

Table 4-1. Troubleshooting-Continued

Trouble	Probable Cause	Checkout Procedure And Remedial Action
Brakes-Continued		
Uneven, noisy, grabbing or hard brakes -cont.	<ol style="list-style-type: none"> 4. Improper brake shoe adjustment. 5. Warped or misaligned shoes. 6. Glazed linings. 7. Greasy linings. 	<ol style="list-style-type: none"> 4. Adjust shoes correctly. 5. Replace shoes. 6. Remove glaze with medium grade sandpaper. 7. Replace linings and check for source of grease.
Brakes do not release.	<ol style="list-style-type: none"> 1. Improperly adjusted brake pedal. 2. Restricted bypass port in master cylinder. 3. Swollen master cylinder piston cups. 4. Wheel cylinders sticking due to dirty or contaminated brake fluid. 	<ol style="list-style-type: none"> 1. Adjust pedal free-travel to 3/16 to 3/8 inch. 2. Replace master cylinder. 3. Rebuild master cylinder. 4. Clean the entire hydraulic system with denatured alcohol, Specification MIL-A-6091, and refill system with new brake fluid. Bleed brake system.
Brake pedal travels to floorboard without noticeable brake action.	Fluid level low in master cylinder reservoir.	Refill master cylinder reservoir and check entire brake system for fluid leaks. Repair if necessary. Bleed brakes.
Brakes drag.	<ol style="list-style-type: none"> 1. Defective brake shoe return spring. 2. Loose or damaged wheel bearing. 3. Linings improperly adjusted. 	<ol style="list-style-type: none"> 1. Replace return spring. 2. Replace wheel bearing. 3. Adjust linings.
Brakes "grab"; vehicle pulls to one side on brake application.	<ol style="list-style-type: none"> 1. Improperly inflated tires. 2. Linings grease soaked. 3. Linings improperly adjusted. 	<ol style="list-style-type: none"> 1. Inflate to correct pressure. 2. Clean linings. 3. Adjust linings.
Slow brake application.	<ol style="list-style-type: none"> 1. Low hydraulic pressure. 2. Brake improperly adjusted. 	<ol style="list-style-type: none"> 1. Check brake fluid level. Add fluid. Check brake lines and connections for leaks. Replace leaking lines. 2. Adjust brakes.

Table 4-1. Troubleshooting-Continued

Trouble	Probable Cause	Checkout Procedure And Remedial Action
Brakes-Continued		
Brakes squeal on application.	<ol style="list-style-type: none"> 1. Glazed or dirty linings. 2. Lining worn to rivet heads. 	<ol style="list-style-type: none"> 1. Clean or replace linings. 2. Replace linings.
Electrical		
Batteries discharge rapidly.	<ol style="list-style-type: none"> 1. Alternator, regulator or wiring faulty. 2. Loose connectors or corroded battery terminals. 3. Voltage regulator not functioning properly. 4. Short circuit in the electrical system. 5. Defective cell in battery. 	<ol style="list-style-type: none"> 1. Repair or replace alternator or regulator. Replace faulty wiring. 2. Clean terminals and connectors. Tighten connectors. 3. Repair or replace voltage regulators. 4. Replace faulty section of wiring. 5. Replace battery.
No battery voltage.	<ol style="list-style-type: none"> 1. Battery discharged. 2. Circuit breaker open. 3. Disconnected battery cable. 4. Master relay defective. 	<ol style="list-style-type: none"> 1. Perform hydrometer test; charge battery. Perform heavy load tests. If battery is not defective, charge. 2. Reset circuit breaker. 3. Connect cable. 4. Repair or replace master relay.
Improper system voltage.	<ol style="list-style-type: none"> 1. Alternator belt slipping. 2. Defective voltage regulator. 3. Insufficient alternator output. 	<ol style="list-style-type: none"> 1. Tighten or replace belt as necessary. 2. Replace voltage regulator. 3. Repair or replace alternator.
Lights dim.	<ol style="list-style-type: none"> 1. Low battery voltage. 2. Poor electrical connections. 	<ol style="list-style-type: none"> 1. Check battery connections and wiring. Perform hydrometer and heavy load tests. If battery is defective, replace. 2. Check wiring. Reconnect any bad connections.
Lights inoperative.	<ol style="list-style-type: none"> 1. Defective bulb. 2. Faulty circuit breaker or fuse. 	<ol style="list-style-type: none"> 1. Replace bulb. 2. Replace circuit breaker or fuse.

Table 4-1. Troubleshooting-Continued

Trouble	Probable Cause	Checkout Procedure And Remedial Action
Brakes-Continued		
Lights inoperative -cont.	3. Broken lead. 4. Defective switch.	3. Replace lead. 4. Replace switch.
Frequent lamp failures.	1. Improper electrical system voltage. 2. Poor battery connections.	1. Check for alternator belt slippage, defective voltage regulator and insufficient alternator output. Repair or replace components as necessary. 2. Clean battery terminals and connections. Tighten connector.

NOTE

Constant voltage regulator built into the fuel gauge.

Lights and fuses fail prematurely. Short battery life. Battery uses excessive amount of water. High charging rate.	Voltage limiter setting too high.	Replace fuel gauge.
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Fuel System

(See Engine section of this table for troubleshooting procedures for excess fuel consumption)

Fuel gauge readings are incorrect.	1. Poor electrical connections. 2. Fuel level transmitter defective. 3. Fuel gauge defective. 4. Voltage limiter defective.	1. Clean and tighten all connections. 2. Replace fuel level transmitter. 3. Replace fuel gauge. 4. Replace fuel gauge.
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Driveshaft

Noisy drive line.	1. Out of balance. 2. Badly worn parts.	1. Realign driveshaft. 2. Replace worn parts.
Drive line vibration.	1. Yokes out of line. 2. Shafts out of balance.	1. Realign yokes. 2. Balance shaft.

Table 4-1. Troubleshooting-Continued

Trouble	Probable Cause	Checkout Procedure And Remedial Action
Axle		
Noise from drive axle.	<ol style="list-style-type: none"> 1. Lubricant not to specified level. 2. Incorrect lubricant. 3. Worn bearings. 	<ol style="list-style-type: none"> 1. Add lubricant to proper level. 2. Drain lubricant. Add correct lubricant. 3. Replace bearings.
Lubricant leaks through axle shafts.	<ol style="list-style-type: none"> 1. Incorrect kind and weight of lubricant. 2. Lubricant above specified level. 	<ol style="list-style-type: none"> 1. Drain lubricant. Add correct lubricant. 2. Drain excess lubricant.
Excessive tire wear.	<ol style="list-style-type: none"> 1. Improper tire inflation. 2. Incorrect toe-in. 	<ol style="list-style-type: none"> 1. Correct inflation. 2. Adjust toe-in.
Exhaust System		
Exhaust gas leakage.	<ol style="list-style-type: none"> 1. Loose pipe connections. 2. Deteriorated exhaust piping or muffler. 	<ol style="list-style-type: none"> 1. Tighten. 2. Replace parts as required.
Excessive noise.	<ol style="list-style-type: none"> 1. Deteriorated muffler and/or exhaust piping. 	<ol style="list-style-type: none"> 1. Replace parts as required.
Windshield Wipers		
Wipers do not move.	<ol style="list-style-type: none"> 1. No electrical connection. 2. Defective motor. 	<ol style="list-style-type: none"> 1. Connect connector. 2. Repair or replace motor.
Air System		

WARNING

Methyol alcohol is flammable. Ensure ignition is off and engine is cool before draining and/or adding alcohol to the alcohol injector. Severe burns can result if engine is hot or the engine is left running.

NOTE

Before attempting troubleshooting procedures, drain alcohol injector and refill with methyol alcohol.

System failure in cold weather.	<ol style="list-style-type: none"> 1. Ice in system. 	<ol style="list-style-type: none"> 1. Start and leave engine running. Set HEATER switch to ON position. Allow engine to run until cab in vehicle is warm. Turn ignition off and bleed off air in tanks. Remove drain plugs and drain all fluids. Thread and tighten drain plugs. Start engine and observe pressure gauge. If pressure gauge reads correctly, open all valves and ensure air flows through all gladhand couplings.
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Table 4-1. Troubleshooting-Continued

Trouble	Probable Cause	Checkout Procedure And Remedial Action
Air System-Continued		
System failure cold weather - cont.	2. Defective air governor.	2. Repair or replace air governor.
	3. Defective air compressor.	3. Repair or replace air compressor.
Outlet pressure low.	1. Ice in system.	1. Refer to system failure step 1 above.
	2. Air lines kinked, split, or obstructed.	2. Check; replace lines as necessary.
	3. Defective air governor.	3. Repair or replace air governor.
	4. Defective air compressor.	4. Repair or replace air governor.
Winterization System		
No power to system.	1. Facility power off.	1. Activate facility power.
	2. Loose plug connection.	2. Check; repair as necessary.
	3. Fuse on junction box assembly defective.	3. Replace fuse.
	4. No power after fuse replacement.	4. Check all wiring for continuity. If continuity checks out, ensure plug and receptacle are not corroded. Replace parts as necessary.
Engine hard to start and idles roughly until engine warms up.	1. Defective battery warmer.	1. Replace battery warmer.
	2. Defective oil thermostat or heater.	2. Replace thermostat or heater as necessary.
Air from heater very cold during engine start-up.	1. Defective coolant thermostat or heater.	1. Replace thermostat or heater as necessary.

Table 4-2. Scheduled Inspection Chart

	Inspection Interval	
	Scheduled	Safety
	3 months or 300 operating hours, whichever comes first	Annual, or 1200 operating hours, whichever comes first
AXLES		
Check and tighten wheel mounting nuts.	X	
Check security of axle mounting to frame.		X
Check differentials for oil leaks.	X	
Check differential and reduction gear case lubricant level.	X	
WHEELS AND TIRES		
Check tires for cuts or foreign objects.	X	
Check hub bolt nuts.	X	
Check bearings for looseness.		X
Check oil seals.	X	
Remove wheelbearings and check bearings and race for defects.		X
BRAKES-SERVICE		
Check master cylinder fluid level.	X	
Check brake lines for leaks.	X	
Inspect linings for wear.		X
Inspect pads for wear		X
BRAKES-PARKING		
Check linkage and cable for wear, and adjust.	X	
Check linings for wear.		X
COOLING SYSTEM		
Check antifreeze protection.	X	
Check coolant color and cleanliness.	X	
Check all hoses and connections for leaks.	X	
Check water pump inlet and outlet connection for leaks.	X	
Flush coolant system.		X
Check radiator for leaks and mounting for security.	X	
Check thermostat operation and housing for tightness.	X	

Table 4-2. Scheduled Inspection Chart-Continued

	Inspection Interval	
	Scheduled	Safety
	3 months or 300 operating hours, whichever comes first	Annual, or 1200 operating hours, whichever comes first
ENGINE		
Check cylinder head nuts.		X
Check manifold nuts and gasket.		X
Check tappet clearance and oil supply to valve springs and seats.		X
Check and adjust water pump and alternator belt tension.	X	
ENGINE FUEL SYSTEM		
Replace fuel filter.		X
Drain fuel tank to remove water and sediment.	X	
Check all fuel lines for leaks.		X
Check fuel supply gauge for accuracy.	X	
Check fuel pump gaskets for leaks.	X	
Visually check fuel tank for leaks.	X	
Check accelerator linkage clevis pins and cotter pins for wear or damage.	X	
Inspect air cleaner filter.	X	
ENGINE ALTERNATOR		
Check for worn brushes.		X
Check voltage regulator output.	X	
ELECTRICAL		
Check all connections.		X
Check for chafed or broken wires.		X
Check retaining clips and grommets.		X
BATTERY		
Check specific gravity.	X	
Check terminals and cables for corrosion and tightness.	X	
TRANSMISSION		
Check fluid level.	X	
Check for oil leaks.	X	
Drain and refill.		X

Table 4-2. Scheduled Inspection Chart-Continued

	Inspection Interval	
	Scheduled	Safety
	3 months or 300 operating hours, whichever comes first	Annual, or 1200 operating hours, whichever comes first
AIR SYSTEM		
Check drive belt tension.	X	
Check lines and fittings for leaks and/or looseness.	X	
Check air filter.	X	
WINTERIZATION SYSTEM		
Check all hoses and connections for leaks.	X	
Check oil pan heater for leaks.	X	
Check all electrical wiring and connections for corrosion and chafed or broken wires.		X

4-4.1 Fuel System Service. The following paragraphs contain procedures for checking and adjusting the fuel system components. All maintenance procedures must be performed at scheduled intervals.

- a. Replacing fuel filter element.
 - (1) Disconnect fuel lines and remove fuel filter from bracket.
 - (2) Remove filter element.
 - (3) Install new element on cover.
 - (4) Install fuel filter in bracket and connect fuel lines.
- b. Adjusting injection pump. Refer to paragraph 5-5.1.21 for injection pump adjustment procedures.
- c. Adjusting fuel injectors. Refer to paragraph 5-5.1.21 for fuel injector adjustment procedures.
- d. Draining fuel water separator. Drain water from fuel water separator at scheduled intervals.
- e. Checking fuel pump. Refer to paragraph 5-5.1.14 and check fuel pump at scheduled intervals.
- f. Cleaning gauge filter of fuel pump. Clean gauge filter at scheduled intervals.
- g. Checking fuel injection timing and pressure. Refer to paragraph 5-5.1.14 and check fuel injection timing and pressure.
- h. Adjusting governor. Refer to paragraph 5-5.1.20 and adjust governor.
- i. Checking and replacing air filter.
 - (1) Remove wing nut and packing from air cleaner and remove air cleaner cover.
 - (2) Separate element and packing rings.
 - (3) Check air filter element for excessive dirt. If dirty, replace regardless of scheduled interval.
 - (4) Install element and packing in air cleaner.
 - (5) Install cover using packing and wing nut.

4-4.2 Cooling System Service. The following paragraphs contain procedures for checking coolant level and adding coolant, as well as draining and refilling the coolant system and testing the thermostat. All maintenance procedures must be performed at scheduled intervals.

- a. Checking and adding coolant.

WARNING

Do not remove radiator cap if vehicle has been running for any period of time as serious burns to personnel may result.

CAUTION

Remove the radiator cap only for testing or when filling the system after service. Removing the cap unnecessarily can cause loss of coolant and allow air to enter the system, which may cause damage by corrosion.

- (1) Check that engine coolant level is between the FULL and ADD marks on the coolant recovery bottle.
- (2) Add coolant to recovery bottle only if coolant level is below ADD mark.
- (3) If ambient temperature is below 32°F, also check level of antifreeze protection by testing coolant with a hydrometer.

NOTE

In an emergency, water alone may be added. However, check the freeze protection as soon as possible, as the addition of water will dilute the antifreeze, reducing its efficiency.

- b. Draining and refilling coolant system.

WARNING

Do not remove radiator draincock or block drain plug when engine has been running for any length of time as burns to personnel may result.

- (1) Loosen draincock on bottom of radiator.
- (2) Remove drain plug from left-rear of cylinder block.
- (3) Tighten radiator draincock and replace block drain plug.

WARNING

Ethylene glycol is toxic to the eyes, skin and respiratory tract. Eye and skin protection is required. Ethylene glycol should only be used in a well-ventilated area.

- (4) Remove radiator cap and add 50/50 mixture of ethylene glycol antifreeze and water to radiator until level reaches to a level of 1-1/2 to 2 inches below filler cap (with vehicle not running).
- (5) Replace radiator cap.
- c. Thermostat testing. Refer to the cooling system paragraph of Chapter 5 of this manual for thermostat testing procedures.

4-4.3 Belt Service. This paragraph contains procedures for checking belts that drive the fan, alternator, air compressor, and power steering pump at scheduled intervals. Check for cracks, fraying, wear and general belt condition. Use tension gauge #J-23600 to check belt tension. Compare readings to chart below and adjust belt tension if necessary.

<i>Belt</i>	<i>Tension (lb-ft)</i>
Fan and Alternator	294-377 (400-512 Nm)
Power Steering	294-377 (400-512 Nm)
Air Compressor	294-377 (400-512 Nm)

If installing new belts, adjust to tension shown in chart above.

4-4.4 Engine Oil and Oil Filter Change. The following paragraphs contain procedures for checking oil level condition and for changing the oil and oil filter. All maintenance procedures must be performed at scheduled intervals.

a. Checking oil.

- (1) Remove dipstick and wipe clean.
- (2) Insert dipstick until cap seats.
- (3) Remove dipstick and note reading. Fluid level should be between ADD and FULL marks.
- (4) Note color and consistency of oil. If oil appears opaque or gummy, refer to the following oil change procedures.
- (5) If level is at or below ADD mark, add oil through filler port until dipstick reading is above ADD mark.
- (6) Refer to figure 4-5, for the correct oil.

b. Changing oil and oil filter.

- (1) Place a receptacle under oil pan and remove drain plug.
- (2) Allow oil pan to drain completely.
- (3) Replace oil pan drain plug. Tighten to torque specified in table 6-2.
- (4) Move receptacle under oil filter.
- (5) Drain filter by loosening center bolt and remove filter element, gasket, case, spring and other parts from body.
- (6) Replace the filter element with a new filter element.

- (7) Clean all parts except filter element with light oil.
- (8) Assemble oil filter, replacing gasket, and install on vehicle. Tighten to torque specified by table 6-2.
- (9) Refer to figure 4-5 to match correct oil types to climate.
- (10) Add 7.9 quarts of oil to engine through filler port.
- (11) Check oil level, using dipstick, and add oil if necessary.

4-4.5 Brake System Service. The following paragraphs contain procedures for inspecting, servicing

and adjusting brake equipment. All maintenance procedures must be performed at scheduled intervals.

a. Checking master cylinder and adding brake fluid.

- (1) Clean tops of master cylinder covers and surrounding area.
- (2) Remove cover and inspect brake fluid level in each cell. Fluid should reach to below rims of each cell in reservoirs.
- (3) If level is low, add fluid meeting SAE Standard J1703 until brake fluid reaches appropriate level.
- (4) Replace covers.

b. Rear drum brake adjustment. The rear drum brakes are the vehicle's only adjustable service brakes. If the rear brakes are disassembled for any reason, an initial adjustment must be performed before installing the drum.

- (1) To perform initial adjustment with drums removed, use brakeshoe-to-drum clearance gauge #J-21177-01 to preset brake lining adjustment. Drums should fit over brake lining with slight drag.

NOTE

Manual adjustment of the rear brakes, with the drums in place, may be accomplished beginning with step 2.

- (2) Remove access slot covers from brake support plates.

CAUTION

The automatic adjuster lever must be disengaged from the adjuster screw before the screw can be rotated or damage to brake components may occur. Use a thin blade screwdriver or section of 1/8 inch welding rod to unseat adjuster lever.

- (3) Rotate adjuster screw in clockwise direction, using brake adjusting tool, until brakes are locked.
 - (4) Rotate adjuster screw in counterclockwise direction until wheel rotates freely.
 - (5) Install access slot cover in brake support plane.
 - (6) Check brake operation before moving vehicle.
 - (7) Complete rear brake and pedal travel adjustment by driving vehicle in reverse and making 10 to 15 firm brake applications. Make one forward brake application between each reverse application to equalize adjustment.
- c. Bleeding brakes. It is necessary to bleed the brake hydraulic system whenever a line has been disconnected or air has entered the system.
- (1) Manual bleeding.
 - (a) Follow procedure given for master cylinder inspection in paragraph 4-4.5a.
 - (b) Loosen metering valve front mounting bolt and insert slotted end of tool #J-23709 under bolt.
 - (c) Push metering valve stem (using tool) to hold valve open and tighten mounting bolt to secure tool.

NOTE

Brake system should be bled in the following sequence:

1. Right rear wheel
 2. Left rear wheel
 3. Right front wheel
 4. Left front wheel
 5. Master cylinder brake line connections.
- (d) Place wrench on bleeder screw. Install rubber hose on screw with free end submerged in transparent container partially filled with clean brake fluid.

- (e) Open bleeder screw 3/4 turn.
- (f) Have other personnel depress brake pedal.
- (g) Close bleeder screw before pedal reaches end of travel.
- (h) Have helper pump up pedal each time bleeder screw is turned. This ensures a strong surge of fluid when screw is reopened.
- (i) Repeat bleeding process until fluid comes out in solid stream without air bubbles.

CAUTION

Do not allow supply of fluid in master cylinder to become exhausted. Check fluid level frequently while bleeding and refill as required. Do not bleed two wheels at a time, and do not bleed the system with the front calipers or rear drums not in place.

- (j) Refill master cylinder as required and install covers and retainer.
 - (k) Remove metering valve tool.
- (1) Test brake operation before moving vehicle.
 - (2) Pressure bleeding.
 - (a) Remove accumulated dirt from master cylinder and cover.
 - (b) Remove cover and rubber diaphragm seal and place cover on lint-free cloth or workbench.

CAUTION

Do not allow cover or diaphragm to contact dirt or foreign material.

- (c) Fill master cylinder if required.
- (d) Install brake bleeder adapter cover on master cylinder.
- (e) Connect hose from pressure bleeder to fitting on adapter and open pressure bleeder release valve.
- (f) Loosen metering valve front mounting bolt and insert end of tool #J-23709 under bolt.
- (g) Push metering valve stem inward (using tool) to hold valve open and tighten mounting bolt to secure tool.

NOTE

Bleed the brake system in the sequence given in manual bleeding procedure.

When using pressure equipment, the bleeding procedure is the same as the one outlined in the manual bleeding procedure, except that no other personnel are needed to depress brake pedal.

- (h) When system has been purged of all air, turn off pressure bleeder and close bleeder fluid release valve.
- (i) Disconnect pressure bleeder hose at adapter fitting and remove master cylinder cover adapter.
- (j) Refill master cylinder to within 1/4 inch of reservoir rims.
- (k) Install cover and rubber diaphragm seal. Make sure cover retainer is in place.
- (l) Loosen metering valve front mounting bolt, remove tool #J-23709 and retighten mounting bolt.
- (m) Test brake operation before moving vehicle.
- d. Front brake linings. Check brake lining thickness through caliper inspection port. See figure 4-1. A wear sensor is attached to the brakeshoes. When brake lining wears to the point at which replacement is necessary, a sensor contacts the disc, making screeching or scraping noise to warn driver that brakeshoes need replacement.
- e. Rear brake lining. Replace linings worn to within 1/32-inch of rivet head.
- f. Run self-adjusting mechanism. Operate adjuster lever and pivot. Check for ease of operation of adjuster screw assembly. Check condition of adjuster components for bending, loose or overheated springs or binding.
- g. Disc brake calipers. Check duct boot for correct installation, tears or signs of leakage, or kinked lines or loose fitting.
- h. Rear wheel cylinders. Pull duct boot back and inspect for leaks. Check condition of pistons and cylinder bores.
- i. Differential warning valve. Check valve and housing for signs of leaks, kinked lines or loose fitting.
- j. Brakelines, fitting and hoses. Check for cracks, swelling, kinks, distortion or leaks. Also, in-

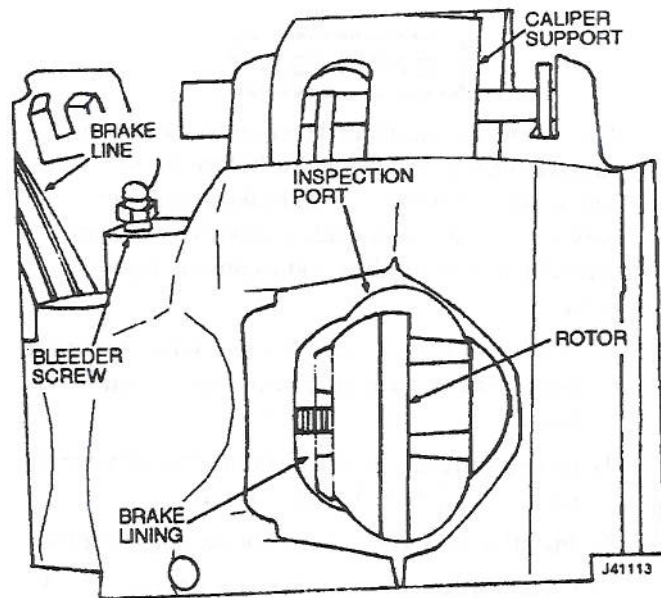


Figure 4-1. Caliper Inspection Port

spect position to be sure no lines are rubbing against exhaust system parts or other components.

- k. Parking brake. Operate parking brake; release and check for smooth operation and brake holding ability. Inspect cables for binds, kinks or frays. With brake released, the rear wheels should turn freely. Adjust parking brake as follows:

NOTE

The service brakes must be adjusted before adjusting the parking brakes.

- (1) Release parking brakes.
- (2) Loosen equalizer locknuts to release tension on cables.
- (3) Inspect all cables for binds, kinks or frayed condition. Replace damaged cables.
- (4) Tighten equalizer locknut until slight drag is produced at wheels.
- (5) Loosen equalizer locknut until wheels rotate freely and brake drag is eliminated.
- (6) Tighten equalizer locknuts securely.
- (7) Check parking brake operation.
- l. Overall brake condition and action. Check for improper brake action, performance complaints or signs of overheating, dragging or pulling. Correct as required.

4-4.6 Battery and Cable Service. The following paragraphs contain procedures for inspection and servicing of the battery and battery cables. All maintenance procedures must be performed at scheduled intervals.

WARNING

Battery fluid contains sulphuric acid. When servicing batteries always wear eye protection (face shield), acid resistant rubber apron and gloves. Keep flame/sparks away from the vent and filler cap openings.

a. Checking and adding electrolyte.

- (1) Lift battery cell caps and inspect fluid level in each cell. Electrolyte should reach bottom of each filler well ring.
- (2) If electrolyte level is low, add distilled or low mineral water to cells until electrolyte reaches appropriate levels.

NOTE

In freezing weather, add water before driving to assure its mixing with acid and to prevent freezing.

b. General winter battery inspection.

WARNING

Whenever disconnecting battery terminals, always disconnect GROUND (negative) terminal first to avoid sparking and danger of explosion.

CAUTION

Handle the battery carefully when removing or replacing it, and avoid tipping it as battery acid is corrosive to painted surfaces.

- (1) Disconnect battery negative cable, then remove positive cable.
- (2) Clean cables and terminal posts with a wire brush terminal cleaner.
- (3) Check battery fluid level and add water, if necessary.
- (4) Remove battery holddown and clean battery case and battery tray, if necessary, with a solution of baking soda and water; then rinse thoroughly.
- (5) Position battery in tray and fasten holddown. Do not overtighten.

WARNING

When connecting battery terminals, always connect POSITIVE terminal first to avoid sparking and danger of explosion.

- (6) Attach positive battery cable, then attach negative cable.
 - (7) Apply a small amount of grease or protective coating to cable ends to minimize corrosion.
- c. Cable inspection and replacement.
- (1) Check battery cables thoroughly for damage, fraying or excessive wear.
 - (2) Replace any worn or damaged cables.

4-4.7 Engine Performance Check. Table 4-3 contains performance specifications for engine components. Refer to paragraph 4-4.8 for tune-up procedures for any components not operating to the specifications.

4-4.8 Engine Tune-Up. Engine tune-up consists of adjusting the governor, valve clearance, injection pump timing and injector nozzles. Refer to this paragraph and paragraph 4-2 for procedures for adjusting and servicing components affecting engine performance.

- a. Adjusting valve clearance. Refer to paragraph 5-5.1.23 and adjust valve clearance.
- b. Adjusting governor. Refer to paragraph 5-5.1.20 and adjust governor.
- c. Adjusting injection pump timing. Refer to paragraph 5-5.1.21 and adjust injection pump timing.
- d. Adjusting injector nozzles. Refer to paragraph 5-5.1.16 and adjust injector nozzles.

4-4.9 Exhaust System Service. Inspect the exhaust system at scheduled intervals for leaks, damage and misalignment. In addition, check exhaust system for grounding against body sheet metal or frame.

4-4.10 Transmission Service. The following paragraphs contain procedures for checking fluid level and condition. Inspections must be made at scheduled intervals while the transmission is at normal operating temperature. Change transmission fluid at scheduled intervals or when fluid condition requires it.

- a. Checking and adding transmission fluid.

Table 4-3. Engine Component Performance Specifications

Item			Nominal Dimension	Maintenance Standard	Repair Limit	Remarks
Idling	rpm	-	-	600	-	Engine as single unit. Idling speed should be stabilized.
Engine Oil Pressure	at 1500 rpm	-	-	44.1-45.5 psi	28.4 psi	Oil temperature: 158-176°F
	at Idling	-	-	14.223 psi	7.1 psi	
Compression Pressure	Pressure	-	-	426.7 psi	270.2 psi	Engine rpm: 200 ± 20 rpm (warm engine)
	Difference between Cylinders	-	-	56.9 psi	-	
Engine Oil Consumption	h/L	-	-	-	Less than 40% of initial value when operated under the same condition	Observe the color of exhaust fumes.
Fuel Consumption	h/L	-	-	-	Less than 60% of initial value when operated under the same condition.	Observe the color of exhaust fumes.
Valve Timing	Inlet Valve	Open 28° B.T.D.C.	-	-	-	When valve clearance is adjusted to greater than 0.012 inch and less than 0.016 inch.
		Close 67° A.B.D.C.	-	-	-	
	Exhaust Valve	Open 67° B.B.D.C.	-	-	-	
		Close 28° A.T.D.C.	-	-	-	
Fuel Injection Timing	B.T.D.C.	20°	-	-	-	Measured by crank angle.

WARNING

At normal operating temperature, the gauge end of the dipstick will be too hot to hold comfortably. Injury to personnel may result.

- (1) Place vehicle on level surface.
- (2) Have engine running at idle speed.
- (3) Apply parking brake.
- (4) Move gearshift lever through all positions. Then move it to NEUTRAL.

WARNING

Stay clear of fan and drive belts when engine is running or injury may result.

- (5) Remove dipstick, located in fill tube at right rear of engine near dash panel, and wipe clean.
- (6) Insert dipstick until cap seats.
- (7) Remove dipstick and check fluid level reading. Level should be between ADD and FULL marks.

CAUTION

Do not overfill. This can lead to foaming which can lead to overheating, fluid oxidation or varnish formation, all of which can interfere with transmission operation.

To check fluid condition note whether fluid smells burned or is full of metal or friction material particles. If so, a complete transmission overhaul may be needed.

- (8) If level is at or below the ADD mark, add sufficient fluid to raise level to FULL mark.
- b. Changing transmission fluid. Change transmission fluid immediately after vehicle operation, before fluid cools. Change transmission fluid as follows:
 - (1) Remove transmission pan screws, pan and gasket.
 - (2) Remove and discard oil filter.
 - (3) Remove and discard O-ring seal from pick-up pipe.
 - (4) Install new O-ring seal on pick-up pipe and install filter and pipe assembly.
 - (5) Clean pan thoroughly and position new gasket on pan. Use petroleum jelly or equivalent to position gasket.
 - (6) Install pan using screws. Tighten screws to torque specified in table 6-2.
 - (7) Pour approximately 5 quarts of transmission fluid into filler pipe. Be sure container spout, funnel or other items in contact with fluid are clean.
 - (8) Start engine and allow it to idle a few minutes.
 - (9) Apply brake pedal and parking brake. Shift transmission into all positions, then return lever to NEUTRAL.
 - (10) With transmission at operating level, check fluid level. Add fluid, if necessary, to bring level to FULL mark.

4-4.11 Transfer Case Service. The following paragraphs contain procedures for checking the transfer case fluid level and for draining and refilling the transfer case. All maintenance procedures must be performed at scheduled intervals.

a. Checking and adding transfer case fluid.

- (1) Remove transfer case fill plug located on rear of transfer case.

- (2) Lubricant should be level with fill hole.
- (3) If fluid level is low before scheduled replacement interval, add transfer case fluid until filled to the appropriate level.

b. Draining and refilling transfer case.

- (1) Remove fill plug and drain plug.
- (2) Allow transfer case to drain completely.
- (3) Install drain plug and tighten to torque specified by table 6-2.
- (4) Add fluid to transfer case to just below level of fill hole.
- (5) Install fill plug and tighten to torque specified by table 6-2.

4-4.12 Propeller Shaft Service. The following paragraphs contain procedures for lubricating different parts of the propeller shaft to use multipurpose lithium base grease. All maintenance procedures must be performed at scheduled intervals.

WARNING

P-D-680 Type II is toxic to the skin, eyes, and respiratory tract. Avoid skin and eye contact. Good general ventilation is normally adequate.

NOTE

Undercoating or rustproofing compounds could unbalance the propeller shafts and cause drivetrain vibrations. Remove any such compounds using P-D-680 Type II.

a. Lubricating sleeve yoke (splines).

- (1) Apply grease gun pressure to sleeve yoke grease fitting until lubricant appears at pressure relief hole in expansion plug at sleeve yoke end of spline.
- (2) Cover pressure relief hole with finger, and continue to apply pressure until grease appears at sleeve yoke seal.

b. Cleaning and lubricating universal joint.

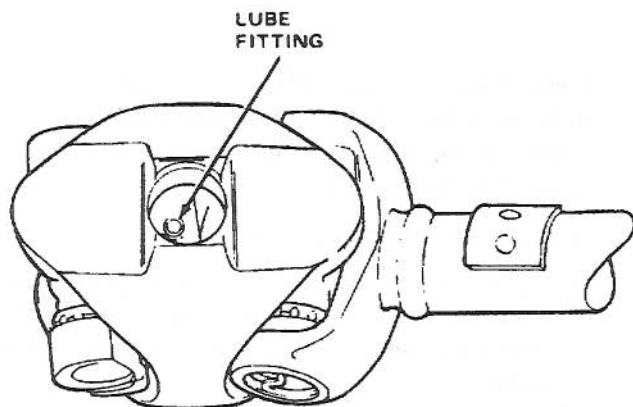
- (1) Raise vehicle on frame-contact type hoist (wheels must be free to rotate).
- (2) Clean dirt from around universal joint.
- (3) Lubricate universal joint (see figure 4-2).

4-4.13 Steering System Service. This paragraph contains procedures for inspecting the steering system. All inspections must be performed at scheduled intervals. Repair or replace components as required.

- a. Check steering components and grease seals for damage or wear.
- b. Check power steering gear assembly for leaks, housing cracks and loose frame mounting.
- c. Check steering damper for leaks or loose mounting.
- d. Check steering toe-in rods and connecting rod for bending, looseness or wear.
- e. Check power steering fluid level. If dipstick reads below FULL mark, add appropriate amount of fluid.

4-4.14 Differential Service. The following paragraphs contain procedures for checking, adding and changing differential fluid and for inspecting the differential for leaks. All maintenance procedures must be performed at scheduled intervals.

- a. Checking and adding differential fluid.
 - (1) Remove plug from differential.
 - (2) Check fluid level using finger. Fluid should reach level just below plug hole.



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Figure 4-2. U-Joint Lubrication Point

- (3) If low, add differential oil until lubricant reaches proper level.
- (4) Install plug.

b. Changing differential fluid.

NOTE

Before changing differential fluid, place a suitable container under differential to catch draining lubricant.

- (1) Operate vehicle for 5 minutes to warm differential fluid.
 - (2) Drain lubricant by removing cover plate.
 - (3) Replace cover plate and fill differential through plug hole to proper level.
 - (4) Operate vehicle for approximately 10 miles, making at least ten figure-eight turns to flush old lubricant out of clutch packs.
 - (5) Repeat steps 2 through 4 replacing cover gasket.
- c. Inspecting differential for leaks. Visually inspect differential body, junction of body and cover plate for signs of leaking fluid. Leaks may be the result of worn or damaged cover gasket. Repair as required.

4-4.15 Wheels and Tires Service. This paragraph contains procedures for checking, adjusting wheels and tires and for lubricating wheels. All maintenance procedures must be performed at scheduled intervals.

- a. Lubricating front wheel bearings. Refer to paragraph 5-5.7.7 for access to front wheel bearing, and lubricate the bearings as follows:

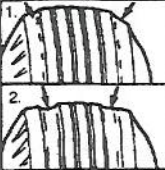
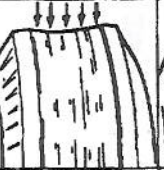


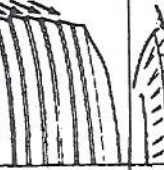

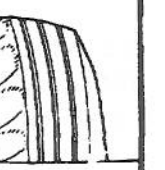
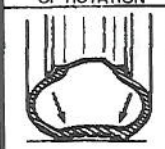
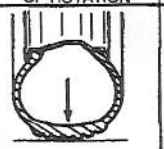
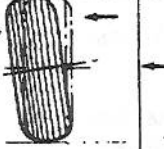
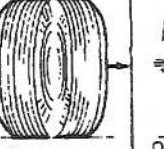
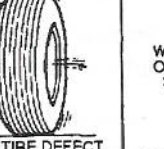
	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
CONDITION							
CAUSE	UNDERINFLATION OR LACK OF ROTATION 	OVERINFLATION OR LACK OF ROTATION 	UNDERINFLATION OR EXCESSIVE SPEED	EXCESSIVE CAMBER 	INCORRECT TOE 	UNBALANCED WHEEL OR TIRE DEFECT 	LACK OF ROTATION OR WORN OR OUT-OF-ALIGNMENT SUSPENSION
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES		REPLACE TIRES	REPLACE FRONT AXLE HOUSING IF NECESSARY	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION

Figure 4-3. Tire Wear Patterns

CAUTION

Do not overfill wheel hub with grease. Leakage may occur, resulting in contamination of brake linings.

- (1) Pack bearings with lithium-based grease, as specified in figure 4-5. Be sure to force grease between rollers.
 - (2) Check bearing races for signs of pitting, brinelling or overheating. Refer to paragraph 5-5.7.7 and replace any damaged parts.
 - (3) Wipe spindle clean and apply small amount of grease.
 - (4) Wipe wheel hub clean and apply small amount of grease inside hub.
 - (5) Refer to paragraph 5-5.7.7 and reassemble wheel.
- b. Adjusting front wheel bearings.
- (1) Raise vehicle.
 - (2) Remove hub cap.
 - (3) Remove outer locknut and lockwasher.
 - (4) Seat bearings by loosening, then tightening, inner locknut to torque specified in table 6-2, using tool #J-6893. Rotate wheel while tightening locknut to seat bearings uniformly.
 - (5) Back off inner locknut 1/6 turn (45°-65°) while rotating wheel.
 - (6) Install lockwasher. Align a lockwasher hole with peg on inner locknut and install washer on nut.
 - (7) Install outer locknut. Tighten outer locknut to minimum of torque specified in table 6-2, using tool #J-6893.
 - (8) Recheck bearing adjustment. Wheel must rotate freely and not display any lateral movement.
 - (9) Install spring cup and pressure spring.

CAUTION

The spring cup must be installed so the recessed side faces the bearing and the flat side faces the pressure spring. The pressure spring should contact the flat side of the cup only.

- (10) Install drive gear snap ring.
 - (11) Coat hub cap rim with Permatex Form-A-Gasket No. 3 and install hub cap.
- c. Checking for abnormal tire wear. Abnormal tire wear can be caused by incorrect inflation pressures, tire-wheel unbalance, worn suspension components, improper brake operation, bent wheels, front wheel misalignment or excessive speed on turns. Refer to figure 4-3 for symptoms and corresponding corrective actions.
- d. Adjusting tire inflation pressure. Standard tire pressure is 75 psi. Check and adjust inflation pressures only when the tires are cold, or driven for less than 2 miles at low speeds below 10 mph, or after the vehicle has been parked for 3 hours or more. Do not reduce inflation pressures if the tires are hot, or driven over 2 miles at speeds above 10 mph. At this stage, tire pressures may increase as much as 6 psi over cold inflation pressures due to air expansion caused by heat buildup in the tire. When checking and adjusting inflation pressures, always use a reliable and accurate gauge to ensure proper inflation levels.
- e. Inspecting tread. Visually inspect tires for any foreign objects lodged in tread. Remove any objects and make sure tire has not been damaged.
- f. Repairing tires. Punctured tires and/or tubes should be removed from the wheel and permanently repaired from the inside, using a combination repair plug and vulcanized patch. When repairing punctures, always follow the manufacturer's directions for repair kit instructions.

NOTE

Punctures in the tread area only are repairable on tubeless tires. Do not attempt to repair punctures in the tire shoulders or sidewalls. In addition, do not attempt to repair a tire that has bulges or blisters; ply separations; broken, cut or cracked beads; fabric cracks or cuts; bald spots; or visible wear indicators or punctures larger than 1/4 inch in diameter.

TIRE ROTATION

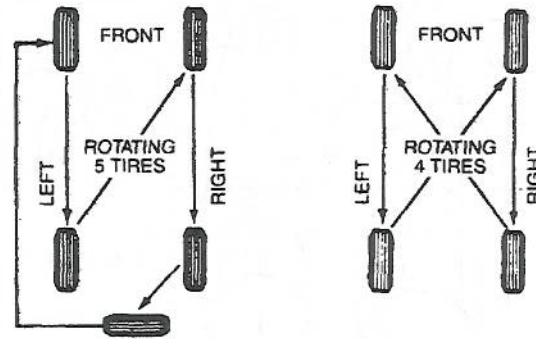


Figure 4-4. Tire Rotation

- g. Rotating tires. The first rotation is the most important in setting the stage for even tread wear. Rotate tires promptly at scheduled intervals and in a pattern shown in figure 4-4.
- h. Checking wheel-retaining nut tightness. Check the torque on all wheel retaining nuts. Make sure all nuts are tightened to torque specified by table 6-2.

4-4.16 **Frame Service.** Check structural members for cracks or signs of overload at scheduled intervals. Tighten all attaching hardware.

4-4.17 **Windshield Wiper Service.** Turn windshield wipers and washers on and check to see that wipers clean fluid off windshield without leaving streaks. Replace wiper blades if necessary. Check washer fluid reservoir level and refill if necessary. Maintenance procedures must be performed at scheduled intervals.

4-4.18 **Air System Service.** Maintenance procedures for all air system components must be performed at scheduled intervals as follows:

WARNING

Depressurize system before attempting any service or repair that requires disassembly of any pressurized components. Severe injury or death can result if system remains pressurized during any component removal.

- a. Replace the air filter element as follows:
 - (1) Disconnect air filter from air compressor.
 - (2) Remove filter element.
 - (3) Install new filter element.
 - (4) Install air filter on air compressor.

- b. Service the alcohol injector as follows:

WARNING

Methyol alcohol is flammable. Ensure ignition is off and engine is cool before draining and/or adding alcohol to the alcohol injector. Severe burns can result if engine is hot or the engine is left running.

- (1) Drain fluid using drain cock located under the alcohol injector.
 - (2) Close drain cock when all fluid has been drained. Remove screws holding reservoir to cover. Carefully remove reservoir from cover.
 - (3) Using a clean shop rag, clean any residue from the reservoir.
 - (4) Inspect the tetraseal for wear. Replace as necessary.
 - (5) Fill reservoir to fill mark with methyol alcohol.
 - (6) Attach reservoir to cover with screws.
- c. Adjust belt tension as necessary, to provide 1/2 inch of flex in middle of belt.

NOTE

During cold weather operation or service, the alcohol injector should be serviced first. Set the HEATER ON/OFF switch to the ON position and start the engine pressurizing the system. Let the engine warm up. Shut engine off, and set the HEATER ON/OFF switch to OFF position. Depressurize system.

- d. Drain fluid from system as follows:
- (1) Remove drain plugs from both heater drain valve assemblies.
 - (2) Allow fluid to drain from both assemblies.

- (3) Thread and tighten plugs to drain valve assemblies.

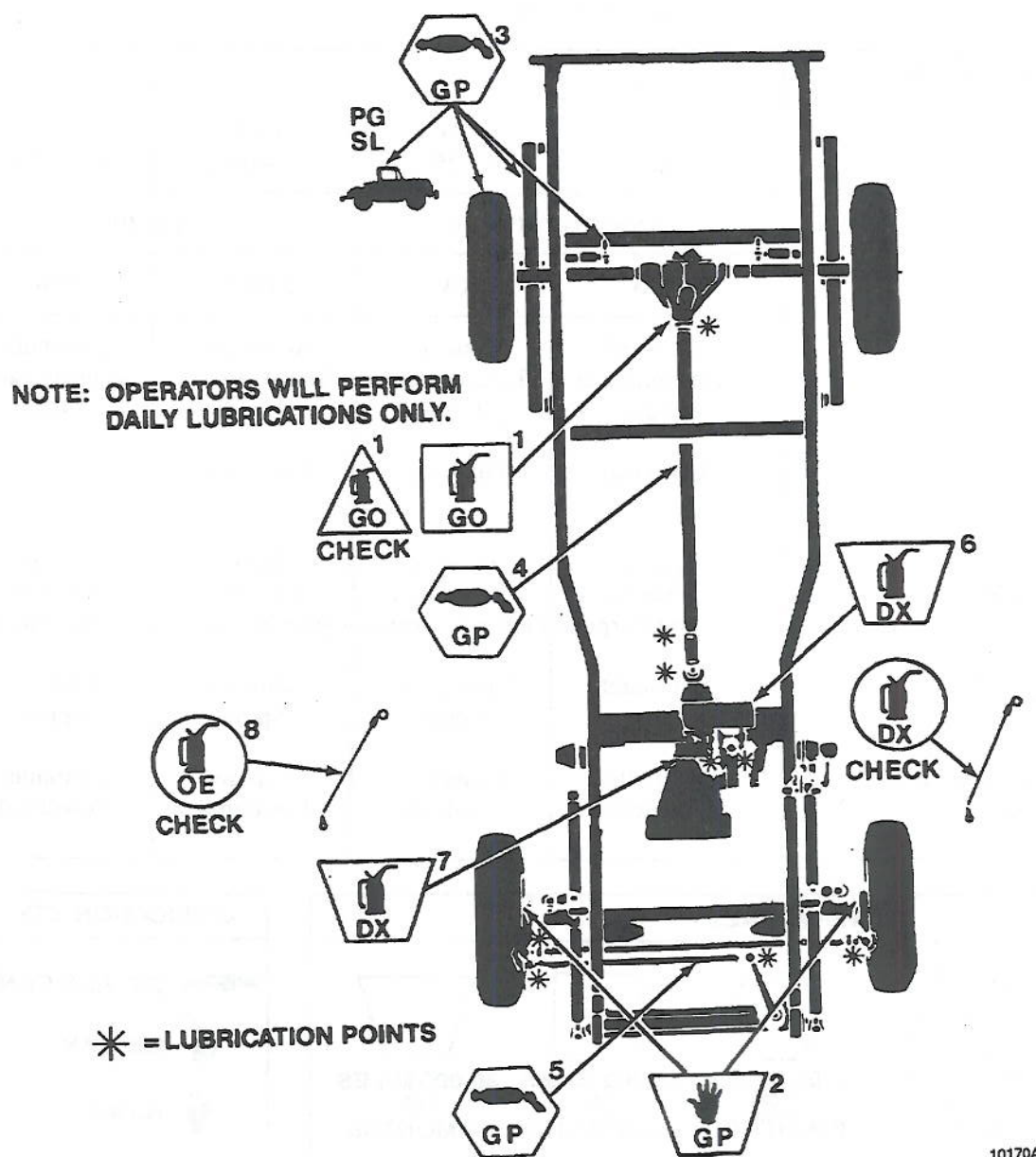
- e. Replace all worm pressure hoses and/or fittings.
- f. Pressurize system and check for leaks. Tighten fittings as necessary.

4-4.19 Winterization System Service. Maintenance procedures for all winterization system components must be performed at scheduled intervals as follows:

- a. Inspect coolant heater and hoses for leaks or signs of wear. Replace as necessary.
- b. Inspect oil thermostat and heater for leaks. Tighten or replace as necessary.
- c. Inspect all electrical wiring for corrosion, burned, frayed or broken wires, and/or loose electrical connections.
- d. Inspect seal on receptacle cover on front of vehicle for signs of wear. Replace seal or cover assembly as necessary.
- e. Inspect battery warmer for dirt and corrosion. Remove battery and clean and/or replace warmer as necessary.

4-5 LUBRICATION.

The lubrication chart, figure 4-5, lists all parts and areas requiring periodic lubrication, the types of lubricants required and the intervals between application. This information is presented through the use of symbols. These symbols are identified and explained in the lubricant key, which also contains special notes regarding some lubrication operations. Lubrication intervals given in this chart are appropriate for normal climatic conditions and must be shortened accordingly when the vehicle is operated under conditions of extreme heat, cold, dust or humidity. Details on the major lubrication procedures (such as engine crankcase, drain and refill) will be found under the appropriate heading in this section.


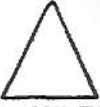








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Figure 4-5. Lubrication Chart (Sheet 1 of 3)

Lubricant Key

Types of Lubricants & Symbols	30°C and up	-7°C to +25°C	+5°C to +40°C	-18°C to +10°C
Engine Oil, OE	15W40 or 20W/40		10W30	
	40W	30W	20W20	10W
DEXRON II, DX	Automatic Transmission Fluid	Automatic Transmission Fluid	Automatic Transmission Fluid	Automatic Transmission Fluid
Oil, Gear, GO SAE 80W-140	Oil, Gear	Oil, Gear	Oil, Gear	
Lithium-Based Chassis Lubricant, GP	Grease, Chassis General Purpose	Grease, Chassis General Purpose	Grease, Chassis General Purpose	Grease, Chassis General Purpose
3M Spray Lube 8902, SL	Lubricant, Spray	Lubricant, Spray	Lubricant, Spray	Lubricant, Spray
Powdered Graphite, AMC/JEEP Silicon Lubricant Spray or Light Oil, PG	Graphite, Powdered	Graphite, Powdered	Graphite, Powdered	Graphite, Powdered

INTERVAL KEY				
				
DAILY	2500 MILES OR 3 MONTHS	5000 MILES OR 6 MONTHS	12,000 MILES OR 12 MONTHS	30,000 MILES OR 30 MONTHS

APPLICATION KEY	
	GREASE GUN
	OIL CAN
	HAND

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Figure 4-5. Lubrication Chart (Sheet 2 of 3)

Lubrication Notes

1. Clean the lubrication fittings with dry cleaning solvent, Federal Specification P-D-680 Type II. Dry before applying lubricant.
2. Intervals specified are for normal operation. The maintenance office may adjust the intervals to compensate for unusual climatic or operating conditions.
3. Check axle differential fluid at 2500 miles or 3 months. Replace differential fluid at 30,000 miles or 30 months.
4. Lubricate every 12,000 miles or 12 months. Replace spindle oil and bearing seals on front wheel bearings (rear wheel bearings do not require periodic or scheduled lubrication).
5. Lubricate body components at 5000 miles or 6 months.
6. Lubricate propeller shafts at 5000 miles or 6 months. Lubricate sleeve yokes (spline and U-joints).
7. Lubricate steering linkage at 5000 miles or 6 months. Lubricate every 12 months or 12,000 miles.
8. Check transfer case fluid at 3 months or 2,500 miles. Replace fluid at 12,000 miles or 12 months.
9. Replace automatic transmission fluid at 12,000 miles or 12 months.
10. Change engine oil at 250 miles and every 1,000 miles afterward.

Figure 4-5. Lubrication Chart (Sheet 3 of 3)

