, both the diaphragm and housing(s) are identified by prominent markings.

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233

Long Stroke Identification

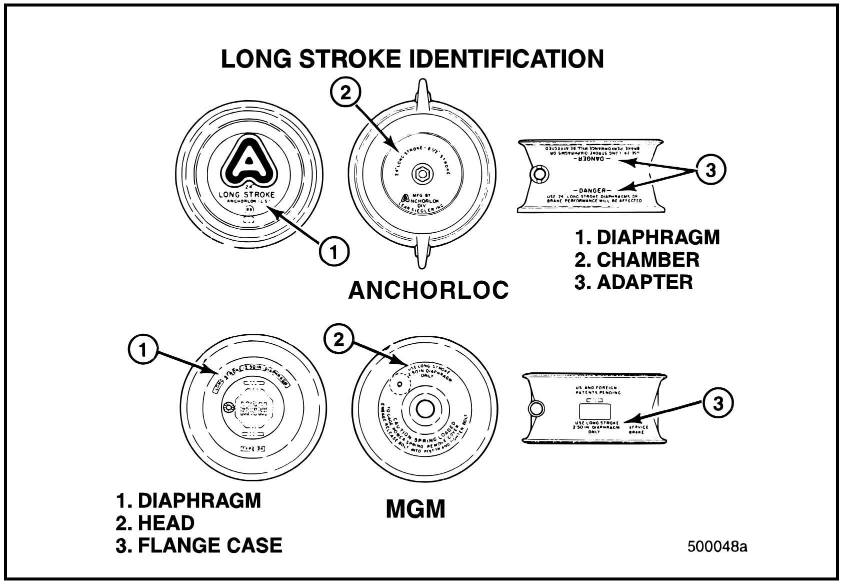

Figure 83 — Long Stroke Identification

AIR BRAKE SYSTEM

Long Stroke Identification

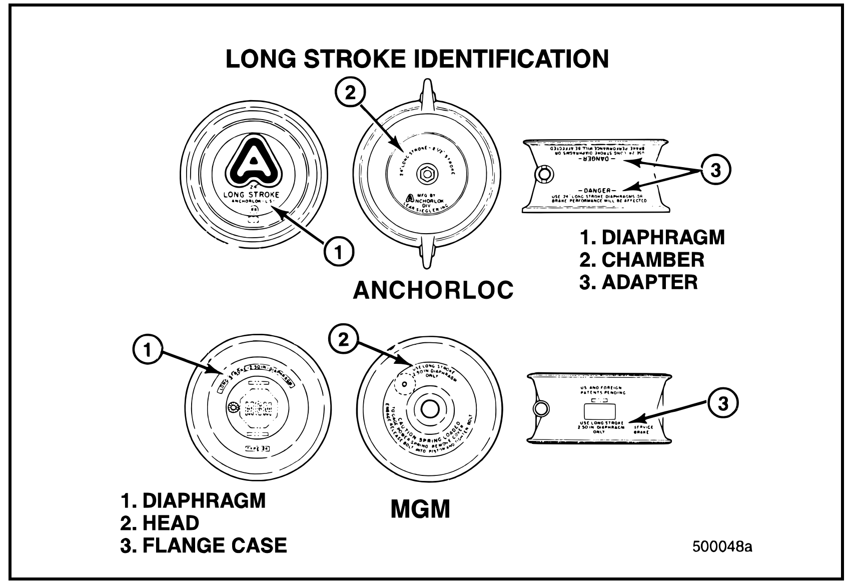

Figure 83 — Long Stroke Identification

234

BRAKE ADJUSTMENT

Cam Brake Adjustment

PROCEDURE FOR CHECKING PUSH ROD TRAVEL

1. With the brakes released, measure the distance between the flat surface of the brake chamber to the center of the push rod clevis pin. (If the chassis is equipped with Haldex automatic slack adjusters, measure to the far side of the clevis pin hole.)

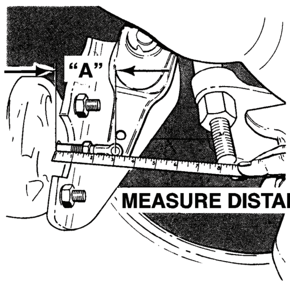

Figure 84 — Brakes Released Measurement

2. Make and hold a full brake treadle application.
3. With the brakes applied, again measure the distance between the flat surface of the brake chamber to the center of the push rod clevis pin (far end of the clevis pin hole for Haldex automatic slack adjusters).

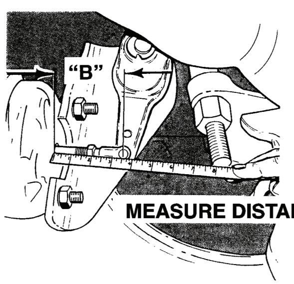

Figure 85 — Brakes Applied Measurement

BRAKE ADJUSTMENT

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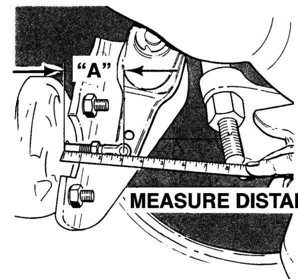

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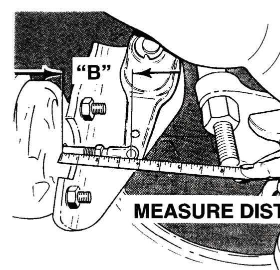

Figure 85 — Brakes Applied Measurement

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4. Subtract the measurement made with the brakes released from the measurement made with the brakes applied. The difference is the stroke.
5. Compare the stroke measurement with the maximum stroke shown in the last column of the chart below.

PUSH ROD TRAVEL SPECIFICATIONS

Chamber Size	Effective Diaphragm Area (Sq. In.)	Overall Diameter Inches	Maximum Applied Stroke mm (Inches)
9 —	9	5-1/4	34.9 (1-3/8)
12 —	12	5-11/16	34.9 (1-3/8)
16 —	16	6-3/8	44.4 (1-3/4)
20 —	20	6-13/16	44.4 (1-3/4)
24 —	24	7-1/4	44.4 (1-3/4)
24L —	24	7-1/4	50.8 (2)
30 —	30	8-1/8	50.8 (2)
36 —	36	9	57.1 (2-1/4)

DANGER

Proper brake adjustment must be maintained for the safe operation of your truck.

BRAKE ADJUSTMENT

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236

⚠ D A N G E R

Raise the axle to be adjusted and support on safety stands.

- ***Support front axle under the axle housing or center of axle.***
- ***Support rear axle under the lower spring trunnion.***

Chock the wheels that remain on the ground.

Release the parking brake while adjusting the brakes.

MANUAL SLACK ADJUSTERS

Adjust the brakes whenever the push rod-applied stroke exceeds the maximum allowable stroke as given in the table on page 236.

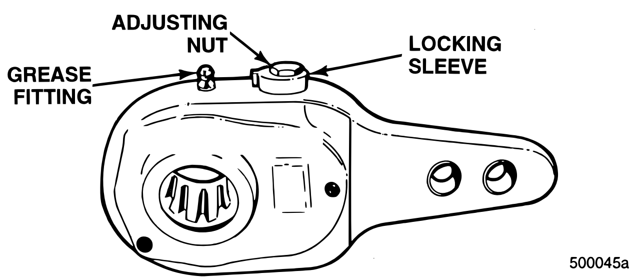

Figure 86 — Manual Slack Adjuster

Position the wrench over the adjusting screw and depress the adjusting lock sleeve BEFORE attempting to turn the adjusting screw. With the brake chamber push rod in the released position, turn the adjusting screw, while rotating the wheel, until the brake linings are against the brake drum. Back off the adjusting screw until the wheel rotates freely. When the adjustment is complete, be sure the locking sleeve is returned to its locked position by allowing the sleeve to engage the hex head of the adjusting screw.

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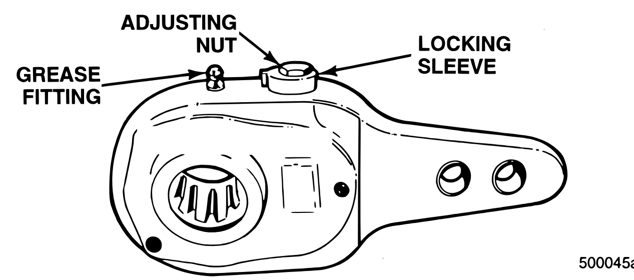

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237

NOTE

Be sure all wheels are on the ground when the brakes are applied.

After proper adjustment, apply the brakes. The slack adjuster arm and brake chamber push rod should form an angle of 90 degrees. The brake chamber push rod should also form a 90-degree angle with the flat mounting surface of the brake chamber. All slack adjusters on the vehicle must be at the same angle.

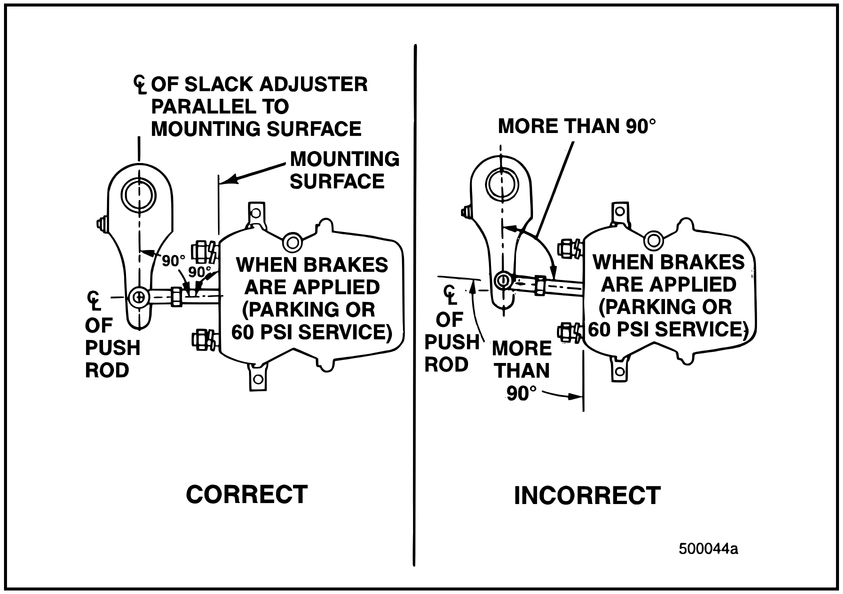

Figure 87 — Proper Slack Adjustment

BRAKE ADJUSTMENT

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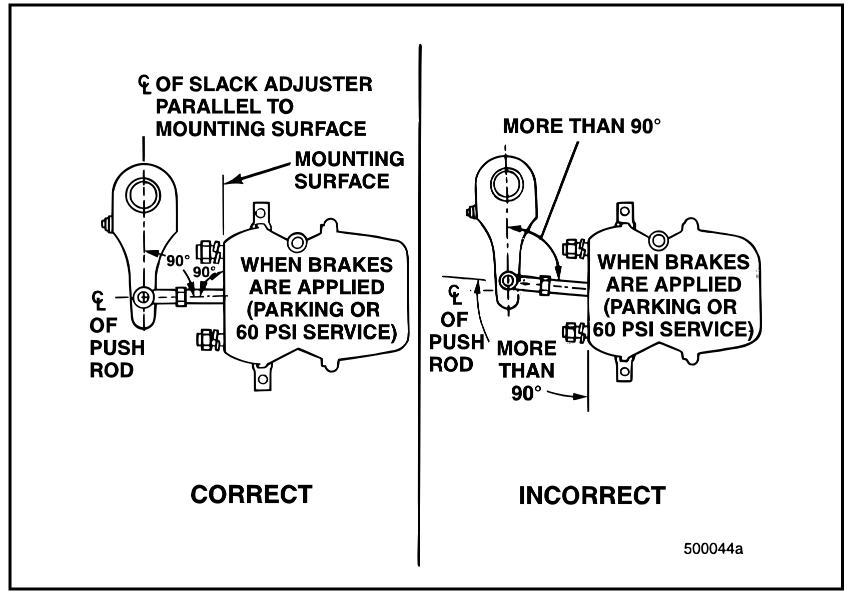

Figure 87 — Proper Slack Adjustment

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AUTOMATIC SLACK ADJUSTERS

Automatic slack adjusters are designed to automatically maintain proper brake chamber stroke and compensate for brake lining wear during normal use. The only time automatic slack adjusters will need adjustment is during initial installation, removal or to back off the brake shoes during brake work such as brake shoe relining, brake drum reconditioning, etc. DO NOT rely on automatic slack adjusters to take up excessive initial clearance. For procedures to adjust automatic slack adjusters, refer to the *Air and Brake System Service Manual*, 16-104.

When push rod travel exceeds specifications (as given in the table on page 236) on a vehicle equipped with automatic slack adjusters, a mechanical problem with the slack adjuster, brake components or improper installation of the slack adjuster is indicated. If brakes are found to be out of adjustment, the vehicle must be taken to the nearest repair facility as soon as possible to have the problem investigated and corrected.

⚠ DANGER

Automatic slack adjusters MUST NOT be manually adjusted in an effort to correct excessive push rod stroke, as this condition indicates that a problem exists with the automatic adjuster, installation of the automatic slack adjuster or problems related to components of the foundation brakes. These conditions will not be corrected by manually adjusting the automatic slack adjusters.

Manual adjustment of automatic slack adjusters is a dangerous practice that could result in serious consequences. This practice gives the vehicle operator a false sense of security about the effectiveness of the brakes, and the brakes will likely soon be out of adjustment again.

⚠ CAUTION

Before attempting to turn the manual adjusting nut on ArvinMeritor™ automatic slack adjusters, the pawl must first be removed or damage to the pawl teeth may result.

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239

CAB MOUNT MAINTENANCE — LEU AND MRU MODELS

Cab Mounting Maintenance and Alignment Adjustment — LEU and MRU Model Chassis

At each C and D inspection interval, cab rear mounting alignment must be checked and adjusted, if necessary, and the anti-vibration pads on the frame-mounted V-brackets must be inspected. Replace any pads that are missing or damaged.

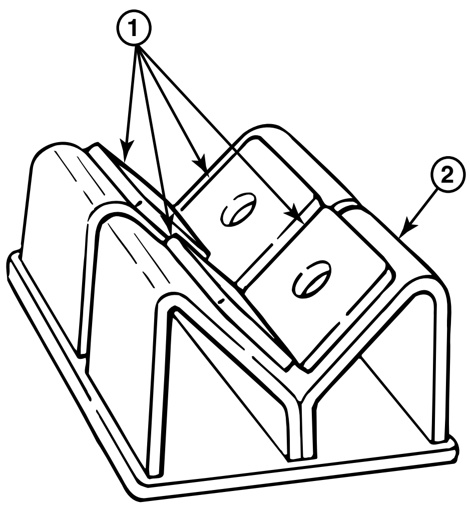

Figure 88 — Cab Mount Anti-Vibration Pads

1. Anti-Vibration Pads	2. V-Bracket

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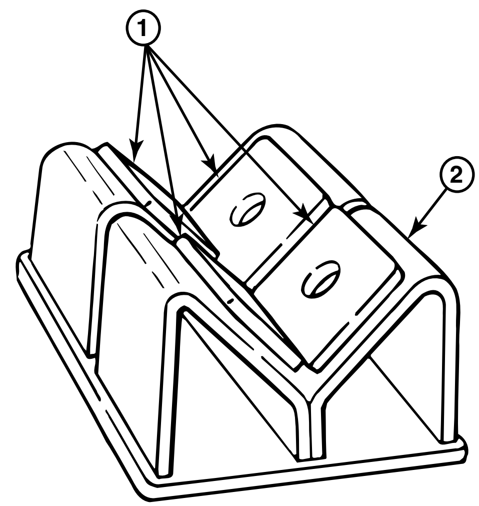

Figure 88 — Cab Mount Anti-Vibration Pads

1. Anti-Vibration Pads | 2. V-Bracket

240

CAB MOUNT/LATCH ALIGNMENT — LEU MODELS

To check cab mount alignment, raise the cab, apply a generous amount of white lithium grease to all four anti-vibration pads on the V-bracket, then lower the cab until the cab latch hook fully engages the V-block. As the hook engages, observe that it enters the block without contacting the edges. Raise the cab and examine the grease on the anti-vibration pads for uniform contact with the mating surfaces of the V-block. Also, when raising the cab, make sure there is no contact or interference between the cab latch hook and the cab V-block. On the right-hand side of the vehicle, make sure the cab latch hook does not contact the turbocharger inlet tube when fully opened. These checks must be performed on each side of the vehicle.

CAB MOUNT MAINTENANCE — LEU AND MRU MODELS

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241

ADJUSTMENT

The mounting bolt holes in the frame-mounted cab mount bracket, latch cylinder mounting plate and cab rear mount V-block are all slotted for adjustment purposes. The frame-mounted bracket can be tilted fore and aft along the vertical centerline of the bracket, and the cab-mounted V-block can be tilted up and down along the horizontal centerline of the block so that uniform contact between the V-block and anti-vibration pads can be obtained. The latch cylinder can be moved in the inboard and outboard directions so that uniform side-to-side contact can be obtained.

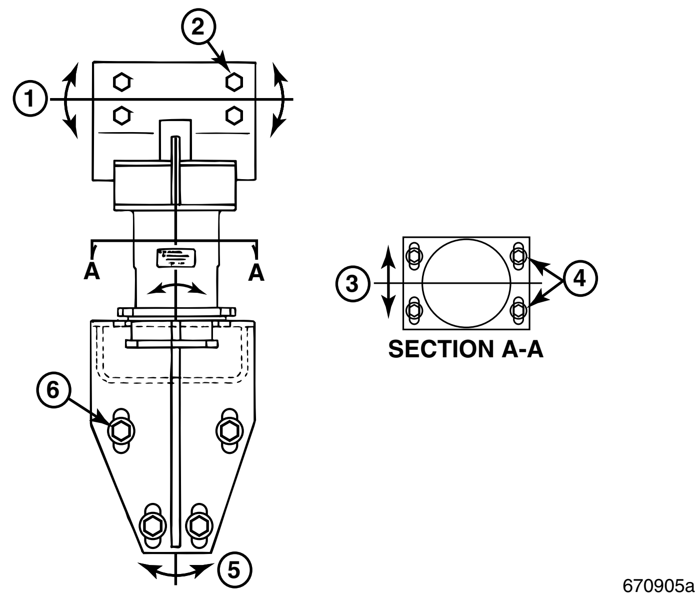

Figure 89 — Adjustment Points — LEU Model Cab

1. Tilt Up/Down	4. Loosen Four Bolts
2. Loosen Eight Bolts	5. Tilt Fore/Aft
3. Move Inboard/Outboard	6. Loosen Four Bolts

CAB MOUNT MAINTENANCE — LEU AND MRU MODELS

ADJUSTMENT

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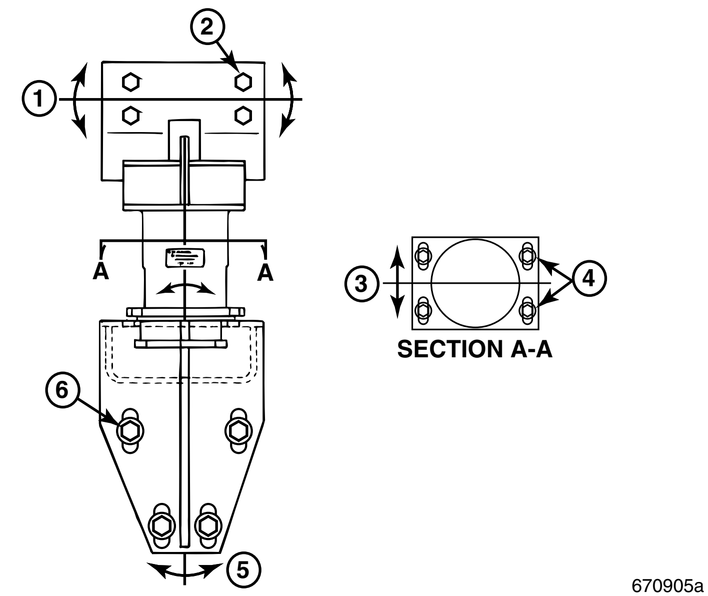

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242

NOTE

The front inner two mounting bolts of the V-block are located behind a body panel. The panel must be removed to access these two bolts.

If the grease print on the anti-vibration pads shows that the V-block is not sitting evenly in the V-bracket in the front-to-back directions (i.e., heavy contact against the front two pads and light contact against the rear two pads), loosen the frame bracket and V-block mounting bolts and tilt the bracket and V-block as required to obtain uniform contact. If the grease print shows that the V-block is not contacting the anti-vibration pads in the side-to-side directions (i.e., heavy contact against the inner two pads and light contact against the outer two pads), loosen the latch cylinder mounting bolts and move the cylinder assembly inboard or outboard as necessary to obtain uniform contact.

After completing the alignment adjustments, tighten the mounting bracket fasteners as follows:

- **Cab Latch Cylinder Mounting Plate —** 34 N•m (25 lb-ft)
- **Frame-Mounted Cab Mount Bracket —** 100 N•m (74 lb-ft)
- **Cab Rear Mount V-Block —** 65 N•m (48 lb-ft)

If the latch hook on the right-hand side of the chassis contacts the turbocharger inlet tube, loosen the inlet tube clamps and rotate the tube inboard, away from the latch hook.

CAB MOUNT MAINTENANCE — LEU AND MRU MODELS

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243

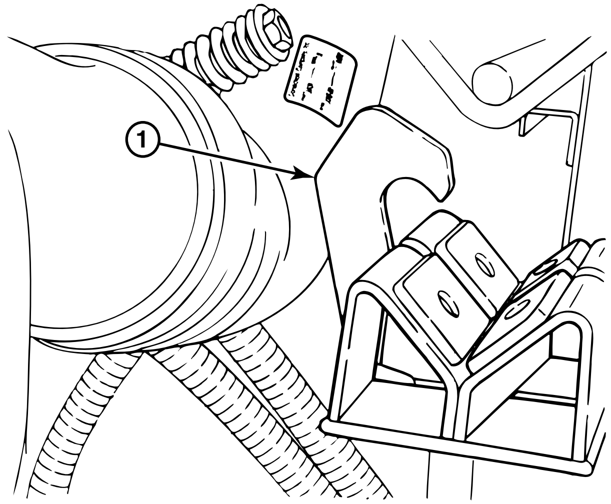

Figure 90 — Adjust Inlet Tube to Avoid Contact with Cab Latch

1. Avoid Contact Between Tube and Latch

CAB MOUNT/LATCH ALIGNMENT — MRU MODELS

To check cab mount alignment, raise the cab, apply a generous amount of white lithium grease to all four anti-vibration pads on the V-bracket, then lower the cab until the cab latch hook fully engages the V-block. As the hook engages, observe that it enters the block without contacting the edges. Raise the cab and examine the grease on the anti-vibration pads for uniform contact with the mating surfaces of the V-block. Also, when raising the cab, make sure there is no contact or interference between the cab latch hook and the cab V-block. These checks must be performed on each side of the vehicle.

CAB MOUNT MAINTENANCE — LEU AND MRU MODELS

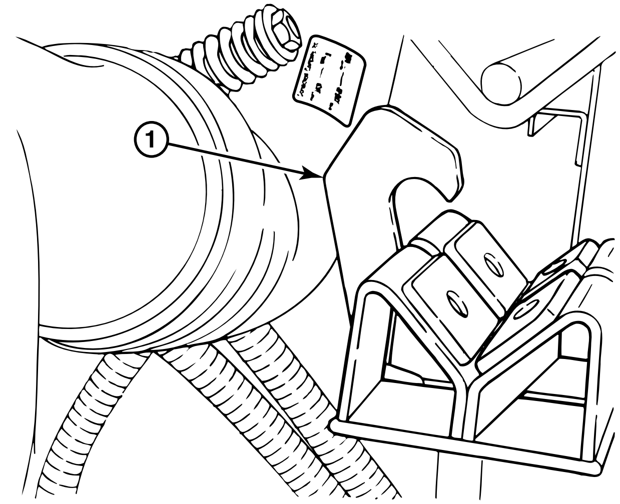

Figure 90 — Adjust Inlet Tube to Avoid Contact with Cab Latch

1. Avoid Contact Between Tube and Latch

CAB MOUNT/LATCH ALIGNMENT — MRU MODELS

To check cab mount alignment, raise the cab, apply a generous amount of white lithium grease to all four anti-vibration pads on the V-bracket, then lower the cab until the cab latch hook fully engages the V-block. As the hook engages, observe that it enters the block without contacting the edges. Raise the cab and examine the grease on the anti-vibration pads for uniform contact with the mating surfaces of the V-block. Also, when raising the cab, make sure there is no contact or interference between the cab latch hook and the cab V-block. These checks must be performed on each side of the vehicle.

244

ADJUSTMENT

The bolt holes in the latch cylinder mounting plate and the cab rear mount V-block are slotted for adjustment purposes. The V-block can be moved fore and aft along the horizontal centerline of the cab to ensure the cab latch hook enters the slot in the V-block without interference. The latch cylinder assembly can be moved in the inboard and outboard directions (relative to the frame) so that uniform side-to-side contact on the anti-vibration pads can be obtained. The mounting bolt holes for the frame-mounted cab mount bracket are not slotted. For uniform front-to-back contact on the anti-vibration pads, it will be necessary to loosen the two mounting bolts and tilt the bracket as necessary to obtain uniform contact.

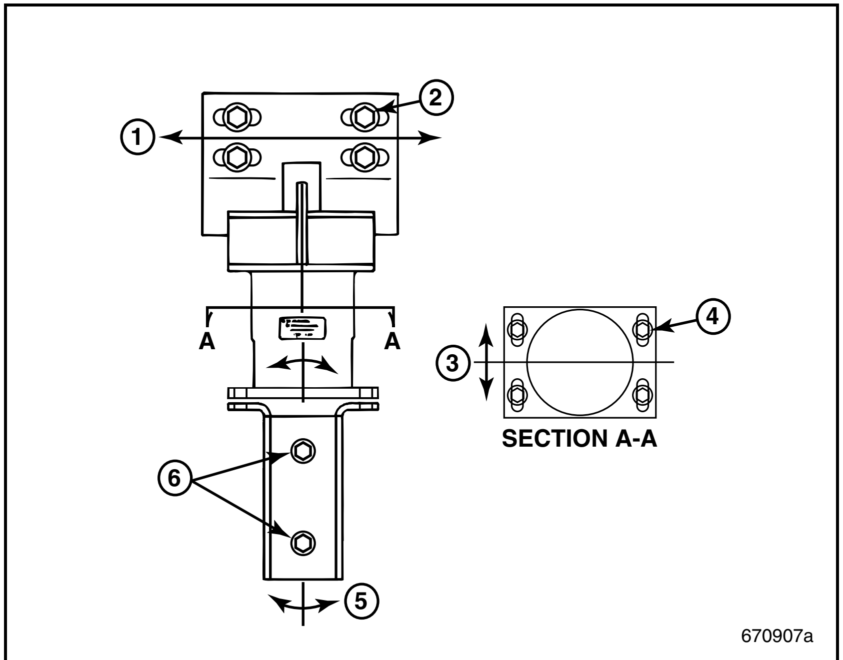

Figure 91 — Adjustment Points — MRU Models

1. Move Fore/Aft	4. Loosen Four Bolts
2. Loosen Eight Bolts	5. Tilt Fore/Aft
3. Move Inboard/Outboard	6. Loosen Six Bolts

CAB MOUNT MAINTENANCE — LEU AND MRU MODELS

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The bolt holes in the latch cylinder mounting plate and the cab rear mount V-block are slotted for adjustment purposes. The V-block can be moved fore and aft along the horizontal centerline of the cab to ensure the cab latch hook enters the slot in the V-block without interference. The latch cylinder assembly can be moved in the inboard and outboard directions (relative to the frame) so that uniform side-to-side contact on the anti-vibration pads can be obtained. The mounting bolt holes for the frame-mounted cab mount bracket are not slotted. For uniform front-to-back contact on the anti-vibration pads, it will be necessary to loosen the two mounting bolts and tilt the bracket as necessary to obtain uniform contact.

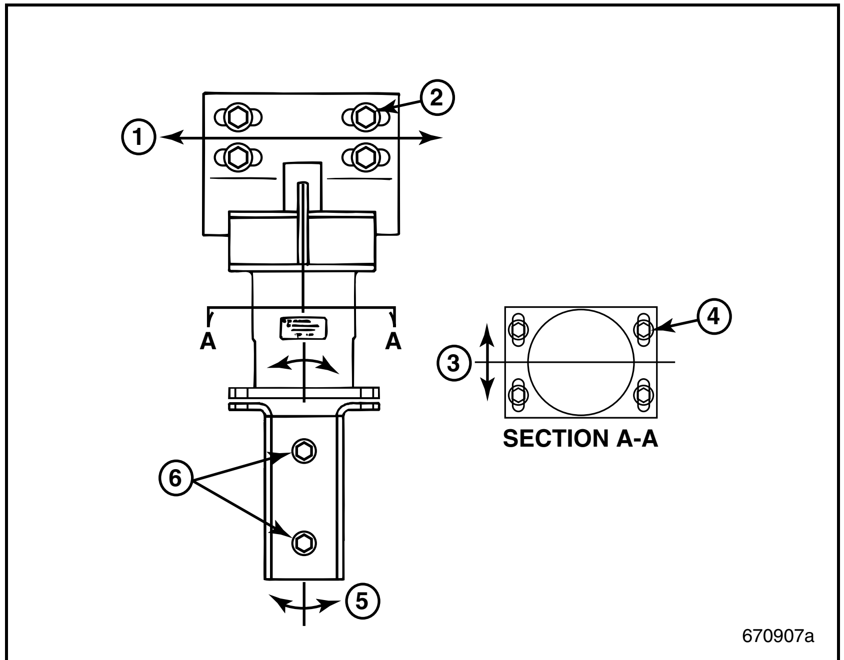

Figure 91 — Adjustment Points — MRU Models

1. Move Fore/Aft 4. Loosen Four Bolts
2. Loosen Eight Bolts 5. Tilt Fore/Aft
3. Move Inboard/Outboard 6. Loosen Six Bolts

245

If the grease print shows that the cab rear mount V-block is not contacting the anti-vibration pads evenly in the fore and aft directions (i.e., heavy contact against the forward two pads and light contact against the rearward two pads), loosen the frame-mounted cab mount bracket and tilt the bracket as necessary to obtain uniform contact. If the grease print shows that the cab rear mount V-block is not contacting the anti-vibration pads evenly in the side-to-side directions (i.e., heavy contact against the inner two pads and light contact against the outer two pads), loosen the latch cylinder mounting bolts and move the cylinder assembly inboard or outboard as necessary to obtain uniform contact. After performing the adjustments to the frame-mounted bracket and the cab latch cylinder mounting plate, verify that the latch hook is centered in the V-block when the cab is completely lowered and does not contact the latch hook as the cab is being raised or lowered. If the latch book is not centered or it contacts the V-block, loosen the eight rear cab mount V-block mounting bolts and move the block fore and aft as required.

After completing the alignment adjustments, tighten the mounting bracket fasteners as follows:

- **Cab Latch Cylinder Mounting Plate —** 34 N•m (25 lb-ft)
- **Frame-Mounted Cab Mount Bracket —** 100 N•m (74 lb-ft)
- **Cab Rear Mount V-Block —** 65 N•m (48 lb-ft)

CAB MOUNT MAINTENANCE — LEU AND MRU MODELS

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246

CLUTCH ADJUSTMENT

For the clutch to release properly, the release bearing must travel 12.7 to 14.3 mm (1/2″ to 9/16″), there must be 3.2 mm (1/8″) of clearance between the clutch release yoke and the release bearing wear pads (free travel) and clutch brake squeeze must occur within the last 6.35 to 9.53 mm (1/4″ to 3/8″) of clutch pedal travel.

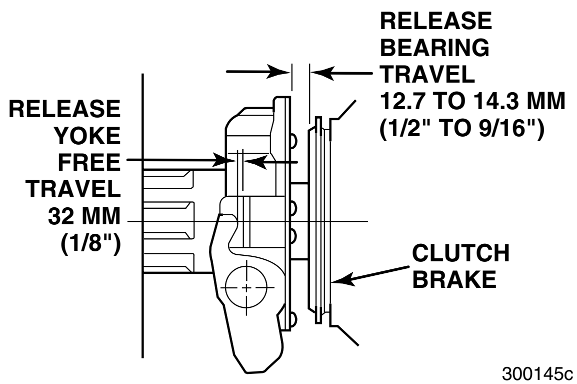

Figure 92 — Release Bearing Travel

Through normal use, the friction surfaces of the clutch wear, resulting in an increase in release bearing travel. As bearing travel increases, clearance between the release yoke and wear pads decreases, which becomes evident as a decrease in clutch pedal free play in the cab. When a decrease in free play is noticed, adjustment of the clutch is necessary to maintain proper clutch release operation. An improperly adjusted clutch will slip and eventually burn out.

When clutch pedal free play in the cab decreases to 12.7 mm (1/2″), the clutch must be adjusted to ensure proper clutch operation. Clutch adjustment must be performed in the following order:

- Verify and adjust clutch brake squeeze
- Adjust clutch pedal free play
- Verify clutch release yoke and release bearing free travel

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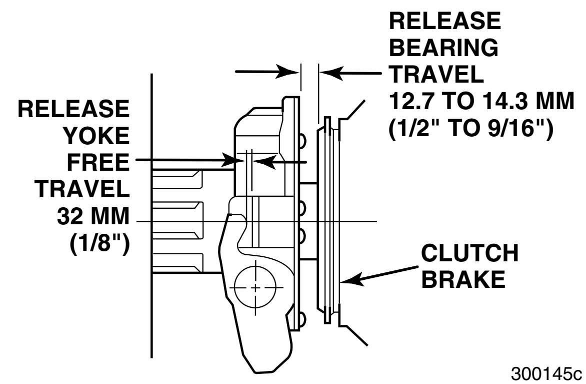

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- Verify and adjust clutch brake squeeze
- Adjust clutch pedal free play
- Verify clutch release yoke and release bearing free travel

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Verify and Adjust Clutch Brake Squeeze

Verify that clutch brake squeeze occurs within the last 6.35 to 9.53 mm (1/4″ to 3/8″) of clutch pedal travel. Clutch brake squeeze is verified as follows:

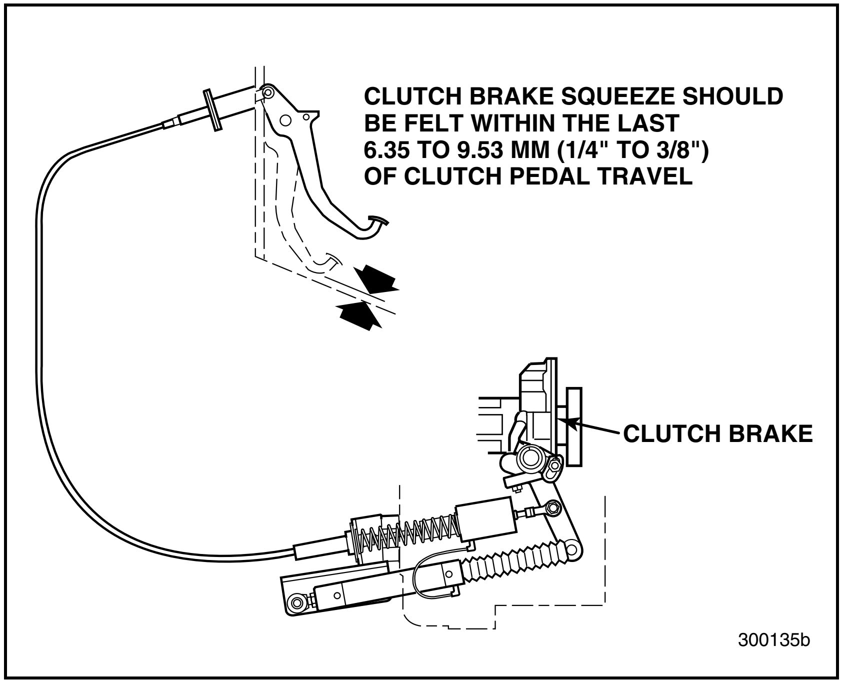

Figure 93 — Verify Clutch Brake Squeeze

1. Remove the inspection cover from the transmission bell housing.
2. Insert a 0.254 mm (0.010-inch) thickness gauge between the rear face of the clutch release bearing and the clutch brake.
3. Have an assistant fully depress the clutch pedal and then slowly release the pedal. Tell the assistant to stop releasing the pedal as soon as the thickness gauge can be pulled from between the release bearing and the clutch brake.
4. Measure the distance between the pedal and the floor. Clutch brake must occur within the last 6.35 to 9.53 mm (1/4″ to 3/8″) of pedal travel.

CLUTCH ADJUSTMENT

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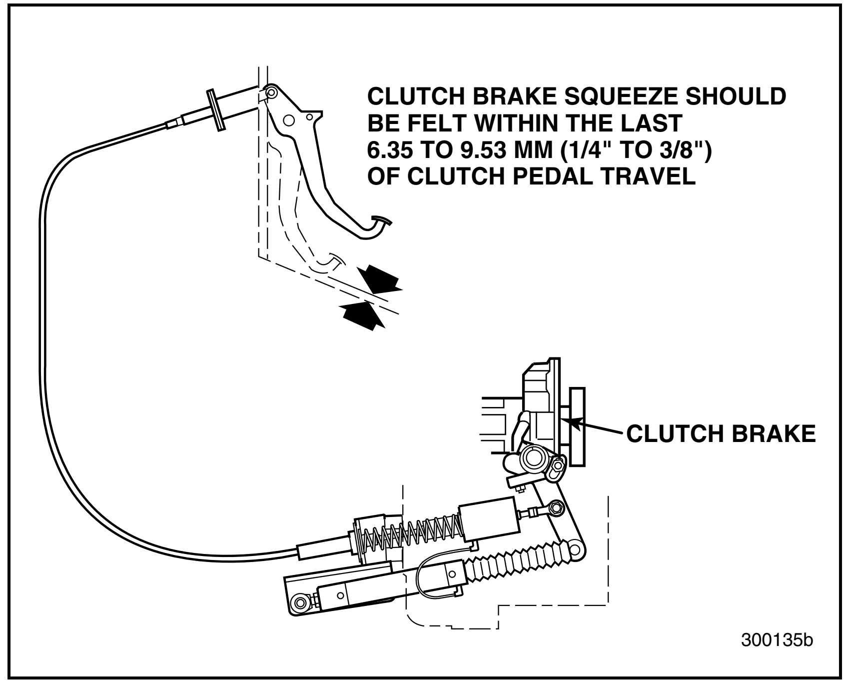

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4. Measure the distance between the pedal and the floor. Clutch brake must occur within the last 6.35 to 9.53 mm (1/4″ to 3/8″) of pedal travel.

248

If clutch brake squeeze is not within specifications, adjust as follows:

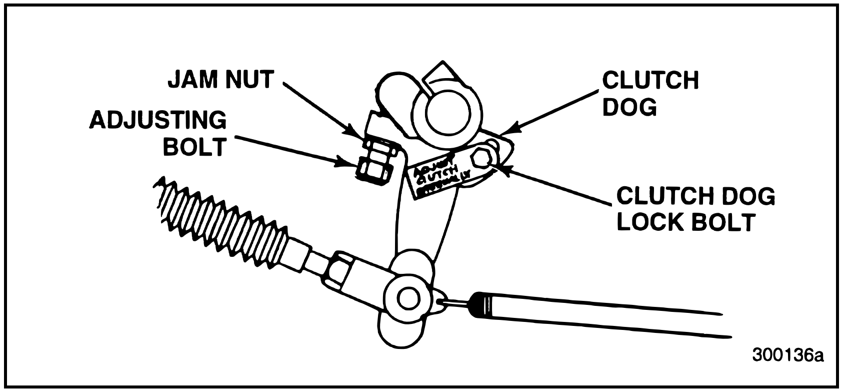
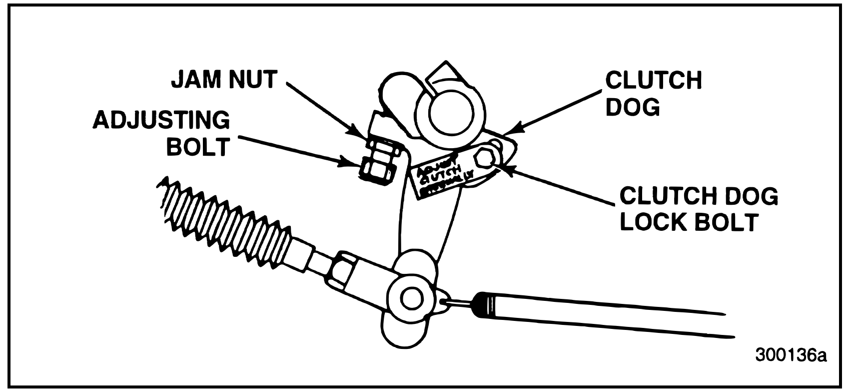


Figure 94 — Clutch Brake Squeeze Adjustment

5. Loosen the clutch dog lock nut.
6. Loosen the adjusting bolt jam nut.
7. Turn the adjusting bolt to properly set clutch brake squeeze.
   - Turning the adjusting bolt clockwise moves clutch brake squeeze further from the end of pedal travel (increases dimension).
   - Turning the adjusting bolt counterclockwise moves clutch brake squeeze closer to the end of pedal travel (decreases dimension).
8. When clutch brake squeeze has been properly set, tighten the clutch dog lock bolt and the adjusting bolt jam nut.

CLUTCH ADJUSTMENT

If clutch brake squeeze is not within specifications, adjust as follows:



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249

Adjust Clutch Pedal Free Play

After verifying and adjusting clutch brake squeeze, clutch pedal free play must be adjusted. MACK chassis utilize either a standard cable-operated or a cable-operated air-assist clutch release system. Clutch pedal free play specifications for both release systems are as follows:

- **Standard cable-operated clutch release system** — 44.5 ± 6.4 mm (1-3/4 ± 1/4 inch)
- **Cable-operated air-assist clutch release system** — 28.6 ± 6.4 mm (1-1/8 ± 1/4 inch)

When clutch pedal free play is properly adjusted to the specifications listed, there will be approximately 3.2 mm (1/8″) of clearance between the clutch release yoke and the release bearing wear pads.

For the air-assist clutch release system, the 28.6 ± 6.4 mm (1-1/8 ± 1/4 inch) of clutch pedal free play allows approximately 76.2–96.5 mm (3 to 3-13/16 inch) of cylinder rod to be visible when measured from the cylinder body to the bottom of the rod end. This dimension provides the proper cable travel and ensures that the cylinder will not bottom when the clutch pedal is pushed in (clutch disengaged).

Clutch pedal free play adjustments are performed by adjusting the internal clutch ring.

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- **Standard cable-operated clutch release system** — 44.5 ± 6.4 mm (1-3/4 ± 1/4 inch)
- **Cable-operated air-assist clutch release system** — 28.6 ± 6.4 mm (1-1/8 ± 1/4 inch)

When clutch pedal free play is properly adjusted to the specifications listed, there will be approximately 3.2 mm (1/8″) of clearance between the clutch release yoke and the release bearing wear pads.

For the air-assist clutch release system, the 28.6 ± 6.4 mm (1-1/8 ± 1/4 inch) of clutch pedal free play allows approximately 76.2–96.5 mm (3 to 3-13/16 inch) of cylinder rod to be visible when measured from the cylinder body to the bottom of the rod end. This dimension provides the proper cable travel and ensures that the cylinder will not bottom when the clutch pedal is pushed in (clutch disengaged).

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250

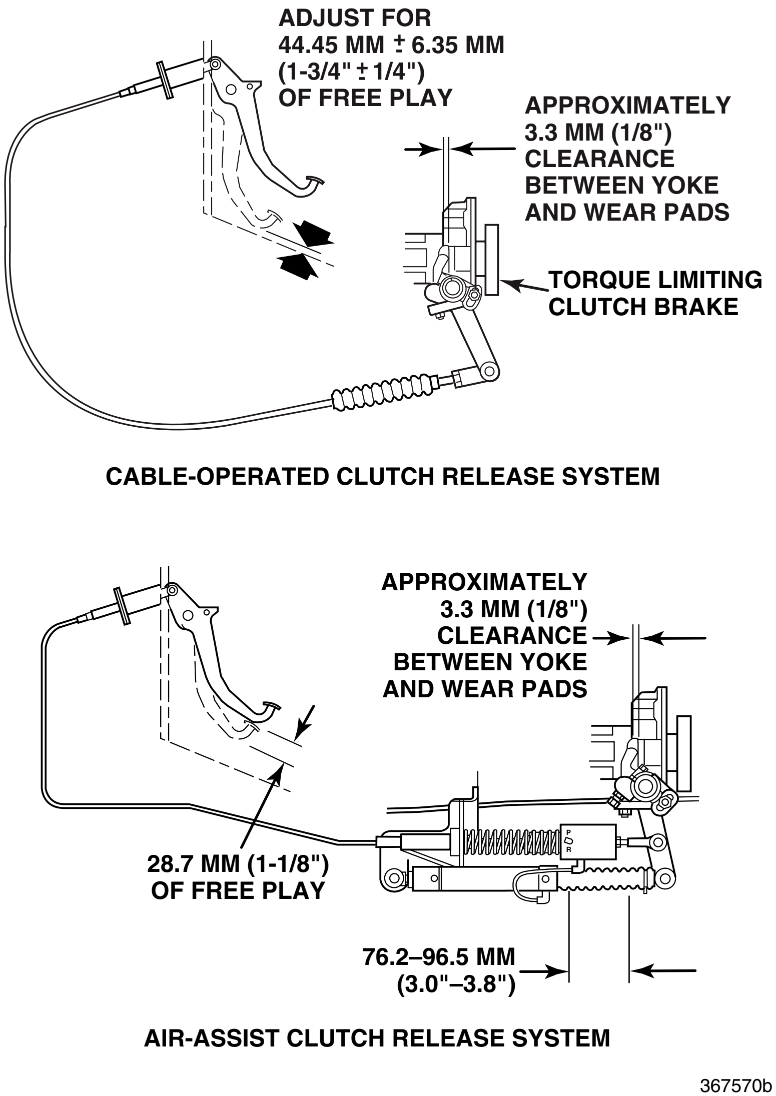

Figure 95 — Clutch Pedal Free Play

CLUTCH ADJUSTMENT

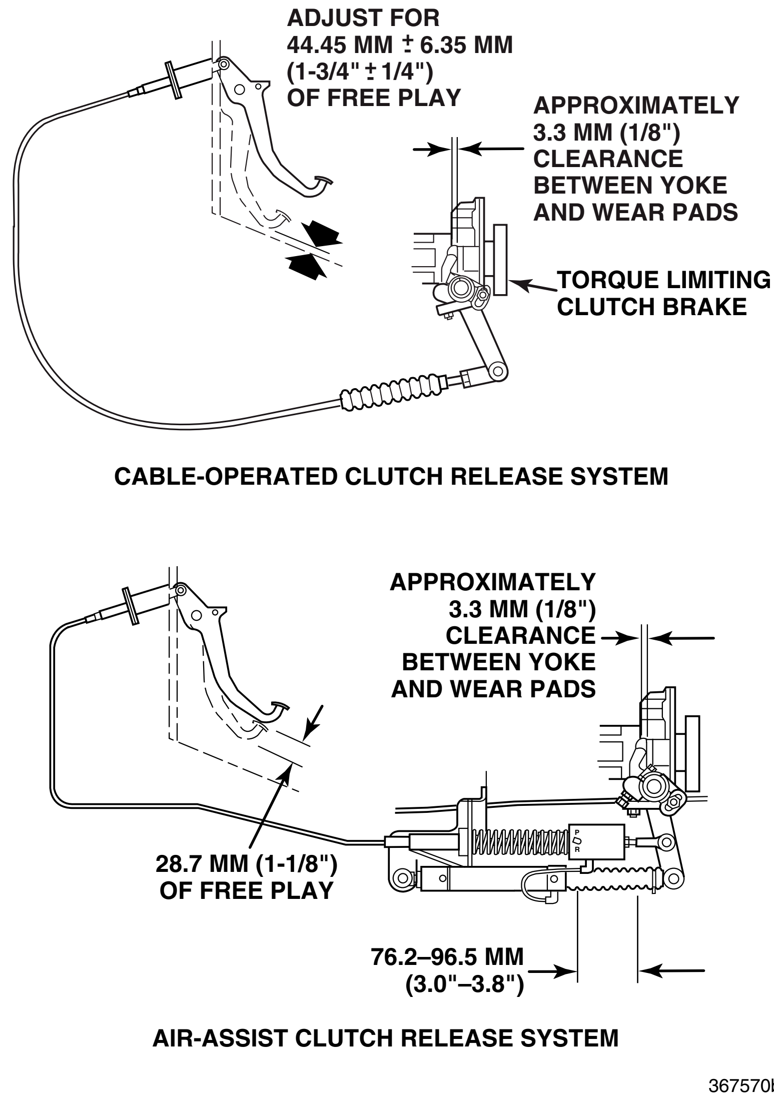
Figure 95 — Clutch Pedal Free Play

251

Adjust clutch pedal free play as follows:

Spicer Solo™ 15-1/2 Inch Self-Adjusting Clutch

The Spicer Solo™ self-adjusting clutch is designed to maintain proper release bearing travel throughout the life of the clutch. The only time adjustment of a Spicer Solo™ self-adjusting clutch should be required is at installation of a new clutch. Adjustment of the clutch is accomplished by fully depressing the clutch pedal until the release bearing contacts and “squeezes” the clutch brake, and then releasing the pedal a minimum of five times. This “release bearing to clutch brake contact” ensures that the clutch release bearing travel is properly set at 12.7 to 14.3 mm (1/2″ to 9/16″) and that the clearance between the release yoke and the release bearing wear pads is 3.2 mm (1/8″).

Spicer Easy Pedal 15-1/2 Inch Angle Spring Clutch with Kwik-Adjust™ Component

1. Rotate the engine in the direction of normal rotation until the Kwik-Adjust™ component is visible through the bell housing inspection hole.
2. Insert a 5/8″ socket or box wrench through the inspection hole and over the hex-headed bolt on the Kwik-Adjust™ component.

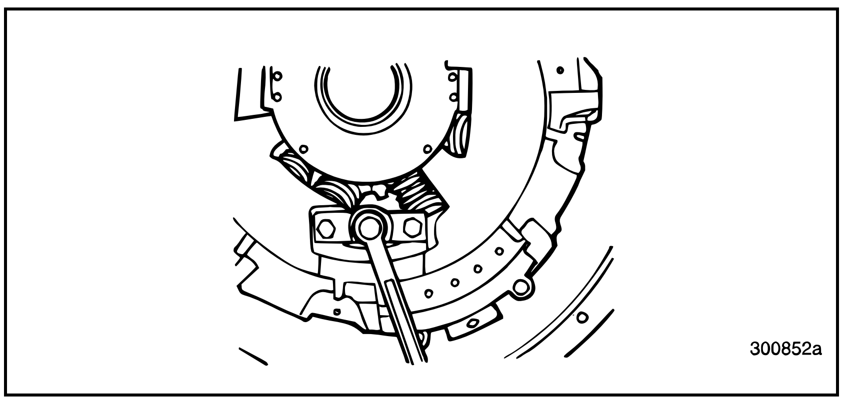

Figure 96 — Wrench on Kwik-Adjust™ Component

CLUTCH ADJUSTMENT

Adjust clutch pedal free play as follows:

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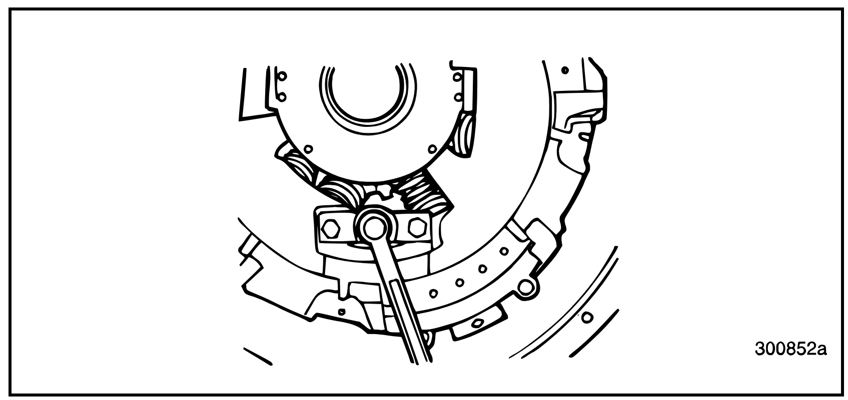

Figure 96 — Wrench on Kwik-Adjust™ Component

252

NOTE

On some clutches, the Kwik-Adjust™ component may utilize a square-headed bolt which requires a 3/4″ 12-point wrench or socket.

3. Have an assistant fully depress the clutch pedal (clutch disengaged).
4. Depress and turn the bolt in the direction of the arrow embossed on the clutch.

NOTE

The clutch must be released before attempting to turn the adjusting bolt.

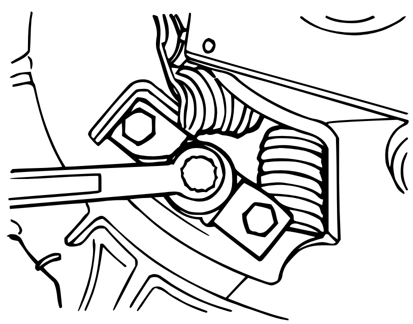

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Figure 97 — Adjusting Clutch Ring

- Turning the Kwik-Adjust™ component clockwise moves the release bearing away from the clutch (increases clutch pedal free play).
- Turning the Kwik-Adjust™ component counterclockwise moves the release bearing toward the clutch (decreases clutch pedal free play).

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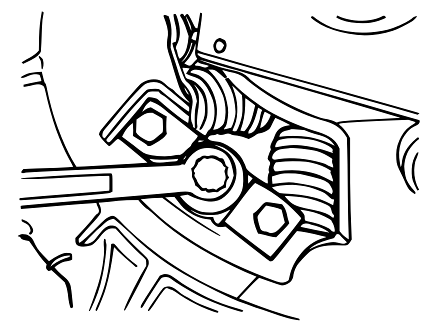

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- Turning the Kwik-Adjust™ component clockwise moves the release bearing away from the clutch (increases clutch pedal free play).
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253

The Kwik-Adjust™ component re-engages at each sixth turn, and a flat of the hex-headed bolt will align with the flat on the edge of the bracket. Kwik-Adjust™ components that utilize the 3/4″ square-headed bolt will re-engage at every 1/4 turn.

5. Measure clutch pedal free play in the cab. If not within specifications, readjust the clutch ring as required.

ArvinMeritor™ 15-1/2 Inch Clutch

1. Rotate the engine in the direction of normal rotation until the clutch adjustment lock plate is visible through the bell housing inspection hole.

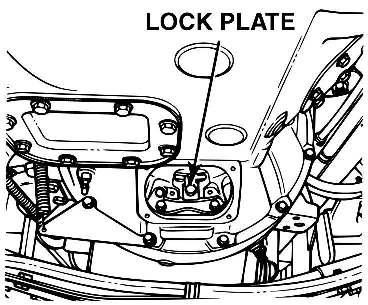

Figure 98 — Clutch Adjusting Lock Plate

2. Remove the screw and washer from the lock plate, and then remove the lock plate.
3. Have an assistant fully depress the clutch pedal (clutch released).
4. Using a universal clutch adjusting tool (tool No. J 36216) or a large screwdriver against the notches on the adjusting ring, turn the adjusting ring to move the release bearing as required to clutch pedal free play. Moving the adjusting ring one notch moves the release bearing approximately 0.50 mm (0.020 inch).

CLUTCH ADJUSTMENT

The Kwik-Adjust™ component re-engages at each sixth turn, and a flat of the hex-headed bolt will align with the flat on the edge of the bracket. Kwik-Adjust™ components that utilize the 3/4″ square-headed bolt will re-engage at every 1/4 turn.

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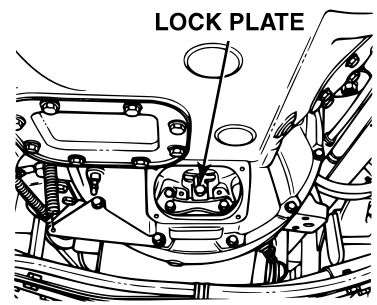

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254

NOTE

The clutch must be disengaged (clutch pedal pushed to the floor) before attempting to turn the clutch adjusting ring.

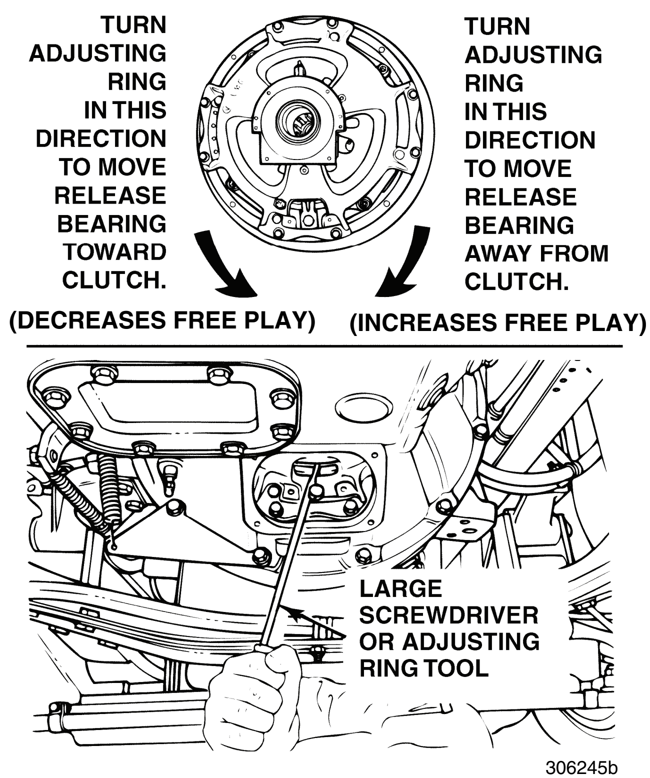


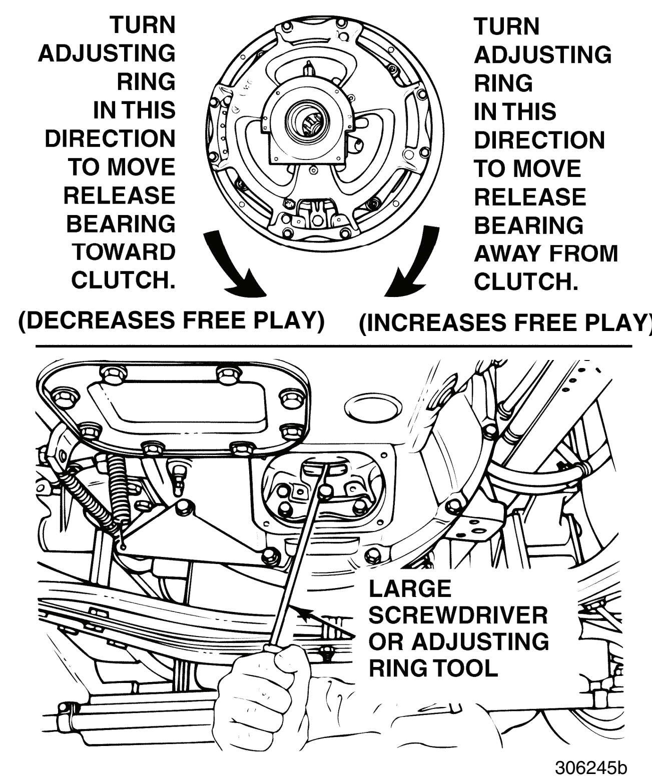
Figure 99 — Adjusting Clutch

5. Measure clutch pedal free play in the cab. If not within specifications, readjust as required.
6. When clutch pedal free play has been adjusted to proper specifications, reinstall the lock plate and tighten the capscrew to 37 N•m (27 lb-ft).

CLUTCH ADJUSTMENT

NOTE

The clutch must be disengaged (clutch pedal pushed to the floor) before attempting to turn the clutch adjusting ring.



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255

Verify Clutch Release Yoke and Release Bearing Travel

After clutch brake squeeze and clutch pedal free play have been properly adjusted, verify that 3.2 mm (1/8″) of clearance exists between the clutch release yoke and the release bearing wear pads, and that release bearing travel is between 12.7 to 14.3 mm (1/2″ and 9/16″). Release bearing travel is the distance between the rear face of the release bearing and the clutch brake. If not within specifications, inspect the clutch release system for a stretched cable, worn clevises, worn or missing rubber pedal stops, etc. Repair or replace components as necessary, and then readjust the clutch.

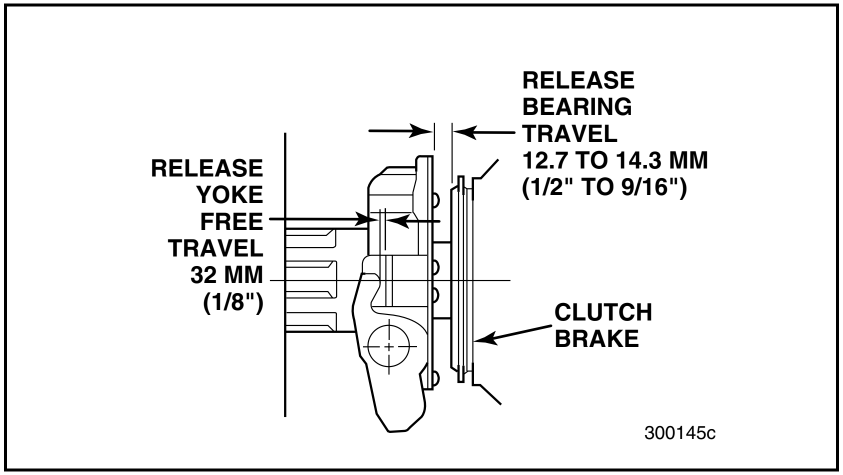

Figure 100 — Measure Release Bearing Travel

After completing the clutch adjustments, reinstall the transmission bell housing inspection cover.

CLUTCH ADJUSTMENT

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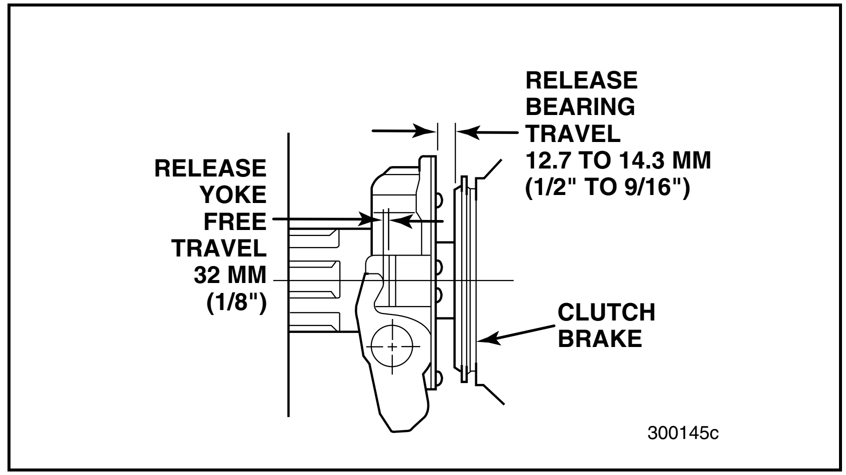

Figure 100 — Measure Release Bearing Travel

After completing the clutch adjustments, reinstall the transmission bell housing inspection cover.

256

Clutch Assist Cylinder Filter

The air-operated clutch assist release system consists of a cable-operated air regulator and a single-acting air cylinder. The air cylinder contains an exhaust port at the “blind-end” of the cylinder where air exhausts from the cylinder as the cylinder rod retracts, and is drawn into the cylinder when the cylinder rod extends. A sintered-bronze filter prevents contaminants from entering the exhaust port. The filter is located just below the coolant surge tank and is secured to the clutch cable with plastic tie wraps. A plastic hose connects the filter to the assist cylinder exhaust port. If the clutch pedal feels “spongy,” or increased pedal effort is noticed, remove the filter from the exhaust port, clean in a suitable non-flammable solvent, blow dry with compressed air and reinstall.

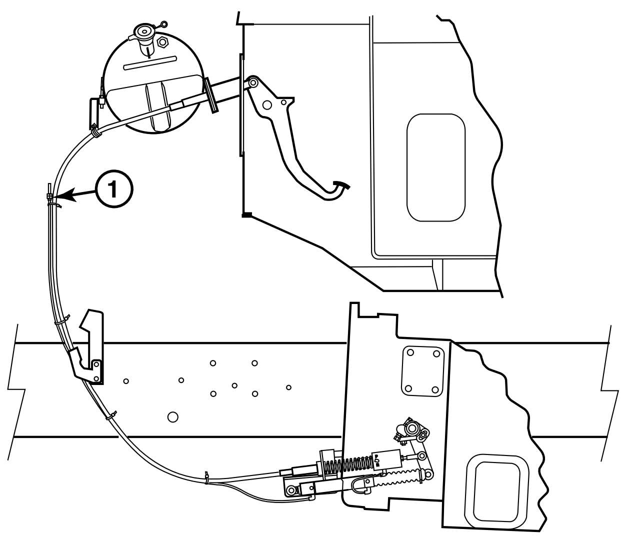

Figure 101 — Clutch Assist Cylinder Filter

1. Sintered-Bronze Filter

CLUTCH ADJUSTMENT

Clutch Assist Cylinder Filter

The air-operated clutch assist release system consists of a cable-operated air regulator and a single-acting air cylinder. The air cylinder contains an exhaust port at the “blind-end” of the cylinder where air exhausts from the cylinder as the cylinder rod retracts, and is drawn into the cylinder when the cylinder rod extends. A sintered-bronze filter prevents contaminants from entering the exhaust port. The filter is located just below the coolant surge tank and is secured to the clutch cable with plastic tie wraps. A plastic hose connects the filter to the assist cylinder exhaust port. If the clutch pedal feels “spongy,” or increased pedal effort is noticed, remove the filter from the exhaust port, clean in a suitable non-flammable solvent, blow dry with compressed air and reinstall.

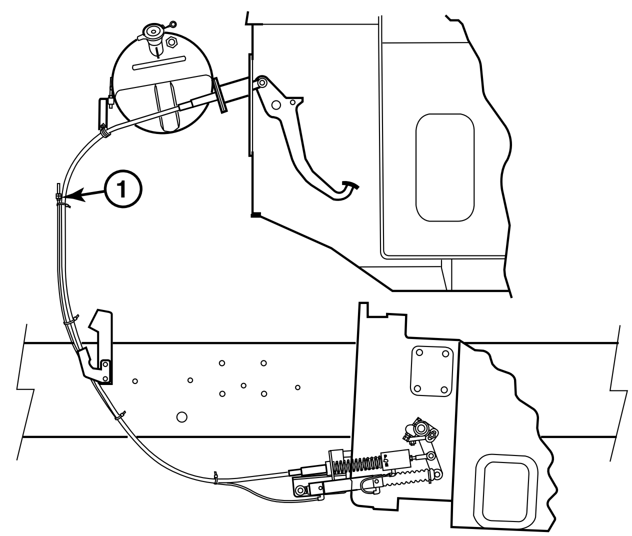

Figure 101 — Clutch Assist Cylinder Filter

1. Sintered-Bronze Filter

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VALVE AND UNIT INJECTOR ADJUSTMENT

Initial Adjustment

An initial valve lash and unit injector pre-load check and adjustment must be performed at the end of the first 200 000 km (125,000 miles), or 12 months of service, whichever occurs first.

Regular Adjustment

After the initial valve adjustment, valve lash and unit injector pre-load must be checked and adjusted at each 400 000 km (250,000 miles), or 24 month interval, whichever occurs first.

Valve lash specifications can be found on the engine identification label which is affixed to the left-hand side of the cylinder head cover at the front of the engine. For valve adjustment procedures, refer to the applicable engine service manual.

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BRAKE DIAGNOSTIC CHART

The following troubleshooting chart summarizes some common dual braking system problems, probable causes and corrections. Use this chart as a guide to service the dual brake system.

CONDITION	**LOW AIR PRESSURE WARNING RED LIGHT DOES NOT GO OUT AFTER STARTUP.**
POSSIBLE CAUSE	**CORRECTION**
1. Loss of one section of the dual system.	1. Observe dual pressure gauge to determine which section is out. Vehicle can be moved with EXTREME care.
2. Loss of complete air brake system.	2. Vehicle cannot be moved. Spring brakes will automatically be set. Look for a malfunction in the main air supply system.
CONDITION	**LOW AIR PRESSURE WARNING RED LIGHT COMES ON WHILE DRIVING VEHICLE.**
POSSIBLE CAUSE	**CORRECTION**
1. Loss of one section of the dual system.	1. Observe dual pressure gauge to establish which section is out. Vehicle can be operated with EXTREME care to the nearest safe parking area.
2. Loss of complete air brake system.	2. Spring brakes will automatically apply. Vehicle cannot be moved. Look for a malfunction in the main air supply system.
3. Governor leaking.	3. Check for leakage. Repair or replace governor.
4. Compressor discharge valves leaking.	4. Repair compressor.

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3. Governor leaking.	3. Check for leakage. Repair or replace governor.
4. Compressor discharge valves leaking.	4. Repair compressor.

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CONDITION	**AIR PRESSURE DROPS QUICKLY WITH ENGINE STOPPED AND BRAKES FULLY APPLIED.**
POSSIBLE CAUSE	**CORRECTION**
1. Treadle valve leaking.	1. Perform leakage test and make necessary repairs.
2. Brake chamber leakage.	2. Repair or replace brake chamber.
3. Hose, tubing or fittings leaking.	3. Check all plumbing and make necessary repairs.

CONDITION	**AIR PRESSURE DROPS QUICKLY WITH ENGINE STOPPED AND BRAKES RELEASED.**
POSSIBLE CAUSE	**CORRECTION**
1. Treadle valve leaking.	1. Perform leakage test and make necessary repairs.
2. Hoses, tubing or fittings leaking.	2. Check all plumbing and make necessary repairs.
3. Parking brake chamber leaking.	3. Replace diaphragm.
CONDITION	**AIR PRESSURE WILL NOT RISE TO NORMAL**
POSSIBLE CAUSE	**CORRECTION**
1. Reservoir drain cock opened.	1. Check drain cock. Close if opened.
2. Excessive air leakage from system components.	2. Perform air leakage test, and make necessary repairs.
3. Governor out of adjustment.	3. Check governor setting. Make adjustment, if necessary.
4. Defective air pressure gauge.	4. Replace air pressure gauge.
5. Faulty compressor.	5. Repair or replace.

BRAKE DIAGNOSTIC CHART

CONDITION	**AIR PRESSURE DROPS QUICKLY WITH ENGINE STOPPED AND BRAKES FULLY APPLIED.**
POSSIBLE CAUSE	**CORRECTION**
1. Treadle valve leaking.	1. Perform leakage test and make necessary repairs.
2. Brake chamber leakage.	2. Repair or replace brake chamber.
3. Hose, tubing or fittings leaking.	3. Check all plumbing and make necessary repairs.

CONDITION	**AIR PRESSURE DROPS QUICKLY WITH ENGINE STOPPED AND BRAKES RELEASED.**
POSSIBLE CAUSE	**CORRECTION**
1. Treadle valve leaking.	1. Perform leakage test and make necessary repairs.
2. Hoses, tubing or fittings leaking.	2. Check all plumbing and make necessary repairs.
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POSSIBLE CAUSE	**CORRECTION**
1. Reservoir drain cock opened.	1. Check drain cock. Close if opened.
2. Excessive air leakage from system components.	2. Perform air leakage test, and make necessary repairs.
3. Governor out of adjustment.	3. Check governor setting. Make adjustment, if necessary.
4. Defective air pressure gauge.	4. Replace air pressure gauge.
5. Faulty compressor.	5. Repair or replace.

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CONDITION	AIR PRESSURE RISES TO NORMAL SLOWLY
POSSIBLE CAUSE	**CORRECTION**
1. Engine speed too low.	1. Check speed and make adjustment.
2. Excessive air leakage from system components.	2. Perform air leakage test and make necessary repairs.
3. Faulty air compressor.	3. Repair or replace.
CONDITION	**AIR PRESSURE RISES ABOVE NORMAL**
POSSIBLE CAUSE	**CORRECTION**
1. Defective air gauge.	1. Disconnect gauge and install master gauge. Observe air pressure.
2. Governor out of adjustment.	2. Adjust or replace governor.
3. Restriction in line between governor and compressor unloading mechanism.	3. Check line for kinks or other restrictions. Replace as required.
4. Air compressor unloading mechanism malfunction.	4. Repair or replace as required.

CONDITION	INSUFFICIENT BRAKES
POSSIBLE CAUSE	**CORRECTION**
1. Low air pressure in the brake system, excessive leaks or delivery pressure below normal.	1. Check system pressure. Make necessary repairs.
2. Brake adjustment, lubrication or relining necessary.	2. Check condition of brakes. Make necessary repairs.
3. Mechanical failure of brake wheel component.	3. Check brake wheel components. Make necessary repairs.
4. Restriction in brake air line.	4. Check brake piping for kinks or other restrictions. Repair as required.

BRAKE DIAGNOSTIC CHART

CONDITION	AIR PRESSURE RISES TO NORMAL SLOWLY
POSSIBLE CAUSE	**CORRECTION**
1. Engine speed too low.	1. Check speed and make adjustment.
2. Excessive air leakage from system components.	2. Perform air leakage test and make necessary repairs.
3. Faulty air compressor.	3. Repair or replace.
CONDITION	**AIR PRESSURE RISES ABOVE NORMAL**
POSSIBLE CAUSE	**CORRECTION**
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2. Governor out of adjustment.	2. Adjust or replace governor.
3. Restriction in line between governor and compressor unloading mechanism.	3. Check line for kinks or other restrictions. Replace as required.
4. Air compressor unloading mechanism malfunction.	4. Repair or replace as required.

CONDITION	INSUFFICIENT BRAKES
POSSIBLE CAUSE	**CORRECTION**
1. Low air pressure in the brake system, excessive leaks or delivery pressure below normal.	1. Check system pressure. Make necessary repairs.
2. Brake adjustment, lubrication or relining necessary.	2. Check condition of brakes. Make necessary repairs.
3. Mechanical failure of brake wheel component.	3. Check brake wheel components. Make necessary repairs.
4. Restriction in brake air line.	4. Check brake piping for kinks or other restrictions. Repair as required.

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CONDITION	BRAKES APPLY TOO SLOWLY
POSSIBLE CAUSE	**CORRECTION**
1. Brake adjustment or lubrication necessary.	1. Check brakes and make necessary repairs.
2. Check causes under "Air Pressure Drops Quickly with Engine Stopped and Brakes Fully Applied."	2. Follow corrections as outlined for possible causes.
3. Restriction in tubing or hoses.	3. Check brake piping for kinks or other restrictions.
CONDITION	**BRAKES RELEASE TOO SLOWLY**
POSSIBLE CAUSE	**CORRECTION**
1. Treadle valve not returning to full released position.	1. Check for accumulated dirt, gravel, etc., around treadle valve pedal (floor-mounted valves). Clean and lubricate treadle roller and hinge pin, or repair or replace treadle valve.
2. Brake adjustment or lubrication necessary.	2. Check brakes. Correct as necessary.
3. Restrictions in tubing or hoses.	3. Check brake piping for kinks or other restrictions. Repair as required.
4. Exhaust port of brake valve, quick release valve or relay valve clogged or restricted.	4. Check valves for proper operation. Repair as necessary.

CONDITION	BRAKES DO NOT RELEASE
POSSIBLE CAUSE	**CORRECTION**
1. Broken or weak return springs.	1. Replace faulty springs.
2. Treadle valve not fully released.	2. Repair or replace valve. Clean under pedal and check for seized hinge pin.
3. Restrictions in tubing or hoses.	3. Check brake piping for kinks or other restrictions. Repair as necessary. Check that hand control is not partially applied.
4. Parking brake chamber leaking.	4. Repair or replace.

BRAKE DIAGNOSTIC CHART

CONDITION	BRAKES APPLY TOO SLOWLY
POSSIBLE CAUSE	**CORRECTION**
1. Brake adjustment or lubrication necessary.	1. Check brakes and make necessary repairs.
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3. Restrictions in tubing or hoses.	3. Check brake piping for kinks or other restrictions. Repair as necessary. Check that hand control is not partially applied.
4. Parking brake chamber leaking.	4. Repair or replace.

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CONDITION	BRAKES GRAB
POSSIBLE CAUSE	**CORRECTION**
1. Grease or oil on brake lining.	1. Replace brake lining.
2. Brake drum out of round.	2. Check brake drum for concentricity. If out of round, machine within allowable limitations.
3. Defective brake valve.	3. Repair or replace brake valve.
4. Brake linkage binding.	4. Check brake linkage for freedom of movement.
CONDITION	**UNEVEN BRAKES**
POSSIBLE CAUSE	**CORRECTION**
1. Brake adjustment, lubrication or relining needed.	1. Adjust, lubricate or reline brakes as necessary.
2. Grease or oil on brake linings.	2. Replace brake lining.
3. Brake shoe or chamber release springs broken.	3. Replace springs.
4. Brake drum out of round.	4. Check brake drum concentricity. If out of round, machine within allowable limitations.
5. Brake chamber diaphragm leaking.	5. Repair or replace brake chamber.
CONDITION	**BRAKES DO NOT APPLY**
POSSIBLE CAUSE	**CORRECTION**
1. Restricted or broken tubing or hoses.	1. Check system. Locate problem area. Repair or replace parts.
2. Faulty treadle valve.	2. Repair or replace.

BRAKE DIAGNOSTIC CHART

CONDITION	BRAKES GRAB
POSSIBLE CAUSE	**CORRECTION**
1. Grease or oil on brake lining.	1. Replace brake lining.
2. Brake drum out of round.	2. Check brake drum for concentricity. If out of round, machine within allowable limitations.
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1. Restricted or broken tubing or hoses.	1. Check system. Locate problem area. Repair or replace parts.
2. Faulty treadle valve.	2. Repair or replace.

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SPECIFICATIONS AND CAPACITIES

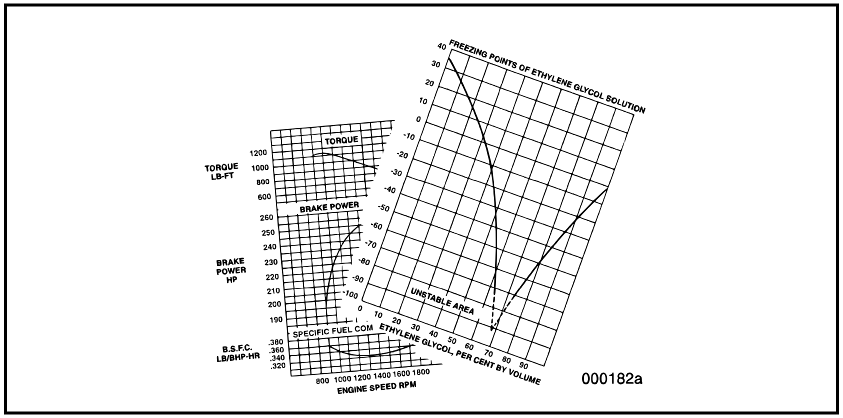

Figure 102 — Specifications and Capacities

NOTE

Components used on certain contract-engineered vehicles may require lubricants other than those specified in this manual. Refer to the operator’s manual supplied with these vehicles for a listing of specified lubricants.

SPECIFICATIONS AND CAPACITIES

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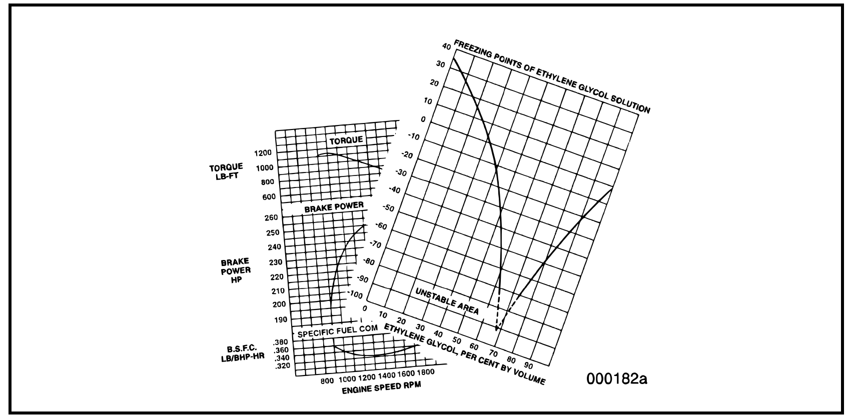

Figure 102 — Specifications and Capacities

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SPECIFICATIONS AND CAPACITIES

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LUBRICANT SPECIFICATIONS

Lubrication of vital engine parts and chassis components, such as oil-lubricated wheel bearings, can best be accomplished by using the highest quality, recommended type and SAE grade lubricants.

To obtain the proper performance level lubricants, show these specifications to your oil supplier. Purchase from a reputable distributor who will assume the responsibility of recommending the proper lubricants for the vehicle. Service components in accordance with MACK recommendations. DO NOT mix brands or types of lubricants.

Engine Oils for MACK Diesel Engines

EO-O PREMIUM PLUS

EO-O Premium Plus (or VDS-4) diesel engine oil is mandatory for use in all 2007 emission compliant MACK MP7 and MP8 engines. Chassis equipped with a 2007 emission compliant engine, which can be identified by the presence of a Diesel Particulate Filter (DPF), also require the use of Ultra Low Sulfur Diesel (ULSD) fuel. EO-O Premium Plus oils exceed the new API service category CJ-4., and have demonstrated high performance capabilities in laboratory and field tests. To satisfy the requirements of EO-O Premium Plus, an oil must pass the MACK T-11 test which measures the ability of the oil to resist soot-related oil thickening, and the MACK T-12 test which is a 300-hour test that measures the resistance of the oil to oxidation at higher oil temperatures and the ability of the oil to control abrasive wear. The T-12 test also measures cylinder wear and bearing abrasive wear. EO-O Premium Plus specification oil must also exceed other industry standard tests that determine general and soot-related wear and resistance to oxidation at higher temperatures.

Use the SAE grade oil as indicated in the following table for seasonal temperature changes.

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Use the SAE grade oil as indicated in the following table for seasonal temperature changes.

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LUBRICANT SPECIFICATIONS

Oil Specification	Ambient Temperature in Degrees °C (°F)	SAE Viscosity Grade	
EO-N Premium Plus ’03	Above –18° (0°)	15W40	5W40**
	Consistently –18° (0°) or below*	10W40	5W40**

* At extremely low temperatures, use an engine block heater to keep the engine warm during extended shutdown or layovers.

** Synthetic Oil

Gear Oils

GO-J and GO-J PLUS specification oils are compounded gear oils (mineral or synthetic base) for use in all MACK components which require gear oil as a lubricant. These two classes of oils have different drain intervals, with GO-J used for standard drain intervals and GO-J PLUS used for extended drain intervals. For an explanation of vehicle usage and an outline of oil change interval mileage/time requirements, refer to “PREVENTIVE MAINTENANCE PROGRAM” on page 14.

NOTE

GO-J and GO-J PLUS gear oils are mandatory for use in all MACK components which require gear oil as a lubricant.

GENERAL REQUIREMENTS

Both GO-J and GO-J PLUS gear oils must be blended from well-refined virgin base stock (or synthetic) and properly compounded with load-carrying and lubricity additives. Water content must be less than 600 ppm (ASTM D-6304, Proc. C). To be approved as MACK Specification GO-J or GO-J PLUS, these oils must meet SAE J 2360, must be stable and must not contain any abrasive or corrosive ingredients.

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GEAR OILS FOR MACK COMPONENTS

Geared Component	Recommended SAE Grade GO-J and GO-J PLUS*	
	Mineral	Synthetic
Carriers	80W90, 80W140, 85W140	75W90, 75W140, 80W140
Flywheel PTO	80W90, 80W140, 85W140	75W90, 75W140, 80W140
Transfer Case	80W90, 80W140, 85W140	75W90, 75W14, 80W140
Oil-Lubricated Wheel Bearings	80W90, 80W140, 85W140	75W90, 75W140, 80W140

* GO-J PLUS is required for MACK geared component extended service drain interval.

GEAR OILS FOR MACK TRANSMISSIONS

Model	Ambient Temperature C° (F°)	Recommended SAE Grade GO-J and GO-J PLUS*	
		Mineral	Synthetic
All MACK Transmissions	All Temperature Operations	80W90, 80W140, 85W140	75W90, 75W140, 80W140

* GO-J PLUS or TO-A PLUS is required for MACK transmission extended service drain interval.

CAUTION

Maximum safe operating oil temperature for MACK transmissions is 121°C (250°F) for mineral-based oil, and 148°C (300°F) for synthetic-based oil.

LUBRICANT SPECIFICATIONS

GEAR OILS FOR MACK COMPONENTS

Geared Component	Recommended SAE Grade GO-J and GO-J PLUS*	
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CAUTION

Maximum safe operating oil temperature for MACK transmissions is 121°C (250°F) for mineral-based oil, and 148°C (300°F) for synthetic-based oil.

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Transmission Oil

TO-A PLUS specification transmission oil is an SAE 40 or 50 grade oil intended for use in all MACK transmissions being used in the Extended Drain Interval Program. For an explanation of vehicle usage and an explanation of oil change interval time/mileage requirements, refer to “PREVENTIVE MAINTENANCE PROGRAM” on page 14. TO-A PLUS is a transmission fluid only.

CAUTION

TO-A PLUS specification oil is intended for use as a transmission lubricant only. DO NOT use TO-A PLUS in transfer cases, carriers or any other component that specified GO-J or GO-J PLUS gear oil.

GENERAL REQUIREMENTS

This oil must be an SAE 40 or 50 transmission oil, must be stable, must not contain any abrasive or corrosive ingredients and must be approved as MACK Specification TO-A PLUS. Water content must be less than 600 ppm ASTM D-6304, Proc. C.

TRANSMISSION FLUID FOR MACK TRANSMISSIONS

Model	Ambient Temperature C° (F°)	Recommended SAE Grade TO-A PLUS*
All MACK Transmissions	All Temperature Operations	SAE 40 or 50

* TO-A PLUS or GO-J PLUS is required for MACK transmission extended service drain interval.

Greases

Grease must be high quality, and free of water, acid or other contents which are harmful to the unit.

LUBRICANT SPECIFICATIONS

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Greases

Grease must be high quality, and free of water, acid or other contents which are harmful to the unit.

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MG-C (CHASSIS LUBE)

General Requirements

This grease shall be composed of oils and such additives as are required to provide the specified properties. This shall be an “EP” grease, and the thickener must be lithium based.

Specific Requirements

NLGI Grade	2
Appearance	Smooth
Worked Penetration:	
60 Strokes, mm/10, D217*	265–295
Dropping point °C (°F), Min., D566* or D2265*	175°C (348°F)
Rust Protection, Rating, Max., D1743*	Pass
Water Washout, 80°C, % Max., D1264*	10
Oil Separation, Mass %, Max., D1742*	10
High Temperature Life, Hrs., Min., D3527*	40
EP Performance:	
Load Wear Index, Kgf, Min., D2596*	30
Weld Point, Kgf, Min., D2596*	200
Timken OK Load, Kg. (Lbs.), Min., D2509*	18 (40)
Four Ball Wear Scar, mm, Max., D2266*	0.6
Water, Mass %, Max., D95*	0.20
Elastomer Compatibility:	Cr NBR-L
Volume Δ , %, D4289*	0 to 30/–5 to +30
Shore A Hardness Δ , Pts. D4289*	0 to –10 /+2 to –15

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Specific Requirements

NLGI Grade	2
Appearance	Smooth
Worked Penetration:	
60 Strokes, mm/10, D217*	265–295
Dropping point °C (°F), Min., D566* or D2265*	175°C (348°F)
Rust Protection, Rating, Max., D1743*	Pass
Water Washout, 80°C, % Max., D1264*	10
Oil Separation, Mass %, Max., D1742*	10
High Temperature Life, Hrs., Min., D3527*	40
EP Performance:	
Load Wear Index, Kgf, Min., D2596*	30
Weld Point, Kgf, Min., D2596*	200
Timken OK Load, Kg. (Lbs.), Min., D2509*	18 (40)
Four Ball Wear Scar, mm, Max., D2266*	0.6
Water, Mass %, Max., D95*	0.20
Elastomer Compatibility:	Cr NBR-L
Volume Δ , %, D4289*	0 to 30/–5 to +30
Shore A Hardness Δ , Pts. D4289*	0 to –10 /+2 to –15

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BASE OIL PROPERTIES

Viscosity, 40°C, cSt. Min., D445*	145
Pour Point, °C (°F), Max., D97*	–15°C (5°F)
Flash Point, °C (°F), Min., D92*	205°C (400°F)
Viscosity Index, Min., D2270*	70

MOLYBDENUM DISULFIDE (WHEN PRESENT)

Concentration, %, Min., X-ray Fluorescent Spectrograph	1.0
Particle Size, Microns, Max., Fisher Subseive	2.0

There is a trend toward the use of multi-purpose grease. Some of the ingredients used in multi-purpose greases are considered fillers or abrasives by the roller bearing manufacturers. The use of these multi-purpose greases may void warranties.

LUBRICANT SPECIFICATIONS

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Viscosity, 40°C, cSt. Min., D445* 145
Pour Point, °C (°F), Max., D97* . . . . –15°C (5°F)
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ANDEROL 776 (EXTREME PRESSURE GREASE)

This grease is a tacky, synthetic diester-based grease containing molybdenum disulfide, and is formulated to have excellent load carrying ability and low friction.

Specific Requirements

Optimum Operating Range, °C (°F)	–40° to 149° (–40° to 300°)
NLGI Number	1
Worked Penetration, D217*	310
Worked Stability, 100,000 strokes, D217*	350
Dropping Point °C (°F), D566*	185° (365°)
Oil Separation, 30 hours @ 100°C (212°F), % FTMS 791, No. 321.2	1
Evaporation, 22 hours @ 99°C (210°F), % D972*	1
Humidity Cabinet, hours, min., ASTM D1748	100
Four Ball Wear, 1200 rpm, 75°C (167°F), 40 KG, hr., mm., D2266*	0.4
Four Ball EP, Weld-Point, KG, ASTM D2783	180

* ASTM test procedure.

BG-A (CLUTCH RELEASE BEARING GREASE)

High temperature grease made for ball and roller bearings. This grease must be NLGI grade 1 or 2, have a minimum melting point of 178°C (350°F), and be stable and non-fibrous.

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RG-A (BRAKE)

An extreme pressure lubricant which has high resistance to corrosion and water leakage, superior adhesive-cohesive properties and low cold shear at sub-zero temperatures. For use in ArvinMeritor™-Standard Stopmaster brakes, it must comply with specification 1779-W-283. Shell Darina No. 1, Sun Sunnaplex No. 1 and Texaco Thermatex EP-1 are approved equivalents.

WG-A (WHEEL BEARING GREASE)

WG-A grease must be composed of only soaps and oils, and must be free of fillers and abrasives. This grease must be non-corrosive to bearing parts in service or storage, and it will show no oil separation in service or storage. Also, WG-A must be a smooth, texture-type grease and have a dropping point in excess of 121°C (250°F) when tested in accordance with ASTM method D217–52T.

Moisture content should not be greater than 0.5%. The oil should have a viscosity of 75 to 100 seconds at 99°C (210°F), near –31°C (0°F) cold test, and it should be a refined product. For normal applications, this grease should have an ASTM penetration at 25°C (77°F) (ASTM method D217–52T) not heavier than 265 when applied to the bearings.

WG-A grease shall not work softer than 310 penetration with 60 strokes in the grease worker or in service. With 5000 strokes in the grease worker, WG-A shall not be softer than 340 penetration. The worked grease (5000 strokes) shall not thicken to an ASTM penetration heavier than 250 when heated to 105°C (220°F) for a test period of 16 hours, and shall not show excessive oil separation after this test.

LUBRICANT SPECIFICATIONS

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SEMI-FLUID GREASE (WHEEL BEARING LUBRICANT)

Semi-fluid grease, such as Mobilith® SHC® 007, is a high-performance, extreme-pressure grease which combines a synthetic-base fluid with a lithium complex soap thickener. The thickener system provides structural stability, a high dropping point and excellent resistance to water wash.

Specific Requirements

NLGI Grade	00
Soap Type	Lithium Complex
Structure, Visual	Smooth: Tacky
Color, Visual	Red
Worked Penetration:	
• 60 strokes, ASTM D217	415
• 10,000 strokes, ASTM D217	420
• 100,000 strokes, ASTM D217	420
Viscosity of Oil, ASTM D445	
• cSt @ 40°C	460
• cSt @ 100°C	46.5
• SUS @ 100°F	2400
• SUS @ 210°F	215
ISO VG	460
EP and Wear Protection	
• Four-Ball Wear Test, ASTM D2266	Scar diameter, 0.70 mm max.
• Four-Ball EP Weld Load, ASTM D2596	250 kg
• Load Wear Index	45
Corrosion Prevention, ASTM D1743, rust test Pass Emcor/SKF Water Wash Test, IP 220 (modified)	0.0
US Steel Mobility, g/min. 18°C (64.4°F)	27
Bomb Oxidation, ASTM D942, psi loss,	
• 100 hour 210°F	2
• 500 hour 210°F	4

LUBRICANT SPECIFICATIONS

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Specific Requirements

NLGI Grade 00
Soap Type Lithium Complex
Structure, Visual Smooth: Tacky
Color, Visual Red
Worked Penetration:
• 60 strokes, ASTM D217 415
• 10,000 strokes, ASTM D217 420
• 100,000 strokes, ASTM D217 420
Viscosity of Oil, ASTM D445
• cSt @ 40°C 460
• cSt @ 100°C 46.5
• SUS @ 100°F 2400
• SUS @ 210°F 215
ISO VG 460
EP and Wear Protection
• Four-Ball Wear Test, ASTM D2266 Scar diameter, 0.70 mm max.
• Four-Ball EP Weld Load, ASTM D2596 250 kg
• Load Wear Index 45
Corrosion Prevention, ASTM D1743, rust test Pass Emcor/SKF Water Wash Test, IP 220 (modified) 0.0
US Steel Mobility, g/min. 18°C (64.4°F) 27
Bomb Oxidation, ASTM D942, psi loss,
• 100 hour 210°F 2
• 500 hour 210°F 4

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Fluids

Fluids must be high quality and free from water, acid or other contents which are harmful to the unit.

BF-B (BRAKE FLUID)

Use heavy-duty-type hydraulic brake fluid meeting the specifications of FMVSS116, type DOT 3, 4 or 5.

CF-A (CAB TILT)

Use fluid meeting military specification MIL-H-5606E.

Power Steering Fluid

Use DEXRON®-type automatic transmission fluid in the power steering system as specified by the label located on the power steering reservoir.

NOTE

DEXRON®-type automatic transmission fluid was implemented into production in the power steering system on certain model chassis during December 2005, whereas certain other models use engine oil. Always refer to the label located on the power steering reservoir when adding fluid to the power steering system to ensure the proper fluid is used.

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DIESEL FUEL

DF-A (Ultra Low Sulfur Diesel Fuel Grades #1D and #2D)

The proper selection of fuel is essential for good economy, performance and engine life. No. 2D ULSD should be used when climatic conditions permit. No. 1D ULSD can be used during cold weather conditions. Blends of No. 1D and No. 2D ULSD fuels can be used to suit various climatic conditions. The chart below contains mixing proportions for No. 1D and No. 2D ULSD fuels.

Recommended Fuel Mixing Proportions		
Ambient Air Temperature	**No. 2 ULSD Fuel**	**No. 1 ULSD Fuel**
Above 0°C (32°F)	100%	0%
0°C to –10°C (32°F to 14°F)	90%	10%
–10°C to –20°C (14°F to –4°F)	70%	30%
Below –20°C (–4°F)	50%	50%

CAUTION

Diesel engines for 2007 and later model year vehicles are designed to operate only with Ultra Low Sulfur Diesel (ULSD) fuel. Use of fuel other than ULSD will reduce the efficiency and durability of the engine, permanently damage the advanced emission control systems, reduce fuel economy and possibly prevent the engine from running at all. Manufacturer's warranties are likely to be rendered void by usage of improper or incorrect fuel, and usage of fuels other than ULSD fuel in diesel-powered vehicles is illegal and punishable with civil penalties. Use of fuel additives to compensate for the lower sulfur content is ***NOT*** *recommended by Mack Trucks.*

Always used good quality fuel meeting the specifications given in the following table.

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Property	Requirements		ASTM Method
	#2 ULSD	#1 ULSD	
Viscosity, cSt @ 40°C (104°F)	2.2–3.0	1.3–2.4	D445
API Gravity @ 15°C (60°F)	32–38	38–42	D287
Volatility, °C (°F)			
IBP, Min.	160 (320)	160 (320)	D86
50%	246 to 288 (475 to 550)	221 to 238 (430 to 460)	
90%, Max.	338 (640)	260 to 288 (500 to 550)	
Cetane Number, Min.	43	43	D613
Lubricity, (mm) Max	520	520	D6079-02
Reflectance, %	80	80	D6468
Total Sulfur, % Max.	0.0015	0.0015	D4294
Pour Point, °C (°F)	–23 (–10) during winter months	–29 (–20) Max.	D97
Corrosion — Copper Strip @ 100°C (212°F)	No. 3B	ASTM 1-Max.	D130
Conradson Carbon on 10% Residium, Max.	0.35	0.25	D4530
Ash Content, % Max.	0.01	0.01	D482
Water and Sediment, % Max.	0.05	0.05	D1796
Flash Point, °C (°F)	52 (125)	52 (125)	D93
Rust Prevention	Light Rusting Max.	Light Rusting Max.	D665A

The products furnished under this specification may be either cracked residuals or straight-run distillates, provided they come within the scope of the specifications listed in the table above. Straight-run distillates, however, are preferred to recycled or cracked fuels.

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NOTE

For premium diesel fuel, use the Engine Manufacturer's Association recommended specification FQP1B.

BioDiesel

Soy Methyl Ester (SME or SOME) BioDiesel fuel in blends up to a B5 concentration (5% blend) is approved by Mack Trucks, Inc.

NOTE

Although higher concentrations are available, concentrations up to B5 (maximum) are the only blends currently approved by Mack Trucks, Inc.

NOTE

MACK Engines are certified to comply with U.S. EPA and California Air Resources Board (CARB) emissions standards based on the use of reference test fuels commonly available in the United States and specified in this manual. Use of alternative fuels, including BioDiesel, may affect engine emissions. Mack Trucks, Inc. does not warrant, and is not responsible for ensuring that the engines will comply with U.S. EPA and CARB emissions standards.

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Handling and Storing Diesel Fuel

Correct handling and storage of diesel fuel during cold and/or inclement winter weather is a key to satisfactory truck performance and reliability.

Observe the following hints and suggestions:

- Storage tanks for diesel fuel should permit periodic removal of sludge and water accumulations. This should be performed on a regular basis at approximately 10-day intervals.
- Fuel should be stored only in clean, non-contaminated tanks situated in a cool, dry location.

NOTE

Never store diesel fuel in a galvanized container. The fuel will dissolve the zinc in the galvanized coating. This zinc will remain in solution in the fuel until it is run through the engine where it will be deposited in the unit injectors causing serious damage.

- When parking the vehicle overnight or longer, fill the fuel tank(s) to prevent build-up of condensation inside the tank(s).
- Remove accumulations of snow, ice, oil or other debris from the area of the filler cap before removing the cap from the tank. Also, remove snow-ice accumulations at the fuel tank vent.

Diesel Fuel and Winter Operation

For winter operation, certain fuel properties become more critical. These properties include:

- Cetane Number — A measure of the ignition value, or the time required to heat, vaporize and ignite the fuel. The higher this rating number, the faster the fuel will burn.
- Pour Point — A temperature-related point at which fuel will no longer flow through the fuel lines and cannot be pumped.

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- Cloud Point — A temperature-related point at which fuel may continue to flow through the fuel lines but filter restriction (plugging) can occur due to crystallizing of the heavier parafinic components of the fuel (also referred to as *jelling* or *waxing* in the fuel).
- Impurities — Water and sediment are of particular importance. Water contamination can cause fuel line freeze-up, unit injector and nozzle damage, as well as component corrosion.

NOTE

When operating in cold weather, fuel waxing can cause many engine performance problems. Be sure to check for fuel jelling or waxing before proceeding with any engine troubleshooting procedures.

Diesel Fuel Additives

Due to potential damage to the fuel system or engine, the use of supplemental diesel fuel additives other than those added by the fuel manufacturer is not recommended by Mack Trucks, Inc.

NOTE

Adding isopropyl alcohol to reduce water contamination and freezing is NOT recommended.

CAUTION

Never blend gasoline with diesel fuel. This practice can cause an explosive mixture resulting in component destruction and engine/fuel system damage.

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CETANE IMPROVERS

Mack Trucks, Inc. currently approves the use of cetane improvers and certain pour-point depressants to improve the combustibility and flow characteristics of the fuel *only if these additives are contained in the fuel as delivered* and not added by the consumer.

NOTE

- Be aware that the minimum cetane rating is now 43 instead of 40, but higher ratings may still be necessary for operation in high altitudes or extreme cold weather.
- Also note that some industry experts state that cetane improvers may cause fuel system *gum-up* problems.

Cetane improvers have the following benefits:

- Easier cold weather starting
- Smoother engine operation
- Reduced diesel knock
- Faster engine warm-up
- Lower emissions
- Reduced misfire and white smoke cleanup time

Fuel Warmers

The use of thermostatically controlled fuel warmers which will maintain fuel temperatures above the gel point and below the flash point of the fuel.

NOTE

The only fuel warmers approved for use on MACK engines are those which use the coolant to regulate the temperature of the fuel. Exhaust gas fuel warmers are not satisfactory, nor are they approved for use.

DIESEL FUEL

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Engine Block Heater

The combination of a fuel warmer, one which uses the engine coolant as the heating medium, and a block heater will alleviate winter starting and operating problems associated with fuel waxing.

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Figure 103 — Engine Block Heaters

DIESEL FUEL

Engine Block Heater

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Figure 103 — Engine Block Heaters

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ANTIFREEZE SPECIFICATIONS

Ethylene glycol- or propylene glycol-based antifreezes are required in MACK Class 8 trucks. All ethylene-glycol and propylene-glycol coolants must be low silicate antifreezes which meet ASTM D4985 test and TMC RP329 criteria. These antifreezes are sometimes referred to as heavy-duty diesel coolants. Passenger car coolants do NOT meet this specification.

Be sure to maintain the required level of antifreeze protection for anticipated winter temperatures in your area of operation. Mack Trucks, Inc. recommends an antifreeze mix in the range between 40% to 60%, depending upon climatic conditions in which the vehicle will be operated.

CAUTION

Do not exceed a 60% solution of ethylene glycol or propylene glycol to water. A higher percentage will not increase protection. Concentrations over 60% adversely affect freeze protection and heat transfer rates.

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CAUTION

Do not exceed a 60% solution of ethylene glycol or propylene glycol to water. A higher percentage will not increase protection. Concentrations over 60% adversely affect freeze protection and heat transfer rates.

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Additional guidelines for maintaining correct antifreeze protection include the following:

- Do not use antifreeze containing anti-leak additives in trucks equipped with coolant filters or conditioners. Also, do not use soluble oil type antifreeze in any MACK cooling system.
- Always mix the water/antifreeze solution before adding it to the cooling system.
- After adding coolant, run the engine until a minimum normal operating temperature is reached. Check the coolant level and add coolant as needed.
- Concentration of antifreeze in the cooling system must be checked with a refractometer twice per year.
- Change coolant at the recommended interval as outlined in “COOLING SYSTEM” on page 91.

A proper coolant mixture contains MACK-approved antifreeze and quality water meeting the minimum acceptable specifications listed in the following table:

Property	Limit	ASTM Test Method
Chloride (Cl), gr/gal (ppm)	2.4 (40) max.	D512b, D512d, D4327
Sulfate (SO4), gr/gal (ppm)	5.9 (100) max.	D516b, D516d, D4327
Total Hardness, gr/gal (ppm)	10 (170) max.	D1126b
Total Solids, gr/gal (ppm)	20 (340)	D1293

Water can be tested by any reputable testing laboratory. If water meeting the above specifications is not available, use de-ionized or distilled water rather than ordinary tap water to minimize the adverse effects of minerals in the water.

ANTIFREEZE SPECIFICATIONS

Additional guidelines for maintaining correct antifreeze protection include the following:

- Do not use antifreeze containing anti-leak additives in trucks equipped with coolant filters or conditioners. Also, do not use soluble oil type antifreeze in any MACK cooling system.
- Always mix the water/antifreeze solution before adding it to the cooling system.
- After adding coolant, run the engine until a minimum normal operating temperature is reached. Check the coolant level and add coolant as needed.
- Concentration of antifreeze in the cooling system must be checked with a refractometer twice per year.
- Change coolant at the recommended interval as outlined in “COOLING SYSTEM” on page 91.

A proper coolant mixture contains MACK-approved antifreeze and quality water meeting the minimum acceptable specifications listed in the following table:

Property	Limit	ASTM Test Method
Chloride (Cl), gr/gal (ppm)	2.4 (40) max.	D512b, D512d, D4327
Sulfate (SO4), gr/gal (ppm)	5.9 (100) max.	D516b, D516d, D4327
Total Hardness, gr/gal (ppm)	10 (170) max.	D1126b
Total Solids, gr/gal (ppm)	20 (340)	D1293

Water can be tested by any reputable testing laboratory. If water meeting the above specifications is not available, use de-ionized or distilled water rather than ordinary tap water to minimize the adverse effects of minerals in the water.

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COOLANT CAPACITIES

Coolant System Capacities

CAUTION

Capacities may vary due to hoses and size of radiator, as well as accessory cooling equipment. After running the engine until normal operating temperature is reached, check the coolant level and add coolant as needed.

Use the chart shown below in conjunction with the Ethylene-Glycol and Propylene-Glycol Protection Charts in this section to determine the amount of antifreeze needed to protect your vehicle.

Chassis Model	Engine Model	Coolant Capacity in Liters (Quarts)
CXU	MP7* MP8*	52 (55) 54 (57)
CHU	MP7* MP8*	52 (55) 54 (57)
GU7	MP7* MP8*	52 (55) 54 (57)
GU8	MP7* MP8*	52 (55) 54 (57)
MRU	MP7* MP8**	48 (51) 52 (55)
LEU	MP7***	58 (61)

* Coolant capacities listed are for chassis equipped with manual transmissions. For automatic transmissions, add 9.5 liters (10 qts.).

** Allison automatic transmission is not an available option for MRU models equipped with an MP8 engine.

*** LEU models are not available with a manual transmission.

COOLANT CAPACITIES

COOLANT CAPACITIES

Coolant System Capacities

CAUTION

Capacities may vary due to hoses and size of radiator, as well as accessory cooling equipment. After running the engine until normal operating temperature is reached, check the coolant level and add coolant as needed.

Use the chart shown below in conjunction with the Ethylene-Glycol and Propylene-Glycol Protection Charts in this section to determine the amount of antifreeze needed to protect your vehicle.

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GU7	MP7* MP8*	52 (55) 54 (57)
GU8	MP7* MP8*	52 (55) 54 (57)
MRU	MP7* MP8**	48 (51) 52 (55)
LEU	MP7***	58 (61)

* Coolant capacities listed are for chassis equipped with manual transmissions. For automatic transmissions, add 9.5 liters (10 qts.).

** Allison automatic transmission is not an available option for MRU models equipped with an MP8 engine.

*** LEU models are not available with a manual transmission.

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Use the following antifreeze protection charts to determine the percentage of antifreeze needed to achieve specific protection levels for various coolant systems.

ETHYLENE-GLYCOL PROTECTION CHART

Ethylene Glycol	Ambient Air Temperature
40%	–24°C (–12°F)
50%	–37°C (–34°F)
60%	–52°C (–62°F)

PROPYLENE-GLYCOL PROTECTION CHART

Propylene Glycol	Ambient Air Temperature
40%	–21°C (–6°F)
50%	–33°C (–27°F)
60%	–49°C (–56°F)

COOLANT CAPACITIES

Use the following antifreeze protection charts to determine the percentage of antifreeze needed to achieve specific protection levels for various coolant systems.

ETHYLENE-GLYCOL PROTECTION CHART

Ethylene Glycol	Ambient Air Temperature
40%	–24°C (–12°F)
50%	–37°C (–34°F)
60%	–52°C (–62°F)

PROPYLENE-GLYCOL PROTECTION CHART

Propylene Glycol	Ambient Air Temperature
40%	–21°C (–6°F)
50%	–33°C (–27°F)
60%	–49°C (–56°F)

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LUBRICANTS AND CAPACITIES

NOTE

Components used on certain contract-engineered vehicles may require lubricants other than those specified in this manual. Refer to the operator's manual supplied with these vehicles for a listing of specified lubricants.

MACK Engines

(See table on page 268 for recommended SAE Grades)

Engine	Lubricant	System Capacity* Liters (Quarts)
MACK MP7	EO-O Premium Plus	36 (38)
MACK MP8 Plastic Oil Pan Steel Oil Pan (forward sump) Steel Oil Pan (rear sump)		 33 (34.9) 37 (39.1) 33 (34.9)

* Total system capacity (dry, after engine overhaul).

LUBRICANTS AND CAPACITIES

LUBRICANTS AND CAPACITIES

NOTE

Components used on certain contract-engineered vehicles may require lubricants other than those specified in this manual. Refer to the operator's manual supplied with these vehicles for a listing of specified lubricants.

MACK Engines

(See table on page 268 for recommended SAE Grades)

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MACK MP7	EO-O Premium Plus	36 (38)
MACK MP8 Plastic Oil Pan Steel Oil Pan (forward sump) Steel Oil Pan (rear sump)		 33 (34.9) 37 (39.1) 33 (34.9)

* Total system capacity (dry, after engine overhaul).

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Oil Change Capacity:

- MP7 Engines
  - — 30 liters (31.7 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters
- MP8 Engines
  - — Plastic Oil Pan (highway models only) — 27 liters (28.5 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters
  - — Steel Oil Pan (axle back vocational vehicles with front sump) — 31 liters (32.8 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters
  - — Steel Oil Pan (axle forward vocational vehicles with rear sump) — 27 liters (28.5 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters

LUBRICANTS AND CAPACITIES

Oil Change Capacity:

- MP7 Engines
  - — 30 liters (31.7 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters
- MP8 Engines
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  - — Steel Oil Pan (axle back vocational vehicles with front sump) — 31 liters (32.8 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters
  - — Steel Oil Pan (axle forward vocational vehicles with rear sump) — 27 liters (28.5 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters

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MACK MAXITORQUE® ES T300 Series Transmissions

(Refer to “GEAR OILS FOR MACK TRANSMISSIONS” on page 269 for recommended SAE grades)

T300 Model Designation	Lubricant	Capacity* Liters (Pints)
T306G	GO-J, GO-J PLUS**, TO-A PLUS**	9.5 (20)
TM308		11.4 (24)
TM308M		14.2 (30)
T309		11.4 (24)
T309LR		11.4 (24)
TM309		11.4 (24)
TM309M		14.2 (30)
T310		11.4 (24)
T310M/MLR		14.2 (30)
T310ME		14.2 (30)
T313LR		14.2 (30)
T313		14.2 (30)
T318LR		14.2 (30)
T318		14.2 (30)
T313LR21		14.2 (30)
T318LR21		14.2 (30)

* Exact amount depends on inclination of transmission. Also, if equipped with a transmission oil cooler or RMPTO, specified oil capacity may vary. Fill to level of filler opening. DO NOT overfill.

** GO-J PLUS and TO-A PLUS required for extended drain interval. TO-A PLUS is a transmission lubricant only, and not to be used in other geared components.

LUBRICANTS AND CAPACITIES

MACK MAXITORQUE® ES T300 Series Transmissions

(Refer to “GEAR OILS FOR MACK TRANSMISSIONS” on page 269 for recommended SAE grades)

T300 Model Designation	Lubricant	Capacity* Liters (Pints)
T306G	GO-J, GO-J PLUS**, TO-A PLUS**	9.5 (20)
TM308		11.4 (24)
TM308M		14.2 (30)
T309		11.4 (24)
T309LR		11.4 (24)
TM309		11.4 (24)
TM309M		14.2 (30)
T310		11.4 (24)
T310M/MLR		14.2 (30)
T310ME		14.2 (30)
T313LR		14.2 (30)
T313		14.2 (30)
T318LR		14.2 (30)
T318		14.2 (30)
T313LR21		14.2 (30)
T318LR21		14.2 (30)

* Exact amount depends on inclination of transmission. Also, if equipped with a transmission oil cooler or RMPTO, specified oil capacity may vary. Fill to level of filler opening. DO NOT overfill.

** GO-J PLUS and TO-A PLUS required for extended drain interval. TO-A PLUS is a transmission lubricant only, and not to be used in other geared components.

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Allison Transmissions*

ALLISON TRANSMISSION LUBRICANTS AND CAPACITIES

Transmission*	Lubricant	Capacity — Liters (Quarts) Initial Fill**	Capacity — Liters (Quarts) Refill***
4000/4500 RDS/EVS/HS	MIL-PRF-46167 Castrol® TranSynd® or Dexron® VI		
Deep oil sump with PTO		48 (51)	43 (45)
Shallow sump with PTO		41 (43)	33 (34)
Deep oil sump without PTO		45 (48)	40 (42)
Shallow sump without PTO		38 (40)	30 (31)

Grade (SAE) or oil type	Minimum Ambient Temperature °C (°F)
MIL-PRF-46167 0W-20 (Arctic oil) TranSynd®	–32 (–25) –30 (–22)
Dexron® VI	–25 (–13)
10W	–20 (–4)
15W-40	–15 (5)
30W	0 (32)
40W	10 (50)

Temperatures below those listed above require pre-heat.

* All capacities are for the transmission alone and do not include external piping such as for filters, coolers, etc.

** Initial fill capacity is the amount of lubricant needed to fill a totally dry transmission such as after an overhaul.

*** Refill capacity is the amount of lubricant needed to fill a unit that has been drained for the purpose of changing the transmission fluid.

For Allison transmission oil level check and change intervals, refer to the Allison transmission service literature.

LUBRICANTS AND CAPACITIES

Allison Transmissions*

ALLISON TRANSMISSION LUBRICANTS AND CAPACITIES

Transmission*	Lubricant	Capacity — Liters (Quarts) Initial Fill**	Capacity — Liters (Quarts) Refill***
4000/4500 RDS/EVS/HS	MIL-PRF-46167 Castrol® TranSynd® or Dexron® VI		
Deep oil sump with PTO		48 (51)	43 (45)
Shallow sump with PTO		41 (43)	33 (34)
Deep oil sump without PTO		45 (48)	40 (42)
Shallow sump without PTO		38 (40)	30 (31)

Grade (SAE) or oil type	Minimum Ambient Temperature °C (°F)
MIL-PRF-46167 0W-20 (Arctic oil) TranSynd®	–32 (–25) –30 (–22)
Dexron® VI	–25 (–13)
10W	–20 (–4)
15W-40	–15 (5)
30W	0 (32)
40W	10 (50)

Temperatures below those listed above require pre-heat.

* All capacities are for the transmission alone and do not include external piping such as for filters, coolers, etc.

** Initial fill capacity is the amount of lubricant needed to fill a totally dry transmission such as after an overhaul.

*** Refill capacity is the amount of lubricant needed to fill a unit that has been drained for the purpose of changing the transmission fluid.

For Allison transmission oil level check and change intervals, refer to the Allison transmission service literature.

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Eaton® Fuller® Manual Transmissions

EATON® FULLER® MANUAL TRANSMISSIONS

Transmission	Lubricant**		Capacity Liters (Pints)*
9 Speeds	Eaton-Approved Synthetic Transmission Lubricant Specification PS-164 Rev 7*** (refer to Note 2 on page 25)		
RT-13609 Series			12.7 (27)
RT-14609 Series			12.7 (27)
RT-16709 Series			12.7 (27)
10 Speeds	Grade (SAE)	Ambient Temp. °C (°F)	
RT-14908LL Series	50	All Temperatures	13 (28)
RT-16908LL Series			13 (28)
FR-13210 Series			11.1 (23.5)
FR-14210 Series			11.1 (23.5)
FR-15210 Series			11.1 (23.5)
FR-16210 Series			11.1 (23.5)
FRO-18210C			11.1 (23.5)
	The following oil specifications are not approved for extended drain intervals or the Eaton extended warranty program. Heavy-Duty Engine Oil Meeting Specification MIL-L-2104 D or Caterpillar TO-4		
11 Speeds			
RTO-14909ALL			13 (28)
RTO-16909ALL			13 (28)
13 Speeds	Grade (SAE)	Ambient Temp. °C (°F)	
RT-14913 Series	50	Above –12° (10°)	13 (28)
RT-16913 Series	40	Above –12° (10°)	13 (28)
RTLO-18913A	30	Below –12° (10°)	13 (28)
15 Speeds			
RT-14915 Series			13 (28)
RT-16915 Series			13 (28)
18 Speeds	Refer to lubricant specifications on previous page.		
RT-14918 Series			13 (28)
RTLO-16918B			13 (28)
RTLO-18918B			13 (28)

* Capacities listed are approximate. Exact amount depends upon degree of engine and transmission inclination. Always fill transmission to level of filler plug hole. DO NOT overfill. Capacity of transmissions equipped with PTOs or oil coolers will be greater than capacities listed.

** Do not use multi-viscosity or EP (Extreme Pressure) GL-5 gear oils. **DO NOT MIX OILS IN THE TRANSMISSION**.

*** Eaton-approved synthetic lubricants are required for extended drain intervals and the Eaton extended warranty. Refer to Eaton® Fuller® service literature for recommended drain intervals and warranty information.

LUBRICANTS AND CAPACITIES

Eaton® Fuller® Manual Transmissions

EATON® FULLER® MANUAL TRANSMISSIONS

Transmission | Lubricant** | Capacity Liters (Pints)*
9 Speeds | Eaton-Approved Synthetic Transmission Lubricant Specification PS-164 Rev 7*** (refer to Note 2 on page 25)
RT-13609 Series 12.7 (27)
RT-14609 Series 12.7 (27)
RT-16709 Series 12.7 (27)
10 Speeds | Grade (SAE) | Ambient Temp. °C (°F)
RT-14908LL Series 50 All Temperatures 13 (28)
RT-16908LL Series 13 (28)
FR-13210 Series 11.1 (23.5)
FR-14210 Series 11.1 (23.5)
FR-15210 Series 11.1 (23.5)
FR-16210 Series 11.1 (23.5)
FRO-18210C 11.1 (23.5)
The following oil specifications are not approved for extended drain intervals or the Eaton extended warranty program. Heavy-Duty Engine Oil Meeting Specification MIL-L-2104 D or Caterpillar TO-4
11 Speeds
RTO-14909ALL 13 (28)
RTO-16909ALL 13 (28)
13 Speeds | Grade (SAE) | Ambient Temp. °C (°F)
RT-14913 Series 50 Above –12° (10°) 13 (28)
RT-16913 Series 40 Above –12° (10°) 13 (28)
RTLO-18913A 30 Below –12° (10°) 13 (28)
15 Speeds
RT-14915 Series 13 (28)
RT-16915 Series 13 (28)
18 Speeds | Refer to lubricant specifications on previous page.
RT-14918 Series 13 (28)
RTLO-16918B 13 (28)
RTLO-18918B 13 (28)

* Capacities listed are approximate. Exact amount depends upon degree of engine and transmission inclination. Always fill transmission to level of filler plug hole. DO NOT overfill. Capacity of transmissions equipped with PTOs or oil coolers will be greater than capacities listed.

** Do not use multi-viscosity or EP (Extreme Pressure) GL-5 gear oils. DO NOT MIX OILS IN THE TRANSMISSION.

*** Eaton-approved synthetic lubricants are required for extended drain intervals and the Eaton extended warranty. Refer to Eaton® Fuller® service literature for recommended drain intervals and warranty information.

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EATON® FULLER® AUTOSHIFT™

Model	Lubricant*	Capacity Liters (Pints)**
	Eaton-Approved Synthetic Transmission Lubricant Specification PS-164 Rev 7*** (refer to Note 2 on page 25)	
	Grade (SAE) Ambient Temp. °C (°F)	
10 Speed RTO-14910(B)(C)-AS3		12 (26)
	50 All Temperatures	
RTO-16910(B)(C)-AS3		12 (26)
18 Speed RTLO-14918(A)-AS3	The following oil specifications are not approved for extended drain intervals or the Eaton extended warranty.	13 (28)
	Heavy-Duty Engine Oil	
RTLO-16918A-AS3	Meeting Specification	13 (28)
	MIL-L-2104 D	
	or	
	Caterpillar TO-4	
	Grade (SAE) Ambient Temp. °C (°F)	
	50 Above –12° (10°)	
	40 Above –12° (10°)	
	30 Below –12° (10°)	

* Do not use multi-viscosity or EP (Extreme Pressure) GL-5 gear oils. **DO NOT MIX OILS IN THE TRANSMISSION**.

** Capacities listed are approximate. Exact amount depends upon degree of engine and transmission inclination. Always fill transmission to level of filter plug hole. DO NOT overfill. Capacity of transmissions equipped with PTOs or oil coolers will be greater than capacities listed.

*** Eaton-approved synthetic lubricants are required for extended drain intervals and the Eaton extended warranty. Refer to Eaton® Fuller® service literature for recommended drain intervals and warranty information.

LUBRICANTS AND CAPACITIES

EATON® FULLER® AUTOSHIFT™

Model	Lubricant*	Capacity Liters (Pints)**
	Eaton-Approved Synthetic Transmission Lubricant Specification PS-164 Rev 7*** (refer to Note 2 on page 25)	
	Grade (SAE) Ambient Temp. °C (°F)	
10 Speed RTO-14910(B)(C)-AS3		12 (26)
	50 All Temperatures	
RTO-16910(B)(C)-AS3		12 (26)
18 Speed RTLO-14918(A)-AS3	The following oil specifications are not approved for extended drain intervals or the Eaton extended warranty.	13 (28)
	Heavy-Duty Engine Oil	
RTLO-16918A-AS3	Meeting Specification	13 (28)
	MIL-L-2104 D	
	or	
	Caterpillar TO-4	
	Grade (SAE) Ambient Temp. °C (°F)	
	50 Above –12° (10°)	
	40 Above –12° (10°)	
	30 Below –12° (10°)	

* Do not use multi-viscosity or EP (Extreme Pressure) GL-5 gear oils. **DO NOT MIX OILS IN THE TRANSMISSION**.

** Capacities listed are approximate. Exact amount depends upon degree of engine and transmission inclination. Always fill transmission to level of filter plug hole. DO NOT overfill. Capacity of transmissions equipped with PTOs or oil coolers will be greater than capacities listed.

*** Eaton-approved synthetic lubricants are required for extended drain intervals and the Eaton extended warranty. Refer to Eaton® Fuller® service literature for recommended drain intervals and warranty information.

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EATON® FULLER® ULTRASHIFT™

Transmission*	Lubricant	Capacity Liters (Pints)
RTO-14910B-DM3 RTO-16910B-DM3	Eaton-Approved Synthetic Transmission Lubricant Specification PS-164 Rev 7*** (refer to Note 2 on page 25) Grade (SAE) — Ambient Temp. °C (°F) 50 — All Temperatures The following oil specifications are not approved for extended drain intervals or the Eaton extended warranty. Heavy-Duty Engine Oil Meeting Specification MIL-L-2104 D or Caterpillar TO-4 Grade (SAE) — Ambient Temp. °C (°F) 50 — Above –12° (10°) 40 — Above –12° (10°) 30 — Below –12° (10°)	12 (26) 12 (26)

* Do not use multi-viscosity or EP (Extreme Pressure) GL-5 gear oils. **DO NOT MIX OILS IN THE TRANSMISSION**.

** Capacities listed are approximate. Exact amount depends upon degree of engine and transmission inclination. Always fill transmission to level of filler plug hole. DO NOT overfill. Capacity of transmissions equipped with PTOs or oil coolers will be greater than capacities listed.

*** Eaton-approved synthetic lubricants are required for extended drain intervals and the Eaton extended warranty. Refer to Eaton® Fuller® service literature for recommended drain intervals and warranty information.

LUBRICANTS AND CAPACITIES

EATON® FULLER® ULTRASHIFT™

Transmission*	Lubricant	Capacity Liters (Pints)
RTO-14910B-DM3 RTO-16910B-DM3	Eaton-Approved Synthetic Transmission Lubricant Specification PS-164 Rev 7*** (refer to Note 2 on page 25) Grade (SAE) — Ambient Temp. °C (°F) 50 — All Temperatures The following oil specifications are not approved for extended drain intervals or the Eaton extended warranty. Heavy-Duty Engine Oil Meeting Specification MIL-L-2104 D or Caterpillar TO-4 Grade (SAE) — Ambient Temp. °C (°F) 50 — Above –12° (10°) 40 — Above –12° (10°) 30 — Below –12° (10°)	12 (26) 12 (26)

* Do not use multi-viscosity or EP (Extreme Pressure) GL-5 gear oils. **DO NOT MIX OILS IN THE TRANSMISSION**.

** Capacities listed are approximate. Exact amount depends upon degree of engine and transmission inclination. Always fill transmission to level of filler plug hole. DO NOT overfill. Capacity of transmissions equipped with PTOs or oil coolers will be greater than capacities listed.

*** Eaton-approved synthetic lubricants are required for extended drain intervals and the Eaton extended warranty. Refer to Eaton® Fuller® service literature for recommended drain intervals and warranty information.

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Steering System

STEERING SYSTEM LUBRICANTS AND CAPACITIES

Steering System	Lubricant	Capacity Liters (Pints)
Power Steering Reservoir Capacity	DEXRON®-type automatic transmission fluid	1.9 (4) Single Gear 3.8 (8) Dual Gear

NOTE

Beginning December 2005, Mack Trucks, Inc. began phasing DEXRON® III into production as the factory fill for the power steering system. Vehicles utilizing DEXRON®-type automatic transmission fluid in the power steering system are identified by the label affixed to the power steering reservoir. When adding fluid to the power steering system, always check the label on the side of the reservoir and be sure to use the correct fluid.

LUBRICANTS AND CAPACITIES

Steering System

STEERING SYSTEM LUBRICANTS AND CAPACITIES

Steering System	Lubricant	Capacity Liters (Pints)
Power Steering Reservoir Capacity	DEXRON®-type automatic transmission fluid	1.9 (4) Single Gear 3.8 (8) Dual Gear

NOTE

Beginning December 2005, Mack Trucks, Inc. began phasing DEXRON® III into production as the factory fill for the power steering system. Vehicles utilizing DEXRON®-type automatic transmission fluid in the power steering system are identified by the label affixed to the power steering reservoir. When adding fluid to the power steering system, always check the label on the side of the reservoir and be sure to use the correct fluid.

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Rear Axles

(See "GEAR OILS FOR MACK COMPONENTS" on page 269 for MACK recommended SAE grades)

REAR AXLE LUBRICANTS AND CAPACITIES

Rear Axle	Carrier	Lubricant	Capacity Liters (Pints)
MACK			
RA23R	CRD203 (1)	GO-J/GO-J PLUS*	16.3 (34.5)
ArvinMeritor™			
RS-23-161	R160 Series	GL-5 or MIL-PRF-2105E	17.6 (37.2)
		GL-5 or MIL-PRF-2105E	
RS-23-186	R180 Series	GL-5 or MIL-PRF-2105E	22.4 (47.3)
Eaton/Dana			
S23-190	S23-190	GL-5 or MIL-PRF-2105E	17.5 (37)

* GO-J PLUS required for MACK geared component extended service drain interval.

For service information, SAE grades and lubricant change intervals for axles other than those manufactured by Mack Trucks, Inc., refer to the specific axle manufacturer's service literature.

LUBRICANTS AND CAPACITIES

Rear Axles

(See "GEAR OILS FOR MACK COMPONENTS" on page 269 for MACK recommended SAE grades)

REAR AXLE LUBRICANTS AND CAPACITIES

Rear Axle	Carrier	Lubricant	Capacity Liters (Pints)
MACK			
RA23R	CRD203 (1)	GO-J/GO-J PLUS*	16.3 (34.5)
ArvinMeritor™			
RS-23-161	R160 Series	GL-5 or MIL-PRF-2105E	17.6 (37.2)
		GL-5 or MIL-PRF-2105E	
RS-23-186	R180 Series	GL-5 or MIL-PRF-2105E	22.4 (47.3)
Eaton/Dana			
S23-190	S23-190	GL-5 or MIL-PRF-2105E	17.5 (37)

* GO-J PLUS required for MACK geared component extended service drain interval.

For service information, SAE grades and lubricant change intervals for axles other than those manufactured by Mack Trucks, Inc., refer to the specific axle manufacturer's service literature.

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Tandem Axles

(See table on page 269 for MACK recommended SAE grades)

TANDEM AXLE LUBRICANTS AND CAPACITIES

Axle Model	Carrier	Lubricant	Capacity** Liters (Pints)	
			Front-Rear Axle	Rear-Rear Axle
S(-)(-)34R	CRDPC92 (1) CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRD(P)202(1)/ CRD 203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)(-)38R	CRDPC92(1)/ CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD 203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)(-)40	CRDPC92(1)/ CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDPC202(1)/ CRDPC203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)(-)440	CRDPC92(1)/ CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)462	CRDPC92(1)/ CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)52	CRDPC112/ CRD113	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)

LUBRICANTS AND CAPACITIES

Tandem Axles

(See table on page 269 for MACK recommended SAE grades)

TANDEM AXLE LUBRICANTS AND CAPACITIES

Axle Model	Carrier	Lubricant	Capacity** Liters (Pints)	
			Front-Rear Axle	Rear-Rear Axle
S(-)(-)34R	CRDPC92 (1) CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRD(P)202(1)/ CRD 203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)(-)38R	CRDPC92(1)/ CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD 203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)(-)40	CRDPC92(1)/ CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDPC202(1)/ CRDPC203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)(-)440	CRDPC92(1)/ CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)462	CRDPC92(1)/ CRD93(1)	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)52	CRDPC112/ CRD113	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)

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Axle Model	Carrier	Lubricant	Capacity** Liters (Pints)	
			Front-Rear Axle	Rear-Rear Axle
S(-)522	CRDPC112/ CRD113	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRD202(1)/ CRD203(1)	GO-J/GO-J PLUS	17 (36)	16.3 (34.5)
S(-)582	CRDPC112/ CRD113	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)652	CRDP95/CRD96	GO-J/GO-J PLUS*	17.9 (38)	17 (36)
Eaton/Dana				
DS/ RS405(P)	DS/RS405(P)	GL-5 (mineral) SHAES-256 (synthetic)	14.7 (31)***	13.2 (28)***
DST40(P)	DST40	GL-5 (mineral) SHAES-256 (synthetic)	14.7 (31)***	13.2 (28)***
DST41(P)	DST41	GL-5 (mineral) SHAES-256 (synthetic)	14.7 (31)***	13.2 (28)***
D46-170HP	D46-170	GL-5 (mineral) SHAES-256 (synthetic)	18.5 (39)***	18.5 (39)***

LUBRICANTS AND CAPACITIES

Axle Model	Carrier	Lubricant	Capacity** Liters (Pints)	
			Front-Rear Axle	Rear-Rear Axle
S(-)522	CRDPC112/ CRD113	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRD202(1)/ CRD203(1)	GO-J/GO-J PLUS	17 (36)	16.3 (34.5)
S(-)582	CRDPC112/ CRD113	GO-J/GO-J PLUS*	16.6 (35)	16.1 (34)
	CRDP202(1)/ CRD203(1)	GO-J/GO-J PLUS*	17 (36)	16.3 (34.5)
S(-)652	CRDP95/CRD96	GO-J/GO-J PLUS*	17.9 (38)	17 (36)
Eaton/Dana				
DS/ RS405(P)	DS/RS405(P)	GL-5 (mineral) SHAES-256 (synthetic)	14.7 (31)***	13.2 (28)***
DST40(P)	DST40	GL-5 (mineral) SHAES-256 (synthetic)	14.7 (31)***	13.2 (28)***
DST41(P)	DST41	GL-5 (mineral) SHAES-256 (synthetic)	14.7 (31)***	13.2 (28)***
D46-170HP	D46-170	GL-5 (mineral) SHAES-256 (synthetic)	18.5 (39)***	18.5 (39)***

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Axle Model	Carrier	Lubricant	Capacity** Liters (Pints)	
			Front-Rear Axle	Rear-Rear Axle
ArvinMeritor				
RT40-145(A)	RT40-145	GL-5	14.3 (30.2)	12.2 (25.8)
RT46-160	RT46-160	GL-5	18.5 (39.1)	16.3 (34.4)
RT46-164EH/P	RT46-164	GL-5	18.0 (38)	15.0 (33)

* GO-J PLUS required for MACK geared component extended service drain intervals.

** Proper oil level is best determined by checking oil level in reference to the oil filler plug hole.

*** Carrier capacity assumes 0-degree installation angle. Installation angles exceeding 10 degrees, or when vehicle must negotiate continuous or long grades, a standpipe may be required to raise oil level. Refer to Eaton Roadranger® service literature for additional information.

For service information, SAE grades and lubricant change intervals for axles other than those manufactured by Mack Trucks, Inc., refer to the specific axle manufacturer's service literature.

LUBRICANTS AND CAPACITIES

Axle Model	Carrier	Lubricant	Capacity** Liters (Pints)	
			Front-Rear Axle	Rear-Rear Axle
ArvinMeritor				
RT40-145(A)	RT40-145	GL-5	14.3 (30.2)	12.2 (25.8)
RT46-160	RT46-160	GL-5	18.5 (39.1)	16.3 (34.4)
RT46-164EH/P	RT46-164	GL-5	18.0 (38)	15.0 (33)

* GO-J PLUS required for MACK geared component extended service drain intervals.

** Proper oil level is best determined by checking oil level in reference to the oil filler plug hole.

*** Carrier capacity assumes 0-degree installation angle. Installation angles exceeding 10 degrees, or when vehicle must negotiate continuous or long grades, a standpipe may be required to raise oil level. Refer to Eaton Roadranger® service literature for additional information.

For service information, SAE grades and lubricant change intervals for axles other than those manufactured by Mack Trucks, Inc., refer to the specific axle manufacturer's service literature.

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MACK ENGINE LINE-UP

MACK MP7 ENGINE LINE-UP

Engine Model	Operating Range	Governed Power	Peak Power	Peak Torque	Torque Rise	Cruise RPM	High Idle	Idle
MP7-355E Econodyne®	1200–1800 rpm	265 kW (355 HP) @ 1800 rpm	265 kW (355 HP) @ 1500–1800 rpm	1844 N•m (1360 lb-ft) @ 1200 rpm	31%	1500 ± 50	2100	500–750
MP7-405E Econodyne®	1200–1800 rpm	302 kW (405 HP) @ 1800 rpm	302 kW (405 HP) @ 1800 rpm	1980 N•m (1460 lb-ft) @ 1200 rpm	24%	1500 ± 50	2100	500–750
MP7-365C MaxiCruise®	1200–1950 rpm	254 kW (340 HP) @ 1950 rpm	272 kW (365 HP) @ 1500–1700 rpm	1980 N•m (1460 lb-ft) @ 1200 rpm	60%	1500 ± 50	2100	500–750
MP7-395C MaxiCruise®	1200–1950 rpm	276 kW (370 HP) @ 1950 rpm	295 kW (395 HP) @ 1500–1700 rpm	2115 N•m (1560 lb-ft) @ 1200 rpm	56%	1500 ± 50	2100	500–750
MP7-365M Maxidyne®	1200–2100 rpm	250 kW (335 HP) @ 2100 rpm	272 kW (365 HP) @ 1500–1900 rpm	1817 N•m (1340 lb-ft) @ 1200 rpm	60%	1500 ± 50	2170	500–750
MP7-405M Maxidyne®	1200–2100 rpm	276 kW (370 HP) @ 2100 rpm	302 kW (405 HP) @ 1500–1900 rpm	2007 N•m (1480 lb-ft) @ 1200 rpm	60%	1500 ± 50	2170	500–750

MACK MP7 Engine Specifications

Bore and Stroke: 123 mm x 152 mm (4.84″ x 5.98″)

Firing Order: 1-5-3-6-2-4

Displacement: 11 liters (671 cu. in.)

Thermostat: 82.2°C (180°F)

Radiator Cap: 16-lb pressure cap

Oil Change Capacity: 30 liters (31.7 qts.) in engine, 6 liters (6.3 qts.) to prefill filters

MACK ENGINE LINE-UP

MACK ENGINE LINE-UP

MACK MP7 ENGINE LINE-UP

Engine Model	Operating Range	Governed Power	Peak Power	Peak Torque	Torque Rise	Cruise RPM	High Idle	Idle
MP7-355E Econodyne®	1200–1800 rpm	265 kW (355 HP) @ 1800 rpm	265 kW (355 HP) @ 1500–1800 rpm	1844 N•m (1360 lb-ft) @ 1200 rpm	31%	1500 ± 50	2100	500–750
MP7-405E Econodyne®	1200–1800 rpm	302 kW (405 HP) @ 1800 rpm	302 kW (405 HP) @ 1800 rpm	1980 N•m (1460 lb-ft) @ 1200 rpm	24%	1500 ± 50	2100	500–750
MP7-365C MaxiCruise®	1200–1950 rpm	254 kW (340 HP) @ 1950 rpm	272 kW (365 HP) @ 1500–1700 rpm	1980 N•m (1460 lb-ft) @ 1200 rpm	60%	1500 ± 50	2100	500–750
MP7-395C MaxiCruise®	1200–1950 rpm	276 kW (370 HP) @ 1950 rpm	295 kW (395 HP) @ 1500–1700 rpm	2115 N•m (1560 lb-ft) @ 1200 rpm	56%	1500 ± 50	2100	500–750
MP7-365M Maxidyne®	1200–2100 rpm	250 kW (335 HP) @ 2100 rpm	272 kW (365 HP) @ 1500–1900 rpm	1817 N•m (1340 lb-ft) @ 1200 rpm	60%	1500 ± 50	2170	500–750
MP7-405M Maxidyne®	1200–2100 rpm	276 kW (370 HP) @ 2100 rpm	302 kW (405 HP) @ 1500–1900 rpm	2007 N•m (1480 lb-ft) @ 1200 rpm	60%	1500 ± 50	2170	500–750

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Firing Order: 1-5-3-6-2-4

Displacement: 11 liters (671 cu. in.)

Thermostat: 82.2°C (180°F)

Radiator Cap: 16-lb pressure cap

Oil Change Capacity: 30 liters (31.7 qts.) in engine, 6 liters (6.3 qts.) to prefill filters

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MACK MP8 ENGINE LINE-UP

Engine Model	Operating Range	Rated Power	Peak Power	Peak Torque	Torque Rise	Cruise RPM	High Idle	Idle
MP8-425E Econodyne®	1200–1800 rpm	317 kW (425 HP) @ 1800 rpm	317 kW (425 HP) @ 1500–1800 rpm	2115 N•m (1560 lb-ft) @ 1200 rpm	26%	1550 ± 50	2150	650
MP8-455E Econodyne®	1200–1800 rpm	339 kW (455 HP) @ 1800 rpm	339 kW (455 HP) @ 1500–1800 rpm	2251 N•m (1660 lb-ft) @ 1200 rpm	25%	1550 ± 50	2150	650
MP8-485E Econodyne®	1200–1800 rpm	362 kW (485 HP) @ 1800 rpm	362 kW (485 HP) @ 1500–800 rpm	2251 N•m (1660 lb-ft) @ 1200 rpm	24%	1550 ± 50	2150	650
MP8-415C MaxiCruise®	1200–1950 rpm	291 kW (390 HP) @ 1950 rpm	309 kW (415 HP) @ 1500–1700 rpm	2251 N•m (1660 lb-ft) @ 1200 rpm	58%	1550 ± 50	2150	650
MP8-445C MaxiCruise®	1200–1950 rpm	298 kW (400 HP) @ 1950 rpm	332 kW (445 HP) @ 1500–1700 rpm	2251 N•m (1660 lb-ft) @ 1200 rpm	54%	1550 ± 50	2150	650
MP8-485C MaxiCruise®	1200–1950 rpm	328 kW (440 HP) @ 1950 rpm	362 kW (485 HP) @ 1500–1700 rpm	2170 N•m (1660 lb-ft) @ 1200 rpm	40%	1550 ± 50	2150	650
MP8-425M Maxidyne®	1200–2100 rpm	246 kW (330 HP) @ 2100 rpm	317 kW (425 HP) @ 1500–1900 rpm	2088 N•m (1540 lb-ft) @ 1200 rpm	58%	1550 ± 50	2150	650
MP8-455M Maxidyne®	1200–2100 rpm	246 kW (330 HP) @ 2100 rpm	339 kW (455 HP) @ 1500–1900 rpm	2237 N•m (1650 lb-ft) @ 1200 rpm	59%	1550 ± 50	2150	650
MP8-485M Maxidyne®	1200–2100 rpm	246 kW (330 HP) @ 2100 rpm	362 kW (485 HP) @ 1500–1900 rpm	2305 N•m (1700 lb-ft) @ 1200 rpm	58%	1550 ± 50	2150	650

MACK ENGINE LINE-UP

MACK MP8 ENGINE LINE-UP

Engine Model	Operating Range	Rated Power	Peak Power	Peak Torque	Torque Rise	Cruise RPM	High Idle	Idle
MP8-425E Econodyne®	1200–1800 rpm	317 kW (425 HP) @ 1800 rpm	317 kW (425 HP) @ 1500–1800 rpm	2115 N•m (1560 lb-ft) @ 1200 rpm	26%	1550 ± 50	2150	650
MP8-455E Econodyne®	1200–1800 rpm	339 kW (455 HP) @ 1800 rpm	339 kW (455 HP) @ 1500–1800 rpm	2251 N•m (1660 lb-ft) @ 1200 rpm	25%	1550 ± 50	2150	650
MP8-485E Econodyne®	1200–1800 rpm	362 kW (485 HP) @ 1800 rpm	362 kW (485 HP) @ 1500–800 rpm	2251 N•m (1660 lb-ft) @ 1200 rpm	24%	1550 ± 50	2150	650
MP8-415C MaxiCruise®	1200–1950 rpm	291 kW (390 HP) @ 1950 rpm	309 kW (415 HP) @ 1500–1700 rpm	2251 N•m (1660 lb-ft) @ 1200 rpm	58%	1550 ± 50	2150	650
MP8-445C MaxiCruise®	1200–1950 rpm	298 kW (400 HP) @ 1950 rpm	332 kW (445 HP) @ 1500–1700 rpm	2251 N•m (1660 lb-ft) @ 1200 rpm	54%	1550 ± 50	2150	650
MP8-485C MaxiCruise®	1200–1950 rpm	328 kW (440 HP) @ 1950 rpm	362 kW (485 HP) @ 1500–1700 rpm	2170 N•m (1660 lb-ft) @ 1200 rpm	40%	1550 ± 50	2150	650
MP8-425M Maxidyne®	1200–2100 rpm	246 kW (330 HP) @ 2100 rpm	317 kW (425 HP) @ 1500–1900 rpm	2088 N•m (1540 lb-ft) @ 1200 rpm	58%	1550 ± 50	2150	650
MP8-455M Maxidyne®	1200–2100 rpm	246 kW (330 HP) @ 2100 rpm	339 kW (455 HP) @ 1500–1900 rpm	2237 N•m (1650 lb-ft) @ 1200 rpm	59%	1550 ± 50	2150	650
MP8-485M Maxidyne®	1200–2100 rpm	246 kW (330 HP) @ 2100 rpm	362 kW (485 HP) @ 1500–1900 rpm	2305 N•m (1700 lb-ft) @ 1200 rpm	58%	1550 ± 50	2150	650

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MACK MP8 Engine Specifications

Bore and Stroke: 131 x 158 mm (5.16″ x 6.22″)

Firing Order: 1-5-3-6-2-4

Displacement: 13 liters (793 cu. in.)

Thermostat: 82.2°C (180°F)

Radiator Cap: 16-lb pressure cap

Oil change capacity:

- Plastic Oil Pan (highway models only) — 27 liters (28.5 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters
- Steel Oil Pan (axle back vocational vehicles with front sump) — 31 liters (32.8 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters
- Steel Oil Pan (axle forward vocational vehicles with rear sump) — 27 liters (28.5 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters

MACK ENGINE LINE-UP

MACK MP8 Engine Specifications

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Firing Order: 1-5-3-6-2-4

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Oil change capacity:

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- Steel Oil Pan (axle back vocational vehicles with front sump) — 31 liters (32.8 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters
- Steel Oil Pan (axle forward vocational vehicles with rear sump) — 27 liters (28.5 quarts) in engine, 6 liters (6.3 quarts) to prefill oil filters

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Engine Information Plate

In compliance with emissions standards requirements, an engine information plate is affixed to all MACK diesel engines. This plate gives basic engine identification information (engine model, serial number and part number), advertised horsepower at rated speed, emissions regulations to which the engine conforms and inlet and exhaust valve lash settings. The engine ID plate is located on the top of the cylinder head cover.

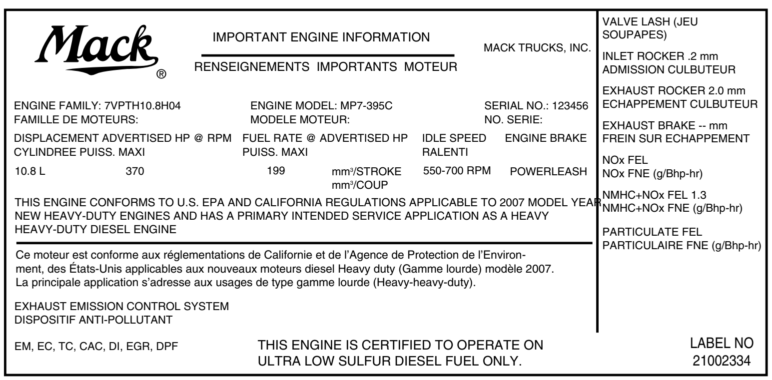

Figure 104 — Engine Information Plate

MACK ENGINE LINE-UP

Engine Information Plate

In compliance with emissions standards requirements, an engine information plate is affixed to all MACK diesel engines. This plate gives basic engine identification information (engine model, serial number and part number), advertised horsepower at rated speed, emissions regulations to which the engine conforms and inlet and exhaust valve lash settings. The engine ID plate is located on the top of the cylinder head cover.

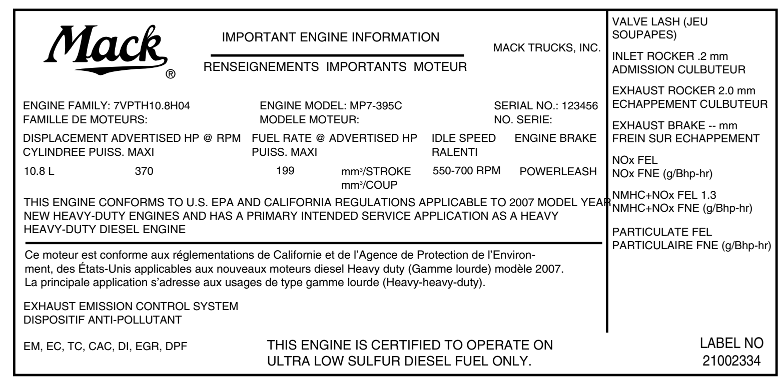

Figure 104 — Engine Information Plate

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CONVERSION CHART

CONVERSION CHART

25.4 millimeters	=	1 inch
1.61 kilometers	=	1 mile
.473 liter	=	1 pint (U.S. liquid)
.946 liter	=	1 quart (U.S. liquid)
.83267 Imperial gallon	=	1 gallon (U.S. liquid)
.01639 liter	=	1 cubic inch
1.3558 Newton meters	=	1 pound-foot
.746 kilowatt	=	1 horsepower
6.895 kilopascals	=	1 pound/square inch
(1.8 x degrees Celsius) + 32	=	degrees Fahrenheit
.03937 inches	=	1 millimeter
.6214 miles	=	1 kilometer
2.1134 pints (U.S. liquid)	=	1 liter
1.0567 quarts (U.S. liquid)	=	1 liter
1.2009 gallons (U.S. liquid)	=	1 Imperial gallon
61.024 cubic inches (U.S. liquid)	=	1 liter
.7376 pound-foot	=	1 Newton meter
1.34 horsepower	=	1 kilowatt
.145 pound/square inch	=	1 kilopascal
.556 x (degrees Fahrenheit –32)	=	degrees Celsius

CONVERSION CHART

CONVERSION CHART

CONVERSION CHART

25.4 millimeters = 1 inch
1.61 kilometers = 1 mile
.473 liter = 1 pint (U.S. liquid)
.946 liter = 1 quart (U.S. liquid)
.83267 Imperial gallon = 1 gallon (U.S. liquid)
.01639 liter = 1 cubic inch
1.3558 Newton meters = 1 pound-foot
.746 kilowatt = 1 horsepower
6.895 kilopascals = 1 pound/square inch
(1.8 x degrees Celsius) + 32 = degrees Fahrenheit
.03937 inches = 1 millimeter
.6214 miles = 1 kilometer
2.1134 pints (U.S. liquid) = 1 liter
1.0567 quarts (U.S. liquid) = 1 liter
1.2009 gallons (U.S. liquid) = 1 Imperial gallon
61.024 cubic inches (U.S. liquid) = 1 liter
.7376 pound-foot = 1 Newton meter
1.34 horsepower = 1 kilowatt
.145 pound/square inch = 1 kilopascal
.556 x (degrees Fahrenheit –32) = degrees Celsius

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MAINTENANCE RECORD

SERVICE PERFORMED	DATE	MILEAGE	SERVICED BY

MAINTENANCE RECORD

MAINTENANCE RECORD

SERVICE PERFORMED	DATE	MILEAGE	SERVICED BY

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SERVICE LITERATURE

If you would like to know more about servicing your new MACK Truck, several options are available. We offer three different types of literature which are described in Figure 105, Figure 106 and Figure 107. Decide which type fits your needs and order from your local dealer or distributor. Service literature can also be ordered online at www.macktrucks.com.

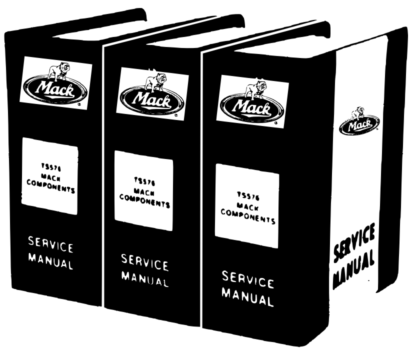

Figure 105 — TS576 — Mack Components Service Manual

SERVICE LITERATURE

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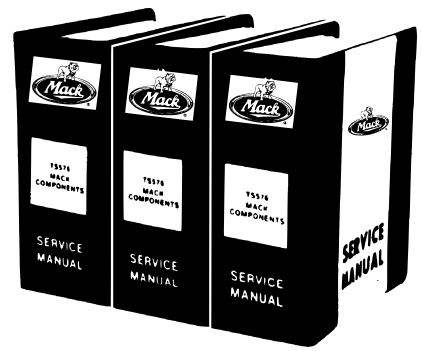

Figure 105 — TS576 — Mack Components Service Manual

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T473 – “CUSTOM HIGHWAY TRUCK SERVICE MANUAL”

This collated service manual is ordered when a MACK chassis contains a number of vendor components not covered in the MACK Components Service Manual. A complete chassis number and GSO number must appear on the BR313 when ordering a custom manual. Also available electronically as the TS473E with the MACK service information supplied on CD.

000100b

Figure 106 — T473 — Custom Highway Truck Service Manual

SERVICE LITERATURE

T473 – “CUSTOM HIGHWAY TRUCK SERVICE MANUAL”

This collated service manual is ordered when a MACK chassis contains a number of vendor components not covered in the MACK Components Service Manual. A complete chassis number and GSO number must appear on the BR313 when ordering a custom manual. Also available electronically as the TS473E with the MACK service information supplied on CD.

000100b

Figure 106 — T473 — Custom Highway Truck Service Manual

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INDIVIDUAL COMPONENT SERVICE MANUALS

Each manual contains complete overhaul, repair and other technical information for the component. Order by specific component name (engine, trans., etc.) and manual identification number. Order one at a time if you prefer.

000101b

Figure 107 — Individual Component Service Manuals

SERVICE LITERATURE

INDIVIDUAL COMPONENT SERVICE MANUALS

Each manual contains complete overhaul, repair and other technical information for the component. Order by specific component name (engine, trans., etc.) and manual identification number. Order one at a time if you prefer.

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Figure 107 — Individual Component Service Manuals

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JULY 2007 (SUPERSEDES JUNE 2007)