MAINTENANCE MANUAL

MODEL _____

SERIAL NO. _____

IMPORTANT!

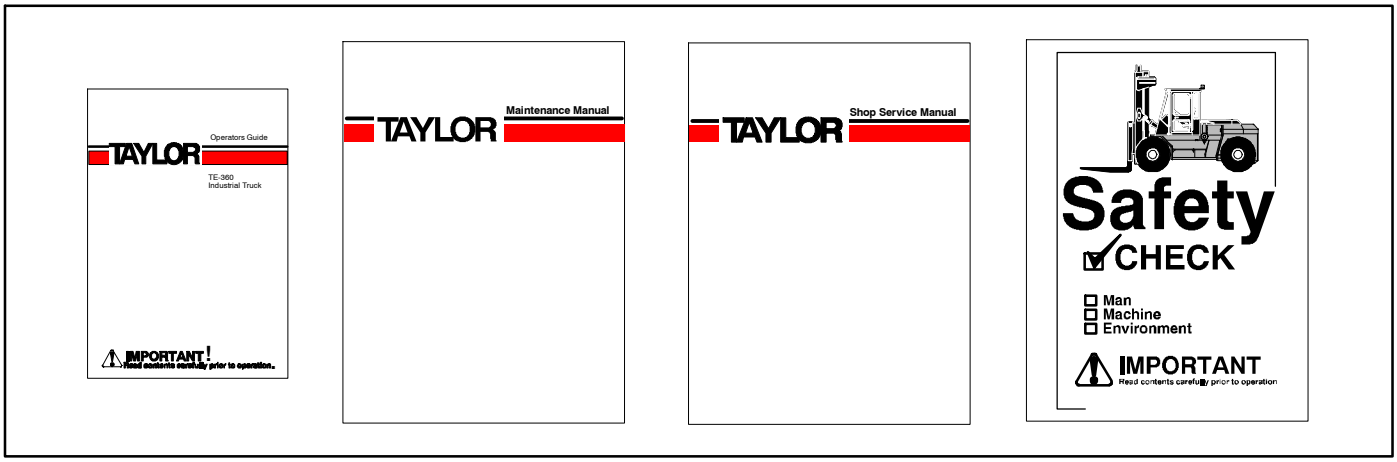
Read contents carefully prior to operation.

⚠WARNING

Operating this powered industrial truck when it is in need of repair can result in death or serious injury to the operator or other personnel or cause severe property damage.

Machine checks must be performed daily:

1. before the machine is placed in service,
2. by qualified, trained, and skilled personnel who have proper tools and knowledge, and
3. in accordance with the Operator's Guide, the Maintenance Manual, the Service Manual, and the *Safety Check* booklet.



Regularly Scheduled maintenance, lubrication, and safety inspections will help ensure a safe and productive work life for the machine and the operator(s).

⚠ **WARNING: *Do not* operate the truck if it is in need of repair. Remove the ignition key and attach a "Lockout" tag.**

⚠ **WARNING: *Do not* attempt to perform maintenance procedures unless you have been thoroughly trained and you have the proper tools.**

⚠ **WARNING: Use only genuine Taylor replacement parts. Lesser quality parts may fail resulting in property damage, personal injury, or death.**

Maintenance personnel who find it necessary to operate this machine, even for a short period of time, must fully understand all operational literature including:

- OSHA operating rules found in 29 CFR 1910.178; Appendix A in *Safety Check*
- ANSI B56.1 rules for operating a powered industrial truck; Appendix B in *Safety Check*
- The Operator's Guide for the machine
- The manufacturer's Safety Booklet
- The manufacturer's Safety Video
- The manufacturer's Service Bulletins
- The content and meaning of all machine decals

⚠ WARNING: If maintenance requires running the engine indoors, ensure the room has adequate flow-through ventilation!

⚠ WARNING: Remove all rings, watches, chains, other jewelry, and all loose clothing before working around moving parts!

⚠ WARNING: Know how to avoid accidents such as those described in the Maintenance / Service Accidents Section of "*Safety Check*":

- Improperly refueling the truck.
- Improperly checking for hydraulic leaks or diesel fuel leaks.
- Improperly checking the engine cooling system.
- Improperly checking battery fluid levels or "jump" starting engines.
- Putting air in a multi-piece tire and rim assembly without proper tools and training.
- Attempting to service a multi-piece tire and rim assembly without proper tools and training.
- Using an improperly suited chain while performing maintenance.
- Using the lift truck hydraulic system as a substitute for a fixed stand.
- Relying on jacks or hoists to support heavy loads.
- Operating a truck that is damaged or in need of repair.
- Climbing on the mast of a forklift, on the top of the cab, or other high places on the machine.
- Operating a machine which has been modified without the manufacturer's approval. This includes the attachment, counterweight, tires, etc.
- Lifting people with a forklift not properly equipped for elevating personnel.

⚠ WARNING: *Do not* operate the vehicle or attempt to perform maintenance on the vehicle while under the influence of alcohol, drugs, or any other medications or substances that slow reflexes, alter safe judgement, or cause drowsiness.

⚠ WARNING: Know how to avoid slip and fall accidents such as those described in the Slip and Fall Accidents Section of "*Safety Check*."

Maintenance Personnel:

- Keep the truck clean, free of oil, grease, and fuel.
- Steam clean / wash the truck prior to performing maintenance. Wear anti-slip footwear when performing maintenance procedures.
- Use OSHA approved ladders and other proper cleaning accessories to access hard to reach maintenance places.
- Keep gratings free of ice, dirt, and gravel.
- Regularly inspect and replace anti-slip mastic on the vehicle as needed.
- Ensure all safety decals are in place on the vehicle.

⚠CAUTION

Observe The Following Precautions For Maximum Safety Of Machine Operation

1. Only trained and responsible operators shall be permitted to handle loads with this truck.
2. Operate the truck from the operator's seat only. Do not allow riders.
3. Test hydraulic controls for proper response before using the machine.
4. Know your load. Do not attempt to lift or transport loads in excess of rated capacity.
5. When the load obstructs the view, operate the truck in the reverse range.
6. Do not stand or work under an elevated load.
7. Transport the load low and tilted back.
8. Avoid sudden stops with a load.
9. Evenly distribute the weight of the load on both forks.
10. Back down a ramp in excess of 10 percent when loaded.
11. The spotting brake is for temporary stops. Do not leave the truck unattended with only the spotting brake applied.
12. Do not move the truck until the air system reaches recommended pressure. Air pressure is required for the service brakes.
13. Have defects repaired immediately. Do not operate a truck with damaged or defective systems.
14. When leaving truck, lifting mechanism shall be fully lowered, controls shall be neutralized, power shut off, parking brake set, and key removed. Block wheels if on incline.

LIMITED WARRANTY

Products manufactured by Taylor Machine Works, Inc. ("Taylor") and sold are warranted by Taylor to be free from defects in material and workmanship, under normal use and service, when Taylor products are operated at or below rated capacity* in accordance with operating instructions.

This warranty is limited to repair or replacement, (as Taylor may elect, and at an establishment authorized by Taylor) of such parts as shall appear to Taylor upon inspection to have been defective in material or workmanship.

This warranty period shall begin on the delivery date of the product to the Purchaser and end on the earlier of twelve (12) months or two thousand (2000) hours. During the first six (6) months or one thousand (1000) hours, Taylor will provide genuine Taylor parts, labor, and travel time to replace or repair any part furnished by Taylor and found to be defective in material and workmanship. If a defect in material and workmanship is found during the first six (6) months and/or one thousand (1000) hours whichever occurs first of the warranty period, Taylor will replace lubricating oil, filters, antifreeze, and other service items made unusable by the defect. In the second six (6) months and/or second one thousand (1000) hours after the delivery date of the truck, Taylor will approve parts only. Only genuine Taylor parts provided by Taylor's Sudden Service, Inc. will be used during the warranty period.

THE FOLLOWING ITEMS ARE NOT COVERED BY THIS WARRANTY:

1. Normal maintenance services and parts or supplies used therein including, without limitation, engine tune-up, wheel alignment, brake and linkage adjustment, lubrication services, tightening and adjusting such as bolts, screws, hoses, fittings, etc., replacement of fuses, bulbs, filters, tune-up parts, fluids and brake and clutch linings, glass; shop supplies such as rags, oil dry, hand soaps, degreasers, cleaning solutions including brake clean, etc.; and adjustments which are a part of the required or recommended predelivery inspection and periodic inspections in accordance with Operator's Manual. Electrical components including wiring will be excluded after the first six (6) months or one thousand (1000) hours whichever occurs first.
2. Normal deterioration of appearance due to use and exposure; or conditions resulting from misuse, negligence, or accident.
3. Any product on which any of the required or recommended periodic inspections or services have not been made.
4. Any parts or accessories, installed on the product which were not manufactured or installed by Taylor whether or not such parts or accessories were selected, recommended or installed by Taylor (including without limitation, engines, tires, batteries, air conditioners, air dryers, etc.). Such parts or accessories shall be covered by the warranties given by the manufacturers thereof and any claim thereof shall be made to such manufacturers.
5. Loss of time, inconvenience, loss of equipment use, other consequential damages or other matters not specifically included.

Taylor parts and assemblies which are furnished and installed under this warranty are themselves within the coverage of the machine warranty and are covered only for the duration of the original machine warranty period.

NOTE: All International warranty parts shipments are F.O.B. point of debarkation, duties, tariffs, or local taxes excluded.

This warranty is expressly in lieu of any other warranties, expressed or implied, including any warranty of merchantability or fitness for a particular purpose.

Replacement parts are warranted for ninety (90) days to be free from defects in material or workmanship. Parts only, no labor.

Taylor Machine Works, Inc. does not authorize any person to create (for Taylor) any other obligation or liability in connection with Taylor products.

*For example, a machine rated capacity at any stipulated load center is the rated lift capacity at less than load center. That is, a machine rated at 20,000 pounds at 24-inch load center connotes 20,000 pounds is the maximum lift capacity even though the load center may be less than 24-inches. Subjecting Taylor products to conditions or loads exceeding those stipulated is justification for immediate cancellation of warranty for products involved.

TAYLOR MACHINE WORKS, INC.
650 North Church Avenue
Louisville, Mississippi 39339
(601) 773-3421 / Fax 601-773-9146

Taylor Remanufacturing Division
REMANUFACTURED TRUCK LIMITED WARRANTY
Continental United States and Canada

Products remanufactured by Taylor Machine Works, Inc. (Taylor), and sold in the Continental United States and Canada are warranted by Taylor to be free from defects in material or workmanship, under normal use and service, when its products are operated at or below rated capacity* in accordance with its operating instructions, for one hundred eighty (180) days or one thousand (1,000) operating hours (whichever first occurs), subject to the following provisions.

This warranty is limited to the repair or replacement, as Taylor may elect, and at an establishment authorized by it, of such parts as shall appear to Taylor, upon inspection, to have been defective in material or workmanship. This warranty does not apply to normal maintenance service (such as service filters), nor does it apply to conditions resulting from misuse, negligence, alteration, lack of specified maintenance, or accident. Loss of time, inconvenience, loss of use of equipment, other consequential damages or other matters not specifically included are NOT covered by this warranty. Any replacement part or assembly warranty will expire at original warranty date. No recommendation of items made by others shall imply or constitute any warranty with respect to such items.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Warranty begins at the earliest of the following times:

1. Invoice date of equipment to a user;
2. The date the equipment is demonstrated, rented or sold to a user;
3. The date a dealer has held the equipment in inventory or storage for six (6) months.

***** Rated capacity at any stipulated load center is the rated lift capacity at less than load center. That is, machine rated at 20,000 pounds at 24-inch load center connotes 20,000 pounds is the maximum lift capacity even though the load center may be less than 24-inches. Subjecting Taylor products to conditions or loads exceeding those stipulated is justification for immediate cancellation of warranty for products involved.

Sudden Service, Inc.
649 North Church Avenue
Louisville, Mississippi 39339-2022
(601) 773-8056 / Fax 601-773-9160

⚠CAUTION

Observe The Following Precautions For Maximum Safety Of Machine Operation

1. Only trained and responsible operators shall be permitted to handle loads with this truck.
2. Operate the truck from the operator's seat only. Do not allow riders.
3. Test hydraulic controls for proper response before using the machine.
4. Know your load. Do not attempt to lift or transport loads in excess of rated capacity.
5. When the load obstructs the view, operate the truck in the reverse range.
6. Do not stand or work under an elevated load.
7. Transport the load low and tilted back.
8. Avoid sudden stops with a load.
9. Evenly distribute the weight of the load on both forks.
10. Back down a ramp in excess of 10 percent when loaded.
11. The spotting brake is for temporary stops. Do not leave the truck unattended with only the spotting brake applied.
12. Do not move the truck until the air system reaches recommended pressure. Air pressure is required for the service brakes.
13. Have defects repaired immediately. Do not operate a truck with damaged or defective systems.
14. When leaving truck, lifting mechanism shall be fully lowered, controls shall be neutralized, power shut off, parking brake set, and key removed. Block wheels if on incline.

Maintenance Manual

Introduction. This manual is to be used as a guide for lubrication and maintenance as well as general equipment care. A separate section is provided to discuss each major component or system. This method of presenting the maintenance instructions enables **Taylor Machine Works, Inc.** to assemble a maintenance manual with explicit instructions on the exact equipment installed on the machine.

Lubrication And Maintenance. Lubrication and maintenance should be performed at regular intervals by observing the Preventive Maintenance Schedule in the appendices. If the machine is being operated under extremely dusty, sandy or humid conditions, the service interval may need to be shortened to prevent excessive wear and ensure longer trouble-free operation.

NOTE: An operator's guide which includes the controls and indicators, daily checks, and safety precautions is furnished with each machine and should remain with the machine at all times.

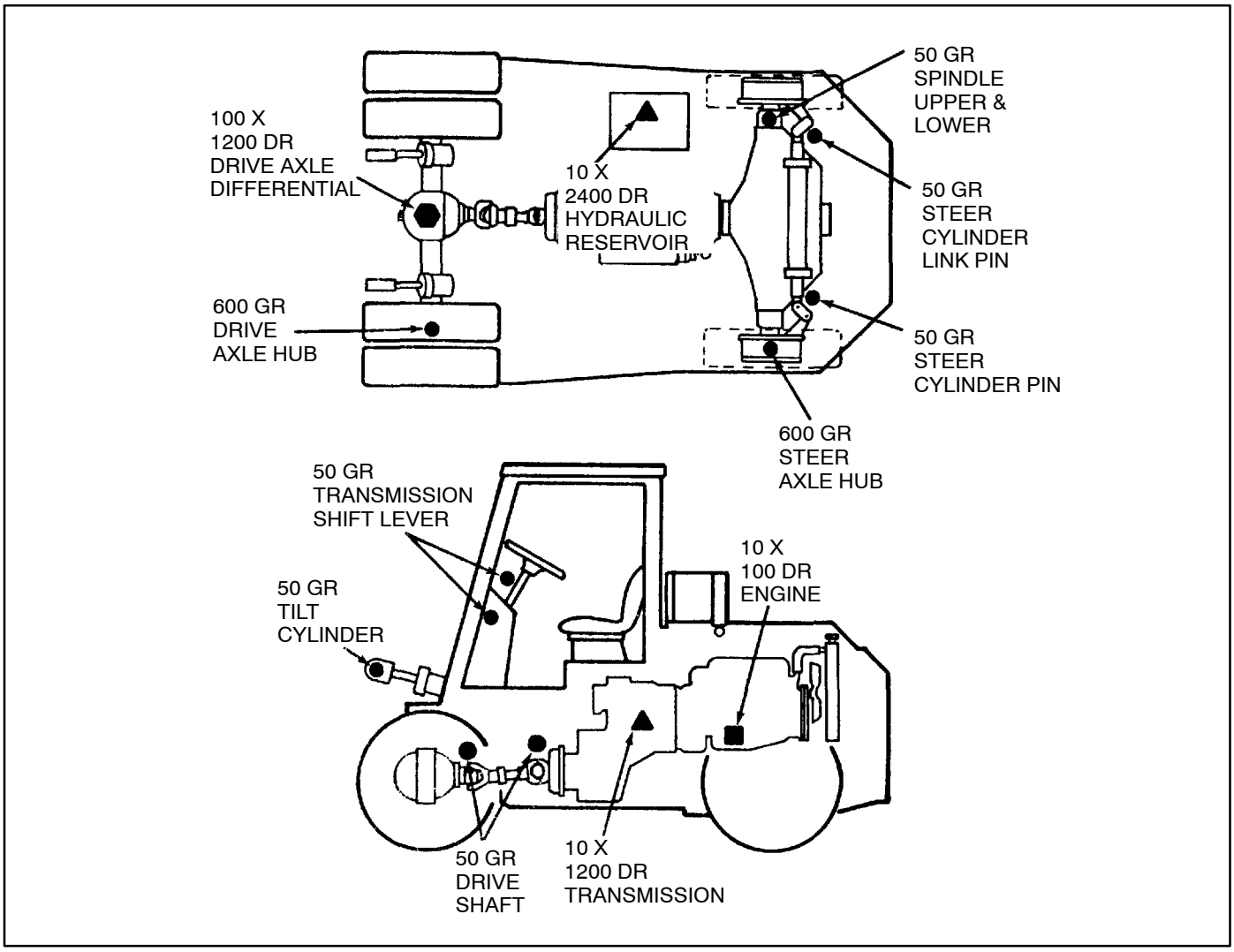


Figure 1. Lubrication Chart

SYMBOL	LUBRICANT	HOURLY INTERVAL	ABBREVIATIONS
■	ENGINE OIL	10 50 100 600 1000 1200 2400	X - Check Lubricant Level DR - Drain and Refill GR - Grease
▲	AUTOMATIC TRANSMISSION FLUID, TYPE C-3		
⬢	GEAR OIL, 90W		
●	MOLY GREASE		

NOTE: See fuel lubricant specifications for types and weights of lubricants used in different temperature ranges.

John Deere 4276 Diesel Engine Lubrication

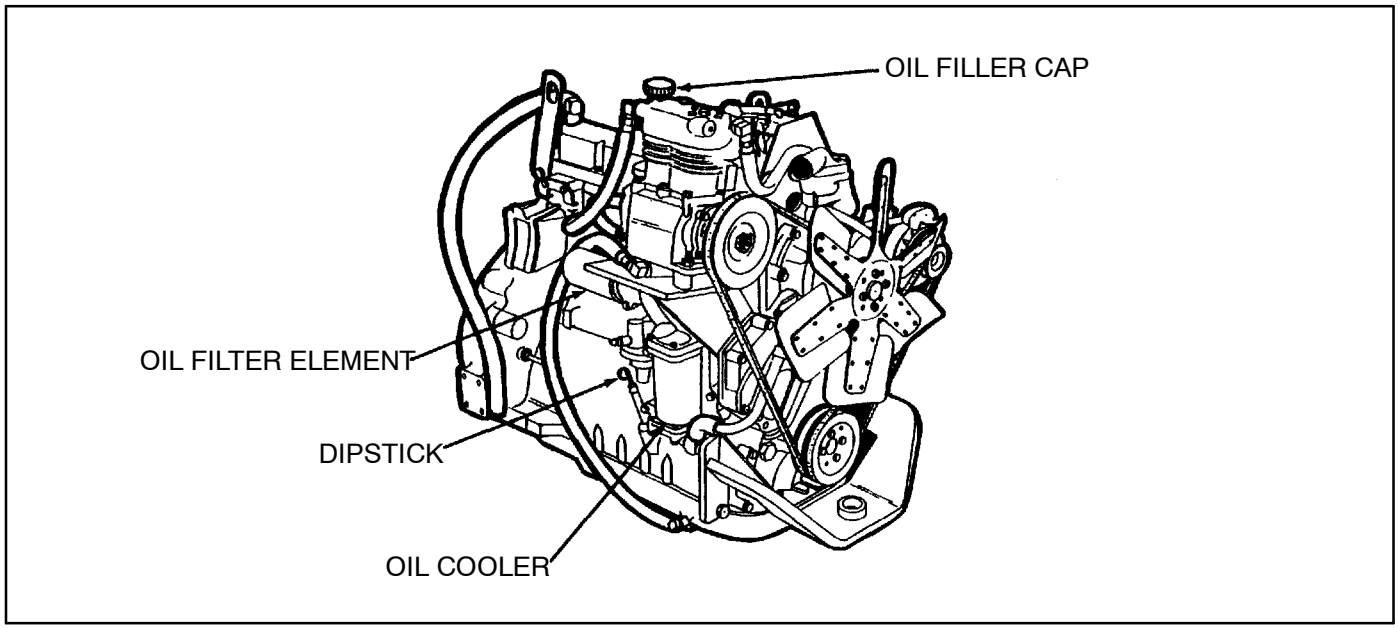


Figure 1. Lubricating System Components

Description. The components of the lubrication system consists of an oil pump, oil filter, oil pressure control valve and an oil cooler. As the system operates, the oil is pumped through the oil cooler and cooled by the engine coolant. The oil is then, passed through the oil filter. After filtering, the oil is distributed to various areas of the engine to provide both cooling and lubrication.

Changing The Oil. Refer to the appendices in the back of this manual for the proper grade of oil to be used, for the temperature range in which the fork lift will be working. The oil should be changed every 100 hours and filter every 200 hours, or sooner if conditions warrant. Perform the following procedures to change the engine oil and filter.

1. Place a drip pan under the oil filter and remove the oil filter using a band type filter wrench. Discard the filter.
2. Place a suitable container under the drain plug in the bottom of the oil pan and remove the drain plug.

NOTE: The oil should be drained when engine is warm. If the oil is drained at the end of the working day, let the engine cool several minutes before draining. This will allow the oil to drain from the upper part of the engine into the oil pan.

3. Reinstall the drain plug.
4. Coat the gasket of the new filter with engine oil.
5. Install the new filter. Tighten the filter by hand until the gasket contacts the adapter face; then, tighten 1/2 to 3/4 turn.
6. Remove the filler cap and service the engine with 15 quarts of oil and reinstall the filler cap.
7. Operate the engine a high idle speed and check the filter and drain plug for leaks.

General Information	
Oil Pressure	45 to 65 psi
Oil Capacity (includes filter change)	15 quarts

53 Series Detroit Diesel Engine Lubrication

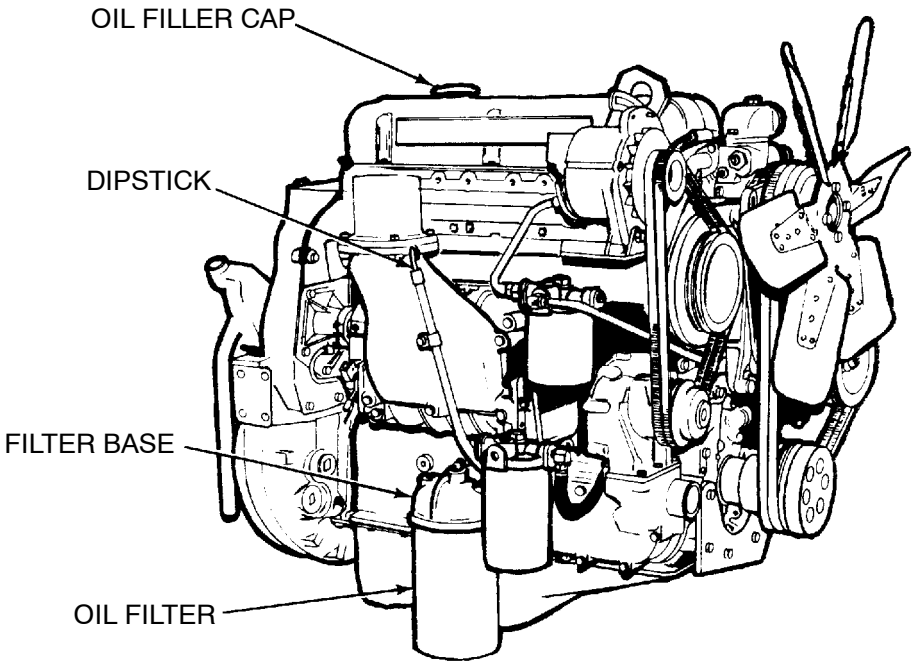


Figure 1-1. Lubricating System Components

Description. The engine lubricating system includes an oil intake screen and tube assembly, an oil pump, a pressure regulator, a full-flow oil filter, and an oil cooler with a bypass valve.

Changing the Oil. Refer to the appendices in the back of this manual for the proper grade of oil to be used. The oil filter element should be replaced each time the engine oil is changed. It is recommended that new engines be started with 100-hour oil change periods. The drain interval may then be gradually increased or decreased, following the recommendations of an independent oil analysis laboratory or the oil supplier (based upon the oil sample analysis) until the most practical oil change period has been established.

1. Provide a suitable container, and remove the drain plug located on the lower portion of the oil pan to drain the oil.
2. Place a drip pan under the oil filter, and remove the oil filter using a band-type filter wrench. Discard the filter.

NOTE: The oil should be drained when the engine is warm. If the oil is drained at the end of a working day, let the engine cool several minutes before draining. This will allow the oil to drain from the upper part of the engine down to the oil pan.

3. Reinstall the drain plug.
4. Coat the surface of the new filter gasket with clean engine oil.
5. Install the new filter. Tighten by hand until the gasket contacts the adapter face; then tighten 1/2 turn.
6. Remove the oil filler cap and fill the engine with oil to the full mark on the dipstick.

NOTE: Allow time for the oil to run down into the oil pan before checking the oil level to ensure an accurate oil level indication on the dipstick.

7. Operate the engine and check for oil leaks.

NOTE: After the engine has been operated at normal operating temperature for several minutes, shut down the engine. Allow time for the oil to run down into the oil pan, and recheck the oil level. Add oil as necessary to bring the oil level up to the full mark on the dipstick.

General Information	
Oil Pressure	
At 1200 rpm	18 psi
At normal operating speed	40 - 80 psi
Oil Capacity (includes filter change)	14 quarts

Ford 300 CID Engine Lubrication

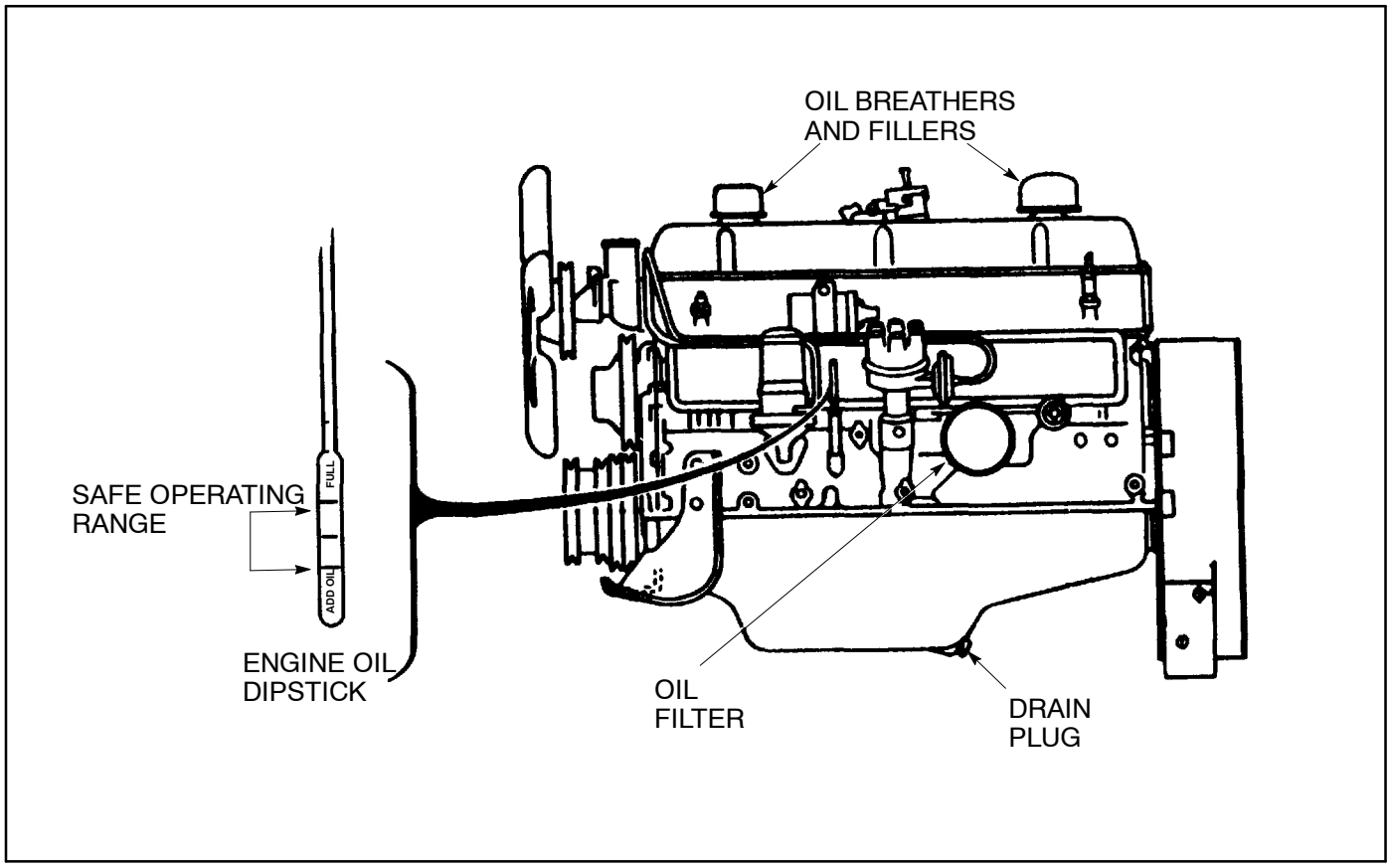


Figure 1. Lubricating System Components

Description. The engine lubricating system consists of an oil screen and tube assembly, an oil pump, a pressure regulator, a full flow oil filter, and crankcase breathers. Oil is drawn from the oil pan sump, through the oil screen and tube assembly by a rotor-type oil pump. Oil under pressure from the pump is forced through the oil filter and engine oil passages to the parts being lubricated. A spring loaded relief valve in the pump limits the maximum pressure in the system. The oil filter is a full-flow type, and filters the entire output of the pump before the oil enters the engine oil passages. A valve integral with the filter permits oil to bypass the filter if the filter becomes clogged. The fumes from the crankcase are vented through two oil fill caps on the rocker arm cover.

Changing The Oil. Refer to the appendices in the back of this manual for the proper grade of oil to be used, for the temperature range in which the fork lift will be working. The oil filter should be after each 100 hours of engine operation, or sooner if conditions warrant. The engine oil should be changed each time the filter is changed. Perform the following procedures to change the engine oil and filter.

1. Place a drip pan under the oil filter, and remove the oil filter (see Figure 1) using a band-type filter wrench. Discard the filter.
2. Place a suitable container under the drain plug in the bottom of the oil pan, and remove the drain plug.

NOTE: The oil should be drained when the engine is warm. If the oil is drained at the end of a working day, let the engine cool several minutes before draining. This will allow the oil to drain from the upper part of the engine down to the oil pan.

3. Reinstall the drain plug.
4. Coat the gasket on the new oil filter with clean engine oil.

5. Install the new filter on the engine block. Tighten the filter by hand until the gasket contacts the adapter face; then tighten 1/2 turn.
6. Remove the two breather caps on top of the rocker arm cover. Wash the breathers in solvent and dry with compressed air.
7. Service the engine with 6 quarts of oil, and reinstall the breather caps.
8. Operate the engine at high idle speed and the filter for leaks.

General Information	
Oil Pressure	40 - 60 psi
Oil Capacity (includes filter change)	6 quarts

53 Series Detroit Diesel Fuel System

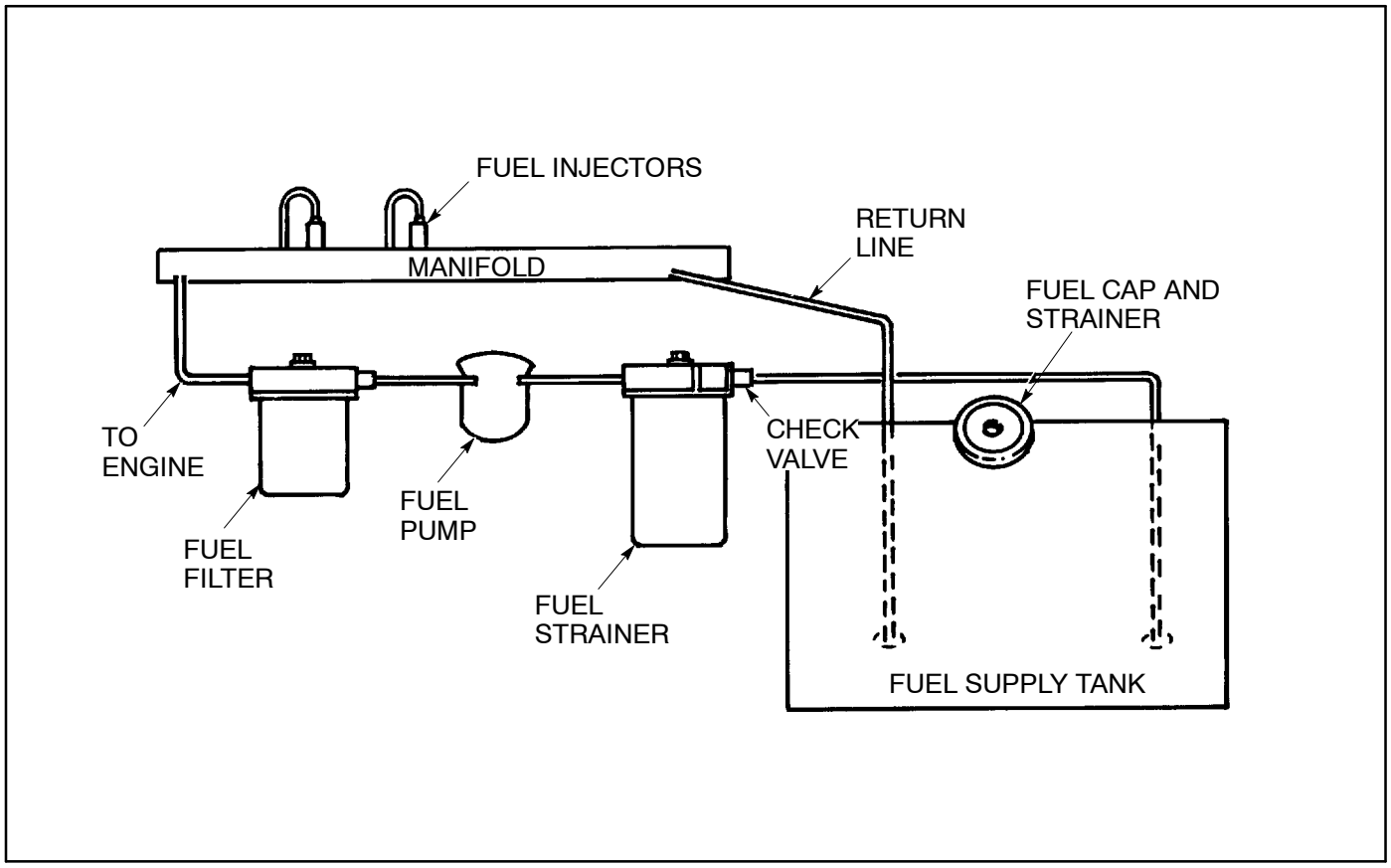


Figure 1. Fuel System

Description. The fuel system consists of a fuel tank, strainer, pump, filter, lines, manifold and fuel injectors. Fuel is drawn from the fuel supply tank through the fuel strainer and enters the fuel pump at the inlet side. Upon leaving the fuel pump under pressure, fuel is forced through the fuel filter and into the inlet manifold. Fuel pipes from the inlet manifold distribute the fuel to the fuel injectors. The fuel strainer removes the larger particles, and the fuel filter removes the smaller foreign particles from the fuel.

Changing the Filter. With the engine shut down, perform the following procedures to replace either the fuel strainer or the fuel filter. The filter should be changed every 400 hours or more often if conditions warrant. Refer to Figure 2 for identification of parts.

1. Place a drip pan under the fuel strainer or filter and remove them using a band-type wrench.
2. Remove and discard the filters.
3. Fill the new filters 2/3 full with clean fuel. Coat the gasket lightly with clean fuel.
4. Install the new filter assembly and tighten it 2/3 of a turn beyond gasket contact.
5. Operate the engine and check for leaks.

Servicing. Refill the fuel tank at the end of each day's operation to prevent condensation from contaminating the fuel.

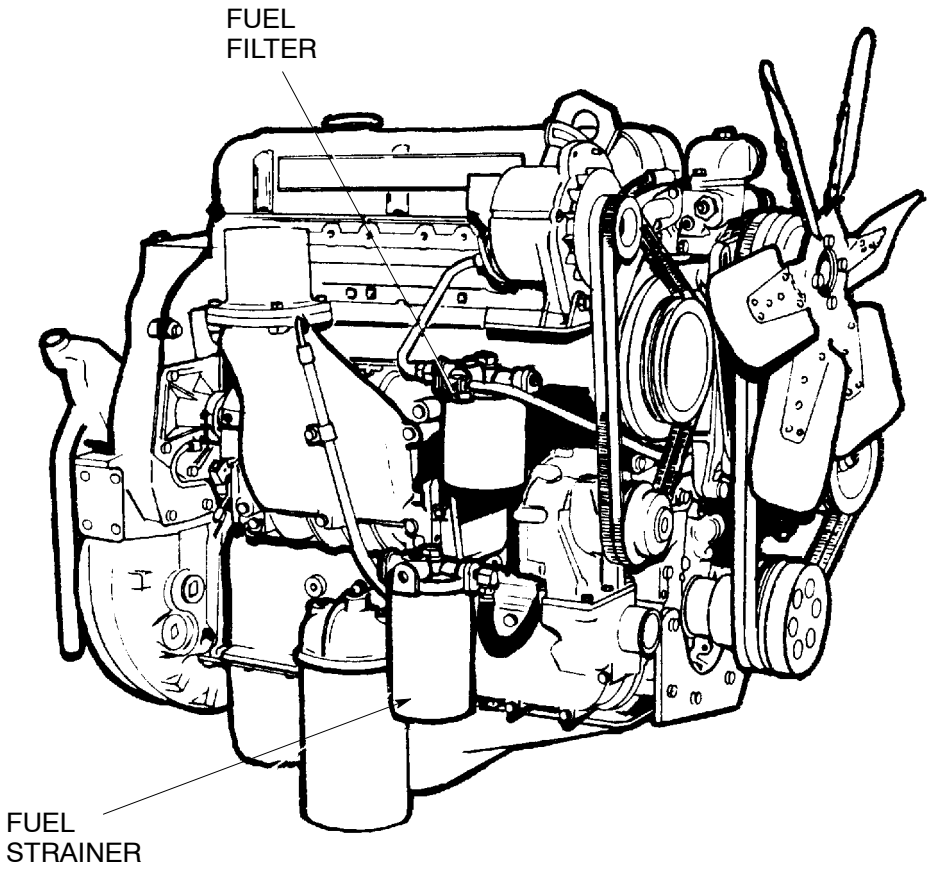


Figure 2. Servicing Fuel Filter and Strainer

John Deere 4276 Diesel Fuel System

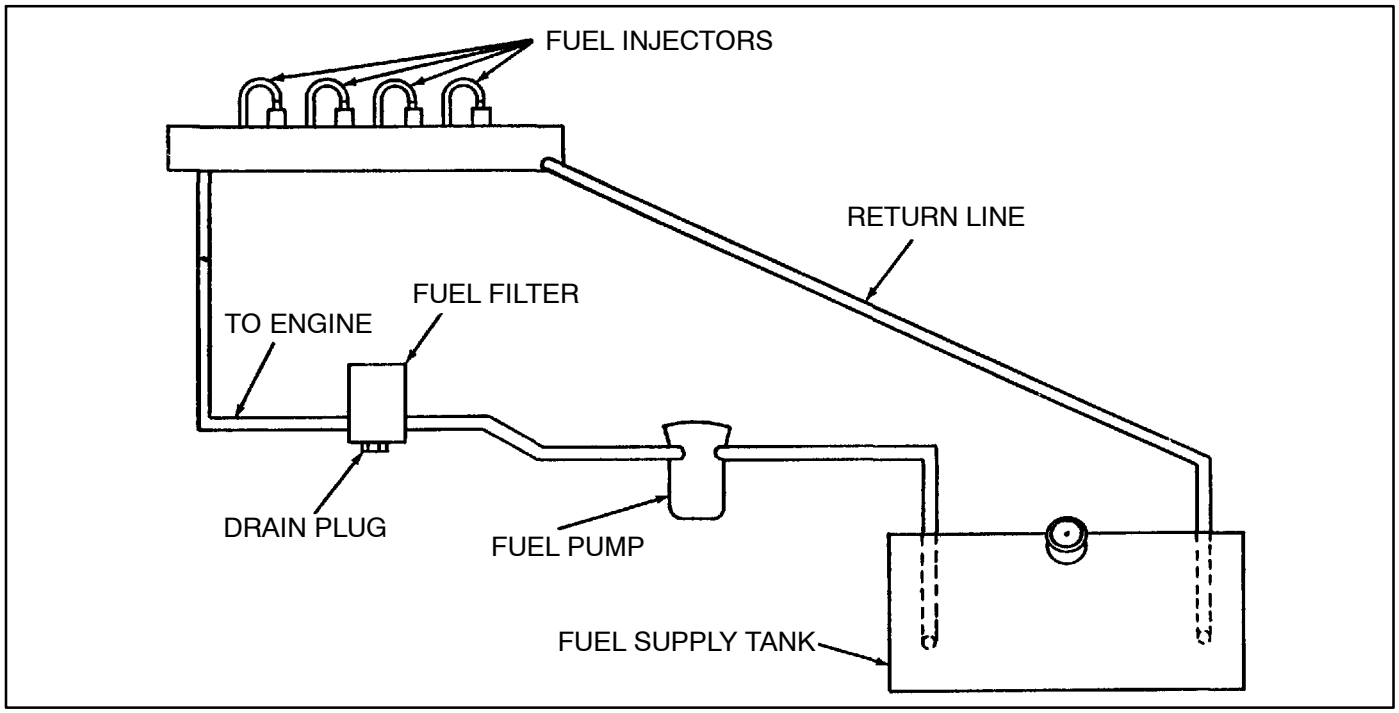


Figure 1. Fuel System

Description. The fuel system consists of a fuel tank, pump, filter, lines, manifold, and fuel injectors. Fuel is drawn from the fuel supply tank and enters the fuel pump at the inlet side. Upon leaving the fuel pump under pressure, fuel is forced through the fuel filter and supplied to the inlet manifold and the fuel injectors.

Before Starting Engine. Drain approximately 1/4 pint of fuel from the fuel filter to remove sediment and water. To drain, remove drain screw on bottom cover. (See Figure 2)

Changing Replacement Elements. The filter elements should be changed every 500 hours or more often if conditions warrant. With the engine shut down, perform the following procedures to replace fuel filter element. Refer to Figure 2 for location and identification of parts.

NOTE: Change the filter after a year if this comes before 500 hours.

1. Place a suitable container under the fuel filter and open the drain screw.

NOTE: The fuel will drain more freely if the plug is removed from the body.

2. To release the top hook of the spring, push the outer finger tab. At the same time pull the inner tab.
3. Remove the spring.
4. Remove the element.
5. Install a new element over the spring pin.
6. Install the bottom hook of the spring.
7. Install the top hook.
8. Close drain screw.

⚠ **CAUTION: Dirt in the spring pin groove or on the end of the spring pin can be washed into the injection system and cause damage to the injection pump or nozzles.**

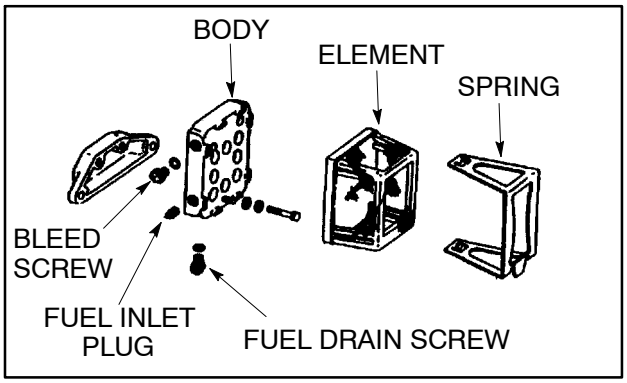


Figure 2. Fuel Filter

Removing Air From Fuel System. When the fuel filter or fuel pump sediment bowl is removed, or the engine runs out of fuel, remove air from the fuel system as follows:

1. Loosen the filter bleed screw.
2. Pump primer lever on the fuel transfer pump until a solid stream of fuel flows from the bleed screw.
3. Tighten the bleed screw.
4. Push primer lever down.

NOTE: If the primer does not pump fuel and no resistance is felt at the upper part of the lever stroke, turn the engine a little with the starter.

Ford Gasoline 300 CID Fuel System

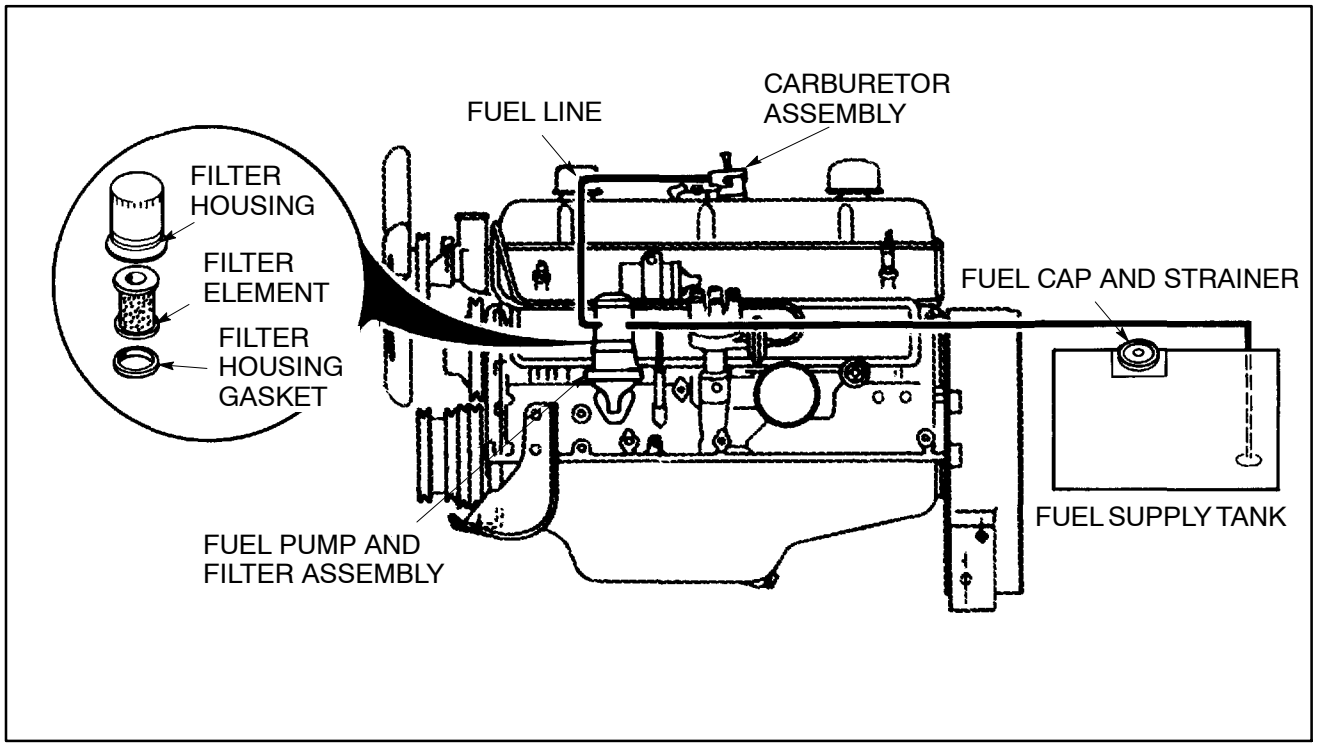


Figure 1. Fuel System

Description. The fuel system consists of a fuel tank, fuel pump and filter assembly, fuel supply lines, and a single venturi float-type carburetor. Fuel is drawn from the fuel supply tank by the fuel pump. Fuel is filtered at the fuel pump before entering the fuel supply line to the carburetor.

Changing Replacement Element. A special fuel filter is located on the fuel pump body. The filter element should be changed every 1200 hours or more often if conditions warrant. Perform the following procedures to replace the filter element.

1. Unscrew the filter housing from the fuel pump.
2. Remove the filter element and gasket. Discard both filter element and gasket.
3. Clean the filter housing in a petroleum cleaning solvent.
4. Place a new filter element over the spout in the fuel pump housing.

⚠ CAUTION: Be sure to use the proper element for this type of installation.

5. Coat a new gasket with light engine oil, and position the gasket on the filter housing.
6. Screw the filter housing onto the fuel pump. Hand tighten the filter housing until housing until the gasket contacts the pump, then tighten the filter housing an additional 1/8 turn.
7. Start the engine and check for fuel leaks.

Carburetor Adjustments. Refer to the manufacturer's manual for carburetor adjustments.

LP Gas Fuel System

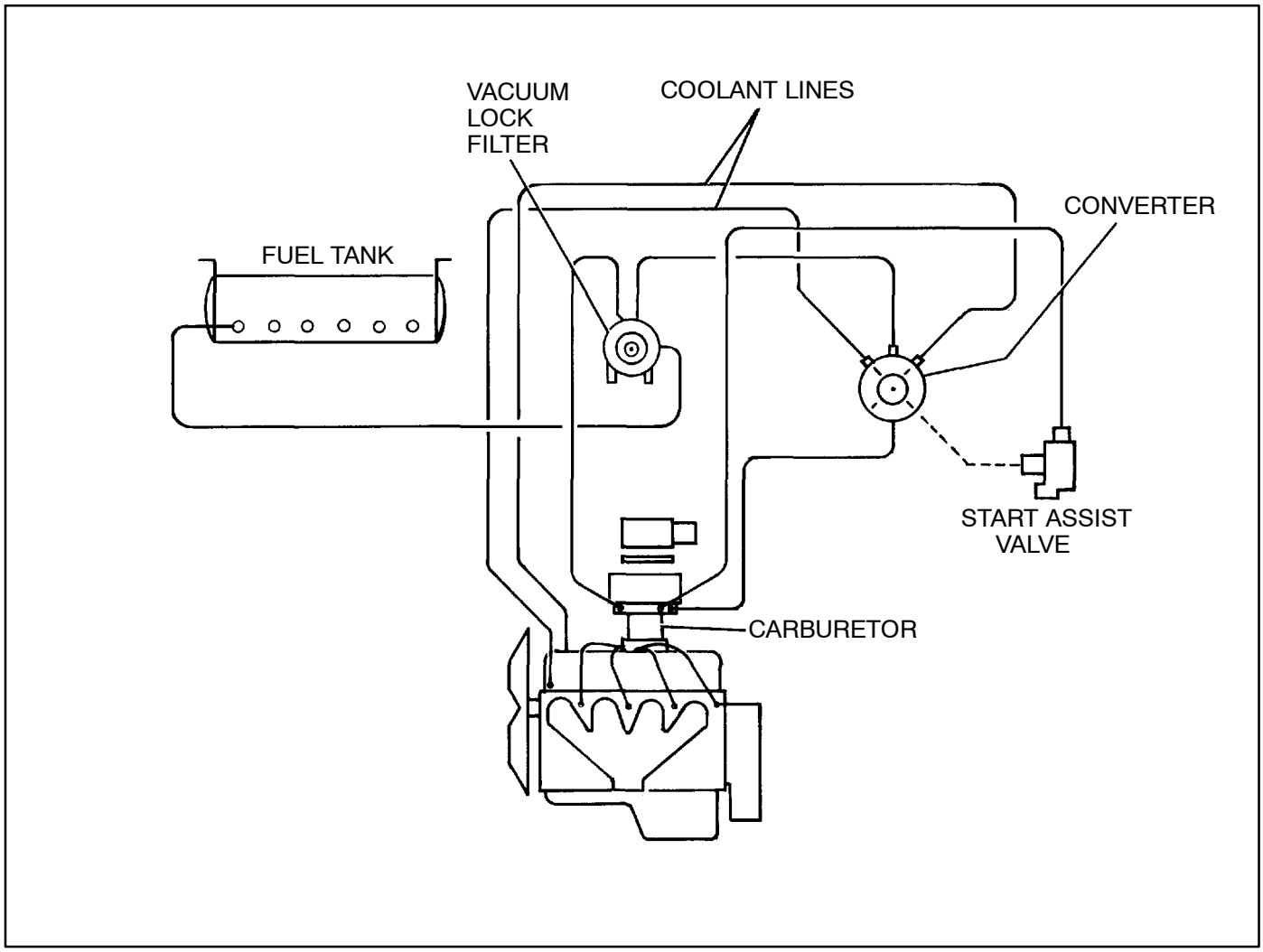


Figure 1. Fuel System

Description. The fuel system consists of the fuel tank, safety connections, converter, carburetor, and interconnecting liquid and vapor lines required to supply LP gas from the fuel tank to the carburetor. Coolant inlet and outlet lines are connected between the engine cooling system and the converter. The high temperature of the engine coolant circulating through the converter aids in vaporization of the LP gas.

Maintenance. The fuel system on an engine equipped to operate on LP gas requires very little maintenance. The fuel filter pads within the vacuum lock filter should be changed every 400 hours of operation. To change the filter pads, remove the ten screws on the “Fuel In” side of the vacuum lock filter. Take care to prevent damage to the gasket. Remove the cover and filter then, install a replacement filter. Position the cover over the filter and secure with the ten screws. To keep the LP gas carburetor operating at peak efficiency the air valve on top of the carburetor should be removed and cleaned every 1200 hours of operation. The fuel lines and fittings should be checked periodically for leaks and serviceable condition.

⚠ WARNING: Any leaks or damage should be repaired immediately because of the possible fire hazard.

Donaldson Air Intake System

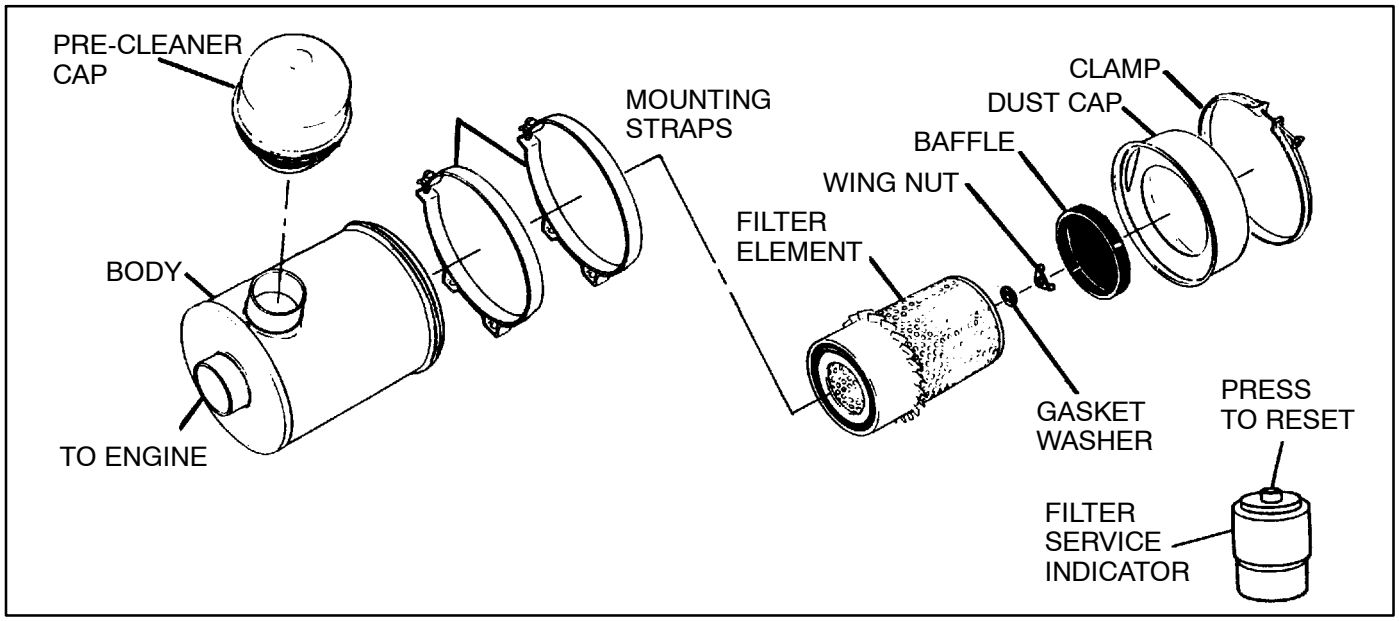


Figure 1. Air Intake System

Description. The Donaldson "Cyclopac" air cleaner is designed for fast, easy disassembly so it can be cleaned efficiently and quickly. The heart of the air cleaner is the double-life filter element, that can be cleaned and reused. Intake air enters the air cleaner through the pre-cleaner cap. When the air reaches the filter element, fins on the element impart a high-speed circular motion to the intake air. This action separates a large portion of the dust from the air by centrifugal action. The dust is swept through a slot in the baffle and collected in the dust cap.

Servicing. If the fork lift is being operated under extremely dust conditions, the dust cup should be emptied every day. Under ordinary operating conditions, dust cup service is required only infrequently. Perform the following procedures to service the dust cup.

1. Remove the clamp (See Figure 1).
2. Remove the dust cup.
3. Empty any dust that has collected in the dust cup, and wipe the inside of the cup clean.
4. Reinstall the dust cup and clamp.

NOTE: Periodically (50 to 100 hours, depending on how dust working conditions are), the filter element should be cleaned.

Perform the following procedures to clean the filter element and air cleaner components.

1. Remove the clamp and dust cup (see Figure 1).
2. Remove the baffle, wing nut, gasket, washer, and remove the filter element.
3. Clean the filter element by directing by directing compressed air on the pleats inside the element (See Figure 2).
4. If the element does not appear to be sufficiently clean after cleaning with compressed air, wash the filter (see Figure 2).

NOTE: Donaldson D-1400 Filter Cleaner (detergent with a carbon-dissolving additive) mixed with water is recommended for washing the filter.

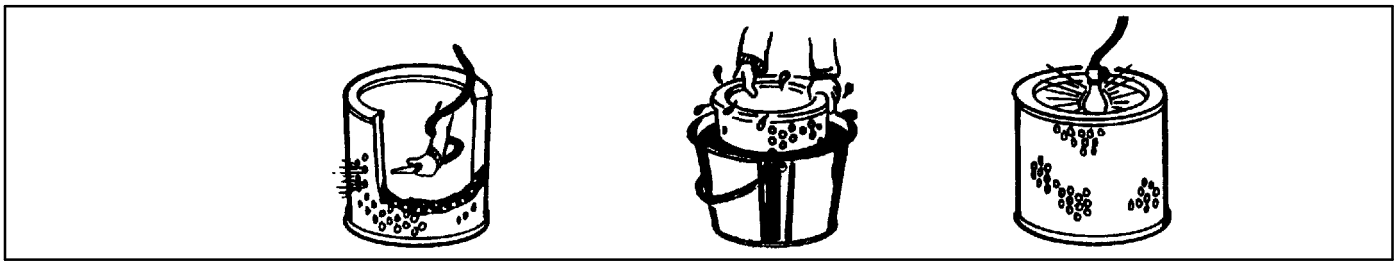


Figure 2. Element Cleaning Methods

5. Inspect the filter element for signs of deterioration or damage, by placing a bright light inside element and rotate element slowly. If any rupture, holes or damaged gaskets are discovered, replace (See Figure 2).
6. Remove all dust and foreign particles from the air cleaner components, and clean the inside of the air cleaner body.
7. Reinstall the filter element, gasket washer, and wing nut.
8. Reinstall the baffle, dust cup, and clamp.
9. Push the reset button on the bottom of the filter cartridge service indicator.

Farr Air Intake System

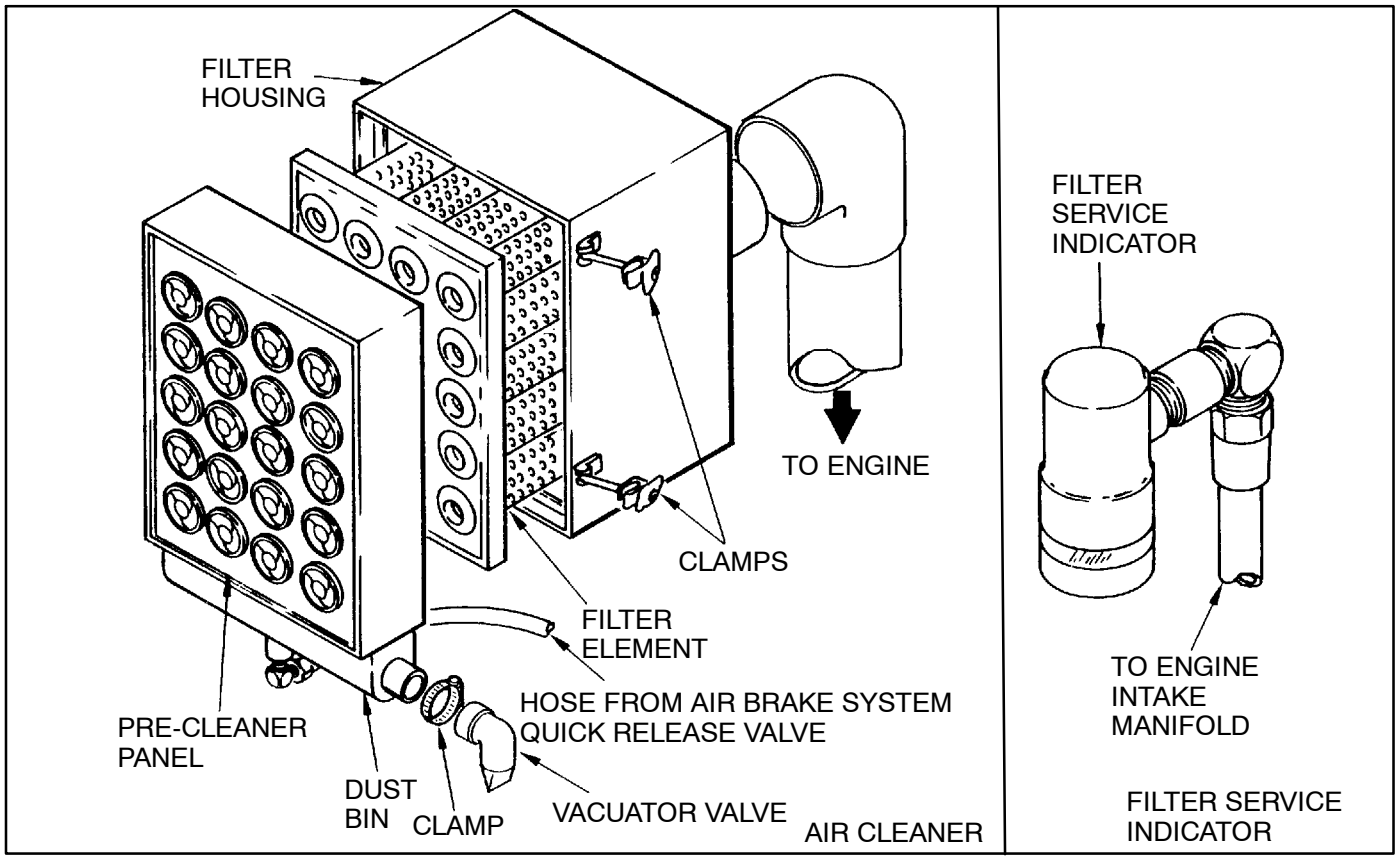


Figure 1. Air Intake System

Description. The Farr “Roto-pamic” two stage air cleaner combines two distinct methods of cleaning intake air. As air enters the pre-cleaner (see Figure1) the design of the pre-cleaner causes the air to spiral. This spiraling action causes dust particles to be separated from the air. These dust particles fall to the bottom of the pre-cleaner panel and collect in the dust bin. This is the first stage of the two stage cleaning. Pre-cleaner air passes through the filter cartridge for second stage cleaning. An air hose is connected from the exhaust port of the air brake system quick release valve to the dust bin. Each time the service brakes are applied, when the brake pedal is released, a charge of air flows from the quick release valve through the air hose and dust bin to the outside atmosphere. This action blows the dust particles out of the dust bin at irregular intervals while the machine is working, and keens the dust bin clean.

Checking Filter Condition. Check the filter service indicator daily. If green is visible through the transparent portion of the case the filter is serviceable. If the filter indicator shows red, the filter element is clogged and should be replaced. The air cleaner filter element should be changed each 600 hours of operation or more often if the filter service indicator shows that the element is clogged.

Replacing The Filter Element.

1. Loosen the clamps attaching the pre-cleaner panel to the air cleaner housing and remove the pre-cleaner panel.

NOTE: The air hose connected to the dust bin is flexible enough so the top of the precleaner panel can be tilted away from the housing, and the panel lowered enough to allow removal of the filter element without disconnecting the air hose.

2. Remove the filter element.

3. Clean the pre-cleaner panel by blowing it out with compressed air.
4. Wipe the housing clean and inspect it for cracks or evidence of leaks.
5. Insert a new filter element in the filter housing. (Ensure that correct replacement element is installed.)
6. Position the pre-cleaner panel on the filter housing and tighten the clamps securely.
7. Check all piping, clamps, hoses and connections for tightness and evidence of leaks.

NOTE: Any loose connections between the filter housing and the engine will allow outside air to enter the engine directly, without passing through the filter.

Cooling System

Description. The cooling system consists of the radiator, piping connecting the radiator to the engine, and a water pump to circulate the coolant through the system. A recovery tank is connected to the top of the radiator which supplies additional coolant and improves the cooling capability.

Checking The Coolant Level. The coolant level should be checked daily. Coolant should be visible in the recovery tank before starting the engine, when the coolant is cold. If the coolant level is too low, add coolant to the recovery tank until coolant is visible between marks. Do not overfill.

⚠ WARNING: Do not remove cap on radiator unless entire system is to be refilled after draining.

Coolant Temperature. When the engine warms up the indicator pointer for the coolant temperature gauge should be in the green area; (180˚ - 200˚F).

Draining The Coolant System. Remove the engine drain plugs to drain coolant from the engine block as well as opening the drain cock in the bottom of the radiator.

NOTE: The engine drain cock is located on the side of the engine block.

Removal of the radiator filler cap will allow air to enter the cooling passages and ensure that the coolant drains completely from the system.

⚠ CAUTION: When freezing weather is expected, any cooling system not adequately protected by antifreeze should be drained.

Leave all drain cocks open until refilling the cooling system.

The cooling system of this equipment is protected to -34°F (-36°C) freezing, and 220°F (104.4°C) boiling. This is a 50 percent ethylene glycol base antifreeze to water solution. It is recommended that 50 percent solution be maintained year round.

NOTE: If the 50 percent antifreeze to water is not maintained, water pump failure may occur.

Cooling Recommendations. The following recommendations are considered beneficial to trouble free operation of the cooling system.

1. Always use a properly inhibited coolant.
2. If freeze protection is required, always use antifreeze with an ethylene glycol base.
3. Re-inhibit antifreeze with a non-chromate inhibitor.
4. Always follow the manufacturer's recommendations on inhibitor usage and handling.
5. Do **Not** use soluble oil.
6. Chromate inhibitors should **Never** be used.
7. Sealer type antifreeze should **Not** be used.
8. Maintain prescribed inhibitor strength.

Filling The Coolant System. Before starting the engine, close all drain cocks and fill the cooling system. If the capacity of the cooling system is unknown, measure the amount of water necessary to fill the cooling system. Drain the cooling system and refill with the desired amounts of water and antifreeze or pre-mix to proper proportions before filling.

NOTE: The use of clean soft water will eliminate the need for descaling solutions to clean the cooling system.

A hard mineral-laden water should be softened with water softener chemicals before it is poured into the cooling system.

Flushing. The cooling system should be flushed each spring and fall. The flushing operation cleans the system of antifreeze solution in the spring and removes the summer rust inhibitor in fall, preparing the cooling system for a new solution.

Inspection. Components of the cooling system should be checked periodically to keep the engine operating at peak efficiency. The thermostat and radiator pressure cap should be checked and replaced if found defective. The cooling system hoses should be inspected and any hose that is abnormally hard or soft should be replaced immediately. Check the hose clamps to make sure they are tight. All external leaks should be corrected as soon as detected. The shroud should be tight against the radiator core to prevent recirculation of air which may lower cooling

efficiently. Check the fan and water pump drive belts for proper tension.

DRIVE BELT INSPECTION. The tension on the fan and water pump drive belts should be such that a firm push with the thumb midway between the pulleys will deflect the belt 1/2 to 3/4 inch. If either of the belts need to be replaced, replace both belts with a matched set. After replacing the belts and adjusting the tension, operate the engine for 15 seconds to seat the belts and readjust the tension. Recheck the belt tension after 30 minutes of operation, and adjust if necessary.

Thereafter, check the tension of the drive belts after every 50 hours of operation and adjust if necessary.

⚠ **CAUTION: A drive belt too tight is destructive to the bearings of the driven part, and a belt too loose will slip.**

Electrical System

Description. The electrical system consists of a battery (or batteries), a battery disconnect switch, a battery charging alternator with voltage regulator, ignition and starter switch, starter, and starter solenoid. The remainder of the electrical system consists of instruments, switches, sending units, wiring, circuit breakers, etc., necessary for operation of the electrical system. Optional equipment selected by the customer will determine the electrical equipment to be installed in addition to the standard electrical system.

Batteries. The batteries are perishable items which require periodic servicing. A properly cared for battery will give long and trouble-free service. Refer to the appendices in the back of this manual for service intervals, and perform the following procedures to maintain the batteries in a serviceable condition.

1. Check the level of the electrolyte regularly. Add water if necessary, but do not overfill.

⚠ **CAUTION: Overfilling can cause poor performance or early battery failure.**

2. Keep the top of the batteries, terminals, and cable clamps clean. When necessary, wash them with a solution of baking soda and water, and rinse with clean water.

⚠ **CAUTION: Do not allow the soda solution to enter the cells.**

3. Inspect the cables, clamps, and hold down brackets regularly. Replace any damaged parts. Clean and re-apply a light coating of grease to the terminals and cable clamps when necessary.
4. Check the electrical system if the batteries become discharged repeatedly.
5. Use the following quick-in-the-unit check as an indication of faulty components in the battery charging circuit.
   a. A fully charged battery and low charging rate indicates normal alternator-regulator operation.
   b. A low battery and high charging rate indicates normal alternator-regulator operation.
   c. A fully charged battery and a high charging rate usually indicates the voltage regulator is not limiting the alternator output.

⚠ **CAUTION: A high charging rate on a fully charged battery will damage the battery and other components.**

   d. A low battery and low or no charging rate could be caused by loose connections, damaged wiring, defective battery, improper regulator operation, or defective alternator.

NOTE: If the machine is to be inoperative or idle for more than 30 days, remove the batteries. The batteries should be stored in a cool dry place. The electrolyte level should be checked regularly and the batteries kept fully charged.

Alternator. The alternator can be expected to give long, trouble-free service; however, the diodes and transistors in the alternator circuit are very sensitive and can be easily destroyed. The following precautions should be observed when working on or around the alternator.

Avoid grounding the output wires or the field wires between the alternator and regulator. Never run an alternator on an open circuit.

Grounding the alternator's output wires or terminals, which are always hot regardless of whether or not the engine is running, and accidently reversing the battery's polarity will destroy the diodes. Grounding the field circuit will also result in the destruction of the diodes. Some voltage regulators provide protection against some of these circumstances; however, extreme caution should be used.

Accidently reversing the battery connections must be avoided. If a booster battery is to be used, the batteries must be connected positive (+) to positive (+), and negative (-) to negative (-).

Never disconnect the batteries while the alternator is in operation. Disconnecting the battery will result in damage to the diodes, caused by momentary high voltage and current induced by the instantaneous collapse of the magnetic field surrounding the field windings.

Drive Belt (Figure 1). Visually inspect the belt. Check the belt for intersecting cracks. Transverse (across the belt width) cracks are acceptable. Longitudinal (direction of belt length) cracks that intersect with transverse cracks are not acceptable. Replace the belt if it is frayed or has pieces of material missing.

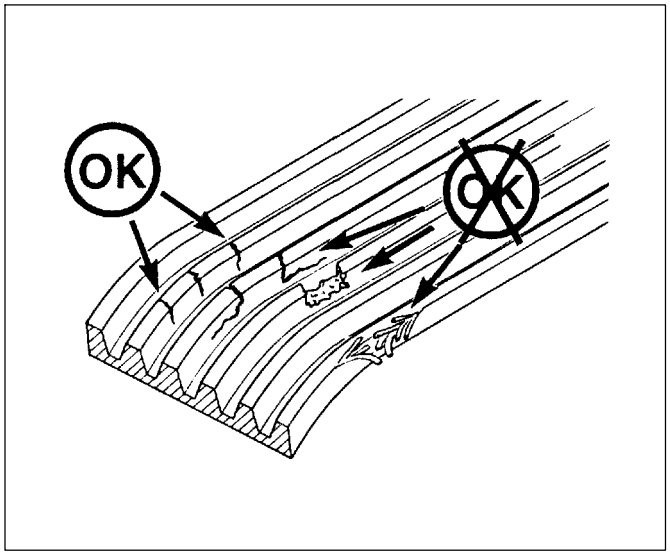


Figure 1. Drive Belt Inspection.

Drive Belt Tension (Figure 2). Measure the belt deflection at the longest span of the belt. Maximum deflection 3/8 to 1/2 inch (9.525 to 12.7 mm).

On engines not equipped with automatic tensioners, the tension on the fan and water pump drive belts should be such that a firm push with the thumb midway between the pulleys will deflect the belt 1/2 to 3/4 inch. If either of the belts need to be replaced, replace both belts with a matched set. After replacing the belt and adjusting the tension, operate the engine for 15 seconds to seat the belt and readjust the tension. Re-check the belt tension after 1/2 hour of operation, and adjust if necessary.

Thereafter, check the tension of the drive belts after every 50 hours of operation and adjust if necessary.

⚠ **CAUTION: Too tight a drive belt is destructive to the bearings of the driven part, and a belt that is too loose will slip.**

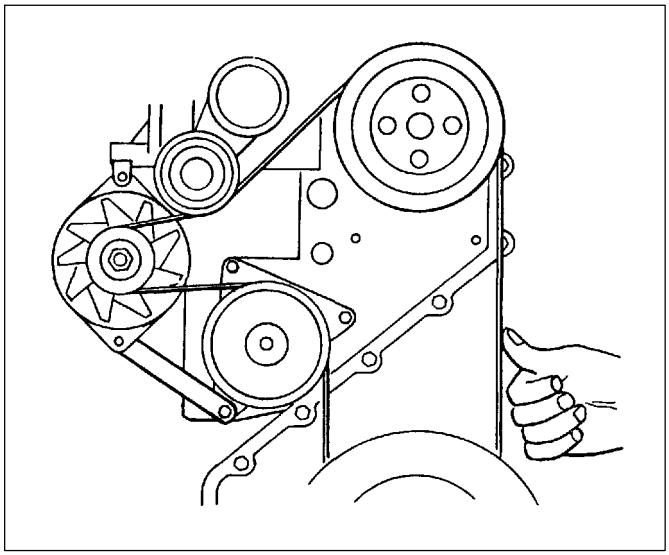


Figure 2. Drive Belt Tension Check.

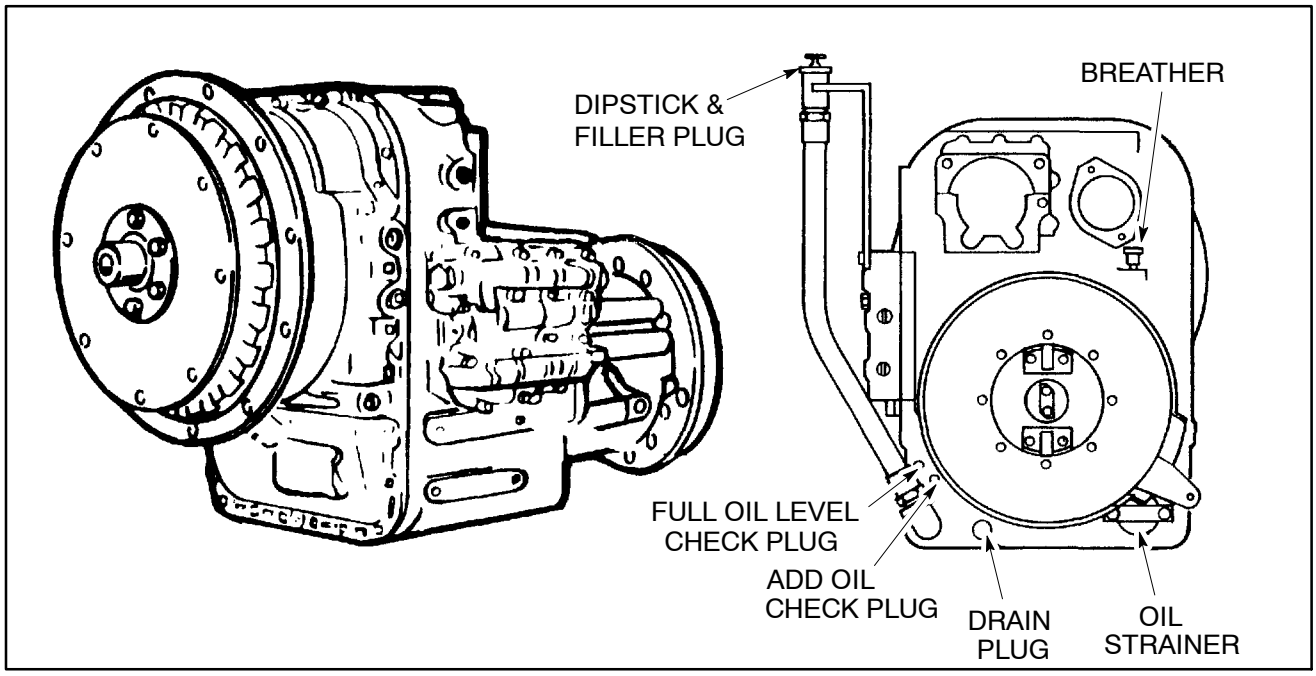


Figure 1. TRT-2000 Series Transmission

Description. A basic 2000 series transmission consists of a twin-turbine torque converter, coupled to planetary gearing, and controlled by hydraulic clutches. It is equipped with an inching control.

Cold Oil Check. This check is made only to determine if there is sufficient oil in the transmission to prevent damage during engine warm-up. Either of the following procedures may be used to perform the cold oil level check.

1. Cold oil check with plugs:
   a. Before starting the engine, remove the full oil level check plug (See Figure 1). If oil flows from the plug opening, the transmission has sufficient oil to permit the engine to be started without damaging the transmission.
   b. If no oil flows from the full oil level plug hole, remove the fill plug (See Figure 1) and add oil through the fill plug hole until oil flows from the full oil level plug hole.
   c. Reinstall the full oil level check plug and the fill plug.
   d. With the range selector in neutral, start the engine. Accelerate the engine to 1000 to 1500 rpm, and operate the engine in this speed range for approximately one minute.

NOTE: Idle rpm is between 500 to 750 rpm.

   e. Remove the add oil check plug (Figure 1). Oil should flow from the add oil check plug hole.

NOTE: Make sure to hold the engine rpm between 1000 to 1500 rpm during this check. If the check is made at a lower rpm, it may result in a low oil level during normal operation.

   f. Add oil, if necessary to bring the oil level up to the add oil check plug hole.

NOTE: When the transmission reaches operating temperature, thermal expansion will raise the oil level to the full plug.

2. Cold oil level check with dipstick:
   a. Before starting the engine, check the oil level. If the oil level is at or above the full mark on the dipstick, the transmission has sufficient oil to permit the engine to be started without damaging the transmission.
   b. With the range selector in neutral, start the engine and accelerate to 1000 to 1500

rpm. Operate the engine in this speed range for approximately one minute.

NOTE: Idle rpm is between 500 to 750 rpm.

c. Check the oil level. The oil level should be at the add oil mark on the dipstick.

NOTE: Make sure to hold the engine rpm between 1000 to 1500 rpm during this check. If the check is made at a lower rpm, it may result in a low oil level during normal operation.

d. Add oil, if necessary to bring the oil level up to the add mark on the dipstick.

Hot Oil Check. The hot oil check is made after the transmission has been operating and the transmission temperature indicator is in the green area (+180˚F. to +220˚F.). When the vehicle has been stopped and the parking brake set, either of the following procedures may be used to perform the hot oil level check.

1. Hot oil level check with plugs:
   a. Operate the engine at idle speed (500 to 750 rpm).
   b. Shift the transmission slowly through all speed ranges to ensure that all areas of the transmission are filled with oil.
   c. Shift the transmission to neutral, and accelerate the engine to 1000 to 1500 rpm.
   d. Remove the full oil level check plug (See Figure 1). Add or drain oil as necessary to bring the oil level up to the full oil level check plug hole.
   e. Reinstall the full oil level check plug. Reinstall the fill plug (See Figure 1), if it was removed.
2. Hot oil level check with dipstick:
   a. Operate the engine at idle speed (500 to 750 rpm).
   b. Shift the transmission slowly through all speed ranges to ensure that all areas of the transmission are filled with oil.
   c. Shift the transmission to neutral, and accelerate the engine to 1000 to 1500 rpm.
   d. Check the oil level. The oil level should be at or near the full mark on the dipstick.
   e. Add or drain oil as necessary to bring the oil level to the full mark on the dipstick.

Oil And Filter Change. The oil filter should be changed every 600 hours; the oil every 1200 hours. However, if the vehicle operates under severe dust and dirt conditions, the oil and filters should be changed more frequently. Change the oil immediately if it has been subjected to severe overheating. Change the oil anytime it shows evidence of contamination.

NOTE: The transmission should be at normal operating temperature (+180˚F to +220˚ F) when the oil is changed.

1. Remove the oil drain plug (See Figure 1).

NOTE: At each oil change examine the oil being drained for evidence of dirt or water. A normal amount of condensation will emulsify in the oil during operation of the transmission. Metal particles in the oil (except for the minute particles normally trapped in the oil filter) indicate damage has occurred in the transmission. When these particles are found in the sump, the transmission must be disassembled and closely inspected to find the source. Metal contamination will require a thorough cleaning of all areas of the transmission when the particles could lodge.

2. Remove the oil strainer cover and strainer from the transmission housing.

NOTE: Any accumulation of sludge or soft dirt in the sump should be removed with flushing oil.

3. Clean the oil strainer by agitating it in mineral spirits or solvent. Dry the strainer with compressed air.
4. Reinstall the oil strainer into the transmission housing. Install the strainer cover and seal ring. Install the two retaining bolts for the strainer cover, and torque to 26 - 32 ft. pounds.
5. Reinstall the drain plug.
6. Remove the oil filter element from the remote mounted filter.
7. Clean the filter shell with mineral spirits or solvent.

8. Install a new filter element, using a new gasket.
9. Remove the full oil level check plug or dipstick and service the transmission with oil through the fill plug until oil flows form the full oil level check plug hole, or is up to the full mark on the dipstick.

NOTE: Refer to the appendices in the back of this manual for the type of oil to be used.

10. Conduct both the cold and hot oil level checks as described above.

NOTE: While performing these procedures, check for leaks at the oil strainer, plug locations and the remote filter assembly.

Cleaning The Transmission Breather. The prevalence of dirt and dust will determine the frequency at which the breather requires cleaning.

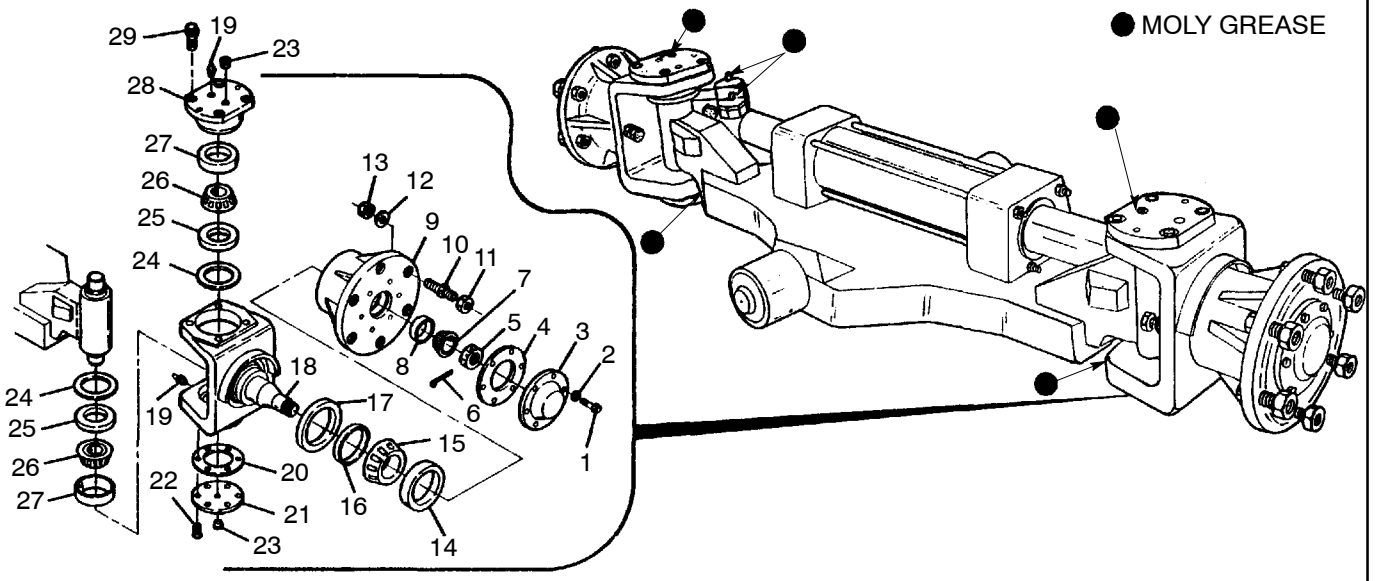
1. Clean the area around the breather before removing it (See Figure 1).

⚠ **CAUTION: Always use a wrench of the proper size to remove or replace the breather. Pliers or a pipe wrench may crush or damage the breather, and produce metal chips which can enter the transmission.**

2. Remove the breather.
3. Wash the breather thoroughly by agitating it in mineral spirits, and dry thoroughly with compressed air.
4. Reinstall the breather.

General Information	
Oil Pressure	160 - 195 psi
Oil Temperature	180° - 220°F
Oil Capacity	30 quarts

Steer Axle



1. CAPSCREW
2. LOCKWASHER
3. HUB CAP
4. GASKET
5. SLOTTED NUT
6. COTTER PIN
7. WHEEL BEARING (OUTER)
8. BEARING RACE (OUTER)
9. HUB
10. STUD
11. NUT (WHEEL RETAINING)
12. FLATWASHER
13. LOCK NUT
14. BEARING RACE (INNER)
15. WHEEL BEARING (INNER)
16. WEAR RING
17. GREASE RETAINER
18. STEER SPINDLE
19. GREASE FITTING
20. GASKET
21. COVER PLATE
22. COUNTERSUNK BOLT
23. PIPE PLUG
24. MUD GUARD
25. OIL SEAL
26. SPINDLE BEARING
27. SPINDLE BEARING RACE
28. SPINDLE BEARING INSERT
29. CAPSCREW

Figure 1. Steer Axle

Description. This steer axle is one of the most rugged in the industry. The unique design prevents scuffing of steer tires and the pivotal mounting ensures an equal load on each steer wheel. This steer axle is equipped with a hydraulic steer cylinder to provide maximum steering pressure to the wheels.

Lubrication. The location of grease fittings that require lubrication are shown in Figure 1. Refer to the appendices in the back of this manual for service intervals and type of lubricant to be used. If the machine is subjected to heavy work schedule under extreme dusty conditions more frequent lubrication may be necessary. The steer axle hubs have tapered roller bearings that require periodic lubrication.

Packing Wheel Bearings. Refer to the appendices in the back of this manual for servicing intervals and type of lubricant to be used. Perform the following procedures to pack the wheel bearings.

1. Jack the axle up and install a jack stand or equivalent to ensure that it is supported safely.

NOTE: The wheel and hub can be removed separately or as an assembly. If the wheel and hub are removed as an assembly, care must be exercised tp avoid damage to the grease retainer from the spindle threads.

2. Remove the wheel retaining nuts (See Figure 1) and remove the wheel and tire assembly.

3. Remove the hub cap and gasket.
4. Remove the cotter pin and slotted nut.
5. Remove the outer bearing and hub assembly.
6. Remove the grease retainer and inner bearing.

NOTE: Do not remove the bearing races unless inspection indicates replacement is necessary.

7. Clean all parts with petroleum base solvent.

⚠ WARNING: If compressed air is used to dry the bearings, do not allow the bearings to spin.

8. Inspect the bearings and bearings races for pitted or scored condition and excessive wear.

NOTE: If either bearings or bearing races are defective, they will be replaced as an assembly.

9. Pack the bearings thoroughly by working grease into the bearings from the large side (use a bearing packer if available).
10. Inspect the grease retainers and gasket for serviceable condition and replace if necessary.
11. Use Figure 1 as a guide and reinstall the bearings and hub assembly by reversing disassembly procedures.

NOTE: When installing the castellated nut, tighten the nut until all play is removed and a slight drag can be felt when the hub is rotated. Back the nut off until the drag disappears and install the cotter pin.

Drive Axle

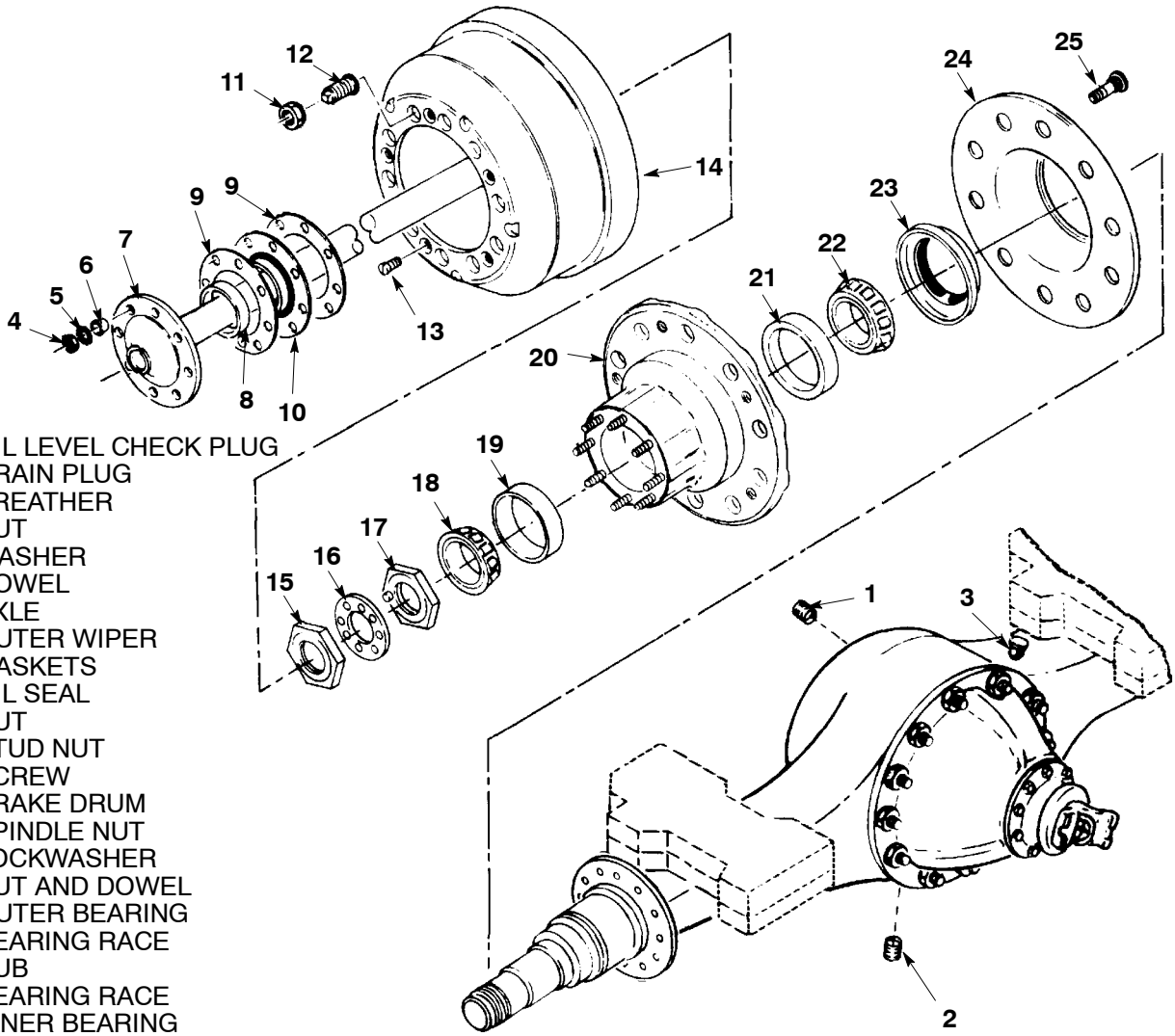


Figure 1. Single Reduction Drive Axle

Figure 14-1. Drive Axle

Description. The single reduction hypoid gearing in the axle has more torque capacity than spiral bevel gearing. The full-floating, forged steel alloy heat-treated axle shafts are designed for long operational life under the most difficult working conditions.

Servicing The Differential. Refer to the appendices in the back of this manual for servicing intervals and type of oil to be used.

1. Checking Oil Level.
   a. Check the oil level in the differential by removing the oil level check plug.
   b. The oil level should be even with the bottom of the oil level check plug hole. Fill the

differential to this level, if the oil level is too low.

c. Reinstall the plug.

2. Changing The Oil.
   a. Remove the drain plug and the oil level check plug.
   b. When the differential is completely drained, reinstall the drain plug.
   c. Service the differential with oil through the oil level check plug hole, until the oil level is even with the bottom of the check plug hole.
   d. Reinstall the oil level check plug.
3. Cleaning The Breather.
   a. Clean the area around the breather before removing it.

⚠ CAUTION: Always use a wrench of the proper size to remove and reinstall the breather. Pliers or a pipe wrench may crush or damage the breather.

   b. Remove the breather.

Repacking Wheel Bearings. The single reduction drive axles are equipped with hubs that require the wheel bearings to be repacked periodically. Refer to the appendices in the back of this manual for the servicing interval and type of lubricant to be used. Perform the following procedures to repack the wheel bearings.

1. Jack up the Yardster and support the axle housing on a suitable stand.
2. Remove the nuts, washers and dowels, and slide the axle shaft along with the gaskets, outer oil seal and wiper out of the hub.

NOTE: Some axles are designed with eight axle studs and others have sixteen. This will not affect the procedures for repacking the wheel bearings, except that replacement parts will be different.

3. Remove the spindle nut, locking washer, nut and dowel, and outer bearing cone.
4. The entire wheel assembly, including the hub, brake drum, tires and rims can now be removed.

NOTE: The tires and rims can be removed first to make disassembly of the hub more convenient if desired.

5. Remove the inner oil seal, wiper and inner bearing cone. Do not remove the bearing cups (races) unless inspection indicates that replacement is necessary.
6. Clean all parts with petroleum base solvent.

⚠ WARNING: If compressed air is used to dry the bearings, do not allow the bearings to spin.

7. Inspect the bearings and bearing races for pitted or scored condition and excessive wear.

NOTE: If either bearings or bearing races are defective, replace both the bearing and race as an assembly.

8. Using new oil seals and wipers, reassemble the bearings and hub assembly by reversing disassembly procedures.

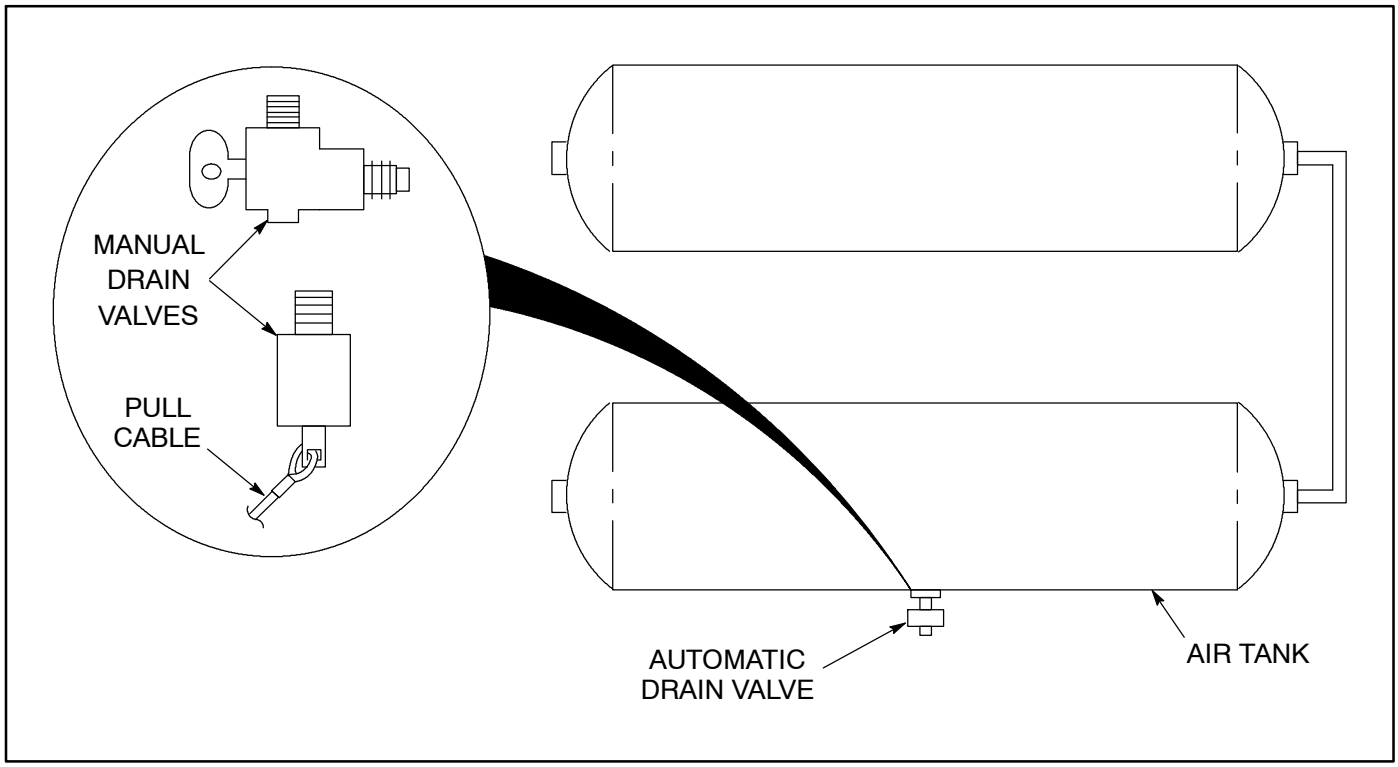


Figure 15-1. Air Tanks

Air Tanks. All compressors pass a certain amount of oil in order to lubricate the cylinder walls and piston rings. Also, depending on the humidity, air entering the compressor contains a certain amount of water. This oil and water normally enters the air tanks in the form of vapor because of the heat generated during compression. After reaching the air tanks they condense to form water emulsion that must be drained off before entering the brake system.

Manual Drain Valve. Some air tanks are equipped with manually operated drain valves to drain any collection of oil and water emulsion from the tanks. Tanks equipped with manual drain valves should be drained daily.

Automatic Drain Valve. Some air tanks are equipped with automatic drain valves. When the brakes are applied and the pressure in the air tank drops approximately 2 psi (13.79 kPa) the automatic drain valve will open momentarily allowing a small amount of air to escape. When this happens any collection of oil and water emulsion will also escape.

Operation of the automatic drain valves should be checked every 200 hours of operation. This should be done with the engine operating and the brake system at normal operating pressure.

NOTE: It will be necessary for someone to observe the automatic drain valves to perform this check.

When the operator applies the brakes, the automatic drain valves should be checked to see that a small amount of air escapes from the valve. The automatic drain valves on all air tanks must be checked.

The automatic drain valves should be removed and cleaned every 6 months.

⚠ WARNING: Never bleed the pressure from the air tanks when the machine is being held with the spotting brake. Set the parking brake.

Perform the following procedures to remove the automatic drain valves.

1. Set the parking brake.
2. Check to see that the spotting brake is in the released position.

3. Bleed the air pressure from the brake system by applying and releasing the service brakes.
4. Depress the plunger in the automatic drain valve to ensure that all pressure is released.
5. Remove the automatic drain valve.

Disassembly And Cleaning. Perform the following procedures to disassemble and clean the automatic drain valves.

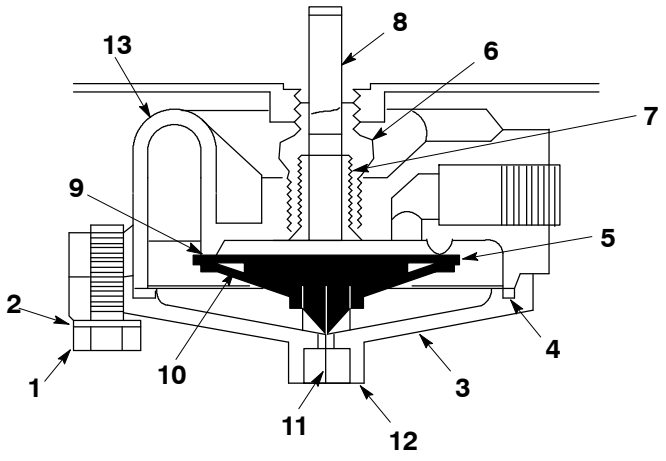
1. Remove the four capscrews (1), Figure 15-2, and lockwashers (2).
2. Remove cover (3) and sealing ring (4).
3. Remove inlet and exhaust valve (5).
4. Remove adapter and filter assembly (6).
5. Remove filter retainer (7) and filter (8).
6. Clean and inspect the filter. Replace the filter if it is clogged.
7. Wipe all rubber parts clean. Cleaning solvent may be used on metal parts.

Reassembly. Perform the following procedures to reassemble the automatic drain valve.

1. Apply a light film of grease on the inlet valve seat (9, Figure 15-2).

⚠ **CAUTION: Do not apply oil or grease to the inlet and exhaust valve.**

2. Place sealing ring (4) in groove of cover (3).
3. Place valve guide (10) over inlet and exhaust valve (5).
4. Place valve guide (10) and inlet and exhaust valve assembly (5) into cover (3) with wire stem (11) projecting through exhaust port (12).
5. Place cover (3) on body (13) and install lockwashers (2) and capscrew (1).
6. Install filter (8) in adapter and screw in filter retainer (7).
7. Install adapter and filter assembly (6) in body (13) and tighten.
8. Reinstall the automatic drain valve in the air tank.



1. CAPSCREWS
2. LOCKWASHERS
3. COVER
4. SEALING RING
5. INLET AND EXHAUST VALVE
6. ADAPTER AND FILTER ASSEMBLY
7. FILTER RETAINER
8. FILTER
9. INLET VALVE SEAT
10. VALVE GUIDE
11. WIRE STEM
12. EXHAUST PORT
13. BODY

Figure 15-2. Automatic Drain Valve

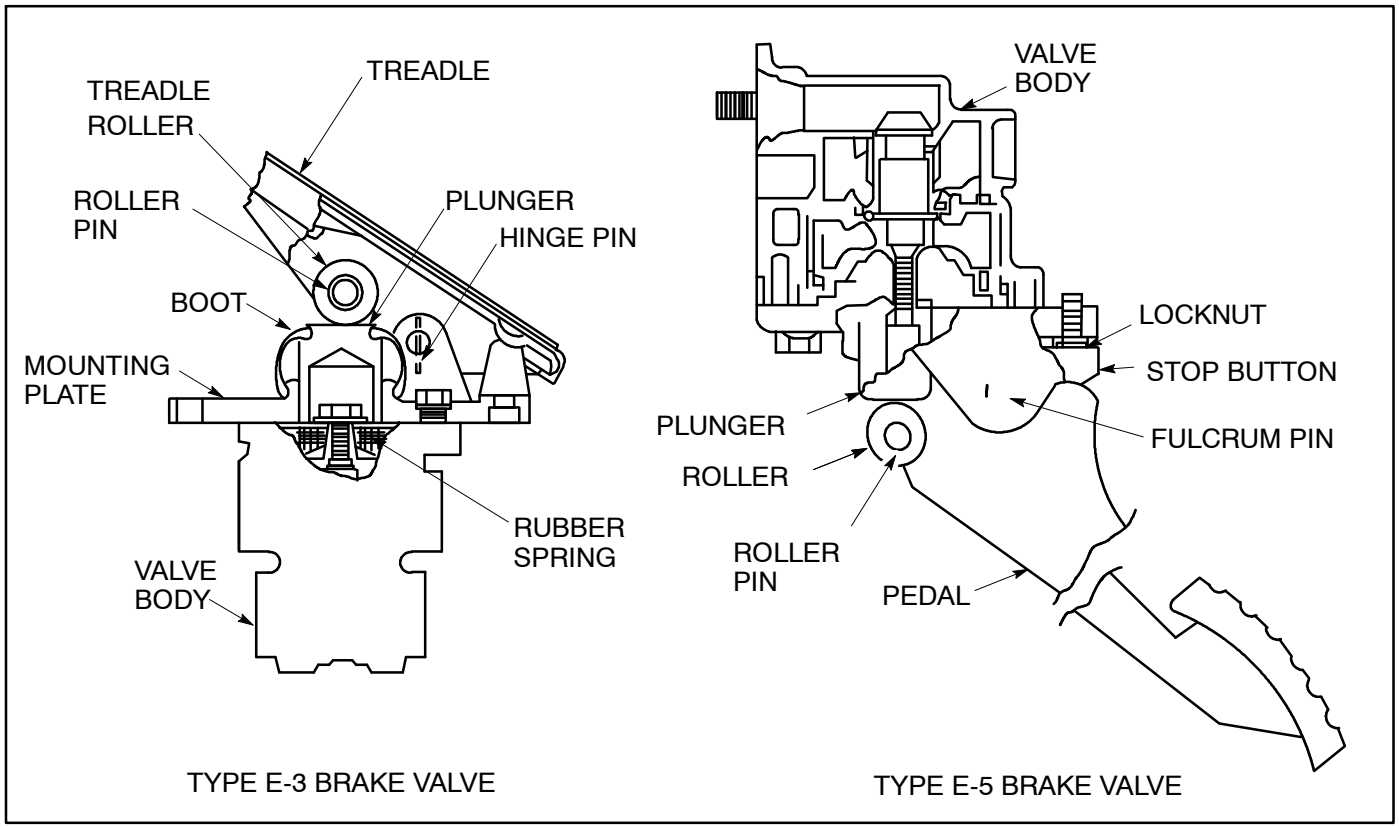


Figure 15-1. Brake Valves

Type E-3 Brake Valve. The brake valve should be lubricated after every 200 hours of operation. Refer to Figure 15-1 for identification of components and perform the following procedures to lubricate the brake valve.

a. Lubricate the treadle roller, roller pin, and hinge pin with engine oil.

b. Lift the boot away from the plunger or mounting plate and put a few drops of light engine oil between the plunger and mounting plate.

⚠ **CAUTION: Avoid using too much oil between the plunger and mounting plate because oil could get on the rubber spring and cause it to deteriorate.**

Lubrication Of The Type E-5 Brake Valve. The brake valve should be serviced after every 200 hours of operation. Refer to Figure 15-1 for identification of components and perform the following procedures to service the brake valve.

a. Lubricate the roller, roller pin, and fulcrum pin with engine oil.

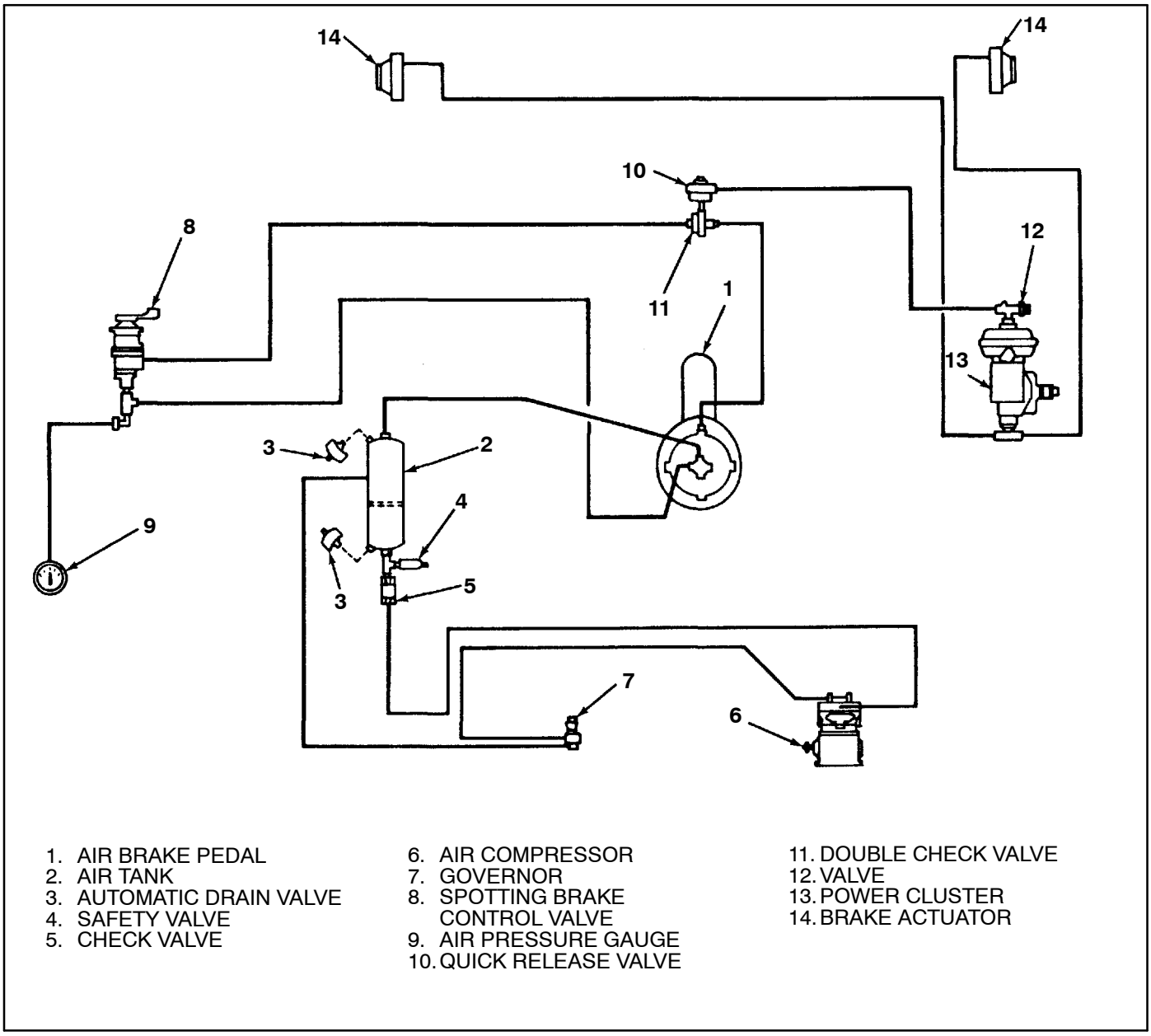
b. Check pedal for free travel.

NOTE: If the pedal has free travel perform the following procedures.

c. Loosen the locknut and back the stop button out until the roller is in contact with the plunger.

d. Hold the stop button in position and tighten the locknut.

Brake System



1. AIR BRAKE PEDAL
2. AIR TANK
3. AUTOMATIC DRAIN VALVE
4. SAFETY VALVE
5. CHECK VALVE
6. AIR COMPRESSOR
7. GOVERNOR
8. SPOTTING BRAKE CONTROL VALVE
9. AIR PRESSURE GAUGE
10. QUICK RELEASE VALVE
11. DOUBLE CHECK VALVE
12. VALVE
13. POWER CLUSTER
14. BRAKE ACTUATOR

Figure 1. Air Over Hydraulic Brake System

Description. The brake system consists of an air compressor, one air tank with two automatic drain valves, a safety valve and a power cluster. It has an air cylinder and a standard hydraulic brake master cylinder. When the service brakes are applied, air pressure is applied to the air cylinder in the power cluster. Actuation of the air cylinder actuates a piston in the hydraulic master cylinder which applies hydraulic pressure to the wheel cylinder. When the brakes are released, spring pressure returns both the air and hydraulic pistons to the released position. The spotting brake control lever on the instrument panel will apply lock the service brakes and release the brakes as the operator desires.

⚠ WARNING: Never leave truck unattended with only spotting brake applied.

Maintenance. Very little maintenance is required on the brake system. Operation of the automatic

drain valves on the air tanks should be checked daily by depressing the plunger in the valve stem. If moisture escapes when the plunger is depressed, continue draining until the flow of moisture ceases.

⚠ **CAUTION: If the automatic drain valves are not operating properly, and are not checked, the accumulation of water in the tanks can fill them to the extent that the brakes will not work.**

All hoses, lines, and fittings should be checked periodically for leaks and serviceable condition.

⚠ **CAUTION: Any abnormal operation of the brakes or brake system should be checked immediately.**

Checking Fluid Level. The fluid level in the hydraulic reservoir should be checked each 50 hours of operation.

Tire and Rim Safety

General

a. **Never** attempt to weld on an inflated tire / rim assembly.

b. **Do not** let anyone mount or demount tires without proper training.

c. **Do not** under any circumstances, attempt to rework, weld, heat, or braze any rim components that are cracked, broken, or damaged. Replace with new parts, or parts that are not cracked, broken, or damaged, and which are of the same size, type and make.

d. **Do not** hammer on rims or components with steel hammers. Use rubber, lead, plastic or brass faced mallets if it is necessary to tap components together.

Demounting

a. **Always** exhaust all air from a single tire and from both tires of a dual assembly prior to removing any rim components such as nuts and rim clamps.

b. Make sure to remove the valve core to exhaust all air from the tire. Remove both cores from a dual assembly.

c. Check the valve stem by running a piece of wire through the stem to make sure it is not plugged.

d. Demounting tools apply pressure to rim flanges to unseat tire beads. Keep your fingers clear. Slant the demounting bead tool about 10° to keep it firmly in place. If it slips off, it can fly with enough force to kill. Always stand to one side when you apply hydraulic pressure.

Inspection

a. Check rim components periodically for fatigue cracks. Replace all cracked, badly worn, damaged and severely rusted components.

b. Clean rims and repaint to stop detrimental effects of corrosion. Be very careful to clean all dirt and rust from the lock ring gutter. This is important to secure the lock ring in its proper position. A filter on the air inflation equipment to remove the moisture from the air line prevents a lot of corrosion. The filter should be checked periodically to see that it is working properly.

c. Make sure correct parts are being assembled. Check your distributor or the manufacturer if you have any doubts.

d. Mixing parts of one manufacturer's rims with those of another is potentially dangerous. Always check manufacturer for approval.

e. **Do not** be careless or take chances. If you are not sure about the proper mating of rim and wheel parts, consult a wheel and rim expert. This may be the tire man who is servicing your fleet, the rim and wheel distributor in your area, or the rim manufacturer.

Mounting And Inflation

a. **Do not** seat rings by hammering while the tire is inflated. Do not hammer on an inflated or partially inflated tire / rim assembly.

b. **Do not** inflate tire before all side and lock rings are in place. Double check to make sure all components are properly seated.

c. Inflate in a safety cage or use safety chains during inflation.

d. Check components for proper assembly again after inflating to approximately 5 psi (34.47 kPa).

e. **Never** sit on or stand in front of a tire and rim assembly that is being inflated. Use a clip-on chuck and make sure the inflation hose is long enough to permit the person inflating the tire to stand to the side of the tire, not in front or in back of the tire assembly.

Operation

a. **Do not** overload rims or over-inflate tire / rim assembly. Check your rim manufacturer if special operating conditions are required.

b. **Do not** use undersized rims. Use recommended rim for the tire.

c. **Never** run a vehicle on one tire of a dual assembly. The carrying capacity of the single tire and rim is dangerously exceeded and operating a vehicle in this manner can result in damage to the rim and tire.

d. **Do not** reinflate a tire that has been run flat without first inspecting the tire, rim, and wheel assembly. Double check the lock ring for damage; make sure that it is secure in the gutter before inflation.

Servicing Tire And Rim On Vehicle

a. Block the tire and wheel on the opposite side of the vehicle before you place the jack in position.

b. Regardless of how hard or firm the ground appears, put hardwood blocks under the jack. Always crib up vehicle with blocks just in case the jack should slip.

c. Remove the bead seat band slowly to prevent it from dropping off and crushing your toes. Support the band on your thigh and roll it slowly to the ground. This will protect your back and toes.

d. When using a cable sling, stand clear; it might snap and lash out.

Compressor Precautions

There have been instances of tires exploding violently while on vehicles. The forces involved in this type explosion are sufficient to cause serious personal injury to anyone in the immediate vicinity. Some of these explosions are believed to have been caused by flammable vapors entering the tire during inflation. When the machine is operating, the temperature of the air and vapor mixture inside the tire will increase. The temperature inside the tire will also increase with an increase in ambient temperature, and when subjected to direct sunlight. If the vapor and air mixture inside the tire is within the ratio limits that will support combustion, and any or all of the above heat increasing factors cause the temperature to rise, an explosion will occur. Following are some precautions that can prevent flammable vapors from entering the compressor, and subsequently being entrapped in tires.

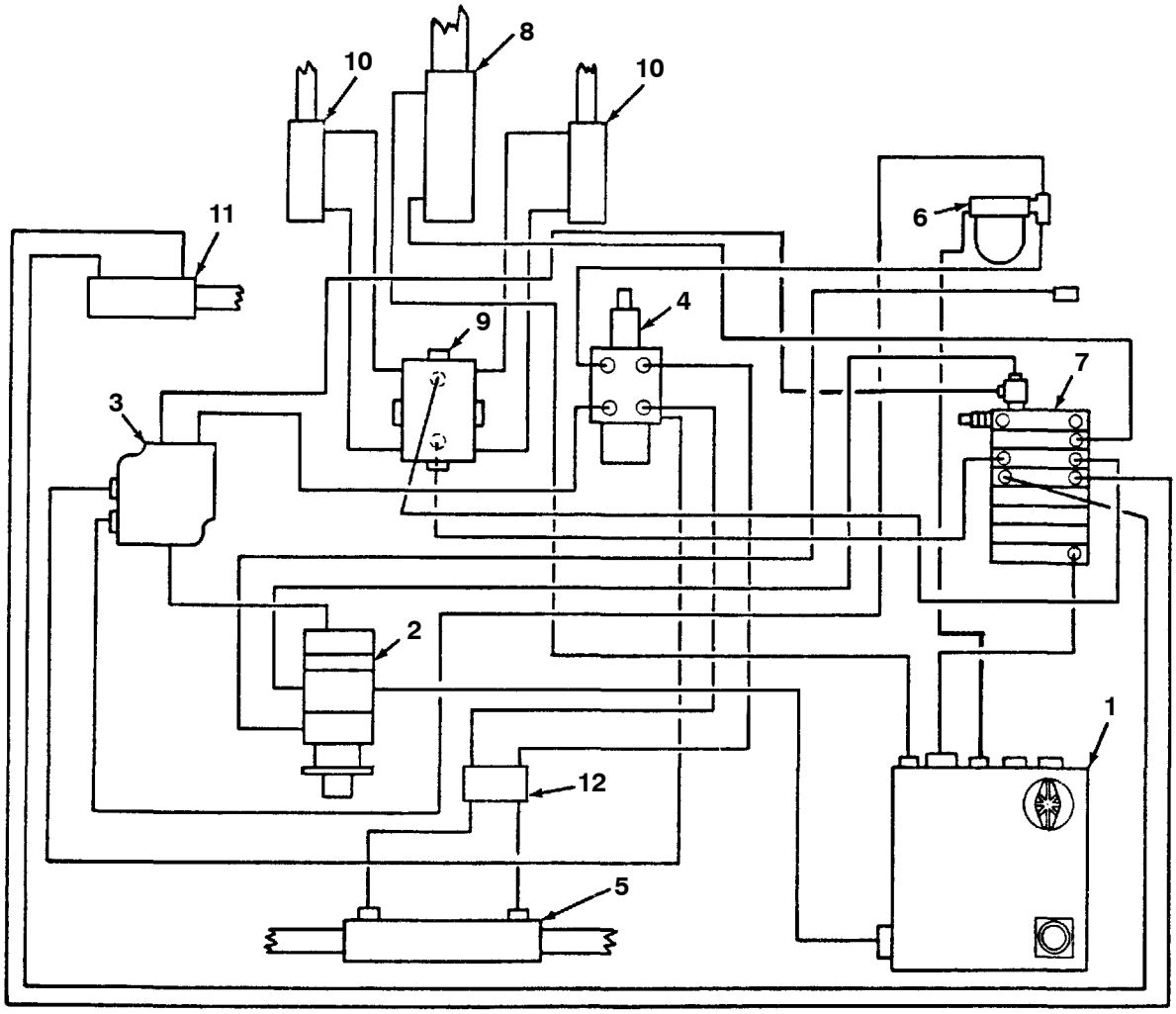
a. **Do not** locate the compressor in a utility room used for storing flammable solvents, paints, thinners, etc. The flammable vapors will be sucked into the compressor intake while the compressor is charging.

b. **Do not** clean the compressor air filter with a flammable solvent. Use a non-flammable solvent, such as carbon tetrachloride.

c. **Do not** use alcohol, methanol, or other flammable agents in the compressor. Drain the compressor tank frequently or locate the compressor inside to eliminate the freezing problem.

d. **Do not** locate the compressor near a battery charger. Batteries emit hydrogen gas during the charging process, which is highly flammable, and could be sucked into the compressor intake.

Hydraulic System



1. HYDRAULIC RESERVOIR
2. PUMP
3. PRIORITY VALVE
4. ORBITROL VALVE
5. STEER CYLINDER
6. STEERING RETURN FILTER
7. HYDRAULIC CONTROL VALVE
8. LIFT CYLINDER
9. TILT LOCK VALVE
10. TILT CYLINDERS
11. OPTIONAL EQUIPMENT SIDE SHIFT CYLINDER
12. CUSHION VALVE

Figure 1. Hydraulic System

Description. The hydraulic system consists basically of a hydraulic reservoir, hydraulic pump, a bank of control valves and actuating cylinders. The orbitrol steering valve receives hydraulic fluid under pressure from the pump through the priority valve. The steering cylinders are actuated by the orbitrol steering valve when the operator turns the steering wheel. Lift and tilt circuits are standard on all machines. If optional equipment is installed, such as, side shift or fork positioning, additional valves, controls and actuating cylinders will be interconnected with the standard hydraulic system.

Servicing.

1. **Checking The Oil Level.** With the lift cylinder fully retracted (carriage down), remove the filler cap with attached dipstick (See Figure 2) and check to see that the oil level is even with the FULL mark on the dipstick. Perform this check daily and add oil if necessary. Check the condition of the filler neck screen before adding oil. Refer to the appendices in the back of this manual for the type of oil to be used.

   When the dipstick and filler cap are reinstalled, be sure the cap is tightened securely. The filler cap is a pressure type cap that requires 4 psi internal pressure to unseat the cap. This ensures that air entering or leaving the reservoir must pass through the breather filter.

NOTE: The filler neck has a safety link that can be raised into position above the filler cap and padlocked.

2. **Breather Filter.** Replace the breather filter after the first 50 hours of operation and every 200 hours thereafter. More frequent replacement may be necessary if the machine is being operated under extremely dusty conditions.

3. **Hydraulic Filter.** The hydraulic filter (See Figure 2) is a reusable filter. The filter element is 100 mesh corrugated screen. Refer to the appendices in the back of this manual for service intervals and perform the following procedures to service the hydraulic filter.

   a. Remove the two hex nuts (See Figure 2).

   b. Remove the two lockwashers and lift the filter head assembly off the studs.

NOTE: The by-pass valve assembly is attached to the filter head. The by-pass valve and o-ring will both be removed with the filter head.

   c. Remove the filter screen.

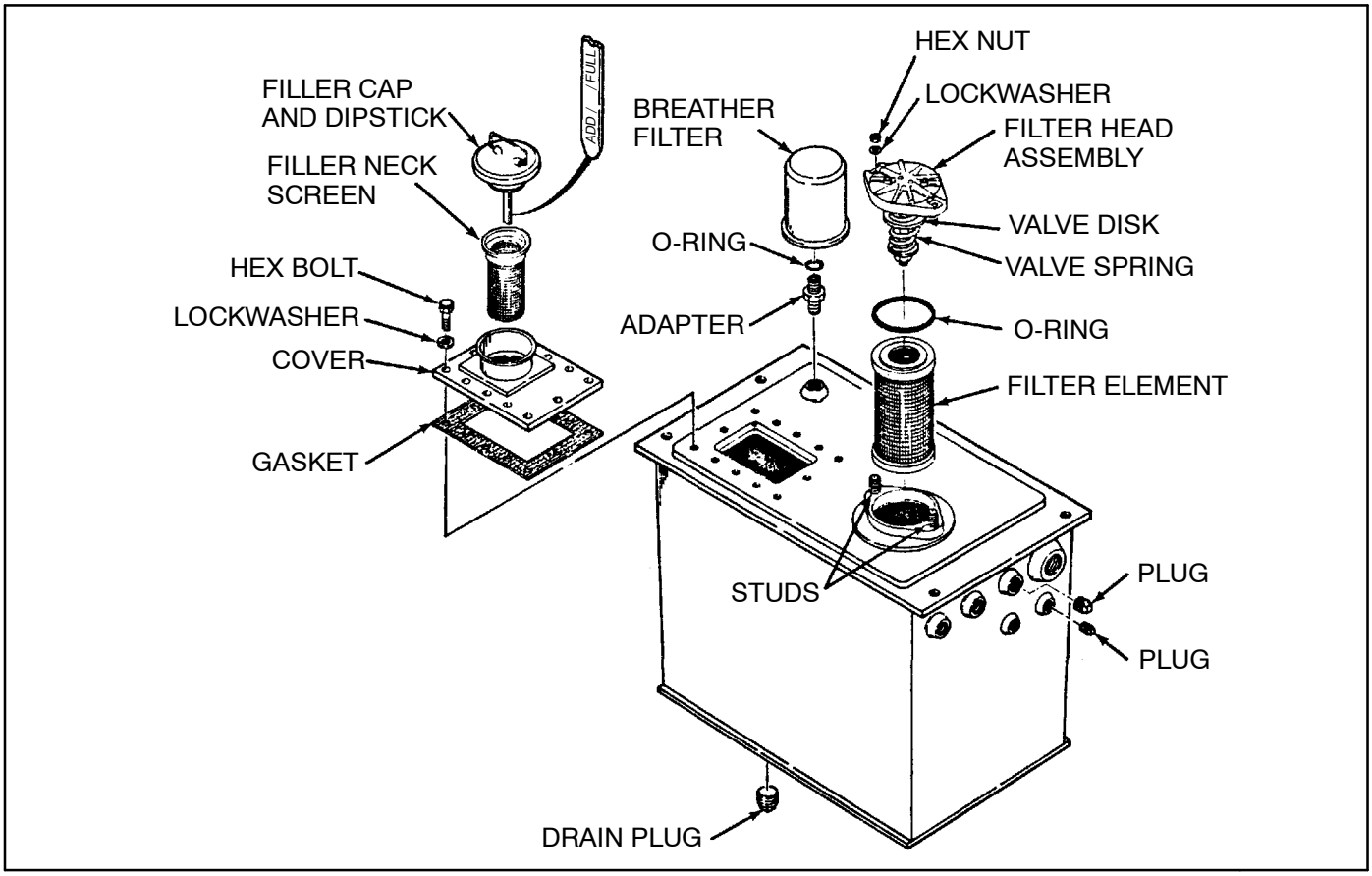


Figure 2. Hydraulic Reservoir

⚠ CAUTION: Lift the filter screen vertically to avoid damaging the pleats in the 100 mesh screen.

d. Clean the filter screen by agitating it in solvent.
e. Dry the filter screen with compressed air.
f. Inspect the screen for holes, crushed pleats or other conditions that would render the screen unserviceable.
g. Inspect the o-ring for serviceable condition and replace if necessary.
h. Inspect the valve assembly springs and disk for serviceable condition. Check sealing surface for nicks and burrs.
i. Reinstall the filter assembly by reversing removal procedures. Torques nuts to 25 ft. pounds.

4. **Changing Hydraulic Oil.** Refer to the appendices in the back of this manual for service intervals and type of oil to be used and perform the following procedures to change the hydraulic oil.
   a. Provide a suitable container and remove the drain plugs (See Figure 2) and drain the hydraulic reservoir.

NOTE: Drain plug must be removed to completely drain tank.

   b. Remove the filler cap and filler neck strainer.

NOTE: The lift cylinder should be fully retracted to keep dilution of the new hydraulic oil to a minimum.

   c. Remove the breather filter.
   d. Remove the twelve hex bolts and lockwashers and remove the hydraulic reservoir cover.
   e. Inspect the cover gasket for serviceable condition and replace if necessary.
   f. Inspect the interior of the reservoir and clean if necessary.

⚠ WARNING: Cleaning the interior of the reservoir with a flammable solvent can create a serious fire hazard.

   g. Reinstall the drain plug.
   h. Reinstall the gasket and reservoir cover.
   i. Install a new breather filter.
   j. Clean and reinstall the filler neck strainer.
   k. Service the hydraulic reservoir with hydraulic oil to the FULL mark on the dipstick.

5. **Changing Steer Filter.** The steer filter, located on the right frame rail under the right fender and easily accessible through an access door, should be changed after the first 100 hours of operation then, every 400 hours thereafter. This is a throw away type filter. Remove and discard the oil filter and install a new filter.

NOTE: Tighten the new filter hand tight and check the system for leaks.

Telescopic Mast

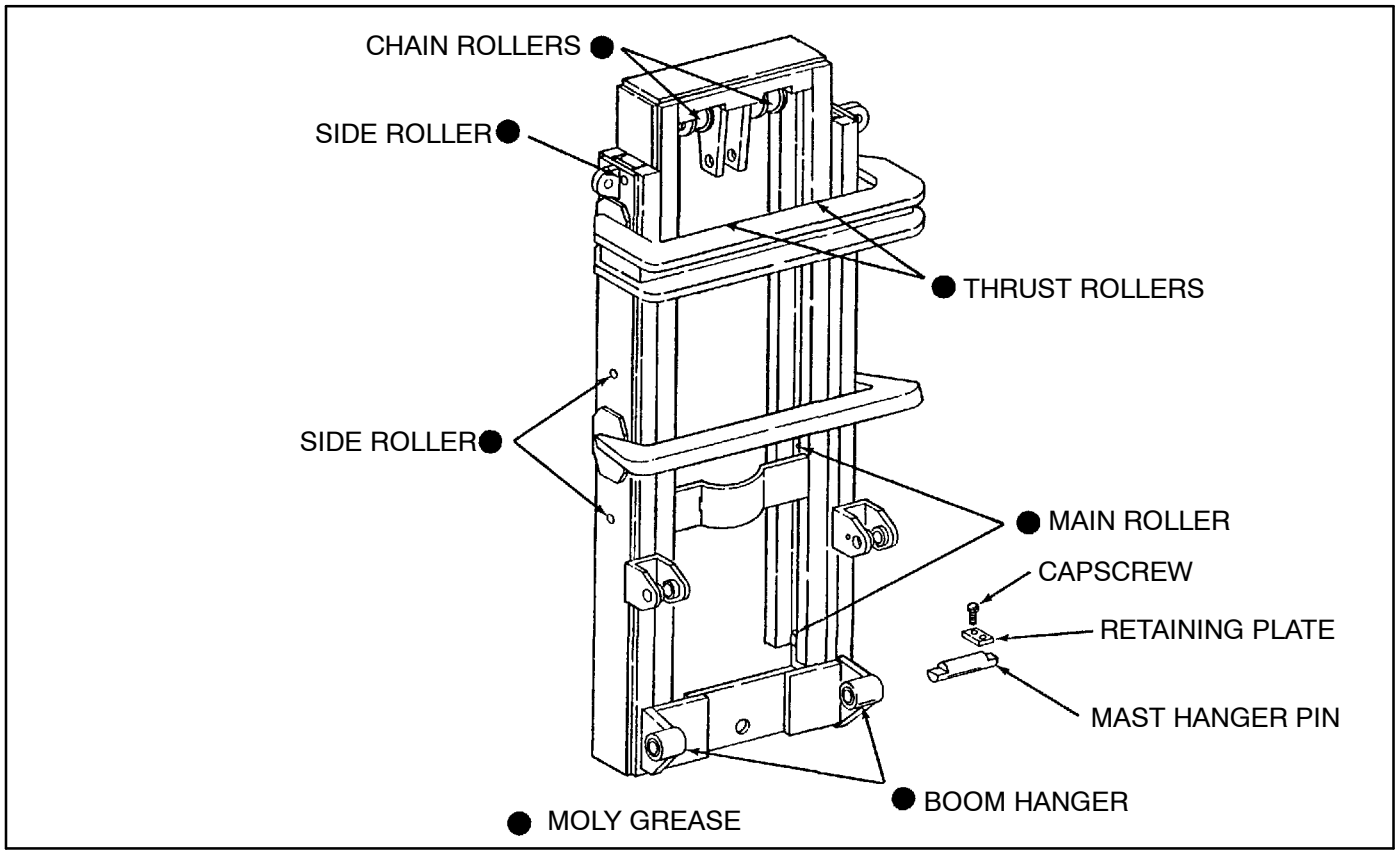


Figure 1. TY Series Telescopic Mast

Description. The telescopic mast is equipped with extra heavy load rollers to accept forward and backward stress. Side rollers absorb side thrust and back-up rollers assure a snug fit between inner and outer channels. Heavy cross bracing is located to provide maximum operator visibility. The telescopic mast is very desirable for operations with limited overhead clearance. Masts are available in various lift heights.

Lubrication. Lubrication of the mast consists primarily of lubricating the chain, roller assemblies, and mast hanger pins.

⚠ **CAUTION: Do not over-lubricate the roller assemblies. If the rollers are over lubricated, they will slide when subjected to a heavy load. If this happens a flat spot will be worn on the roller and it will continue to slide until replaced with a new roller.**

Grease fittings are provided for lubricating the rollers and mast hanger pins. Holes are provided in the outer section of the mast for access to the grease fittings for the rollers on the inner section of the mast. The mast must be operated until the holes in the outer mast are aligned with the grease fittings. Refer to the appendices in the back of this manual for lubrication intervals and type of lubricant to be used. Refer to Figure 1 for location of lubrication points.

Inspection. The mast assembly should be inspected at frequent intervals for evidence of welds that have partially failed, excessive wear, and evidence of sliding rollers. The capscrews attaching the mast hanger pin retaining plates should be checked to assure that they are tight. If the capscrews are loose or suspected of being loose, they should be torqued to 175 to 195 foot pounds.

Freelift Telescopic Mast

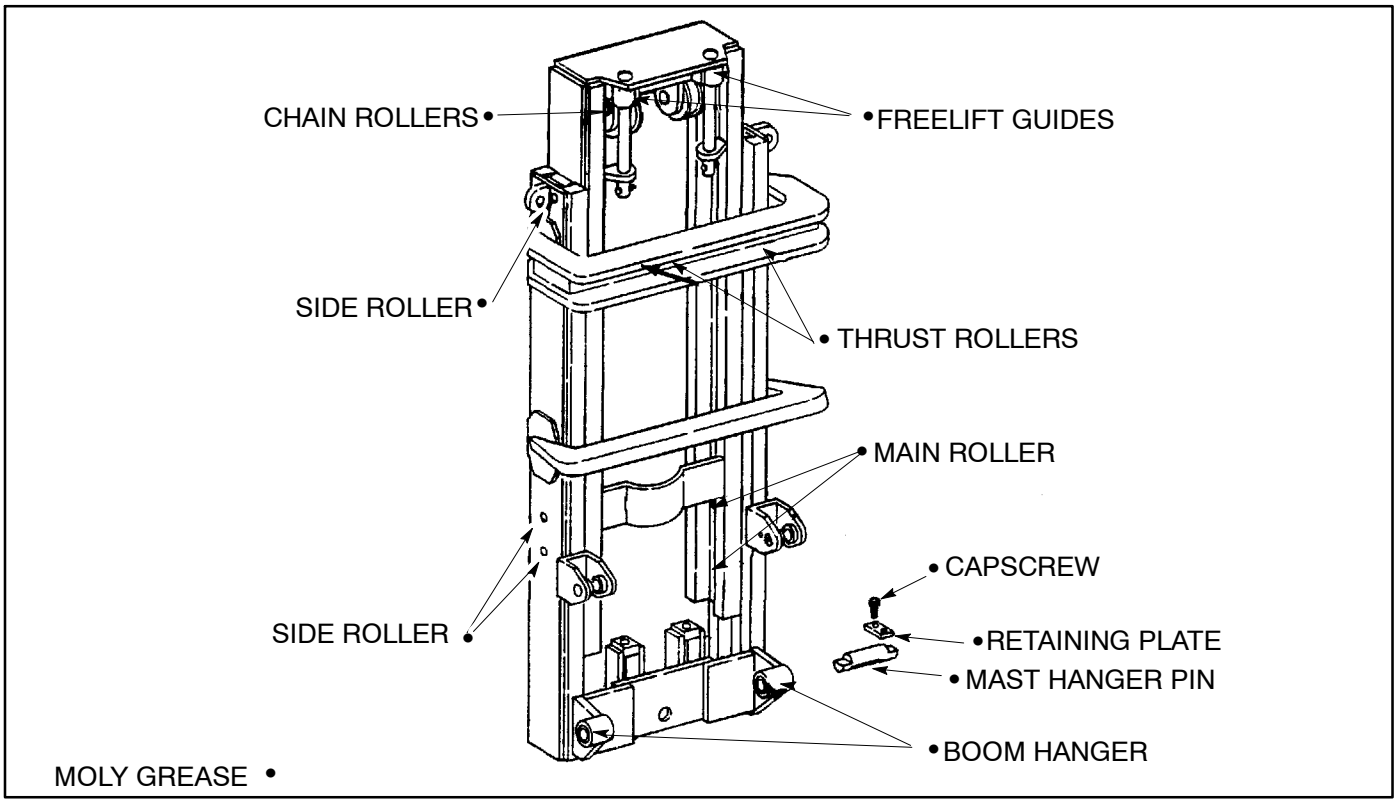


Figure 1. Freelift Telescopic Mast

Description. The telescopic mast is equipped with extra heavy load rollers to accept forward and backward stress. Side rollers absorb side thrust and back-up rollers assure a snug fit between inner and outer channels. Heavy cross bracing is located to provide maximum operator visibility. The telescopic mast is very desirable for operations with limited overhead clearance. Masts are available in various lift heights.

Lubrication. Lubrication of the mast consists primarily of lubricating the chain, roller assemblies and mast hanger pins.

⚠ **CAUTION: Do not over-lubricate the roller assemblies. If the rollers are over lubricated, they will slide when subjected to a heavy load. If this happens a flat spot will be worn on the roller and it will continue to slide until replaced with a new roller.**

Grease fittings are provided for lubricating the rollers and mast hanger pins. Holes are provided in the outer section of the mast for access to the grease fittings for the rollers on the inner section of the mast. The mast must be operated until the holes in the outer mast are aligned with the grease fittings. Refer to the appendices in the back of this manual for lubrication intervals and type of lubricant to be used. Refer to Figure 1 for location of lubrication points.

Inspection. The mast assembly should be inspected at frequent intervals for evidence of welds that have partially failed, excessive wear and evidence of sliding rollers. The capscrews attaching the mast hanger pin retaining plates should be checked to assure that they are tight. If the capscrews are loose or suspected of being loose, they should be tightened.

Type “C” Carriage

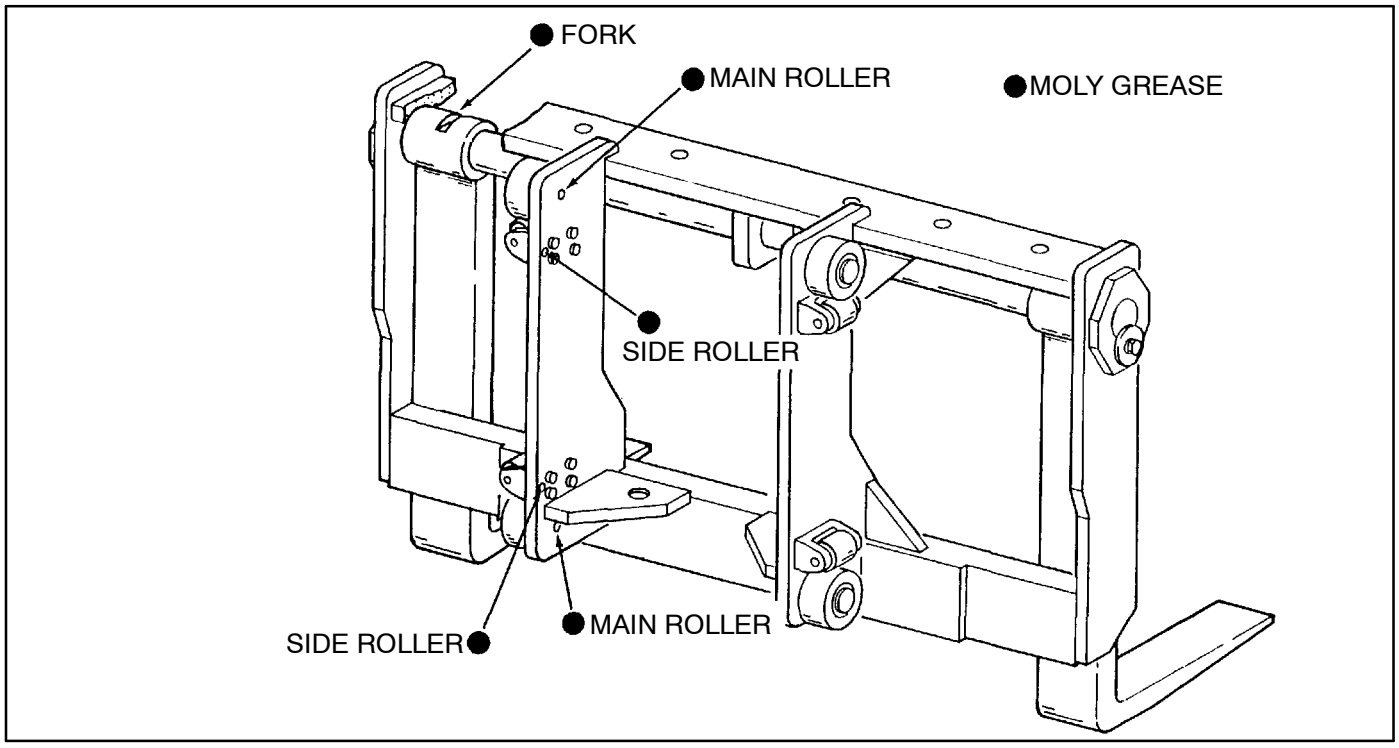


Figure 1. Type “C” Carriage

Description. This carriage permits independent manual adjustment of the forks from “kiss” to full width of the carriage. A much heavier mounting pin is required, but it makes an ideal arrangement for handling coils or cylindrical stock as well as conventional loads. This carriage is available with hydraulically adjustable forks as an option.

Maintenance. Practically no maintenance is required on this carriage. Periodic inspection of the carriage to ensure that it is serviceable is sufficient. Refer to the service chart in the appendices for service intervals.

Lubrication. Lubrication of the rollers and the fork pin, along which the forks slide when adjusted are the only lubrication points.

⚠ **CAUTION: Do not over-lubricate the roller assemblies. If the rollers are over-lubricated they will slide when subjected to a heavy load. If this happens a flat spot will be worn on the roller and the roller will continue to slide until replaced.**

Type C Carriage With Side Shift

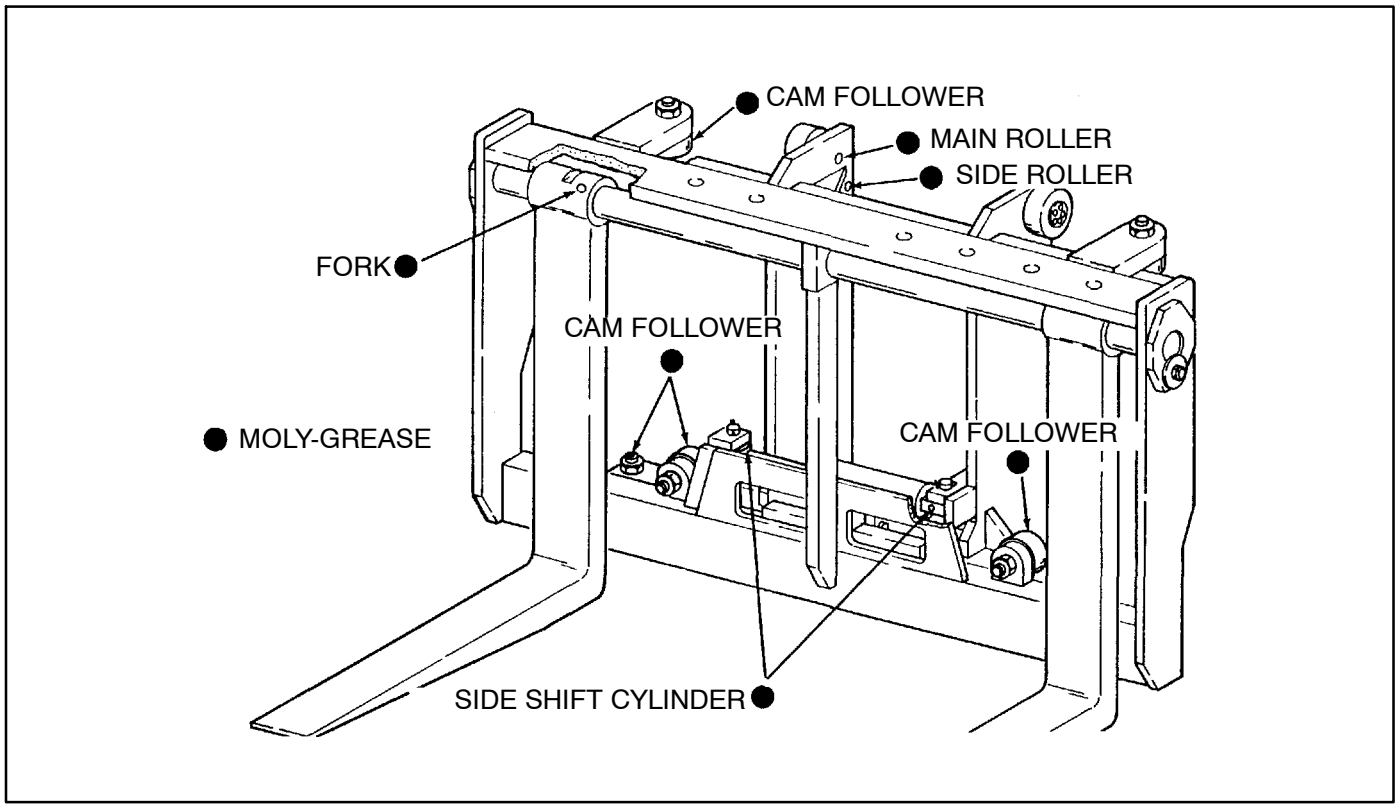


Figure 1. Fully Adjustable Pin-Type Carriage with Hydraulic Side Shift

Description. This carriage permits independent manual adjustment of the forks from the center structural member to the full width of the carriage. A much heavier mounting pin is required, but it makes an ideal arrangement for handling coils or cylindrical stock as well as conventional loads. The hydraulically operated side shift is excellent for placing stacked loads in a limited space. The time consuming process of maneuvering the entire machine into exact position is eliminated.

Maintenance. Practically no maintenance is required on this carriage. Periodic inspections should be made to ensure that the carriage is serviceable. These inspections should include checking all welds to see if they are solid. The hydraulic side shift cylinder and hydraulic hoses should be checked for leaks and serviceable condition. Rollers should be inspected for flat spots and evidence of sliding. These inspections should be performed at the normal service intervals. Refer to the Preventive Maintenance chart in the appendices for service intervals.

Lubrication. The fork mounting pin, rollers, and surfaces along which the forks travel when the machine is operating require lubrication. Refer to the Preventive Maintenance chart in the appendices for service intervals and type of lubricant to be used. Figure 1 indicates the location of grease fittings and other areas that require lubrication.

⚠ **CAUTION: The roller assemblies must not be over lubricated. Excess grease inside the mast rails will cause the rollers to slide when subjected to a heavy load. If this happens a flat spot will be worn on the roller and the roller will continue to slide until replaced by a new roller.**

Type “C” Carriage With Fork Positioning

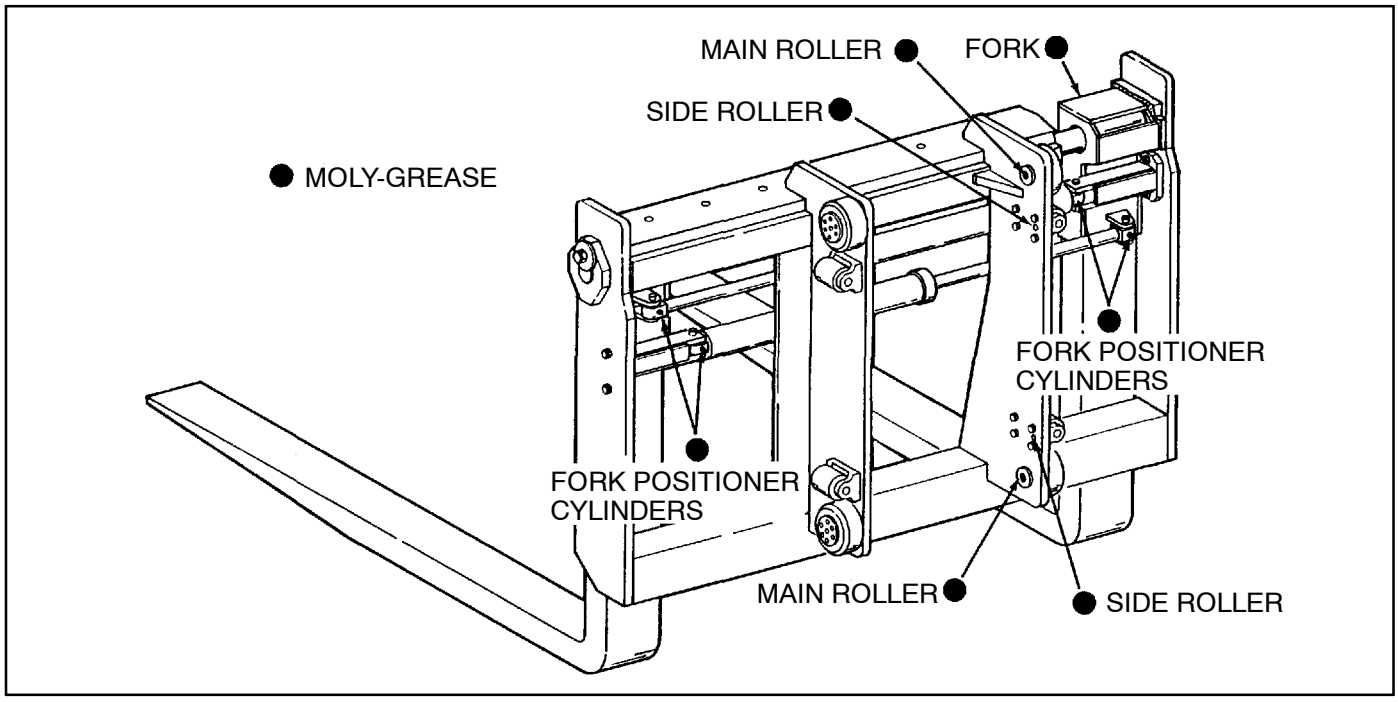


Figure 1. Type “C” Carriage with Fork Positioning

Description. This carriage permits independent fork positioning. The forks are positioned hydraulically by control levers mounted inside the cab. The distance of the adjustable travel is also an option on the larger carriages.

Maintenance. There is practically no maintenance required on this carriage. Periodic inspections should be made to ensure that the carriage is serviceable. These inspections should include checking all welds to see if they are solid. The hydraulic fork positioning cylinders and hydraulic lines should be checked for leaks and serviceable condition. Rollers should be inspected for flat spots or evidence of sliding. These inspections should be performed at the normal servicing intervals. Refer to the service chart in the appendices for service intervals.

Lubrication. The fork mounting pin, rollers and surfaces along which the forks travel when the machine is operating require lubrication. Refer to the service chart in the appendices for service intervals and type of lubricant to be used. Figure 1 indicates the location of grease fittings and other areas that require lubrication. The carriage must be positioned so the four lubricating holes in the mast are aligned with the four grease fittings on the side rollers in order to lubricate the side rollers.

⚠ **CAUTION: The roller assemblies must not be over-lubricated. Excess grease inside the mast rails will cause the rollers to slide when subjected to a heavy load. If this happens a flat spot will be worn on the roller and the roller will continue to slide until replaced by a new roller.**

Power Unit
Power Transfer
Axles
Brake Control System
Steering Control
Chassis
Hydraulic System
Attachments

Trouble	Cause	Corrective Action
Engine Won't Start or is Hard to Start	1. No fuel in tank	1. Fill fuel tank
	2. Controls improperly set for starting	2. Set controls (emergency shutdown valve if equipped)
	3. Fuel pump inoperative, not primed or air locked	3. Bleed off air and prime as necessary
	4. Plugged fuel filter or strainer	4. Replace elements
	5. Too cold for starting without auxiliary starting aid	5. Use starting aid
	6. Engine not turning over fast enough (defective starter; too heavy oil or inadequate battery capacity)	6. Use proper weight oil for temperature; repair starter; charge or change battery
	7. Improper fuel	7. Use fuel meeting specifications
	8. Clogged injectors or fuel lines	8. Eliminate clogged condition
	9. Water in fuel	9. a. Drain 1/4 pint from both the fuel strainer and filter daily b. Change fuel filter elements c. Fill fuel tank daily
	10. Exhaust valves not closing, worn, burned or warped	10. Service cylinder head as needed
	11. Improper tappet clearances	11. Adjust valves
	12. Clogged air filter and / or blower screen	12. Replace filter element; clean blower screen
	13. Lack of compression due to leaking gaskets or excessive cylinder and ring wear	13. Replace gaskets or rebuild engine as necessary
Smoky Exhaust	<u>Black Smoke</u>	
	1. Engine overloaded	1. Operate at governed rpm or shift to next lower gear
	2. Injectors, injection pump or governor control defective or improperly timed or adjusted	2. Repair and adjust fuel system as necessary
	3. Emergency shutdown partially closed	3. Reset emergency shutdown valve

Trouble	Cause	Corrective Action
Smoky Exhaust (Continued)	4. Using injectors of too high delivery capacity	4. Use next proper size injector approved by Taylor
	5. Improper fuel	5. Check fuel specifications
	6. Insufficient air	6. Check air cleaner and blower
	<u>Blue Smoke</u>	
	7. Excessive engine oil in combustion chamber due to worn, clogged or stuck rings	7. Be sure the detergency level of engine oil meets specifications; rebuild engine if necessary
	8. Excessive crankcase oil bypassing piston rings due to worn or scored liners	8. Rebuild engine
	9. Internal oil or fuel leaks	9. Eliminate leaks
	10. Fuel too heavy for type of operation	10. Use proper fuel
	<u>White Smoke</u>	
	11. Engine not warmed up	11. Warm up engine
	12. Engine operating too cold	12. Check thermostat
	13. Water vapor, water leaking into combustion chamber from cooling system	13. Eliminate cooling system leak
Engine Overheats	1. Overloaded Engine	1. Operate at governed rpm when possible; operate in next lower gear
	2. Lack of cooling water or lack of circulation of water	2. Add water, eliminate circulation problem (check pump, hoses, radiator)
	3. Faulty thermostat not opening properly	3. Replace thermostat
	4. Insufficient air circulation (loose fan belt; flow of air through radiator restricted)	4. Tighten fan belt; remove air restriction
	5. Scale or deposits in cooling system	5. Clean cooling system
	6. Insufficient circulation of lubricating oil, or low oil level	6. Fill with oil; be sure oil is circulating properly

Trouble	Cause	Corrective Action
Engine Overheats (Continued)	7. Radiator capacity inadequate	7. Install radiator with proper capacity (if radiator is ever damaged and replaced be sure proper size is installed)
Excessive Lubricating Oil Consumption	1. External leaks (gaskets, oil seals, drain plugs, etc.)	1. Eliminate leaks
	2. Internal leaks (oil coolers, oil filters, blower seals, etc.)	2. Eliminate leaks
	3. Poor oil control in cylinders (worn cylinders or rings; stuck or plugged rings. Worn valve stems and guides)	3. Plugged or stuck rings can sometimes be opened or loosened by use of higher additive levels in engine oil. Otherwise, dismantle and repair as necessary
	4. Excessively worn main and rod bearings	4. Rebuild engine
	5. Excessive engine oil pressure	5. Adjust oil pressure
	6. Lubricating oil too light for operating conditions	6. Use proper viscosity oil
	7. Excessive crankcase pressure	7. Check crankcase breather; check also for piston ring bypass. Clean breather or rebuild engine as necessary
	8. Oil level too high in crankcase	8. Reduce oil level in crankcase
Excessive Engine Deposits	1. Engine running too hot or too cold	1. Perform the cleaning and / or repair necessary to regulate engine temperature to specifications
	2. Imperfect combustion	2. Check injectors and timing
	3. Improper type fuel for service conditions	3. Change to proper fuel
	4. Dust from air	4. Check air induction system for leaks
	5. Unsuitable crankcase oil	5. Use recommended crankcase oil
	6. Oil left in crankcase too long	6. Change engine oil more frequently

Trouble	Cause	Corrective Action
Excessive Engine Deposits (Continued)	7. Oil filters neglected	7. Change element more often
Rough Engine Operation	1. Imperfect injection or timing off (premature injection)	1. Adjust or repair injectors as necessary
	2. Excessive wear or maladjustment	2. Adjust or replace as necessary
	3. Water in fuel	3. a. Drain 1/4 pint fuel daily from both fuel strainer and filter. b. Change elements (spin on) c. Keep fuel tank full
	4. Air in fuel pump or fuel lines	4. Eliminate air
	5. Improper fuel	5. Check fuel specifications
	6. Erratically sticking valves or injectors	6. Change interval on engine oil and filter may need to be shortened. Weak valve springs. Excessively carboned valves may have to be cleaned. Clean or exchange injectors if necessary
Engine Stops Suddenly	1. Out of fuel, fuel pump, failure, plugged or broken fuel line	1. Fill fuel tank; repair plugged or broken fuel line
	2. Water in fuel	2. Eliminate contaminated fuel from the system; replace with clean fuel of recommended specifications
	3. Fuel filters plugged	3. Replace filter elements
	4. Piston or bearing seizure due to lack of lubrication or overheating; water in cylinder (hydrostatic lock)	4. Lubricate engine; allow to cool; engine may be damaged so badly that complete rebuilding will be necessary
	5. Emergency stop inadvertently tripped	5. Reset emergency stop if equipped
	6. Stalled by excessive load	6. Use lower gear; match load to capacity of engine

Trouble	Cause	Corrective Action
Engine Hard to Start or Will Not Start	1. No fuel in tank	1. Fill fuel tank
	2. Low battery power	2. Check electrolyte level and specific gravity of battery
	3. Too much resistance in starting circuit	3. Clean and tighten all connections on batteries and starter
	4. Crankcase oil too heavy	4. Use correct oil
	5. Wrong fuel	5. See your fuel supplier. Use correct fuel.
	6. Water, dirt, or air in fuel system	6. Drain, flush, fill, and remove air from system
	7. Plugged fuel filter	7. Install a new filter element
	8. Injection nozzles dirty or not working correctly	8. Clean or adjust as necessary
	9. Fuel pump primer lever is up	9. Push lever down
Engine Runs Irregularly or Stops	1. Low coolant temperature	1. If water temperature gauge is not in normal range, see “Coolant Temperature Too Low” below.
	2. Plugged fuel filter	2. Install a new filter element
	3. Water, dirt, or air in fuel system	3. Drain, flush, fill, and remove air from system
	4. Injection nozzles dirty or not working correctly	4. Clean or adjust as necessary
	5. External leaks	5. Inspect clamps and hose. Install new parts if necessary.
Coolant Temperature Too Low	1. Thermostat not working correctly	1. Remove and check thermostat

Trouble	Cause	Corrective Action
Coolant Temperature Too High	1. Engine working too hard	1. Take away load
	2. Low coolant level	2. a. Fill radiator to correct level b. Check radiator and hoses for loose connections and leaks
	3. Fan belts loose or not working correctly	3. Tighten belt or install new belt
	4. Dirty radiator core	4. a. Clean the radiator core b. Cooling system needs flushing
	5. Defective thermostat	5. Remove and check thermostat
	6. Temperature gauge not working correctly	6. a. Check coolant temperature with thermometer b. Install new gauge if necessary
Engine Has Little Power	1. Engine working too hard	1. Take away load
	2. Plugged air intake	2. Clean air cleaner
	3. Plugged fuel filter	3. Install new filter element
	4. Wrong fuel	4. Use correct fuel
	5. Engine too hot	5. See “Coolant Temperature Too High” above
	6. Below normal engine temperature	6. Remove and check thermostat
	7. Wrong valve clearance	7. Adjust valves
	8. Injection nozzles dirty or not working correctly	8. Clean or adjust as necessary
	9. Injection pump out of time	9. Adjust injection pump
Engine Knocks	1. Not enough oil	1. Add correct oil
	2. Injection pump out of time	2. Adjust injection pump.

Trouble	Cause	Corrective Action
Engine Uses Too Much Fuel	1. Wrong fuel 2. Plugged or dirty air cleaner 3. Engine working too hard 4. Wrong valve clearance 5. Injection nozzles dirty 6. Injection pump out of time 7. Engine not at correct temperature	1. Use correct fuel 2. Clean air cleaner 3. Take away load 4. Adjust valves 5. Clean or adjust as necessary 6. Adjust injection pump 7. Check thermostats
Exhaust Gas is Black or Gray	1. Plugged or dirty air cleaner 2. Muffler not working correctly 3. Engine working too hard 4. Injection nozzles dirty 5. Engine out of time	1. Clean air cleaner 2. Incorrect fuel 3. Take away load 4. Clean or adjust 5. Reset the time
Exhaust Gas is White	1. Incorrect fuel 2. Cold engine 3. Thermostat not working 4. Engine out of time	1. Use correct fuel 2. Warm up engine to normal operating temperature 3. Remove and check thermostat 4. Reset time
Engine Uses Too Much Oil	1. Crankcase oil too light 2. Oil leaks	1. Use correct oil 2. Check for leaks in lines, around gaskets and drain plug
Low Oil Pressure	1. Low oil level 2. Wrong oil 3. Plugged oil filter	1. Fill with oil to proper level 2. Drain and fill crankcase with correct oil 3. Install new filter

Gasoline and LP Gas Engines

Troubleshooting is the application of a definite procedure, in a logical sequence, to locate and eliminate the cause of trouble in a particular system or unit. Always look first for the obvious causes of trouble such as an empty gas tank, wet engine, or loose wiring. Check first the items most easily and inexpensively corrected; then, proceed to the more difficult, time-consuming and expensive items.

Problem	Cause	Correction
Engine Does Not Turn	1. Battery discharged or terminals too dirty to delivery adequate current	1. Clean terminals if needed. Check battery for charge and capacity. Charge or replace battery as necessary.
	2. No current getting to starter solenoid	2. No current getting to starter solenoid
	a. Ignition switch or starter button not letting enough current through to starter solenoid	a. Replace ignition switch or starter button as necessary.
	b. Current leaks or broken wire between battery and solenoid (actuating circuit)	b. Eliminate current leak; repair or replace wire.
	3. No current going through starter solenoid	3. No current going through starter solenoid.
	a. Defective solenoid or big battery cables between battery and solenoid or between solenoid and starter, broken, corroded or grossly undersize; battery ground cable corroded	a. Jump across starter solenoid heavy terminals with jumper cable or heavy wire to check solenoid; if starter does not turn, also jump from starter to battery output terminal before condemning solenoid. Clean, replace wiring or replace solenoid as necessary.
	4. Starter does not turn when adequate current delivered	4. Starter does not turn when adequate current delivered
	a. Mud in starter	a. Clean and dry starter, being careful not to damage starter.
	b. Internal parts worn, open circuit or short circuit	b. Repair or replace as necessary
	5. Starter motor turns but does not turn over engine	5. Starter motor turns but does not turn over engine.
	a. Starter drive inoperative	a. Replace starter drive.
	6. Water in cylinder	6. Remove sparks plugs and turn engine to check; dismantle and repair it if water in cylinder.
	7. Engine seized	7. Dismantle engine and repair as necessary.

Problem	Cause	Correction
Engine Cranks Slowly	1. Battery low in charge or capacity inadequate	1. Charge or replace battery.
	2. Excessive resistance in starter circuit	2. Check cables for size. Clean or replace if necessary.
	3. Defective starter	3. Repair or replace as necessary.
	4. Excessive friction in engine	4. Eliminate friction in engine.
Engine Turns Over Normally But Will Not Start	<u>Engine</u>	
	1. Mechanical failure in camshaft drive	1. Repair camshaft drive.
	2. Burned, warped or stuck valves	2. Repair cylinder head.
	3. Low compression due to wornout piston rings	3. Rebuild engine.
	4. Engine valves out of time	4. Time engine valves.
	<u>Fuel System</u>	
	1. No fuel in tank	1. Fill tank.
	2. No fuel in carburetor	2. Check operation of fuel pump; check for clogged condition at the fuel filter; check fuel inlet line for restrictions. Check flexible lines at the fuel pump for collapsed condition, fuel tank line for restrictions, fuel tank vent for plugging.
	3. Clogged jets or passages in carburetor	3. Clean or replace carburetor; this condition usually occurs when an engine has not been in use for an extended period of time and fuel was left in the carburetor.
	4. Choke inoperative	4. Repair choke.
	5. Excessive fuel in engine (flooded condition)	5. Hold throttle open and turn starter briefly (not over 30 seconds); occasionally it may be necessary to allow engine to set for a while to get is started; (Flooding is frequently associated with bad ignition, bad starting motor or inadequate battery capacity.) If flooding occurs often, check for wornout or stuck fuel inlet needle, excessive fuel pump pressure.

Problem	Cause	Correction
Engine Turns Over Normally But Will Not Start (continued)	Ignition System 1. No spark or weak spark at plugs. a. Malfunctioning primary circuit (no spark or inadequate spark leaving coil) b. Malfunctioning secondary circuit (fat, bright blue spark leaves the ignition coil but does not reach the spark plug) (1) Defective cable between ignition coil and distributor cap, ends of cable corroded (2) Defective ignition cables between distributor cap and plugs, malfunctioning rotor, cracked, dirty or corroded distributor cap terminals (either inside or outside of the cap) (3) Bad spark plugs (4) Improper ignition timing (5) Choke not operating properly	1. a. Check coil output by removing coil to distributor wire from the distributor cap and holding it 1/4 inch from a good ground while the engine is turned over with the ignition switch on. If a fat, bright blue spark does not jump the gap, repair the primary circuit as necessary. (1) Clean ends of cable or replace as necessary. (2) Clean or replace as need dictates. (3) Replace plugs. (4) Time ignition distributor. (5) Check, service choke as necessary.
Engine Starts But Fails to Keep Running	Fuel System 1. Idle fuel mixture needles improperly adjusted 2. Idle speed set too low 3. Choke stuck closed and flooding engine or not sufficiently closed for temperature 4. Float setting incorrect 5. Fuel inlet needle sticking 6. Dirt, water or gum in fuel lines or carburetor 7. Inadequate fuel pump delivery 8. Fuel lines bent or sucking together 9. Fuel filter clogged Ignition System 1. Breaker points improperly adjusted (usually too open) 2. Defective spark plugs	1. Adjust mixture with idle adjustment screw(s). 2. Increase engine idle speed. 3. Adjust or service choke as necessary. 4. Adjust float setting. 5. Clean or replace needle. 6. Remove water or clean fuel system as necessary. 7. Service fuel pump. 8. Service fuel lines; check tank cap vent. 9. Replace fuel filter. 1. Adjust ignition points. 2. Replace plugs.

Problem	Cause	Correction
Engine Starts But Fails to Keep Running (continued)	3. Open circuit at resistor 4. Leakage in high tension wiring 5. Ignition coil or condenser breaker down under operating temperature	3. Replace ignition resistor. 4. Tape or replace wiring to eliminate current leak. 5. Replace defective unit.
Engine Runs But Misses Steadily At All Speeds	Isolate the miss by operating the engine with one cylinder not firing. This is done by operating the engine with the ignition cable removed from one spark plug at a time, until all cylinders are checked. Ground the spark plug wire removed. If engine speed changes when a particular cylinder is shorted out, that cylinder was "hitting". If no change in engine speed is noticed when the spark plug cable is removed, that cylinder is "missing".	
	<u>Ignition System</u> 1. Defective spark plug cable. Hold spark plug cable near a good ground and watch for a fat, bright blue spark; cracked, corroded distributor cap 2. Bad spark plugs 3. Defect in ignition primary circuit (between battery and ignition points) causing weak spark at all cylinders, but not showing up in all cylinders <u>Engine</u> 1. Vacuum leak (carburetor gaskets or manifold gaskets)	1. Replace spark plug cable if found defective. It is usually advisable to replace cables in sets. 2. Replace spark plugs. 3. Eliminate defect in ignition primary circuit. Check all components but check especially carefully the condenser, resistor and the ignition points. 1. Eliminate vacuum leaks.
Engine Runs But Misses Irregularly At All Speeds	<u>Engine</u> 1. Exhaust system restricted 2. Anti-smog device clogged or otherwise defective (if so equipped) 3. Blown cylinder head gasket	1. Eliminate restriction. 2. Clean or replace as inspection indicates need. 3. Remove cylinder heads and replace gasket. Shave cylinder heads if warped beyond acceptable limits (see specifications in the engine manual.).

Problem	Cause	Correction
Engine Runs But Misses Irregularly At All Speeds (continued)	<u>Ignition System</u>	
	1. Breaker points not properly adjusted	1. Adjust breaker points.
	2. Defective breaker points, condenser, secondary wiring, coil or spark plugs	2. Test, repair or replace as test indicates need.
	3. High tension leak across the coil, rotor or distributor cap	3. Clean or replace as necessary to eliminate high tension leak.
	4. Defective ignition switch or wiring between battery and ignition coil	4. Repair or replace as necessary.
	<u>Fuel System</u>	
	1. Choke stuck in closed position	1. Open choke; check controls.
	2. Carburetor float setting incorrect	2. Set float.
	3. Fuel inlet system not operating properly (needle and seat gummed up; has trash under it or is worn too much to seat)	3. Clean or replace as necessary. If needle and seat has trash under it, be sure to use only clean fuel and fuel filter if not currently used.
	4. Dirt or water in the fuel lines or carburetor	4. Drain fuel system and refill with clean fuel. Clean fuel system as necessary.
	5. Restricted fuel piping between tank and carburetor (sucked together or pinched)	5. Remove restriction; if flexible lines sucked together also check tank cap vent.
	6. Restricted fuel filter	6. Change filter or replace element.
	<u>Cooling System</u>	
	1. Internal leak in cooling system (cracked cylinder head or engine block, leaking head gasket) causing water to enter cylinder(s)	1. Dismantle as far as necessary to perform the necessary repair or replacement.
	2. Engine not reaching normal temperature	2. Check thermostat.
Engine Misses At Idle and / or Slow Speeds, But Hits at Medium and High Speeds	<u>Engine</u>	
	1. Burned, warped or stuck valve(s)	1. Service cylinder head.
	<u>Cooling System</u>	
	1. Coolant leaking into engine cylinders (leaking head gasket(s) or cracked block cylinder head(s)	1. Stop engine leak. Dismantle the engine as far as necessary to locate leak and perform service as inspection indicates need.

Problem	Cause	Correction
Engine Misses At Idle and / or Slow Speeds, But Hits at Medium and High Speeds (continued)	<u>Fuel System</u> 1. Idle fuel mixture screws not properly adjusted 2. Clogged idle and slow speed circuits in carburetor (idle discharge holes, idle passages, idle air bleeds or main jet) <u>Ignition</u> 1. Excessive play in distributor shaft 2. Worn distributor cam 3. Defective coil, rotor, condenser, breaker points, ignition wiring or spark plugs	 1. Adjust screws. 2. Clean passages as necessary. 1. Rebuild or replace distributor. 2. Rebuild or replace distributor. 3. Perform checks necessary to locate defective units and perform the needed adjustments and replacements.
Rough Engine Idle	<u>Engine</u> 1. Loose engine support 2. Cylinder head bolts not properly torqued 3. Defective cylinder head gasket 4. Leaking head gasket(s) or cracked cylinder head or block, admitting coolant to cylinders 5. Valve lash too tight 6. Crankcase ventilation regulator valve defective or a restricted vent tube 7. Worn camshaft lobes <u>Exhaust System</u> 1. Exhaust control valve sticking <u>Ignition System</u> 1. Improperly adjusted or defective ignition points 2. Fouled or improperly adjusted spark plugs 3. Incorrect ignition timing 4. Spark plug misfiring	 1. Tighten support. 2. Torque cylinder head(s). 3. Replace head gasket(s). 4. Dismantle engine as far as necessary and repair or replace the defective components. 5. Adjust valves. 6. Clean and inspect; then, repair or replace damaged or malfunctioning parts. 7. Replace camshaft. 1. Free up valve; replace if necessary. 1. Replace ignition points or adjust. 2. Adjust spark plug cap; clean or replace if necessary. 3. Time engine ignition. 4. Replace spark plugs.

Problem	Cause	Correction
Rough Engine Idle (continued)	Fuel System	
	1. Engine idle speed set too slow	1. Increase engine idle speed.
	2. Idle fuel mixture screw(s) not properly adjusted	2. Adjust idle mixture screw(s).
	3. Carburetor float setting incorrect	3. Set carburetor float level to specifications.
	4. Air leaks between the carburetor, spacer, governor, or the manifold and / or fitting	4. Eliminate air leaks.
	5. Fuel leaks in carburetor	5. Stop carburetor fuel leaks.
	6. Power valve in carburetor leaking	6. Replace or rebuild carburetor.
	7. Secondary throttle plates not closing (4 barrel carburetor) or improperly adjusted	7. Service and adjust secondary throttle plates.
	8. Idle fuel system air bleeds or fuel passages restricted	8. Clean passages.
	9. Fuel bleeding from accelerator pump discharge nozzle (accelerator pump check not functioning properly)	9. Rebuild or replace carburetor. It is frequently impossible to satisfactorily rebuild carburetor (seats corroded or pitted)
	10. Leaking fuel pump, lines or fittings	10. Stop leaks.
Poor Acceleration	Engine	
	1. Leaking valves, improperly adjusted valves, worn timing chain or gears, worn camshaft lobes; worn pistons rings causing low compression	1. Test engine to locate exact nature of trouble; if any of these problems other than leaking valves exist, it is probably more practical to remove and completely rebuild or exchange the engine.
	Ignition System	
	1. Incorrect ignition timing	1. Time engine ignition.
	2. Fouled or improperly adjusted spark plugs	2. Adjust, clean or replace plugs.
	3. Improperly adjusted or defective ignition points	3. Adjust or replace points.
	4. Distributor not advancing properly (if distributor machine not available, check with timing light.)	4. Service advance mechanism to deliver proper advance pattern. Normally the vacuum advance diaphragm is all that will need service. If you can blow through it, it is defective.

Problem	Cause	Correction
Poor Acceleration (continued)	5. Loose or defective spark control valves on Ford 6 cylinder engines with all vacuum-controlled distributor advance mechanism	5. Tighten or replace valve. It may be necessary to open distributor vacuum passage in carburetor.
	6. Defective ignition cables	6. Repair or replace ignition cables. (If cables are leaking, it is usually best to replace them in sets.) *NOTE: Radio-resistant wires containing a linen or fiber core, carbon-impregnated cables cause trouble more frequently than wirecored ignition cables. When replacing ignition cables, better performance will be obtained with wire-coded cables.*
	<u>Fuel System</u>	
	1. Accelerator pump malfunction	1. Rebuild or replace carburetor.
	2. Float setting incorrect	2. Set float to specifications.
	3. Throttle linkage not properly adjusted to open throttle adequately	3. Adjust throttle linkage.
	4. Accelerator pump stroke not properly adjusted	4. Adjust accelerator pump stroke.
	5. Leaking power valve, gaskets, or accelerating pump diaphragm or piston	5. Clean and rebuild carburetor or replace it.
	6. Dirt or corrosion in accelerating system (most likely to occur after machine has been idle for substantial periods of time with fuel left in carburetor.)	6. Clean and rebuild carburetor or replace carburetor. If carburetor is badly corroded or pitted, replacement is preferable.
	7. Distributor vacuum passages in carburetor stopped up	7. Clean passages.
	8. Restricted fuel filter	8. Replace fuel filter.
	9. Defective fuel pump	9. Replace fuel pump.
	<u>Exhaust System</u>	
	1. Exhaust valve stuck closed or exhaust system otherwise restricted	1. Free up exhaust valve; remove any other exhaust restriction.

Problem	Cause	Correction
Poor Acceleration (continued)	Power Transmission	
	1. Manual clutch slipping	1. Adjust pedal clearance or rebuild clutch to stop slipping.
	2. Torque converter malfunctioning	2. Check first mechanical connections of torque converter to engine; if trouble not here, dismantle and repair torque converter.
	Brakes	
	1. Adjusted too tight	1. Loosen up on brake adjustments.
Engine Does Not Develop Full Power, or Has Poor High Speed Performances	Engine	
	1. Positive crankcase ventilation system not operating properly (if so equipped)	1. Clean and inspect PVC system; replace valve or other parts as required.
	2. Excessively worn valve guides	2. Service cylinder head.
	3. Low compression from worn piston rings	3. Rebuild cylinder block.
	4. Camshaft lobe(s) worn below limits	4. Replace camshaft. When camshaft trouble occurs, it is advisable to carefully evaluate the condition of the entire engine to determine whether it should be completely rebuilt. Also evaluate the engine oil used.
	Fuel System	
	1. Restricted air cleaner	1. Clean oil bath air cleaners and replace oil; replace dry-type air cleaner elements.
	2. Restricted fuel filter	2. Replace fuel filter or fuel filter element.
	3. Clogged or undersize main jets and / or improper float setting	3. Clean carburetor, change jets to proper size for elevation or adjust float for specified fuel level.
	4. Clogged or under size secondary jets (4 barrel carburetors)	4. Clean or replace jets as necessary.
	5. Power valve or passages clogged or damaged	5. Clean or replace.
	6. Secondary throttle plates not opening or not opening properly (4 barrel carburetors only)	6. Service throttle plates as necessary.

Problem	Cause	Correction
Engine Does Not Develop Full Power, or Has Poor High Speed Performance (continued)	7. Fuel pressure incorrect (engine either flooding or starving)	7. Check fuel pump pressure and delivery by specifications. Change pump if necessary to bring pump pressure and delivery volume to specifications.
	8. Distributor vacuum passages in carburetor blocked	8. Clean passages.
	9. Restriction in fuel piping in tank or anywhere between tank and carburetor	9. Locate and eliminate restriction.
	<u>Ignition System</u>	
	1. Ignition timing not properly adjusted	1. Adjust ignition timing.
	2. Defective coil, condenser or rotor	2. Replace defective units.
	3. Distributor not advancing properly	3. Check advance pattern on distributor machine or with timing light. Make corrections as need dictates.
	4. Excessive play in distributor shaft or distributor cam worn excessively	4. Rebuild distributor or replace it.
	5. Fouled or improperly adjusted spark plug(s) or spark plugs with incorrect heat range	5. Clean, adjust or use replacement plugs of proper heat range.
	6. Improperly adjusted or defective ignition points	6. Adjust or replace ignition points.
	<u>Exhaust System</u>	
	1. Exhaust valve sticking or restriction elsewhere in exhaust system	1. Free exhaust valve and eliminate any other restriction that is found.
	<u>Cooling System</u>	
	1. Thermostat inoperative or of incorrect heat range	1. Change thermostat.
	2. Thermostat installed improperly (bottom side up)	2. Install thermostat properly.
	3. Any condition in the cooling system that prevents engine from reaching normal temperature (no thermostat, improper air shrouding, wrong fan, etc.)	3. Put in thermostat, make other corrections, as necessary.

Problem	Cause	Correction
Engine Does not Develop Full Power, or Has Poor High Speed Performance (continued)	Governor	
	1. Incorrect adjustment	1. Adjust governor.
	2. Throttle plate(s) in governor (velocity-type) not completely opening	2. If plates cannot be made to completely open, replace the velocity-type governor.
	3. Defective governor	3. Service or replace governor.
Excessive Fuel Consumption	Engine	
	1. Positive crankcase ventilation system clogged or otherwise defective	1. Clean, inspect or replace as necessary.
	2. Valve adjustment	2. Adjust valves (mechanical lifters).
	Fuel System	
	1. Fuel pump pressure excessive	1. Replace pump or install a fuel pressure regulator.
	2. Engine idle speed too high	2. Adjust engine idle speed.
	3. Idle fuel mixture needles adjusted improperly	3. Adjust idle fuel mixture needles.
	4. Accelerator pump stroke too great for engine, temperature or elevation	4. Adjust pump stroke lever to proper position.
	5. Restricted air cleaner	5. Clean and replace oil in oil bath air cleaner; replace element in dry-type cleaners.
	6. Fuel level in carburetor too high	6. Adjust fuel lever in carburetor by manipulating tang on carburetor float. (See specifications).
	7. Carburetor jets worn or wrong size for elevation	7. Replace jets with proper size for engine and elevation.
	8. Carburetor power valve malfunction (piston sticking in cylinder or diaphragm leaking)	8. Rebuild or change carburetor.
	9. Carburetor air bleeds restricted	9. Clean carburetor. Any time it is necessary to dismantle and clean the carburetor, it is wise to rebuild it at the same time.

Problem	Cause	Correction
Excessive Fuel Consumption (continued)	10. Accelerator pump discharge port(s) or nozzle(s) siphoning (discharge ball or needle not properly seating)	10. Clean and rebuild carburetor, being sure to seat accelerator pump discharge ball or needle. If accelerator pump discharge check seats are pitted, replace carburetor.
	11. *SPECIAL NOTE: Clogging of any passage in a carburetor indicates the likelihood of either inadequate air or fuel filtration*	11. *SPECIAL NOTE: Clogging of any passage in a carburetor indicates the likelihood of either inadequate air or fuel filtration.*
	<u>Cooling System</u>	
	1. Check thermostat operation and heat range	1. Replace thermostat if defective or of improper heat range.
	<u>Ignition System</u>	
	1. Ignition timing incorrect	1. Time ignition.
	2. Distributor points not properly adjusted or burned	2. Adjust or replace points as inspection indicates need.
	3. Spark plugs missing	3. Remove plugs and clean, gap or replace as necessary.
	4. Distributor spark advance not operating properly	4. Inspect spark advance mechanism for proper operation. Make necessary repairs or replacements.
	<u>Chassis</u>	
	1. Tire pressure too low	1. Increase tire pressure.
	2. Brake adjustment too tight	2. Loosen up brake adjustment.
Engine Temperature Gauge Indicates Overheating or Engine Actually Overheating	<u>Engine</u>	
	1. Cylinder head bolts not properly torqued	1. Torque cylinder head bolts.
	2. Incorrect valve lash or clearance (solid or mechanical lifters)	2. Adjust.
	3. Low oil lever or incorrect viscosity oil used	3. Add oil; change to proper viscosity.
	4. Exhaust valve stuck closed	4. Free exhaust valve.
	5. Exhaust piping restricted (plugged with dirt or crushed)	5. Remove restriction in exhaust piping.

Problem	Cause	Correction
Engine Temperature Gauge Indicates Overheating or Engine Actually Overheating (continued)	<u>Cooling System</u>	
	1. Water low	1. Add water or water-antifreeze solution in winter (Cure the disease instead of just treating the symptoms–find the leak and stop it).
	2. Water pump belt broken or slipping	2. Adjust water pump driving belt or replace it if broken.
	3. Radiator fins obstructed or shutter closed (if so equipped)	3. Clean radiator fins, open shutter.
	4. Air ducting through radiator and fan to engine not properly designed or damaged	4. Arrange air ducting properly.
	5. Radiator capacity inadequate for engine or engine load and speed	5. Install radiator of proper capacity.
	6. Thermostat defective or improperly installed	6. Install thermostat properly; replace it if defective.
	7. Water pump impeller slipping on water pump otherwise inoperative	7. Rebuild or change out the water pump.
	8. Wrong engine fan for operating conditions	8. Change engine fan.
	<u>Gauge and Connections</u>	
	1. Temperature gauge not registering proper temperature or constant voltage regulator defective; sending unit defective or wire damaged	1. Change out defective parts as necessary to obtain accurate reading on the gauge.
	<u>Ignition System</u>	
	1. Incorrect ignition timing	1. Time engine ignition.
	2. Incorrect distributor advance	2. Service distributor advance mechanism; (vacuum advance diaphragm is defective if you can blow through it).
Engine Fails to Reach Normal Operating Temperature	1. False temperature registered by gauge	1. Service temperature gauge and associated parts.
	2. Thermostat inoperative or of improper heat range	2. Replace thermostat.

Problem	Cause	Correction
Loss of Coolant	Engine	
	1. Cylinder head gasket defective	1. Replace head gasket; shave head if warpage out of limits. See engine specifications.
	2. Intake manifold to cylinder head(s) gasket defective (applies to V-type engines only)	2. Replace gasket.
	3. Cylinder head or intake manifold bolts not properly torqued	3. Torque intake manifold or cylinder head bolts to specifications.
	4. Cylinder black core plugs leaking	4. Replace core plugs.
	5. Temperature sending unit leaking	5. Stop leak.
	6. Cracked cylinder head or block, warped cylinder head or block surface allowing water to enter cylinders	6. Repair leaks in cylinder head(s) or block if possible. A good sealer may do the job. If not, dismantle and repair or replace as necessary. Shave warped cylinder heads. If cylinder head gasket leakage is a problem, be sure head bolts are properly torqued.
	Cooling System	
	1. Loose or damaged hose connections, rotted hoses	1. Tighten clamps or replace hoses.
	2. Leaking radiator or water pump	2. Repair or replace.
	3. Radiator cap defective	3. Replace radiator cap.
	4. Engine overheating and boiling	4. See “Engine Temperature Gauge Indicates Overheating”.

Problem	Cause	Correction
Noisy Hydraulic Valve Lifter	This problem rarely exists on engines which have their engine oil and oil filter elements changed according to the manufacturer's recommendations. Be sure to follow the recommendations both as to oil specifications and frequency of change. *Note: As engines approach the end of their useful life, it may be necessary to increase the frequency of change on both oil filter element and engine oil. Nondetergent oil is not to be used under any condition.* A noisy valve lifter can be located by operating the engine at idle speed and placing a finger on the face of the valve spring retainer. If the lifter is not functioning properly, a shock will be felt when the valve opens. Another method of identifying a noisy lifter is by the use of a piece of hose or a stethoscope. With the engine operating at idle speed, place one end of the hose near the end of the valve stem and the other end to the ear and listen for a metallic noise. Repeat this procedure on each intake and exhaust valve until the noisy lifter(s) has been located. The most common causes of hydraulic valve lifter troubles are dirt, gum varnish, carbon deposits and air bubbles. Dirt in the lifter assembly can prevent the disc valve from seating, or it may become lodged between the plunger and body surfaces. In either case, the lifter becomes inoperative due to failure to "pump-up", or because the internal parts are no longer free to function properly. When dirt is found to be responsible for lifter malfunction, remove the lifter assembly and thoroughly clean it, if oil and filter changes do not clean up the system. Recommended engine oil and filter change intervals should be followed to minimize lifter problems caused by dirt. If lifter problems are common, it may be necessary to increase the frequency of change on both the oil filter element and engine oil. Deposits of gum and varnish cause similar conditions to exist which may result in lifter malfunction. If these conditions are found to be present, the lifter should be disassembled and cleaned in solvent to remove all traces of deposits, (if the engine cannot be cleaned up with engine oil and filter changes). Air bubbles in the lubricating oil, caused by an excessively high or low oil level, may likewise cause lifter malfunction. A damaged oil pick-up tube may allow air to be drawn into the lubricating system. Check for engine oil aeration as follows:	

Problem	Cause	Correction
Noisy Hydraulic Lifter (continued)	Check the engine oil level to be sure it is within specifications. Operate the engine at approximately 1200 rpm until normal operating temperature is reached. Stop the engine and remove the oil pressure sending unit. Install a fitting in this opening with a petcock-type valve that will permit attachment of a 1/4 to 3/8 inch diameter hose of sufficient length to direct the oil discharge into the oil filler pipe. Start the engine and operate it at approximately 500 rpm for a minimum of 5 minutes; then, open the valve slightly to permit a steady discharge of oil. Check the oil flow for air bubbles. Increase the engine speed to approximately 1000 rpm and check for air bubbles in the oil. To facilitate checking for air bubbles, direct the flow over white paper or through a piece of transparent tube. The engine should not be operated at excessive speeds or for extended periods with the oil bleed attached. If oil aeration is evident, remove the oil pan for further test and / or inspection of the oil pump intake system. Perform corrective action as required to remove air from the lubricating oil.	

Trouble	Cause	Corrective Action
Transmission Overheats	1. Low oil level	1. Add oil to proper level
	2. High oil level	2. Drain oil to proper level
	3. Improper oil	3. Drain; fill with proper oil. (See specifications.)
	4. Engine overheated (engine coolant too hot to lower temperature of transmission oil in transmission oil coolant)	4. Eliminate engine overheating problem. (See engine troubleshooting section.)
	5. Low converter-out pressure	5. Refer to "Low Converter-Out-Pressure" section
	6. Clogged or dirty oil cooler, cooler lines	6. Clean cooler and lines; replace if necessary
	7. Inefficient operating range	7. Shift to next lower gear and operate at governed rpm as much as possible
	8. Oil aerated, foaming	8. See "Oil aerated, foaming" under "Low Main Pressure" below
	9. Stator(s) locked	9. Check for low top speed of vehicle
	10. Air-to-oil cooler dirty	10. Blow out cooler fins
Low Oil Pressure A. Low Main Pressure	1. Low oil level	1. Add oil to proper level
	2. Clogged strainer screen	2. Clean screen
	3. Weak or broken main-pressure regulator spring	3. Replace spring or pressure regulator
	4. Clutch cutoff valve sticking open	4. Rebuild main-pressure regulator valve body assembly
	5. Inching control valve linkage out of adjustment	5. Rebuild control valve body assembly
	6. Inching control valve linkage out of adjustment	6. Adjust linkage
	7. Oil aerated	7. a. Low oil level-fill to level b. High oil level-drain to proper level c. Improper oil-drain, refill with recommended oil d. Dirty strainer screen-clean screen e. Ruptured control valve body gasket-replace gasket f. Internal leakage-overhaul transmission

Trouble	Cause	Corrective Action
Low Oil Pressure (continued)	8. Input oil pump worn or damaged	8. Rebuild pump
	9. Lubrication pressure regulator valve dirty, open*	9. Clean valve
B. Low Converter-Out Pressure	1. Low main pressure	1. See "Low Main Pressure" section above
	2. Converter-in bypass valve leaking	2. Rebuild main-pressure regulator valve
C. Low Lubrication Oil Pressure	1. Lubrication pressure regulator valve dirty, open*	1. Clean valve
	2. Lubrication pressure regulator valve seal washer damaged*	2. Replace washer
	3. Lubrication pressure regulator valve spring weak or broken*	3. Replace spring
	4. Low main pressure	4. Refer to "Low Main Pressure" section
Loss of Power	1. Low engine output	1. Correct engine problem
	2. Converter element interference	2. Check for noise at stall, overhaul converter
	3. Clutch slipping	3. Check clutch pressure; check for worn piston seals. Overhaul of transmission may be necessary
	4. Control valves not properly positioned	4. Check linkage adjustments
	5. Low main pressure	5. Refer to "Low Main Pressure" section
	6. Overheating	6. Refer to "Transmission Overheats" section
	7. Water in oil	7. Check for leaking oil cooler; change oil
No Power Transmitted in any range	1. Low main pressure	1. Refer to "Low Main Pressure" section
	2. Control valves not properly positioned	2. Check, adjust valve linkage
	3. Clutch slipping	3. Check clutch pressure; check for worn piston seals; rebuild if necessary

*CRT Models Only.

Trouble	Cause	Corrective Action
No Power Transmitted in any range (continued)	4. Mechanical failure 5. Stripped drive ring or flexplate 6. Rivets stripped out of differential	7. Dismantle and rebuild 8. Replace 9. Dismantle and repair differential
No Power Transmitted in one range	1. Clutch slipping 2. Control valves not properly positioned 3. Mechanical failure	1. Check clutch pressure; check for worn piston seals; rebuild if necessary 2. Check, adjust control valve linkage 3. Disassemble and rebuild transmission
Slow Clutch Engagement	1. Low main pressure 2. Worn piston seals	1. See “Low Main Pressure” section 2. Overhaul transmission
High Converter-Out Pressure	1. Restricted oil cooler or cooler lines 2. Lubrication pressure regulator valve sticking closed	1. Clean or replace cooler and lines as necessary 2. Inspect and correct sticking condition
Vehicle Operates in All Forward Gears, but Stalls in All Reverse Gears	1. Forward clutch failed (will not release)	1. Overhaul transmission
Vehicle Operates in All Reverse Gears, in Low Range, but Stalls in All Forward Gears	1. Reverse clutch failed (will not release)	1. Overhaul transmission
Vehicle Operates Forward and Reverse in Low Range but Stalls in Intermediate and High Range	1. Low range clutch failed (will Not release)	1. Overhaul transmission

Trouble	Cause	Corrective Action
Vehicle Operates Forward and Reverse in Intermediate Range but Stalls in Low and High	1. Intermediate range clutch failed (will not release)	1. Overhaul transmission
Vehicle Operates Forward or Reverse in High Range, but Stalls in Low and Intermediate	1. High range clutch failed (will not release)	1. Overhaul transmission

Drive Axles

Trouble	Cause	Corrective Action
Differential Overheats	1. Low oil level	1. Fill to correct level with recommended lubricant. (See lubricant specifications.)
	2. Incorrect lubricant	2. Drain, flush and refill with lubricant of recommended specifications
	3. Incorrect bearing adjustment	3. Adjust bearings. Replace any that are damaged or excessively worn
	4. Breather in differential housing plugged	4. Clean breather; replace if damaged
	5. Oil level too high	5. Drain oil down to check plug level in differential
Loss of Oil Out of Differential	1. Damaged or badly worn pinion shaft oil seal	1. Replacing oil seal and check for loose pinion bearings or pinion nut
	2. Loose carrier mounting bolts	2. Check and tighten mounting bolts. Replace gasket if damaged or broken.
	3. Breather in differential housing plugged, forcing oil by seals	3. Clean breather; replace if damaged
Noisy Differential		
1. Noise on Drive	1. Ring gear and pinion adjustment too loose (excessive backlash)	1. Adjust
2. Noise on Coast	2. Ring gear and pinion adjustment too tight (insufficient backlash)	2. Adjust
3. Constant Noise	3. a. Worn bearings b. Chipped gear teeth	3. a. Replace bearings b. Replace gears
4. Noise on Turns	4. Worn or damaged differential pinion gears, side gears or pinion journals	4. Replace differential parts
Final Drives Overheat (Planetary Axles)	1. Low oil level	1. Fill to correct level with specified lubricant
	2. Incorrect type and grade lubricant	2. Drain, flush, inspect, repair if necessary; install specified lubricant
	3. Incorrect lubricant for operating temperature	3. Install correct lubricant specified for temperature range

Trouble	Cause	Corrective Action
Final Drives Overheat (Planetary Axles) (continued)	4. Wheel bearings improperly adjusted 5. Scored planet pins	4. Adjust wheel bearings to recommended preload 5. Inspect and replace defective parts
Loss of Oil Out of Final Drives (Planetary Axles)	1. Damaged or broken wheel driver gasket 2. Damaged or broken hub cap gasket 3. Damaged or excessively worn wheel oil seals 4. Loose wheel bearings	1. Replace gasket 2. Replace gasket 3. Replace oil seals and adjust wheel bearings properly 4. Adjust wheel bearings properly and replace oil seal
Noisy Final Drives (Planetary Axles)	1. Lack of lubricant 2. Worn bearings in wheels or planet gears 3. Chipped gear teeth	1. Fill to proper level indicated on hub cap 2. Replace bearings 3. Replace gears

Air Brake System

Problem	Cause	Correction
Insufficient Brakes	1. Brakes need adjusting, lubricating, or relining	1. Adjust and/or lubricate. Replace linings if excessively worn.
	2. Low air pressure in the brake system	2. a. Check and correct excessive air leaks. b. Check governor and repair or replace if defective. c. Check compressor and repair if defective. d. Replace or repair defective control valves.
	3. Brake valve delivery pressure below normal	3. Repair or replace defective valve.
Brakes Apply Too Slowly	1. Brakes need adjusting or lubricating	1. Adjust and/or lubricate.
	2. Low air pressure in the brake system	2. Make the same checks as in No. 2 under “Insufficient Brakes” above.
	3. Brake valve delivery pressure below normal	3. Repair or replace defective valve.
	4. Excessive leakage with brakes applied	4. Check and correct air leak.
	5. Restricted tubing or hose line	5. Clear restriction by opening or replacing restricted tubing or hose line.
Brakes Release Too Slowly	1. Brakes need adjusting or lubricating	1. Adjust and/or lubricate.
	2. Brake valve not returning to fully released position	2. Remove, disassemble, check, and clean valve. Replace excessively worn or damaged parts. Mount valve and check.
	3. Restricted tubing or hose line	3. Locate restriction and correct.
	4. Exhaust port of brake valve restricted or plugged	4. Remove restriction or unplug to permit proper exhaust of air.
	5. Defective brake valve	5. Remove and repair or replace with a new valve.

Hydraulic And Hydraulic Vacuum Assisted Brake Systems

Problem	Cause	Correction
Insufficient Brakes	1. Brakes delivery pressure below normal	1. Replace or repair master cylinder or hydrovac unit
	2. Air entrapped in the hydraulic braking system	2. Bleed brakes by holding brake applied and loosening the bleeder screws. Tighten bleeder screws when air has been expelled. Check fluid level in brake master cylinder and add fluid as needed to bring up to correct level.
	3. Hydraulic fluid low in brake system	3. Fill hydraulic brake master cylinder to specified level and bleed brakes to expel air if required. Recheck fluid level.
Brakes Apply Too Slowly	1. Brake delivery pressure below normal	1. Repair or replace defective master cylinder and / or hydrovac
	2. Excessive leakage with brakes applied	2. Check and correct leaks
	3. Restricted tubing or hose lines	3. Clear restriction by opening or replacing restricted tubing or hose line
	4. Air entrapped in hydraulic brake system	4. Bleed brakes to expel air. Recheck fluid level in master cylinder
	5. Brake master cylinder or hydrovac malfunctioning	5. Disassemble and inspect malfunctioning master cylinder or hydrovac; repair or replace as needed
Brakes Release Too Slowly	1. Restricted tubing or hose line	1. Locate and correct restriction
	2. Defective master cylinder or hydrovac	2. Disassemble master cylinder and / or Hydrovac and repair as needed.
Brakes Grab	1. Oil, grease, or brake fluid on brake lining	1. Disassemble and clean or replace brake lining. Eliminate leak
	2. Brake drums out of round	2. Remove drum and true up or replace
	3. Defective master cylinder and / or hydrovac	3. Repair or replace master cylinder and / or hydrovac
	4. Restriction in tubing or hose line	4. Remove restriction and replace damaged tubing and / or hose lines

Problem	Cause	Correction
Uneven Brakes	1. Grease on brake lining	1. Disassemble, clean and / or replace brake lining.
	2. Brake drum our of round	2. Remove drum and true up or replace.
	3. Defective brake drum (expanding excessively under load and heat)	3. Replace defective drum
Brakes Do Not Apply	1. No pressure in brake system	1. a. Check for open or broken line b. Check master cylinder and / or hydrovac; repair or replace if defective
	2. Restricted or broken tubing or hose line	2. Repair and / or replace damaged or restricted tubing or hose line
	3. Low fluid level in hydraulic brake master cylinder or hydrovac	3. Fill to specified level and bleed to expel entrapped air.
Brakes Do Not Release	1. Defective master cylinder	1. Repair or replace defective master cylinder
	2. Restriction in tubing or hose line	2. Remove restriction. Replace damaged tubing or hose line.
	3. Air entrapped in brake hydraulic system	3. Bleed off entrapped air at bleeder screw. Re-check fluid level in hydraulic brake master cylinder.

Steering System

Problem	Cause	Correction
Slow or Hard Steering	1. Dirt in system	1. Drain, flush, and refill.
	2. Wear on sleeve and spool in steering valve	2. Replace.
	3. Wear on orbit gear in steering valve	3. Replace.
	4. Steering pump defective	4. Repair or replace pump.
	5. Partial restriction on hydraulic suction circuit	5. Check suction lines for restrictions
	6. Low oil supply	6. Replenish oil supply with proper grade and weight oil. (See lubricant specifications)
	7. Filter in suction line stopped up (if so equipped)	7. Service the filter.
	8. Steering control valve defective	8. Repair or replace control valve.
	9. Steering cylinder rod bent	9. Replace.
	10. Mixed or foaming oils in steering system	10. Drain and flush system. Replace oil with proper weight oil. (See lubricant specifications.)
	11. Low air pressure in tires	11. Inflate to correct pressure.
	12. Low steer pressure	12. Set pressure.
Steering Wheel Does Not Center	1. Binding in linkage	1. Re-align.
	2. Broken centering springs in steering valve	2. Replace spring.
	3. Bent steer column	3. Replace column.
No Response When Steering Wheel is Turned Slowly	1. Dirt in system	1. Drain, flush, and refill with clean oil.
	2. Oil level is low	2. Fill to proper level.
	3. Steer cylinder failure	3. Repair steer cylinder.
Wrong Response to Steering Wheel	1. Lines hooked up wrong to ports in steering valve	1. Reconnect.
	2. Orbit gear misaligned in steering valve	2. Re-align.

Problem	Cause	Correction
Continuous Steering Wheel Rotation	1. Dirty fluid 2. Broken centering springs in steering valve 3. Input linkage binding 4. Burr on sleeve or spool in steering valve	1. Drain, flush, and refill. 2. Replace. 3. Re-align. 4. Repair.
No Response	1. Sleeve and spool locked in steering valve 2. Pump failure 3. Hose or filter clogged 4. Relief valve stuck	1. Disassemble, repair, or replace. 2. Check and correct. 3. Check and correct. 4. Drain, flush, and refill.

NOTE: Field repair of the Orbitrol valve is not recommended except by qualified service personnel.

Repair instructions available on request.

Chassis

Problem	Cause	Correction
Cracks in Welds, especially at the point where the mast is pinned to the chassis.	1. The chassis is carefully engineered and ruggedly constructed so that need for service in this area is highly improbable; however, it occasionally is needed.	1. Have cracks in welds repaired immediately.
Hinged Doors and Access Panels Becoming Unhinged	1. Doors and access panels not being properly replaced after use.	1. Make sure these are properly closed.

Hydraulic System

One of the most misunderstood systems, and perhaps the hardest to troubleshoot, is the hydraulic system incorporated in industrial trucks. What appears to be a simple failure of a component is usually corrected by replacement of that component, without due regard to the cause of the failure. There may be several individual systems such as lift, steer, and attachment, tied together to become one overall hydraulic system. In which event, what happens to one subsystem may affect every other subsystem. Therefore, it is absolutely necessary that special attention be given to pressures and cleanliness.

The most meaningful system check a serviceman can use in diagnosing a problem is the check of the hydraulic circuit pressure on any machine that uses hydraulic components. The two cardinal rules that should be followed are:

1. Excessive pressure does not offer any operational advantage. It only shortens component life.
2. Pressure just high enough to achieve component function is always the most desirable setting.

We must also remember that the only reasons for making a hydraulic pressure check are to verify that the system is to specifications or to troubleshoot the system to pinpoint a malfunction. Before an accurate reading can be obtained the following steps must be taken:

1. The hydraulic oil must be to Taylor specifications. Any oil not to these specifications can give a faulty reading.
2. The hydraulic system should have been run long enough to bring the system temperature to approximately 125 to 150°F (51.6 to 65.5°C).

NOTE: One of the best ways to attain this temperature is to bottom out a cylinder and keep it bottomed out which passes the oil over the relief valve, thereby generating heat.

⚠ **CAUTION: If a pump or valve is being replaced, always take a preliminary pressure reading on the cold oil, at idle rpm, because if there is a malfunctioning pressure-relief valve in the system it can burst the pump housing. Normally, if a cylinder is bottomed out it will kill the engine before bursting the pump. If your gauge reading begins to exceed the maximum allowed pressure, do not bottom out the function completely.**

It is extremely important that pressure readings on Taylor equipment be taken at the point specified in service bulletins. If the pressure gauge is installed at another point in the system, readings other than the correct one can or will be obtained due to back pressure and other causes. It should be noted that readings for accuracy should be obtained when the vehicle engine is running between 1000 and 1500 rpm. This gives a good, reasonable flow of oil with pressures approaching the relief valve settings and the settings of other units of the system without excessive back pressure.

When a new pump is installed, allow the engine to idle for 15 or 20 minutes before pressurizing the system. This allows the pump to become thoroughly lubricated and to reach the same temperature as the oil.

Problem	Cause	Correction
Hydraulic Pressure Will Not Build Up	1. Low oil supply	1. Check and fill to proper level with correct grade and weight of oil.
	2. Clogged filter	2. Clean or replace filter.
	3. Broken hose or connection	3. Replace damaged hoses and tighten connections.
	4. Excessive air leak on suction line to pump	4. Locate leak and correct. Replace damaged or broken hoses and connections.
	5. Badly worn or defective pump	5. Disassemble pump and replace worn or damaged parts; check shaft seals for source of trouble.
	6. Badly worn or defective control valve	6. Disassemble, clean and inspect. Replace weak or broken springs, seals and gaskets. If valve plungers are damaged or excessively worn, replace the complete valve assembly.
	7.	7.
	a.Stripped drive ring or flex plate on transmission	a.Replace
	b.Broken pump drive shaft	b.Replace
Low Pressure In System	1. Relief valve setting too low (oil may flow through relief valve and back to reservoir without reaching point of use)	1. Adjust relief valve as necessary.
	2. Relief valve stuck open (may be an indication that system contains dirty or deteriorated oil)	2. Look for dirt and sludge in valve. If valve is dirty, disassemble and clean. Be sure oil meets Taylor specifications.
Hydraulic Pressure Builds Up But Drops Off Rapidly	1. Broken pump shaft	1. Disassemble pump and replace broken and excessively worn parts.
	2. Low oil supply	2. Fill reservoir to proper level with correct weight and grade of oil.
	3. Obstructed hose, line or connection	3. Locate and remove obstruction. Replace excessively worn or damaged hoses or connections.
	4. Defective control or relief valve	4. Disassemble, inspect and repair or replace valve.

Problem	Cause	Correction
Hydraulic Pressure Builds Up Very Slowly or Jerkily	1. Engine speed too slow	1. Increase engine speed rpm and check.
	2. Low oil supply	2. Fill reservoir.
	3. Excessively worn pump	3. Remove pump, disassemble and replace worn or damaged parts.
	4. Obstructed suction line of filter	4. Locate and remove obstruction.
	5. Dirt or other foreign matter under relief valve plunger	5. Disassemble valve, clean and assemble properly.
	6. Scored relief valve plunger or seat	6. Replace damaged parts. Assemble properly.
	7. Weak or broken relief valve spring	7. Replace spring.
Erratic Action	1. Air in System	1. a. Check reservoir oil level. b. Check pump seals, pipe and tubing connections, and all other possible leak areas.
	2. Valves, pistons, etc., sticking or binding	2. a. Check part for mechanical deficiencies. b. Look for dirt, oil sludge, varnishes and lacquers. c. Replace worn parts and check type of oil being used.
	3. Sluggishness when machine is first started	3. a. Check tank filters. b. Under severe conditions use immersion heater.
Pump Not Pumping	1. Intake clogged	1. Check filters, strainers and line from reservoir to pump.
	2. Low oil level	2. Bring oil up to recommended level in reservoir. Intake line must be below oil level.
	3. Air leak in intake (indicated by noisy pump)	3. Pour oil over suspected leakage points. If the noise stops, the leak has been found and can be repaired.
	4. Oil too heavy	4. Drain system and refill.
	5. Pump worn out	5. Check output pressure. If pump is not producing specified pressure, replace pump.
	6. Mechanical trouble (broken shaft, loose coupling, etc.)	6. Locate by noise, repair or replace.

Problem	Cause	Correction
System Overheating	1. Oil viscosity too high	1. Check oil recommendations. If in doubt about the oil system, drain and refill. Adjust viscosity requirements for unusual temperature conditions.
	2. Internal leakage too high	2. Check for wear and loose packing. Check to see if oil viscosity is too low. If tempted to try a higher viscosity, proceed with caution.
	3. Excessive discharge pressure at relief setting	3. Reset pressure.
	4. Low oil pressure	4. Reset pressure.
	5. Low oil	5. Indicated by high oil temperature. Refill oil to proper level.
Noisy Pump	1. Air leaking into system	1. a. Check reservoir oil level. b. Check pump seals, pipe and tubing connections, and all other possible leak areas.
	2. Cavitation (the formation of vacuum in a pump when it does not get enough oil)	2. Check for clogged or restricted intake line or plugged air vent in reservoir. Check strainers in intake line. Check viscosity of oil.
	3. Loose or worn pump parts	3. a. Check manufacturer's maintenance instructions. Look for worn gaskets and seals. Replace all worn parts. Check oil for proper grade and quality. b. Clean filter or strainer. Check filter capacity and quality of oil. c. Determine recommended speed.
Slow or Excessive Cycle Time	1. Air in system	1. Bleed system.
	2. Internal leak in motor, cylinder or control valve	2. Replace piston seals or replace cylinder if walls are scored. Replace or repair valve. Clean unit.
	3. Worn pump	3. Repair or replace.
	4. High viscosity oil causing sluggish action during or after warm-up	4. Consult the pump manufacturer's recommendations or the oil supplier for correct viscosity.

Problem	Cause	Correction
External Oil Leakage	1. Cylinder or valve seals worn 2. Hose or tubing loose or defective	1. Replace seals. 2. Tighten or replace if necessary.
Excessive Wear	1. Abrasive matter in oil passing through pump 2. Viscosity of oil too low at working conditions 3. Sustained high pressure above maximum pump rating 4. Air recirculation causing chatter in system	1. Install adequate filter or replace oil more often. 2. Check pump manufacturer's recommendations or consult lubrication engineer. 3. Check relief or regulator valve maximum setting. 4. Remove air from system.
Breakage of Parts Inside Pump Housing	1. Excessive pressure above maximum pump rating 2. Seizure due to lack of oil 3. Solid matter being wedged in pump 4. Excessive tightening of head-screws	1. Check relief or regulator valve maximum setting. 2. Check reservoir oil level, oil filter and possibility of restriction in suction line more often. 3. Inspect filter or suction line. 4. Follow pump manufacturer's recommendations.
Cylinders Creep When Stopped in Intermediate Position	1. Internal leakage in actuating cylinders or operating valves 2. Load check in control valve not seating	1. Replace piston packing or replace cylinder if walls are scored. Replace or repair valve. 2. Clean unit to remove foreign matter.

Preventive Maintenance

Service Symbols	Service Intervals									
A-Adjust C-Clean CG-Change D-Drain GR-Grease X-Check	10 Hrs	50 Hrs	100 Hrs	200 Hrs	400 Hrs	500 Hrs	600 Hrs	1000 Hrs	1200 Hrs	1500 Hrs
POWER UNIT										
ENGINE:										
Oil level - check for evidence of external leakage	X	X	X	X	X	X	X	X	X	X
Oil change and filter element				D	D		D	D	D	
Bypass filter element (if equipped)				CG	CG		CG	CG	CG	
Throttle control linkage (use engine oil)				GR	GR		GR	GR	GR	
Crankcase breather							C		C	
Clean engine									C	
Check engine mounts									X	
Emergency shutdown mechanism (Detroit Diesel)							X		X	
Engine Protection System - Check plumbing for leaks, check vent filters on Master Control and Colant Loss Valve (change if dirty). Perform test.				X	X		X	X	X	
FUEL SYSTEM:										
Fill fuel tank - check for leaks	X	X	X	X	X	X	X	X	X	X
Fuel filters (diesel engines)	D	D	D	D	D	D	D	D	D	D
Fuel filter elements (diesel engines)					CG				CG	
Fuel filter elements (gas engines)									CG	
Fuel tank, cap, lines and clamps							X		X	
AIR INTAKE SYSTEM:										
Check for leaks	X	X	X	X	X	X	X	X	X	X
Farr air cleaner element (or by filter indicator)							CG		CG	
Donaldson air cleaner elements (or by filter indicator)			X	X	X	X	X	X	X	X
Primary element						CG		CG		CG
Safety element (or by internal indicator)										CG
EXHAUST SYSTEM:										
PTX Purifier							C		C	
COOLING SYSTEM:										
Coolant level and fan belts	X	X	X	X	X	X	X	X	X	X
Belt tensioner and belt (B & C Series Cummins)						X		X		X
Hoses, clamps, and radiator - check for leaks		X	X	X	X	X	X	X	X	X
Radiator (clean externally) as conditions warrant							C		C	
Drain and flush cooling system									D	
Water filter									CG	
ELECTRICAL SYSTEM:										
Battery - check water level and specific gravity		X	X	C	C	C	C	C	C	C
Alternator belts		X	X	X	X	X	X	X	X	X
POWER TRANSFER										
TRANSMISSION (Allison):										
Maintain fluid level to full mark and check for leaks	X	X	X	X	X	X	X	X	X	X
Clean transmission breather				C	C		C	C	C	
Drain and refill transmission. Clean transmission oil intake filter screen (use new gasket)									D	
Transmission filter element. Clean filter housing (use new gaskets)							CG		CG	
TRANSMISSION (TC-28):										
Maintain fluid level to full mark and check for leaks	X	X	X	X	X	X	X	X	X	X
Clean transmission breather				C	C		C	C	C	
Drain and refill transmission								D		
Transmission filter element. Clean filter shell. Clean sump screens (use new gasket)		CG	CG			CG		CG		CG
DRIVE SHAFTS:										
Lubricate drive shaft, universal joints, slip joints, and all other bearings			GR	GR	GR	GR	GR	GR	GR	GR
AXLES										
STEER AXLE:										
Lubricate all grease fittings on steer axle			GR	GR	GR	GR	GR	GR	GR	GR
Repack steer axle hub bearing							GR		GR	
Wheel bearing adjustment							A		A	
Check mounting bolts			X	X	X	X	X	X	X	X
DRIVE AXLE:										
Differential and planetary hubs - maintain oil level			X	X	X	X	X	X	X	X
Drain and refill differential and planetary hubs									D	
Wheel bearing adjustment									A	

Service Symbols	Service Intervals									
A-Adjust C-Clean CG-Change D-Drain GR-Grease X-Check	10 Hrs	50 Hrs	100 Hrs	200 Hrs	400 Hrs	500 Hrs	600 Hrs	1000 Hrs	1200 Hrs	1500 Hrs
DRIVE AXLE (Continued):										
Repack wheel bearings in drive axle hubs (if grease packed)							GR		GR	
Inspect brake linings							X		X	
Check oil level in sump cooled wet disc hubs			X	X	X	X	X	X	X	X
Check mounting bolts			X	X	X	X	X	X	X	X
BRAKE CONTROL SYSTEM										
AIR BRAKES:										
Check automatic drains				X	X		X	X	X	
Check air lines and connections			X	X	X	X	X	X	X	X
Brake reservoir oil level			X							
Brake cooling oil at hubs			X						CG	
Clean power cluster breather (if equipped)				C	C		C	C	C	
CHASSIS										
Lubricate all grease fittings on machine not listed elsewhere. Use engine oil on linkage not having grease fittings			GR	GR	GR	GR	GR	GR	GR	GR
WHEEL EQUIPMENT:										
Check tires, valve caps, wheels, lugs and tire pressure (refer to data plate on lift truck for torque information)	X	X	X	X	X	X	X	X	X	X
HYDRAULIC SYSTEM										
HYDRAULIC PIPING AND RESERVOIR:										
Maintain oil level in hydraulic tank to full mark	X	X	X	X	X	X	X	X	X	X
Check piping for chafing, cracked hoses, loose fittings, and leaks		X	X	X	X	X	X	X	X	X
Drain and refill entire hydraulic system and clean inside tank. **Drain and refill every 2400 hours.**										
HYDRAULIC FILTERS:										
Replace hydraulic tank breather		CG		CG	CG		CG	CG	CG	
Hydraulic intake filter screens (or when indicator shows red)			CG				C		C	
Hydraulic filter screens (inside tank)									C	
Steering return line			CG		CG				CG	
HYDRAULIC VALVES:										
Check for free operation. (Restriction may indicate rust or dirt in system)		X	X	X	X	X	X	X	X	X
HYDRAULIC CYLINDERS:										
Observe speed of movement - check for leaks		X	X	X	X	X	X	X	X	X
ACCUMULATOR:										
Check precharge	X			X	X		X	X	X	
ATTACHMENTS										
MAST:										
Lubricate mast hinge			GR	GR	GR	GR	GR	GR	GR	GR
Lubricate mast main, side, chain and hose rollers. Lubricate tilt cylinder bushings and other grease fittings on mast, including special equipment.			GR	GR	GR	GR	GR	GR	GR	GR
Refer to Leaf Chain Care, Maintenance, and Replacement.										
Check all mast mounting hardware (mast hanger)			X	X	X	X	X	X	X	X
CARRIAGES:										
Lubricate carriage main and side rollers			GR	GR	GR	GR	GR	GR	GR	GR
Lubricate fork pin on Type C carriage			GR	GR	GR	GR	GR	GR	GR	GR
Lubricate side shift roller, cylinders, fork positioner cylinders, and any other grease fittings on carriage assembly, including special equipment.			GR	GR	GR	GR	GR	GR	GR	GR
*Forks must be magnetic particle tested (magnafluxed) for cracks annually (2400 hours).	X	X	X	X	X	X	X	X	X	X
PULPWOOD:										
Lubricate main and side rollers, lubricate trip mechanism, roto, and other grease fittings on pulpwood carriage.			GR	GR	GR	GR	GR	GR	GR	GR
CONTAINER HANDLER:										
Lubricate the sliding surfaces of the expansion beams; twistlock grease fittings, expansion cylinder and grease fittings, pile slope cylinder ends, and any other grease fittings on the carriage.			GR	GR	GR	GR	GR	GR	GR	GR
Visually inspect all twistlocks and guide lugs	X	X	X	X	X	X	X	X	X	X
Visual inspection of twistlocks and guide lugs by maintenance personnel									X	
Check twistlocks and guide lugs ultrasonically or by magnaflux every 2400 hours. Replace if defective.										
Replace twistlocks and guide lugs every 4800 hours.										

*Refer to Fork Inspection, Repair, and Testing.

SERVICE CAPACITIES

Cooling System:
- 300 Ford Gasoline . . . . . 24 Quarts
- 3-53 GM Diesel . . . . . 24 Quarts
- 4276 John Deere Diesel . . . . . 24 Quarts

Fuel Tank . . . . . 30 Gallons

Engine Lubrication (Includes Filter Change):
- 300 Ford Gasoline . . . . . 6 Quarts
- 3-53 GM Diesel . . . . . 12 Quarts
- 4276 John Deere Diesel . . . . . 15 Quarts

Transmission:
- Allison TRT-2211 . . . . . 28 Quarts

Drive Axle Differential:
- Rockwell H-172 . . . . . 10 Quarts

Hydraulic Tank . . . . . 22 Gallons

HYDRAULIC PRESSURE SETTINGS

Model	Lift & Tilt (psi)	Steer (psi)	Accessory Pressure
TY-100	1800	2000	1200
TY-120	2100	2000	1200
TY-150	2500	2000	1200

Daily Operational Checks

1. Engine
   - ✓ _____ Fan Belt (Air Compressor Belts)
   - ✓ _____ Engine Oil
   - ✓ _____ External Leaks
   - ✓ _____ Mounts
   - ✓ _____ Acceleration
2. Transmission
   - ✓ _____ Temperature
   - ✓ _____ Pressure
   - ✓ _____ Check Oil Level
   - ✓ _____ Performance
   - ✓ _____ Parking Brake
   - ✓ _____ Mounts
3. Fuel System
   - ✓ _____ Fill Fuel Tank.
   - ✓ _____ Check for Visible Leaks.
   - ✓ _____ Check Tank Cap for Security.
4. Air Intake
   - ✓ _____ Check Filter Indicator.
   - ✓ _____ Check for Visible Leaks.
5. Cooling System
   - ✓ _____ Check Coolant Level Sight Glass.
   - ✓ _____ Check Hoses, Clamps, & Radiator for Leaks.
   - ✓ _____ Visually Check Radiator Fins for Dirt, etc.
6. Electrical System
   - ✓ _____ Check Back-up Alarm.
   - ✓ _____ Check Strobe Light.
   - ✓ _____ Check Horn.
   - ✓ _____ Check All Gauges on Dash (Engine and Transmission Temperature; Air Gauge).
   - ✓ _____ Check Alternator Belt.
7. Power Transfer
   - ✓ _____ Check Transmission Fluid Level to **Full Mark.**
   - ✓ _____ Visually Check for Leaks.
8. Steer Axle
   - ✓ _____ Visually Check Lugs and Studs for Tightness.
   - ✓ _____ Visually Check Hubs for Leaks.
9. Drive Axle
   - ✓ _____ Bolted Connections
   - ✓ _____ Visually Check Lugs and Studs for Tightness.
   - ✓ _____ Visually Check Hubs for Leaks.
10. Brake Control, Wet Brakes
    - ✓ _____ Check Fluid in Remote Reservoir.
    - ✓ _____ Manually Drain Air Tanks.
    - ✓ _____ Check Air Pressure
11. Air Brakes
    - ✓ _____ Drain Air Tanks
    - ✓ _____ Check Air Pressure
12. Chassis
    - ✓ _____ Check Handrails.
    - ✓ _____ Make Sure Entrance to Cab is Free of Oil, Grease, Fuel and other slippery material.
13. Hydraulic System
    - ✓ _____ Check Fluid level.
    - ✓ _____ Visually Check for Leaks.
    - ✓ _____ Make sure All Functions are Working Properly.
14. Mast and Carriage
    - ✓ _____ Mast Hanger Bolts
    - ✓ _____ Visually Check For Cracks.
    - ✓ _____ Visually Check Lift Chain.
15. Container Attachment
    - ✓ _____ Visually Inspect Twistlock Guide Lugs for Damage and Check Plungers.
    - ✓ _____ Visually Inspect Mast Hoses, Attachment Hoses, and Cables.
    - ✓ _____ Check All Functions.
16. Attachment Indicator Lights
    A. Twistlock System
       - ✓ _____ **Red Light** illuminated means twistlocks are **Unlocked.**
       - ✓ _____ **Amber Light** illuminates when **all 4 twistlocks are in Container Corner Castings.**
       - ✓ _____ **Green Light** illuminates when **all 4 twistlocks are Locked.**
       - ✓ _____ **Amber Light** goes out when **Box is Lifted in the Air.**

    B. Pin System
       - ✓ _____ **Red Light** means **all 4 Beams are Fully Extended.**
       - ✓ _____ **Amber Light** means **all 4 Soft-landing Switches are Functioning.**
       - ✓ _____ **Green Light** appears when Clamping a Pin System Box. There MUST be 1500 PSI in Clamp Circuit to Activate Green Light Pin.
       - ✓ _____ **Blue Light** means Rear Clamps **are in Position.**

Leaf Chain Care, Maintenance, and Replacement

The leaf chain (or chains) on your Taylor material handling equipment was selected based on thousands of hours of safe operation over many years of fork lift trucks working in various types of material handling operations.

The entire chain system, including chain anchors, anchor supports, bearings, and chain rollers, is sized for the basic model capacity and load center shown on the serial plate.

The utility of fork lift truck type material handling equipment requires it to operate under a wide variety of load conditions. These vary from a few low lifts to a very large number of high lifts per operating hour.

The leaf chain is subjected to all the variations of environment, such as moisture, chemicals, temperature extremes, abrasives and even salt water in some applications. The chain cannot have the benefit of a protective coating (paint) and must depend on **proper lubrication** for combating the effect of these conditions. The lubrication program greatly affects chain life.

The utility of the lift truck requires it to operate with a variety of attachments, such as forks, coil rams, paper roll clamps, containers, marinas, and other attachments, all of which will place different dynamic loads and load requirements on the hoist chains.

This wide variety of variables makes it impossible for Taylor to accurately predict an exact service life of the leaf chain on the Taylor material handling equipment. Therefore, **the following procedure of inspection and replacement is recommended to avoid sudden failure.**

Maintenance and Replacement of the Leaf Chain

In addition to the daily walk-around inspections, at each 500 hours of operation, the chain should be thoroughly cleaned and inspected for elongation, pin rotation and protrusion, cracked plates, stretched (enlarged hole), worn contour and worn surfaces on outside links or pin heads. (If any of the above are observed, **replace the entire length of both chains.)** (See illustrations of Modes and Failure.)

Careful visual inspection of both inside and outside where possible of the chain links will reveal some of these early indications of chain failure which can cause total chain breakage if left in service.

NOTE: A hand-held mirror can aid tremendously in hard to see areas.

Particular attention should be given to that part of the chain which passes over the chain roller the most frequently when under load.

It will be necessary to move the carriage to several locations and block to prevent any possibility from falling to gain the best possible visual access to the greatest number of pitches of chain.

⚠ WARNING: Utilize proper safety precautions when blocking.

After the chain is inspected and found to be serviceable, relubricate and place back in service.

At 2,000 hours, disassemble the leaf chain from the vehicle in accordance with the shop service manual (page 27A-1). **Thoroughly clean the chain and visually inspect** for possible failure modes as for the 500 hour interval adding to that procedure the following. Articulate each joint of the chain in both directions where the entire radius around each pin can be inspected for cracks.

Particular attention should be given that length of chain which passes over the rollers.

If the 2,000 hour inspection does not reveal any apparent excess wear or chain damage, relubricate and reinstall as follows:

5). Reverse the chain by replacing the mast end on the carriage and carriage end on the mast.

6). Turn the chain over where the former roller side becomes the outside.

At each 500 hours after the leaf chain is reinstalled, inspect and relubricate and follow the same procedure as on a new machine.

At 4,000 operating hours remove and discard the leaf chain and replace with a new and lubricated chain. Taylor's recommendation to replace the chain at 4,000 hours is based on typical service duty cycles. Experience in a specific application may allow this interval to be increased or may require that it be decreased. Any change should be based on thorough inspection procedures outlined in this manual.

Modes of Chain Failure — See Illustrations on Page 3

1). Normal Wear – Chain Elongation. This is the result of wear when the load chain articulates over the chain rollers. See illustration No. 1 for explanation of wear limits. If the length exceeds allowable wear limits (see text), **replace entire length of both chains.**

2). Chain Stretch. This can be a combination of chain wear and overload (see illustration No. 7). This will show up as some elongation in plates which do not pass over the rollers. Treat chain stretch the same as normal wear provided **no** chain plates are cracked. If length of chain exceeds allowable pin to pin distance using the wear gauge, **replace entire length of both chains.**

NOTE: Chain overload is generally the result of improper operation.

3). Plate/Pin Rotation and/or Plate/Pin Lateral Movement. This is generally caused by the plate seizing the pin at articulation which indicates **lack of lubrication** where the joint rotates over the roller. (See illustration No. 2.) This can result in pin breakage in extreme cases. If any evidence of pin rotation is noted, **replace entire length of both chains.**

4). Plate/Pin Cracks. Cracks result from fatigue, stress corrosion, corrosion fatigue. (See illustrations No. 3, 4, and 5.) If any cracks are observed of any kind on any link, **replace entire length of chain.**

5). Chain Joint Stiffness. (See illustration No. 6.) **Lack of lubrication.** Check the chain for other modes of failure. If none are observed, lubricate thoroughly and place back in service.

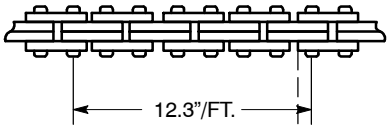
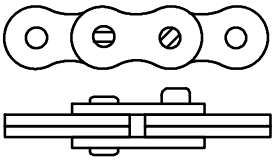
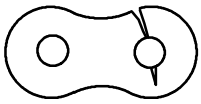
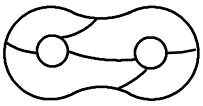
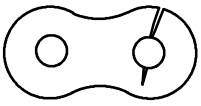
6). Edge Wear of Plates. (See illustration No. 8.) Edge wear can occur at extended hours of service and if sliding of chain occurs because of chain roller bearing problems. If wear exceeds 5% of plate height of unused plate, **replace entire length of chain.**

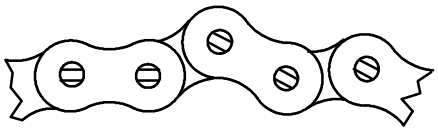
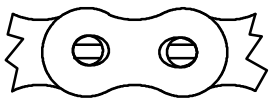
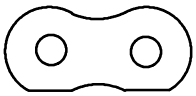
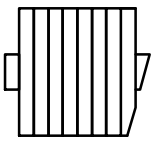
7). Worn Outside Links or Pin Heads. (See illustration No. 9.) Check for misalignment of the chain roller which causes roller bearing failure or centerline of chain roller is out of alignment.

NOTE: The chain will run toward the high side of the roller.

Check (see Check Procedure) the chain for all modes of failure. If **none** are found, eliminate the misalignment, turn the chain over, and place back in service.

Modes of Chain Failure

Appearance and/or Symptom	Probable Cause	Correction
1. Excessive Length (elongation) **If chain gauge shows more than 12.3 inches per foot of elongation.** 	Normal Wear Permanent deformation (stretch) from overload	**Replace chain** ⚠ **Replace chain**
2. Abnormal Protrusion or Turned Pins 	Excessive friction from high loading and inadequate lubrication	⚠ **Replace chain and lubricate more frequently**
3. Cracked Plates (Fatigue) 	Loading beyond chain's capacity (dropping load and catching it)	⚠ **Replace chain and eliminate dynamic (impulse) overloading**
4. Arc-like Cracked Plates (Stress Corrosion) 	Severe rusting or exposure to acidic or caustic medium, plus static stress at press fit between pin and plate. (No cyclic stress necessary)	⚠ **Replace chain and protect from hostile environment by lubricating more frequently**
5. Cracked Plates (Corrosion Fatigue) Perpendicular to Pitch Line, plus rust or other evidence of chemical corrosion 	Corrosive environment and cyclic motion (chain under cyclic operation)	⚠ **Replace chain and protect from hostile environment by lubricating more frequently**

Appearance and/or Symptom	Probable Cause	Correction
6. Tight Joints 	Dirt or foreign substance packed in joints Corrosion and rust Bent pins	⚠ **Clean and relube** **Replace chain** **Replace chain**
7. Enlarged Holes 	High overload, dropping and catching load	⚠ **Replace chain and correct cause of overload**
8. Worn Contour (Edge Wear) 	Normal wear on sheave bearing area Abnormal wear, rubbing on roller	⚠ **Replace chain and correct cause of overload** **Check chain roller bearing**
9. Worn Surfaces on Outside Links or Pin Heads 	Misalignment, rubbing on roller flanges	⚠ **Check alignment of anchors, chain rollers and chain roller pin.**

⚠ **WARNING:**

1. Use proper safety precautions.
   a. Always lower the mast and carriage to its lowest position before inspecting the leaf chain, unless the mast and carriage are securely blocked.
   b. Always use OSHA approved support means (man lift, scaffolding, ladder, or platform) when inspecting, removing, or servicing lift chains. Always turn off the engine. Do not allow anyone to touch the controls while people are near the upright.
2. Use Lockout / Tagout Procedure to reduce causes of possible injury

Lockout / Tagout Procedure

Purpose

This procedure establishes the minimum requirements for lockout / tagout of energy sources that could cause injury to personnel. All employees shall comply with the procedure.

Responsibility

The responsibility for seeing that this procedure is followed is binding upon all employees. All employees shall be instructed in the safety significance of the lockout / tagout procedure by (designate individual). Each

new or transferred affected employee shall be instructed by (designate individuals) in the purpose and use of the lockout / tagout procedure.

Preparation for Lockout / Tagout

Employees authorized to perform lockout / tagout shall be certain as to which switch, valve, or other energy isolating devices apply to the equipment being locked out / tagged out. More than one energy source (electrical, mechanical, or others) may be involved. Any questionable identification of sources shall be cleared by the the employees with their supervisors. Before lockout / tagout commences, job authorization should be obtained.

Sequence of Lockout / Tagout Procedure

1) Notify all affected employees that a lockout / tagout is required and the reason therefor.
2) If the equipment is operating, shut it down by the normal stopping procedure.
3) Operate the switch, valve, or other energy isolating device so that the energy source(s) (electrical, mechanical, hydraulic, etc.) is disconnected or isolated from the equipment. Stored energy, such as that in capacitors, springs, elevated crane members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc. must also be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding-down, etc.
4) Lockout / tagout the energy isolating devices with an assigned individual lock / tag.
5) After ensuring that no personnel are exposed and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate.

⚠ **CAUTION:** *Return operating controls to neutral after the test.*

6) The equipment is now locked out / tagged out.

Restoring Equipment to Service

1) When the job is complete and equipment is ready for testing or normal service, check the equipment area to see that no one is exposed.
2) When equipment is all clear, remove all locks / tags. The energy isolating devices may be operated to restore energy to equipment.

Procedure Involving More Than One Person

In the preceding steps, if more than one individual is required to lockout / tagout equipment, each shall place his own personal lock / tag on the energy isolating device(s). One designated individual of a work crew or a supervisor, with the knowledge of the crew, may lockout / tagout equipment for the whole crew. In such cases, it shall be the responsibility of the individual to carry out all steps of the lockout / tagout procedure and inform the crew when it is safe to work on the equipment. Additionally, the designated individual shall not remove a crew lock / tag until it has been verified that all individuals are clear.

Rules for Using Lockout / Tagout Procedure

All equipment shall be locked out / tagged out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy isolating device bearing a lock / tag.

3. Use only assembled chain. Do not build lengths from individual components.
4. Do not attempt to rework damaged chains by replacing only the components obviously faulty. The entire chain may be compromised and should be discarded.
5. Do not weld any chain or component. Welding spatter should never be allowed to come in contact with chain or components.

Fork Inspection, Repair and Testing

Forks in use shall be visually inspected daily and must be magnetic particle tested (magnafluxed) for cracks at intervals of not more than 2400 hours or whenever any defect or permanent deformation is detected. Severe applications will require more frequent inspection.

When forks are used in pairs, the rated capacity of each fork shall be at least half of the manufacturer's rated capacity of the truck, and at the rated load center distance shown on the lift truck nameplate.

Fork inspection shall be carried out carefully by trained personnel with the aim of detecting any damage, failure, deformation, etc., which might impair safe use. Any fork which shows such a defect shall be withdrawn from service, and shall not be returned to service unless it has been satisfactorily repaired.

⚠ WARNING: Do not weld on forged forks. Failure to follow this warning could lead to seriously weakened forks that could fail prematurely under normal loads. When necessary, the welding of fork bushings should only be done by qualified welders knowledgeable of the appropriate welding practice.

The fork shall be thoroughly examined visually for cracks and if considered necessary, subjected to a nondestructive crack detection process, special attention being paid to the heel and welds attaching all mounting components to the fork blank. This inspection for cracks must also include any special mounting mechanisms of the fork blank to the fork carrier including bolt type mountings and forged upper mounting arrangements for hook and shaft type carriages. The forks shall not be returned to service if surface cracks are detected.

The straightness of the upper face of the blade and the front face of the shank shall be checked. If the deviation from straightness exceeds 0.5% of the length of the blade and/or the height of the shank, respectively, the fork shall not be returned to service until it has been repaired.

Any fork that has a deviation of greater than 3° fork angle from the original specification shall not be returned to service.

The difference in height of one set of forks when mounted on the fork carrier shall be checked. If the difference in tip heights exceeds 3% of the length of the blade, the set of forks shall not be returned to service until repaired.

It shall be confirmed that the positioning lock is in good repair and correct working order. If any fault is found, the fork shall be withdrawn from service until satisfactory repairs have been effected.

The fork blade and shank shall be thoroughly checked for wear, special attention being paid to the vicinity of the heel. If the thickness is reduced to 90% of the original thickness, the fork shall not be returned to service.

The support face of the top hook and the retaining faces of both hooks shall be checked for wear, crushing, and other local deformations. If these are apparent to such an extent that the clearance between the fork and the fork carrier becomes excessive, the fork shall not be returned to service until repaired.

If the fork marking is not clearly legible, it shall be renewed. Marking shall be renewed per instructions from original supplier.

Each fork shall be clearly stamped with its individual load rating in an area readily visible and not subject to wear.

Only the manufacturer of the fork or an expert of equal competence shall decide if a fork may be repaired for continued use, and the repairs shall only be carried out by such parties.

It is not recommended that surface cracks or wear be repaired by welding. When repairs necessitating resetting are required, the fork shall subsequently be subjected to an appropriate heat treatment, as necessary.

A fork that has undergone repairs shall only be returned to service after being submitted to, and passing, the test procedures. The test load shall correspond to 2.5 times the rated capacity marked on the fork.

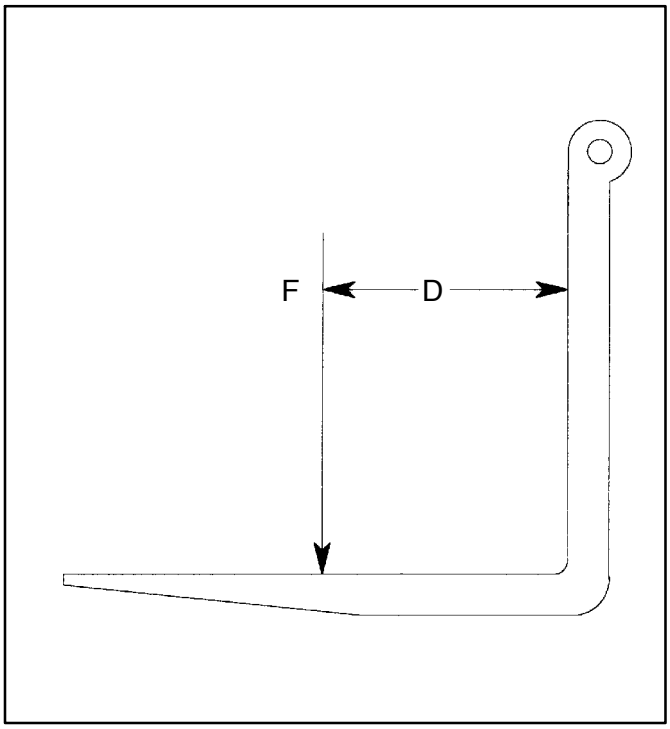


Fig. 1 Typical Fork

Fork strength shall permit the following loading and method of test.

1. The test load F shall be applied to it at the applicable distance D from the front face of the fork arm shank (see Fig. 1).
2. The fork arm shall be restrained in a manner identical to that used on the forklift truck.
3. The test load shall be applied twice, gradually and without shock, and maintained for 30 seconds each time.
4. The fork arm shall be checked before and after the second application of the test load. It shall not show any permanent deformation.

RECOMMENDED GEAR OILS

Chevron U.S.A., Inc.	ULTRA Gear ISO 220
Continental Oil Company	Conoco SCL Gear Lubricant, SAE 90
Gulf Oil Corporation	Gulf Hypoid Gear Lubricant, SAE 90
Humble Oil and Refining Company	Enco Gear Oil, SAE 90
Lion Oil Company	Multipurpose SCL Gear Lubricant, SAE 90
Standard Oil Company	Special SCL Gear Lubricant, SAE 90
Quaker State Oil and Refining Corporation	Quaker State Super Quadrolube X-SCL Gear Lubricant, SAE 90
Valvoline Oil Company	Valvoline SCL Gear Lubricant, SAE 90

The list of commercially available oils was compiled for the convenience of owners and operators. It is based on information received from the suppliers of these oils. Responsibility for the quality of oils and their performance in service must remain with the oil company marketing the lubricant.

This list is not to be construed as a complete list of oils meeting specifications for use and does not imply endorsement of any specific brand.

Fuel and Lubricant Specifications

This replaces all previously published Fuel and Lubricant Specifications.

PRODUCT	USED IN	SPECIFICATIONS	TEMPERATURE	FACTORY FILLED
ENGINE OIL	Cummins Diesels*	API Classification CH–4, CH–4/SJ, CI–4, CJ–4, CK–4		Chevron Delo 400 XLE Multi-grade Heavy Duty Motor Oil SAE 15W 40
	Volvo Diesel	API Classification CI–4, CH–4, CF, SL		
	All Diesel Engines	SAE 5W 30	-20° F to 68° F	
		SAE 10W 30	-5° F to 68° F	
		SAE 15W 40	+5° F to 115° F	
	Gas & LP Engines	API Classification CG–4, CH–4/SJ, CI–4 SAE 5W 30	Below 60° F	
DIESEL FUEL	All Diesel Engines (Tier 3, Tier 4i, Tier 4F)	ASTM Spec D-975 No. 1 or No. 2, Ultra Low Sulfur Diesel Sulfur Maximum: 15 PPM Centane Minimums: 40 - above 32° F 45 - below 32° F	All Temperatures	Chevron Diesel No. 2 With Temp. Supressor Added November Thru March
ANTI-FREEZE	Cooling System	Maintain 50 - 50% Soft Water** Ethylene Glycol (Low Silicate Antifreeze) GM 6038-M or ASTM D3306 & D6210	Protection to -34° F	Chevron Delo XLC Coolant / Antifreeze Phosphate Free
RUST INHIBITOR	Cooling System	Any Reputable Manufacturer Non-Chromate Only	All Temperatures	Included in Antifreeze
TRANS-MISSION	Automatic Transmission	C-4 Type Fluid with Friction Control Modifiers. *NOTE: Chevron 1000 Tractor Hydraulic Fluid and Mobil 424 have proven to be most effective in controlling wet disc brake noise.*	All Temperatures	Chevron 1000 Tractor Hydraulic Fluid
HYDRAU-LIC FLUID	Hydraulic System			
WET DISC BRAKE COOLING	Wet Disc Brakes			
GEAR OIL	Differentials Planetary Hubs Gear Boxes	Extreme Pressure Gear Oil (GL-5 or MIL-2105D) SAE 85W 140	10° F Minimum	Chevron Delo Gear Lubricant ESI 80W 90
		SAE 80W 90	-15° F Minimum & Any Higher Temperatures	
BRAKE FLUID	Wet Disc Brake Actuator	C-4 Type Fluid with Friction Control Modifiers. See Hydraulic Fluid Above.	All Temperatures	Chevron 1000 Tractor Hydraulic Fluid
WHEEL BEARINGS AND SEALED CHAIN ROLLERS	All Timken® Bearings Which Use Grease	Chevron Ulti-Plex*** EP Grease or Equivalent	Grade 1 below 0° F Grade 2 above 0° F	Chevron Ulti-Plex EP Grease
GREASE FITTINGS	All Other Grease Fittings	Chevron Ultra Duty*** EP2 Grease or Equivalent	Grade 1 below 0° F Grade 2 above 0° F	Chevron Ultra Duty EP2 Grease
LEAF CHAINS		Vistac® ISO 150 Lubricant	All Temperatures	Vistac® ISO 150 Lubricant

* Always refer to Cummins Operation and Maintenance Manuals for each engine family for oil specification and drain interval information. Severe engine damage may result if specific oil and drain interval recommendations are not followed.

** Soft Water - Cannot contain more than 300 parts per million hardness or 100 parts per million of either chloride or sulfide. (See engine manual.)

*** Grease recommendations are based on commercial products which have given satisfactory service. Users must be assured of similar performance with products represented to be equivalent.

Electrical System Maintenance Requirements

This document contains information of vital importance concerning the inspection and repair of electrical system components. If damaged electrical system components are not corrected, they can lead to fires causing death, serious injury and / or property damage.

It is important that the machine be inspected regularly. Any damaged electrical system components must be repaired immediately by qualified repair technicians.

Electrical System Maintenance Requirements

WARNING: Death or serious injury may occur from fire. Improper maintenance of the electrical system may result in electrical shorts which can cause fires. Regularly inspect and maintain electrical harnesses, cables, and electrical components as outlined. Ensure that harnesses are properly routed and secured after servicing the truck.

WARNING: Keep vehicle clean and free of grease, oil or dirt build up that can act as fuel for a fire.

Electrical system components must be regularly inspected, maintained, and repaired to ensure safe operation of powered industrial trucks. The following requirements are provided to aid maintenance personnel in proper electrical system maintenance practices. The following requirements are in addition to the regular daily inspections in the operator's guide, maintenance manual, and safety literature included with the truck.

Inspection

In addition to the daily inspection required by OSHA, a thorough visual inspection of all battery cables, wiring harnesses, and electrical connections should be made every 6 months or 1,500 hours of truck operation to check for damage or wear. Wiring harnesses should also be thoroughly inspected any time a major component is removed (i.e. engine, transmission, operator base, etc.) or when an electrical problem occurs.

Prior to any inspection, thoroughly clean the vehicle paying particular attention to the areas to be inspected.

Some areas in which to pay special attention during the inspection include:

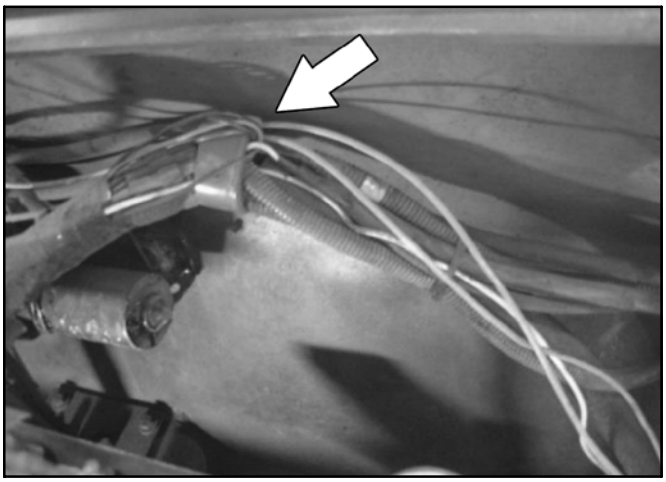
- Areas where there is relative movement between components (i.e. engine / frame).
- Areas where wiring runs around corners, edges of parts, or through holes.
- Areas where components are exposed to high temperatures (i.e. near exhaust components).
- Areas where components are secured with clamps, straps, ties, etc.
- Battery cables (entire length) and terminals
- Connectors / connections
- Wire harnesses in cable tracks or over rollers

Problems requiring maintenance include:

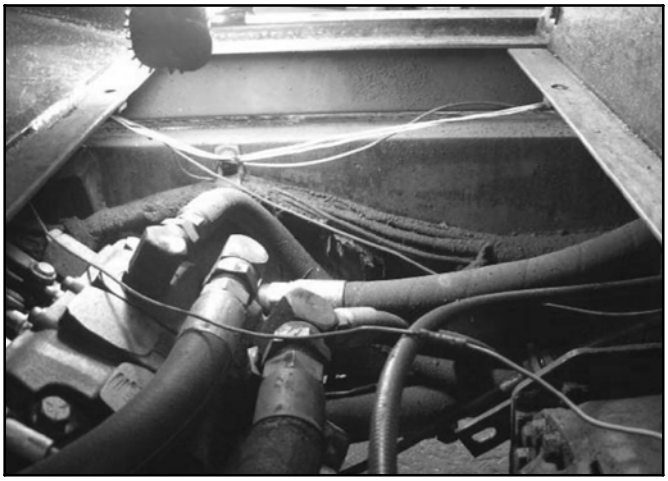
- Build up of combustible material on wiring harnesses or vehicle components
- Worn harness coverings
- Wear in wire insulation
- Exposed conductors
- Evidence of arcing
- Loose fasteners or clamps
- Unprotected or uncovered wires
- Improper repairs or additions
- Corrosion
- Discoloration of connectors
- Improperly secured wiring

NOTE: *Any damaged electrical system components must be repaired or replaced before the unit is returned to service.*

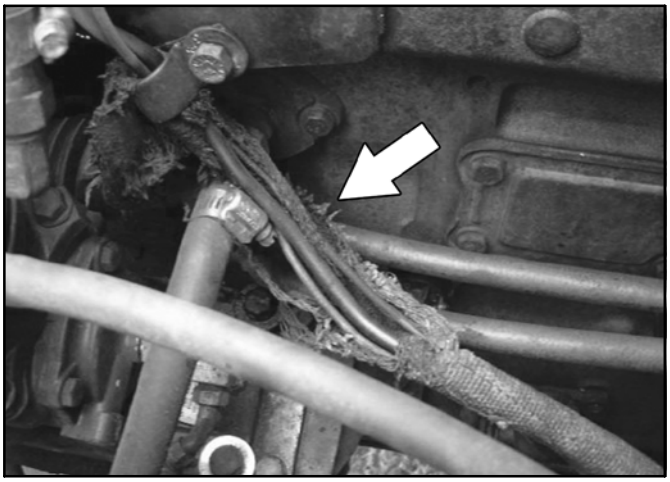
Examples of electrical system maintenance problems are shown in the illustrations below:



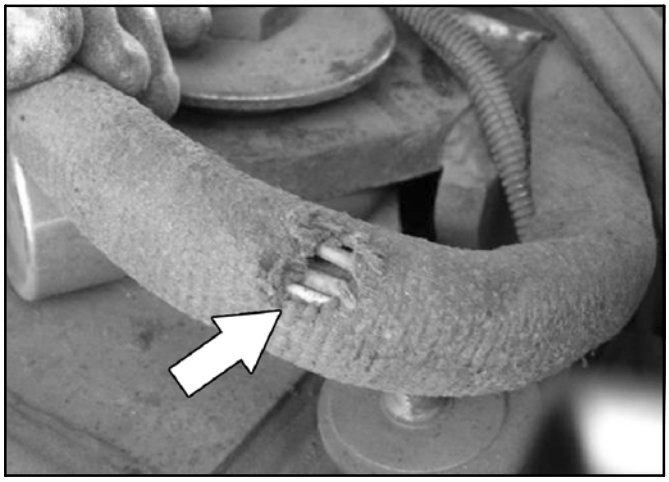
Unprotected Wires



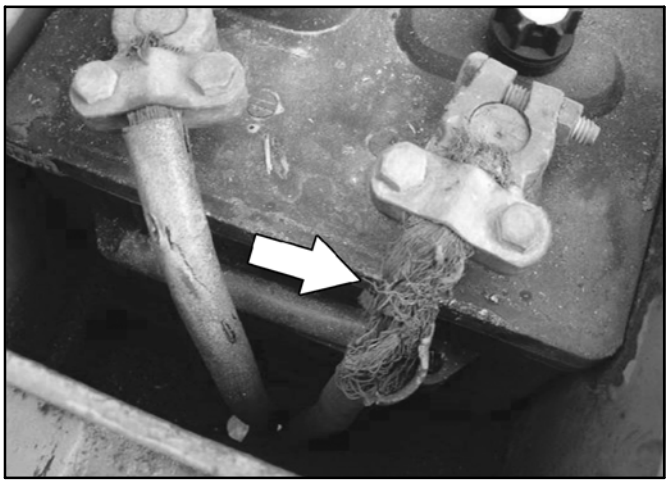
Improper Wire Routing / Unprotected Wires



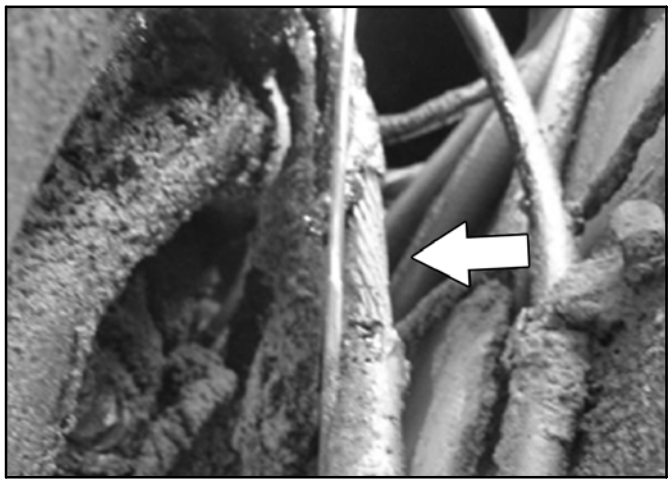
Damaged Sheathing / Unprotected Wires



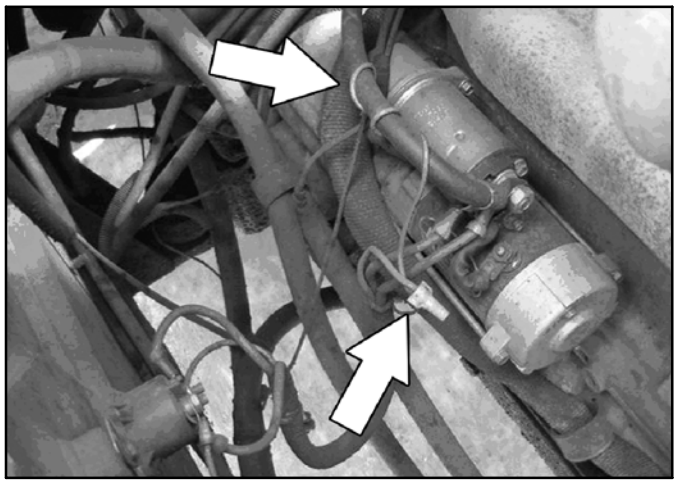
Worn Sheathing



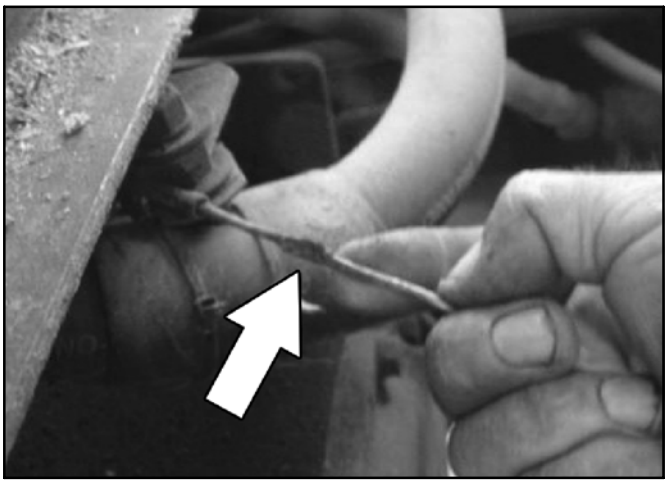
Frayed Battery Cable



Exposed Conductor / Grease Buildup

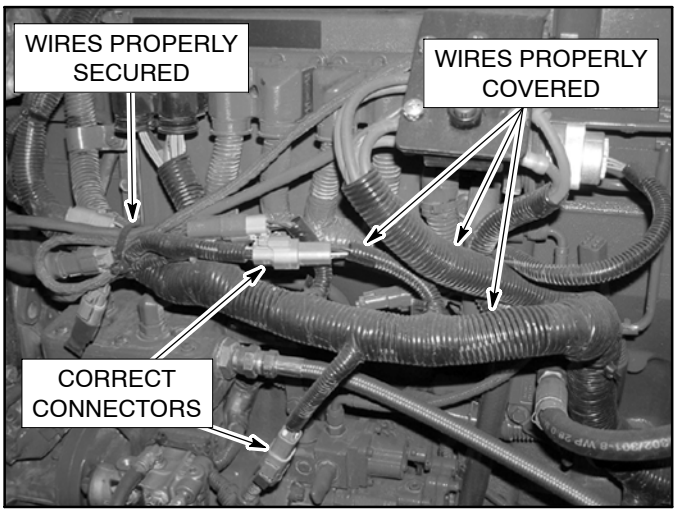


Improper Routing And Connector
Unprotected Wires



Worn or Damaged Wire Insulation
Unprotected Wires

Proper Electrical Wiring Maintenance



Wires Properly Connected, Covered, and Secured

Battery Cable Properly Covered

Corrective Actions

WARNINGS:

- **Use only genuine Taylor replacement parts. Lesser quality parts may fail resulting in property damage, personal injury, or death.**
- **Under no circumstances, without prior written approval from Taylor Machine Works, should the electrical system of the machine be modified in a manner which affects safe vehicle operation as per OSHA 29 CFR1910.178 (a) (4).**
- **Only trained and qualified maintenance personnel should make inspections and repairs on the electrical system and components.**

NOTE: *There are many types of aftermarket electrical components which may or may not meet OEM specifications, quality and design requirements. Always use genuine Taylor replacement parts.*

Corrective actions to follow to repair electrical system components include:

- Keep the vehicle free of grease, oil and dirt build up by regular thorough cleaning.
- Use genuine Taylor replacement parts (wire, connectors, looms, clamps, etc.).
- Use approved split loom to cover worn or missing protective covering on wiring harnesses.
- Tape minor worn places on conductors with electrical tape before covering with wiring loom.
- Protect all wiring with approved loom.
- Properly clamp connectors / terminals on wiring. Use proper crimping tools to attach terminals and connectors.
- Remove and replace damaged wires. Replace wires with same gauge. Short (less than 1" long) damaged sections of wire may be repaired by removing the damaged section and re-connecting the wire with an approved crimp-type connector.
- Never repair or replace a large single wire with multiple small wires.
- Never use connectors that are not approved by TMW.
- Never use residential wiring connectors.
- Use properly sized connectors for wire size.
- Never replace circuit breakers with circuit breakers of higher amperage.
- Keep spacing between wire harness and moving parts.
- Check the integrity of connectors and replace if necessary.
- Replace missing clamps.
- When replacing wire harnesses, use common sense to minimize chaffing when securing and use existing clamping points when possible.
- Properly route wiring and wire harnesses during repairs.
- Use rubber grommets to protect wiring and harnesses which run through holes.

Note: Complete replacement wiring harnesses are available through all Taylor's normal service parts outlets.

Taylor Electrical Part Numbers

Commonly Used Electrical Maintenance Repair Parts

Part Number	Part Description
1730-010	Split Loom 5/8"
1730-011	Split Loom 3/4"
1730-013	Split Loom 1/4"
1730-014	Split Loom 7/8"
1730-015	Split Loom 1 1/4"
1730-016	Split Loom 1 1/2"
1730-020	Split Loom 13/32"
1730-300	Split Loom 3/8"
1730-301	Split Loom 1/2"
2000-317	Split Loom 1"
2315-050	Relay 12V 20/30Amp
2324-017	Socket, Gold Plated 20 ga
2324-028	Pin, Gold Plated 20 ga
2324-055	Terminal, #10 Yellow Ring 10-12 ga
2324-096	Terminal, 3/8" Ring 6 ga
2324-100	Terminal, #6 Blue Ring 14-16 ga
2324-112	Terminal, #4 Red Ring 18-22 ga
2324-150	Butt Splice, 14-16 ga
2324-160	Butt Splice, 14-16 ga
2324-165	Terminal, 1/4" Ring 6 ga
2324-171	Terminal, Yellow Push-on Female 10-12 ga

Part Number	Part Description
2324-172	Terminal, Yellow Push-on Male 10–12 ga
2324-241	Terminal, Blue Push-on Male 14–16 ga
2324-242	Terminal, Blue Push-on Female 14-16 ga
2324-285	Stud mount tie down
2324-340	Terminal, #10 Blue Ring 14-16 ga
2324-380	Terminal, #8 Blue Ring 14-16 ga
2324-384	Terminal, Blue Female 90 deg Push-on 14-16 ga
2324-427	**Weather Pack Socket 14-16 ga
2324-428	**Weather Pack Pin 14-16 ga
2324-571	*Deutsch Pin 14-16 ga
2324-572	*Deutsch Socket 14-16 ga
2324-729	*Deutsch crimp tool, 12-26 ga
2324-846	Heavy Duty Crimper
2324-847	Butt Splice, 6 ga
5144-002	*Deutsch removal tool, Blue 16 ga
5144-003	*Deutsch removal tool, Red 20 ga
5144-005	*Deutsch removal tool, Yellow 12 ga
5144-006	*Deutsch removal tool, White 6 ga
5144-009	Weather Pack removal tool

Notes: All wires must conform to Type SXL, GXL or TXL SAE J1128 Specifications

* These parts are required for proper removal and installation of Deutsch connections

** These parts require Packard GM12014254 crimp tool

Remaining parts may be installed with common tools

Hydraulic System Maintenance Requirements

This document contains information of vital importance concerning the inspection and repair of hydraulic system components. If damaged hydraulic system components are not corrected, they can lead to failures or fires causing death, serious injury or property damage.

It is important that the machine be inspected regularly. Any damaged hydraulic system components must be repaired immediately by qualified repair technicians. The following information is provided to aid maintenance personnel in the inspection of the hydraulic system and identification of areas that may require attention. All safety rules and repair practices included in the other sections of the maintenance manual must be followed.

Hydraulic System Maintenance Requirements

WARNING: Death or serious injury may occur from fire. Improper maintenance of the hydraulic system may result in leaks which can cause fires.

- **Regularly inspect and maintain hydraulic hoses, valves, and hydraulic components as outlined.**
- **Ensure that hoses are properly routed and secured after servicing the truck.**
- **Keep vehicle clean and free of grease, oil or dirt build up that can act as fuel for a fire.**

WARNING: Death or serious injury may occur from catastrophic failure. Improper maintenance of the hydraulic system may lead to failure of truck functions which can affect proper truck operation.

Hydraulic system components must be regularly inspected, maintained, and repaired to ensure safe operation of powered industrial trucks. The following requirements are provided to aid maintenance personnel in proper hydraulic system maintenance practices. These following requirements are in addition to the routine daily inspections in the operator's guide, maintenance manual, and safety literature included with the truck.

Additionally, the following recommendations for inspection, maintenance and repair apply to other systems or components on the truck which contain or transmit flammable materials. These systems include engine lubrication systems and fuel systems. If not regularly inspected and properly maintained, similar hazards exist which may lead to death, serious injury or property damage due to fires.

Inspection

In addition to the daily inspection required by OSHA, a thorough visual inspection of all hydraulic hoses, valve assemblies and hydraulic connections should be made every 6 months or 1,500 hours of truck operation to check for damage or wear. Hydraulic hoses and connections should be inspected for damage and wear any time a major component is removed (i.e. engine, transmission, operator base, etc.) or when a hydraulic problem occurs.

Prior to any inspection, thoroughly clean the vehicle paying particular attention to the areas to be inspected.

Some areas requiring special attention during the inspection include:

- Areas where there is relative movement between components (i.e. engine / frame)
- Areas where hoses run around corners, edges, or through holes
- Areas where hoses cross
- Areas where components are exposed to high temperatures (i.e. near exhaust components)
- Areas where components are secured with clamps, straps, ties, etc.
- Adapters/ Connectors / connections between hoses and components
- Hoses in cable and hose tracks or over rollers
- Fuel lines and connections

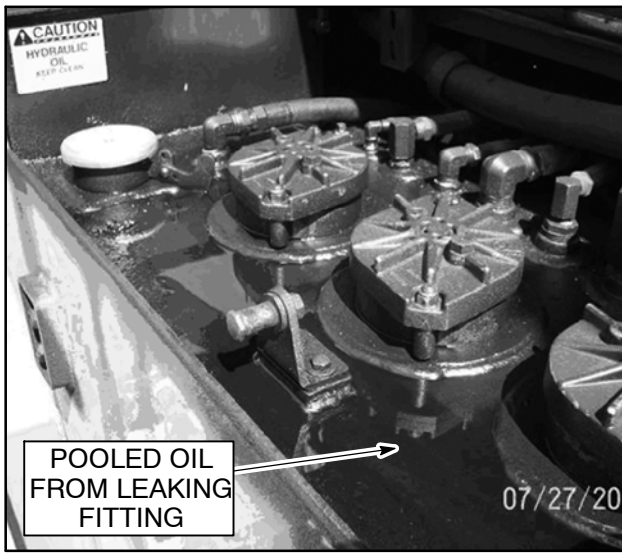
Problems requiring maintenance include:

- Build up of combustible material on hoses, valves or vehicle components
- Worn hose coverings
- Leaking hoses/connections
- Loose hose or adapter connections
- Improper repairs or additions
- Corrosion
- Improperly secured or unsecured hoses
- Excessive vibration of hydraulic or fuel hoses and components

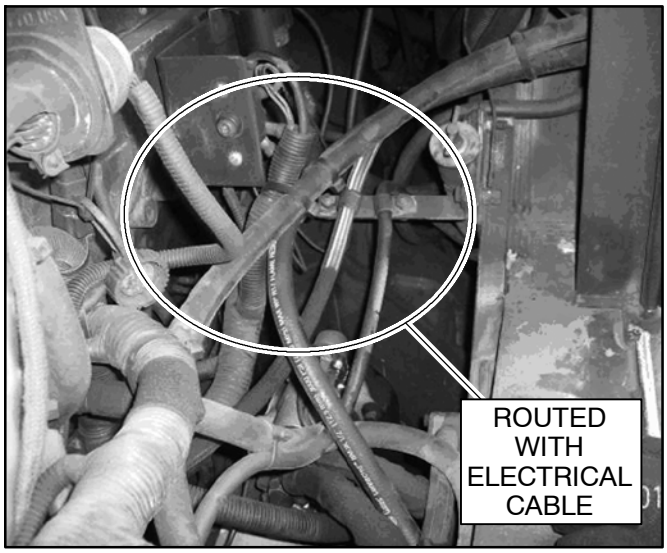
NOTE: *Any damaged hydraulic system or fuel system components must be repaired or replaced before the unit is returned to service.*

Examples of hydraulic system maintenance problems are shown in the illustrations below:

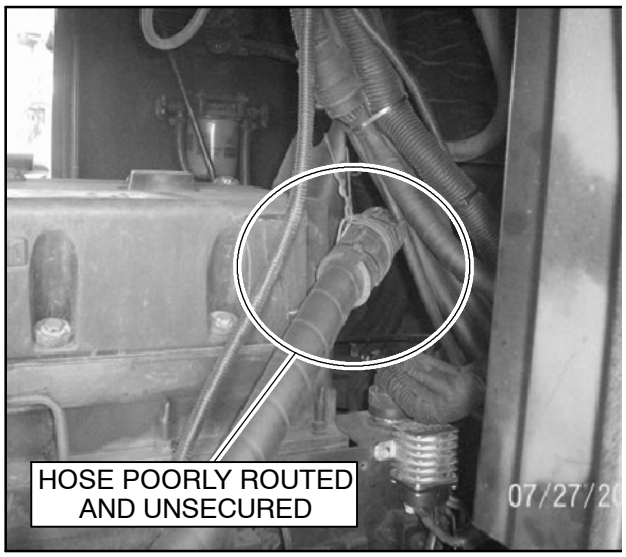
Build up of Combustible Materials on hoses or components



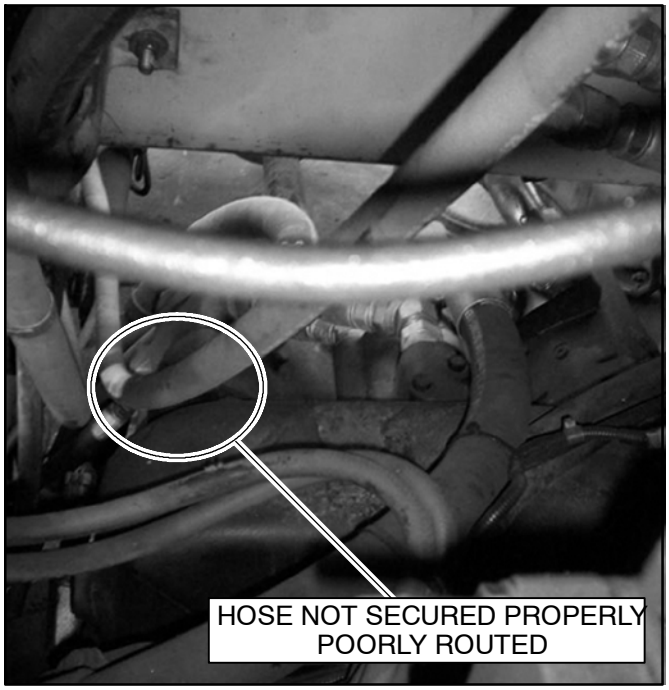
Leaking Hoses or Connections



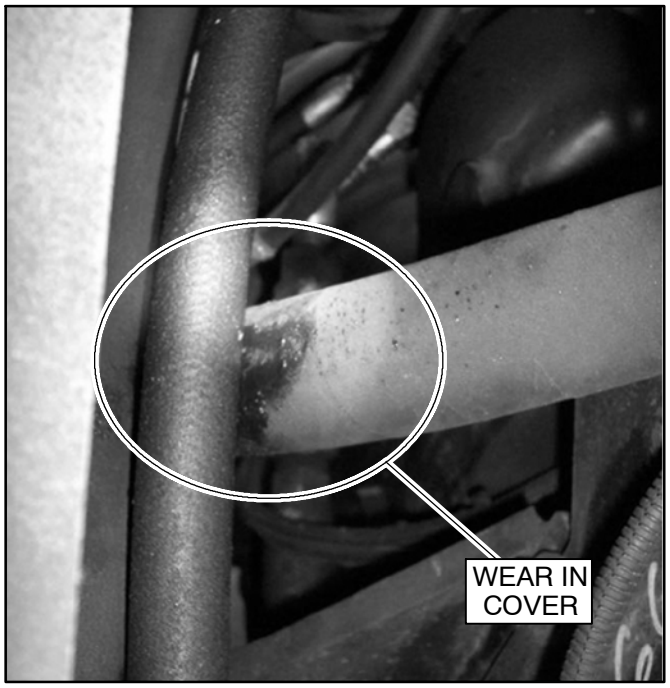
Improper Routing of Hydraulic Hoses and Wiring



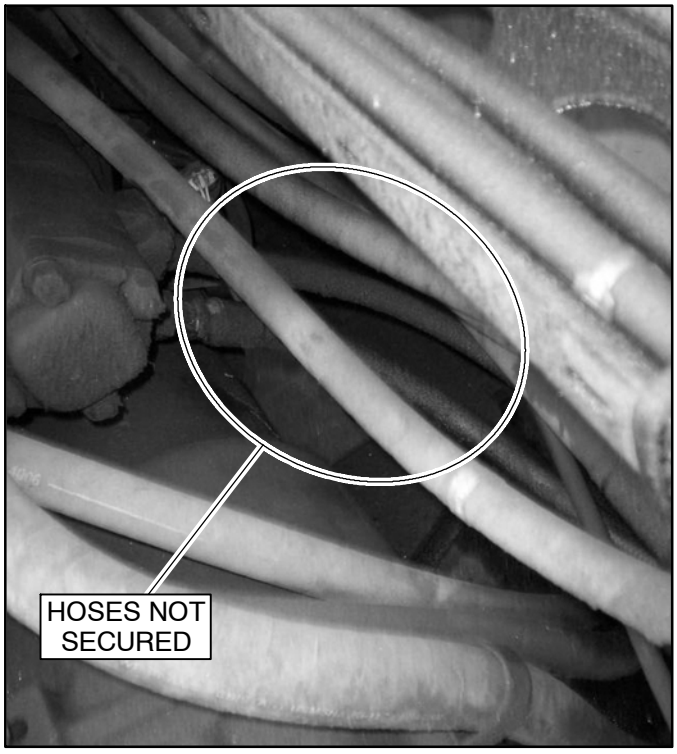
Improper Routing of Hydraulic Hoses or Improperly Secured Hoses



Poor Routing of Hydraulic Hoses
or Unsecured Hoses



Worn Hose Coverings



Improperly Secured or Unsecured Hoses

Corrective Actions

WARNING: Death or serious injury may occur from improper maintenance practices.

- **Use only genuine Taylor replacement parts. Lesser quality parts may fail.**
- **Under no circumstances should the hydraulic system be modified in a manner which affects safe operation unless prior written approval is granted by Taylor Machine Works. (Ref OSHA 29 CFR 1910.178 (a)(4).**
- **Only trained and qualified maintenance personnel should make inspections and repairs to the hydraulic system and components.**

NOTE: *There are many types of aftermarket hydraulic components which may or may not meet OEM specifications, quality, and design requirements. Always use genuine Taylor replacement parts.*

Corrective actions to follow to repair hydraulic system components include:

- Keep the vehicle free of grease, oil, and dirt build up by regular thorough cleaning.
- Use genuine Taylor replacement parts (hoses, adapters, clamps, sheathing, etc.).
- Properly install connectors / adapters on hoses. Use proper crimping tools to attach connectors and adapters to hoses.
- Remove and replace damaged hoses. Replace hoses with OEM hose assemblies.
- Never use hoses/connectors/adapters that are not approved by TMW.
- Use properly sized connectors/adapters for hose size.
- Never replace a hose with a hose of lower pressure rating.
- Maintain spacing between hoses and moving parts.
- Maintain spacing between hoses and wiring.
- Avoid hoses crossing over each other at perpendicular angles.
- Always use properly sized clamps to firmly secure hoses.
- Check the integrity of connectors/adapters and replace if necessary.
- Replace missing clamps.
- When securing replacement hoses, use common sense to minimize chaffing.
- Use existing clamping points when possible.
- Properly route hoses during repairs.
- Use rubber grommets to protect hoses routed through holes.
- Route hoses away from hot surfaces.
- Keep electrical wires and harnesses separated from hydraulic hoses.

Taylor Hydraulic Part Numbers (Commonly Used Hydraulic Maintenance Repair Parts)

Part Number	Part Description
2000-346	Pressure Check - 1/4 NPT
2000-347	Pressure Check - 1/8 NPT
2000-258	Pressure Check - 7/16 SAE
2000-259	Pressure Check - 9/16 SAE
2954-536	Pressure Check - 9/16 ORS
2954-537	Pressure Check - 11/16 ORS
2954-538	Pressure Check - 13/16 ORS
2000-464	Test Hose - 1/4 NPT - 24"
2000-465	Test Hose - 1/4 NPT - 36"
2000-959	Test Hose - 1/4 NPT - 48"
2000-960	Test Hose - 1/4 NPT - 72"
1709-200	250" rubber hose clamp
1709-151	.38" rubber hose clamp
1709	.50" rubber hose clamp
1709-050	.56" rubber hose clamp
1709-055	.69" rubber hose clamp
1709-100	.75" rubber hose clamp
1709-105	.94" rubber hose clamp
1709-108	1" rubber hose clamp
1709-112	1.06" rubber hose clamp
1709-115	1.12" rubber hose clamp
1709-115	1.12" rubber hose clamp
1709-128	1.31" rubber hose clamp
1709-118	1.50" rubber hose clamp
1709-120	1.56" rubber hose clamp
1709-122	1.75" rubber hose clamp
1709-051	1.81" rubber hose clamp
1709-124	2" rubber hose clamp
1709-126	2.25" rubber hose clamp
1709-160	2.625" rubber hose clamp

Part Number	Part Description
1709-127	2.75" rubber hose clamp
1709-161	3.56" rubber hose clamp
1273-703	1/4 tap weld on boss
1316-024	3/8 tap weld on boss
1316-025	5/16 tap weld on boss
1709-908	4" hose hanging straps for clamping hoses
1709-909	6" hose hanging straps for clamping hoses
1709-907	8" hose hanging straps for clamping hoses
1709-904	12" hose hanging straps for clamping hoses
1709-905	16" hose hanging straps for clamping hoses
1709-906	20" hose hanging straps for clamping hoses
2000-713	Small hose protector shield
2000-714	Medium hose protector shield
2000-715	Large hose protector shield
2324-373	12" tie down straps for wiring
2324-374	18" tie down straps for wiring
2945-073	1" nylon abrasion sleeve
2945-074	1.59" nylon abrasion sleeve
2945-075	1.75" nylon abrasion sleeve
2945-076	2.38" nylon abrasion sleeve
2945-049	2.54" nylon abrasion sleeve
2945-099	1" nylon abrasion sleeve with Velcro
2945-101	1.5" nylon abrasion sleeve with Velcro
2945-059	2" nylon abrasion sleeve with Velcro
2945-095	3" nylon abrasion sleeve with Velcro
2945-096	4" nylon abrasion sleeve with Velcro

Notes: Complete replacement hose assemblies are available through all Taylor's normal service parts outlets.

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.

3637 North Church Avenue
Louisville, Mississippi 39339-2017 USA
Phone: 662.773.8056
Fax: 662.773.9157
www.taylorsuddenservice.com

you can depend on Big Red