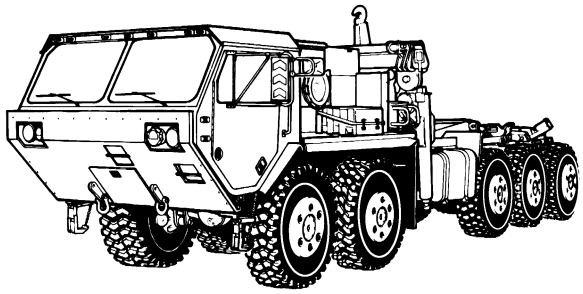
TM 9-2320-364-34-1

THIS MANUAL SUPERSEDES TM 9-2320-364-34-1 DATED 25 FEB 1994, INCLUDING ALL CHANGES.

TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE VOLUME I

PALLETIZED LOAD SYSTEM



MODEL M1074/M1075

NSN 2320-01-304-2277
NSN 2320-01-304-2278

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DISTRIBUTION RESTRICTION
Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
AUGUST 1999

WARNING

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU

Carbon monoxide is a colorless, odorless, DEADLY POISONOUS gas and when breathed deprives body of oxygen and causes SUFFOCATION. Breathing air with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Permanent BRAIN DAMAGE or DEATH can result from severe exposure.

The following precautions MUST be followed to ensure personnel are safe whenever personnel heater or main or auxiliary engine is operated for any purpose.

- DO NOT operate personnel heater or engine of vehicle in enclosed area without adequate ventilation.
- DO NOT idle engine for long periods without ventilator blower operation. If tactical situation permits, open hatches.
- DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
- NEVER sleep in a vehicle when the heater is operating or the engine is idling.
- BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, IMMEDIATELY EVACUATE AND VENTILATE the area. Affected personnel treatment shall be: expose to fresh air; keep warm, DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 12-11 and get medical attention.
- BE AWARE; neither the gas particulate filter unit nor field protection mask for nuclear-biological-chemical protection will protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

WARNING

Blowing transmission oil can cause injury to eyes. Safety goggles must be worn when testing transmission oil pressure switch.

WARNING

Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

WARNING

During pressure tests, ensure air pressure is drained to 0 psi (0 kPa) before taking off air compressor line or taking off any cover plates. If pressure is not released, plates or line could blow off and harm personnel. Air tanks have greater than 30 psi (207 kPa) in them. Do not drain air tanks with any part of body in air spray path. Skin embolisms and/or debris in eyes can occur from released pressure.

WARNING

Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

WARNING

High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.

WARNING

Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

WARNING

Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

WARNING

The LHS hydraulic system operates at oil pressures up to 3625 psi (24,994 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.

WARNING

Middle frame and hook arm combined weight is 2100 lbs (953 kg). Hook arm cylinders weigh 210 lbs (95 kg) each. Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.

WARNING

Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

WARNING

- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

WARNING

If matchmarks are not aligned during installation of yoke, erratic steering will result. Erratic steering can cause serious injury or death to personnel.

WARNING

Use care when disconnecting intergear link. If it falls, it will cause injury to personnel.

WARNING

The truck steering operates with 3000 psi (20,685 kPa) hydraulic pressure. A high pressure hydraulic oil stream can pierce a body and cause severe injury to personnel. Never disconnect any high pressure hydraulic oil line or fitting without first dropping pressure to zero.

WARNING

Do not stand in front of vehicle when testing air box pressure. Brakes could fail and vehicle could move forward causing injury or death.

WARNING

Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.

WARNING

Use a clean thick waste cloth or like material to remove the cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.

WARNING

Moving engine components can cause severe injury. Keep away from alternator belts and pulleys while engine is running.

WARNING

Never use fuel to clean parts. Fuel is highly flammable. Serious injury to personnel could result if fuel ignites during cleaning.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc). Failure to comply may result in injury to personnel.

WARNING

Steam cleaning creates hazardous noise levels and severe burn potential. Eye, skin, and ear protection is required. Failure to comply may result in injury to personnel.

WARNING

Solvents used with a spray gun must be used in a spray booth with filter. Face shield must be used by personnel operating spray gun. Failure to comply may result in injury to personnel.

WARNING

CARC paint contains isocyanate (HDI) which is highly irritating to skin and respiratory system. High concentrations of HDI can produce symptoms of itching and reddening of skin, a burning sensation in throat and nose and watering of the eyes. In extreme concentrations, HDI can cause cough, shortness of breath, pain during respiration, increased sputum production, and chest tightness. The following precautions must be taken whenever using CARC paint:

- ALWAYS use air line respirators when using CARC paint unless air sampling shows exposure to be below standards. Use chemical cartridge respirator if air sampling is below standards.
- DO NOT let skin or eyes come in contact with CARC paint. Always wear protective equipment (gloves, ventilation mask, safety goggles, etc.).
- DO NOT use CARC paint without adequate ventilation.
- NEVER weld or cut CARC-coated materials.
- DO NOT grind or sand painted equipment without high-efficiency air purifying respirators in use.
- BE AWARE of CARC paint exposure symptoms; symptoms can occur a few days after initial exposure. Seek medical help immediately if symptoms are detected.

WARNING

Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC 9-237. Protective clothing and goggles must be worn; adequate protective equipment used, a suitable fire extinguisher kept nearby, and requirements of TC 9-237 strictly followed.

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

WARNING

Engine/transmission assembly weighs 3946 lbs (1791 kg). Attach suitable lifting device of adequate capacity for removal or installation to prevent possible injury to personnel.

WARNING

Use extreme care when installing engine/transmission assembly. Ensure engine/transmission assembly does not swing and damage equipment.

WARNING

Air compressor weighs 115 lbs (52 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Ensure cradle is fully supported upon removal of four screws and lockwashers or cradle may fall and cause injury to personnel.

WARNING

Transmission weighs 1050 lbs (477 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Transmission weighs 1023 lbs (477 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Cylinder head weighs 182 lbs (83 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Use extreme care when removing or installing spring retainers. Spring retainers are under tension and can act as projectiles when released suddenly. Ensure proper eye protection is worn to prevent injury to personnel.

WARNING

Use extreme care when compressing, releasing, removing, or installing springs. Springs are under tension and can act as projectiles when released. Ensure proper eye protection is worn to prevent injury to personnel.

WARNING

Vibration damper may fall from crankshaft and may cause injury to personnel.

WARNING

Ensure there are no personnel working under truck while performing this task. Engine will be supported by lifting device. If lifting device fails, engine may fall and cause severe injury or death to personnel.

WARNING

Lifting device is attached to support engine. Ensure lifting device is positioned snug to engine lifting bracket to prevent engine from falling. Failure to comply may result in injury or death to personnel.

WARNING

Lifting device must remain in place and truck must be properly tagged until after installation of this task is performed. Failure to comply may result in engine falling causing severe injury or death to personnel.

WARNING

Driveshafts can weigh up to 100 lbs (45kg). Properly support driveshafts when removing screws. After screws and brackets are removed, driveshafts can fall and may cause injury to personnel.

WARNING

Use extreme care when removing spring from oil cooler adapter plate. Spring is under tension and can act as a projectile when released. Ensure all personnel wear proper eye protection to prevent possible injury to personnel.

WARNING

Ensure all debris is kept clear of blower during removal. Failure to comply may result in damage to equipment.

WARNING

Blower lobes turn freely. Ensure fingers, jewelry, and hair are kept clear of rotors in blower. Failure to comply may result in severe injury to personnel.

WARNING

Blower weighs 71 lbs (32 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Gloves must be used when handling turbocharger insulation blanket. Turbocharger insulation blanket is made of fiberglass and may cause skin irritation. Failure to comply may result in injury to personnel.

WARNING

Gloves must be used when handling insulation blanket. Insulation blanket is made of fiberglass and may cause skin irritation. Failure to comply may result in injury to personnel.

WARNING

Turbocharger weighs 57 lbs (26 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Use extreme care when turning rotating assembly. Rotating assembly is sharp and injury to personnel may result.

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine.

WARNING

Bottom tank assembly weighs 82 lbs (37 kg). Ensure bottom tank is fully supported prior to removal or installation. Failure to comply may result in injury to personnel or damage to equipment.

WARNING

Top tank assembly weighs 76 lbs (35 kg). Ensure top tank assembly is fully supported prior to removal or installation. Failure to comply may result in injury to personnel or damage to equipment.

WARNING

Use extreme care when removing tester. Sudden release of pressure can cause injury to personnel.

WARNING

Allow engine to cool before removing harness to avoid injury to personnel.

WARNING

Corrosion compound contains alkali. Do not get in eyes; wear safety goggles/glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush with large amounts of water for at least 15 minutes and get immediate medical attention.

WARNING

Middle frame weighs 2500 lbs (1135 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

After removing wires and cables from battery terminals, ensure no contact is made with battery terminals, other wires, cables or any metal surface to prevent damage to parts, personal injury, or death.

WARNING

Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when preforming maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.

WARNING

Upon installation of all wires and cables, ensure no contact is made with battery terminals or other wires and cables. Strap wires and cables away from battery terminals and other wires and cables as required to prevent damage to parts, personal injury, or death.

WARNING

Do not drain transmission fluid while transmission is hot. Injury to personnel may result.

WARNING

Driveshaft weighs 90 lbs (41 kg). The aid of an assistant is required to prevent possible injury to personnel.

WARNING

Ensure one screw is left in place behind lifting bracket in flywheel. Screw is intended to secure flywheel until lifting device is in place. Failure to comply may result in serious injury to personnel and damage to equipment.

WARNING

Flywheel weighs 175 lbs (79 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

During flywheel removal, torque converter turbine can remain attached to flywheel or remain on transmission. Use care to prevent torque converter turbine from falling. If torque converter turbine stays attached to flywheel, lockup clutch may fall out of transmission. Use care to prevent lockup clutch from falling. Failure to comply may result in serious injury to personnel and damage to equipment may occur.

WARNING

Flywheel weighs 175 lbs (79 kg). Use extreme caution when dropping flywheel. Keep feet and hands out from under flywheel to avoid injury to personnel.

WARNING

Transfer case weighs 1500 lbs (681 kg). Attach lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Remove and install one transfer case support bracket at a time. Removing both transfer case support brackets at same time will cause transfer case to fall causing damage to parts or severe injury or death to personnel.

WARNING

Axle No. 1 and No. 2 weighs 1,950 lbs (885 kg). Use jackstands to support axles. Failure to do so could result in injury to personnel.

WARNING

Torque rod is under extreme pressure when being pressed from axle. Torque rod can be dangerous when it breaks loose and could cause injury to personnel.

WARNING

Axle No. 1 weighs 1950 lbs (885 kg). Attach a transmission jack prior to removal or installation. The axle must be chained to the transmission jack or an out of balance condition may result. Failure to comply may result in serious injury or death to personnel.

WARNING

Keep fingers out of beam holes. Failure to comply could result in serious injury to personnel.

WARNING

Axle No. 2 weighs 1907 lbs (866 kg) (without brake drums). Attach a transmission jack prior to removal or installation. The axle must be chained to the transmission jack or an out of balance condition may result. Failure to comply may result in serious injury or death to personnel.

WARNING

Pivot and spindle assembly weighs 90 lbs (41 kg). Support pivot and spindle assembly prior to removal to prevent possible injury to personnel.

WARNING

Trailing beam assembly weighs 150 lbs (68 kg). Attach a suitable lifting device to axle end of trailing beam assembly prior to removal or installation to prevent possible injury to personnel.

WARNING

Main fuel tank weighs between 50 to 700 lbs (23-318 kg) depending on the quantity of fuel inside. Support main fuel tank with suitable lifting device prior to removing mounting hardware to prevent possible injury to personnel.

WARNING

Axle No. 3 weighs 1780 lbs (808 kg). Attach a suitable lifting device prior to removal or installation to prevent possible injury to personnel. Axle housing must be chained to lifting device to prevent an out of balance condition when longitudinal torque rod is removed. Axle could roll out of control causing serious injury or death to personnel.

WARNING

Ensure axle is fully supported by jackstands prior to removing hydraulic jack from trailing beam assembly. Failure to comply may result in injury to personnel.

WARNING

Keep hands and feet clear of Axle No. 3 until Axle No. 3 is secured by longitudinal torque rod. Failure to comply may result in injury to personnel.

WARNING

Axle No. 4 weighs 1925 lbs (874 kg). Attach a transmission jack prior to removal or installation. The axle housing must be chained to transmission jack or an out-of-balance condition may result. Failure to comply may result in serious injury or death to personnel.

WARNING

The truck end of torque rod must not be removed. Axle No. 4 and 5 share mounting hardware for longitudinal torque rod. If hardware is removed from crossmember, an out-of-balance condition for both axles will result. Any personnel under axle No. 5, which is not secured at this time, could be seriously injured or killed.

WARNING

Axle No. 5 weighs 1905 lbs (865 kg). Attach a transmission jack prior to removal or installation. The axle housing must be chained to transmission jack or an out-of-balance condition may result. Failure to comply may result in serious injury or death to personnel.

WARNING

Brake shoes may be coated with dust. Breathing this dust may be harmful to your health. Do not use compressed air to clean brake shoes. Wear a filter mask approved for use against brake dust. Failure to comply may result in injury or death to personnel.

WARNING

Brake assembly weighs 80 lbs (36 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Brake assembly will swing out on Axles No. 1 and 2 when overhead lifting device is used and screws are removed. Support brake assembly during removal or injury to personnel may result.

WARNING

Use care when removing or installing brake springs. Brake springs are under spring tension and can act as projectiles when released and could cause severe injury to personnel.

WARNING

Ensure braided hose is cool prior to removal or injury to personal may result.

WARNING

Wheel hub assembly weight 115 lbs (52 kg). Support wheel hub assembly with suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

The steering hydraulic system operates at oil pressures up to 3000 psi (20,685 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.

WARNING

Do not remove castle nut from drag link before applying upward pressure on drag link. Serious injury to personnel or damage to equipment may result.

WARNING

Stand clear of tires while turning them. Failure to do so may result in injury or death to personnel.

WARNING

Do not turn relief plunger out more than flush with end of steering gear cover. Plunger could blow out and spray hydraulic oil, causing serious injury to personnel.

WARNING

Steering gear weighs 190 lbs (86 kg). Ensure steering gear is properly supported upon removal from truck. Failure to comply may result in severe injury to personnel.

WARNING

Front steering gear needs to be supported on transmission jack with two wooden blocks located in front of front steering gear. Wooden blocks should be 4 by 6 by 11 in. and 2 by 4 by 11 in. and should be positioned as shown. Failure to comply may result in steering gear falling from transmission jack and causing injury to personnel.

WARNING

Pitman arm is under pressure. Parts can act as projectiles when released and could cause severe eye injury to personnel.

WARNING

Intermediate steering gear weighs 170 lbs (77 kg). Attach lifting device prior to removal to prevent injury to personnel.

WARNING

Steering gear weighs 165 lbs (75 kg). Attach lifting device prior to removal to prevent possible injury to personnel.

WARNING

Cab weighs 1700 lbs (772 kg). Attach suitable lifting device prior to removal or installation of cab support to prevent possible injury to personnel.

WARNING

Rear crossmember weighs 220 lbs (100 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Power module frame weights 275 lbs. (125 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Ensure truck frame is securely supported before removing spring assembly. If truck falls, serious injury to personnel or death may result.

WARNING

Do not stick fingers in pin holes. Injury to personnel may result.

WARNING

Front spring assembly weighs 208 lbs (94 kg). Rear spring assembly weighs 175 lbs (79 kg). Attach a suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Air bags may still be pressurized even though air pressure gauge reads 0 psi. Remove air line slowly to allow air to escape. Failure to comply may result in air line blowing off causing serious injury to personnel.

WARNING

Ensure truck is securely supported before removing equalizer beams. If truck falls, serious personal injury or death may result.

WARNING

Two equalizer beams and cross tube weigh 445 lbs (202 kg) assembled. Each equalizer beam weighs 212 lbs (96 kg). Attach a suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Equalizer beam weighs 212 lbs (96 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Force required to remove beam end bushings and beam center bushing may exceed 30 tons (27 metric tons). Use of a press of 60-ton (54 metric tons) capacity or more is required to remove and install bushings. Use care when pressing out bushings to prevent serious personal injury or death. Always wear eye protection to prevent injury when operating press.

WARNING

Rust preventive contains alkali. Do not get in eyes; wear goggles/safety glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush eyes with large amounts of water for at least 15 minutes and get immediate medical attention.

WARNING

Trailing beam bracket weighs 83 lbs. (38 kg). Attach a suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Do not drain coolant if water temperature gage reads above 180 degrees F (82 degrees C). Contact with steam or hot coolant will result in serious injury to personnel.

WARNING

Always wear eye protection and protective clothing when handling glass. Failure to comply may result in injury to personnel.

WARNING

Fender weighs 74 lbs (34 kg). Use an assistant to remove to prevent possible injury to personnel.

WARNING

LHS control box weighs 200 lbs (91 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

The crane hydraulic system operates at oil pressures up to 3100 psi (21,375 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.

WARNING

Crane weighs 4,700 lbs (2,134 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Boom weighs 2100 lbs (953 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Erection cylinder weight 78 lbs (35 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

One pin secures erection cylinder, tension cylinder, and mast. Be careful to drive out pin only as far as needed to remove erection cylinder, or other components may fall, causing injury to personnel.

WARNING

Lift cylinder weighs 122 lbs (55 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

One pin secures both lift cylinders and mast. Be careful to drive out pin only as far as needed to remove selected cylinder and prevent possible injury to personnel.

WARNING

Ensure boom is fully supported by the LHS hook. Failure to support boom with LHS hook will cause boom to drop and may result in serious injury or death to personnel.

WARNING

Long pin also holds in mast and erection cylinder. Be careful to drive out pin only as far as needed to remove tension cylinder to prevent possible injury to personnel.

WARNING

Mast weighs 109 lbs (49 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Telescope cylinder weighs 70 lbs (32 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Hoist assembly weighs 210 lbs (95 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

When second spring is released, cable follower may fly up against bracket. Keep hands and face away from this area, or injury to personnel may result.

WARNING

Turntable weighs 150 lbs (68 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Gear weighs 135 lbs (61 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Subframe weighs 1420 lbs (645 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Swing drive gear reducer weighs 140 lbs (64 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Four valve bank weighs 75 lbs (34 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Outrigger cylinder weighs 115 lbs (52 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Using HOIST control lever, crane should lift test weight a maximum of 1 in. (2.5 cm) before Overload Sensing System (OSS) disables hoist. If hoist lifts test load higher than 1 in. (2.5 cm), OSS is not functioning correctly and crane has failed load test. Perform Follow-On Maintenance and notify GS Maintenance.

WARNING

The winch hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping the pressure to zero. Failure to comply may result in serious injury or death to personnel.

WARNING

Hook weighs 200 lbs (91 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Hook arm weighs 1100 lbs (499 kg). Attach suitable lifting device prior to installation prevent possible injury to personnel.

WARNING

The LHS hydraulics system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury to personnel.

WARNING

Middle frame weighs 1000 lbs (454 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Main cylinder weighs 325 lbs (148 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Compression frame weighs 4200 lbs (1907 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

LHS main manifold bracket assembly weighs 120 lbs (54 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Main hydraulic pump weighs 215 lbs (98 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Never stand in front of main hydraulic pump during lifting. Hydraulic pump can swing out of door and cause serious injury to personnel.

WARNING

Prolonged contact with lubricating oil, MIL-L-7808 may causes skin rash. Skin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be well ventilated to keep fumes to keep fumes to a minimum.

WARNING

Hook arm cylinders weighs 210 lbs. (95 kg). Attach suitable lifting device prior to removal, installation, or lifting to prevent possible injury to personnel.

WARNING

Ensure hook arm assembly is supported with wooden block prior to removal to prevent possible injury to personnel.

WARNING

Middle frame, hook arm and hook have a combined weight of 2,300 lbs. (1,044 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Oil will spray from cylinder manifold ports when rod is moved in or out. Cover ports with two cleaning cloths to prevent oil from spraying. Failure to comply may result in injury to personnel.

WARNING

Sharp edges of exhaust pipe could cause injury to personnel.

WARNING

Sharp edges of exhaust tube could cause injury to personnel.

WARNING

Battery box weighs 75 lbs (34 kg). Attach suitable lifting device prior to installation to prevent possible injury to personnel.

WARNING

Upon installation of all wires and cables, ensure No contact is made with battery terminals or other wires and cables. Strap wires as required to prevent injury or death to personnel or damage to equipment.

WARNING

200 AMP alternator weight 75 lbs (34 kg) Use an assistant to prevent possible injury.

WARNING

Always disconnect battery ground cable or power source before working on electrical components or injury to personnel may result. Discharge capacitors as noted. If personnel receive an electrical shock, get immediate medical attention.

WARNING

Machine gun ring front support weighs 55 lbs (25 kg). Attach suitable lifting device prior to installation to prevent injury to personnel.

WARNING

Machine gun ring weighs 295 lbs (134 kg). Attach suitable lifting device prior to installation to prevent injury to personnel.

WARNING

Starter weighs 73 lbs. (33 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Engine weighs 2600 lbs (1180 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Keep out from under engine when lifting. If engine slips, sways, or falls, serious injury or death may result.

WARNING

Diesel fuel is flammable. Do not perform this procedure near fire, flame or sparks. Injury or death to personnel could result.

WARNING

When installing lifting device, keep hands clear of rotors to prevent injury to personnel.

WARNING

Cylinder head with lifting device weighs 182 lbs (83 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Flywheel housing weighs 187 lbs (85 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Keep hands clear of gears when loosening nuts to prevent injury to personnel.

WARNING

Vibration damper may drop off crankshaft and may cause injury to personnel.

WARNING

Crankshaft weighs 185 lbs (84 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Control valve cover is under spring tension. Use extreme care when removing cover. Control valve cover may project when released suddenly. Ensure proper eye protection is worn to prevent injury to personnel.

WARNING

Slave piston is retained by spring under compression. Ensure proper eye protection is worn to avoid injury to personnel.

WARNING

Spring is under extreme tension. Wear proper eye protection. Spring may shoot out and cause injury to personnel.

WARNING

Avoid contact with steam. Steam can cause burns, blindness, and other serious injury. Ensure the wearing of protective aprons, gloves, and safety goggles when using live steam or injury to personnel may result.

WARNING

When making this pressure test, make sure personnel are protected against pressurized air and oil from possible rupture or leak in hose or fitting on cylinder head or injury to personnel may result.

WARNING

Some chemical agents (detergents, solvents, alkalis, etc.) may irritate skin or be harmful to the eyes. Others must only be used with adequate ventilation. When working with potentially harmful chemical substances, read and heed the warnings on the product labels and follow prescribed safety precautions. When working with any potentially harmful substance - including live steam, hot water, and compressed air - wear appropriate safety equipment (face shield, gloves, apron, etc.) if required, and use extreme care to avoid injury to personnel.

WARNING

Wear proper eye protection to protect against stream of pressurized water from leak or rupture of fitting, hose, or oil cooler core to prevent injury to personnel.

WARNING

Use care when removing or installing piston rings. Piston rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

WARNING

High pressure steam can blow particles into eyes, can cause severe burns, and creates hazardous noise levels. Eye, skin, and hearing protection is required.

WARNING

Engine block weighs 732 lbs (332 kg). Attach suitable lifting device before removal to prevent possible injury or death to personnel.

WARNING

Be careful when using high air pressure. Ensure connections and seals are tight before applying pressure. High air pressure can blow out parts, hoses or debris with force. Explosive force can damage equipment and cause injury to personnel.

WARNING

Keep out from under engine when lifting. If engine slips, sways or falls, serious injury or death may result.

WARNING

Keep hands and fingers clear of rotors. If rotors turn, fingers may get caught between rotors and result in injury to personnel.

WARNING

Use care when removing retaining pin. Spring behind plug is under tension. Wear proper eye protection to avoid personal injury.

WARNING

Use care when replacing valve plug. Spring behind plug is under tension. Wear proper eye protection to avoid personal injury.

WARNING

Use care when replacing valve stop. Spring behind stop is under tension. Wear proper eye protection to avoid injury to personnel.

WARNING

Cover is under spring pressure. Wear proper eye protection to avoid personal injury.

WARNING

Washer is under spring tension. Wear proper eye protection to avoid injury to personnel.

WARNING

Torque converter housing weighs 100 lbs (45 kg). Attach suitable lifting device for removal or installation to prevent possible injury to personnel.

WARNING

When screws are removed, oil pump will fall. Make sure that assistant firmly supports oil pump inside torque converter housing to prevent personal injury or damage to parts.

WARNING

Forward clutch and turbine shaft assembly weighs 67 lbs (30 kg). Attach suitable lifting device for removal or installation to prevent possible injury to personnel.

WARNING

Use extreme caution when dropping forward clutch assembly. Keep feet and hands out from under parts to avoid personal injury.

WARNING

Ensure personnel wear heat resistant gloves prior to heating PTO gear with propane torch. Failure to comply may result in severe injury or death to personnel.

WARNING

Use extreme caution when dropping fifth clutch housing. Keep feet and hands out from under fifth clutch housing to avoid injury to personnel.

WARNING

Make sure all personnel stand clear when releasing pressure on spring compressor. Retaining ring can cause personal injury if not properly seated in retaining ring groove.

WARNING

Front planetary carrier assembly weighs 54 lbs (25 kg). Attach suitable lifting device for removal to prevent possible injury to personnel.

WARNING

Use extreme care when removing lifting bracket. Sun gear shaft, main shaft and gear fit loosely and may fall out and cause injury to personnel or damage to parts.

WARNING

Do not lift rear planetary assembly by ball bearing on rear end. Bearing may come off and planetary may fall resulting in personal injury or damage to equipment.

WARNING

Keep fingers away from inside of transmission housing while installing rear carrier assembly or injury to personnel may result.

WARNING

Planetary differential assembly weighs 160 lbs (73 kg). Use suitable lifting device to prevent possible injury to personnel.

WARNING

Planetary carrier assembly weighs 85 lbs (39 kg). Use the aid of an assistant to turn differential case over to prevent injury to personnel.

WARNING

Rear shaft assembly weighs 100 lbs (45 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Rear housing weighs 210 lbs (95 kg). Attach suitable lifting device before removal or installation to prevent possible injury to personnel.

WARNING

Center shaft assembly weighs 145 lbs (66 kg). Attach suitable lifting device before removal or installation to prevent possible injury to personnel.

WARNING

Upper shaft assembly weighs 115 lbs (52 kg). Attach suitable lifting device before removal or installation to prevent possible injury to personnel.

WARNING

Differential shaft assembly weighs 100 lbs (45 kg). Use an assistant during removal or installation to prevent possible injury to personnel.

WARNING

Differential housing weighs 90 lbs (41 kg). Attach suitable lifting device before removal or installation to prevent possible injury to personnel.

WARNING

Front housing weighs 200 lbs (91 kg). Attach suitable lifting device before removal to prevent possible injury to personnel.

WARNING

To prevent injury to personnel or equipment damage, make sure chains will not slip off shaft assembly during lifting operation.

WARNING

Assembled portion of upper shaft assembly weighs 100 lbs (45 kg). Use an assistant to prevent possible injury to personnel.

WARNING

Axle No. 3 weighs 1780 lbs (807 kg). Attach a suitable lifting device prior to removal to prevent possible injury to personnel. Chains must be attached to axle housing to prevent an out of balance condition when axle is lifted. Axle could roll out of control causing serious injury or death to personnel.

WARNING

Brake drum weighs 132 lbs (60 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Spring in air brake chamber is very powerful and is under tension. Failure to cage air brake chamber before removal will release tension of spring abruptly and could result in injury to personnel.

WARNING

Air brake chamber can only be unscrewed a maximum of one turn. Otherwise, incorrect brake operation could result.

WARNING

Wheel hub assembly weighs 115 lbs (52 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Brake assembly weighs 80 lbs (36 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Seal race is extremely hot. Do not touch seal race without protective gloves or severe burns to hands could result.

WARNING

Pivot and spindle assembly weighs 90 lbs (41 kg). Use the aid of an assistant to prevent possible injury to personnel.

WARNING

Differential assembly weighs 198 lbs (90 kg). Attach a suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Differential and bevel gear weighs 70 lbs (32 kg). Attach a suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Prussian Blue Dye is poisonous and can burn skin on contact. Over exposure to dye can cause heart and skin problems, dizziness and unconsciousness.

WARNING

Differential assembly weighs 450 lbs (204 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Split torque weighs 62 lbs (28 kg). The aid of an assistant is required to prevent possible injury to personnel.

WARNING

Split torque weighs 62 lbs (28 kg) without flange assembly and 75 lbs (34 kg) with flange assembly. The aid of an assistant is required to prevent possible injury to personnel.

WARNING

Properly support spindle during removal. Failure to comply may result in injury to personnel.

WARNING

Differential assembly weighs 500 lbs (227 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Front housing weighs 90 lbs (41 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Ring and pinion assembly weighs 60 lbs (27 kg). Attach a suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Self-recovery winch weighs 980 lbs (445 kg). Attach suitable lifting device prior to removal or installation to prevent injury to personnel.

WARNING

Left side and right side mount weigh 48 lbs (22 kg). Ensure hands and fingers are kept clear of left side and right side mounts during removal. Failure to comply may result in serious injury to personnel.

WARNING

Ensure fingers do not get caught between secondary planetary carrier and ring gear or injury to personnel may result.

WARNING

Wheel end assembly weighs 200 lbs (91 kg). Support wheel end assembly with suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Internal pistons are under moderate spring tension. Keep pistons compressed when installing locknut. Failure to comply may result in injury to personnel.

WARNING

Exhaust manifolds and engine parts are hot. Use care to prevent personal injury.

WARNING

Use care when removing or installing springs. Springs are under tension and can act as projectiles when released and could cause severe eye injury.

WARNING

Alternator weighs 75 lbs (34 kg). Use the aid of an assistant to prevent possible injury to personnel.

WARNING

Engine weighs 2,600 lbs (1,180 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Keep out from under engine when lifting. If engine slips, sways, or falls, serious injury or death may result.

WARNING

Use care when removing retaining rings. Retaining rings are under tension and can act as projectiles when released causing injury to personnel.

WARNING

Accumulator testing and charging can expose personnel to high pressure nitrogen. Use of proper safety equipment is required to prevent serious injury or death.

WARNING

Accumulator testing and servicing can expose personnel to high pressure nitrogen. Use of proper safety equipment is required to prevent serious injury or death.

WARNING

High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.

WARNING

To prevent corrosion, parts should be dipped in rust preventive within two hours of degreasing.

WARNING

Approved hearing protection devices and protective goggles must be worn when performing tasks. Failure to comply may result in injury to personnel.

WARNING

Fan may engage without warning. do not place any part of body in area of fan operation. Failure to do so may result in injury or death to personnel.

WARNING

Use care when removing or installing retaining rings. Retaining rings are under tension and can act as projectiles when released causing injury to personnel.

WARNING

Release air pressure prior to opening container or injury to personnel could result.

WARNING

Upper container weighs 222 lbs (101 kg). Attach lifting device prior to removal or installation to prevent injury to personnel.

WARNING

Transmission assembly weighs 1,061 lbs (482 kg). Attach lifting device prior to removal or installation to prevent injury to personnel.

WARNING

Protective goggles must be worn when drilling holes. Failure to comply may result in injury to personnel.

WARNING

Upper container weighs 250 lbs (114 kg). Attach lifting device prior to removal or installation to prevent injury to personnel.

WARNING

Transfer case weighs 1,388 lbs (630 kg). Attach lifting device prior to removal or installation to prevent injury to personnel.

WARNING

Axle No. 3 weighs 1,780 lbs (807 kg) and Axle No. 4 weighs 1,925 lbs (873 kg). Use jackstands to support axles. Failure to do so could result in injury to personnel.

WARNING

Driveshafts can weigh up to 100 lbs (45 kg). Properly support driveshafts when removing screws. After screws and brackets are removed, driveshaft can fall and cause injury to personnel.

WARNING

Pivot and spindle assembly weighs 90 lbs (41 kg). Use the aid of an assistant to prevent possible injury to personnel.

WARNING

Wheel end assembly weighs 300 lbs (136 kg). Support wheel end assembly with suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

The trailing beam assembly weighs 150 lbs (68 kg). Attach a suitable lifting device to truck end of trailing beam assembly prior to removal or installation to prevent possible injury to personnel.

WARNING

Axle No. 3 weighs 1780 lbs (808 kg). Attach a suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Keep fingers out of trailing beam assembly holes. Failure to comply could result in serious injury to personnel.

WARNING

Trailing beam assembly weighs 150 lbs (68 kg). Attach a hydraulic jack to axle end of air suspension beam assembly prior to installation to prevent possible injury to personnel.

WARNING

Main fuel tank weighs 50 to 700 lbs (23 to 318 kg) depending on the quantity of fuel inside. Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Axle No. 4 and Axle No. 5 share mounting hardware for longitudinal torque rods. Both axles must be supported during removal of screws and locknuts or axles may fall. Failure to comply may result in injury or death to personnel.

WARNING

Spindle is heavy. Properly support spindle during disassembly or serious injury to personnel may occur.

WARNING

Seal race is extremely hot. Do not tough seal race without protective gloves or severe burns to hands could result.

WARNING

Ensure crankcase cover is fully supported before removing screws. Failure to comply may result in crankcase cover falling causing injury to personnel.

WARNING

Upper container weighs 480 lbs (218 kg). Attach lifting device prior to removal to prevent injury to personnel.

WARNING

Allow cable to slowly retract. Cable is under tension and can snap back rapidly. Ensure that proper eye protection is used. Failure to comply may result in serious injury to personnel.

WARNING

Allow engine to cool before performing this procedure or injury to personnel may occur.

WARNING

Engine must be cool before performing maintenance. Failure to comply may result in injury to personnel.

WARNING

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

WARNING

Mounts weigh 48 lbs (22 kg). Ensure hands and fingers are kept clear of left side and right side mounts during removal and installation. Failure to comply may result in serious injury to personnel.

WARNING

Do not use brake drum that exceeds maximum wear specification. Failure to comply may result in brake failure and serious injury or death to personnel.

WARNING

Brake drum weighs 134 lbs (61 kg). Use lifting device or aid of an assistant to lift drum. Failure to comply may result in injury to personnel.

WARNING

Do not loosen locknuts more than one full turn. Failure to do so may cause steering gear to fall and cause injury or death to personnel.

WARNING

All personnel must stay clear of cab when lifting is in progress. Failure to comply may result in injury or death to personnel.

WARNING

Inner-mid section weighs 1,000 lbs (454 kg). Attach suitable lifting device prior to removal to prevent injury to personnel.

WARNING

Do not stick fingers under section to remove wear pads, or injury to hands may result.

WARNING

Outer-mid section weighs 800 lbs (363 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

- Fly section weighs 450 lbs (204 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.
- Keep fly section level or structural section will fall out. Move fly section slowly. Keep assembly as level as possible during removal. Failure to comply may cause injury to personnel.

WARNING

Structural section weighs 175 lbs (79 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Unsafe torching practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to heat metals. Protective clothing, gloves, and goggles must be worn; adequate protective equipment used; and a suitable fire extinguishers kept nearby. Failure to comply may result in severe injury to personnel.

WARNING

At least 0.06 in. (1.5 mm) of clearance is required between highest spot on fly section and bottom of wear pad or section may not operate properly. Damage to equipment may result.

WARNING

Boom weighs 2,100 lbs (953 kg). Attach suitable lifting device prior to installation to prevent possible injury to personnel.

WARNING

Ensure charging cylinder contains dry nitrogen. Dry nitrogen tanks are marked with one or two black bands. Certain other gasses can cause accumulator to explode. Failure to comply may result in injury to personnel.

WARNING

Compression frame weighs 800 lbs (363 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

WARNING

Screws are extremely hot. Do not touch screws without protective gloves or severe burns to hands could result.

WARNING

The main hydraulic system operates at oil pressures up to 3,675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.

WARNING

Cylinder weighs in excess of 210 lbs (95 kg). Attach suitable lifting device prior to lifting to prevent possible injury to personnel.

WARNING

Left front support bracket weighs 98 lbs (44 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Box assembly weighs 92 lbs (42 kg). Ensure box assembly is properly supported prior to removal to prevent possible injury to personnel.

WARNING

Right front support bracket weighs 98 lbs (44 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Front support assembly weighs 660 lbs (300 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Stow weldment weighs 410 lbs (186 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Rear guide assembly weighs 70 lbs (32 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Rear roller bracket weighs 155 lbs (70 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Rear roller brackets weigh 150 lbs (68 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Right strut bracket assembly weighs 80 lbs (36 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Horizontal roller weighs 75 lbs. (34 kg). Attach suitable lifting device prior to installation to prevent possible injury to personnel.

WARNING

Lifting frame weighs 1,600 lbs (704 kg). Attach suitable lifting device prior to installation to prevent possible injury to personnel.

WARNING

Container lock could drop suddenly if not supported. Failure to comply may result in injury to personnel.

WARNING

Tip of removal tool is very sharp. Use caution when using tool. Failure to comply may result in injury to personnel.

WARNING

Gloves must be used when handling turbocharger cover. Turbocharger cover is made of fiberglass and may cause skin irritation. Failure to comply may result in injury to personnel.

WARNING

Components in each valve bore are spring-loaded and must be compressed while removing retaining pin. Ensure proper eye protection is worn to avoid injury to personnel.

WARNING

Rear planetary carrier assembly weighs 86 lbs (39 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

WARNING

Rear cover weighs 98 lbs (44 kg). Attach suitable lifting device for removal or installation to prevent possible injury to personnel.

WARNING

Ensure that upward lifting force is applied to the holding fixture before screws are removed or transfer case may shift downward causing personal injury or damage to equipment.

WARNING

Press on inner diameter of bearing or equipment damage may result.

WARNING

Parts of the brake assembly may be coated with brake dust; breathing this dust can harm personnel.

- Use a filter mask approved for use against asbestos dust.
- Never use compressed air or dry brush to clean these assemblies.
- Use an industrial type vacuum cleaner with a high-efficiency filter system to remove dust.
- Use water and a soft bristle brush or cloth to remove dirt or mud.

WARNING

Differential gear weighs 70 lbs (32 kg). Attach a suitable lifting device prior to installation to prevent possible injury to personnel.

WARNING

Axle No. 3 weighs 2,048 lbs (808 kg). Attach a suitable lifting device prior to removal or installation to prevent possible injury to personnel. Axle housing must be chained to lifting device to prevent an out of balance condition when longitudinal torque rod is removed. Axle could roll out of control causing serious injury or death to personnel.

LIST OF EFFECTIVE PAGES Insert latest changed pages. Destroy superseded pages.

NOTE

The portion of the text effected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by a shadowed or screened areas, or by miniature pointing hands.

Dates of issue for original and changed pages are:

Original ..... 0 ... 25 February 1994 Revision 1 ... 0 ..... 1 August 1999

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 1098 CONSISTING OF THE FOLLOWING:

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A-1 - A-2	0				
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B-8 Blank	0				
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C-36 Blank	0				
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* Zero In This Column Indicates An Original Page.

TECHNICAL MANUAL

No. 9-2320-364-34

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C. 01 August 1999

Direct Support and General Support Maintenance Manual

PALLETIZED LOAD SYSTEM

MODEL M1074/M1075
NSN 2320-01-304-2277
NSN 2320-01-304-2278

Current as of 01 August 1999

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Publications and Blank Forms), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM." The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or email your letter, DA Form 2028, or DA Form 2028-2, located at the back of this manual direct to: Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-AC-NML, Rock Island, IL 61299-7630. The email address is amsta-ac-nml@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726. A reply will be furnished to you.

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HOW TO USE THIS MANUAL

This manual is designed to help maintain the Model M1074/M1075 Palletized Load System (PLS) truck. Listed below are some special features included in this manual to help locate and use the needed information:

- A front cover table of contents is provided for quick reference to chapters and sections that will be used often.
- Warning, caution, and note headings, subject headings, and other essential information are printed in bold type making them easier to see.
- The maintenance tasks describe what must be done to the truck before starting the task (Equipment Condition), and what must be done to return the vehicle to operating condition after the task is finished (Follow-On Maintenance).
- The Appendixes are located at the end of the manual. They contain a reference guide to other manuals, a list of expendable supplies and materials, and other material for maintaining the PLS truck.
- In addition to text, there are exploded-view illustrations showing how to take a component off and put it back on. Cleaning and inspection procedures are also included as required.
- Chapter 2 of this manual covers basic toubleshooting and Direct Support Maintenance for each PLS truck.

Follow these guidelines when using this manual:

- Read all WARNINGS and CAUTIONS before performing any procedure.
- The equipment conditions found in the maintenance procedures are of a general nature and the mechanic may be able to perform only certain steps within a procedure to accomplish the equipment condition.

CHAPTER 1

INTRODUCTION

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Section I. GENERAL INFORMATION

1-1. SCOPE.

This chapter provides general information, equipment descriptions and principles of operation for the M1074/M1075 Palletized Load System (PLS). The PLS will herein be referred to as the truck.

a. Type of Manual. Direct and General Support Maintenance Instructions, TM 9-2320-364-34.

b. Model Numbers and Equipment Names. The different truck models are listed below:

M1074	Truck with crane (Figure 1-1)
M1075	Truck without crane (Figure 1-2)
M1076	Trailer (Figure 1-3)
M1077	Flatrack (Figure 1-4)

c. Purpose of Equipment. The PLS is an ammunition-hauling tactical wheeled truck and trailer combination with integral self-load/unload capability using the PLS flatrack (FR).

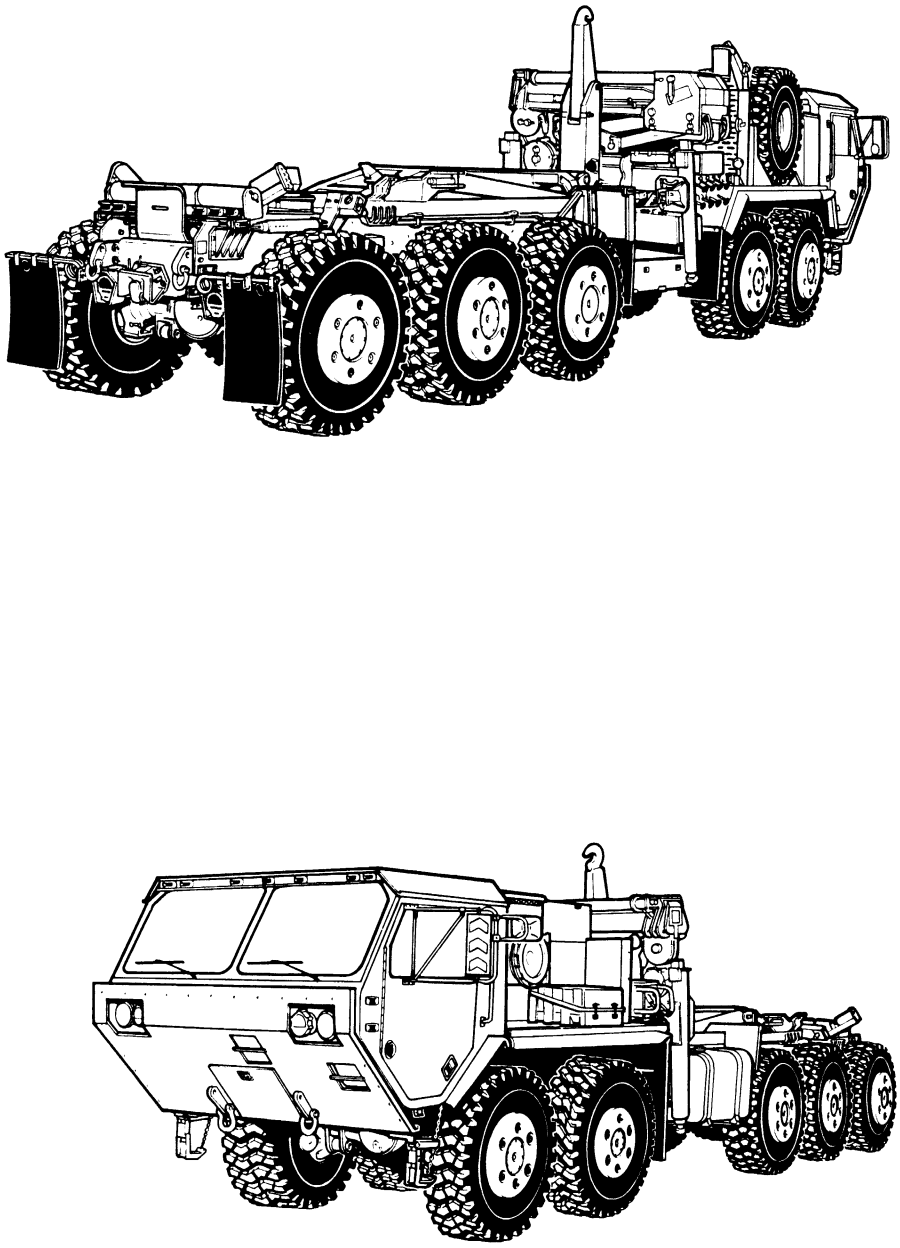


Figure 1-1. M1074 Palletized Load System Truck (With Crane)

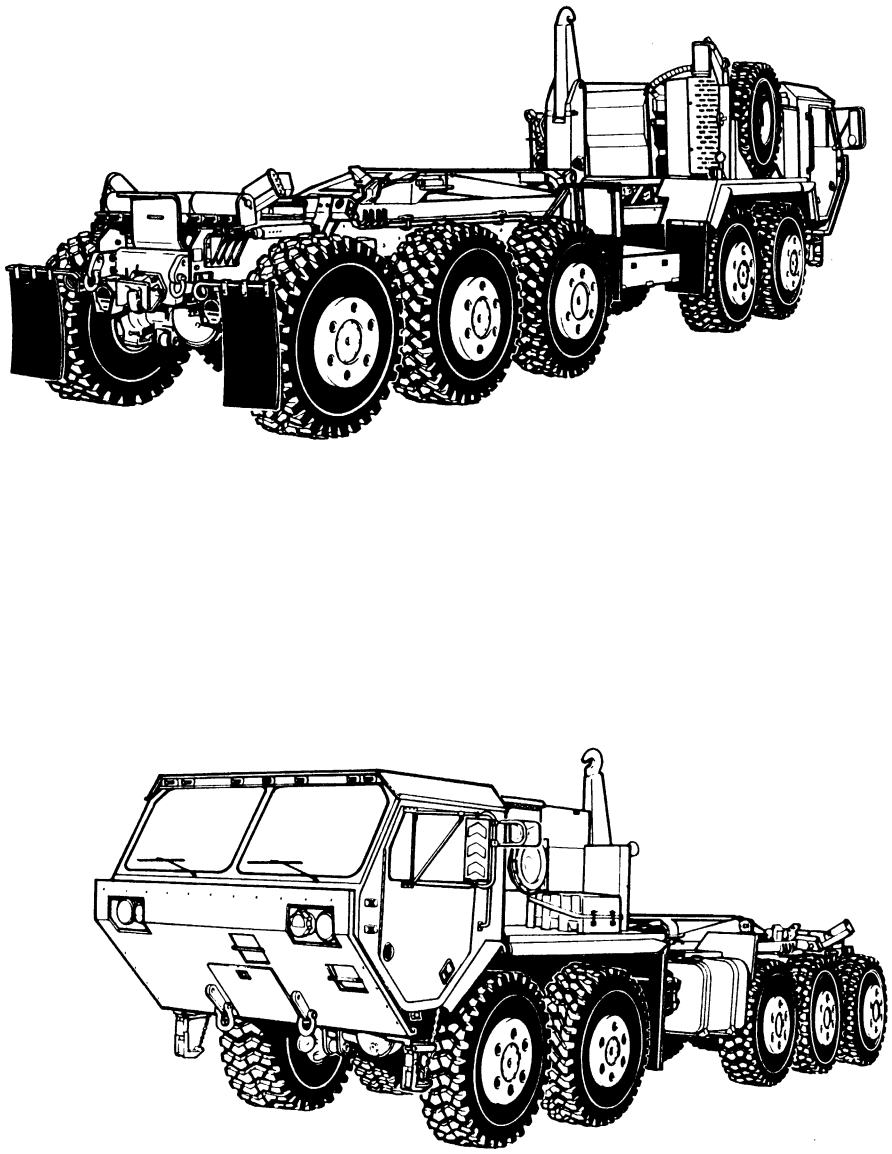


Figure 1-2. M1075 Palletized Load System Truck (Without Crane)

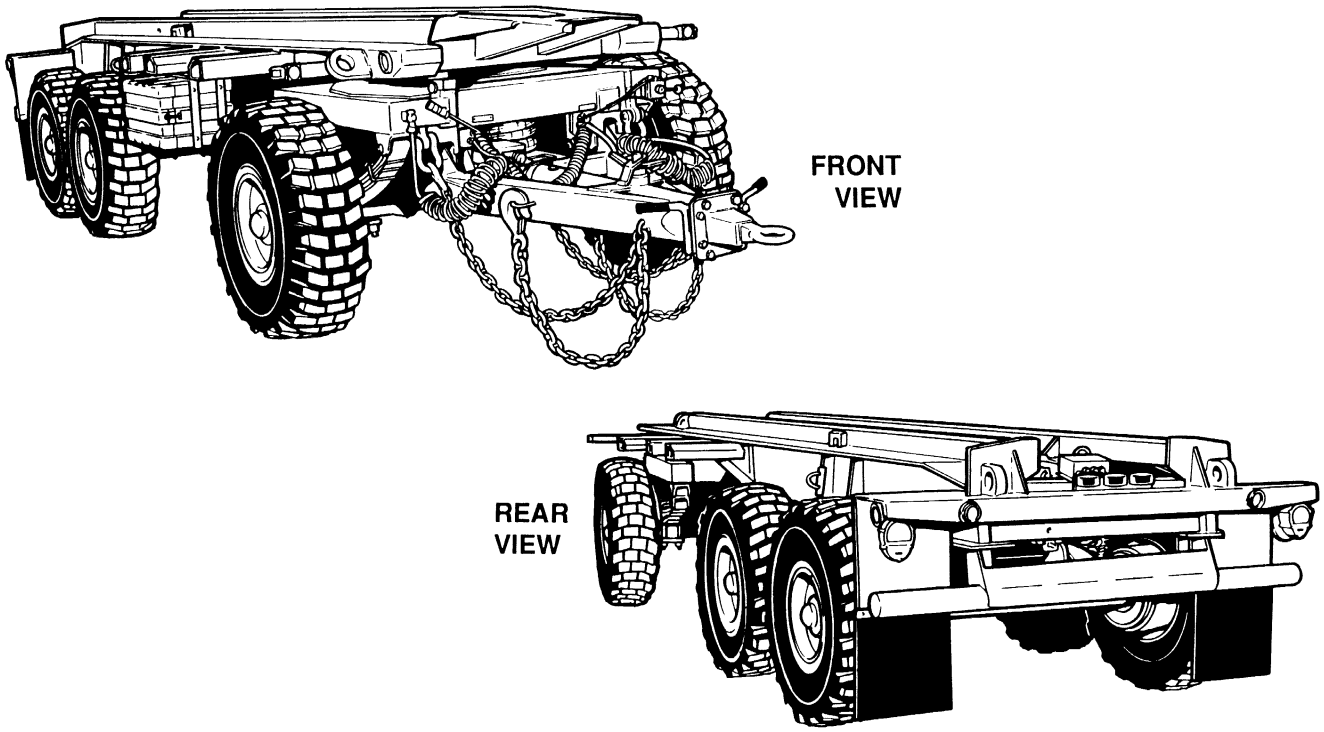


Figure 1-3. M1076 PLS Trailer

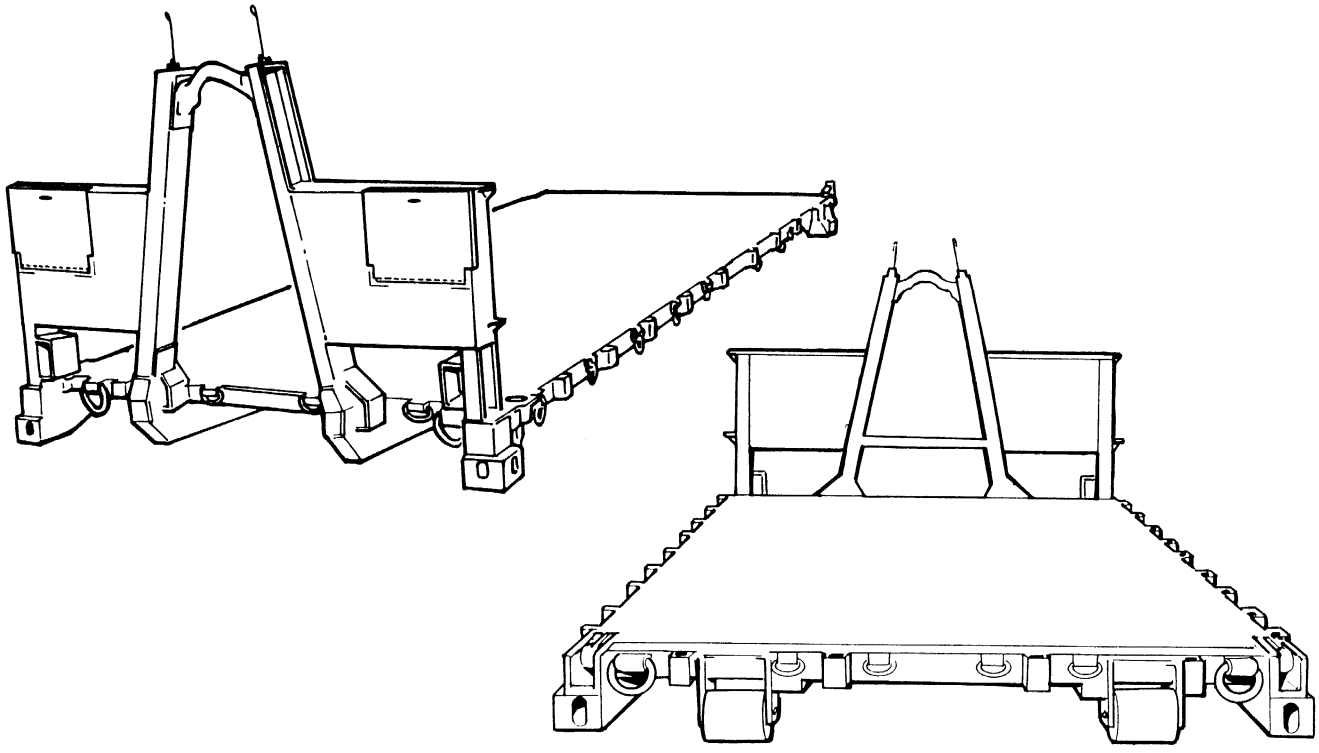


Figure 1-4. M1077 PLS Flatrack

1-2. MAINTENANCE FORMS, RECORDS AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS) (Maintenance Management UPDATE).

1-3. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE.

Command decision, according to tactical situation, will determine when the destruction of the truck will be accomplished. A destruction plan will be prepared by the using organization unless one has been prepared by a higher authority. For general destruction procedures for this truck, refer to TM 750-224-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use (US Army Tank-Automotive Command).

1-4. OFFICIAL NOMENCLATURE, NAMES AND DESIGNATIONS.

Table 1-1 lists the nomenclature cross-references used in this manual.

Table 1-1. Nomenclature Cross-Reference

Common Name	Official Nomenclature
Cable	Wire rope
Cold Start System	Ether quick-start system
Engine Coolant	Antifreeze, ethylene glycol mixture
Gladhand	Quick-disconnect coupling
Truck	Palletized Load System
Jacobs Brake	Engine Retarder

1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your Palletized Load System needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF368 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E-MPA, Warren, Michigan 48397-5000. We'll send you a reply.

1-6. WARRANTY INFORMATION.

Refer to PLS Warranty Technical Bulletin, TB 9-2320-364-15 for complete warranty information covering the truck. Warranty starts on the date found in block 23, DA Form 2408-9, in the logbook. Report all defects in material or workmanship to the supervisor, who will take appropriate action.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-7. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES.

Refer to TM 9-2320-364-10 for equipment characteristics, capabilities and features.

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Refer to TM 9-2320-364-10 for location and description of major components.

1-9. EQUIPMENT DATA.

Refer to TM 9-2320-364-10 for equipment data.

Section III. PRINCIPLES OF OPERATION

1-10. POWER TRAIN.

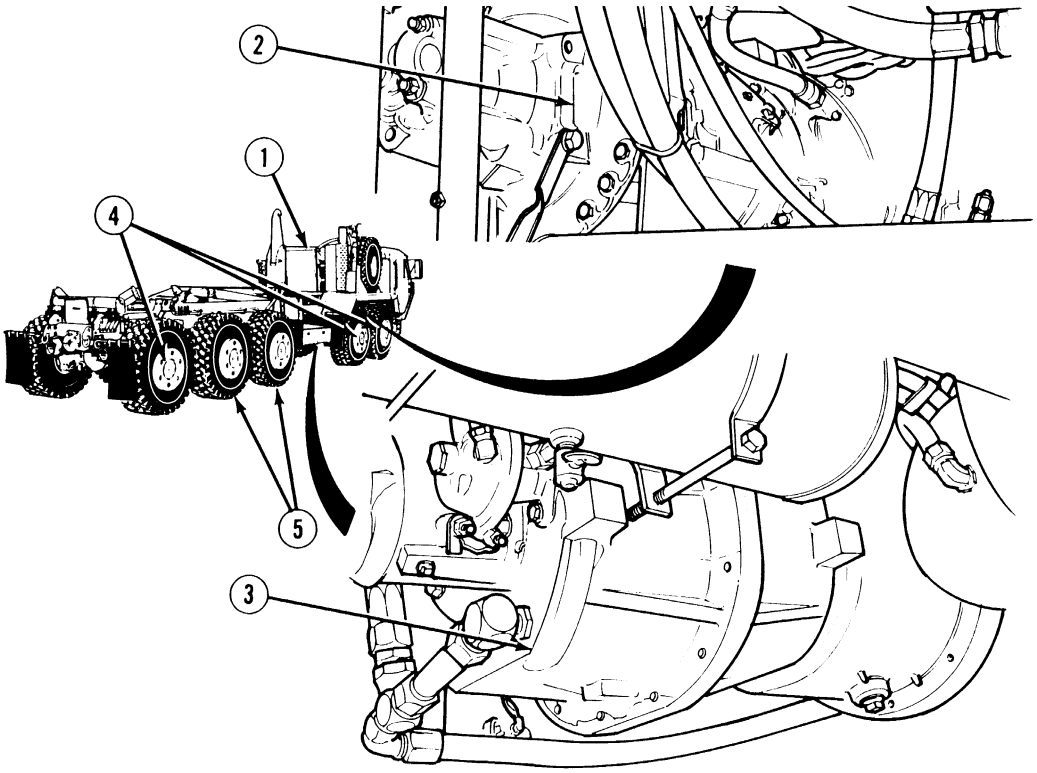


Figure 1-5. Power Train

Power for the truck is provided by a diesel engine (1) (Figure 1-5) which is coupled directly to an automatic transmission (2). Power from the transmission is transferred to the transfer case (3) and on to the drive and steering axles (4) and the drive only axles (5) through a series of drive shafts and universal joints. The truck drive train is enhanced through the use of the Detroit Diesel Electronic Control II (DDEC II) or Detroit Diesel Electronic Control III (DDEC III) electronic engine controller and the Allison Transmission Electronic Control (ATEC) electronic transmission controller. The primary components of the ATEC system are an Electronic Control Unit (ECU) and shifter in the truck cab, an electrohydraulic valve module beneath the transmission gearing section that contains solenoid valves for clutch control, a throttle sensor that is activated by the accelerator pedal and an output speed sensor that relays the transmission out speed to the ECU for shifting and control functions.

a. Engine. The truck is equipped with a Detroit Diesel Corporation (DDC) Model 8V92TA engine rated at 500 HP. The drive train control system consists of the engine and transmission systems.

(1) The DDEC II and DDEC III contain a microprocessor-based electronic control module to regulate the electronic distributor unit. This distributor unit controls the individual or unit injectors that regulate both the amount and timing of fuel delivery. The DDEC II and DDEC III electronically govern engine speed and can be programmed to accommodate truck configuration changes. The DDEC II and DDEC III are electronically linked with the transmission, through the ATEC, to improve truck performance.

(2) The DDEC and ATEC systems perform self diagnostics, engine/transmission system diagnostics and truck performance diagnostics. Self diagnostics includes personnel initiated checks of main electronic components such as solenoids, wiring, sensors and control modules. System diagnostics monitor critical engine and transmission parameters such as oil temperature, oil pressure, coolant temperature, voltage and gear range attained. Truck performance diagnostic capabilities aid the mechanic in isolating problems outside of the electronic control system. Operating data is stored in the DDEC II's and DDEC III's memory for display at a later time. Stored data includes total engine hours and fuel consumed. The DDEC also tracks intermittent problems by logging the number of occurrences and the engine hours of each occurrence.

b. Transmission. The truck uses an Allison 700 Series Transmission, Model CLT-755. This hydro-kinetic type transmission has an integral-locking torque converter, lock-up clutch, constant mesh planetary gearing, the ATEC, a speedometer and a control valve body assembly.

(1) The Electronic Control Unit (ECU), which contains the microprocessor based electronics, is located in a protected area within the truck. The ECU receives information, in the form of signals from switches and sensors, processes the information and sends electrical signals to the appropriate solenoids which control the transmission operation. The ECU features diagnostics which can sense many electronic system malfunctions and identify them with a displayed code. The ECU also protects the transmission from cold weather start-ups by inhibiting normal shifting functions until a minimum sump oil temperature of 20 degrees F (–7 degrees C) is attained.

(a) The CHECK TRANS light alerts the operator, momentarily, every time the system is activated, as a lamp check, and/or when the ECU finds a problem in the system. If the check transmission light comes on, the problem is minor. In most cases, the transmission will continue to operate in a normal manner. However, in some cases the ECU will take action to reduce the possibility of damage to the truck or the transmission. The transmission should be serviced at the next opportunity.

(b) The DO NOT SHIFT light and/or buzzer alerts the operator, momentarily, every time the system is activated as a lamp check and any time the ECU has detected a more severe problem in the system. The ECU will cause the transmission to hold-in-gear and disengage the lock-up clutch.

(2) The push button range selector is totally electronic. Range selection is achieved by means of seven snap dome switches. To select a range, touch the pad. The pad will light up, a beep will be heard and a "click" will be felt. The transmission will be ready to operate in the selected range. The range selector also has a "DO NOT SHIFT" light and a warning tone or buzzer.

(a) Select the Drive position and the truck will start in first (low range only) or second range and automatically upshift to a higher range as output speed increases. As the truck slows down, output speed decreases and the transmission automatically downshifts to the correct range. If a locked brake or a slick-surface condition should occur, the ECU will command converter operation and inhibit downshifts for a period of time or until normal wheel speed has been restored. Drive (4) should be selected for moderate loads, grades and over-the-road operation with restrictive speed limits. Drive (3) is appropriate for operating in rough terrain or in heavy traffic. Drive (2) should be selected when need for speed control requires a second gear hold condition such as descending steep grades where additional engine braking is required, for operation on rough terrain, or greater retarder action. Selecting Drive (1) permits the driver to operate the truck in areas where maximum performance in extremely rough terrain is required.

1-10. POWER TRAIN (CONT).

CAUTION

Do not allow a truck to coast in neutral. Engine braking is nullified and the transmission will not receive adequate lubrication.

(b) Select the Neutral (N) pad when checking truck accessories and for extended periods of engine idle operation. The push button range selector will automatically select neutral when the master switch is turned on.

(c) Stop the truck before shifting from Forward (F) to Reverse (R) or from Reverse (R) to Forward (F). Touch the reverse (R) pad on the selector. The light under the Reverse (R) pad will light and the reverse warning signal on rear of truck will be activated.

(d) When the ECU detects a serious problem in the system, a beeper tone is produced for 10 seconds and a “DO NOT SHIFT” light is activated to warn the driver that the transmission is held-in-gear. Selecting another pad will have no affect or change, nor will a tone sound be produced.

(3) All lubricating and clutch-applied oil is provided by an engine-driven pump (in the transmission). Because of the pump location ahead of the transmission gearing and clutches, the engine cannot be started by pushing or towing the truck. Therefore, anytime that the truck must be towed, or pushed, the drive-line must be disconnected.

c. Transfer Case. The truck transfer case has two speeds and a 30/70 differential. The transfer case 30/70 differential provides full time, all wheel drive and proportions approximately 30 percent of the torque to the front tandem and 70 percent of the torque to the rear tridem. The differential has a driver-controlled air actuated lock-up mechanism which consists of a sliding lockout collar that locks the differential housing to the output shaft. This differential lock-up provides increased mobility in adverse operating conditions.

d. Suspension. The front tandem suspension is a walking beam suspension with a special low-friction spring. The third axle suspension is an air ride suspension. The rear tandem suspension is a specially designed low-friction spring.

(1) The suspension system design maintains tire/ground contact under adverse terrain profiles and conditions. The design equalizes loads between axles and provides the necessary roll stability to operate on a 30 percent side slope. The truck uses 16.00R20 tires of a tubeless radial design.

(2) The truck uses three steering axles. The front tandem axle wheels and the last axle wheels steer. Power steering controls the steering gear at each steering axle. The power steering pump is direct driven at the engine. The cab steering wheel provides directional input to the first and second axle steering gears. A control link from the first axle master steering gear provides a mechanical link to the second axle slave steering gear. The second axle slave gear provides directional control from a rotary output shaft to the steering gear on the fifth axle. The steering gears are sized to turn the wheels when the truck is fully loaded.

e. Axles. The truck uses a three drive/steer hub reduction axle and two hub reduction axle design.

1-11. ENGINE SYSTEMS.

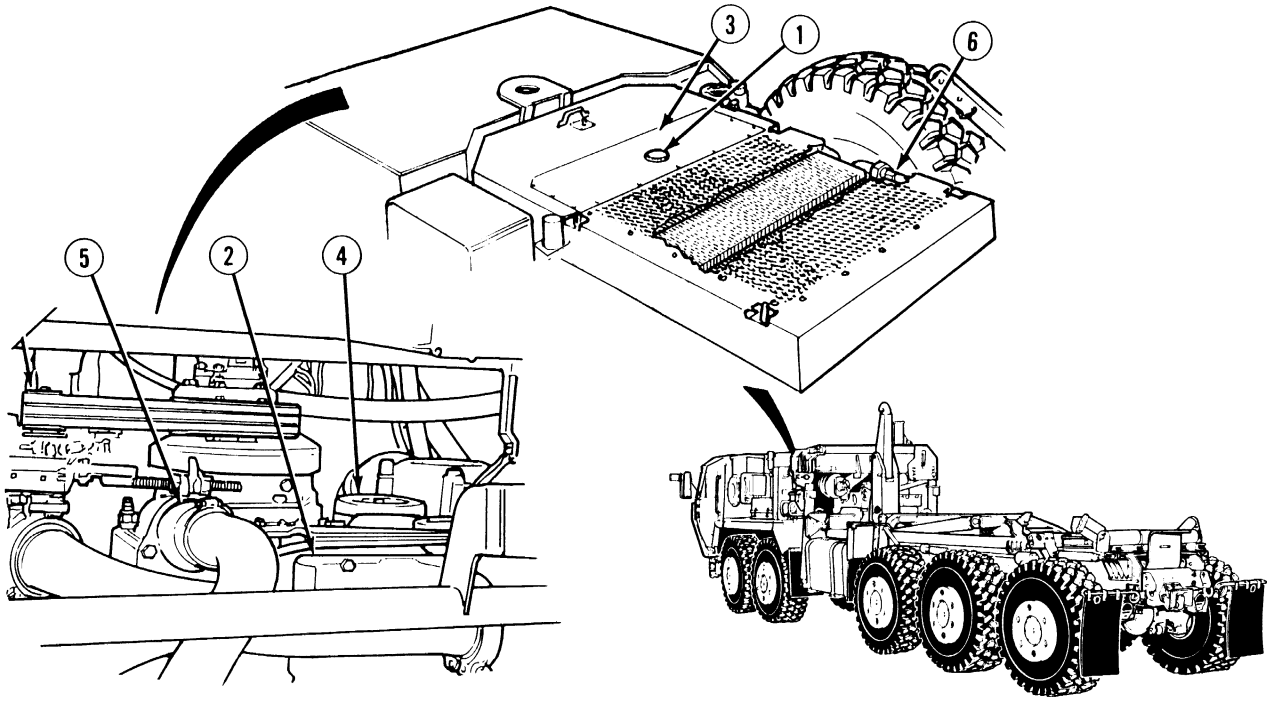


Figure 1-6. Cooling System

a. Cooling System. The pressure-type cooling system (Figure 1-6) protects the engine by removing heat generated during the combustion process. Pressure within the cooling system is regulated by a pressure release in the radiator filler cap (1). The hot coolant flows from the engine (2) to the radiator tank (3) and through the radiator core where a stream of air removes heat. This stream of air is drawn through the core by the fan. A water pump (4) draws the coolant from the radiator and pushes it through the engine repeating the cooling process. Thermostats (5) mounted in each coolant outlet elbow, remain closed until the coolant approaches a predetermined temperature at which time they open. When the coolant temperature drops below the thermostat rating, they close. An air vent line between the radiator and the water pump inlet removes air trapped in the engine when the cooling system is being filled. An oil cooler (6) is mounted in the radiator lower tank.

1-11. ENGINE SYSTEMS (CONT).

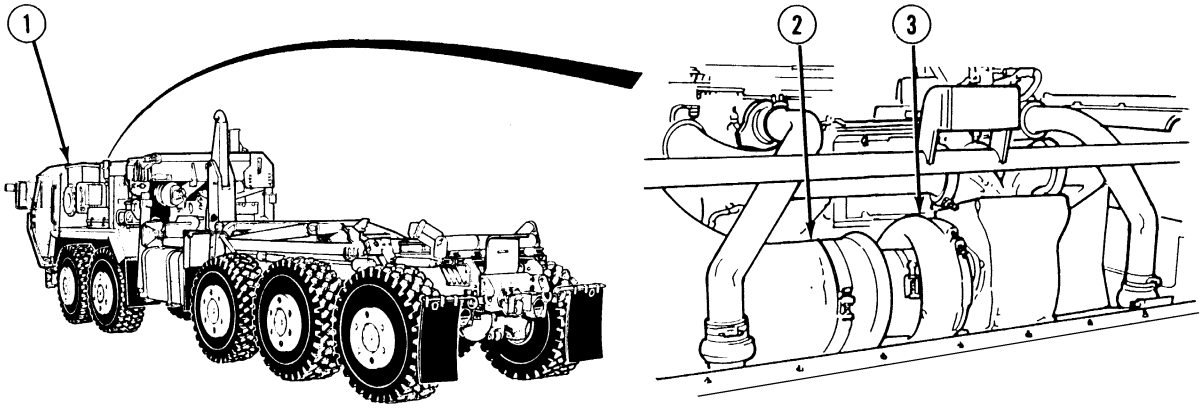


Figure 1-7. Air Intake System

b. Air Intake System. The air intake system (Figure 1-7) consists of a dry-type air cleaner (1), ducting (2), turbocharger (3) and engine blower. Engine exhaust gases flow through the turbocharger driving a turbine wheel. A compressor wheel on the opposite end of the turbine wheel shaft rotates and draws in fresh air through the air cleaner, compresses the air and delivers it to the engine blower.

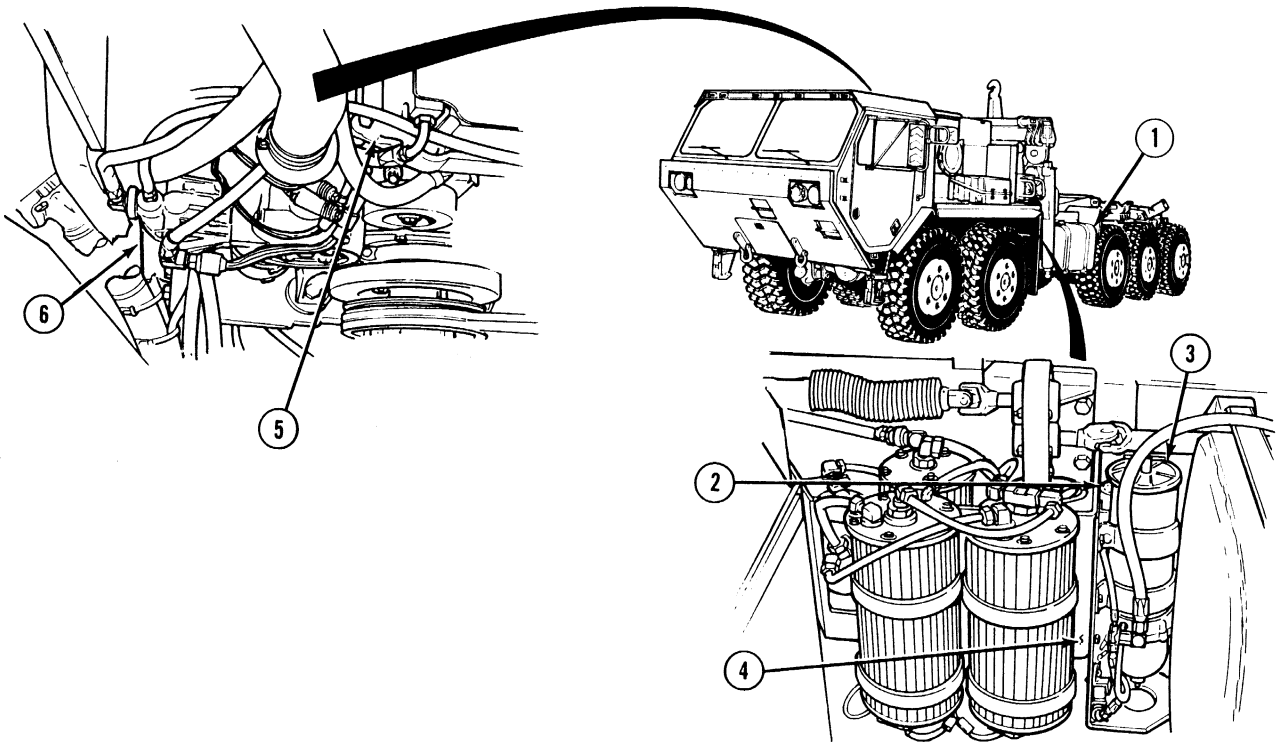


Figure 1-8. Fuel System

c. Fuel System. In the fuel system (Figure 1-8), fuel is drawn from the fuel tank (1) and passes through the electrical priming fuel pump (2) and the fuel/water separator (3). A fuel shut-off valve (4) controls the flow of fuel to the engine. A mechanical fuel pump (5) draws fuel through the secondary fuel filter (6) to the engine. Surplus fuel from the injectors is returned to the fuel tank through a return line. The fuel/water separator removes water and large solid particles from the fuel. The finer particles are removed by the secondary filter before they can enter the fuel injectors.

1-12. ELECTRICAL SYSTEM.

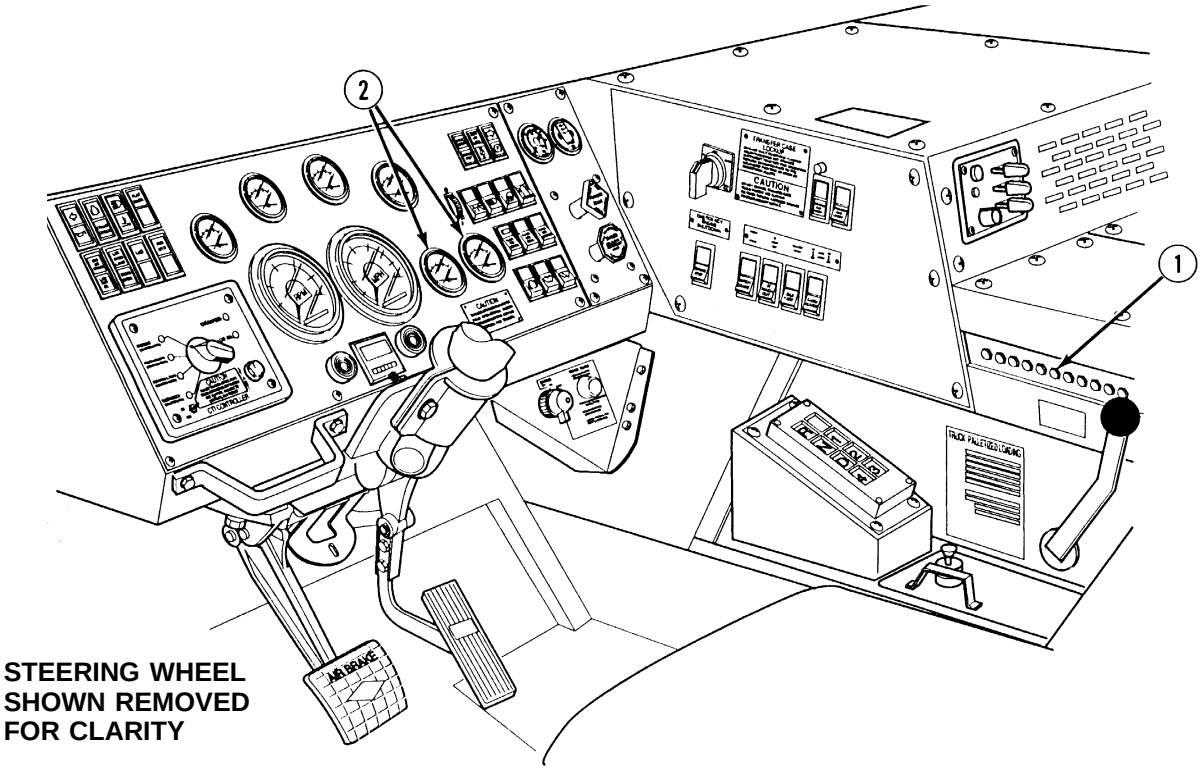


Figure 1-9. Electrical System

The 24 VDC electrical system (Figure 1-9) is waterproof, has reverse polarity protection and incorporates a 12 VDC lighting subsystem. Manual resetting circuit breakers (1) are used throughout the system and all circuits are identified. The voltages for the electrical system are indicated by two voltmeters (2) located on the dash panel inside the drivers compartment. Circuit breakers located in the cab protect the main circuits.

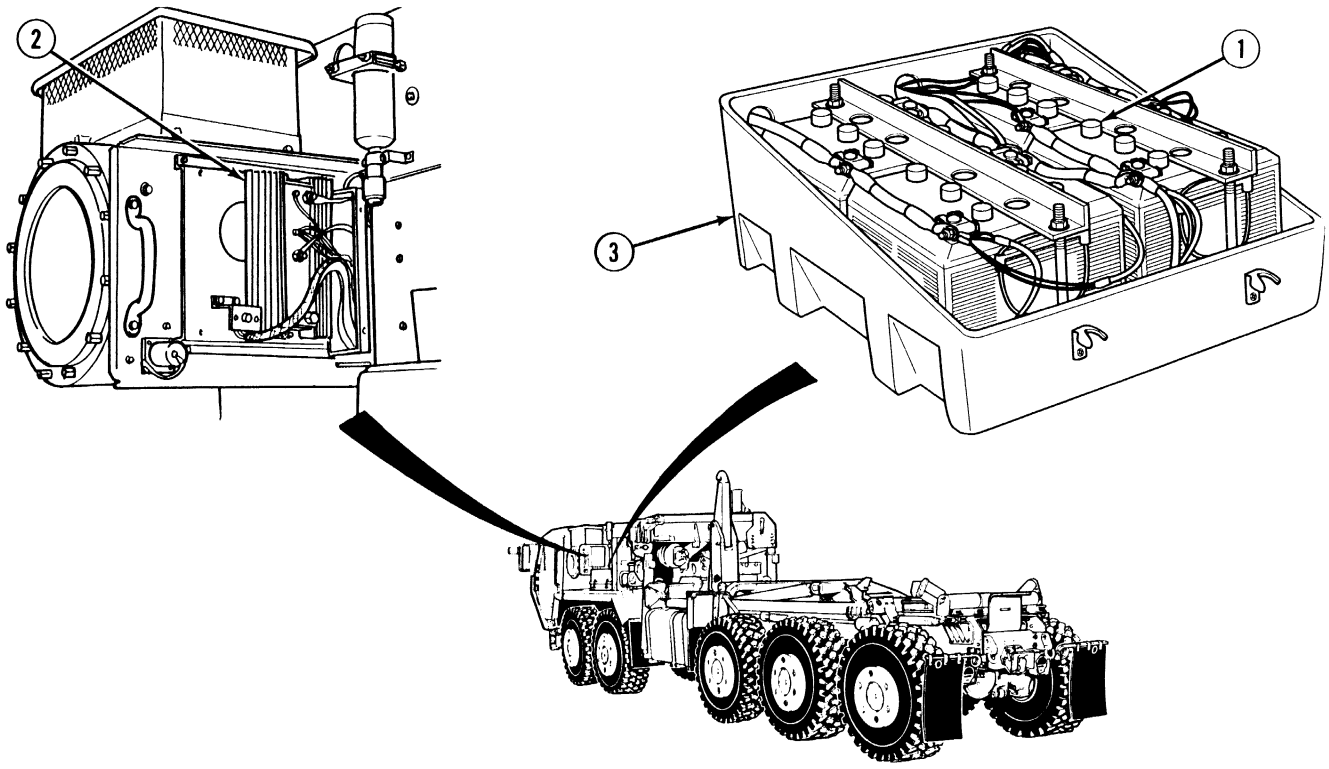


Figure 1-10. Electrical System

Electrical system (Figure 1-10) power is provided by four 12-volt series-parallel connected batteries (1). PLS trucks are either equipped with the dual voltage control system (DUVAC) and a 145 AMP alternator or the polarity protection system and a 200 AMP alternator. The DUVAC (2) delivers up to full alternator output on demand to either the 24 volt load, 12 volt load, or any combined load requirement from a single alternator. The DUVAC system can maintain battery equalization and balance even when the batteries are not matched or when they are in different charge states. Separate voltage regulation is provided for each battery bank. The battery box (3) is located on the left-hand fender and vents to the truck exterior. This location provides protection from the environment and allows ready access for service. The fiberglass battery box cover is designed to prevent short circuits during maintenance and operation. Power is distributed throughout the truck by wiring harnesses. The harnesses are interconnected by pin connectors. Connectors are provided at the rear of the truck to supply power for towed loads.

1-12. ELECTRICAL SYSTEM (CONT).

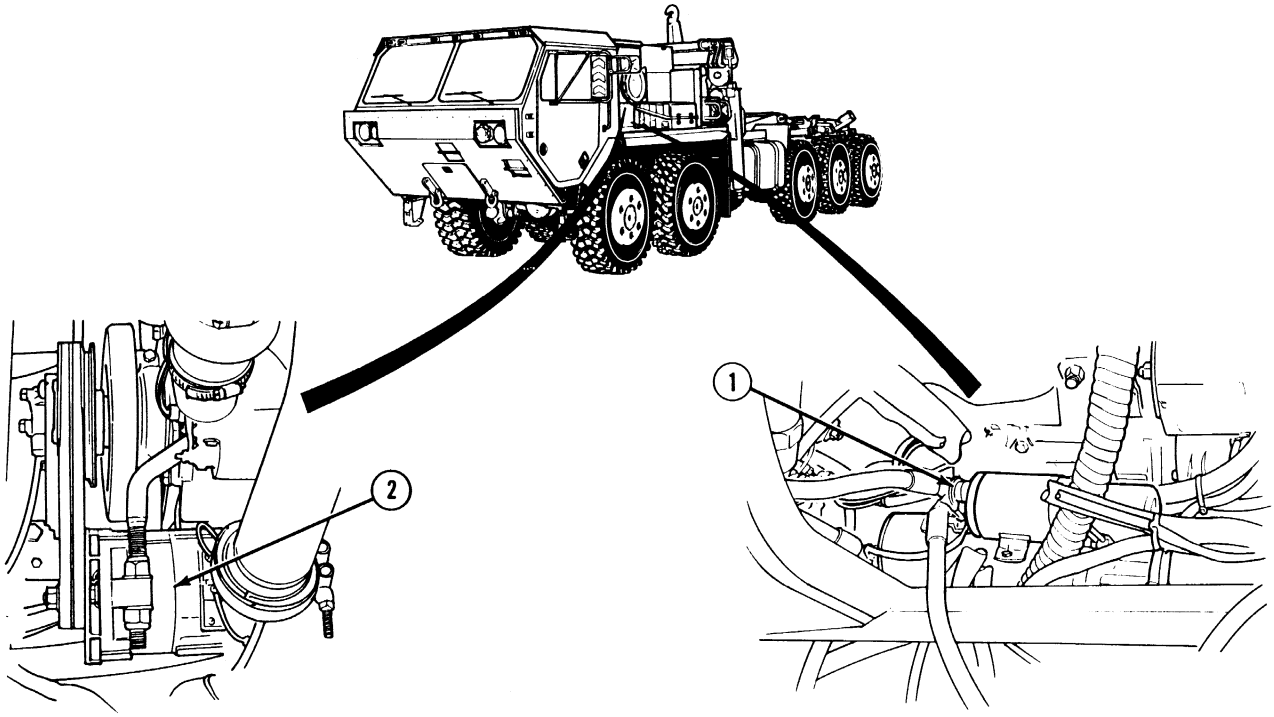


Figure 1-11. Electrical System

In the electrical system (Figure 1-11) a heavy duty starting motor (1) is mounted on the engine flywheel housing and provides the cranking power necessary for starting the engine. The DUVAC maintains both a 14- and 28-volt level for proper battery charging. The alternator (2) provides sufficient amperage to operate all electrical components and charge the batteries during engine idling. Truck exterior lights are mounted in protective locations or are protected to prevent damage. Protection is provided for lights during cross country travel. Polycarbonate lenses are provided for all lights except the sealed beam headlights and service lights. The PLS electrical system supplies all of the electrical power needed to operate the truck and trailer. The complete electrical system is made up of the following sub-systems:

- Power Storage and Generating
- Engine Starting and Stopping
- Service Lighting
- Blackout Lighting
- Accessory Lighting
- Instruments
- Warning Lights and Buzzers

a. Power Storage and Generating. Power storage for the truck consists of four 12-volt batteries. The four batteries are divided into two sets. Two batteries in each set are wired in parallel to produce higher amperage. The two sets are then wired in series to produce 24 volts. While the batteries can power all of the systems for a limited time, their primary purpose is to supply power to the engine's starting system. Once the engine is running, the generating system provides the electrical power for all of the systems. The engine driven alternator generates alternating current (AC) which is passed through a set of rectifiers that change it into direct current (DC). This direct current is used to charge the batteries and is distributed to the other systems of the PLS. The DUVAC adjusts alternator output to fit the needs of the electrical system.

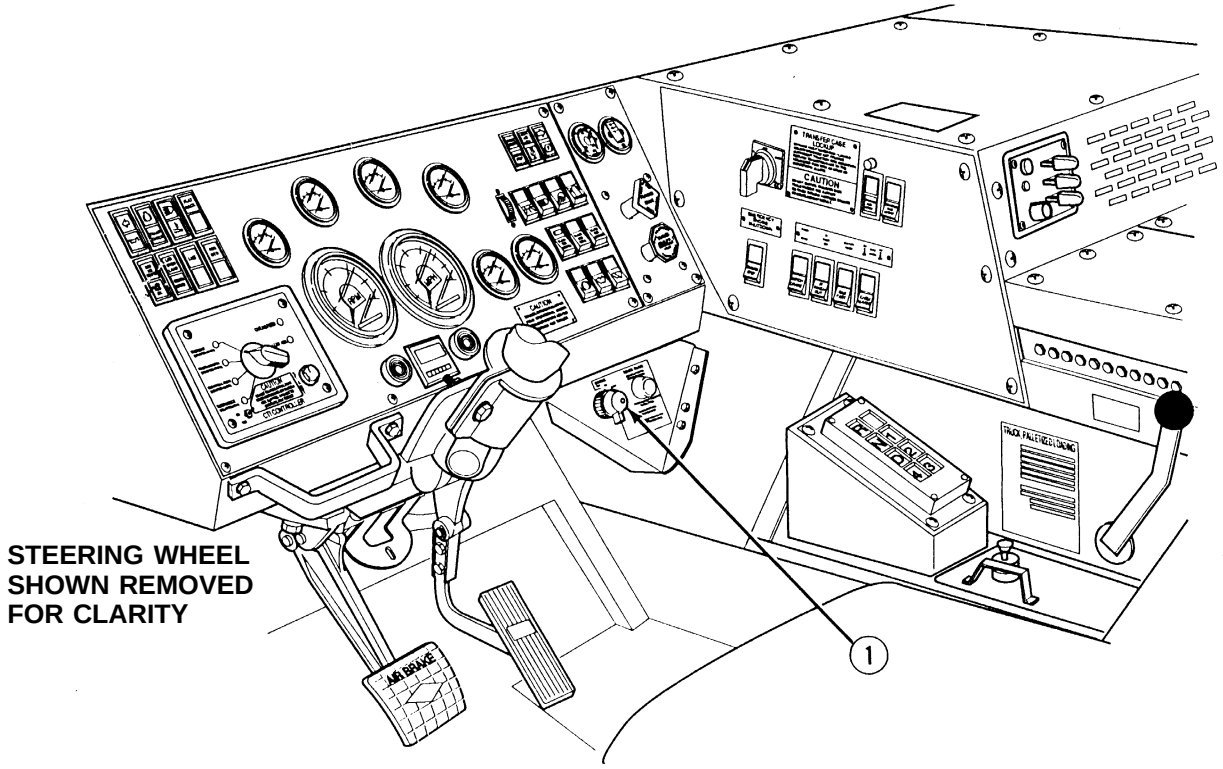


Figure 1-12. Engine Starting System

b. Engine Starting and Stopping. The engine starting system (Figure 1-12) uses the stored electrical energy of the batteries to turn the starter motor. When the ignition switch (1) is turned to the START position, electrical power is passed through the neutral safety switch to the starter relay. The starter relay, when energized, draws electrical power directly from the batteries and sends it to the starter motor solenoid. When the solenoid is energized, the starter motor draws electrical power from the batteries and turns the engine. To stop the engine, shut off ignition switch.

1-12. ELECTRICAL SYSTEM (CONT).

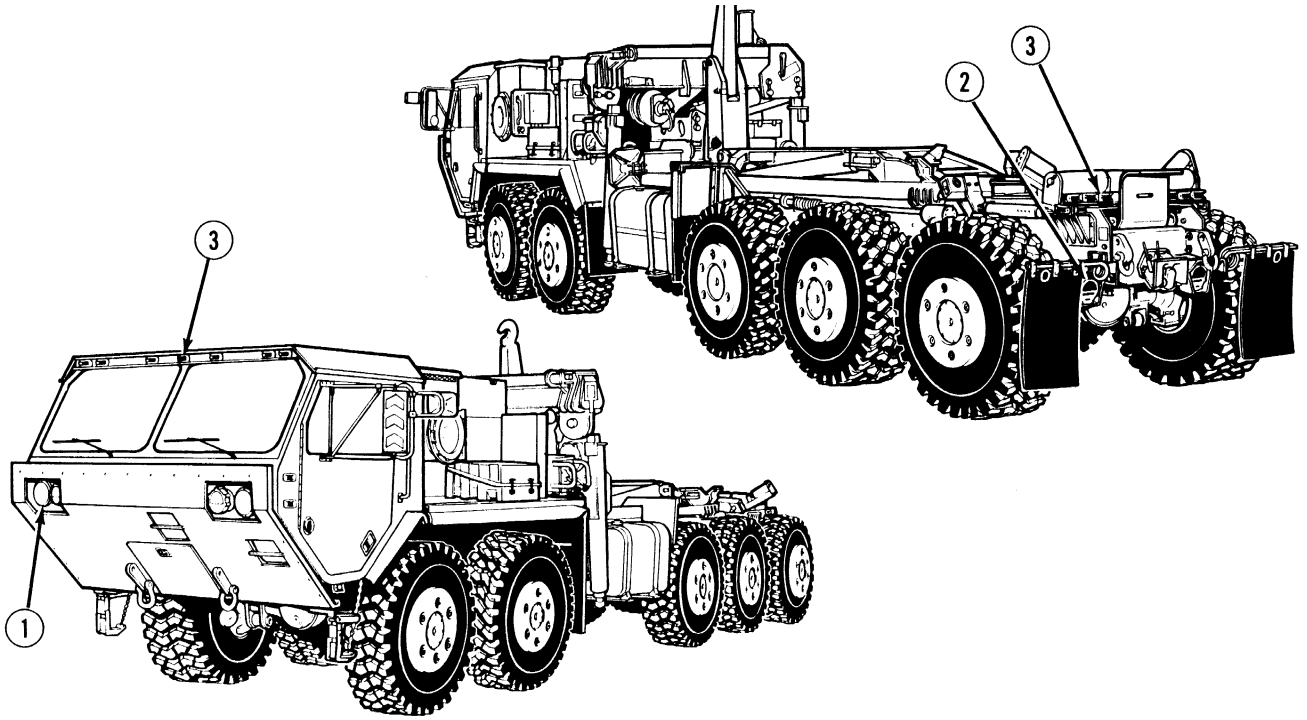


Figure 1-13. Service Lighting System

c. Service Lighting. The service lighting system (Figure 1-13,) includes the headlights (1), tail lights (2) and clearance marker lights (3). They are energized by pressing the blackout light selector switch to the OFF position. The stop lights, clearance marker lights, panel lights, turn signals and emergency flashers are then controlled by separate switches located in the cab.

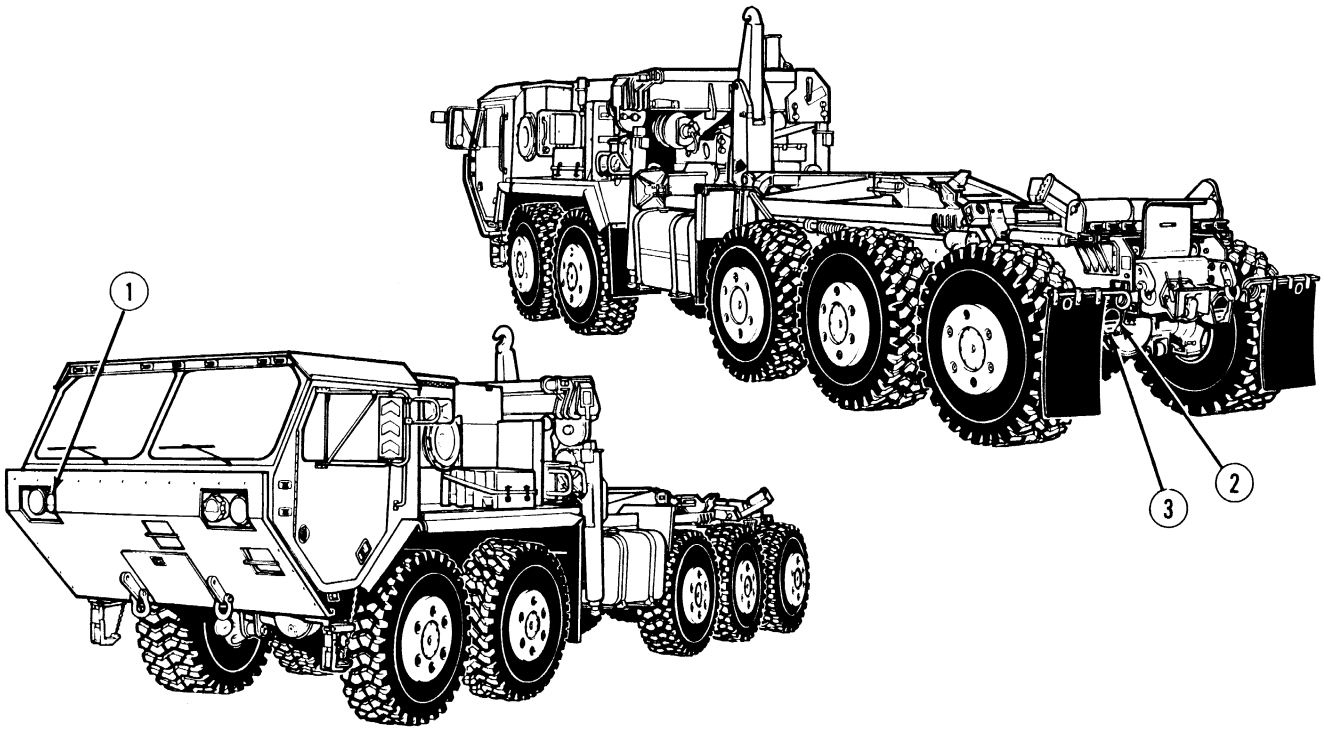


Figure 1-14. Blackout Lighting System

d. Blackout Lighting. The blackout lighting system (Figure 1-14) includes the front blackout marker lights (1), rear blackout marker lights (2), blackout stop lights (3) and panel lights. These are energized by turning on the blackout light selector switch and either the blackout marker switch or the blackout drive switch. The blackout stop lights and the panel lights are then controlled by other switches located in the cab.

e. Accessory Lighting. The accessory lighting system includes the dome light, beacon light and worklights. These are energized by turning the blackout light switch to the OFF position. The dome light, beacon light and worklights are then controlled by separate switches in the cab. The worklights also have switches built into the light assemblies themselves.

1-12. ELECTRICAL SYSTEM (CONT).

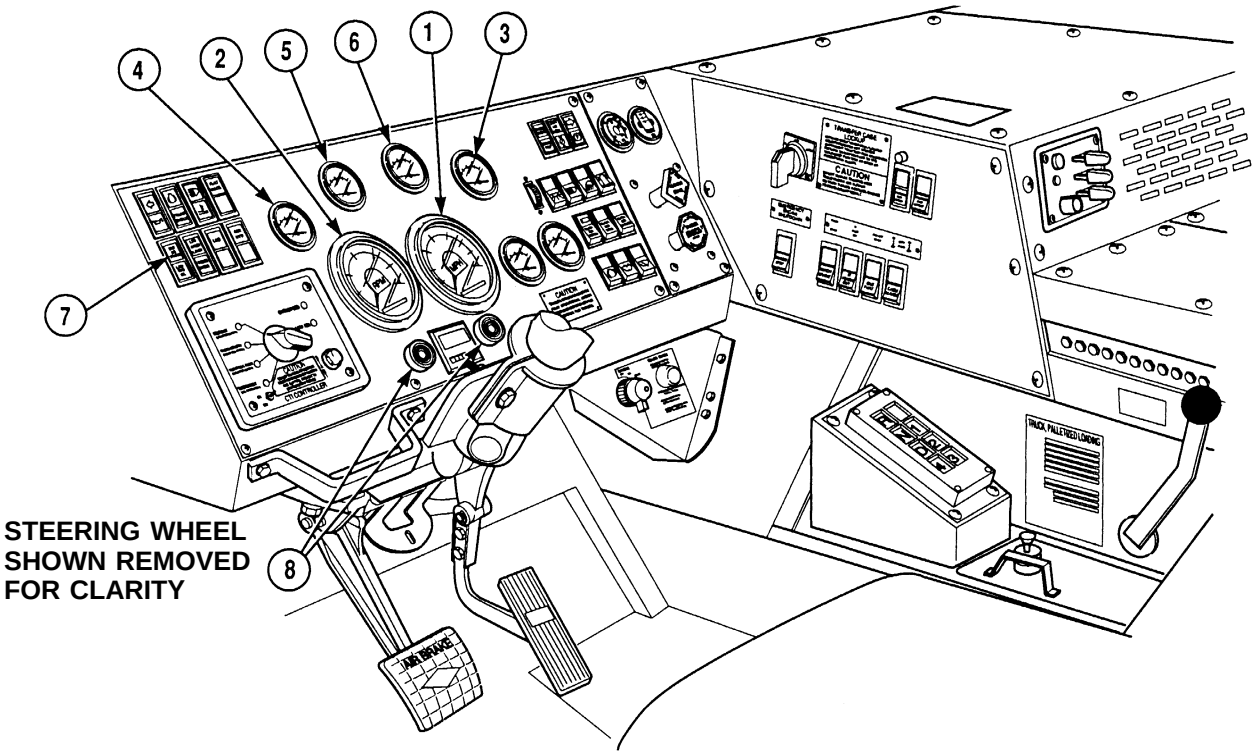


Figure 1-15. Instrument System

f. Instruments. The instrument system (Figure 1-15) includes all gages that give the operator information. The speedometer (1) receives signals from a sending unit mounted on the transfer case. Tachometer (2) input is provided from the DDEC controller. The fuel gage (3), oil pressure gage (4), water temperature gage (5) and transmission oil temperature gage (6) all receive electrical signals from sending units. These sending units monitor fluid level, pressure and temperature and send this information to the gages.

g. Warning Lights and Buzzers. The warning lights (7) and buzzers (8) in the cab are activated by sensors located in different systems. These include low air pressure, low engine oil pressure, low hydraulic oil level and high water temperature. When one or more of these sensors are activated, they energize the proper light and/or buzzer, informing the operator of a problem.

1-13. AIR SYSTEM.

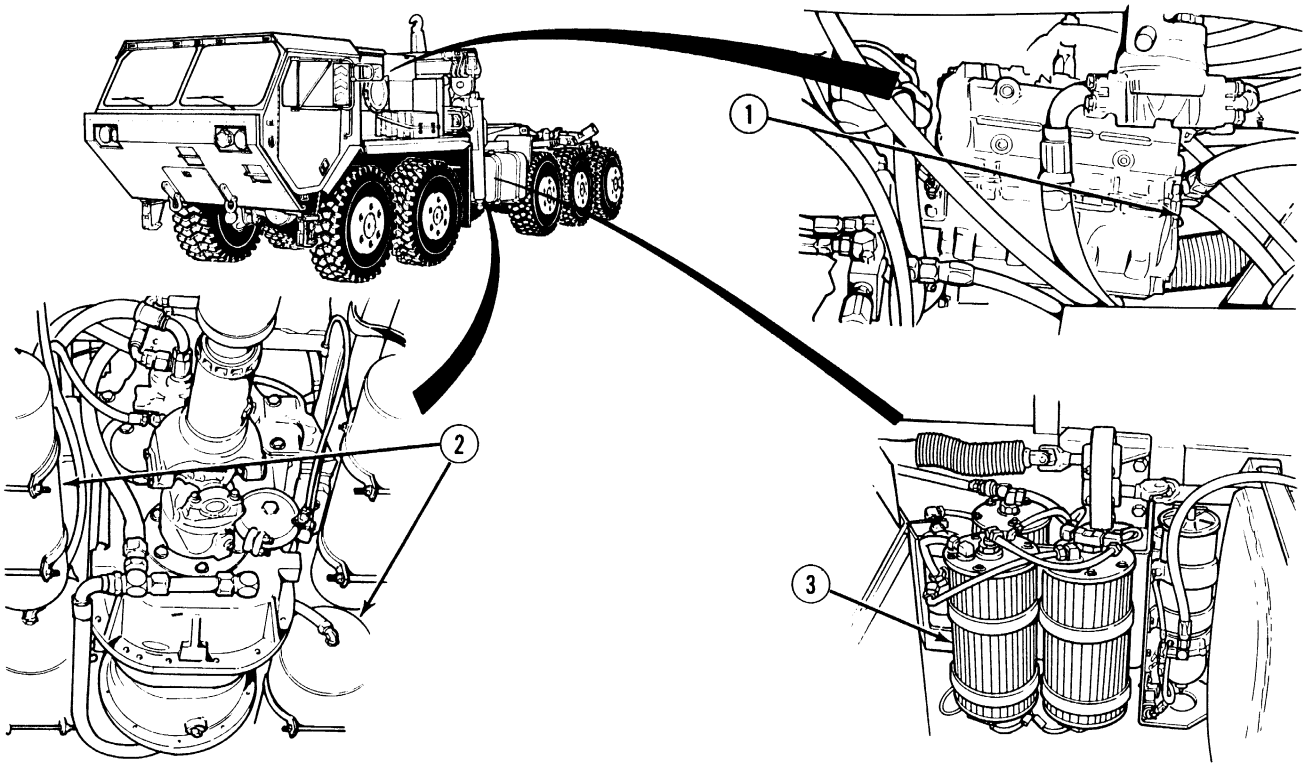


Figure 1-16. Air System

The air system (Figure 1-16) consists of an engine-driven air compressor (1) and five air reservoirs (2). The system includes the necessary valves and air lines to control the truck's air operated devices. Pressurized air from the air compressor is passed through the air dryer (3) to the reservoir. The air dryer removes dirt and moisture from the pressurized air. Air from one reservoir goes to the brake treadle valve. This air passes to the rear brake chambers, located on axles #3, #4, and #5, which control the axle rear service brake. Air pressure in this system is shown by the red needle on the AIR PRESS gage. Air from another reservoir goes to the brake treadle valve. This air passes to the front brake chambers, located on axles #1 and #2, which control the front axle service brakes. Air pressure in this system is shown by the green needle on the AIR PRESS gage. The PARKING BRAKE valve applies or releases the rear axle (parking) brakes. The reservoirs are interconnected in such a way that if one reservoir fails, air will be supplied to release the rear axle (parking) brake from whichever reservoir is functioning. If air pressure falls below 60 to 70 psi (414 to 483 kPa) in either system, a buzzer will sound, the LOW AIR indicator will light and the rear axle brakes will be applied.

1-14. HYDRAULIC SYSTEM.

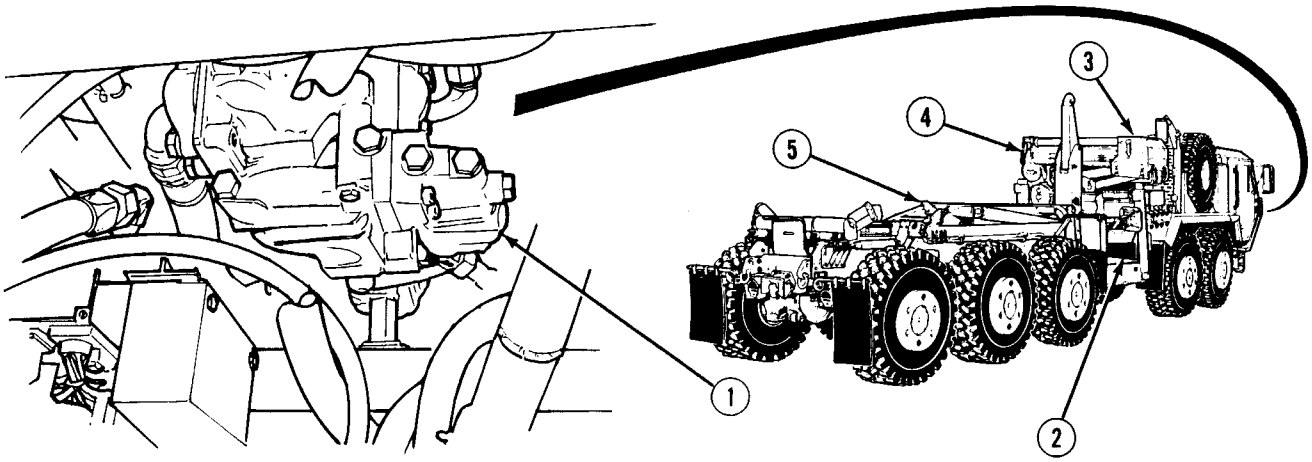


Figure 1-17. Hydraulic System

The hydraulic system (Figure 1-17) pumps (1) mounted in front of the engine provide the fluid power to operate the power steering, Self-Recovery Winch (SRW) (2), cooling fan (3), Material Handling Crane (MHC) (4) and Load Handling System (LHS) (5). A manually operated selector switch in the cab is used to select the auxiliary hydraulics.

1-15. STEERING SYSTEM.

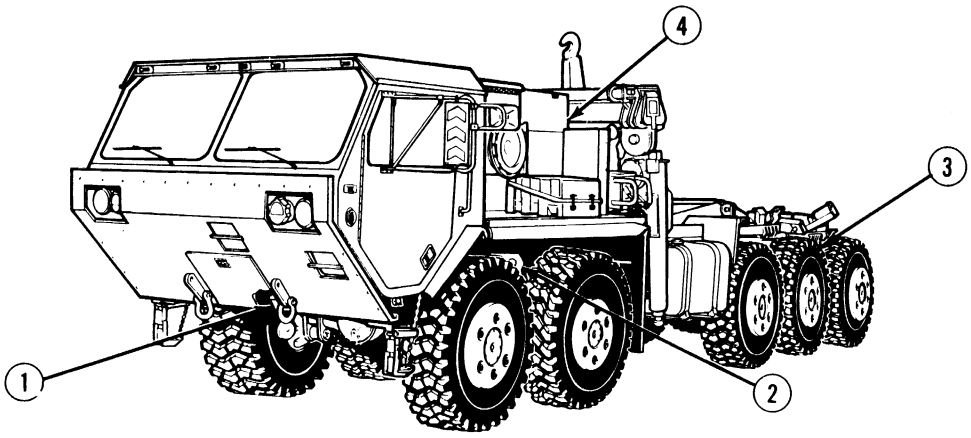


Figure 1-18. Steering System

Steering system (Figure 1-18) power is supplied to steering gears (1), (2) and (3) by an engine-driven pump. The steering fluid reservoir (4) is separate from the main hydraulic system. The steering wheel, which is mechanically linked to the steering gear, rotates a gear that positions a spool in the front steering gear (1). This motion is hydraulically transmitted to a piston in the intermediate steering gear (2) causing it to follow the pitman arm and transmit rotary motion to the rear steering gear (3). These pitman arms move the steering mechanism on the axles left or right causing the truck to steer left or right. An emergency backup hydraulic pump, driven by the transfer case middle shaft, supplies limited emergency steering.

1-16. SELF-RECOVERY WINCH (SRW).

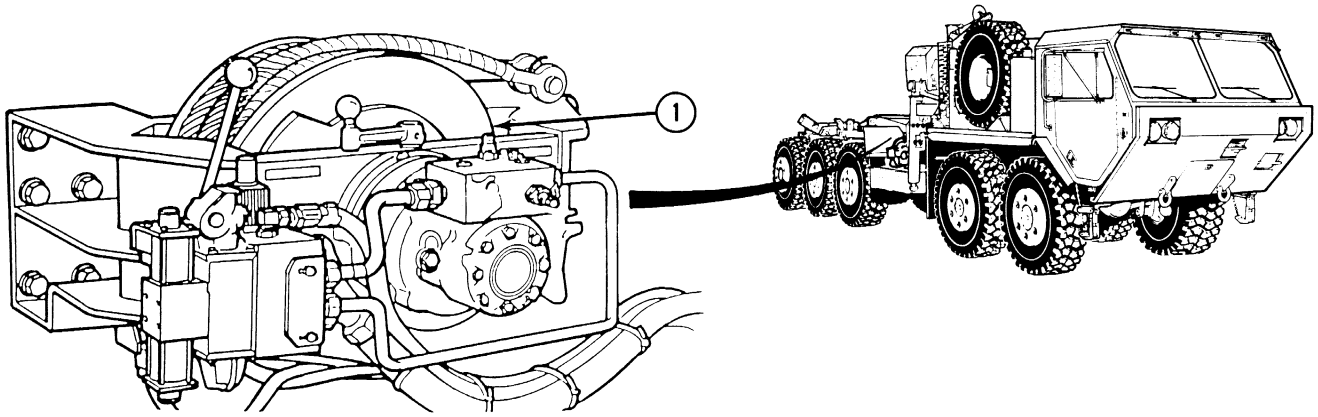


Figure 1-19. Self-Recovery Winch (SRW)

When specified, the truck is equipped with a winch (1) (Figure 1-19) for self-recovery capable of forward and rearward deployment. The winch is equipped with a holding brake and hydraulic counter-balance valve to safely deploy and hold the full rated load of the winch. The winch brake is automatic and is fully engaged anytime the winch is stopped or not in use and is fully released during operation. The winch cable is equipped with a clevis end and roller assemblies are provided to guide the cable. The winch is controllable from the driver's position and at the winch itself. All controls revert to neutral when released.

1-17. MATERIAL HANDLING CRANE (MHC).

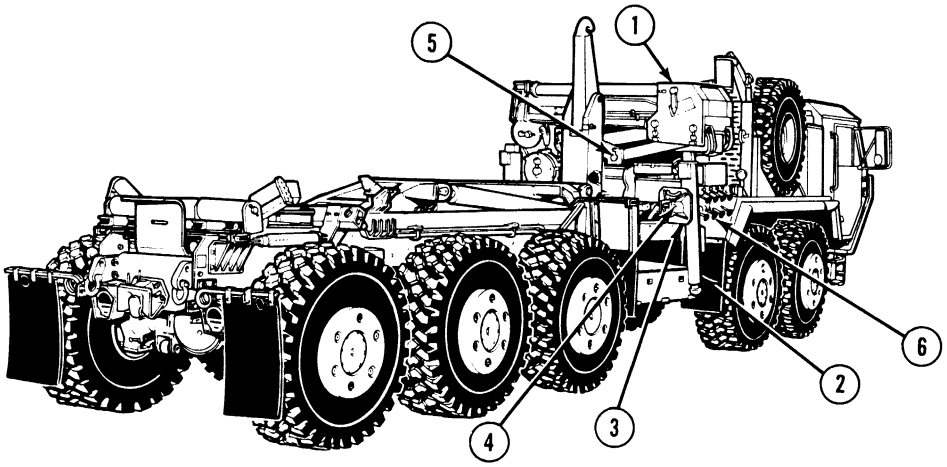


Figure 1-20. Material Handling Crane (MHC)

The truck Material Handling Crane (MHC) (Figure 1-20) is a fully hydraulic load-moment sensing crane (1) powered by the truck hydraulic system. The crane is mounted behind the cab, bolt-attached to the truck frame and is capable of lifting a 3,900 lb (1770 kg) pallet from any location on the FR. The crane can load/unload pallets to either side of the truck. Truck stability and leveling is accomplished with left- and right-side hydraulically operated stabilizers (2) that are fabricated as a part of the crane substructure. These stabilizers/outrigger jacks can be controlled from either side of the truck by individual hydraulic controls. The jacks can level the truck when it is inclined up to 7 degree side slope. Check valves are used to hold the outriggers position. Safety switches are installed in the outrigger jacks to prevent crane operation unless the outriggers are in place. The outrigger pads (3) are attached to the outrigger jacks by means of quick pins (4) and are stowed on the crane base. The pads swivel 360 degrees when installed on the jacks.

a. Hydraulic System. The hydraulic filters and strainers are located to provide direct access and to allow removal without causing damage to the truck. Bypasses are furnished, where necessary, to protect filters during cold temperature operation. All cylinder rods exposed during operations have a hard chromium plating. Integral mounted or cartridge-type holding valves prevent sudden cylinder collapse in the event of hose burst or major hydraulic failure. If a hydraulic system failure occurs, a hydraulic hand pump (5) located at the operator station permits the operator to lower any load to the ground and stow the crane. The MHC is operated by two hydraulic valve banks (6), located approximately 60 inches (152 cm) above ground on the passenger side of the truck. Four electro-proportional control valves with manual handles connected to spools are used to control crane proper function. Three additional proportional manual control valves are used for erection and outrigger control. The outrigger manual control valves are also duplicated on the driver’s side of the truck.

1-17. MATERIAL HANDLING CRANE (CONT).

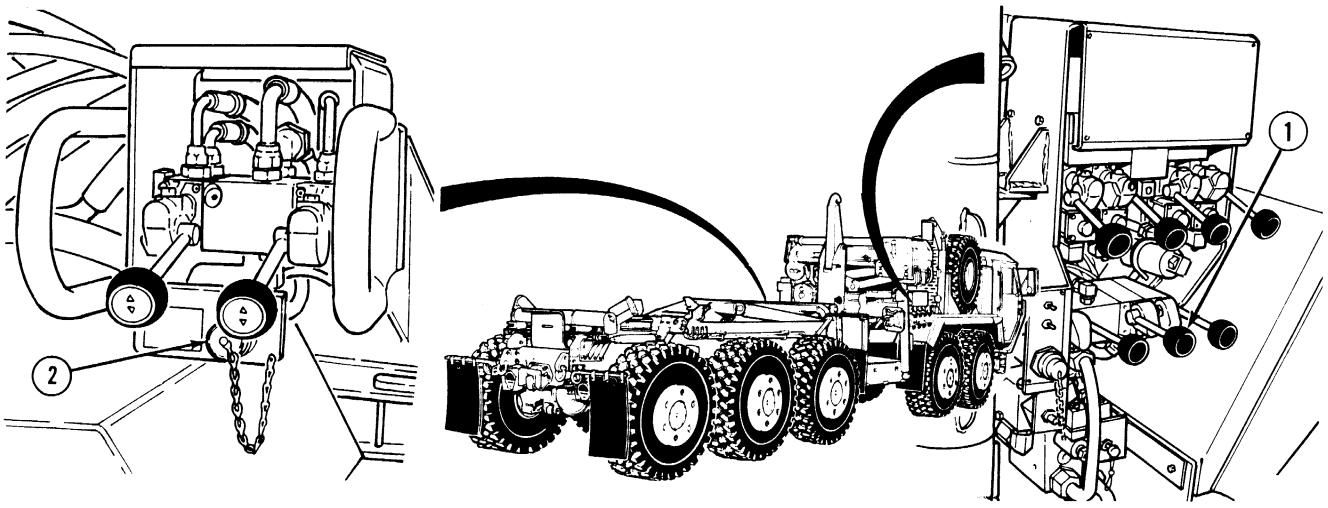


Figure 1-21. Fixed Controls

b. Fixed Controls. All crane controls and indicators (1) (Figure 1-21) are located at the crane position on the passenger side of the truck. Controls (2) on the driver's side will also operate the outriggers. The controls are accessible to the operator while standing on the ground. Control valves, both crane and outrigger, automatically return to the neutral position should the operator inadvertently or intentionally release the control.

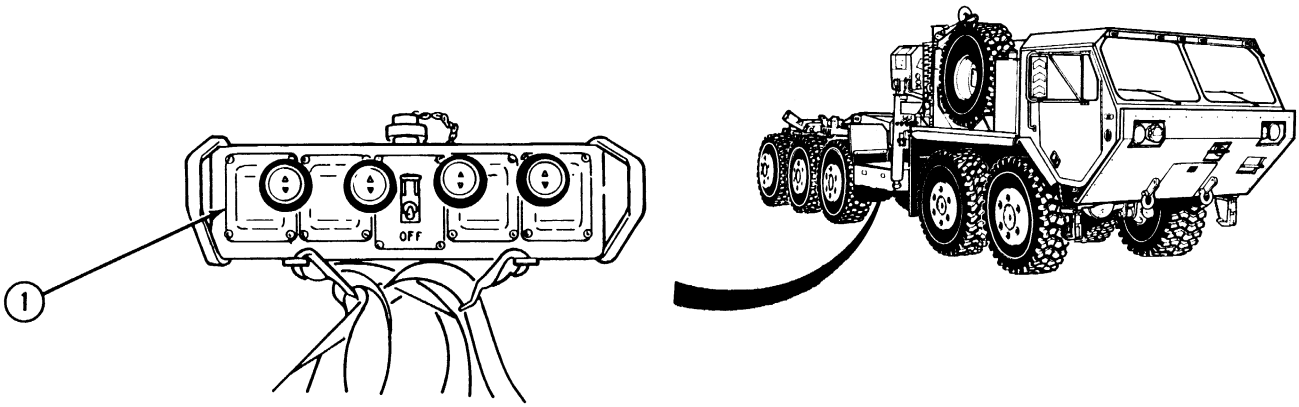


Figure 1-22. Remote Controls

c. Remote Controls. The remote control system (Figure 1-22) is designed to operate the spools of the directional control valve. Remote control is proportionally variable. Remote control (1) is provided with an emergency shutdown capability and designed so that when activated, all remote control crane functions cease and truck speed is reduced to idle. The operator can operate the remote control anywhere within 35 ft. (10.7 m) of the crane base. The controller has multiple functions to match control levers on the fixed control except for the mast and outrigger controls.

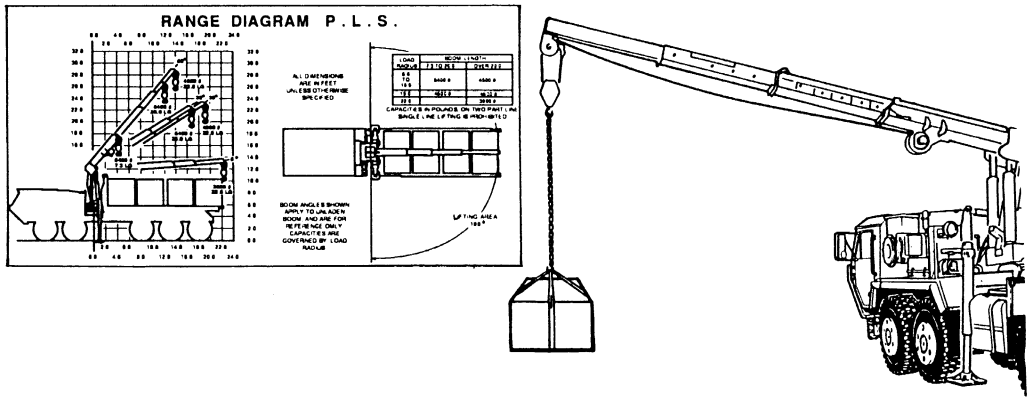


Figure 1-23. Overload Shutdown

d. Overload Shutdown. The crane is provided with an overload shutdown (Figure 1-23) which precludes structurally overloading. Two block and overload conditions are sensed through line-pull of the hoist. A preprogrammed micro-processor that is constantly comparing boom angle, boom length and hoist line pull activates solenoid valves in the telescope out, lift up, lift down and hoist up circuits when the unit is overloaded or two-blocked. During an overload condition, the crane's function cease. Hoist down, telescope in and swing in either direction can be used manually to bring the crane to a safe position.

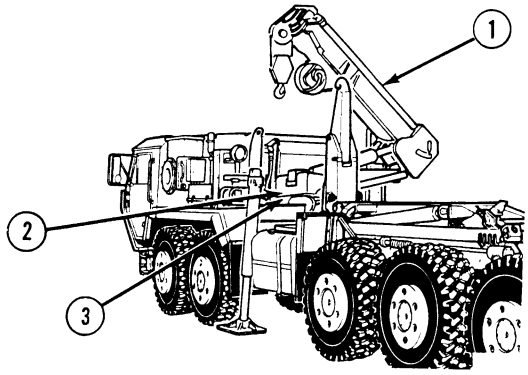


Figure 1-24. Hoist, Swing Drive and Brake

e. Hoist. The crane provides vertical lift of a 3,900 lb. (1769 kg) load at 22.5 ft. (6.86 m) by means of a hoist (1) (Figure 1-24) with a 5.8 cu. in. (95 cu. cm.) motor. The hoist is controllable by manual control at the fixed operators station, or at the remote control. The hoist has a spring applied, hydraulically released multi-disc pack brake, hydraulically coupled to the hoist circuit, which applies automatically when the hoist control is released.

f. Swing Drive and Brakes. The swing drive (2) is a planetary gear box driven by a hydraulic motor to give a swing speed on 0.8 rpm. Mechanical stops limit the rotation to 180 degrees. The swing brake (3) is a spring applied, hydraulically released multi-disc pack, hydraulically coupled to the swing circuit, applying automatically when the swing control is released.

1-18. LOAD HANDLING SYSTEM (LHS).

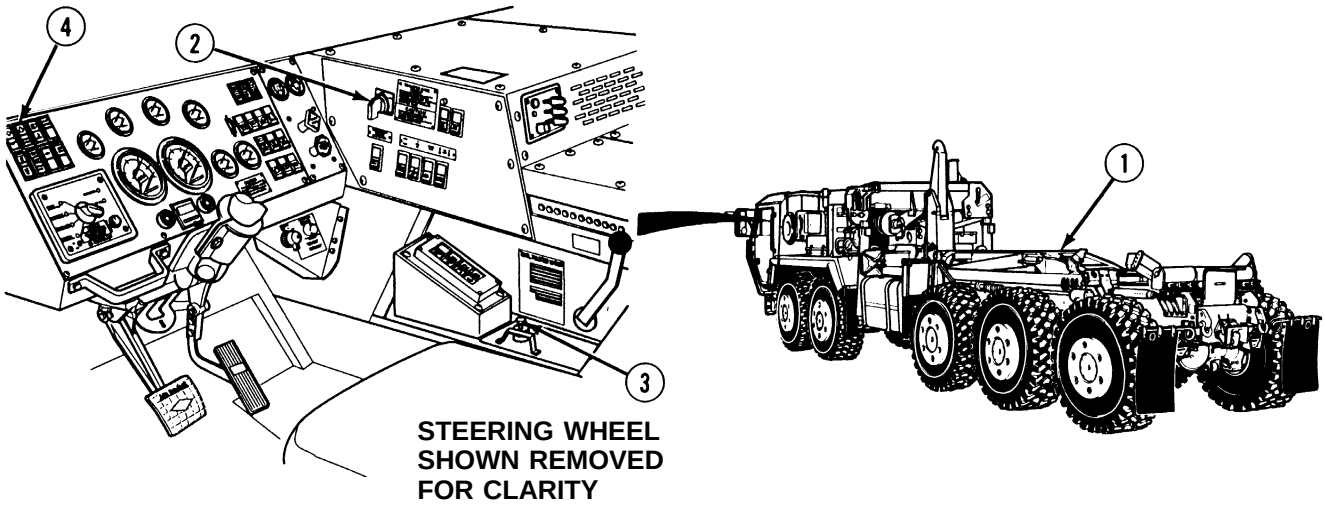


Figure 1-25. Load Handling System (LHS)

The truck is equipped with a Load Handling System (LHS) (Figure 1-25). The LHS (1) is fully hydraulic, powered by the truck hydraulic system and is operated by hydraulic selector switch (2) and joystick (3) located to the driver's right in the truck cab. The LHS control system is electrically powered from the truck electrical system. The LHS is capable of the following, with a flatrack (FR) loaded with 33,000 lb. (15 metric tons) nominal payload:

- Loading/unloading the FR from the truck to 12 in. (30.5 cm) below ground level and any intermediate level,
- Loading/unloading from uneven ground slopes of 10 degrees from the trucks lateral and horizontal axis,
- Loading/unloading to/from the trailer or ramps in which the height is equal to or less than the height from the ground to the bottom of the FR (while on the truck).

a. Flatrack Locking. The LHS is designed with automatic locking features that secure the FR for all modes of transportation. The LHS can automatically guide, center and secure a FR to the truck so that even during rough trail operations, the FR remains safely secured.

b. LHS Overload. The LHS will not function when the payload exceeds 36,300 lbs. (16,480 kg) maximum. A warning light (4), located in the cab in plain view of the driver, activates when a FR with a payload between 34,500 and 35,500 lbs. (15,663 to 16,117 kg) is being loaded by the LHS while under the worst conditions.

c. Hydraulic System. Hydraulic filters are located to provide direct access and to allow removal without damage to the truck. By-passes are furnished where necessary to protect filters during cold temperature operation. All cylinder rods exposed during operation have a hard chromium plating.

d. Slave Hydraulics. Self-sealing quick disconnect hydraulic couplings and a hose with appropriate connectors are provided so that one PLS truck can readily hydraulically power the LHS of another PLS truck.

1-19. WHEELS AND TIRES.

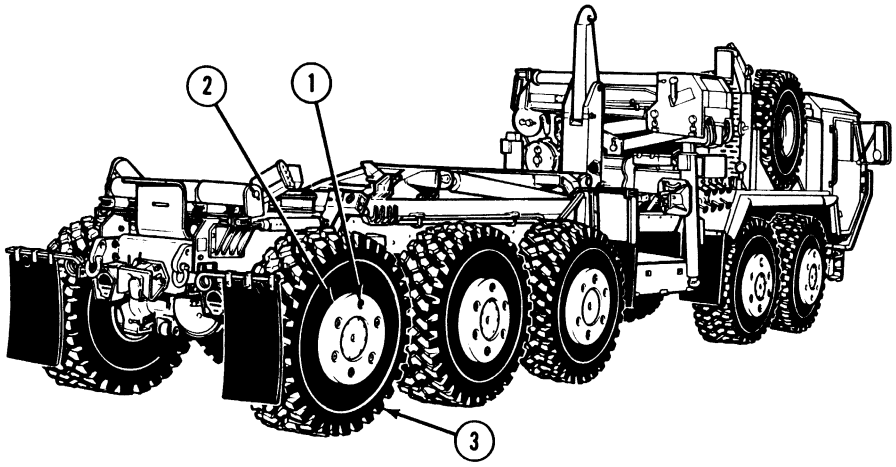


Figure 1-26. Wheels and Tires

Each truck has eleven wheel/tire assemblies (Figure 1-26); the ten installed on the truck axles plus a spare. The components of each wheel/tire assembly are the wheel, tire, valve stem, Central Tire Inflation System (CTIS), wheel valve, bead lock and wheel cover.

a. Wheel. The 20 by 10 inch wheel is manufactured in two pieces. Twelve studs (1) that protrude from the rear wheel half are used to bolt the two halves together. These studs are also used to mount the CTIS wheel valve bracket and secure the wheel cover (2).

b. Tire. The 16.00R20 tires (3) are tubeless.

c. Bead Lock. The bead lock is installed inside the assembled wheel and tire. It assures that the tire stays pressurized when tire pressure is low. It is manufactured in two halves that are bolted together.

d. CTIS Wheel Valve. The wheel valve assembly allows air flow in and out of the tire during CTIS inflation/deflation cycles. It is mounted to the wheel and secured by a bracket assembly. The input and output ports are fitted with two flexible and steel tubes in parallel.

e. Valve Stem. The valve stem connects inside the wheel and is routed to the CTIS wheel valve.

f. Wheel Cover. The entire wheel end contains a wheel cover to protect the CTIS valve and air lines from physical damage. This cover always must be in place whenever the truck is in operation. It is secured to the wheel via four of the wheel studs.

1-20. CENTRAL TIRE INFLATION SYSTEM (CTIS).

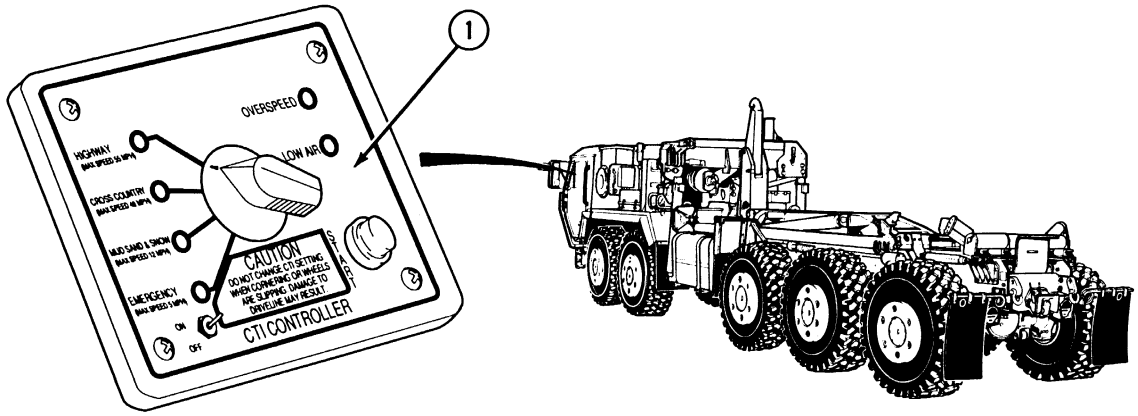


Figure 1-27. Central Tire Inflation System (CTIS)

The Central Tire Inflation System (CTIS) (Figure 1-27) is designed to adjust the pressure of all tires on the truck for different traction conditions. The CTIS controller (1) has four pressure settings which the operator selects and activates in the cab. The CTIS consists of control valves for air supply and distribution, a dash mounted electrical controller that adjusts tire pressure, along with required air tubing, electrical cables, air dryer and air compressor. The drive-line lock-up controls with the exception of the TRANSFER CASE LOCKUP are integrated with the CTIS to simplify operation of the truck. Refer to TM 9-2320-364-10 for operating controls and indicators for the CTIS.

1-21. CAB.

The truck cab features a full width configuration and is positioned forward of the first axle. The cab controls and operating mechanisms are designed to accommodate a crew of two wearing the full range of clothing. Heating, ventilation, lighting, noise, vibration and shock control is provided for personnel use. The cab contains all of the driving controls and gages and some operating controls for the mounted equipment. Refer to TM 9-2320-364-10 for information concerning operating controls and indicators.

1-22. PLS TRAILER (PLST).

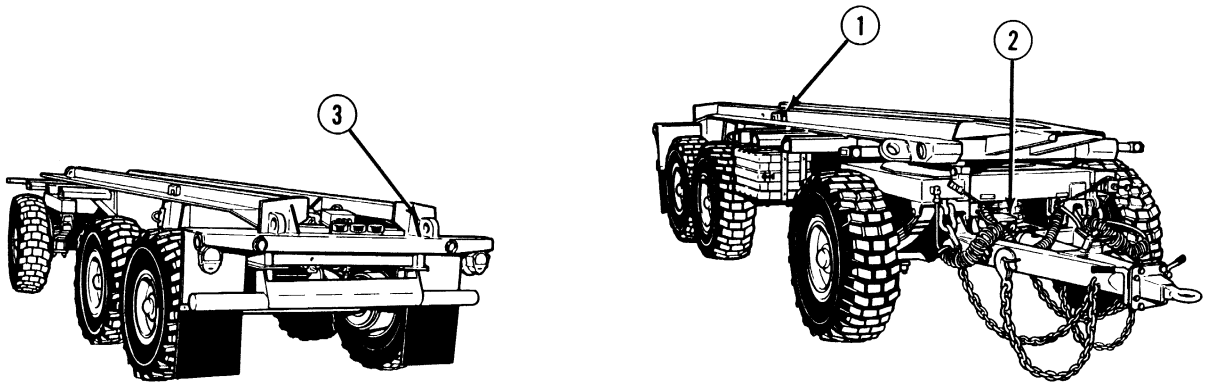


Figure 1-28. Palletized Load System Trailer (PLST)

The Palletized Load System Trailer (PLST) (Figure 1-28) is a three axle trailer designed to carry a Flatrack (FR) with a 33,000 lb. (15 metric tons) nominal payload. It can accommodate both full and partial loaded flatracks. Guides laterally position the FR on the trailer rear stops and these locate the longitudinal position of the FR in relation to the PLST. These stops prevent the FR from sliding rearward. A pneumatic locking device (1), located between the frame rails just above the second axle, hooks to engage the lock points and secure the FR to the PLST. An air valve controls the position of the lock hooks. Springs retain the hooks in the locked position. The PLST has a standard 12 volt electrical system with 24 volt military adapters (2). Also provided are two intervehicular electrical connecting cables of sufficient length to reach the towing truck. Two towing eyes (3), at the rear of the PLST permit towing with a medium duty tow bar. The spare tire carrier is ahead of the second axle in the center of the frame. The spare tire is held in place with bolts through the wheel bolt pattern. The spare tire and wheel assembly can be raised and secured in the spare tire carrier by the trailer-provided hand-operated winch. The PLST uses turntable-type steering for tracking and turning and is equipped with an air braking system. All three axles use 16.5 in. diameter by 7 in. wide (419 mm by 178 mm) S-cam brakes. The PLST has a dual brake system with separate service and emergency brake system. The PLST brake system is activated and charged by the truck air supply. The brakes are self-adjusting. Refer to TM 9-2330-385-14 for Operator's, Unit, Direct Support and General Support Maintenance for the PLS Trailer.

a. Service Brakes. The six service brakes on the PLST are powered by 24/20 inch (61/51 cm) brake chambers. Six inch automatic slack adjusters are provided with all brake chambers. The service brakes are activated when a signal from the foot-operated treadle valve or hand operated control valve is sent through a series of relay valves. The relay valves convert the proportioned service brake signal from the truck into a regulated service brake chamber pressure.

1-22. PLS TRAILER (PLST) (CONT).

b. Parking Brakes. Spring chamber parking brakes are provided on all PLST axles. The application and release of the six PLST spring brakes is controlled by a spring brake control valve. An absence of air pressure in the emergency/spring brake supply line causes the spring brake control valve to activate the spring brakes. The spring brake control valve also retains air pressure in the PLST air reservoir so the PLST spring brakes can be released by the spring release valve. The spring brake control valve also prevents compounding of pressures in the brake chambers by relieving the pressure on the spring brake side of the chambers when the spring brakes are set and the service brakes are applied. The PLST spring brake release valve is located on the right front corner of the trailer. This valve releases the PLST spring brakes without a prime mover air supply when there is sufficient air reservoir pressure. After the spring brakes have been released, they can be reapplied by actuating the release valve. When air is supplied through the emergency/spring brake supply line, the spring release valve is over-ridden and the trailer spring brakes are released. If there is insufficient air reservoir pressure to release the trailer parking brakes, a cage nut release is provided on each spring chamber to mechanically release the spring brakes.

c. Emergency Brakes. Whenever there is a loss of pressure from the truck or PLST air reservoir, the emergency brakes are activated.

1-23. PLS FLATRACK (FR).

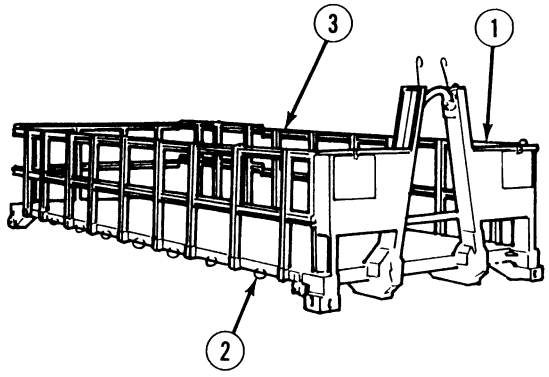


Figure 1-29. Palletized Load System Flatrack (FR)

The Flatrack (FR) (1) (Figure 1-29) accommodates a 33,000 lb. (15 metric tons) nominal payload during all modes of transportation and during all specified load/unload operations. The FR is designed to withstand the dynamic and static loads imposed while fully loaded during LHS load/unload operations. The FR has an empty weight of 3250 lb. (1476 kg) without sideboards. The FR can accommodate palletized, break bulk and 20 ft. (6.1 m) ISO container payloads. Tiedowns (2) and sideboards (3) are used to contain and hold cargo. Refer to TM 9-3990-206-14&P for Unit, Direct Support and General Support Maintenance for the PLS Flatrack.

CHAPTER 2

VEHICLE MAINTENANCE

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Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For a listing of special tools, TMDE, and support equipment, refer to the Tool Identification List, Appendix F, the Maintenance Allocation Chart (MAC) (TM 9-2320-364-20), and to the Repair Parts and Special Tools List (RPSTL), TM 9-2320-364-24P.

2-3. REPAIR PARTS.

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (TM 9-2320-364-24P) covering Direct and General Support Maintenance for this equipment.

Section II. SERVICE UPON RECEIPT

2-4. UNPACKING AND DEPROCESSING.

a. Unpacking. Upon receipt of a new truck, the receiving organization must see if it has been properly prepared for service and is in good condition. Inspect all assemblies, subassemblies, and accessories to be sure they are in proper working order (TM 9-2320-364-10). Secure, clean, and correctly adjust and/or lubricate as needed (TM 9-2320-364-10 and TM 9-2320-364-20). Check all tools and equipment to be sure every item is accounted for (TM 9-2320-364-10-HR) in good condition, clean, and properly mounted or stowed (TM 9-2320-364-10).

b. Deprocessing. Read "Processing and Deprocessing Record of Shipping, Storage, and Issue of Trucks and Spare Engines" tag, (DD Form 1397) and follow all precautions checked. This tag should be attached to the steering wheel, shifting lever, or ENGINE START switch.

2-5. HAND RECEIPT MANUAL AND INVENTORY OF EQUIPMENT.

When a new truck is first received by the using organization, it is necessary to inventory the truck equipment. For detailed procedures, refer to Hand Receipt Manual, TM 9-2320-364-10-HR.

2-6. SERVICE BEFORE OPERATION.

a. General.

(1) Refer to TM 9-2320-364-10 for operating instructions for the truck.

(2) Upon receipt of a new, used, or reconditioned truck, the receiving organization must see if it has been properly prepared for service and is in good condition (TM 9-2320-364-10). Inspect all assemblies, subassemblies and accessories to be sure they are in proper working order. Secure, clean, and correctly adjust and/or lubricate (TM 9-2302-364-10 and TM 9-2320-364-20) as needed. Check all tools and equipment to be sure every item is there (TM 9-2320-364-10-HR), in good condition, clean, and properly mounted or stowed (TM 9-2320-364-10).

(3) Follow general procedures for all services and inspections given in TM 9-2320-364-10.

b. Inspection and Servicing Equipment.

NOTE

If truck has been driven to the using organization, most or all of the following work should have been done.

(1) When truck is received, inspect all items for damage that may have occurred during shipping and unloading operations. Pay close attention to any loose or missing nuts, bolts, screws, access plates, drain plugs, draincocks, oil plugs, assemblies, subassemblies, or components that may be easily lost or broken in transit. Check Basic Issue Items (BII) against checklist to make sure all items are accounted for and are in good condition (TM 9-2320-364-10-HR). Carefully list all discrepancies.

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(2) Clean all exterior surfaces coated with rust-preventive compound with drycleaning solvent.

(3) Perform the Unit Level Semiannual (6 month or 3,000-mile) Preventive Maintenance Checks and Services (PMCS), (TM 9-2320-364-20).

(4) Lubricate specific points shown in TM 9-2320-364-10 and TM 9-2320-364-20 regardless of interval. Do not lubricate gear cases or engine. Check processing tag for gear case and engine oil. If tag states the oil is good for 500 mi (805 k) of operation and is of the proper grade for local climatic operation, check oil level but do not change oil.

(5) Schedule a Semiannual service in accordance with DA Pam 738-750. Arrange for front tandem crossmember torque check (TM 9-2320-364-20) at 3,000 mi (4,827 km).

(6) Activate battery if truck is delivered with dry-charged battery (TM 9-6140-200-14).

WARNING

- Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.
- Use extreme care when removing the radiator pressure cap. Sudden release of pressure can cause a steam flash which could seriously injure personnel. Slowly loosen cap to the first stop to relieve pressure before removing cap completely. After opening, securely tighten cap.
- Use a clean, thick waste cloth or like material to remove radiator pressure cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.

(7) Check radiator coolant. Check if solution is adequate for expected climatic conditions. Refer to TB 750-651 for preparation of antifreeze solutions. Put tag near filler cap with type of antifreeze and degree of protection written on tag.

2-6. SERVICE BEFORE OPERATION (CONT).

c. Special Service Instructions.

(1) Truck Body and Sheet Metal Inspection.

(a) Inspect body and sheet metal for evidence of damage during shipment.

(b) Check doors, latches, and hinges on compartments for proper operation.

(c) Check mounting hardware and tighten as necessary.

(2) Truck Cab Inspection.

(a) Inspect cab for evidence of damage during shipment.

(b) Inspect windshields and window glass for cracks or other damage.

(c) Check door latches, hinges, and windows for proper operation.

(d) Check seats and seat belts to ensure they are securely installed, and that operator's seat adjustments are functioning properly.

(3) Engine Inspection.

(a) Remove any seals, plugs or tape used to seal air inlets and ports on the engine during shipping.

(b) Check crankcase oil level with dipstick.

(c) Examine air cleaner element for dirty or restricted condition.

(d) Inspect engine and cooling hose connections for evidence of leakage.

(e) Clean away any obstruction of cooling air flow to radiator.

(4) Transmission Inspection.

(a) Check fluid level with dipstick.

(b) Check external lines for evidence of leakage.

(5) Transfer Case Inspection.

(a) Check level of lubricant at fill plug.

(b) Inspect lubrication pump and external lines for evidence of leakage.

(c) Operate driveline controls and observe power to front axle.

(d) Inspect bolts on driveline U-joints.

(6) Electrical System Inspection.

(a) Inspect battery cable connections and clean and tighten as necessary.

(b) Check light for burned out lamps, loose connections, and dirty or broken lenses.

(c) Ensure alternator is charging properly.

(d) Ensure all electrical equipment functions.

(7) Air System Inspection.

(a) Drain any water from reservoirs.

(b) Inspect air hose and tubing connections for leakage.

(8) Steering System Inspection.

(a) Check steering hydraulic reservoir for proper fluid level.

(b) Examine steering linkage and steering gears for damage incurred during shipment.

(c) Examine steering hoses and connections for evidence of leakage.

(d) Check steering system for proper operation during road test.

(9) Chassis and Running-Gear Inspection.

(a) Check all lubricant levels.

(b) Check axle housing pressure vents to ensure freedom from foreign matter.

(10) Tire Inspection.

(a) Check tire inflation.

(b) Inspect tires for serious cuts, bubbles, cracks, bruises, dry-rot, foreign objects, or exposure of internal cords. Remove foreign objects lodged between treads.

(c) Check all wheel mounting nuts for proper torque (TM 9-2320-364-10).

(d) Check front and rear suspension for broken spring leaves, damaged components, or damaged air bags.

(11) Fuel System Inspection.

(a) Check fuel level and replenish, if necessary.

(b) Inspect fuel lines, connections, and filters for evidence of leakage.

Section III. TROUBLESHOOTING

2-7. TROUBLESHOOTING INTRODUCTION.

This section contains step-by-step procedures for identifying, locating, isolating and repairing equipment malfunctions.

This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify the supervisor.

2-8. TROUBLESHOOTING INSTRUCTIONS.

The first part of this section explains the use of the Troubleshooting Logic Tree. These procedures make use of Simplified Test Equipment for Internal Combustion Engines-Reprogrammable (STE/ICE-R), Detroit Diesel Electronic Control II (DDEC II) and Allison Transmission Electronic Control (ATEC) for testing and fault isolation. DDEC III troubleshooting is located in the TM 9-2320-364-20.

a. Simplified Test Equipment for Internal Combustion Engines - Reprogrammable (STE/ICE-R). The PLS truck is equipped with several STE/ICE-R sensors that are used to support troubleshooting procedures. STE/ICE-R tests, employing these sensors, are incorporated into the standard troubleshooting tests to aid in fault isolation. The STE/ICE-R acts as a conventional digital multimeter to measure voltage, current and resistance. It can also measure pressure, speed, compression unbalance, engine power and some specialized battery and starter evaluations. The STE/ICE-R is powered by the truck batteries using an electrical harness called the Diagnostic Connector Assembly (DCA). The complete system includes a truck test meter (VTM), a transducer kit (TK), cables, transit case and technical publications. The STE/ICE-R can make TK measurements while connected to the DCA. STE/ICE tests are referenced. VIN number for PLS truck is “38”.

b. Diagnostic Data Reader (DDR) Description.

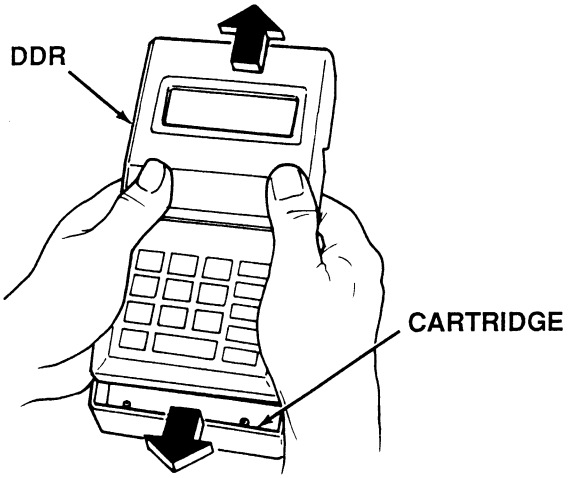
(1) DDR cartridge replacement.

(a) Disconnect DDR cable from DDL connector MC13.

(b) Hold DDR with thumbs placed against slanted surface and grasp cartridge with fingers.

(c) Squeeze DDR, push thumbs forward against slanted surface, and slide cartridge back at the same time.

(d) Slide cartridge from DDR.



(e) Seat cartridge on back of DDR.

CAUTION

Damage will occur to the cartridge if it is held at an angle during installation. The cartridge must be held flat before sliding into place.

(f) Slide cartridge forward until the cartridge clicks into place.

(2) Cable connections to truck.

(a) The data/power cable must be connected to the truck before the DDR can function.

(b) The DDR will energize as soon as it is connected to the truck's electrical system and the ENGINE switch is turned ON. If it does not, there are several things to check.

(3) Troubleshooting.

(a) If the unit does not power up, check that the cartridge is plugged in correctly. Slide the cartridge out and plug it in again. If there is grease, oil or other grime on the edgeboard, carefully remove it with a soft cloth. DO NOT use solvents and DO NOT attempt to clean the terminals in the DDR unit itself.

(b) Check the 2-amp fuse located inside the cartridge. Remove the screws to disassemble the cartridge. Always use a 2-amp fuse for replacement.

(4) Readout window. The readout window contains a liquid crystal display (LCD). It has four lines, each with 20 characters. This provides a great deal of information at one time. A built-in backlight ensures that you will be able to read the display regardless of the lighting conditions in the truck. The readout uses letters, numbers and special symbols.

(5) Keypad.

(a) The keypad features 16 keys. They are totally sealed against contamination, including grease and fluids. You can clean them with a damp cloth or mild cleaner. DO NOT immerse the DDR in fluids; the edgeboard connector is NOT sealed.

(b) The keys operate with a soft touch, but unlike membrane keys, they "give" to indicate that your entry has been made.

(c) Ten NUMERIC KEYS arranged calculator-style for quick operation. Each key is imprinted with a single digit.

1 To the right side of the keypad, there are four arrow keys, each imprinted with a direction arrow. The UP and DOWN arrow keys are used to scroll through the lines of the display. Each touch of a key causes the display to move one line, up or down. The LEFT and RIGHT arrow keys are used to toggle back and forth between choices given by the display; they may have other purposes, depending on which cartridge is used.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

2 The FUNC key, below the arrow keys, lets you choose various DDR modes, or functions, depending on the cartridge in use. These include several operating modes and a printing mode.

3 The ENTER key lets you tell the DDR when to do something. Depending on what's showing in the readout window display, the ENTER key can make a selection, confirm an answer, or instruct the DDR to continue to the next step.

(6) RS232 port. On the right side of the DDR case is an RS232 port. Using the proper cables, you can connect to a printer or terminal.

(7) DDL connector. The DDR receives information from the truck's on-board computer, the DDEC electronic control module (ECM) ATEC electronic control unit (ECU), through a connector called the Display Data Line (DDL). The DDL has 12 terminal cavities. The DDL adaptor plug is located on the left side of the cab at left door hinge area under the edge of the instrument panel.

c. DDEC II and DDEC III Operation.

(1) General instructions.

(a) The Check Engine Light (CEL) and Check Gages Light (CGL) will light for five seconds when the ENGINE switch is first turned ON as a bulb and system check. If the Check Engine Light remains on, the self-diagnostic system has detected a fault.

(b) The first step in diagnosis is identifying the symptom or problem condition. Always refer to DDEC II Troubleshooting (All Conditions) to begin troubleshooting.

Symptom A	CEL comes on and stays on
Symptom B	CEL is always off
Symptom C	CEL operates normally (comes on for up to 5 seconds, then goes off) and a fault is present
Symptom D	CEL and fault are intermittent
Symptom E	Engine cranks but will not start
Symptom F	CGL is always on or always off

(c) Once the key symptom is identified, refer to the fault index to find the page number of the flowchart for that symptom. Symptoms A, C, D and F's starting flowcharts will list secondary symptoms (Symptoms B and E have no secondary symptoms). Look to the right of the secondary symptom to find the page on which to begin troubleshooting. Go to that page.

(d) Diagnosis is built on codes that are displayed on the Diagnostic Data Reader (DDR) (Table 2-1). Since the self-diagnostics do not detect all possible faults, the absence of a code does not mean there are no problems in the system. If a DDEC problem is suspected (even in the absence of a code), go to the DDEC II Troubleshooting (All Conditions) flowchart, TM 9-2320-364-20 or DDEC III Troubleshooting (All Conditions) flowchart, TM 9-2320-364-20. This chart can lead you to other charts which can aid in the troubleshooting process.

(e) If, after DDEC II or DDEC III troubleshooting is completed and other symptoms remain, go to Engine Troubleshooting.

(2) Using the Diagnostic Data Reader (DDR).

(a) Plug reader into truck connector and turn ENGINE switch ON.

Table 2-1. DDEC II System Code Index

Code Number	Affected Sensor	Description
11	Vernier Control	System on for 2 seconds with too low a voltage at the Vernier Control input to the DDEC ECM.
12	Vernier Control	System on for 2 seconds with too high a voltage at the Vernier Control input to the DDEC ECM.
14	Oil Temperature (OTS)	Engine running for 8 minutes with too high a voltage at the OTS input to the DDEC ECM.
15	Oil Temperature (OTS)	Engine running for 2 seconds with too low a voltage at the OTS input to the DDEC ECM.
21	Throttle Position (TPS)	System running for 2 seconds with too high a voltage at the TPS input to the DDEC ECM.
22	Throttle Position (TPS)	System running for 2 seconds with too low a voltage at the TPS input to the DDEC ECM.
23	Fuel Temperature (FTS)	Engine running for 8 minutes with too high a voltage at the FTS input to the DDEC ECM.
24	Fuel Temperature (FTS)	Engine running for 2 seconds with too low a voltage at the FTS input to the DDEC ECM.
25		NO CODES - No faults have been detected by DDEC since the last time the codes were cleared.
32		ECM FAILURE - The backup system inside the DDEC ECM has failed.
33	Turbo Boost (TBS)	Engine running (at less than 800 RPM or less than 30% of maximum torque) for 5 seconds with too high a voltage at the TBS input to the DDEC ECM.
34	Turbo Boost (TBS)	Engine running for 2 seconds with too low a voltage at the TBS input to the DDEC ECM.
35	Oil Pressure (OPS)	Engine running for 2 seconds at less than 800 RPM with too high a voltage at the OPS input to the DDEC ECM. Oil temperature must be greater than 60 degrees C to log this code.
36	Oil Pressure (OPS)	Engine running for 2 seconds with too low a voltage at the OPS input to the DDEC ECM.
41	Timing Reference (TRS)	The number TRS pulses received per revolution was incorrect or completely missing. One pulse per cylinder per revolution is required.
42	Synchronous Reference (SRS)	Did not receive an SRS pulse on every firing of the #1 cylinder.
44		HIGH OIL TEMPERATURE - System running for 2 seconds with the oil temperature greater than a calibrated limit.
45		LOW OIL PRESSURE - Engine running with the oil pressure less than the limit (different limits at different RPM's) for 7 seconds.
46		LOW BATTERY VOLTAGE - Engine running with low battery voltage (less than 10 volts) for more than 30 seconds.
51		EEPROM ERROR - An error has been detected in the EEPROM (Electrically Erasable, Programmable, Read Only Memory) inside the DDEC ECM.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

Table 2-1. DDEC II System Code Index (CONT).

Code Number	Affected Sensor	Description
52		ECM FAILURE - The DDEC ECM was unable to correctly convert sensor voltages into numbers for computer usage.
53		EEPROM ERROR - An error has been detected in the EEPROM inside the DDEC ECM which affects the logging of trouble codes.
56		ECM FAILURE - The DDEC ECM was unable to correctly convert sensor voltages into numbers for computer usage.
61 thru 68		RESPONSE TIME TOO LONG - The response time of the injector was longer than the maximum limit or the injector never responded at all. Oil temperature must be greater than 30 degrees C and battery voltage must be between 11 volts and 16 volts to log this code. The code is only logged at less than 2000 RPM.
71 thru 78		RESPONSE TIME TOO SHORT - The response time of the injector was shorter than the minimum limit. Oil temperature must be greater than 30 degrees C and battery voltage must be between 11 volts and 16 volts to log this code. The code is only logged at less than 2000 RPM.

(b) When the reader powers up, observe the data readout window. It will remain on for several seconds. If the reader does not power up, check connections and be sure the ENGINE switch is ON.

```
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SOFTWARE COPYRIGHT
1989-91 VERSION 3.0
DDEC I AND DDEC II
```

Data Readout Window

(c) Observe the data readout window displaying a second message indicating communication with the DDEC Electronic Control Module (ECM). If needed, press ENTER on the DDR to display the screen.

(d) After a few seconds, the first four lines in a data list will appear on the screen.

(e) Use the UP and DOWN arrow keys to move through the list. The first four lines appear as follows:

```
01    ACTIVE CODES        YES
02    HISTORIC CODE       YES
04    ENGINE RPM          xxxx
05    ECM VOLTAGE         xxx
```

Data Readout Window

(f) If, at any time, you observe a NO DATA message on the screen, check the cable connector and ensure the ENGINE switch is ON. Lastly, troubleshoot the DDEC ECM (Para 2-13).

(g) Press the FUNC key to display the following screen:

FUNCTION SELECTIONS SELECT DESIRED MENU [ENGINE] <——> PRO LINK

Data Readout Window

(h) Use the LEFT arrow key to toggle to the ENGINE choice, then press ENTER.

(i) Observe the Engine menu with a list of choices. You can move up and down on the list using the UP and DOWN arrow keys.

ENG MENU SELECTIONS DIAGNOSTIC CODES

Data Readout Window

(j) Select DIAGNOSTIC CODES and press ENTER to display the next menu screen:

DIAGNOSTIC CODE MENU MODE 01 ACTIVE CODES

Data Readout Window

(k) Use the UP and DOWN arrow keys to select MODE 1 ACTIVE codes, MODE 2 HISTORIC CODES and MODE 40 CLEAR CODES. Press ENTER for desired selections.

(l) Generally, you will select ACTIVE CODES. Refer to the specific malfunction or condition and referenced instructions for more information. An ACTIVE CODE display resembles:

DDEC II S60 12.7 PTO HIGH VOLTAGE ACTIVE CODE 12

Data Readout Window

(m) Clear DDEC codes.

CODES LAST CLEARED AT XXXXXXX.X ENG HRS DO YOU WANT TO CLEAR CODES YES <——> [NO]

Data Readout Window

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

1 Select Mode 40 on the DDR.

2 Use arrow keys on the DDR to select YES.

3 Press ENTER.

NOTE

When ENTER has been pressed, the DDR will clear all stored codes and check the DDEC ECM to ensure all codes are cleared. The DDR will then display the results of the clearing function.

CODES NOT CLEARED
ENTER TO RETRY
FUNC TO EXIT

Data Readout Window

4 Press ENTER to retry the clearing function or FUNC to exit Mode 40.

(3) Tools needed for DDEC diagnosis. The following tools and equipment are required to properly diagnose a complete system:

(a) Voltmeter and Ohmmeter: Use a digital volt-ohmmeter J-34029, or equivalent digital multimeter to measure voltage and resistance when required. A digital multimeter must be used when specified in the procedure.

(b) Test Light 6V: Use when specified in the procedure.

(c) Jumper Wires: Use to bypass a circuit and to insert between special connectors. This will permit access to the connector terminals for circuit checking.

(d) Diagnostic Data Reader (DDR) PRO LINK 9000: J38500-203.

(4) Reading diagnostic codes. If you have turned to this instruction to begin diagnosis of a problem and already know how to read, as well as understand Active and Historical codes, go to DDEC II Troubleshooting (All Conditions) and begin DDEC Troubleshooting.

(5) DDEC mode descriptions. Table 2-2 lists and describes each DDEC mode.

(6) Flashing DDEC codes. DDEC troubleshooting procedures are designed to be performed with the DDR. In situations where a DDR is not available, DDEC codes can be read by flashing them on the CEL. For example, codes 13 and 23 will be flashed as follows:

(a) Turn OFF ENGINE switch (TM 9-2320-364-10).

(b) Place a jumper wire between wires 435 and 451 on DDL connector MC13, terminals A and M.

(c) Turn ON ENGINE switch, observe the CEL and record the codes being flashed.

(d) The CEL will flash once for the one in the number 13 and pause for about a half a second.

Table 2-2. DDR Mode Index

Mode Number	Name	Description
01	ACTIVE CODES	If there is a condition present that causes the CEL to be ON, the condition is said to be active. An Active Code is set in DDEC ECM memory. The readout is YES if any active codes are present, and NO if there are none.
02	HISTORIC CODES	If a condition existed in the past to cause an active code, but the condition is no longer present, the condition is called historic. A Historic Code is set in DDEC ECM memory. The readout is YES if any historic codes are present, and NO if there are none. Engine protection codes (22, 44, and 45) will also store additional information, which will tell the engine hours when the code was set, the duration the code existed, and the number of times the code was logged.
04	ENGINE RPM	This displays the engine crankshaft revolutions per minute as determined from the timing reference sensor (TRS).
05	ECM VOLTAGE	This is the battery voltage available to the DDEC ECM.
07	TPS COUNTS	This is a digital value for the throttle position sensor (TPS). Range is 0 to 225 counts.
07	TPS IN %	This value is the percent opening of the throttle as determined from the throttle position sensor.
10	INJ RESP TIMES	This value is the fuel injector response time.
11	CYLINDER CUTOUT	Locates a cylinder whose output is different from other cylinders.
15	FUEL TEMP	This readout indicates the temperature of the fuel entering the engine in degrees Fahrenheit or Celsius, depending on which mode (English or Metric) you have chosen.
17	OIL PRS PSI (kPa)	Engine oil pressure is indicated in psi or kPa, depending on which mode (English or Metric) you have chosen.
18	OIL TEMP	This readout indicates the temperature of the engine oil in degrees Fahrenheit or Celsius, depending on which mode you have chosen.
19	BOOST PSI (kPa)	Turbo boost pressure is indicated in psi or kPa, depending on which mode you have chosen.
20	IDLE SPEED RPM	This is the engine idle RPM value.
21	PTO COUNTS	Power take-off counts is a digital representation of the PTO sensor voltage. Range 0 to 225 counts.
22	PTO SET RPM	This is an indication of the set RPM for the power take-off.
30	CHECK ENG LHT	This is an indication of the output command to the CEL. Readout is ON or OFF.
30	ENG BRK ENBLE	This is an indication of the status of the engine brake. Readout is ON or OFF.
30	STOP ENG LHT	This is an indication of the output command to the CGL. Readout is ON or OFF.
31	SRS RECEIVED	This is an indication of the signal from the synchronous reference sensor is being received. Readout is YES or NO.
40	CLEAR CODES	This mode is used to clear all stored codes in the DDEC ECM.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

(e) Then the CEL will flash three times for the three in the number 13 and pause for about three seconds.

(f) After the three second pause, the CEL will flash two times for the two in the number 23 and pause for about a half of a second.

(g) After the half second pause, the CEL will flash three times for the three in the number 23.

(h) The CEL will continue to flash in this manner until all of the DDEC codes in the DDEC ECM memory are displayed.

(i) Turn OFF the ENGINE switch when all of the DDEC codes are flashed.

(j) Remove the jumper wire.

(k) Proceed to DDEC Troubleshooting (TM 9-2320-364-20) and the first code flashed by the CEL.

d. ATEC Operation.

(1) The “CHECK TRANS” and “DO NOT SHIFT” lights will come ON when the ENGINE switch is first turned ON as a bulb and system check. If lights remain ON when truck is started and/or placed into gear, a failure has been detected. The ATEC ECU for the transmission will place a code into memory.

(2) System selection procedure.

(a) Copyright screen. When the DDR powers up, the readout displays the copyright screen for several seconds.

MPSI PRO-LINK 9000 SOFTWARE COPYRIGHT 1989 VERSION 1.00 ATEC I

Data Readout Window

(b) System selection process. In the ATEC I system, you must select the transmission type from the Transmission Type menu.

ATEC I SYSTEM SELECT TRANS TYPE MT(B) 600 OR V. HT (B) OR C(L)(B)T 700

Data Readout Window

(c) Note the arrow symbols in the DDR display. They remind you to use the UP and DOWN arrow keys to scroll to the desired transmission type. Each touch will move the display up or down by one item. If you hold an arrow key down, the display will scroll quickly. The list is circular; it will return to the beginning after the last one is viewed.

(d) When you see the CLBT755 on the bottom line, press the ENTER key. The DDR now begins to display data. Refer to Step (4) (Data display).

(3) Non-volatile memory. The ATEC cartridge has a non-volatile memory. This means that stored data are not lost when the DDR is disconnected from the truck power source.

NOTE

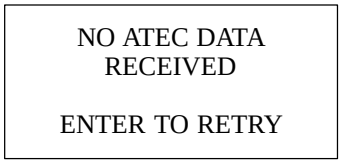
When the DDR establishes communication with the ATEC ECU in a truck, the DDR memory buffers are all cleared. You cannot use a truck's DDL connector to power your DDR to review recorded data. The recorded data will be lost.

(a) When the DDR is connected to an external power source, for instance, at your workbench, the DDR recognizes that it is not communicating with an ATEC ECU. Under these conditions, the FUNC key is active. You can access stored data for review and printing. These include ATEC ECU operating data, diagnostic codes and snapshot data. For example, suppose you have used the DDR to store snapshot data during a road test. Later, using your workbench power supply, you can review the recorded data.

(4) Data display.

(a) Data readout. The main function of the DDR is to provide you with data from the truck's on-board computer, called the ATEC electronic control unit (ECU). This is what the DDR automatically does after the system type has been determined.

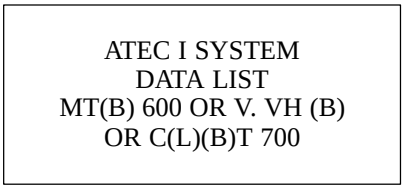
1 If the DDR is unable to establish communication with the ATEC ECU in the truck, you will see a NO DATA display. Press ENTER to command the DDR to try again.



Data Readout Window

2 If communication cannot be established and the NO DATA display reappears, see Step (4)(b).

3 When communication is established and the correct transmission type input, you will see the system confirmation screen.



Data Readout Window

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

4 This display will appear for about three seconds.

```
ECU A/N   16035879
DIAG CODES    21  32
TPS   128  CNTS  50  2%
RANGE SEL   N ATT   N
```

Data Readout Window

5 Use the UP and DOWN arrow keys to scroll through the entire data list. Pressing a key causes the display to move one line. Holding a key causes the display to scroll quickly. Pressing the LEFT arrow key causes the display to advance four lines. Pressing the RIGHT arrow key causes the display to move backward four lines. When you reach the end of the list, you will see the display that tells you which system you are testing.

NOTE

Parameters in the data list that do not pertain to the system you are testing will be designated by NA, meaning not available.

6 For an explanation of each of the items in the data list, refer to Steps (12) through (31) of this section.

(b) What to do with NO DATA Readout. If you get the NO DATA message, there are several things to check:

1 Bad connection - Check the truck cable at each terminal for a good connection. In an extreme case, a wire may be broken in the truck cable or in the ATEC ECU wiring.

2 Engine ON OFF switch - Be sure the ENGINE switch is ON.

3 Bad ATEC ECU, or blown ATEC ECU fuse - If the ATEC ECU is incapable of transmitting data, the DDR will not receive any.

(c) Data freeze operation.

1 There are times when you want to be able to quickly view several operating parameters at the same time, even though they are not normally together in the data list. One way to do this is to create a custom data list using the Custom Data List function. Another way is to use the Data Freeze function.

NOTE

There are two differences between Custom Data List and Data Freeze. In Custom Data, you can scroll the entire reorganized data list exactly like the normal data list. In Data Freeze, the items you “freeze” cannot be scrolled. The rest of the list scrolls normally. Also, you can use a custom list, but not a data freeze, when using Snapshot.

2 To freeze a line of data, follow Steps 3 through 5.

NOTE

You must be viewing the data list before you can freeze an item.

3 For the purposes of freezing data, the four lines in the readout display are numbered 1 through 4 from the top. Use the UP and DOWN arrow keys to scroll the data list. When an item you want to freeze is visible (on any readout line), press the numerical key that corresponds to the readout line of that item. A solid black square appears next to the item. In the following example, suppose you want to freeze OIL TEMP. To do so, press numerical key 3 because OIL TEMP is displayed on line 3.

LOCKUP RPM	1234
OUTPUT RPM	1234
OIL TEMP 123F	1234
FWD PRESS SW	OFF

Data Readout Window

4 Now, when you use the UP and DOWN arrows to scroll the data list, OIL TEMP remains frozen in position on the third line of the display. Although the item is frozen, its value is able to change, according to system operation.

RETARD REQUEST	YES
RETARD COMMAND	YES
OIL TEMP 123F	123C
SPECIAL INPUT	OFF

Data Readout Window

5 Now, suppose you also want to watch SPECIAL INPUT. Use the UP and DOWN arrow keys to scroll the list. As you can see above, the third line remains frozen. Eventually, your item appears on line 4. Press numerical key 4. The square will appear to indicate that line 4 is also frozen. You can continue doing this until you have frozen data on all four lines.

(d) Unfreezing data. There are two ways to unfreeze data. To unfreeze just one line, press the numerical key corresponding to the line you want to unfreeze. The solid square disappears and the line can now be scrolled. To unfreeze the entire display at once, press the numerical key 0 (zero). All solid squares disappear and all lines are unfrozen.

(e) Functions. The DDR's main purpose is to display data and it does this automatically. The DDR can also perform several other jobs, called functions. These functions are of two types. Some of them relate to the way DDR communicates with the ATEC ECU in the truck, such as diagnostic codes and ranges. Other functions relate to the way the DDR itself operates, such as Snapshot, RS-232 Serial Port and Contrast Adjustment.

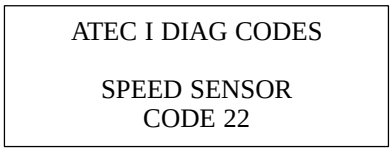
(f) Use of the FUNC key. For access to the functions, press the FUNC key. The DDR is programmed to provide access to only those functions that apply. If you see a function displayed, it is available to use. If you do not see a function displayed, it does not apply.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

(5) Diagnostic codes. When the ENTER key is pressed on the DIAGNOSTIC CODES selection, the DDR will display the code number, along with a description of the code(s) stored in the ATEC ECU.

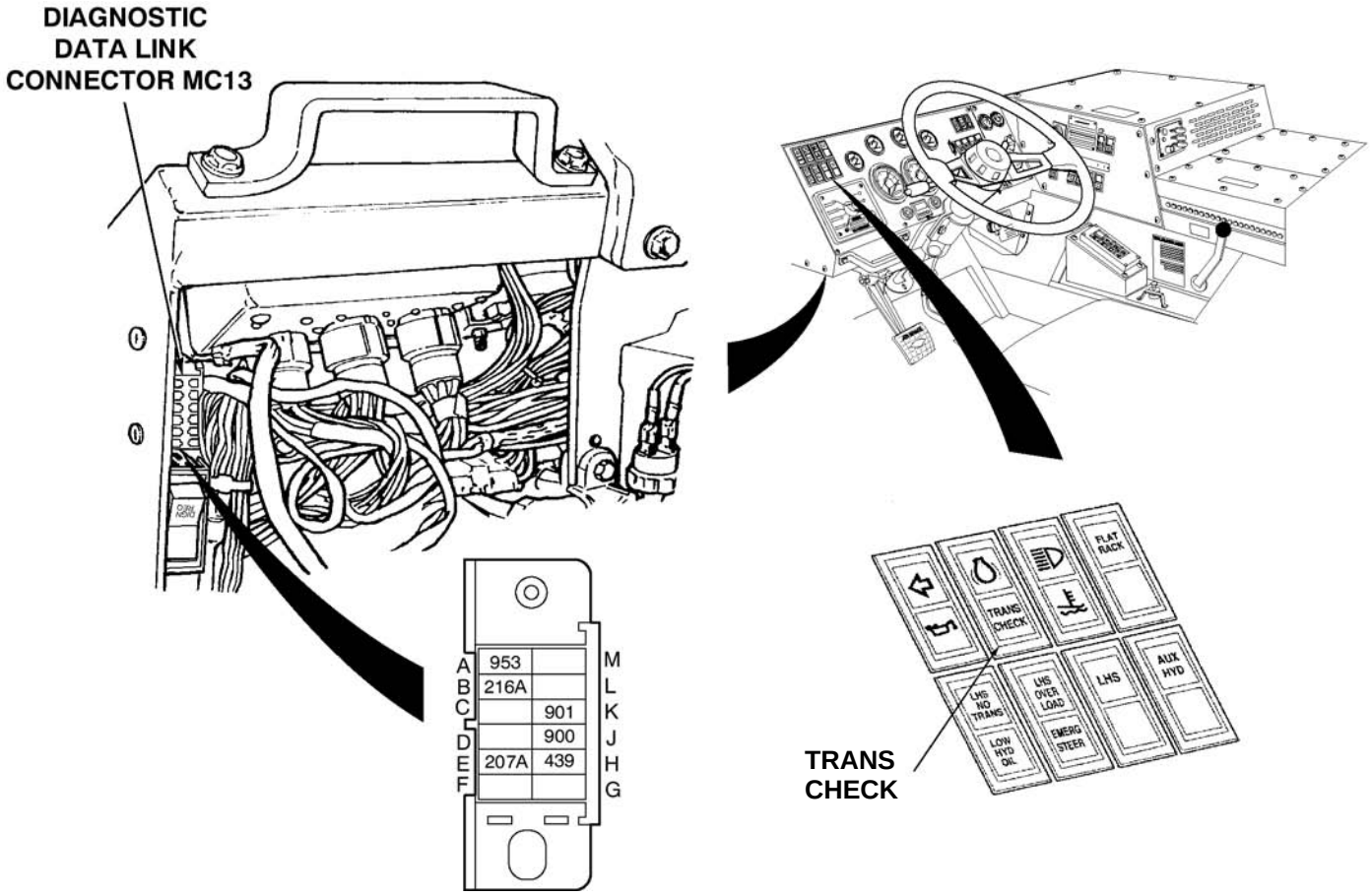
(a) When viewing DIAG CODES in the normal data list, the number on the left is usually a more severe code than the code on the right side of the display. If both memory locations have a code stored in the ATEC ECU, the arrows will appear on the bottom line of the code display screen.

(b) The readout contains the name of the system or component that caused the code to be set.



Data Readout Window

(c) Press the FUNC key to exit.



(6) Flashing ATEC codes. ATEC troubleshooting procedures are designed to be performed with the DDR. In situations where a DDR is not available, ATEC codes can be read by flashing them on the "TRANS CHECK" light. If "TRANS CHECK" light does not flash, no faults have been detected by ATEC since the last time the codes were cleared. For example, codes 13 and 23 will be flashed as follows:

(a) Turn OFF ENGINE switch (TM 9-2350-364-10).

(b) Place a jumper wire between terminals A and B on DDL connector MC13.

(c) Start engine, observe the "TRANS CHECK" light and record the codes being flashed.

(d) The "TRANS CHECK" light will flash once for the one in the number 13 and pause for about a half a second.

(e) Then the "TRANS CHECK" light will flash three times for the three in the number 13 and pause for about three seconds.

(f) After the three second pause, the "TRANS CHECK" light will flash two times for the two in the number 23 and pause for about a half a second.

(g) After the half second pause, the "TRANS CHECK" light will flash three times for the three in the number 23.

(h) The "TRANS CHECK" light will continue to flash in this manner until all of the ATEC codes in the ATEC ECM memory are displayed.

(i) Turn OFF the ENGINE switch when all of the ATEC codes are flashed.

(j) Remove the jumper wire.

(k) Proceed to ATEC Troubleshooting (TM 9-2320-364-20) and the first code flashed by the "TRANS CHECK" light.

(7) Clear ATEC codes.

(a) Turn OFF ENGINE switch (TM 9-2320-364-10).

(b) Place a jumper wire between terminals A and B on DDL connector MC13.

(c) Start engine (TM 9-2320-364-10).

(d) Observe “TRANS CHECK” light for codes being flashed.

(e) Apply brake and shift the transmission in the following sequence:

1 N (Neutral).

2 D (Drive).

3 R (Reverse) (Leave in reverse until “TRANS CHECK” light stops flashing, approximately five seconds).

4 N (Neutral).

(f) If “TRANS CHECK” light stops flashing, codes have been cleared and fault corrected.

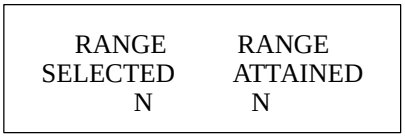
(g) If “TRANS CHECK” light continues flashing, fault has not been corrected.

(h) Turn OFF ENGINE switch.

(i) Remove jumper wire.

(8) Range selected/range attained. When the driver selects a specific range for the transmission, the ATEC ECU begins shifting the transmission through the various ranges, depending on operating conditions, until the selected range is attained. Under some conditions, the range selected and the range attained will be the same. In other cases, the transmission will not attain the range selected. This information is of diagnostic value.

(a) When you select this function, the DDR reads out the range selected and the range attained.



Data Readout Window

NOTE

In the diagnostic mode, the ATEC ECU update rate is approximately 1½ seconds. If the transmission is shifting rapidly, it is possible that the transmission may pass through several "attained" ranges more quickly than the readout can display them. This is not a fault of either the ATEC ECU or the DDR.

(b) In this mode, the update rate is about ¼ of a second, so the values received will be more accurate than in the normal data list mode.

(c) Range selected readout:

R - Reverse
N - Neutral
F5 - 1st through 5th (Drive)
F4 - 1st through 4th (Drive)
F3 - 1st through 3rd (Drive)
F2 - 1st through 2nd
F1 - 1st

(d) Range attained readout:

R2 - Second reverse
R - Reverse
N - Neutral
1C - 1st converter
1L - 1st lockup
2C - 2nd converter
2L - 2nd lockup
3C - 3rd converter
3L - 3rd lockup
4C - 4th converter
4L - 4th lockup
5C - 5th converter
5L - 5th lockup

(9) Custom data list. When you use your DDR to read data for an ATEC I system, it will be displayed in the same order each time because the list is fixed in the DDR's memory.

(a) There may be some instances when the programmed order of the data list is not convenient. For example, in order to solve a particular driveability problem, you need to look at TPS, Range SEL/ATT and Lockup RPM, all at the same time. But these three pieces of information are not together in the data list. The following text describes a method to watch all three items at the same time.

(b) Locate Custom Data List in the DDR Main Function menu and press ENTER.

(c) Once you enter the Custom Data List mode, you will be given a choice between continuing to use the standard list or creating a custom list. The default is STANDARD.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

SELECT DATA LIST DESIRED (STANDARD) CUSTOM

Data Readout Window

(d) Use the LEFT and RIGHT arrows to toggle to your choice and press ENTER. Refer to Steps 1 and 2 for STANDARD instructions; or Step (e) for creating a custom list.

1 If you choose STANDARD, one of two things happens. If there was no custom list already in memory, you will be returned to the menu. If a custom list is still in DDR memory, you will see:

RESET CUSTOM LIST ARE YOU SURE? YES [NO]

Data Readout Window

2 This display gives you the choice of continuing to use the existing custom list (choose NO) or creating a new custom list (choose YES). If you choose NO, you will return to the menu. If you choose YES, refer to Step (e) below. Press ENTER to confirm your choice.

(e) Creating a custom list. You are now ready to actually create a new custom list. The available diagnostic parameter list is displayed on the bottom line, one item at a time. Use the UP and DOWN arrow keys to scroll the list.

SELECT PARAMETER PRESS ENTER Current line = 2 RANGE SEL/ATT

Data Readout Window

1 Line 4 now automatically indexes to the next item in the data list. Notice that the number on line 3 indicates that you are ready to select the parameter you want to place on the second line of your custom list. Use the UP and DOWN arrow keys to locate RANGE SEL/ATT in the list on line 4 and press ENTER. RANGE SEL/ATT is now entered on the second line of your customized list. Continue this process until you have located and entered each item you want on your customized list.

2 Press FUNC to exit. You can now use your customized list to read data. It is also available in Snapshot.

NOTE

If you change your mind while creating a custom list, you can use the LEFT arrow key to back up through the list. When the item you wish to change appears, simply scroll the parameter list to locate the new item and ENTER it. Also note that backing up through the list erases each item you pass through. You will have to recreate the list from the point of the change item.

(10) Snapshot. The Snapshot function permits the DDR to record data while the truck is being driven. Then the data can be played back when you return to the shop. You can use this feature to locate operating problems that would be difficult to locate by any other method. Depending on truck type and the data rate, the DDR will record over 50 minutes of data.

NOTE

The amount of information that can be recorded is determined by the data update rate selected. Refer to Step (11)(f) (Data update rate).

(a) When you are using Snapshot, the DDR is continuously recording data. When the memory is filled, the oldest data is dropped and the new data is continuously added. When an operating condition occurs, the DDR puts a marker in the data recording so you can find the exact spot later during play back. We call this ability to mark data for play back a “trigger”. Because driveability problems are often related to diagnostic codes, one of your choices is to use a diagnostic code as the trigger. You can choose any code, or a specific code to be the trigger. Or you can trigger the recorder yourself manually if a suspicious driveability condition occurs.

(b) It is sometimes helpful to look at data that occurred before the operating condition happened, for instance, looking for an unnatural trend. It is also sometimes helpful to look at data that occurred after the operating condition happened. DDR allows you to decide ahead of time how much data will be retained before, as well as after, the trigger point.

(c) When you select the Snapshot function, you will see the Snapshot menu selection readout. Choices include Quick Trigger, Trigger Set-Up, Data Update Rate and Review Snapshot.

SNAPSHOT MODE XXX FRAMES FREE SELECTIONS QUICK TRIGGER

Data Readout Window

NOTE

The second line indicates the amount of frames of memory available to record data. Although there is no simple way to relate frames to the amount of driving time that will be recorded, generally a larger number translates into more minutes of recording time than a smaller number.

(d) Quick trigger. You will use Quick Trigger to start the snapshot process. If you are using Snapshot for the first time, selecting Quick Trigger automatically chooses the default operation. This is the manual Any Numeric Key trigger.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

(e) If you are ready to take a second or third snapshot, using Quick Trigger permits you to use the operating parameters you used before. This means you do not have to constantly reset parameters.

(f) Trigger setup. When you choose this menu entry, you can specify what will be used as the trigger.

SELECT SNAPSHOT TRIGGER SOURCE SELECTIONS ANY NUMERIC KEY

Data Readout Window

(g) Any numeric key. When you specify Any Numeric Key as the trigger, the DDR will place a marker in the recording at the time you press any of the numeric keys. You will probably use this trigger when you want to find the cause of a driveability problem that you can feel or hear when driving the truck. When the condition occurs, trigger the DDR by pressing any numeric key.

(h) After entering Any Numeric Key, you will be given the opportunity to adjust the memory trigger point. Refer to Step (n) (Adjust memory trigger point).

(i) If you choose diagnostic code as trigger source. If you decide to use a code as the trigger, you will be given two additional choices: Any Code or Specific Code.

SELECT SNAPSHOT TRIGGER SOURCE SELECTIONS ANY CODE

Data Readout Window

(j) If you use the ENTER key to choose Any Code, the DDR will recognize any diagnostic code as the trigger. You will now be given the opportunity to adjust the memory trigger point. Refer to Step (n) (Adjust memory trigger point).

(k) If you use the ENTER key to choose Specific Code, the DDR will give you the opportunity to specify which code you want as the trigger.

SELECT CODE CURRENT CODE [21] CODE 21

Data Readout Window

(l) The code presently chosen is enclosed in the brackets on line 2. There are two ways to choose another diagnostic code. You can input your choice with the numerical keys and press ENTER. Or you can use the UP and DOWN arrow keys to scroll the list. The code number choices appear on line 4. When you see the code you desire, press ENTER.

(m) You will now be given the opportunity to adjust the memory trigger point. Refer to Step (n) (Adjust memory trigger point).

(n) Adjust memory trigger point. You will get to this point, regardless of which trigger method you chose. Now you have the opportunity to determine where in memory you want the trigger.

```
DO YOU WISH
TO ADJUST THE MEMORY
TRIGGER POINT?
YES          [NO]
```

Data Readout Window

(o) If you do not wish to adjust the memory trigger point, press ENTER. The Snapshot function now begins. The readout displays the message: WAITING FOR TRIGGER.

```
ECU  A/N     16035879
DIAG CODES     21  32
TPS  128 CNTS  50  2%
WAITING FOR TRIGGER
```

Data Readout Window

NOTE

To find out what happens when the trigger occurs, refer to Step (11) (Processing trigger).

(p) If you do wish to adjust the memory trigger point, use the LEFT arrow key to toggle the indicator to YES and press ENTER. The display will now permit you to choose how much data you want retained in memory before and after the trigger point.

```
T  INDICATES LOCATION
   OF TRIGGER IN
      MEMORY
  BEG    MID    END
   [      T      ]
```

Data Readout Window

(q) Use the LEFT and RIGHT arrows to move the T to the place you want the trigger to be. If you do not move the T, the DDR will continue recording data after the trigger occurs, placing the trigger in the middle of the data recorded. If you place the T at the right, the DDR will quit recording data as soon as the trigger occurs. All of the data recorded will be before the trigger point. If you place the T at the left, the DDR will continue recording data after the trigger occurs, placing the trigger at the beginning of the data recorded.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

NOTE

- The DDR begins recording data as soon as you see WAITING FOR TRIGGER on the bottom line of the readout. The DDR has no way of knowing when an operating condition is going to occur. So, when memory is full, the oldest data is dropped to make room for new data, in a continuing circular process. The trigger point you select actually determines how long the recording continues after the trigger occurs.
- To find out what happens when the trigger occurs, refer to Step (11) (Processing trigger).

(11) Processing trigger. While the DDR is waiting for the trigger to occur, the bottom line reads WAITING FOR TRIGGER. As soon as the trigger occurs (numeric key, any code, or specific code), the bottom line reads PROCESSING TRIGGER. This notice remains until the DDR has taken sufficient data to satisfy the trigger point location you selected.

(a) When the recording is completed, the display will change to permit you to play back the data recorded.

```
ECU  A/N    16035879
DIAG CODES    21  32
TPS  128  CNTS 50  2%
T=27   C=14  GO TO...
```

Data Readout Window

NOTE

- Refer to Step (b) (Review snapshot) to learn how to interpret this display.
- Regardless of which trigger you have chosen, when PROCESSING TRIGGER is visible on the readout, you can terminate the recording process at any time by pressing a numeric key.

(b) Review snapshot.

NOTE

The Review Snapshot mode choice does NOT appear in the Snapshot menu until you have actually triggered a recording.

(c) Choose this mode to play back the data recorded.

```
ECU  A/N    16035879
DIAG CODES    21  32
TPS   128  CNTS  50  2%
T=27   C-14   GO TO...
```

Data Readout Window

(d) The top three lines contain data. Use the UP and DOWN arrow keys to scroll through the list.

(e) The bottom line contains the Snapshot operating information. The letter T indicates the number of the frame that contains the trigger. The letter C indicates the number of the frame you are CURRENTLY looking at. Use the LEFT and RIGHT arrow keys to increase or decrease the number of CURRENT frame. Observe the data as you move from one frame to the next. The display will show you the changes that took place. If you want to jump immediately to a specific frame, use the numeric keys to input the desired frame number. The numbers you input will replace the dashes after the GO TO. When you press ENTER, you will jump directly to the specified frame.

NOTE

- If you tell the DDR to GO TO a stream number larger than the highest one stored, the dashes will reappear.
- If you plan to print out the data just recorded, write down the frame numbers of the data streams you want to print. You will need to know these frame numbers when you enter the Print function.

(f) Data update rate. The data displayed by your DDR is updated at specified intervals. You can specify how often you want this to happen using Data Update Rate.

DATA UPDATE RATE SELECT DELAY THEN PRESS ENTER CURRENT=0.0 NEW=0.0

Data Readout Window

(g) The amount of time that elapses between updates is called the delay. This can be varied from 0.0 to 9.9 seconds. Use the numerical keys to input a NEW delay rate. When this rate is displayed, press ENTER. The DDR will return to the Snapshot menu.

(12) Contrast adjust. Contrast refers to the darkness of the readout letters and numbers when compared with the background. Under some viewing angles and at various air temperatures, you will be able to see the readout better if you adjust contrast.

NOTE

If you are using the DDR in direct sunlight, the heat of the sun may affect contrast. As temperature goes up, the display may darken. If so, adjust contrast.

(a) To adjust contrast, select the Contrast Adjust function.

DISPLAY CONTRAST TO CHANGE CONTRAST DEPRESS OR

Data Readout Window

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

(b) You can change contrast by holding down either the UP or DOWN arrow key. Both keys cause the contrast to move through its entire range. You must hold the key down for several seconds. After the contrast reaches minimum, the readout will seem to disappear. This is normal. Simply keep holding the key down and the readout will return.

(c) To exit Contrast Adjust, press the FUNC key.

NOTE

Each time the DDR is powered up, the contrast is automatically set at an average value.

(13) Restart. When you select Restart and press ENTER, the DDR system restarts from the beginning (Step [2]). The copyright screen will not appear. The display will read: REQUESTING ATEC DATA. Refer to Step (2)(b) (System selection procedure) earlier in this manual.

(14) ECU/A/N. The ATEC ECU and the calibration PROM together are identified by an 8-digit assembly number.

(15) Diagnostic codes. When certain conditions occur, a diagnostic code will be set in one of two memory locations of the ATEC ECU. Both memory locations are displayed and the code in the left position is usually more severe to transmission operation.

(16) TPS counts and percent (%). Throttle position sensor (TPS) monitors the position of the fuel control lever on the engine. The resulting voltage signal is converted to digital counts by the ATEC ECU. It is possible for the readout to range from 255 counts at idle to nearly 0 counts at open throttle. The throttle position count is converted by the ATEC ECU to percentage of throttle applied. It is possible for the readout to range from 0% (closed) to 100% (fully open).

(17) Range SEL. When the truck driver operates the shift selector in the truck cab, the readout indicates the range selected. Note that this is the range selected, not necessarily the range the transmission actually attains. Also refer to Step (18) (Range ATT). The readouts include:

R - Reverse	F4 - 1st through 4th (Drive)
N - Neutral	F3 - 1st through 3rd (Drive)
F2 - 1st through 2nd	F5 - 1st through 5th (Drive)
F1 - 1st	

(18) Range ATT. In response to the driver's request for a particular range, the ATEC ECU issues commands for the transmission to shift. Due to operating conditions, the range actually attained may or may not match the range selected. Also refer to Step (17) (Range SEL). The readouts include:

R2 - Second reverse	3C - 3rd converter
R - Reverse	3L - 3rd lockup
N - Neutral	4C - 4th converter
1C - 1st converter	4L - 4th lockup
1L - 1st lockup	5C - 5th converter
2C - 2nd converter	5L - 5th lockup
2L - 2nd lockup	

NOTE

In the diagnostic mode, the ATEC ECU update rate is approximately 1½ seconds. If the transmission is shifting rapidly, it is possible that the transmission may pass through several "attained" ranges more quickly than the readout can display them. This is not a fault of either the ATEC ECU or the DDR.

(19) The readout displays the transmission output shaft speed (rpm) when the transmission made its last range upshift or downshift. Converter lockups are excluded. Due to the slow update rate of the ATEC ECU, be careful to match the displayed value with the proper shift. If you are not certain, use the transmission HOLD feature to inhibit unwanted shifts.

(20) A speed sensor is located on the rear cover of the transmission to detect output shaft rpm. The readout shows actual transmission output shaft speed in revolutions per minute; the readout lower limit is 60 rpm.

(21) The readout indicates the transmission output shaft speed (rpm) when the last converter lock-up (engage or disengage) occurred. When the converter is locked up (engaged), it provides a direct mechanical link from the engine through the converter. When the converter is not locked (disengaged), the converter pump and turbine are connected by hydraulic fluid only. Lock-up rpm is generally different at closed and open throttle positions.

(22) Oil temperature. A temperature sensor is located in the transmission sump on CLT755 transmission. It is located in the lock-up valve body assembly. High oil temperature may result from overfilling or cooling system problems. Low oil temperature may result from cold weather conditions. The readout provides both Fahrenheit (-60°F to 350°F) and Celsius (-51°C to 177°C).

(23) FWD PRESS SW. A pressure switch in the transmission detects if the transmission has attained a forward range. The readout is ON when there is forward pressure and OFF when there is no forward pressure. Because the ATEC ECU needs input from both forward and reverse switches to determine neutral range, refer to Step (24) (REV PRESS SW). Neutral is indicated when both readings are OFF.

(24) REV PRESS SW. A pressure switch in the transmission detects if the transmission has attained a reverse range. The readout is ON when there is reverse pressure and OFF when there is no reverse pressure. Because the ATEC ECU needs input from both forward and reverse switches to determine neutral range, refer to Step (23) (FWD PRESS SW). Neutral is indicated when both readings are OFF.

(25) When the transmission has been placed in reverse range, the readout indicates ON as a reverse warning signal. When the transmission is shifted from reverse range, the readout displays OFF.

NOTE

Oil level and fluidic sensor systems are used to detect low oil level conditions. The readout is OFF when a low oil level condition is detected. The readout is ON when the oil level is above the low oil level detection point.

(26) Oil lube/LVL SW. This type of oil condition indicator is fluidic. The switch is used in the PLS truck.

(27) Retard request. On the PLS truck, an instrument panel-mounted control is used to request operation of the engine brake. The readout indicates ON when the engine brake is requested and OFF when the engine brake is not requested. Refer to Step (28) (Retard command) for further information.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

(28) Retard command. When the retard control is operated (see Step [27] Retard request) the ATEC ECU gives a command to operate the engine brake. The readout indicates YES when the retard command is given and NO when the command is not given.

(29) Special input. This readout indicates the position of a special input switch used for certain options, ON or OFF.

(30) Range commanded. This is the output signal to indicate that a specific gear range has been attained. The readout is YES or NO.

(31) Input voltage. The readout indicates the voltage available to the ATEC ECU.

e. Measurements Required for Troubleshooting.

CAUTION

Use proper sized test leads and ensure care is used when checking for resistance, continuity or voltage at connectors or damage to equipment can result.

(1) Resistance measurements.

(a) Connect red test lead to Volt-Ohm input connector and black lead to COM input connector on meter.

(b) Set the function/range switch to the desired ohm position. If the magnitude of the resistance is not known, set the switch to the highest range, then reduce until a satisfactory reading is obtained.

(c) If the resistance being measured is connected to a circuit, turn ENGINE switch OFF.

(d) Connect test leads to the circuit being measured. When measuring high resistance, be careful not to contact adjacent points, even if they are insulated. Some insulators have a relatively low insulation resistance which can affect the resulting measurement.

(e) Read the resistance value on the digital display.

(2) Continuity checks.

(a) Place the function/range switch in any ohm range.

NOTE

Some meters show “1+m”, or simply “1” when function/range switch is in any ohm position.

(b) Connect the red test lead to the Volt-Ohm input connector and black lead to COM input connector on the meter. When the test leads are separated or measuring an out-of-range resistance, the digital display will indicate “OL’’ (Over Limit).

(c) Put one test probe at one end of the wire or circuit to be tested. Use the other test lead to trace the circuit. When continuity is established, an ohm symbol will appear in the upper left corner of the digital display. If contact in the wire is maintained long enough (about ¼ of a second), the OL will disappear and the resistance value of the wire or circuit will appear next to the symbol.

(d) If your multimeter does not work in this manner, learn how it operates before performing troubleshooting.

(3) Voltage measurements. The PLS truck is equipped with both 12 vdc and 24 vdc circuits. Troubleshooting procedures will reference 12 vdc and 24 vdc measurements, however these values can vary. When the batteries are fully charged, 12.6 vdc can be measured on an open 12 volt circuit and 14.5 vdc can be measured when the engine is running at 1000 rpm. When the batteries are fully charged, 25.2 vdc can be measured on an open 24 volt circuit and 29 vdc can be measured when the engine is running at 1000 rpm.

(a) Connect the red test lead to the volt-ohm input connector and the black lead to the COM input on the meter. If a DC-AC switch is present, make sure it is set to the DC position.

(b) Set the function/range switch to the desired volts position. If the magnitude of the voltage is not known, set the switch to a range which will be able to read most voltages seen on the truck (typically, a 200V range will do). Then reduce the range until a satisfactory reading is obtained.

(c) Connect the test leads to the circuit being measured. In the DDEC II diagnostic procedures, voltage measurements are always given as being taken at pins, sockets, battery (+) or ground. Following the voltage measurement point, the color test lead tube used is given in parenthesis (red is volt-ohm connection and black is the COM connection).

f. General Relay Troubleshooting Procedures. The following general relay troubleshooting procedures apply to all PLS relays.

NOTE

Configuration data covering each relay is listed in Table 2-3.

(1) Pull relay out of socket just enough for the relay terminals to make contact with receptacle terminals. Leave about 1/4 to 3/8 in. (6.35 to 9.53 mm) space between the relay and relay socket to insert a multimeter lead and make contact with the terminal listed in the troubleshooting test.

(2) Perform truck operation that will actuate the relay in question.

g. General Wire Test Procedures. PLS troubleshooting isolates problems down to the components that could cause a specific failure. When all of the components in a circuit are tested without isolating a fault, the wires are the only other components that could be suspected of being damaged. Each wire that must be tested may pass through two or more connectors. The following procedures provide general instructions for testing electrical wires. These procedures will either attempt to measure a voltage at the working end of a circuit or continuity from the power end of a specific wire to the working end. Before either of these tests are performed, all connectors in the circuit must be checked for looseness.

CAUTION

Use proper sized test leads and ensure care is used when checking for resistance, continuity or voltage at connectors or damage to equipment can result.

(1) Wire voltage drop test.

(a) Disconnect connector from the component (light, relay, motor, etc.) at the working end of the circuit.

(b) Check connector terminal(s) for damage; repair or replace connector as necessary.

(c) Setup truck conditions that will create voltage at the working end of the wire.

2-8. TROUBLESHOOTING INSTRUCTIONS (CONT).

NOTE

PLS is equipped with 12 vdc and 24 vdc circuits. The troubleshooting fault that referenced these general wire tests will provide voltage information for testing wires.

(d) Check for the required voltage at the working end of the wire.

1 If the required voltage is not measured at the working end of the wire, go to Step (e).

2 If the required voltage is measured at the working end of the wire, the fault has not been isolated. Continue with the fault isolation tests or notify supervisor.

(e) Disconnect the first connector in line from the working end of the wire to the power source.

(f) Check for the required voltage at the working end of the wire.

1 If the required voltage is not measured at the working end of the wire, go to Step (g).

2 If the required voltage is measured at the working end of the wire, a fault is in the section of wire most recently disconnected. Repair the wire and perform the voltage test again.

(g) Repeat Steps (d) and (e) until all sections of the suspect wire are tested.

(2) Wire continuity test.

(a) Disconnect wire from the component (light, relay, motor, etc.) at the working end of the circuit and from the power end.

(b) Setup truck conditions that will create the desired circuit.

(c) Check continuity from power end of the wire to the working end of the wire.

1 If continuity is not measured go to Step (d).

2 If continuity is measured, the fault has not been isolated. Continue with the fault isolation tests or notify supervisor.

(d) Disconnect the first connector from the working end of the wire in line to the power source.

(e) Check continuity.

1 If continuity is not measured, go to Step (f).

2 If continuity is measured, a fault is in the section of the wire most recently disconnected. Repair the wire and perform the continuity test again.

(f) Repeat Steps (d) and (e) until all sections of the suspect wire are tested.

(3) Wire harness shorting wires test.

(a) Disconnect wire harness connector with wire suspected of damage.

Table 2-3. Relay Configuration Data

Voltage	Relay No.	Nomenclature	Terminal No./Wire No. 30	85	86	87	87A	Coil Resistance	12 vdc into Relay at Terminal	24 vdc into Relay at Terminal	Contact Position 30 to 87A and 30 to 87 at Position
12 volt	R1	Head Lts	1927	1049	1435	1017/ 1017	--	Position 85-86/ 85 ± 15 ohms	85 30		Closed Open
12 volt	R2	Cl. Lts	1835	1920	1435/ 1435	1012/ 1017	--	Position 85-86/ 85 ± 15 ohms	85 30		Closed Open
12 volt	R3	Horn	1026	1031	1016	1168	--	Position 85-86/ 85 ± 15 ohms	85 30		Closed Open
12 volt	R4	Work Lt	1040	1040A	1435/ 1435	1040B	--	Position 85-86/ 85 ± 15 ohms	85 30		Closed Open
12 volt	R5	Dimmer	1017	1017A	1435/ 1435	1007	1006	Position 85-86/ 85 ± 15 ohms	85 30		Closed Open
12 volt	R6	Beacon	1413	1184	1435/ 1435	1029	--	Position 85-86/ 85 ± 15 ohms	85 30		Closed Open
12 volt	R7	Trans	1713	508/ white	1711/ white	1839	--	Position 85-86/ 85 ± 15 ohms	86 30		Closed Open
12 volt	R8	Retarder	1839/ 211	213	1871/ 1871	1716/ 1714	--	Position 85-86/ 85 ± 15 ohms	86 30		Closed Open
12 volt	R9	Ck. Trans	1409	215	1517	--	1435	Position 85-86/ 85 ± 15 ohms	86 30		Closed Open
12 volt	R10	Reverse	1891	214	1871/ 1871	1149	--	Position 85-86/ 85 ± 15 ohms	86 30		Closed Open
12 volt	R11	Neutral	1021/ 1021	231	1871/ 1871	1021A	--	Position 85-86/ 85 ± 15 ohms	86 30		Closed Open
24 volt	R12	24 Volt	1189	1435/ 1435	1872	1189	--		30	86	Closed Open

Table 2-3. Relay Configuration Data - CONT.

Voltage	Relay No.	Nomenclature	Terminal No./Wire No. 30	85	86	87	87A	Coil Resistance	12 vdc into Relay at Terminal	24 vdc into Relay at Terminal	Contact Position 30 to 87A and 30 to 87 at Position
12 volt	R13	Trailer B.O. Stop	1676/ 1676	1435/ 1435	1678	1678C	--	Position 85-86/ 85 ±15 ohms	86 30		Closed Open
12 volt	R14	Trailer Serv Tail	1676/ 1676	1435/ 1435	1017	1008C	--	Position 85-86/ 85 ±15 ohms	86 30		Closed Open
12 volt	R15	L.H. Turn	1676/ 1676	1435/ 1435	1003	1003C	--	Position 85-86/ 85 ±15 ohms	86 30		Closed Open
12 volt	R16	R.H. Turn	1676/ 1676	1435/ 1435	1004	1004C	--	Position 85-86/ 85 ±15 ohms	86 30		Closed Open
12 volt	R17	Trailer B.O. Tail	1676	1435/ 1435	1680	1680C	--	Position 85-86/ 85 ±15 ohms	86 30		Closed Open
24 volt	R18	DDEC	1075B	1435	1872	1871	--			86 30	Closed Open
24 volt	R19	Trans DDEC	1867	1435/ 1435	1872/ 1872	1875	--			86 30	Closed Open
24 volt	R20	Interaxle	1882/ 1882	1884	1888/ 1888	1889	--			86 30	Closed Open
24 volt	R21	Diff Lock	1882	1885	1888	1890	--			86 30	Closed Open
24 volt	R22	Crane Hi Idle	510	231	1737	510	--			86 30	Closed Open
24 volt	R23	Hi Range Lockout	1885	1435/ 1435	1095	1885	--			86 30	Closed Open
24 volt	R24	T.C. Dual Mode	309	1435/ 1435	1095	315/ 313	--			86 30	Closed Open

(b) Set multimeter select switch to ohms.

(c) Connect positive (+) multimeter lead to harness connector terminal of the suspected wire.

(d) Connect negative (–) multimeter lead to each of the other terminals in the harness connector.

1 If there is continuity, the suspected wire and the wire where continuity is measured are shorting together; repair wire.

2 If there is no continuity, all wires are OK.

(4) Wire repair. Refer to TM 9-2320-364-20 for the repair of wire harness connectors. Refer to TM 43-0158 for detailed instructions concerning electrical wiring repairs. Wire harness repair is limited to splicing and taping of wires at Unit Maintenance. If a wire harness cannot be repaired, notify DS Maintenance.

2-9. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING.

a. Page Layout. Troubleshooting procedures are divided into logic tree pages and test pages.

(1) A logic tree page is always a left-hand page, facing the test page on the right. The logic tree page provides the sequence of steps required to isolate a fault to a failed component. All critical information for decision making is on the left-hand page. Each logic tree page contains the following information:

(a) **INITIAL SETUP** - This box is located only on the first logic tree page of a fault. INITIAL SETUP lists tools, materials, references, personnel and equipment needed to troubleshoot the fault.

(b) **KNOWN INFO** - This box is located in the top left-hand column. KNOWN INFO lists conditions and information that will eliminate specific components as the cause of the fault.

(c) **POSSIBLE PROBLEMS** - This box is located directly below KNOWN INFO. All of the system components that could cause a fault are listed in the POSSIBLE PROBLEMS box. The first component listed in the POSSIBLE PROBLEMS box is the one that will be tested at that step in the logic sequence. When one of the components is tested and found to be operational, it is entered at the bottom of the KNOWN INFO box as OK.

(d) **QUESTION** - Each question, located in the middle column, refers to the first possible problem listed in POSSIBLE PROBLEMS. If the answer to the question is YES, proceed to the next step. If the answer is NO, follow the NO arrow to obtain directions for correcting the problem. If the step contains a WARNING or CAUTION message, a small shadow box is printed above the question. Text for WARNINGs or CAUTIONs is on the following right-hand page.

(e) **TEST OPTIONS** - This box is located in the top right-hand column. TEST OPTIONS lists tests available for testing parts suspected of failing.

(f) **REASON FOR QUESTION** - This box is located directly below TEST OPTIONS. It explains the purpose for the question in the middle column.

2-9. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT).

(2) A test page is always a right-hand page, facing the logic tree page on the left. The test provides detailed instructions for testing the first component listed in the POSSIBLE PROBLEMS box. This test will also provide an answer for the question in the middle column. Note the arrow connecting the test on the right-hand page to the REASON FOR QUESTION. When possible, illustrations are included to provide visual details. Warnings, cautions, and notes contain additional information for testing.

b. How to Begin Troubleshooting.

(1) Determine the symptom or condition that indicates a problem or failure. Troubleshooting is divided into symptoms peculiar to a truck system or component, for example: air system or engine. Refer to the Troubleshooting Fault Index (Table 2-4). Follow DDEC II and DDEC III Troubleshooting BEFORE going to Engine Troubleshooting.

(2) Go to the referenced page to begin troubleshooting. Open the manual flat so both the left-hand and right-hand pages are displayed before you. The information on both pages is important to resolve the problem or failure. However, the experienced technician can follow the left-hand page instructions and refer to the right-hand page when necessary.

(3) Follow the Diagnostic Procedure. Answer question no. 1 on the left-hand page and follow the YES or NO path to either the remedy or the next question. If necessary, look on the right-hand page for test instructions and illustrations.

(4) Observe warnings, cautions and notes. The formatting and symbols used in this manual for warnings, cautions and notes are as follows:

WARNING

This is the symbol for a warning statement. If you see the word WARNING above a question on the left-hand page, look on the right-hand page for the text of the message. WARNINGs describe a situation which could cause severe injury or death to personnel.

CAUTION

This is the symbol for a caution statement. If you see the word CAUTION above a question on the left-hand page, look on the right-hand page for the text of the message. CAUTIONs describe a situation which could cause damage to equipment.

NOTE

This is the symbol for a note. Notes are located directly above the test to which they refer. Notes provide additional information for performing a test.

c. Abbreviations and Commonly Used Terms.

(1) A/D - Analog to Digital: The computer inside the DDEC ECM uses an A/D converter to convert a sensor voltage into a number with which the computer can work.

(2) Active Codes - These are the codes that currently keep the Check Engine Light on. They can only be read using the Diagnostic Data Reader.

(3) BAT - Battery.

(4) CEL - Check Engine Light: Mounted on the dash panel. Has two functions:

(a) Serves as a warning lamp to tell the driver that a problem has occurred and that the truck should be taken in for service as soon as possible.

(b) Serves as a light bulb check and system check. The Check Engine Light (CEL) will come on for about 5 seconds when the ENGINE switch is turned ON. If the CEL remains on, the self-diagnostics system has detected a problem. If the problem goes away, the light will go out, but the HISTORICAL trouble code will be stored in the DDEC ECM memory.

(5) CGL - Check Gages Light: Mounted on the dash, it lights to warn the driver when a potential engine damaging condition has been detected (low oil pressure, low coolant, or engine over temperature). As a light bulb check, the CGL will come on for about 5 seconds when ignition switch is placed in the ON position.

(6) CKT - Circuit.

(7) COM - Common.

(8) DCA - Diagnostic Connector Assembly: An electrical harness on the truck which allows the STE/ICE-R to be powered and to make measurements of key truck signals from a single connection. In addition to many basic electrical signals such as starter voltage and current, it includes engine speed and fuel return pressure. The STE/ICE-R can make TK measurements while connected to the DCA.

(9) DDEC II - The Detroit Diesel Electronic Controls, second generation.

(10) DDEC III - The Detroit Diesel Electronic Controls, third generation.

(11) DDL - Diagnostic Data Link: The lines (wires) over which the DDEC ECM communicates information to be read by a Diagnostic Data Reader.

(12) DDR - Diagnostic Data Reader: The hand-held tool used for troubleshooting with the DDEC (DDR or PRO-LINK 9000).

(13) Diagnostics - Troubleshooting by following an exact procedure.

(14) DL+ - Data Link, positive side. Used for communications to the Diagnostic Data Reader, as well as other applications.

(15) DL– - Data Link, negative side. Used for communications to the Diagnostic Data Reader, as well as other applications.

(16) DREQ - Diagnostic Request Terminal: The pin on the DDL connector which must be grounded to obtain diagnostic codes (pin M).

(17) ECM - Electric Control Module: The brains of DDEC II and DDEC III. It receives input from the DDEC II and DDEC III sensors and switches, calculates injector firing times and duration (using a built-in computer) and fires the injectors at the appropriate times. The ECM is powered by a 12 vdc input voltage.

(18) EEPROM - Electronically Erasable Programmable Read Only Memory: Contains the engine calibration.

(19) EFPA - Electronic Foot Pedal Assembly.

(20) Erratic - Intermittent.

2-9. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT).

(21) EUI - Electronic Unit Injector.

(22) Historical Codes - All codes kept in DDEC ECM memory (may not trip the CEL). These codes can be cleared by using the Diagnostic Data Reader.

(23) OPS - Oil Pressure Sensor: Monitors oil pressure at the main oil gallery.

(24) OTS - Oil Temperature Sensor: Monitors oil temperature in the turbo oil supply line.

(25) PW - Pulse width: The amount of time in crank degrees that the DDEC ECM is requesting the injectors to be turned on.

(26) SRS - Synchronous Reference Sensor: Detects when the first cylinder in the firing order is about to be fired.

(27) STE/ICE-R - Simplified Test Equipment for Internal Combustion Engines - Reprogrammable: A testing system used for performing tests and measurements on the truck. In addition to acting as a conventional digital multimeter to measure voltage, current and resistance, it is also capable of measuring pressure, speed, compression, unbalance, engine power and some specialized battery and starter evaluations. It is powered by the truck batteries. The complete system includes a truck test meter (VTM), a transducer kit (TK), cables, transit case and technical publications. STE/ICE tests are referenced.

(28) System - A collection of devices which all are related to each other because they depend on each other to do some function or job. For example, the function of the fuel system is to inject fuel into the cylinders at the correct time in the correct amount and with the correct quantity. The collection of devices that are required to do this include the fuel pump, fuel lines, lift pump, fuel filter and injectors.

(29) TBS - Turbo Boost Sensor: Used to monitor turbo boost pressure. The sensor generates a voltage (from 0 to 5 volts) which is proportional to pressure.

(30) Test Chain: A series of tests to be followed in a particular order or sequence (numbered).

(31) TPS - Throttle Position Sensor: Used to detect throttle position (percent of throttle).

(32) Troubleshooting - The process of making measurements and observing the operation of the truck to find out if and where any problems exist.

(33) TRS - Timing Reference Sensor: Detects whenever any cylinder is about to be fired.

(34) VIN - Vehicle Identification Number.

(35) VTM - Truck Test Meter: A box which performs the measurement and analysis functions of the STE/ICE-R system.

Table 2-4. Troubleshooting Fault Index

Fault Number	Troubleshooting Procedure	Page Number
ENGINE SYSTEM FAULT INDEX		
1.	Engine Does Not Develop Full Power	2-44
2.	Engine Overheats (Water Temperature Gage Continuously Reads Over 230°F [110°C])	2-64
3.	Low Engine Oil Pressure (Less Than 5 psi [34 kPa]) At Idle, Less Than 40 psi (276 kPa) During Normal Operation	2-70
4.	Excessive Black Or Gray Exhaust Smoke (Engine At Normal Operating Temperature)	2-80
5.	Excessive Oil Consumption Or Blue Exhaust Smoke (Engine At Normal Operating Temperature)	2-92
6.	White Exhaust Smoke (Engine At Normal Operating Temperature)	2-104
TRANSMISSION SYSTEM FAULT INDEX		
1.	Low Oil Level Sensor Circuit Faulty	2-116
2.	Forward Pressure Switch Circuit Faulty	2-124
3.	Reverse Pressure Switch Circuit Faulty	2-130
4.	Oil Temperature Sensor Circuit Faulty	2-136
5.	Solenoids J, F, D, C, B, A, G, E Or H Circuit Faulty	2-140
6.	Transmission Overheats (Trans Temp Gage Continuously Reads Over 220°F [104° C])	2-146
7.	Transmission Unusually Noisy When Operating	2-152
8.	Transmission Will Not Shift Into Gear, Shifts Out Of Gear, Does Not Respond To Range Selection, OrOperates Abnormally	2-160
9.	Engine Stalls When Transmission Is Shifted Into Gear	2-168

Table 2-4. Troubleshooting Fault Index (CONT).

Fault Number	Troubleshooting Procedure	Page Number
AIR SYSTEM FAULT INDEX		
1.	Air Pressure Buildup Is Slow	2-178
2.	Noisy Air Compressor Operation	2-184
MAIN HYDRAULICS SYSTEM FAULT INDEX		
1.	Crane And Winch Operate Slowly	2-192
2.	Fan, LHS, Winch And Crane Do Not Operate Or Operate Slowly	2-196
3.	LHS, Winch And Crane Operate Slowly	2-202
4.	Fan Does Not Operate	2-206
5.	Fan Speed Does Not Decrease From High To Low Speed	2-214
6.	Fan Does Not Operate At High Speed	2-224
7.	Hydraulic System Operation Unusually Noisy	2-240
LOAD HANDLING SYSTEM (LHS) FAULT INDEX		
1.	Loss Of Hook Arm Safe Lowering	2-250
2.	Loss Of Middle Frame Safe Lowering	2-264
3.	Hook Arm Does Not Load	2-270
4.	Hook Arm Does Not Unload	2-286
5.	Loss Of Hook Arm Load Holding	2-302
6.	Middle Frame Does Not Load	2-322
7.	Middle Frame Does Not Unload	2-342
8.	Middle Frame Does Not Operate	2-360
9.	LHS Does Not Operate Or Operates Slowly	2-370
10.	Loss Of Middle Frame Load Holding	2-390
11.	LHS Hook Arm Disengages From Flatrack While Unloading	2-410

Table 2-4. Troubleshooting Fault Index (CONT).

Fault Number	Troubleshooting Procedure	Page Number
CRANE SYSTEM FAULT INDEX		
1.	Outriggers Do Not Operate Or Operate Slowly	2-428
2.	LH Outrigger Does Not Operate	2-446
3.	RH Outrigger Does Not Operate	2-460
4.	Four Valve Bank Functions (Swing, Lift, Telescope And Hoist) Do Not Operate Or Operate Slowly	2-474
5.	Mast Does Not Operate Or Operates Slowly	2-482
6.	Mast Does Not Raise	2-502
7.	Mast Does Not Lower	2-508
8.	Crane Does Not Swing Or Swings Slowly	2-514
9.	Crane Does Not Swing Clockwise (CW)	2-532
10.	Crane Does Not Swing Counter Clockwise (CCW)	2-540
11.	Boom Does Not Telescope In Or Telescopes In Slowly	2-548
12.	Boom Does Not Telescope Out Or Telescopes Out Slowly	2-562
13.	Boom Does Not Telescope Or Telescopes Slowly	2-576
14.	Boom Does Not Raise Or Raises Slowly	2-590
15.	Boom Does Not Lower Or Lowers Slowly	2-604
16.	Boom Does Not Operate Or Operates Slowly	2-614
17.	Boom Creeps Down	2-628
18.	Hoist Does Not Operate Or Operates Slowly	2-640
19.	Hoist Does Not Lower	2-650
20.	Hoist Does Not Raise	2-660

Table 2-4. Troubleshooting Fault Index (CONT).

Fault Number	Troubleshooting Procedure	Page Number
CRANE SYSTEM FAULT INDEX (CONT).		
21.	Crane Fails Load Test	2-674
22.	Overload Shutdown System (OSS) Disables Crane Functions, Boom Up, Boom Down, Telescope Out And Hoist Up	2-708
WINCH SYSTEM FAULT INDEX		
1.	Self-Recovery Winch (SRW) Does Not Operate	2-728
STEERING SYSTEM FAULT INDEX		
1.	Truck Is Hard To Steer	2-746

2-10. ENGINE TROUBLESHOOTING.

This paragraph covers Engine System Troubleshooting. The Engine System Fault Index, Table 2-5, lists faults for the engine system of the PLS truck.

Table 2-5. Engine System Fault Index

Fault No.	Description	Page
1.	Engine Does Not Develop Full Power	2-44
2.	Engine Overheats (Water Temperature Gage Continuously Reads Over 230°F [110°C])	2-64
3.	Low Engine Oil Pressure; (Less Than 5 psi [34 kPa] At Idle, Less Than 40 psi [276 kPa] During Normal Operation)	2-70
4.	Excessive Black Or Gray Exhaust Smoke (Engine At Normal Operating Temperature)	2-80
5.	Excessive Oil Consumption Or Blue Exhaust Smoke (Engine At Normal Operating Temperature)	2-92
6.	White Exhaust Smoke (Engine At Normal Operating Temperature)	2-104

2-10. ENGINE TROUBLESHOOTING (CONT).

1. ENGINE DOES NOT DEVELOP FULL POWER.

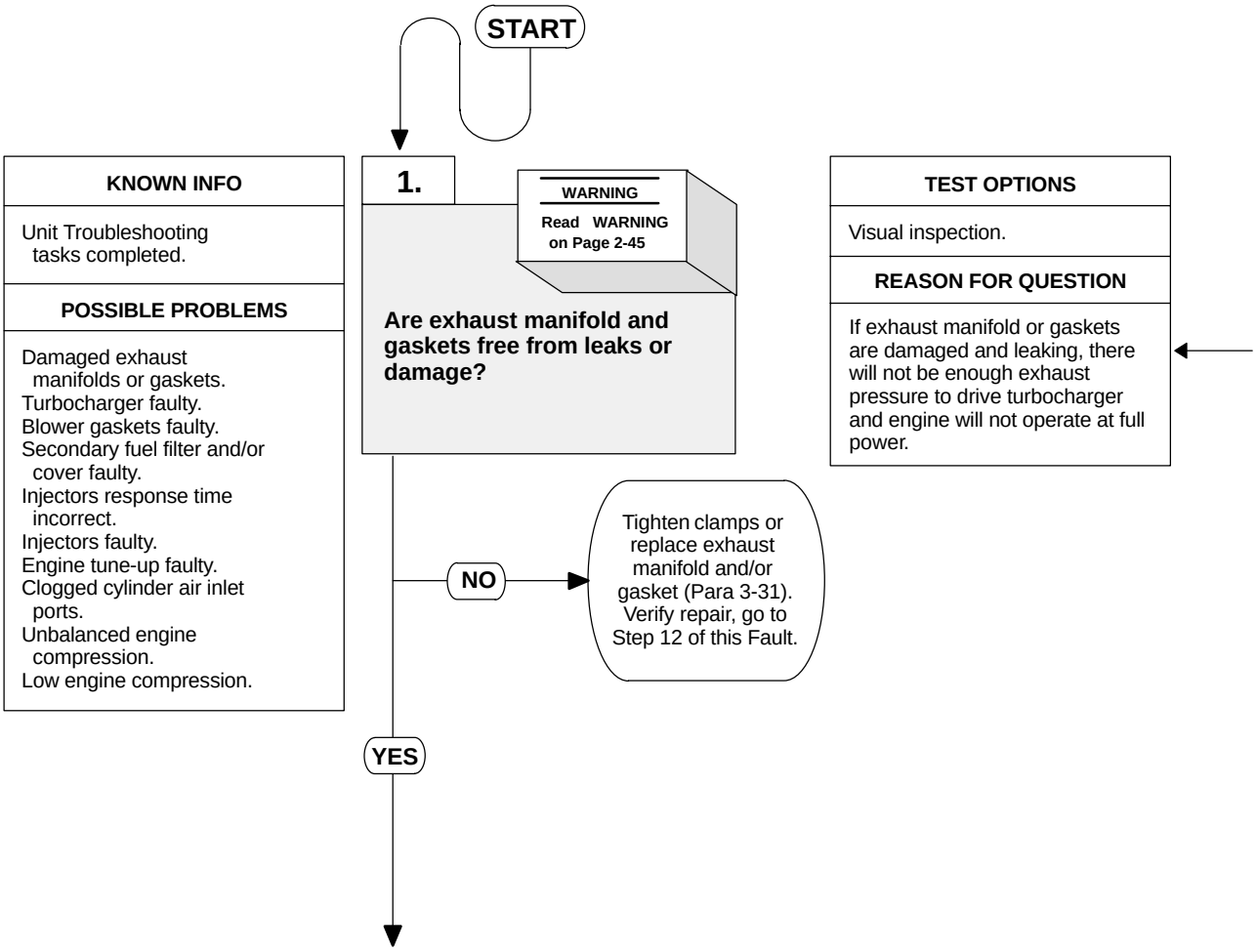
INITIAL SETUP

Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Analyzer Set, STE/ICE-R (Item 15, Appendix F)
- Cartridge, DDEC (Item 29, Appendix F)
- Connector Remover (Item 42, Appendix F)
- Reader, Diagnostic (Item 180, Appendix F)

Materials/Parts
- Solution, Soap (Item 67, Appendix B)
- Gasket (2) (Item 115, Appendix E)
- Gasket (4) (Item 116, Appendix E)
- Lockwasher (30) (Item 282, Appendix E)

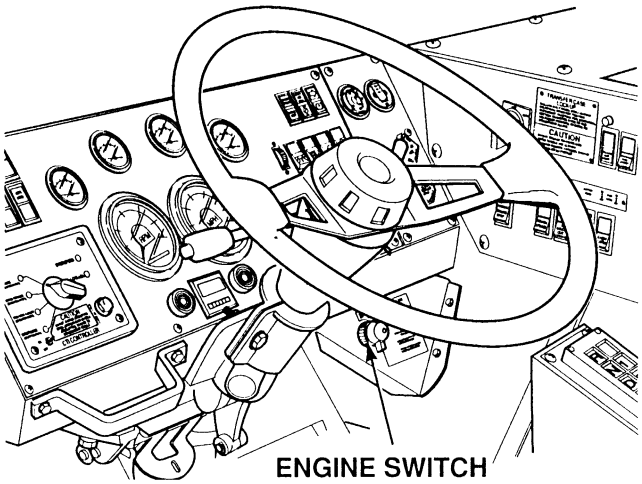
References
- TM 9-2320-364-10
- TM 9-2320-364-20
- TM 9-4910-571-12&P

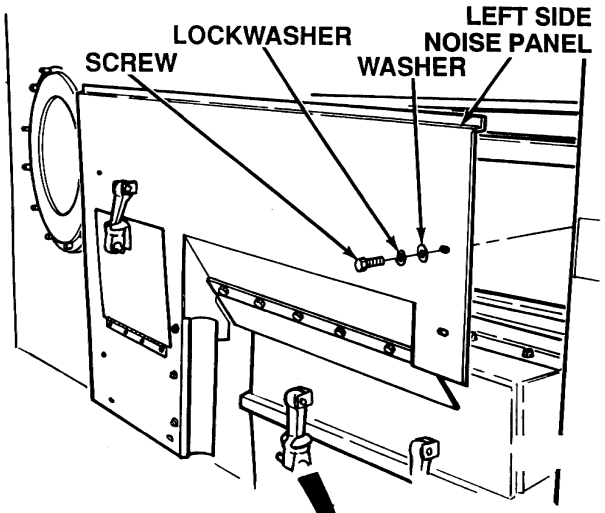
Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)



WARNING

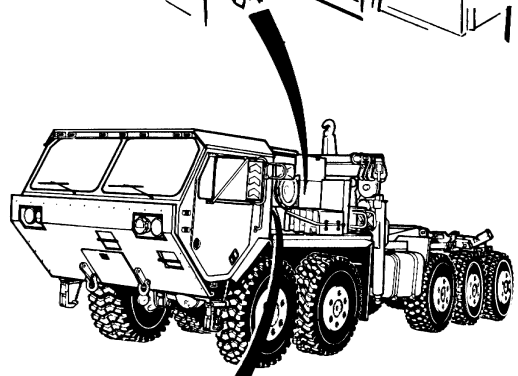
Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

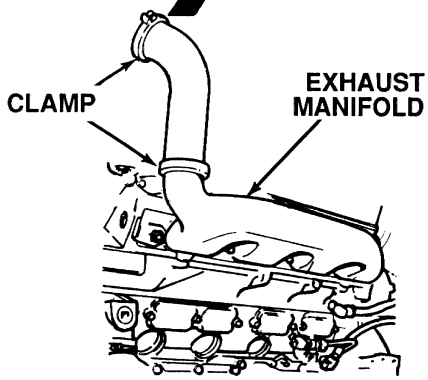




VISUAL INSPECTION

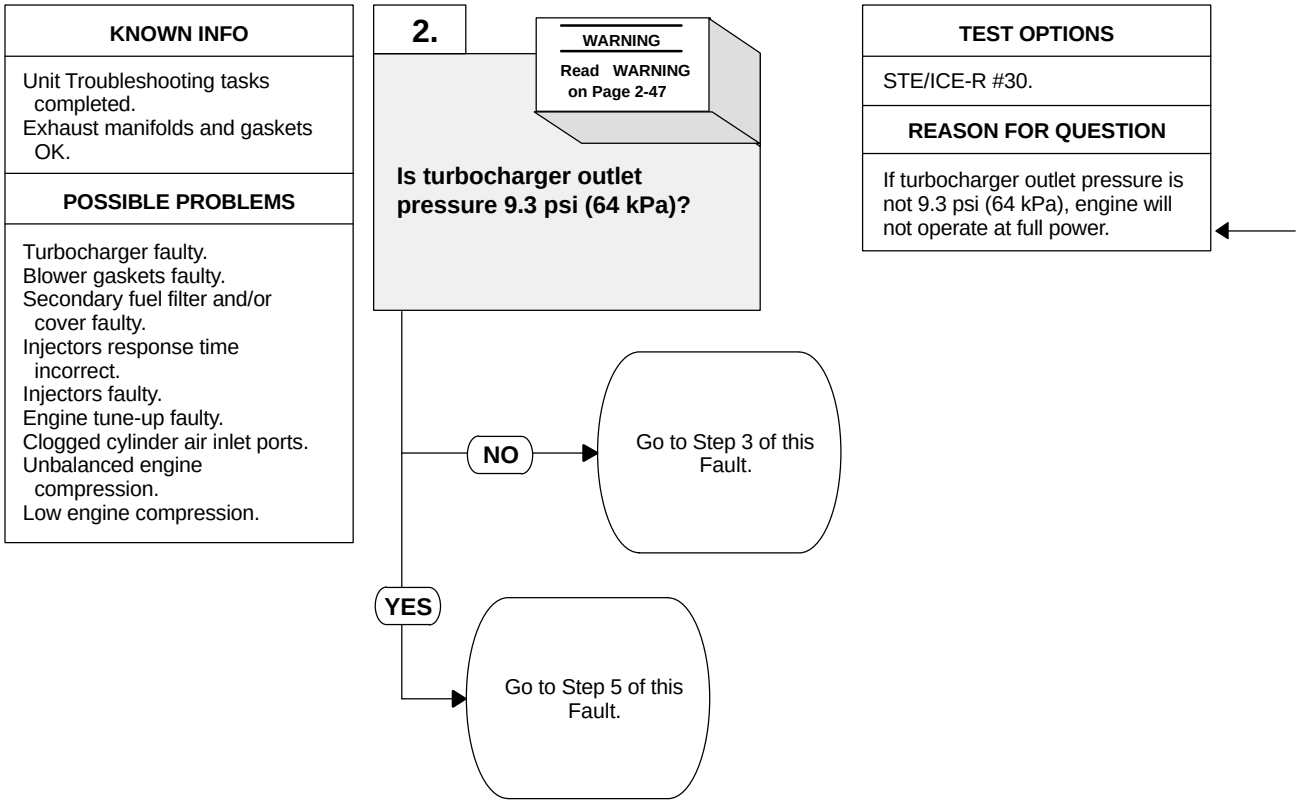
(1) Remove right side noise panel, (TM 9-2320-364-20).
(2) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(3) Start engine, (TM 9-2320-364-10).
(4) Check exhaust manifold, gasket and clamps for leaks and damage.
    (a) If clamps are loose, tighten clamps. If exhaust manifold or gaskets are leaking or damaged replace exhaust manifold and/or gaskets, (Para 3-31).
    (b) If exhaust manifold or gaskets are not leaking or damaged, perform Step (5) below and go to Step 2 of this Fault.
(5) Turn OFF ENGINE switch.





SHOWN REMOVED FOR CLARITY

1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).



WARNING

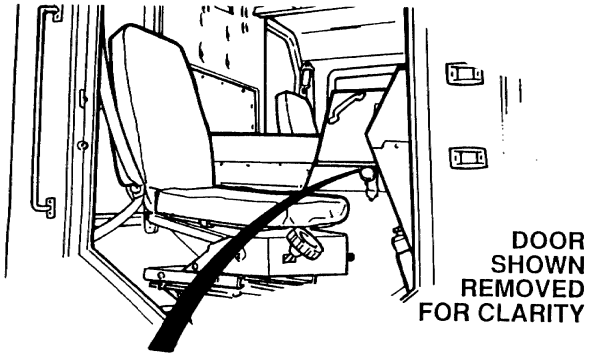
Do not stand in front of vehicle when testing air box pressure. Brakes could fail and vehicle could move forward causing injury or death.

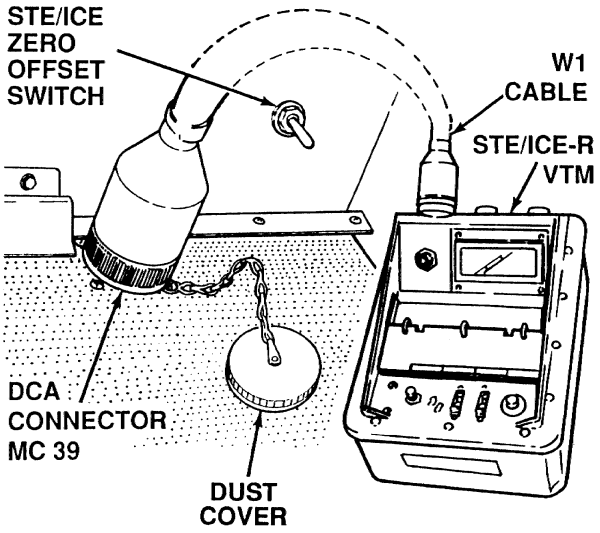
CAUTION

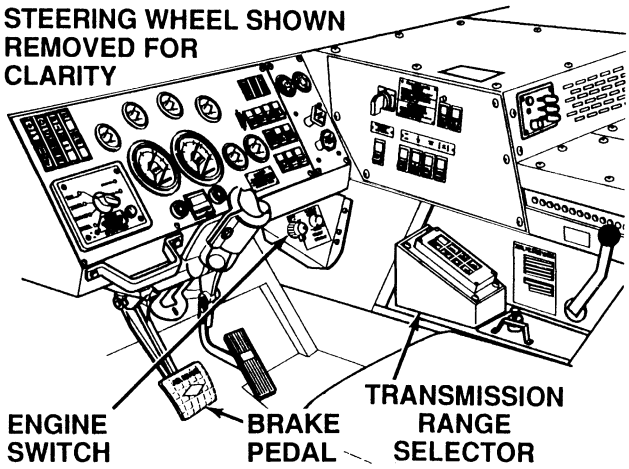
Do not operate vehicle with transmission engaged and engine at maximum RPM for more than 15 seconds at a time. Transmission oil heats up quickly and could cause damage to transmission.

STE/ICE-R #30

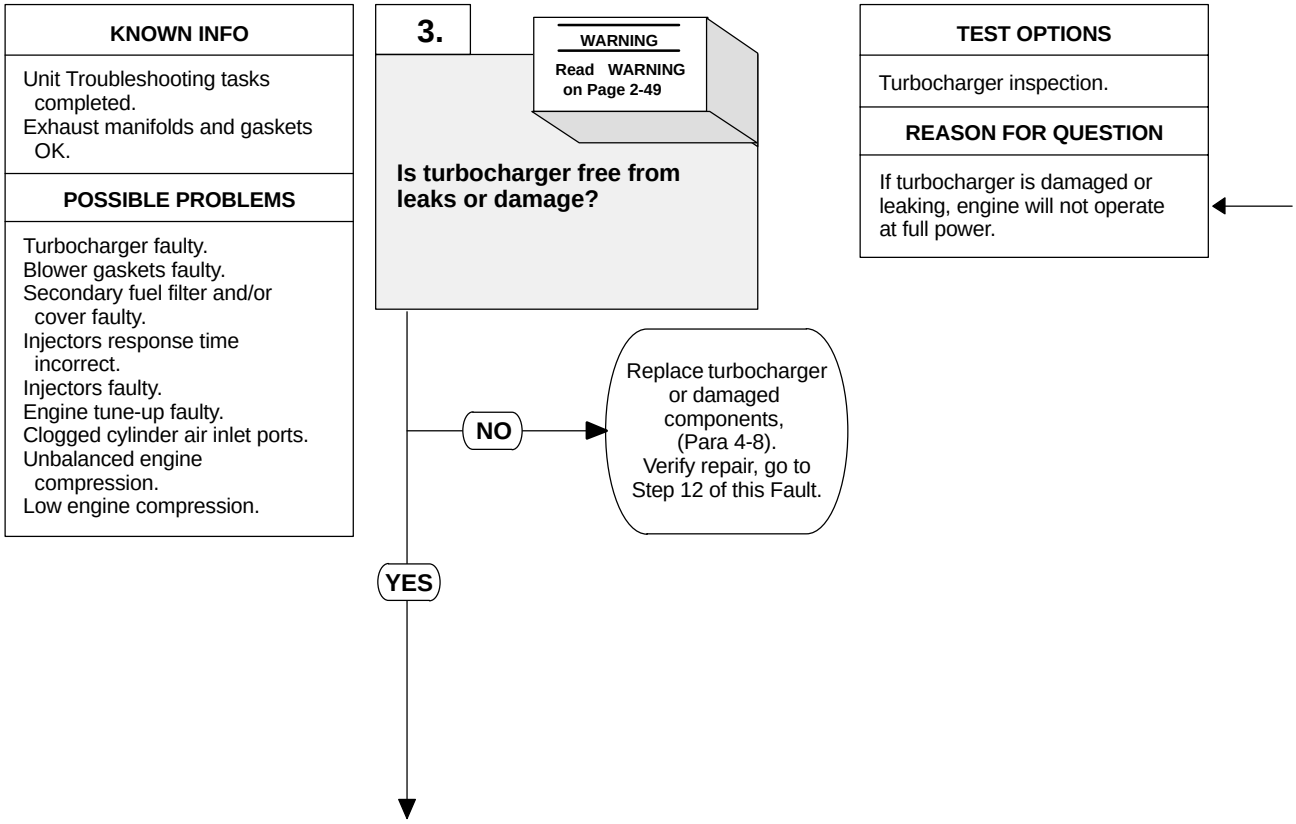
(1) Remove dust cover from DCA connector MC39.
(2) Connect DCA cable W1 to the vehicle test meter (VTM) and DCA connector MC39.
(3) Power up STE/ICE-R VTM in the DCA mode, (TM 9-4910-571-12&P).
(4) Set test select switch to #30.
(5) Start engine and allow engine to run for 5 minutes, (TM 9-2320-364-10).
(6) Perform Offset test, (TM 9-4910-571-12&P).
(7) Apply brake pedal and move transmission range selector to drive (D) position.
(8) Increase engine rpm to approximately 2150 rpm.
(9) Press and release test button to obtain test results.
    (a) If turbocharger outlet pressure is not 9.3 psi (64 kPa), perform Steps (10) through (14) below and go to Step 3 of this Fault.
    (b) If turbocharger outlet pressure is 9.3 psi (64 kPa), perform Steps (10) through (14) below and go to Step 5 of this Fault.
(10) Return engine rpm to approximately 600 rpm.
(11) Move transmission range selector to neutral (N) position.
(12) Turn OFF ENGINE switch.
(13) Disconnect DCA cable W1.
(14) Install dust cover on DCA connector MC39.







1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).

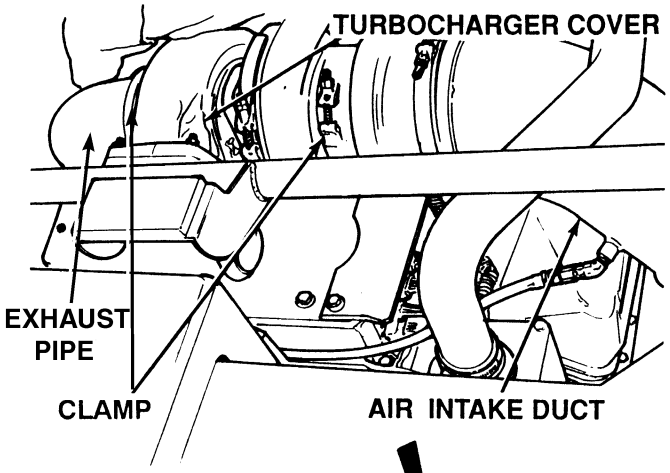


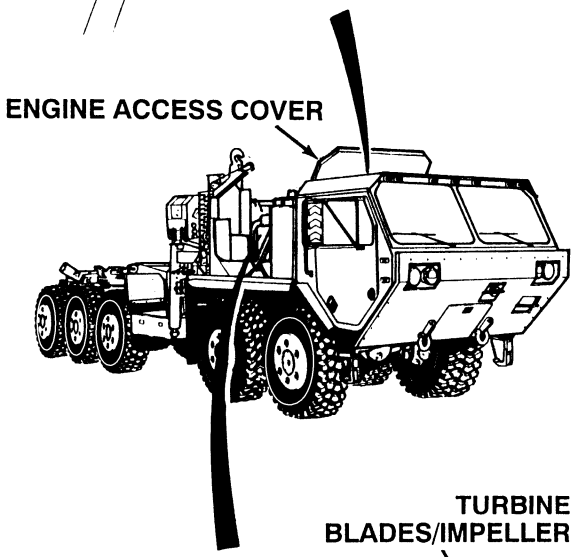
WARNING

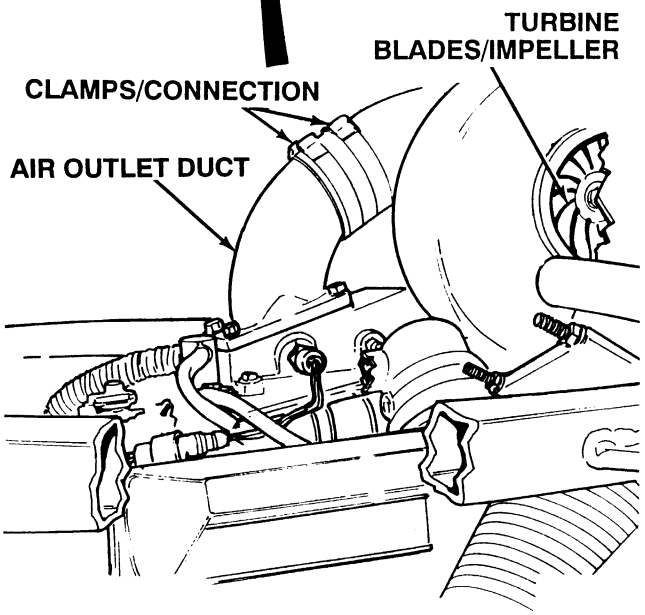
Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

TURBOCHARGER INSPECTION

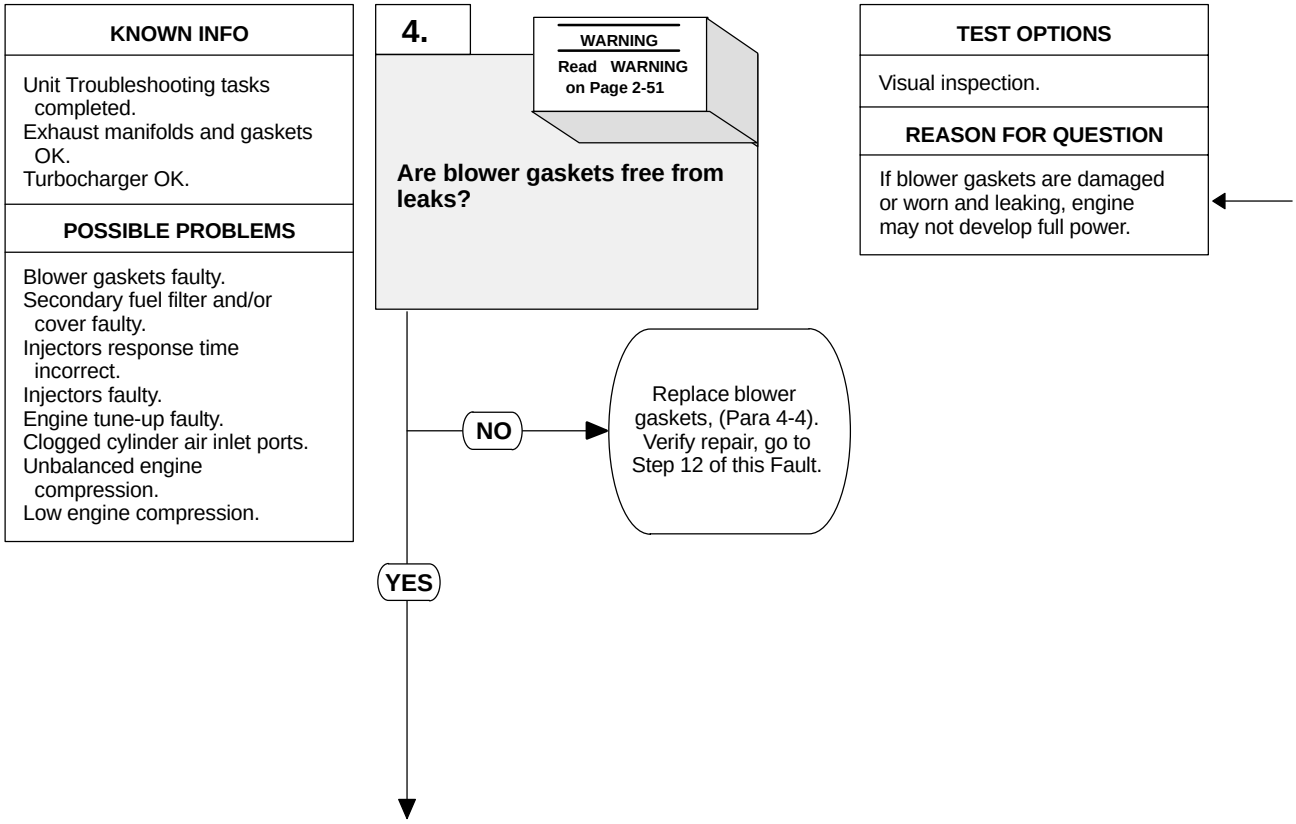
(1) Open engine access cover, (TM 9-2320-364-10).
(2) Loosen clamp and remove air intake duct from turbocharger.
(3) Loosen clamp and remove exhaust pipe from turbocharger.
(4) Check mountings, air intake and outlet ducting gasket, clamps and connection for damage.
  (a) If mountings, intake or exhaust ducting gasket and connection are damaged, replace damaged components, (Para 4-8) and perform Step (6) below.
  (b) If mountings, intake and exhaust ducting and connection are OK, go to Step 5 below.
(5) Check impeller and turbine blades for free movement and damage.
  (a) If impeller or turbine blades do not move freely or if there are signs of internal oil leaks, replace turbocharger, (Para 4-8).
  (b) If impeller and turbine blades move freely and there are no signs of oil leaks, perform Step (6) below and go to Step 4 of this Fault.
(6) Install air intake duct and clamp.
(7) Install exhaust pipe and clamp.







1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).



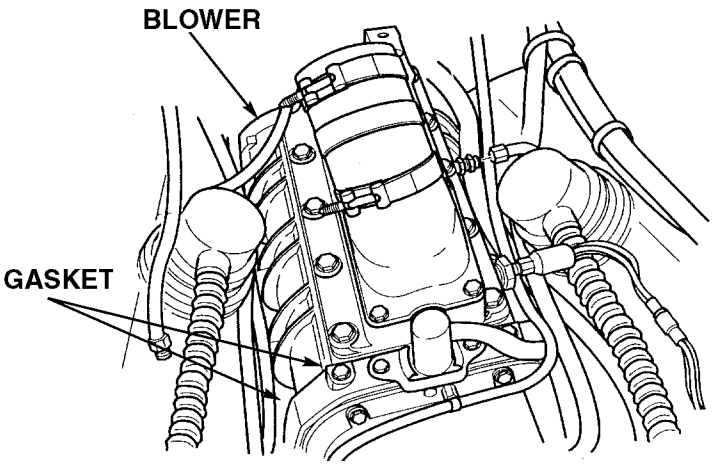
WARNING

Allow engine to cool before performing troubleshooting maintenance. If necessary, use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

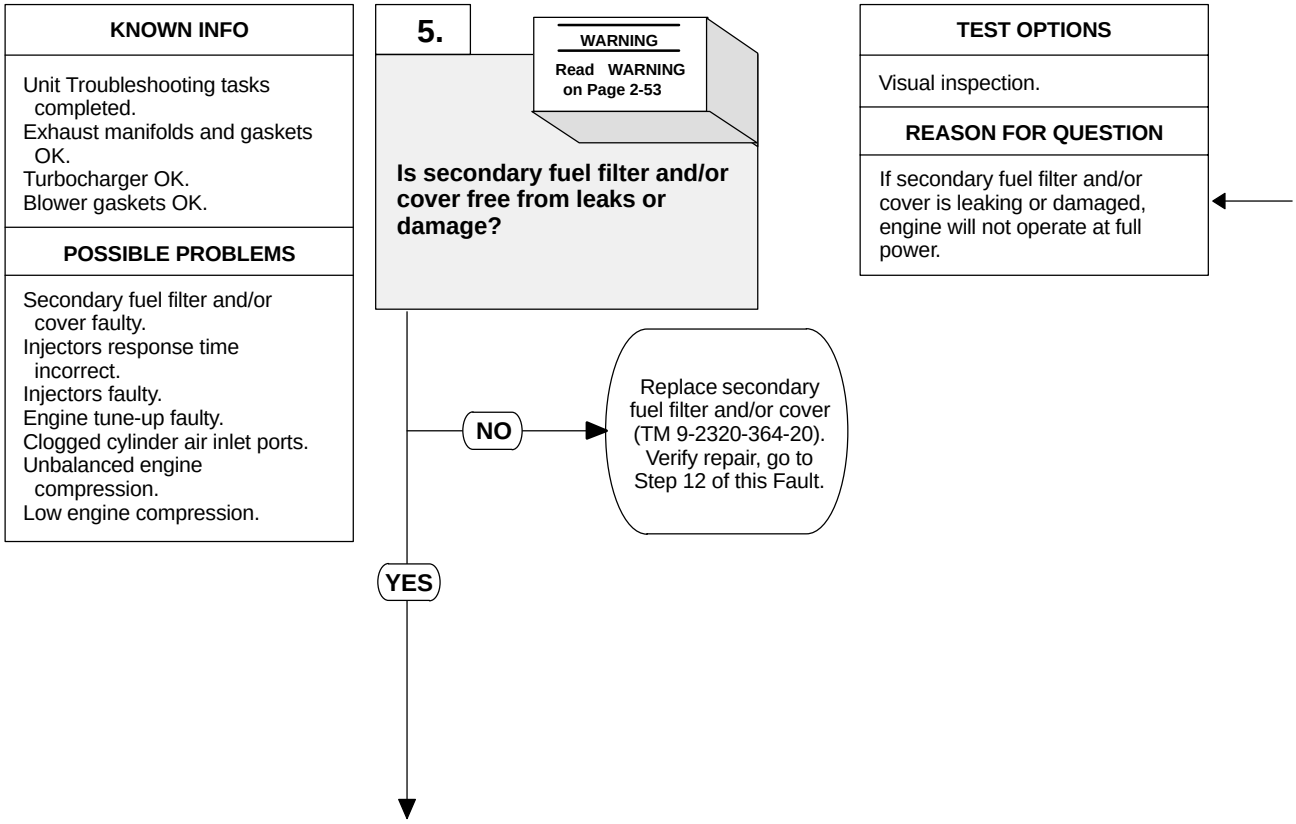
VISUAL INSPECTION

(1) Start engine, (TM 9-2320-364-10).
(2) Use soap solution and check for leaks from blower gaskets.
(3) Turn engine OFF.
(4) Close engine access cover.





1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).

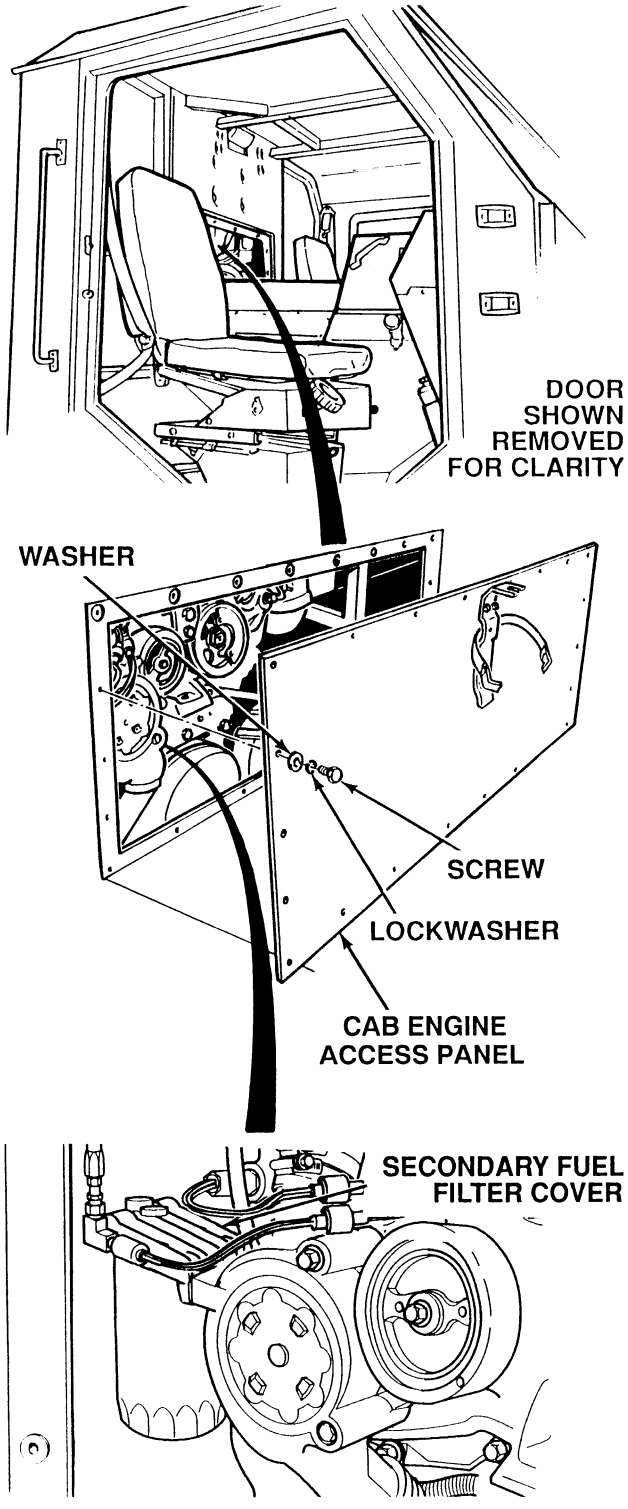


WARNING

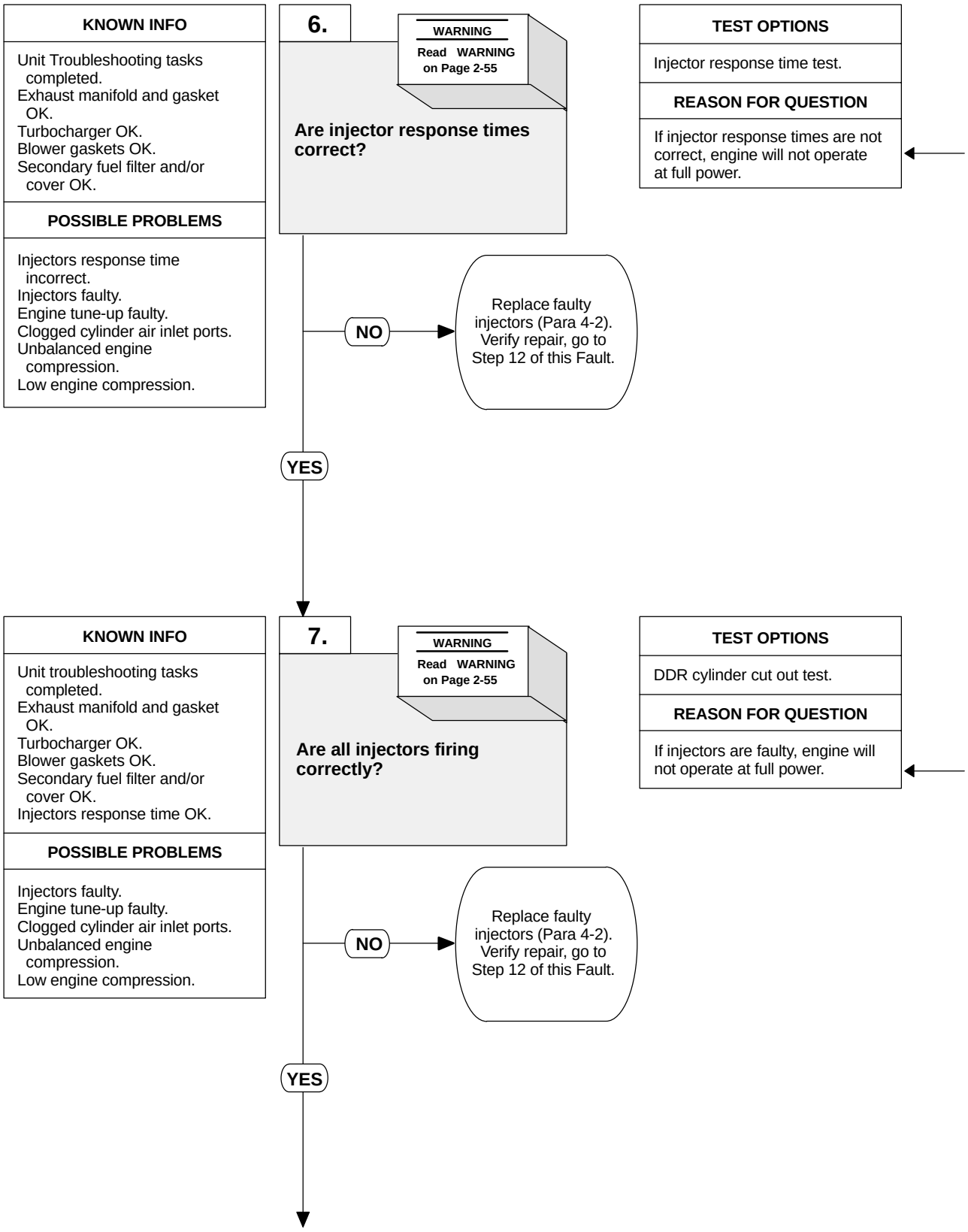
Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

VISUAL INSPECTION

(1) Remove 22 screws, lockwashers, washers, and cab engine access panel. Discard lockwashers.
(2) Turn ON ENGINE switch, (TM 9-2320-364-10).
(3) Check secondary fuel filter and/or cover for leaks or damage.
  (a) If secondary fuel filter and/or cover is leaking or damaged, perform Steps (4) and (5) below and replace secondary fuel filter and/or cover, (TM 9-2320-364-20).
  (b) If secondary fuel filter and/or cover is not leaking or damaged, fuel filter and/or cover are OK.
(4) Turn OFF ENGINE switch.
(5) Install cab engine access panel with 22 lockwashers, washers, and screws.



1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).

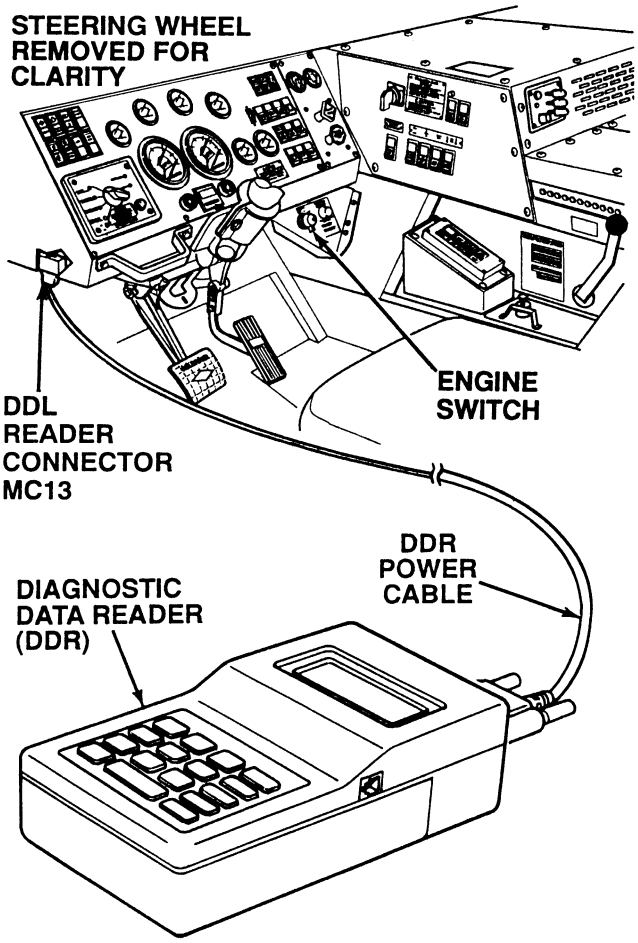


WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

INJECTOR RESPONSE TIME TEST

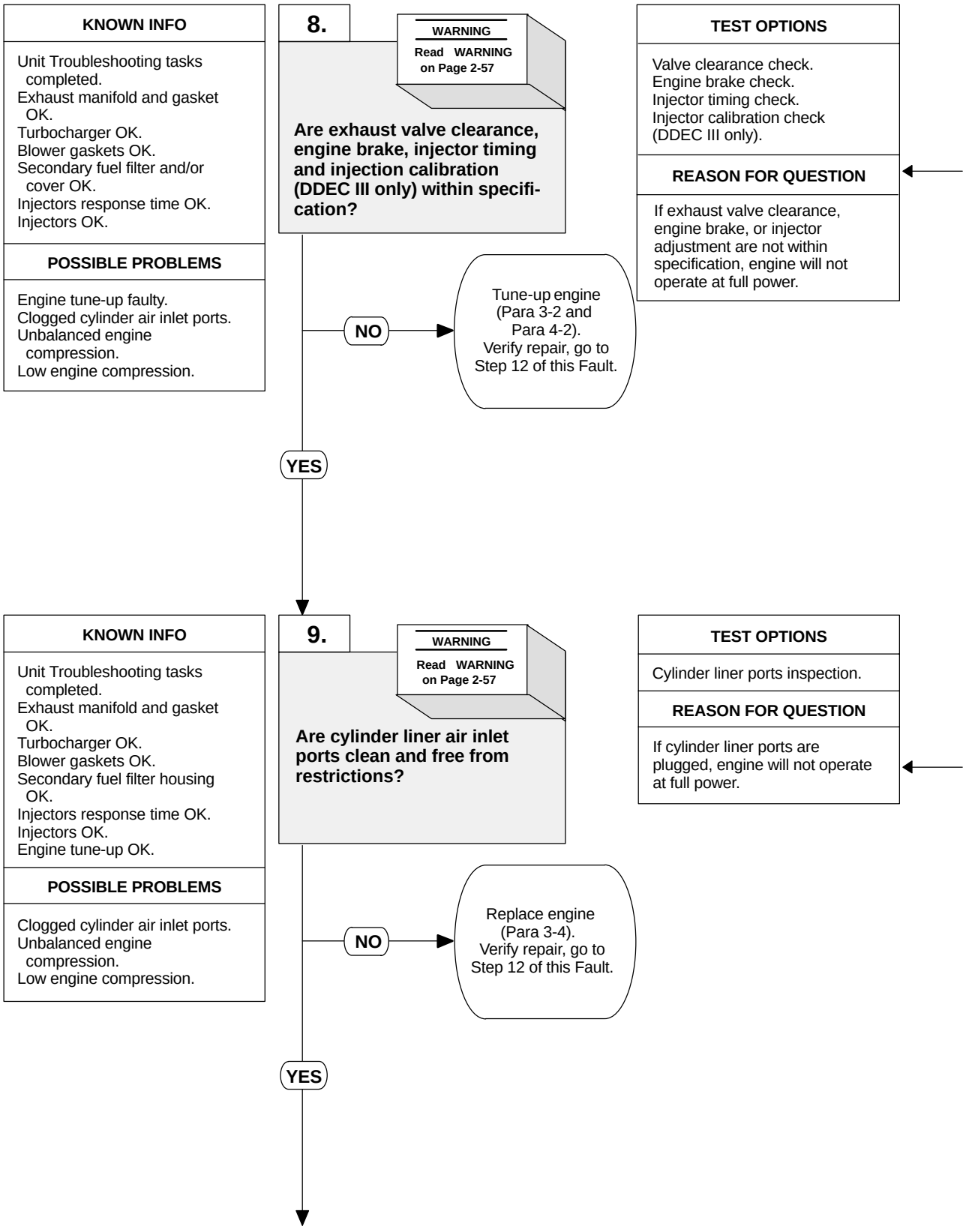
(1) Connect DDR to DDL connector MC13.
(2) Start engine, (TM 9-2320-364-10).
(3) Select mode 10 to display fuel injector response times on DDR.
(4) Compare response times of all eight injectors.
  (a) If any injector response time is less than others or .80 milliseconds, perform Step (5) below and replace injector, (Para 4-2).
  (b) If injector response times are same as others or greater than .80 milliseconds, response times are OK.
(5) Turn OFF ENGINE switch.



DDR CYLINDER CUT OUT TEST

(1) Start engine, (TM 9-2320-364-10).
(2) Select mode 11 to display pulse widths on DDR.
(3) Compare pulse widths of all eight injectors.
  (a) If pulse widths are less than the NO CUT OUT PW (pulse widths), or different from cylinder to cylinder, perform Steps (4) and (5) below and replace injector, (Para 4-2).
  (b) If pulse widths are equal to or greater than the NO CUT OUT PW (pulse widths), perform Step (4) and (5) below and go to Step 8 of this Fault.
(4) Turn OFF ENGINE switch.
(5) Disconnect DDR from DDL connector MC13.

1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).



WARNING

Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

VALVE CLEARANCE, ENGINE BRAKE, INJECTOR TIMING AND INJECTOR CALIBRATION (DDEC III ONLY) CHECK

Check exhaust valve clearance, engine brake retarder adjustment, and injector timing, (Para 3-2).

(1) If engine exhaust valve clearance, engine brake retarder adjustment, injector timing and injector calibration (DDEC III only) are not within specifications, perform engine tune-up, (Para 3-2 and Para 4-2).

(2) If engine exhaust valve clearance, engine brake retarder adjustment, injector timing and injector calibration (DDEC III only) are within specifications, go to Step 9 of this Fault.

CYLINDER LINER PORTS INSPECTION

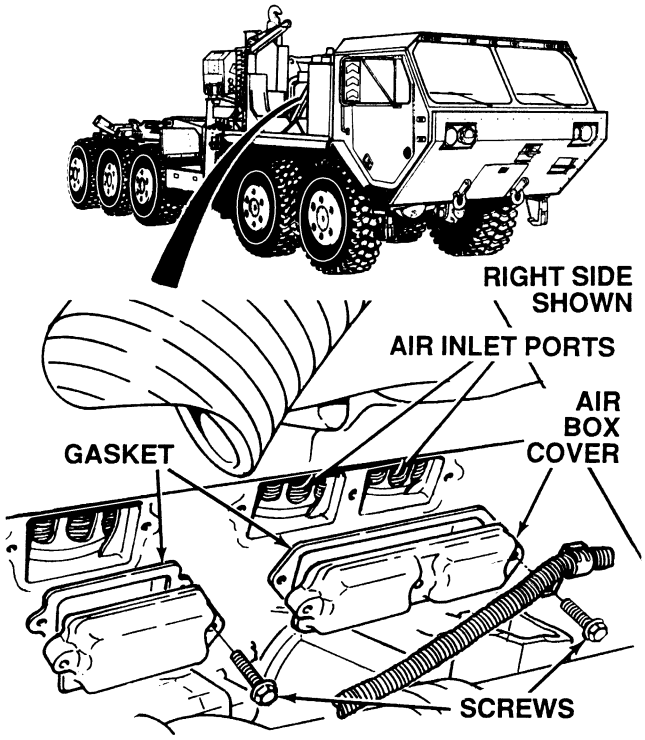
(1) Remove 14 screws, six engine air box covers and gaskets. Discard gaskets.

(2) Check for clogged cylinder liner air inlet ports.

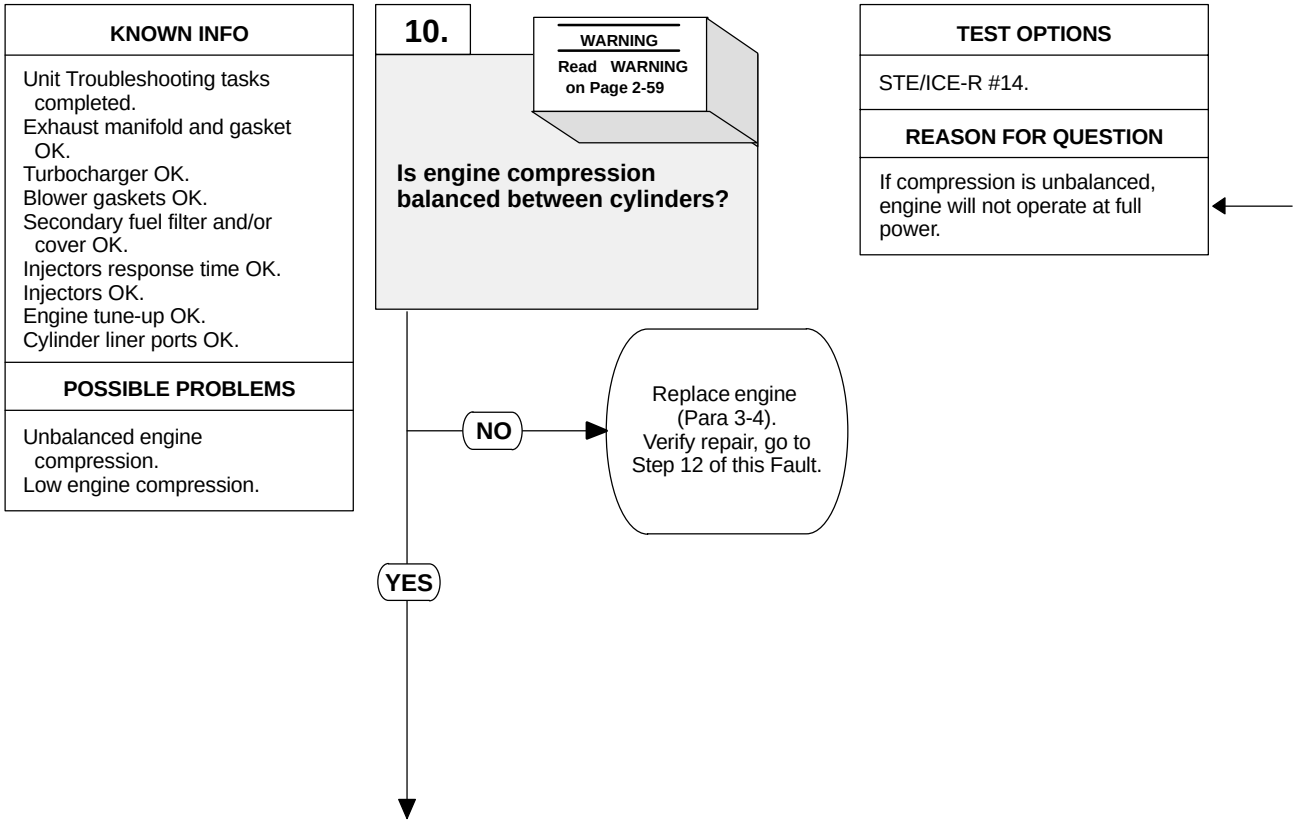
(3) (a) If cylinder liner air inlet ports are clogged, perform Step (4) below and replace engine, (Para 3-4).

(b) If cylinder liner air inlet ports are not clogged, perform Step (4) below and go to Step 10 of this Fault.

(4) Install six gaskets and engine air box covers with 14 screws.



1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).



CAUTION

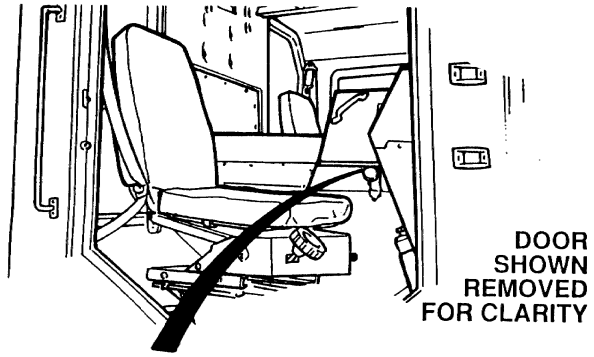
- Do not run more than two compression unbalance tests in a row.
- A fail message means compression is too far unbalanced to measure with STE/ICE-R.

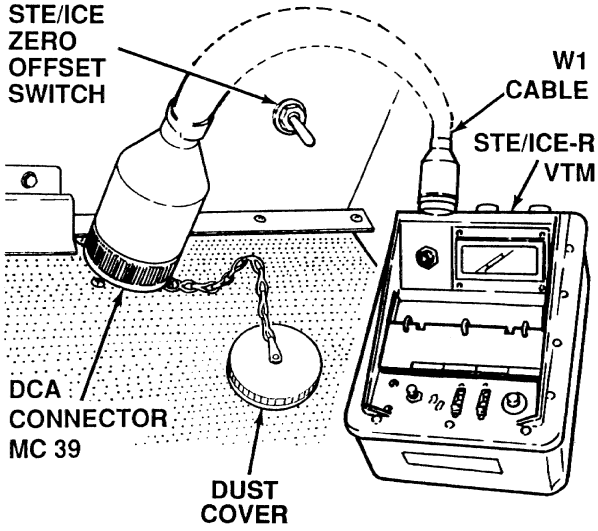
STE/ICE-R #14

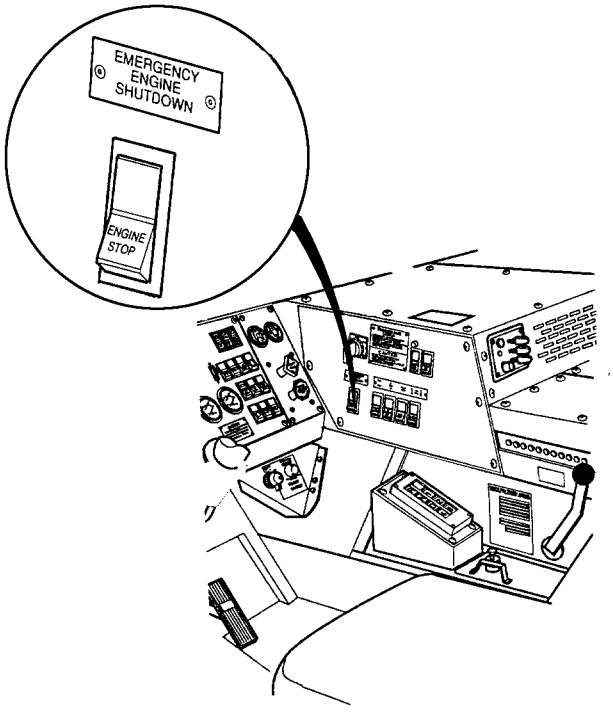
(1) Remove dust cover from DCA connector MC39.
(2) Connect DCA cable W1 to the vehicle test meter (VTM) and DCA connector.
(3) Power up STE/ICE-R VTM in the DCA mode, (TM 9-4910-571-12&P).
(4) Perform confidence Test.
(5) Enter vehicle identification number (VIN) (38).
(6) Perform STE/ICE-R #72 test.
(7) Perform STE/ICE-R #73 test.
(8) Perform STE/ICE-R #74 test.
(9) Perform STE/ICE-R #75 test.
(10) Set test select switch to #14.
(11) Press and release test button.
(12) Wait for a GO to appear on VTM display. If "UEH" appears, refer to TM 9-4910-571-12&P, test #14, and enter following information:

AT		ENTER
CYL	–	04
CV1	–	3
CV2	–	98
CV3	–	43
CV4	–	4
CV5	–	53

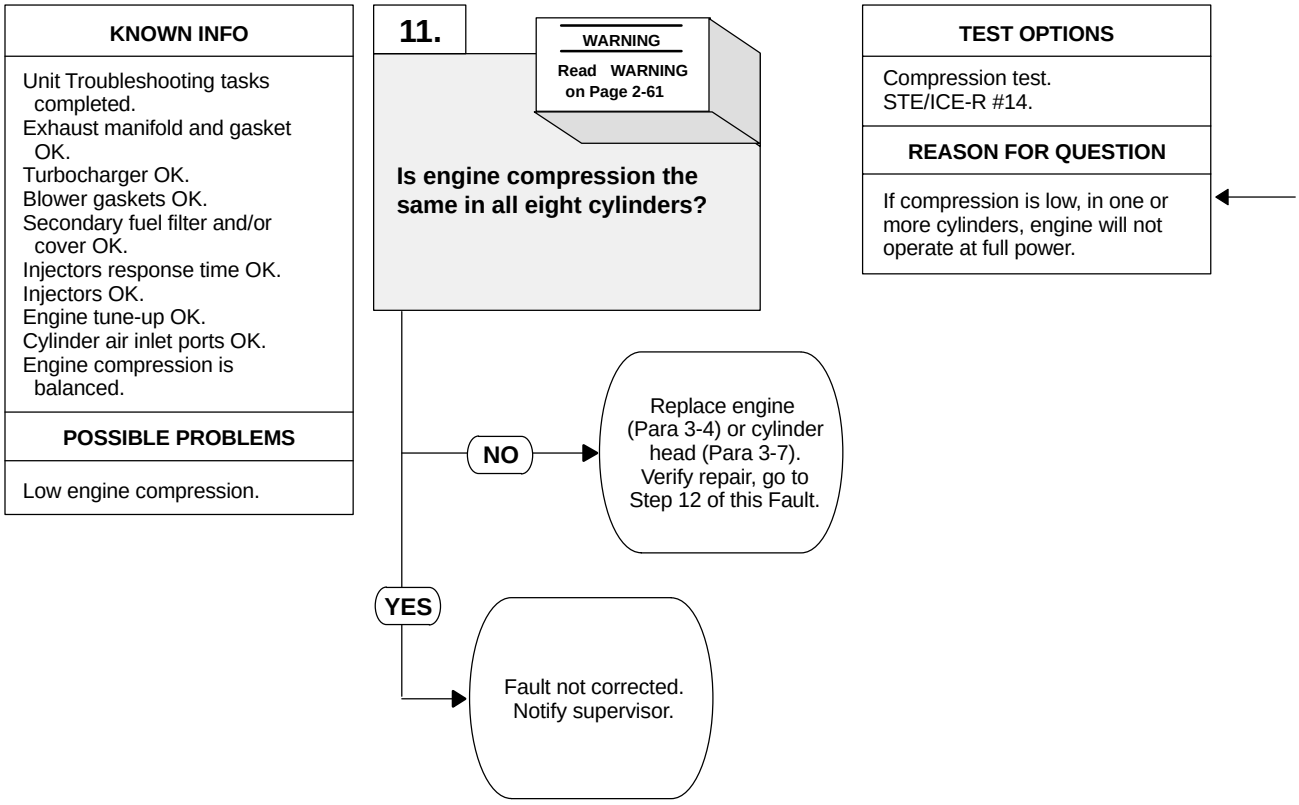
(13) Push down and hold engine stop switch and crank engine until OFF appears on VTM display. If a GO appears, repeat Steps (10) through (13) above.
(14) Stop cranking engine and release engine stop switch, observe number displayed on VTM display. Number displayed is the percent unbalance between the highest and lowest cylinders. If "UEH" appeared, valves for Step "A" will be "1.00 min to 1.20 max". Valve for Step "B" will be "above 1.20".
  (a) If the percentage of unbalance is between 0 and 11 percent, perform Steps (15) and (16) below and replace engine, (Para 3-4).
  (b) If the percentage of unbalance cylinder is above 11 percent, perform Steps (15) and (16) below and go to Step 11 of this Fault.
(15) Disconnect DCA cable W1 from DCA connector MC39.
(16) Install dust cover on DCA connector MC39.







1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).



WARNING

Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

COMPRESSION TEST

(1) Start engine, (TM 9-2320-364-10).
(2) Remove radiator cap and check for exhaust gas bubbles in coolant.
  (a) If bubbles are present in coolant, turn OFF ENGINE switch and go to Step (3) below.
  (b) If there are no bubbles, turn OFF ENGINE switch and go to Step (6) below.
(3) Perform compression test on each cylinder, (Para 3-3).
  (a) If pressure is below minimum requirements listed in Table 2-6, go to Step (4) below.
  (b) If pressure is above minimum requirements listed in Table 2-6, fault not corrected. Notify supervisor.
(4) Remove cylinder head, (Para 3-7).
(5) Check cylinder head for cracks, leaking valve seats or injector tubes.
  (a) If any of the components listed above are damaged, replace the cylinder head, (Para 3-7).
  (b) If all of the components listed above are OK, go to Step (6) below.
(6) Remove 14 screws and six air box covers and gaskets. Discard gaskets.
(7) Check pistons and piston rings for damage. Rings should spring in and out when pushed in.
  (a) If pistons and/or piston rings are damaged, replace engine, (Para 3-4).
  (b) If pistons and piston rings are not damaged, pistons and piston rings are OK, fault not corrected. Notify supervisor.
(8) Install cylinder head.

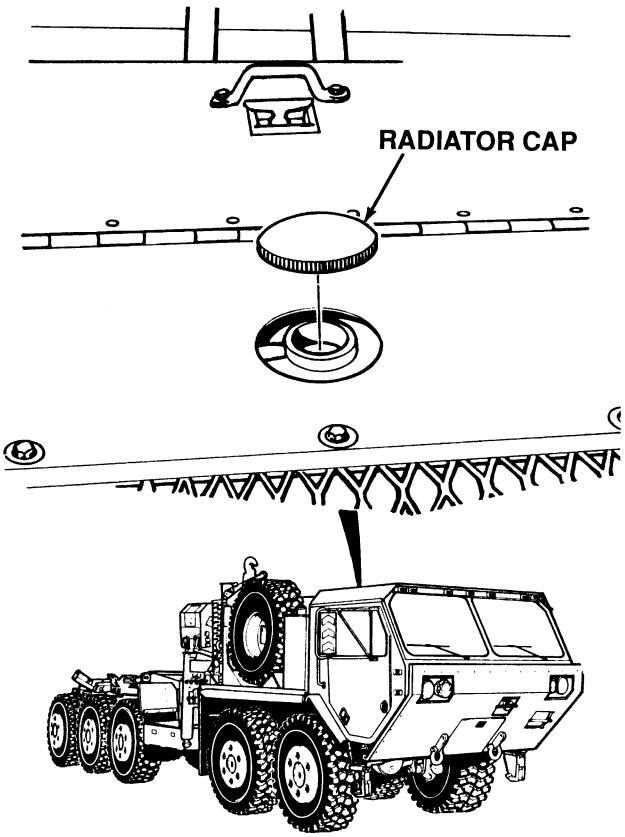
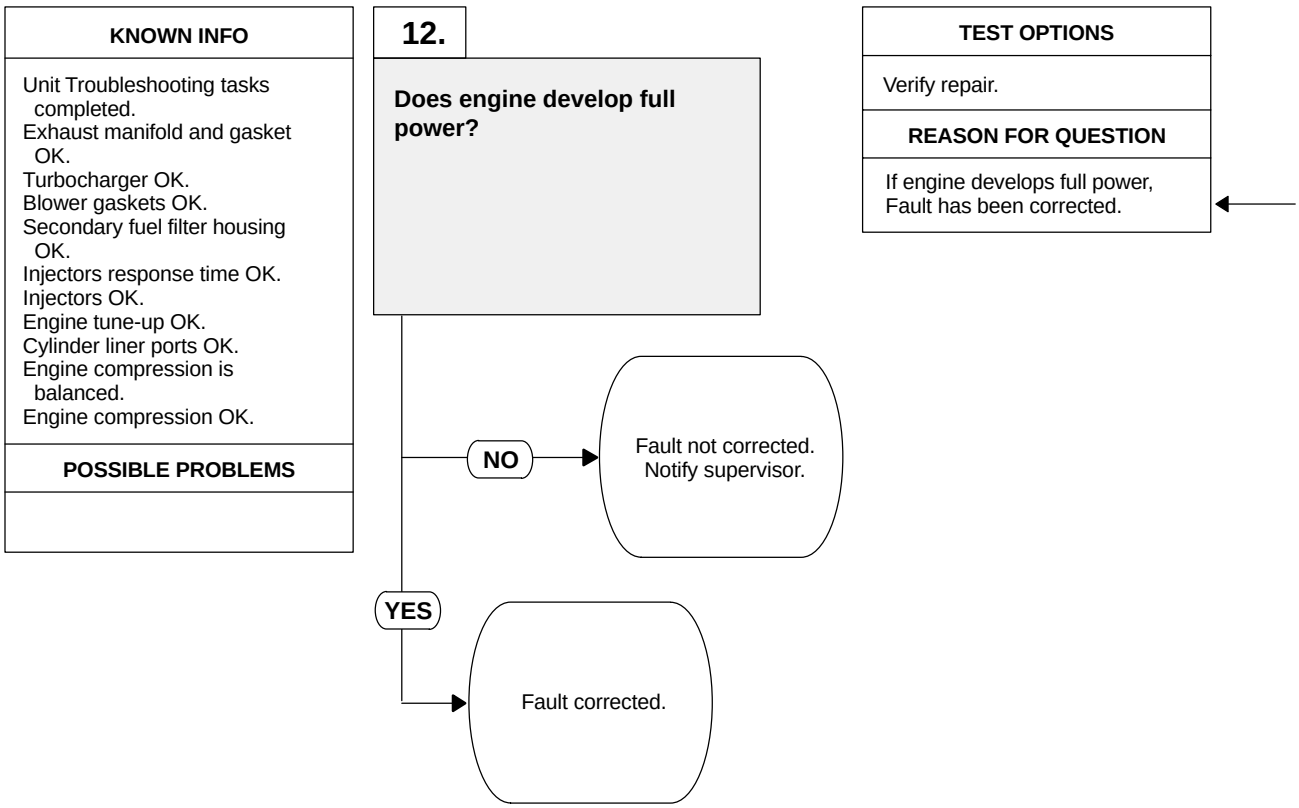


Table 2-6. Compression Pressure Specifications

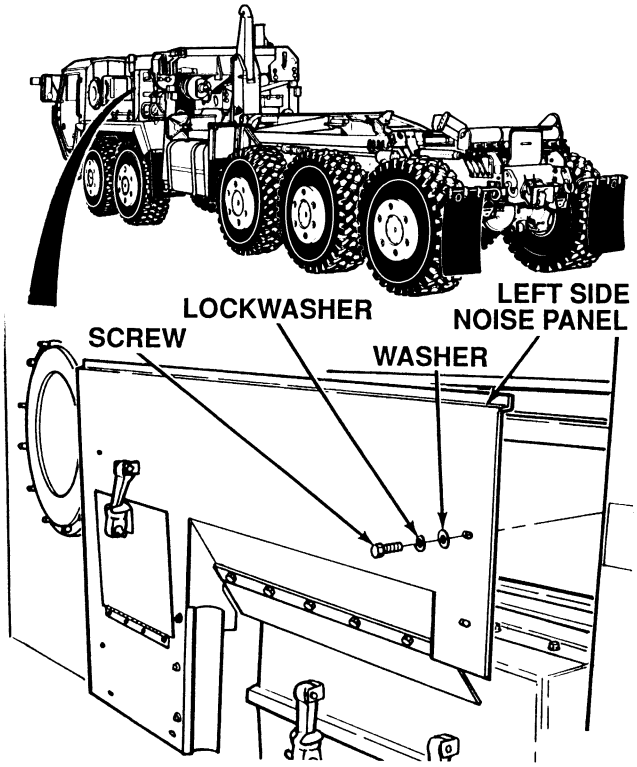
Minimum Compression Pressure at 600 RPM		Altitude above Sea Level	
psi	kPa	feet	meters
450	3101	500	152
415	2859	2,500	762
385	2653	5,000	1,524
355	2446	7,500	2,286
330	2274	10,000	3,048

1. ENGINE DOES NOT DEVELOP FULL POWER (CONT).



VERIFY REPAIR

(1) Operate truck, (TM 9-2320-364-10) at 2100 rpm in each gear.
   (a) If normal operating speeds cannot be sustained at 2100 rpm, fault not corrected. Perform Steps (2) and (3) below and notify supervisor.
   (b) If normal operating speeds can be sustained, fault has been corrected.
(2) Install right side noise panel, (TM 9-2320-364-20).
(3) Install left side noise panel, eight washers, lockwashers and screws.



2-10. ENGINE TROUBLESHOOTING (CONT).

2. ENGINE OVERHEATS (WATER TEMPERATURE GAGE CONTINUOUSLY READS OVER 230°F [110°C]).

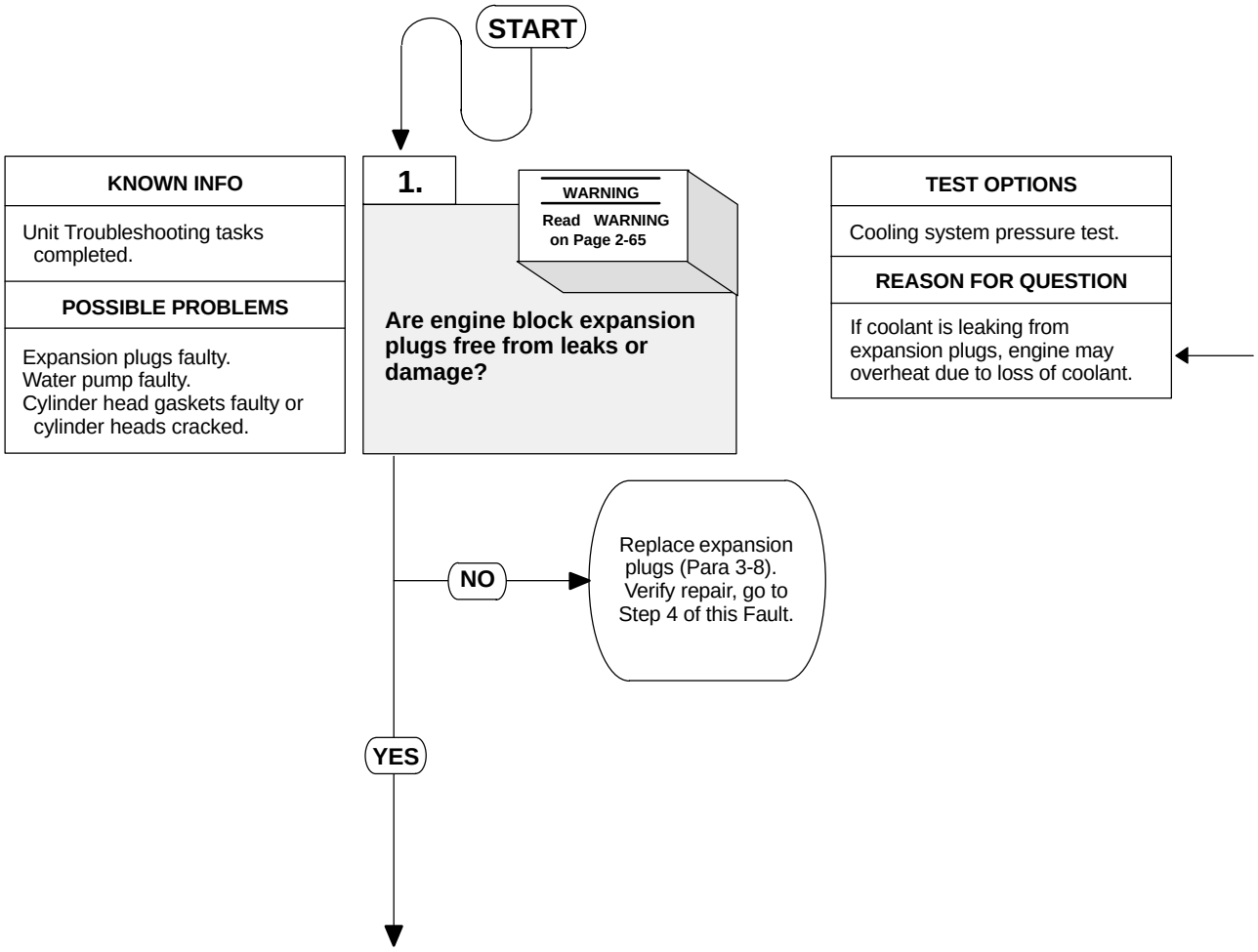
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Tester, Pressure, Radiator (Item 237, Appendix F)

Materials/Parts
Lockwasher (30) (Item 282, Appendix E)

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

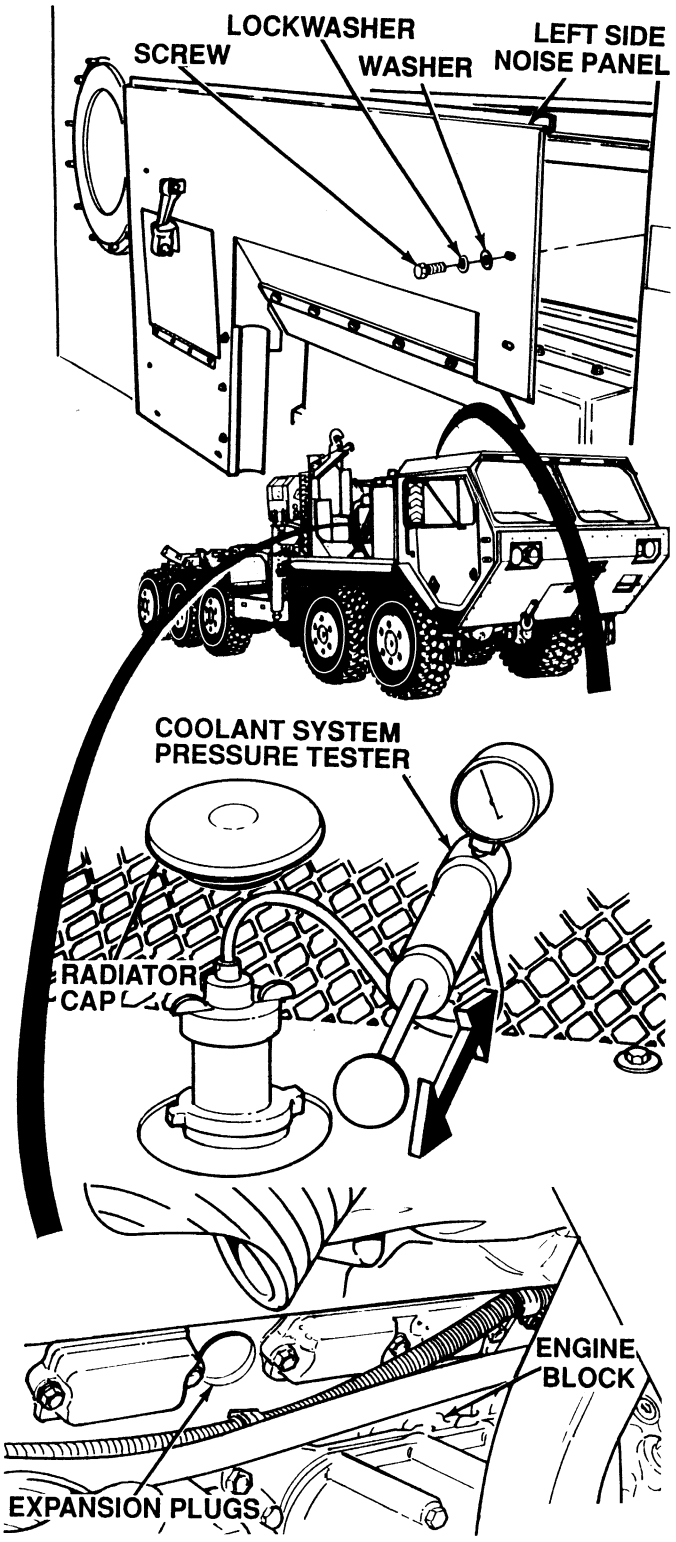


WARNING

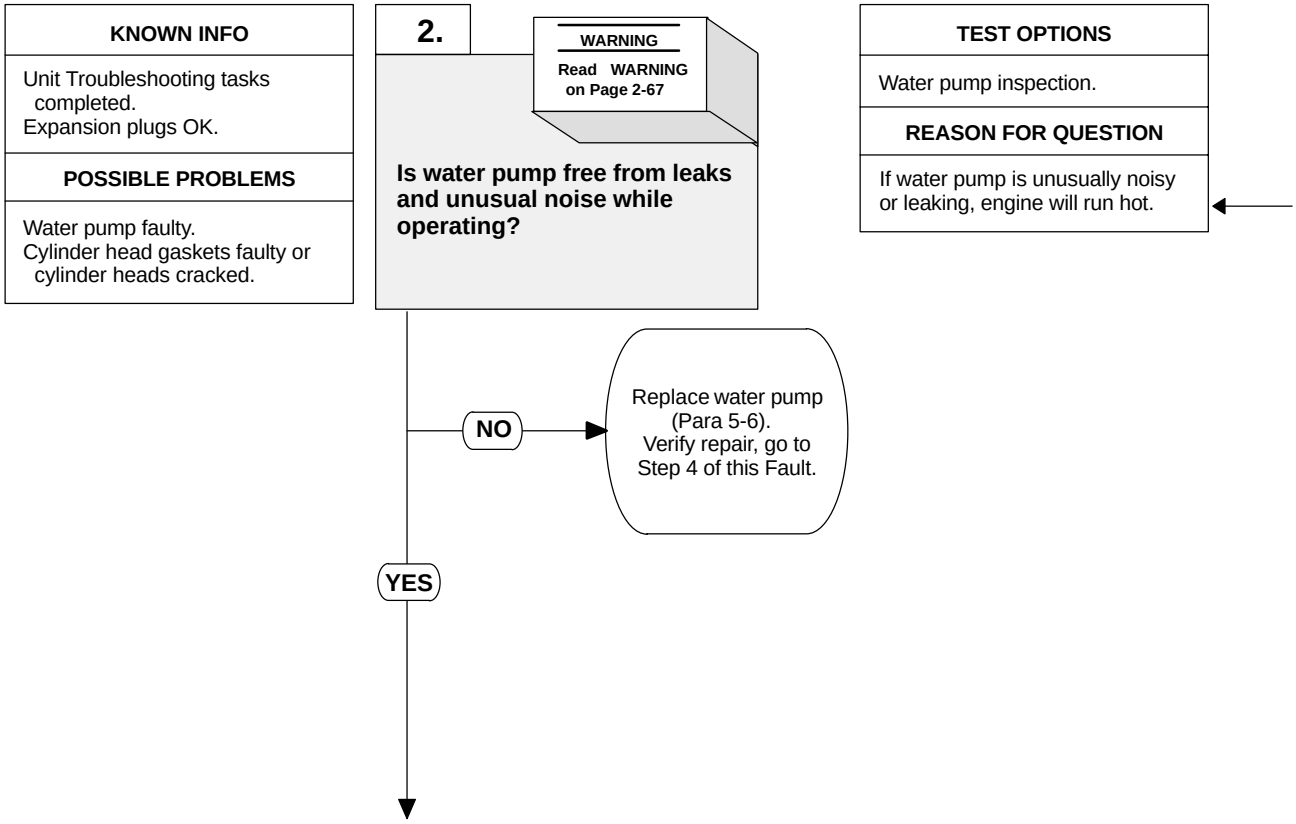
- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.
- Use a clean, thick waste cloth or like material to remove the cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.

COOLING SYSTEM PRESSURE TEST

(1) Remove right side noise panel, (TM 9-2320-364-20).
(2) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(3) Remove radiator cap, (TM 9-2320-364-10).
(4) Install cooling system pressure tester.
(5) Pressurize cooling system to 10 psi (69 kPa) and check expansion plugs for leaks.
  (a) If expansion plugs are leaking, replace expansion plugs, (Para 3-8).
  (b) If expansion plugs are not leaking, expansion plugs are OK.
(6) Release pressure and remove cooling system pressure tester.
(7) Install radiator cap.



2. ENGINE OVERHEATS (CONT).

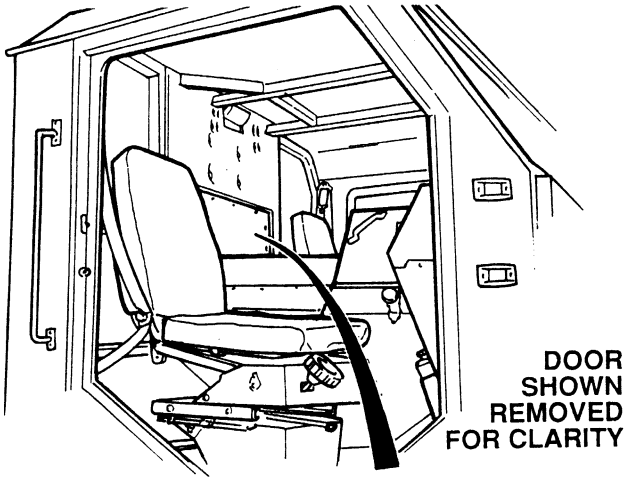


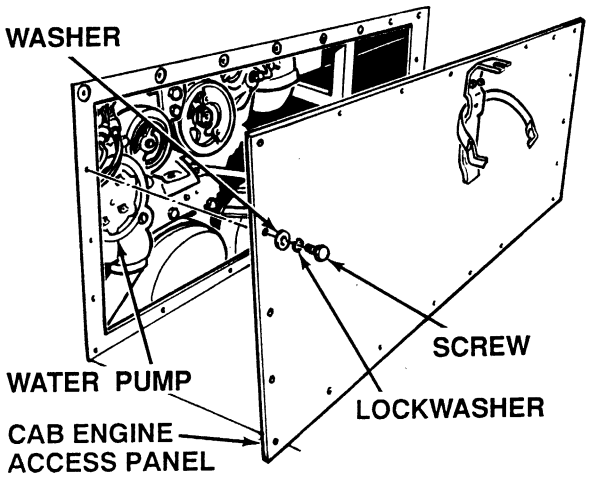
WARNING

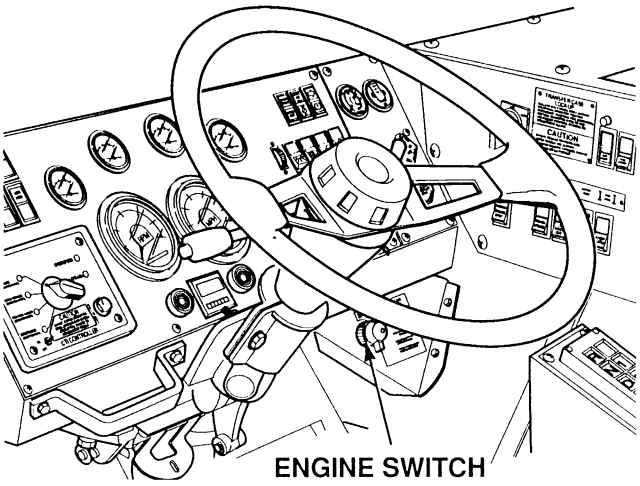
- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Moving engine components can cause severe injury. Keep away from alternator belts and pulleys while engine is running.

WATER PUMP INSPECTION

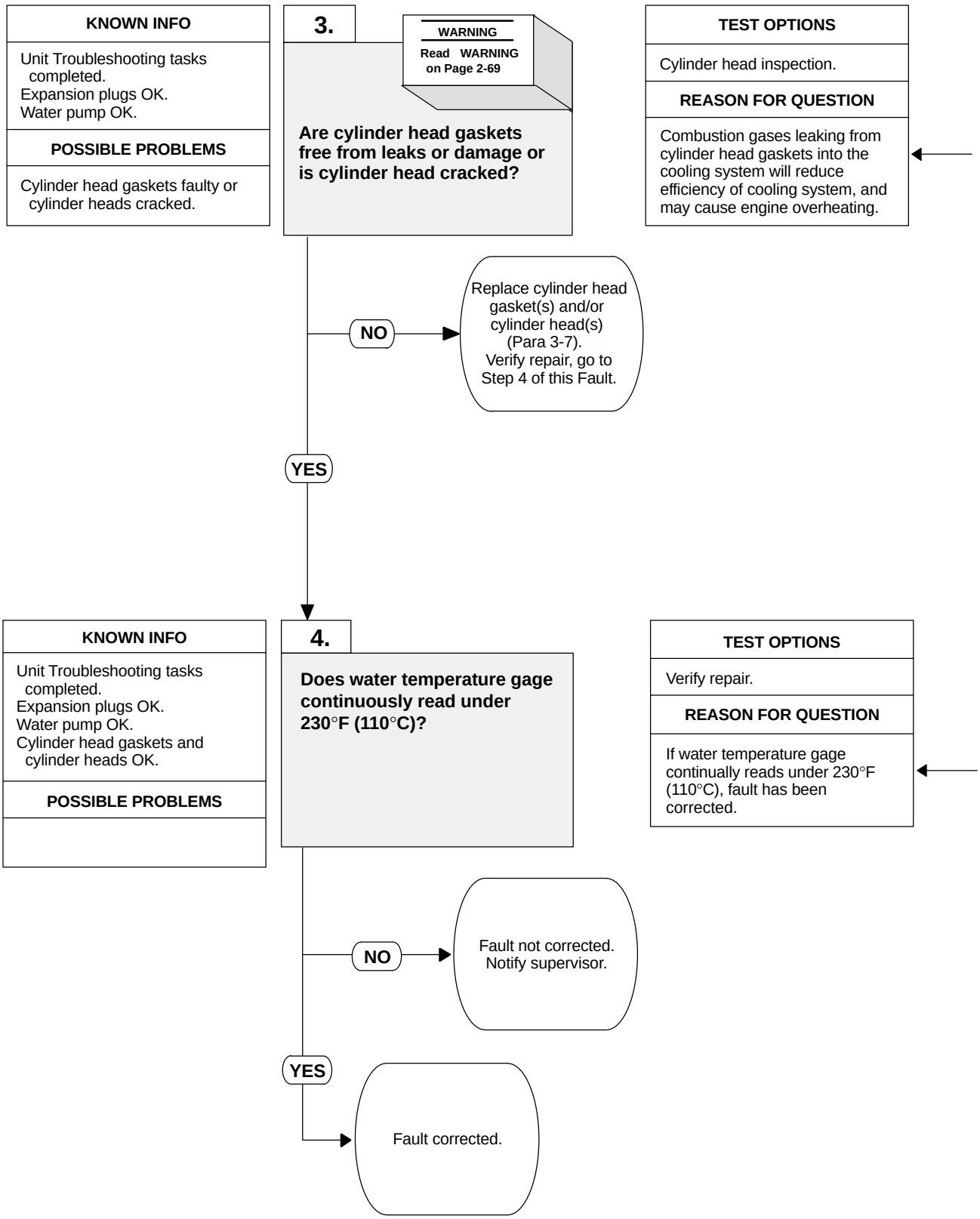
(1) Remove 22 screws, lockwashers, washers and cab engine access panel. Discard lockwashers.
(2) Start engine, (TM 9-2320-364-10).
(3) Check water pump for leaks or unusual noise during operation.
  (a) If water pump leaks or is unusually noisy, turn OFF ENGINE switch and replace water pump, (Para 5-6).
  (b) If water pump does not leak or is not unusually noisy during operation, perform Steps (4) and (5) below and go to Step 3 of this Fault.
(4) Turn OFF ENGINE switch.
(5) Install cab engine access panel, 22 washers, lockwashers and screws.





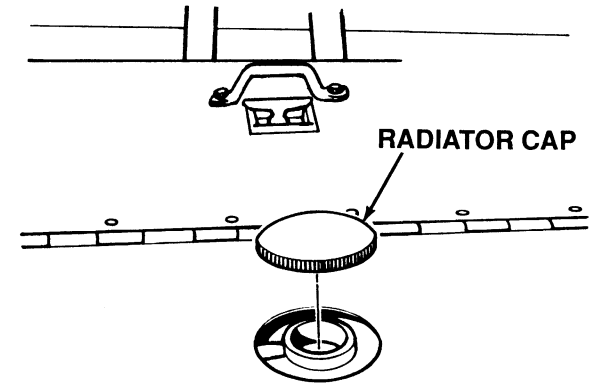


2. ENGINE OVERHEATS (CONT).



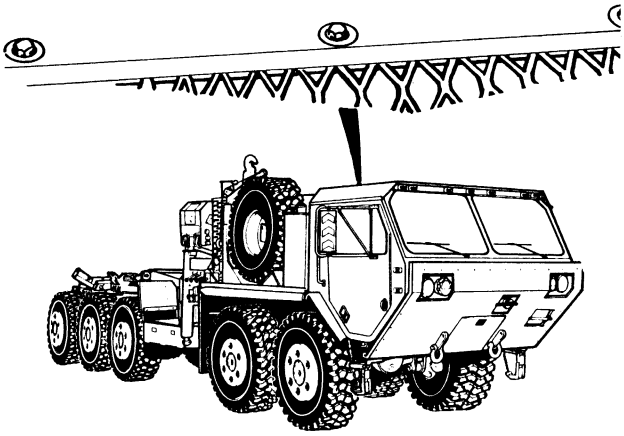
WARNING

- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.
- Use a clean, thick waste cloth or like material to remove the cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.



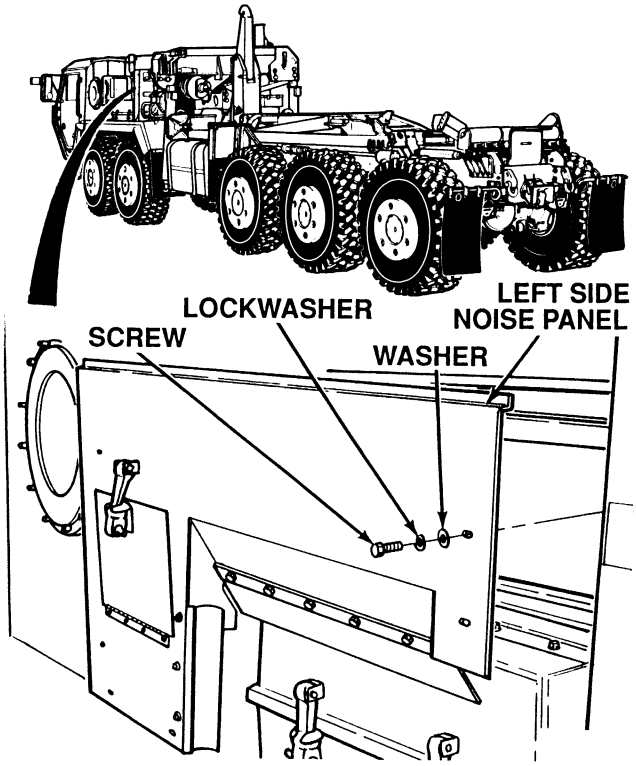
CYLINDER HEAD INSPECTION

(1) Start engine, (TM 9-2320-364-10).
(2) Remove radiator cap and check for bubbles.
  (a) If bubbles are seen, perform Steps (3) and (4) below and replace cylinder head gaskets or cylinder head(s), (Para 3-7).
  (b) If bubbles are not seen, perform Steps (3) and (4) below and go to Step 4 of this Fault.
(3) Turn OFF ENGINE switch.
(4) Install radiator cap.



VERIFY REPAIR

(1) Start engine, (TM 9-2320-364-10) and allow it to run until engine temperature stabilizes.
  (a) If water temperature gage continuously reads over 230°F (110°C), fault not corrected. Perform Steps (2) through (4) below and notify supervisor.
  (b) If water temperature gage continuously reads under 230°F (110°C), fault has been corrected.
(2) Turn OFF ENGINE switch.
(3) Install left side noise panel with eight washers, lockwashers and screws.
(4) Install right side noise panel, (TM 9-2320-364-20).



2-10. ENGINE TROUBLESHOOTING (CONT).

3. LOW ENGINE OIL PRESSURE (LESS THAN 5 PSI [34 KPA] AT IDLE, LESS THAN 40 PSI [276 KPA] DURING NORMAL OPERATION).

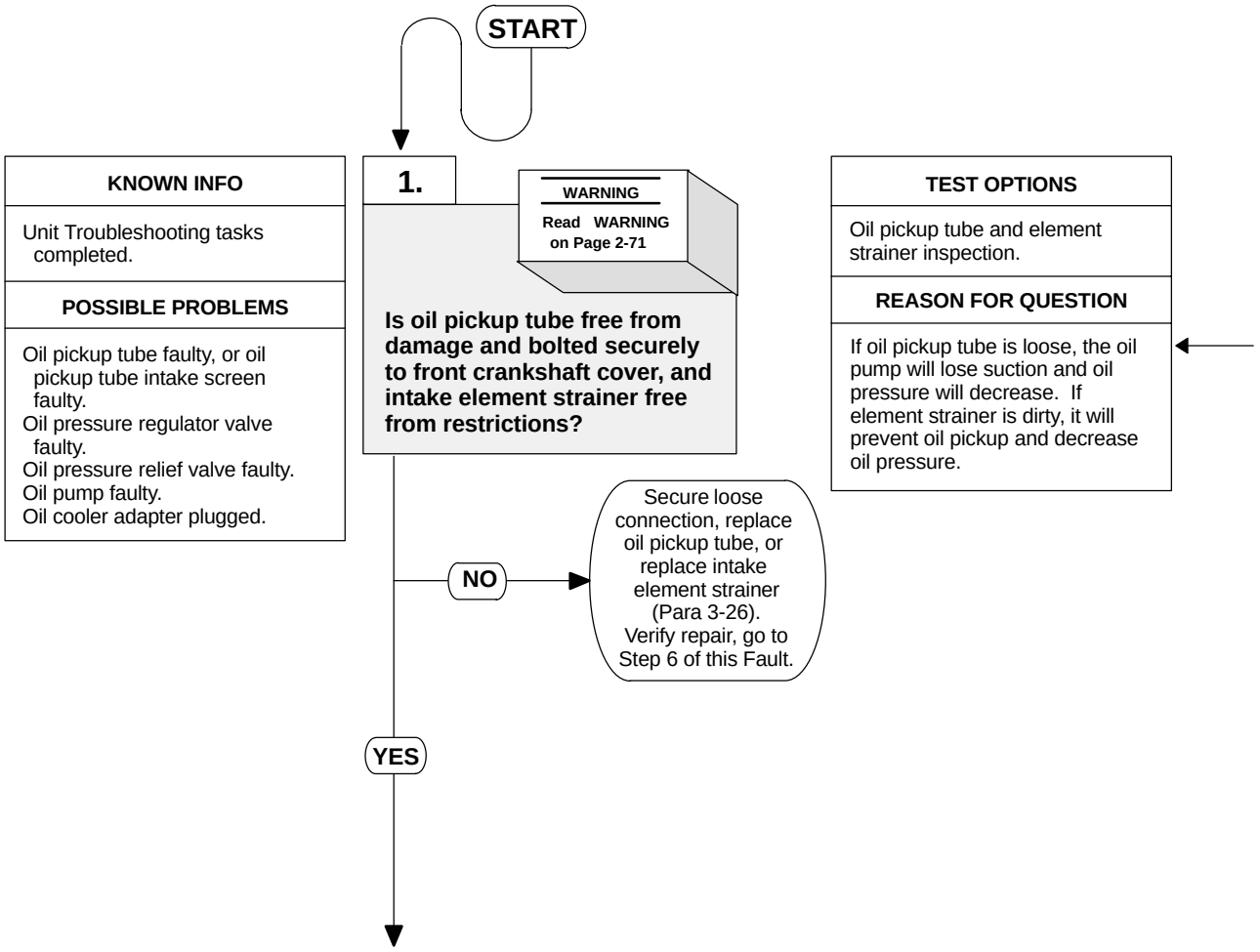
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)

Materials/Parts
Solvent, Drycleaning, (Item 68, Appendix B)
Screw, Self-locking, (Item 554, Appendix E)
Strainer, Element, (Item 675, Appendix E)

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

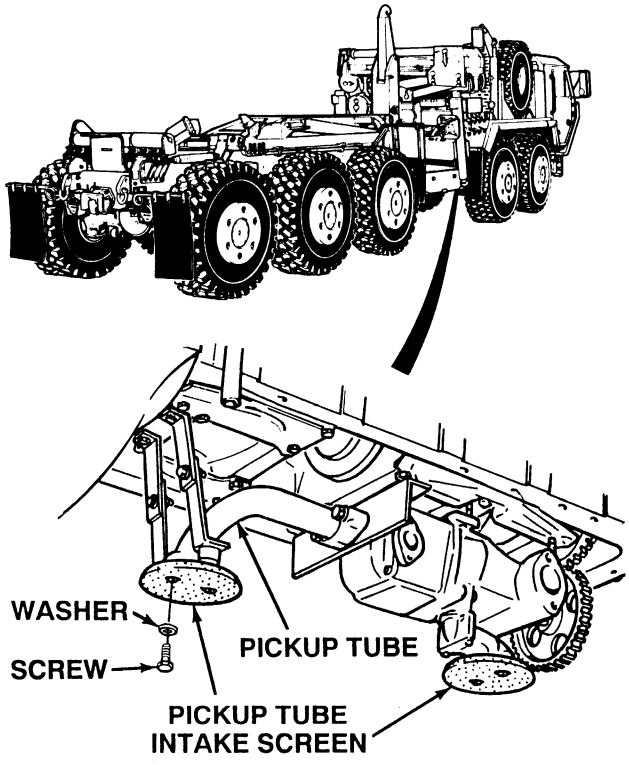


WARNING

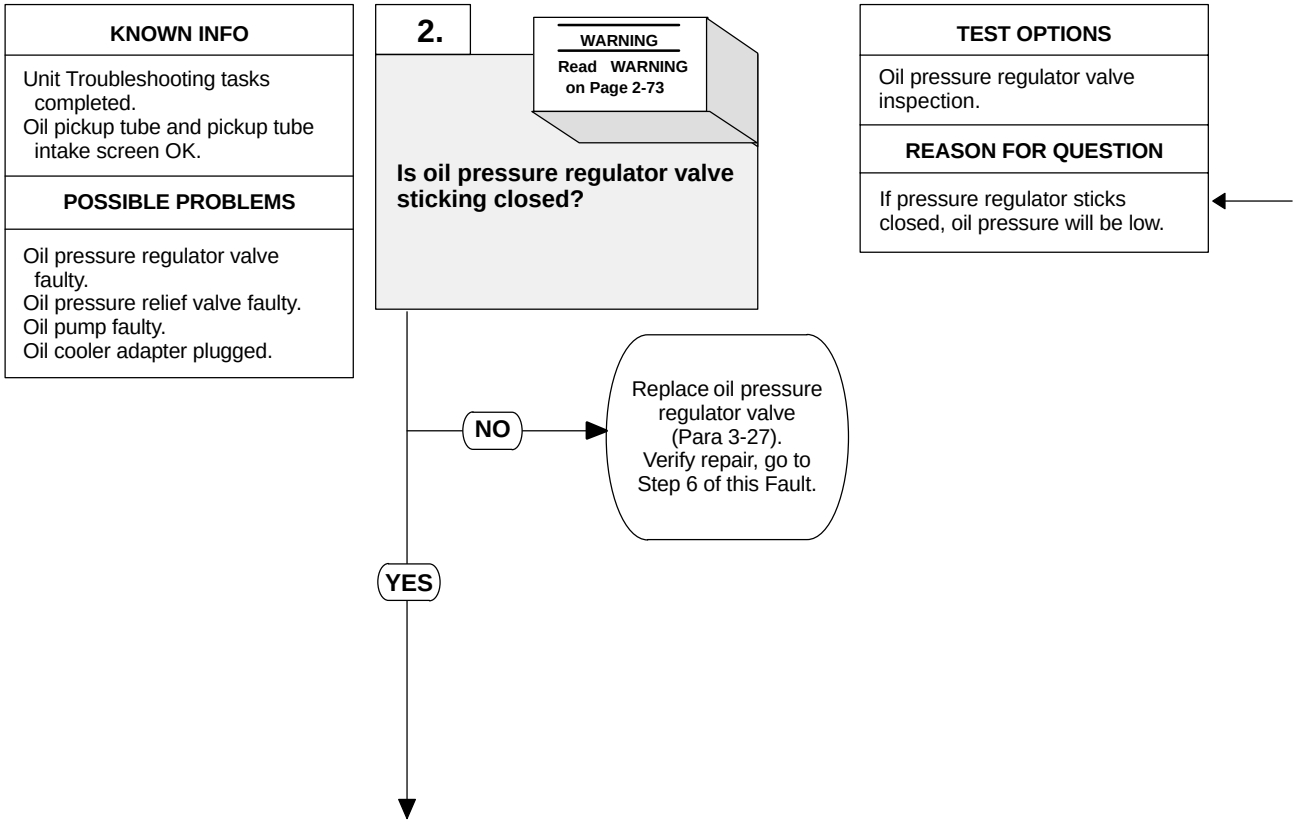
Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

OIL PICKUP TUBE AND ELEMENT STRAINER INSPECTION

(1) Remove engine oil pan (Para 3-22).
(2) Check pickup tube and mounting hardware for looseness and damage.
  (a) If pickup tube is loose, tighten connection (Para 3-26).
  (b) If pickup tube is damaged, replace tube (Para 3-26).
  (c) If pickup tube is not damaged, go to Step 3 below.
(3) Remove two self-locking screws, washers and oil pickup screen strainer Discard self-locking screws.
(4) Check oil pickup tube screen strainer for restrictions.
  (a) If oil pickup tube screen strainer is restricted, replace element strainer, perform Step (5) and (6) below and go to Step 6 of this Fault.
  (b) If oil pickup tube screen strainer is not restricted, perform Step (5) below and go to Step 2 of this Fault.
(5) Install oil pickup tube screen strainer, two washers and self-locking screws.
(6) Install engine oil pan.



3. LOW ENGINE OIL PRESSURE (CONT).

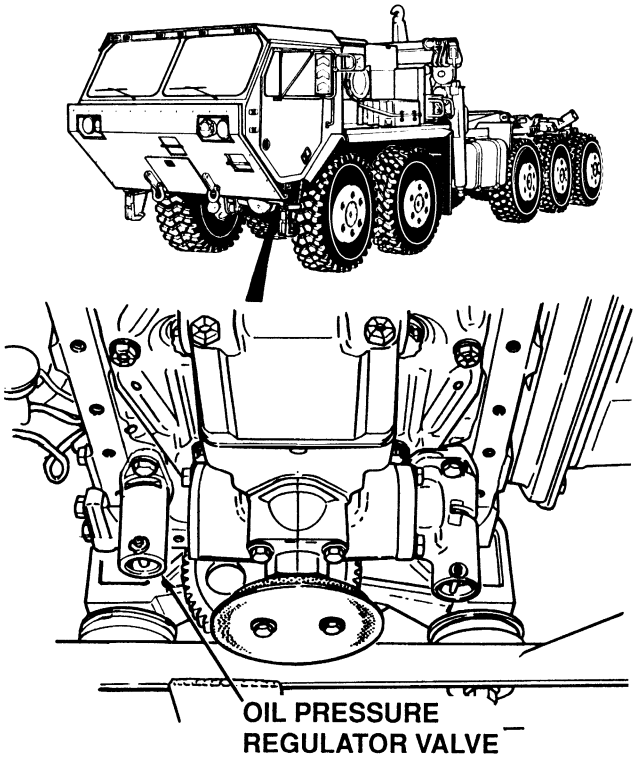


WARNING

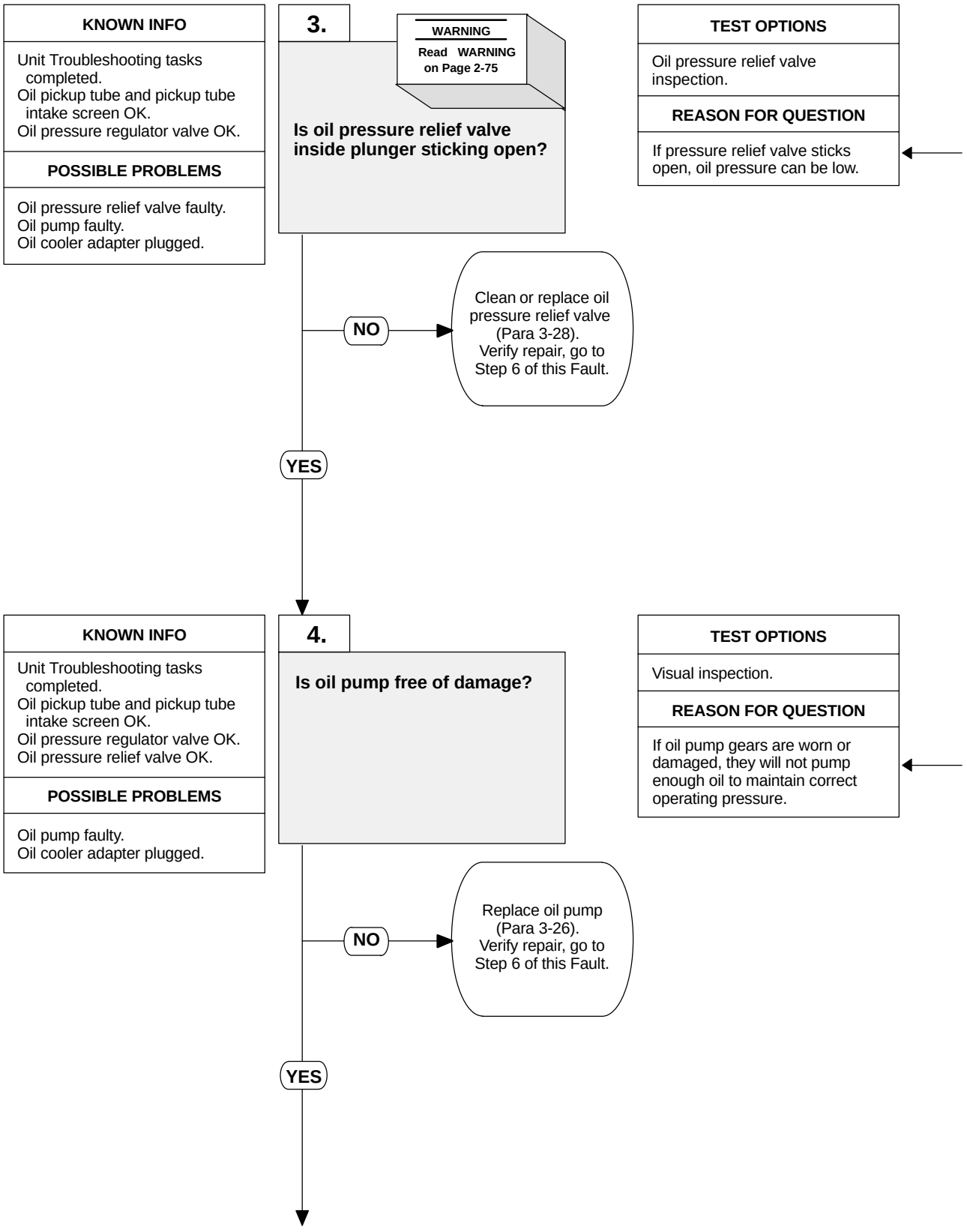
- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.

OIL PRESSURE REGULATOR VALVE INSPECTION

(1) Remove oil pressure regulator valve (Para 3-27).
(2) Clean oil pressure regulator valve with drycleaning solvent.
(3) Check valve inside oil pressure regulator valve for sludge, scoring, and not opening.
  (a) If valve has sludge on it, clean valve again with drycleaning solvent.
  (b) If valve is scored or not opening completely, replace oil pressure regulator valve (Para 3-27).
  (c) If valve is not scored and opens completely, go to Step 3 of this Fault.



3. LOW ENGINE OIL PRESSURE (CONT).

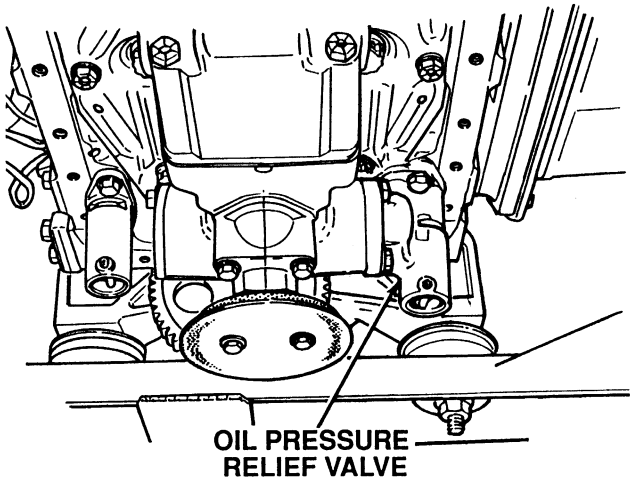


WARNING

- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.

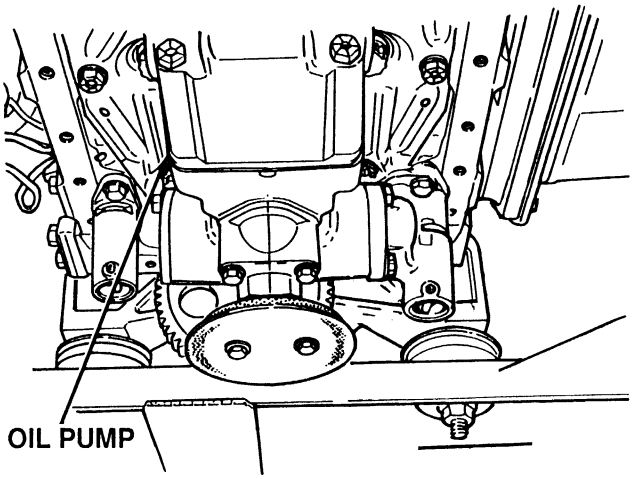
OIL PRESSURE RELIEF VALVE INSPECTION

(1) Remove oil pressure relief valve (Para 3-28).
(2) Clean oil pressure relief valve with drycleaning solvent.
(3) Check valve inside oil pressure relief valve for sludge, scoring, and not closing.
  (a) If valve has sludge on it, clean valve with drycleaning solvent.
  (b) If valve is scored or not closing completely, replace oil pressure relief valve (Para 3-28).
  (c) If valve is not scored and closes completely, go to Step 5 of this Fault.

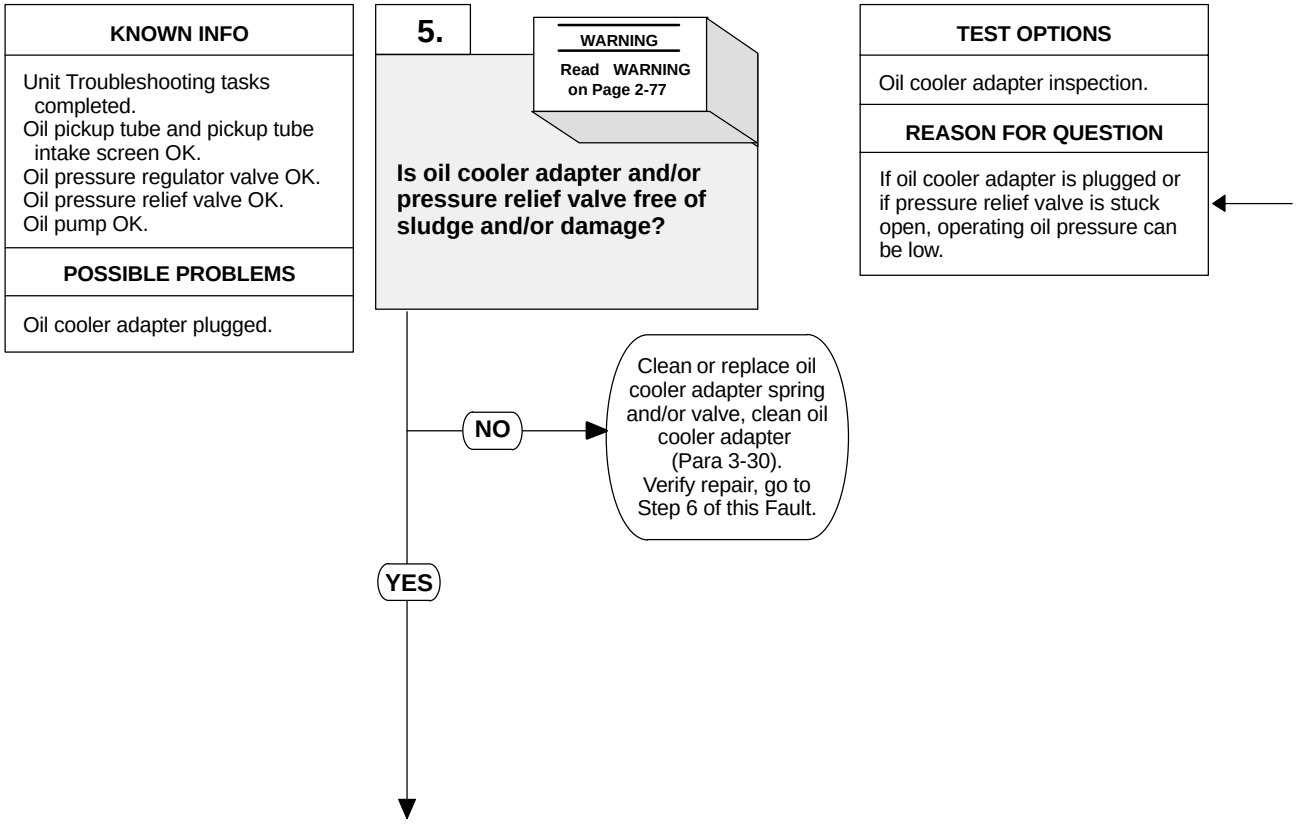


VISUAL INSPECTION

(1) Remove engine oil pump (Para 3-26).
(2) Clean engine oil pump with drycleaning solvent.
(3) Check engine oil pump for sludge, broken gear teeth, or other damage. Make sure pump turns freely.
  (a) If oil pump is damaged, replace oil pump.
  (b) If oil pump is not damaged, oil pump is OK.
(4) Install engine oil pump (Para 3-26).
(5) Install oil pressure relief valve (Para 3-28).
(6) Install oil pressure regulator valve (Para 3-27).
(7) Install engine oil pan (Para 3-22).



3. LOW ENGINE OIL PRESSURE (CONT).

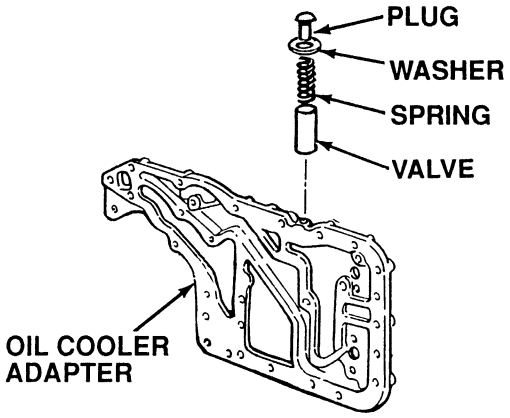


WARNING

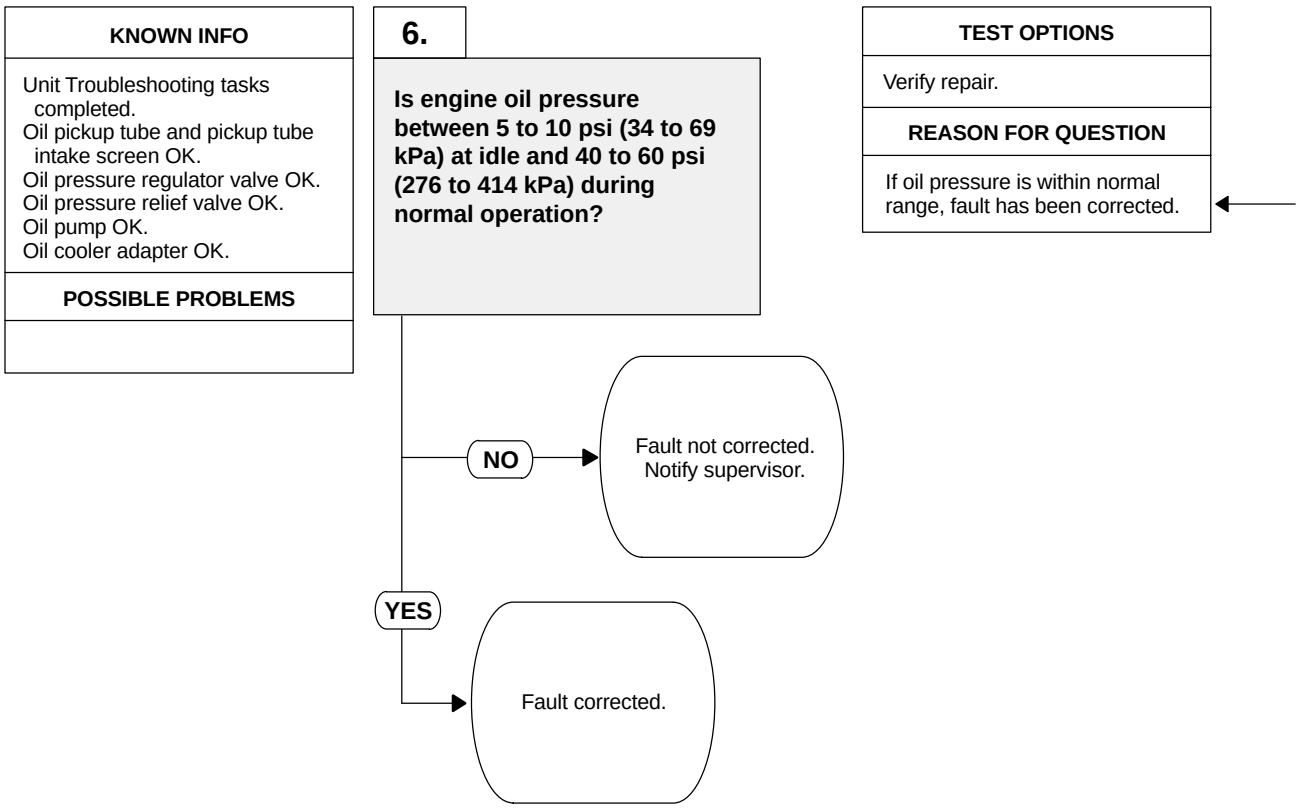
- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.
- Use care when removing springs. Springs are under tension and can act as projectiles when released and could cause severe eye injury.

OIL COOLER ADAPTER INSPECTION

(1) Remove engine oil cooler adapter (Para 3-30).
(2) Remove plug, washer, spring and valve from oil cooler adapter.
  (a) If valve and spring are clogged with sludge or damaged, clean or replace valve and/or spring (Para 3-30). Perform Steps (4) and (5) below and go to Step 6 of this Fault.
  (b) If valve and spring are clean and free of damage, go to Step 3 below.
(3) Check inside ports of oil cooler adapter.
  (a) If oil cooler adapter is clogged with oil sludge, clean core with dry cleaning solvent. Perform Steps (4) and (5) below and go to Step 6 of this Fault.
  (b) If cooler adapter is clean and free of sludge, fault not corrected. Perform Steps (4) and (5) below and notify supervisor.
(4) Install valve, spring, washer and plug.
(5) Install oil cooler adapter.

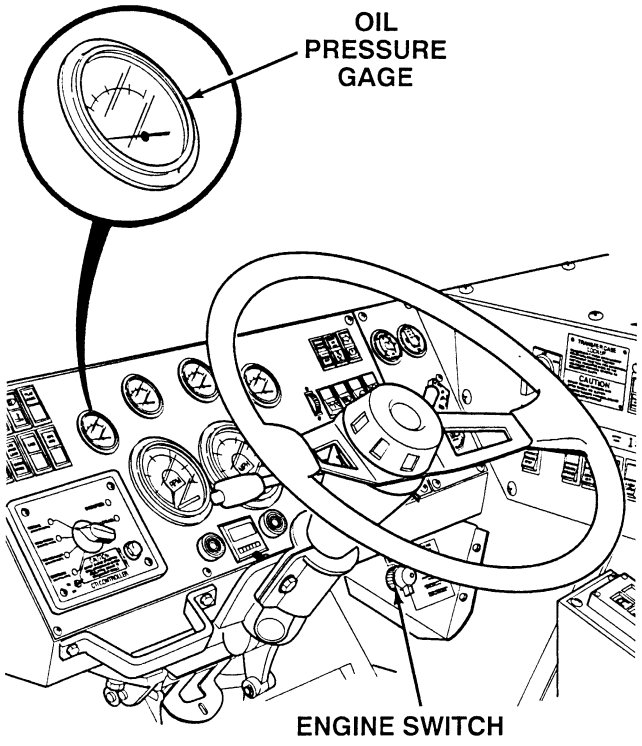


3. LOW ENGINE OIL PRESSURE (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10) and run until oil pressure stabilizes.
   (a) If oil pressure is not between 5 to 10 psi (34 to 69 kPa) at idle and 40 to 60 psi (276 to 414 kPa) when oil pressure has stabilized, fault not corrected. Turn OFF ENGINE switch and notify supervisor.
   (b) If oil pressure is within normal range, fault has been corrected.
(2) Turn OFF ENGINE switch.



2-10. ENGINE TROUBLESHOOTING (CONT).

4. EXCESSIVE BLACK OR GRAY EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE).

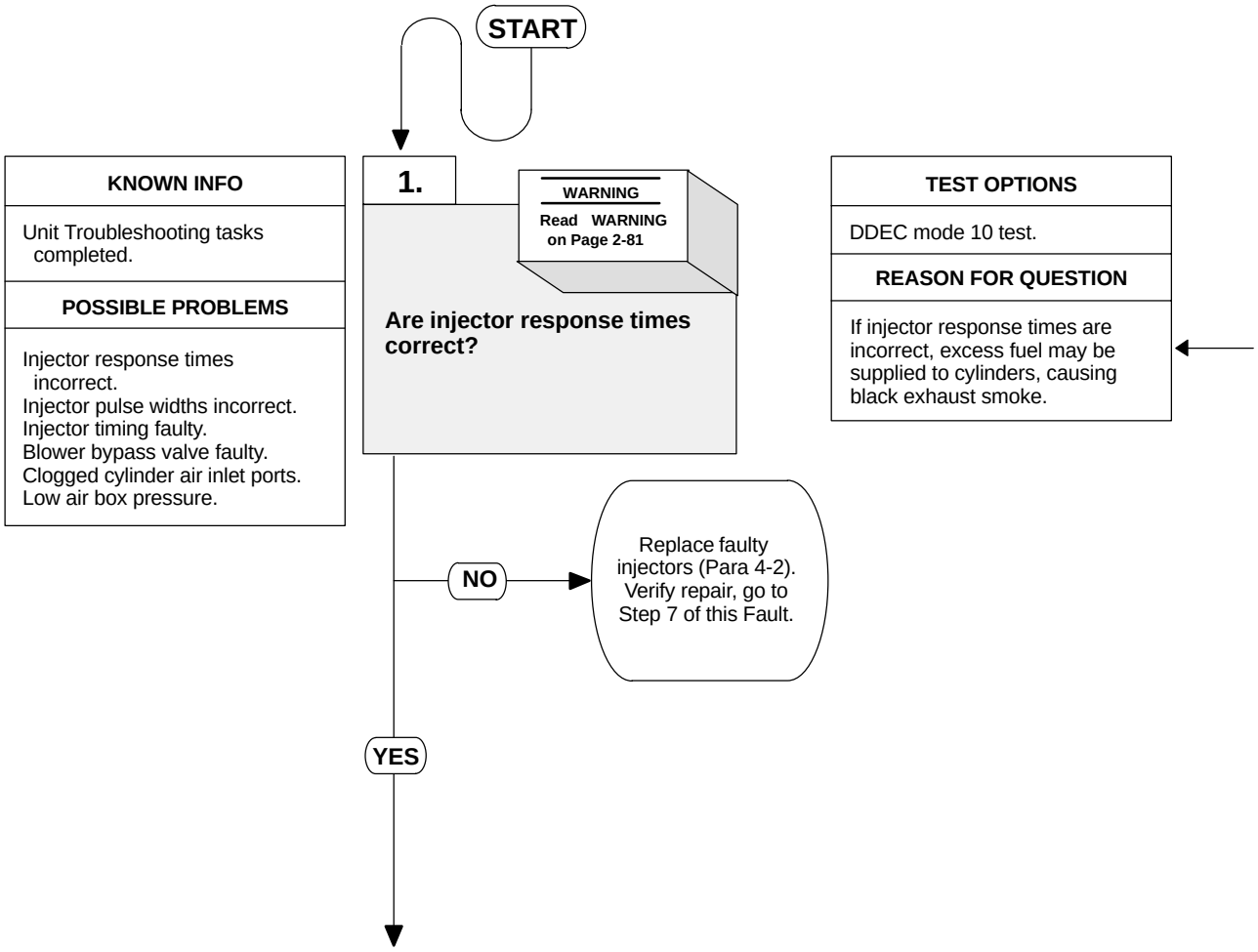
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Analyzer Set, STE/ICE-R (Item 15, Appendix F)
Cartridge, DDEC (Item 29, Appendix F)
Reader, Diagnostic (Item 180, Appendix F)

Materials/Parts
Gasket (2) (Item 115, Appendix E)
Gasket (4) (Item 116, Appendix E)
Lockwasher (8) (Item 282, Appendix E)

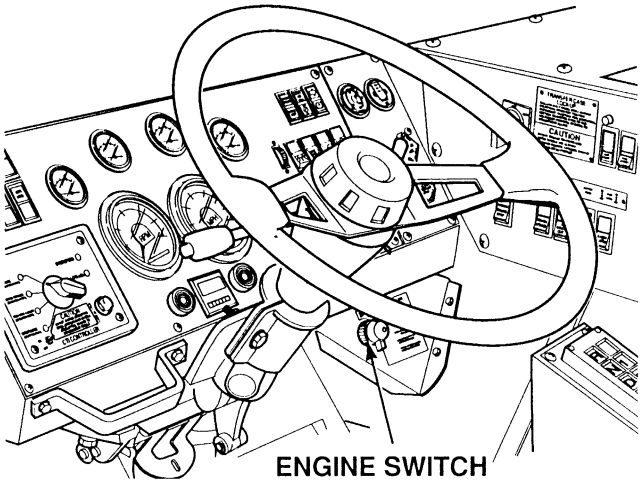
References
TM 9-2320-364-10
TM 9-2320-364-20
TM 9-4910-571-12&P

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



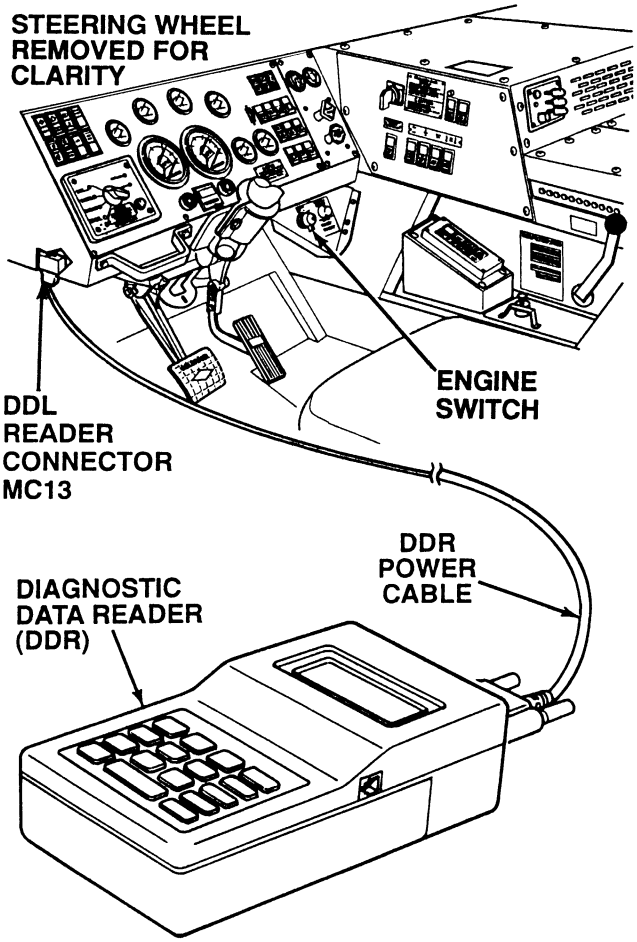
WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

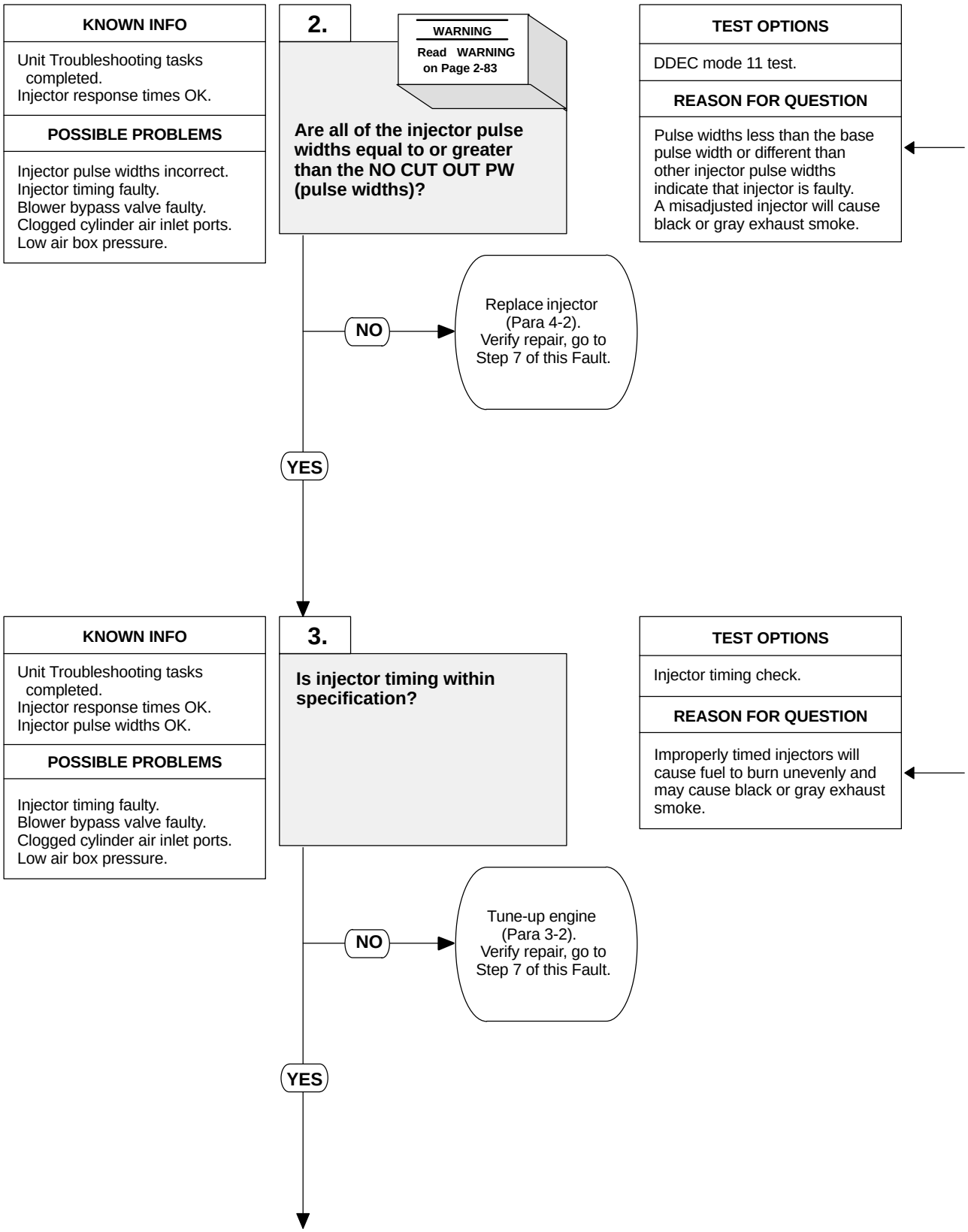


DDEC MODE 10 TEST

(1) Connect DDR to DDL connector MC13.
(2) Start engine (TM 9-2320-364-10).
(3) Select mode 10 to display fuel injector response times on DDR.
(4) Compare response times of all eight injectors.
  (a) If any injector response time is less than others or less than .80 milliseconds, perform Steps (5) and (6) below and replace injector (Para 4-2).
  (b) If injector response times are same as others or greater than .80 milliseconds, response times are OK.
(5) Turn OFF ENGINE switch.
(6) Disconnect DDR from DDL connector MC13.



4. EXCESSIVE BLACK OR GRAY EXHAUST SMOKE (CONT).

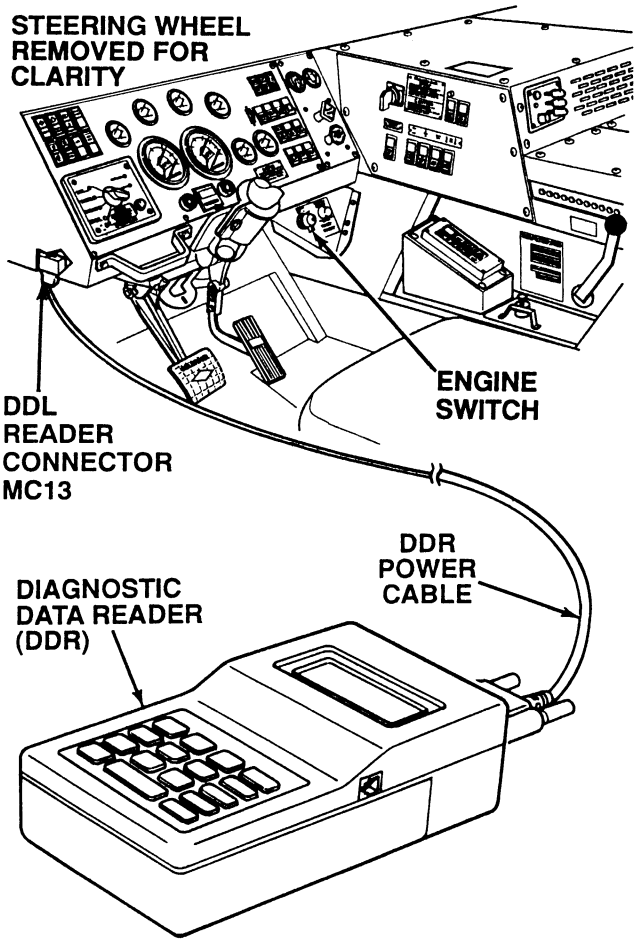


WARNING

- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

DDEC MODE 11 TEST

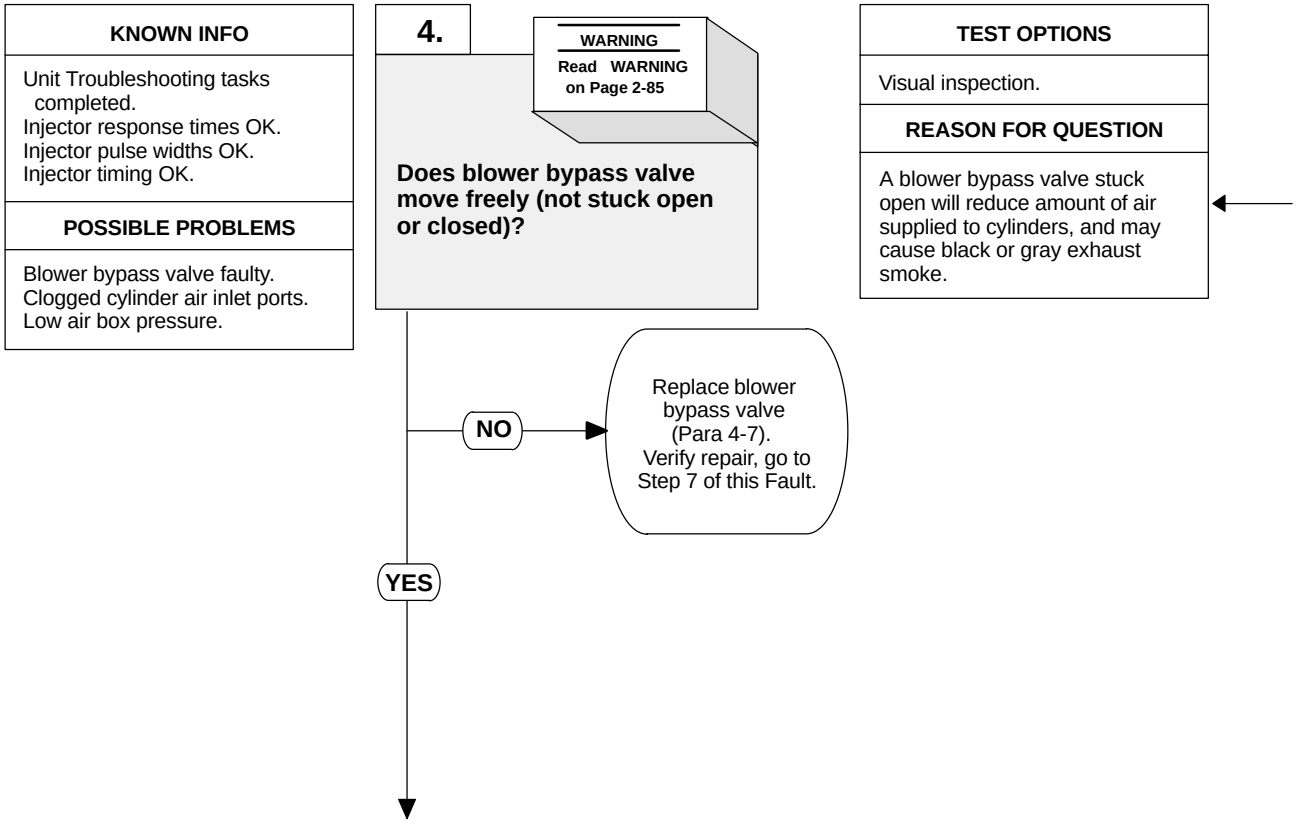
(1) Connect DDR to DDL connector MC13.
(2) Start engine (TM 9-2320-364-10).
(3) Select mode 11 to display pulse widths on DDR.
(4) Compare pulse widths of all eight injectors.
  (a) If pulse widths are less than the NO CUT OUT PW (pulse widths), or different from cylinder to cylinder, perform Steps (5) and (6) below and replace injector (Para 4-2).
  (b) If pulse widths are equal to or greater than the NO CUT OUT PW (pulse widths), perform Steps (5) and (6) below and go to Step 3 of this Fault.
(5) Turn OFF ENGINE switch.
(6) Disconnect DDR from DDL connector MC13.



INJECTOR TIMING CHECK

Check injector timing.
  (1) If injectors are out of time, time injectors (Para 3-2).
  (2) If injectors are in time, go to Step 4 of this Fault.

4. EXCESSIVE BLACK OR GRAY EXHAUST SMOKE (CONT).

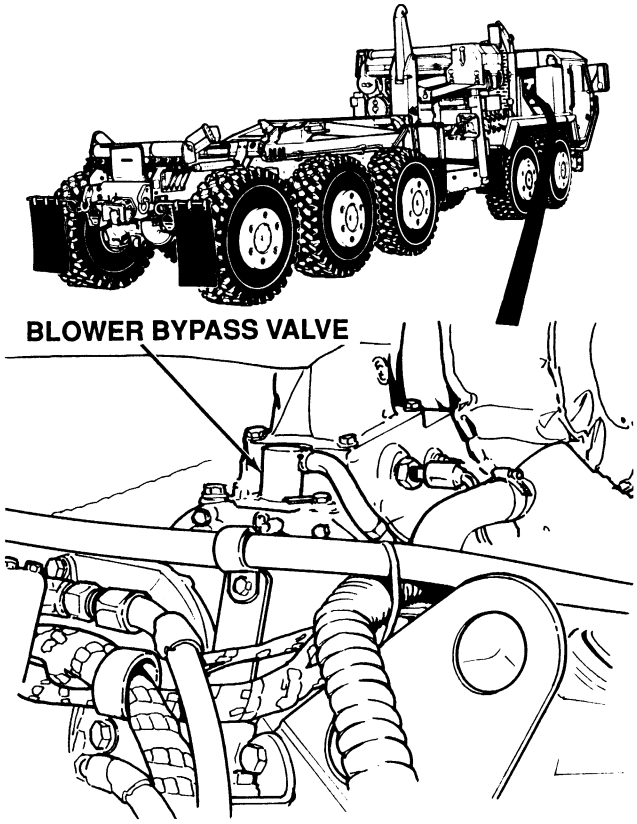


WARNING

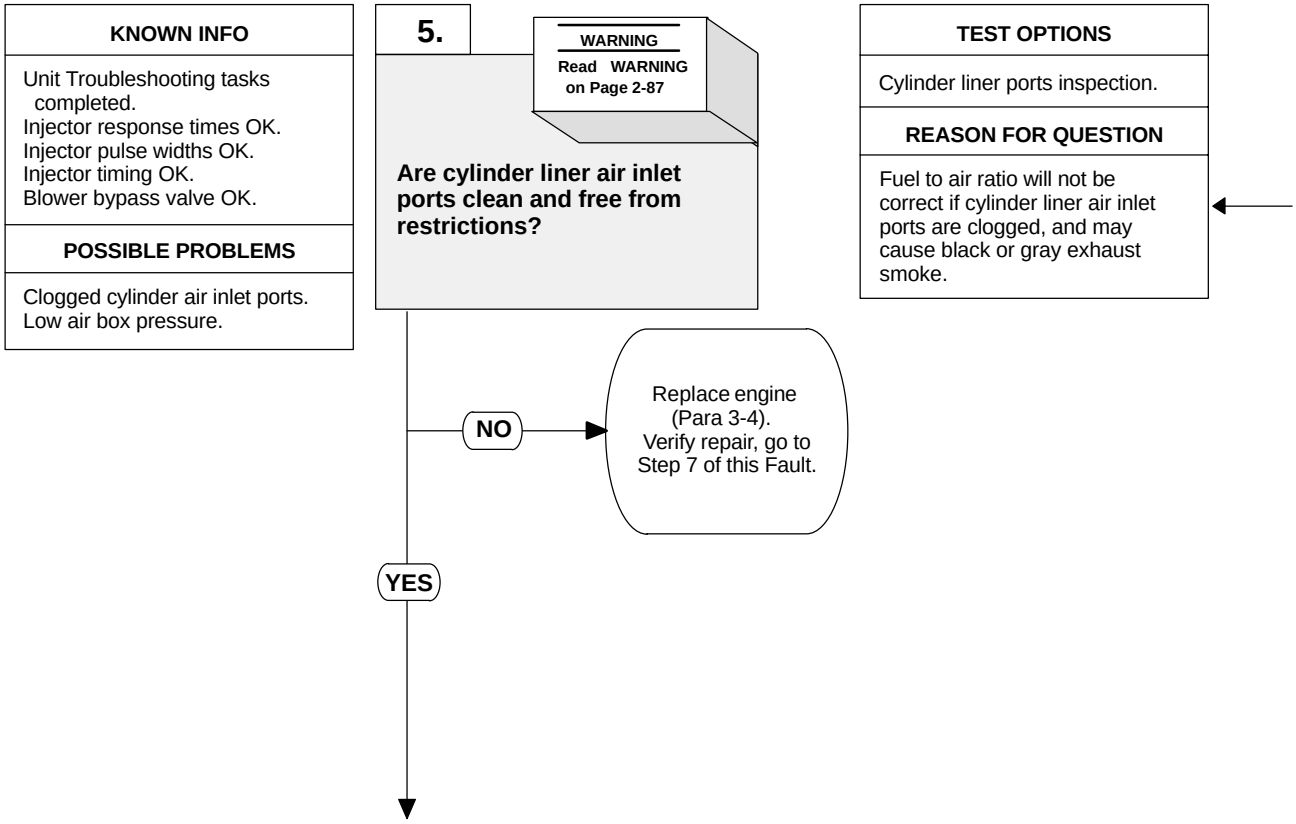
Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

VISUAL INSPECTION

(1) Remove blower bypass valve (Para 4-7).
(2) Push blower bypass valve piston open by hand. Spring pressure should fully close valve.
   (a) If blower bypass valve piston cannot be opened with hand pressure or will not fully seat with spring pressure, replace blower bypass valve (Para 4-7).
   (b) If blower bypass valve piston can be opened with hand pressure and fully closed with spring pressure, blower bypass valve is OK.
(3) Install blower bypass valve (Para 4-7).



4. EXCESSIVE BLACK OR GRAY EXHAUST SMOKE (CONT).

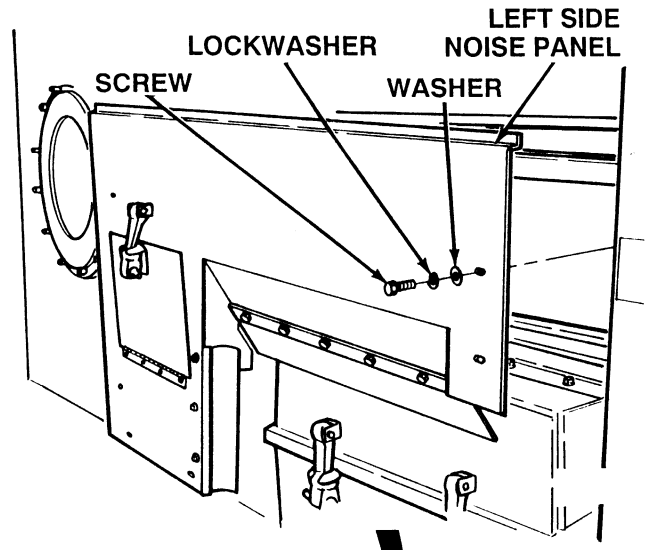


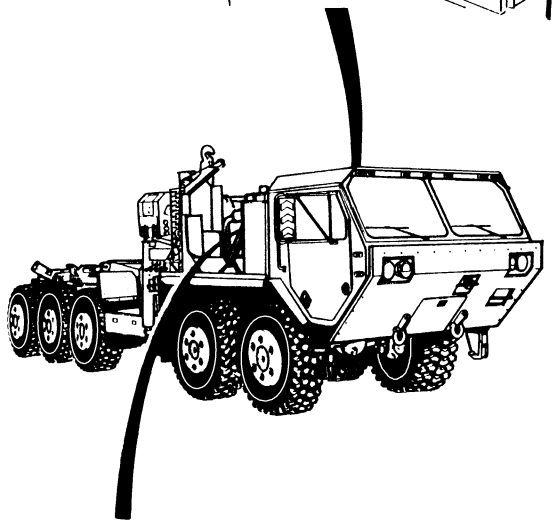
WARNING

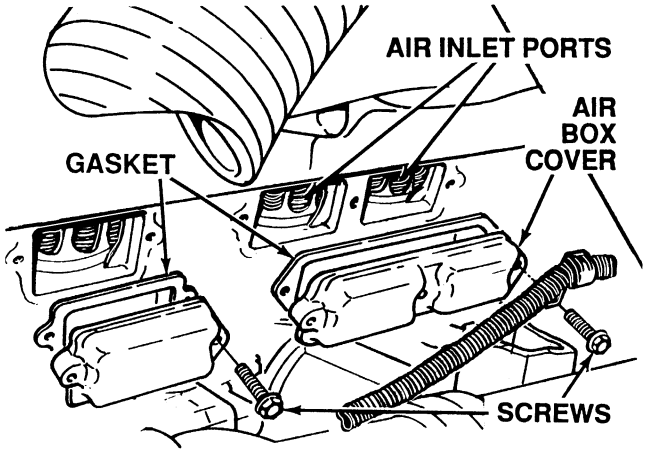
Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

CYLINDER LINER PORTS INSPECTION

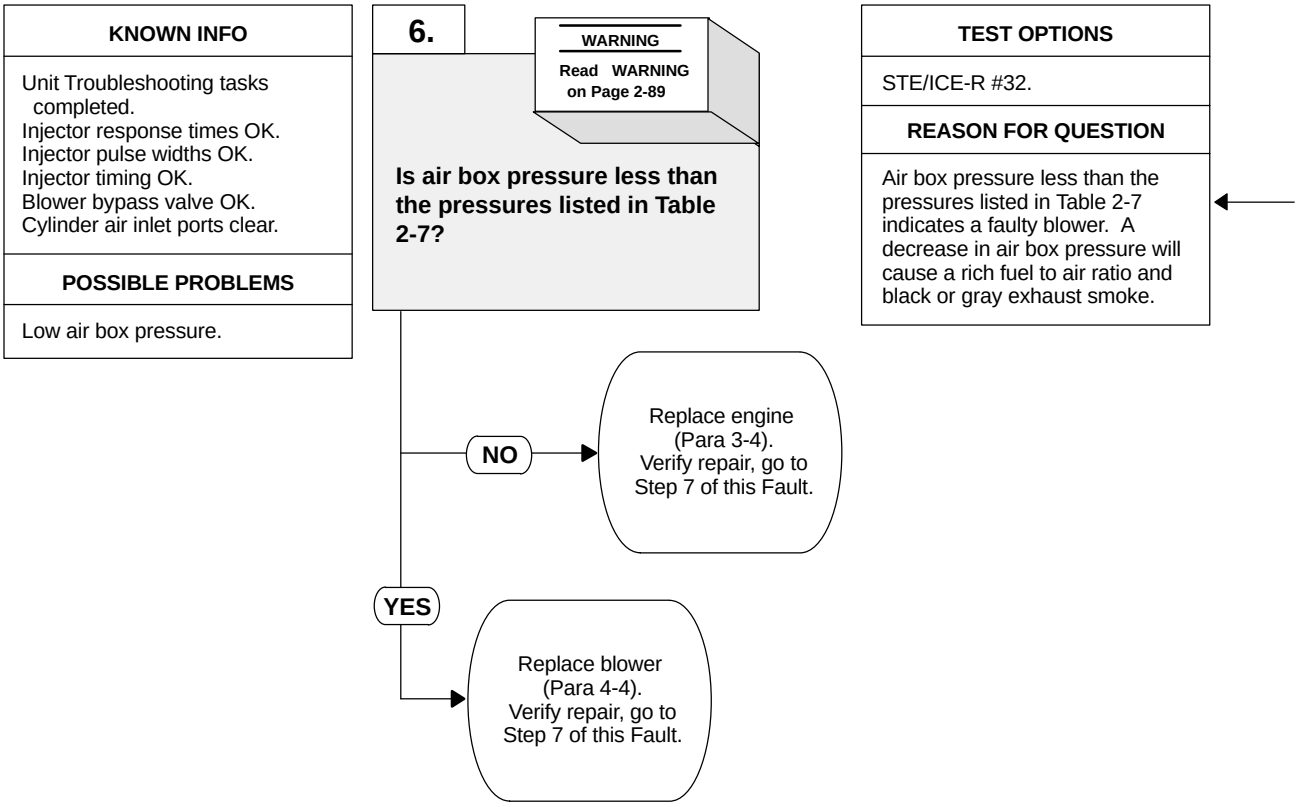
(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove 14 screws, six engine air box covers and gaskets. Discard gaskets
(3) Check for clogged cylinder liner air inlet ports.
(4) (a) If cylinder liner air inlet ports are clogged, replace engine (Para 3-4).
    (b) If cylinder liner air inlet ports are not clogged, perform Step (5) below and go to Step 6 of this Fault.
(5) Install six gaskets and engine air box covers with 14 screws.







4. EXCESSIVE BLACK OR GRAY EXHAUST SMOKE (CONT).



WARNING

Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

STE/ICE-R #32

(1) Remove dust cover from DCA connector MC39.
(2) Connect STE/ICE-R DCA W1 to the vehicle test meter (VTM) and DCA connector.
(3) Power up STE/ICE-R VTM in the DCA mode.
(4) Perform confidence test.
(5) Enter vehicle identification number.
(6) Perform STE/ICE-R #72 test.
(7) Perform STE/ICE-R #73 test.
(8) Perform STE/ICE-R #74 test.
(9) Perform STE/ICE-R #75 test.
(10) Set STE/ICE-R test select switch to 32.
(11) Press and hold STE/ICE-R test button until CAL appears on display.
(12) Release STE/ICE-R test button and wait for offset value to appear on display.
(13) Start engine (TM 9-2320-364-10).
(14) Press and release STE/ICE-R test button to obtain test results.
  (a) If reading is greater than those shown in Table 2-7 (Engine Air Box Pressures), perform Steps (15) through (17) and replace engine (Para 3-4).
  (b) If reading is less than those shown in Table 2-7 (Engine Air Box Pressures), perform Steps (15) through (17) below and replace blower (Para 4-4).
(15) Turn OFF ENGINE switch.
(16) Disconnect DCA cable W1 from DCA connector MC39.
(17) Install dust cover on DCA connector MC39.

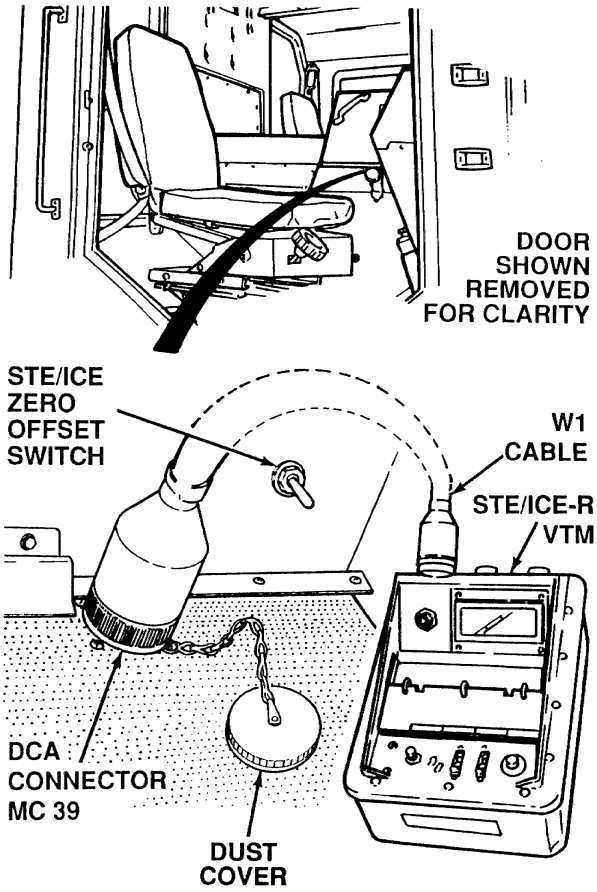
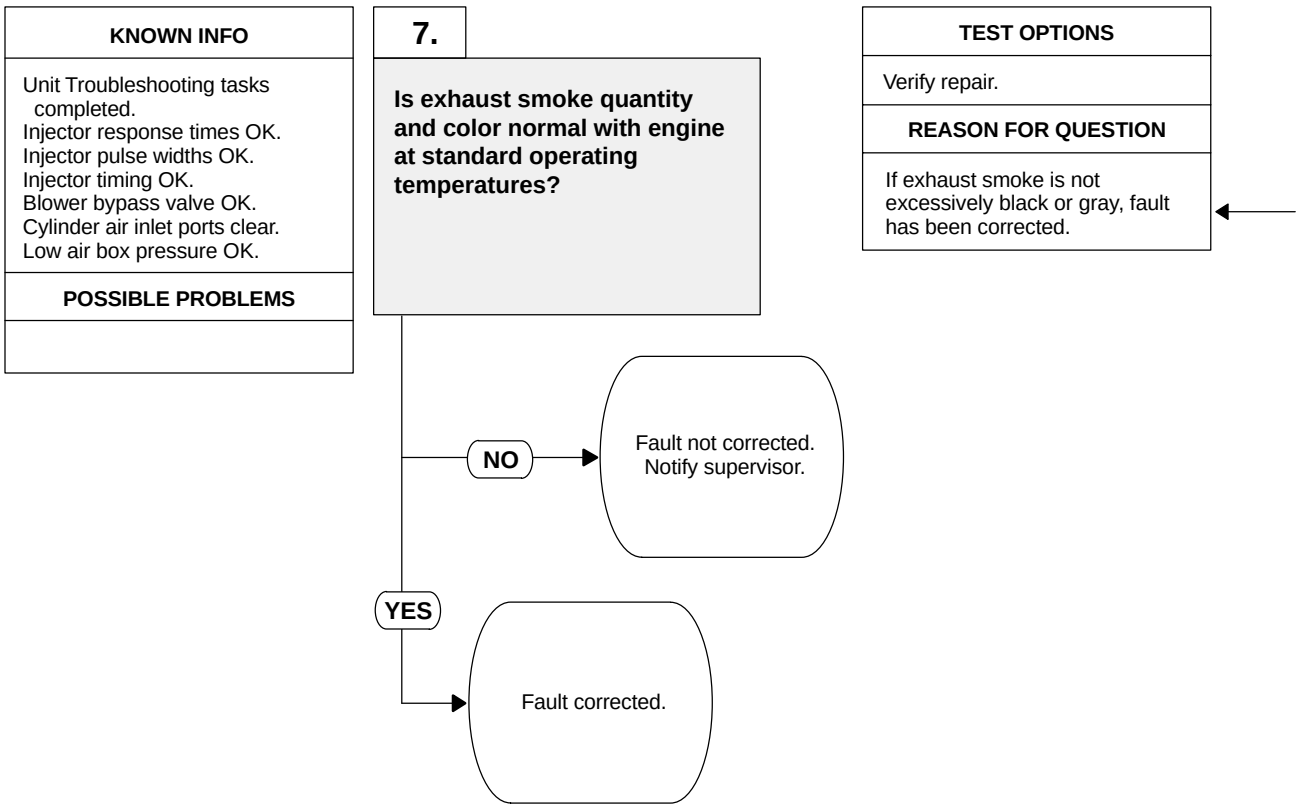


Table 2-7. Engine Air Box Pressures

Air Box Pressure Full Load Minimum*	1800 rpm in. Hg (mm Hg)	1950 rpm in. Hg (mm Hg)	2100 rpm in. Hg (mm Hg)
At zero exhaust back pressure	48 (1216)	52.2 (1322)	54.8 (1388)
At maximum exhaust back pressure	41.9 (1061)	46.1 (1168)	48.7 (1233)

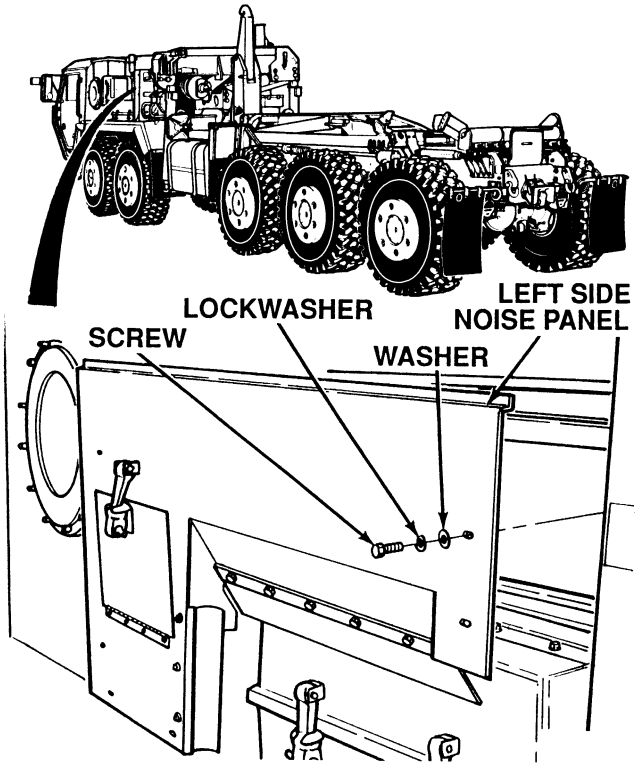
* 500 BHP 5234775 DDEC 1.520 timing

4. EXCESSIVE BLACK OR GRAY EXHAUST SMOKE (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
   (a) If exhaust smoke is excessive and black or gray in color, fault not corrected. Perform Steps (2) through (4) below and notify supervisor.
   (b) If exhaust smoke is normal in quantity and color, fault has been corrected.
(2) Turn OFF ENGINE switch.
(3) Install left side noise panel with eight washers, lockwashers and screws.
(4) Install right side noise panel (TM 9-2320-364-20).



2-10. ENGINE TROUBLESHOOTING (CONT).

5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE).

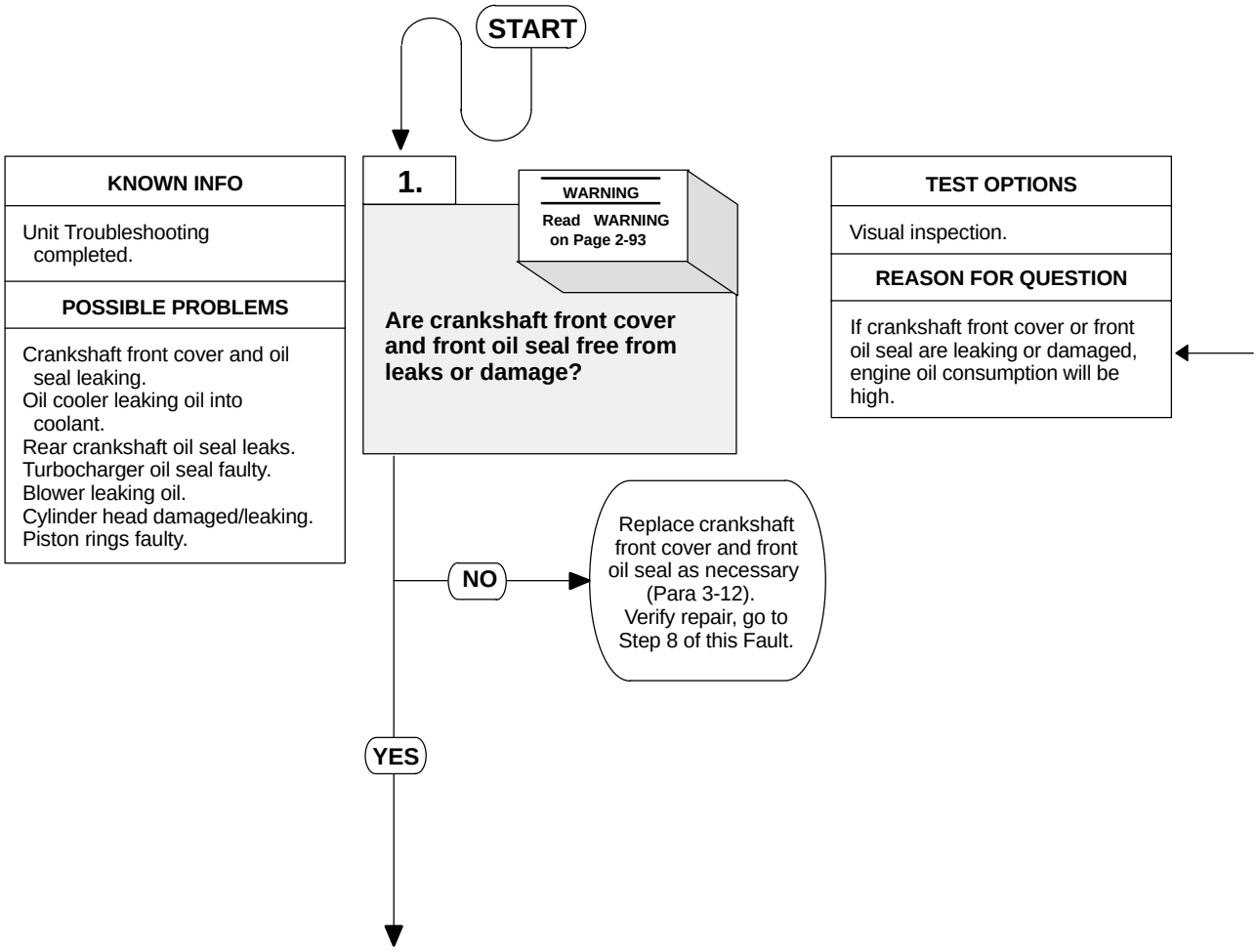
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Reader, Diagnostic (Item 180, Appendix F)

Materials/Parts
Gasket (2) (Item 115, Appendix E)
Gasket (4) (Item 116, Appendix E)
Lockwasher (30) (Item 282, Appendix E)

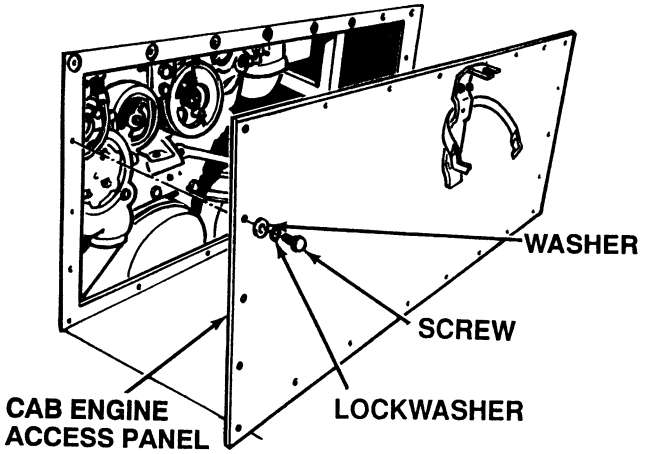
References
TM 9-2320-364-10
TM 9-2320-364-20

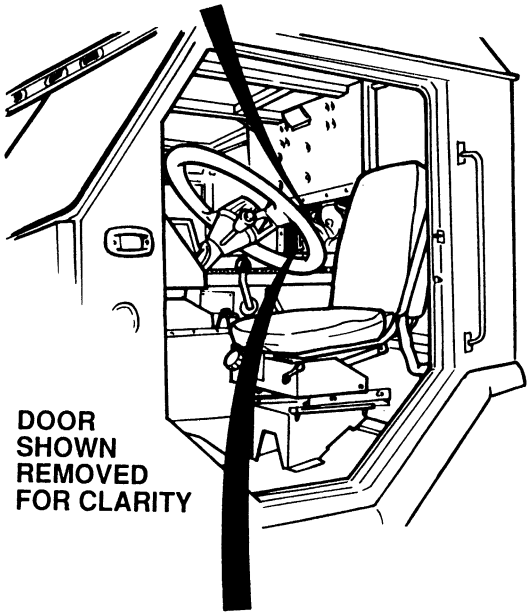
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



WARNING

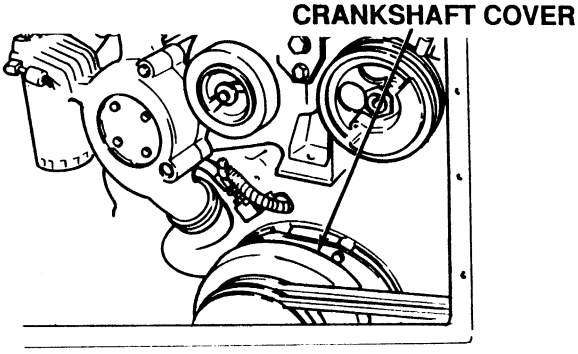
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.



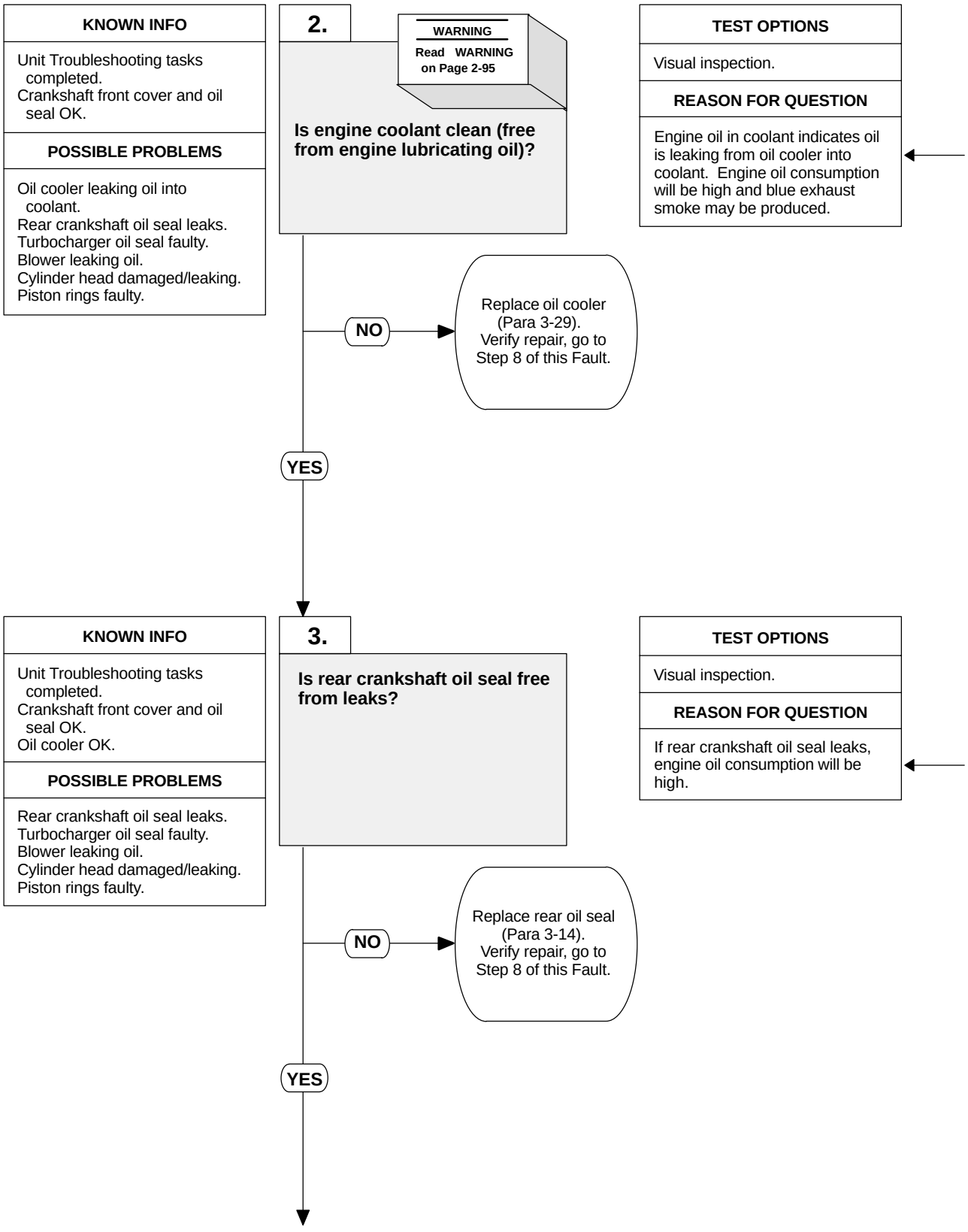


VISUAL INSPECTION

(1) Remove 22 screws, lockwashers, washers and cab engine access panel. Discard lockwashers.
(2) Check crankshaft front cover and front oil seal for leaks or damage.
  (a) If crankshaft front cover or front oil seal, are leaking or damaged, replace crankshaft front cover or front oil seal (Para 3-12).
  (b) If crankshaft front cover and front oil seal are not leaking or damaged, go to Step 2 of this Fault.

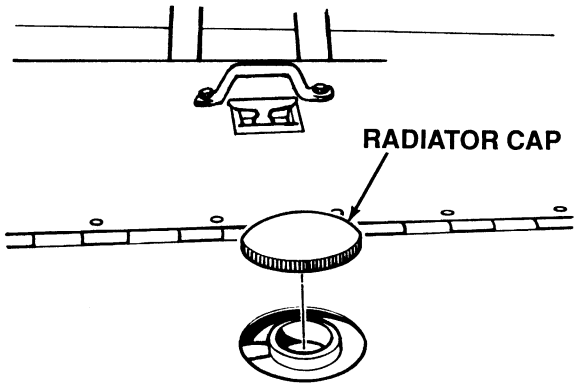


5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (CONT).



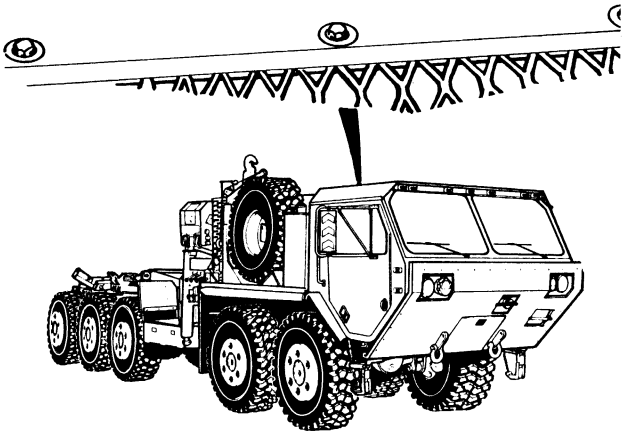
WARNING

- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.
- Use a clean, thick waste cloth or like material to remove the cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.



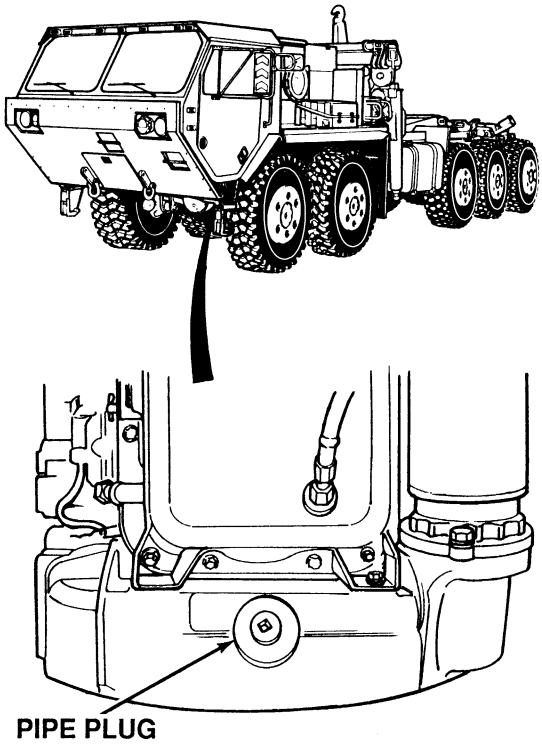
VISUAL INSPECTION

(1) Remove radiator cap (TM 9-2320-364-10).
(2) Check coolant for engine lubricating oil.
  (a) If engine lubricating oil is present in coolant, replace oil cooler (Para 3-29).
  (b) If no engine lubricating oil is present in coolant, perform Step (3) below and go to Step 3 of this Fault.
(3) Install radiator cap.

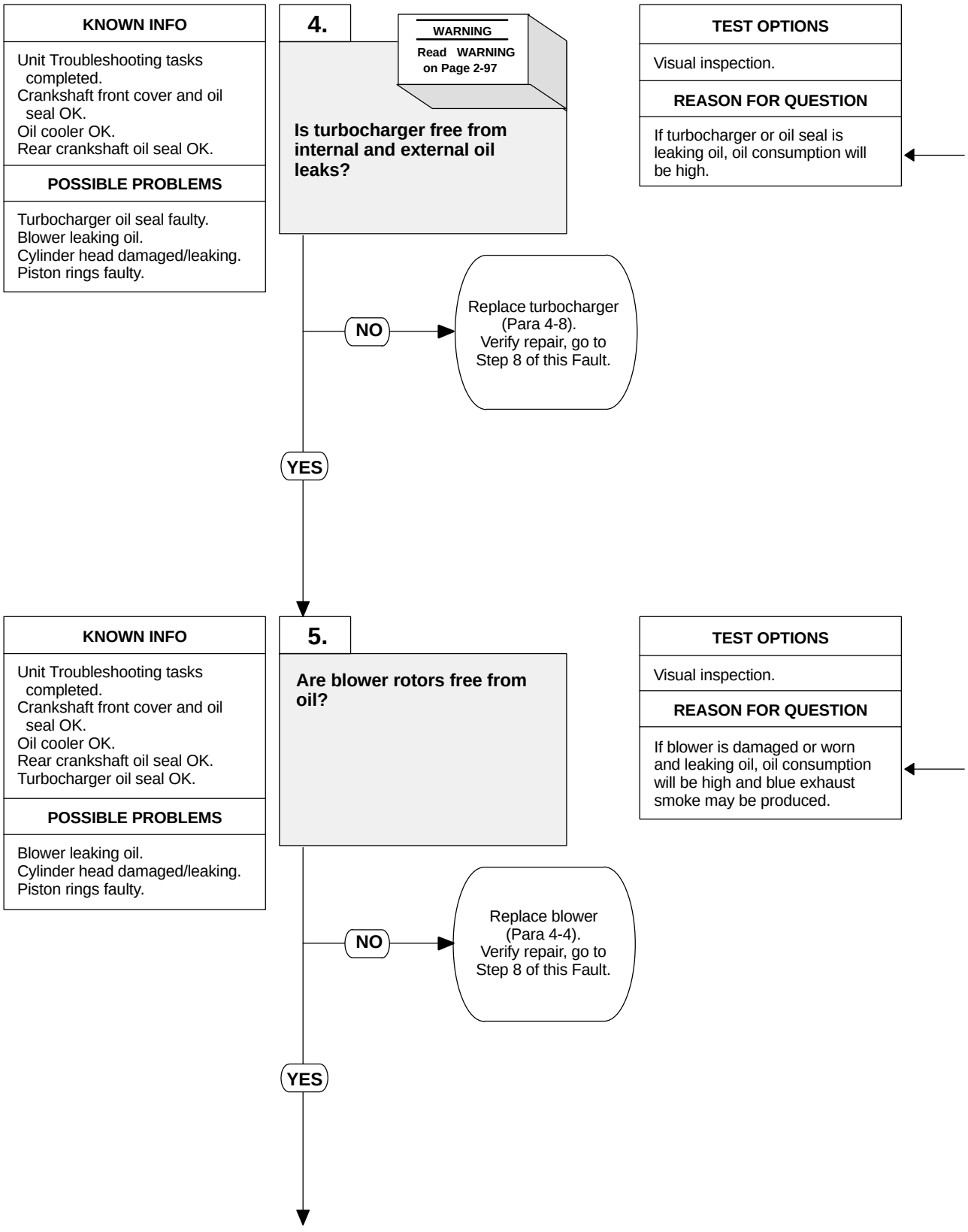


VISUAL INSPECTION

(1) Remove pipe plug from bottom of flywheel housing.
(2) Check for oil in housing.
  (a) If oil is present in flywheel housing, go to Step (3) below.
  (b) If no oil is present in flywheel housing, go to Step (6) below.
(3) Remove engine and transmission (Para 3-4).
(4) Check rear oil seal for oil leaks.
  (a) If rear oil seal leaks, replace oil seal (Para 3-14).
  (b) If rear oil seal does not leak, perform Steps (5) and (6) below and go to Step 4 of this Fault.
(5) Install engine and transmission (Para 3-4).
(6) Install pipe plug in flywheel housing.



5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (CONT).

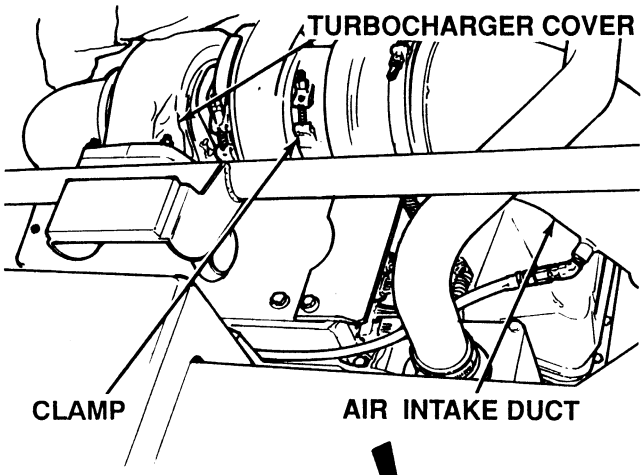


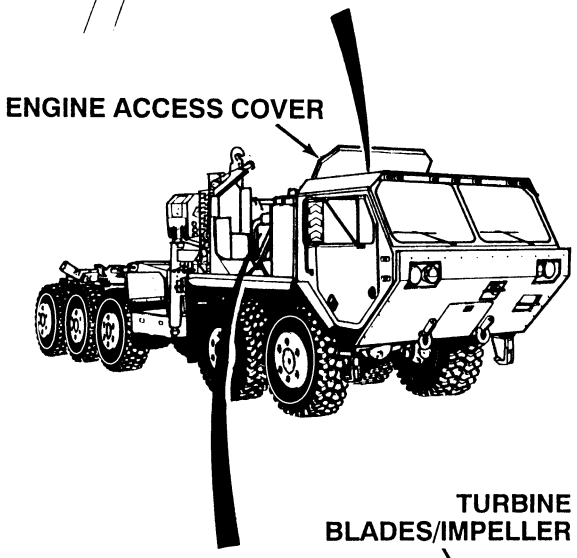
WARNING

Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

VISUAL INSPECTION

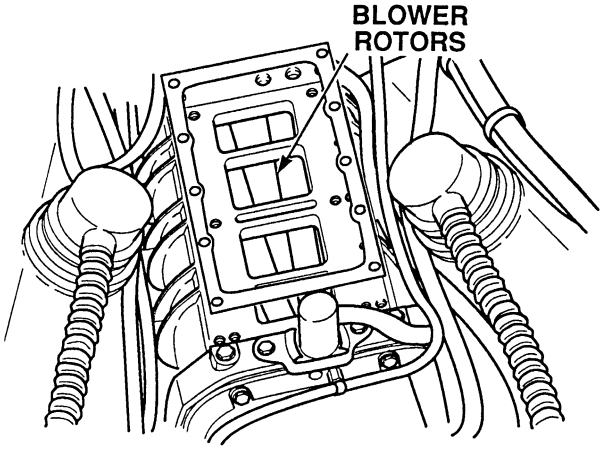
(1) Remove right side noise panel (TM 9-2320-364-20).
(2) Loosen clamps and remove air outlet duct from turbocharger.
(2) Loosen clamp and remove exhaust duct from turbocharger.
(3) Check impeller and turbine blades for oil leaks.
  (a) If there is oil present inside the turbocharger, replace turbocharger (Para 4-8).
  (b) If the inside of the turbocharger is free of oil, go to Step 5 of this Fault.

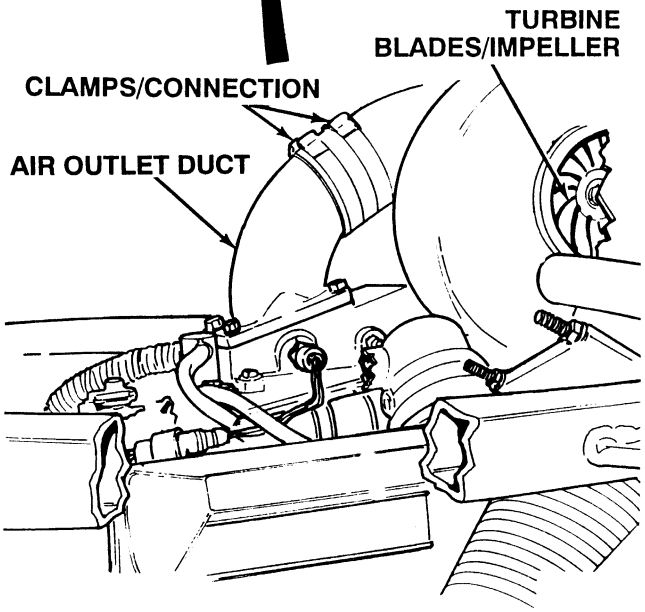




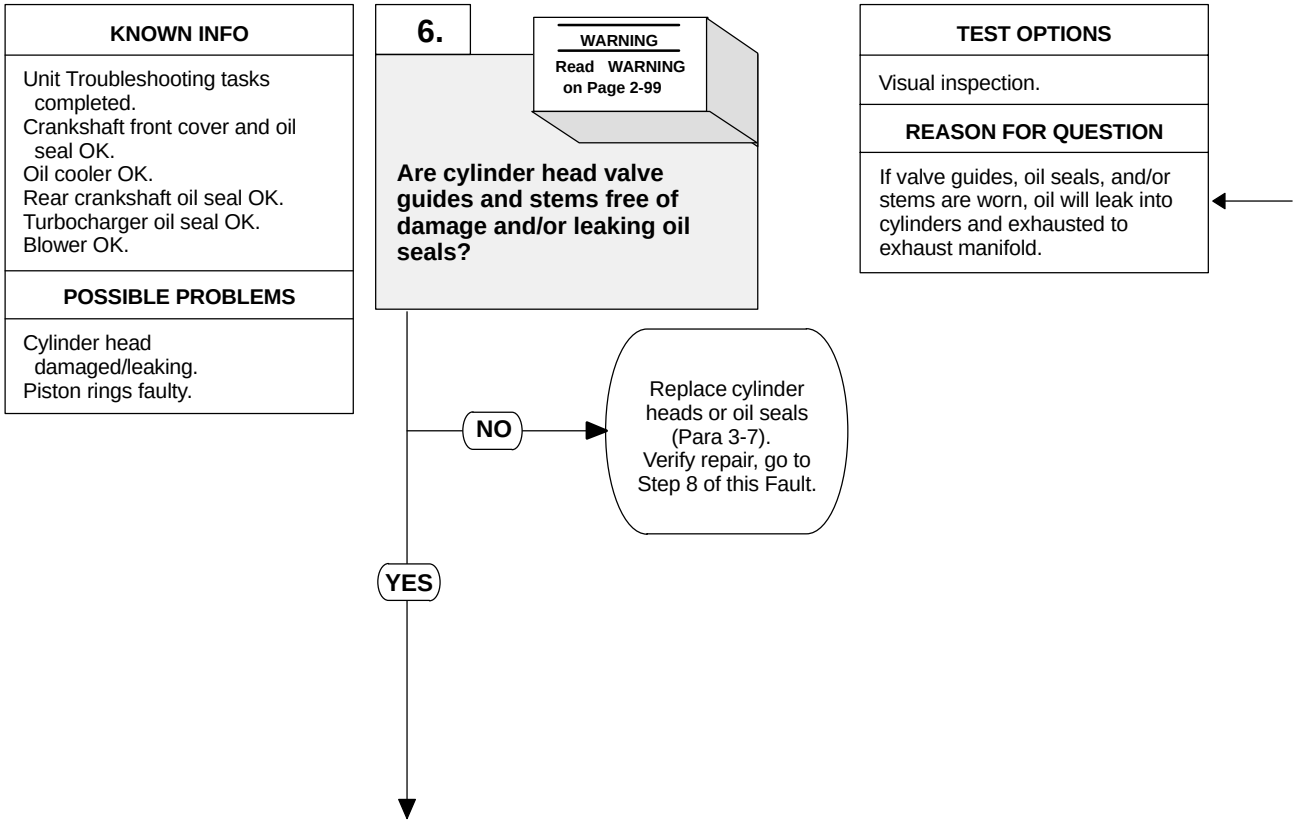
VISUAL INSPECTION

(1) Remove air inlet housing (Para 4-3).
(2) Check blower rotors for signs of oil.
  (a) If signs of oil are found, replace blower (Para 4-4).
  (b) If no signs of oil are found, perform Step (3) below and go to Step 6 of this Fault.
(3) Install air inlet housing (Para 4-3).





5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (CONT).

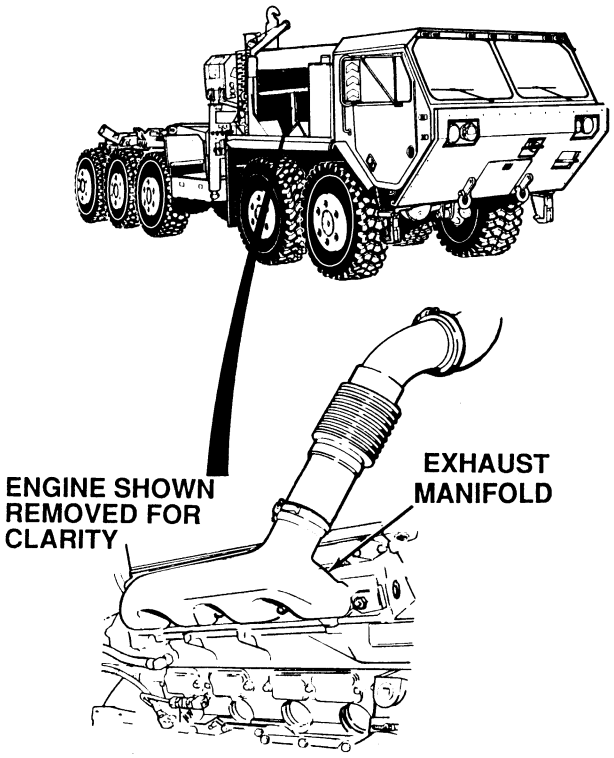


WARNING

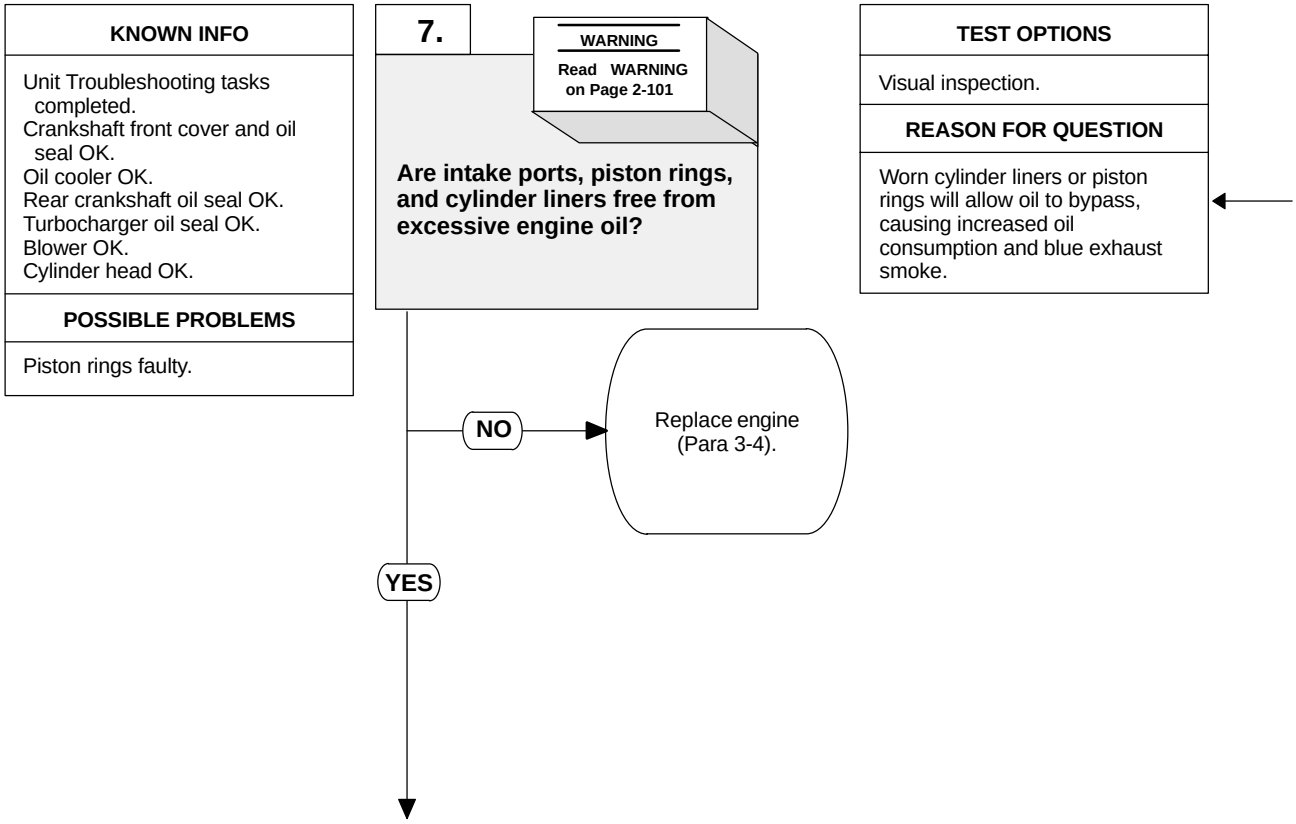
Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

VISUAL INSPECTION

(1) Remove exhaust manifolds (Para 3-31).
(2) Check inside of exhaust manifolds for leaking oil.
  (a) If there is oil present inside the exhaust manifolds, go to Step (3) below.
  (b) If there is no oil inside the exhaust manifold, go to Step 7 of this Fault.
(3) Remove cylinder head (Para 3-7).
(4) Check cylinder head, valve guides, valve guides seals, head gasket and oil seals for cracks and damage.
  (a) If cylinder head, gaskets and/or seals are damaged, replace damaged components (Para 3-7).
  (b) If cylinder head, gaskets and seals are OK, go to Step 7 of this Fault.
(5) Install cylinder head (Para 3-7).
(6) Install exhaust manifolds (Para 3-31).



5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (CONT).

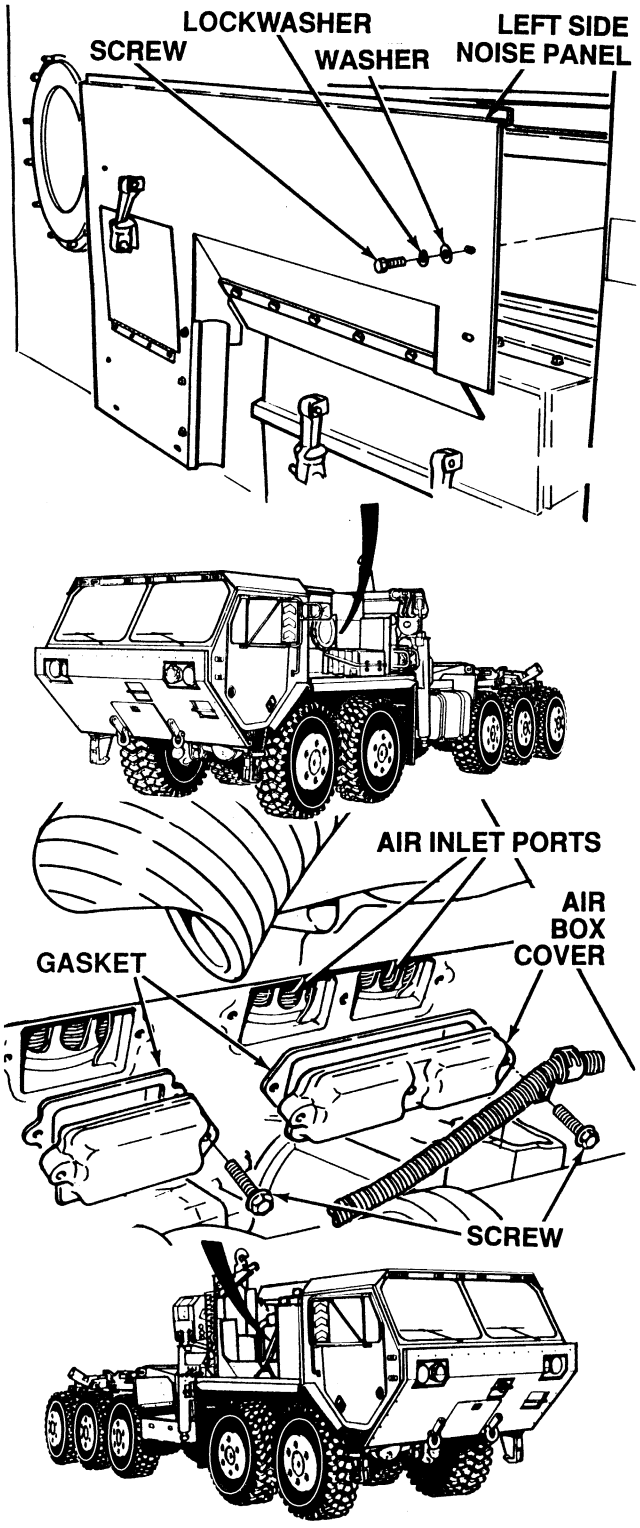


WARNING

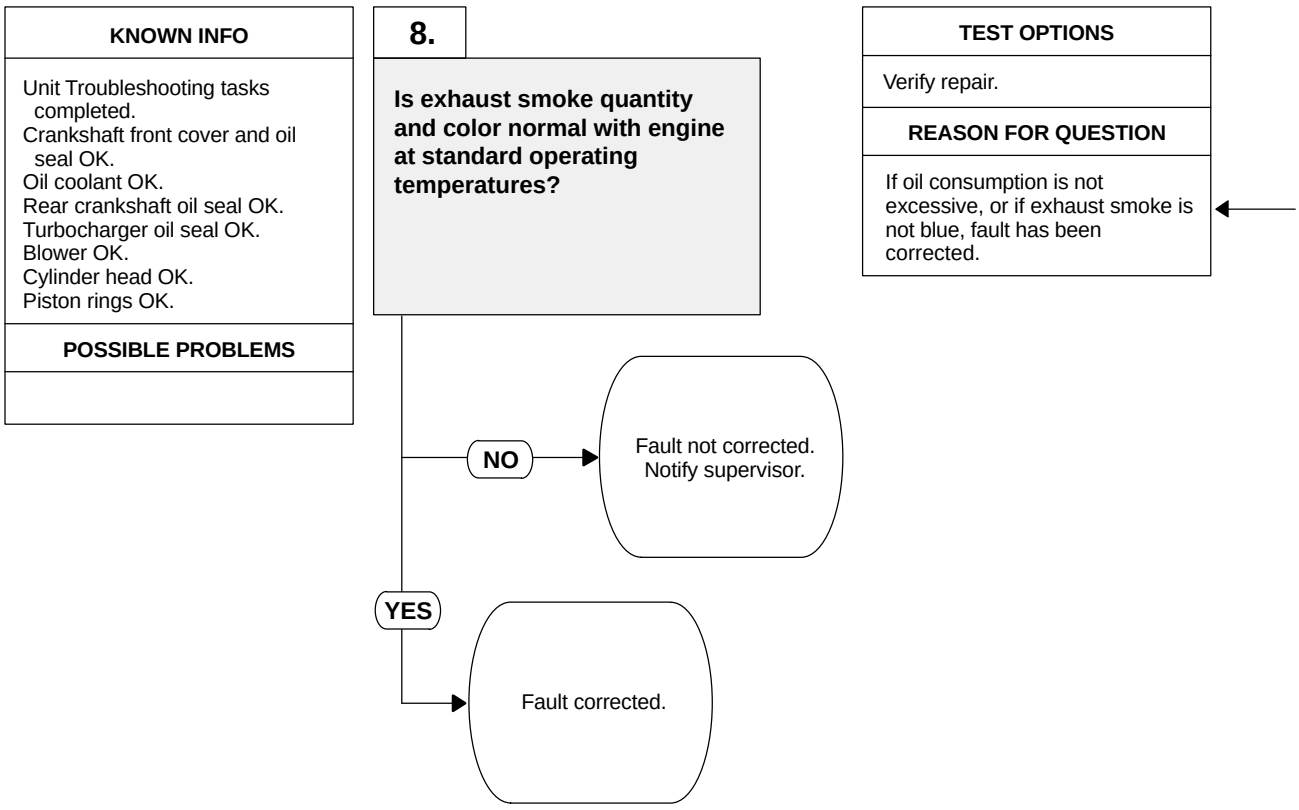
Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

VISUAL INSPECTION

(1) Remove eight screws, washers, lockwashers and left side noise panel.
Discard lockwashers.
(2) Remove 14 screws, six air box covers and gaskets. Discard gaskets.
(3) Check for oil leakage past cylinder ports or piston rings.
  (a) If oil is leaking past cylinder ports or piston rings, perform Step (4) and (5) below and replace engine (Para 3-4).
  (b) If oil is not leaking past cylinder ports or piston rings, perform Step (4) and (5) below and go to Step 8 of this Fault.
(4) Turn OFF ENGINE switch.
(5) Install six gaskets and air box covers with 14 screws.

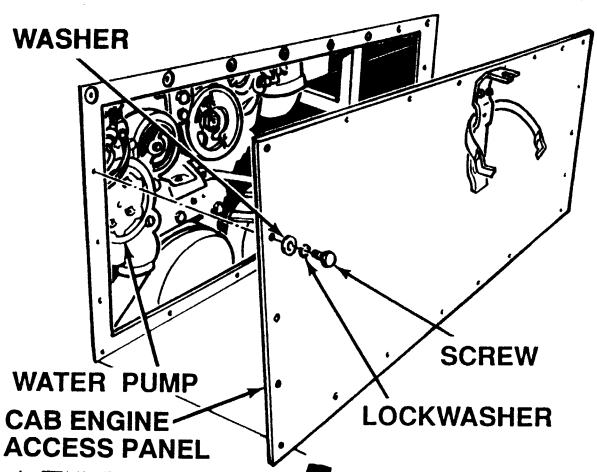


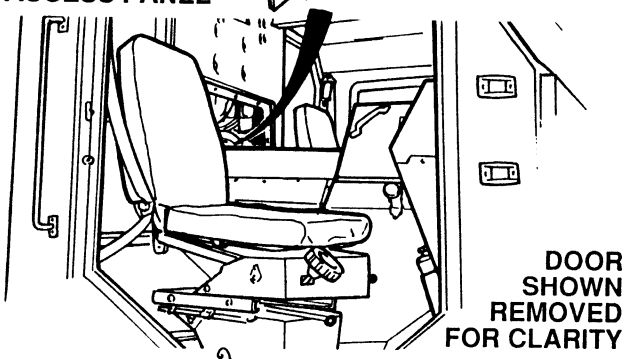
5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (CONT).

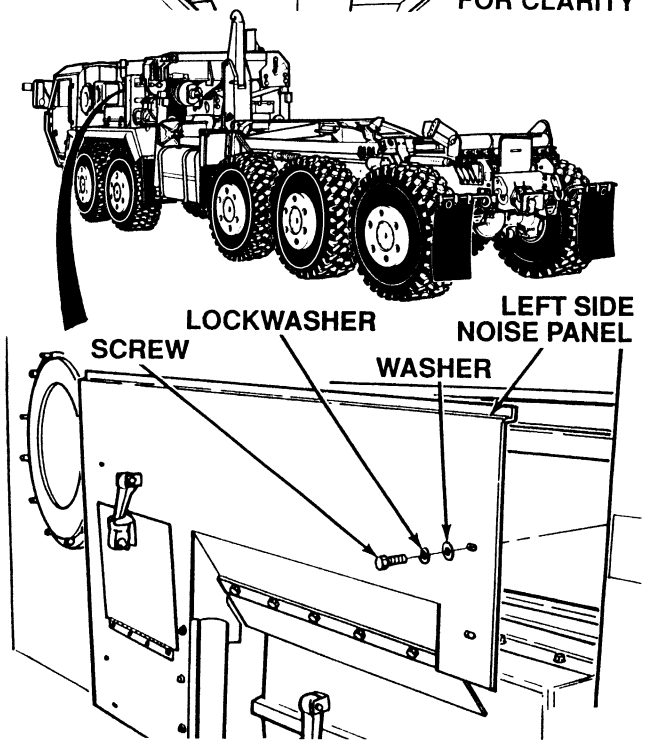


VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10) and observe quantity and color of exhaust smoke.
   (a) If exhaust smoke is excessive and blue in color and oil consumption is still high, fault not corrected. Perform Steps (2) through (5) below and notify supervisor.
   (b) If oil pressure is within normal range, and exhaust smoke color is normal, fault has been corrected.
(2) Turn OFF ENGINE switch.
(3) Install cab engine access panel with 22 washers, lockwashers and screws.
(4) Install left side noise panel with eight washers, lockwashers and screws.
(5) Install right side noise panel (TM 9-2320-364-20).







2-10. ENGINE TROUBLESHOOTING (CONT).

6. WHITE EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE).

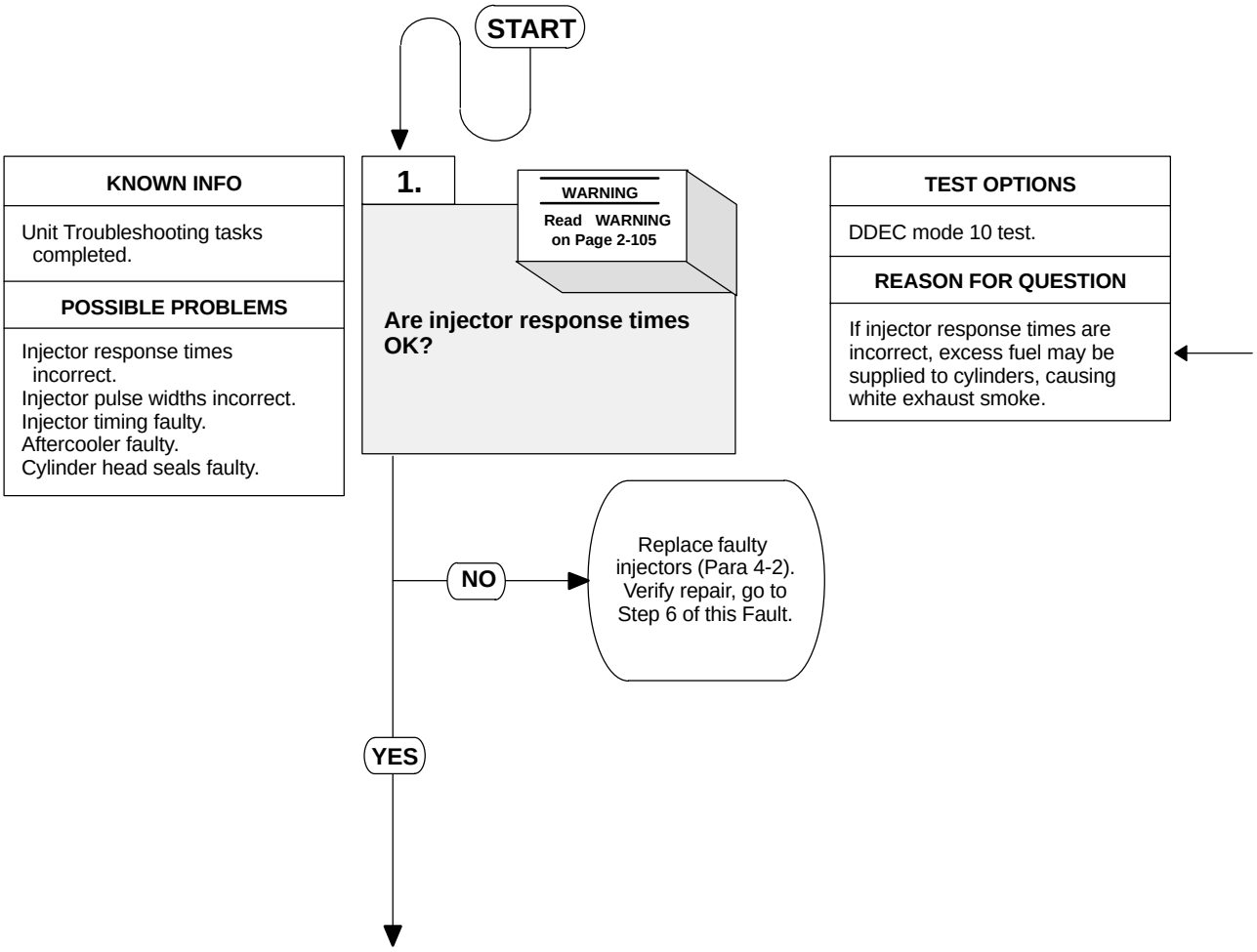
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Cartridge, DDEC (Item 29, Appendix F)
Reader, Diagnostic (Item 180, Appendix F)
Tester, Pressure, Radiator (Item 237, Appendix F)

Materials/Parts
Gasket (2) (Item 115, Appendix E)
Gasket (4) (Item 116, Appendix E)
Lockwasher (8) (Item 282, Appendix E)

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

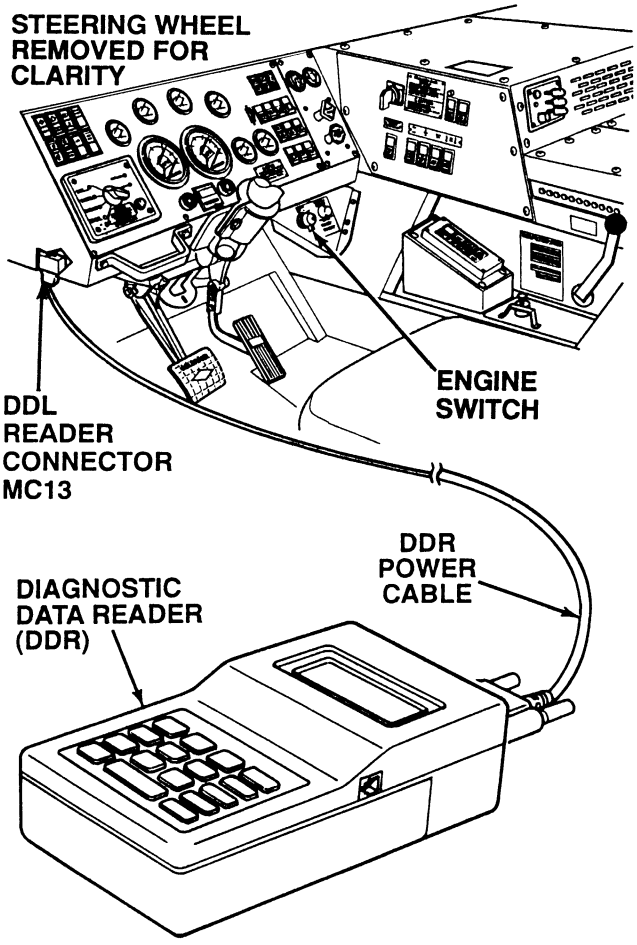


WARNING

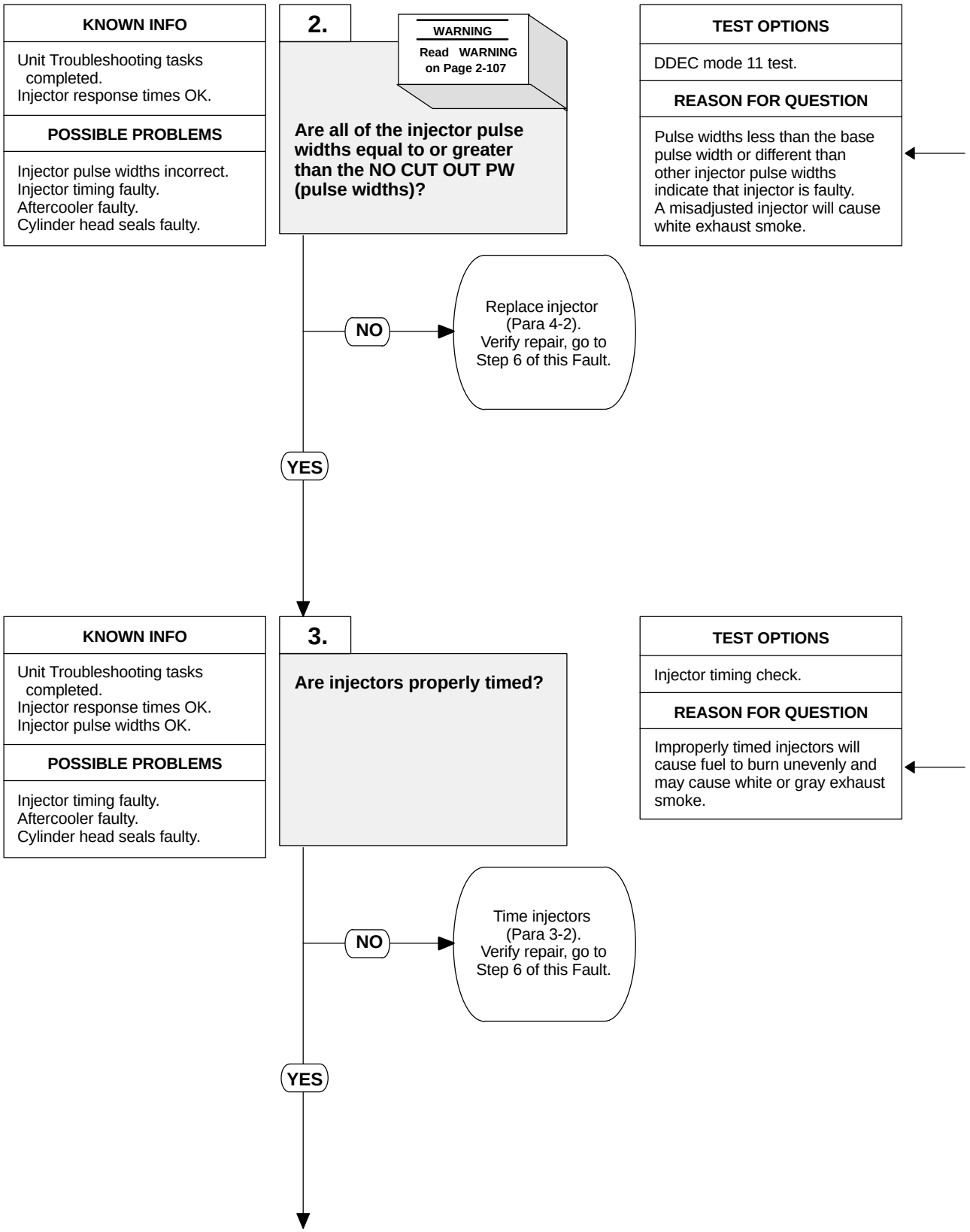
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

DDEC MODE 10 TEST

(1) Connect DDR to DDL connector MC13.
(2) Start engine (TM 9-2320-364-10).
(3) Select mode 10 to display fuel injector response times on DDR.
(4) Compare response times of all eight injectors.
    (a) If any injector response time is less than others or .80 milliseconds, perform Steps (5) and (6) below and replace injector (Para 4-2).
    (b) If injector response times are same as others or greater than .80 milliseconds, response times are OK, perform Steps (5) and (6) below and go to Step 2 of this Fault.
(5) Turn OFF ENGINE switch.
(6) Disconnect DDR form DDL connector MC13.



6. WHITE EXHAUST SMOKE (CONT).

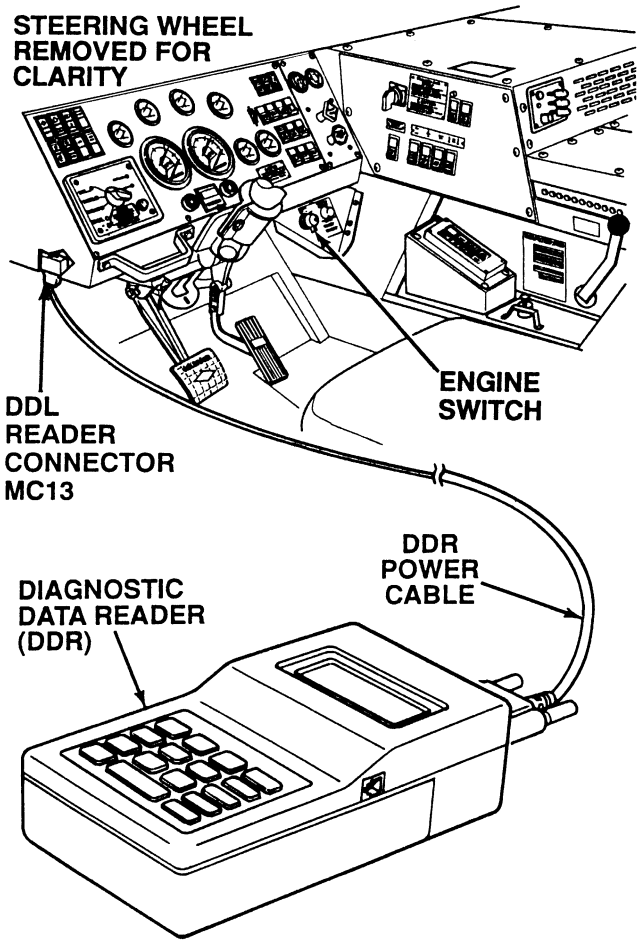


WARNING

Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

DDR TEST

(1) Connect DDR to DDL connector MC13.
(2) Start engine (TM 9-2320-364-10).
(3) Select mode 11 to display pulse widths on DDR.
(4) Compare pulse widths of all eight injectors.
  (a) If pulse widths are less than the NO CUT OUT PW (pulse widths), or different from cylinder to cylinder, perform Steps (5) and (6) below and replace injector (Para 4-2).
  (b) If pulse widths are equal to or greater than the NO CUT OUT PW (pulse widths), perform Steps (5) and (6) below and go to Step 3 of this Fault.
(5) Turn OFF ENGINE switch.
(6) Disconnect DDR from DDL connector MC13.



INJECTOR TIMING CHECK

Perform injector timing check (Para 3-2).
(1) If injectors are out of time, time injectors (Para 3-2).
(2) If injectors are in time, go to Step 4 of this Fault.

6. WHITE EXHAUST SMOKE (CONT).

KNOWN INFO
Unit Troubleshooting tasks completed. Injector response times OK. Injector pulse widths OK. Injector timing OK.
POSSIBLE PROBLEMS
Aftercooler faulty. Cylinder head seals faulty.

4.

WARNING

Read WARNING on Page 2-109

Is aftercooler free from leaks or damage?

NO → Replace aftercooler (Para 5-5). Verify repair, go to Step 6 of this Fault.

YES

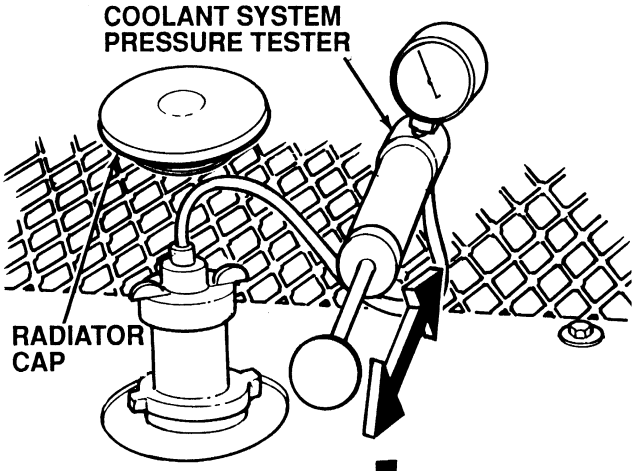
TEST OPTIONS
Aftercooler inspection.
REASON FOR QUESTION
Air passes from blower through aftercooler to air box and cylinders. Presence of coolant in air box indicates faulty aftercooler. If aftercooler is faulty, white exhaust smoke will be produced.

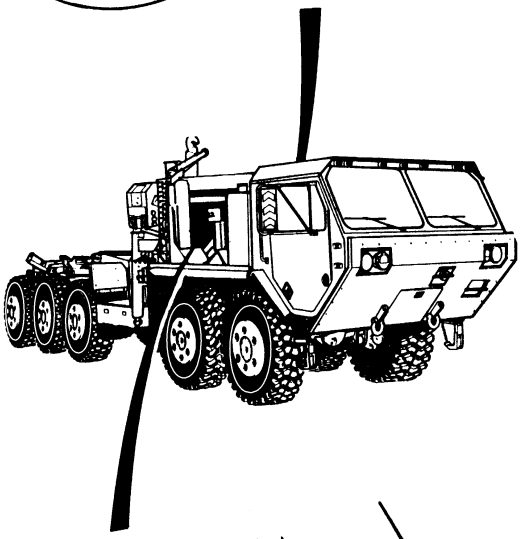
WARNING

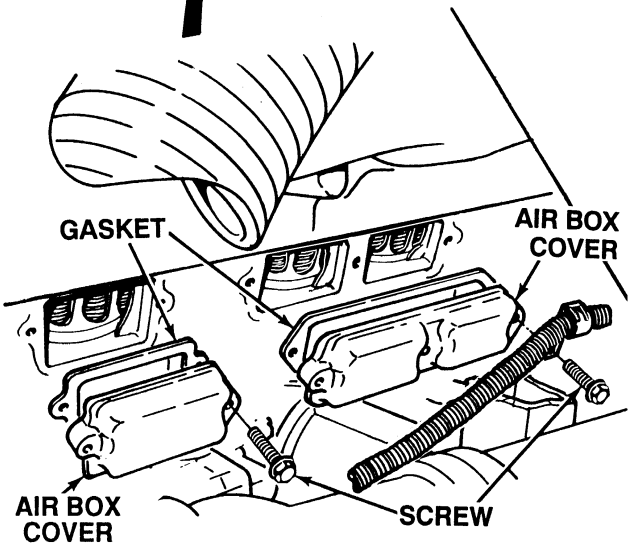
- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.
- Use a clean, thick waste cloth or like material to remove the cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.

AFTERCOOLER INSPECTION

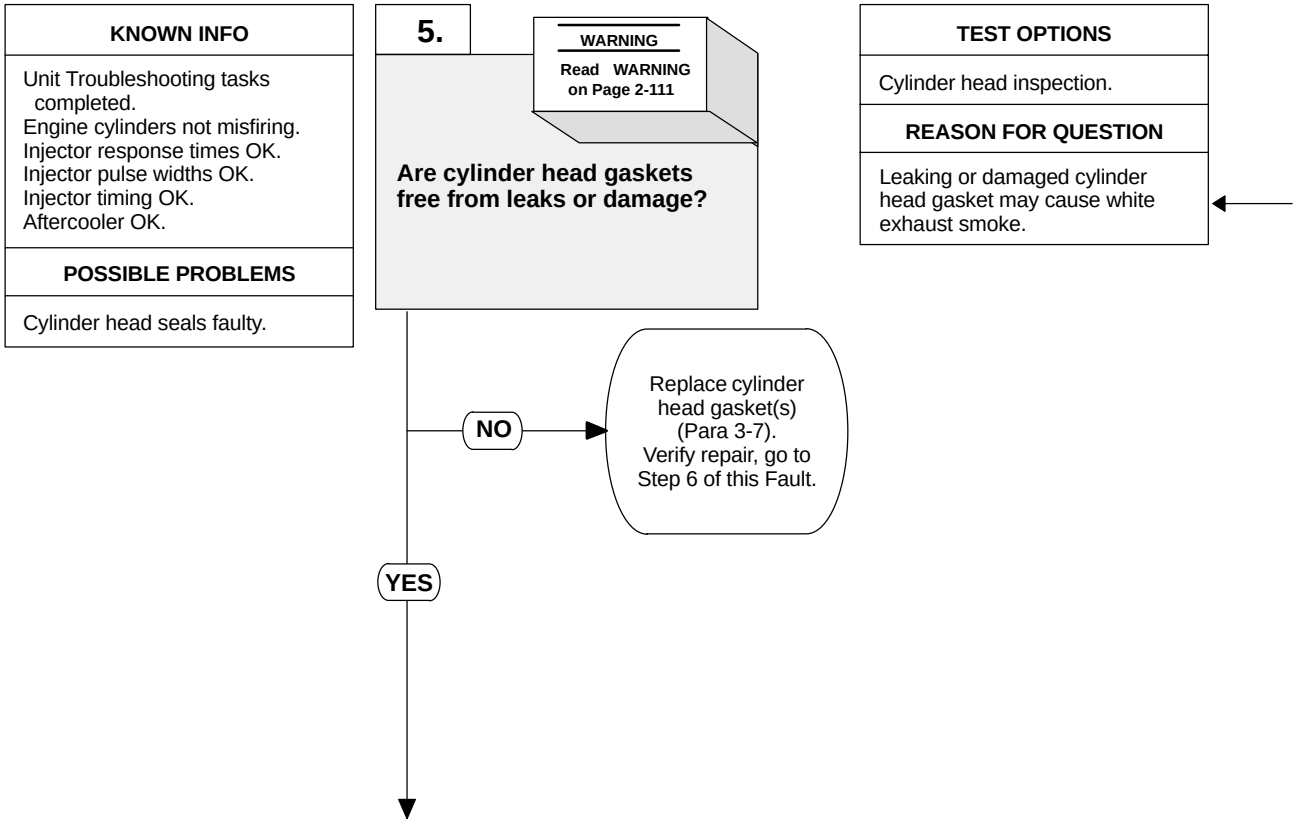
(1) Remove right side noise panel (TM 9-2320-364-20).
(2) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(3) Remove 14 screws, six engine air box covers and gaskets. Discard gaskets.
(4) Remove radiator cap (TM 9-2320-364-10).
(5) Install cooling system pressure tester on radiator.
(6) Pressurize cooling system to 10 psi (69 kPa) and check air box for coolant.
  (a) If coolant is found in air box, replace aftercooler (Para 5-5).
  (b) If no coolant is found in air box, perform Step (7) below and go to Step 5 of this Fault.
(7) Release pressure.







6. WHITE EXHAUST SMOKE (CONT).

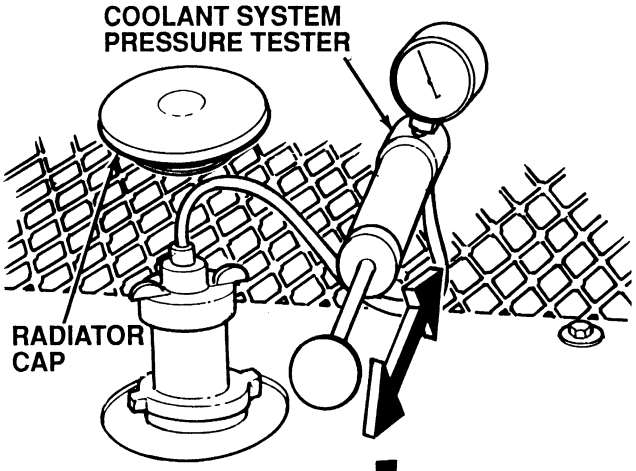


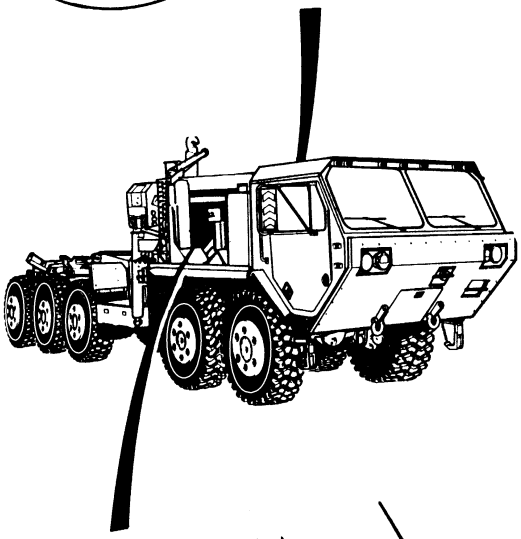
WARNING

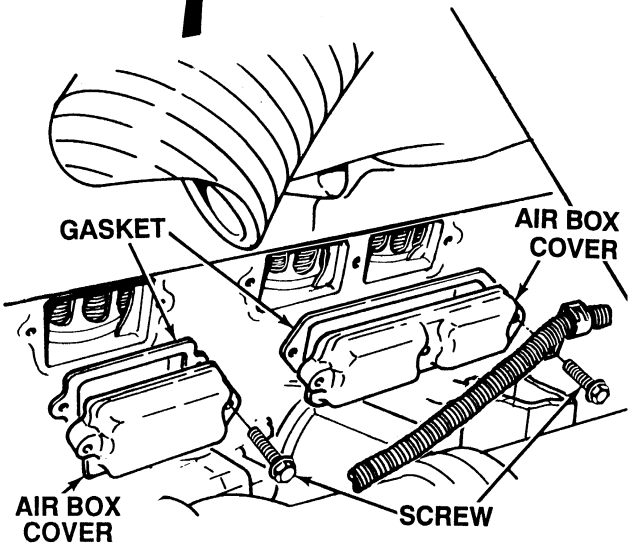
- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.
- Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.
- Use a clean, thick waste cloth or like material to remove the cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.

CYLINDER HEAD INSPECTION

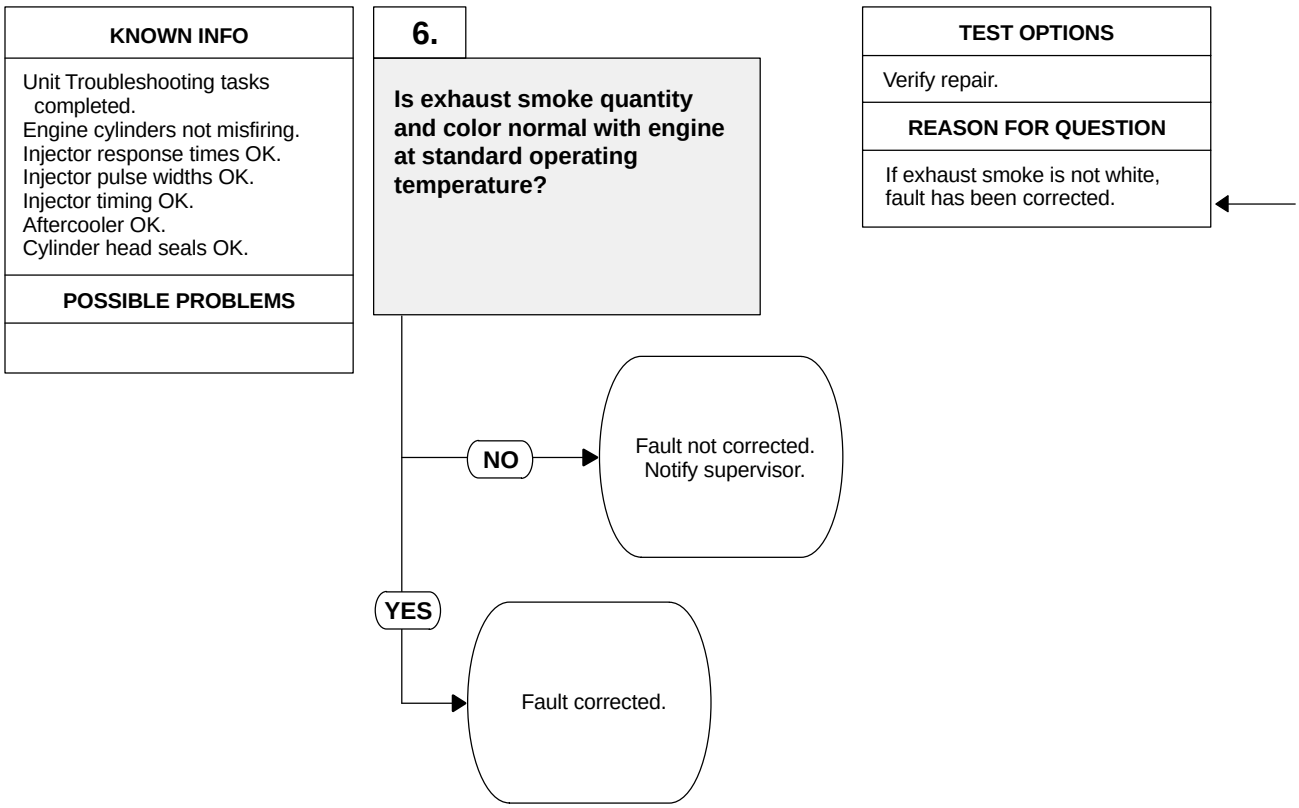
(1) Install cooling system pressure tester on radiator.
(2) Pressurize cooling system to 10 psi (69 kPa) and check cylinder heads for leaks.
  (a) If cylinder heads show signs of coolant leaking, replace cylinder head, sealing rings and preformed packings (Para 3-7).
  (b) If cylinder head, sealing rings and preformed packings are not leaking but pressure still goes down, notify GS Maintenance.
(3) Release pressure and remove cooling system pressure tester from radiator.
(4) Install radiator cap.
(5) Install six gaskets, engine air box covers and 14 screws.





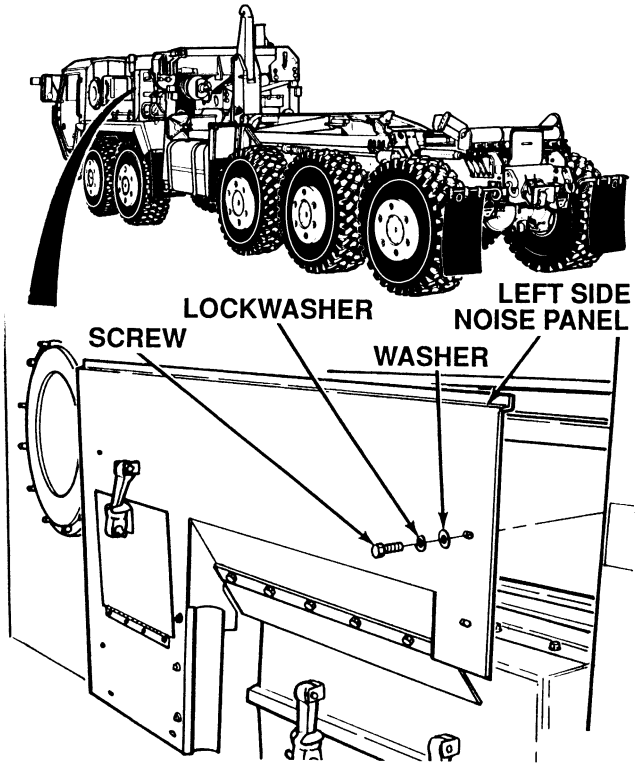


6. WHITE EXHAUST SMOKE (CONT).



VERIFY REPAIR

(1) Start truck and observe quantity and color of exhaust smoke (TM 9-2320-364-10).
   (a) If exhaust smoke is still white, fault not corrected. Perform Steps (2) through (4) below and notify supervisor.
   (b) If exhaust smoke is normal in quantity and color, fault has been corrected.
(2) Turn OFF ENGINE switch.
(3) Install left side noise panel with eight washers, lockwashers and screws.
(4) Install right side noise panel (TM 9-2320-364-20).



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING.

This paragraph covers Transmission System Troubleshooting. The Transmission System Fault Index, Table 2-8, lists faults for the transmission system of the PLS truck.

Table 2-8. Transmission System Fault Index

Fault No.	Description	Page
1.	Low Oil Level Sensor Circuit Faulty	2-116
2.	Forward Pressure Switch Circuit Faulty	2-124
3.	Reverse Pressure Switch Circuit Faulty	2-130
4.	Oil Temperature Sensor Circuit Faulty	2-136
5.	Solenoids J,F,D,C,B,A,G,E Or H Circuit Faulty	2-140
6.	Transmission Overheats (Trans Temp Gage Continuously Reads Over 220°F [104°C])	2-146
7.	Transmission Unusually Noisy When Operating	2-152
8.	Transmission Will Not Shift Into Gear, Shifts Out Of Gear, Does Not Respond To Range Selection, Or Operates Abnormally	2-160
9.	Engine Stalls When Transmission Is Shifted Into Gear	2-168

2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

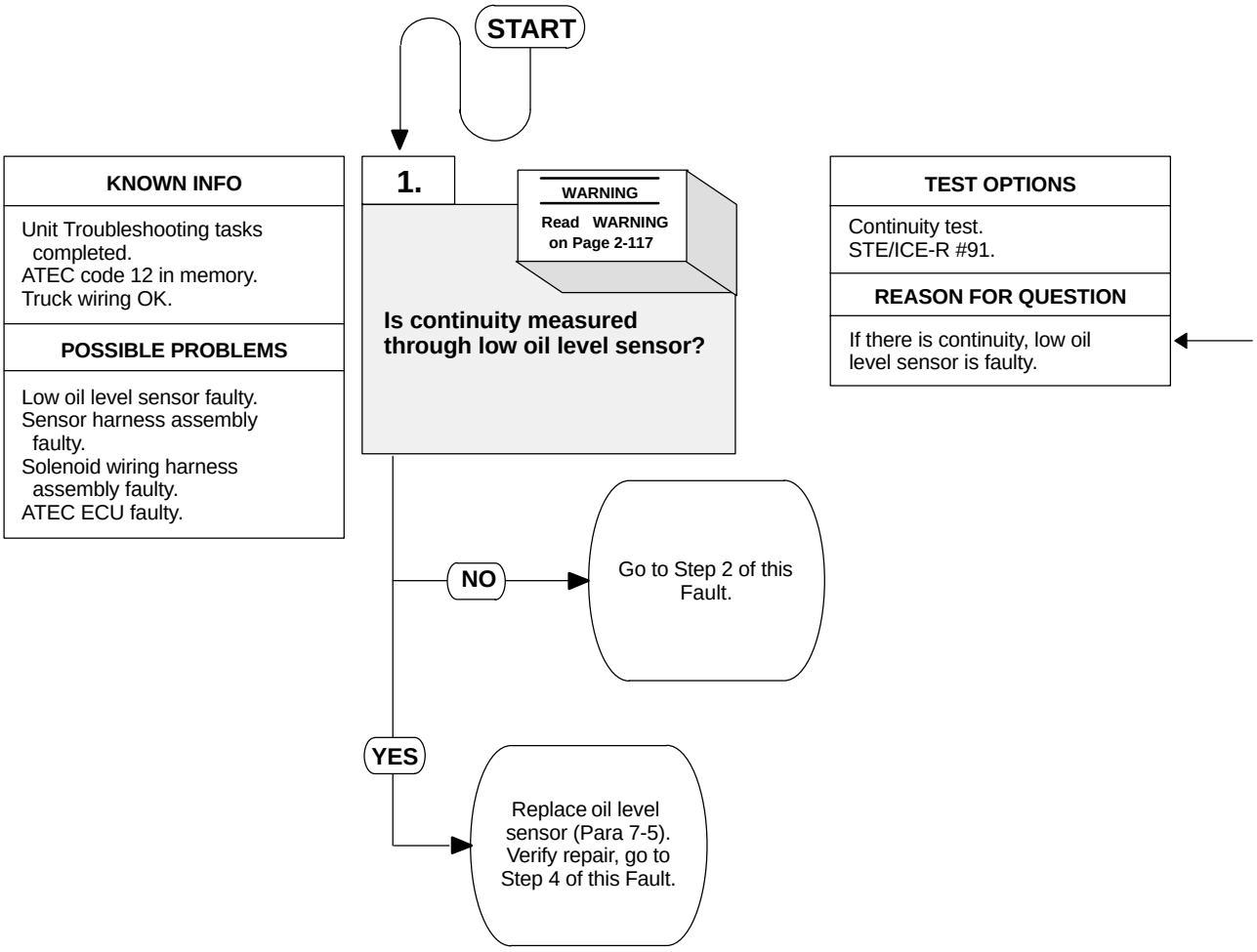
1. LOW OIL LEVEL SENSOR CIRCUIT FAULTY.

INITIAL SETUP

Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Analyzer Set, STE/ICE-R (Optional) (Item 15, Appendix F)
- Cartridge, ATEC (Item 28, Appendix F)
- Harness, Breakout (Item 94, Appendix F)
- Multimeter (Item 140, Appendix F)
- Reader, Diagnostic (Item 180, Appendix F)
- Jumperwire

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Transmission internal oil filter removed, (Para 7-4)
- Left rear fender skirt removed, (TM 9-2320-364-20)

References
- TM 9-2320-364-10
- TM 9-2320-364-20
- TM 9-4910-571-12&P

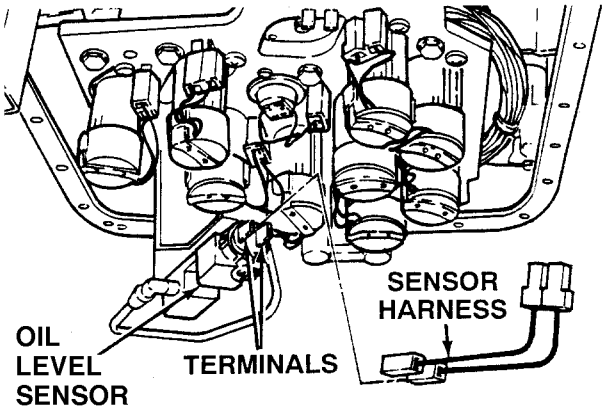


WARNING

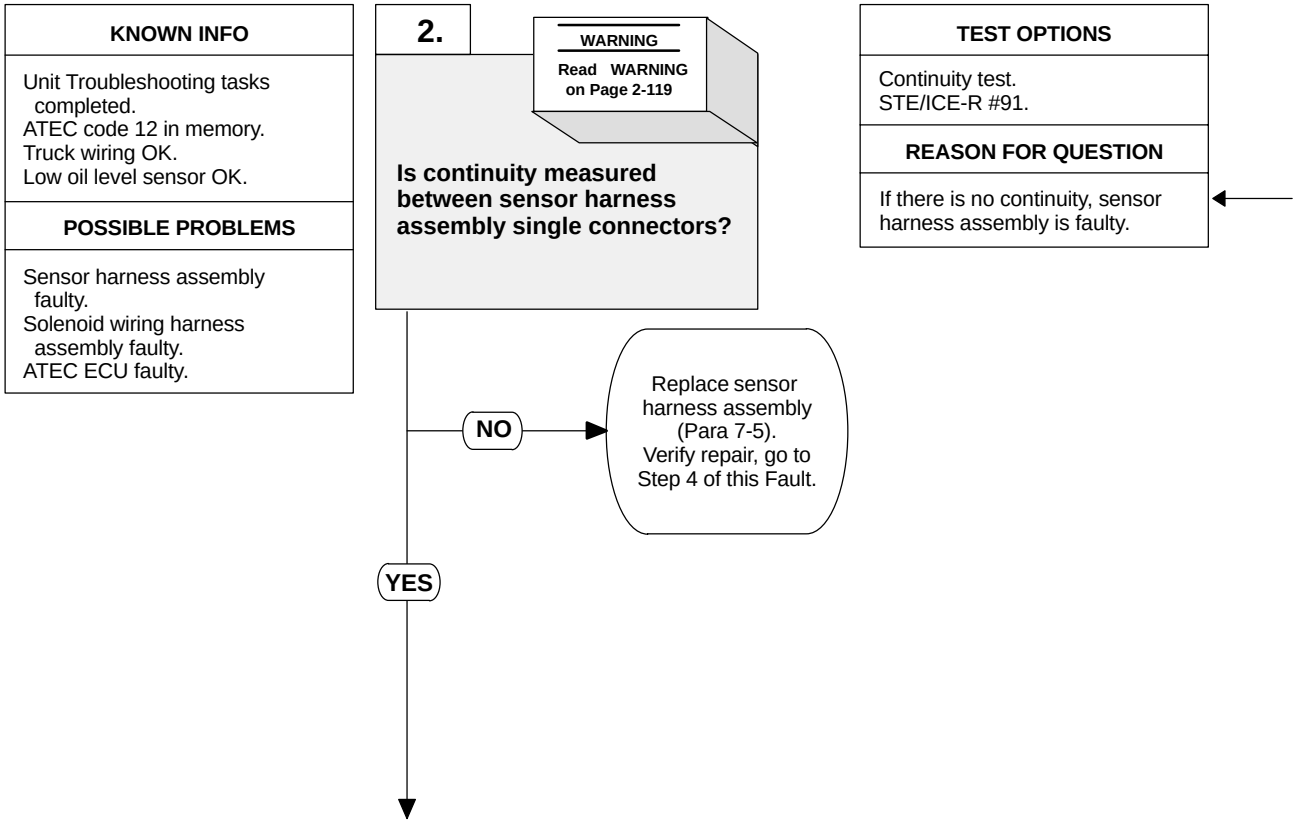
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

CONTINUITY TEST

(1) Set multimeter select switch to ohms.
(2) Disconnect sensor harness assembly from low oil level sensor.
(3) Is there continuity between oil level sensor terminals?
  (a) If there is no continuity, low oil level sensor is OK. Go to Step 2 of this Fault.
  (b) If there is continuity, replace low oil level sensor (Para 7-5).



1. LOW OIL LEVEL SENSOR CIRCUIT FAULTY (CONT).

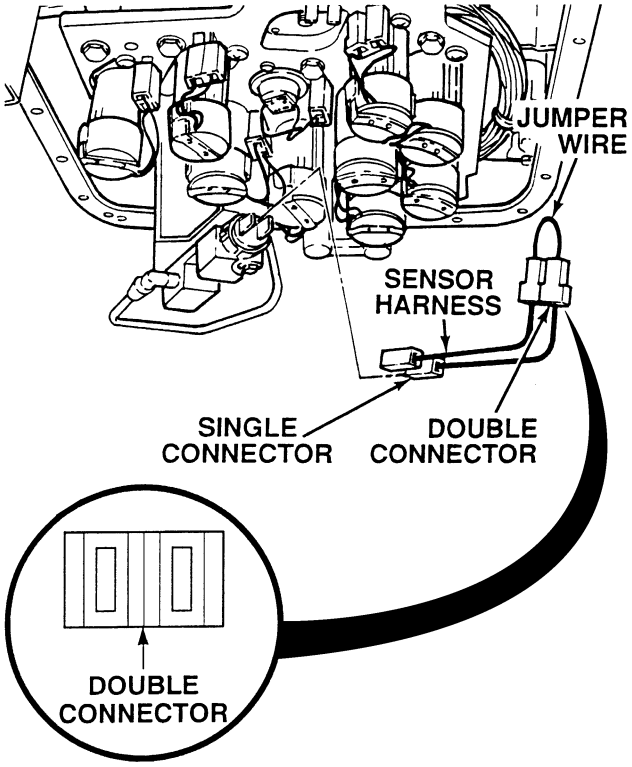


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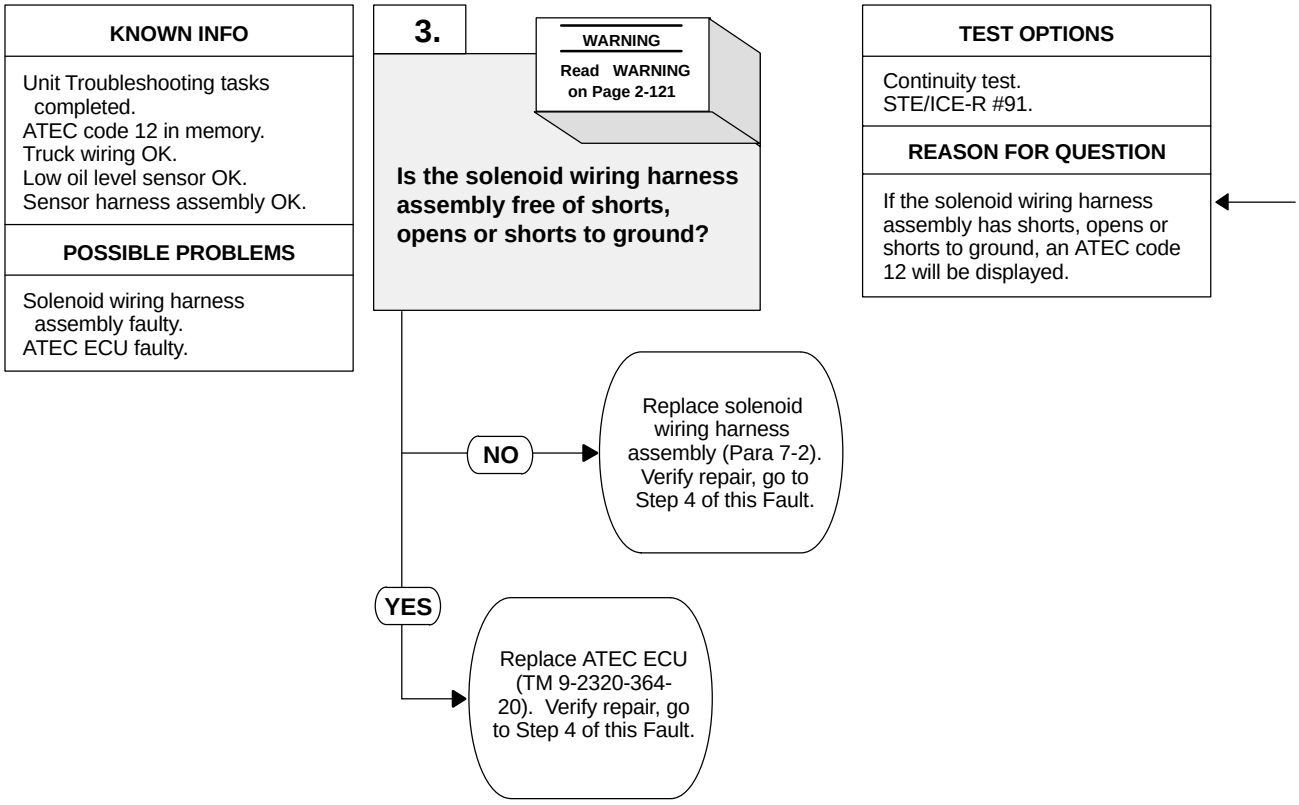
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

CONTINUITY TEST

(1) Disconnect sensor harness assembly from solenoid wiring harness assembly connectors.
(2) Connect jumper wire between terminals of sensor harness assembly double connector.
(3) Is there continuity between the sensor harness assembly single terminals?
    (a) If there is no continuity, replace sensor harness assembly (Para 7-6).
    (b) If there is continuity, sensor harness assembly is OK.



1. LOW OIL LEVEL SENSOR CIRCUIT FAULTY (CONT).

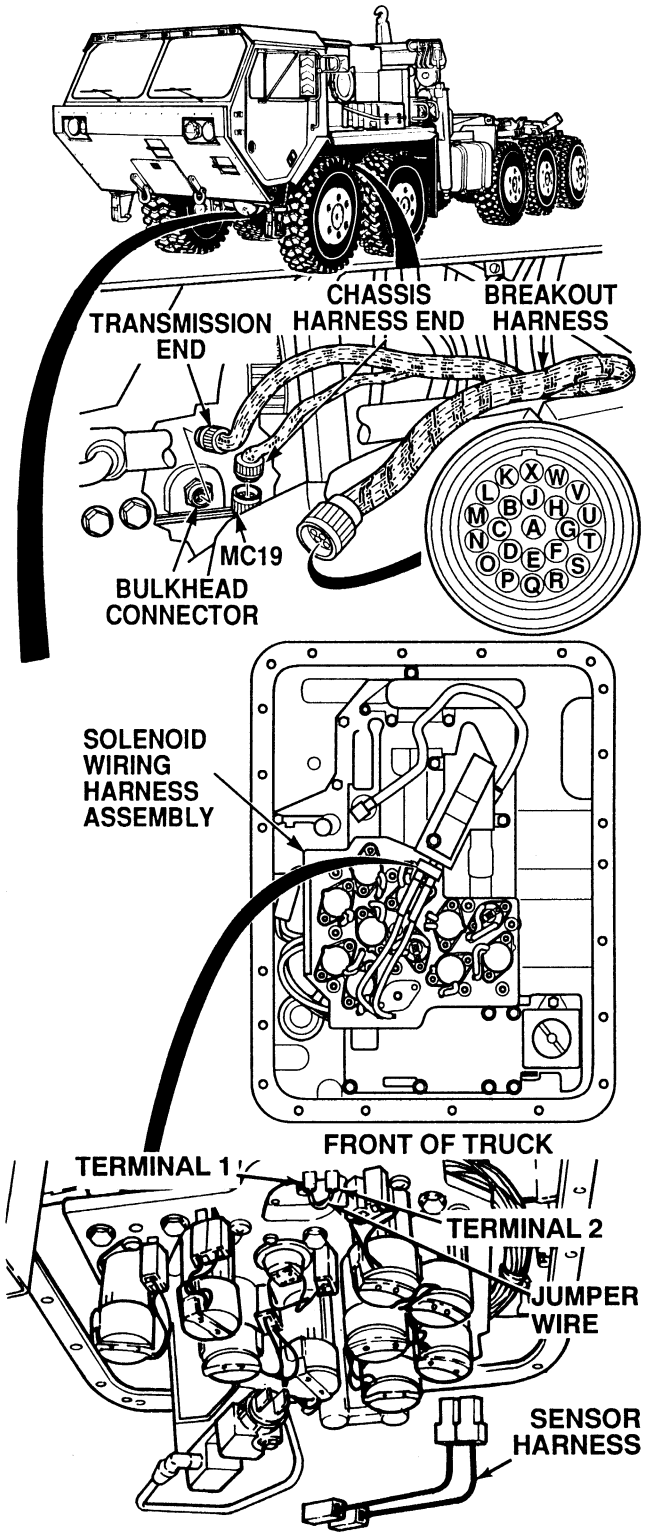


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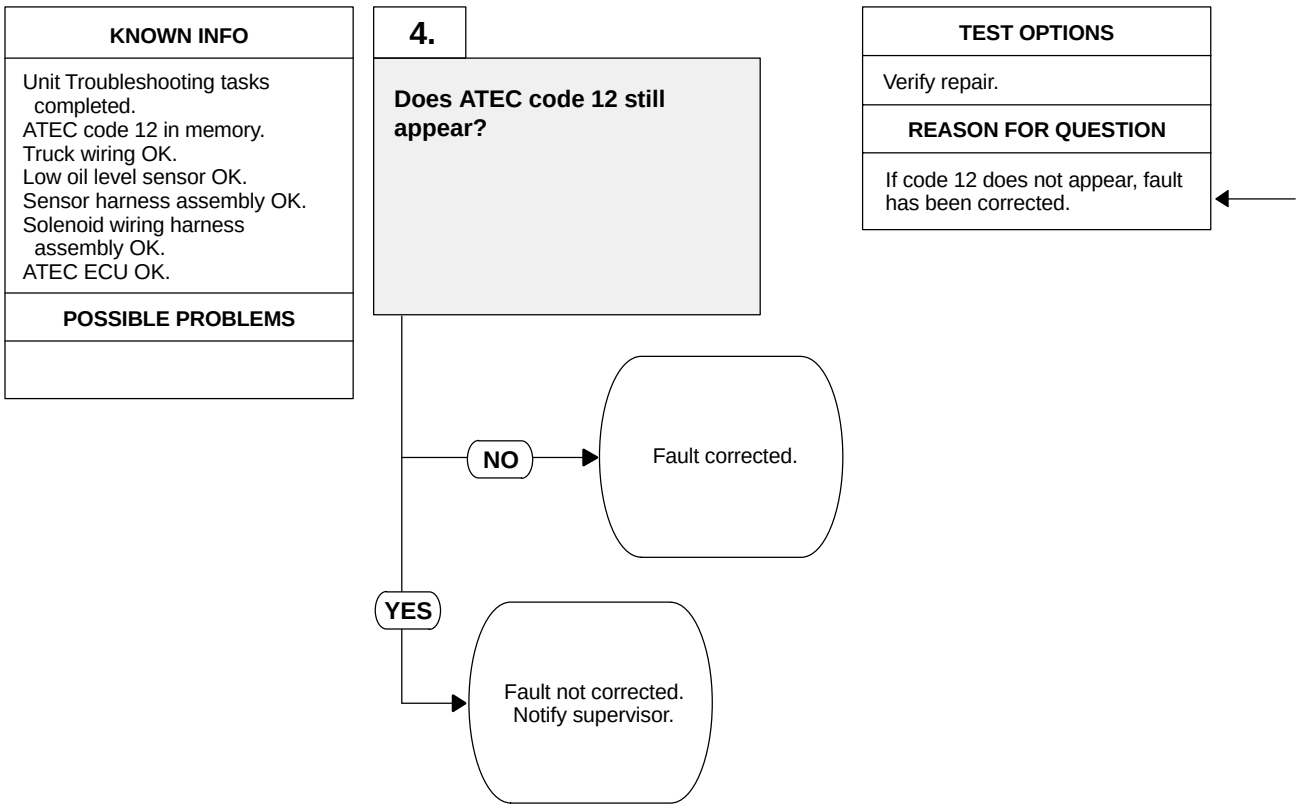
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

CONTINUITY TEST

(1) Disconnect connector MC19 from transmission bulkhead connector.
(2) Connect breakout harness connector to transmission bulkhead connector.
(3) Is there continuity between terminal E and any other wire on breakout harness connector?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (4) below.
(4) Is there continuity between terminal H and any other wire on breakout harness connector?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (5) below.
(5) Connect a jumper wire between terminals 1 and 2 of solenoid wiring harness.
(6) Is there continuity between terminals E and H on breakout harness connector?
  (a) If there is no continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is continuity, go to Step (7) below.
(7) Is there continuity between terminal H on the breakout harness connector and a known good ground?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, replace ATEC ECU (TM 9-2320-364-20).
(8) Remove jumper wire from terminals 1 and 2.
(9) Install sensor harness assembly.
(10) Remove breakout harness.
(11) Connect connector MC19 to transmission bulkhead connector.
(12) Install internal oil filter (Para 7-4).

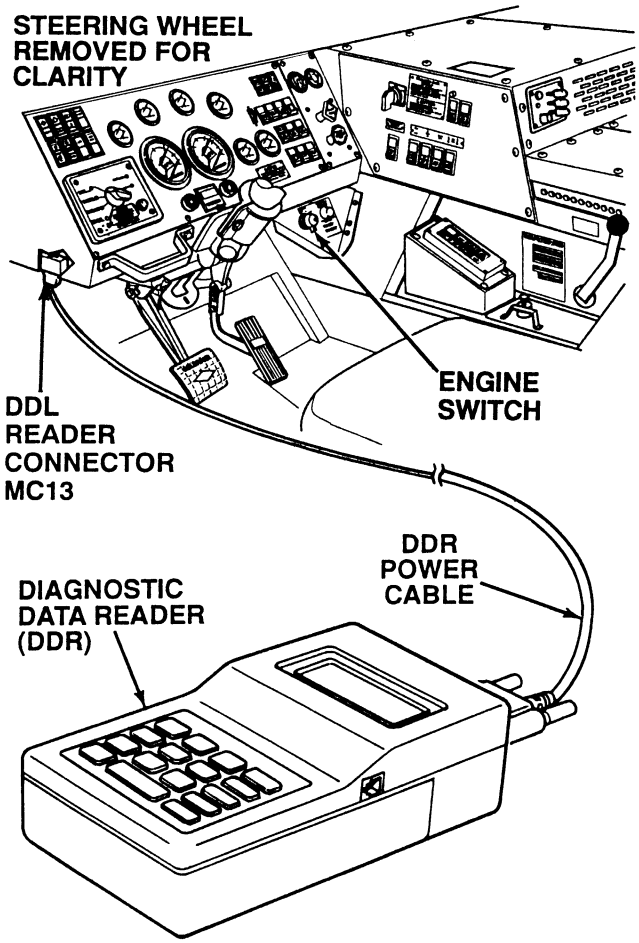


1. LOW OIL LEVEL SENSOR CIRCUIT FAULTY (CONT).



VERIFY REPAIR

(1) Install an ATEC cartridge in DDR (TM 9-2320-364-20).
(2) Connect DDR cable to DDL connector MC13.
(3) Start engine (TM 9-2320-364-10).
(4) Clear codes on DDR reader.
(5) Check DDR for an active code 12.
  (a) If a code 12 is not displayed, fault has been corrected. Perform Steps (6) through (8) below.
  (b) If a code 12 is displayed, fault not corrected. Perform Steps (6) through (8) below and notify supervisor.
(6) Turn OFF ENGINE switch.
(7) Disconnect DDR cable from DDL connector MC13.
(8) Install left rear fender skirt (TM 9-2320-364-20).



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

2. FORWARD PRESSURE SWITCH CIRCUIT FAULTY.

INITIAL SETUP

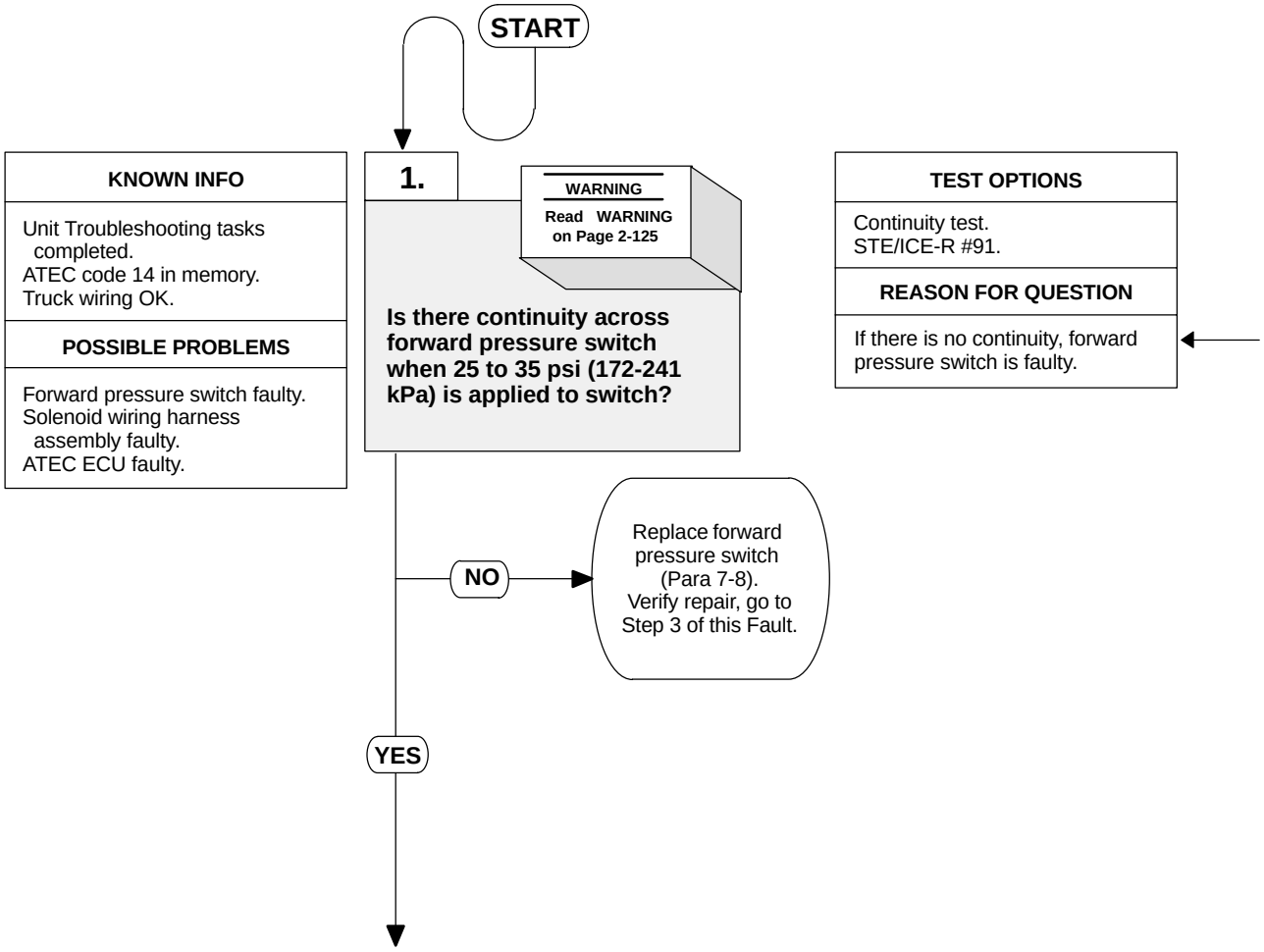
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Analyzer Set, STE/ICE-R (Optional) (Item 15, Appendix F)
Cartridge, ATEC (Item 28, Appendix F)
Goggles, Industrial (Item 83, Appendix F)
Gun, Airblow (Item 86, Appendix F)
Harness, Breakout (Item 94, Appendix F)
Multimeter (Item 140, Appendix F)
Reader, Diagnostic (Item 180, Appendix F)
Wrench Set, Socket 3/8 In. (Item 273, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)
Zonal Separator, Oil and Water Spray Gun (Item 280, Appendix F)
Jumperwire

Materials/Parts
Packing, Preformed (Item 400, Appendix E)

Personnel Required
Two

References
TM 9-2320-364-10
TM 9-2320-364-20
TM 9-4910-571-12&P

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Left rear fender skirt removed, (TM 9-2320-364-20)
Transmission internal oil filter removed, (Para 7-4)

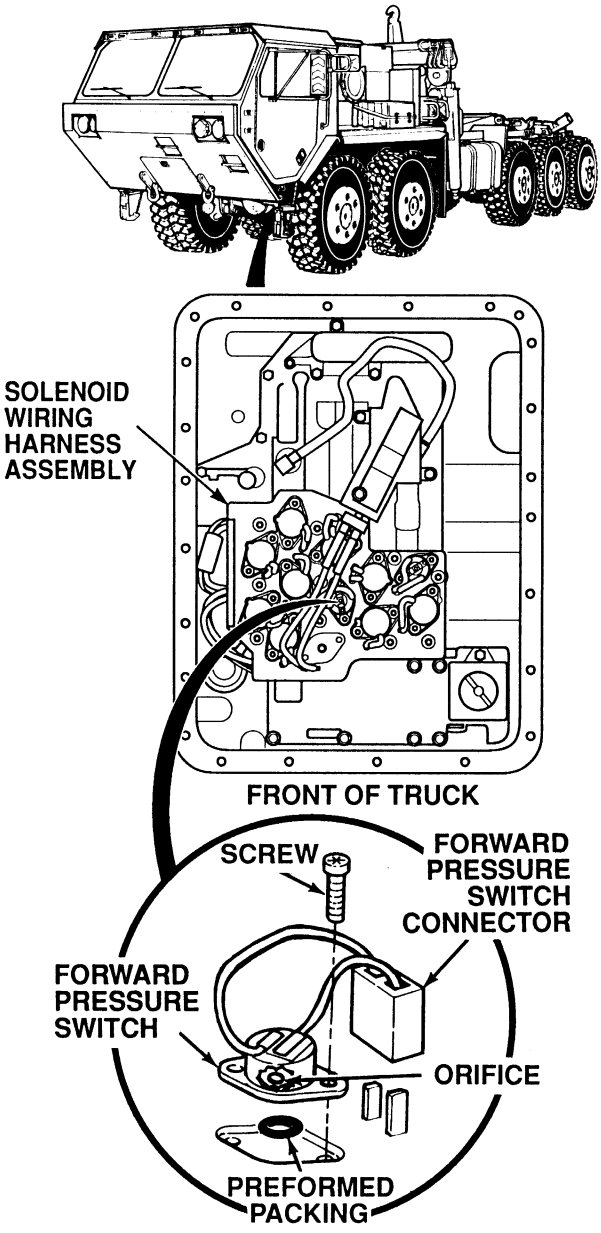


WARNING

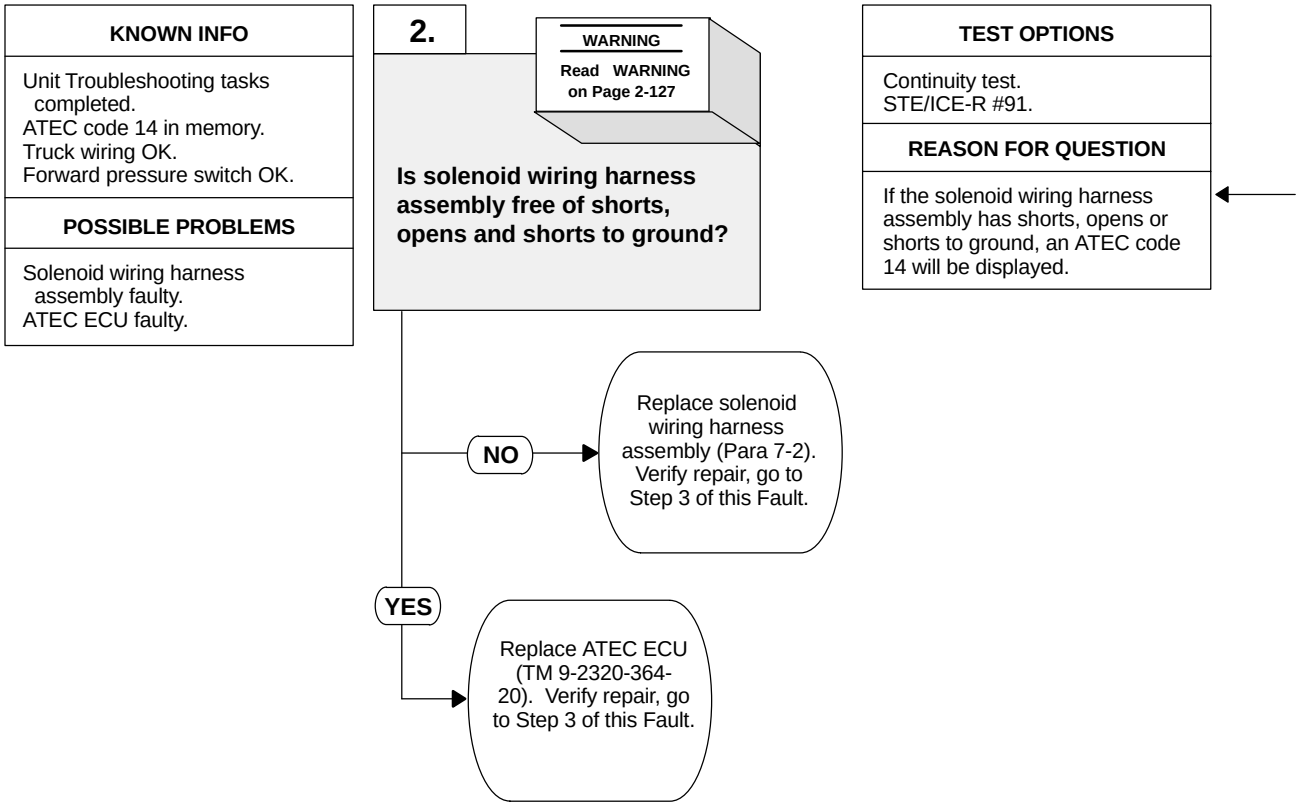
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.
- Blowing transmission oil can cause injury to eyes. Safety goggles must be worn when testing transmission oil pressure switch.

CONTINUITY TEST

(1) Remove two screws, forward pressure switch and preformed packing. Discard preformed packing.
(2) Disconnect pressure switch connector.
(3) With the aid of an assistant, apply 25 to 35 psi (172 to 241 kPa) air to pressure switch orifice and check continuity across pressure switch.
  (a) If there is no continuity, replace forward pressure switch (Para 7-8).
  (b) If there is continuity, pressure switch is OK.
(4) Install preformed packing, pressure switch and two screws. Tighten screws to 60 to 84 lbs-in (6.8 to 9.5 N·m).



2. FORWARD PRESSURE SWITCH CIRCUIT FAULTY (CONT).

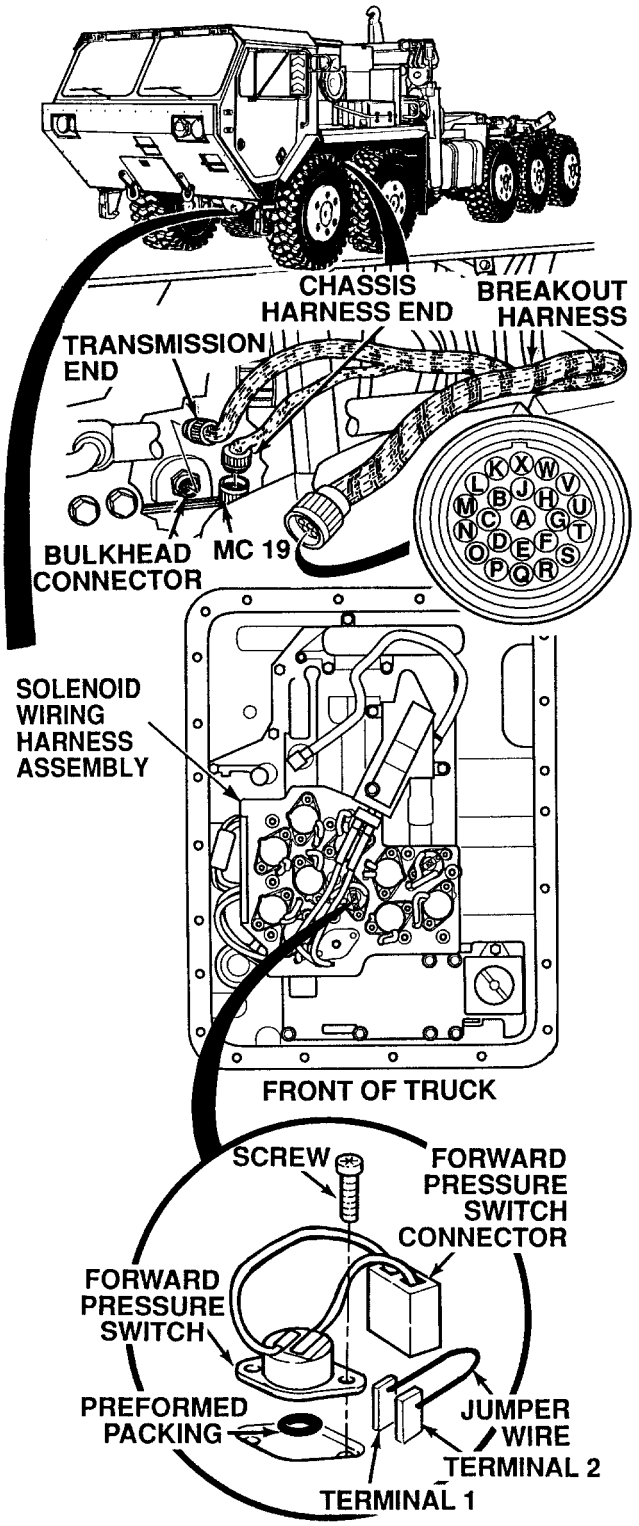


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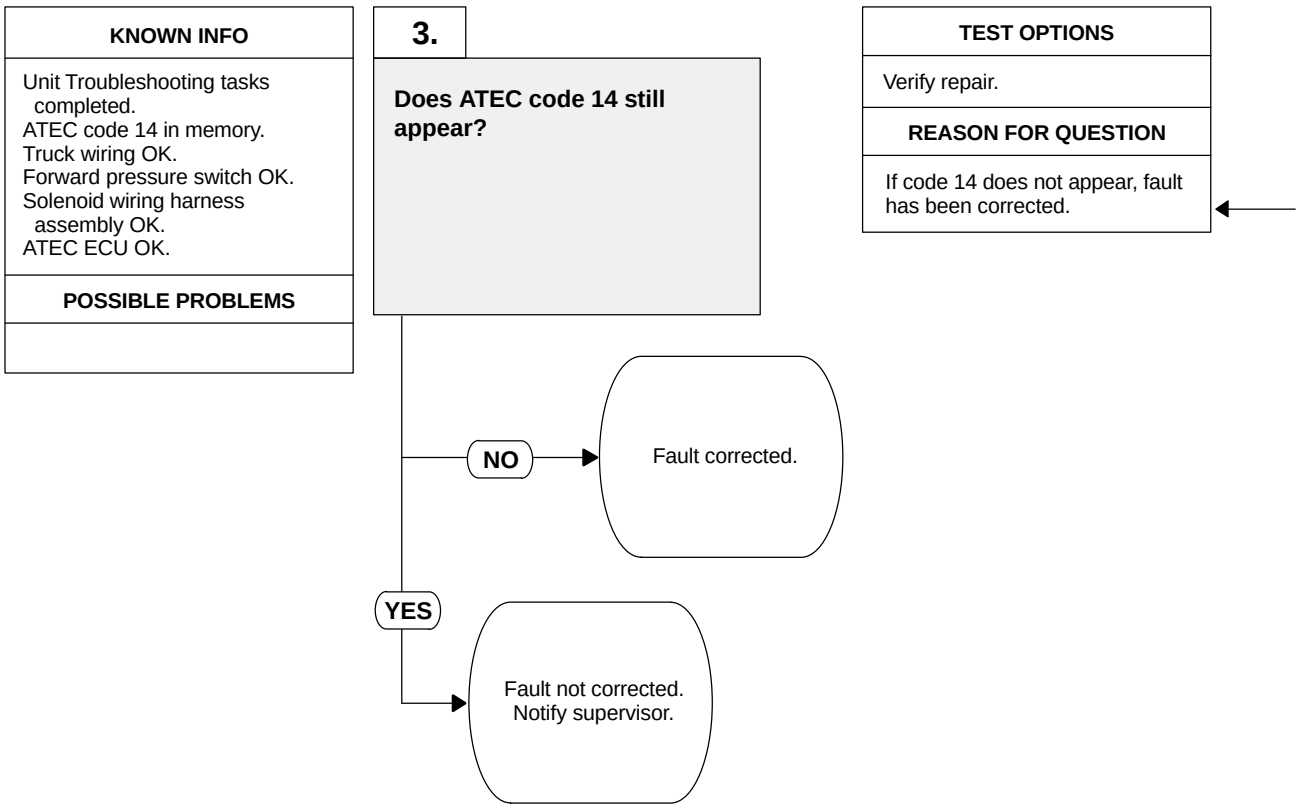
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

CONTINUITY TEST

(1) Disconnect connector MC19 from transmission bulkhead connector.
(2) Connect breakout harness connector to transmission bulkhead connector.
(3) Is there continuity between terminal E and any other wire on breakout harness connector?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (4) below.
(4) Is there continuity between terminal F and any other wire on breakout harness connector?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (5) below.
(5) Connect a jumper wire between terminals 1 and 2.
(6) Is there continuity between terminals E and F on breakout harness connector?
  (a) If there is no continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is continuity, go to Step (7) below.
(7) Is there continuity between terminal F on the breakout harness connector and a known good ground?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, replace ATEC ECU (TM 9-2320-364-20).
(8) Remove jumper wire from terminals 1 and 2.
(9) Remove breakout harness.
(10) Connect MC19 connector to bulkhead connector.
(11) Install internal oil filter (Para 7-4).

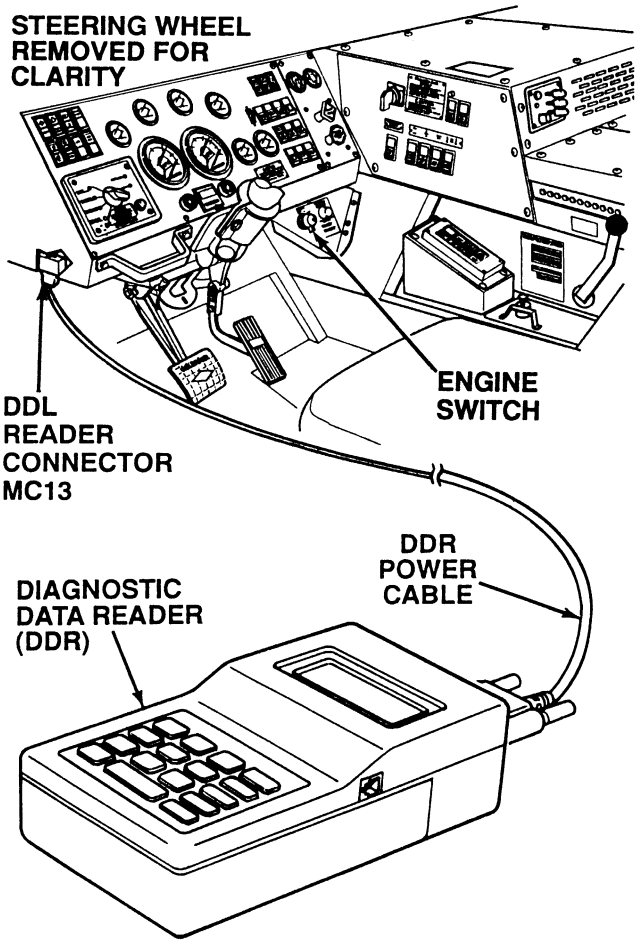


2. FORWARD PRESSURE SWITCH CIRCUIT FAULTY (CONT).



VERIFY REPAIR

(1) Install an ATEC cartridge in DDR (TM 9-2320-364-20).
(2) Connect DDR cable to DDL connector MC13.
(3) Start engine (TM 9-2320-364-10).
(4) Clear codes on DDR reader.
(5) Check DDR for an active code 14.
  (a) If a code 14 is not displayed, fault has been corrected. Perform Steps (6) through (8) below.
  (b) If a code 14 is displayed, fault not corrected. Perform Steps (6) through (8) below and notify supervisor.
(6) Turn OFF ENGINE switch.
(7) Disconnect DDR cable from DDL connector MC13.
(8) Install left rear fender skirt (TM 9-2320-364-20).



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

3. REVERSE PRESSURE SWITCH CIRCUIT FAULTY.

INITIAL SETUP

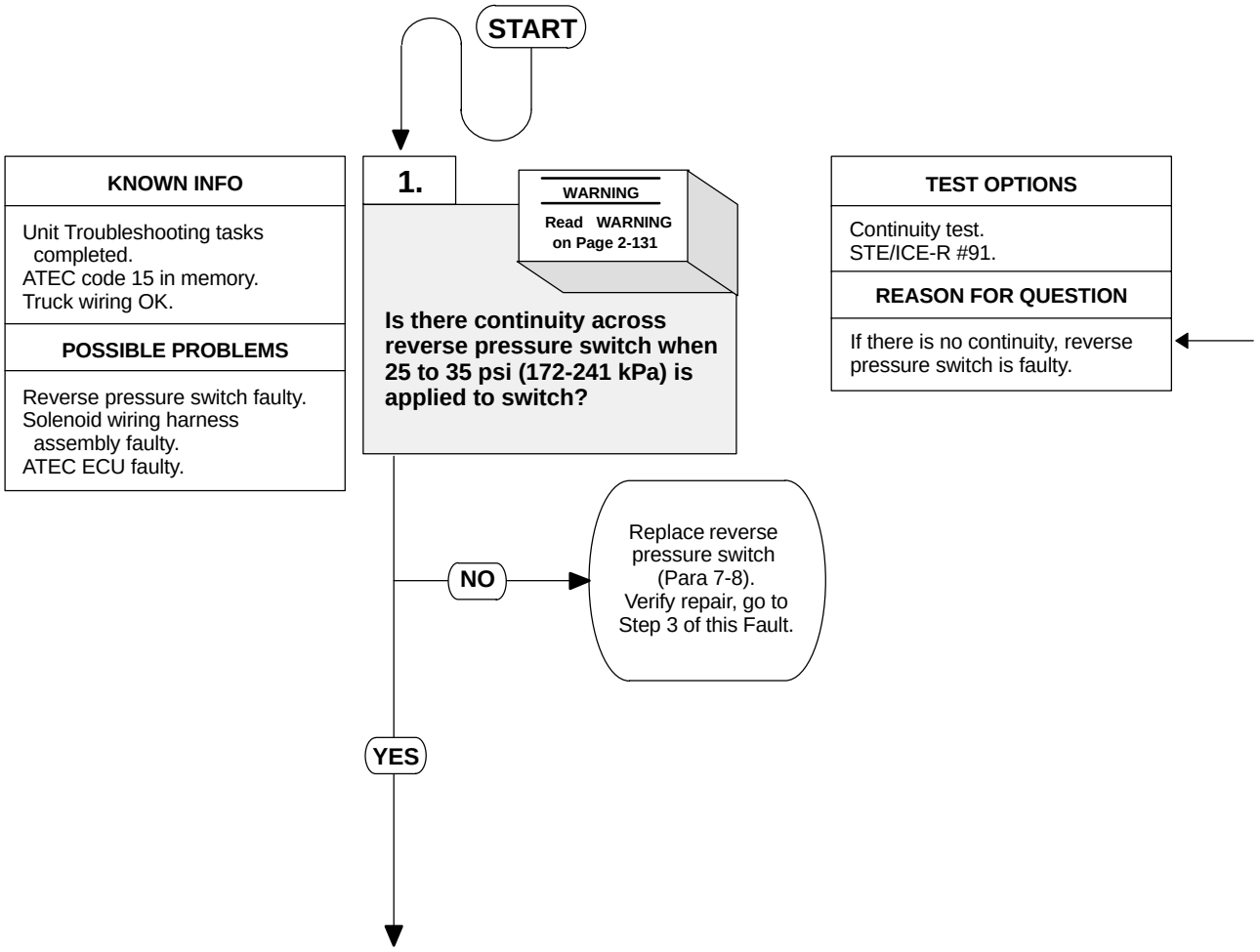
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Analyzer Set, STE/ICE-R (Optional) (Item 15, Appendix F)
Cartridge, ATEC (Item 28, Appendix F)
Goggles, Industrial (Item 83, Appendix F)
Gun, Airblow (Item 86, Appendix F)
Harness, Breakout (Item 94, Appendix F)
Multimeter (Item 140, Appendix F)
Reader, Diagnostic (Item 180, Appendix F)
Wrench Set, Socket 3/8 In. (Item 273, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)
Zonal Separator, Oil and Water Spray Gun (Item 280, Appendix F)
Jumperwire

Materials/Parts
Packing, Preformed (Item 400, Appendix E)

Personnel Required
Two

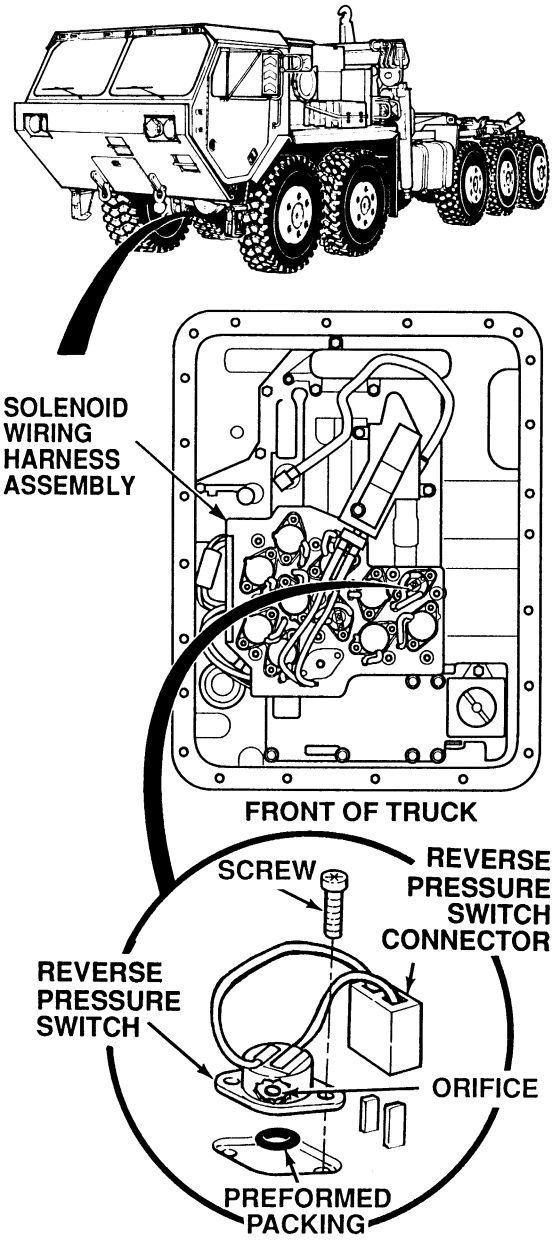
References
TM 9-2320-364-10
TM 9-2320-364-20
TM 9-4910-571-12&P

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Left rear fender skirt removed, (TM 9-2320-364-20)
Transmission internal oil filter removed, (Para 7-4)



WARNING

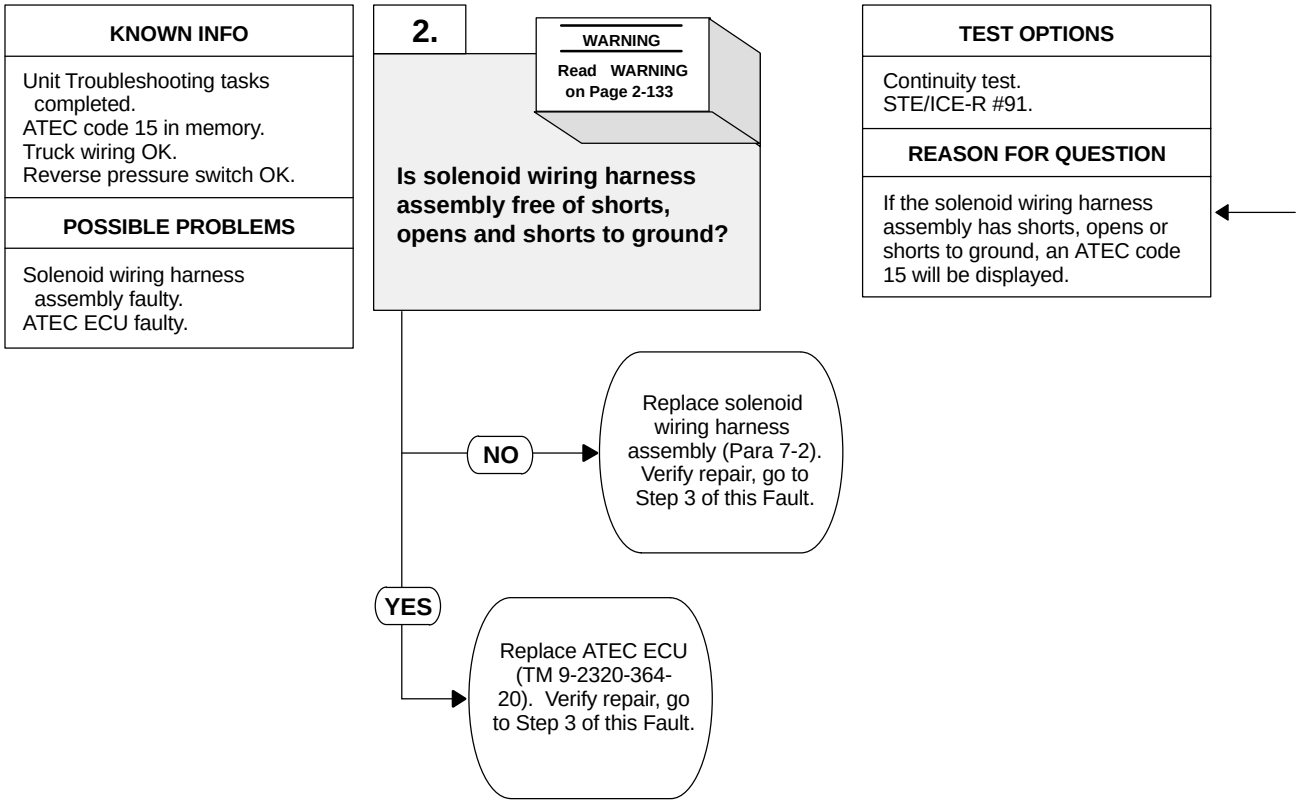
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.
- Blowing transmission oil can cause injury to eyes. Safety goggles must be worn when testing transmission oil pressure switch.



CONTINUITY TEST

(1) Remove two screws, reverse pressure switch and preformed packing. Discard preformed packing.
(2) Disconnect pressure switch connector.
(3) With the aid of an assistant, apply 25 to 35 psi (172 to 241 kPa) air to pressure switch orifice and check continuity across pressure switch.
  (a) If there is no continuity, replace reverse pressure switch (Para 7-8).
  (b) If there is continuity, pressure switch is OK.
(4) Install preformed packing, pressure switch and two screws. Tighten screws to 60 to 84 lbs-in (6.8 to 9.5 N·m).

3. REVERSE PRESSURE SWITCH CIRCUIT FAULTY (CONT).

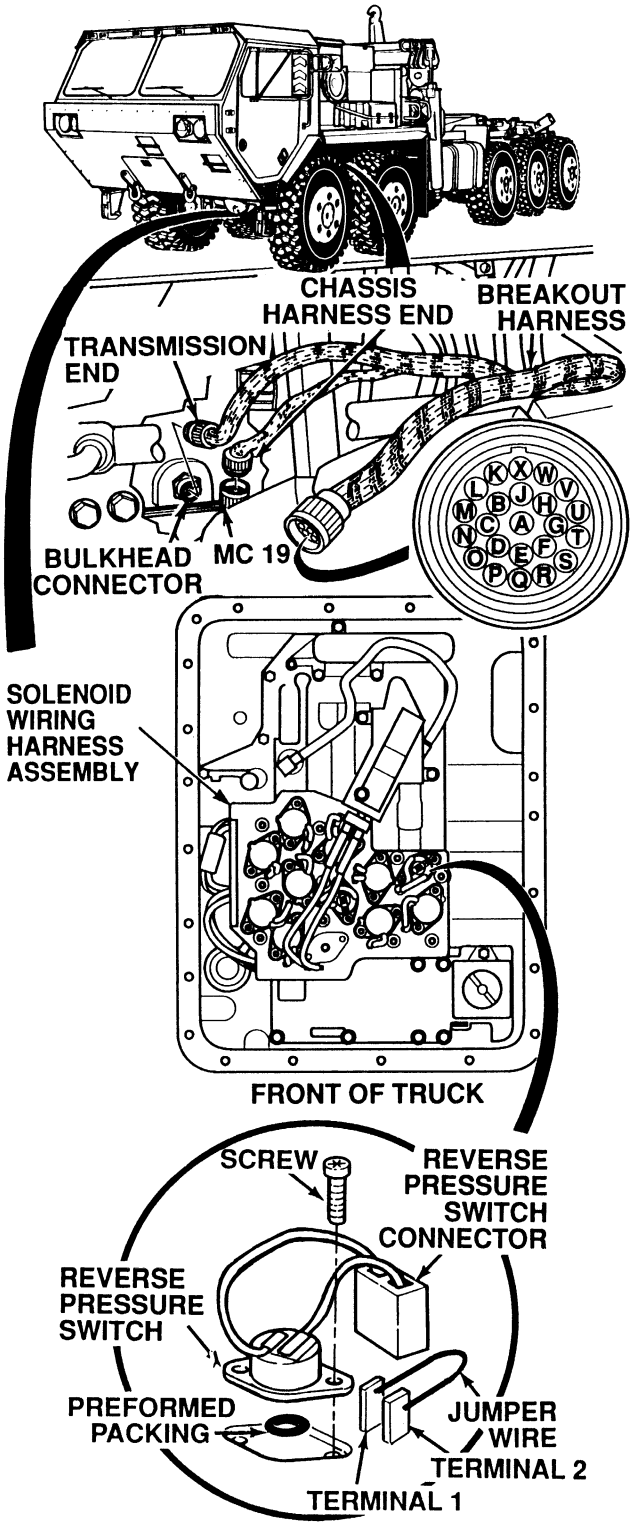


WARNING

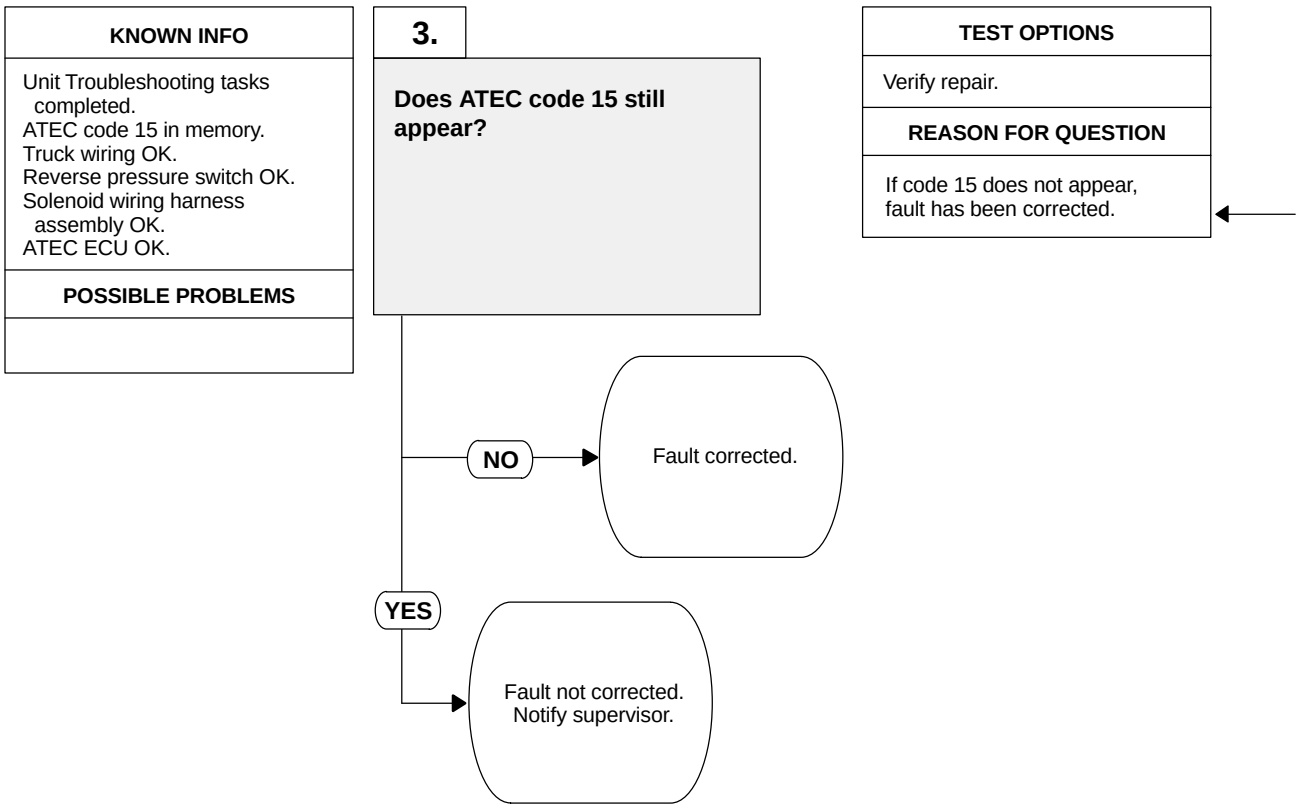
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

CONTINUITY TEST

(1) Disconnect connector MC19 from transmission bulkhead connector.
(2) Connect breakout harness connector to transmission bulkhead connector.
(3) Is there continuity between terminal E and any other wire on breakout harness connector?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (4) below.
(4) Is there continuity between terminal G and any other wire on breakout harness connector?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (5) below.
(5) Connect a jumper wire between terminals 1 and 2.
(6) Is there continuity between terminals E and G on breakout harness connector?
  (a) If there is no continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is continuity, go to Step (7) below.
(7) Is there continuity between terminal G on the breakout harness connector and a known good ground?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2)
  (b) If there is no continuity, replace ATEC ECU (TM 9-2320-364-20).
(8) Remove jumper wire from terminals 1 and 2.
(9) Remove breakout harness.
(10) Connect connector MC19 to bulkhead connector.
(11) Install internal oil filter (Para 7-4).

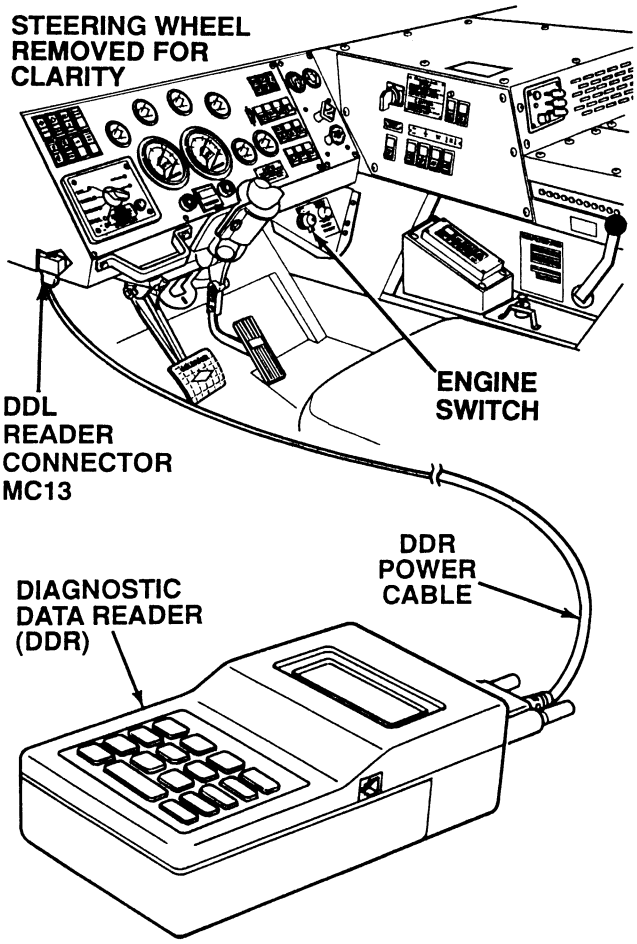


3. REVERSE PRESSURE SWITCH CIRCUIT FAULTY (CONT).



VERIFY REPAIR

(1) Install an ATEC cartridge in DDR (TM 9-2320-364-20).
(2) Connect DDR cable to DDL connector MC13.
(3) Start engine (TM 9-2320-364-10).
(4) Clear codes on DDR reader.
(5) Check DDR for an active code 15.
  (a) If a code 15 is not displayed, fault has been corrected. Perform Steps (6) through (8) below.
  (b) If a code 15 is displayed, fault not corrected. Perform Steps (6) through (8) below and notify supervisor.
(6) Turn OFF ENGINE switch.
(7) Disconnect DDR cable from DDL connector MC13.
(8) Install left rear fender skirt (TM 9-2320-364-20).



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

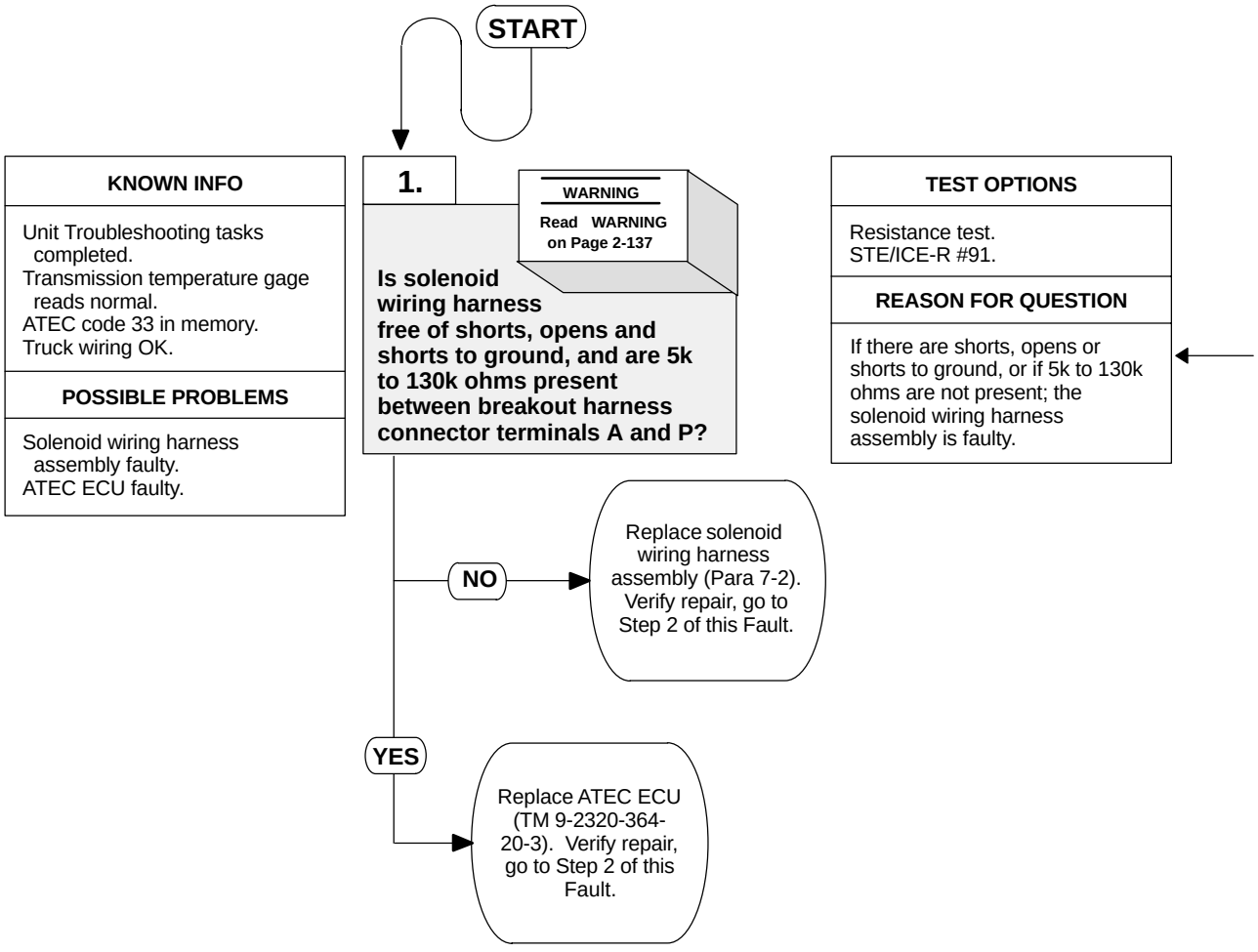
4. OIL TEMPERATURE SENSOR CIRCUIT FAULTY.

INITIAL SETUP

Tools and Special Tools
- Tool Kit General Mechanic's (Item 240, Appendix F)
- Analyzer Set, STE/ICE-R (Optional) (Item 15, Appendix F)
- Cartridge, ATEC (Item 28, Appendix F)
- Harness, Breakout (Item 94, Appendix F)
- Multimeter (Item 140, Appendix F)
- Reader, Diagnostic (Item 180, Appendix F)

References
- TM 9-2320-364-10
- TM 9-2320-364-20
- TM 9-4910-571-12&P

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Left rear fender skirt removed, (TM 9-2320-364-20)

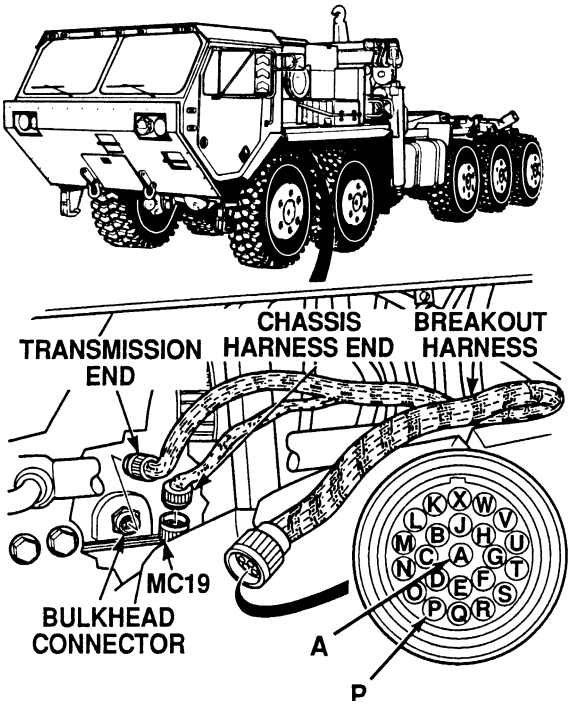


WARNING

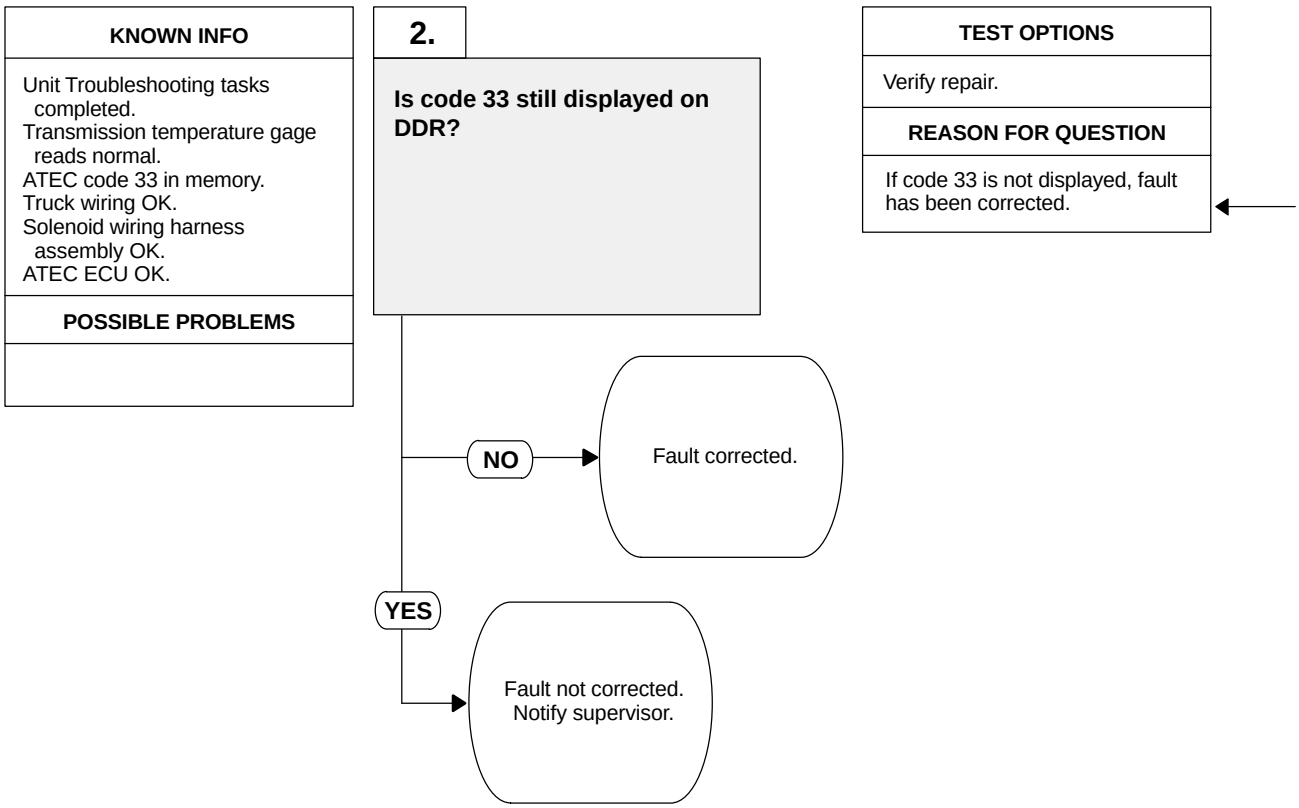
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

RESISTANCE TEST

(1) Disconnect connector MC19 from transmission bulkhead connector.
(2) Connect breakout harness to transmission bulkhead connector.
(3) Is there resistance between breakout harness terminals A and P?
  (a) If less than 5k ohms or more than 130k ohms are present, remove breakout harness and replace solenoid wiring harness assembly (Para 7-2).
  (b) If 5k to 130k ohms are present, perform Steps (4) and (5) below and replace ATEC ECU (TM 9-2320-364-20).
(4) Remove breakout harness.
(5) Connect connector MC19 to bulkhead connector.

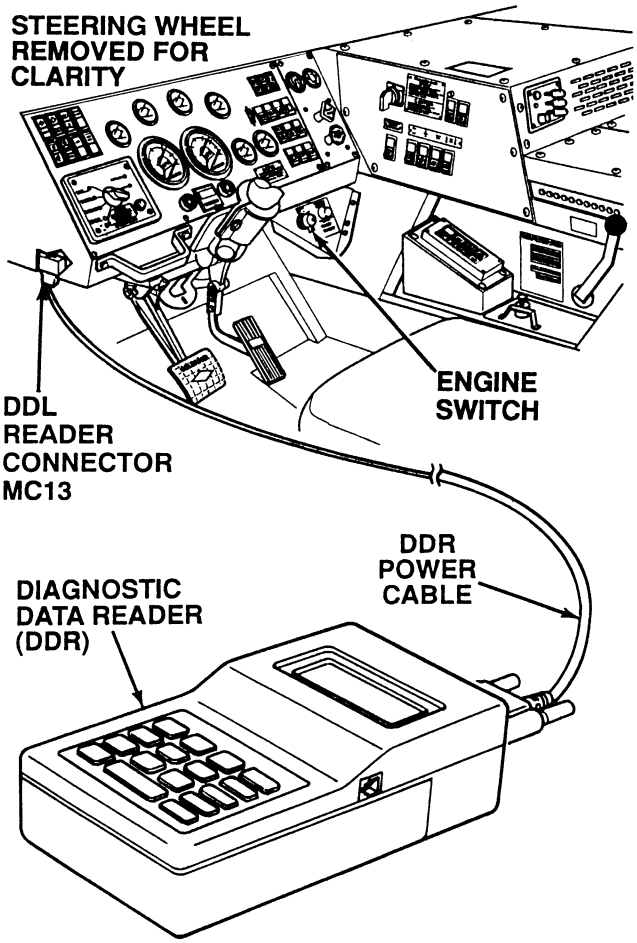


4. OIL TEMPERATURE SENSOR CIRCUIT FAULTY (CONT).



VERIFY REPAIR

(1) Install an ATEC cartridge in DDR (TM 9-2320-364-20).
(2) Connect DDR cable to DDL connector MC13.
(3) Start engine (TM 9-2320-364-10).
(4) Clear codes on DDR reader.
(5) Check DDR for an active code 33.
  (a) If a code 33 is not displayed, fault has been corrected. Perform Steps (6) through (8) below.
  (b) If a code 33 is displayed, fault not corrected. Perform Steps (6) through (8) below and notify supervisor.
(6) Turn OFF ENGINE switch.
(7) Disconnect DDR cable from DDL connector MC13.
(8) Install left rear fender skirt (TM 9-2320-364-20).



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

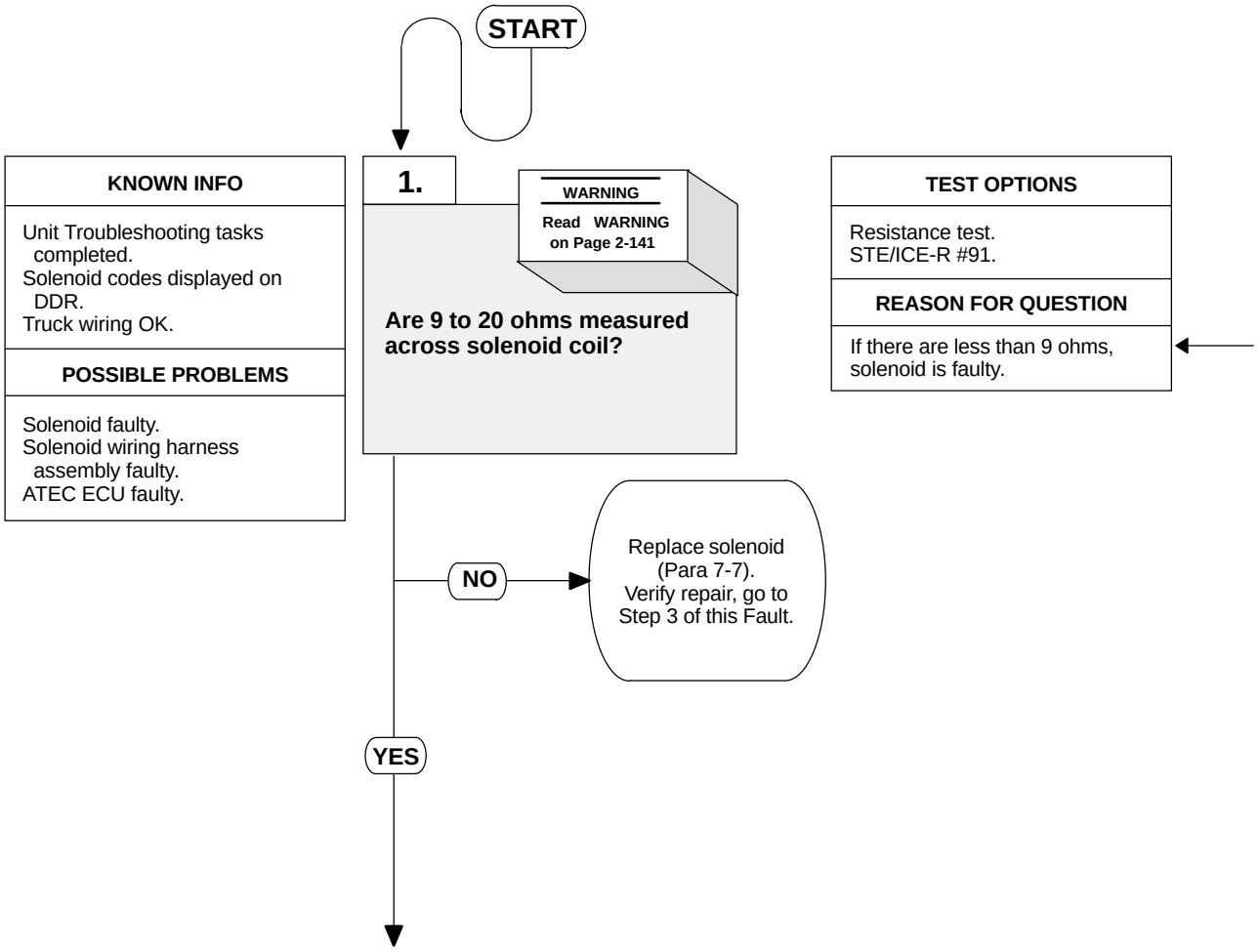
5. SOLENOIDS J, F, D, C, B, A, G, E OR H CIRCUIT FAULTY.

INITIAL SETUP

Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Analyzer Set, STE/ICE-R (Optional) (Item 15, Appendix F)
- Cartridge, ATEC (Item 28, Appendix F)
- Harness, Breakout (Item 94, Appendix F)
- Multimeter (Item 140, Appendix F)
- Reader, Diagnostic (Item 180, Appendix F)
- Jumperwire

References
- TM 9-2320-364-10
- TM 9-2320-364-20
- TM 9-4910-571-12&P

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Left rear fender skirt removed, (TM 9-2320-364-20)
- Transmission internal oil filter removed, (Para 7-4)



WARNING

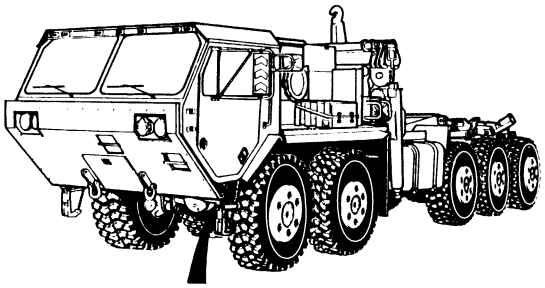
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

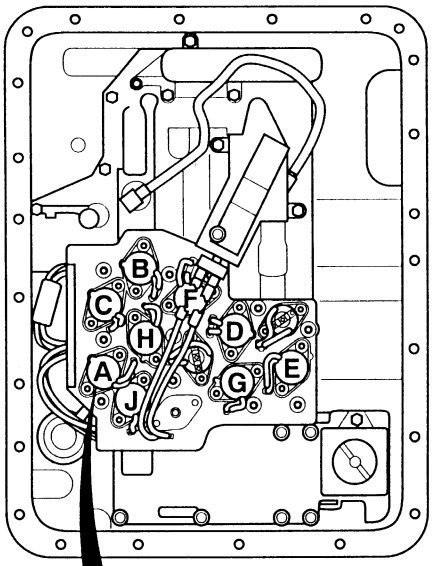
Table 2-9. Breakout Harness/Solenoid Wire Harness Assembly Test Points

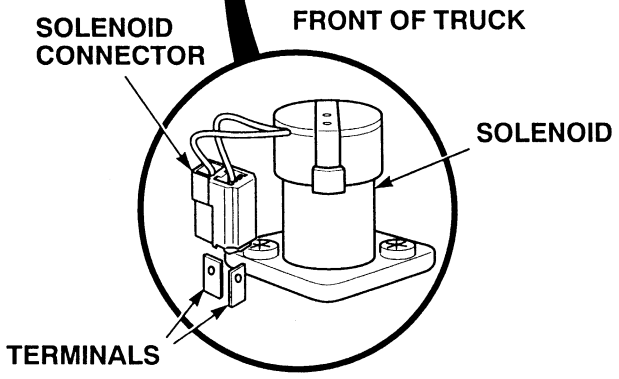
Solenoid (Code No.)	Breakout Harness/Solenoid Wire Harness Assembly Test Points	
	Output Wires Terminals	Input Wires Terminals
J	B	D
F	V	U
D	V	W
C	W	B
B	U	T
A	C	T
G	O	L
E	M	N
H	K	N

RESISTANCE TEST

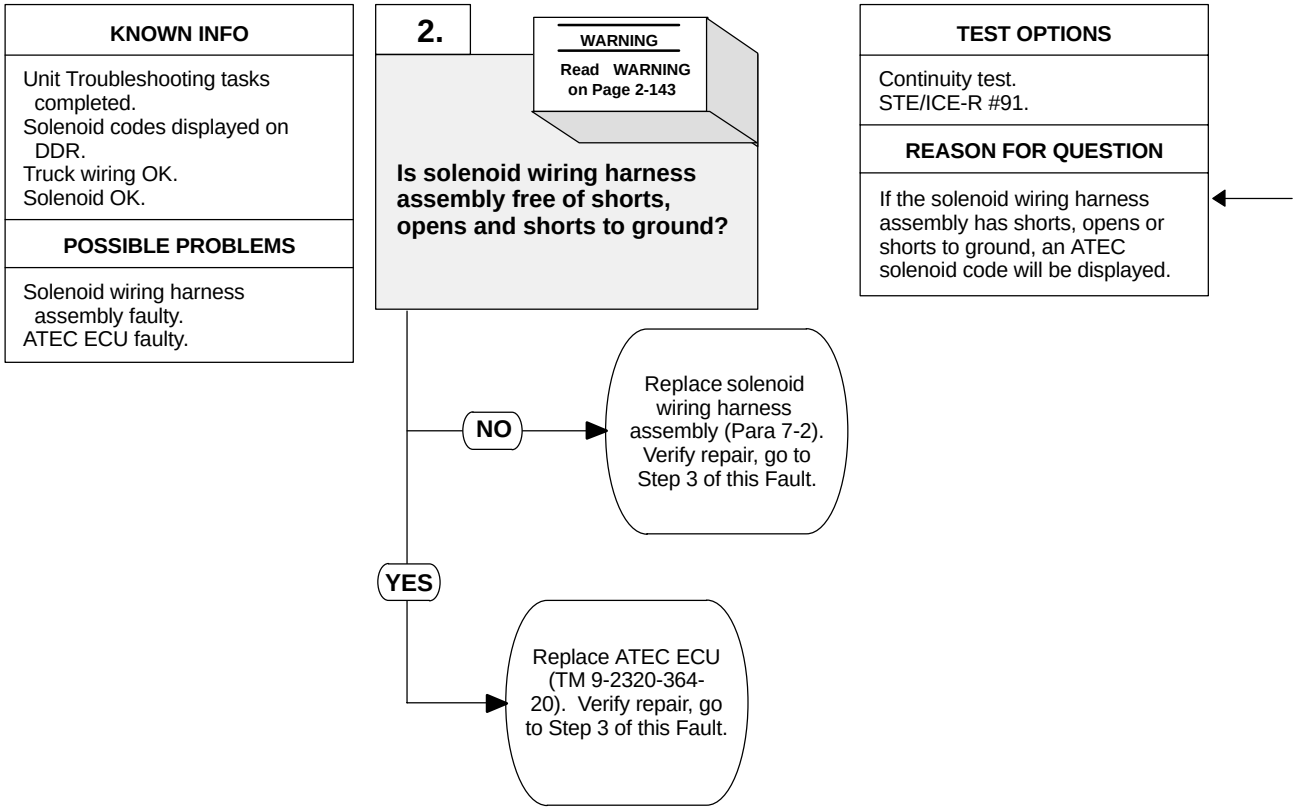
(1) Disconnect solenoid connector.
(2) Measure resistance between solenoid connector terminals (see Table 2-9).
  (a) If 9 to 20 ohms are not present, replace solenoid (Para 7-7).
  (b) If 9 to 20 ohms are present, solenoid is OK.







5. SOLENOIDS J, F, D, C, B, A, G, E OR H CIRCUIT FAULTY (CONT).



WARNING

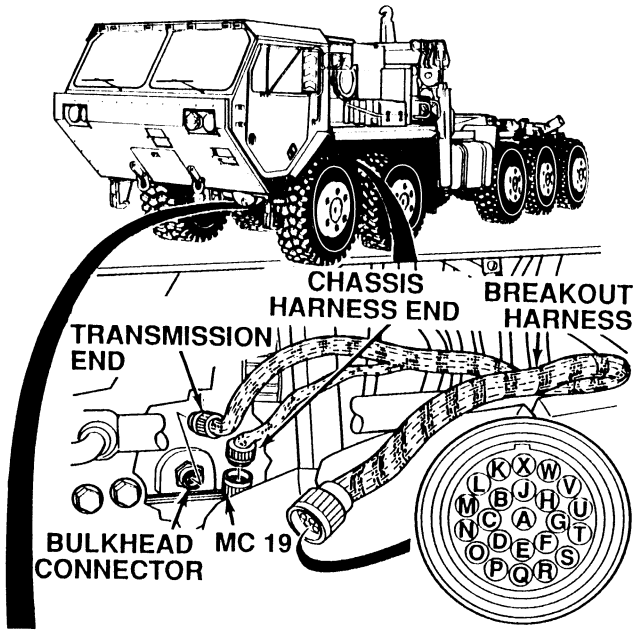
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

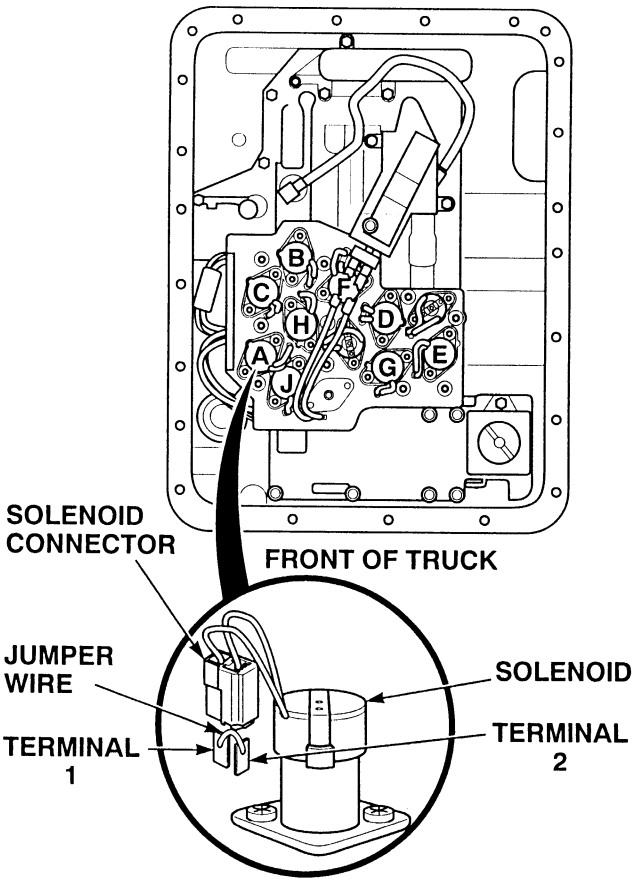
NOTE

Table 2-9 lists the breakout connector/solenoid power input and output terminals for each solenoid.

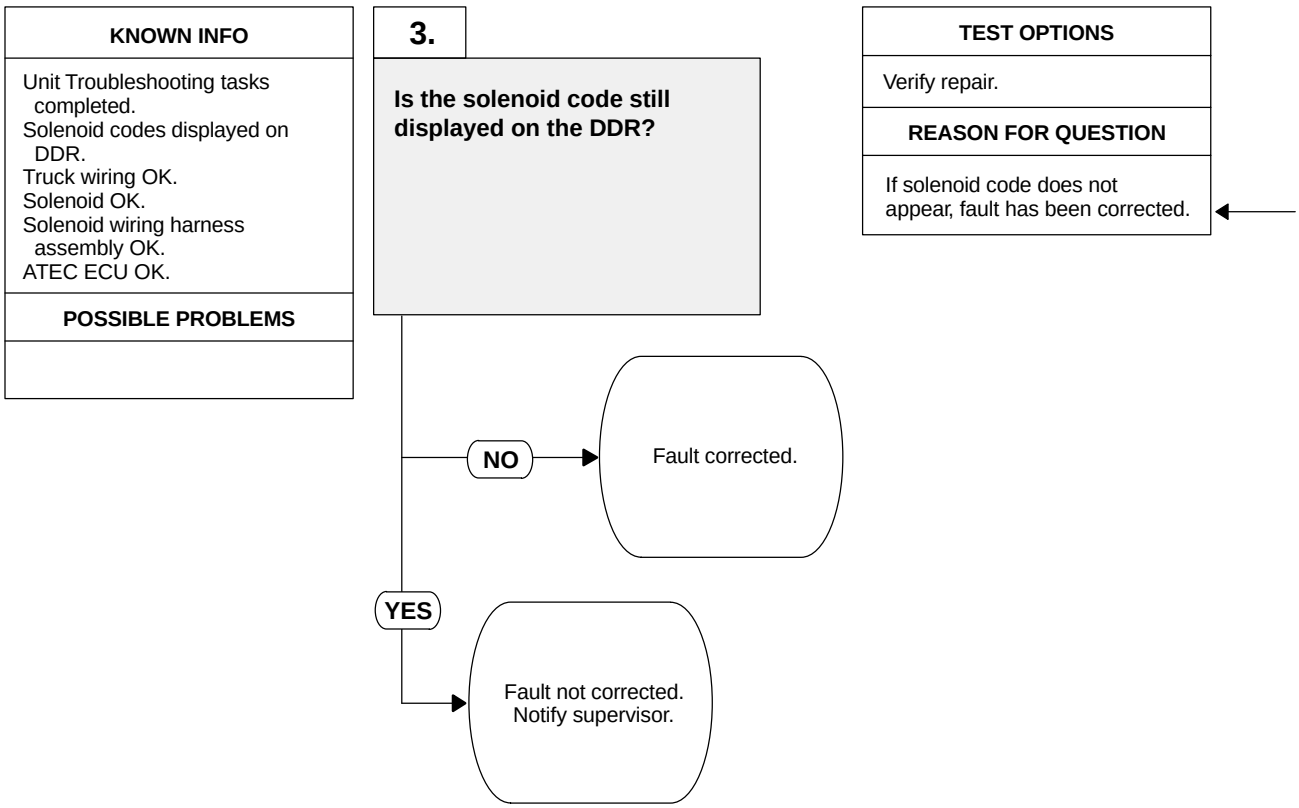
CONTINUITY TEST

(1) Disconnect connector MC19 from transmission bulkhead connector.
(2) Connect breakout harness connector to transmission bulkhead connector.
(3) Is there continuity between the breakout harness input terminal for the suspected faulty solenoid, and any other breakout harness terminal?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (4) below.
(4) Is there continuity between the breakout harness output terminal for the suspected faulty solenoid, and any other breakout harness terminal?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (5) below.
(5) Connect a jumper wire between terminals 1 and 2 of suspected faulty solenoid.
(6) Is there continuity between the breakout harness input and output terminals of the suspected faulty solenoid?
  (a) If there is no continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is continuity, go to Step (7) below.
(7) Is there continuity between terminal 1 and a known good ground with jumper wire connected?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, replace ATEC ECU (TM 9-2320-364-20).
(8) Remove jumper wire from terminals 1 and 2.
(9) Remove breakout harness.
(10) Connect connector MC19 to transmission bulkhead connector.
(11) Install internal oil filter (Para 7-4).



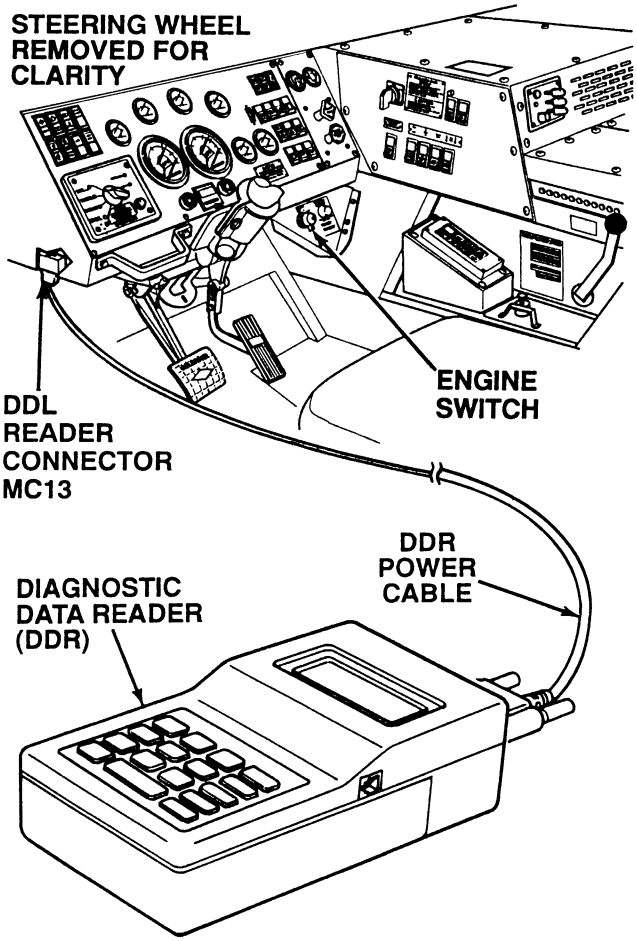


5. SOLENOIDS J, F, D, C, B, A, G, E OR H CIRCUIT FAULTY (CONT).



VERIFY REPAIR

(1) Install an ATEC cartridge in DDR (TM 9-2320-364-20).
(2) Connect DDR cable to DDL connector MC13.
(3) Turn ON ENGINE switch (TM 9-2320-364-10).
(4) Clear codes on DDR reader.
(5) Check DDR for solenoid code.
  (a) If code is not displayed, fault has been corrected. Perform Steps (6) through (8) below.
  (b) If code is displayed, fault not corrected. Perform Steps (6) through (8) below and notify supervisor.
(6) Turn OFF ENGINE switch.
(7) Disconnect DDR cable from DDL connector MC13.
(8) Install left rear fender skirt (TM 9-2320-364-20).



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

6. TRANSMISSION OVERHEATS (TRANS TEMP GAGE CONTINUOUSLY READS OVER 220°F [104°C]).

INITIAL SETUP

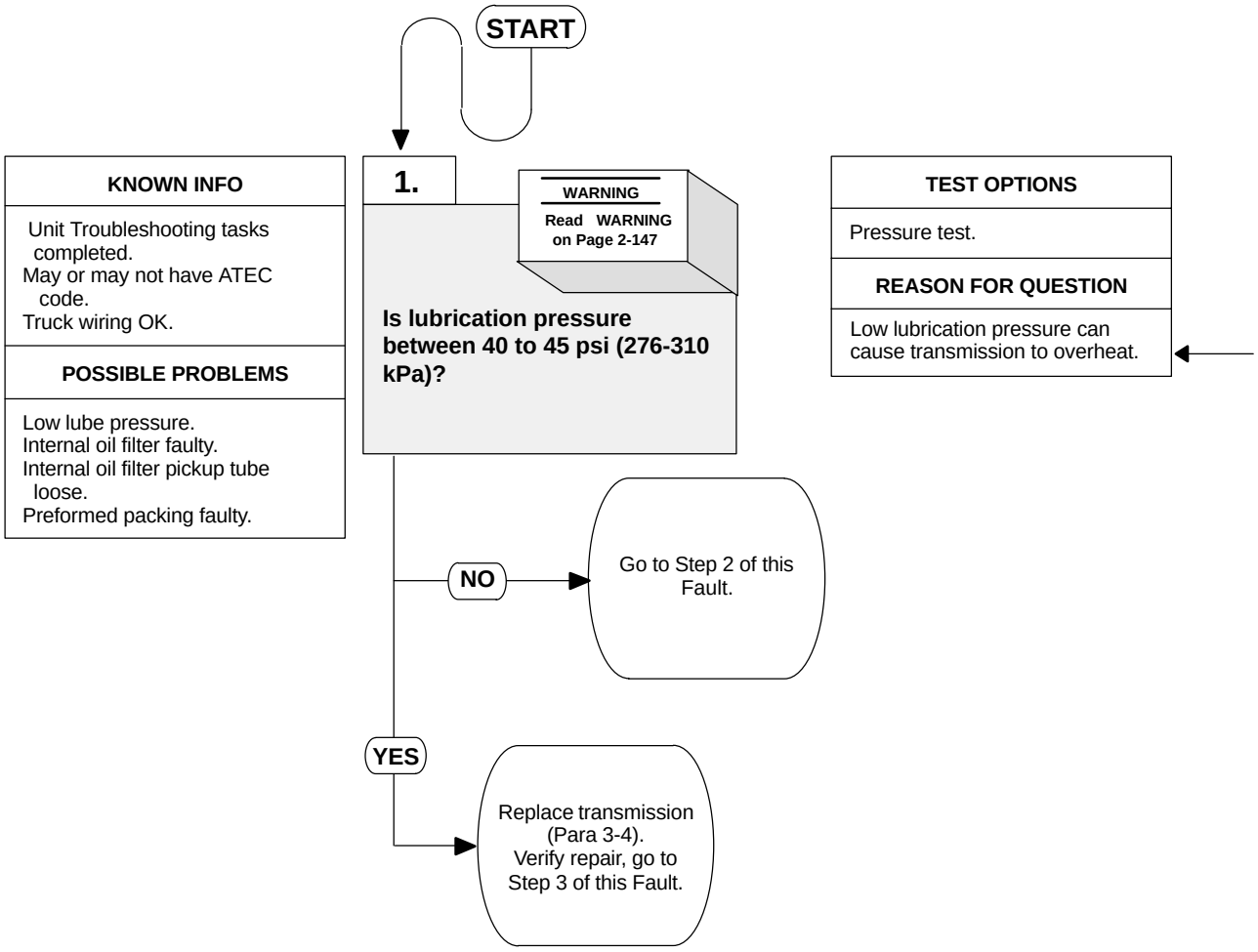
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench Set, Socket 3/8 In. (Item 273, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)

Materials/Parts
Sealing Compound (Item 53, Appendix B)

Personnel Required
Two

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



WARNING

- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

CAUTION

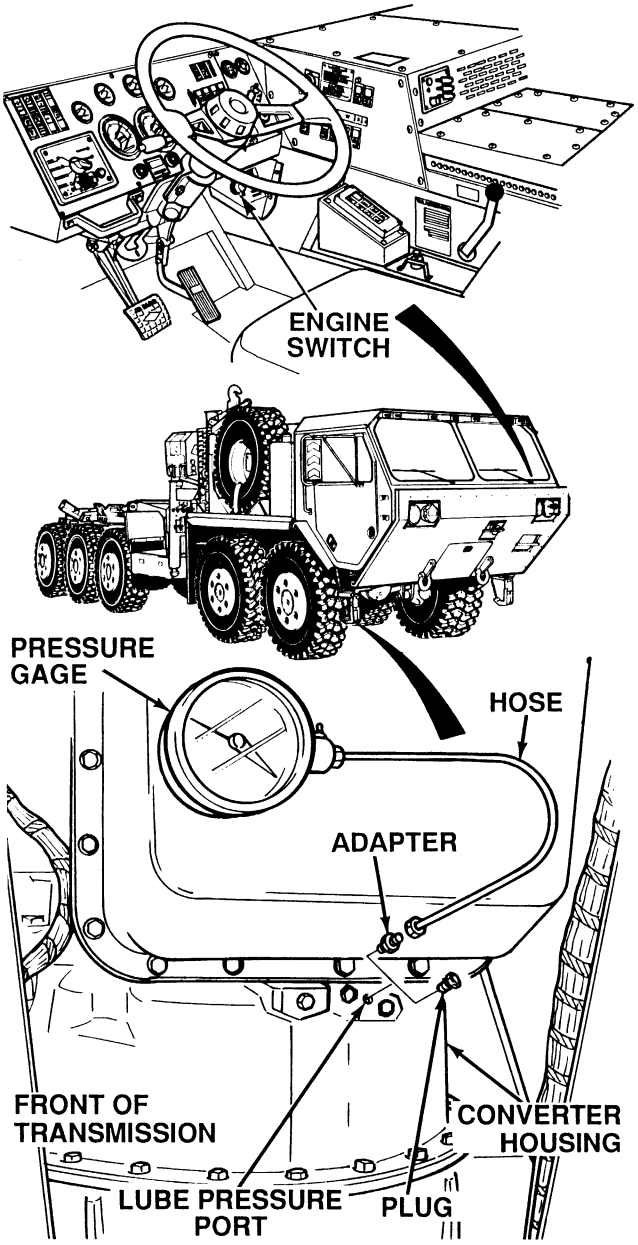
Due to limited work area, be prepared with suitable container to catch approximately one quart of oil when removing lube oil pressure port plug, or hose for pressure gage, from underside of torque converter housing, personnel can become wet with oil.

NOTE

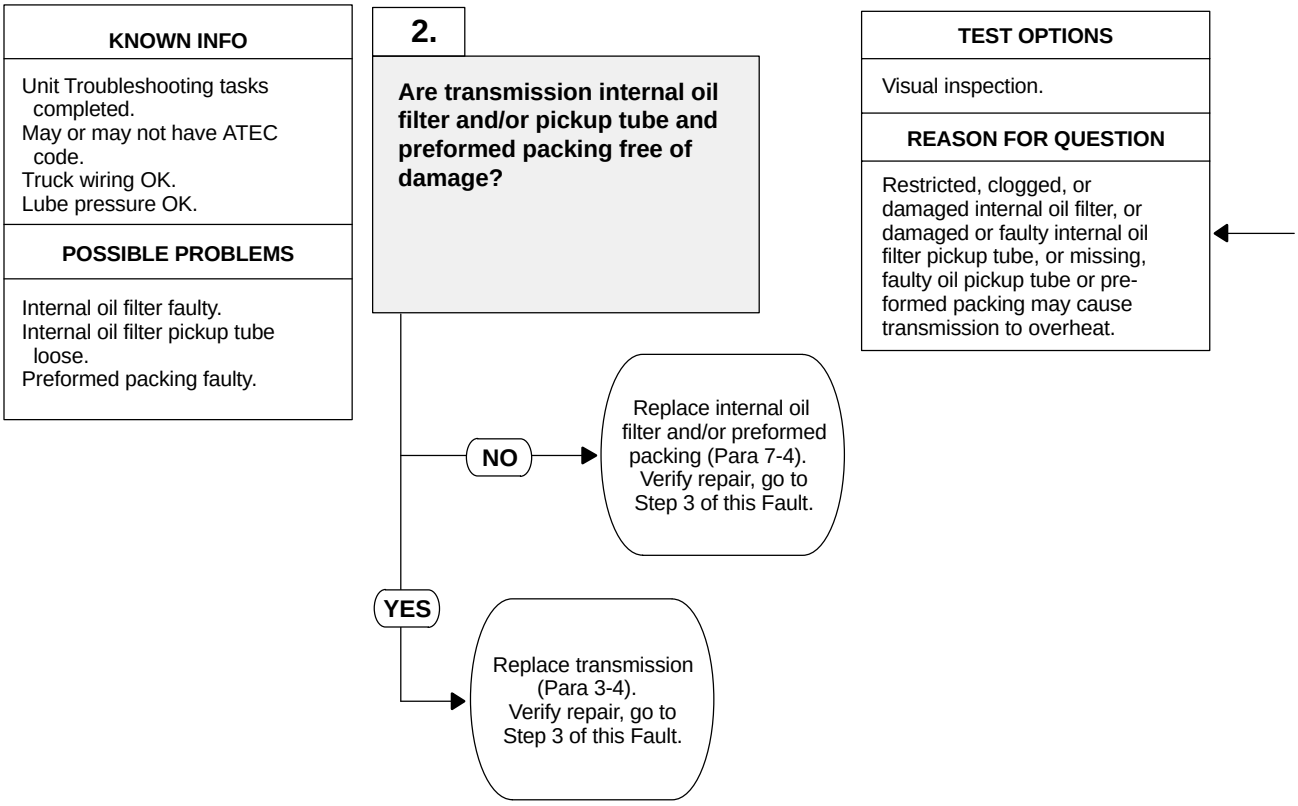
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) Remove plug from lube pressure port in converter housing.
(2) Install 1/8 in. NPT adapter from pressure test kit.
(3) Install 6 ft. (1.8 m) hose from kit on adapter and 0 to 160 psi (1103 kPa) gage on hose. Extend gage out from under truck.
(4) Start engine (TM 9-2320-364-10). Operate at approximately 1400 RPM while assistant reads pressure gage.
  (a) If lubrication pressure is not between 40 to 45 psi (276 to 310 kPa), perform Steps (5) through (7) below and go to Step 2 of this Fault.
  (b) If lubrication pressure is OK, perform Steps (5) through (7) below and replace transmission (Para 3-4).
(5) Turn OFF engine switch.
(6) Remove pressure gage, hose, and adapter from lube port of converter housing.
(7) Apply thread sealing compound and install plug in lubrication port of converter housing. Tighten plug to 48 to 60 lb-in (5.4 to 6.8 N·m).

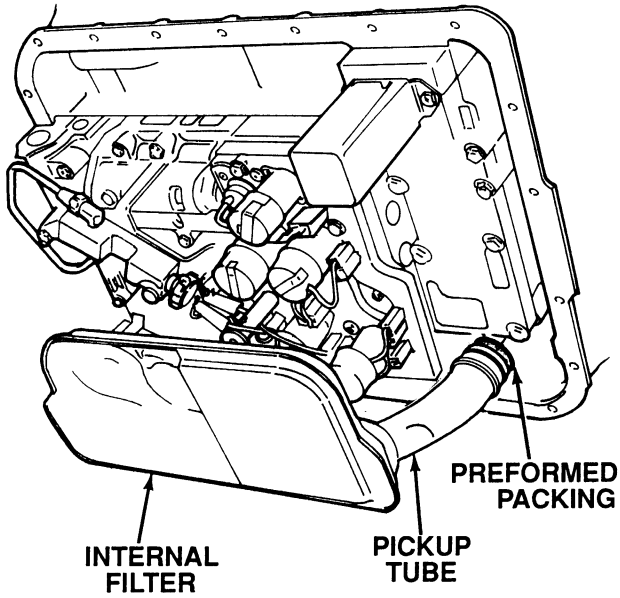


6. TRANSMISSION OVERHEATS (TRANS TEMP GAGE CONTINUOUSLY READS OVER 220°F [104°C]) (CONT).

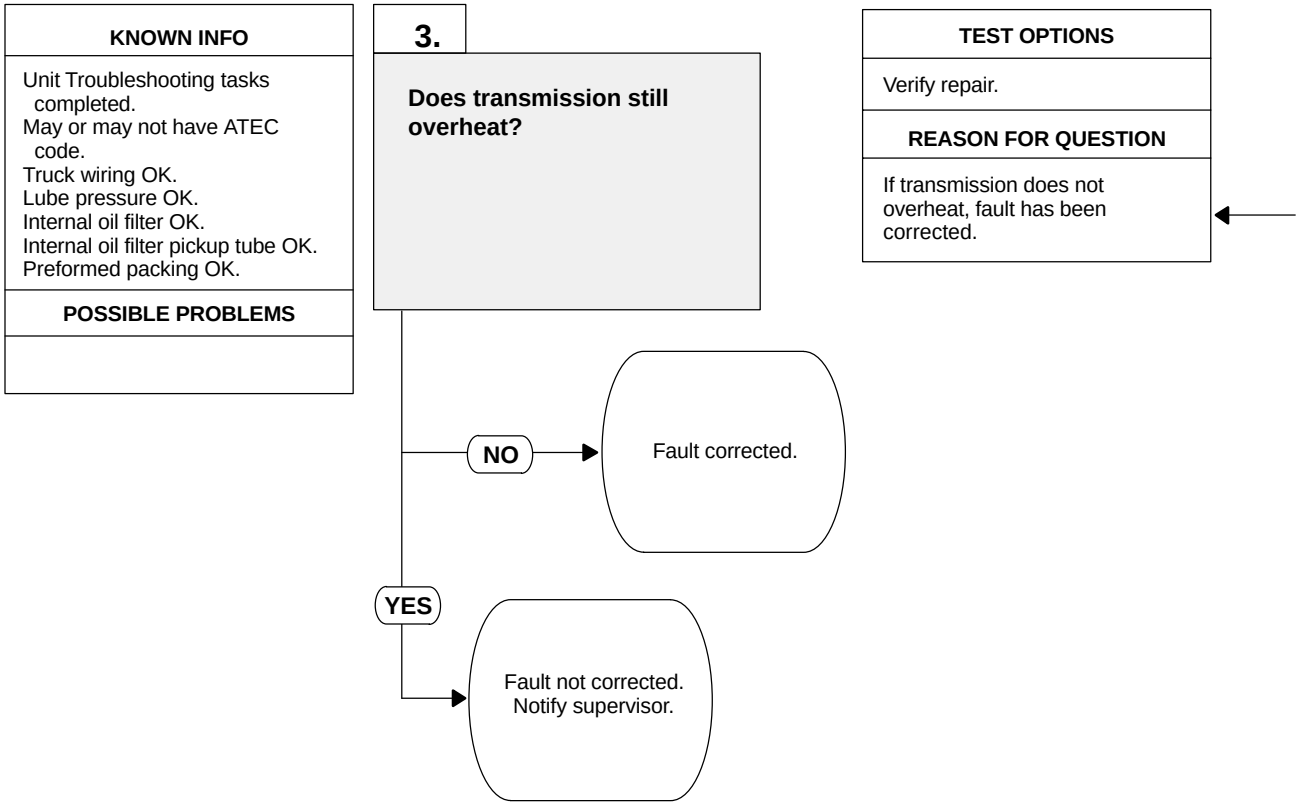


VISUAL INSPECTION

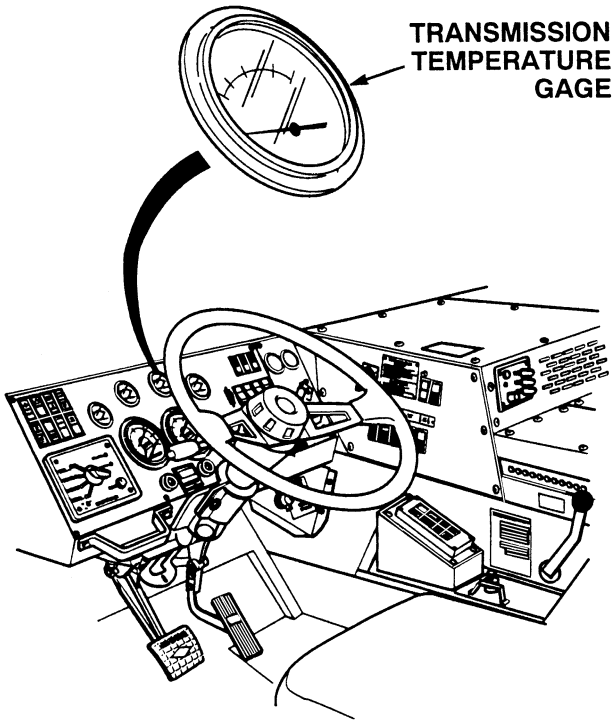
(1) Remove transmission internal oil filter (Para 7-4).
(2) Inspect oil filter for damaged pickup tube, missing or defective preformed packing, or clogged filter.
   (a) If filter or pickup tube and/or preformed packing are damaged or clogged, replace internal oil filter (Para 7-4).
   (b) If filter and oil pickup tube are OK, replace transmission (Para 3-4).



6. TRANSMISSION OVERHEATS (TRANS TEMP GAGE CONTINUOUSLY READS OVER 220°F [104°C]) (CONT).



VERIFY REPAIR
Operate truck (TM 9-2320-364-10). (1) If transmission operates normally, fault has been corrected. (2) If transmission temperature gage continues to read over 220°F (104°C), fault not corrected. Notify supervisor.



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

7. TRANSMISSION UNUSUALLY NOISY WHEN OPERATING.

INITIAL SETUP

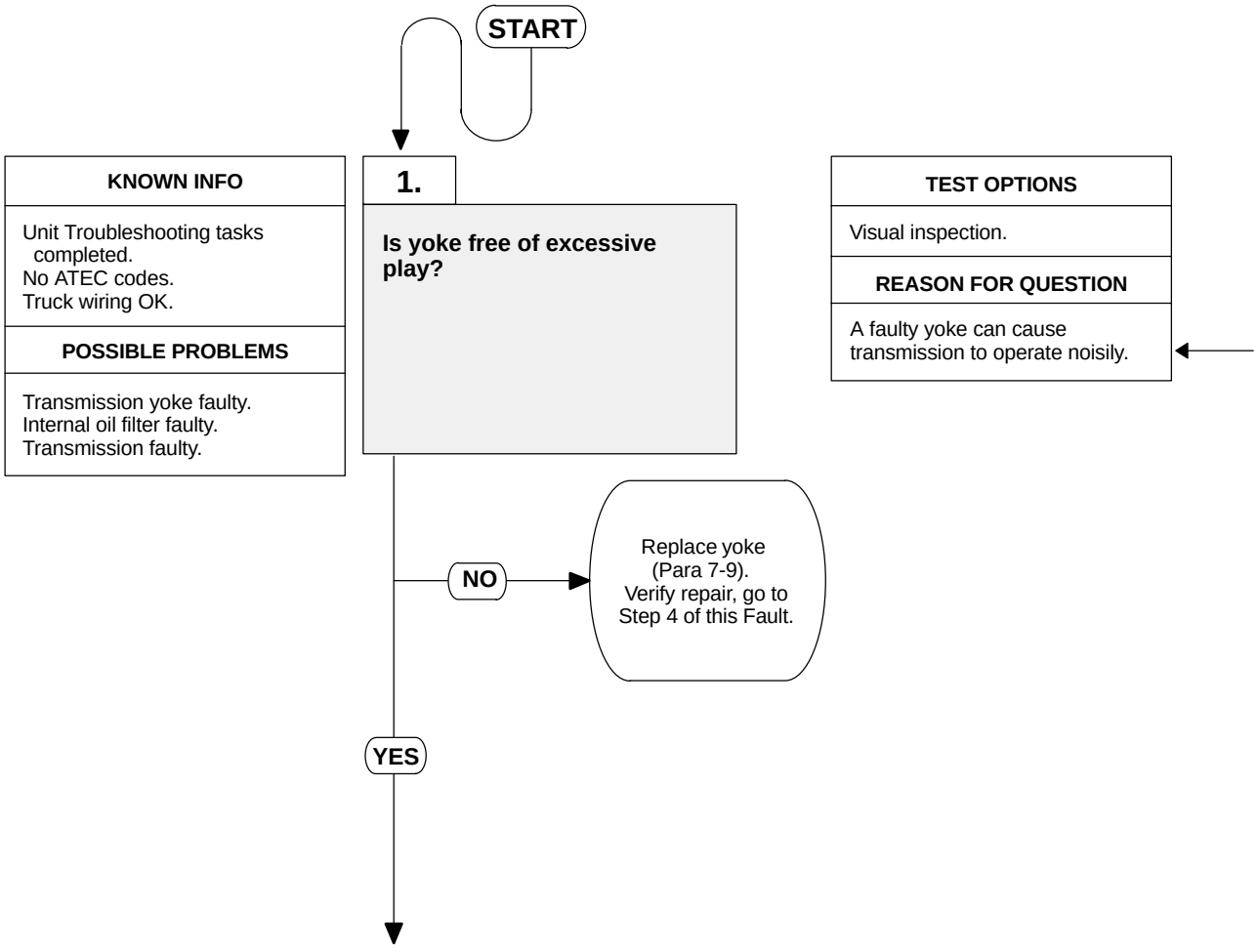
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench Set, Socket 3/8 In. (Item 273, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)

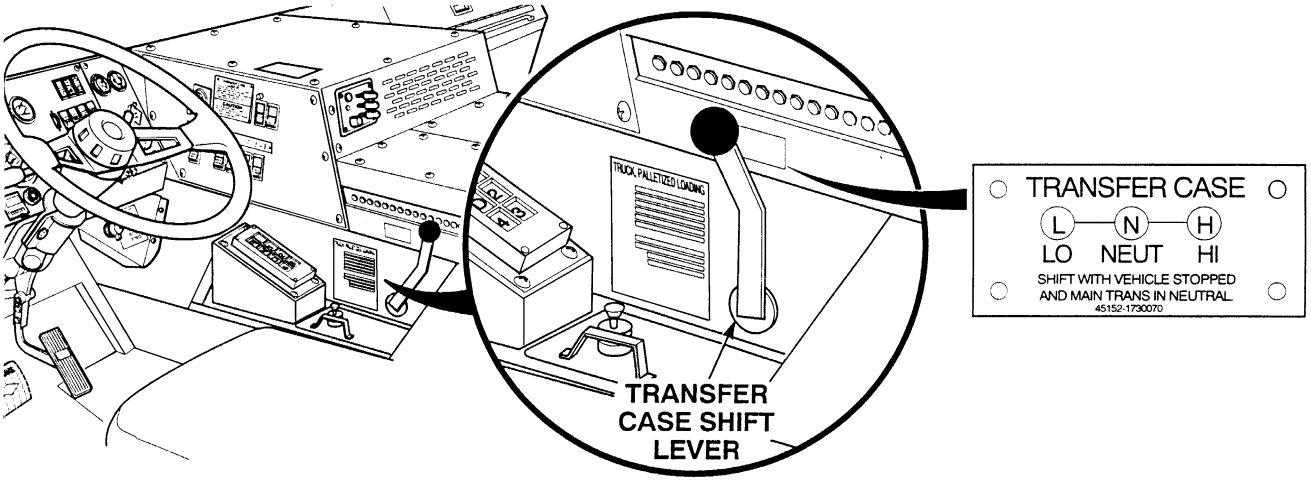
Materials/Parts
Sealing Compound (Item 53, Appendix B)

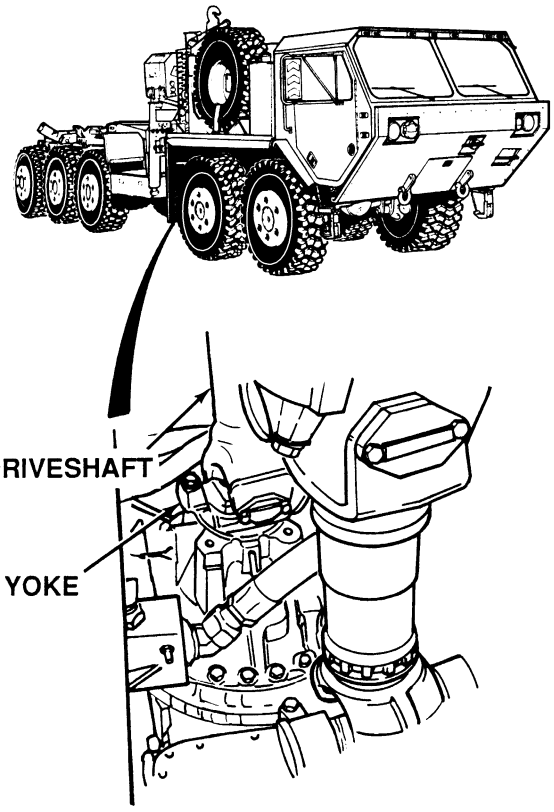
Personnel Required
Two

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



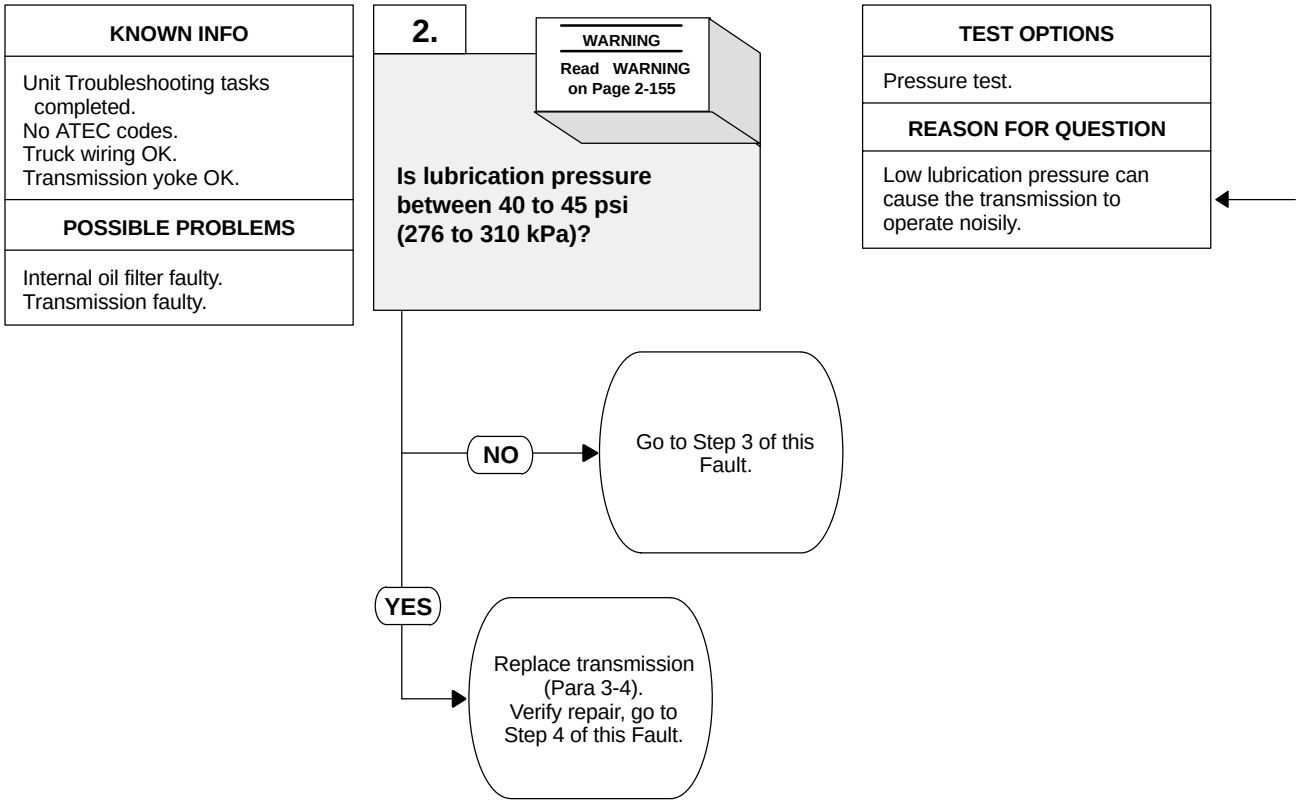




VISUAL INSPECTION

(1) Shift transfer case to NEUT (N) (TM 9-2320-364-10).
(2) Turn transmission driveshaft back and forth by hand.
  (a) If shaft is loose in yoke, replace yoke (Para 7-9).
  (b) If shaft is not loose, go to Step 3 below.
(3) Shift transfer case to HI (H).

7. TRANSMISSION UNUSUALLY NOISY WHEN OPERATING (CONT).



WARNING

- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

CAUTION

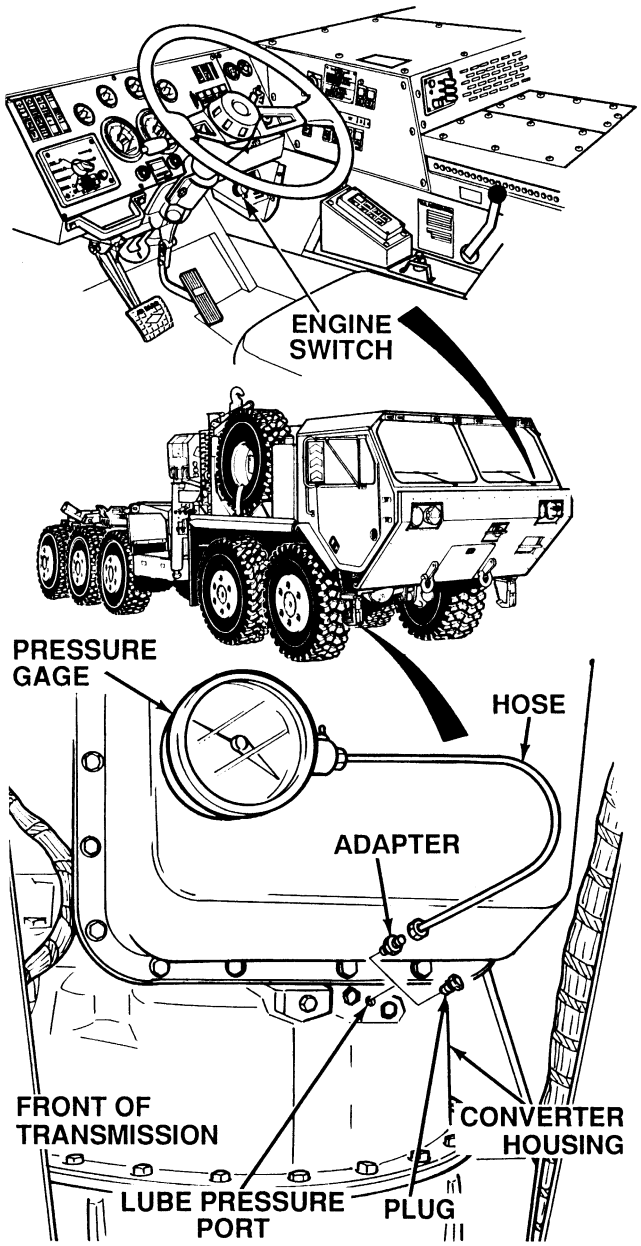
Due to limited work area, be prepared with suitable container to catch approximately one quart of oil when removing lube oil pressure port plug, or hose for pressure gage, from underside of torque converter housing, personnel can become wet with oil.

NOTE

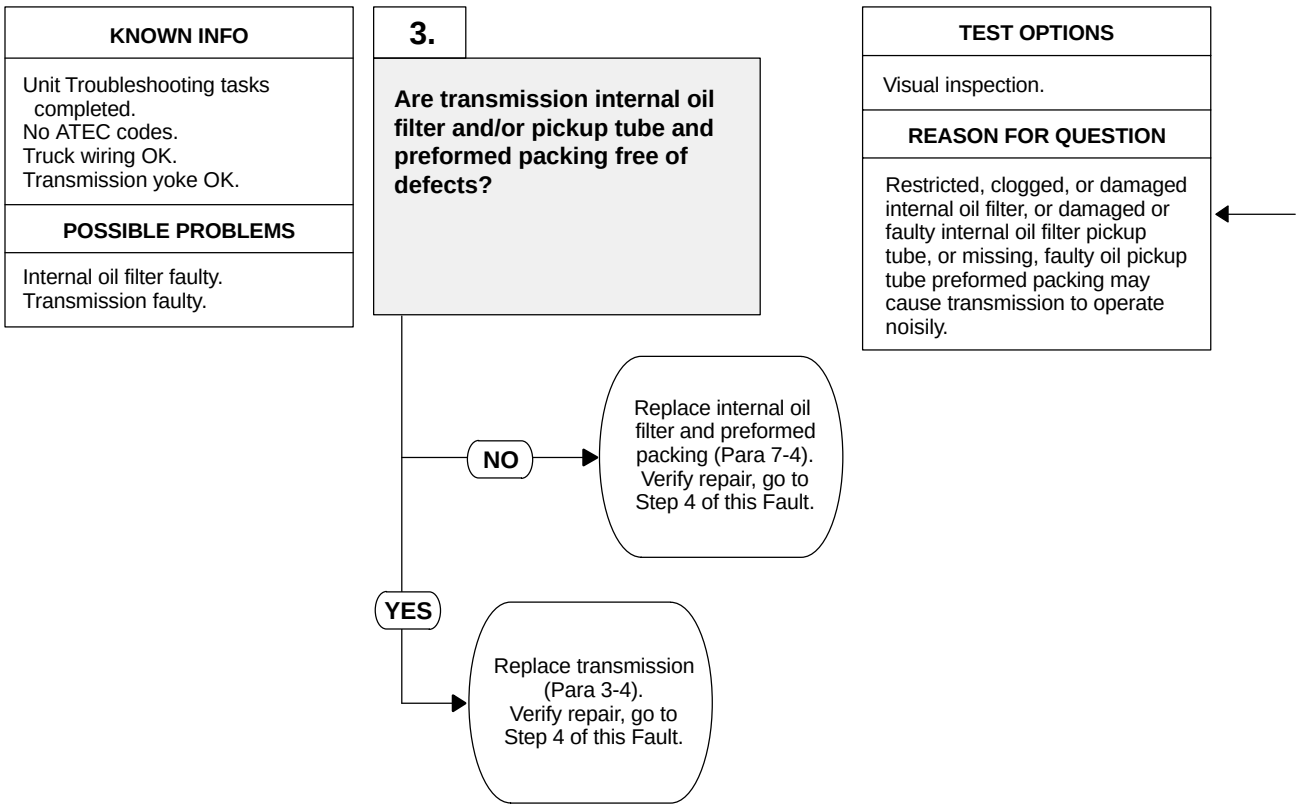
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST

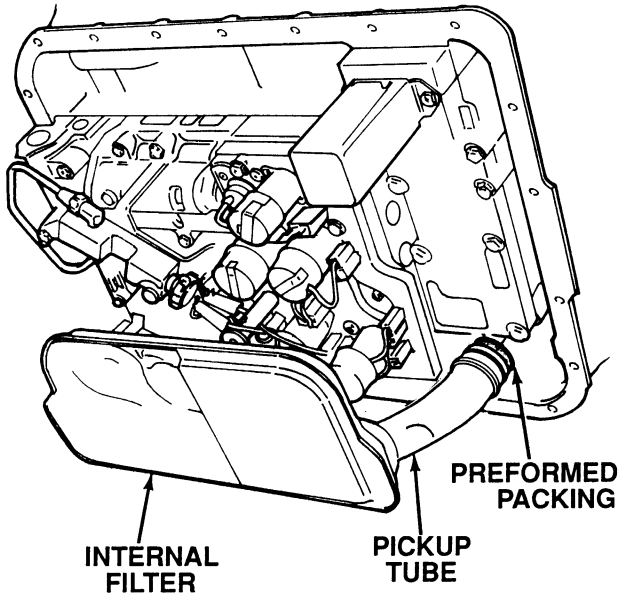
(1) Remove plug from lube pressure port of converter housing.
(2) Install 1/8 in. NPT adapter from pressure test kit.
(3) Install 6 ft. (1.8 m) hose from kit on adapter and 0 to 160 psi (1103 kPa) gage on hose. Extend gage out from under truck.
(4) Start engine (TM 9-2320-364-10). Operate at approximately 1400 RPM while assistant reads pressure gage.
  (a) If lubrication pressure is not between 40 to 45 psi (276 to 310 kPa), perform Steps (5) through (7) below and go to Step 3 of this Fault.
  (b) If lubrication pressure is OK, perform Steps (5) through (7) below and replace transmission (Para 3-4).
(5) Turn OFF engine switch.
(6) Remove pressure gage, hose, and adapter from lube port of converter housing.
(7) Apply thread sealing compound and install plug in lubrication port of converter housing. Tighten plug to 48 to 60 lb-in (5.4 to 6.8 N·m).



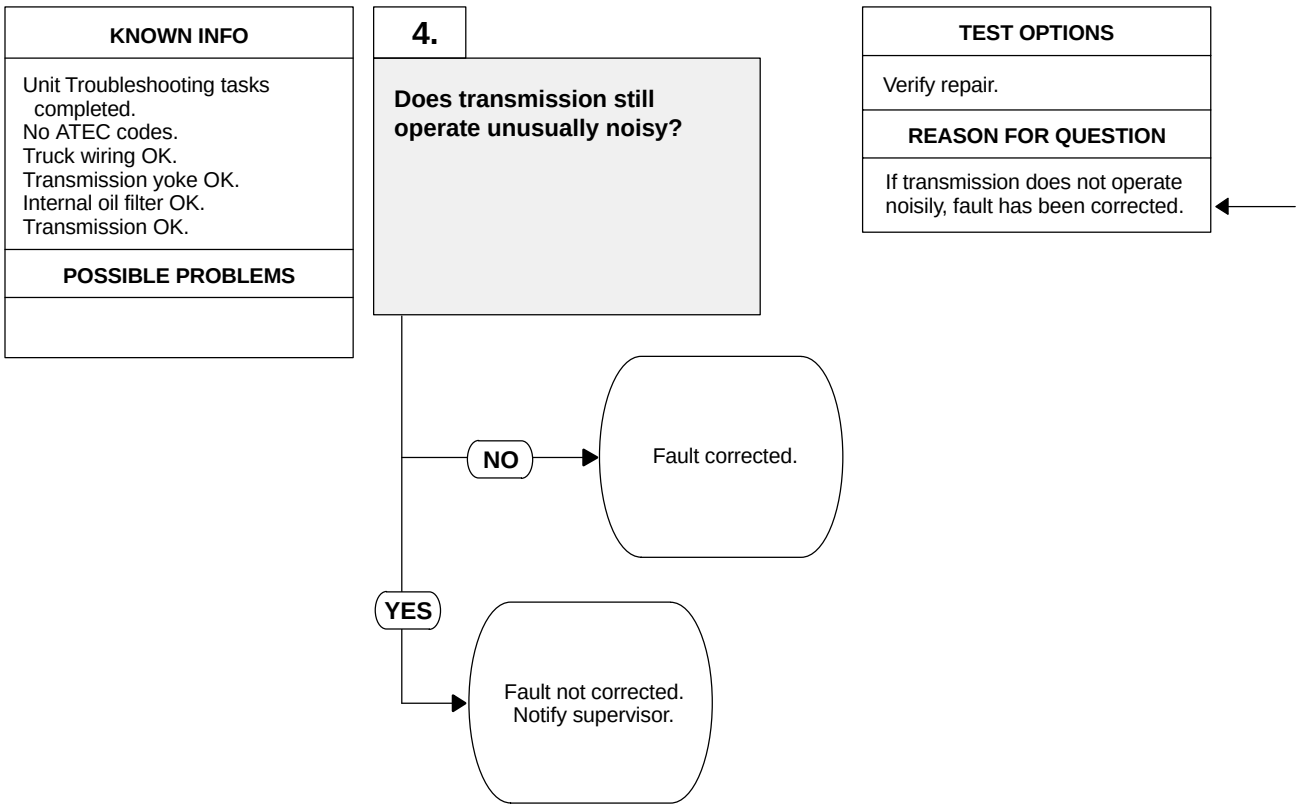
7. TRANSMISSION UNUSUALLY NOISY WHEN OPERATING (CONT).



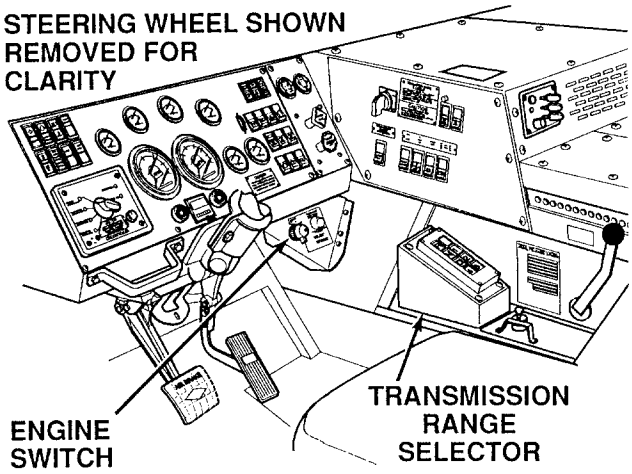
VISUAL INSPECTION
(1) Remove transmission internal oil filter (Para 7-4). (2) Inspect oil filter for damaged pickup tube, missing or defective preformed packing, or clogged filter. (a) If filter or pickup tube and/or preformed packing are damaged or clogged, replace internal oil filter (Para 7-4). (b) If filter and oil pickup tube are OK, replace transmission (Para 3-4).



7. TRANSMISSION UNUSUALLY NOISY WHEN OPERATING (CONT).



VERIFY REPAIR
Operate truck (TM 9-2320-364-10). (1) If transmission operates normally, fault has been corrected. (2) If transmission continues to operate noisily, fault not corrected. Notify supervisor.



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

8. TRANSMISSION WILL NOT SHIFT INTO GEAR, SHIFTS OUT OF GEAR, DOES NOT RESPOND TO RANGE SELECTION, OR OPERATES ABNORMALLY.

INITIAL SETUP

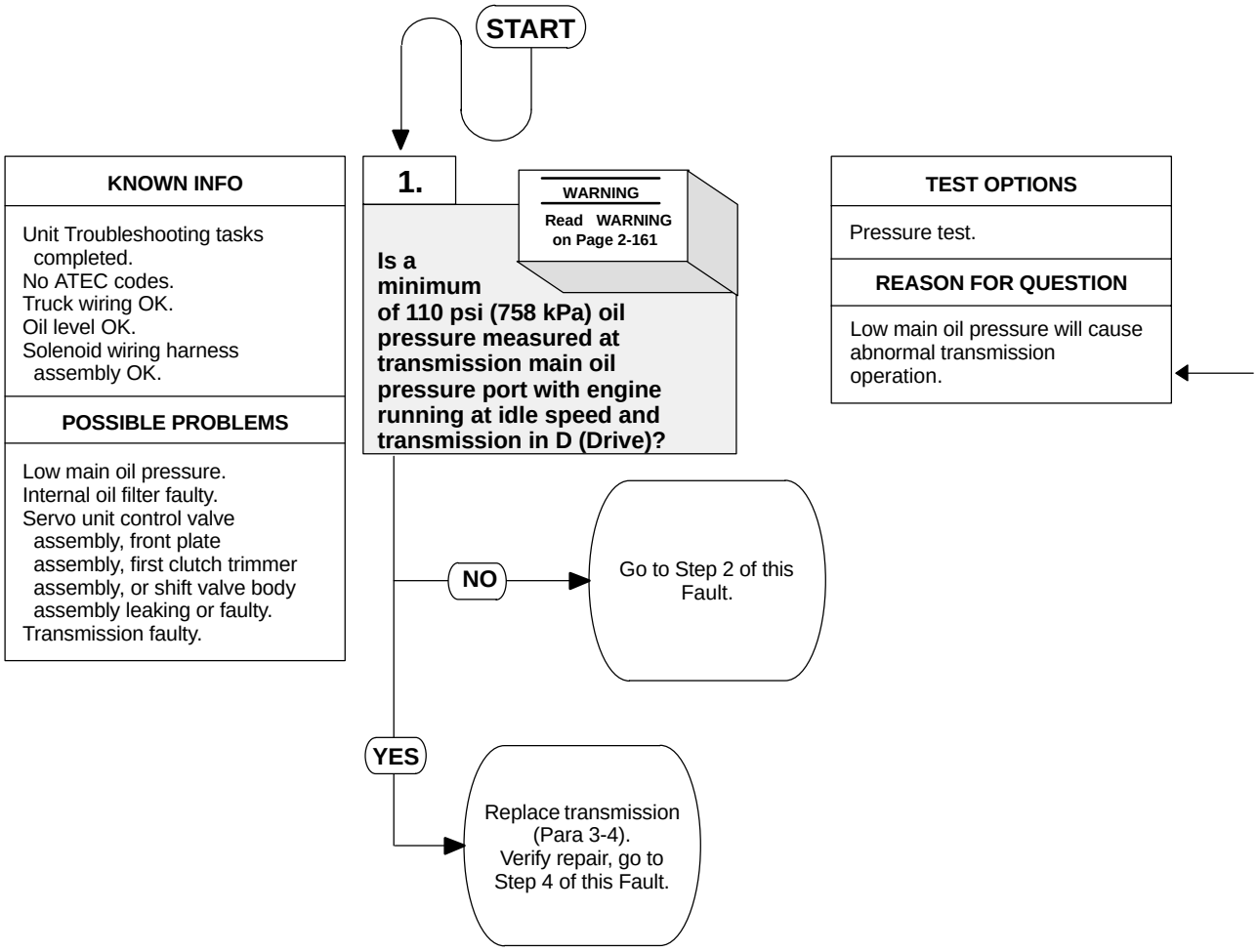
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench Set, Socket 3/8 In. (Item 273, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Sealing Compound (Item 53, Appendix B)

Personnel Required
Two

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



WARNING

- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

CAUTION

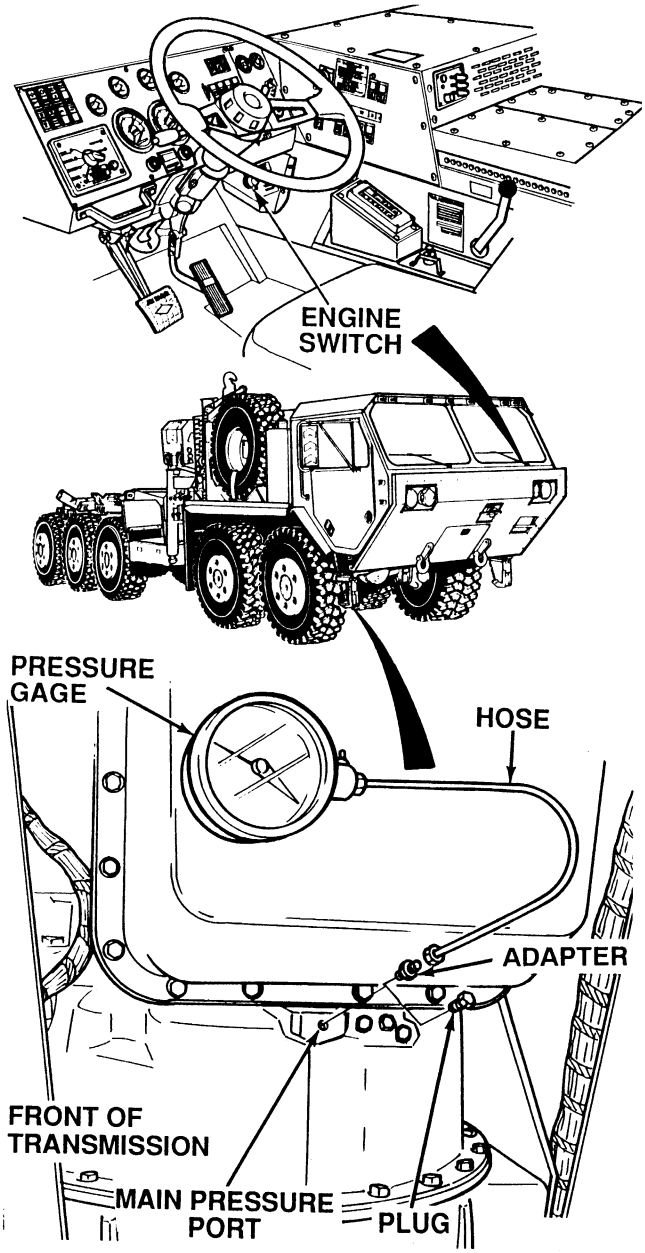
Due to limited work area, be prepared with suitable container to catch approximately one quart of oil when removing lube oil pressure port plug, or hose for pressure gage, from underside of torque converter housing, personnel can become wet with oil.

NOTE

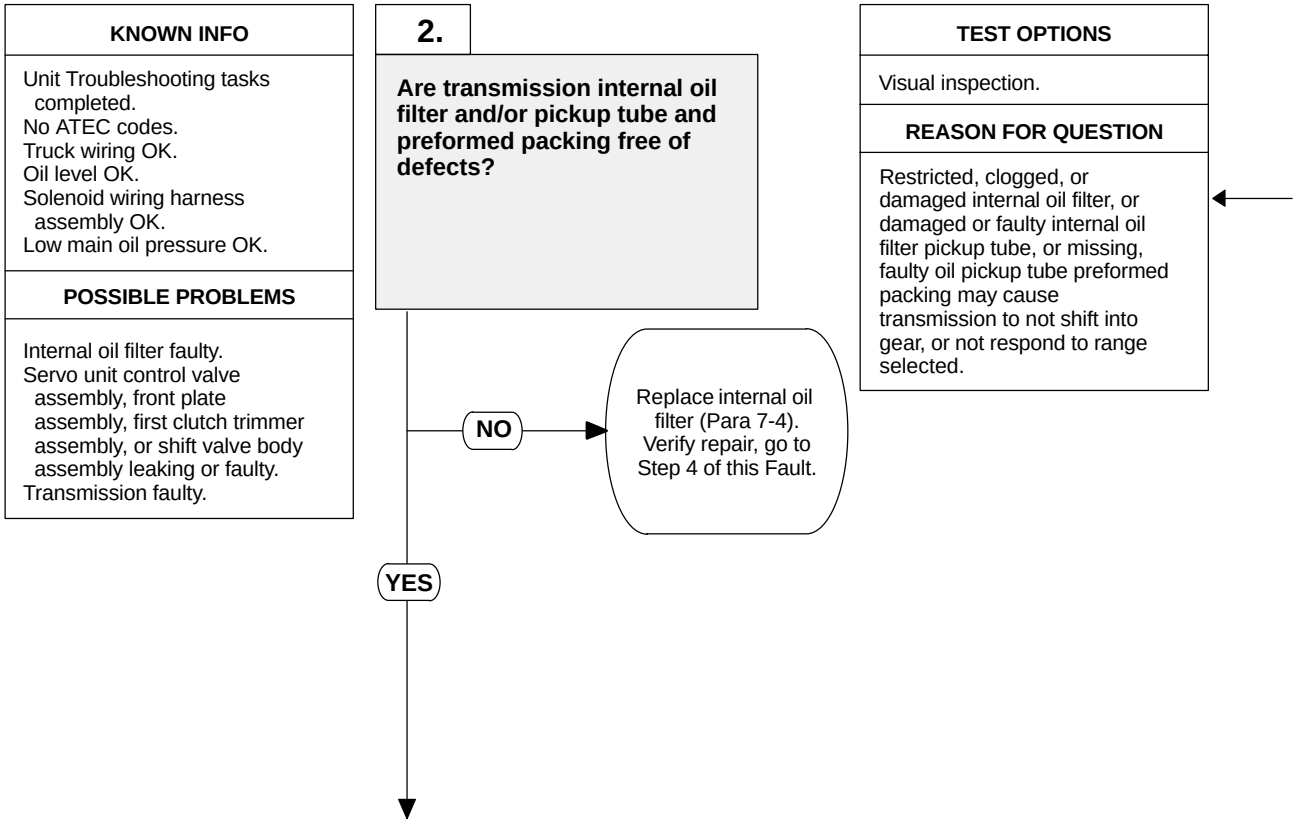
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) Remove main oil pressure port plug.
(2) Install 1/8 in. NPT adapter from pressure test kit in main pressure port.
(3) Install 6 ft. (1.8 m) hose from kit on adapter and 0 to 2000 psi (13790 kPa) gage on hose. Extend hose out from under truck to read while truck is in gear and running.
(4) Start engine and allow to run at idle speed.
(5) Select D (Drive) at shift selector (TM 9-2320-364-10) while assistant reads pressure gage.
    (a) If pressure is less than 110 psi (758 kPa), perform Steps (6) through (10) below and go to Step 2 of this Fault.
    (b) If pressure is a minimum of 110 psi (758 kPa), perform Steps (6) through (10) below and replace transmission (Para 3-4).
(6) Select N (Neutral) at shift selector.
(7) Turn OFF engine switch.
(8) Remove 1/8 in. adapter, hose, and gage from main oil pressure port.
(9) Apply thread sealing compound to plug.
(10) Install plug in main port of converter housing. Tighten plug to 48 to 60 lb-in (5.4 to 6.8 N·m).

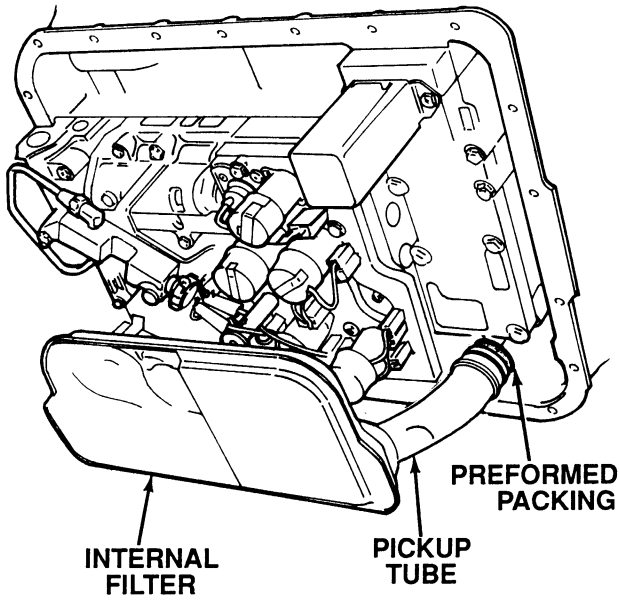


8. TRANSMISSION WILL NOT SHIFT INTO GEAR, SHIFTS OUT OF GEAR, DOES NOT RESPOND TO RANGE SELECTION, OR OPERATES ABNORMALLY (CONT).

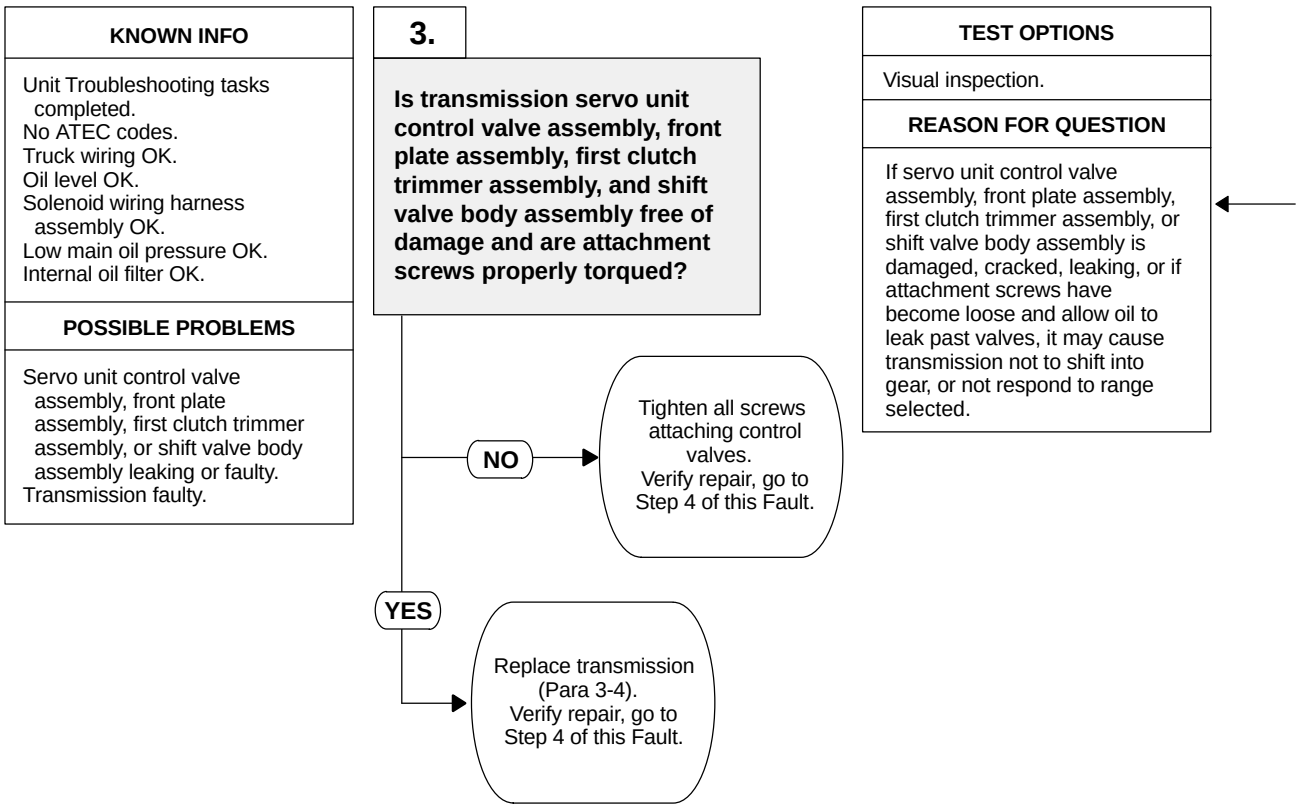


VISUAL INSPECTION

(1) Remove transmission internal oil filter (Para 7-4).
(2) Inspect oil filter for damaged pickup tube, missing or defective preformed packing, or clogged filter.
   (a) If filter or pickup tube and/or preformed packing are damaged or clogged, replace internal oil filter (Para 7-4).
   (b) If filter and oil pickup tube are OK, go to Step 3 of this Fault.

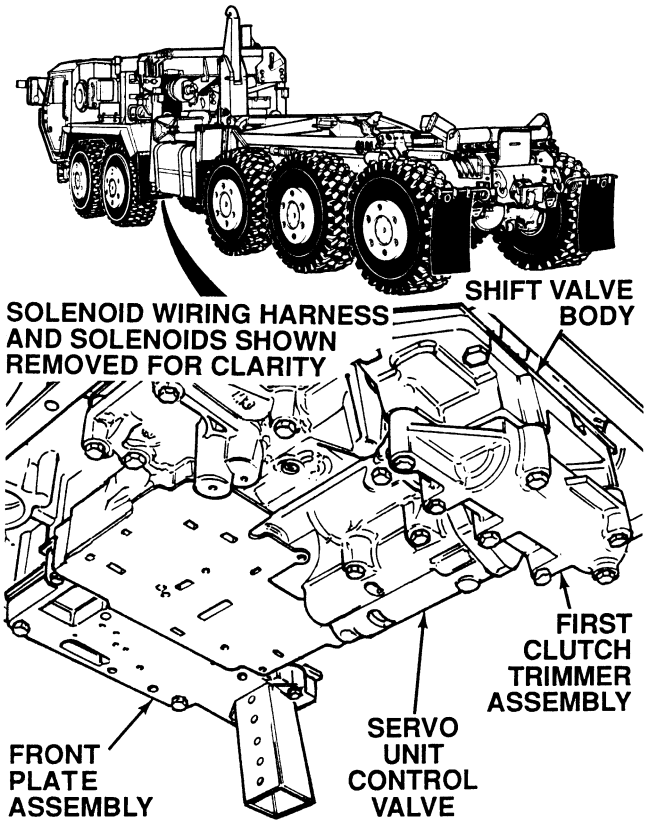


8. TRANSMISSION WILL NOT SHIFT INTO GEAR, SHIFTS OUT OF GEAR, DOES NOT RESPOND TO RANGE SELECTION, OR OPERATES ABNORMALLY (CONT).

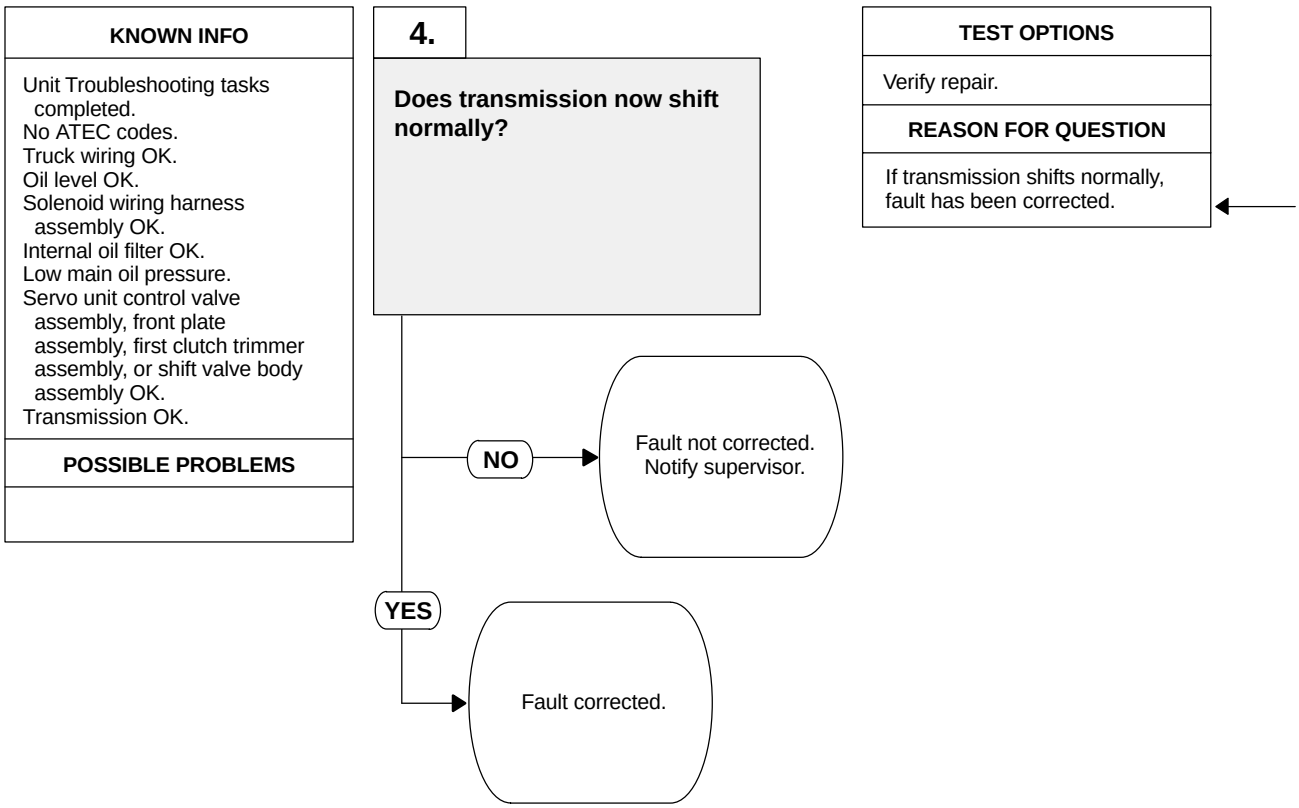


VISUAL INSPECTION

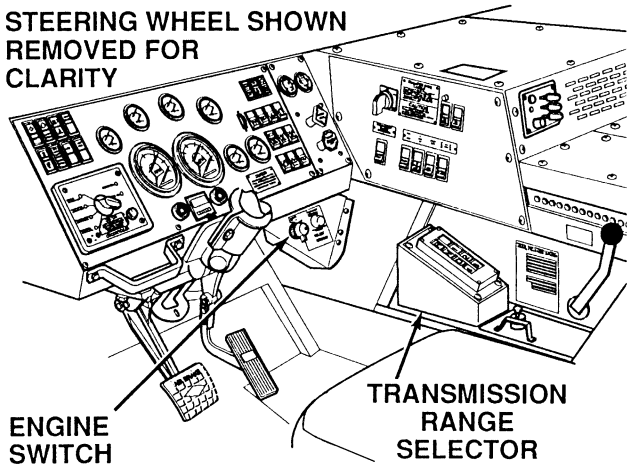
(1) Inspect servo unit control valve assembly for cracks or damage.
  (a) If servo unit control valve assembly is cracked or damaged, replace transmission (Para 3-4).
  (b) If servo unit control valve assembly is not cracked or damaged, go to Step (2) below.
(2) Inspect front plate assembly for cracks or damage.
  (a) If front plate assembly is cracked or damaged, replace transmission (Para 3-4).
  (b) If front plate assembly is not cracked or damaged, go to Step (3) below.
(3) Inspect first clutch trimmer assembly for cracks or damage.
  (a) If first clutch trimmer assembly is cracked or damaged, replace transmission (Para 3-4).
  (b) If first clutch trimmer assembly is not cracked or damaged, go to Step (4) below.
(4) Inspect shift valve body for cracks or damage.
  (a) If shift valve body is cracked or damaged, replace transmission (Para 3-4).
  (b) If shift valve body assembly is not cracked or damaged, go to Step (5) below.
(5) Check screws of all valve assemblies for proper torque.
  (a) Tighten all screws attaching valve assemblies 96 to 144 lb-in (10.8 to 16.3 N·m), perform Steps (6) and (7) below and go to Step 4 of this Fault.
  (b) If screws of valve assemblies are OK, replace transmission (Para 3-4).
(6) Install transmission internal oil filter (Para 7-4).
(7) Add transmission oil as necessary (TM 9-2320-364-20).



8. TRANSMISSION WILL NOT SHIFT INTO GEAR, SHIFTS OUT OF GEAR, DOES NOT RESPOND TO RANGE SELECTION, OR OPERATES ABNORMALLY (CONT).



VERIFY REPAIR
Operate truck (TM 9-2320-364-10). (1) If truck does not shift into gear, shifts out of gear, does not respond to range selection, or otherwise operates abnormally, fault not corrected. Notify supervisor. (2) If truck operates normally, fault has been corrected.



2-11. TRANSMISSION SYSTEM TROUBLESHOOTING (CONT).

9. ENGINE STALLS WHEN TRANSMISSION IS SHIFTED INTO GEAR.

INITIAL SETUP

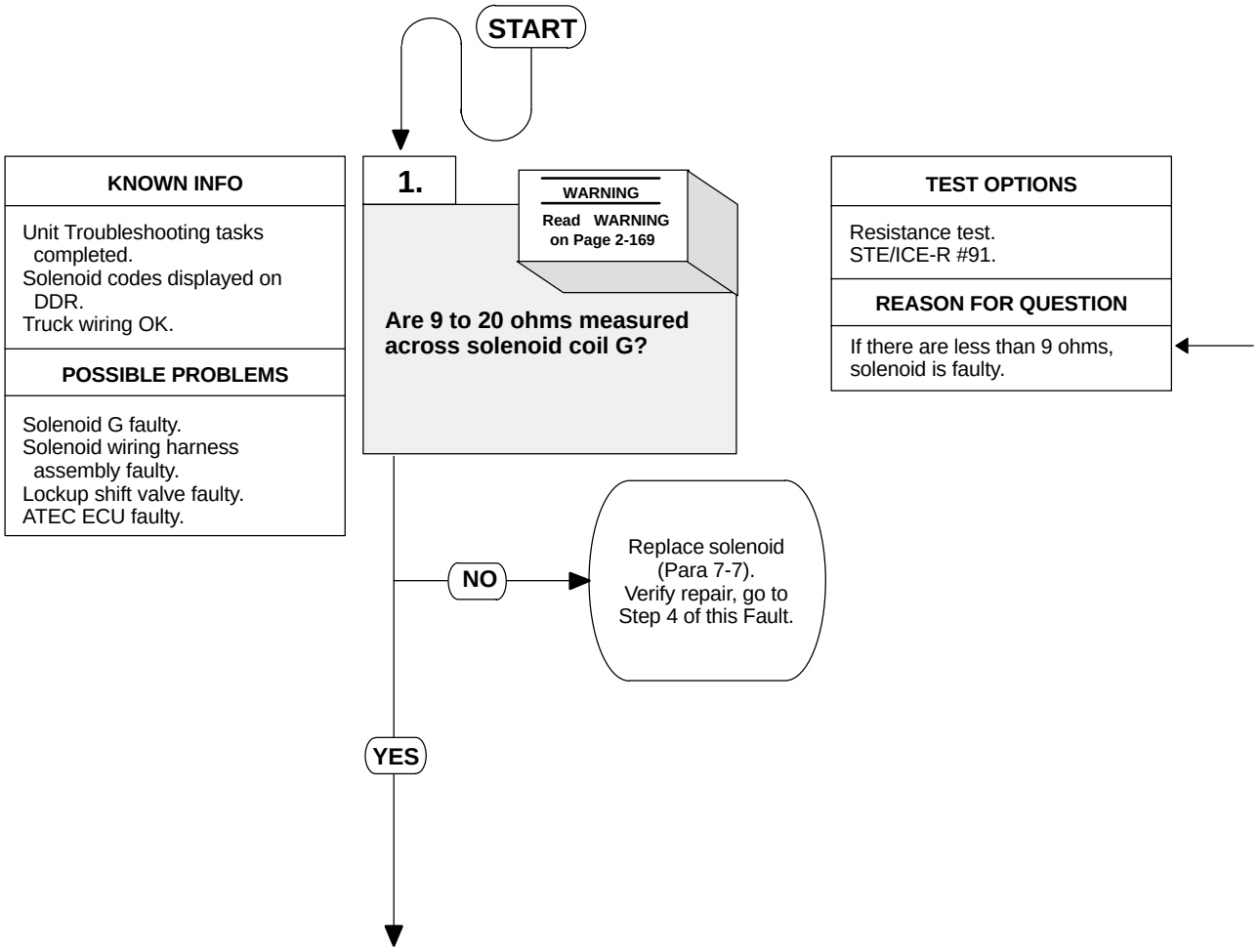
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Analyzer Set, STE/ICE-R (Optional)
(Item 15, Appendix F)
Cartridge, ATEC (Item 28, Appendix F)
Harness, Breakout (Item 94, Appendix F)
Multimeter (Item 140, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Reader, Diagnostic (Item 180, Appendix F)
Wrench, Torque (0-60 N·m)
(Item 276, Appendix F)
Jumperwire

Materials/Parts
Sealing Compound (Item 53, Appendix B)

Personnel Required
Two

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Left rear fender skirt removed,
(TM 9-2320-364-20)
Transmission internal oil filter removed, (Para 7-4)



WARNING

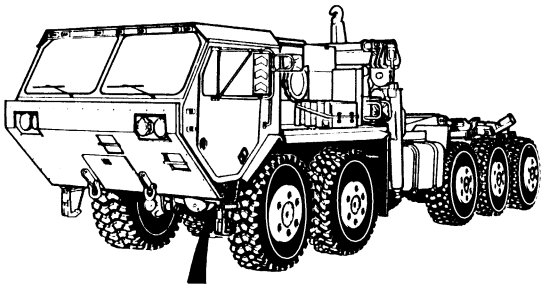
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

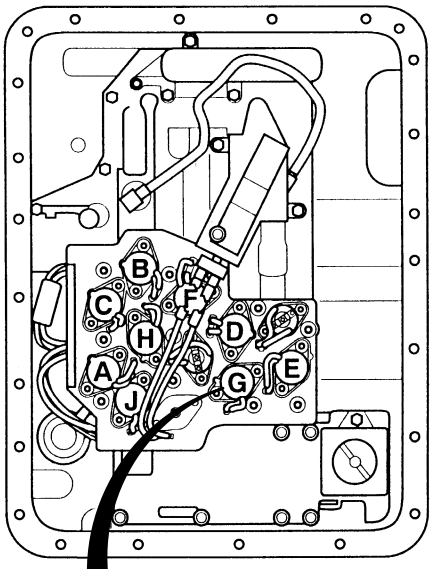
Table 2-10. Breakout Harness/Solenoid Wire Harness Assembly Test Points

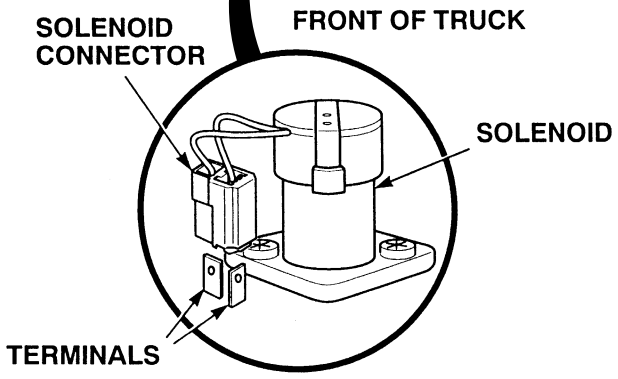
Solenoid (Code No.)	Breakout Harness/Solenoid Wire Harness Assembly Test Points	
	Output Wires Terminals	Input Wires Terminals
J	B	D
F	V	U
D	V	W
C	W	B
B	U	T
A	C	T
G	O	L
E	M	N
H	K	N

RESISTANCE TEST

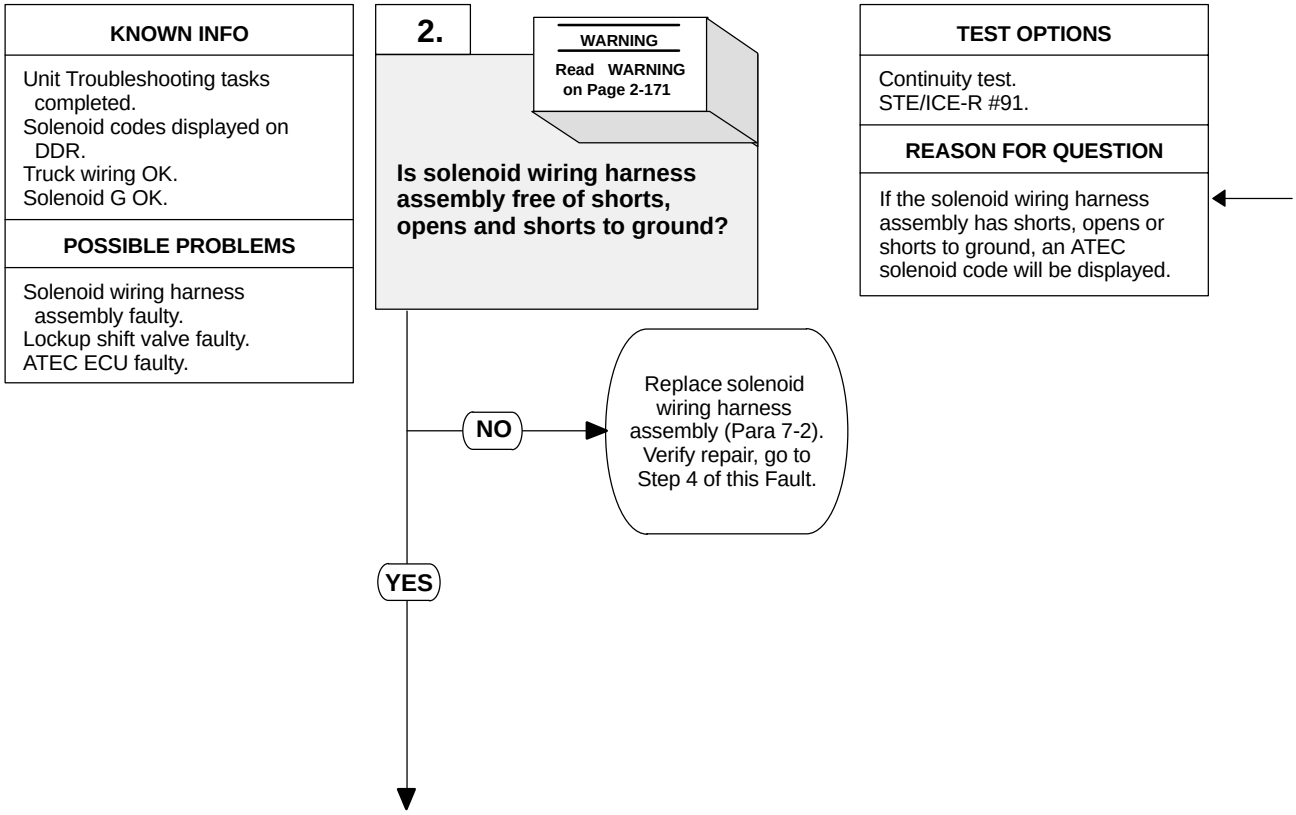
(1) Disconnect solenoid connector.
(2) Measure resistance between solenoid connector terminals (see Table 2-10.
  (a) If 9 to 20 ohms are not present, replace solenoid (Para 7-7).
  (b) If 9 to 20 ohms are present, solenoid is OK.







9. ENGINE STALLS WHEN TRANSMISSION IS SHIFTED INTO GEAR (CONT).



WARNING

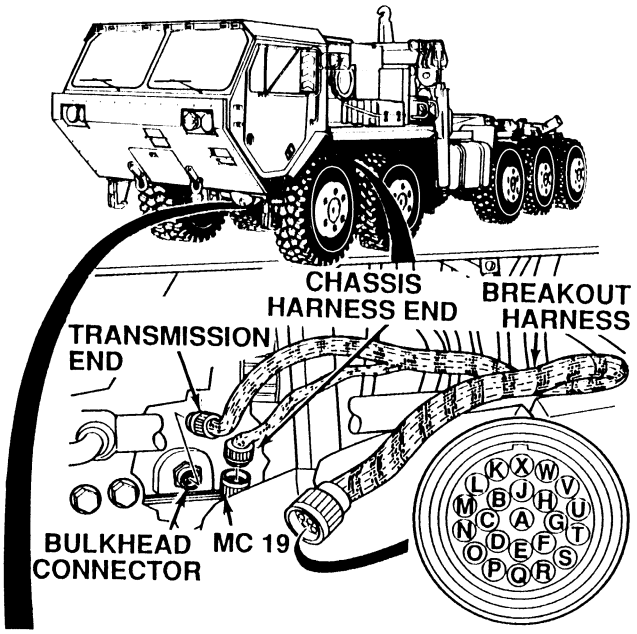
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

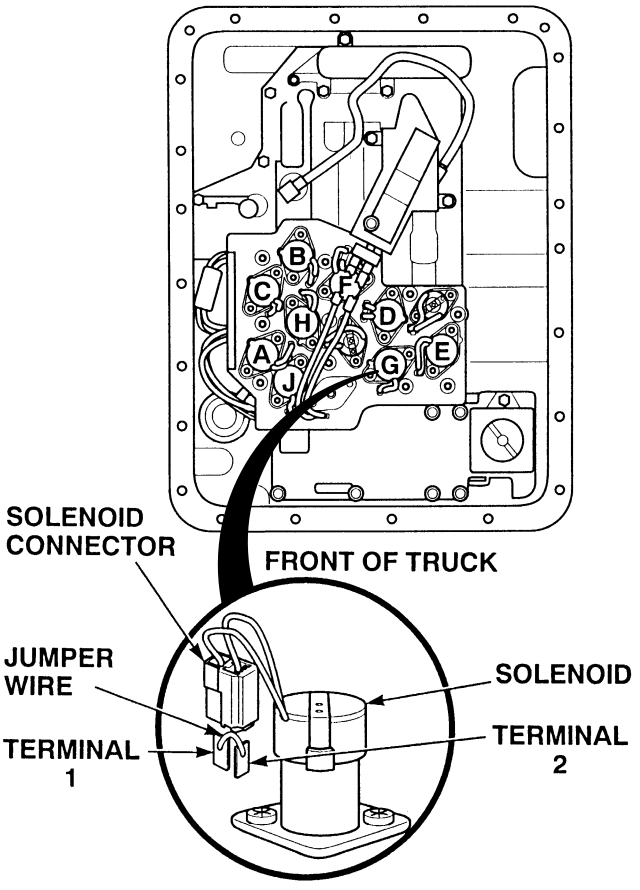
NOTE

Table 2-10 lists the breakout connector/solenoid power input and output terminals for each solenoid.

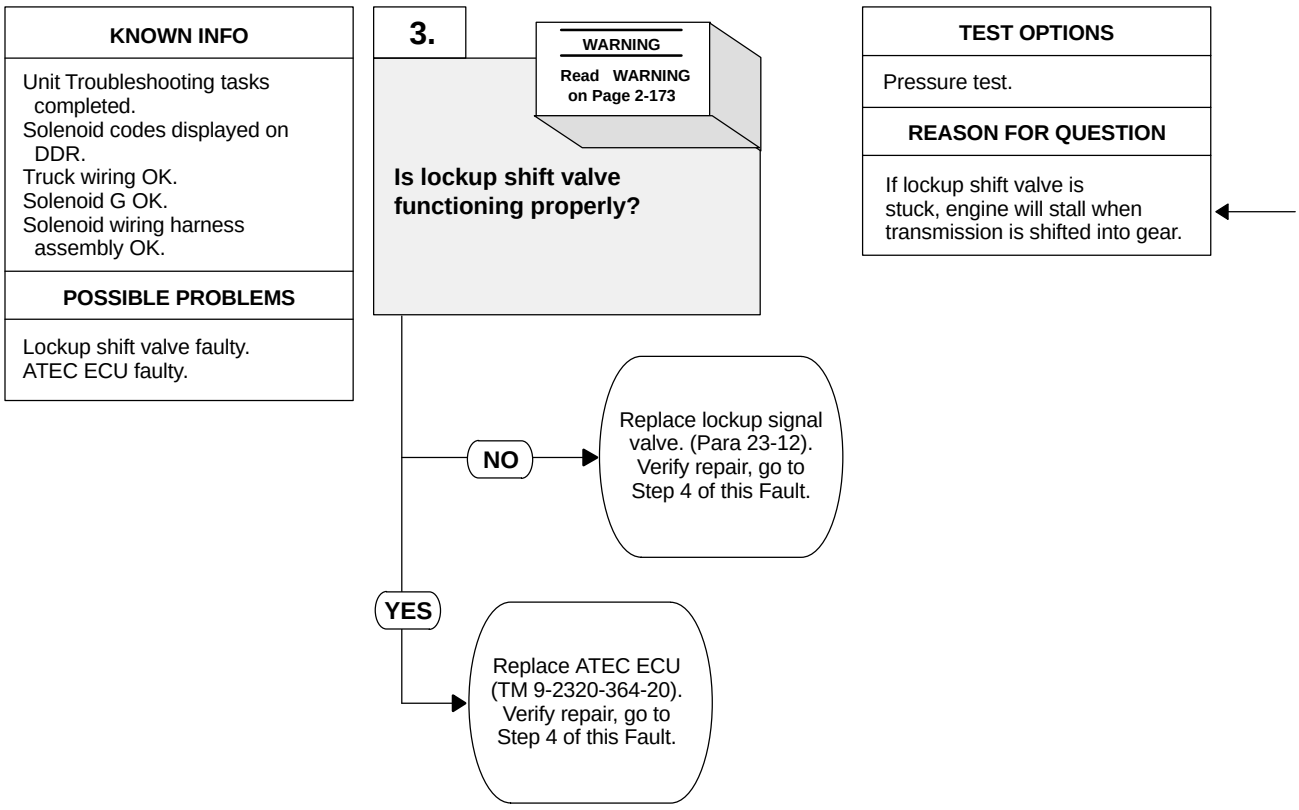
CONTINUITY TEST

(1) Disconnect connector MC19 from transmission bulkhead connector.
(2) Connect breakout harness connector to transmission bulkhead connector.
(3) Is there continuity between the breakout harness input terminal for the suspected faulty solenoid, and any other breakout harness terminal?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (4) below.
(4) Is there continuity between the breakout harness output terminal for the suspected faulty solenoid, and any other breakout harness terminal?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, go to Step (5) below.
(5) Connect a jumper wire between terminals 1 and 2 of suspected faulty solenoid.
(6) Is there continuity between the breakout harness input and output terminals of the suspected faulty solenoid?
  (a) If there is no continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is continuity, go to Step (7) below.
(7) Is there continuity between terminal 1 and a known good ground with jumper wire connected?
  (a) If there is continuity, replace solenoid wiring harness assembly (Para 7-2).
  (b) If there is no continuity, solenoid wiring harness assembly is OK.
(8) Remove jumper wire from terminals 1 and 2.
(9) Remove breakout harness.
(10) Connect connector MC19 to transmission bulkhead connector.
(11) Install internal oil filter (Para 7-4).





9. ENGINE STALLS WHEN TRANSMISSION IS SHIFTED INTO GEAR (CONT).



WARNING

- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

CAUTION

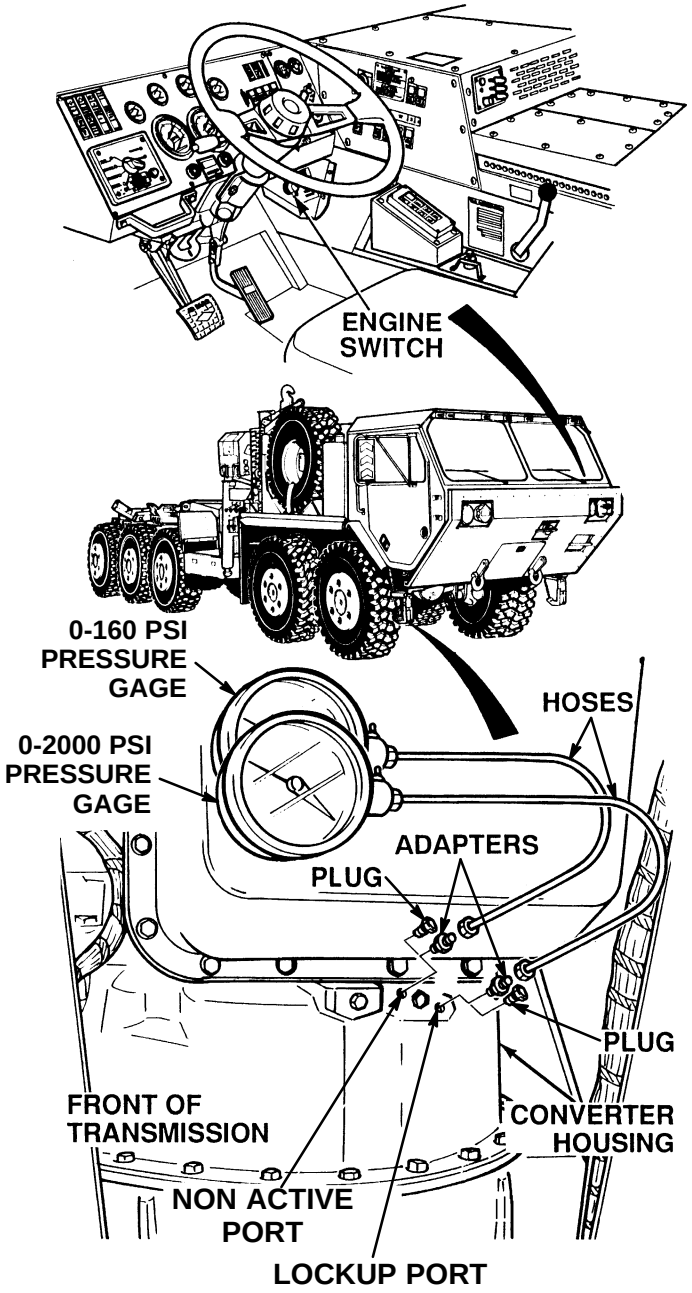
Due to limited work area, be prepared with suitable container to catch approximately one quart of oil when removing lube oil pressure port plug, or hose for pressure gage, from underside of torque converter housing, personnel can become wet with oil.

NOTE

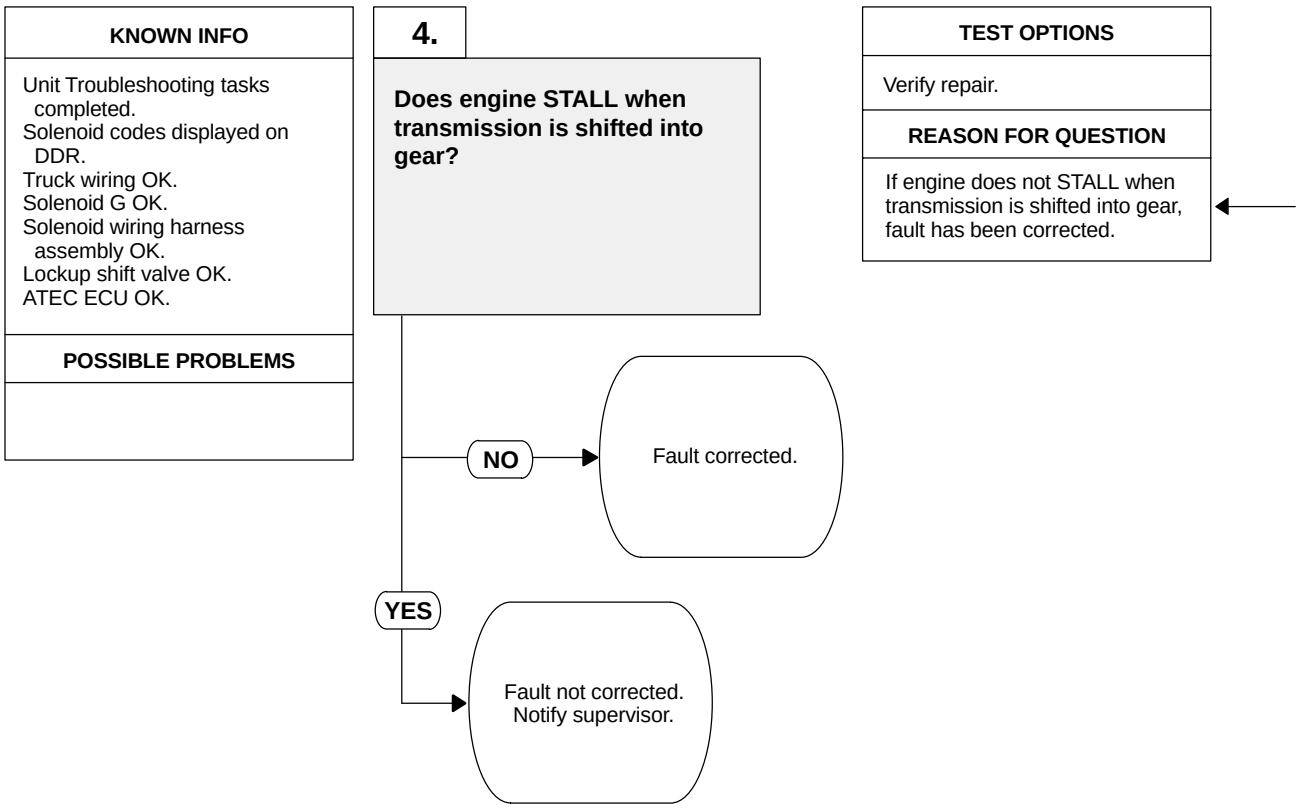
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) Remove plugs from “non active” and “lockup” ports of converter housing.
(2) Install 1/8 in. NPT adapters, from pressure test kit, in “nonactive” and “lockup” ports of converter housing.
(3) Install 5 ft. (1.5 m) hose from kit, on adapter in “non active” port and 0 to 160 psi (1,103 kPa) gage on hose. Extend hose out from under truck.
(4) Install 8 ft. (2.4 m) hose from kit on adapter in “lockup” port and 0 to 2000 psi (13,790 kPa) gage on hose. Extend gage out from under truck.
(5) Start engine (TM 9-2320-364-10) and allow to run at idle speed while assistant reads pressure gages.
(a) If pressure is between 150 to 160 psi (1,034 kPa to 1,103 kPa) on both gages, lockup shift valve is OK, replace ATEC ECU, (TM 9-2320-364-20).
(b) If pressure is between 150 to 160 psi (1,034 kPa to 1,103 kPa) on gage hooked up to ”lockup” port, and no pressure is shown on gage hooked up to “non active” port, replace lockup shift valve (Para 23-12).
(6) Turn OFF engine switch.
(7) Remove gages, hose, and adapters from “lockup” and “non active” ports of converter housing.
(8) Apply thread sealing compound and install plugs in lubrication ports of converter housing. Tighten plugs to 48 to 60 lb-in (5.4 to 6.8 N·m).

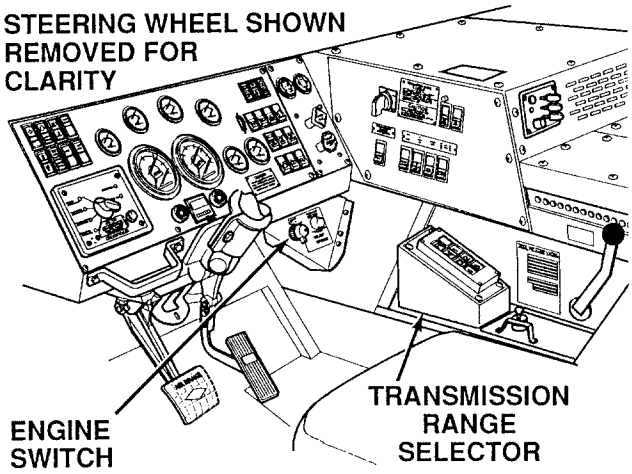


9. ENGINE STALLS WHEN TRANSMISSION IS SHIFTED INTO GEAR (CONT).



VERIFY REPAIR

(1) Operate truck (TM 9-2320-364-10).
   (a) If engine does not stall when transmission is shifted into gear, fault has been corrected.
   (b) If engine continues to stall when transmission is shifted into gear, fault not corrected. Notify supervisor.
(2) Install left rear fender skirt (TM 9-2320-364-20).



2-12. AIR SYSTEM TROUBLESHOOTING.

This paragraph covers Air System Troubleshooting. The Air System Fault Index, Table 2-11, lists faults for the air system of the PLS truck. Refer to schematic Figure 2-1 when performing tests and corrective actions.

Table 2-11. Air System Fault Index

Fault No.	Description	Page
1.	Air Pressure Buildup Is Slow	2-178
2.	Noisy Air Compressor Operation	2-184

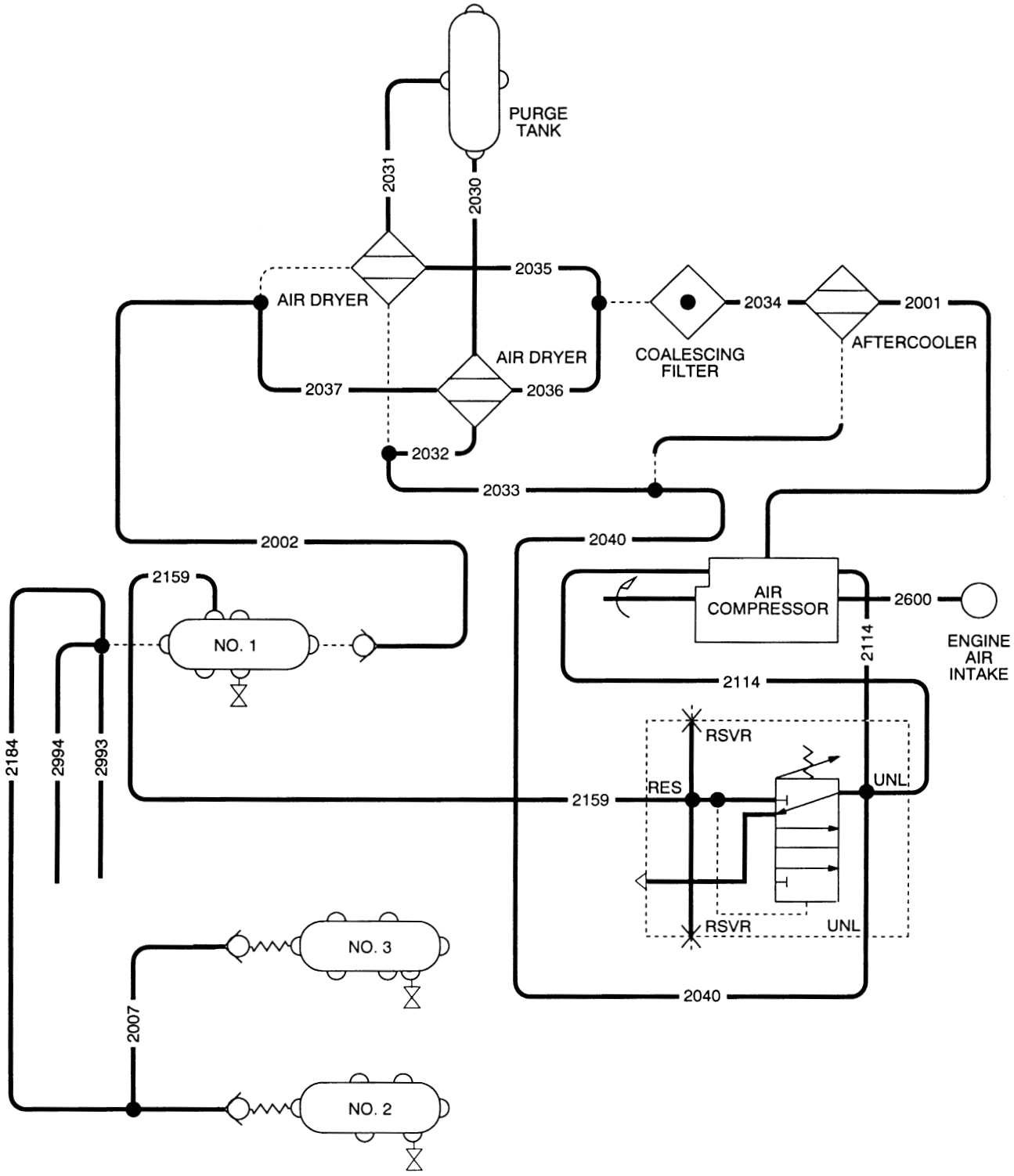


Figure 2-1. Air System Diagram.

2-12. AIR SYSTEM TROUBLESHOOTING (CONT).

1. AIR PRESSURE BUILDUP IS SLOW.

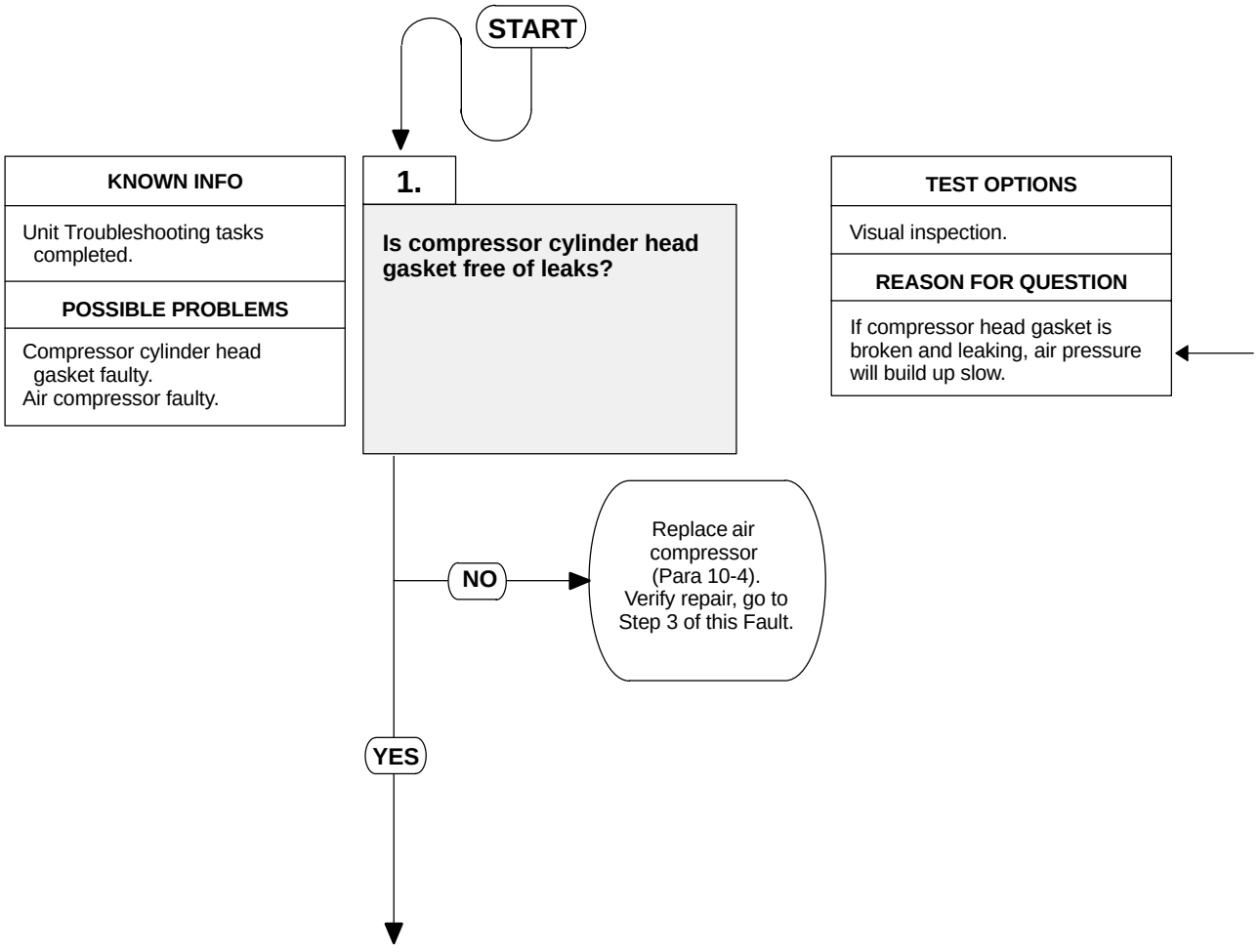
INITIAL SETUP

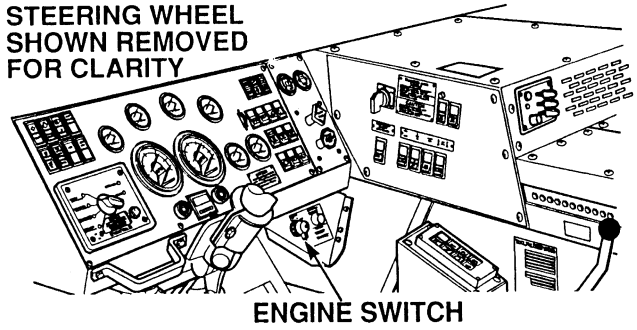
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench, Combination 1-1/2 in.
(Item 260, Appendix F)

Materials/Parts
Solution, Soap (Item 67, Appendix B)

References
TM 9-2320-364-20
TM 9-2320-364-10

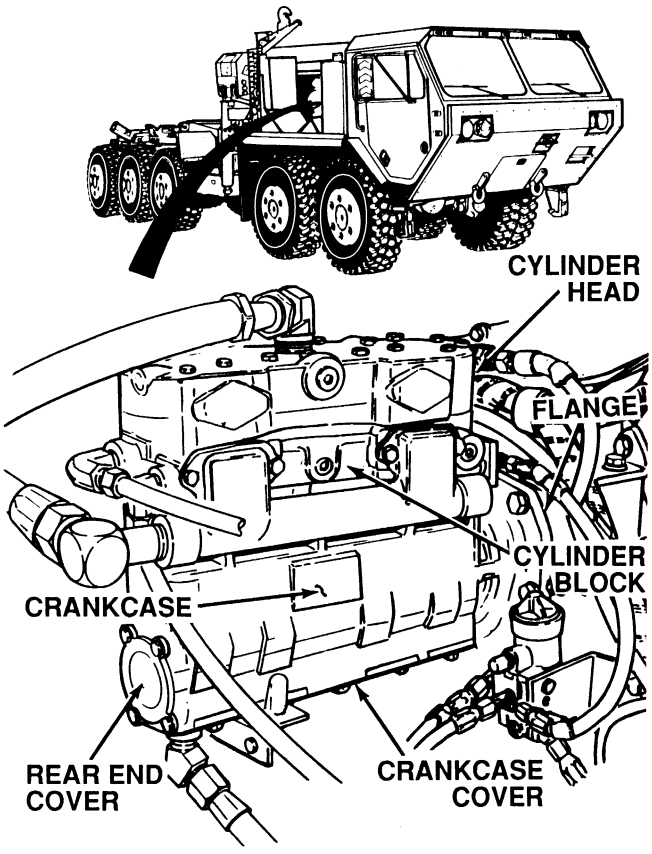
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brakes applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Right side noise panel removed,
(TM 9-2320-364-20)
Central Tire Inflation System (CTIS) turned off,
(TM 9-2320-364-10)



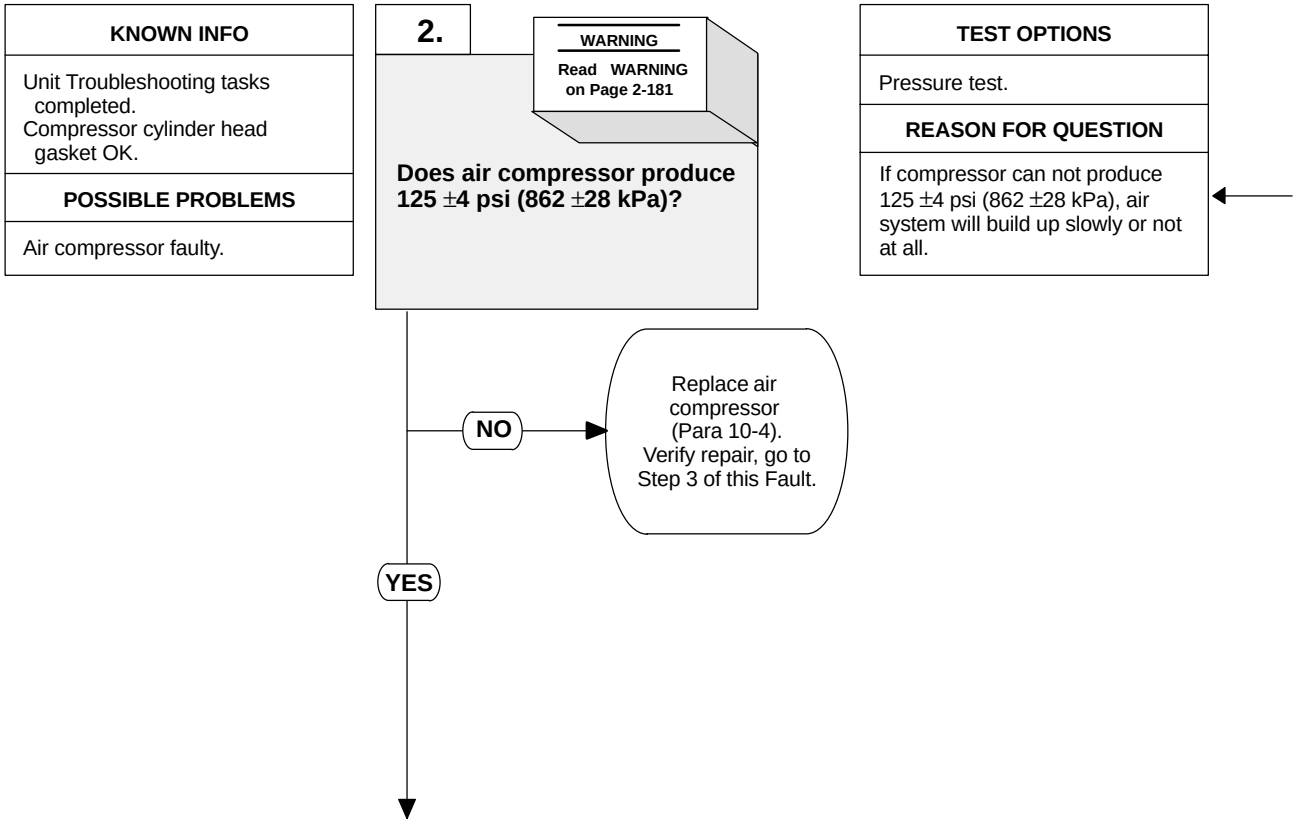


VISUAL INSPECTION

(1) Apply soap solution between cylinder head and cylinder block.
(2) Start engine (TM 9-2320-364-10).
(3) Inspect compressor for bubbles indicating visible leaks between cylinder head and cylinder block.
  (a) If compressor does leak, turn OFF ENGINE switch, and replace air compressor (Para 10-4).
  (b) If compressor does not leak, cylinder head gasket is OK.
(4) Turn OFF ENGINE switch.



1. AIR PRESSURE BUILDUP IS SLOW (CONT).



WARNING

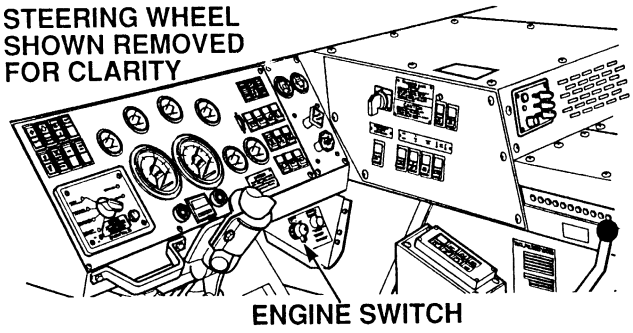
- During pressure tests, ensure air pressure is drained to 0 psi (0 kPa) before taking off air compressor line or taking off any cover plates. If pressure is not released, plates or line could blow off and harm personnel. Air tanks have greater than 30 psi (207 kPa) in them. Do not drain air tanks with any part of body in air spray path. Skin embolisms and/or debris in eyes can occur from released pressure.
- Allow engine to cool before performing troubleshooting maintenance. If necessary use insulated pads and gloves. Hot engine components will burn and cause injury to personnel.

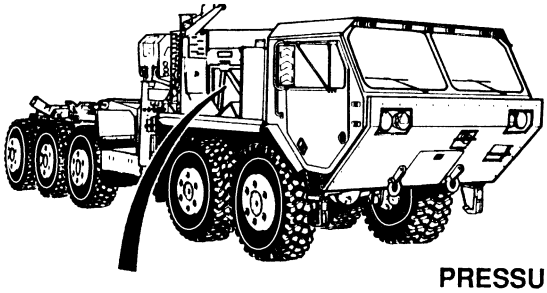
CAUTION

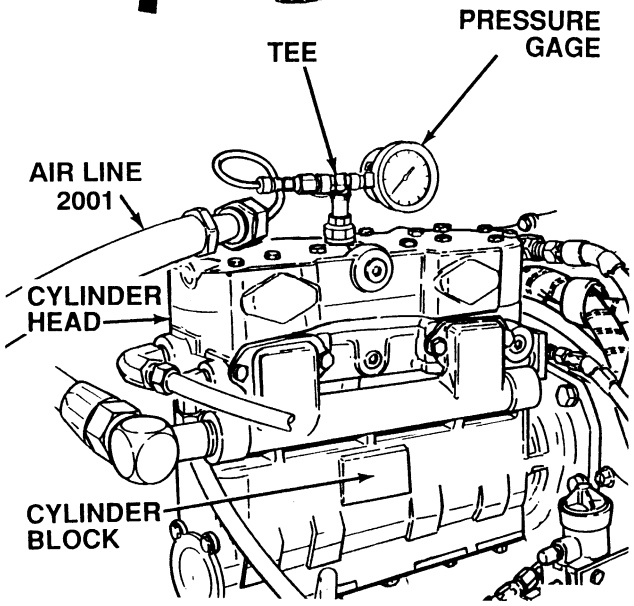
Be sure line and air gage are clear of fan, or damage to equipment could result.

PRESSURE TEST

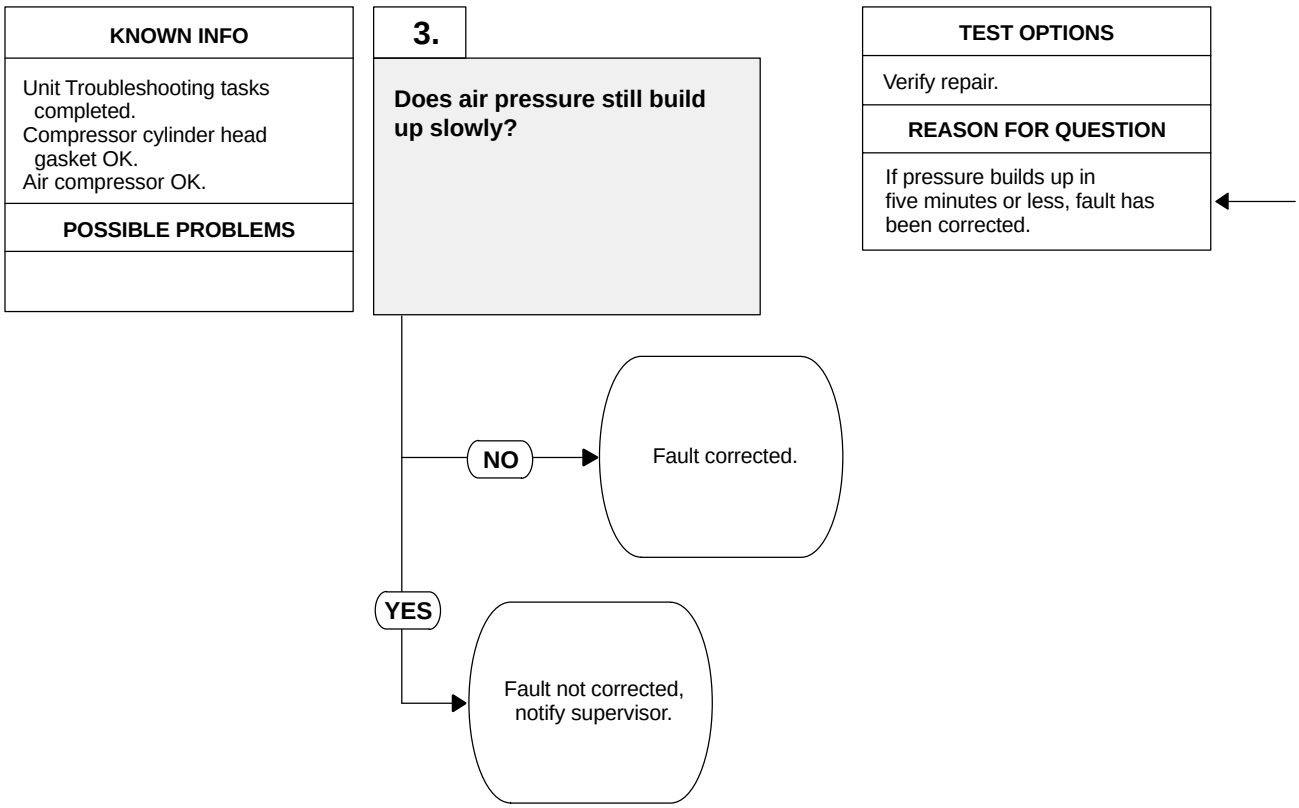
(1) Disconnect air line 2001 from elbow on compressor.
  (a) If there is oil dripping from line 2001, turn OFF ENGINE switch, and replace air compressor (Para 10-4).
  (b) If there is no oil dripping from line 2001, go to Step 2 below.
(2) Remove elbow from air compressor port and install tee in its place.
(3) Install air line 2001 and pressure gage on tee.
(4) Start engine and allow pressure to build up (TM 9-2320-364-10).
  (a) If 125 ±4 psi (862 ±28 kPa) are not measured, perform Steps (5) through (7) below, and replace air compressor (Para 10-4).
  (b) If 125 ±4 psi (862 ±28 kPa) are measured, air compressor is OK.
(5) Turn OFF ENGINE switch.
(6) Remove pressure gage, air line 2001, and tee from air compressor.
(7) Install elbow and connect air line 2001 to elbow.





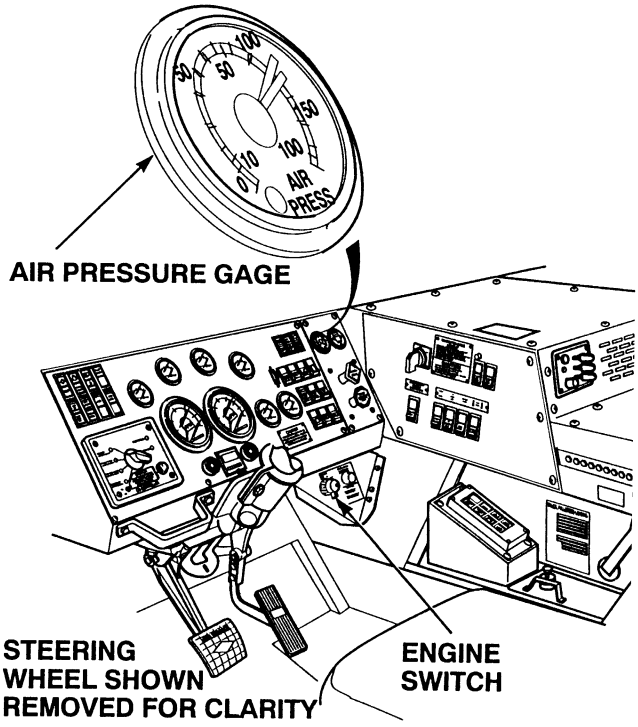


1. AIR PRESSURE BUILDUP IS SLOW (CONT).



VERIFY REPAIR

(1) Start engine and allow pressure to build up (TM 9-2320-364-10).
(2) Observe air pressure gage.
  (a) If air pressure does build up to 125 ±4 psi (862 ±28 kPa) in 5 minutes, fault has been corrected. Perform Step (3) below.
  (b) If air pressure does not build up to 125 ±4 psi (862 ±28 kPa) in 5 minutes, fault not corrected. Perform Step (3) below and notify supervisor.
(3) Install right side noise panel (TM 9-2320-364-20).



2-12. AIR SYSTEM TROUBLESHOOTING (CONT).

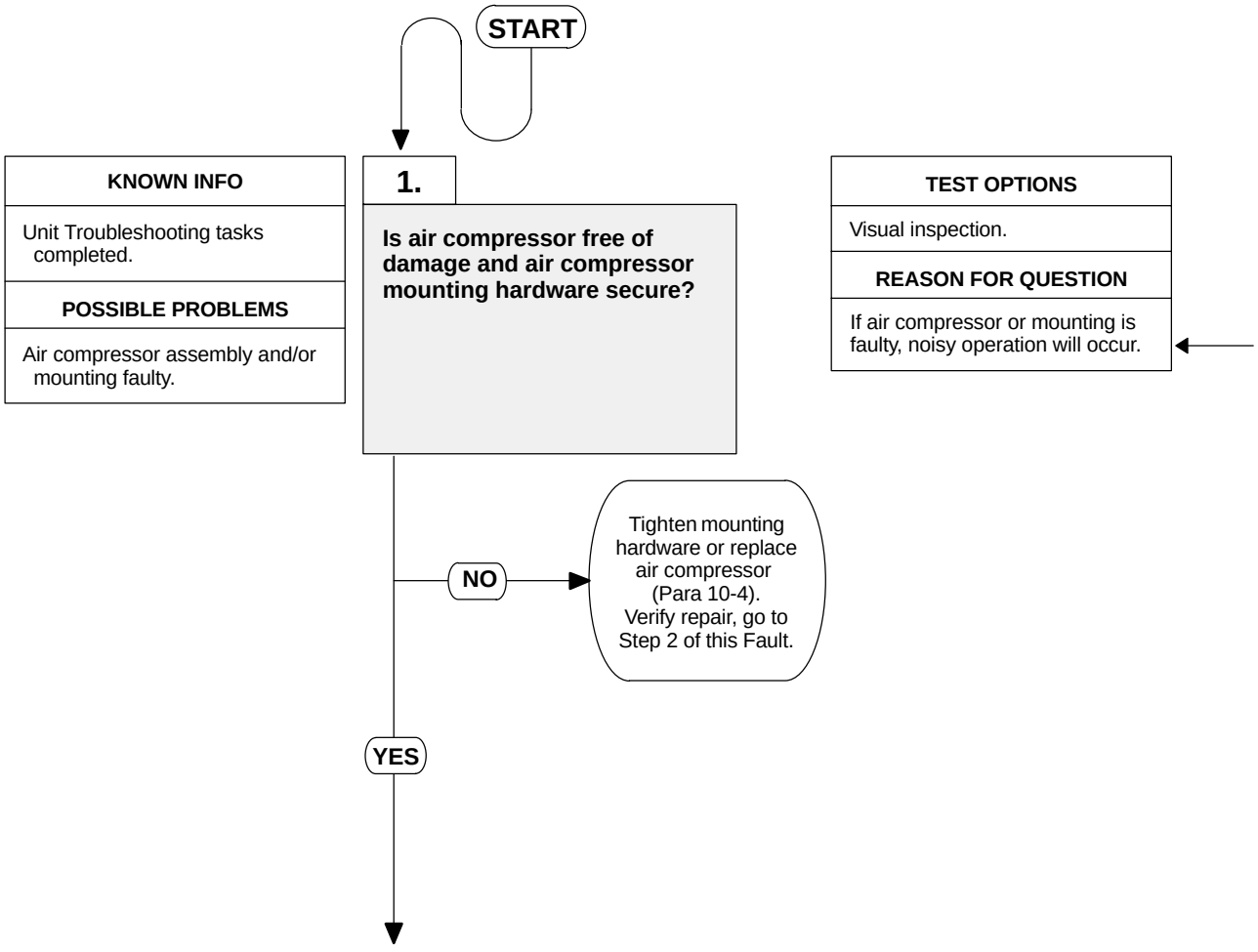
2. NOISY AIR COMPRESSOR OPERATION.

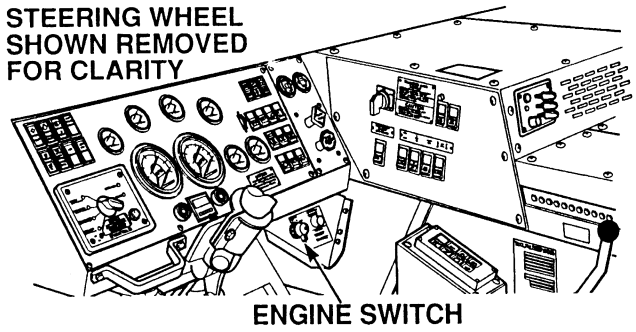
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)

References
TM 9-2320-364-20
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brakes applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Right side noise panel removed,
(TM 9-2320-364-20)



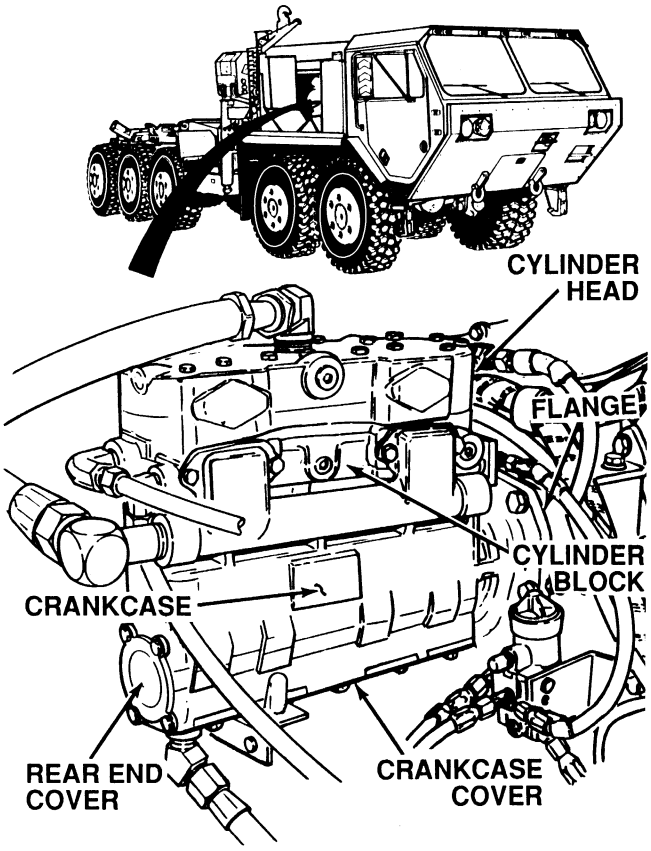


VISUAL INSPECTION

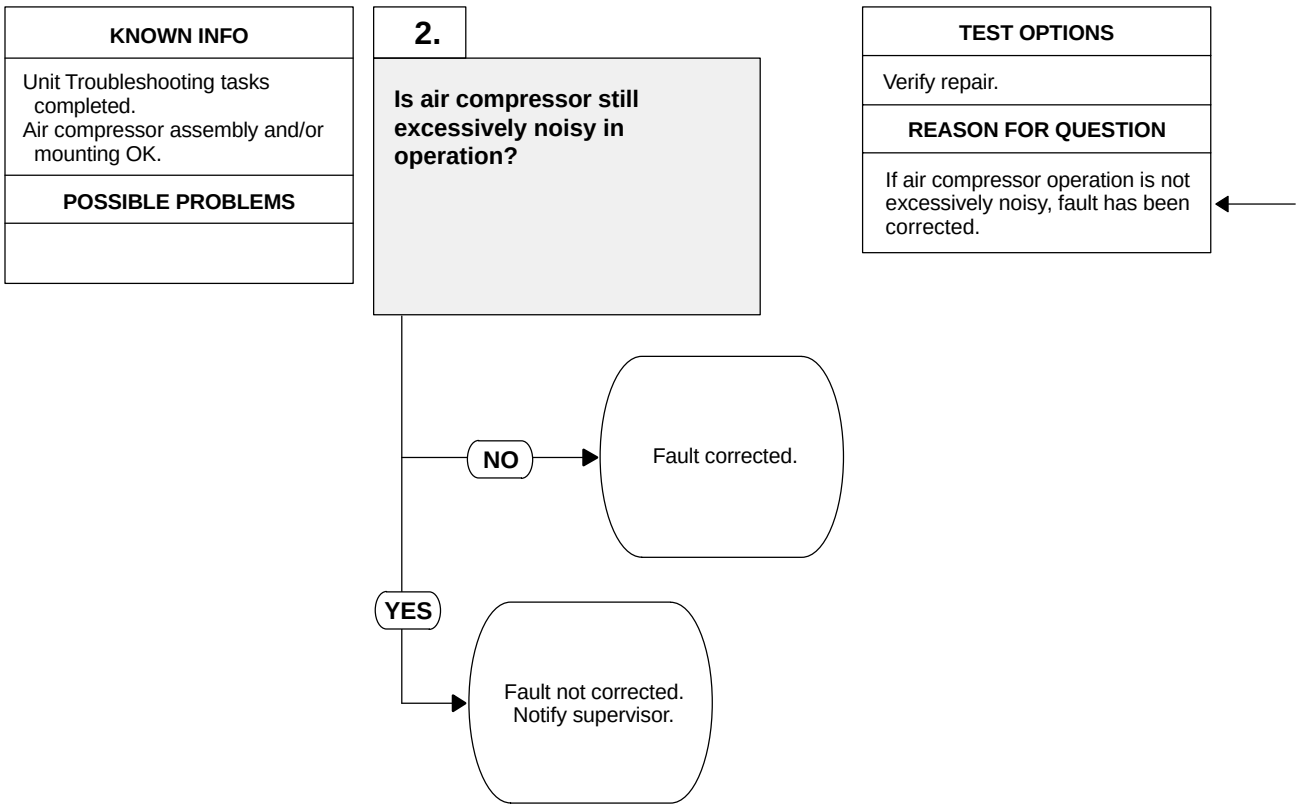
Check air compressor for damage and loose or damaged mounting hardware.

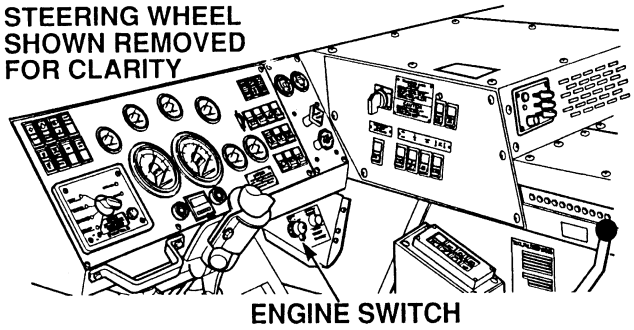
(1) If compressor is cracked, leaking, or mounting hardware loose or damaged, tighten or replace loose or damaged mounting hardware (Para 10-4).

(2) If compressor is securely mounted and is not damaged, compressor is OK.



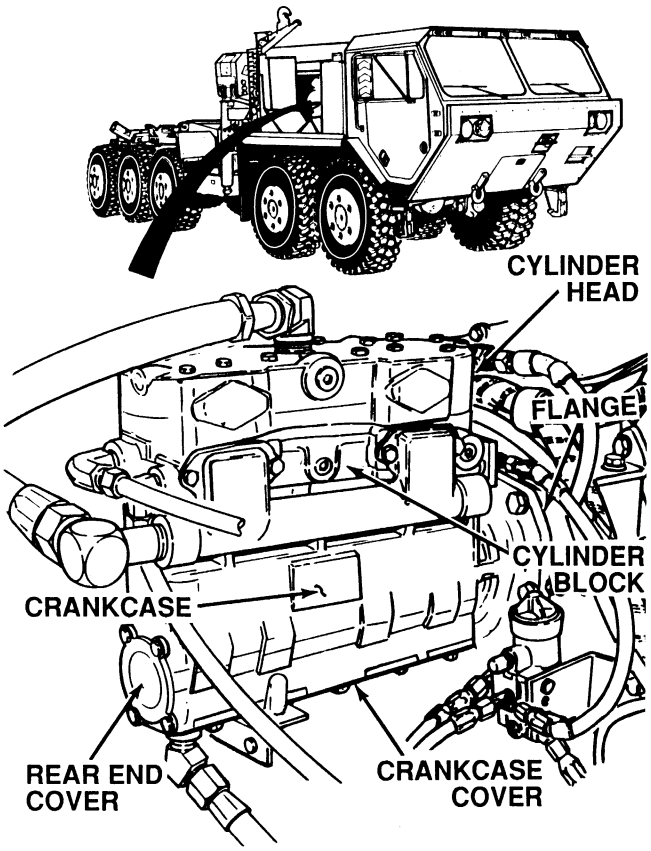
2. NOISY AIR COMPRESSOR OPERATION (CONT).





VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Listen for excessive noise from air compressor.
    (a) If compressor operation is not excessively noisy, fault has been corrected. Perform Steps (3) and (4) below.
    (b) If compressor operation is still excessively noisy, fault not corrected. Perform Steps (3) and (4) below and notify supervisor.
(3) Turn OFF ENGINE switch.
(4) Install right side noise panel (TM 9-2320-364-20).



2-13. HYDRAULIC SYSTEM TROUBLESHOOTING.

This paragraph covers Hydraulic System Troubleshooting. The Hydraulic System Fault Index, Table 2-12, lists faults for the hydraulic system of the PLS truck. Refer to schematic Figures 2-2 and 2-3 when performing tests and corrective actions.

Table 2-12. Hydraulic System Fault Index

Fault No.	Description	Page
1.	Crane And Winch Operate Slowly	2-192
2.	Fan, LHS, Winch And Crane Do Not Operate Or Operate Slowly	2-196
3.	LHS, Winch And Crane Operate Slowly	2-202
4.	Fan Does Not Operate	2-206
5.	Fan Speed Does Not Decrease From High To Low Speed	2-214
6.	Fan Does Not Operate At High Speed	2-224
7.	Hydraulic System Operation Unusually Noisy	2-240

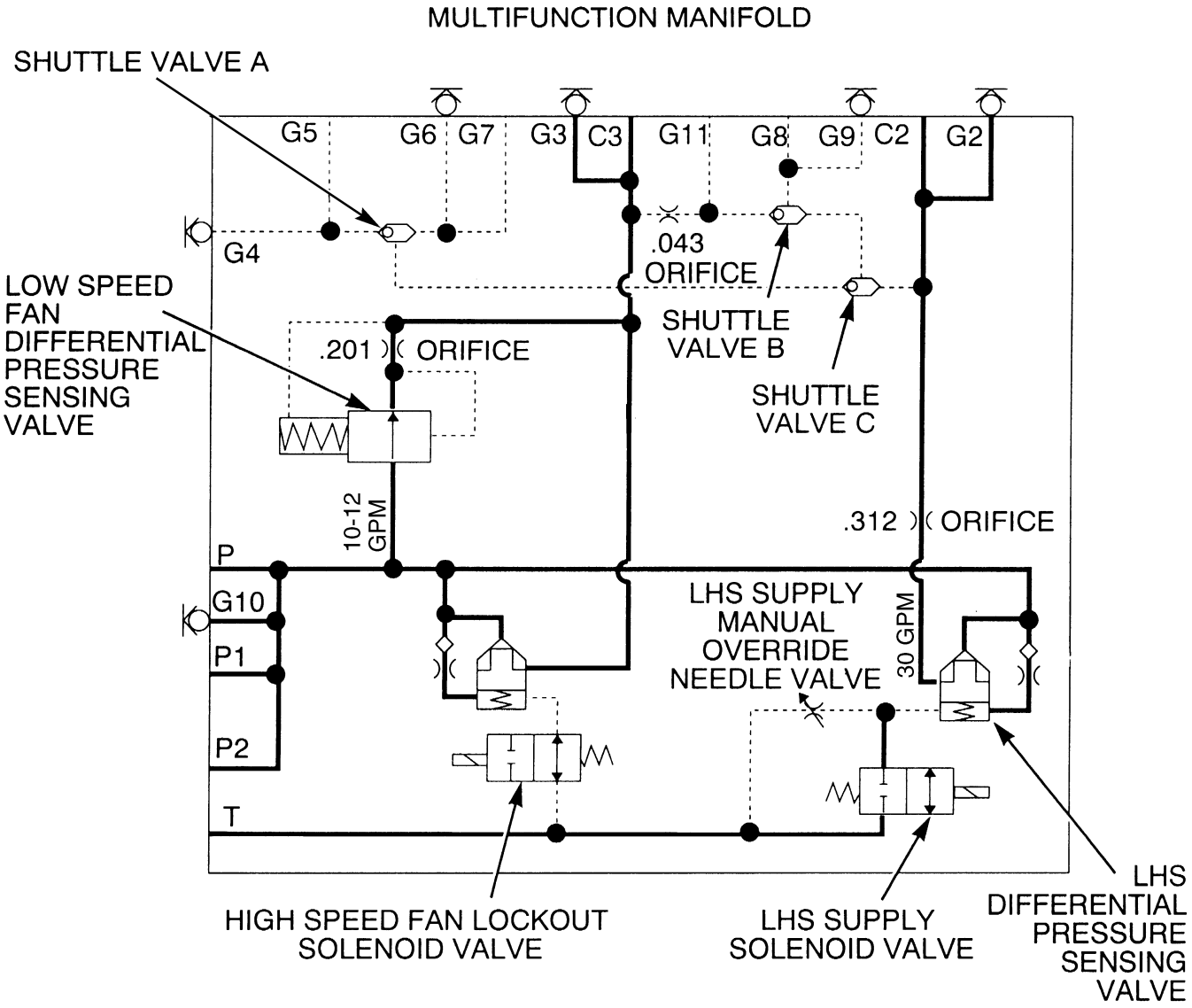


Figure 2-2. Multifunction Manifold Hydraulic Schematic

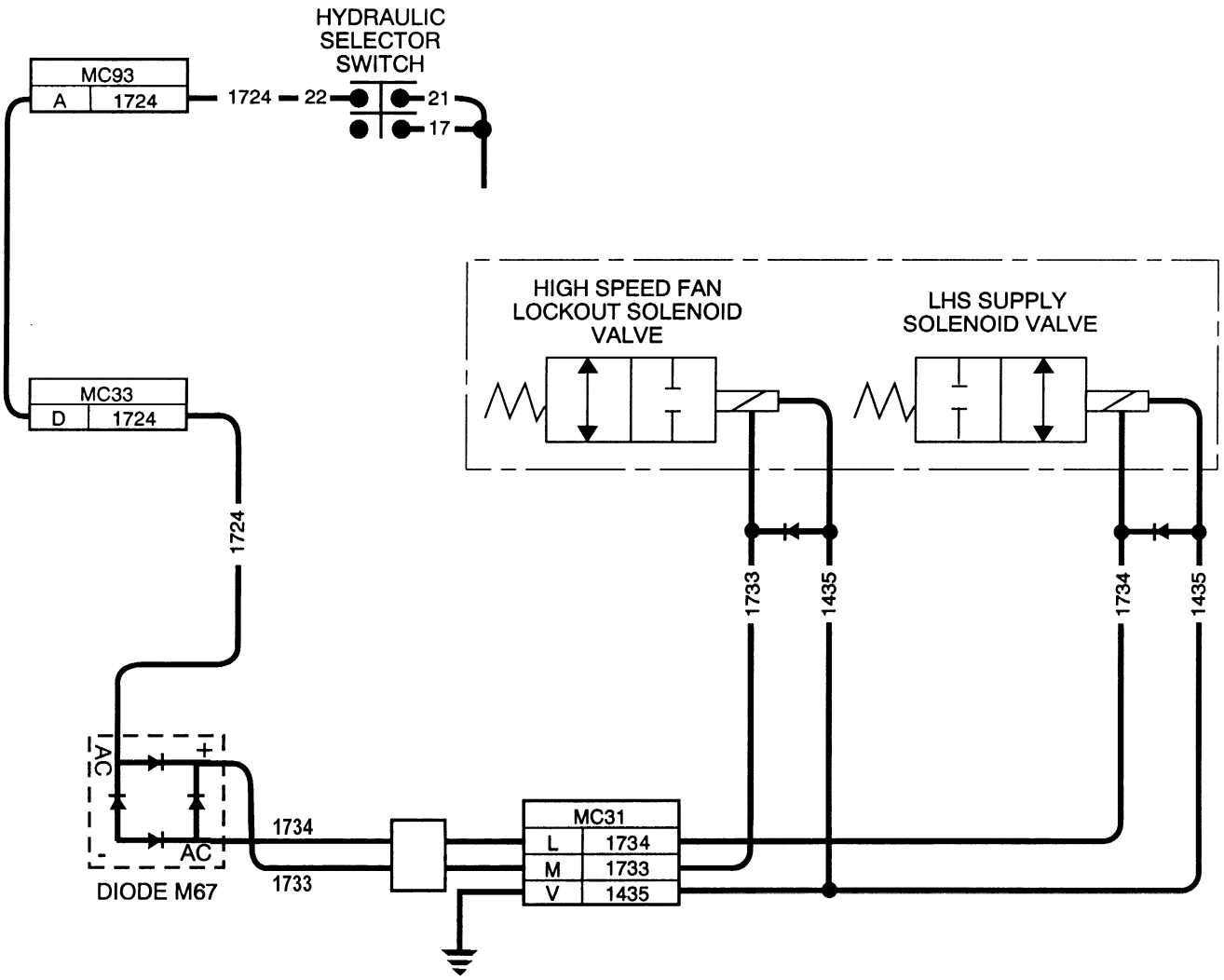


Figure 2-3. Multifunction Manifold Wiring Schematic

2-13. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

1. CRANE AND WINCH OPERATE SLOWLY.

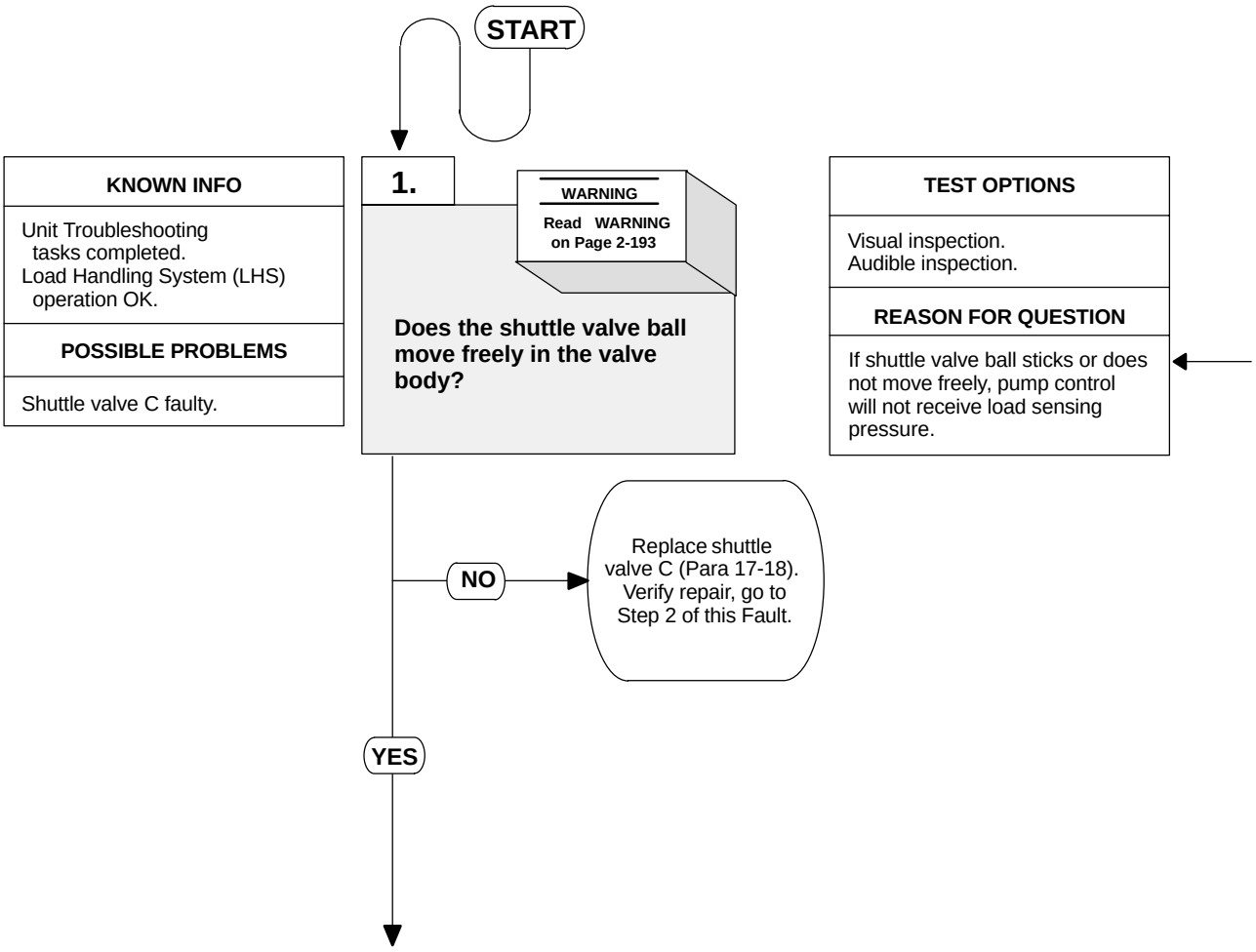
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Lockwashers (4) (Item 266, Appendix E)
Lockwashers (8) (Item 282, Appendix E)
Parts Kit, Seal (Item 410, Appendix E)

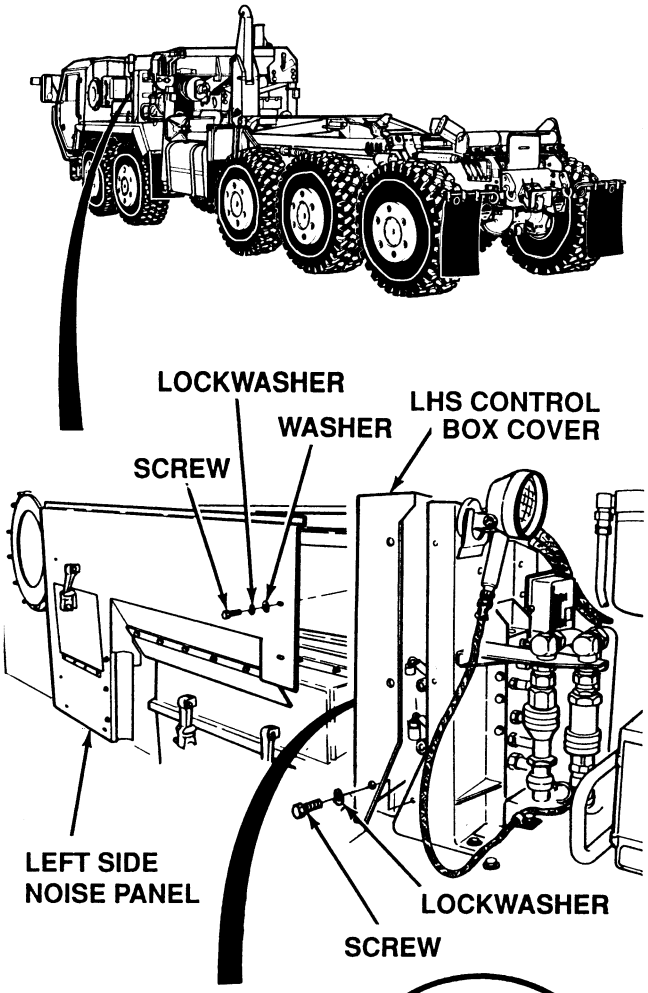
References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



WARNING

- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

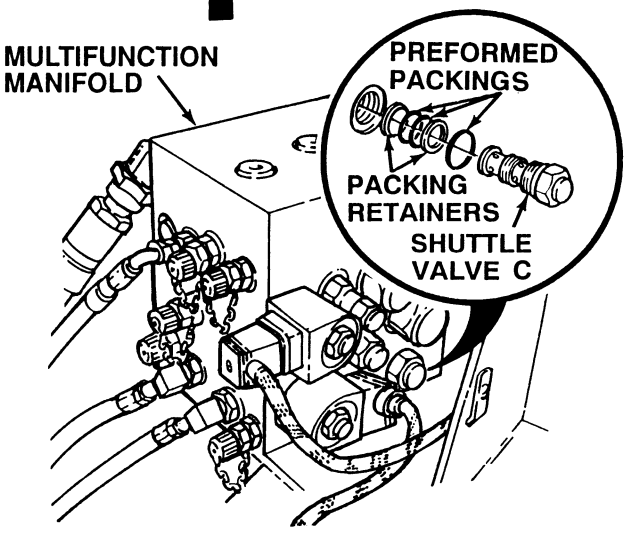


NOTE

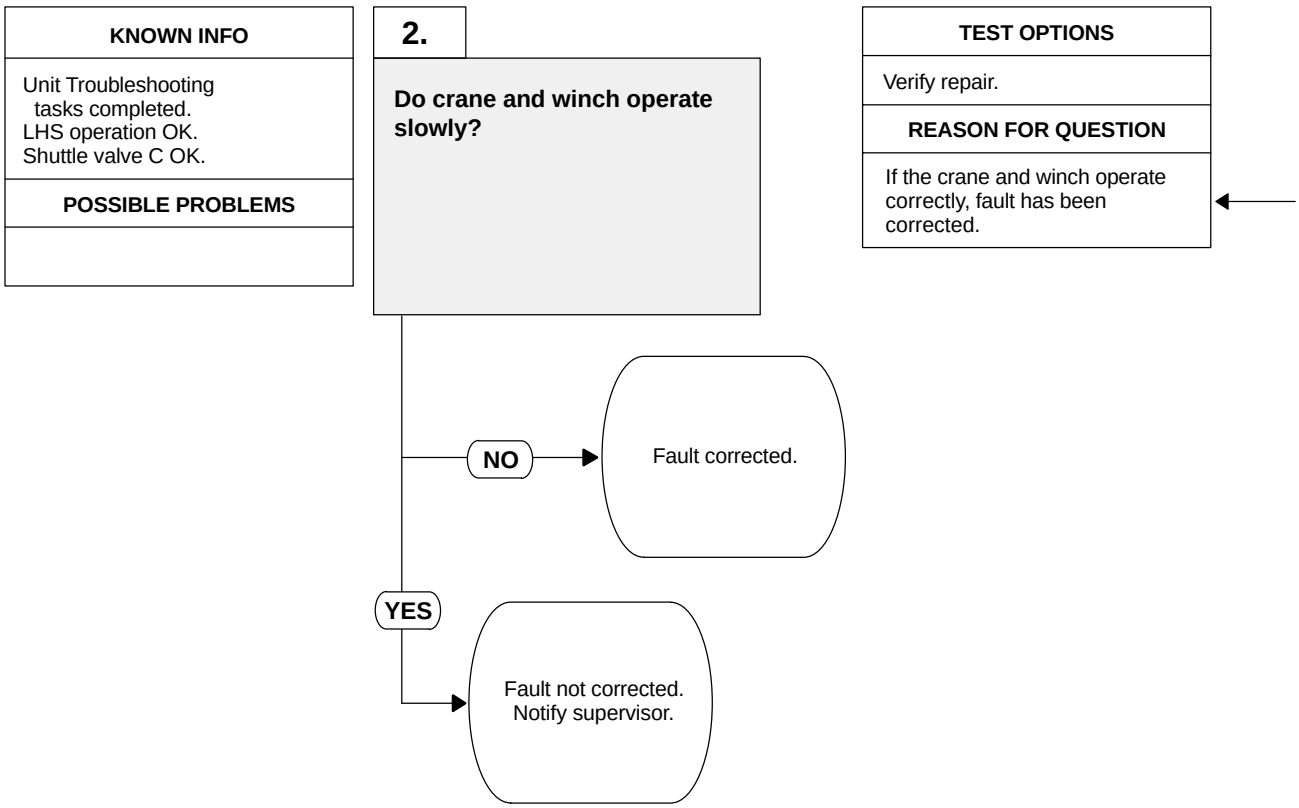
- Use drain pan to catch leaking hydraulic oil.
- Only remove center screw on engine side of LHS control box cover.

VISUAL/AUDIBLE INSPECTION

(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(3) Remove shuttle valve C from multifunction manifold.
(4) Remove and discard three preformed packings and two packing retainers.
(5) Shake valve and listen for ball to rattle.
  (a) If ball does not rattle, clean or replace shuttle valve C (Para 17-18).
  (b) If check ball rattles, shuttle valve is OK.
(6) Lubricate two preformed packings and packing retainers with hydraulic oil and install on shuttle valve.
(7) Install shuttle valve C.

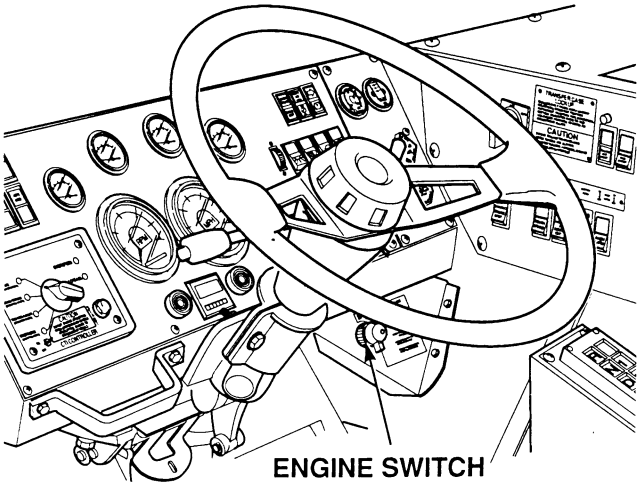


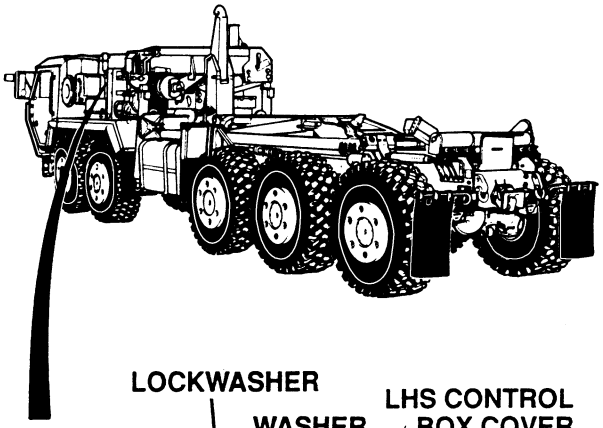
1. CRANE AND WINCH OPERATE SLOWLY (CONT).

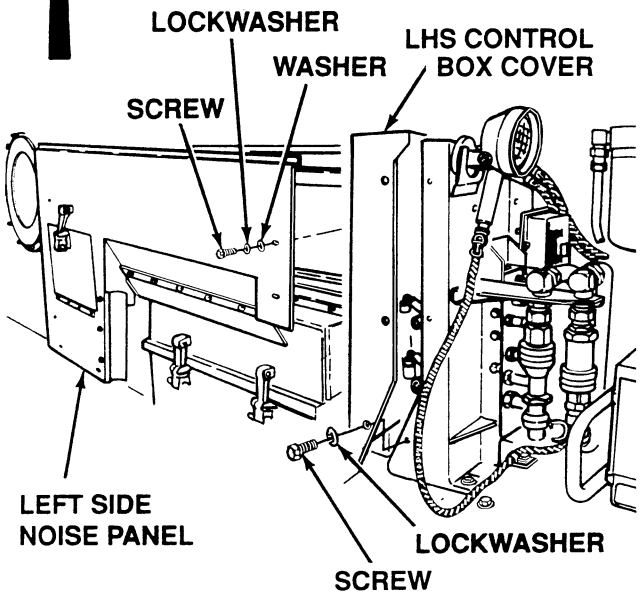


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Operate crane and winch.
  (a) If crane and winch operate correctly, fault has been corrected. Perform Steps (4) through (6) below.
  (b) If crane and winch still operate slowly, fault not corrected. Perform Steps (4) through (6) below and notify supervisor.
(4) Turn OFF ENGINE switch.
(5) Install LHS control box cover and four lockwashers and screws.
(6) Install left side noise panel and eight washers, lockwashers and screws.







2-13. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

2. FAN, LHS, WINCH AND CRANE DO NOT OPERATE OR OPERATE SLOWLY.

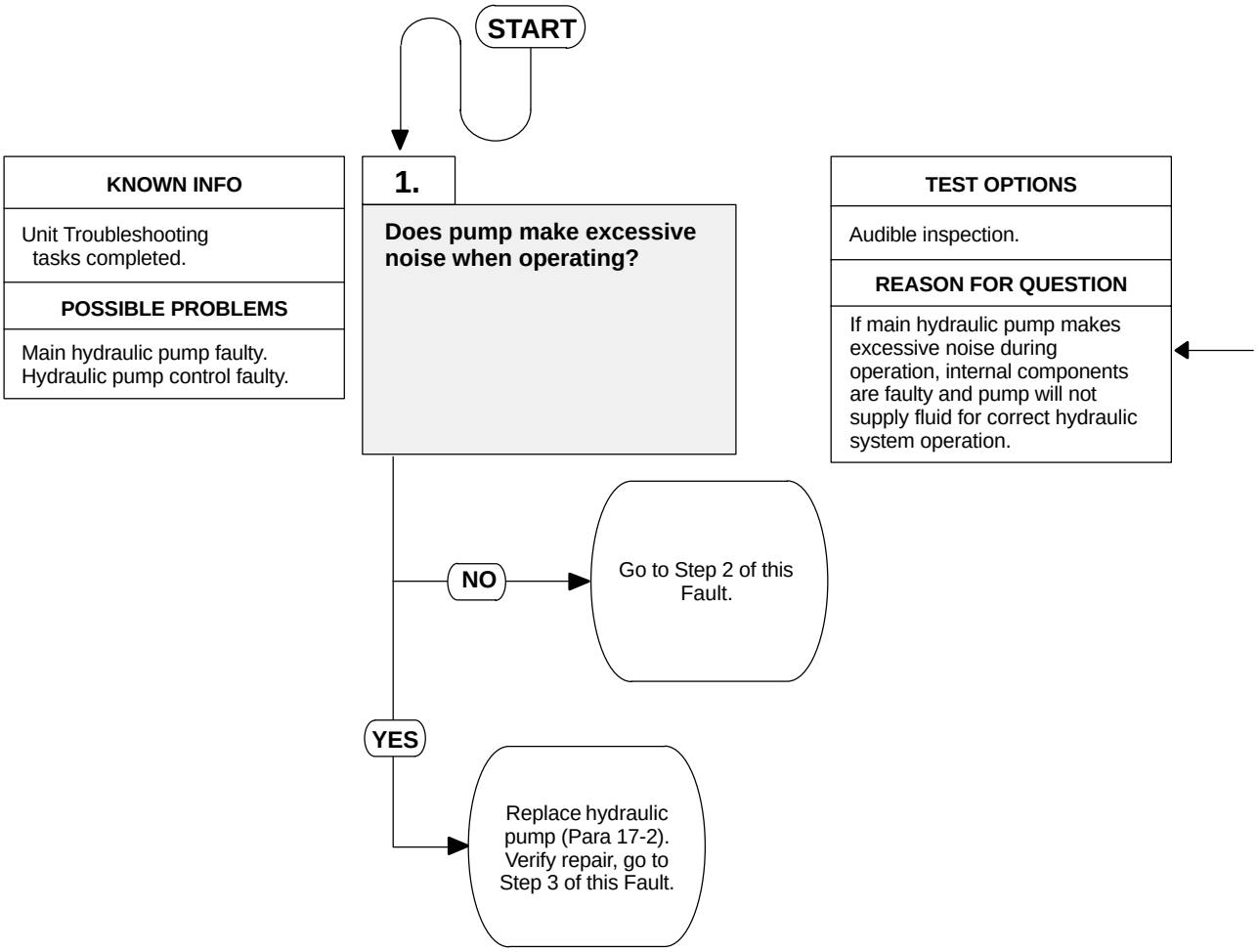
INITIAL SETUP

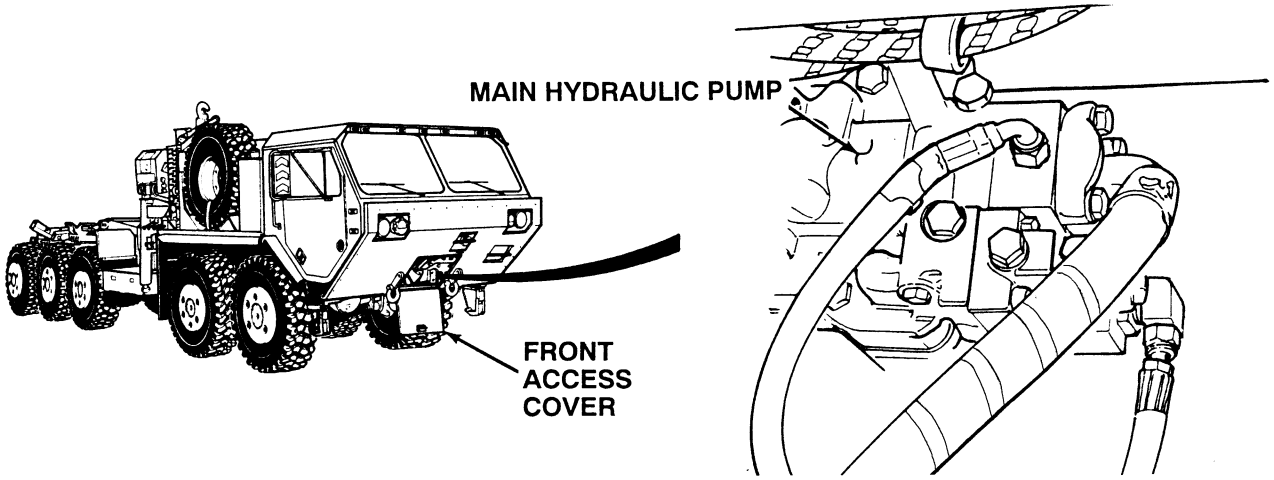
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)

References
TM 9-2320-364-10
TM 9-2320-364-20

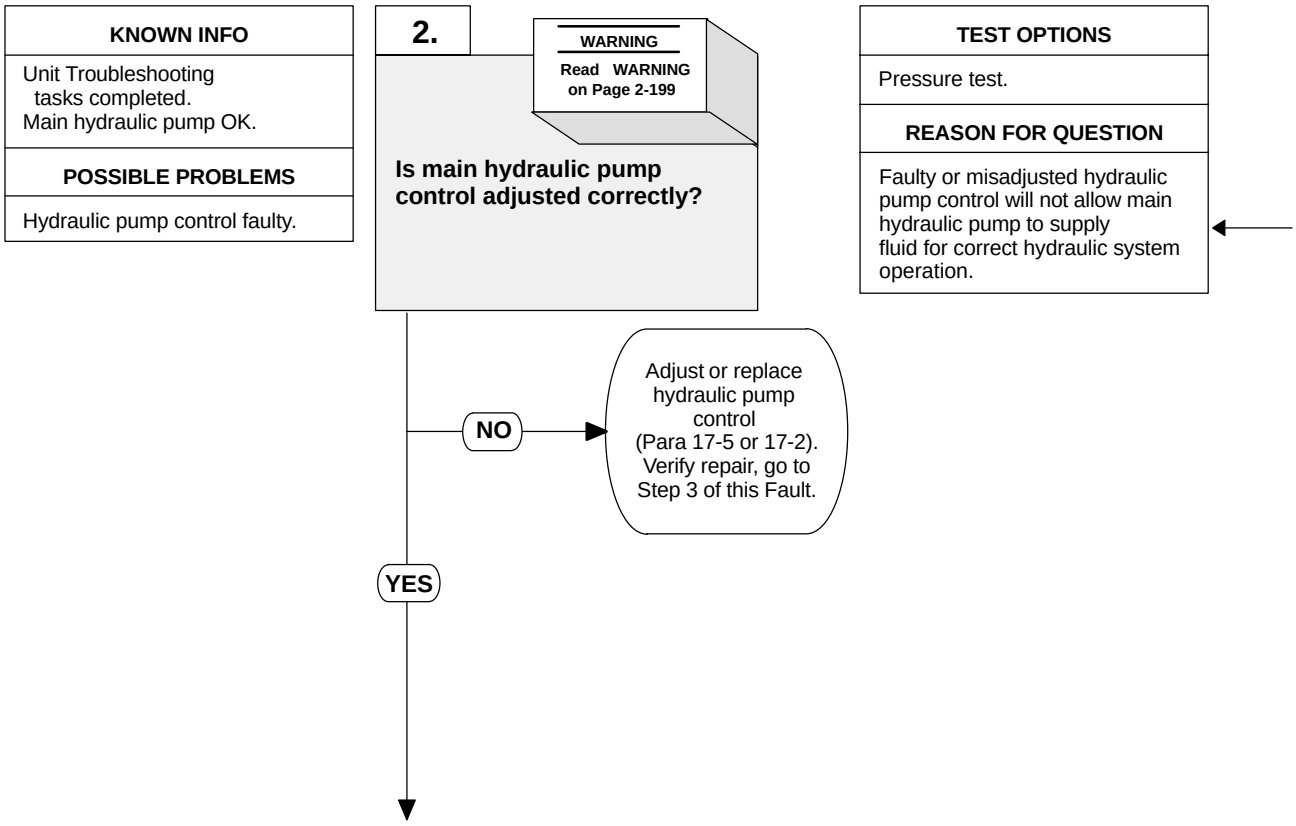
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)





AUDIBLE INSPECTION
(1) Start engine (TM 9-2320-364-10). (2) Open front access cover. (3) Listen to main hydraulic pump operation. (a) If pump does not rattle, turn OFF ENGINE switch and go to Step 2 of this Fault. (b) If pump rattles while operating, turn OFF ENGINE switch and replace main hydraulic pump (Para 17-2).

2. FAN, LHS, WINCH AND CRANE DO NOT OPERATE OR OPERATE SLOWLY (CONT).



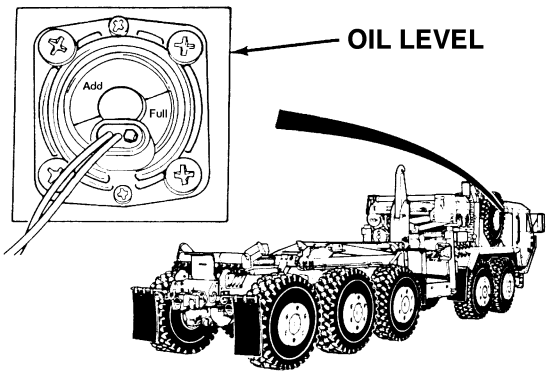
WARNING

- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

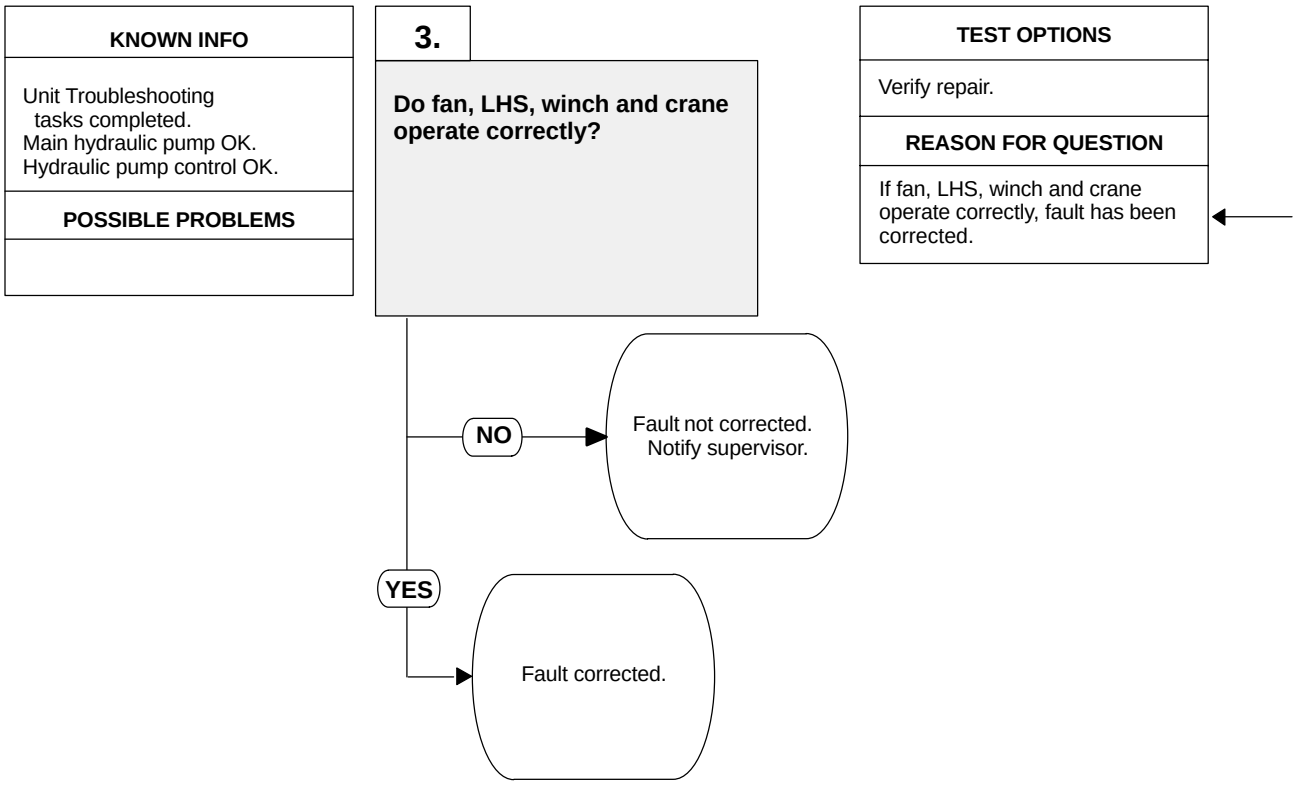
PRESSURE TEST

(1) Refer to Para 17-5 and check main hydraulic pump output pressure.
   (a) If 3,675 +75, –50 psi (25,339 +517, –345 kPa) are not present on flowmeter pressure gage when flow drops to 0 gpm (0 lpm), adjust or replace hydraulic pump control (Para 17-5).
   (b) If 3,675 +75, –50 psi (25,339 +517, –345 kPa) are present, hydraulic pump control is OK.

(2) Check main hydraulic reservoir oil level and add oil as necessary (TM-9-2320-364-20).

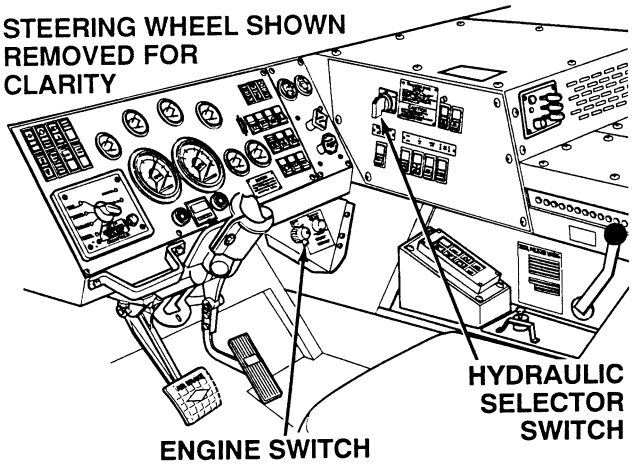


2. FAN, LHS, WINCH AND CRANE DO NOT OPERATE OR OPERATE SLOWLY (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Operate LHS, winch and crane and observe operation.
    (a) If systems above do not operate correctly, fault not corrected. Perform Steps (3) and (4) below and notify supervisor.
    (b) If systems above operate correctly, fault has been corrected.
(3) Turn OFF ENGINE switch.
(4) Turn hydraulic selector switch OFF.



2-13. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

3. LHS, WINCH AND CRANE OPERATE SLOWLY.

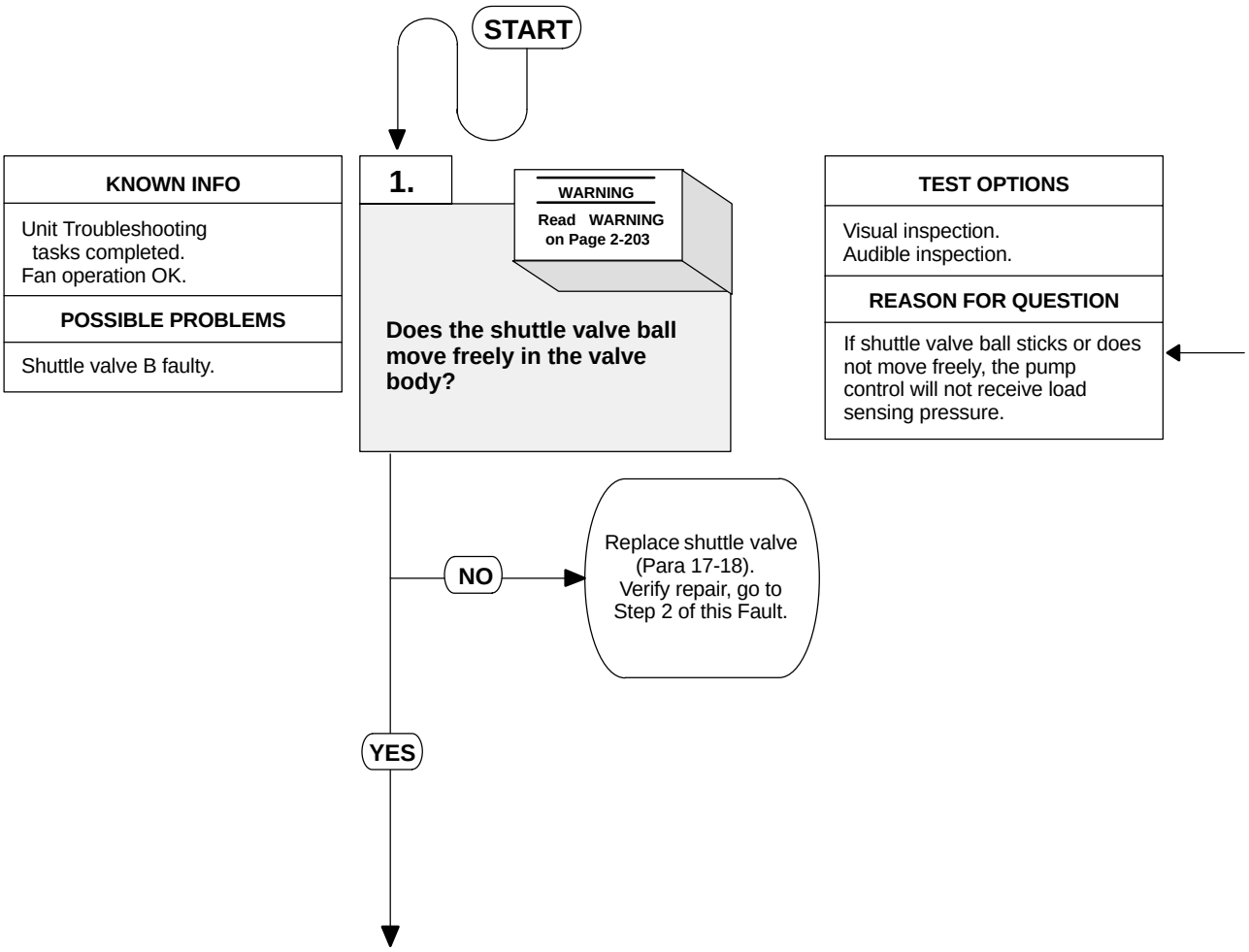
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Lockwashers (4) (Item 266, Appendix E)
Lockwashers (8) (Item 282, Appendix E)
Parts Kit, Seal (Item 411, Appendix E)

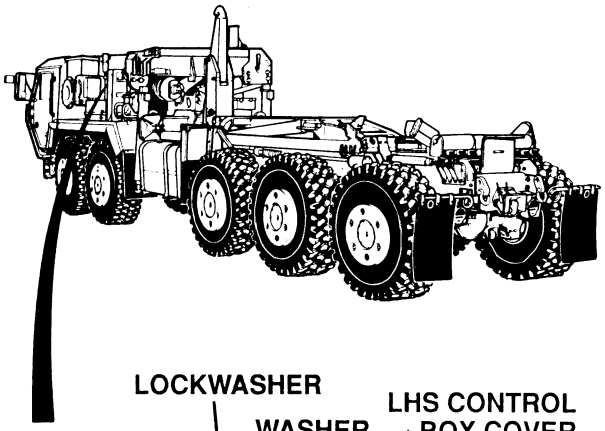
References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



WARNING

- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

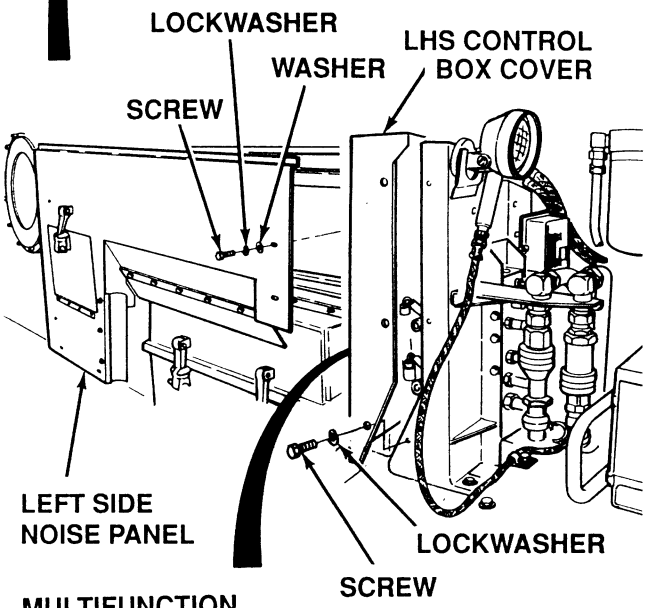


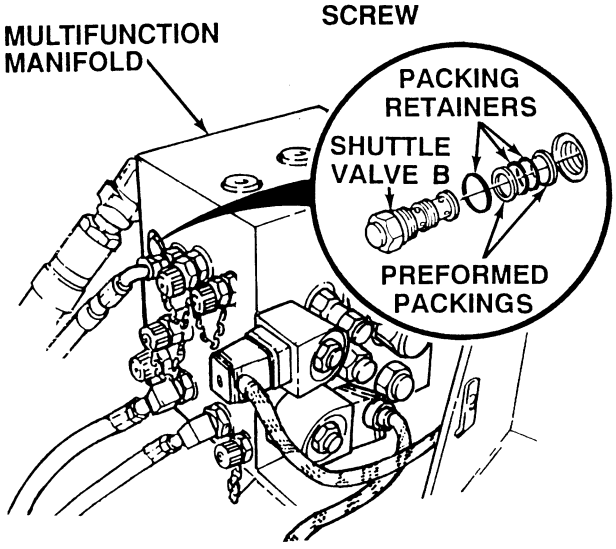
NOTE

- Use drain pan to catch leaking hydraulic oil.
- Only remove center screw on engine side of LHS control box cover.

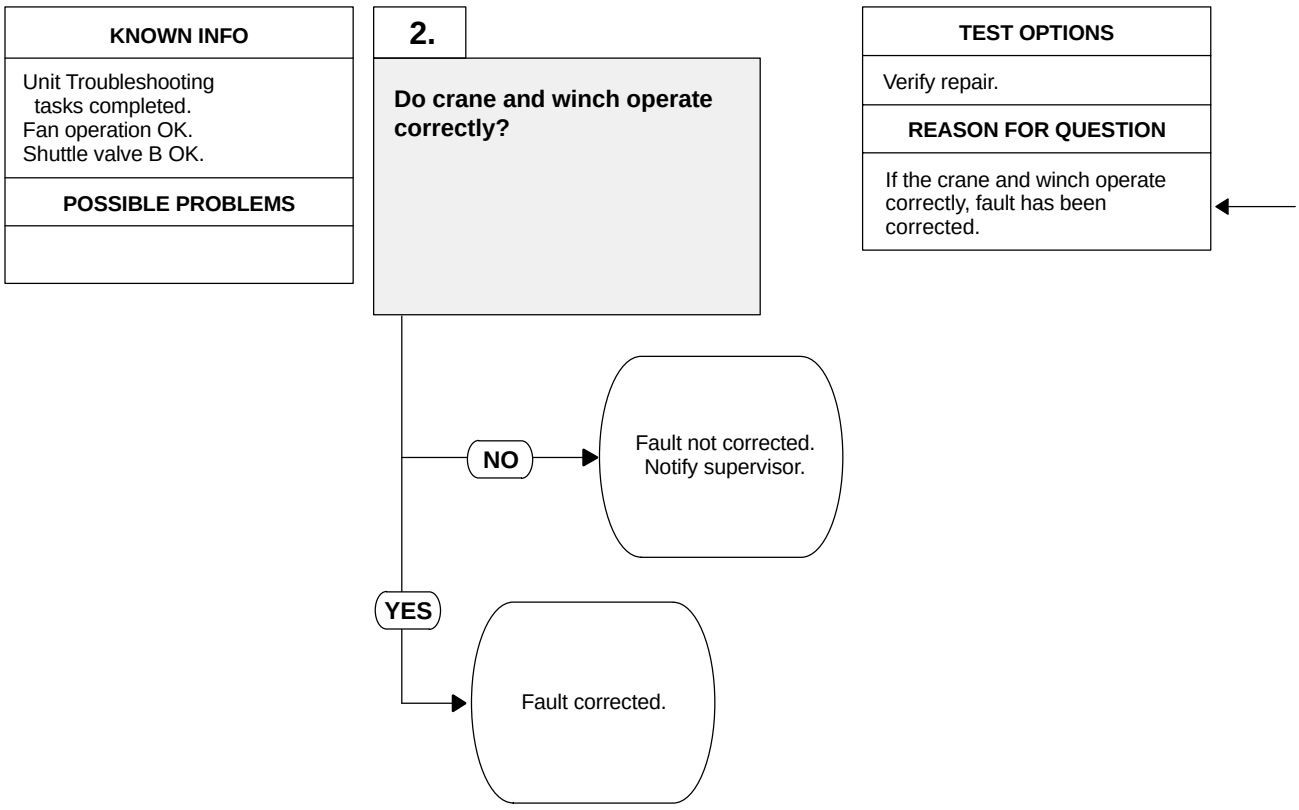
VISUAL/AUDIBLE INSPECTION

(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(3) Remove shuttle valve B from multifunction manifold.
(4) Remove and discard three preformed packings and two packing retainers.
(5) Shake valve and listen for ball to rattle.
  (a) If ball does not rattle, clean or replace shuttle valve (Para 17-18).
  (b) If check ball rattles, shuttle valve is OK.
(6) Lubricate preformed packing with hydraulic oil and install on shuttle valve.
(7) Install shuttle valve B.



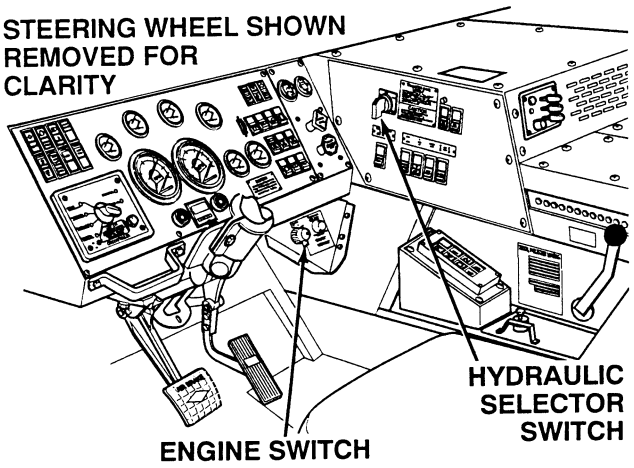


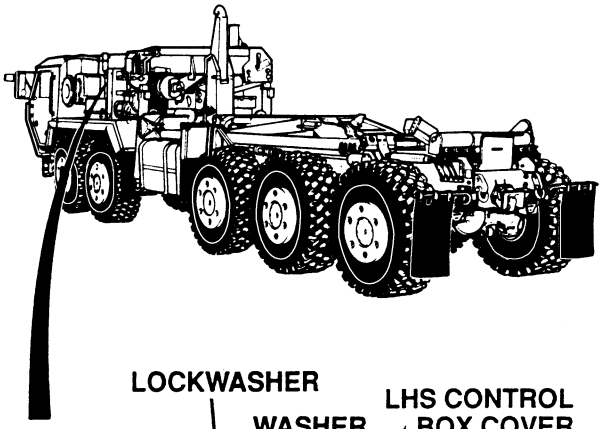
3. LHS, WINCH AND CRANE OPERATE SLOWLY (CONT).

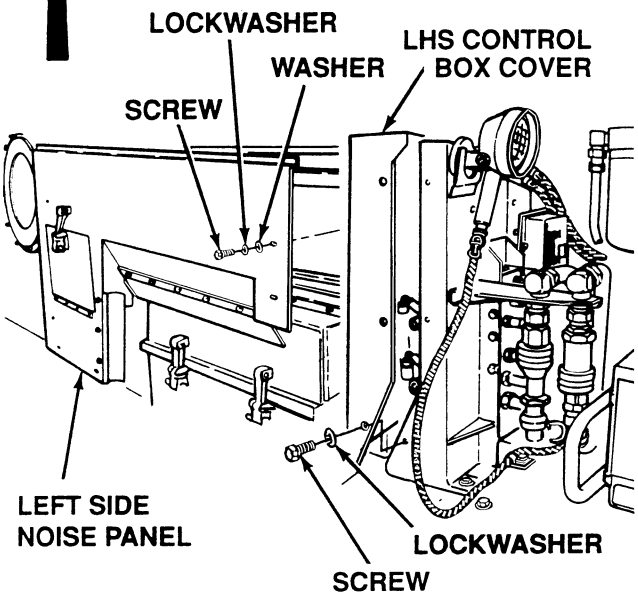


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Operate crane and winch and observe operation.
  (a) If crane and winch still operate slowly, fault not corrected. Perform Steps (4) through (7) below and notify supervisor.
  (b) If crane and winch operate correctly, fault has been corrected.
(4) Turn OFF ENGINE switch.
(5) Turn hydraulic selector switch OFF.
(6) Install LHS control box cover and four lockwashers and screws.
(7) Install left side noise panel, eight washers, lockwashers and screws.







2-13. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

4. FAN DOES NOT OPERATE.

INITIAL SETUP

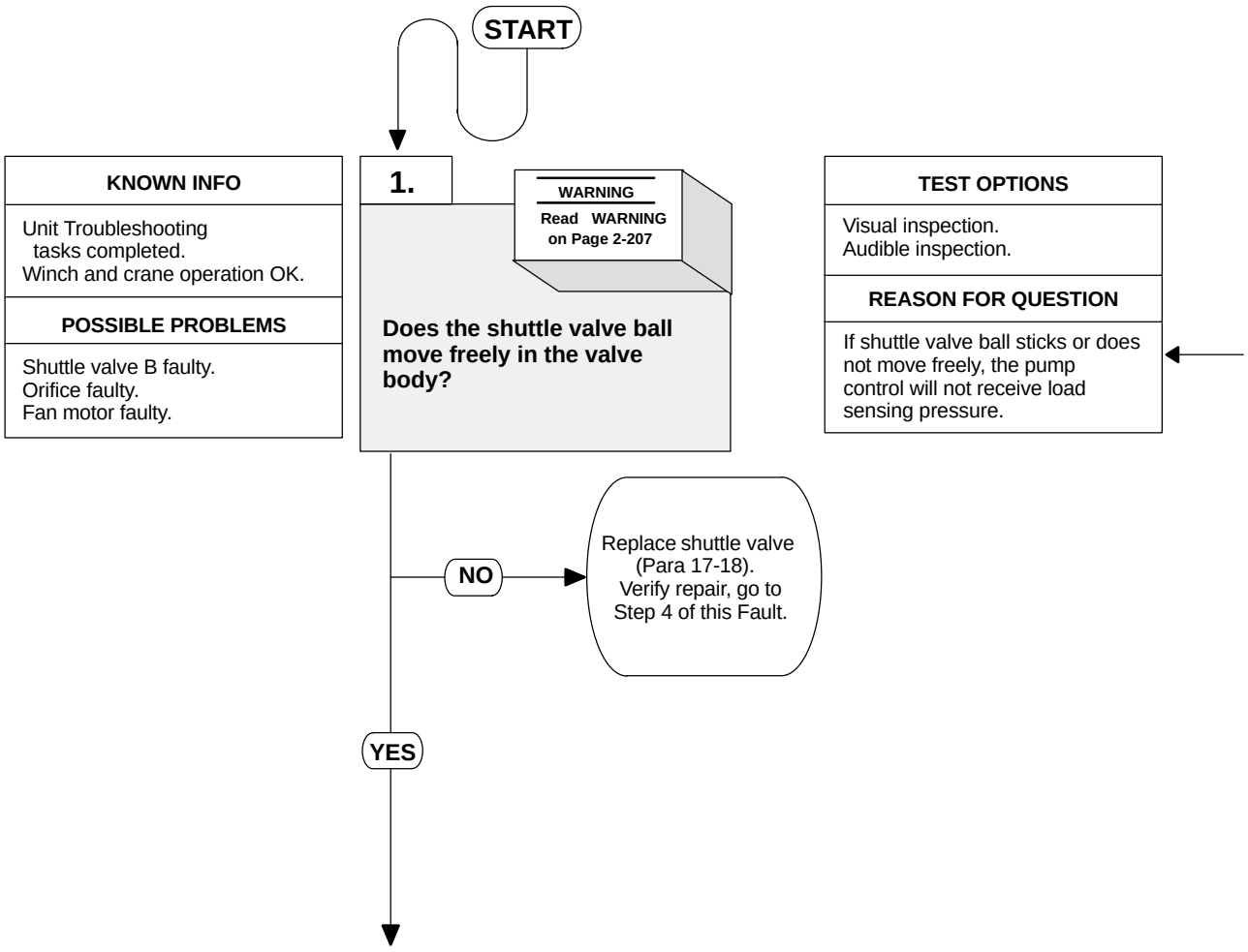
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Lockwashers (4) (Item 266, Appendix E)
Lockwashers (8) (Item 282, Appendix E)
Parts Kit, Seal (Item 412, Appendix E)

Personnel Required
Two

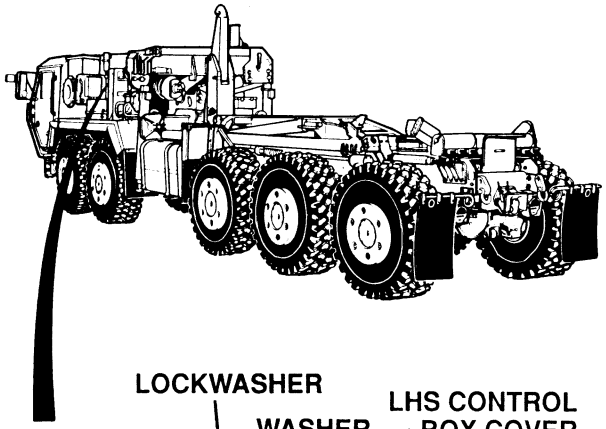
References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



WARNING

- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

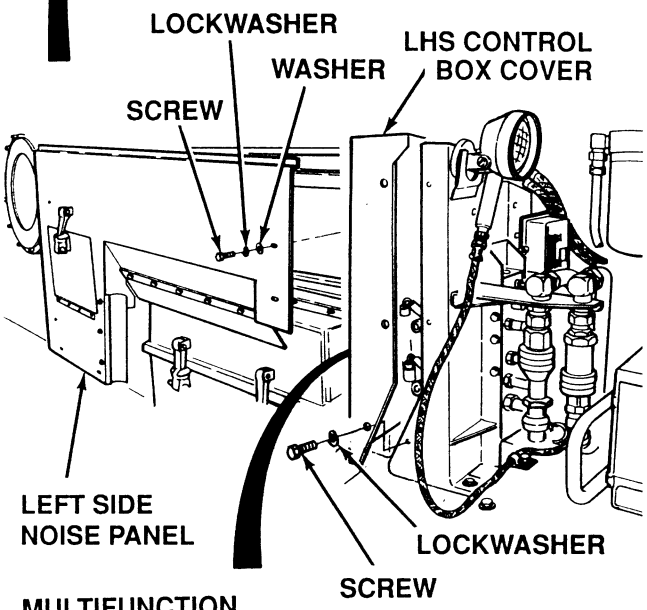


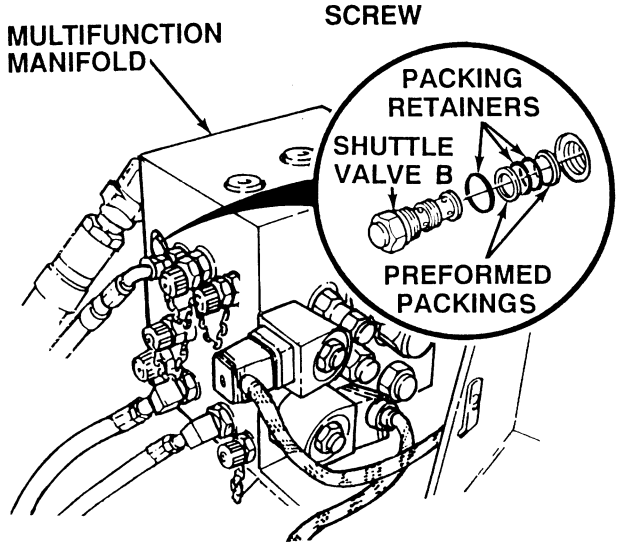
NOTE

- Use drain pan to catch leaking hydraulic oil.
- Only remove center screw on engine side of LHS control box cover.

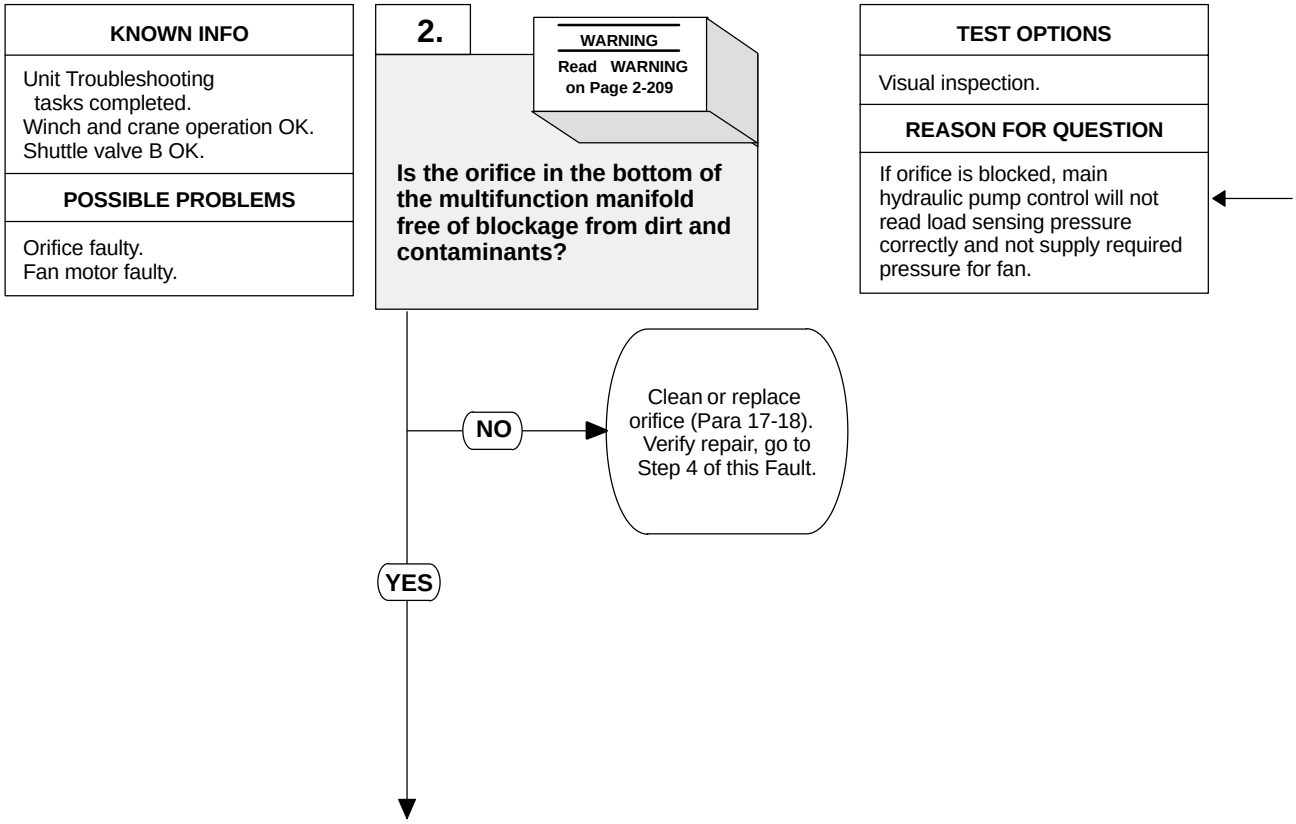
VISUAL/AUDIBLE INSPECTION

(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(3) Remove shuttle valve B from multifunction manifold.
(4) Remove and discard three preformed packings and two packing retainers.
(5) Shake valve and listen for ball to rattle.
  (a) If ball does not rattle, clean or replace shuttle valve B (Para 17-18).
  (b) If check ball rattles, shuttle valve is OK.
(6) Lubricate two preformed packings and packing retainers with hydraulic oil and install on shuttle valve.
(7) Install shuttle valve B.





4. FAN DOES NOT OPERATE (CONT).



WARNING

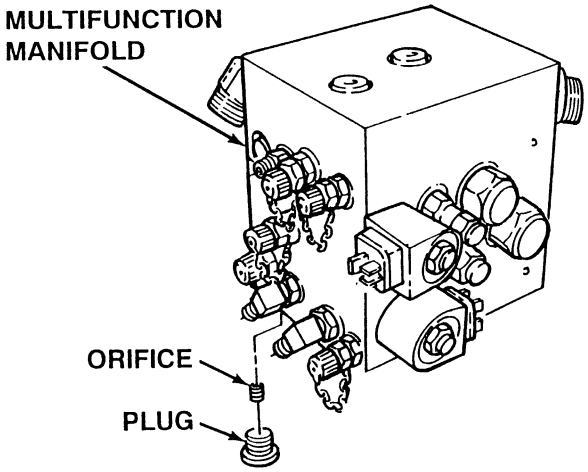
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

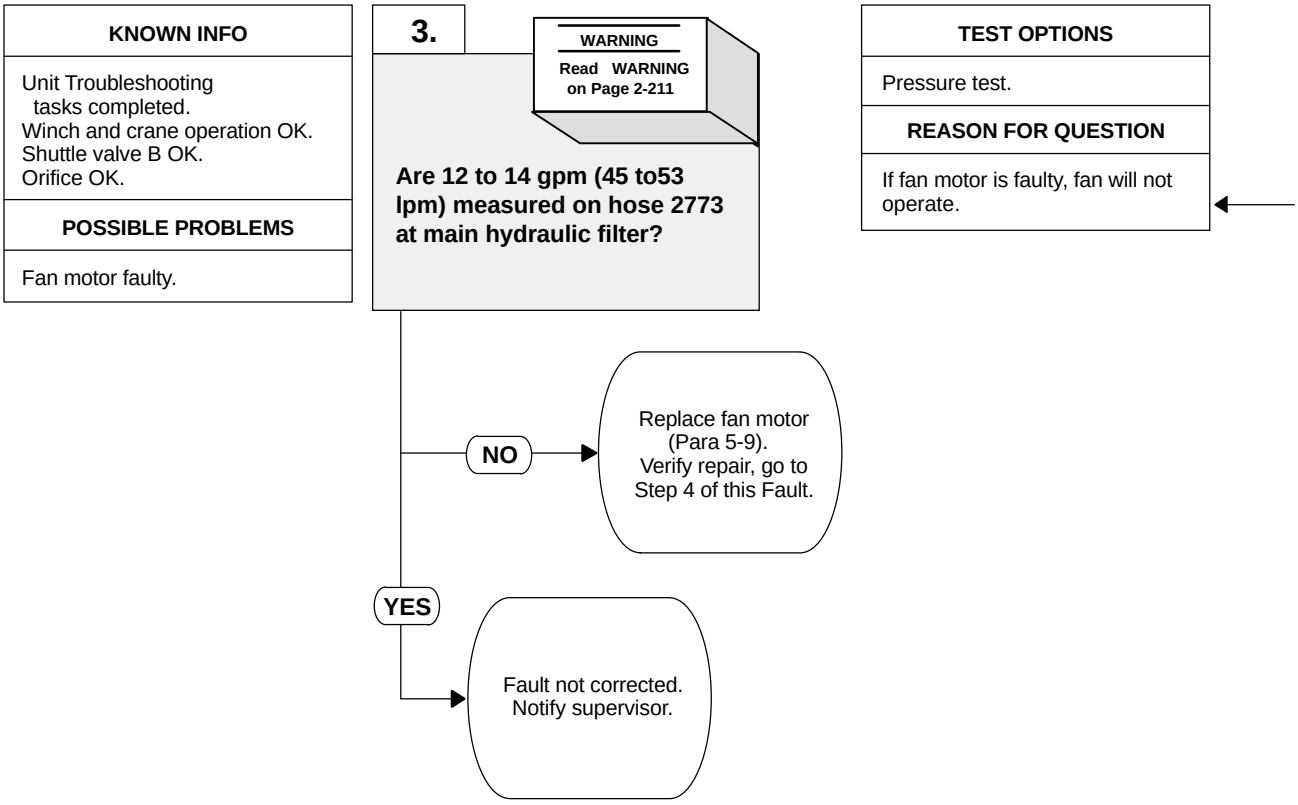
Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove multifunction manifold (Para 17-18).
(2) Remove plug and orifice from bottom of multifunction manifold.
(3) Inspect orifice for clogging and dirt.
  (a) If orifice is clogged or dirty, clean or replace orifice (Para 17-18).
  (b) If orifice is not clogged or dirty, orifice is OK.
(4) Install orifice and plug in bottom of multifunction manifold.
(5) Install multifunction manifold (Para 17-18).



4. FAN DOES NOT OPERATE (CONT).



WARNING

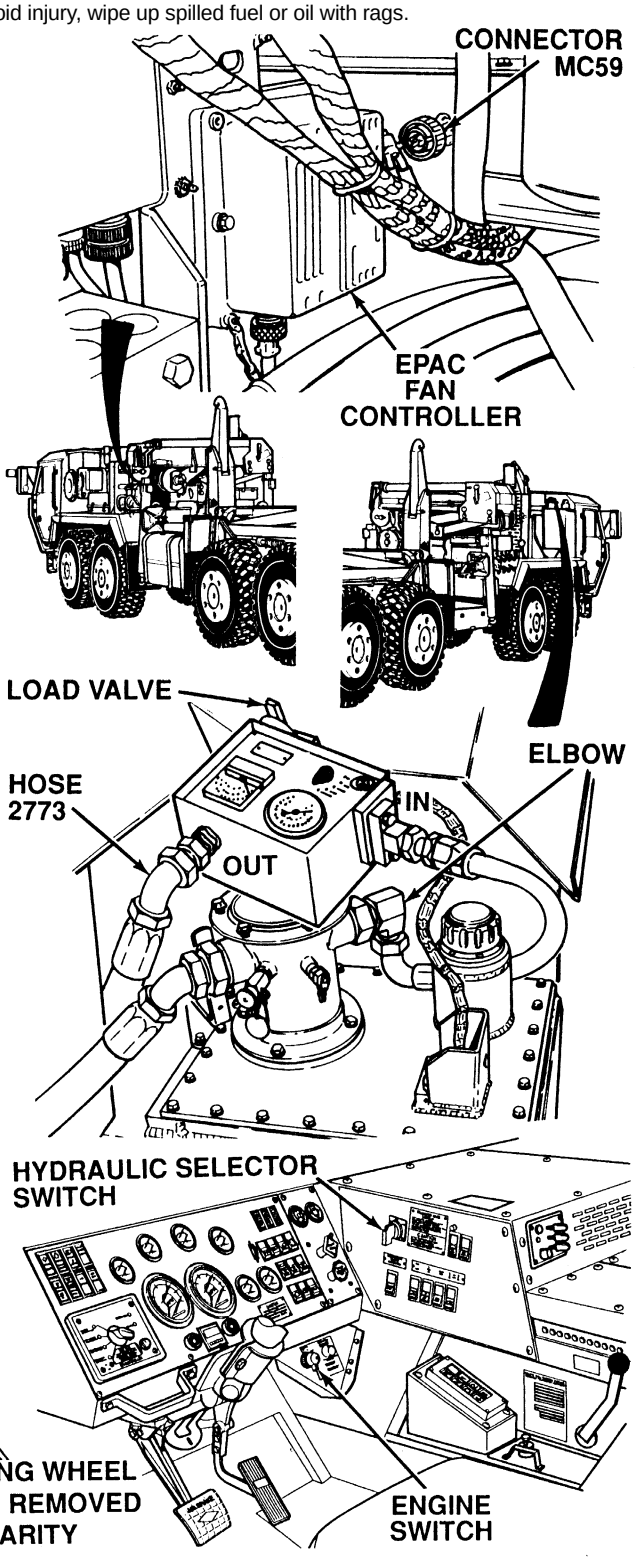
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

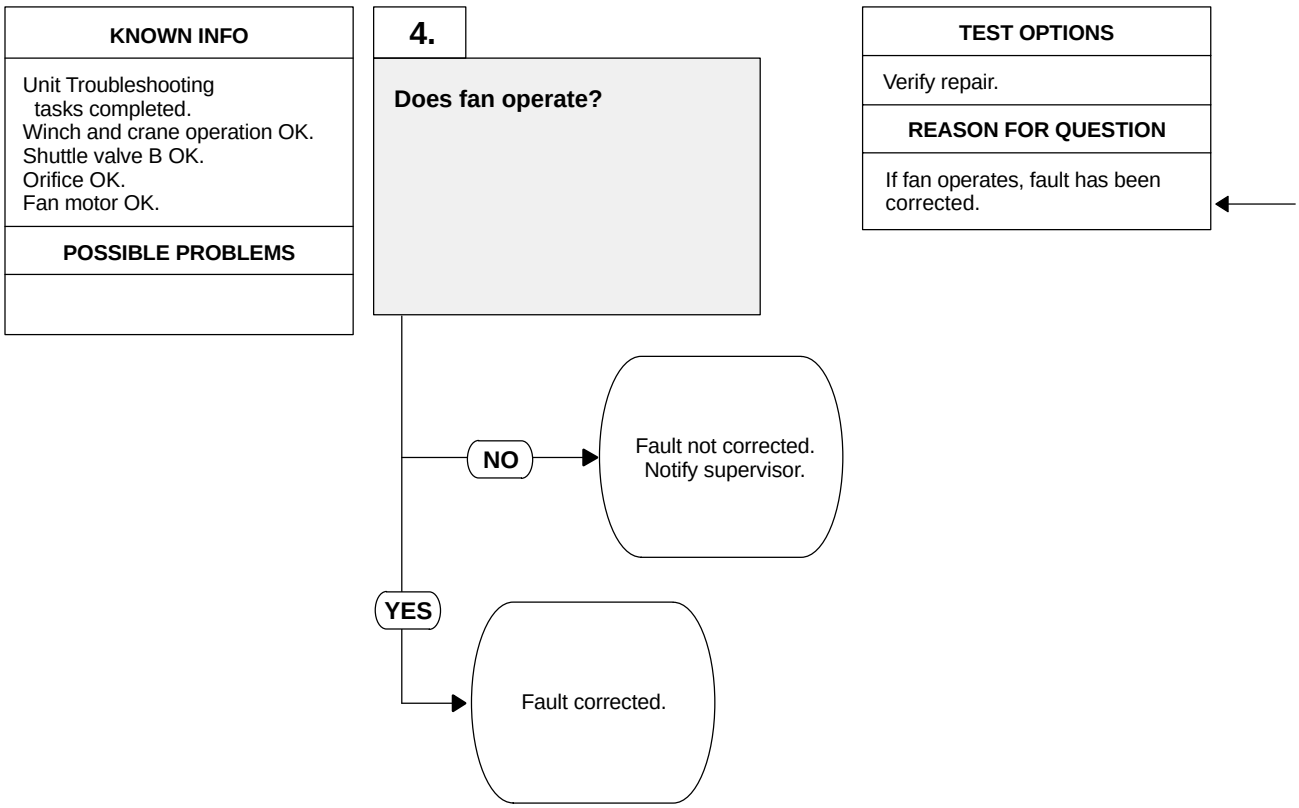
Use drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) Disconnect hose 2773 from main hydraulic filter.
(2) Connect hose 2773 to out port of flow meter.
(3) Connect a hose between flow meter in port and filter elbow.
(4) Completely open flow meter load valve.
(5) Disconnect connector MC59 from EPAC.
(6) Start engine (TM 9-2320-364-10). Allow engine to run until reaching normal operating temperature 170° to 195°F (77° to 91°C).
(7) While assistant presses throttle switch, observe flow meter.
  (a) If 12 to 14 gpm (45 to 53 lpm) are not present, perform Steps (8) through (10) below and replace fan motor (Para 5-9).
  (b) If 12 to 14 gpm (45 to 53 lpm) are present, perform Steps (8) through (10) below and notify supervisor.
(8) Release throttle switch and turn OFF ENGINE switch.
(9) Connect connector MC59 to EPAC.
(10) Remove flow meter and connect hose 2773 to main hydraulic filter output elbow.

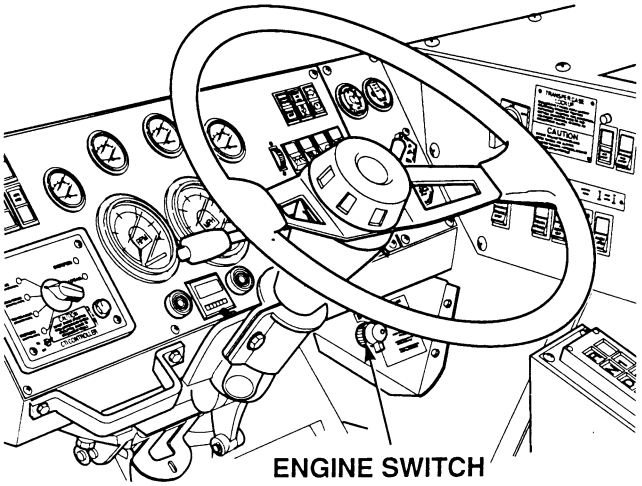


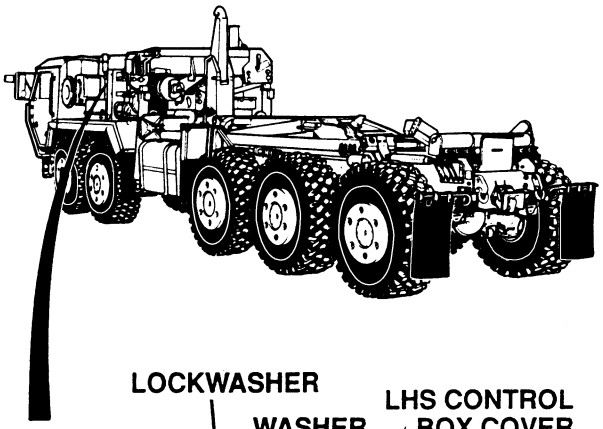
4. FAN DOES NOT OPERATE (CONT).

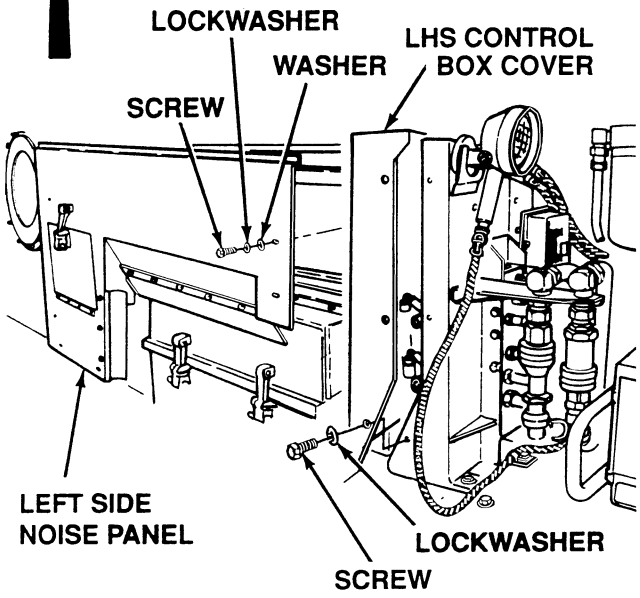


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Observe fan operation.
  (a) If fan does not operate, fault not corrected. Perform Steps (4) through (6) below notify supervisor.
  (b) If fan operates, fault has been corrected.
(4) Turn OFF ENGINE switch.
(5) Install LHS control box cover and four lockwashers and screws.
(6) Install left side noise panel with eight washers, lockwashers and screws.







2-13. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

5. FAN SPEED DOES NOT DECREASE FROM HIGH TO LOW SPEED.

INITIAL SETUP

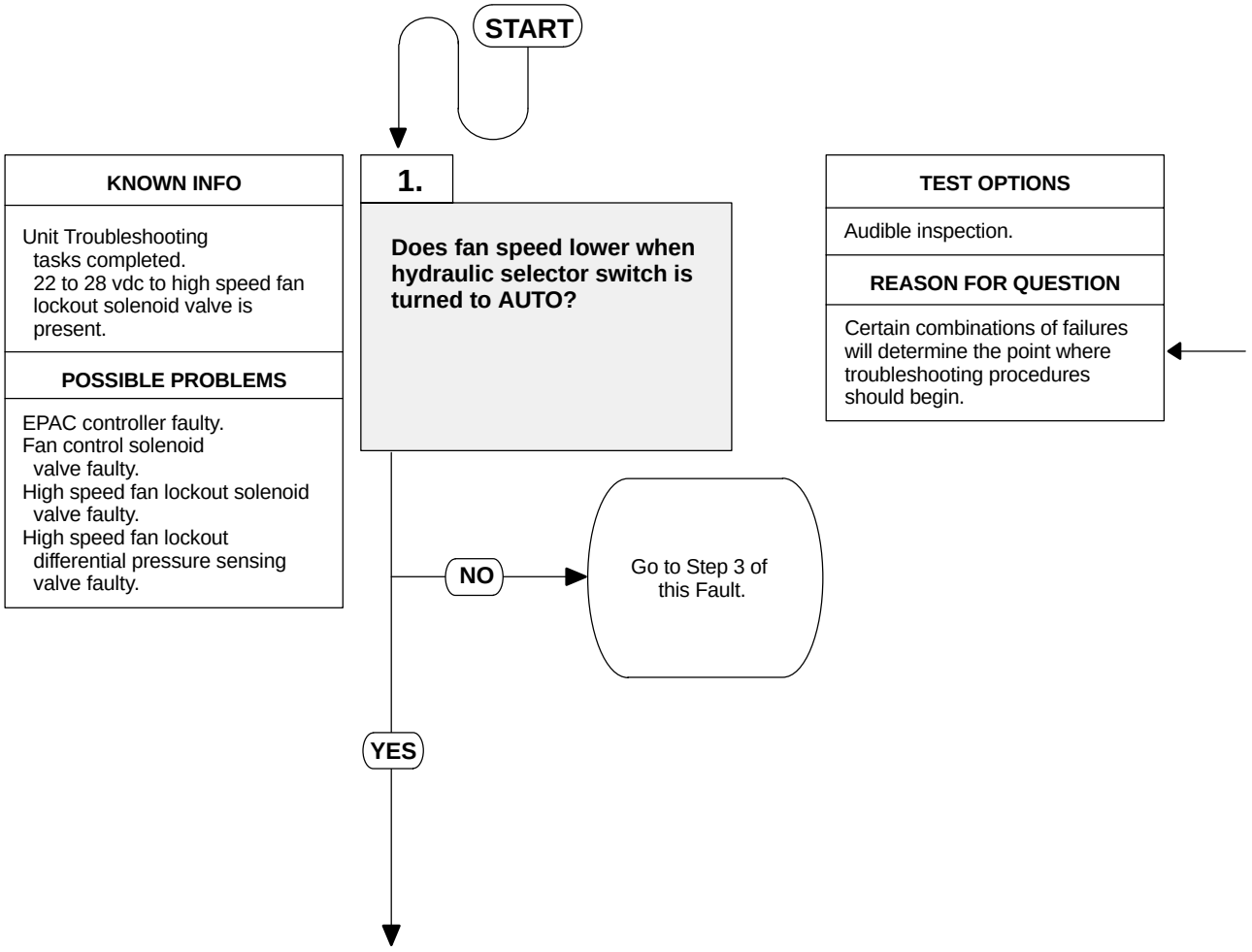
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Analyzer Set, STE/ICE-R (Optional)
(Item 15, Appendix F)
Multimeter (Item 140, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Sealing Compound (Item 62, Appendix B)
Lockwashers (4) (Item 266, Appendix E)
Lockwashers (30) (Item 282, Appendix E)
Parts Kit, Seal (Item 412, Appendix E)
Parts Kit, Seal (Item 408, Appendix E)

Personnel Required
Two

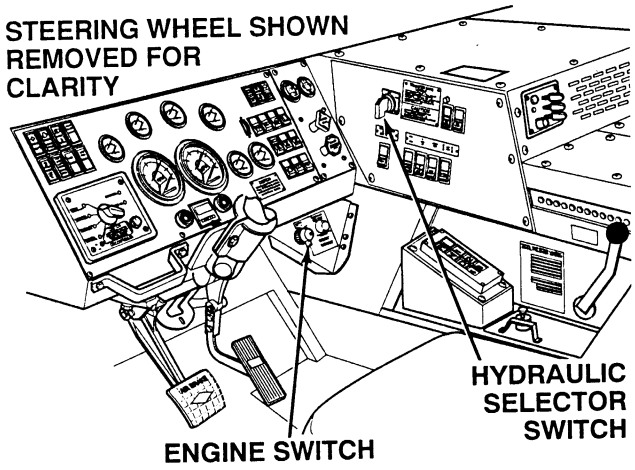
References
TM 9-2320-364-10
TM 9-2320-364-20
TM 9-4910-571-12&P

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Coolant temperature at 190°F, (88°C)

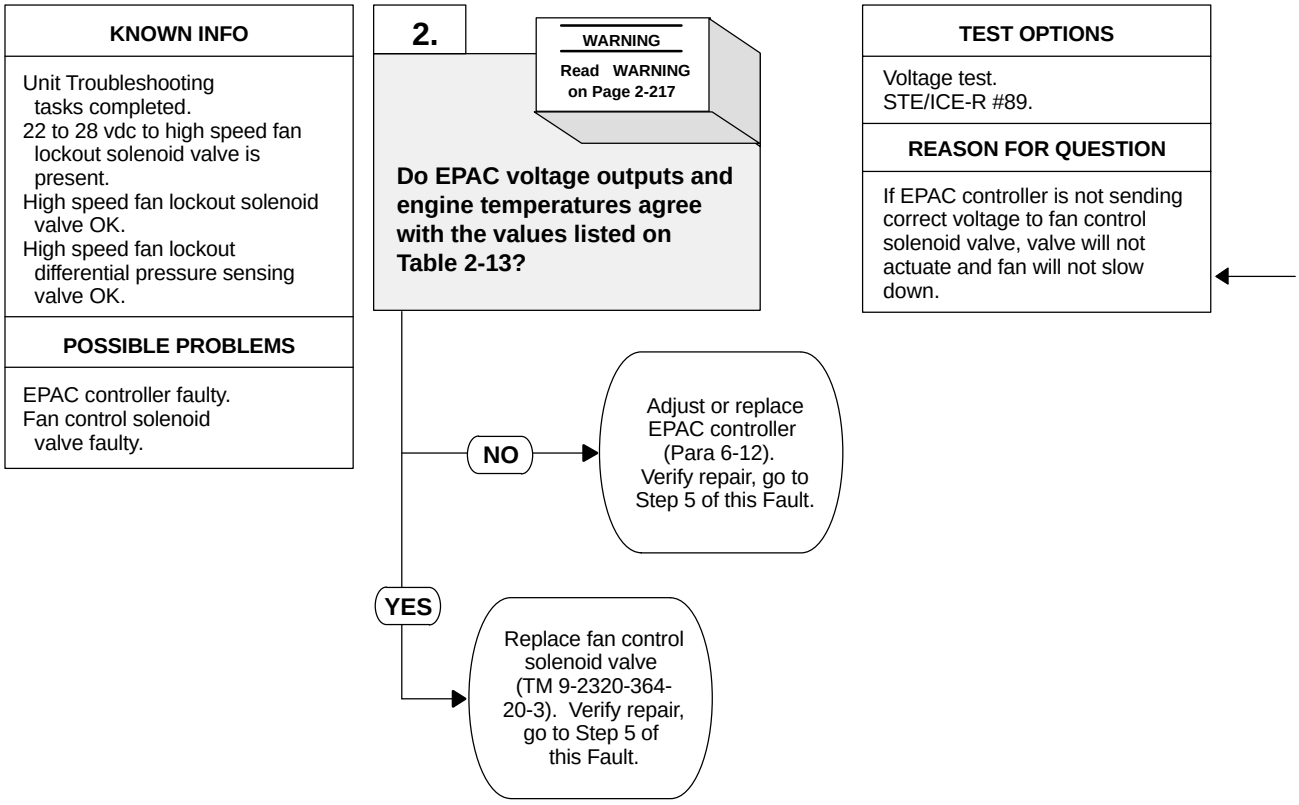


AUDIBLE INSPECTION

(1) Start engine (TM 9-2320-364-10).
(2) Turn hydraulic selector switch to AUTO.
(3) Listen for audible slowing down of fan.
    (a) If fan does not slow down, perform Steps (4) and (5) below and go to Step 3 of this Fault.
    (b) If fan does slow down, perform Steps (4) and (5) below and go to Step 2 of this Fault.
(4) Turn hydraulic selector switch OFF.
(5) Turn OFF ENGINE switch.



5. FAN DOES NOT DECREASE FROM HIGH TO LOW SPEED (CONT).



WARNING

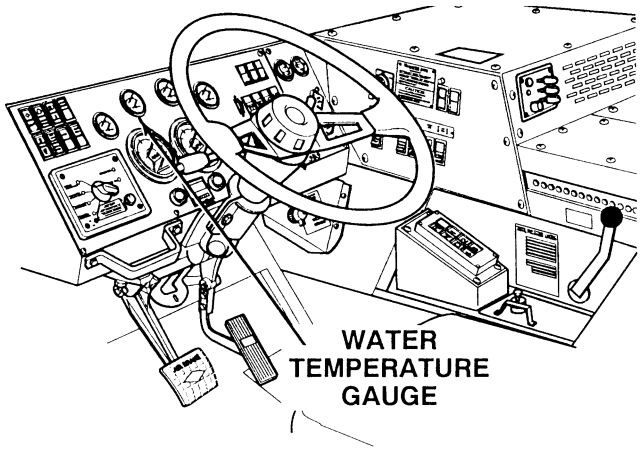
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

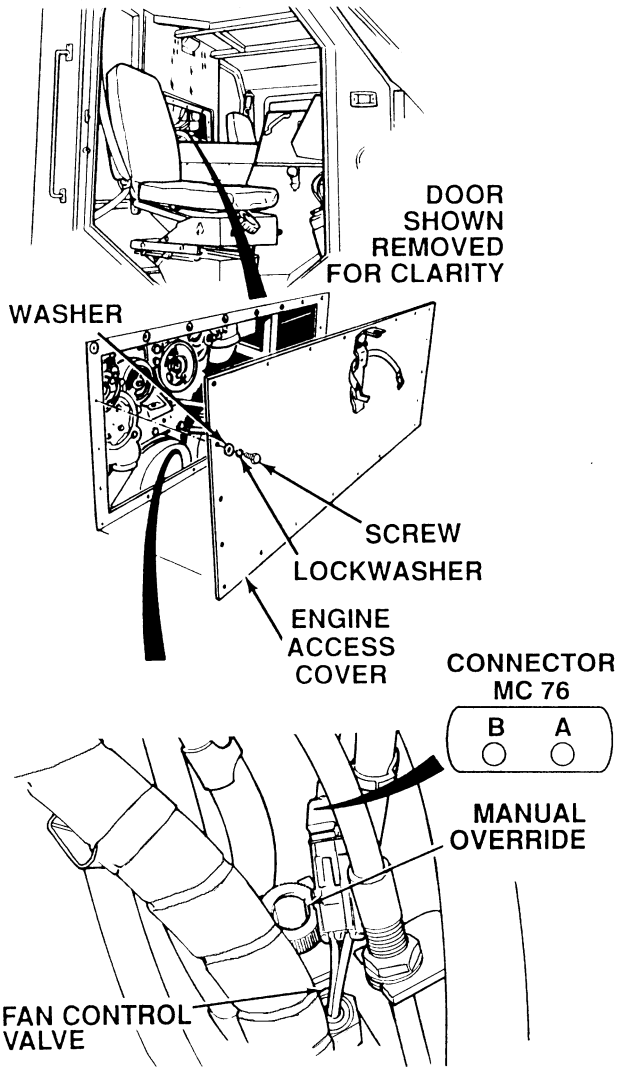
Table 2-13. EPAC Temperature vs Voltage Values

Water Temp. Gage Reading °F	Water Temp. Gage Reading C°	Voltage Values (vdc)
170	77	22
175	79	16
185	85	12
190	88	10
202-204	94-96	7.3-7.7

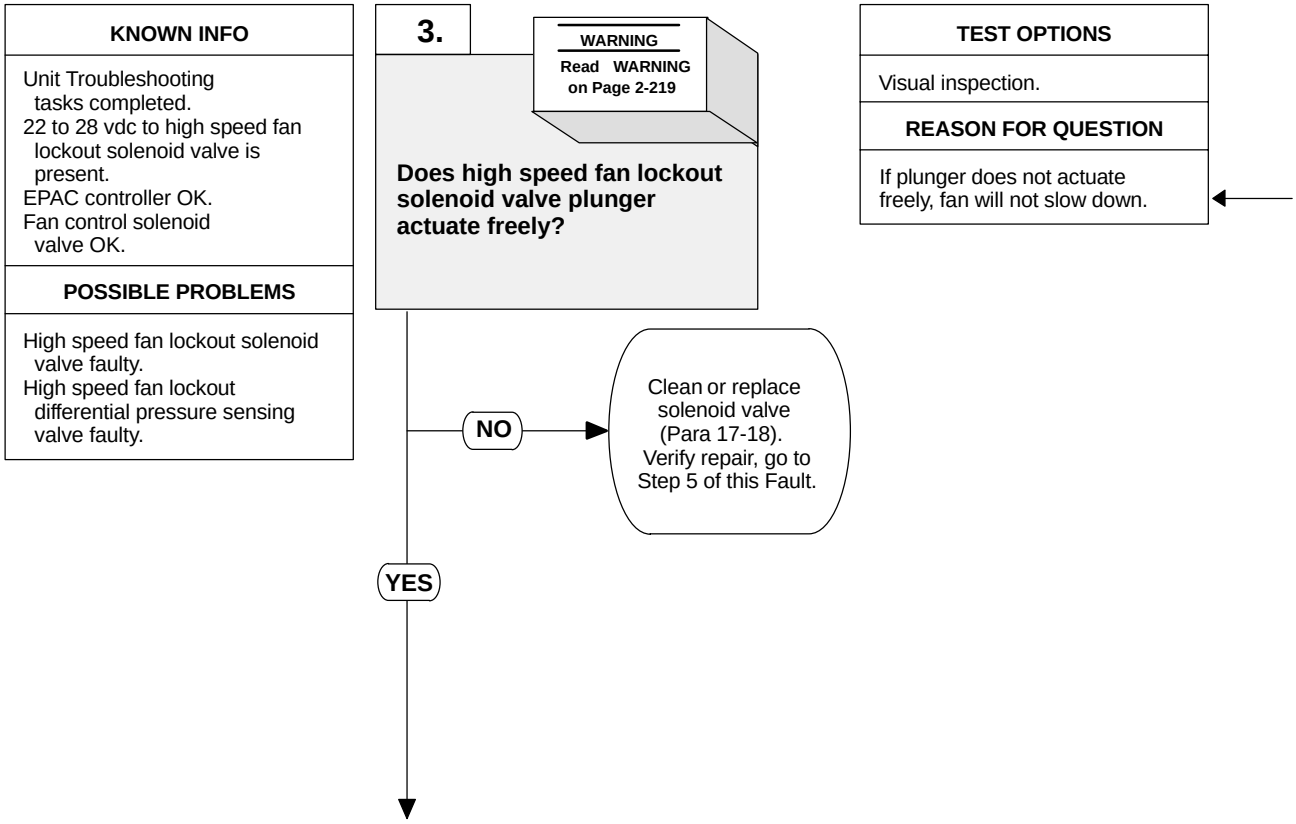
VOLTAGE TEST

(1) Remove 22 screws, lockwashers, washer and access panel. Discard lockwashers.
(2) Set multimeter select switch to volts dc.
(3) Start engine (TM 9-2320-364-10).
(4) Allow engine to warm up to at least 175°F (79°C) and turn OFF ENGINE switch.
(5) Disconnect connector MC76 from fan control solenoid valve.
(6) Connect positive (+) multimeter lead to wire 1936 at harness connector MC76, terminal A.
(7) Connect negative (–) multimeter lead to wire 1935 at harness connector MC76, terminal B.
(8) While assistant turns ON ENGINE switch, observe multimeter and check EPAC output voltages versus engine water temperature readings (Table 2-13).
  (a) If voltage outputs are not correct, perform Steps (9) through (11) below and adjust or replace EPAC (Para 6-12).
  (b) If voltage outputs are correct, replace fan control solenoid valve (TM 9-2320-364-20).
(9) Turn OFF ENGINE switch.
(10) Connect connector MC76 to fan control solenoid valve connector.
(11) Install inside access panel with 22 washers, lockwashers and screws.





5. FAN DOES NOT DECREASE FROM HIGH TO LOW SPEED (CONT).



WARNING

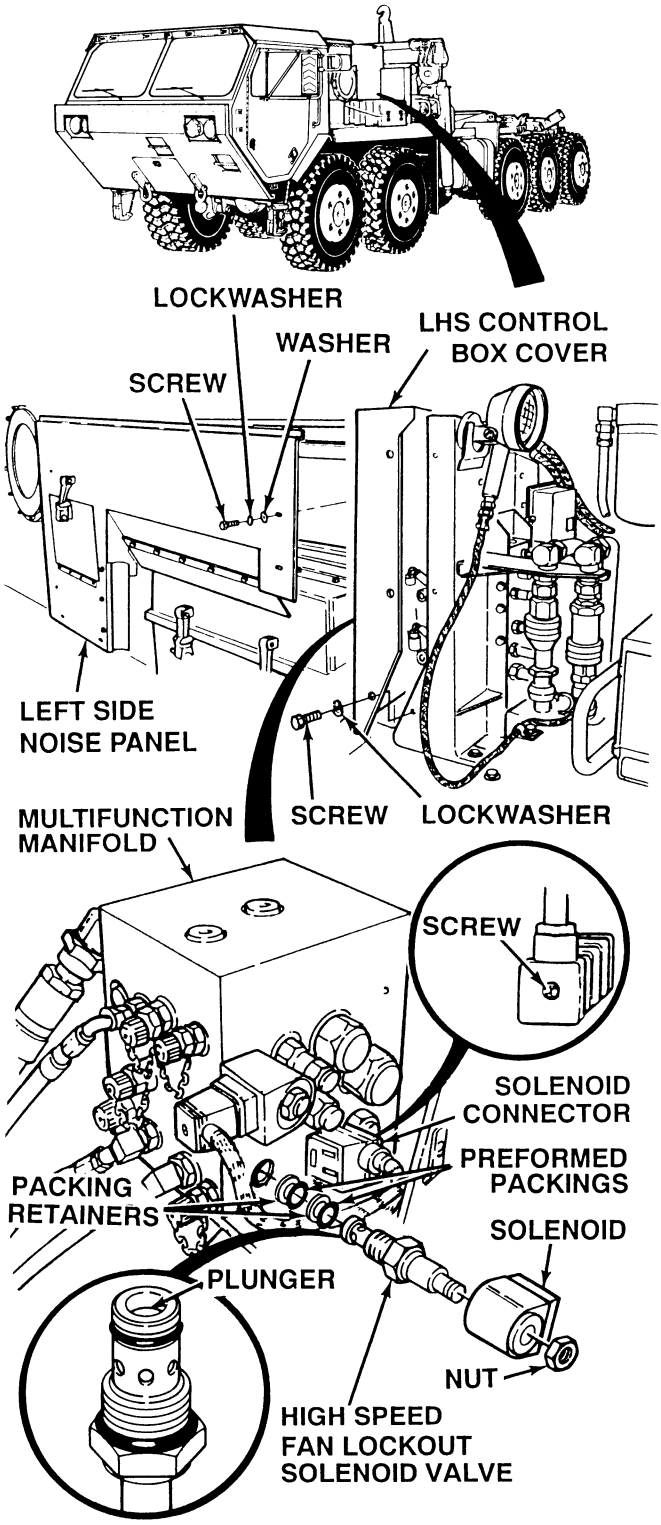
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

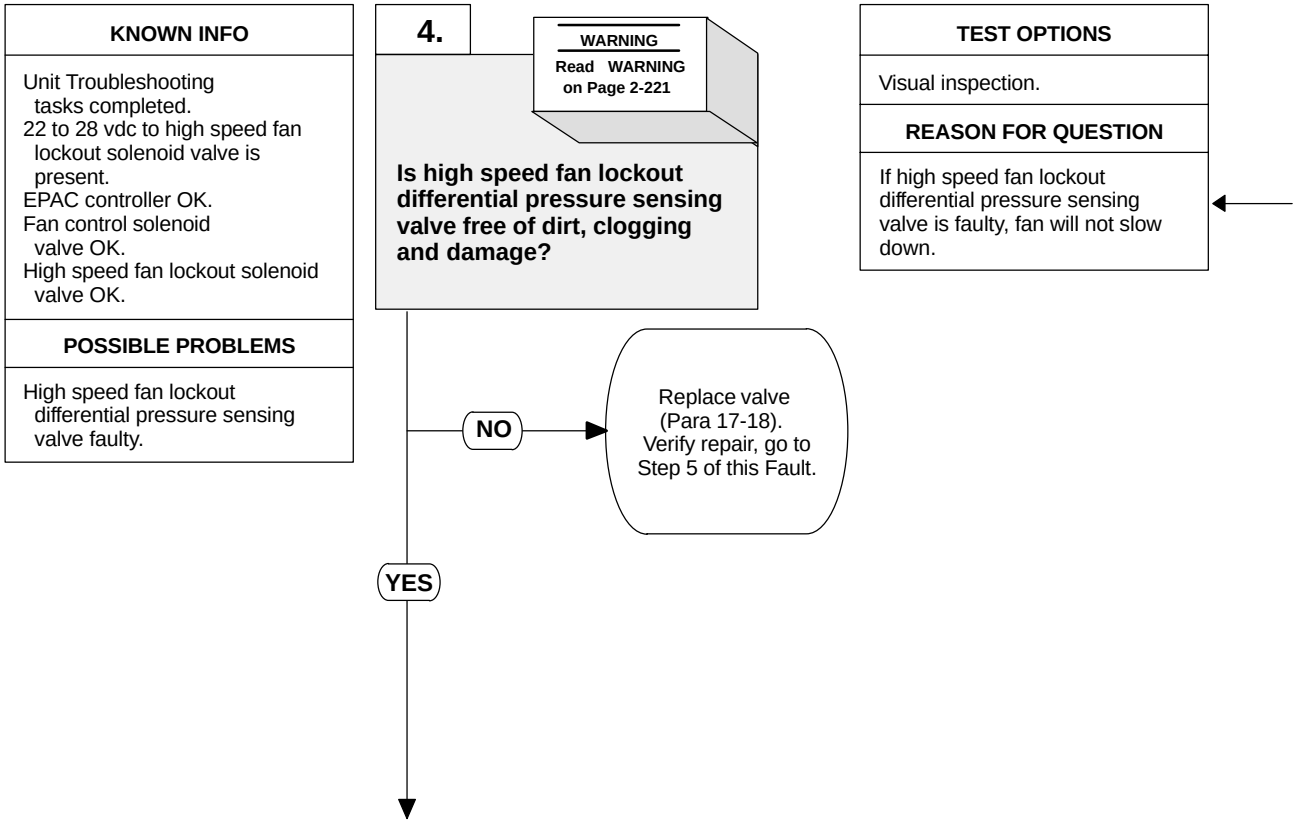
- Use drain pan to catch leaking hydraulic oil.
- Only remove center screw on engine side of LHS control box cover.

VISUAL INSPECTION

(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(3) Loosen screw and disconnect solenoid connector.
(4) Remove nut and solenoid.
(5) Remove high speed fan lockout solenoid valve from multifunction manifold.
(6) Remove and discard two preformed packings and packing retainers.
(7) Push plunger inside valve with a non-metallic probe.
  (a) If plunger sticks or does not move freely up and down, replace solenoid valve (Para 17-18).
  (b) If plunger moves freely up and down, solenoid valve is OK.
(8) Lubricate two preformed packings and packing retainers with hydraulic oil and install on solenoid valve.
(9) Install high speed fan lockout solenoid valve.
(10) Install solenoid and nut.
(11) Connect solenoid connector.
(12) Tighten connector screw and coat head of connector screw with sealing compound.



5. FAN DOES NOT DECREASE FROM HIGH TO LOW SPEED (CONT).



WARNING

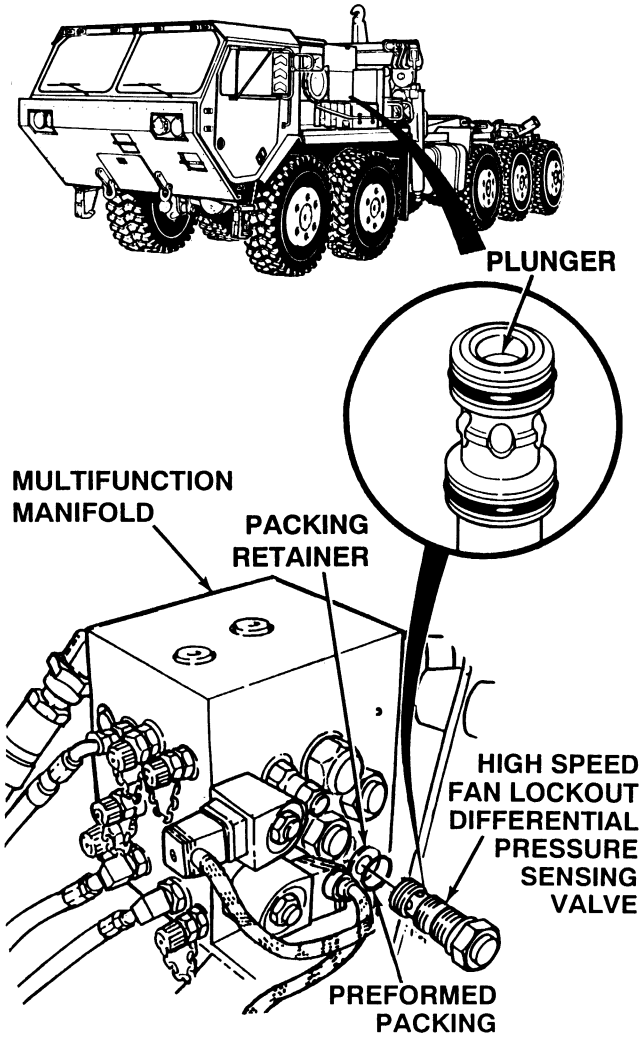
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

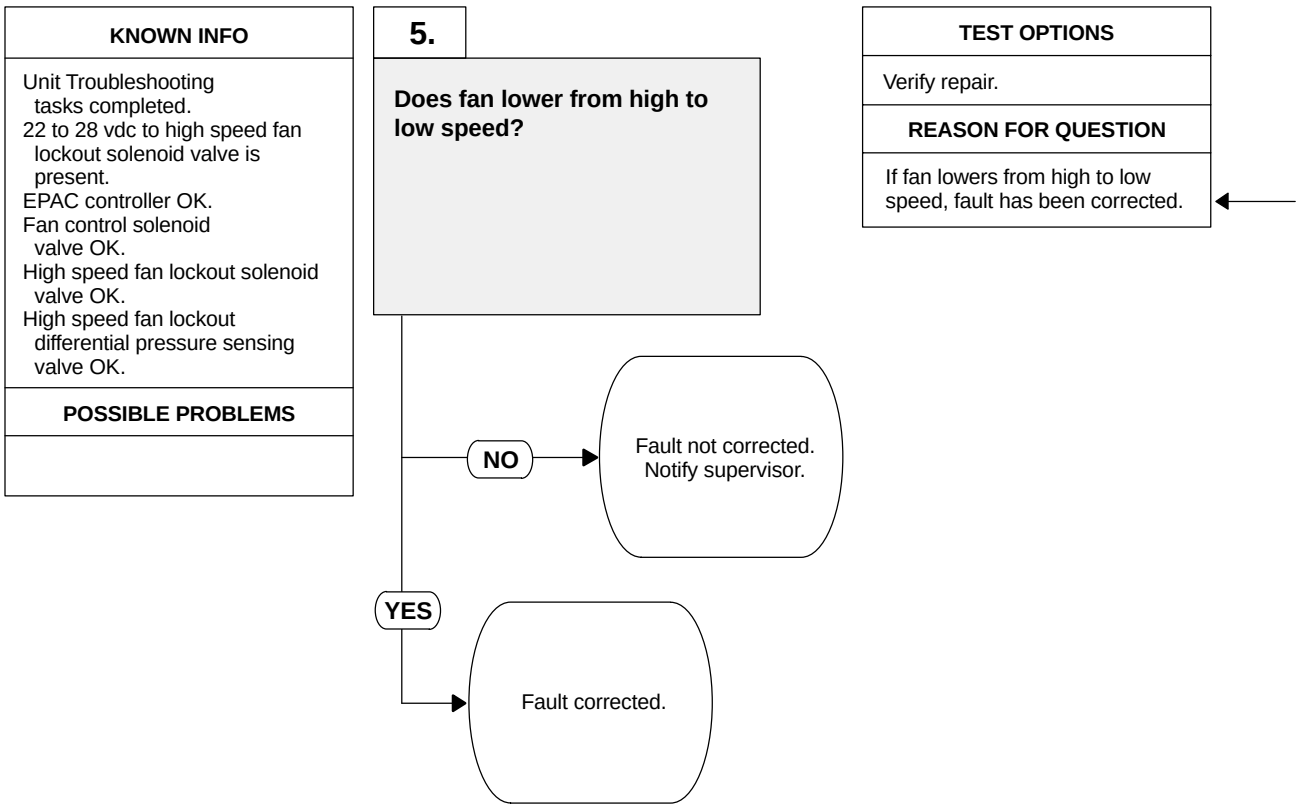
Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove high speed fan lockout differential pressure sensing valve from multifunction manifold.
(2) Remove and discard three preformed packings and four packing retainers.
(3) Push plunger inside valve with a non-metallic probe.
  (a) If plunger sticks and does not move freely up and down, replace differential pressure sensing valve (Para 17-18).
  (b) If plunger moves freely up and down, differential pressure sensing valve is OK.
(4) Lubricate three preformed packings and four packing retainers with hydraulic oil and install on differential pressure sensing valve.
(5) Install high speed fan lockout differential pressure sensing valve.

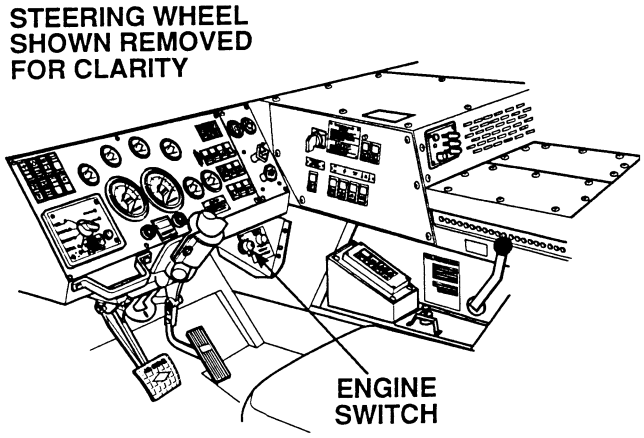


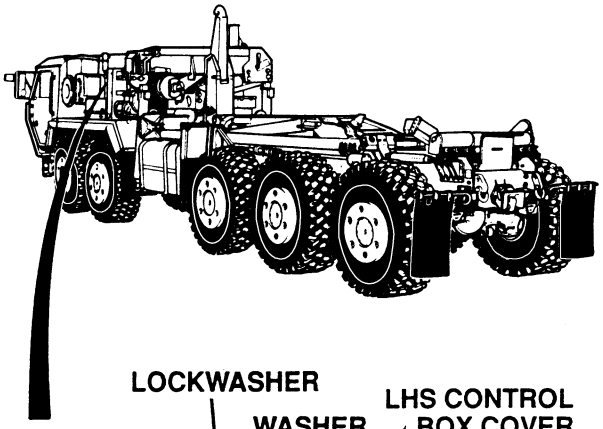
5. FAN DOES NOT DECREASE FROM HIGH TO LOW SPEED (CONT).

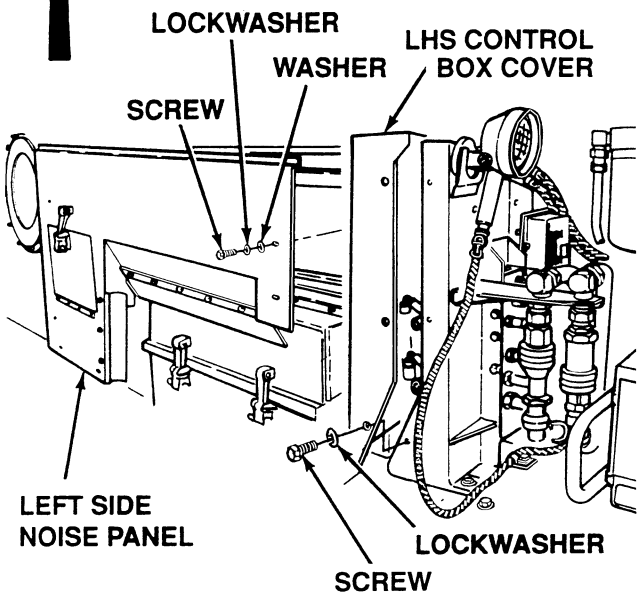


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Listen and observe fan.
  (a) If fan speed does not lower, fault not corrected. Perform Steps (4) through (6) below and notify supervisor.
  (b) If fan speed lowers, fault has been corrected.
(4) Turn OFF ENGINE switch.
(5) Install LHS control box cover and four lockwashers and screws.
(6) Install left side noise panel, eight lockwashers and screws.







2-13. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

6. FAN DOES NOT OPERATE AT HIGH SPEED.

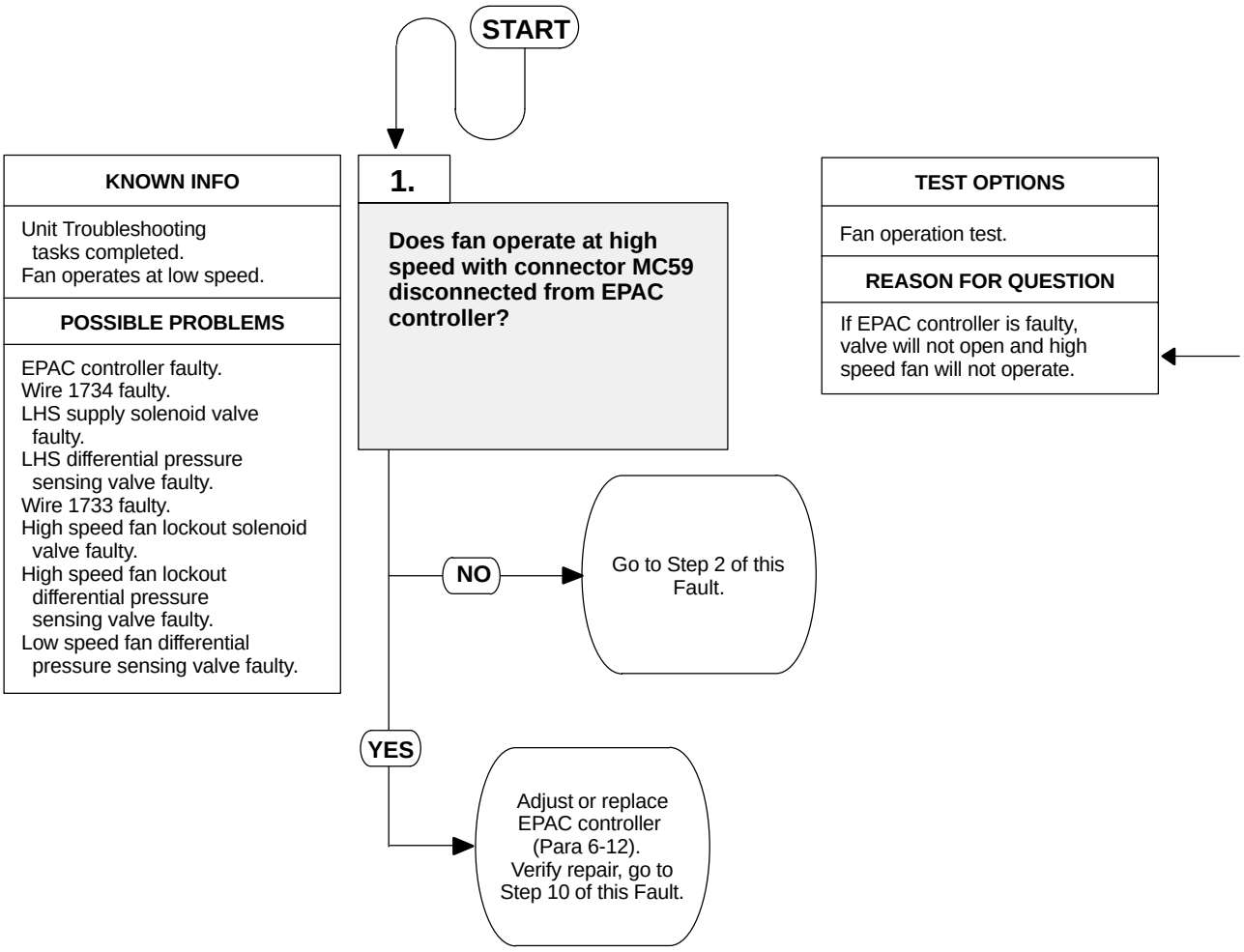
INITIAL SETUP

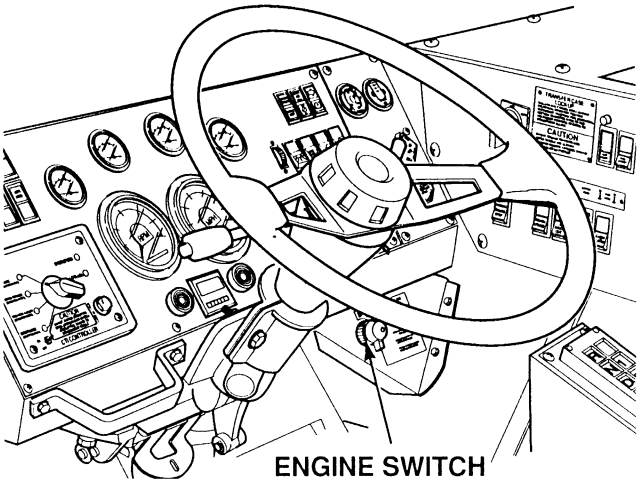
Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Analyzer Set, STE/ICE-R (Optional) (Item 15, Appendix F)
- Multimeter (Item 140, Appendix F)
- Pan, Drain 4 gal (Item 144, Appendix F)

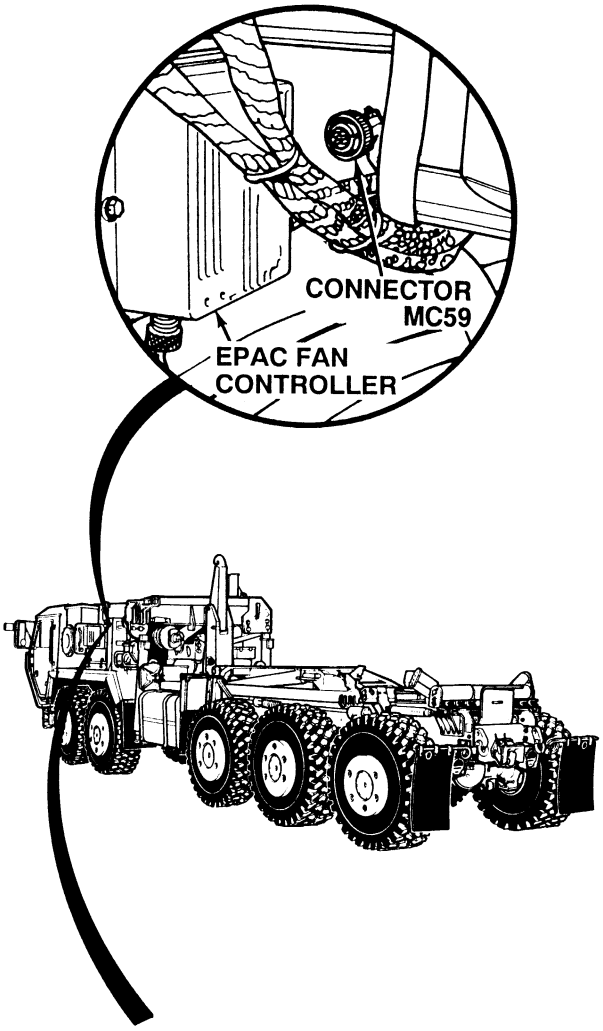
Materials/Parts
- Oil, Hydraulic (Item 34, Appendix B)
- Sealing Compound (Item 62, Appendix B)
- Lockwashers (4) (Item 266, Appendix E)
- Lockwashers (8) (Item 282, Appendix E)
- Packing, Preformed (Item 352, Appendix E)
- Parts Kit, Seal (Item 410, Appendix E)
- Parts Kit, Seal (Item 411, Appendix E)
- Parts Kit, Seal (Item 412, Appendix E)

References
- TM 9-2320-364-10
- TM 9-2320-364-20
- TM 9-4910-571-12&P

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Coolant temperature at 190°F, (88°C)

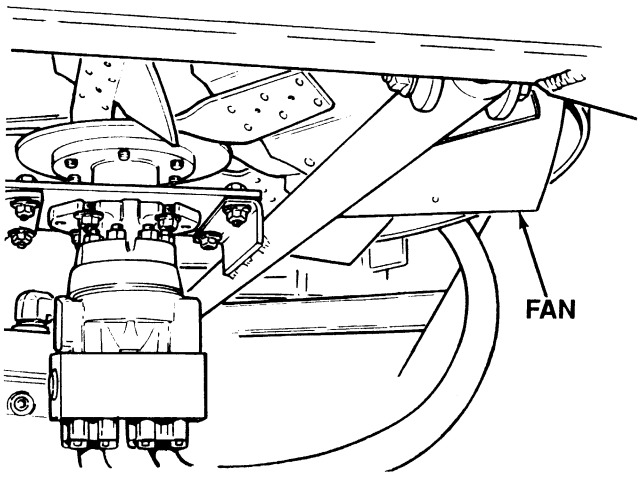






FAN OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Disconnect connector MC59 from EPAC and observe fan operation.
  (a) If fan does not operate at high speed, Turn OFF ENGINE switch and go to Step 2 of this Fault.
  (b) If fan operates at high speed, turn OFF ENGINE switch and adjust or replace EPAC (Para 6-12).



6. FAN DOES NOT OPERATE AT HIGH SPEED (CONT).

KNOWN INFO

Unit Troubleshooting tasks completed.
Fan operates at low speed.
EPAC controller OK.

POSSIBLE PROBLEMS

Wire 1734 faulty.
LHS supply solenoid valve faulty.
LHS differential pressure sensing valve faulty.
Wire 1733 faulty.
High speed fan lockout solenoid valve faulty.
High speed fan lockout differential pressure sensing valve faulty.
Low speed fan differential pressure sensing valve faulty.

2.

WARNING
Read WARNING on Page 2-227

Does fan operate at high speed with connector MC59 disconnected and hose 2777 disconnected from LHS control box?

NO → Go to Step 5 of this Fault.

YES

TEST OPTIONS

Fan operation test.

REASON FOR QUESTION

If fan operates at high speed, LHS supply solenoid valve and/or differential sensing valve are faulty.

WARNING

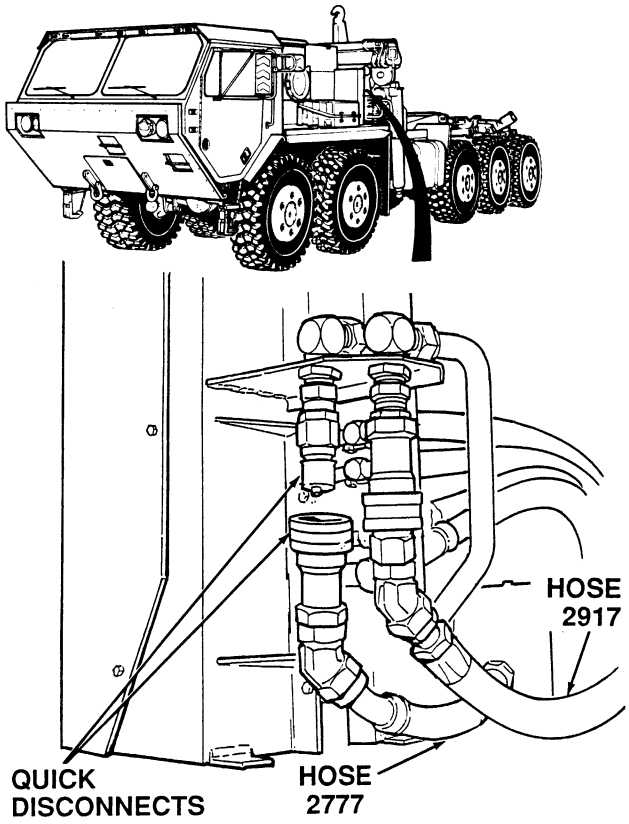
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

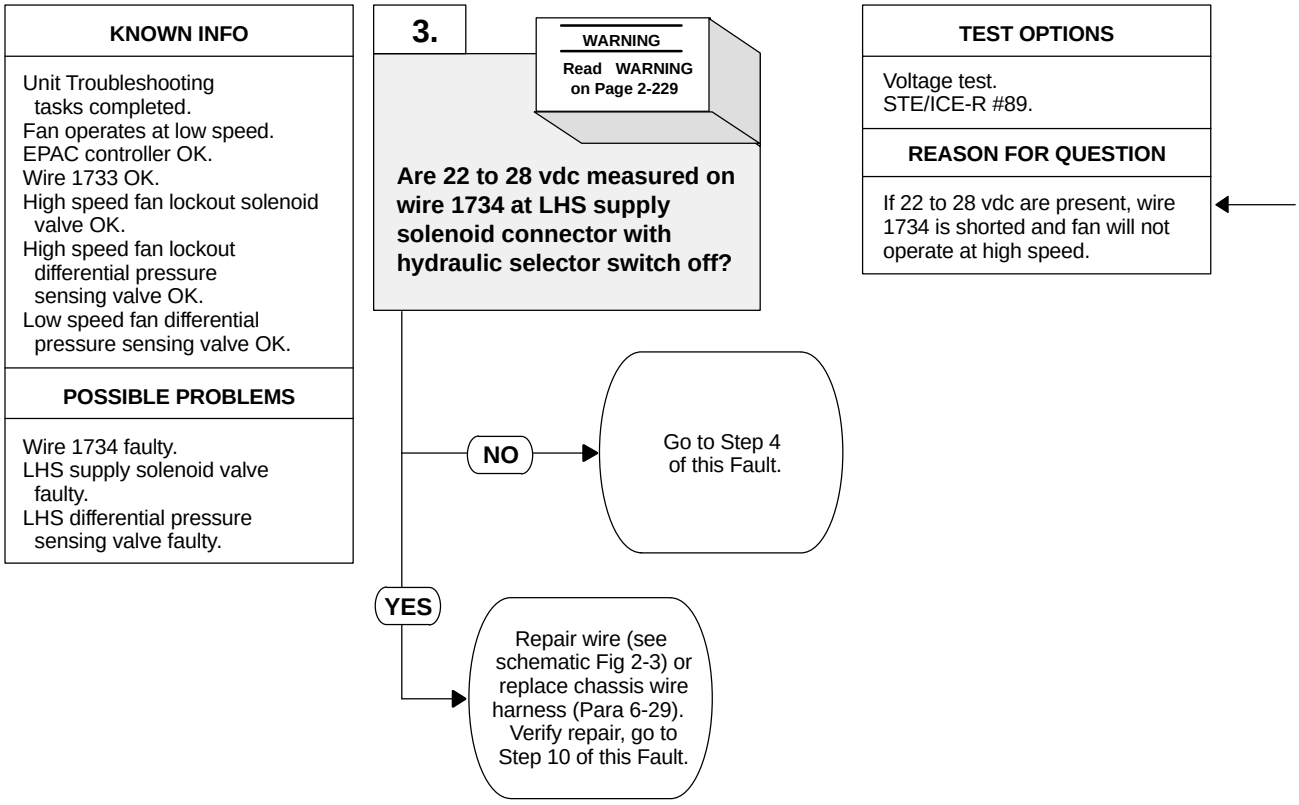
Use drain pan to catch leaking hydraulic oil.

FAN OPERATION TEST

(1) Disconnect hose 2777 female quick disconnect from LHS control box and listen for change in fan speed.
(2) Start engine (TM 9-2320-364-10).
  (a) If fan does not operate at high speed, perform Steps (3) and (4) below and go to Step 5 of this Fault.
  (b) If fan operates at high speed, perform Steps (3) and (4) below and go to Step 3 of this Fault.
(3) Turn OFF ENGINE switch.
(4) Connect hose 2777 to LHS control box.



6. FAN DOES NOT OPERATE AT HIGH SPEED (CONT).



WARNING

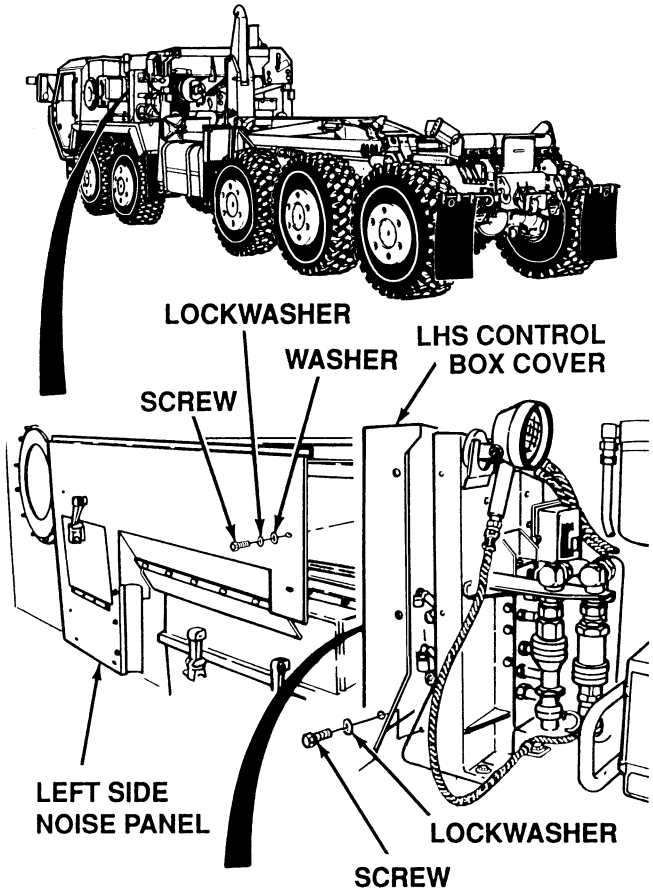
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

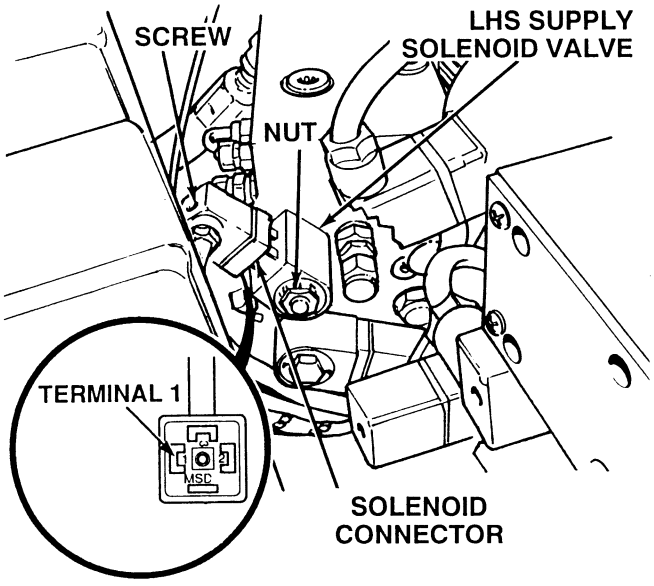
NOTE

Only remove center screw on engine side of LHS control box cover.

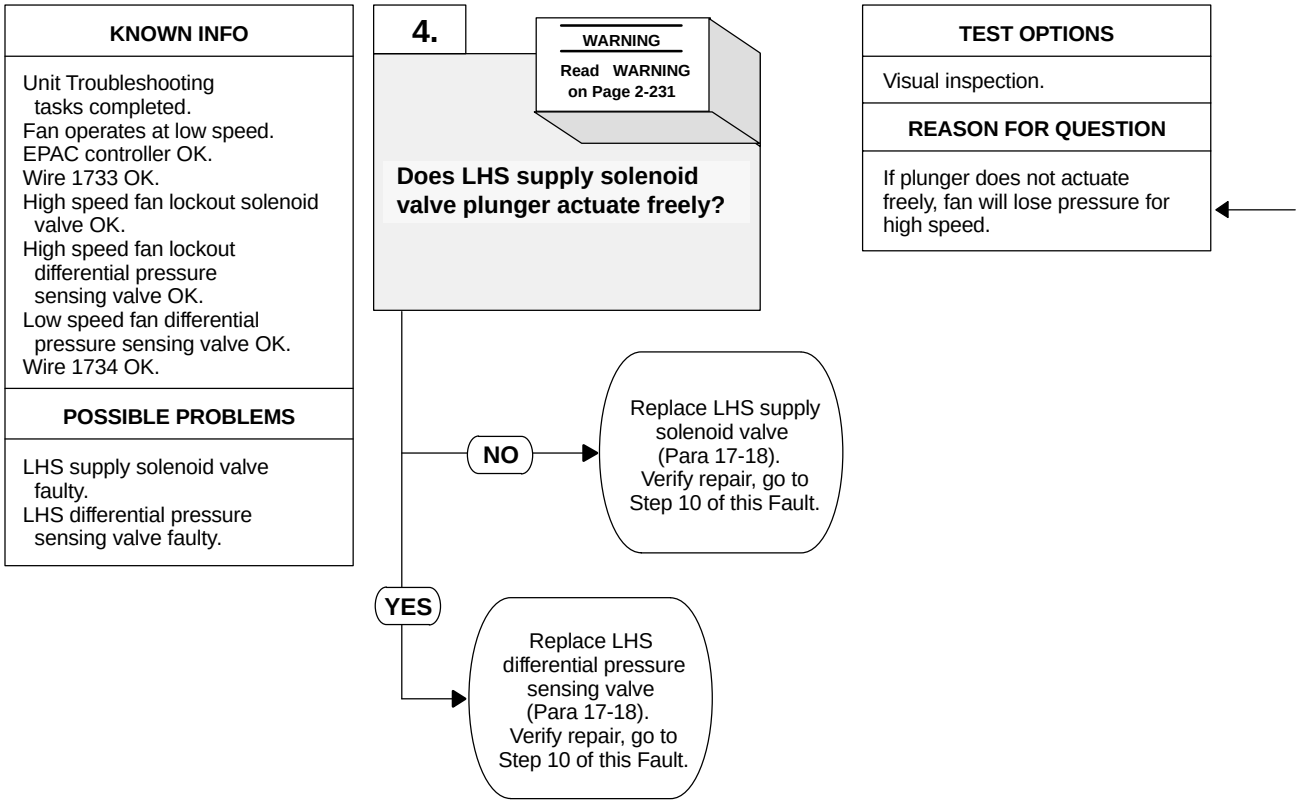
VOLTAGE TEST

(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(3) Loosen screw and disconnect solenoid connector.
(4) Set multimeter select switch to volts dc.
(5) Connect positive (+) multimeter lead to solenoid connector, terminal 1.
(6) Connect negative (–) multimeter lead to a known good ground.
(7) Turn ON ENGINE switch (TM 9-2320-364-10).
  (a) If 22 to 28 vdc are not present, wire 1734 is OK. Turn OFF ENGINE switch and go to Step 4 of this Fault.
  (b) If 22 to 28 vdc are present, turn OFF ENGINE switch and repair wire 1734 (see schematic Fig 2-3) or replace chassis wire harness (Para 6-29).





6. FAN DOES NOT OPERATE AT HIGH SPEED (CONT).



WARNING

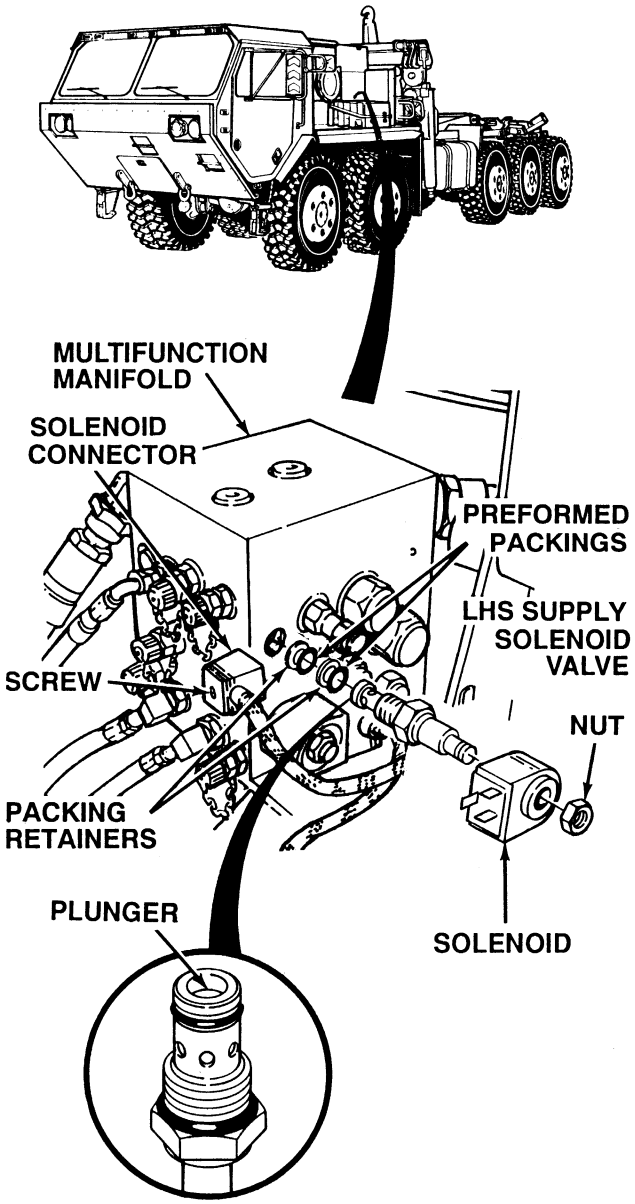
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Adhesive, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove nut and solenoid.
(2) Remove LHS supply solenoid valve.
(3) Remove and discard two preformed packings and packing retainers.
(4) Push plunger inside valve with a non-metallic probe.
  (a) If plunger sticks or does not move freely up and down, replace solenoid valve (Para 17-18).
  (b) If plunger moves freely up and down, solenoid valve is OK.
(5) Lubricate two preformed packings and packing retainers with hydraulic oil and install on solenoid valve.
(6) Install LHS supply solenoid valve.
(7) Install solenoid and nut.
(8) Connect solenoid connector.
(9) Tighten connector screw and coat head of connector screw with sealing compound.



6. FAN DOES NOT OPERATE AT HIGH SPEED (CONT).

KNOWN INFO

Unit Troubleshooting tasks completed.
Fan operates at low speed.
EPAC controller OK.
Wire 1734 OK.
LHS supply solenoid valve OK.
LHS differential pressure sensing valve OK.

POSSIBLE PROBLEMS

Wire 1733 faulty.
High speed fan lockout solenoid valve faulty.
High speed fan lockout differential pressure sensing valve faulty.
Low speed fan differential pressure sensing valve faulty.

5.

WARNING

Read WARNING on Page 2-233

Are 22 to 28 vdc measured on wire 1733 at high speed fan lockout solenoid connector, terminal 2 with hydraulic selector switch off?

NO → Go to Step 6 of this Fault.

YES → Repair wire (see schematic Fig 2-3) or replace chassis wire harness (Para 6-29). Verify repair, go to Step 10 of this Fault.

TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

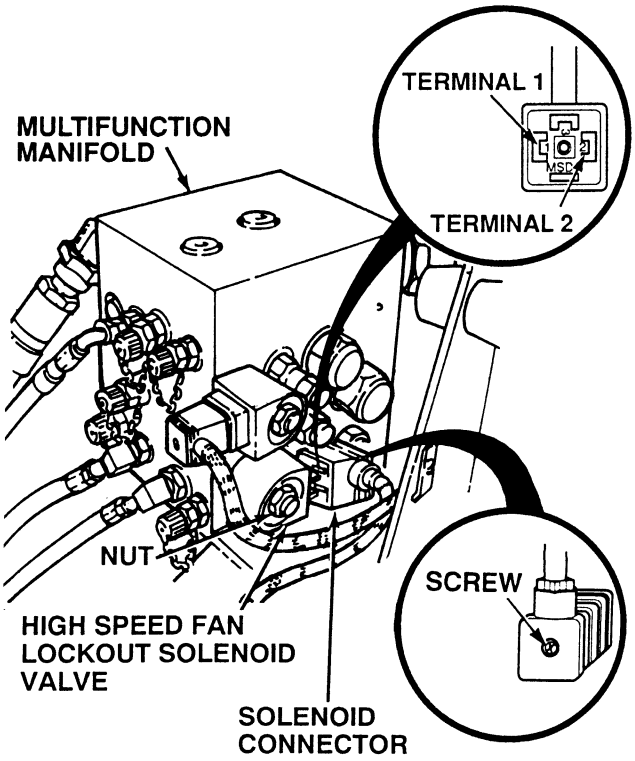
If 22 to 28 vdc are present, wire 1733 is shorted and fan will not operate at high speed.

WARNING

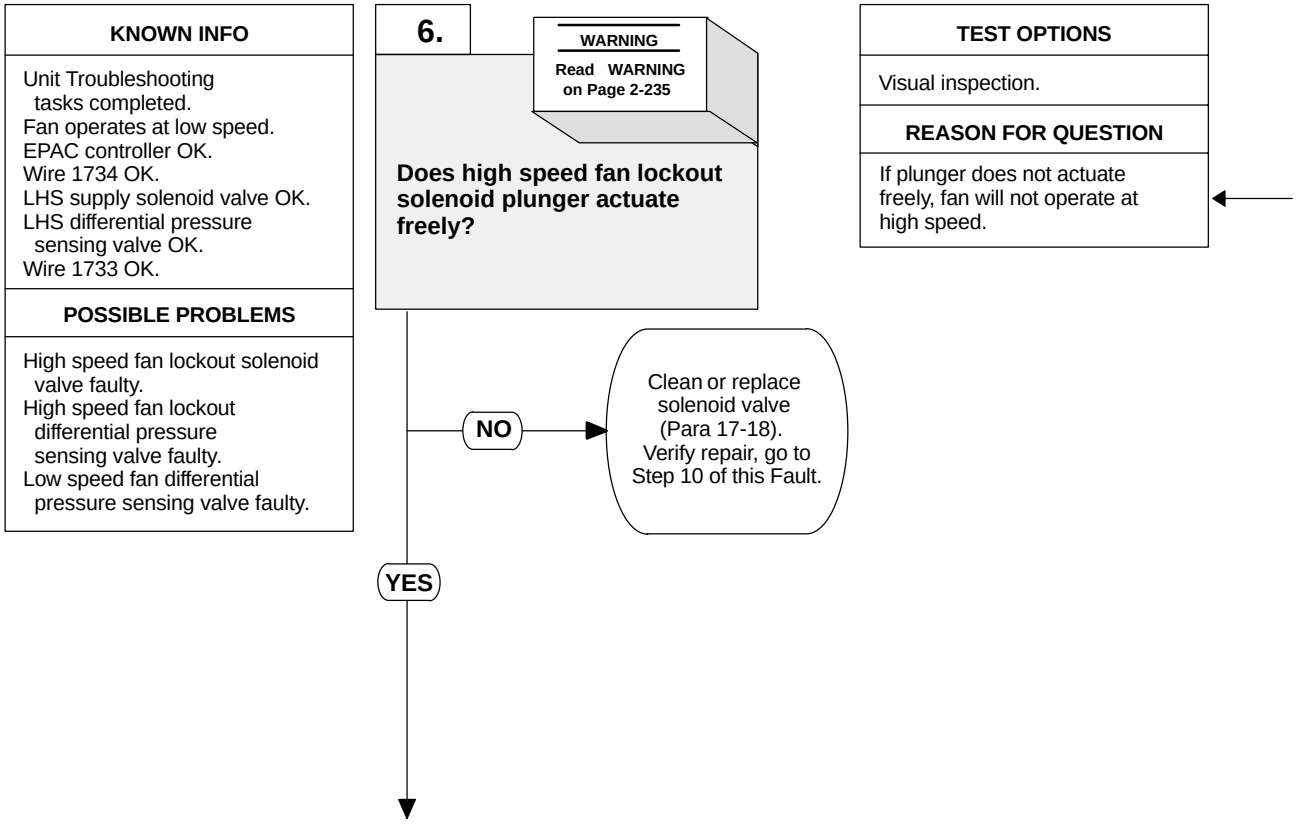
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.

VOLTAGE TEST

(1) Loosen screw and disconnect solenoid connector from high speed fan lockout solenoid valve.
(2) Set multimeter select switch to volts dc.
(3) Connect positive (+) multimeter lead to wire 1733 at connector, terminal 2.
(4) Connect negative (–) multimeter lead to a known good ground.
(5) Check to ensure hydraulic selector switch is OFF.
(6) Turn ON ENGINE switch (TM 9-2320-364-10).
    (a) If 22 to 28 vdc are not present, wire 1733 is OK. Turn OFF ENGINE switch and go to Step 6 of this Fault.
    (b) If 22 to 28 vdc are present, turn OFF ENGINE switch and repair wire 1733 (see schematic Fig 2-3) or replace chassis wire harness (Para 6-29).



6. FAN DOES NOT OPERATE AT HIGH SPEED (CONT).



WARNING

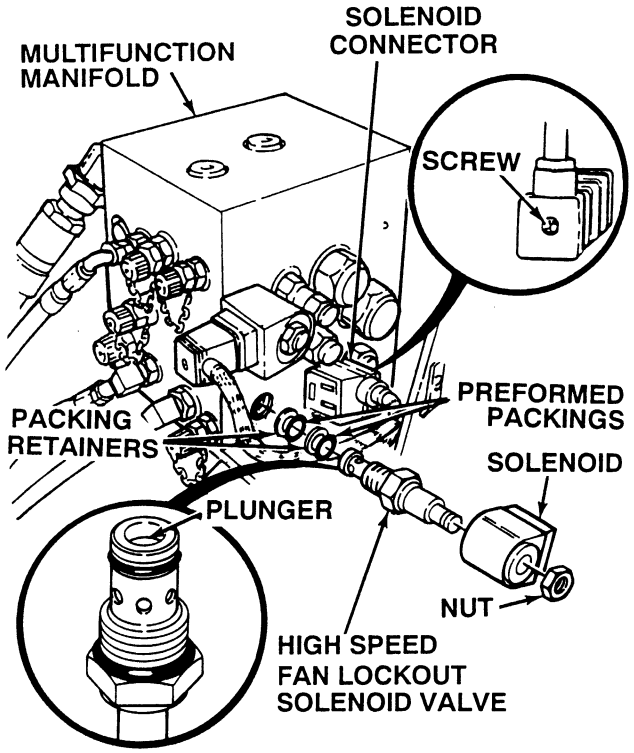
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Adhesive, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove nut and solenoid.
(2) Remove high speed fan lockout solenoid valve from multifunction manifold.
(3) Remove and discard two preformed packings and packing retainers.
(4) Push plunger inside valve with a non-metallic probe.
  (a) If plunger sticks or does not move freely up and down, replace solenoid valve (Para 17-18).
  (b) If plunger moves freely up and down, solenoid valve is OK.
(5) Lubricate two preformed packings and packing retainers with hydraulic oil and install on solenoid valve.
(6) Install high speed fan lockout solenoid valve.
(7) Install solenoid and nut.
(8) Connect solenoid connector.
(9) Tighten connector screw and coat head of connector screw with sealing compound.



6. FAN DOES NOT OPERATE AT HIGH SPEED (CONT).

KNOWN INFO

Unit Troubleshooting tasks completed.
Fan operates at low speed.
EPAC controller OK.
Wire 1734 OK.
LHS supply solenoid valve OK.
LHS differential pressure sensing valve OK.
Wire 1733 OK.
High speed fan lockout solenoid valve OK.

POSSIBLE PROBLEMS

High speed fan lockout differential pressure sensing valve faulty.
Low speed fan differential pressure sensing valve faulty.

7.

WARNING
Read WARNING on Page 2-237

Is high speed fan lockout differential pressure sensing valve free of dirt, clogging and damage?

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If fan differential pressure sensing valve is blocked or faulty, fan will not operate at high speed.

NO → Replace valve (Para 17-18). Verify repair, go to Step 10 of this Fault.

YES

KNOWN INFO

Unit Troubleshooting tasks completed.
Fan operates at low speed.
EPAC controller OK.
Wire 1734 OK.
LHS supply solenoid valve OK.
LHS differential pressure sensing valve OK.
Wire 1733 OK.
High speed fan lockout solenoid valve OK.
High speed fan lockout differential pressure sensing valve OK.

POSSIBLE PROBLEMS

Low speed fan differential pressure sensing valve faulty.

8.

WARNING
Read WARNING on Page 2-237

Is low speed fan differential pressure sensing valve free of dirt, clogging and damage?

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If low speed fan valve is blocked or faulty, fan will not operate at high speed.

NO → Replace valve (Para 17-18). Verify repair, go to Step 10 of this Fault.

YES

WARNING

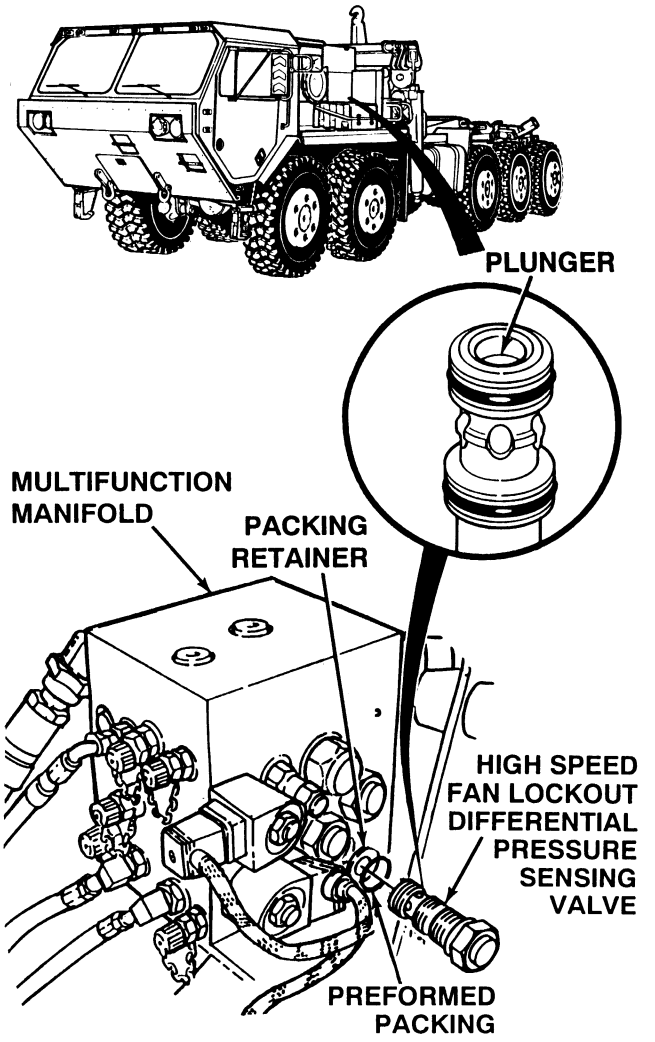
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove high speed fan lockout differential pressure sensing valve from multifunction manifold.
(2) Remove and discard three preformed packings and four packing retainers.
(3) Push plunger inside valve with a non-metallic probe.
  (a) If plunger sticks and does not move freely up and down, replace differential pressure sensing valve (Para 17-18).
  (b) If plunger moves freely up and down, differential pressure sensing valve is OK.
(4) Lubricate three preformed packings and four packing retainers with hydraulic oil and install on valve.
(5) Install high speed fan lockout differential pressure sensing valve.

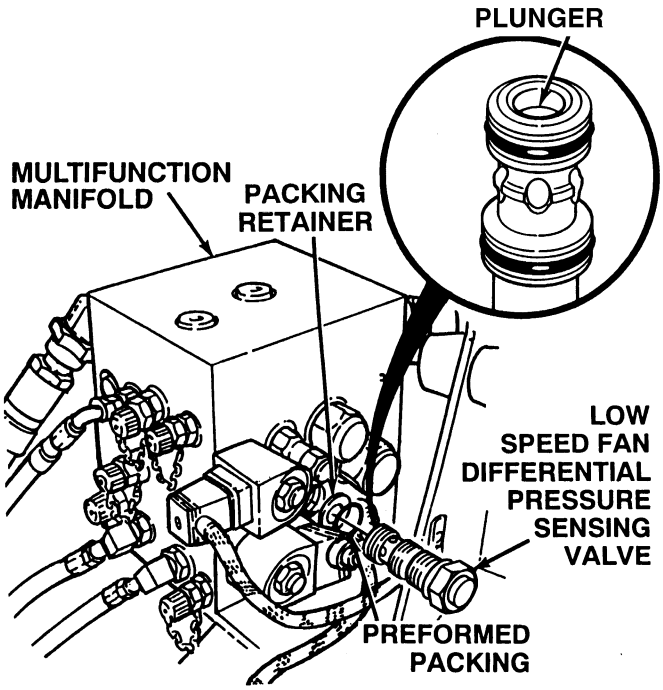


NOTE

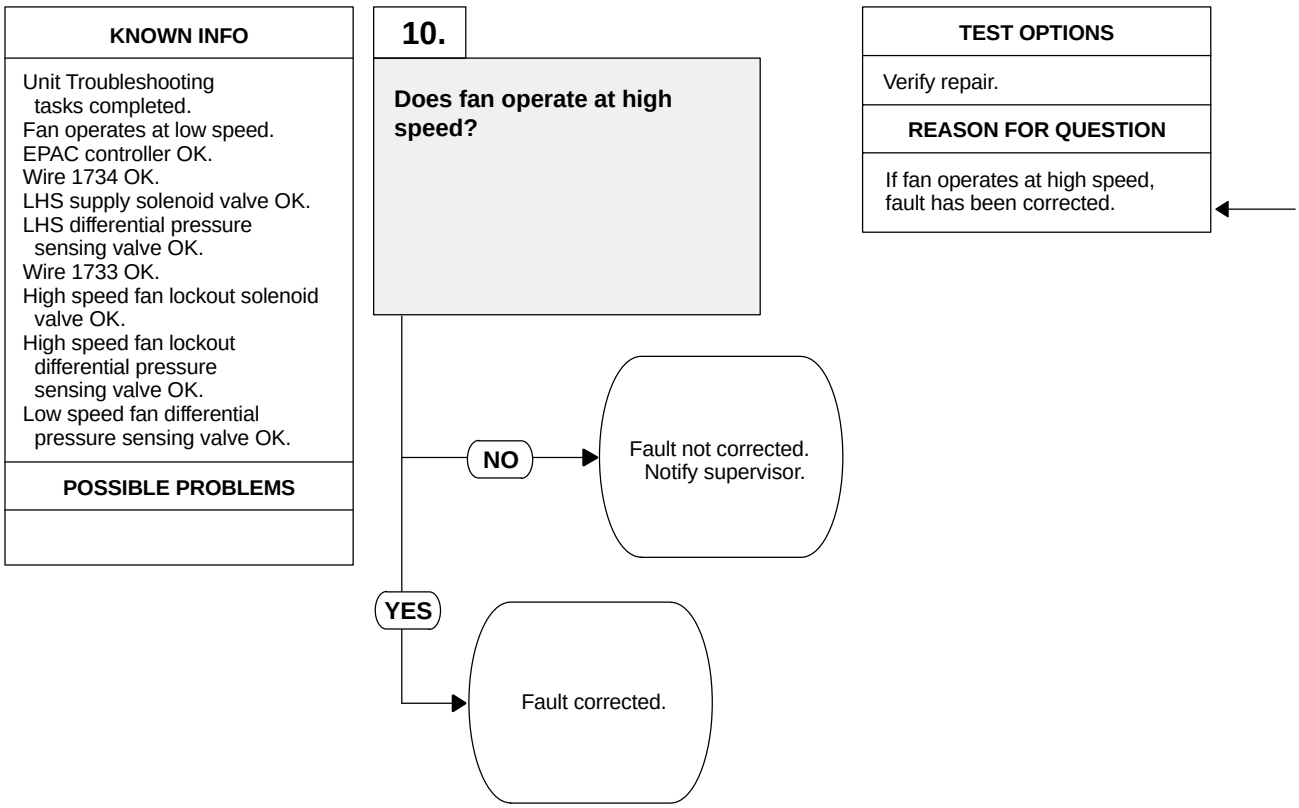
Use drain pan to catch leaking hydraulic oil.

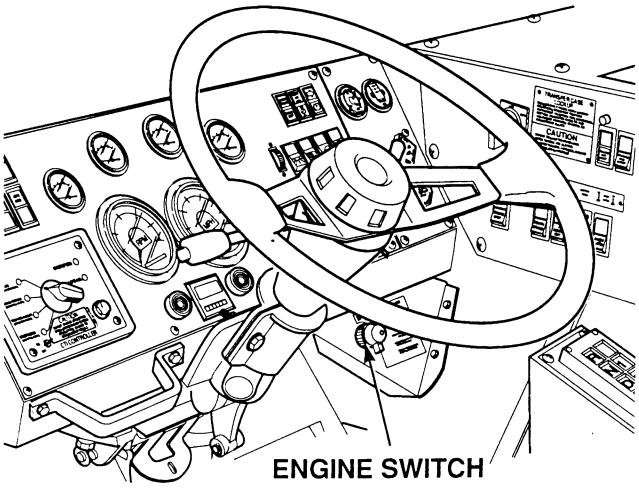
VISUAL INSPECTION

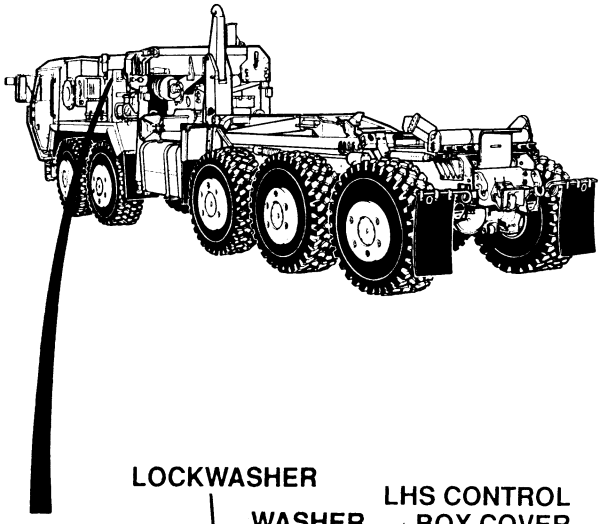
(1) Remove low speed fan differential pressure sensing valve from multifunction manifold.
(2) Remove and discard two packing retainers and five preformed packings.
(3) Push plunger inside valve with a non-metallic probe.
  (a) If plunger sticks and does not move freely up and down, replace differential pressure sensing valve (Para 17-18).
  (b) If plunger moves freely up and down, differential pressure sensing valve is OK.
(4) Lubricate two packing retainers and five preformed packings and install on valve.
(5) Install low speed fan differential pressure sensing valve.

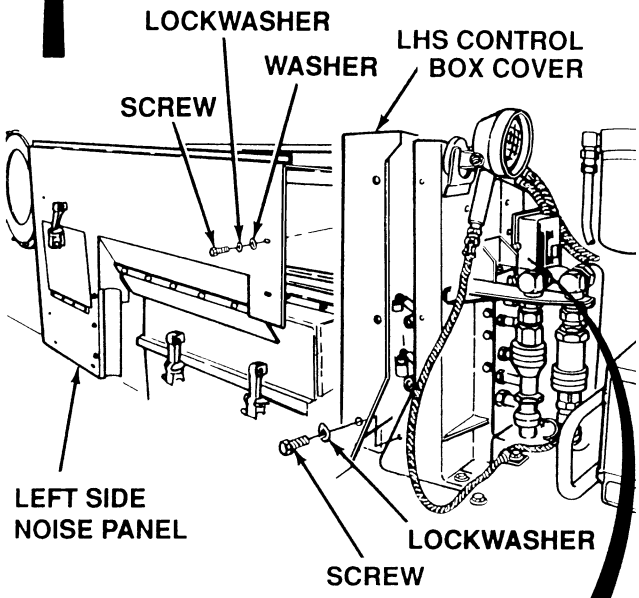


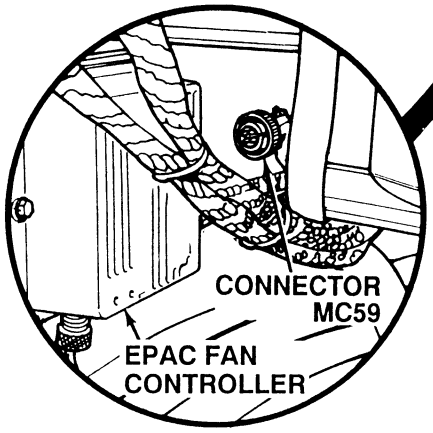
6. FAN DOES NOT OPERATE AT HIGH SPEED (CONT).











VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Inspect fan operation.
  (a) If fan does not operate at high speed, fault not corrected. Perform Steps (4) through (7) below and notify supervisor.
  (b) If fan operates at high speed, fault has been corrected.
(4) Turn OFF ENGINE switch.
(5) Install LHS control box cover, four lockwashers and screws.
(6) Install left side noise panel eight washers, lockwashers and screws.
(7) Connect connector MC59 to EPAC controller.

2-13. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

7. HYDRAULIC SYSTEM OPERATION UNUSUALLY NOISY.

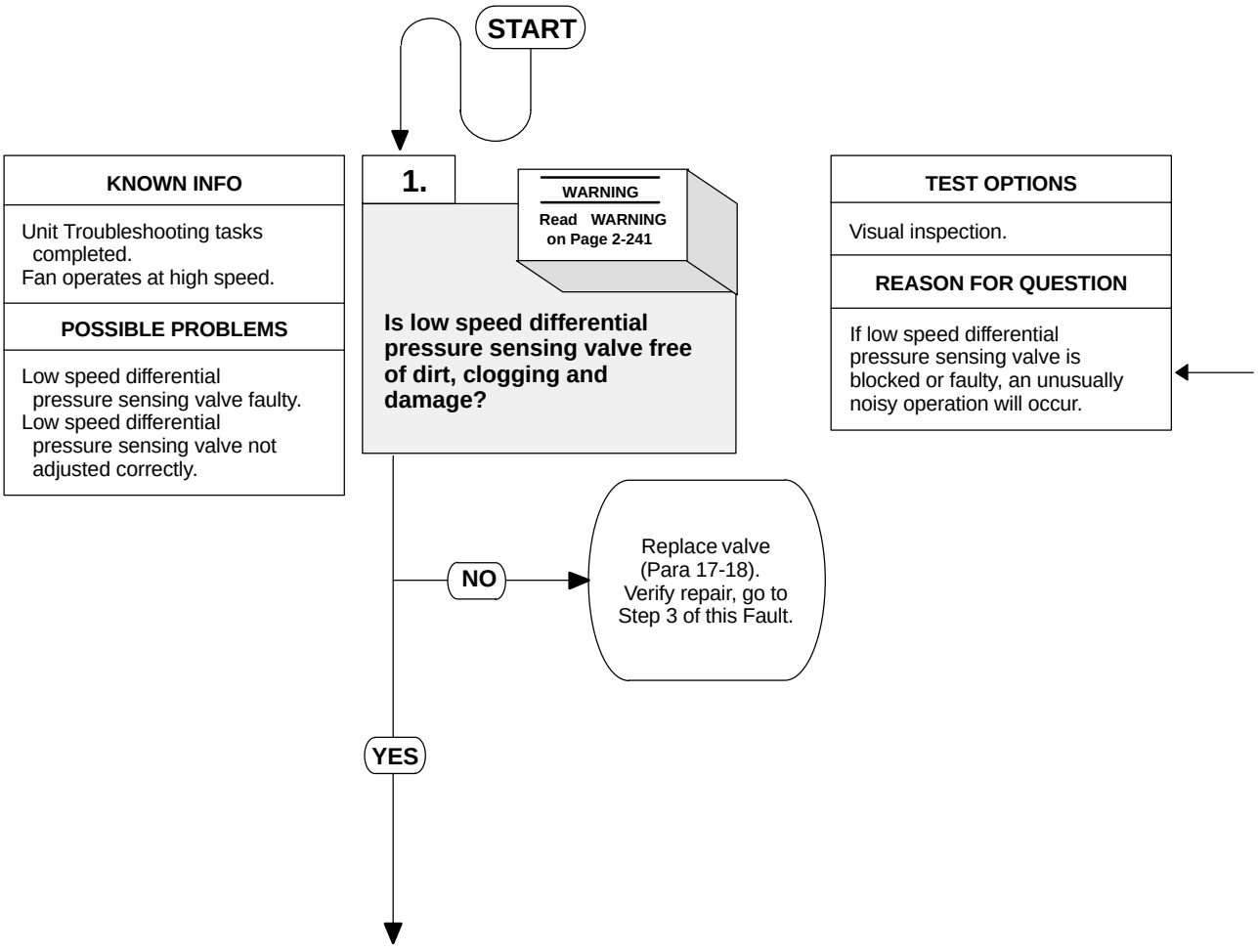
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Pan, Drain 4 Gal (Item 144, Appendix F)

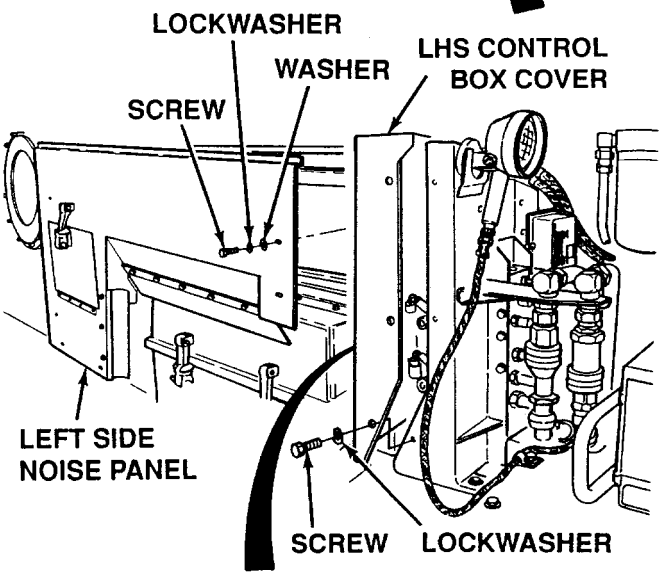
Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Lockwashers (4) (Item 266, Appendix E)
Lockwashers (8) (Item 282, Appendix E)
Parts Kit, Seal (Item 411, Appendix E)

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Coolant temperature at 190°F, (88°C)







WARNING

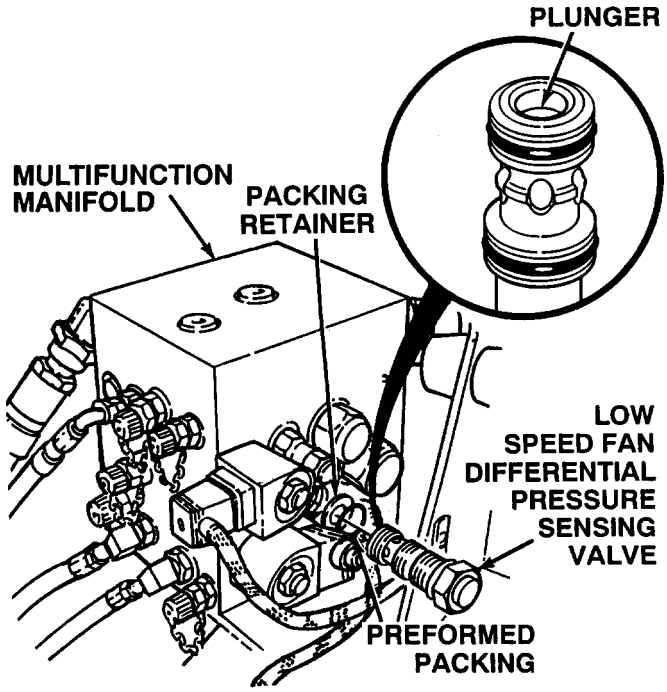
- High pressure hydraulics [oil under 3,675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

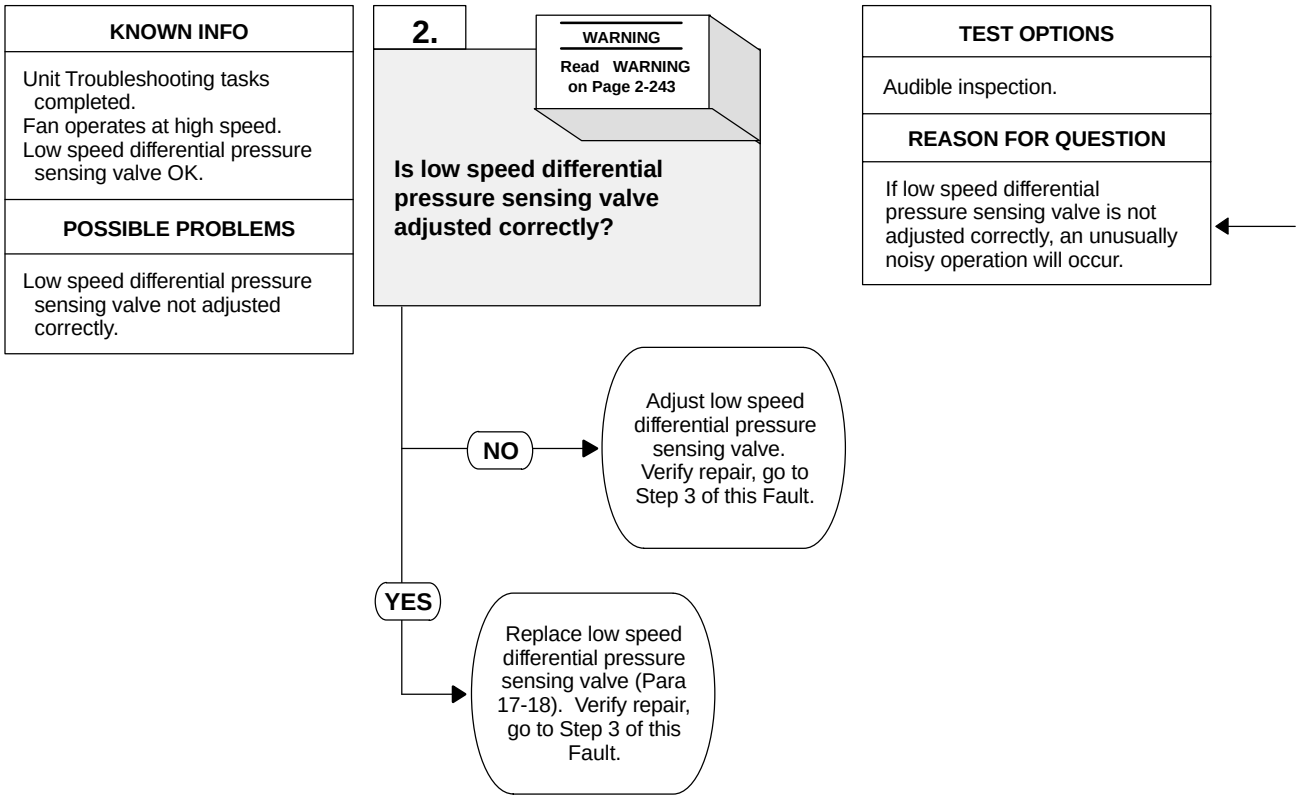
Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(3) Remove low speed differential pressure sensing valve from multifunction manifold.
(4) Remove and discard three preformed packings and four packing retainers.
(5) Push plunger inside valve with a non-metallic probe.
  (a) If plunger sticks and does not move freely up and down, replace differential pressure sensing valve (Para 17-18).
  (b) If plunger moves freely up and down, differential pressure sensing valve is OK.
(6) Lubricate three preformed packings and four packing retainers with hydraulic oil and install on valve.
(7) Install low speed differential pressure sensing valve.



7. HYDRAULIC SYSTEM OPERATION UNUSUALLY NOISY (CONT).

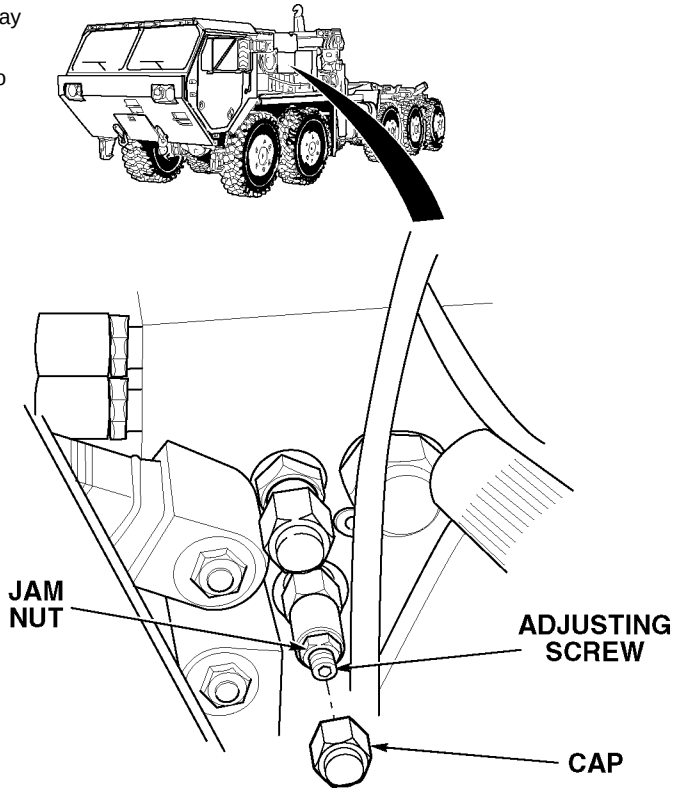


WARNING

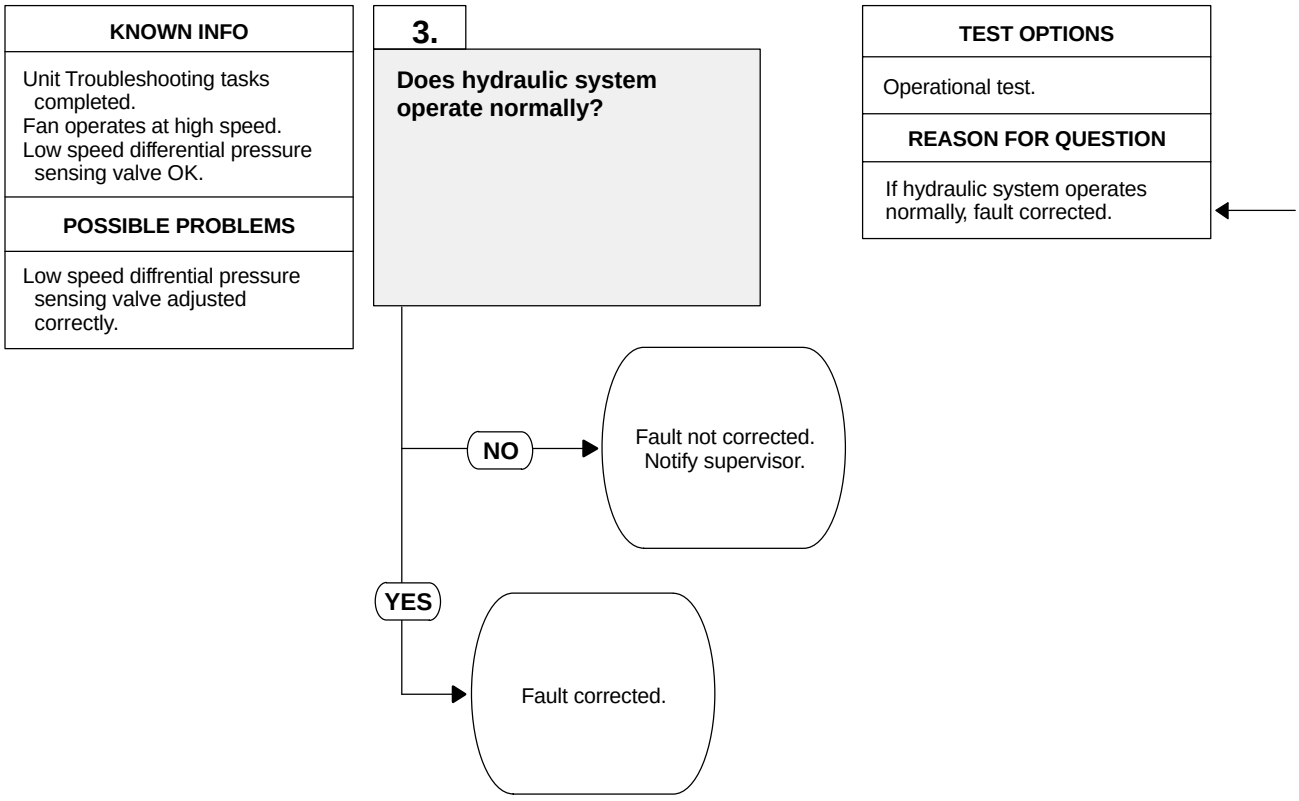
- High pressure hydraulics [oil under 3,675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

AUDIBLE INSPECTION

(1) Remove cap from low speed differential pressure sensing valve.
(2) Start engine, (TM 9-2320-364-10).
(3) Loosen jam nut.
(4) Turn adjustable screw one turn clockwise (maximum of four turns).
  (a) If noise only decreases slightly, valve is not adjusted correctly. Continue adjustment (maximum of four turns) until noise is gone.
  (b) If noise does not decrease, valve is faulty. Replace valve, (Para 17-18).
(5) Tighten jam nut.
(6) Replace cap.
(7) Shut OFF engine.

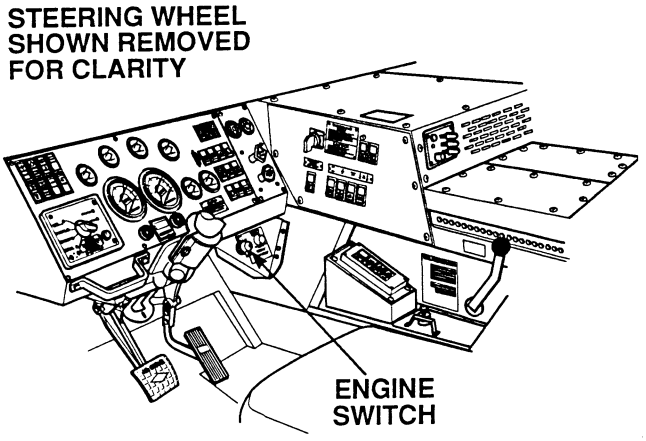


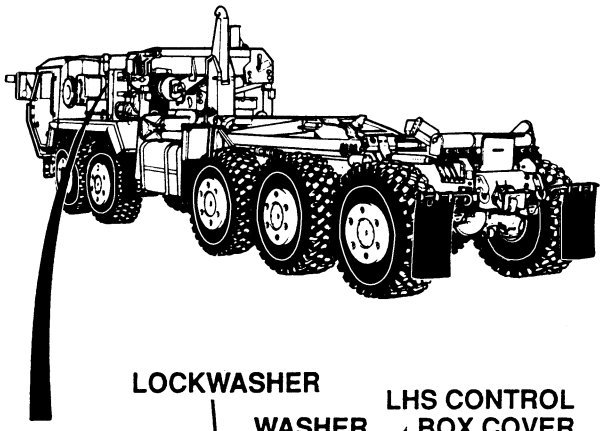
7. HYDRAULIC SYSTEM OPERATION UNUSUALLY NOISY (CONT).

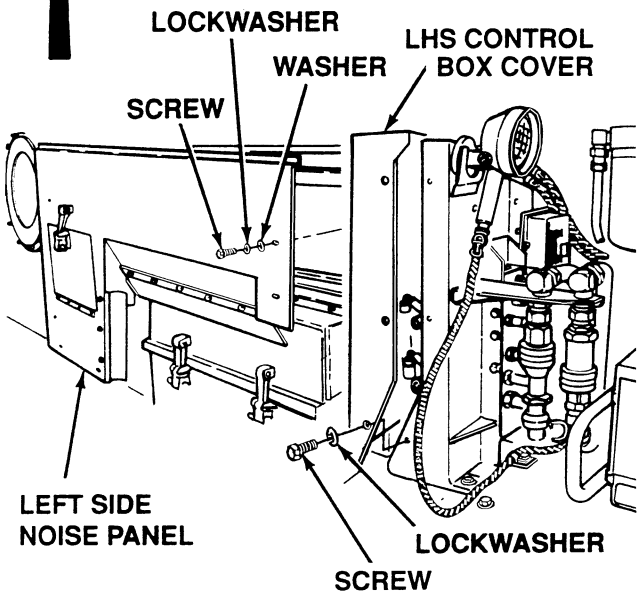


OPERATIONAL TEST

(1) Check hydraulic oil level and add oil as necessary, (TM 9-2320-364-10).
(2) Start engine.
(3) Operate winch.
  (a) If hydraulic system operation is unusually noisy, fault not corrected. Perform Step (4), (5) and (6) below and notify supervisor.
  (b) If hydraulic system operation is normal, fault has been corrected.
(4) Turn OFF engine switch.
(5) Install LHS control box cover and four lockwashers and screws.
(6) Install left side noise panel, eight lockwashers and screws.







2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING.

This paragraph covers Load Handling System (LHS) Troubleshooting. The LHS Fault Index, Table 2-14, lists faults for the LHS of the PLS truck. Refer to schematics, Figures 2-4 through 2-6 when performing tests and corrective actions.

Table 2-14. Load Handling System Fault Index

Fault No.	Description	Page
1.	Loss Of Hook Arm Safe Lowering	2-250
2.	Loss Of Middle Frame Safe Lowering	2-264
3.	Hook Arm Does Not Load	2-270
4.	Hook Arm Does Not Unload	2-286
5.	Loss Of Hook Arm Load Holding	2-302
6.	Middle Frame Does Not Load	2-322
7.	Middle Frame Does Not Unload	2-342
8.	Middle Frame Does Not Operate	2-360
9.	LHS Does Not Operate Or Operates Slowly	2-370
10.	Loss Of Middle Frame Load Holding	2-390
11.	LHS Hook Arm Disengages From Flatrack While Unloading	2-410

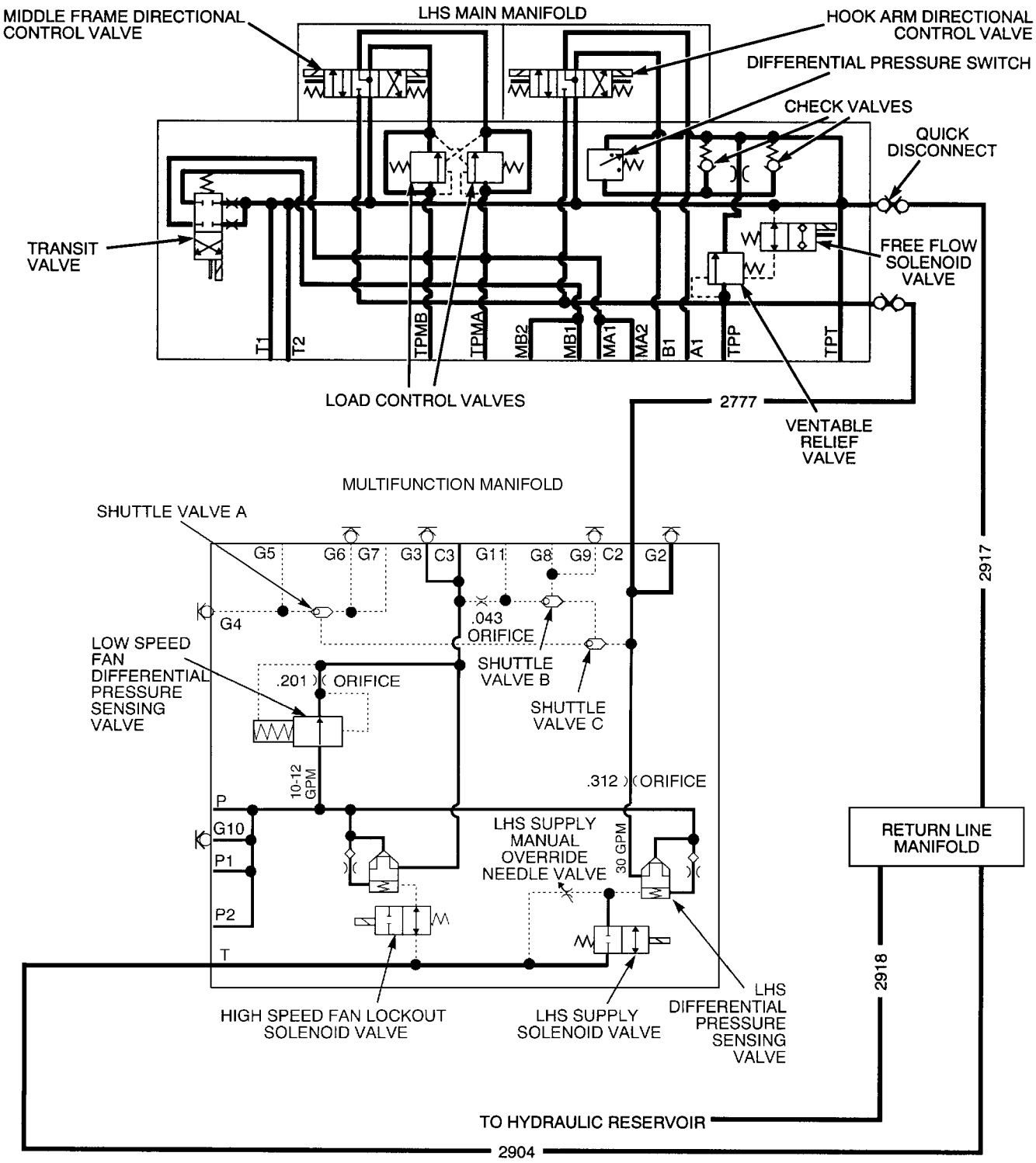


Figure 2-4. LHS Supply Circuit

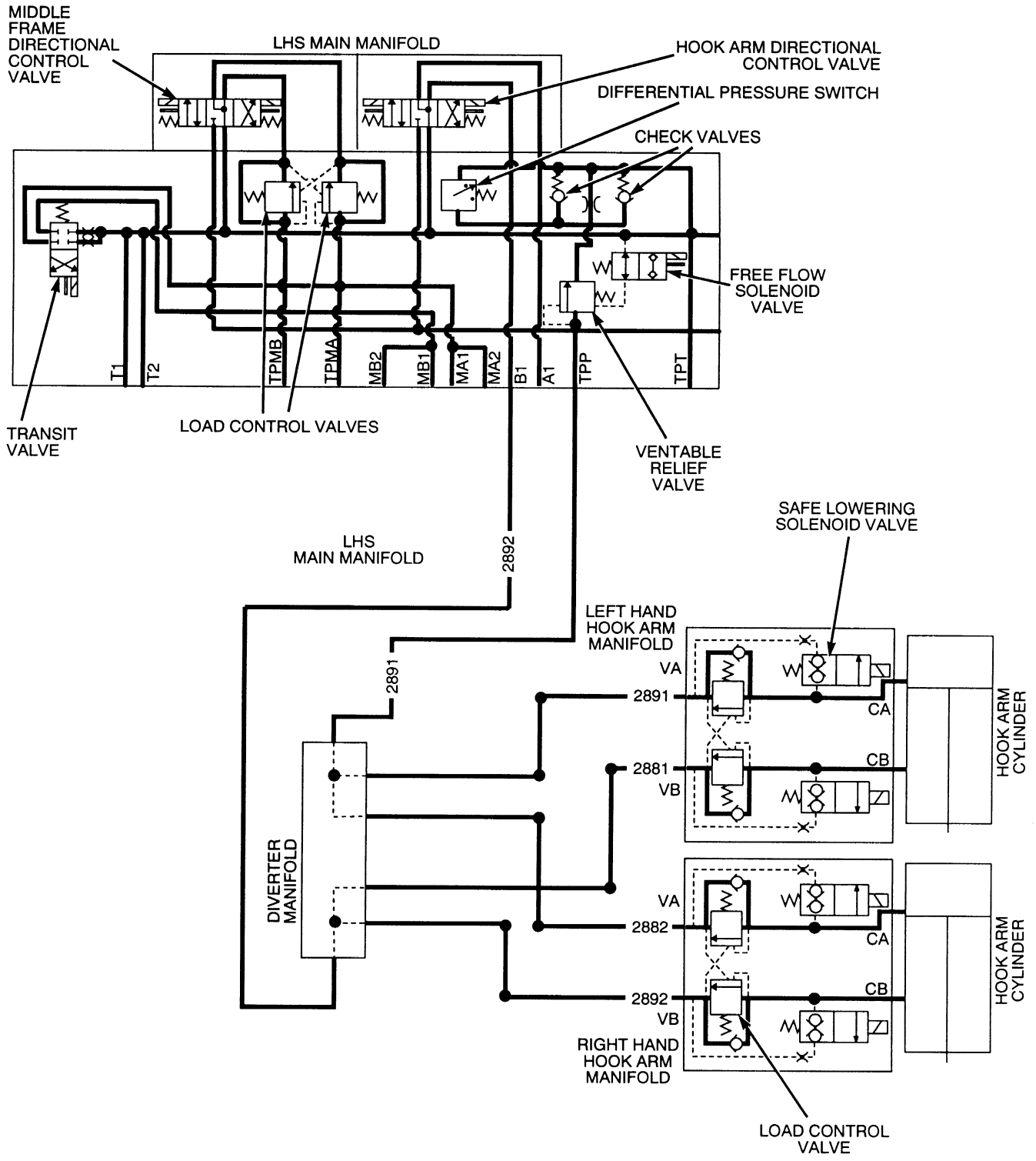


Figure 2-5. LHS Hook Arm Circuit

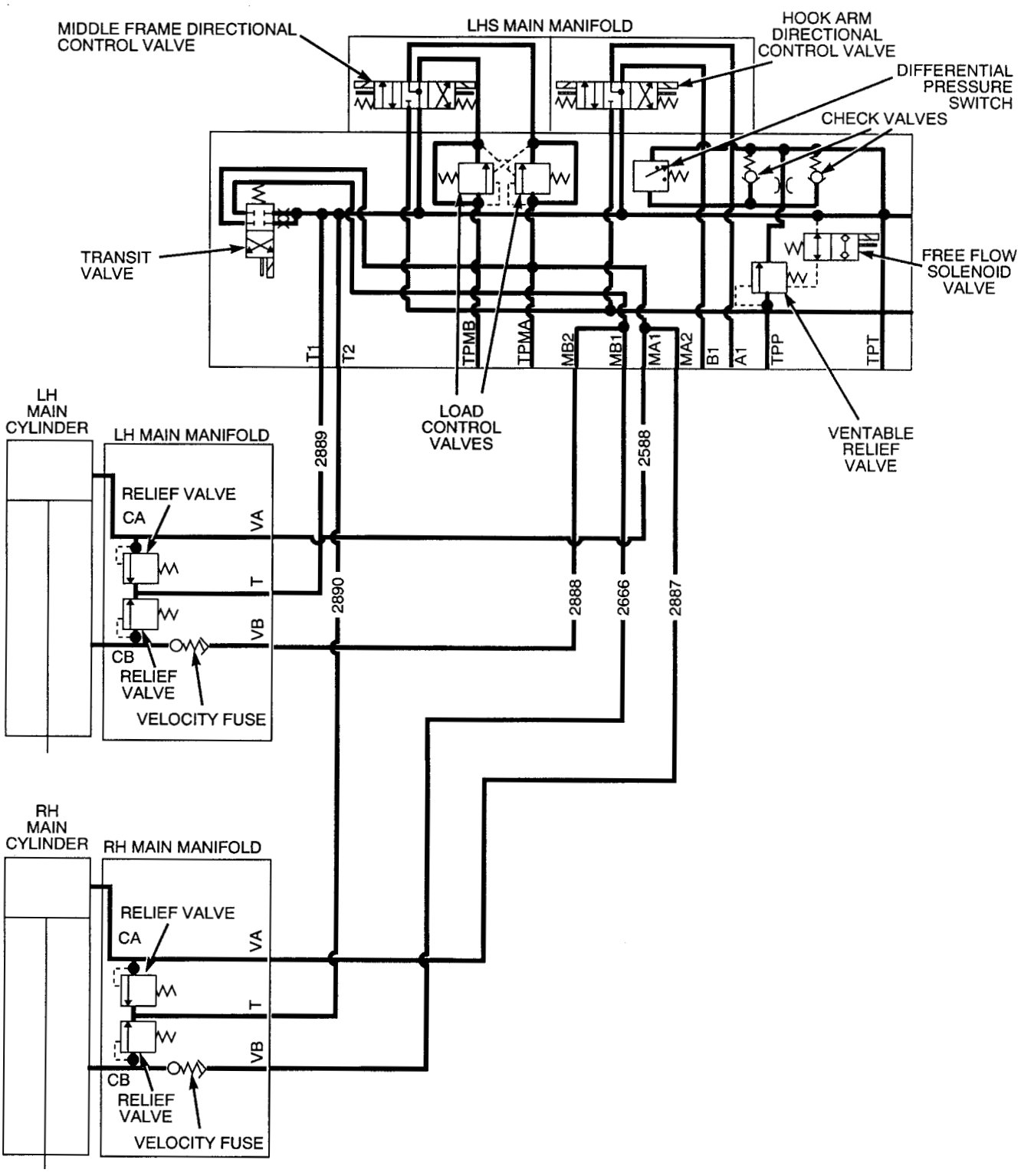


Figure 2-6. LHS Middle Frame Circuit

2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

1. LOSS OF HOOK ARM SAFE LOWERING.

INITIAL SETUP

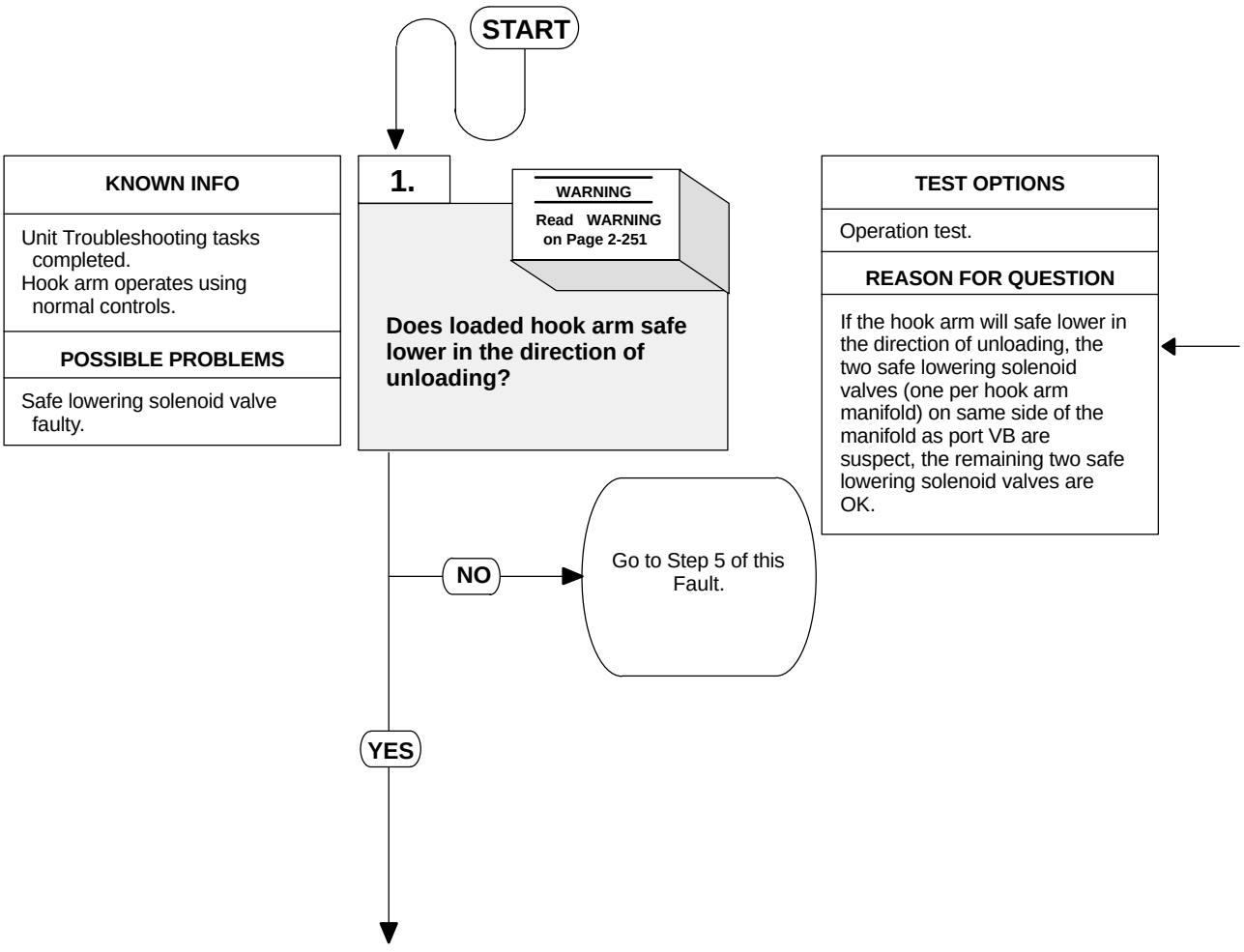
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Jackstand (2) (Item 132, Appendix F)
Wooden Block (2) (Appendix C)
Steel Tube (Appendix C)
Load (500 lb [227 kg] minimum)

Materials/Parts
Sealing Compound (Item 62, Appendix B)
Lockwasher (4) (Item 266, Appendix E)
Packing, Preformed (4) (Item 393, Appendix E)

Personnel Required
Two

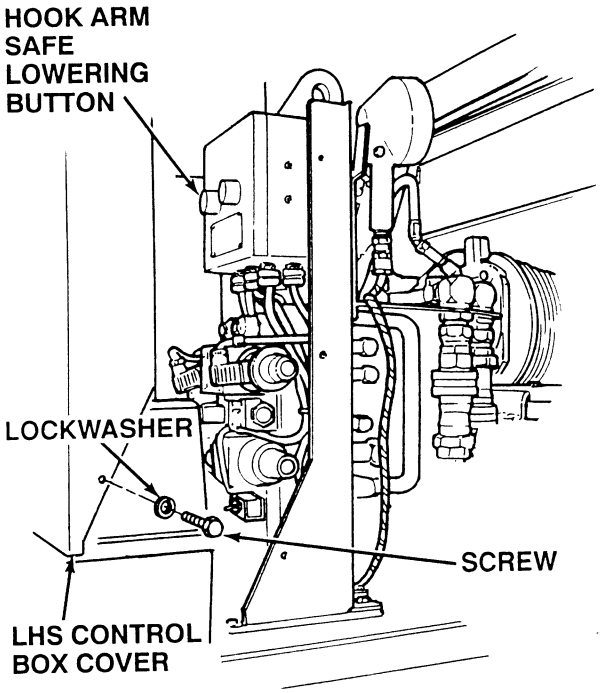
References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

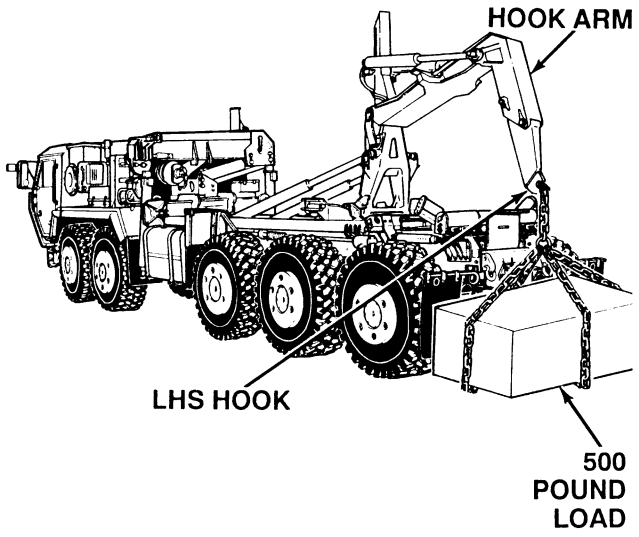


NOTE

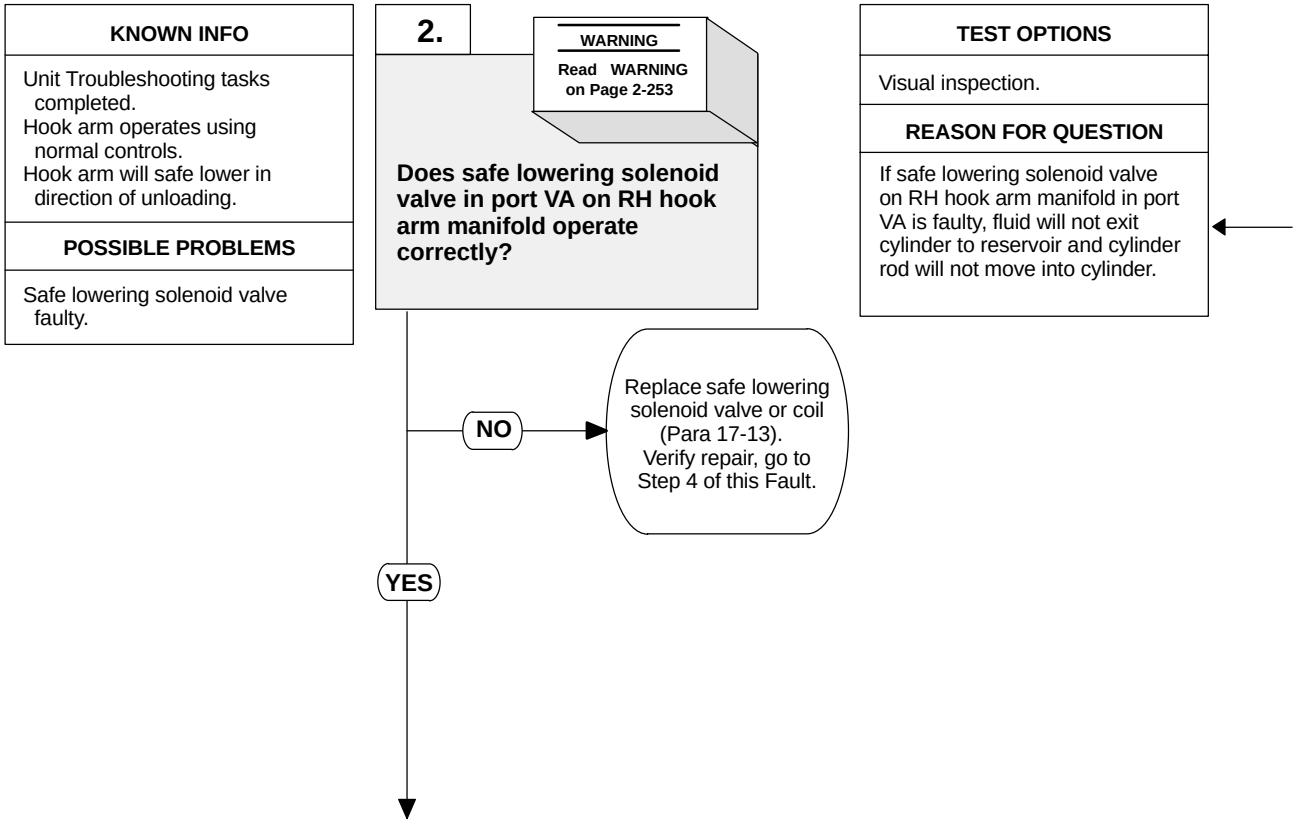
Only remove center screw on engine side of LHS control box cover.

OPERATION TEST

(1) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(2) Position LHS hook to rear of truck (TM 9-2320-364-10).
(3) Attach 500 lb (227 kg) minimum load to hook.
(4) Raise hook arm approximately half of its travel.
(5) Push in hook arm safe lowering button.
    (a) If hook arm does not safe lower, lower load using normal controls, Perform Steps (6) through (9) below and go to Step 5 of this Fault.
    (b) If hook arm does safe lower, perform Steps (6) through (9) below and go to Step 2 of this Fault.
(6) Remove load from hook.
(7) Put LHS in transit position.
(8) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.



1. LOSS OF HOOK ARM SAFE LOWERING (CONT).



WARNING

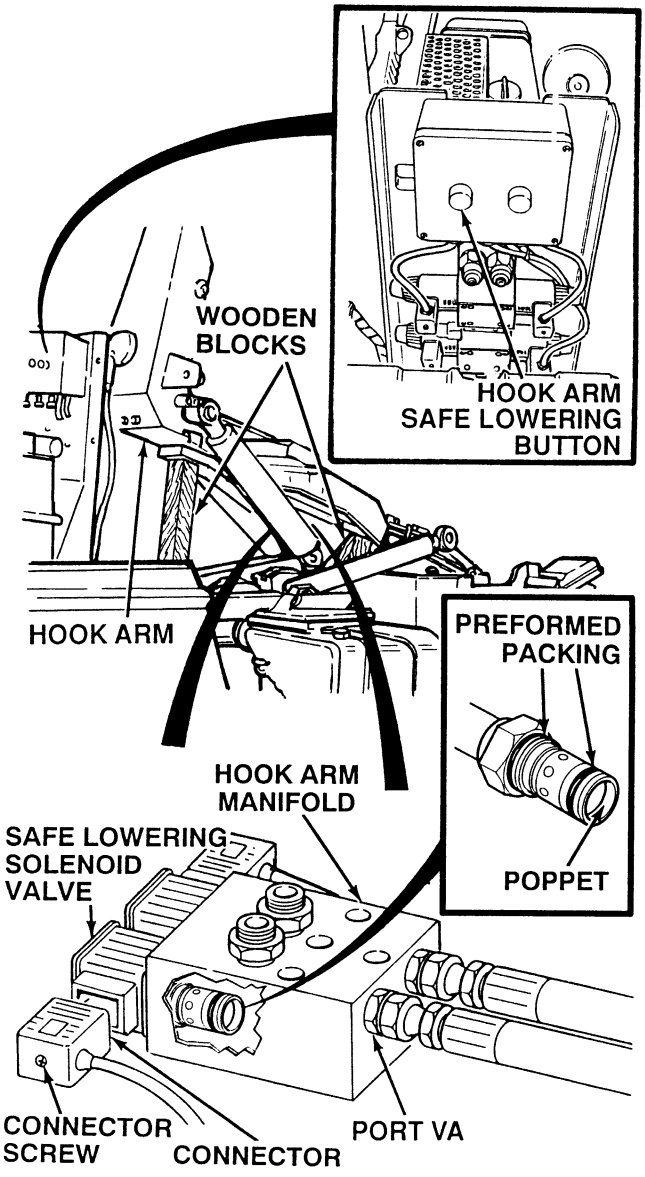
- Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

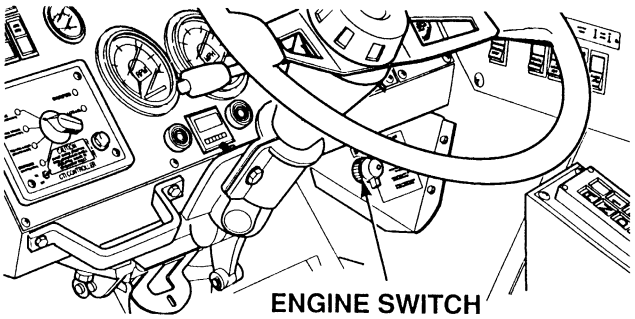
CAUTION

Do not scratch surface of cylinder rod. Damage to cylinder seals could result causing cylinder failure.

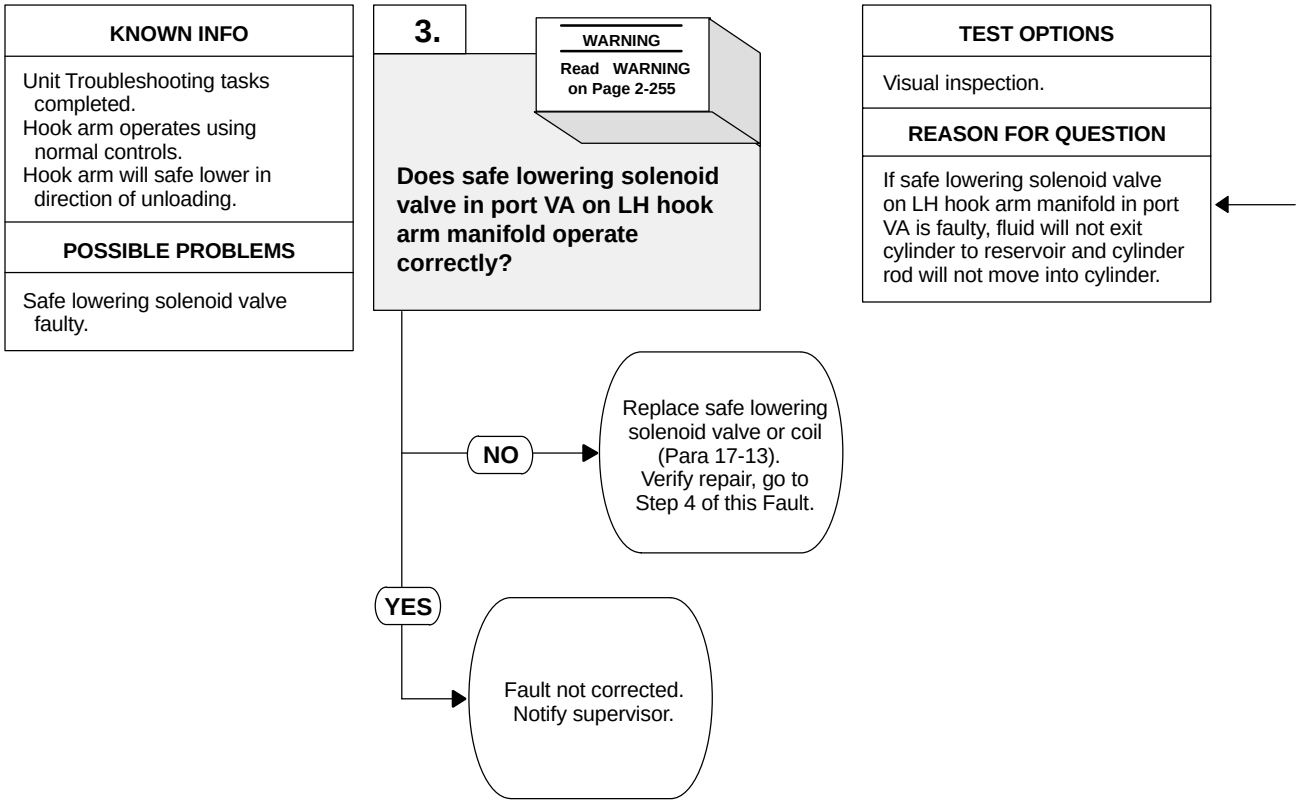
VISUAL INSPECTION

(1) Raise hook arm approximately 24 in. (61 cm) and block into position.
(2) Turn OFF ENGINE switch (TM 9-2320-364-10).
(3) Loosen connector screw and disconnect connector from safe lowering solenoid valve in port VA on RH hook arm manifold.
(4) Remove safe lowering solenoid valve and preformed packings from RH hook arm manifold. Discard preformed packings.
(5) Attempt to push poppet into valve toward solenoid coil.
  (a) If poppet does not move, replace safe lowering solenoid valve (Para 17-13). Perform Step (14) below and go to Step 4 of this Fault.
  (b) If poppet moves, perform Steps (6) through (8) below.
(6) Connect connector to removed safe lowering solenoid valve and tighten connector screw.
(7) Turn ON ENGINE switch.
(8) With the aid of an assistant, hold in safe lowering button and observe the poppet valve.
  (a) If poppet does not move, turn OFF ENGINE switch and replace the solenoid coil (Para 17-13). Perform Step (14) below and go to Step 4 of this Fault.
  (b) If poppet moves, the solenoid coil is OK. Perform Steps (9) through (13) below and go to Step 3 of this Fault.
(9) Turn OFF ENGINE switch.
(10) Disconnect connector from removed safe lowering solenoid valves.
(11) Install safe lowering solenoid valve and preformed packings in port VA on RH hook arm manifold.
(12) Connect connector to safe lowering solenoid valve.
(13) Tighten screw and coat head of screw with sealing compound.
(14) Remove two wooden blocks from hook arm.





1. LOSS OF HOOK ARM SAFE LOWERING (CONT).



WARNING

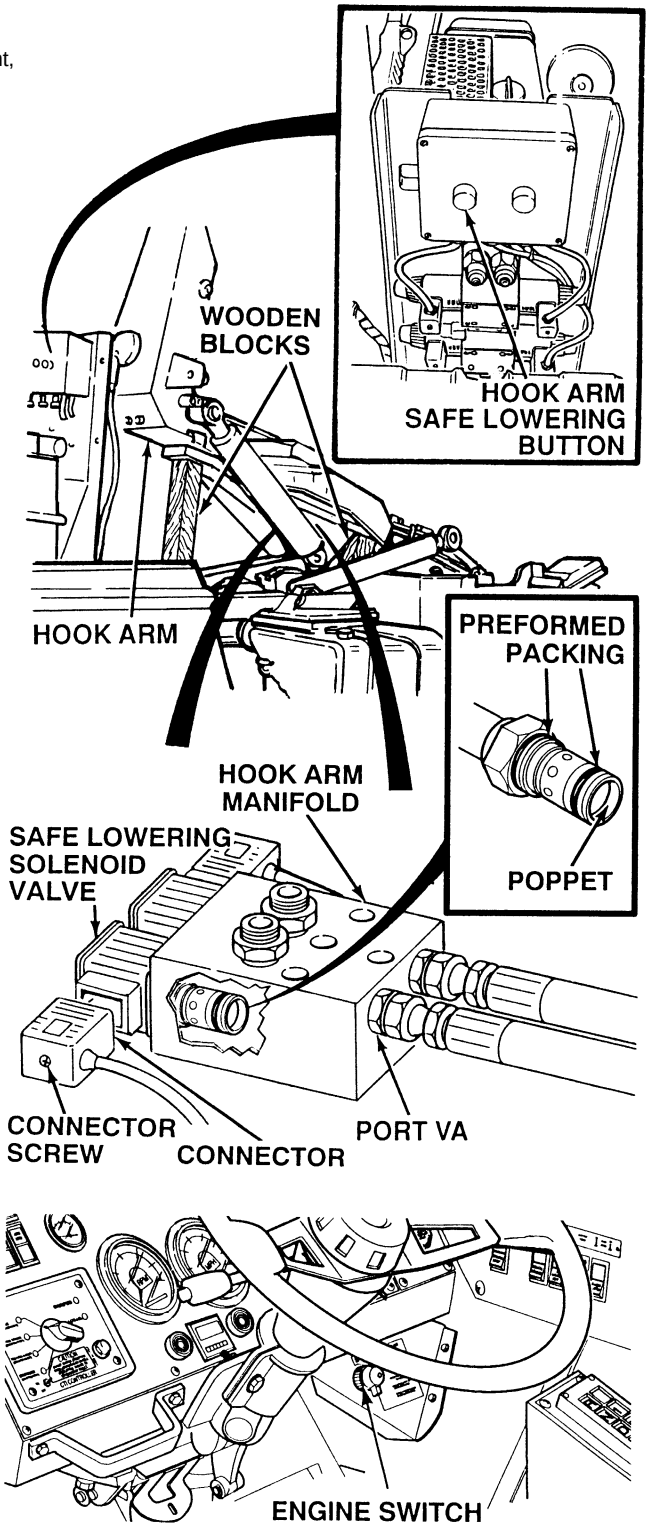
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

CAUTION

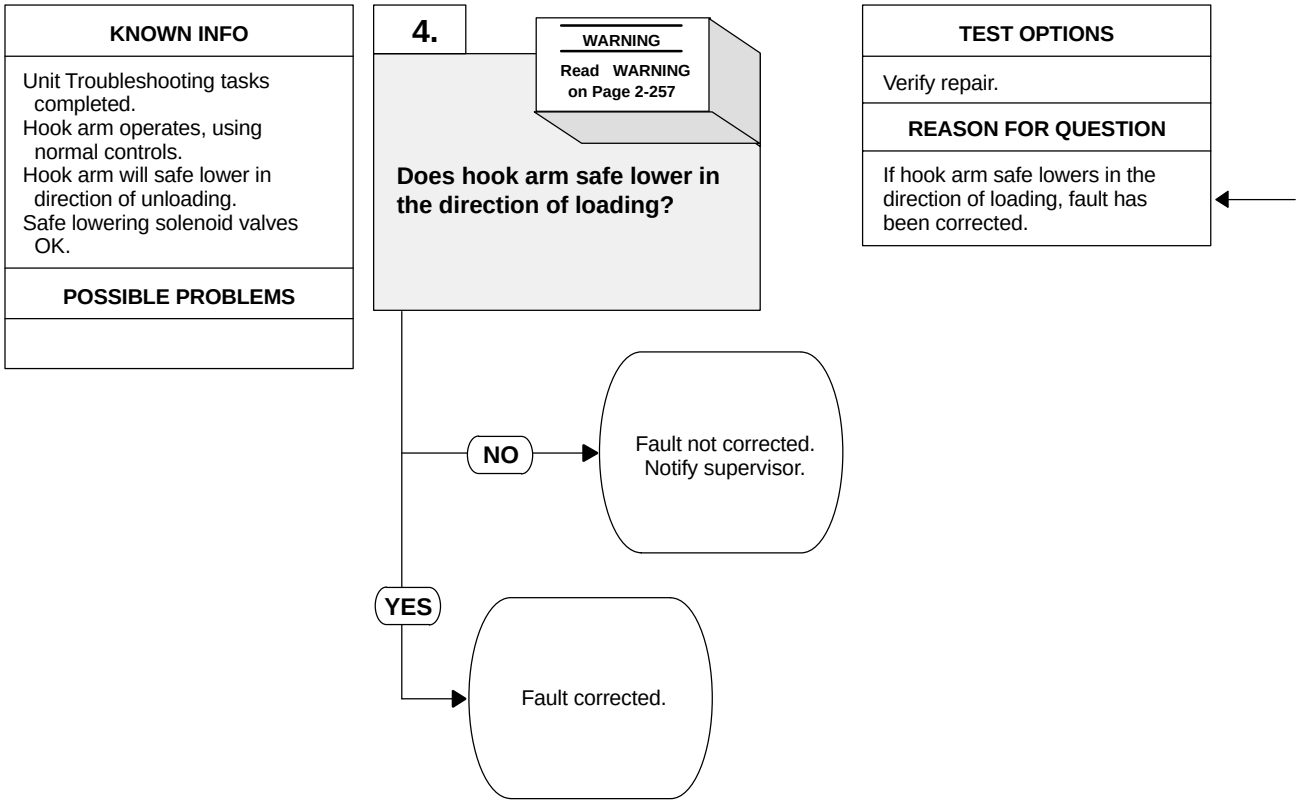
Do not scratch surface of cylinder rod. Damage to cylinder seals could result causing cylinder failure.

VISUAL INSPECTION

(1) Loosen connector screw and disconnect connector from safe lowering solenoid valve in port VA on LH hook arm manifold.
(2) Remove safe lowering solenoid valve and preformed packing from LH hook arm manifold. Discard preformed packing.
(3) Attempt to push poppet into valve toward solenoid coil.
  (a) If poppet does not move, replace safe lowering solenoid valve (Para 17-13). Perform Step (12) below and go to Step 4 of this Fault.
  (b) If poppet moves, perform Steps (4) through (6) below.
(4) Connect connector to removed safe lowering solenoid valve and tighten connector screw.
(5) Turn ON ENGINE switch (TM 9-2320-364-10).
(6) With the aid of an assistant , hold in safe lowering button and observe the poppet valve.
  (a) If poppet does not move, turn OFF ENGINE switch and replace the solenoid coil (Para 17-13). Perform Step (12) below and go to Step (4) of this Fault.
  (b) If poppet moves, fault not corrected. Perform Steps (7) through (12) below and notify supervisor.
(7) Turn OFF ENGINE switch.
(8) Loosen connector screw and disconnect connector from removed safe lowering solenoid valves.
(9) Install safe lowering solenoid valve and preformed packing in port VA on LH hook arm manifold.
(10) Connect connector to safe lowering solenoid valve.
(11) Tighten connector screw and coat head of connector screw with sealing compound.
(12) Remove two wooden blocks from hook arm.



1. LOSS OF HOOK ARM SAFE LOWERING (CONT).

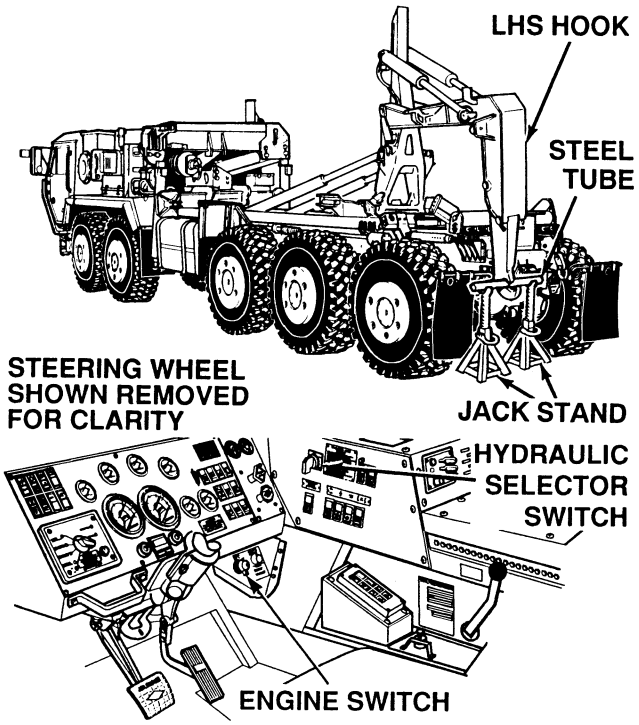


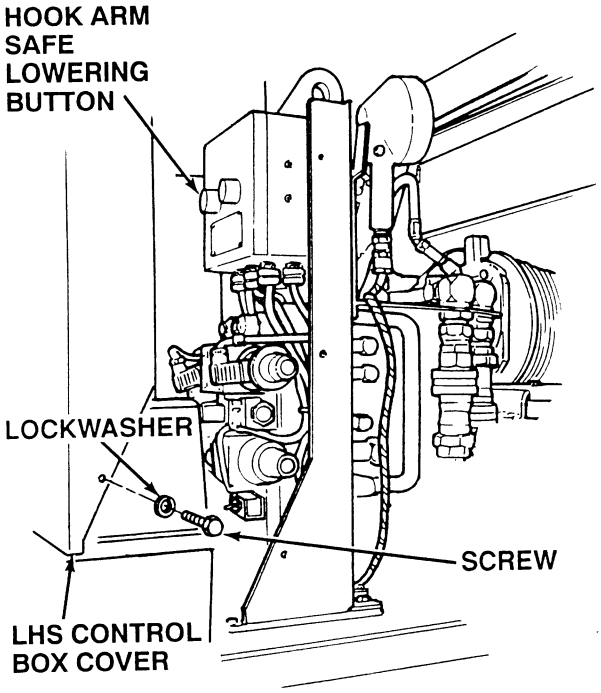
WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

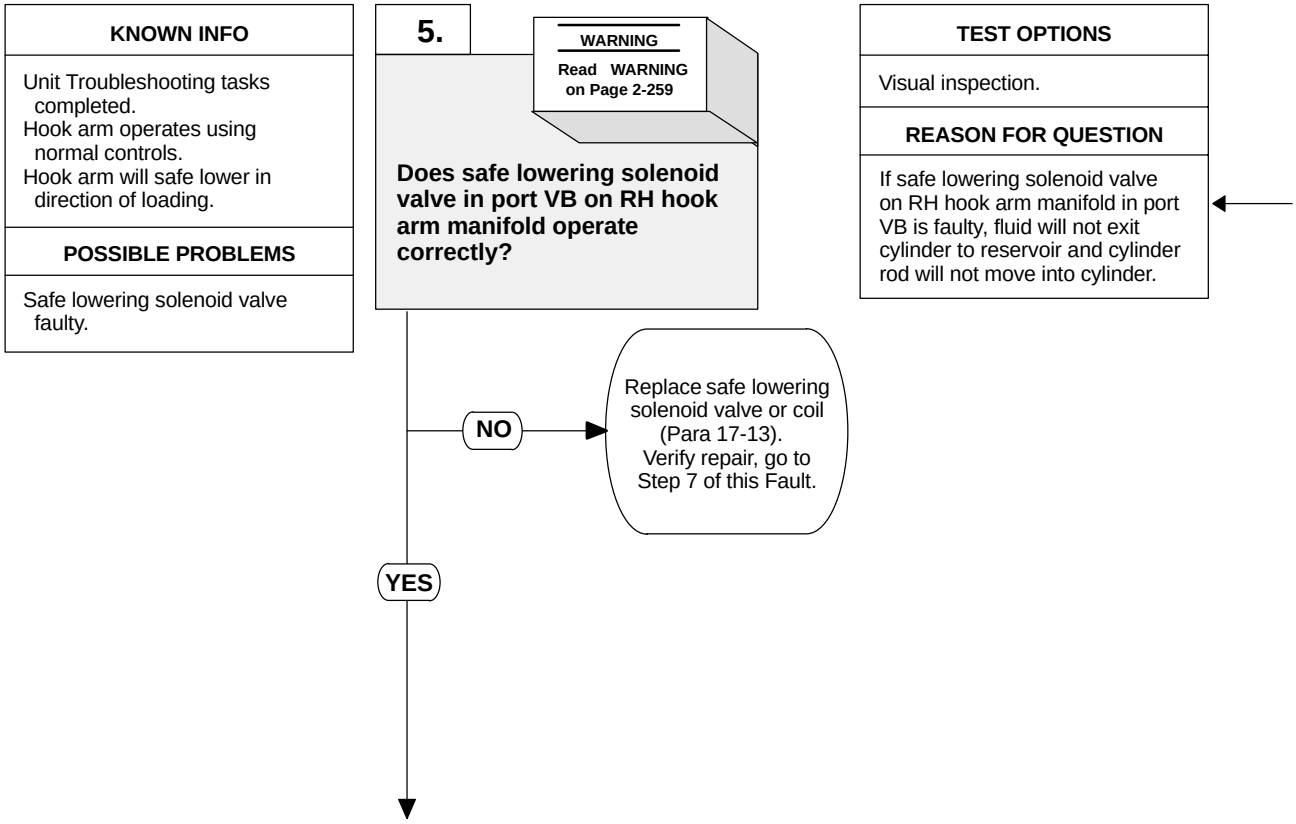
VERIFY REPAIR

(1) Position LHS hook to rear of truck and engage hook on steel tube supported by jackstands.
(2) Using LHS, lift truck only enough to lift vehicle weight off suspension. Do not lift tires off ground.
(3) Push in hook arm safe lowering button.
    (a) If truck does not settle on its suspension, fault not corrected. Perform Steps (4) through (8) and notify supervisor.
    (b) If truck settles on its suspension, fault has been corrected.
(4) Disengage hook from steel tube.
(5) Put LHS in transit position.
(6) Set hydraulic selector switch to OFF position (TM 9-2320-364-10).
(7) Turn OFF ENGINE switch.
(8) Install four screws, lockwashers and LHS control box cover.





1. LOSS OF HOOK ARM SAFE LOWERING (CONT).



WARNING

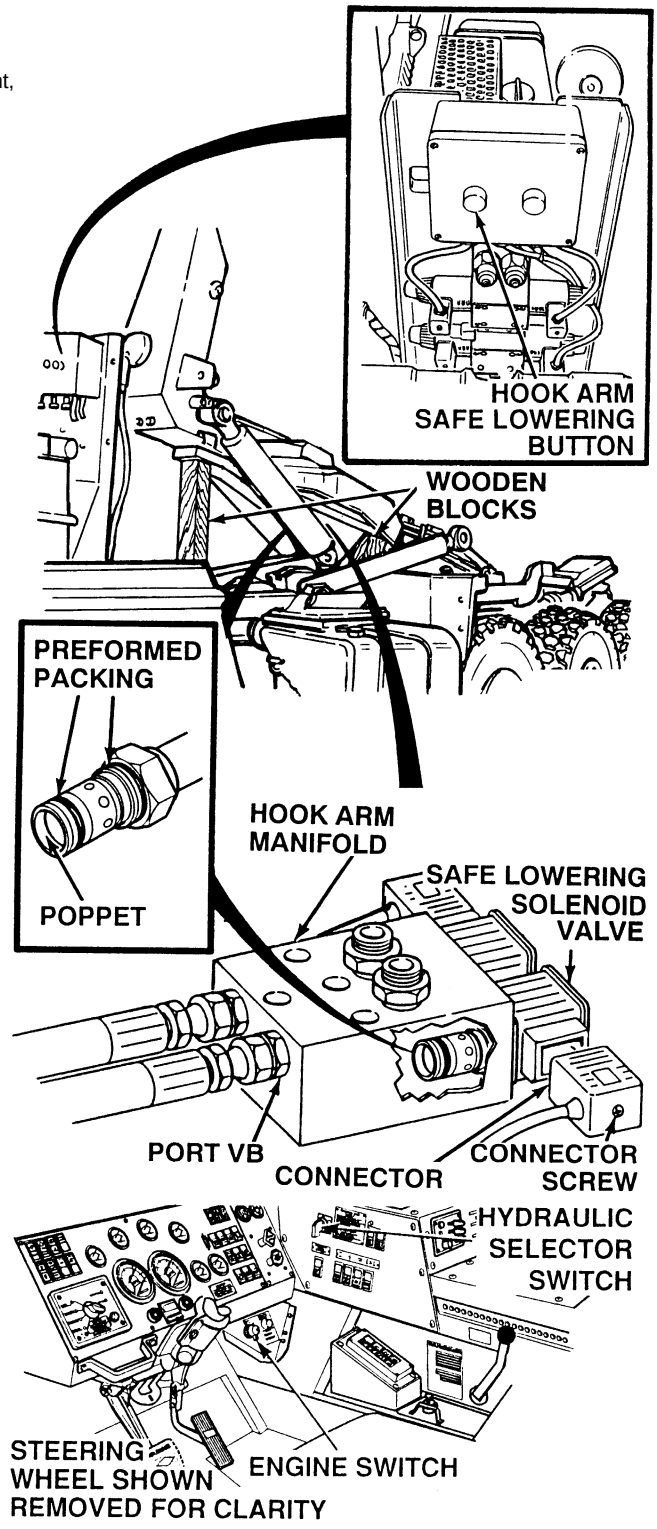
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

CAUTION

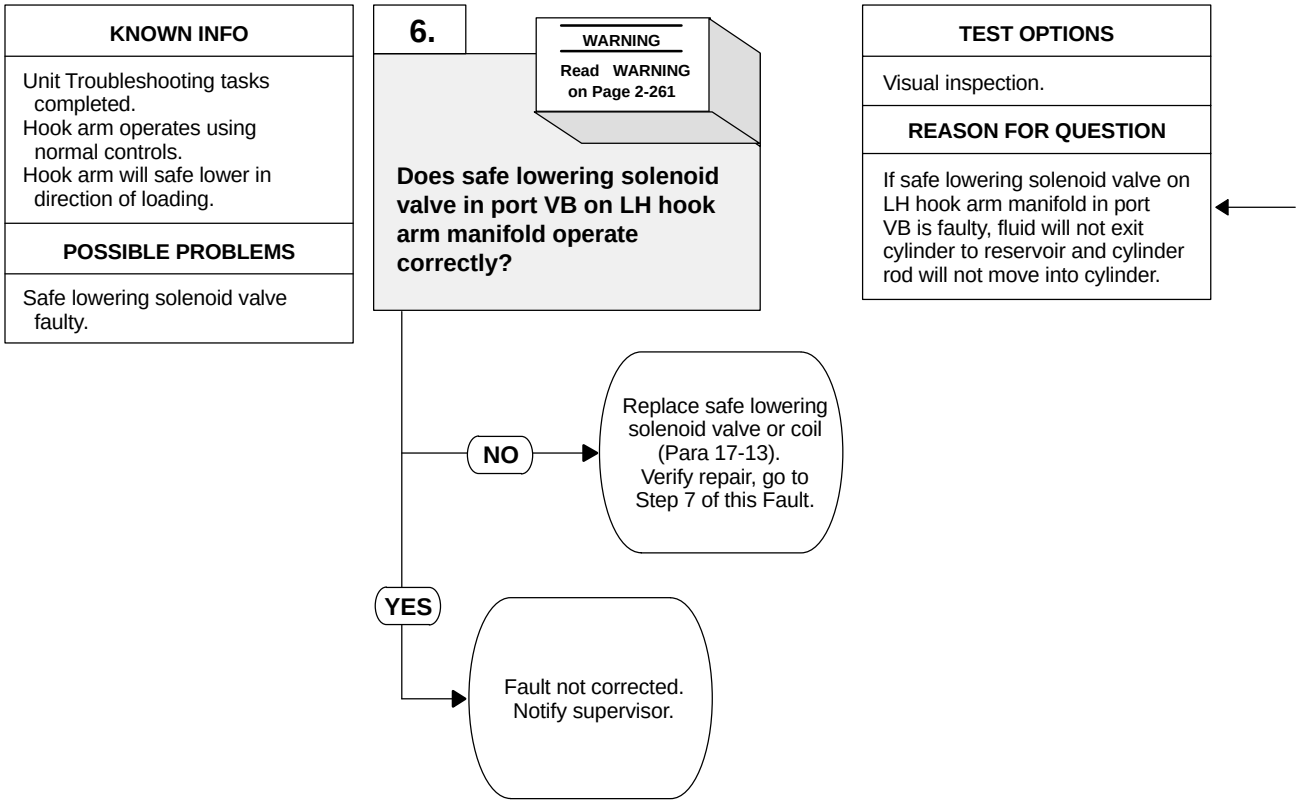
Do not scratch surface of cylinder rod. Damage to cylinder seals could result causing cylinder failure.

VISUAL INSPECTION

(1) Raise hook arm approximately 24 in. (61 cm) and block into position (TM 9-2320-364-10).
(2) Turn OFF ENGINE switch.
(3) Loosen screw and disconnect connector from safe lowering solenoid valve in port VB on RH hook arm manifold.
(4) Remove safe lowering solenoid valve and preformed packings from RH hook arm manifold. Discard preformed packings.
(5) Attempt to push poppet into valve toward solenoid coil.
  (a) If poppet does not move, replace safe lowering solenoid valve (Para 17-13). Perform Step (14) below and go to Step 7 of this Fault.
  (b) If poppet moves, perform Steps (6) through (8) below.
(6) Connect connector to removed safe lowering solenoid valve and tighten connector screw.
(7) Turn ON ENGINE switch.
(8) With the aid of an assistant , hold in safe lowering button and observe the poppet valve.
  (a) If poppet does not move, turn OFF ENGINE switch and replace the solenoid coil (Para 17-13). Perform Step (14) below and go to Step 7 of this Fault.
  (b) If poppet moves, the solenoid coil is OK. Perform Steps (9) through (13) and go to Step 6 of this Fault.
(9) Turn OFF ENGINE switch.
(10) Loosen connector screw and disconnect connector from removed safe lowering solenoid valves.
(11) Install safe lowering solenoid valve and preformed packings in port VB on RH hook arm manifold.
(12) Connect connector to safe lowering solenoid valve.
(13) Tighten screw and coat head of connector screw with sealing compound.
(14) Remove two wooden blocks from hook arm.



1. LOSS OF HOOK ARM SAFE LOWERING (CONT).



WARNING

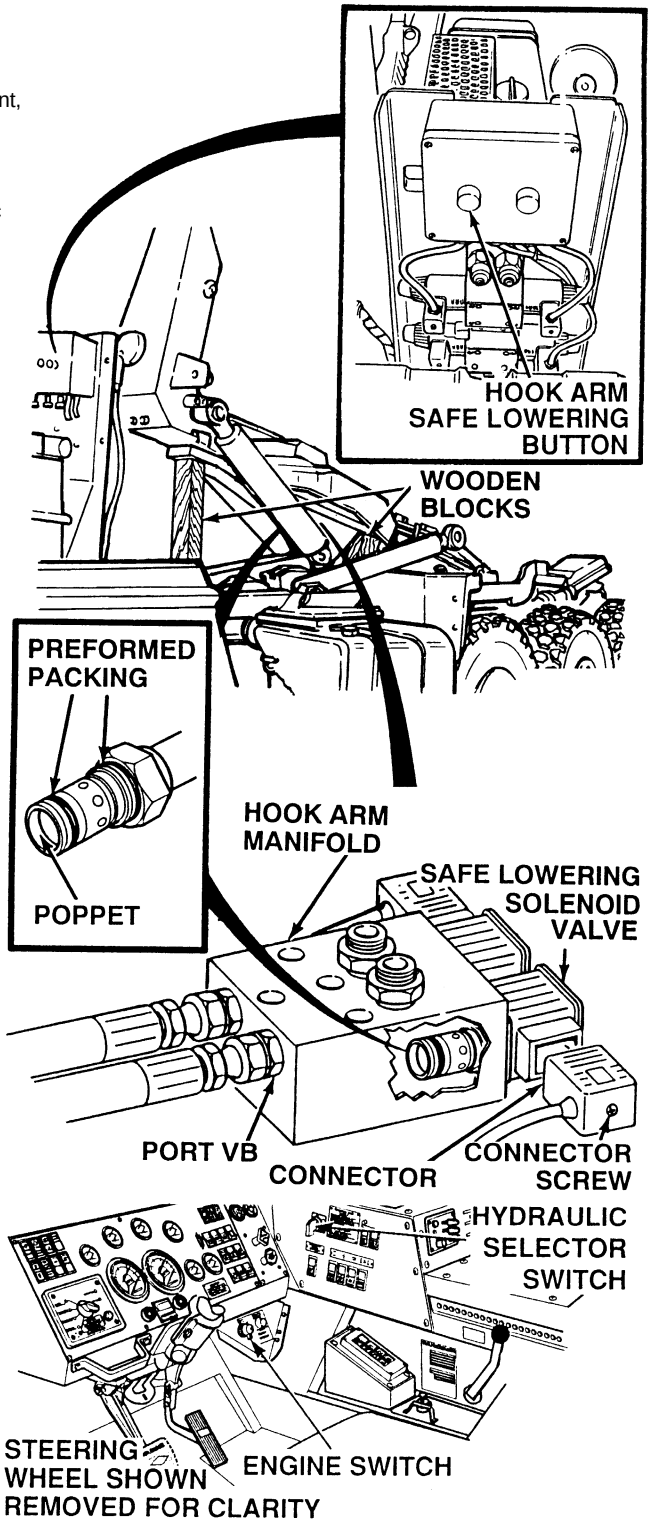
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

CAUTION

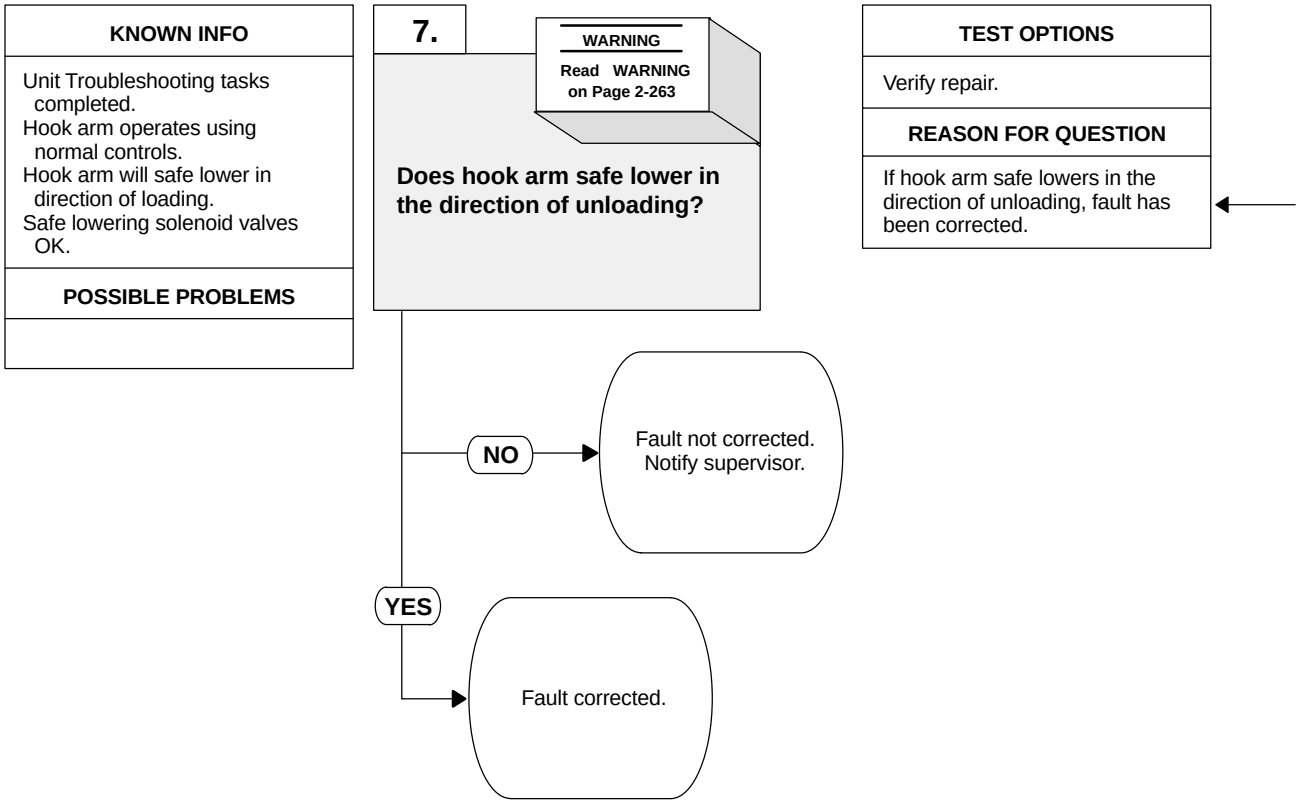
Do not scratch surface of cylinder rod. Damage to cylinder seals could result causing cylinder failure.

VISUAL INSPECTION

(1) Loosen connector screw and disconnect connector from safe lowering solenoid valve in port VB on LH hook arm manifold.
(2) Remove safe lowering solenoid valve and preformed packing from LH hook arm manifold. Discard preformed packing.
(3) Attempt to push poppet into valve toward solenoid coil.
  (a) If poppet does not move, replace safe lowering solenoid valve (Para 17-13). Perform Step (12) below and go to Step 7 of this Fault.
  (b) If poppet moves, perform Steps (4) through (6) below.
(4) Connect connector to removed safe lowering solenoid valve and tighten connector screw.
(5) Turn ON ENGINE switch (TM 9-2320-364-10).
(6) With the aid of an assistant, hold in safe lowering button and observe the poppet valve.
  (a) If poppet does not move, turn OFF ENGINE switch and replace the solenoid coil (Para 17-13). Perform Steps (7) through (12) below and go to Step 7 of this Fault.
  (b) If poppet moves, fault not corrected. Perform Steps (7) through (12) below and notify supervisor.
(7) Turn OFF ENGINE switch.
(8) Loosen connector screw and disconnect connector from removed safe lowering solenoid valves.
(9) Install safe lowering solenoid valve and preformed packing in port VB on LH hook arm manifold.
(10) Connect connector to safe lowering solenoid valve.
(11) Tighten connector screw and coat head of connector screw with sealing compound.
(12) Remove two wooden blocks from hook arm.

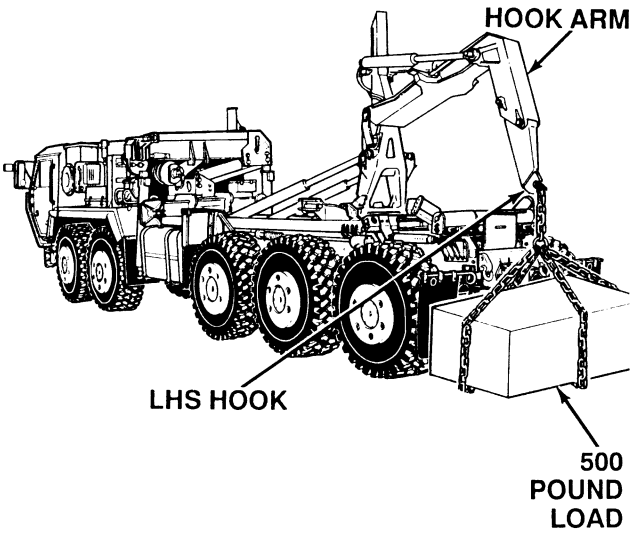


1. LOSS OF HOOK ARM SAFE LOWERING (CONT).



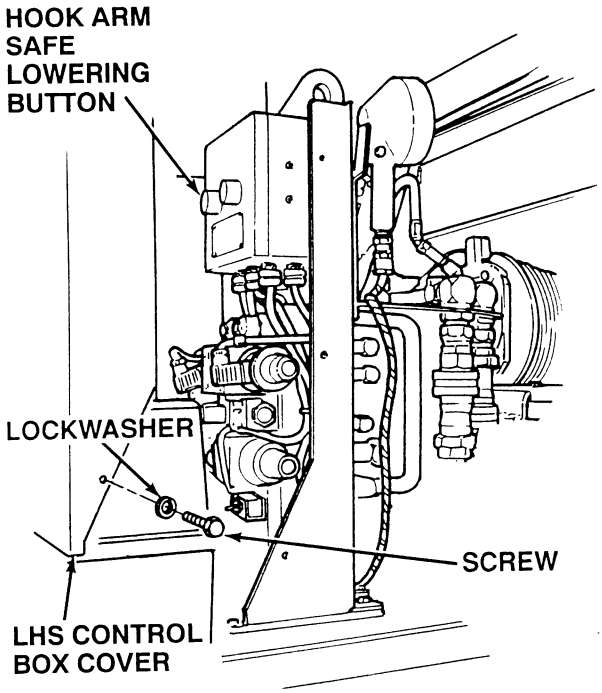
WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.



VERIFY REPAIR

(1) Position LHS hook to rear of truck (TM 9-2320-364-10).
(2) Attach 500 lb (227 kg) minimum load to hook.
(3) Raise hook arm approximately half of its travel.
(4) Push in hook arm safe lowering button.
  (a) If hook arm does not safe lower, fault not corrected. Lower load using normal controls, perform Steps (5) through (10) below and notify supervisor.
  (b) If hook arm safe lowers, fault has been corrected.
(5) Disengage load from hook.
(6) Put LHS in transit position.
(7) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.
(10) Install four screws, lockwashers and LHS control box cover.



2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

2. LOSS OF MIDDLE FRAME SAFE LOWERING.

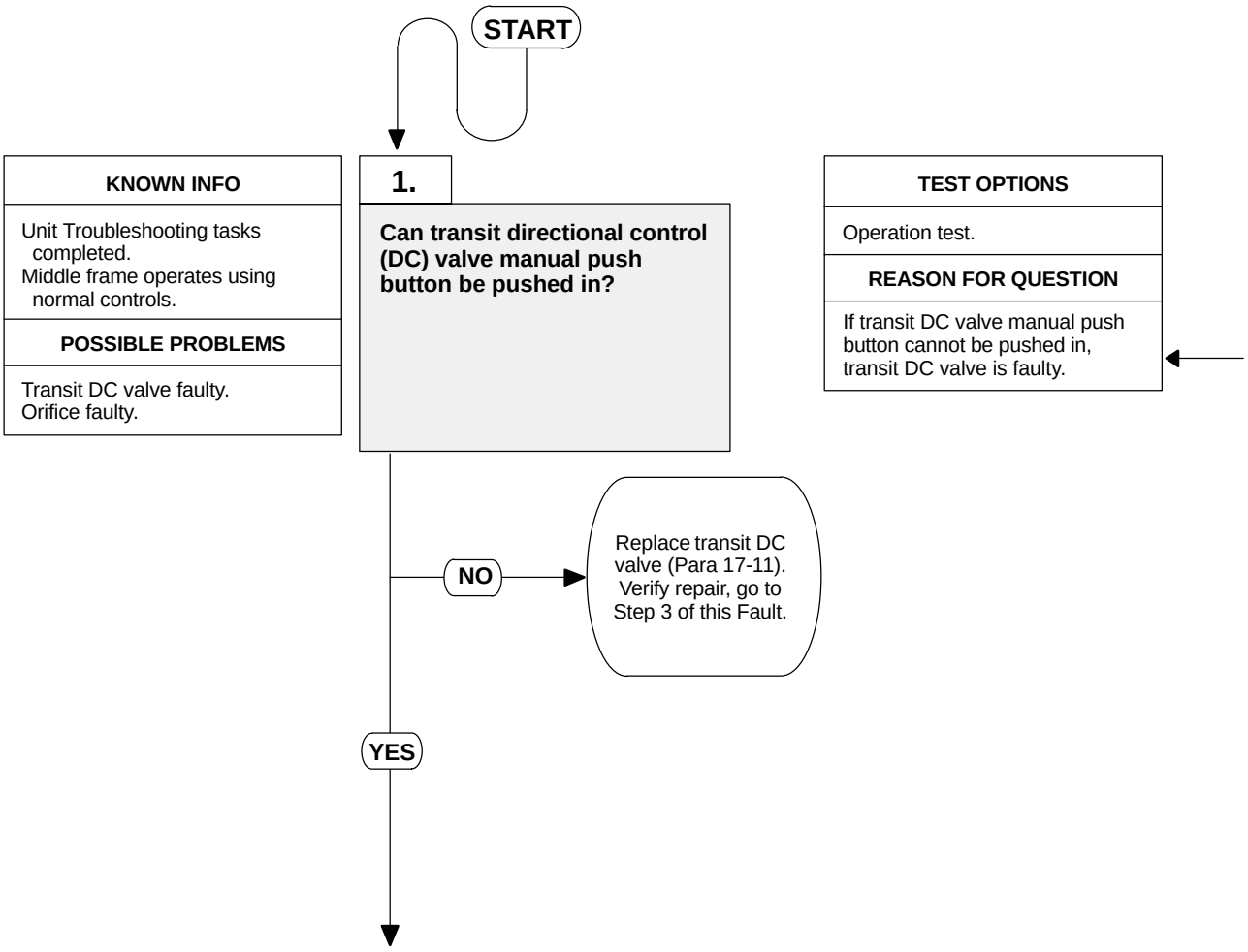
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Jackstand (2) (Item 132, Appendix F)
Wrench, Torque (0-60 N·m)
(Item 276, Appendix F)
Wrench Set, Socket 3/8 in. Drive
(Item 273, Appendix F)
Steel Tube, (Appendix C)

Materials/Parts
Oil, Hydraulics (Item 34, Appendix B)
Lockwashers (4) (Item 266, Appendix E)
Packing, Preformed (Item 393, Appendix E)

References
TM 9-2320-364-10

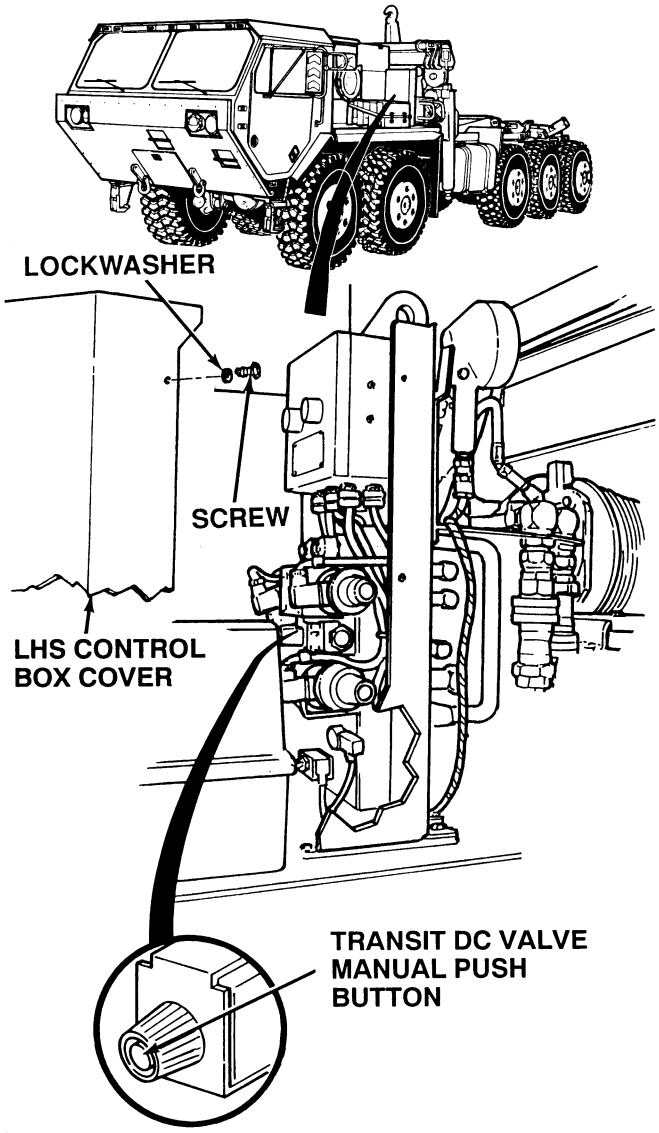
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



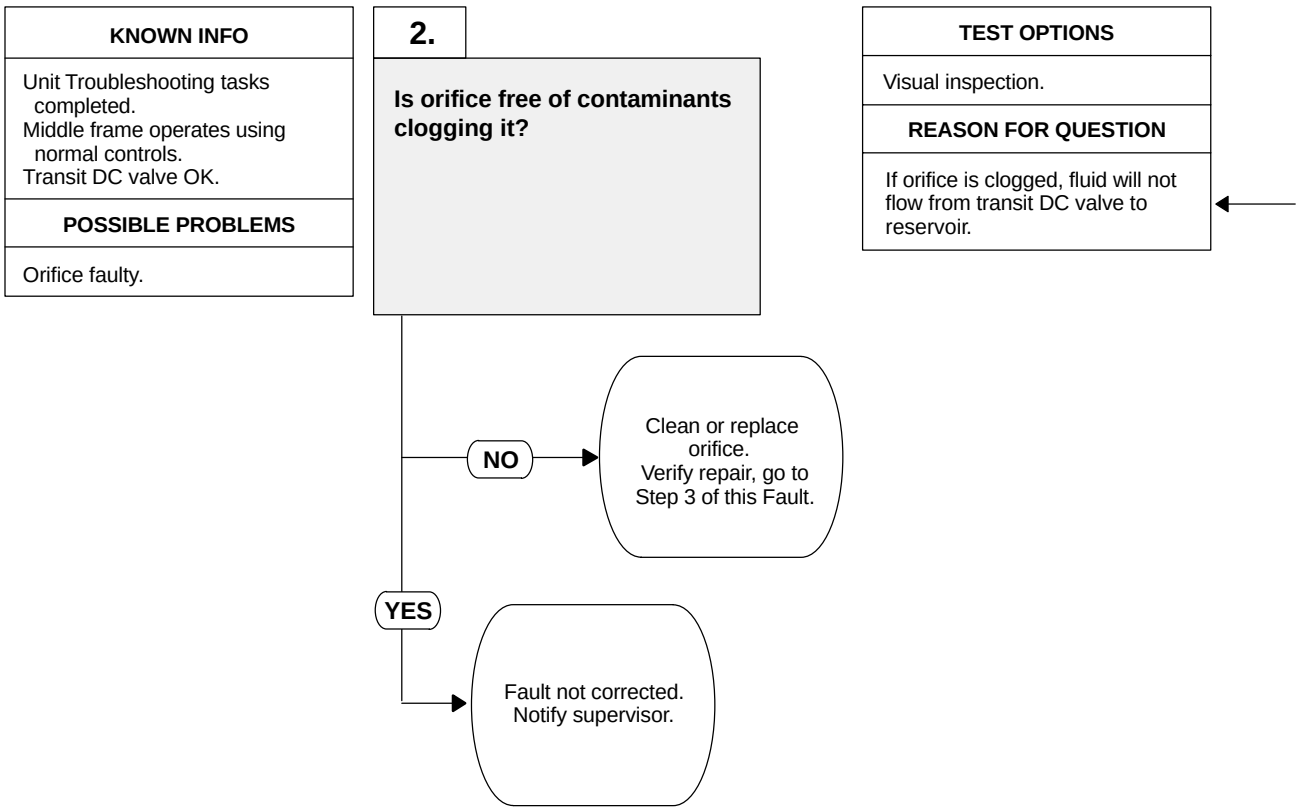
NOTE

- Ensure manual push button is pushed past free play to engage.
- Only remove center screw on engine side of LHS control box cover.

OPERATION TEST
(1) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers. (2) Push in transit DC valve manual push button (TM 9-2320-364-10). (a) If button cannot be pushed in, transit DC valve is faulty. Replace transit DC valve (Para 17-11). (b) If button can be pushed in, transit DC valve is OK.

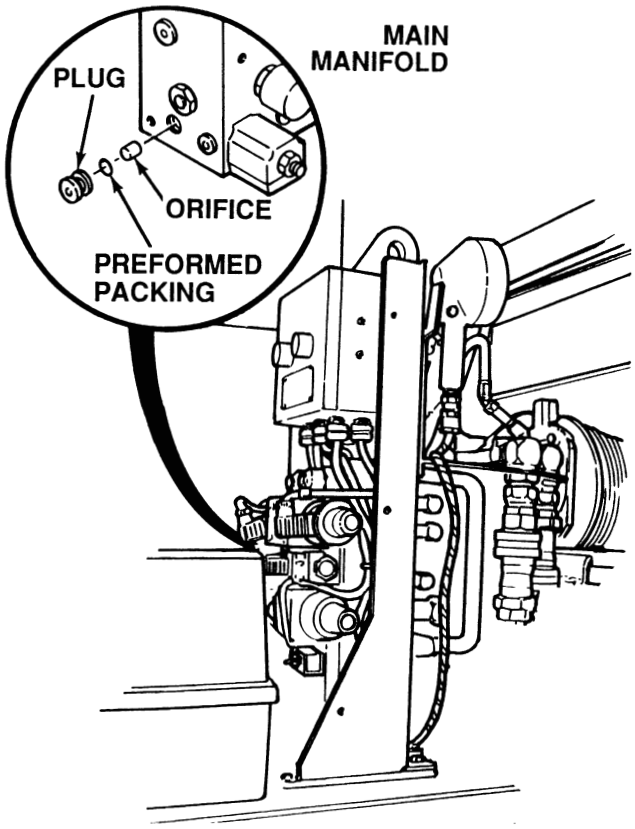


2. LOSS OF MIDDLE FRAME SAFE LOWERING (CONT).

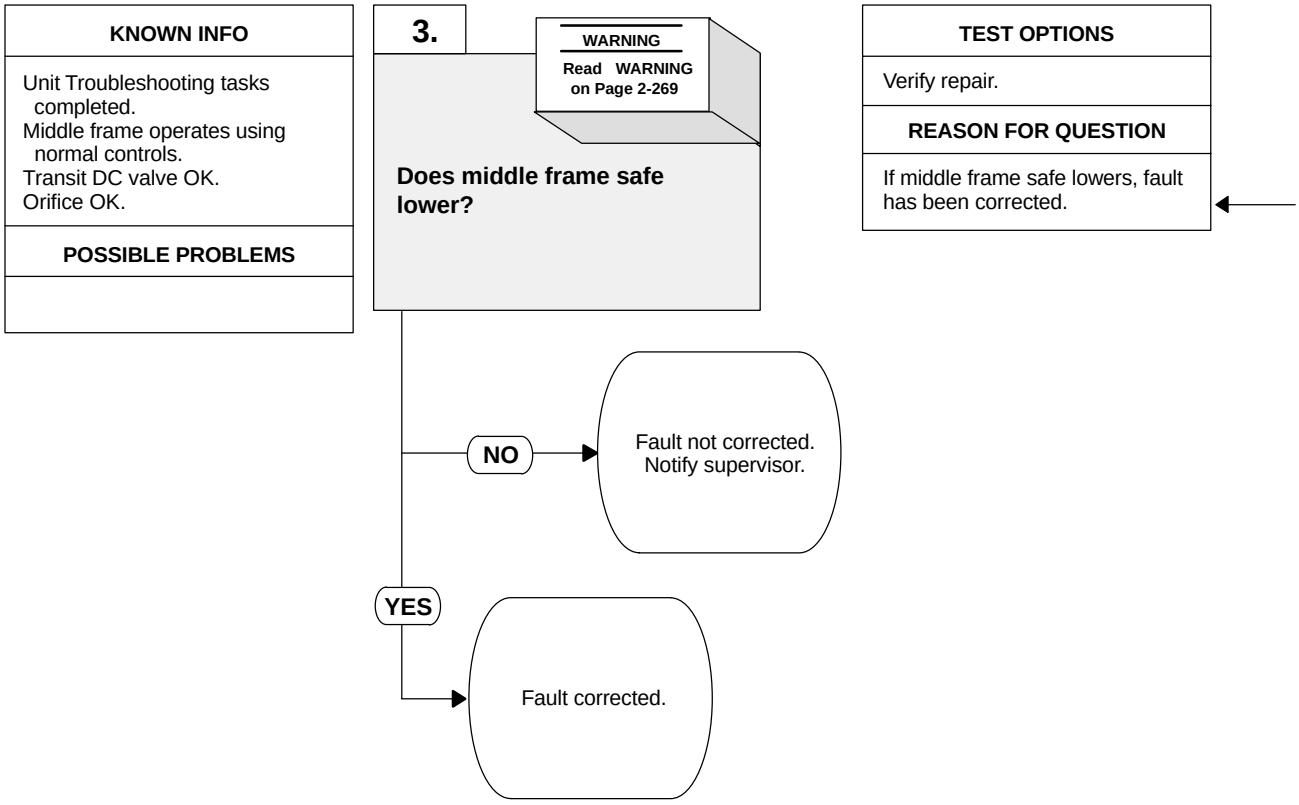


VISUAL INSPECTION

(1) Remove LHS main manifold (Para 16-43).
(2) Remove plug, preformed packing and orifice from main manifold. Discard preformed packing.
(3) Inspect orifice for contaminants or clogging.
  (a) If orifice is plugged or damaged, clean or replace orifice and perform Steps (4) through (7) below.
  (b) If orifice is OK, fault not corrected. Perform Steps (4) through (7) below and notify supervisor.
(4) Install orifice in main manifold.
(5) Lubricate preformed packing.
(6) Install preformed packing on plug and install plug in main manifold. Tighten to 96 lb-in (11 N·m).
(7) Install LHS main manifold.

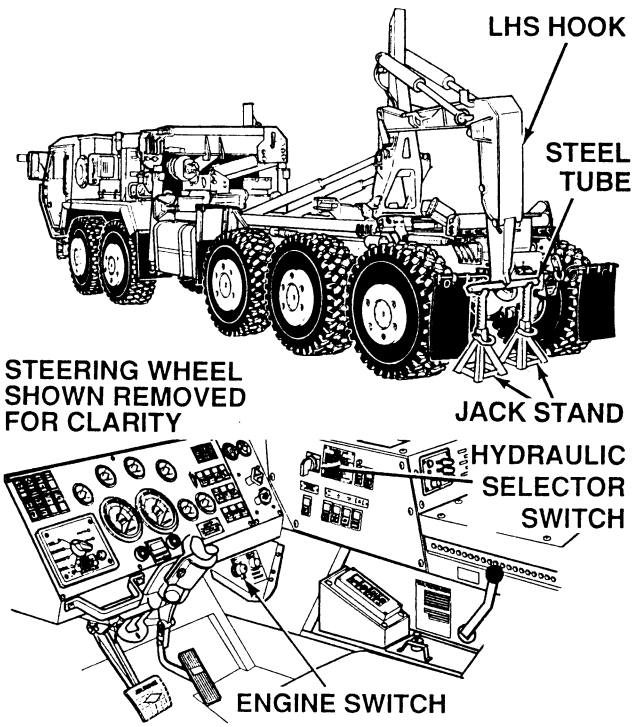


2. LOSS OF MIDDLE FRAME SAFE LOWERING (CONT).



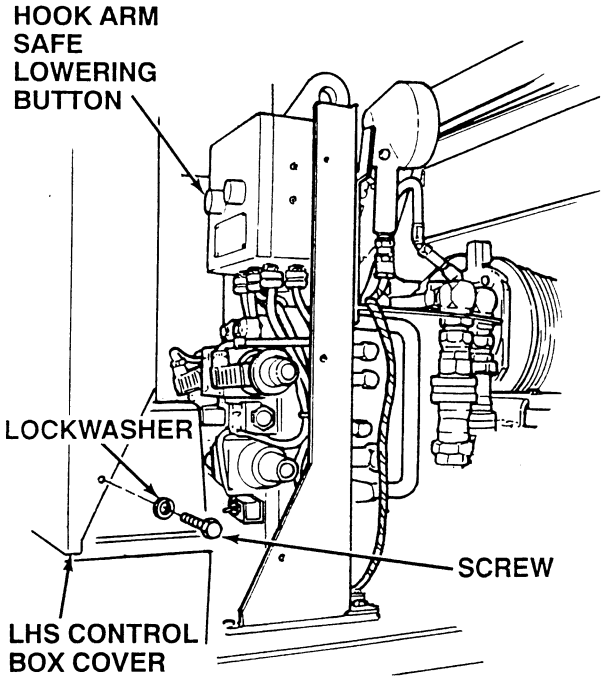
WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.



VERIFY REPAIR

(1) Position LHS hook to rear of truck and engage hook on steel tube supported by jackstands.
(2) Using LHS, lift truck only enough to lift vehicle weight off suspension. Do not lift tires off ground.
(3) Push in middle frame safe lowering button.
  (a) If truck does not settle on its suspension, fault not corrected. Perform Steps (4) through (8) below and notify supervisor.
  (b) If truck settles on its suspension, fault has been corrected.
(4) Disengage hook from steel tube.
(5) Put LHS in transit position.
(6) Set hydraulic selector switch to OFF position (TM 9-2320-364-10).
(7) Turn OFF ENGINE switch.
(8) Install four screws, lockwashers and LHS control box cover.



2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

3. HOOK ARM DOES NOT LOAD.

INITIAL SETUP

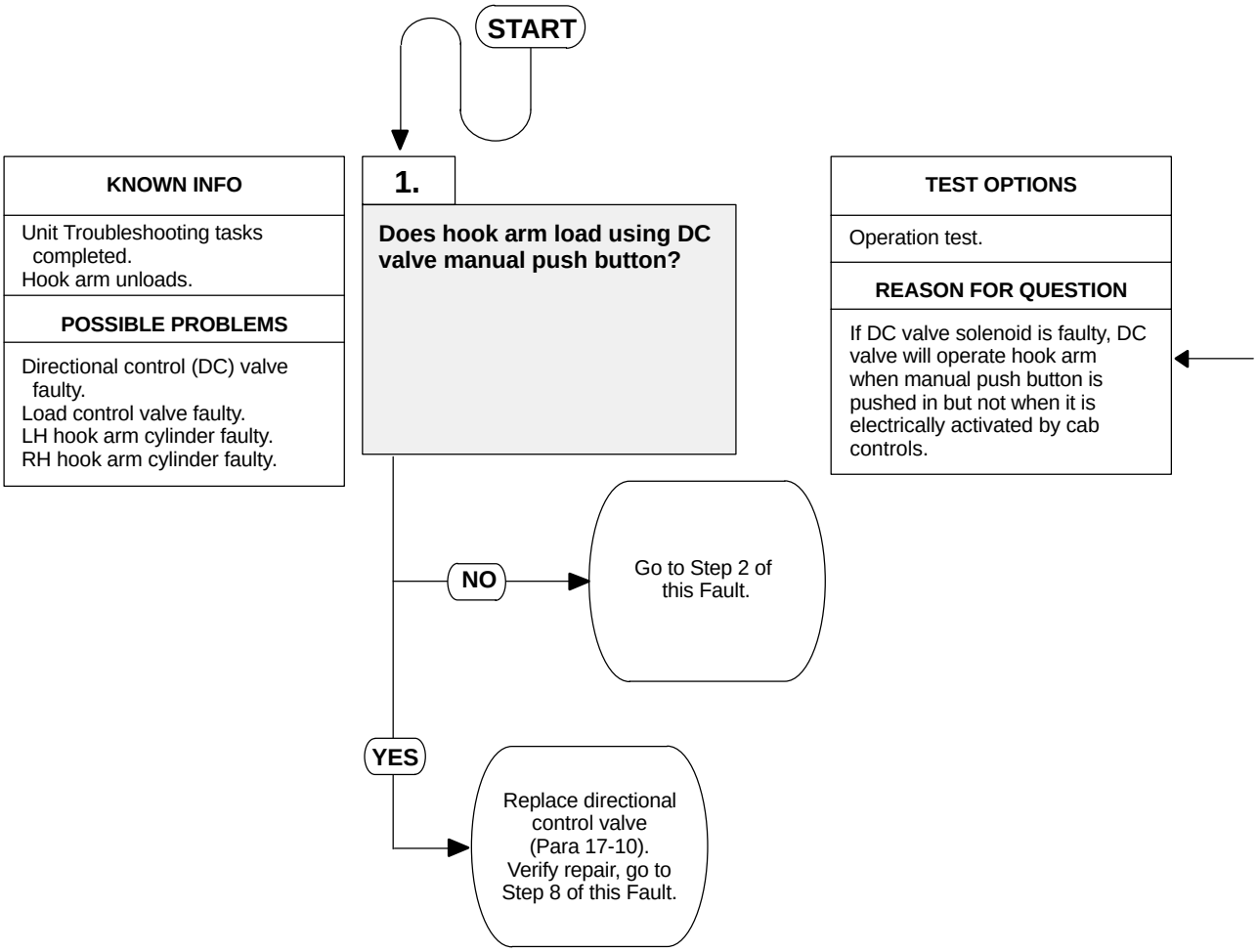
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Sealing Compound (Item 62, Appendix B)

Personnel Required
Two

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

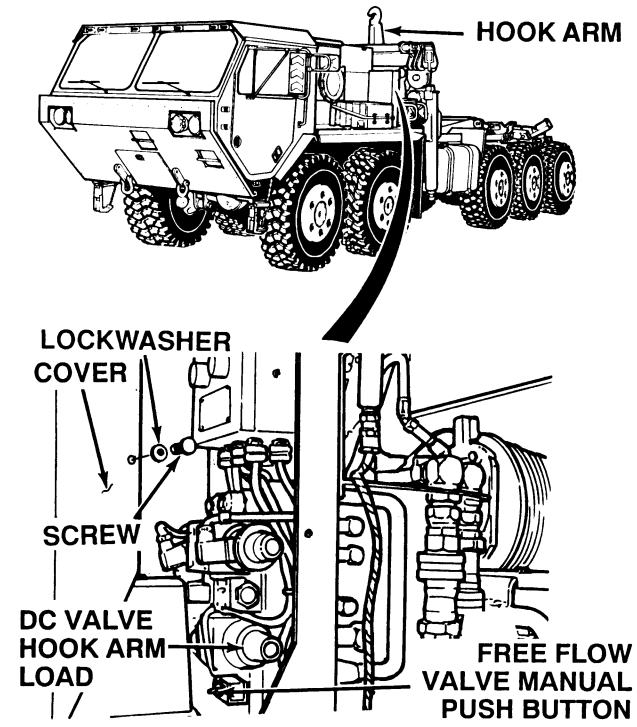


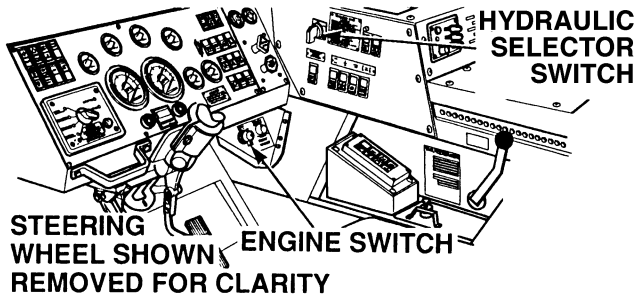
NOTE

- Ensure manual push button is pushed past free play to engage.
- Only remove center screw on engine side of LHS control box cover.

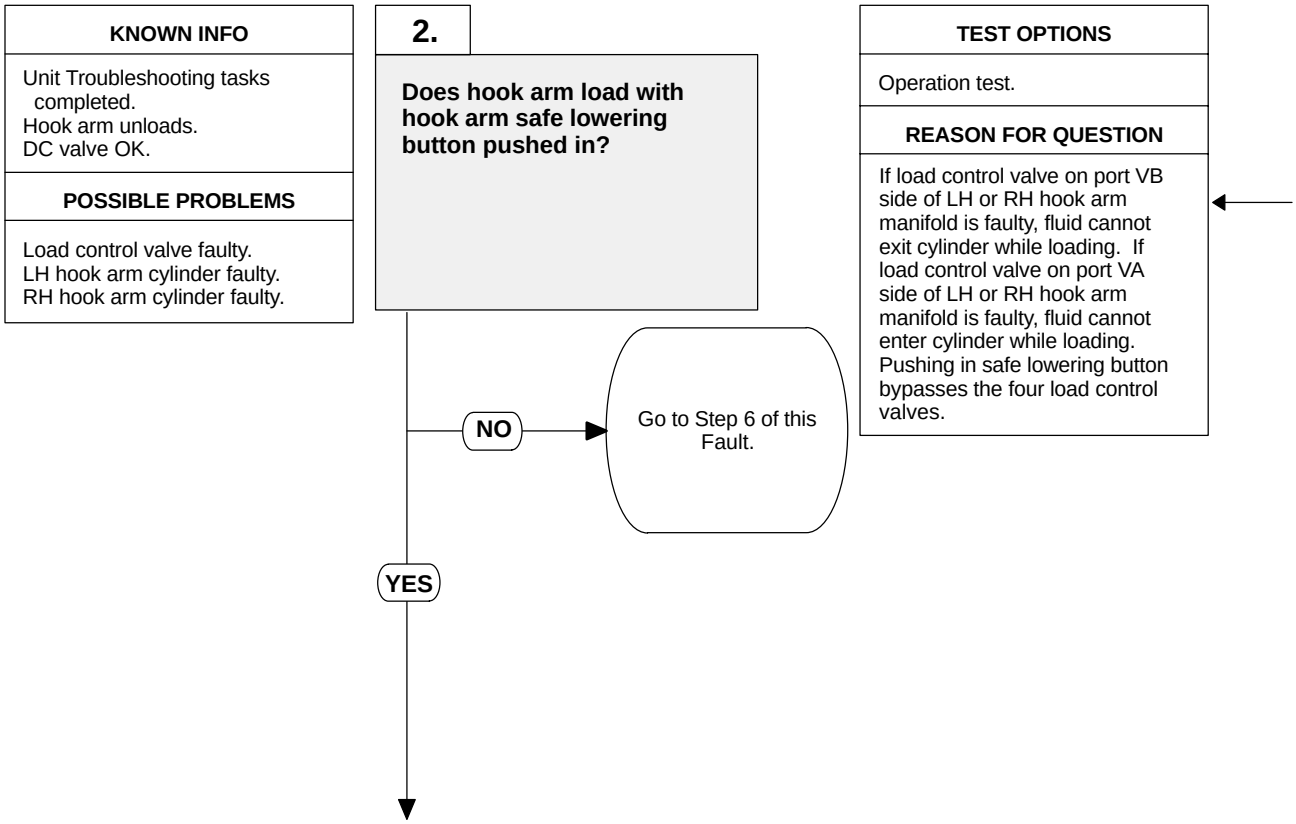
OPERATION TEST

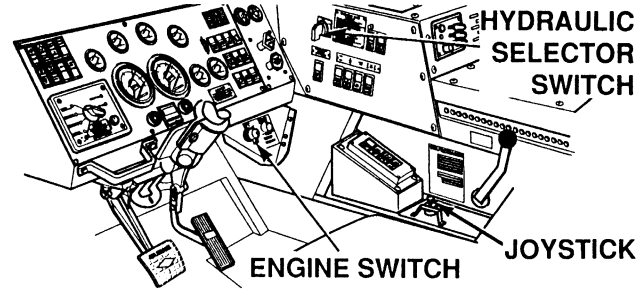
(1) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(2) Start engine (TM 9-2320-364-10).
(3) Set hydraulic selector switch to MAN HA.
(4) Push in free flow valve manual push button while pushing in DC valve hook arm load manual push button.
  (a) If hook arm loads, perform Steps (5) and (6) below and replace upper DC valve (Para 17-10).
  (b) If hook arm does not load, DC valve is OK.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.

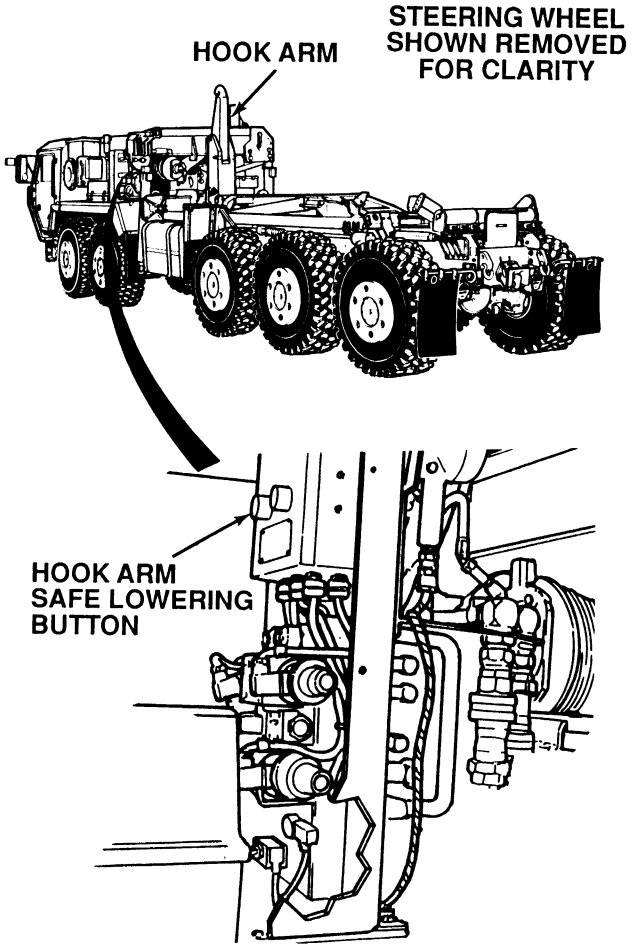




3. HOOK ARM DOES NOT LOAD (CONT).



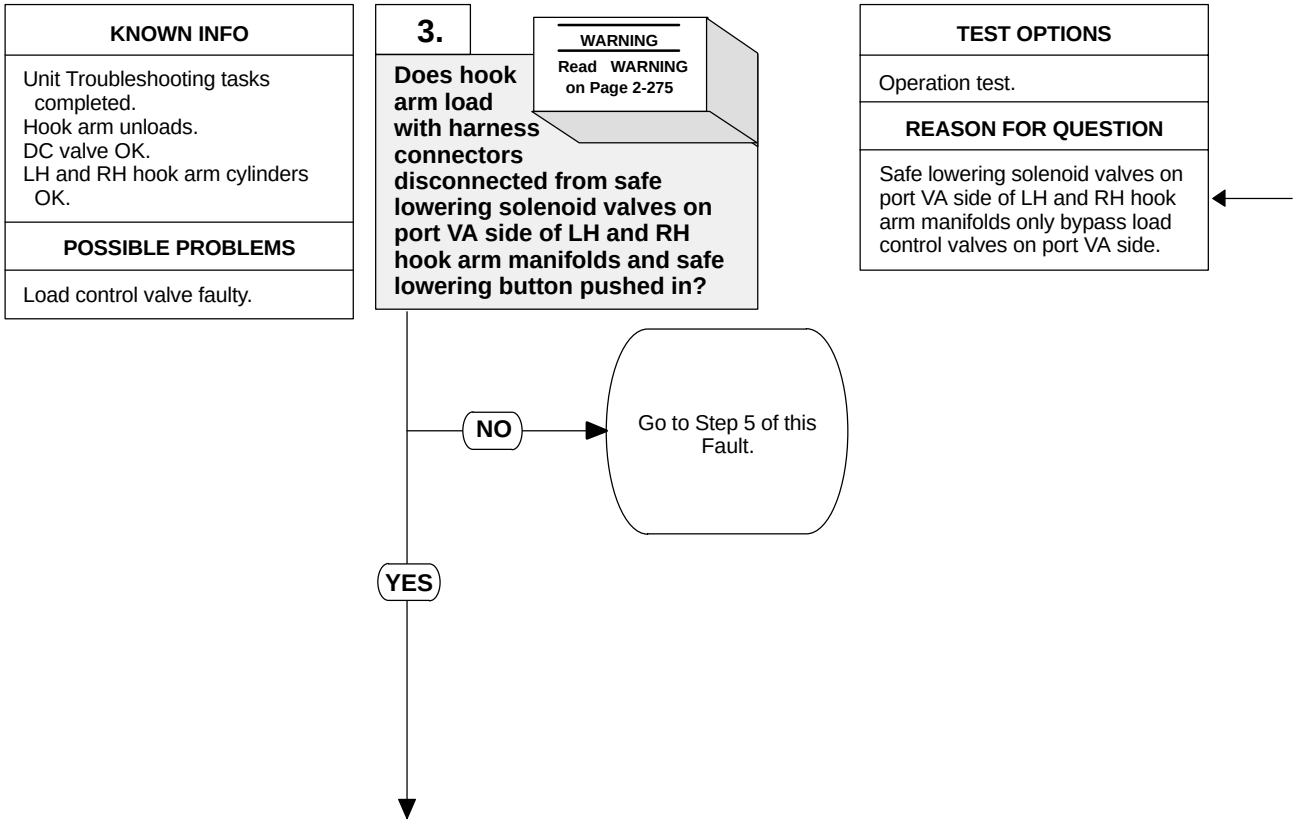




OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to MAN HA.
(3) With the aid of an assistant, attempt to load using cab joystick while pushing in hook arm safe lowering button.
    (a) If hook arm does not load, perform Steps (4) and (5) below and go to Step 6 of this Fault.
    (b) If hook arm loads, perform Steps (4) and (5) below and go to Step 3 of this Fault.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.

3. HOOK ARM DOES NOT LOAD (CONT).

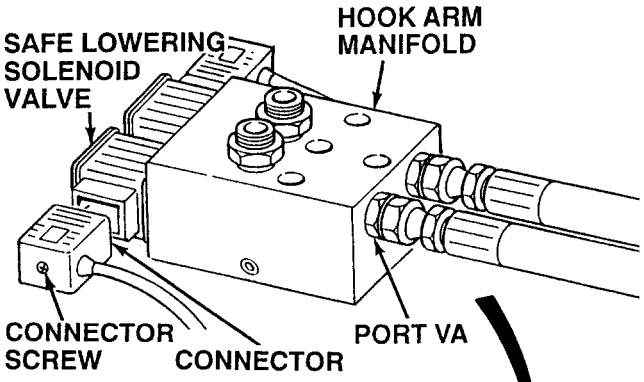


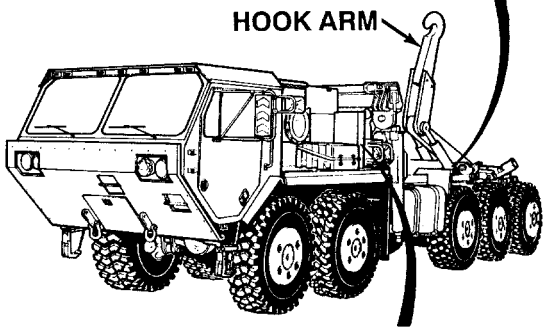
WARNING

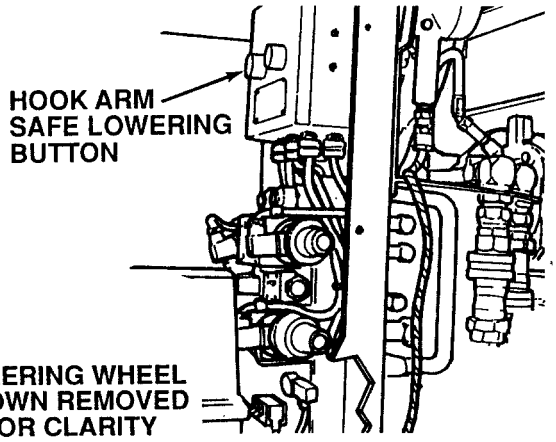
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

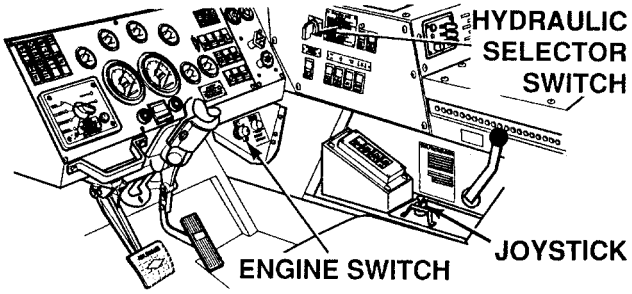
OPERATION TEST

(1) Raise hook arm approximately 24 in. (61 cm) (TM 9-2320-364-10).
(2) Loosen connector screw and disconnect connector from safe lowering solenoid valve on port VA side of LH hook arm manifold.
(3) Loosen connector screw and disconnect connector from safe lowering solenoid valve on port VA side of RH hook arm manifold.
(4) Set hydraulic selector switch to MAN HA.
(5) With the aid of an assistant, attempt to load using cab joystick while pushing in hook arm safe lowering button.
  (a) If hook arm does not load, perform Steps (6) and (7) below and go to Step 5 of this Fault.
  (b) If hook arm loads, perform Steps (6) through (9) below and go to Step 4 of this Fault.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.
(8) Connect connector to safe lowering solenoid valve on LH hook arm manifold.
(9) Tighten connector screw and coat head of connector screw with sealing compound.

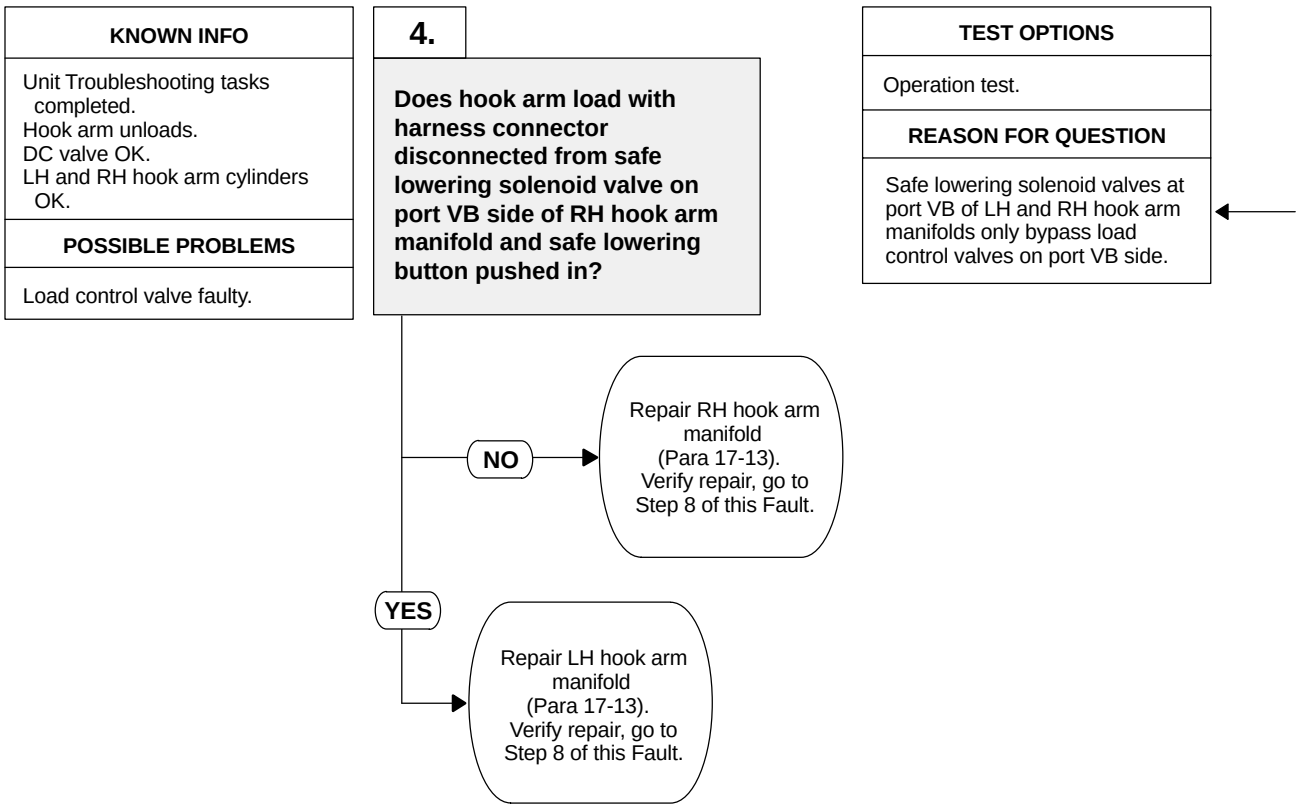






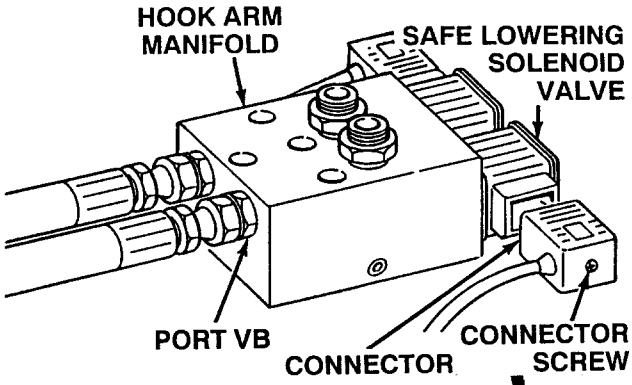


3. HOOK ARM DOES NOT LOAD (CONT).



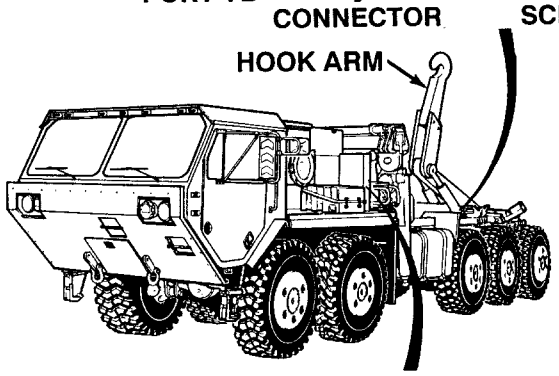
WARNING

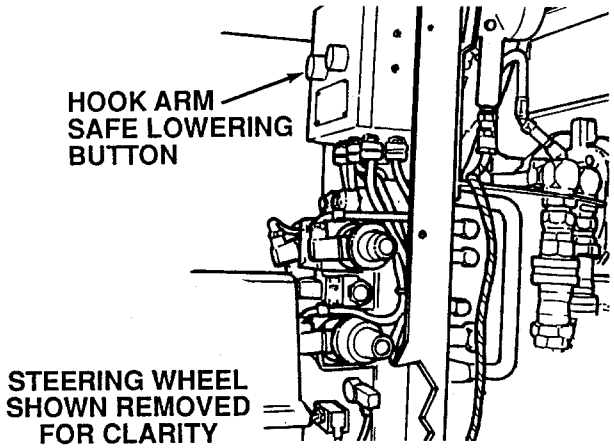
Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

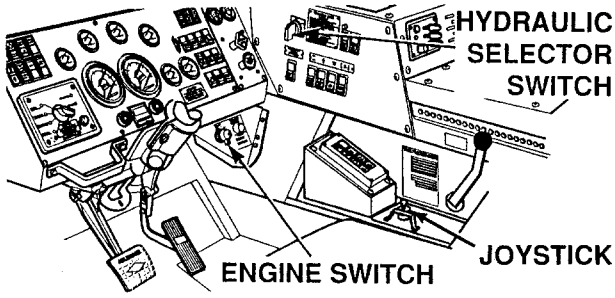


OPERATION TEST

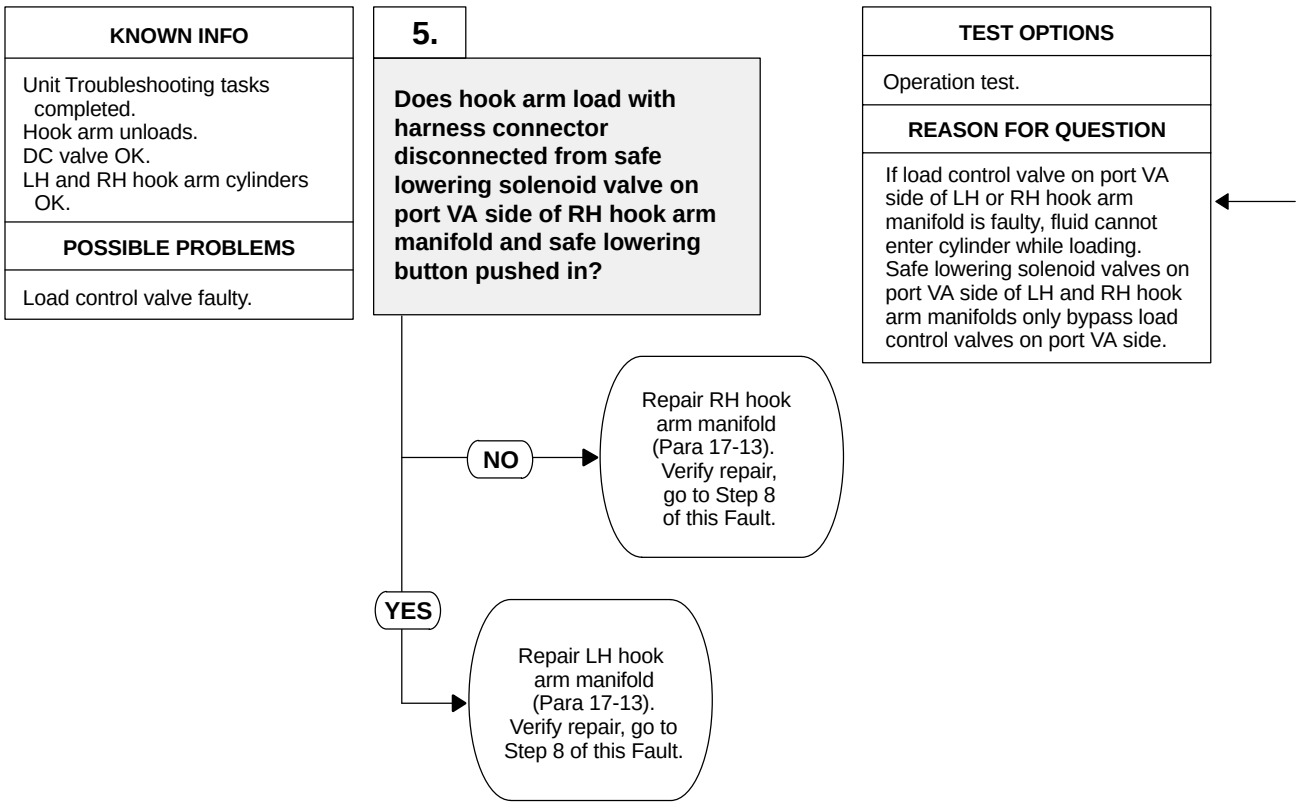
(1) Raise hook arm approximately 24 in. (61 cm) (TM 9-2320-364-10).
(2) Loosen connector screw and disconnect connector from safe lowering solenoid valve on port VB side of RH hook arm manifold.
(3) Set hydraulic selector switch to MAN HA.
(4) With the aid of an assistant, attempt to load using cab joystick while pushing in hook arm safe lowering button.
  (a) If hook arm does not load, perform Steps (5) and (6) below and repair RH hook arm manifold at port VB (Para 17-13).
  (b) If hook arm loads, perform Steps (5) and (6) below and repair LH hook arm manifold at port VB (Para 17-13).
(5) Turn OFF ENGINE switch.
(6) Set hydraulic selector switch to OFF position.







3. HOOK ARM DOES NOT LOAD (CONT).

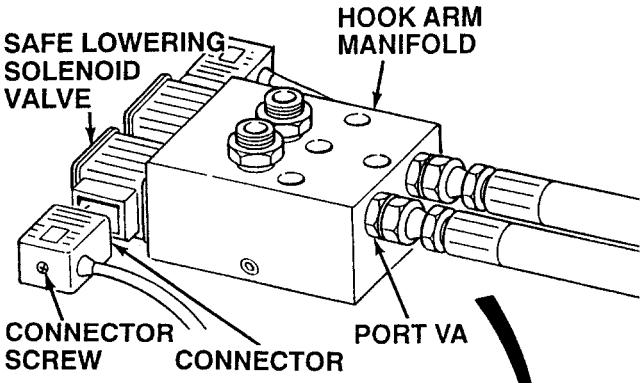


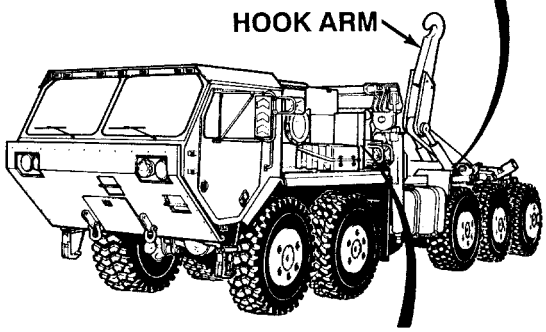
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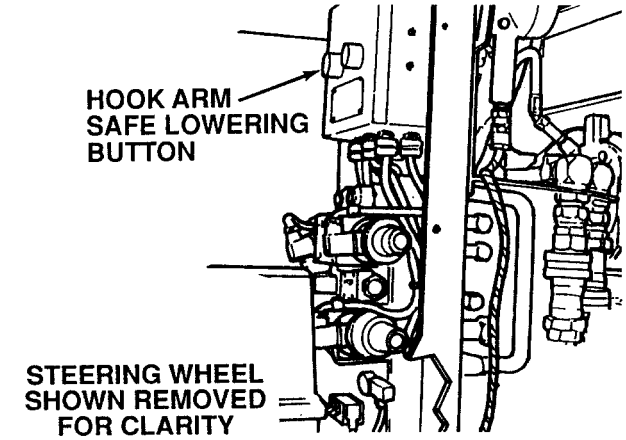
Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

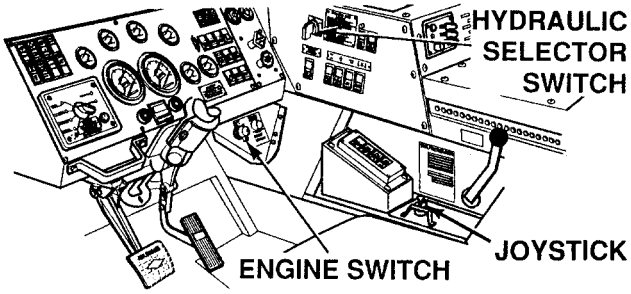
OPERATION TEST

(1) Connect connector on safe lowering solenoid valve on port VA side of LH hook arm manifold.
(2) Turn ON ENGINE switch (TM 9-2320-364-10).
(3) Set hydraulic selector switch to MAN HA.
(4) With the aid of an assistant, attempt to load using cab joystick while pushing in hook arm safe lowering button.
  (a) If hook arm does not load, perform Steps (5) and (6) below and repair RH hook arm manifold at port VA (Para 17-13).
  (b) If hook arm loads, perform Steps (5) and (6) below and repair LH hook arm manifold at port VA (Para 17-13).
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.

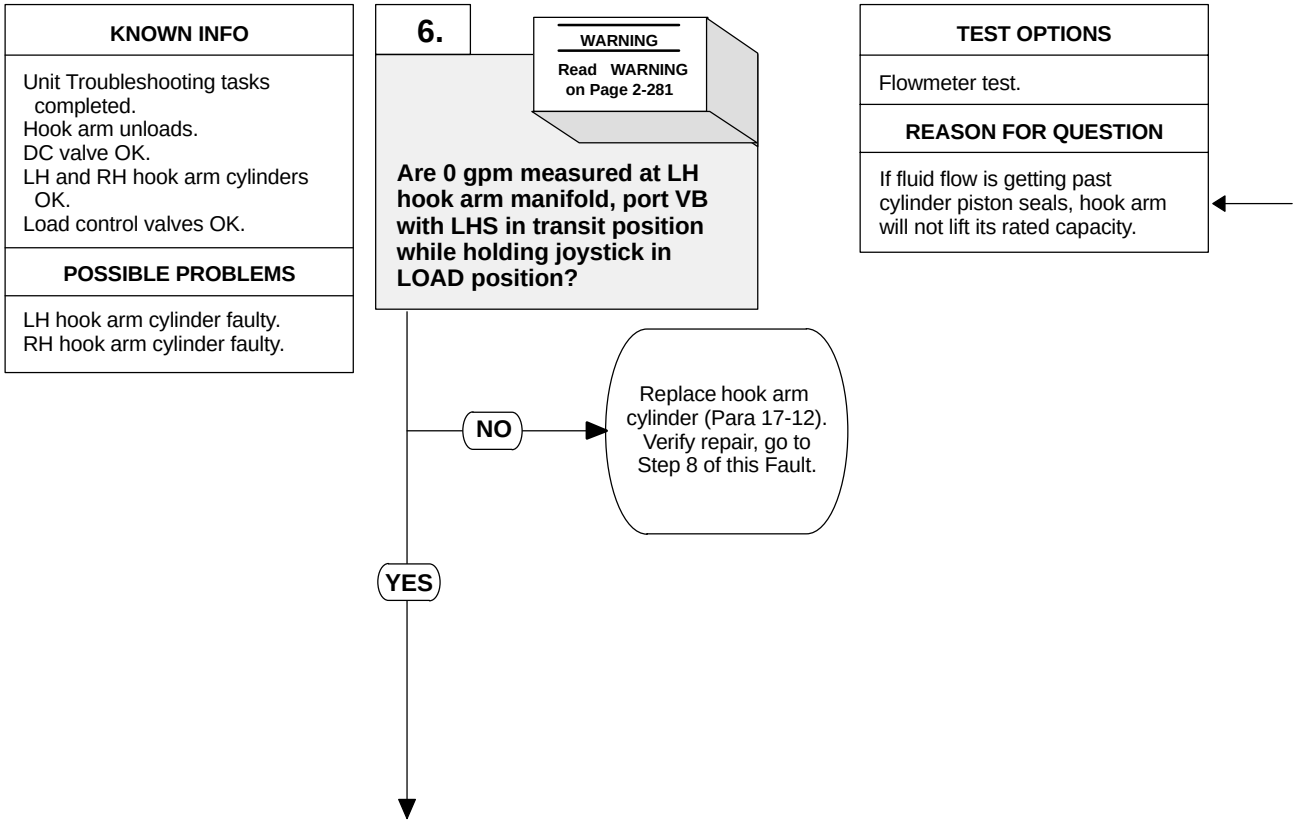






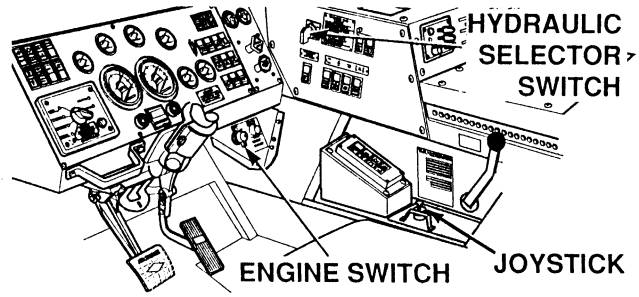


3. HOOK ARM DOES NOT LOAD (CONT).



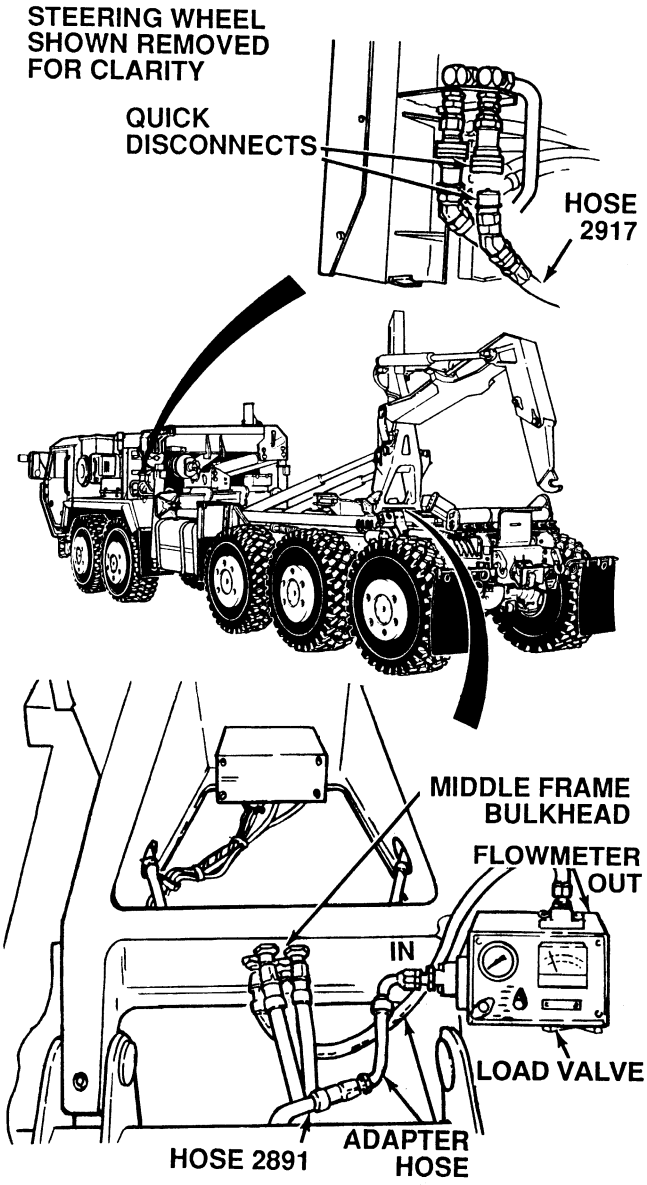
WARNING

- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

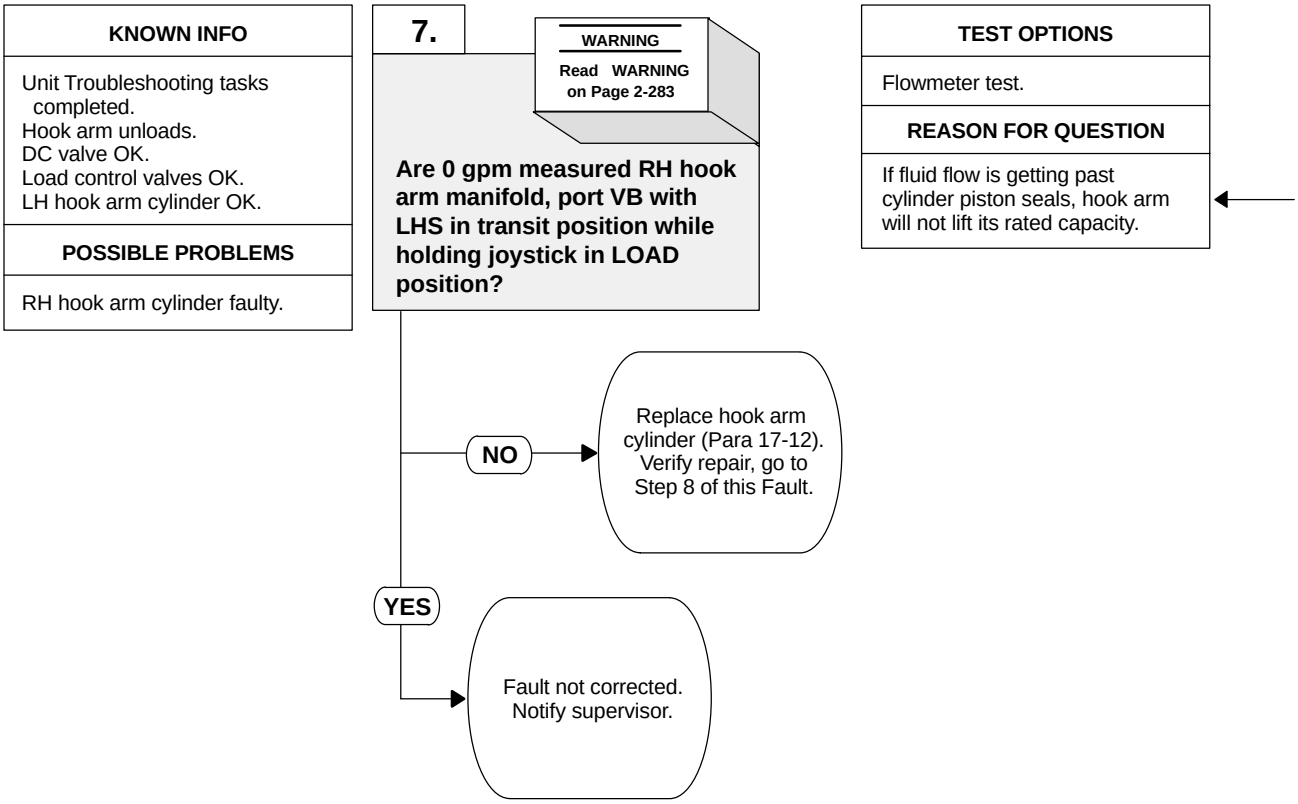


FLOWMETER TEST

(1) Put LHS in transit position (TM 9-2320-364-10).
(2) Turn OFF ENGINE switch.
(3) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(4) Disconnect hose 2891 from middle frame bulkhead.
(5) Connect adapter hose to hose 2891.
(6) Connect adapter hose to middle frame bulkhead.
(7) Connect flowmeter IN port to adapter hose connected to hose 2891.
(8) Connect flowmeter OUT port to adapter hose connected to middle frame bulkhead.
(9) Completely open flowmeter load valve.
(10) Connect hose 2917 quick disconnect.
(11) Start engine.
(12) Set hydraulic selector switch to MAN HA position.
(13) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (14) through (21) below and replace LH cylinder (Para 17-12).
  (b) If 0 gpm (0 lpm) are present, fault not corrected. Perform Steps (14) through (21) below and to to Step 7 of this Fault.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(17) Disconnect flowmeter from two adapter hoses.
(18) Disconnect adapter hose from middle frame bulkhead.
(19) Disconnect adapter hose from hose 2891.
(20) Connect hose 2891 to middle frame bulkhead.
(21) Connect quick disconnect hose 2917.



3. HOOK ARM DOES NOT LOAD (CONT).

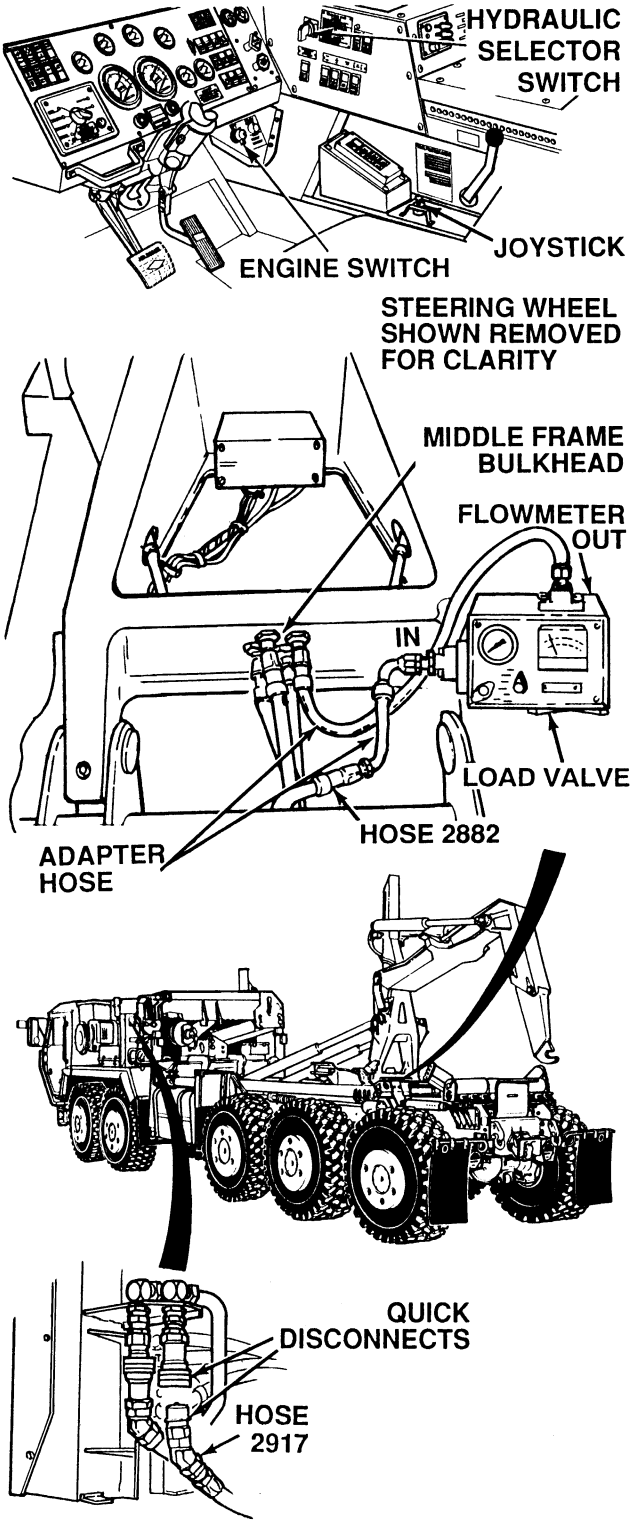


WARNING

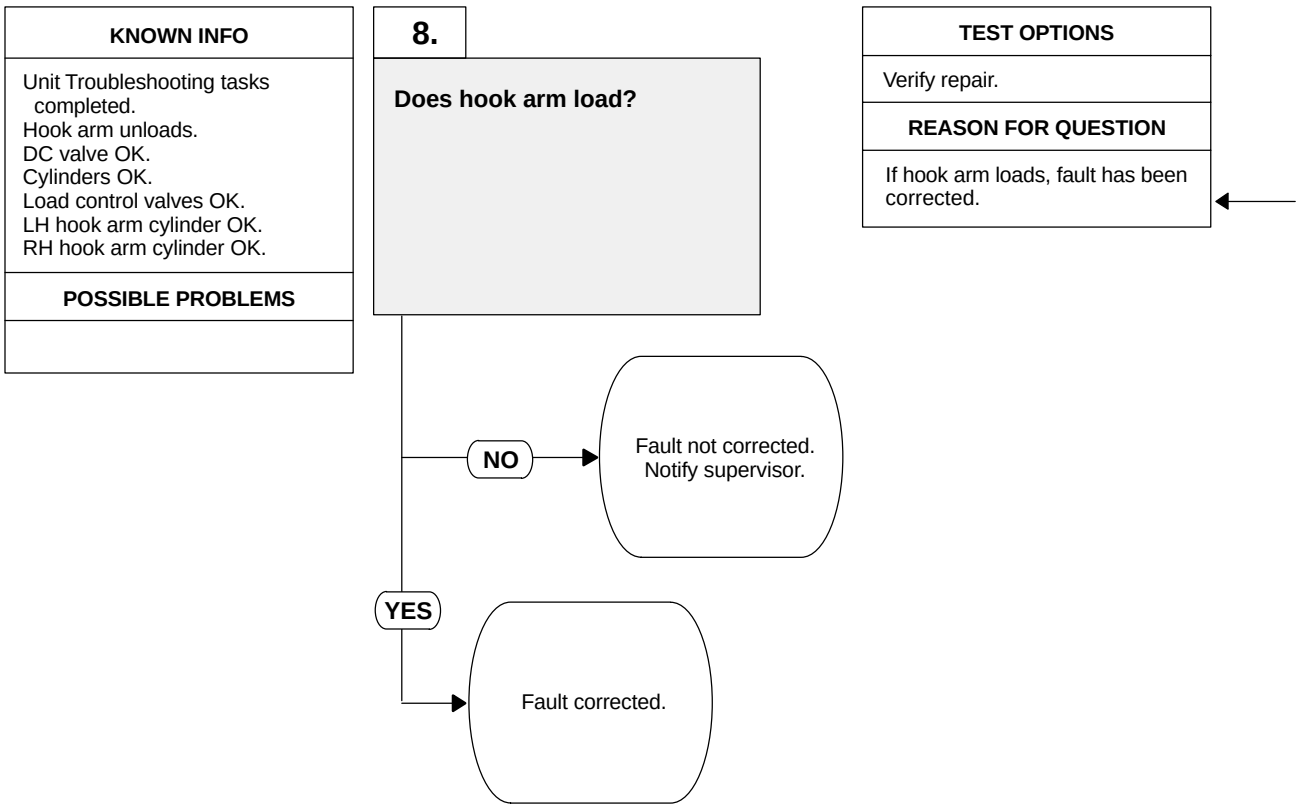
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors and hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.

FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2882 from middle frame bulkhead.
(3) Connect adapter hose to hose 2882.
(4) Connect adapter hose to middle frame bulkhead.
(5) Connect flowmeter IN port to adapter hose connected to hose 2882.
(6) Connect flowmeter OUT port to adapter hose connected to middle frame bulkhead.
(7) Completely open flowmeter load valve.
(8) Connect quick disconnects.
(9) Start engine (TM 9-2320-364-10).
(10) Set hydraulic selector switch to MAN HA position.
(11) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (19) below and replace RH cylinder (Para 17-12).
  (b) If 0 gpm (0 lpm) are present, fault not corrected. Perform Steps (12) through (19) below and notify supervisor.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(15) Disconnect flowmeter from two adapter hoses.
(16) Disconnect adapter hose from middle frame bulkhead.
(17) Disconnect adapter hose from hose 2882.
(18) Connect hose 2882 to middle frame bulkhead.
(19) Connect quick disconnect hose 2917.

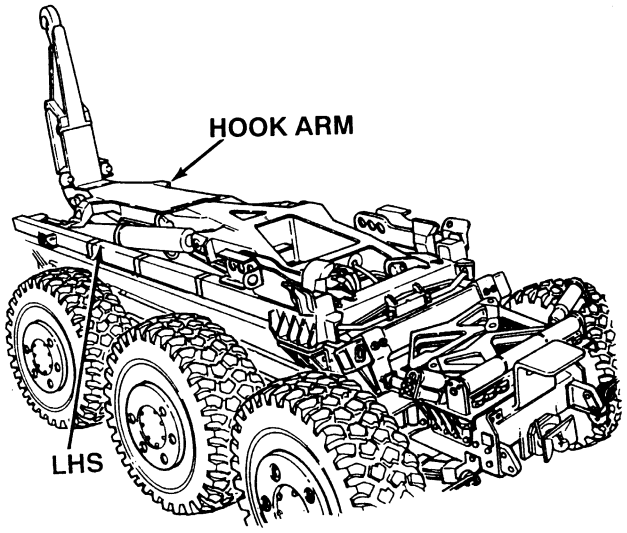


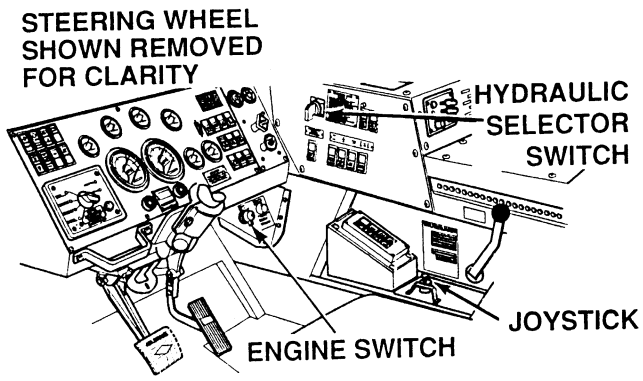
3. HOOK ARM DOES NOT LOAD (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to AUTO position.
(3) Hold joystick in LOAD position.
  (a) If hook arm does not load, fault not corrected. Perform Steps (4) through (6) below and notify supervisor.
  (b) If hook arm loads, fault has been corrected.
(4) Place LHS in the transit position.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.





2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

4. HOOK ARM DOES NOT UNLOAD.

INITIAL SETUP

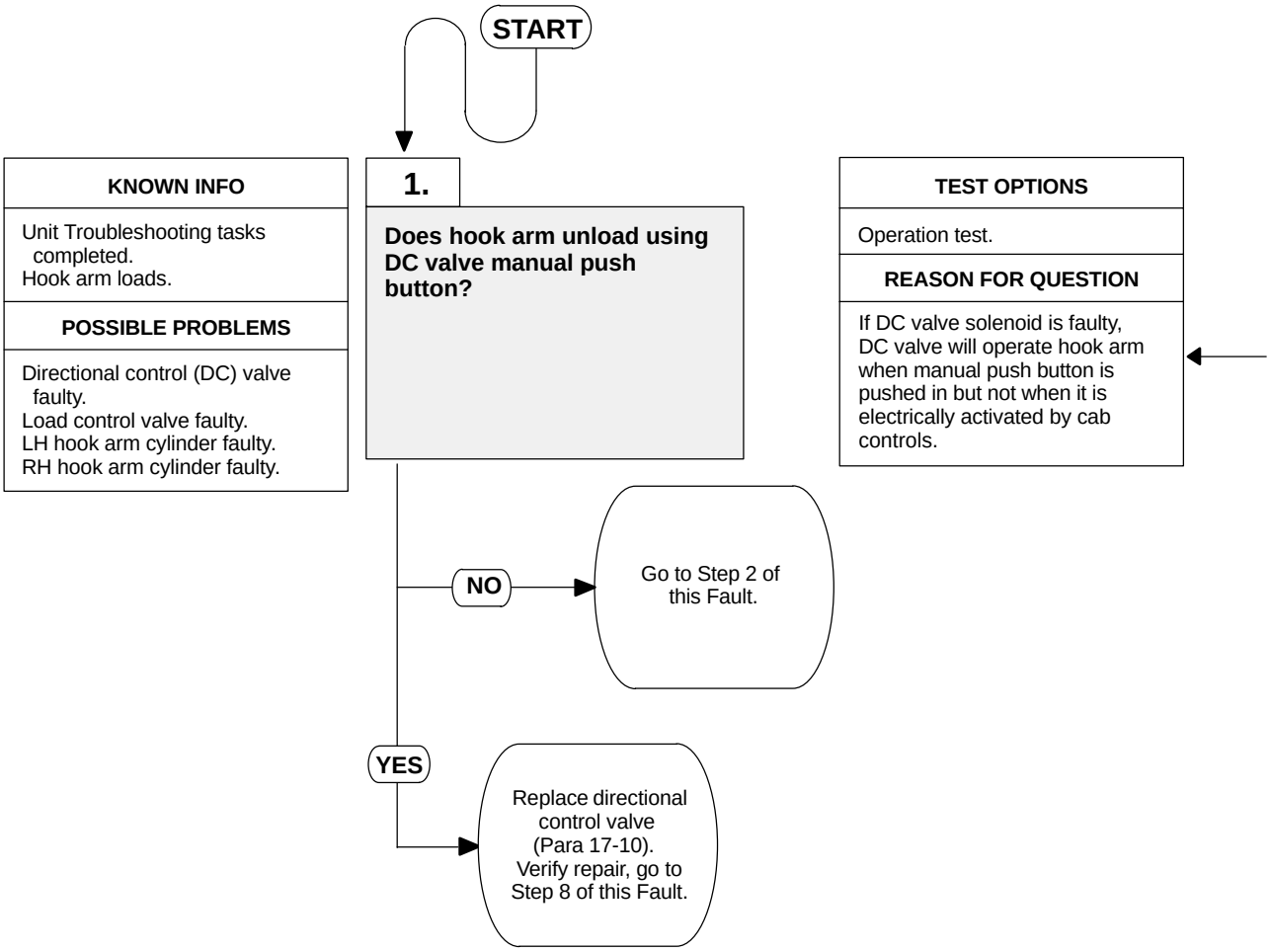
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Sealing Compound (Item 62, Appendix B)
Lockwasher (4) (Item 266, Appendix E)

Personnel Required
Two

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

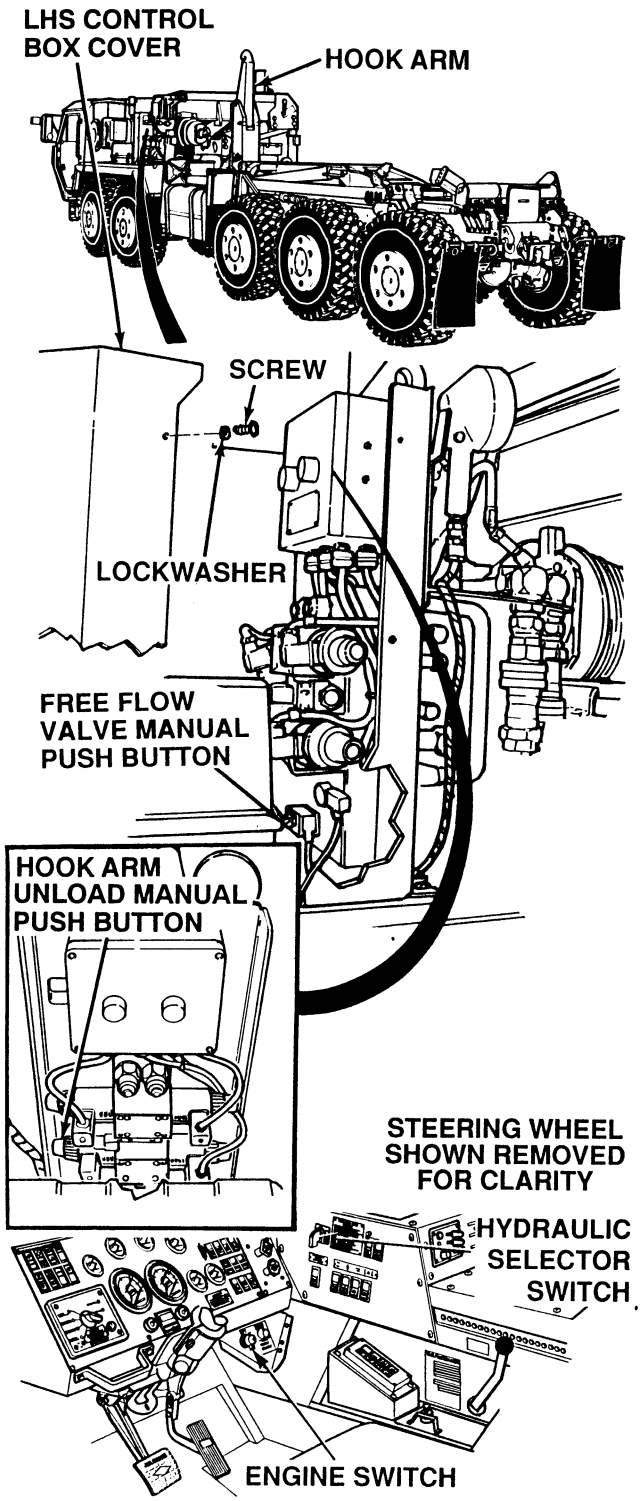


NOTE

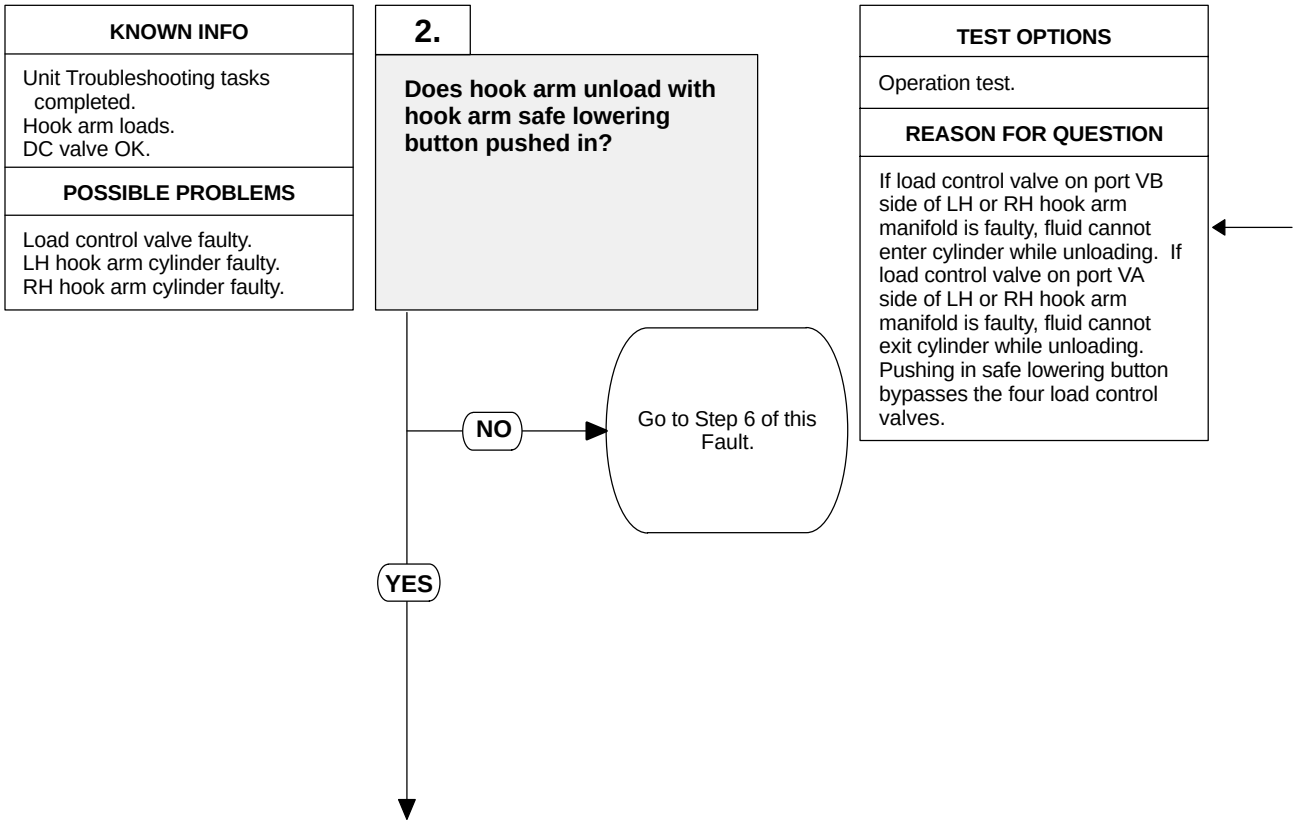
- Ensure manual push button is pushed past free play to engage.
- Only remove center screw on engine side of LHS control box cover.

OPERATION TEST

(1) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(2) Start engine (TM 9-2320-364-10).
(3) Set hydraulic selector switch to MAN HA.
(4) Push in free flow valve manual push button while pushing in DC valve hook arm unload manual push button.
    (a) If hook arm does not unload, DC valve is OK. Perform Steps (5) and (6) below and go to Step 2 of this Fault.
    (b) If hook arm unloads, perform Steps (5) and (6) below and replace upper DC valve (Para 17-10).
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.



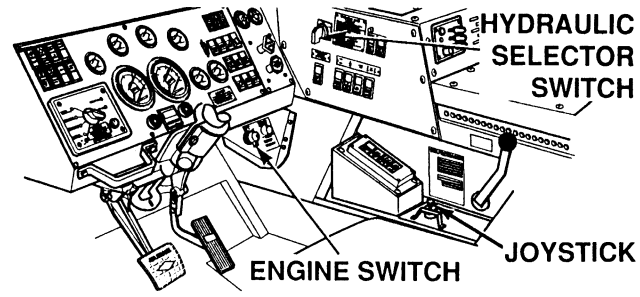
4. HOOK ARM DOES NOT UNLOAD (CONT).

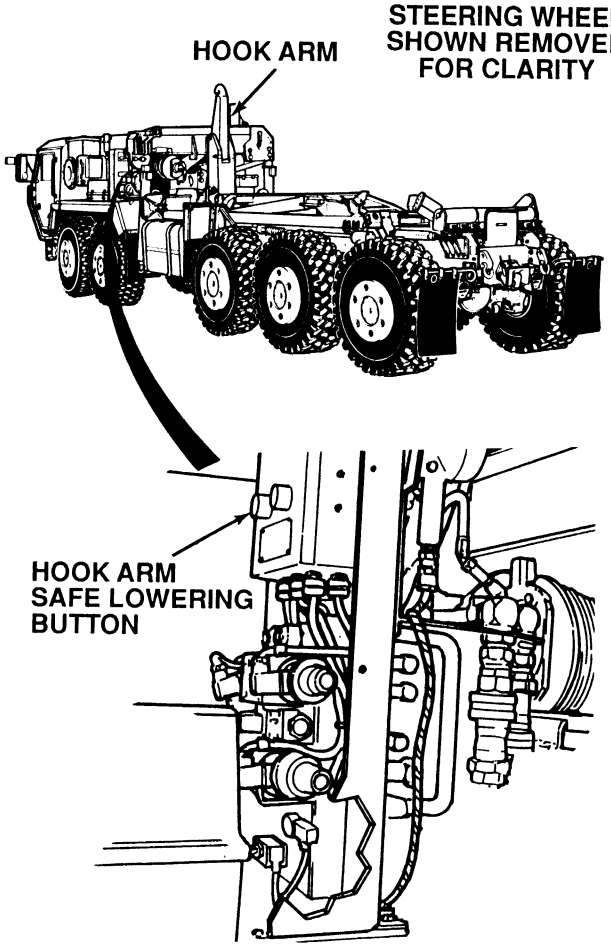


OPERATION TEST

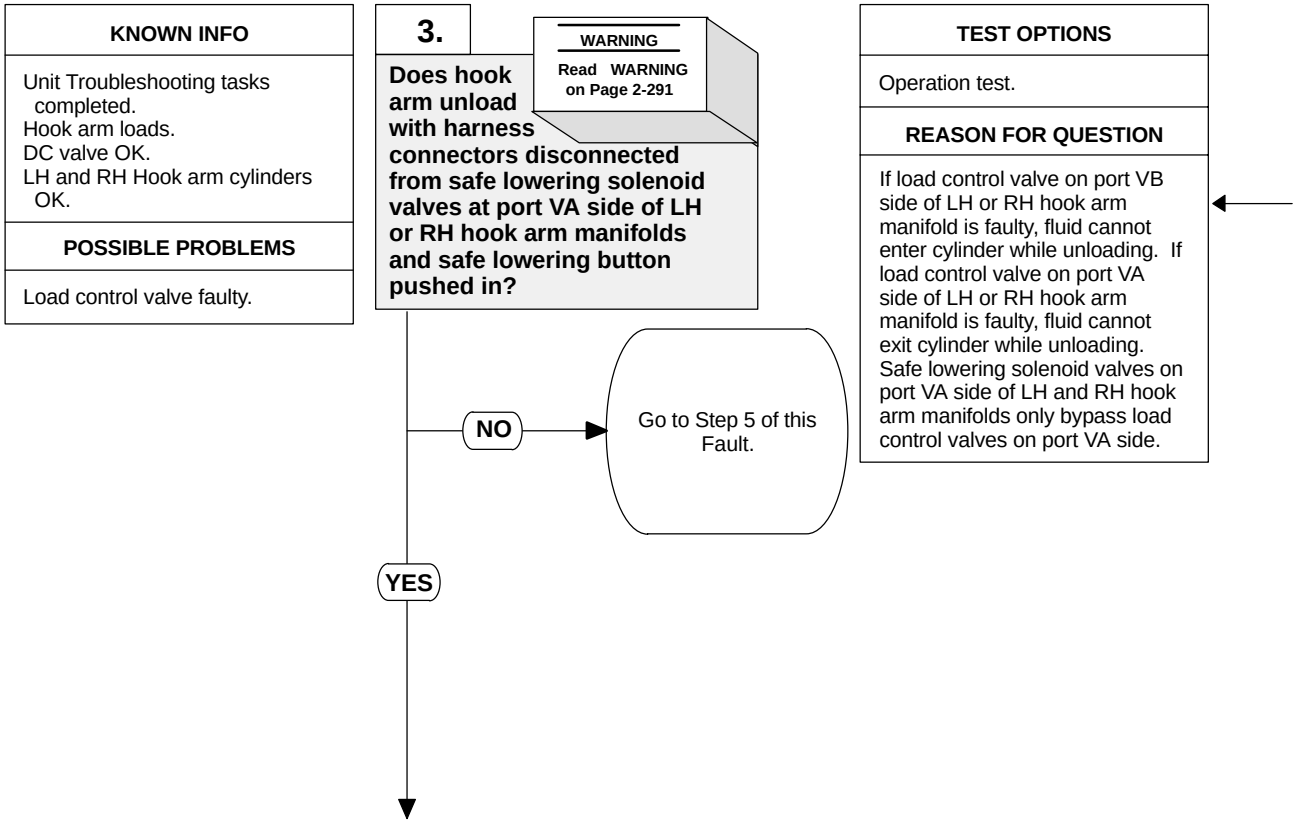
With the aid of an assistant, attempt to unload using cab joystick while pushing in hook arm safe lowering button (TM 9-2320-364-10).

(1) If hook arm does not unload, go to Step 6 of this Fault.
(2) If hook arm unloads, go to Step 3 of this Fault.





4. HOOK ARM DOES NOT UNLOAD (CONT).

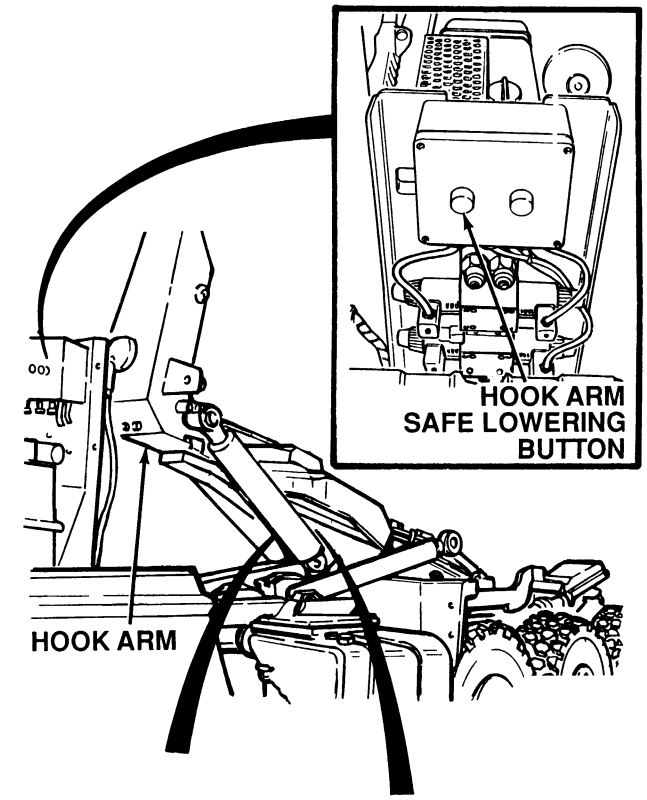


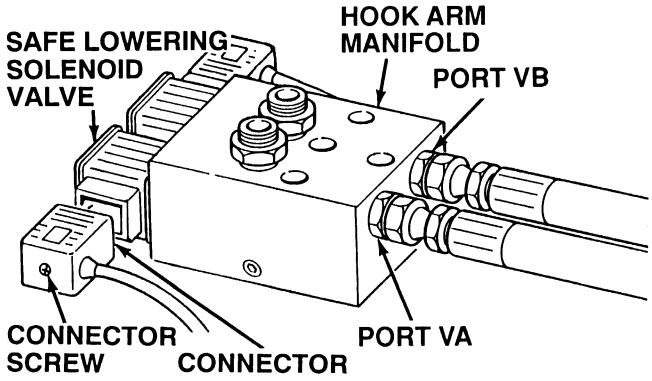
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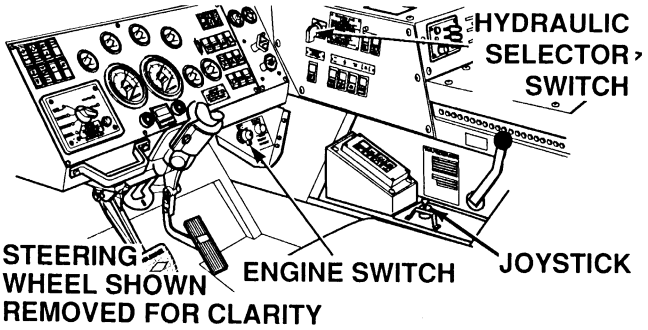
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

OPERATION TEST

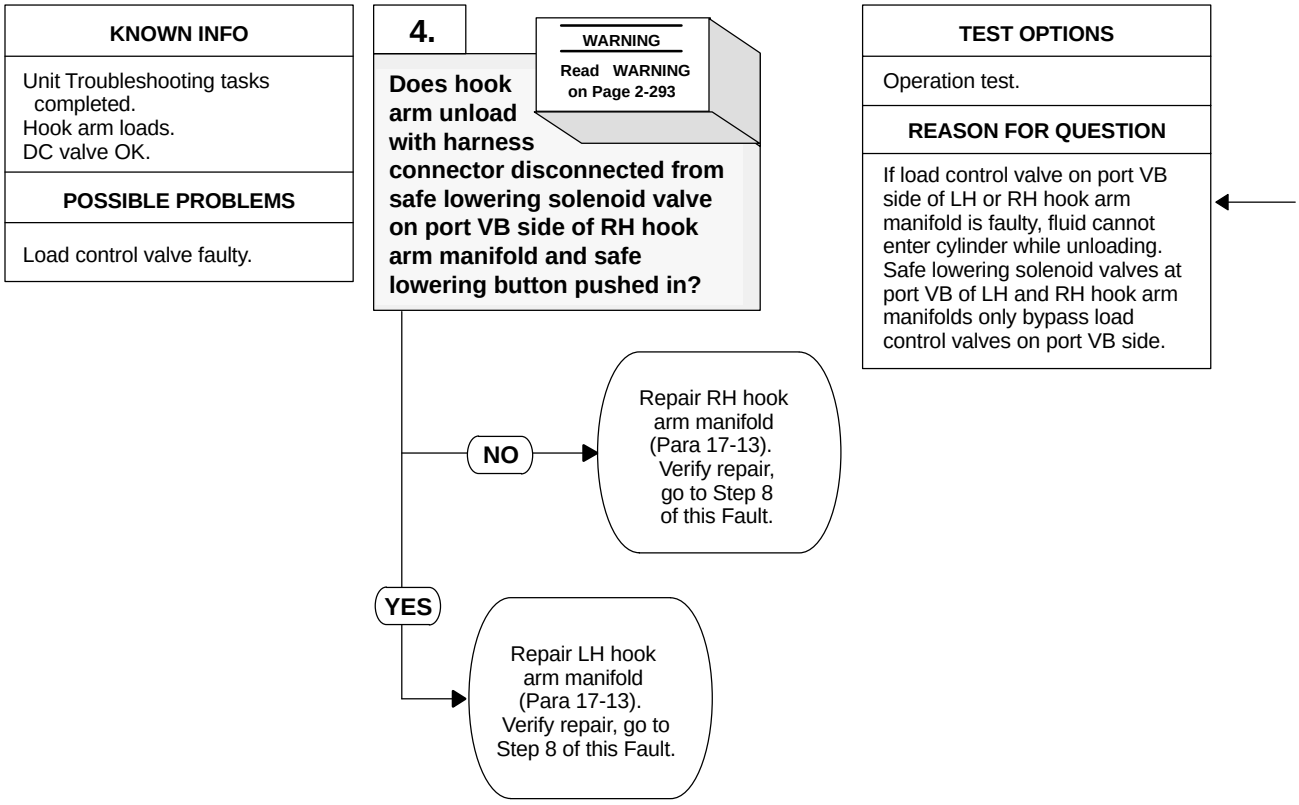
(1) With the aid of an assistant, raise hook arm approximately 24 in. (61 cm) while holding in hook arm safe lowering button (TM 9-2320-364-10).
(2) Loosen connector screw and disconnect connector from safe lowering solenoid valve on port VA side of LH hook arm manifold.
(3) Loosen connector screw and disconnect connector from safe lowering solenoid valve on port VA side of RH hook arm manifold.
(4) Set hydraulic selector switch to MAN HA.
(5) With the aid of an assistant, attempt to unload using cab joystick while pushing in hook arm safe lowering button.
    (a) If hook arm does not unload, perform Steps (6) through (9) below and go to Step 5 of this Fault.
    (b) If hook arm unloads, perform Steps (6) through (9) below and go to Step 4 of this Fault.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.
(8) Connect connector to safe lowering solenoid valve on LH hook arm manifold.
(9) Tighten connector screw and coat head of connector screw with sealing compound.







4. HOOK ARM DOES NOT UNLOAD (CONT).

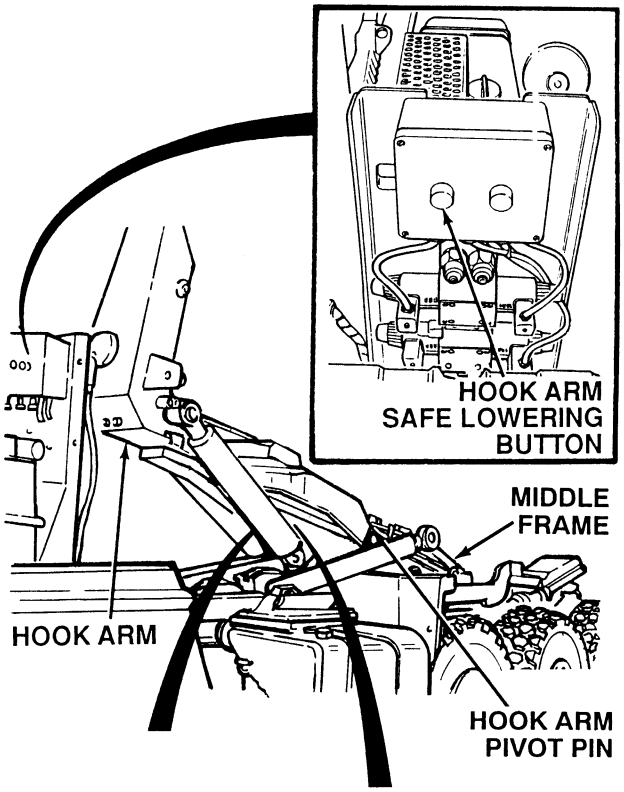


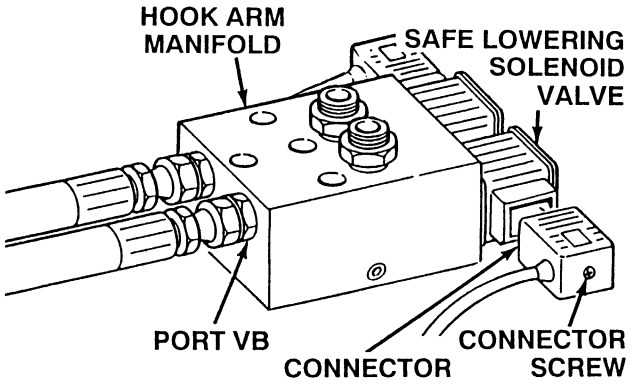
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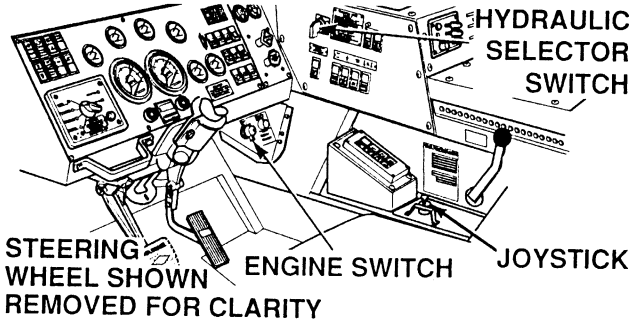
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury or death.
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

OPERATION TEST

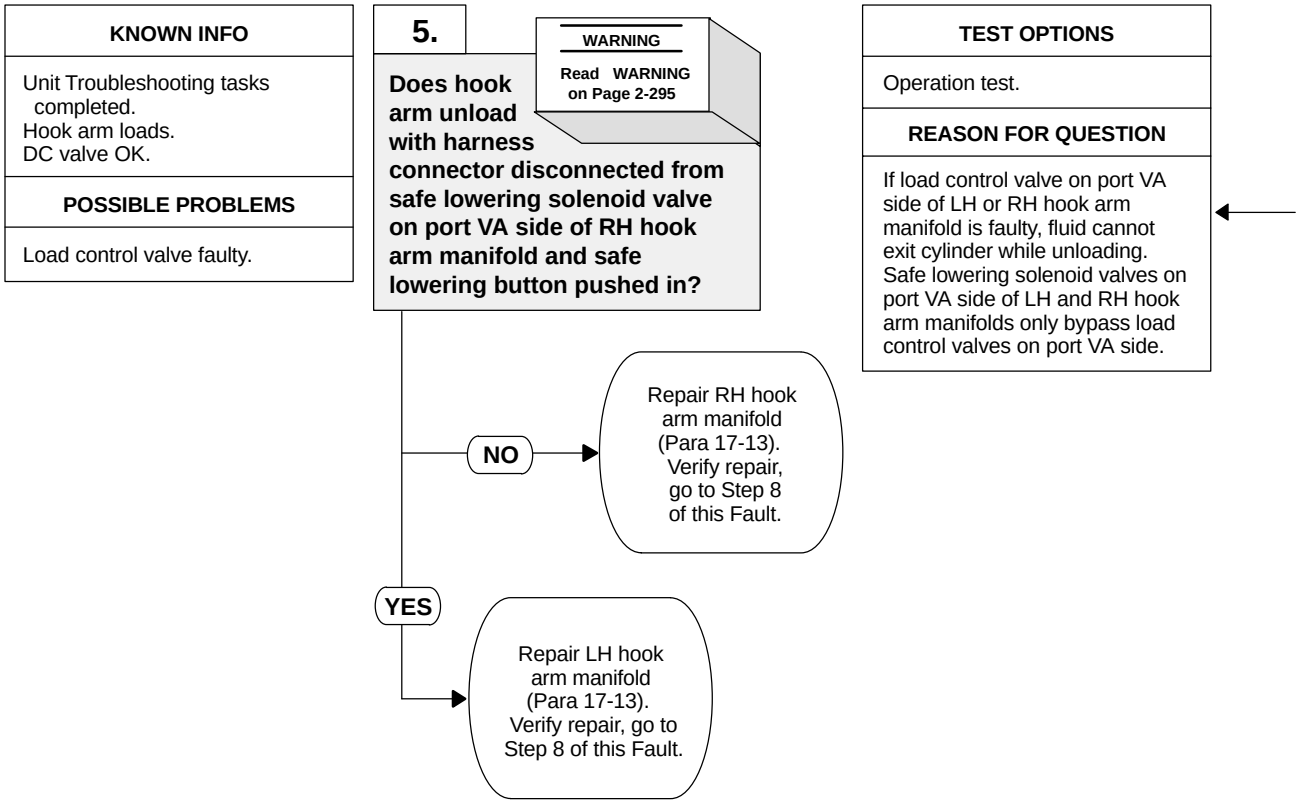
(1) With the aid of an assistant, raise hook arm approximately 24 in. (61 cm) while holding in hook arm safe lowering button (TM 9-2320-364-10).
(2) Set hydraulic selector switch to MAN HA.
(3) Loosen connector screw and disconnect connector from safe lowering solenoid valve on port VB side of RH hook arm manifold.
(4) With the aid of an assistant, attempt to unload using cab joystick while pushing in hook arm safe lowering button.
  (a) If hook arm does not unload, load control valve is faulty. Perform Steps (5) through (8) below and repair RH hook arm manifold at port VB (Para 17-13).
  (b) If hook arm unloads, load control valve is faulty. Perform Steps (5) through (8) below and repair LH hook arm manifold at port VB (Para 17-13).
(5) Connect connector to safe lowering solenoid valve on port VB side of RH hook arm manifold.
(6) Tighten connector screw and coat head of connector screw with sealing compound.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.







4. HOOK ARM DOES NOT UNLOAD (CONT).

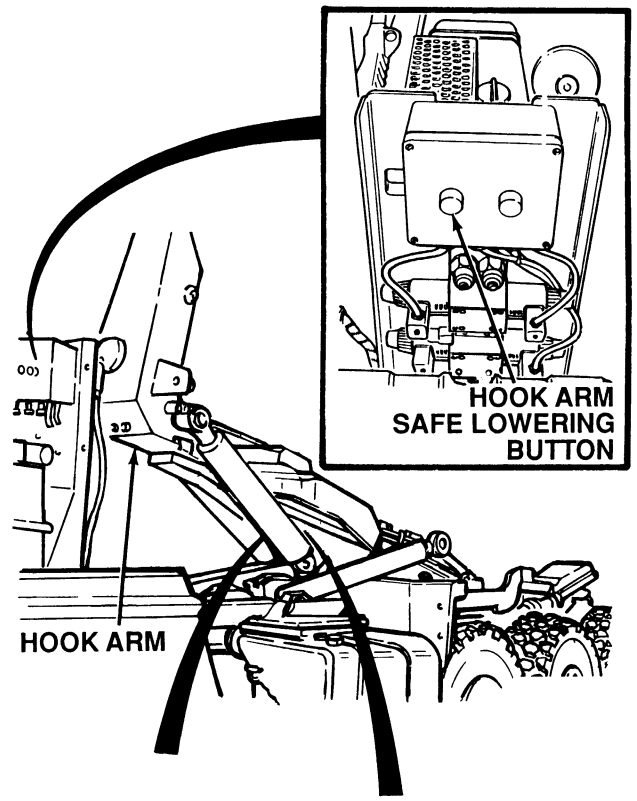


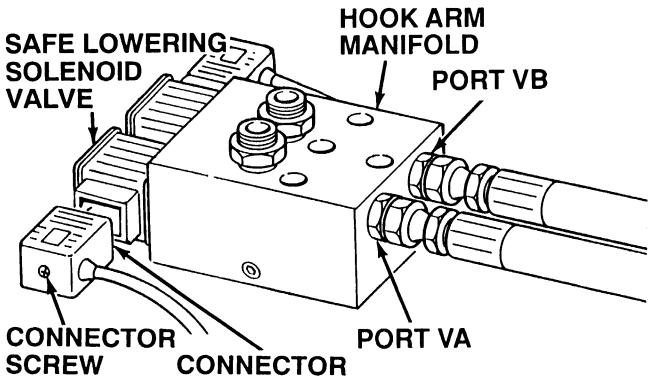
WARNING

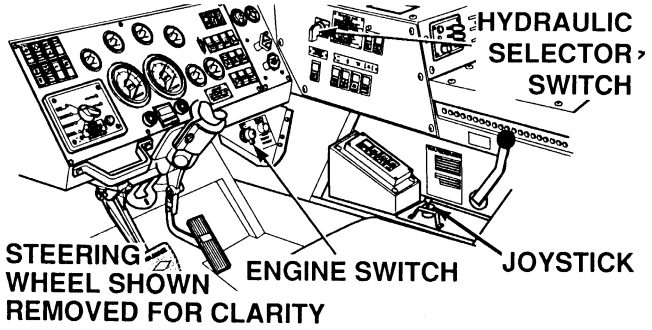
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

OPERATION TEST

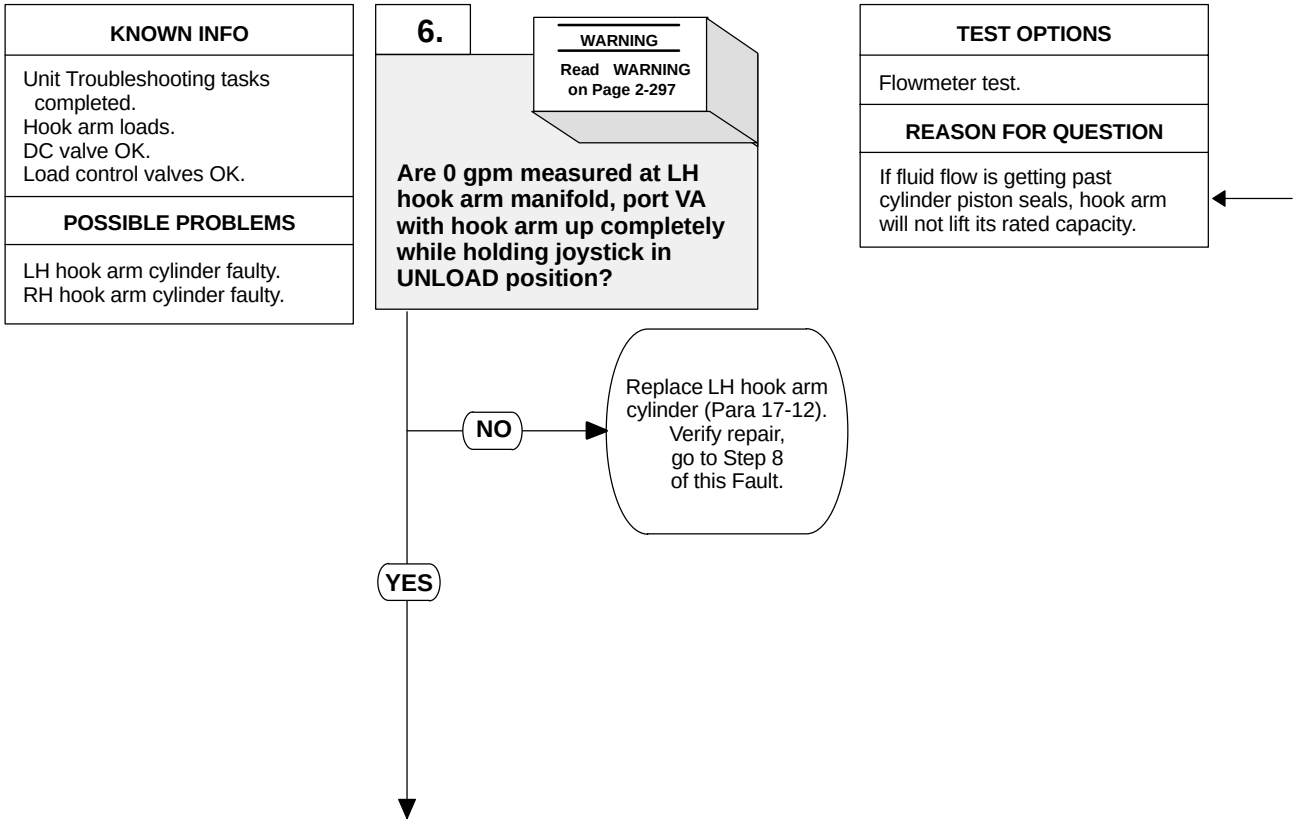
(1) Loosen connector screw and disconnect connector from safe lowering solenoid valve on port VA side of RH hook arm manifold.
(2) With the aid of an assistant, attempt to unload using cab joystick while pushing in hook arm safe lowering button (TM 9-2320-364-10).
  (a) If hook arm does not unload, load control valve is faulty. Perform Steps (3) through (6) below and repair RH hook arm manifold at port VA (Para 17-13).
  (b) If hook arm unloads, load control valve is faulty. Perform Steps (3) through (6) below and repair LH hook arm manifold at port VA (Para 17-13).
(3) Connect connector to safe lowering solenoid valve on port VA side of RH hook arm manifold.
(4) Tighten connector screw and coat head of connector screw with sealing compound.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.







4. HOOK ARM DOES NOT UNLOAD (CONT).

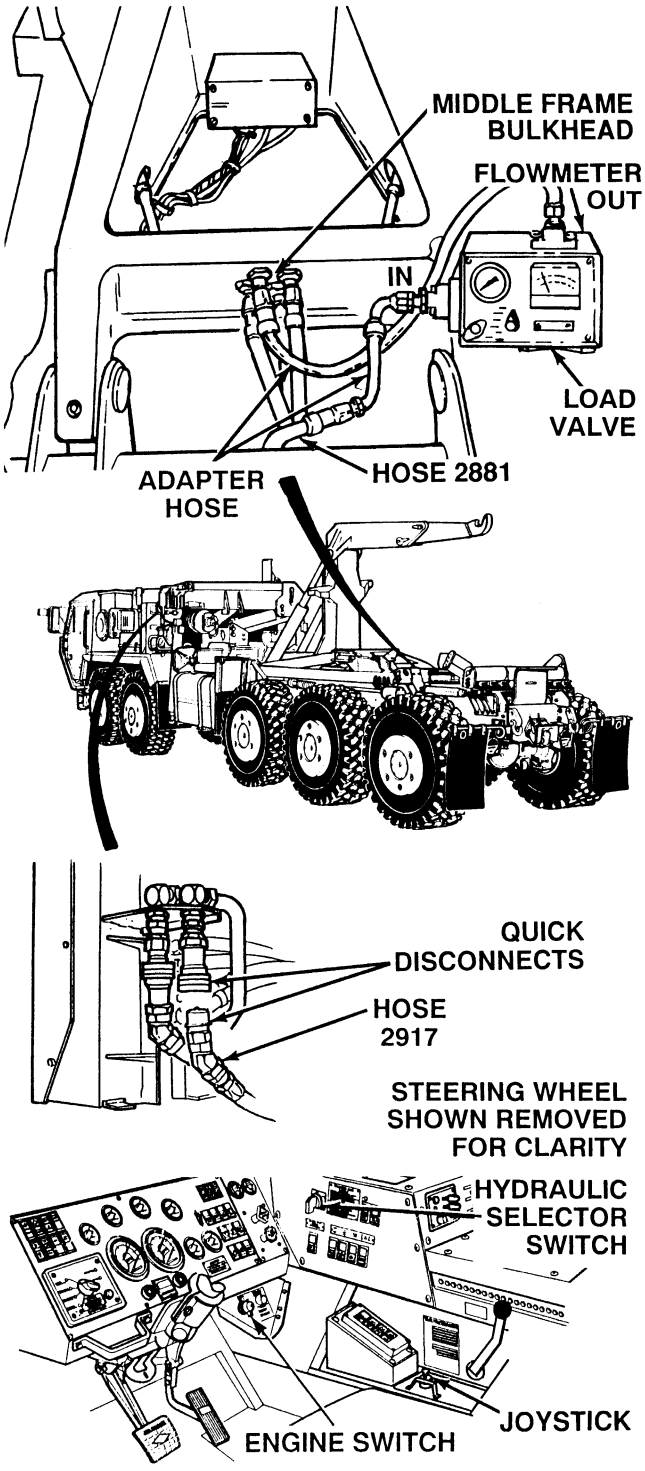


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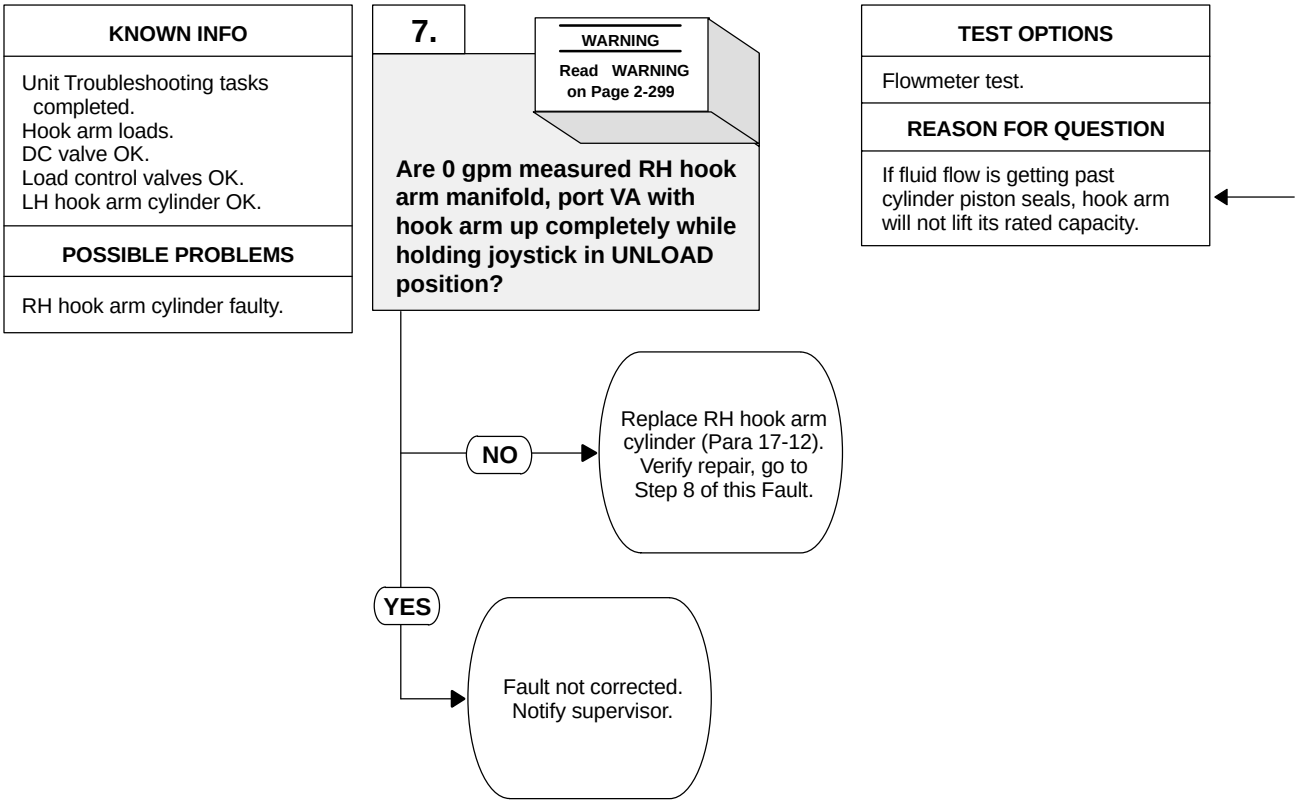
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

FLOWMETER TEST

(1) Raise hook arm completely (TM 9-2320-364-10).
(2) Set hydraulic selector switch to OFF position.
(3) Turn OFF ENGINE switch.
(4) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(5) Disconnect hose 2881 from middle frame bulkhead.
(6) Connect adapter hose to hose 2881.
(7) Connect adapter hose to middle frame bulkhead.
(8) Connect flowmeter IN port to adapter hose connected to hose 2881.
(9) Connect flowmeter OUT port to adapter hose connected to middle frame bulkhead.
(10) Completely open flowmeter load valve.
(11) Connect quick disconnect hose 2917.
(12) Start engine (TM 9-2320-364-10).
(13) Set hydraulic selector switch to MAN HA position.
(14) With the aid of an assistant, observe flowmeter while holding joystick in UNLOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (15) through (22) below and replace LH cylinder (Para 17-12).
  (b) If 0 gpm (0 lpm) are present, cylinder is OK.
(15) Set hydraulic selector switch to OFF position.
(16) Turn OFF ENGINE switch.
(17) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(18) Disconnect flowmeter from two adapter hoses.
(19) Disconnect adapter hose from middle frame bulkhead.
(20) Disconnect adapter hose from hose 2881.
(21) Connect hose 2881 to middle frame bulkhead.
(22) Connect quick disconnect hose 2917.

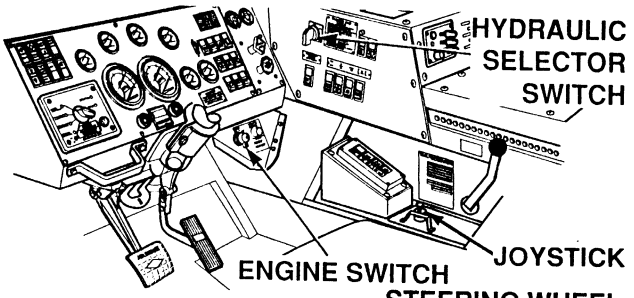


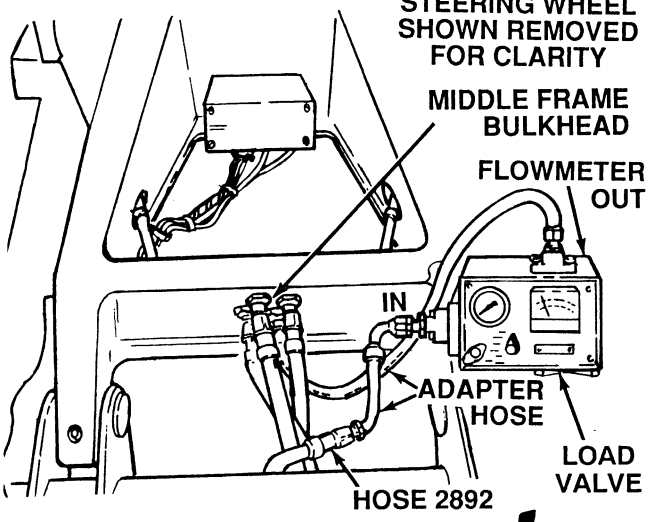
4. HOOK ARM DOES NOT UNLOAD (CONT).



WARNING

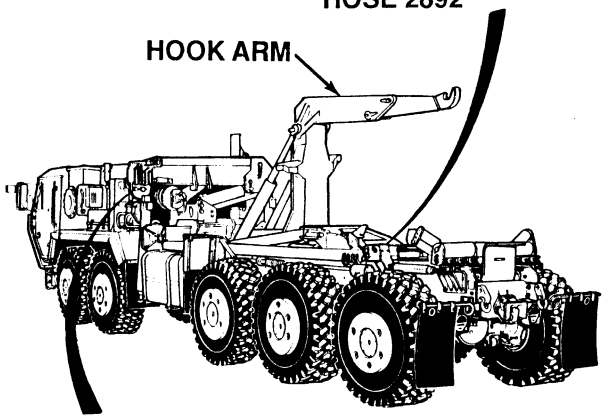
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

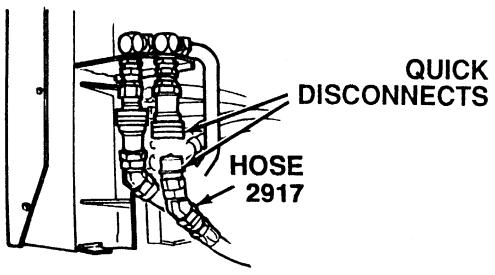




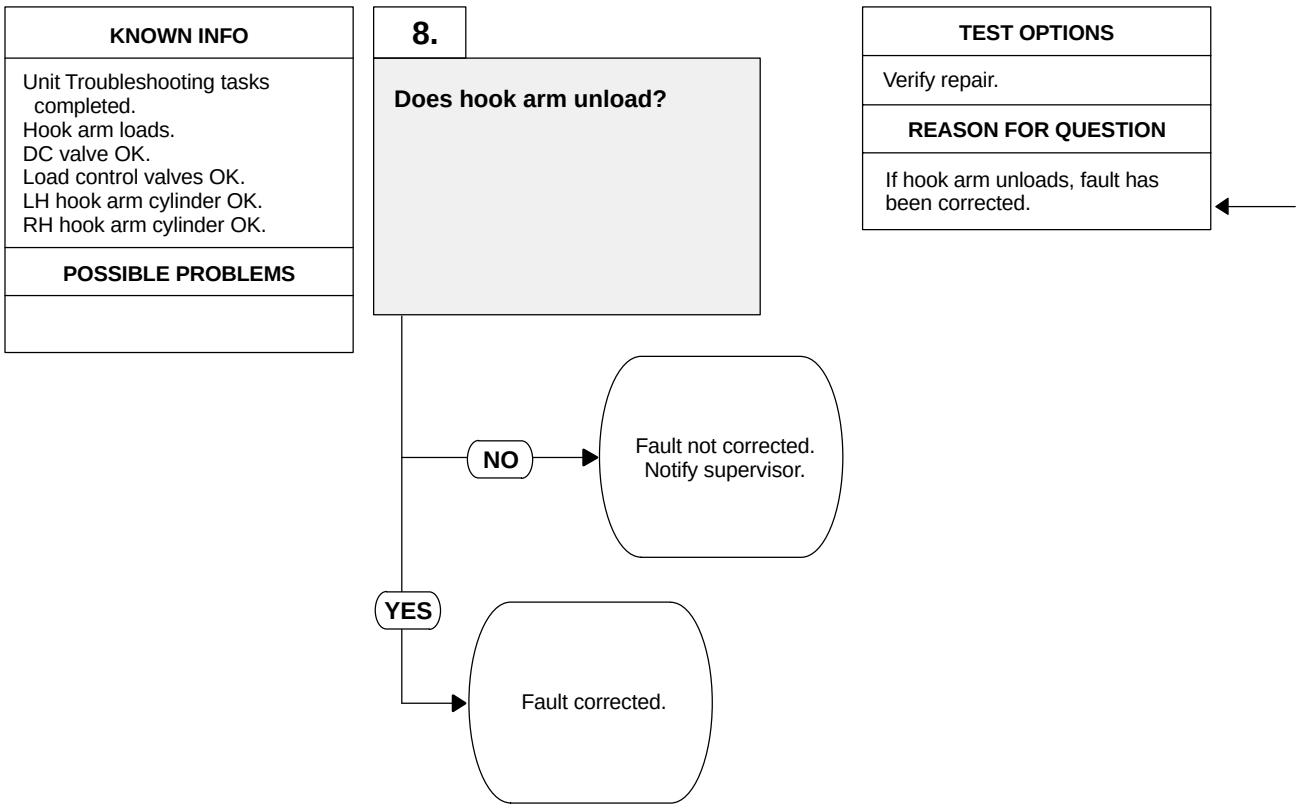
FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2892 from middle frame bulkhead.
(3) Connect adapter hose to hose 2892.
(4) Connect adapter hose to middle frame bulkhead.
(5) Connect flowmeter IN port to adapter hose connected to hose 2892.
(6) Connect flowmeter OUT port to adapter hose connected to middle frame bulkhead.
(7) Completely open flowmeter load valve.
(8) Connect quick disconnect hose 2917.
(9) Start engine (TM 9-2320-364-10).
(10) Set hydraulic selector switch to MAN HA position.
(11) With the aid of an assistant, observe flowmeter while holding joystick in UNLOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (19) below and replace RH cylinder (Para 17-12).
  (b) If 0 gpm (0 lpm) are present, cylinder is OK.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(15) Disconnect flowmeter from two adapter hoses.
(16) Disconnect adapter hose from middle frame bulkhead.
(17) Disconnect adapter hose from hose 2892.
(18) Connect hose 2892 to middle frame bulkhead.
(19) Connect quick disconnect hose 2917.



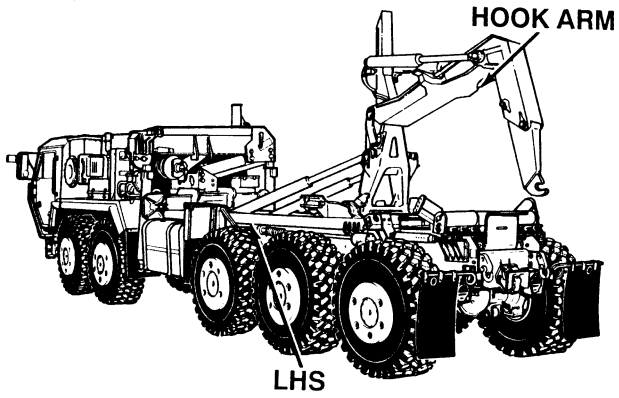


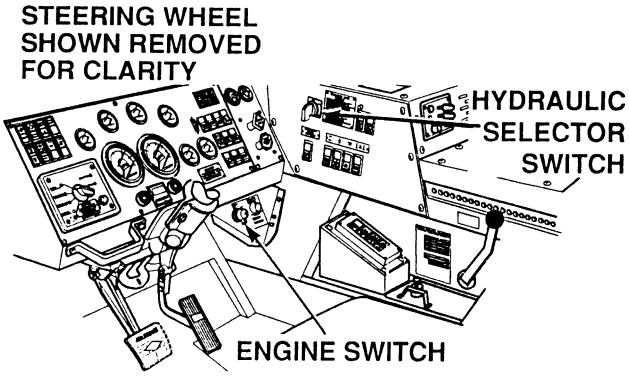
4. HOOK ARM DOES NOT UNLOAD (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to AUTO position.
(3) Hold joystick in UNLOAD position.
  (a) If hook arm does not unload, fault not corrected. Perform Steps (4) through (6) below and notify supervisor.
  (b) If hook arm unloads, fault has been corrected.
(4) Put LHS in transit position.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.





2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESOOTING (CONT).

5. LOSS OF HOOK ARM LOAD HOLDING.

INITIAL SETUP

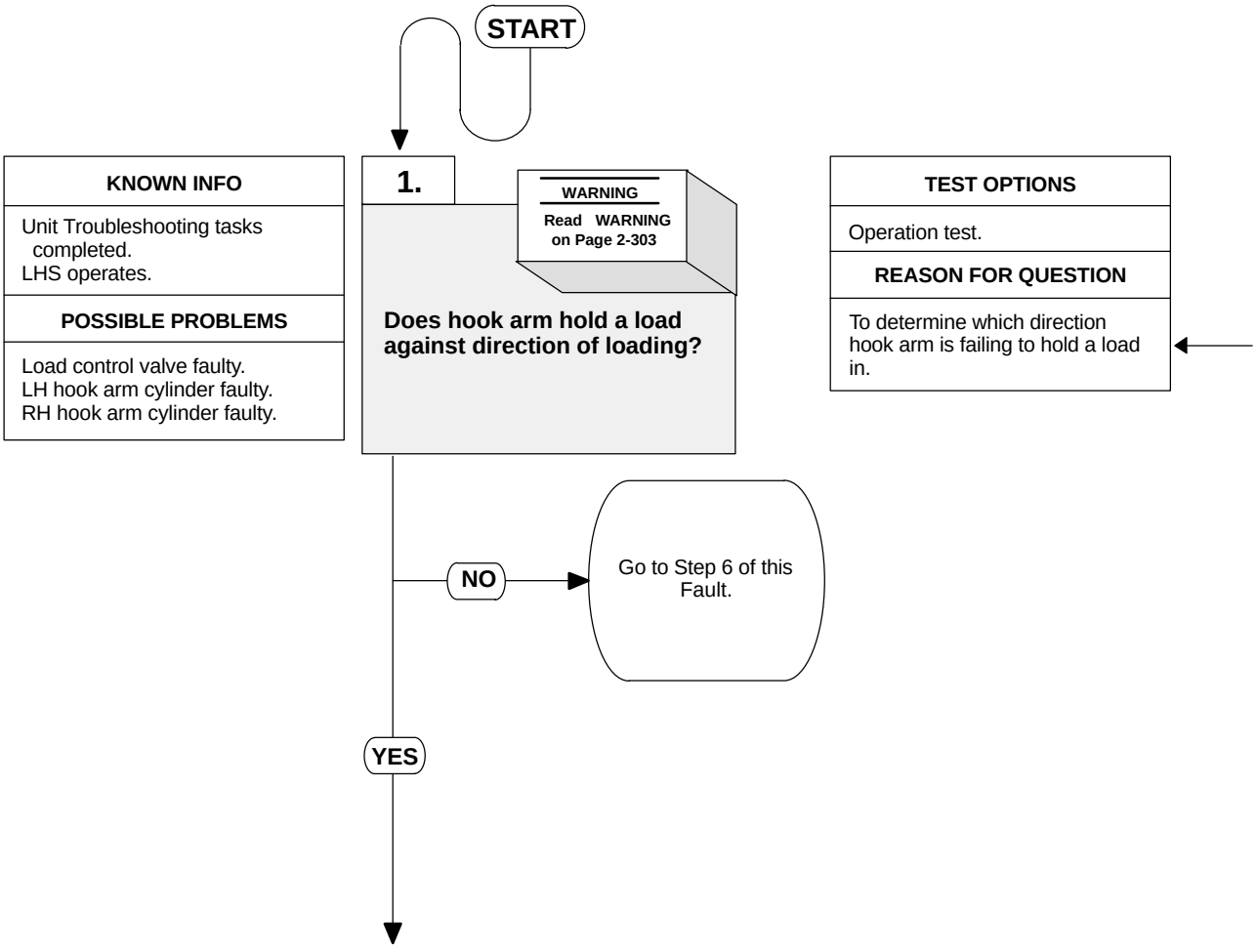
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Cap and Plug Set (Item 34, Appendix F)
Jackstand (2) (Item 132, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Steel Tube (Appendix C)
Load (500 lb [227 kg] minimum)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)

Personnel Required
Two

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

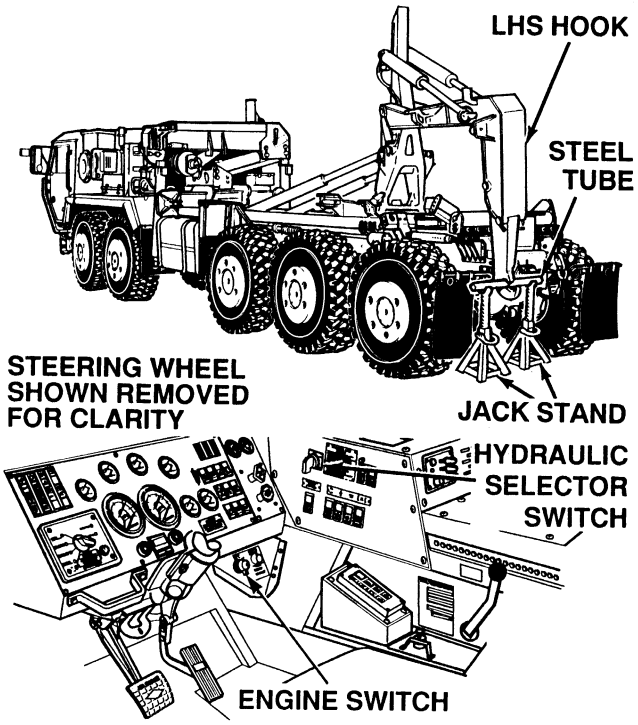


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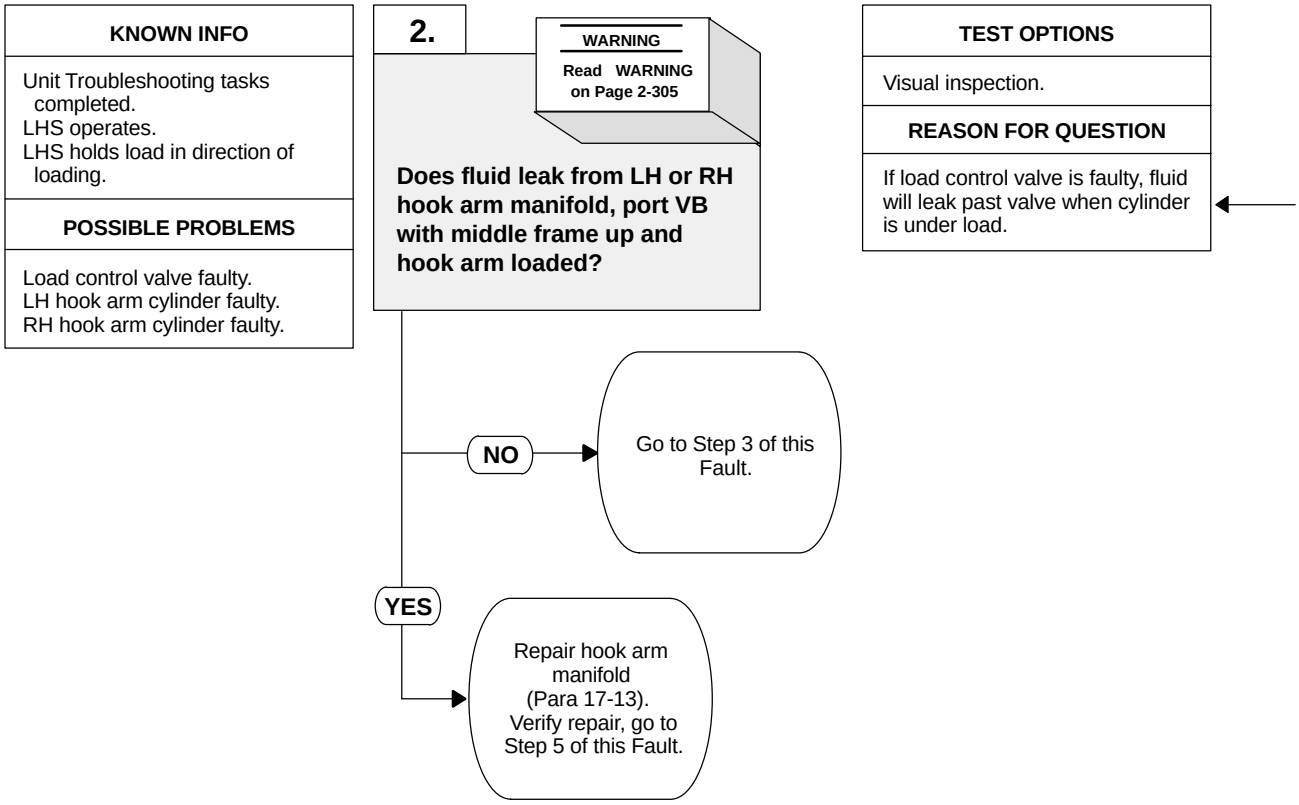
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

OPERATION TEST

(1) Position LHS hook to rear of truck and engage hook on steel tube supported by jackstands.
(2) Using LHS, lift truck only enough to lift vehicle weight off suspension. Do not lift tires off ground.
   (a) If hook arm does not hold weight off vehicle suspension, lower truck and perform Steps (4) and (5) below and go to Step 6 of this Fault.
   (b) If hook arm does hold weight off vehicle suspension, perform Steps (3) through (5) below and go to Step 2 of this Fault.
(3) Disengage hook from steel tube.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.



5. LOSS OF HOOK ARM LOAD HOLDING (CONT).



WARNING

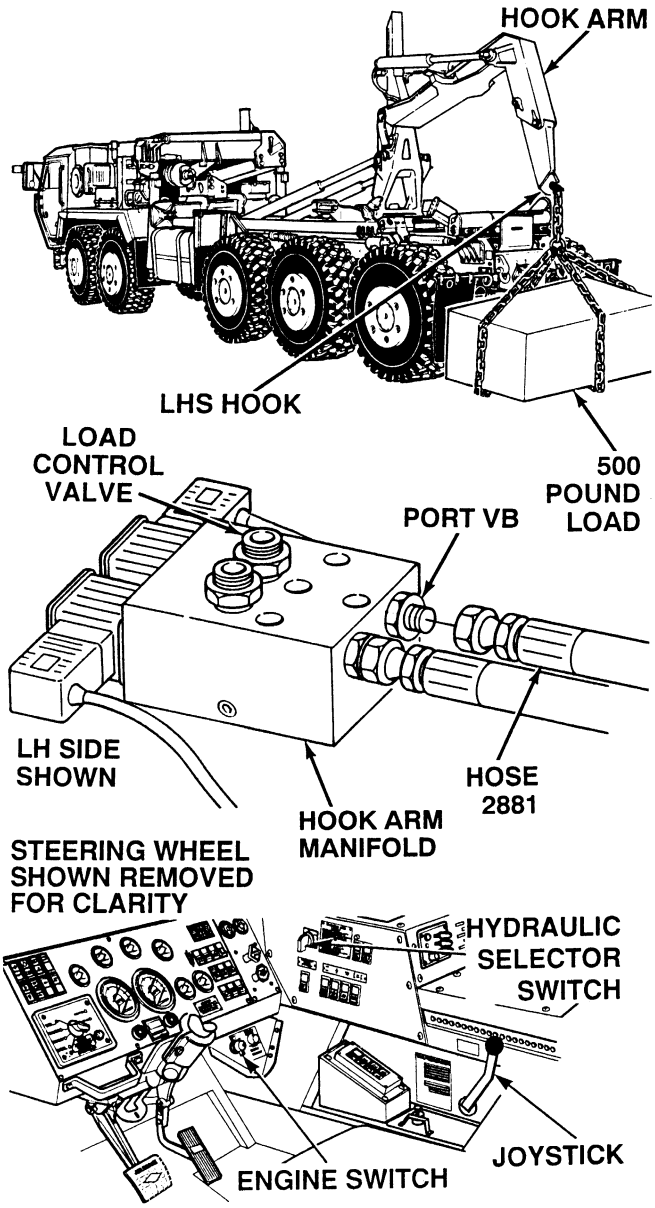
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

NOTE

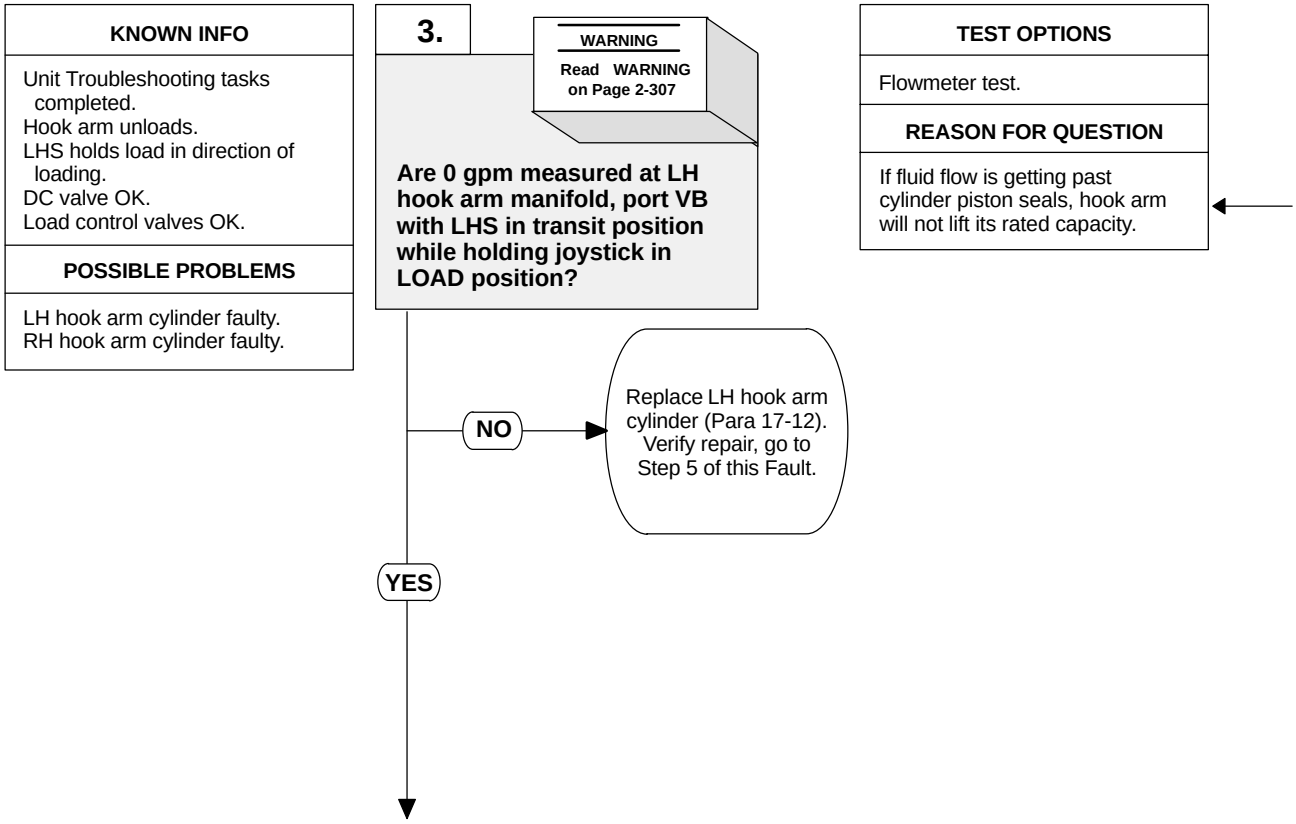
Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Attach 500 lb (227 kg) minimum load to hook.
(2) Raise hook arm approximately half of its travel (TM 9-2320-364-10).
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.
(5) Disconnect hose 2881 from LH hook arm manifold, port VB. Plug hose.
(6) Disconnect hose 2892 from RH hook arm manifold, port VB. Plug hose.
(6) Allow one to two minutes to pass to allow excess oil laying in manifold to drain out.
  (a) If hydraulic fluid stops draining from hook arm manifolds, load control valves are OK. Perform Steps (7) through (13) below and go to Step 3 of this Fault.
  (b) If hydraulic fluid continues to drain from LH or RH hook arm manifold at port VB, remove plug from hose and connect hose to hook arm manifold that does not leak. Replace load control valve at leaking port VB (Para 17-13).
(7) Remove plugs from hoses 2881 and 2892.
(8) Connect hose 2881 to LH hook arm manifold, port VB and hose 2892 to RH hook arm manifold, port VB.
(9) Turn ON ENGINE switch.
(10) Set hydraulic selector switch to MAN HA position.
(11) Disengage LHS hook arm from load.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.



5. LOSS OF HOOK ARM LOAD HOLDING (CONT).

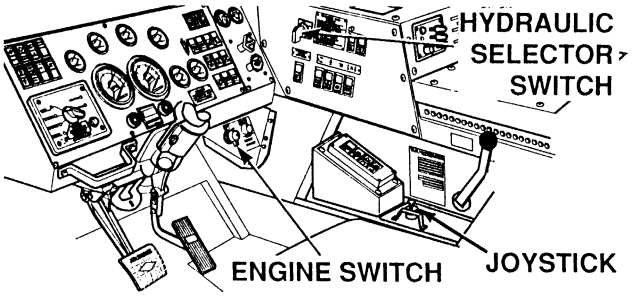


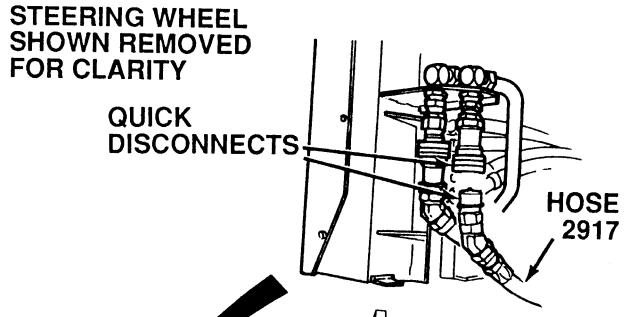
WARNING

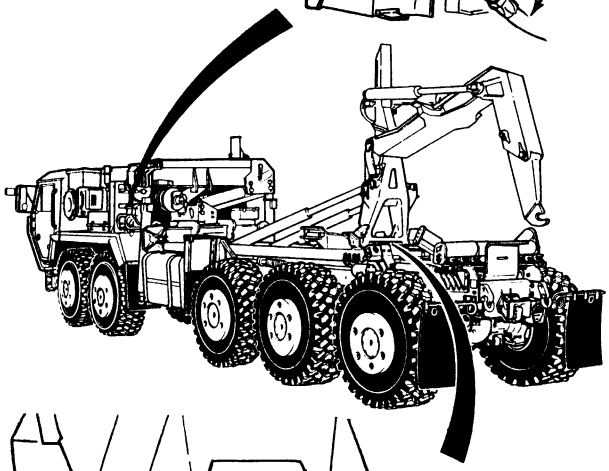
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

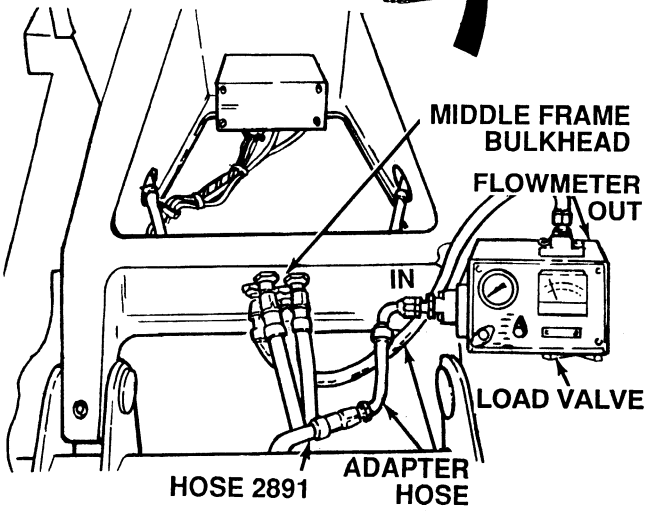
FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2891 from middle frame bulkhead.
(3) Connect adapter hose to hose 2891.
(4) Connect adapter hose to middle frame bulkhead.
(5) Connect flowmeter IN port to adapter hose connected to hose 2891.
(6) Connect flowmeter OUT port to adapter hose connected to middle frame bulkhead.
(7) Completely open flowmeter load valve.
(8) Connect quick disconnect hose 2917.
(9) Start engine (TM 9-2320-364-10).
(10) Set hydraulic selector switch to MAN HA position.
(11) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (19) below and replace LH hook arm cylinder (Para 17-12).
  (b) If 0 gpm (0 lpm) are present, cylinder is OK.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(15) Disconnect flowmeter from two adapter hoses.
(16) Disconnect adapter hose from middle frame bulkhead.
(17) Disconnect adapter hose from hose 2891.
(18) Connect hose 2891 to middle frame bulkhead.
(19) Connect quick disconnect hose 2917.

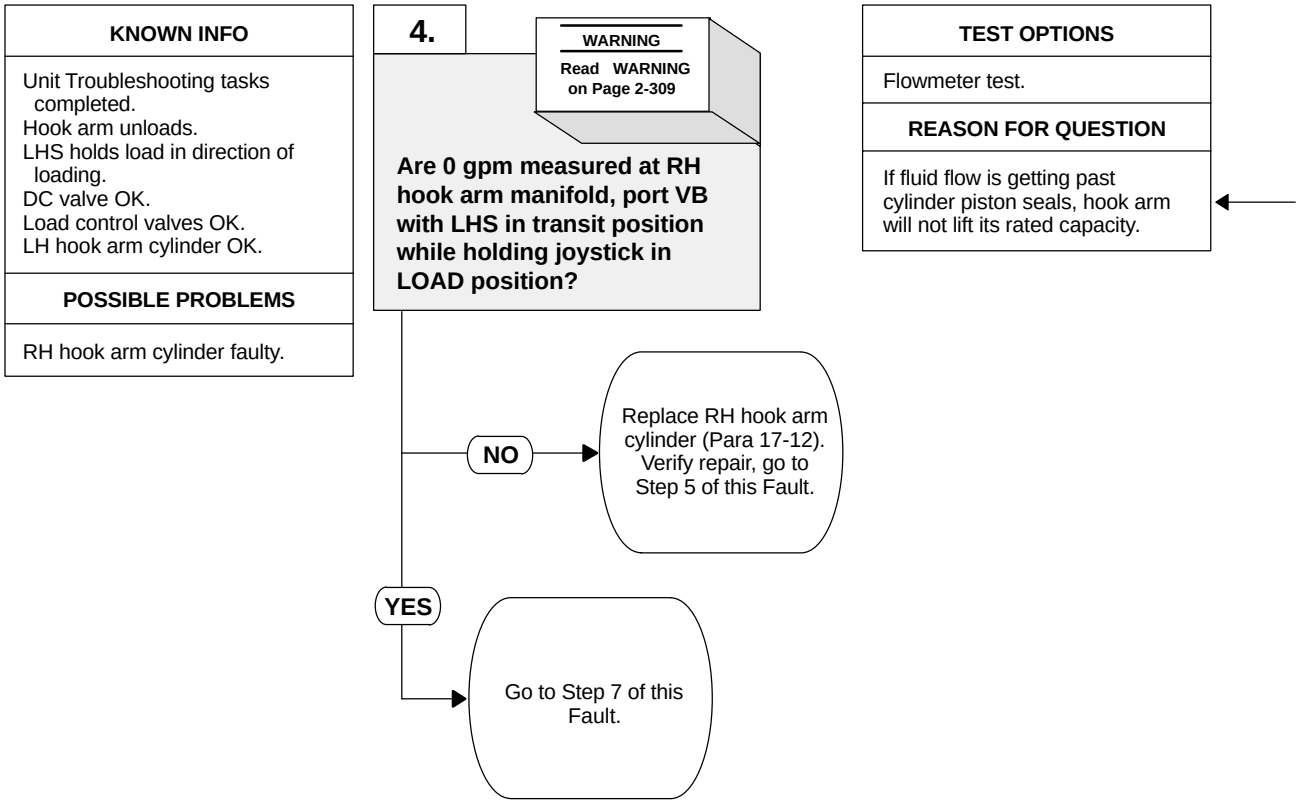








5. LOSS OF HOOK ARM LOAD HOLDING (CONT).

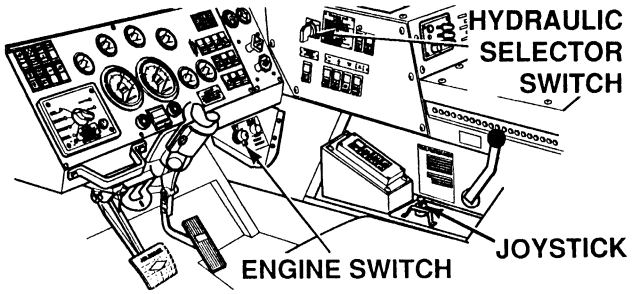


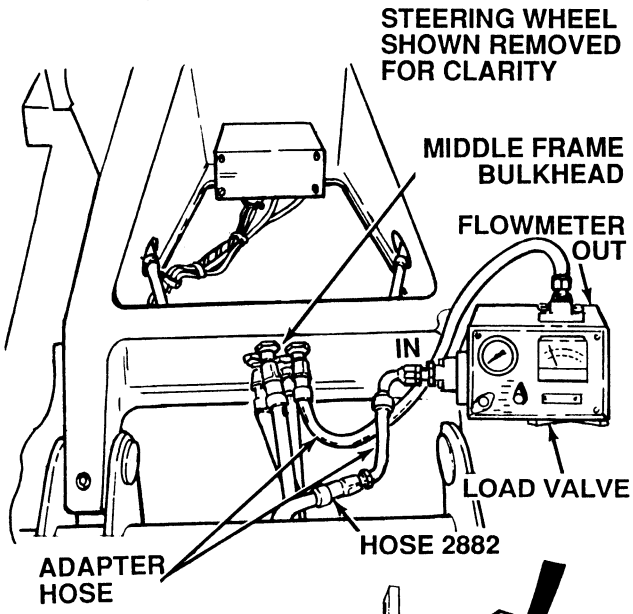
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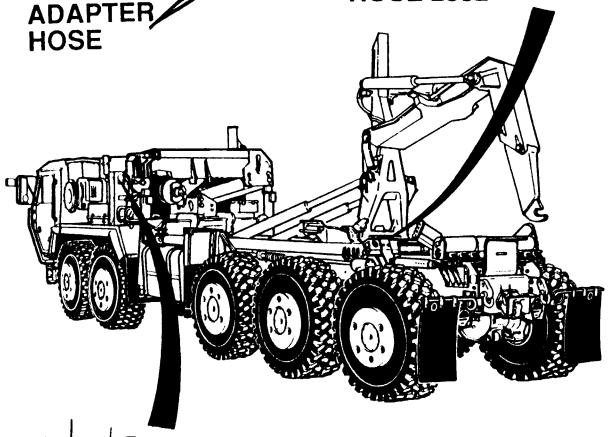
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

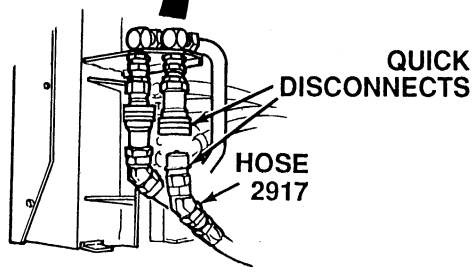
FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2882 from middle frame bulkhead.
(3) Connect adapter hose to hose 2882.
(4) Connect adapter hose to middle frame bulkhead.
(5) Connect flowmeter IN port to adapter hose connected to hose 2882.
(6) Connect flowmeter OUT port to adapter hose connected to middle frame bulkhead.
(7) Completely open flowmeter load valve.
(8) Connect quick disconnect hose 2917.
(9) Start engine (TM 9-2320-364-10).
(10) Set hydraulic selector switch to MAN HA position.
(11) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (20) below and replace RH hook arm cylinder (Para 17-12).
  (b) If 0 gpm (0 lpm) are present, cylinder is OK. Perform Steps (12) through (20) below and go to Step 7 of this Fault.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(15) Disconnect flowmeter from two adapter hoses.
(16) Disconnect adapter hose from middle frame bulkhead.
(18) Disconnect adapter hose from hose 2882.
(19) Connect hose 2882 to middle frame bulkhead.
(20) Connect quick disconnect hose 2917.

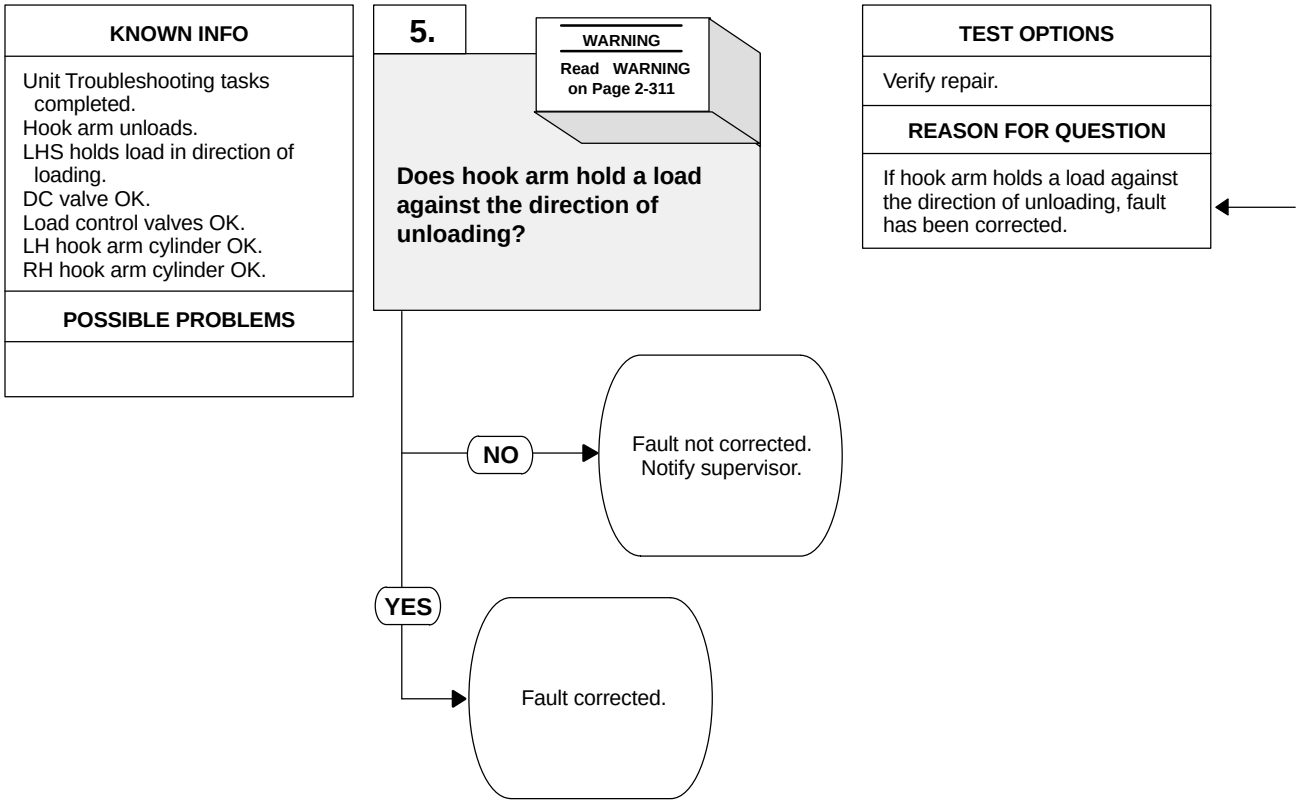








5. LOSS OF HOOK ARM LOAD HOLDING (CONT).

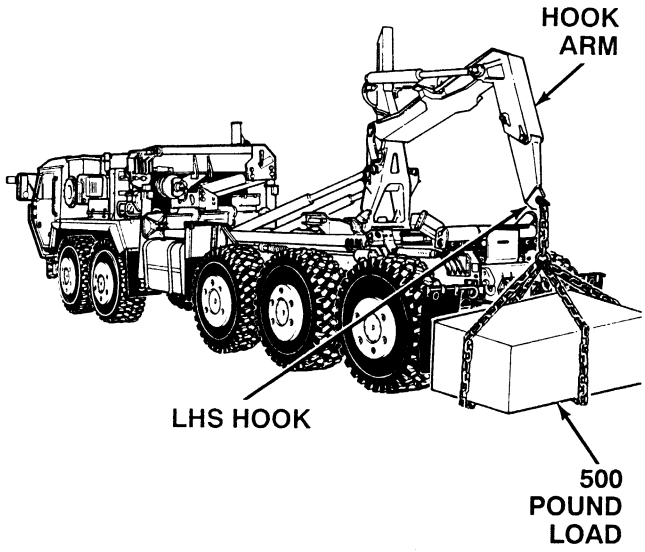


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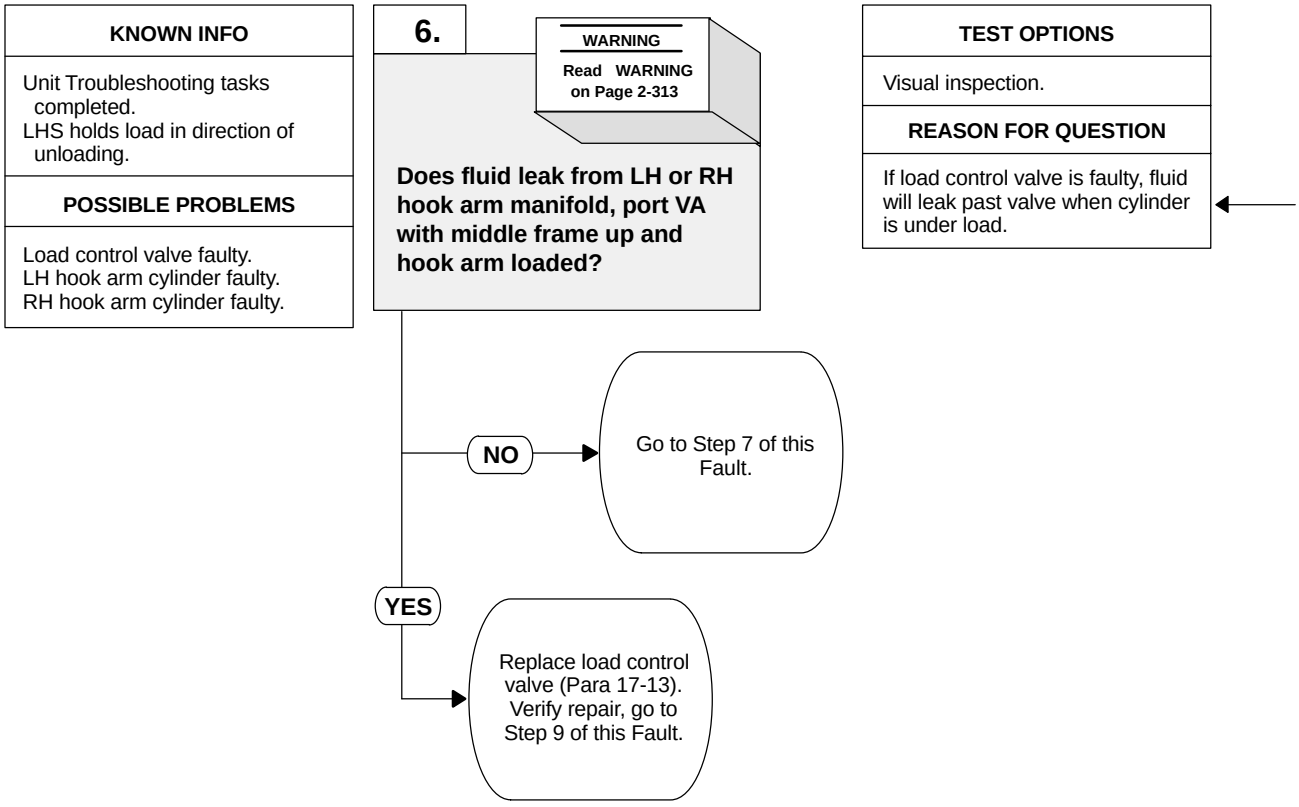
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

VERIFY REPAIR

(1) Attach 500 lb (227 kg) minimum load to hook.
(2) Raise hook arm approximately half of its travel (TM 9-2320-364-10).
(3) Turn OFF ENGINE switch.
  (a) If hook arm does not hold load, fault not corrected. Lower load using normal controls, perform Steps (4) through (7) below and notify supervisor.
  (b) If hook arm holds load, fault has been corrected.
(4) Disengage LHS hook arm from load.
(5) Put LHS in transit position.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.



5. LOSS OF HOOK ARM LOAD HOLDING (CONT).

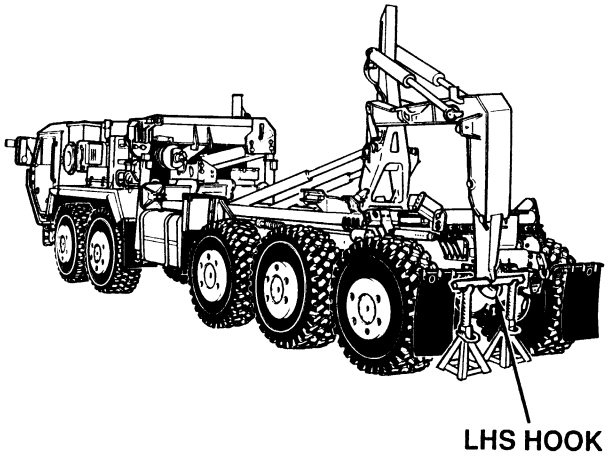


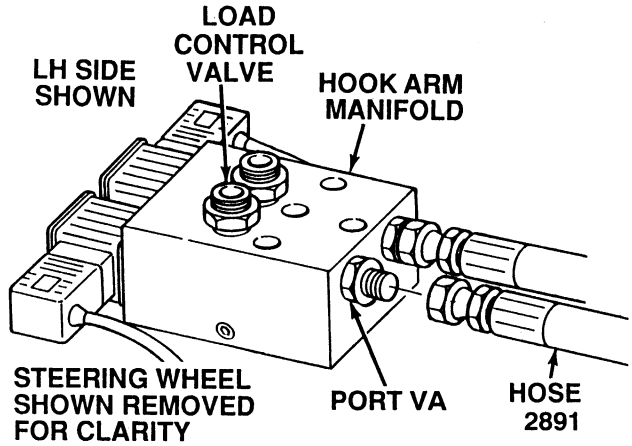
WARNING

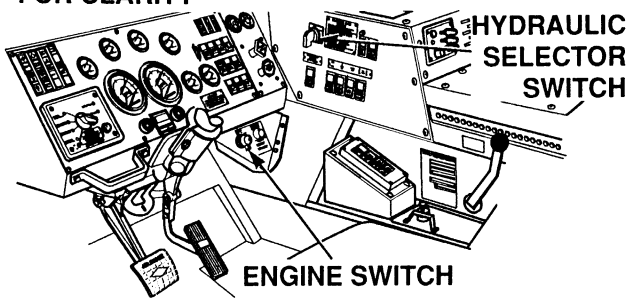
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

VISUAL INSPECTION

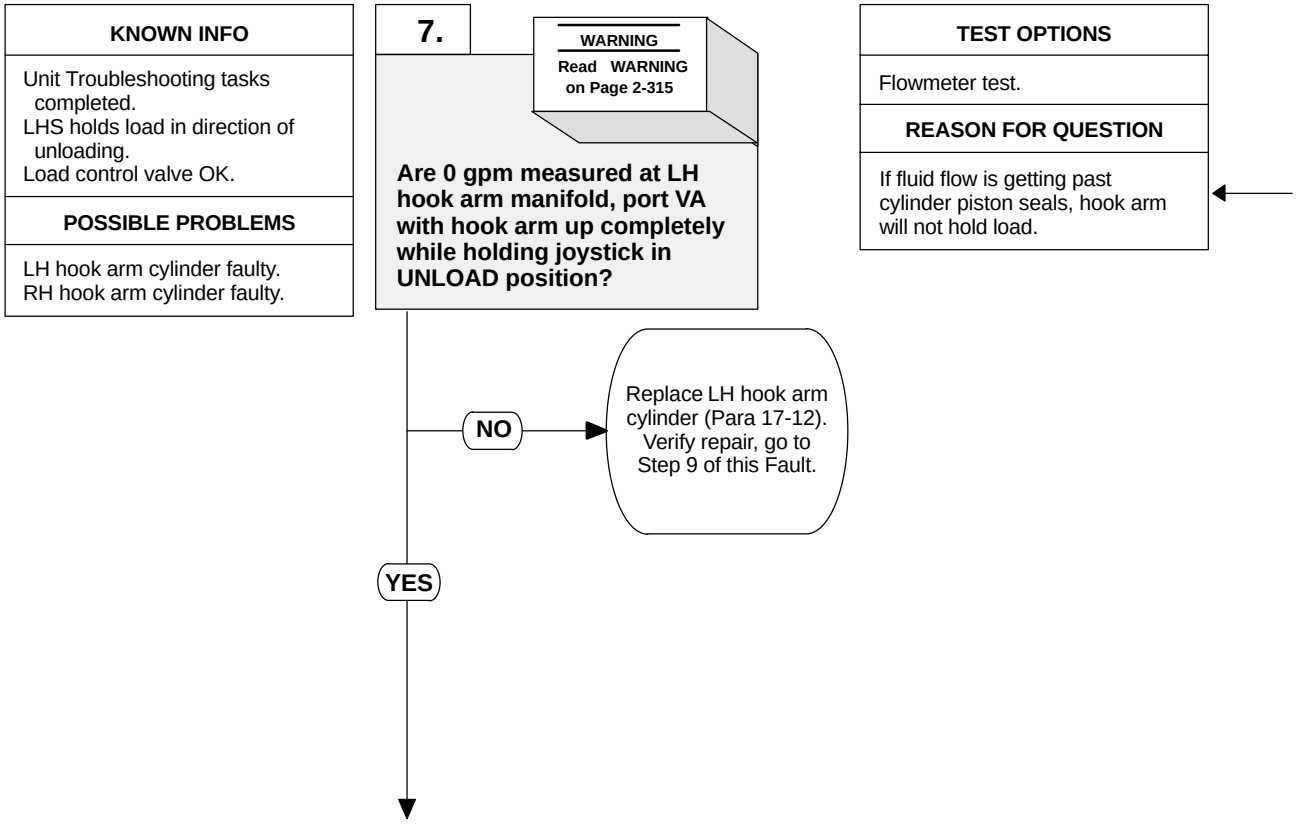
(1) Using LHS, lift truck only enough to lift vehicle weight off suspension. Do not lift tires off ground (TM 9-2320-364-10).
(2) Set hydraulic selector switch to OFF position.
(3) Turn OFF ENGINE switch.
(4) Disconnect hose 2891 from LH hook arm manifold, port VA. Plug hose.
(5) Disconnect hose 2882 from RH hook arm manifold, port VA. Plug hose.
  (a) If no fluid leaks from LH or RH hook arm manifold at port VA, load control valves are OK. Perform Steps (6) through (8) below and go to Step 7 of this Fault.
  (b) If fluid leaks from LH or RH hook arm manifold where hose is removed, remove plug from hose and connect hose to hook arm manifold that does not leak. replace load control valve at leaking port VA (Para 17-13).
(6) Remove plugs from hoses 2891 and 2882.
(7) Connect hose 2891 to LH hook arm manifold, port VA.
(8) Connect hose 2882 to RH hook arm manifold, port VA.







5. LOSS OF HOOK ARM LOAD HOLDING (CONT).



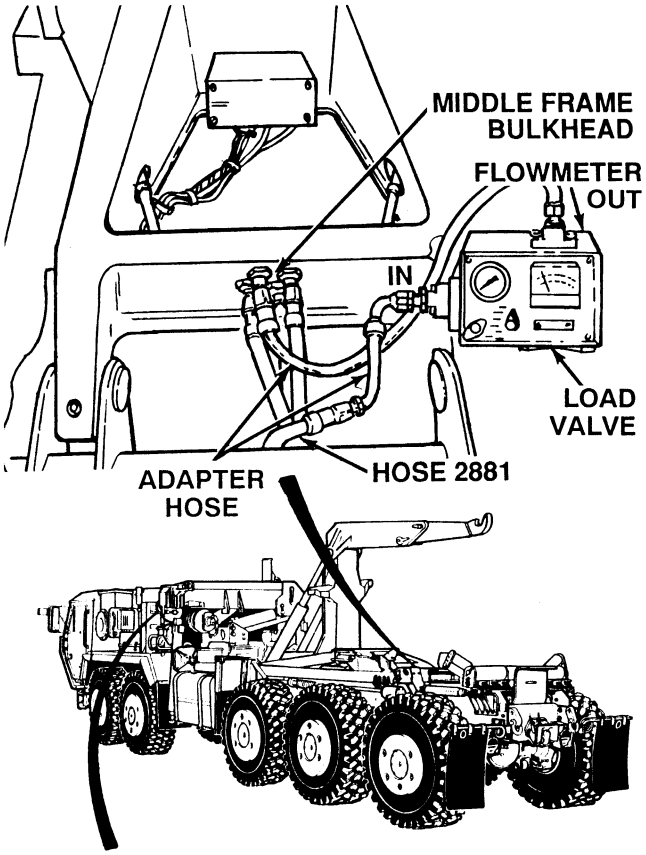
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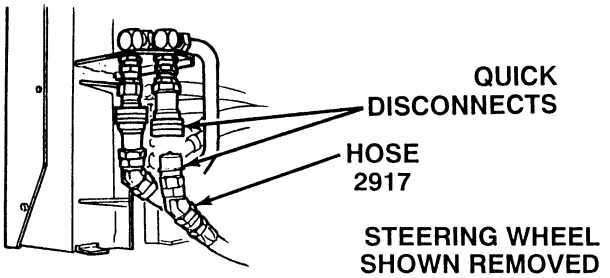
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

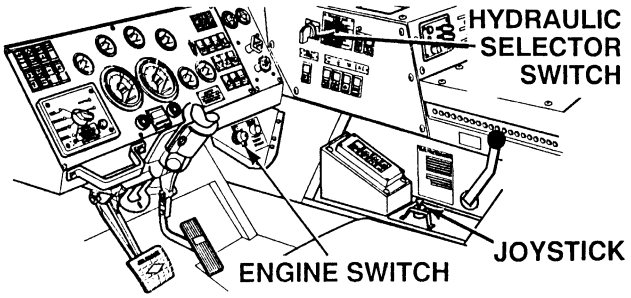
FLOWMETER TEST

(1) Disengage hook from steel tube.
(2) Raise hook arm completely (TM 9-2320-364-10)
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.
(5) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(6) Disconnect hose 2881 from middle frame bulkhead.
(7) Connect adapter hose to hose 2881.

Continued on next page.







5. LOSS OF HOOK ARM LOAD HOLDING (CONT).

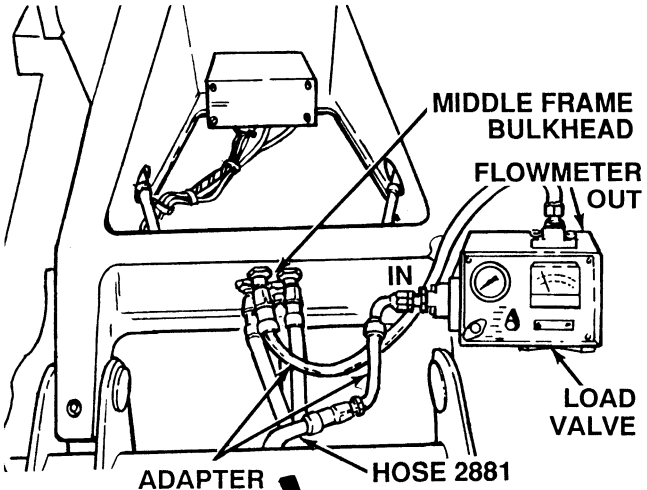
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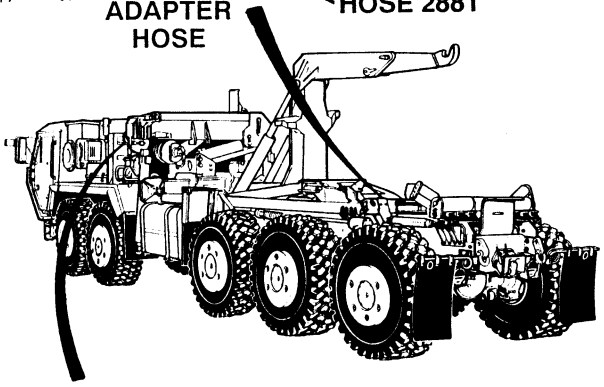
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

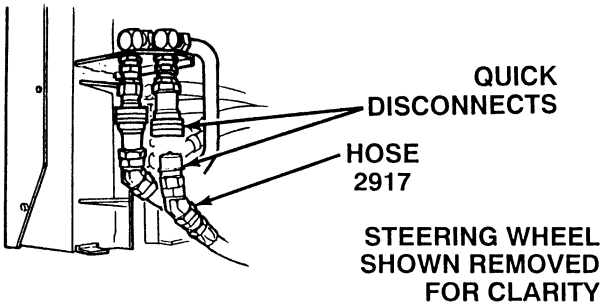
FLOWMETER TEST (CONT).

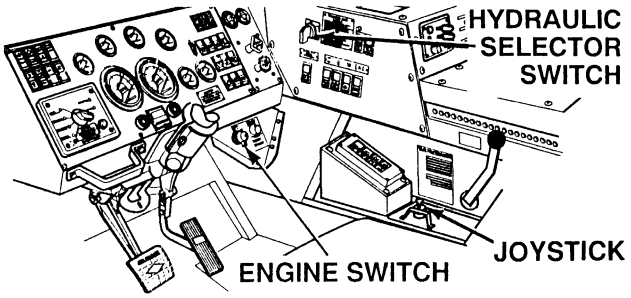
(8) Connect adapter hose to middle frame bulkhead.
(9) Connect flowmeter IN port to adapter hose connected to hose 2881.
(10) Connect flowmeter OUT port to adapter hose connected to middle frame bulkhead.
(11) Completely open flowmeter load valve.
(12) Connect quick disconnect hose 2917.
(13) Start engine.
(14) Set hydraulic selector switch to MAN HA position.

Continued on next page.







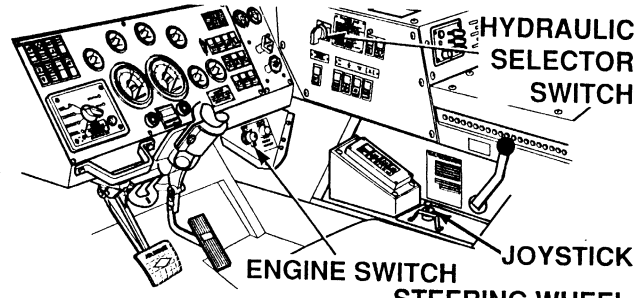


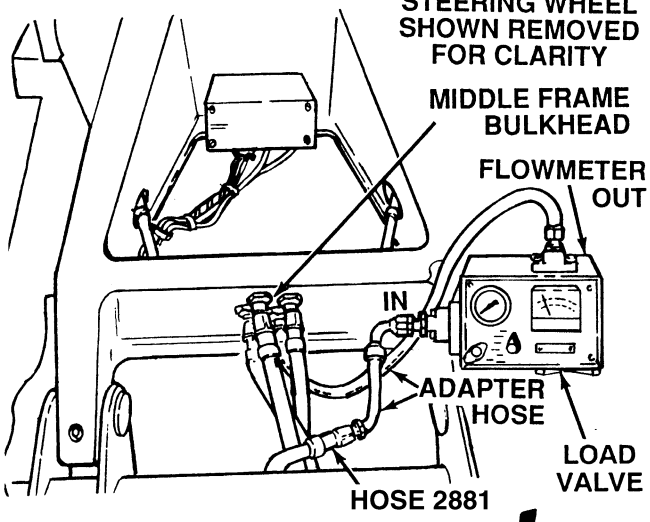
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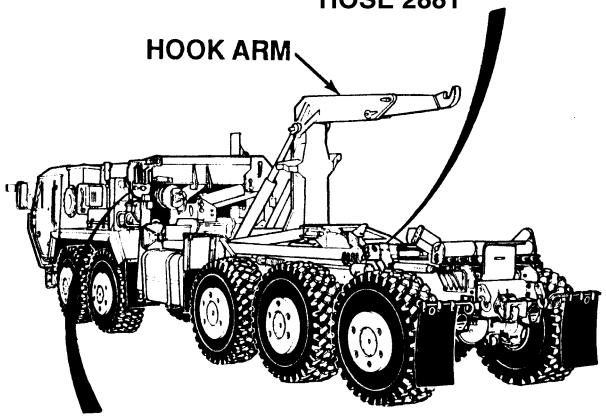
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

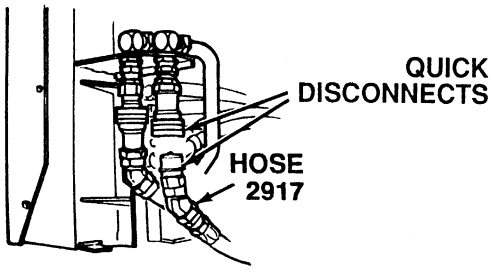
FLOWMETER TEST (CONT).

(15) With the aid of an assistant, observe flowmeter while holding joystick in UNLOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (16) through (23) below and replace LH hook arm cylinder (Para 17-12).
  (b) If 0 gpm (0 lpm) are present, cylinder is OK.
(16) Set hydraulic selector switch to OFF position.
(17) Turn OFF ENGINE switch.
(18) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(19) Disconnect flowmeter from two adapter hoses.
(20) Disconnect adapter hose from middle frame bulkhead.
(21) Disconnect adapter hose from hose 2881.
(22) Connect hose 2881 to middle frame bulkhead.
(23) Connect quick disconnect hose 2917.

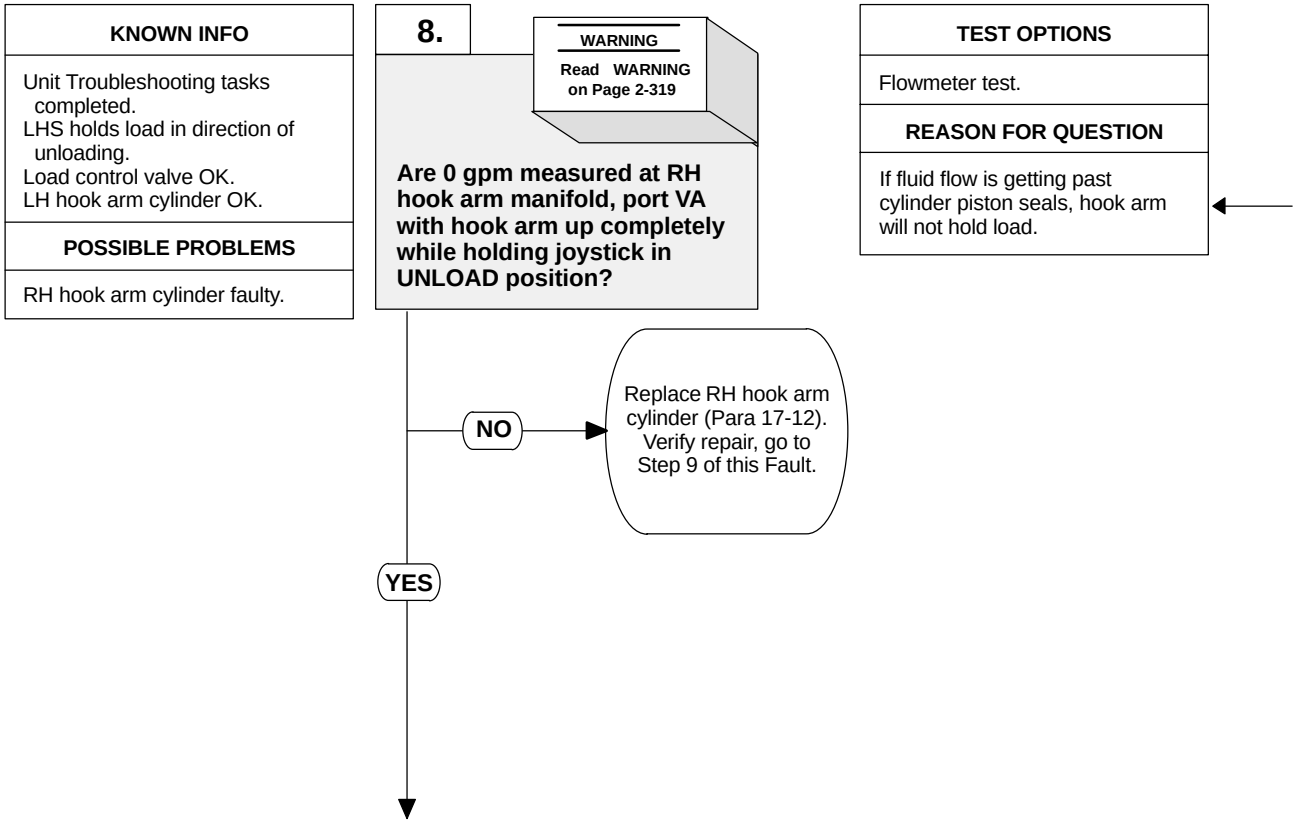








5. LOSS OF HOOK ARM LOAD HOLDING (CONT).

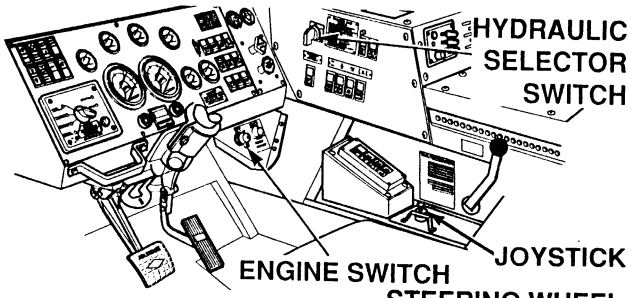


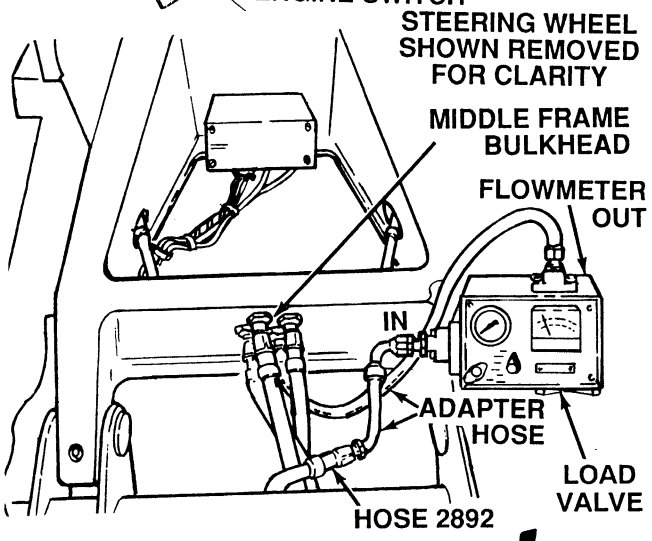
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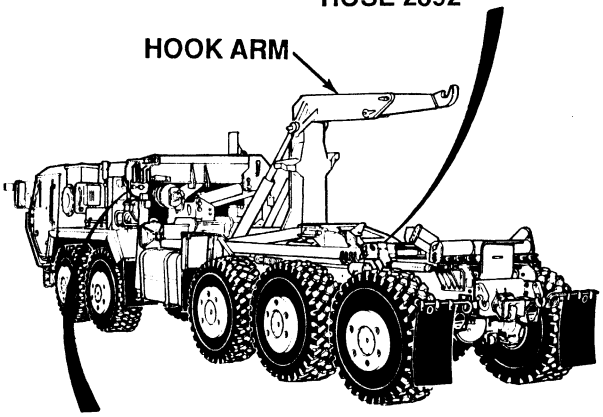
- High pressure hydraulics [oil under 3675 psi (25,339 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not get under LHS when disconnecting or connecting connectors or hoses. A hydraulic malfunction could cause LHS to lower causing serious injury.

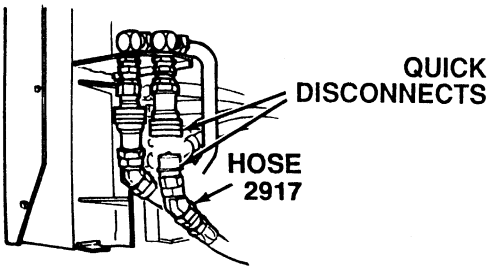
FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2892 from middle frame bulkhead.
(3) Connect adapter hose to hose 2892.
(4) Connect adapter hose to middle frame bulkhead.
(5) Connect flowmeter IN port to adapter hose connected to hose 2892.
(6) Connect flowmeter OUT port to adapter hose connected to middle frame bulkhead.
(7) Completely open flowmeter load valve.
(8) Connect quick disconnect hose 2917.
(9) Start engine (TM 9-2320-364-10).
(10) Set hydraulic selector switch to MAN HA position.
(11) With the aid of an assistant, observe flowmeter while holding joystick in UNLOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (19) below and replace RH hook arm cylinder (Para 17-12).
  (b) If 0 gpm (0 lpm) are present, cylinder is OK.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(15) Disconnect flowmeter from two adapter hoses.
(16) Disconnect adapter hose from middle frame bulkhead.
(17) Disconnect adapter hose from hose 2892.
(18) Connect hose 2892 to middle frame bulkhead.
(19) Connect quick disconnect hose 2917.

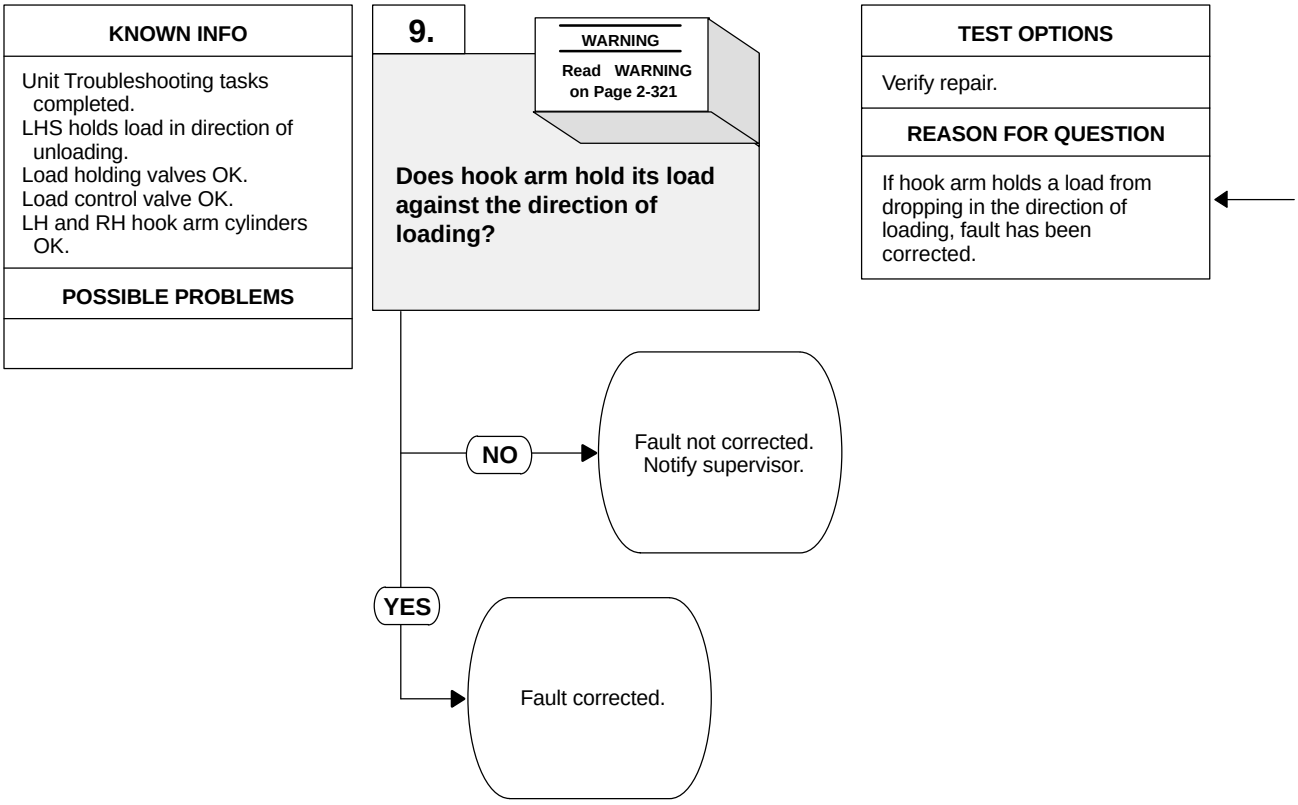








5. LOSS OF HOOK ARM LOAD HOLDING (CONT).

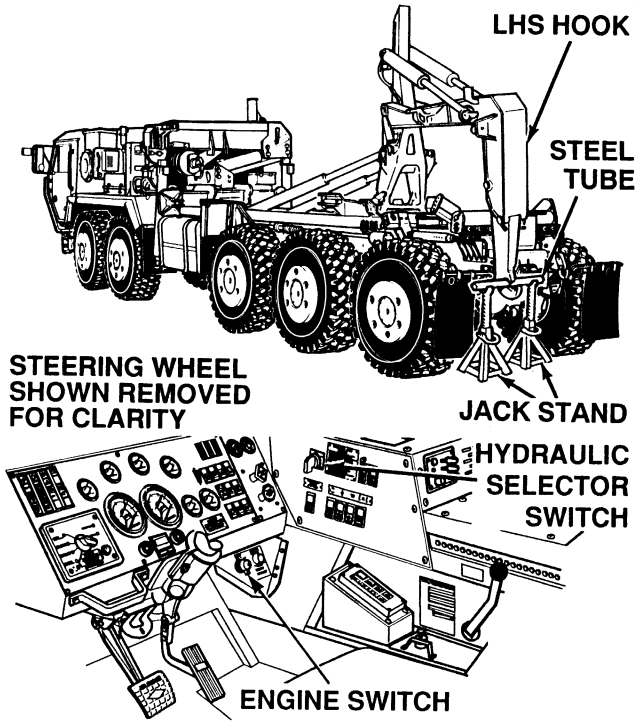


WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

VERIFY REPAIR

(1) Position LHS hook to rear of truck and engage hook on steel tube supported by jackstands.
(2) Using LHS, lift truck only enough to lift vehicle weight off suspension. Do not lift tires off ground.
(3) Turn OFF ENGINE switch (TM 9-2320-364-10).
  (a) If hook arm does not hold weight off vehicle suspension, fault not corrected. Perform Steps (4) through (7) below and notify supervisor.
  (b) If hook arm holds weight off vehicle suspension, fault has been corrected.
(4) Disengage hook from steel tube.
(5) Put LHS in transit position.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.
(8) Check main hydraulic oil level and add oil as necessary (TM 9-2320-364-20).



2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

6. MIDDLE FRAME DOES NOT LOAD.

INITIAL SETUP

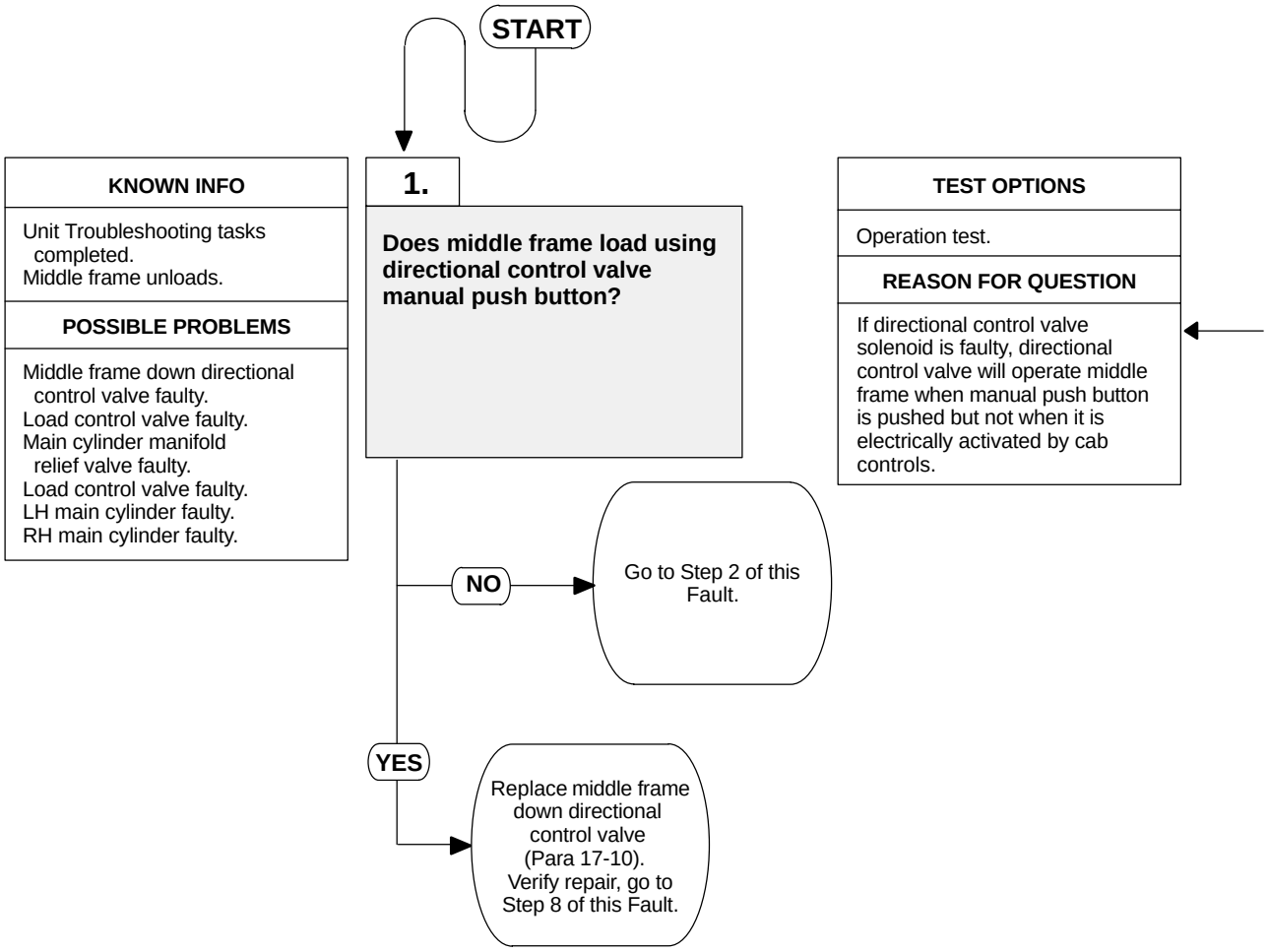
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 34, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench Set, Socket 3/8 in. Drive (Item 273, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)

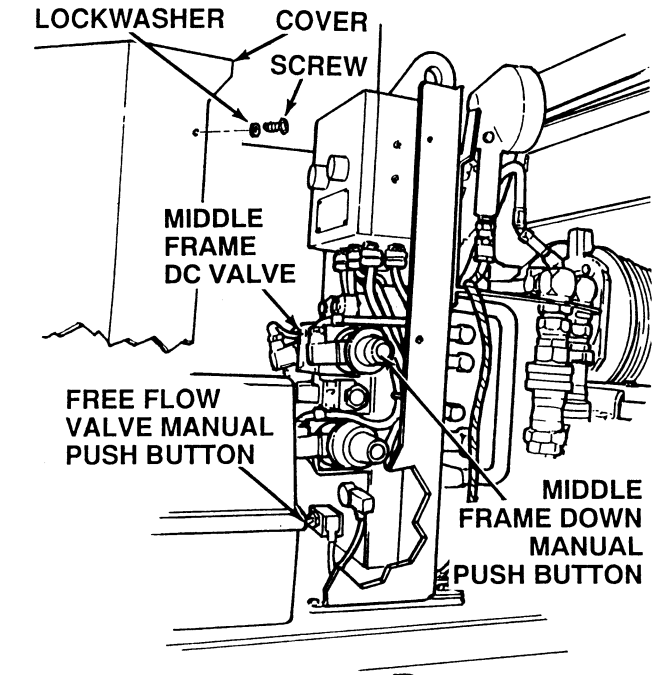
Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Lockwashers (4) (Item 266, Appendix E)
Parts Kit, Seal (Item 408, Appendix E)

Personnel Required
Two

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



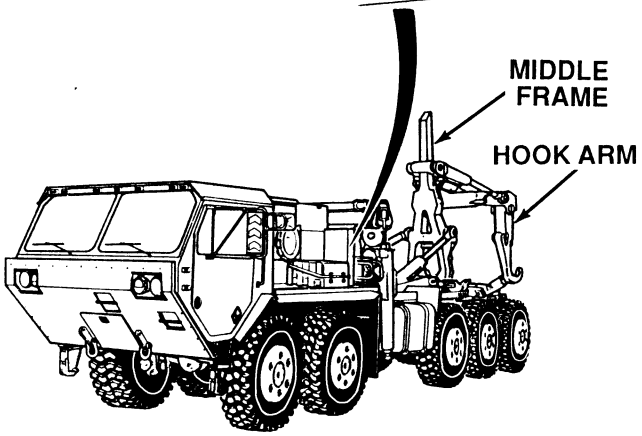


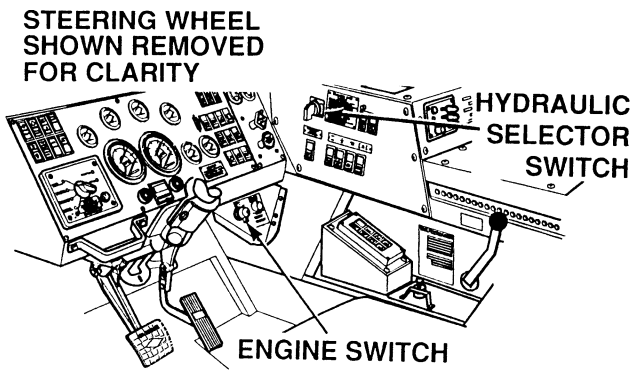
NOTE

- Ensure button is pushed past free play to engage.
- Only remove center screw on engine side of LHS control box cover.

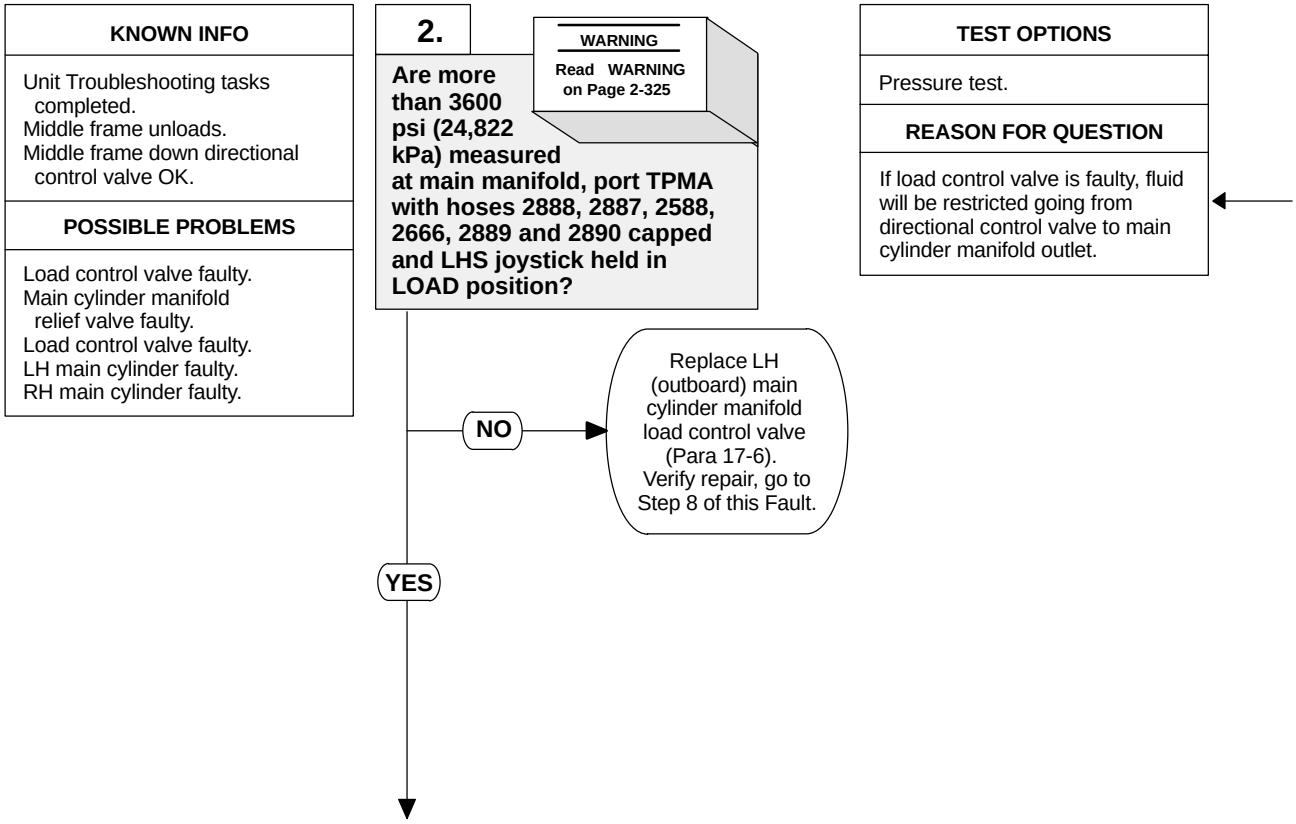
OPERATION TEST

(1) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(2) Start engine (TM 9-2320-364-10).
(3) Set hydraulic selector switch to MAN MF.
(4) Push in free flow valve manual push button while pushing in directional control valve middle frame down manual push button.
  (a) If middle frame does not load, perform Steps (5) through (7) below and go to Step 2 of this Fault.
  (b) If hook arm loads, perform Steps (5) and (6) below and replace middle frame down directional control valve (Para 17-10).
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.
(7) Install LHS control box cover, four lockwashers and screws.





6. MIDDLE FRAME DOES NOT LOAD (CONT).



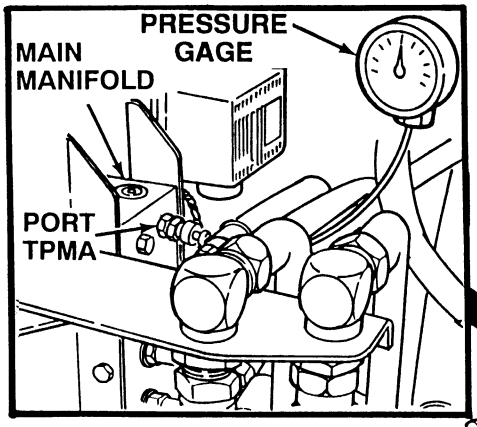
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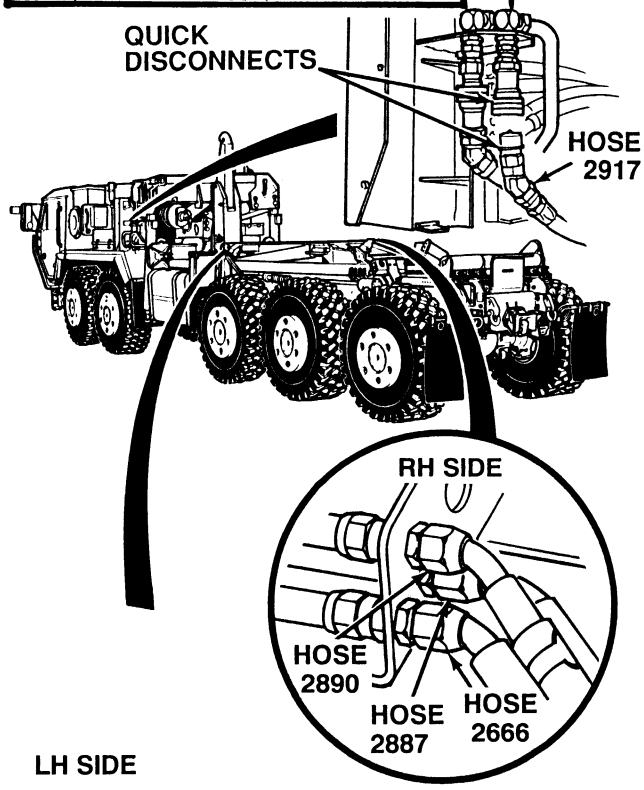
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

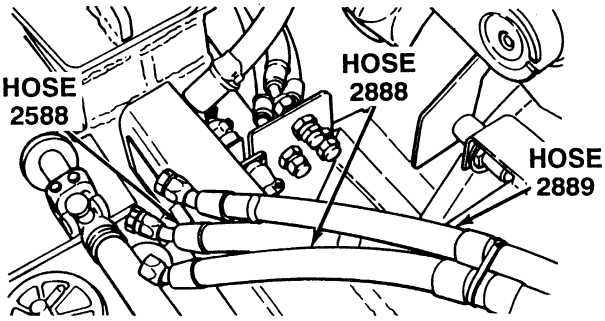
PRESSURE TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Remove plug from main manifold, port TPMA.
(3) Remove preformed packing and backup ring from plug. Discard preformed packing and backup ring.
(4) Connect pressure gage to main manifold, port TPMA.
(5) Tag, mark and disconnect hoses 2888, 2887, 2588, 2666, 2889 and 2890 from six compression frame bulkhead fittings.
(6) Cap and plug six hoses and six bulkhead fittings using metal caps and plugs.
(7) Connect quick disconnect hose 2917.

Continued on next page.







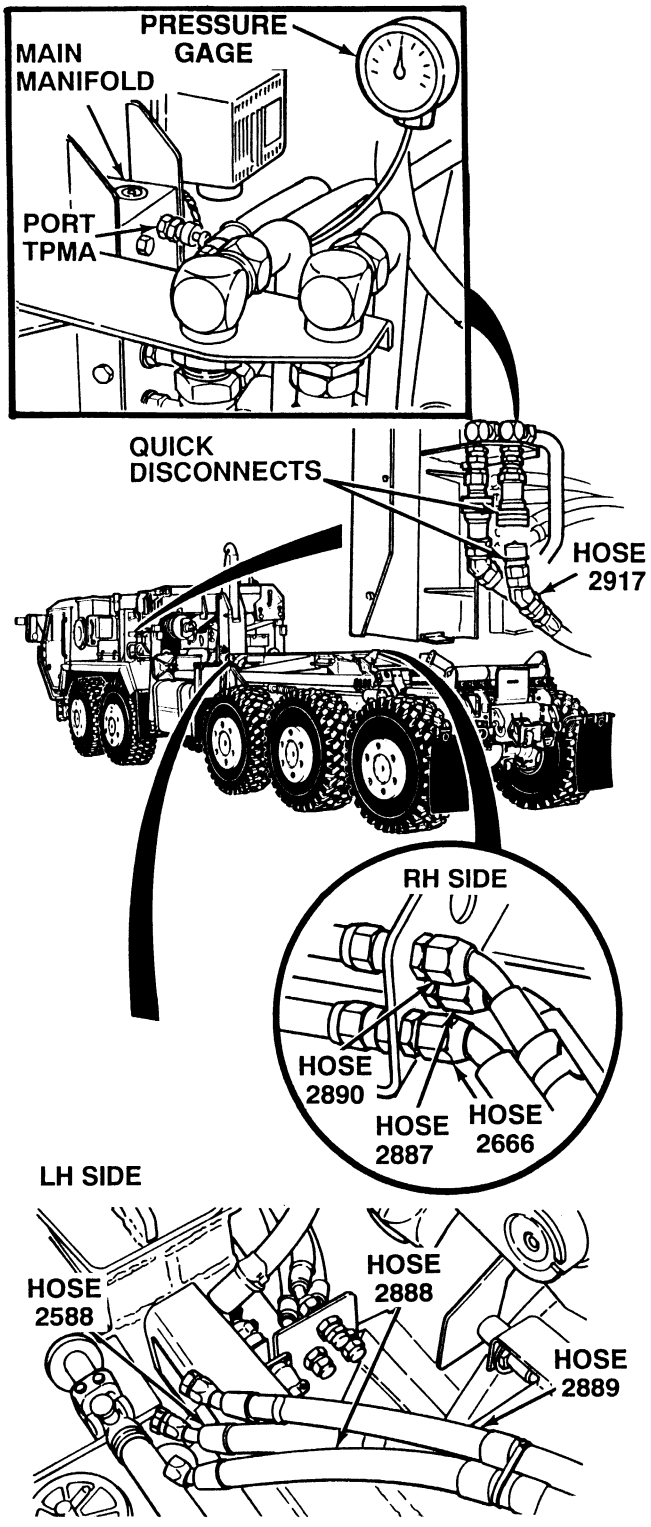
6. MIDDLE FRAME DOES NOT LOAD (CONT).

WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST (CONT).

(8) Start engine (TM 9-2320-364-10).
(9) Raise hook arm approximately 24 in. (61 cm).
(10) Set hydraulic selector switch to MAN MF.
(11) With the aid of an assistant, observe pressure gage while holding joystick in LOAD position.
  (a) If more than 3675 psi (25,339 kPa) are not present, perform Steps (12) through (21) below and replace LH (outboard) main cylinder manifold load control valve (Para 17-6).
  (b) If 3675 psi (25,339 kPa) or more are present, load control valve is OK.
(12) Put LHS in transit position.
Continued on next page.

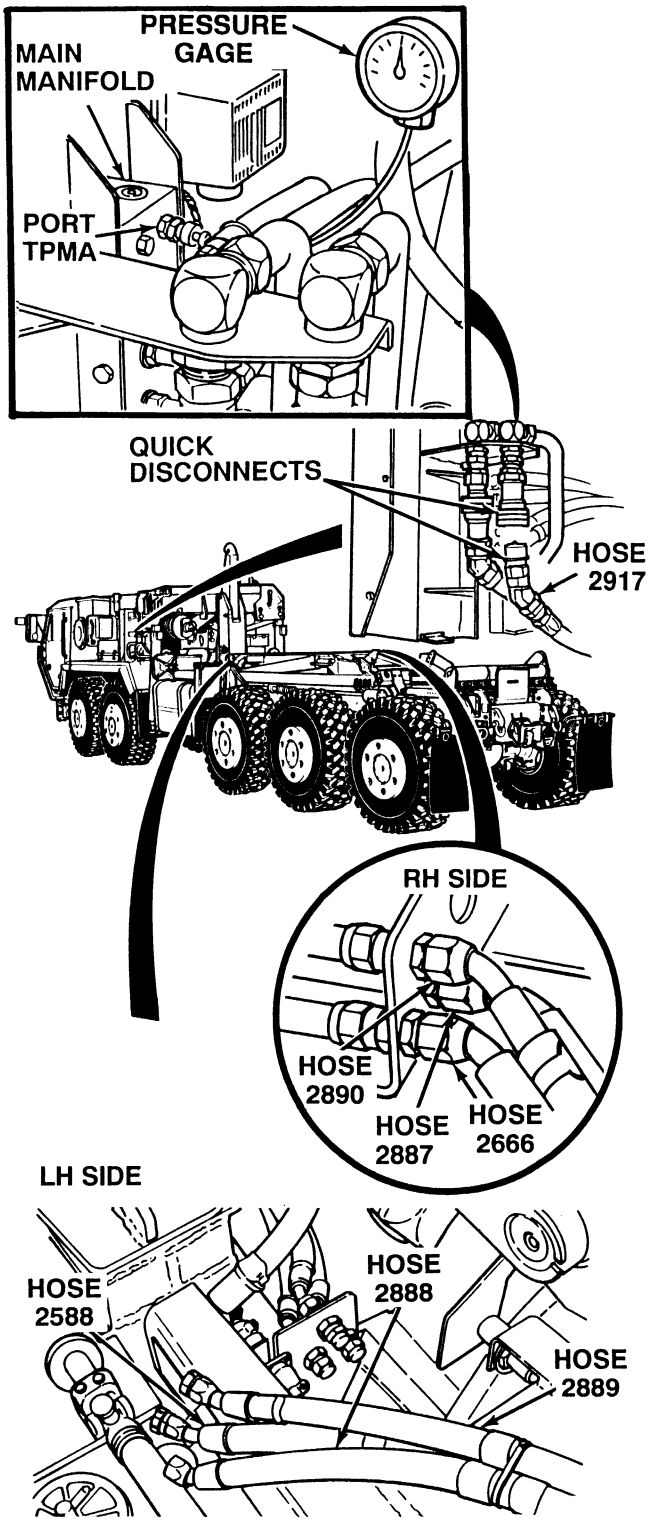


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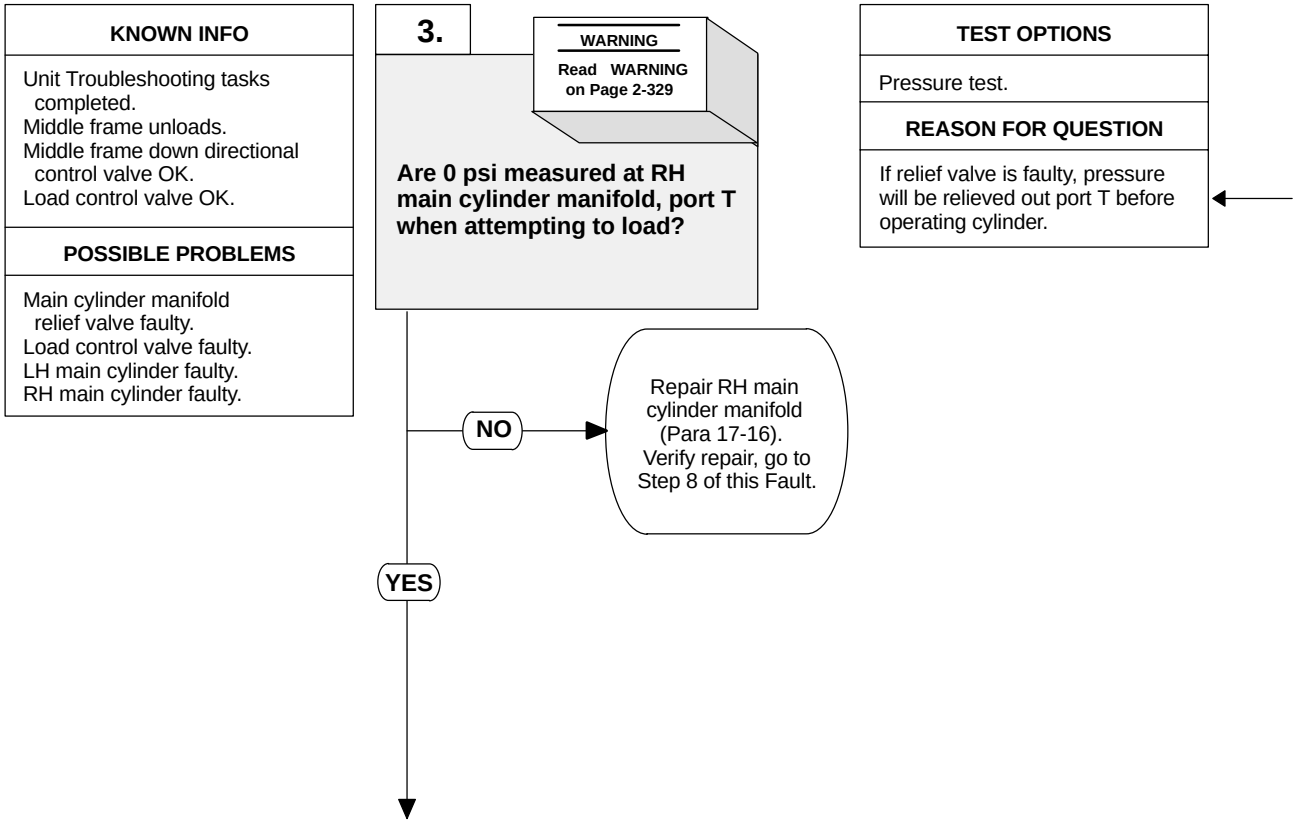
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST (CONT).

(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(16) Remove pressure gage from main manifold.
(17) Lubricate preformed packing and backup ring with hydraulic oil.
(18) Install preformed packing and backup ring on plug and install plug in main manifold, port TPMA. Tighten to 96 lb-in (11 N·m).
(19) Remove caps and plugs from six bulkhead fittings and hoses.
(20) Connect hoses 2888, 2887, 2588, 2666, 2889 and 2890 to bulkhead fittings.
(21) Connect quick disconnect hose 2917.



6. MIDDLE FRAME DOES NOT LOAD (CONT).

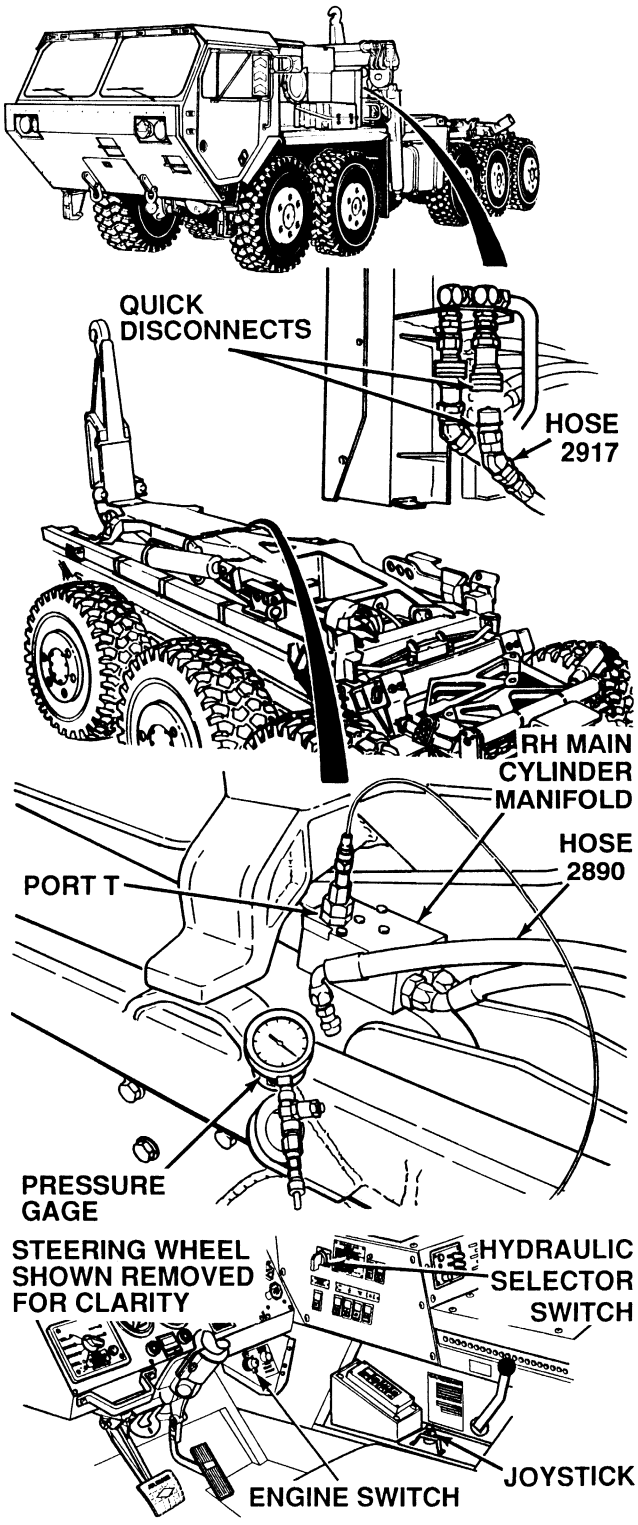


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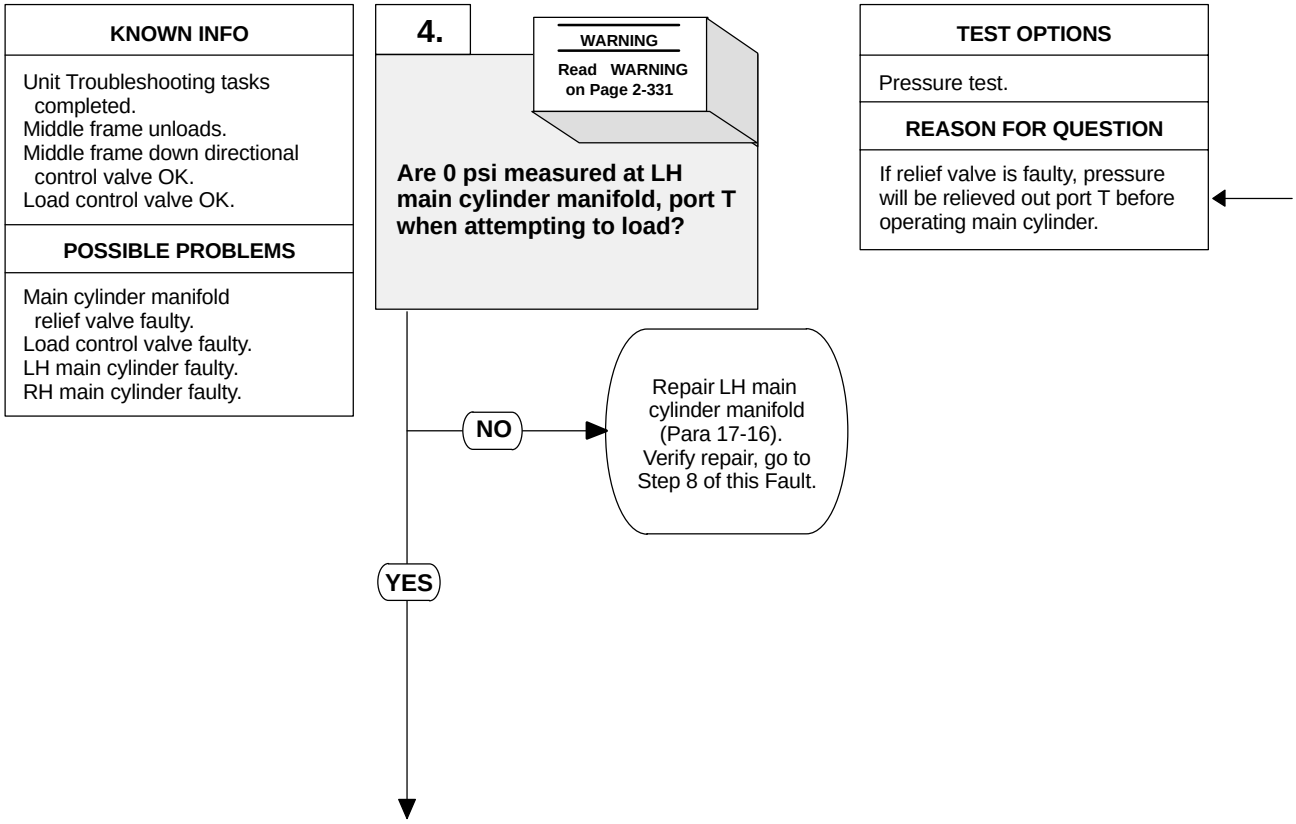
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2890 from adapter at port T of RH main cylinder manifold.
(3) Install metal plug in removed hose.
(4) Connect pressure gage to adapter at main cylinder manifold, port T.
(5) Connect quick disconnect hose 2917.
(6) Start engine (TM 9-2320-364-10).
(7) Set hydraulic selector switch to MAN MF.
(8) With the aid of an assistant, observe gage while holding joystick in LOAD position.
    (a) If more than 0 psi (0 kPa) are present, relief valve is faulty. Perform Steps (9) through (12) and (15) below and repair RH main cylinder manifold (Para 17-16).
    (b) If 0 psi (0 kPa) are present, relief valve is OK.
(9) Set hydraulic selector switch to OFF position.
(10) Turn OFF ENGINE switch.
(11) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(12) Remove gage from adapter.
(13) Remove plug from hose.
(14) Connect hose to adapter.
(15) Connect quick disconnect hose 2917.



6. MIDDLE FRAME DOES NOT LOAD (CONT).

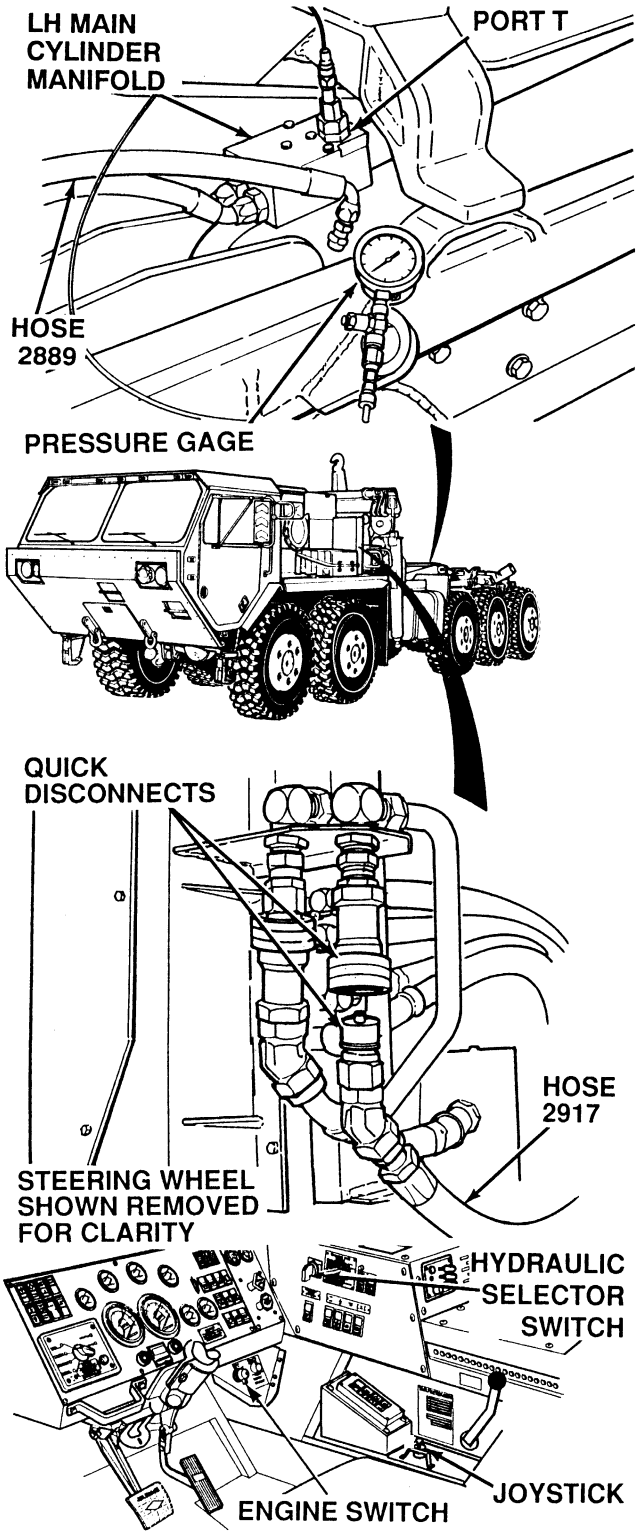


WARNING

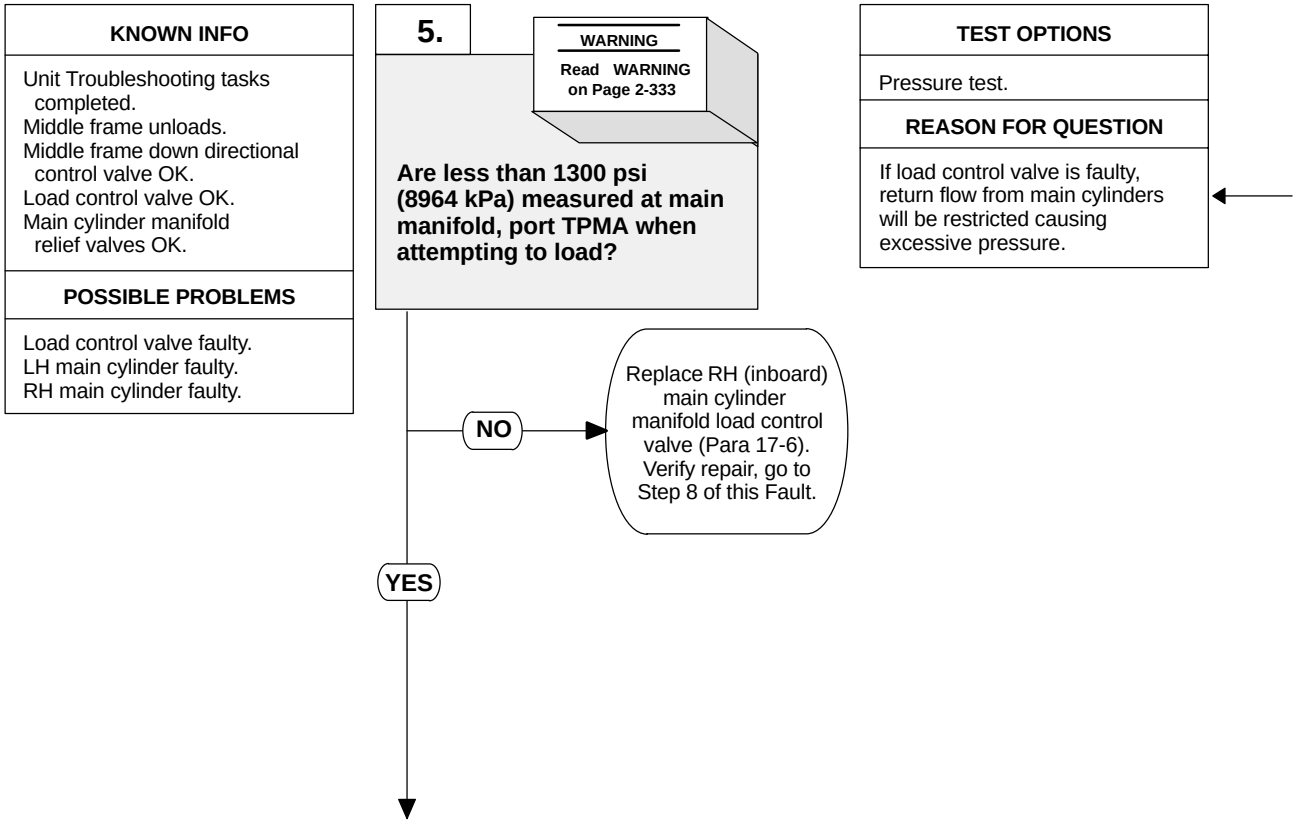
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2889 from adapter at port T of LH main cylinder manifold.
(3) Install metal plug in removed hose.
(4) Connect pressure gage to adapter at LH main cylinder manifold, port T.
(5) Connect quick disconnect hose 2917.
(6) Start engine (TM 9-2320-364-10).
(7) Set hydraulic selector switch to MAN MF.
(8) With the aid of an assistant, observe gage while holding joystick in LOAD position.
    (a) If more than 0 psi (0 kPa) are present, relief valve is faulty. Perform Steps (9) through (12) and (15) below and repair LH main cylinder manifold (Para 17-16).
    (b) If 0 psi (0 kPa) are present, relief valve is OK.
(9) Set hydraulic selector switch to OFF position.
(10) Turn OFF ENGINE switch.
(11) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(12) Remove gage from adapter.
(13) Remove plug from hose.
(14) Connect hose to adapter.
(15) Connect quick disconnect hose 2917.



6. MIDDLE FRAME DOES NOT LOAD (CONT).

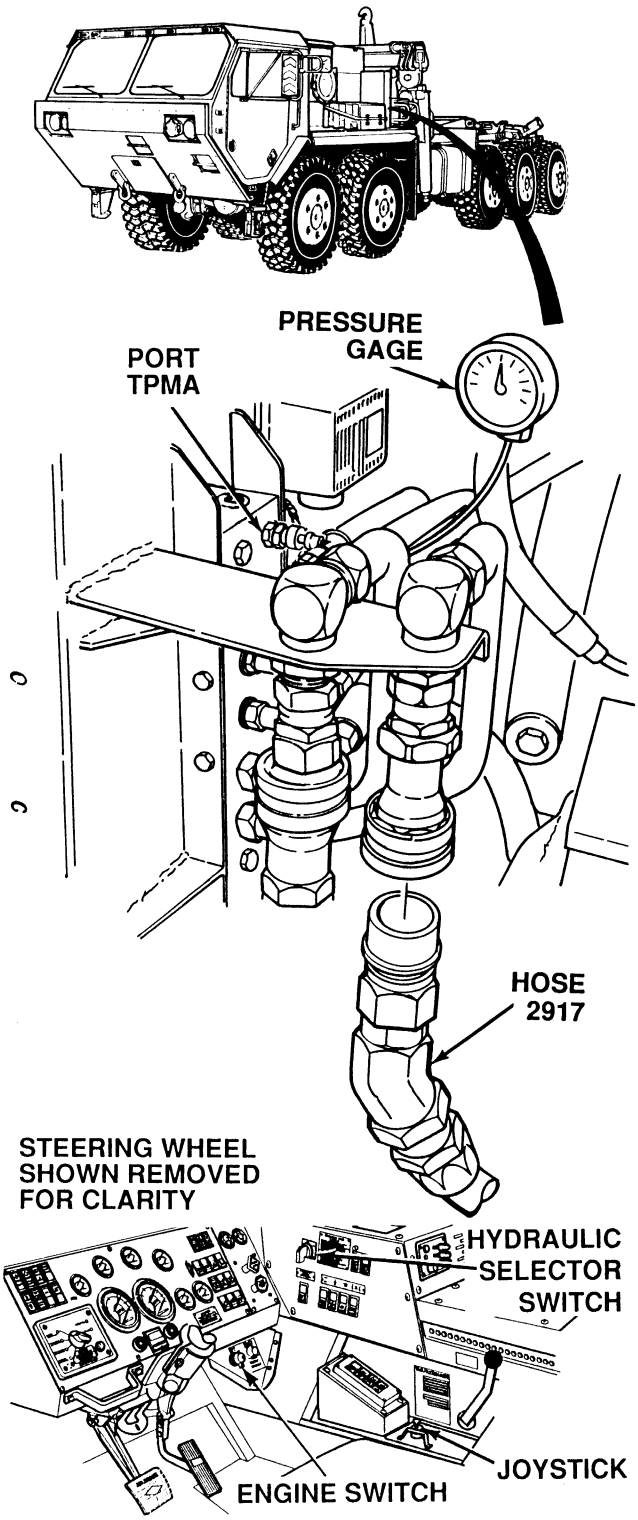


WARNING

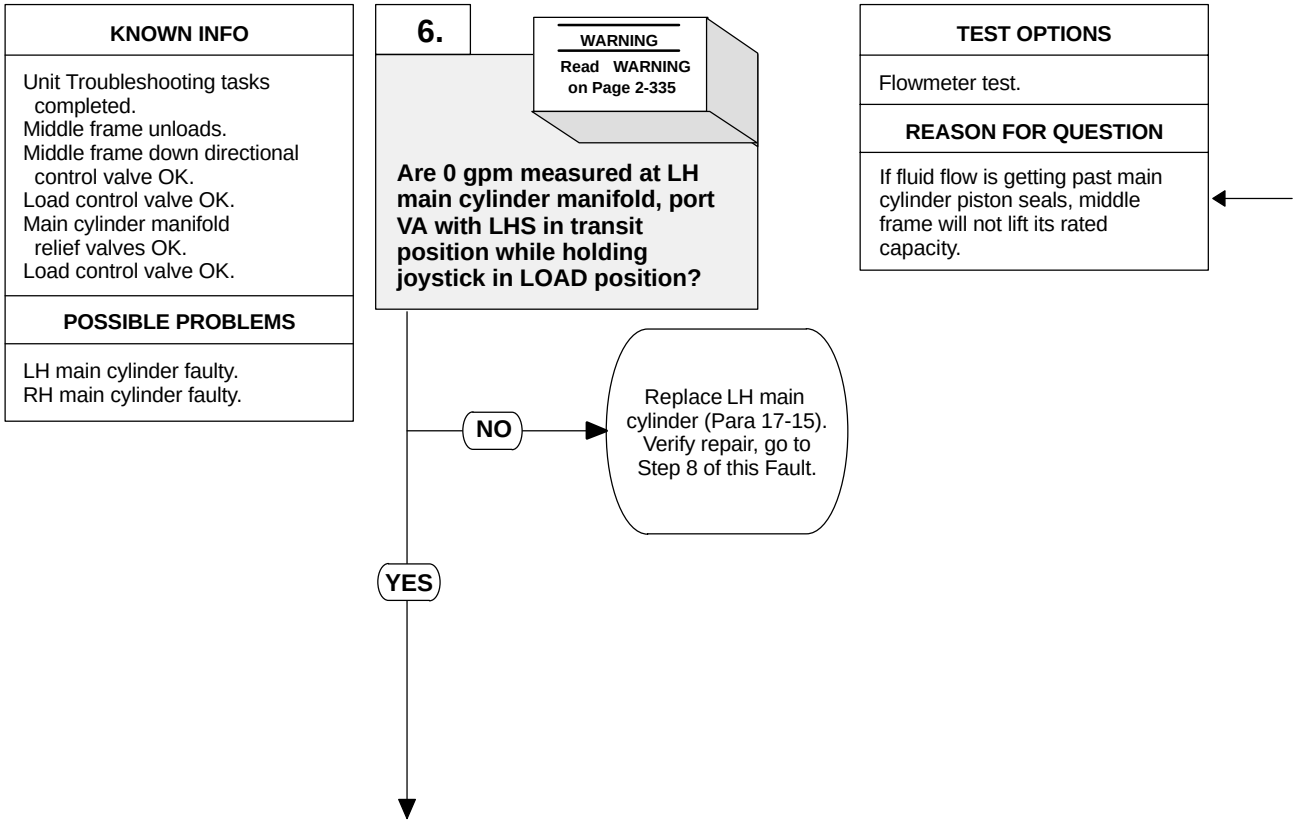
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Remove plug from main manifold, port TPMA.
(3) Remove preformed packing and backup ring from plug. Discard preformed packing and backup ring.
(4) Connect pressure gage to main manifold, port TPMA.
(5) Connect quick disconnect hose 2917.
(6) Start engine (TM 9-2320-364-10).
(7) Set hydraulic selector switch to MAN MF.
(8) Raise main frame approximately 24 in. (61 cm).
(9) With the aid of an assistant, observe pressure gage while holding joystick in LOAD position.
    (a) If more than 1300 psi (8964 kPa) are present, perform Steps (10) and (16) below and replace RH (inboard) main cylinder manifold load control valve (Para 17-6).
    (b) If 1300 psi (8964 kPa) or less are present, load control valve is OK.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(13) Remove pressure gage from main manifold.
(14) Lubricate preformed packing and backup ring with hydraulic oil.
(15) Install preformed packing and backup ring on plug and install plug in main manifold, port TPMA. Tighten to 96 lb-in (11 N·m).
(16) Connect quick disconnect hose 2917.

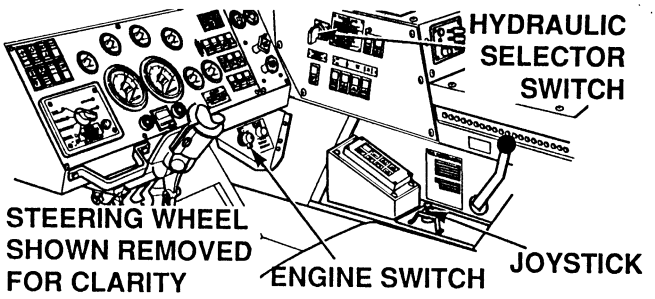


6. MIDDLE FRAME DOES NOT LOAD (CONT).



WARNING

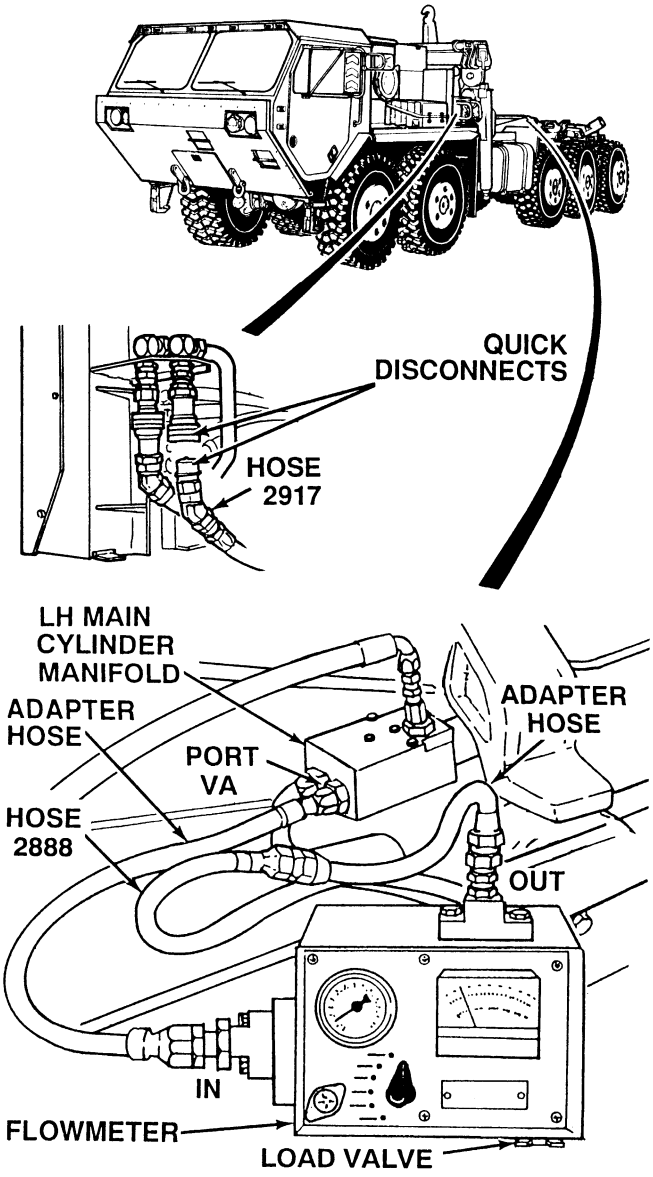
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.



FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2888 from LH main cylinder manifold adapter port VA.
(3) Connect adapter hose to hose 2888.
(4) Connect adapter hose to main cylinder manifold adapter port VA.
(5) Connect flowmeter OUT port to adapter hose connected to hose 2888.
(6) Connect flowmeter IN port to adapter hose connected to LH main cylinder manifold, port VA.
(7) Completely open flowmeter load valve.
(8) Set flowmeter to LOW scale.
(9) Connect quick disconnect hose 2917.
(10) Start engine (TM 9-2320-364-10).
(11) Set hydraulic selector switch to MAN MF position.

Continued on next page.



6. MIDDLE FRAME DOES NOT LOAD (CONT).

WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

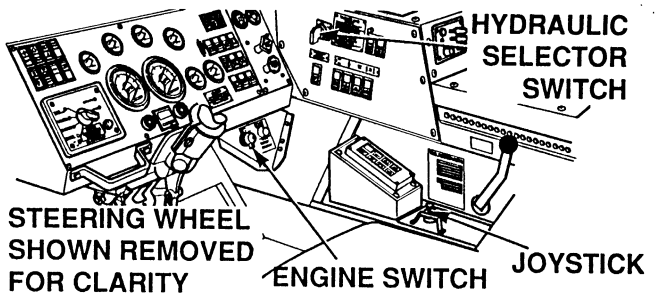
FLOWMETER TEST (CONT).

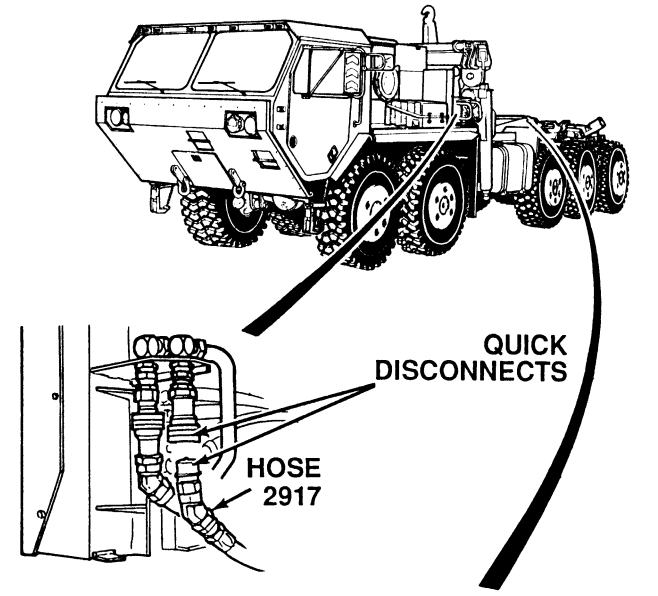
(12) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (lpm) are present, perform Steps (13) through (20) below and replace LH main cylinder (Para 17-15).
  (b) If 0 gpm (0 lpm) are present, LH main cylinder is OK.

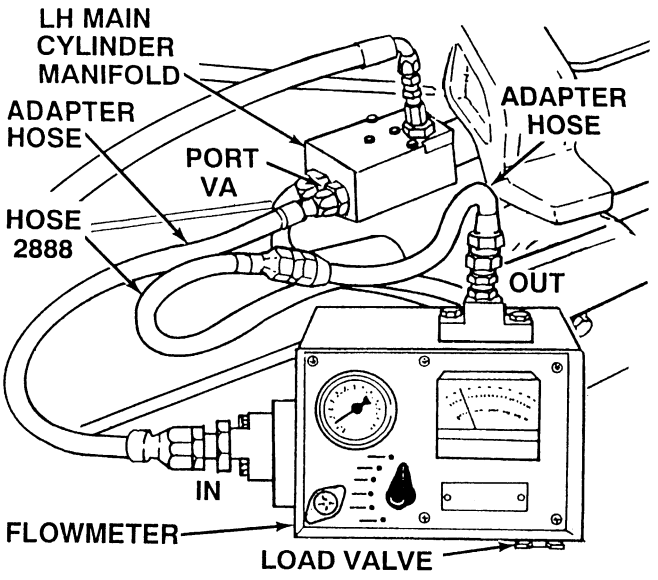
(13) Set hydraulic selector switch to OFF position.

(14) Turn OFF ENGINE switch.

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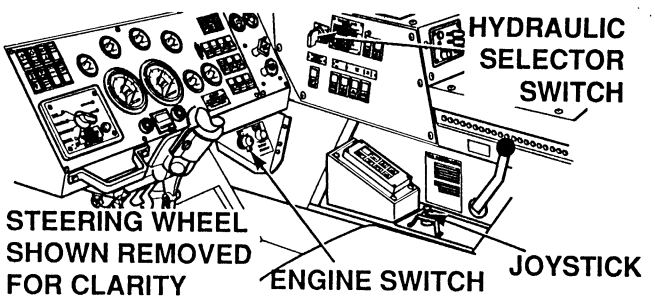






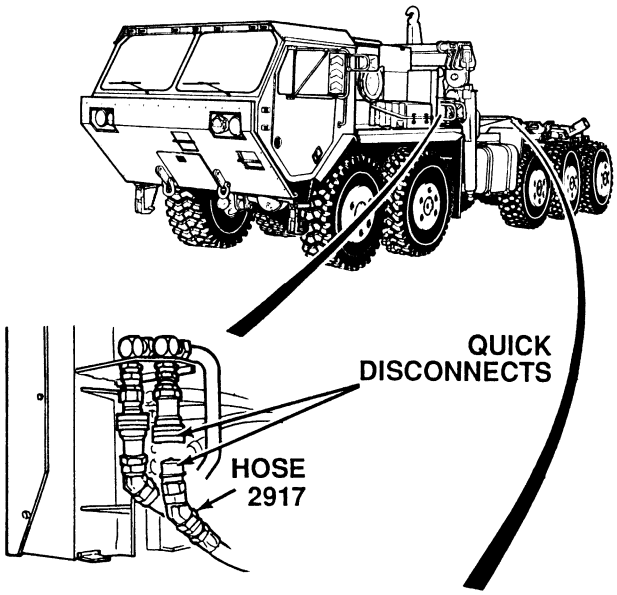
WARNING

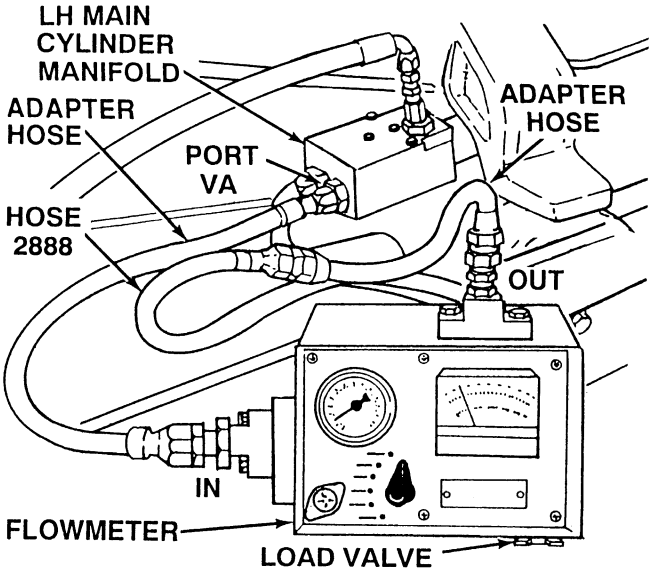
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.



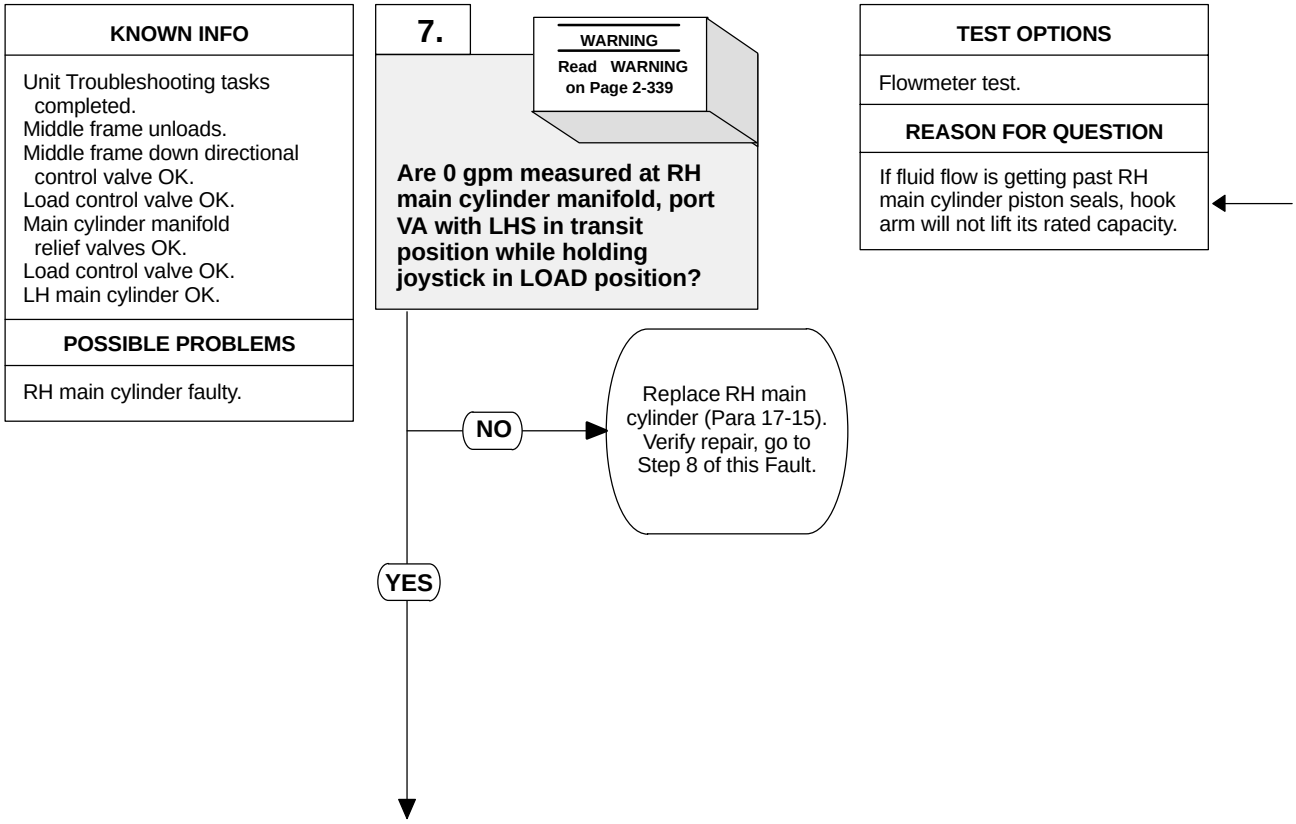
FLOWMETER TEST (CONT).

(15) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(16) Disconnect flowmeter from two adapter hoses.
(17) Disconnect adapter hose main cylinder manifold adapter.
(18) Disconnect adapter hose from hose 2888.
(19) Connect hose 2888 to LH main cylinder manifold adapter port VA.
(20) Connect quick disconnect hose 2917.





6. MIDDLE FRAME DOES NOT LOAD (CONT).

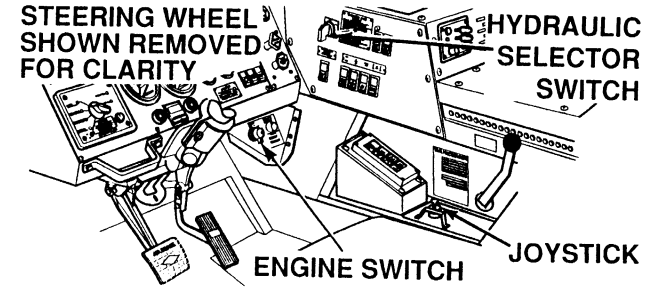


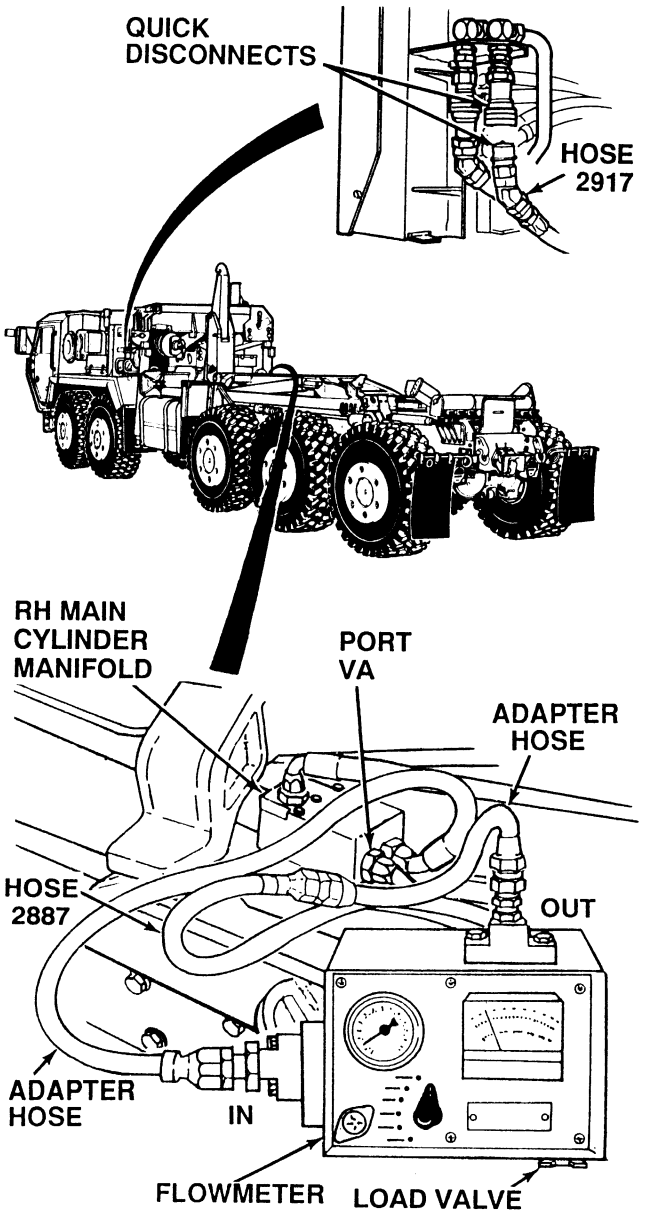
WARNING

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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

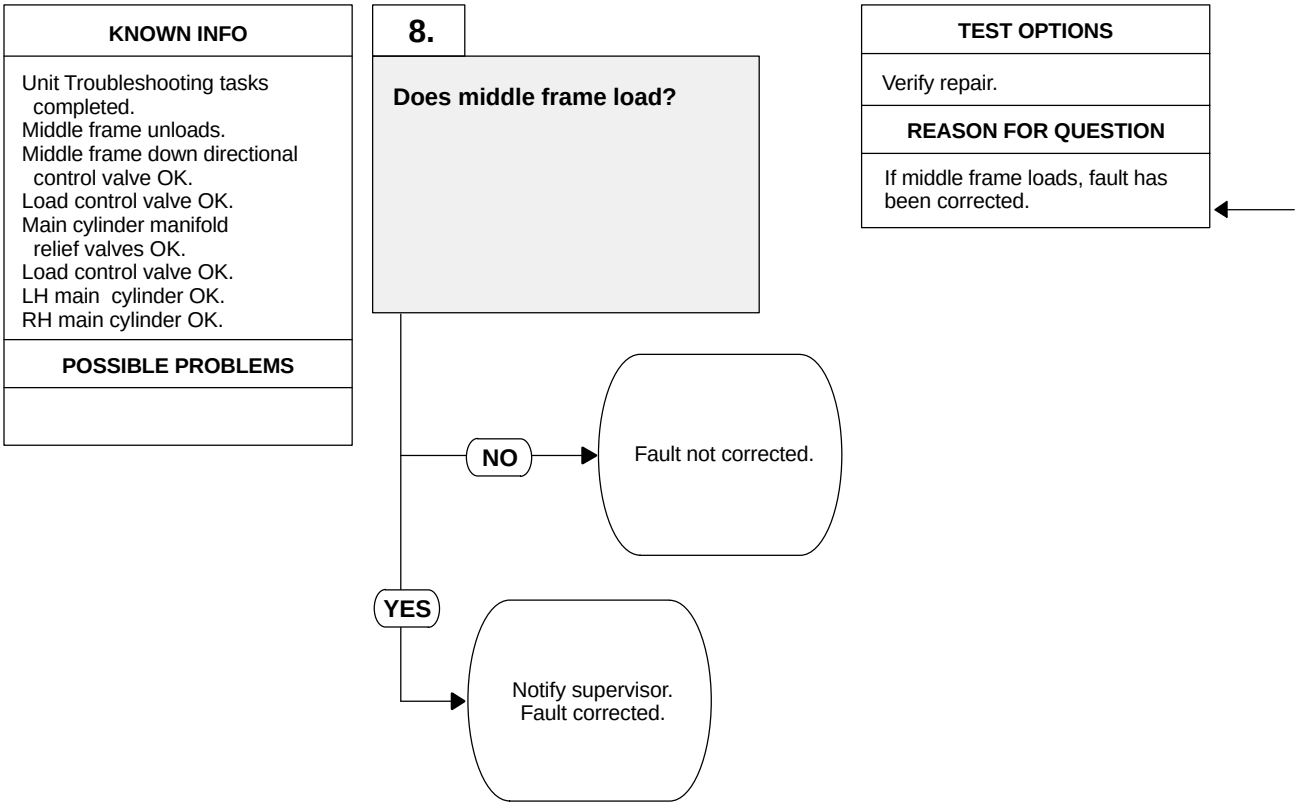
FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2887 from RH main manifold adapter port VA.
(3) Connect adapter hose to hose 2887.
(4) Connect adapter hose to main cylinder manifold adapter port VA.
(5) Connect flowmeter OUT port to adapter hose connected to hose 2887.
(6) Connect flowmeter IN port to adapter hose connected to manifold.
(7) Completely open flowmeter load valve.
(8) Set flowmeter to LOW scale.
(9) Connect quick disconnect hose 2917.
(10) Start engine (TM 9-2320-364-10).
(11) Set hydraulic selector switch to MAN MF position.
(12) With the aid of an assistant, observe flow meter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (13) through (23) below and replace RH main cylinder (Para 17-15).
  (b) If 0 gpm (0 lpm) are present, RH main cylinder is OK.
(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(16) Disconnect flowmeter from two adapter hoses.
(17) Disconnect adapter hose main cylinder manifold adapter.
(18) Disconnect adapter hose from hose 2887.
(19) Connect hose 2887 to main cylinder manifold adapter port VA.
(20) Connect quick disconnect hose 2917.



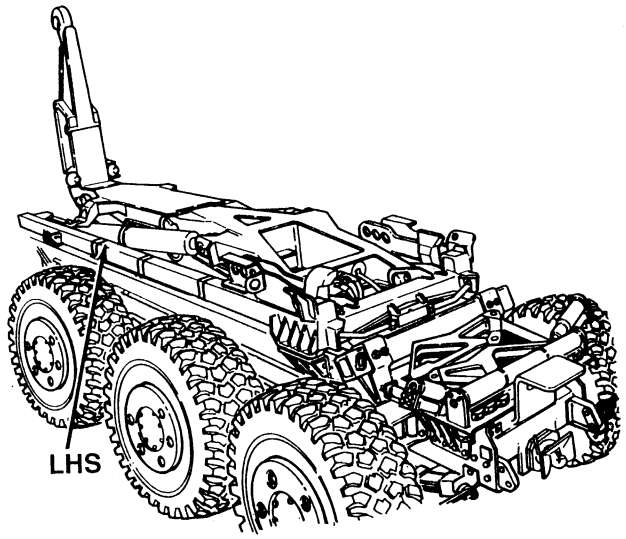


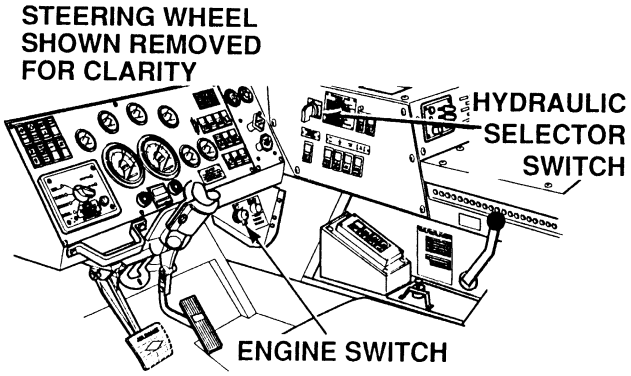
6. MIDDLE FRAME DOES NOT LOAD (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to AUTO position.
(3) Hold joystick in LOAD position.
  (a) If middle frame does not load, fault not corrected. Perform Steps (4) through (5) below and notify supervisor.
  (b) If middle frame does load, fault has been corrected.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.





2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

7. MIDDLE FRAME DOES NOT UNLOAD.

INITIAL SETUP

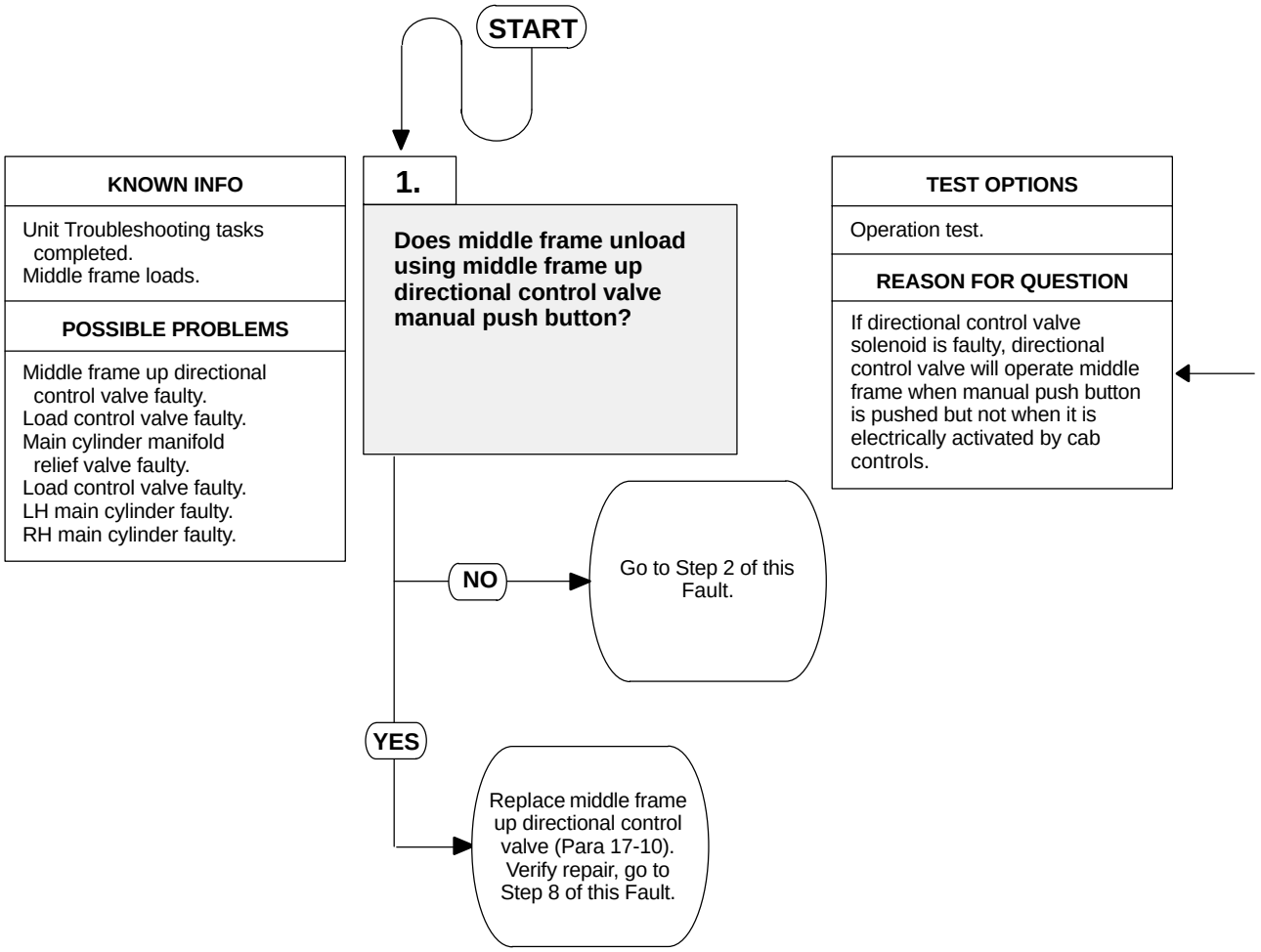
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 34, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench Set, Socket 3/8 in. Drive (Item 273, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)

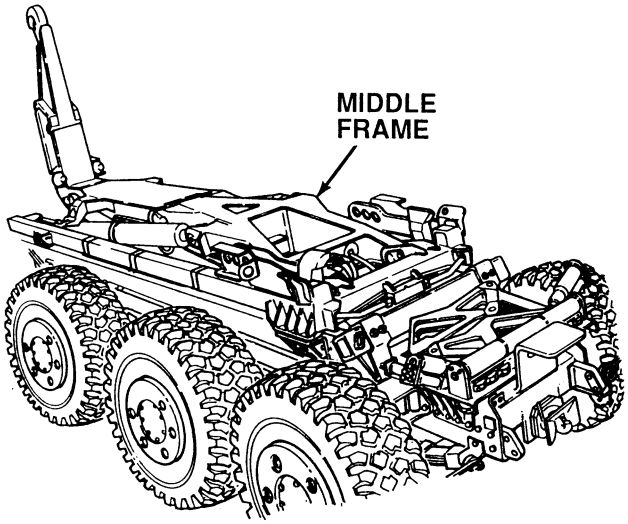
Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Lockwashers (4) (Item 266, Appendix E)
Parts Kit, Seal (Item 408, Appendix E)

Personnel Required
Two

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



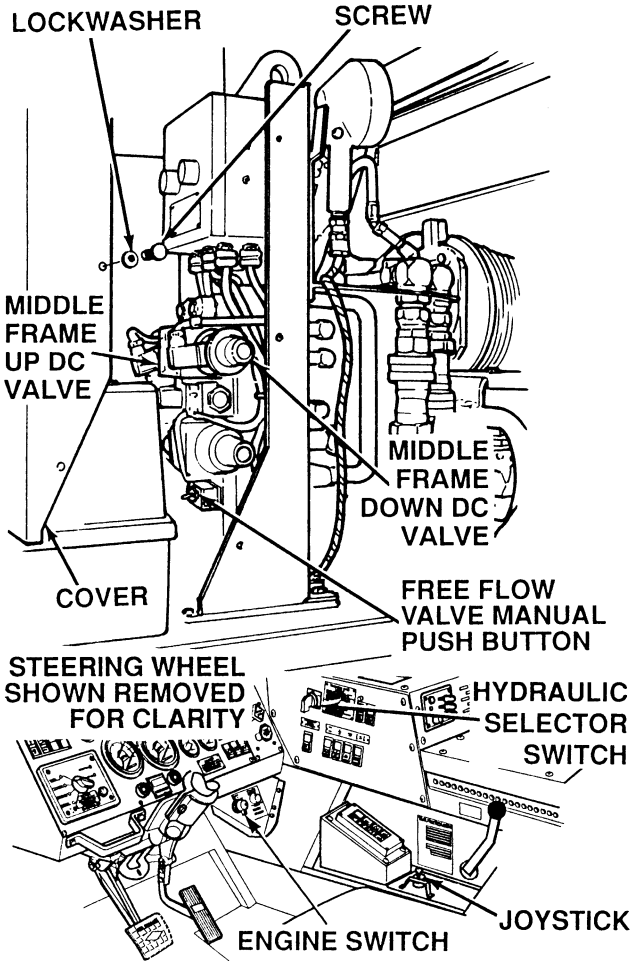


NOTE

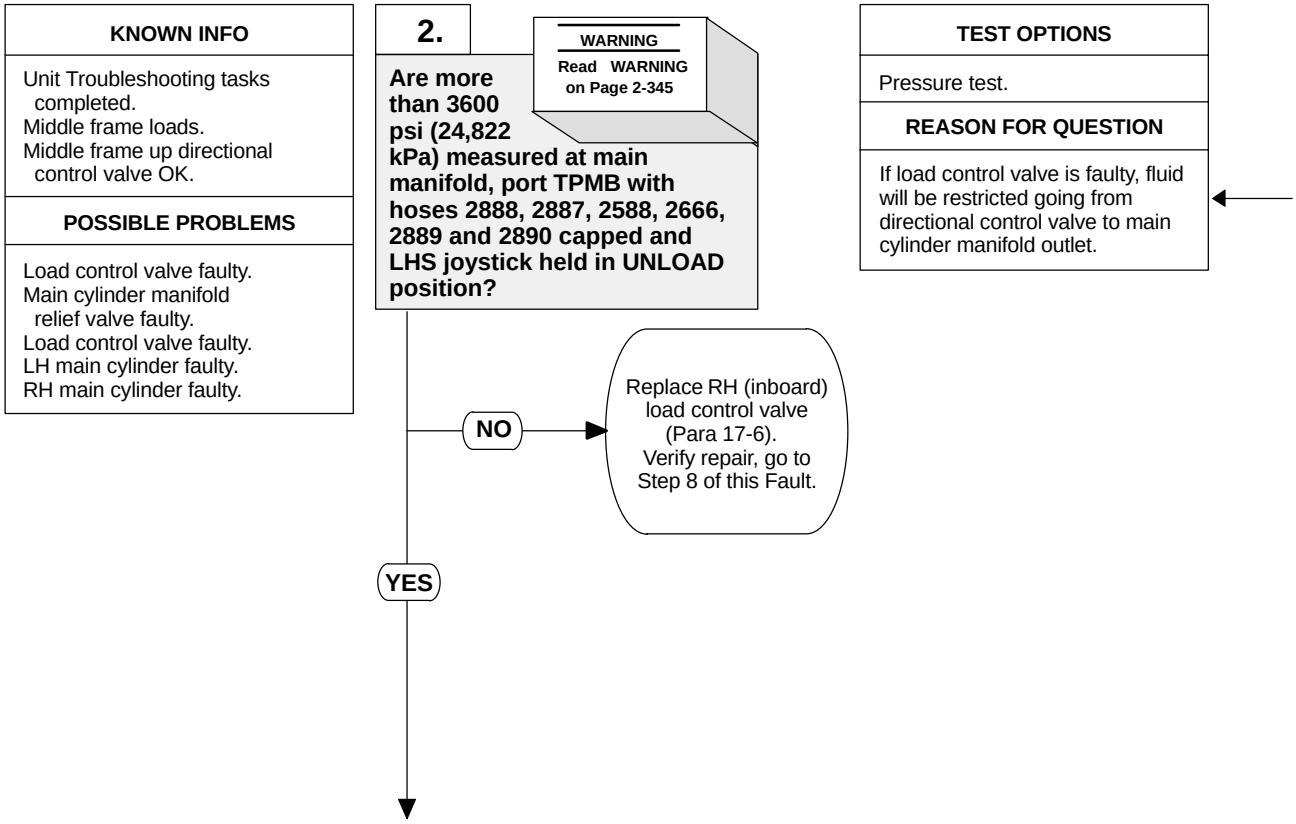
- Ensure button is pushed past free play to engage.
- Only remove center screw on engine side of LHS control box cover.

OPERATION TEST

(1) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(2) Start engine (TM 9-2320-364-10).
(3) Set hydraulic selector switch to MAN MF.
(4) Push in free flow valve manual push button while pushing in directional control valve middle frame up manual push button.
  (a) If middle frame does not unload, perform Steps (5) through (7) below and go to Step 2 of this Fault.
  (b) If hook arm unloads, perform Steps (5) and (6) below and replace middle frame up directional control valve (Para 17-10).
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.
(7) Install LHS control box cover, four lockwashers and screws.



7. MIDDLE FRAME DOES NOT UNLOAD (CONT).



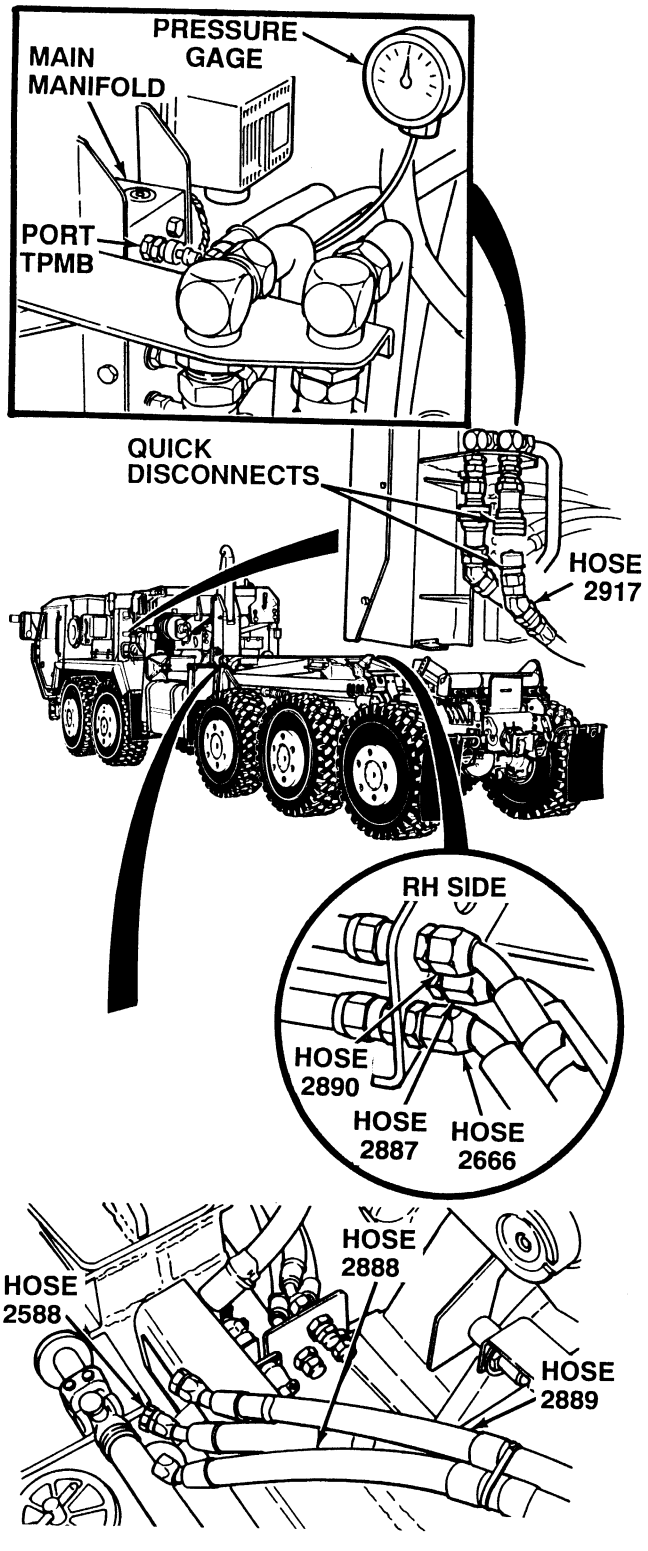
WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Remove plug from main manifold, port TPMB.
(3) Remove preformed packing and backup ring from plug. Discard preformed packing and backup ring.
(4) Connect pressure gage to main manifold, port TPMB.
(5) Tag, mark and disconnect hoses 2888, 2887, 2588, 2666, 2889 and 2890 from six compression frame bulkhead fittings.
(6) Cap and plug six hoses and six bulkhead fittings using metal caps and plugs.
(7) Connect quick disconnect hose 2917.
(8) Start engine (TM 9-2320-364-10).
(9) Raise hook arm approximately 24 in. (61 cm).
(10) Set hydraulic selector switch to MAN MF.

Continued on next page.



7. MIDDLE FRAME DOES NOT UNLOAD (CONT).

WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
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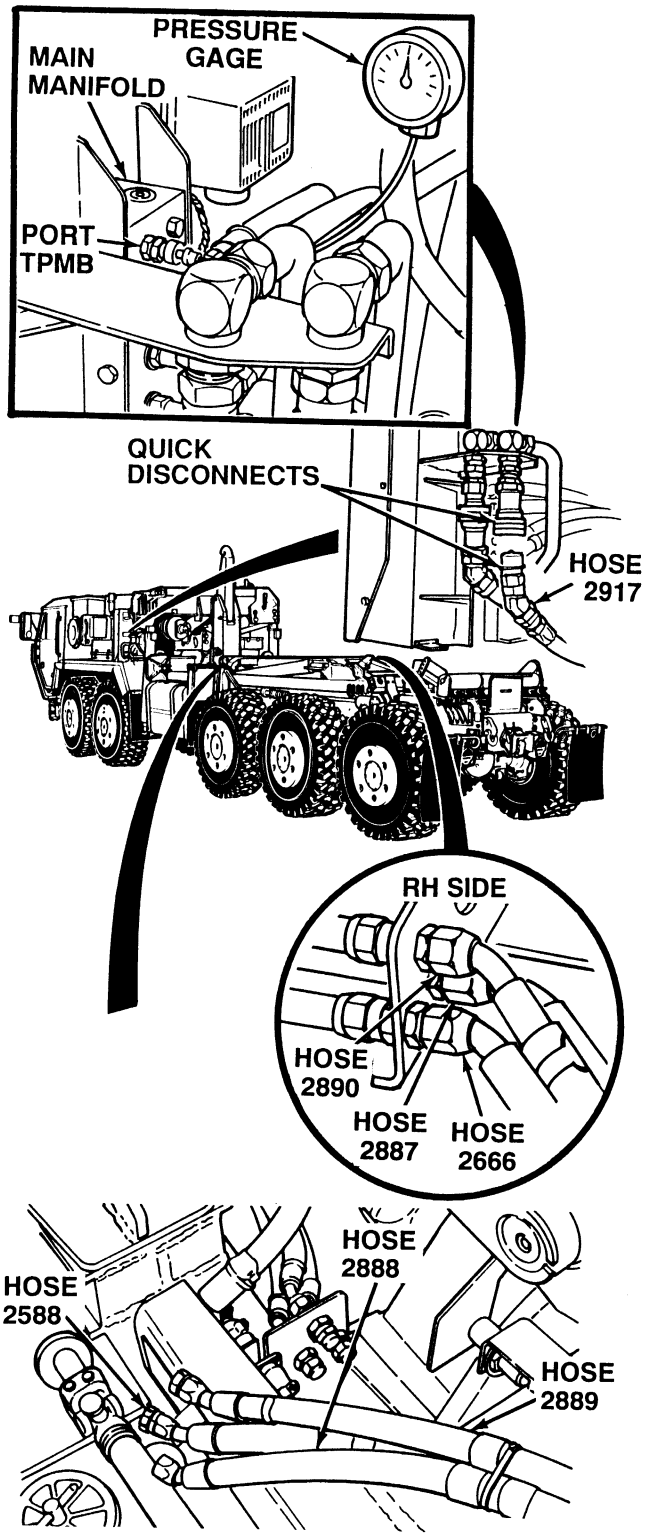
PRESSURE TEST (CONT).

(11) With the aid of an assistant, observe pressure gage while holding joystick in UNLOAD position.
  (a) If less than 3600 psi (24,822 kPa) is present, perform Steps (12) through (21) below and replace RH (inboard) load control valve (Para 17-6).
  (b) If 3600 psi (24,822 kPa) or more are present, load control valve is OK.

(12) Put LHS in transit position.

(13) Set hydraulic selector switch to OFF position.

Continued on next page.

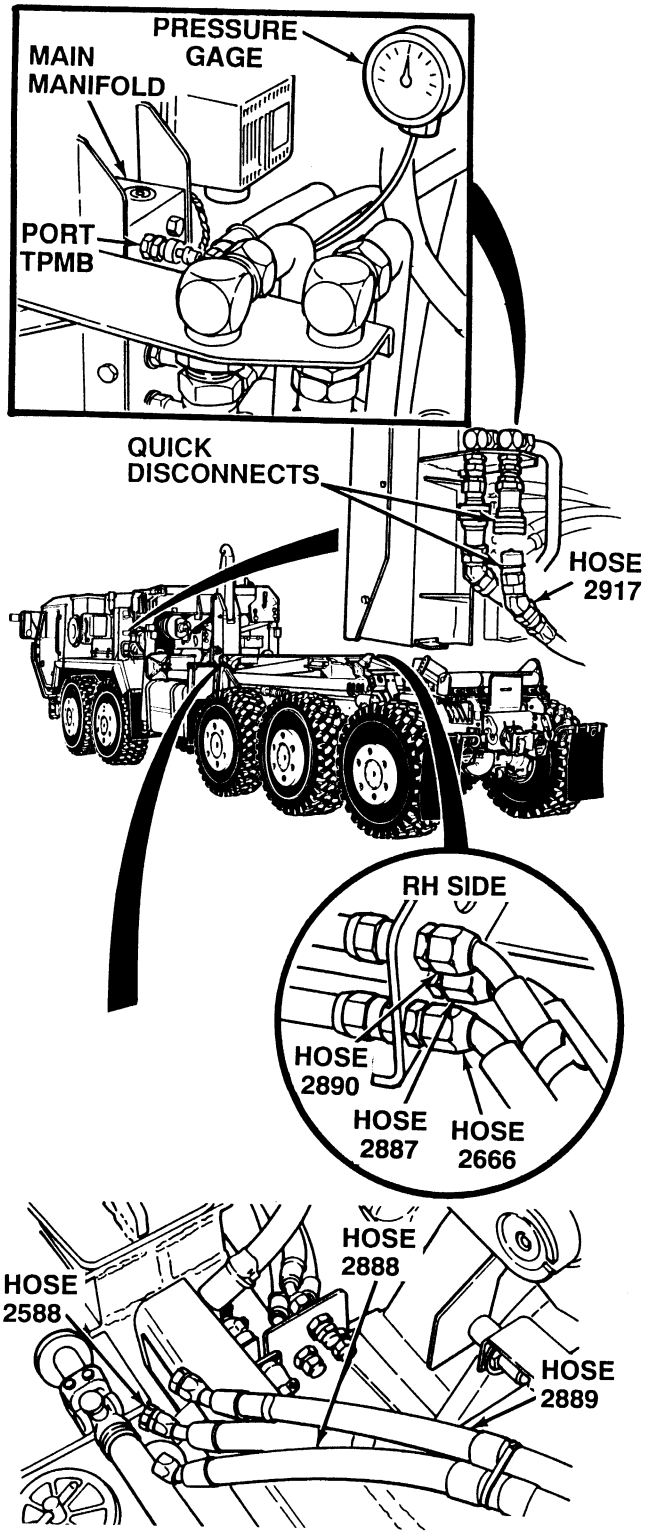


WARNING

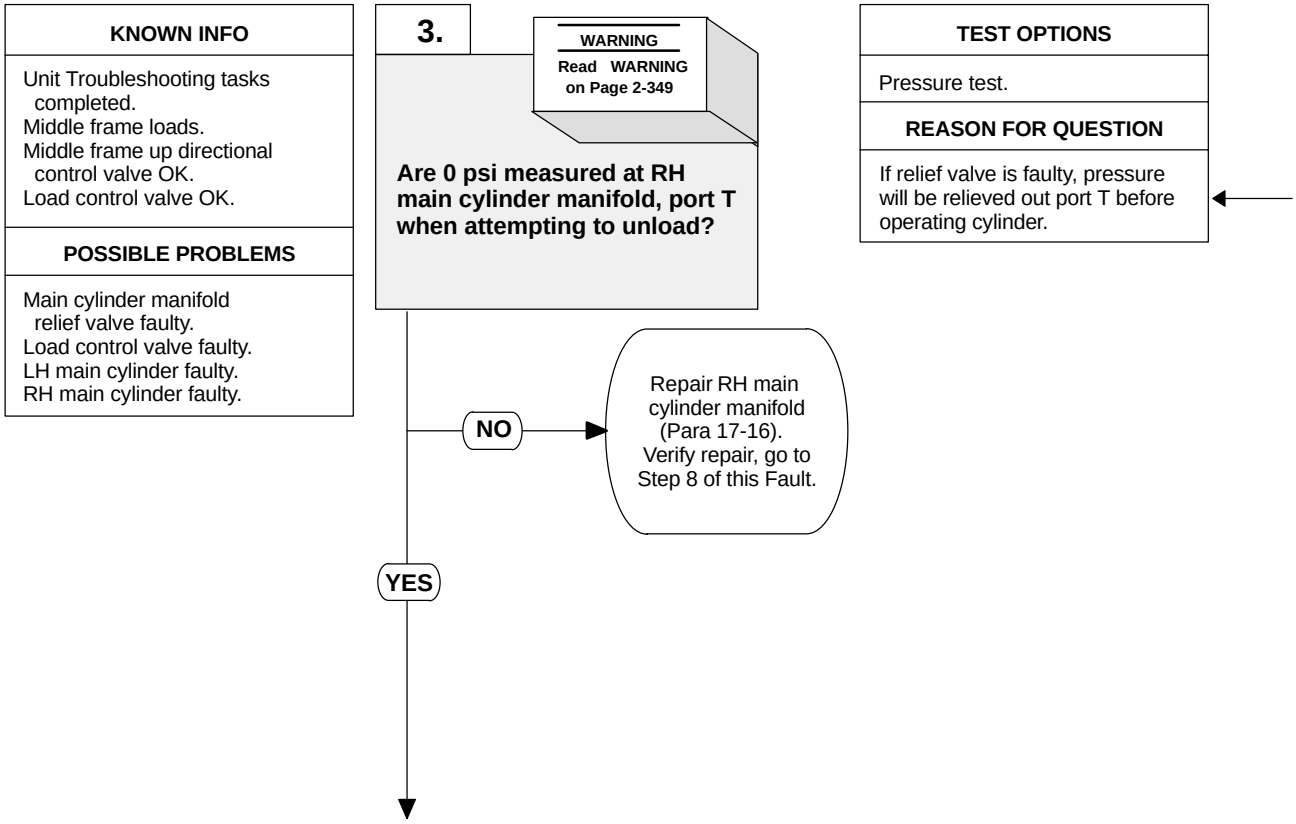
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PRESSURE TEST (CONT).

(14) Turn OFF ENGINE switch.
(15) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(16) Remove pressure gage from main manifold.
(17) Lubricate preformed packing and backup ring with hydraulic oil.
(18) Install preformed packing and backup ring on plug and install plug in main manifold, port TPMB. Tighten to 96 lb-in (11 N·m).
(19) Remove caps and plugs from six bulkhead fittings and hoses.
(20) Connect six hoses to bulkhead fittings.
(21) Connect quick disconnect hose 2917.



7. MIDDLE FRAME DOES NOT UNLOAD (CONT).

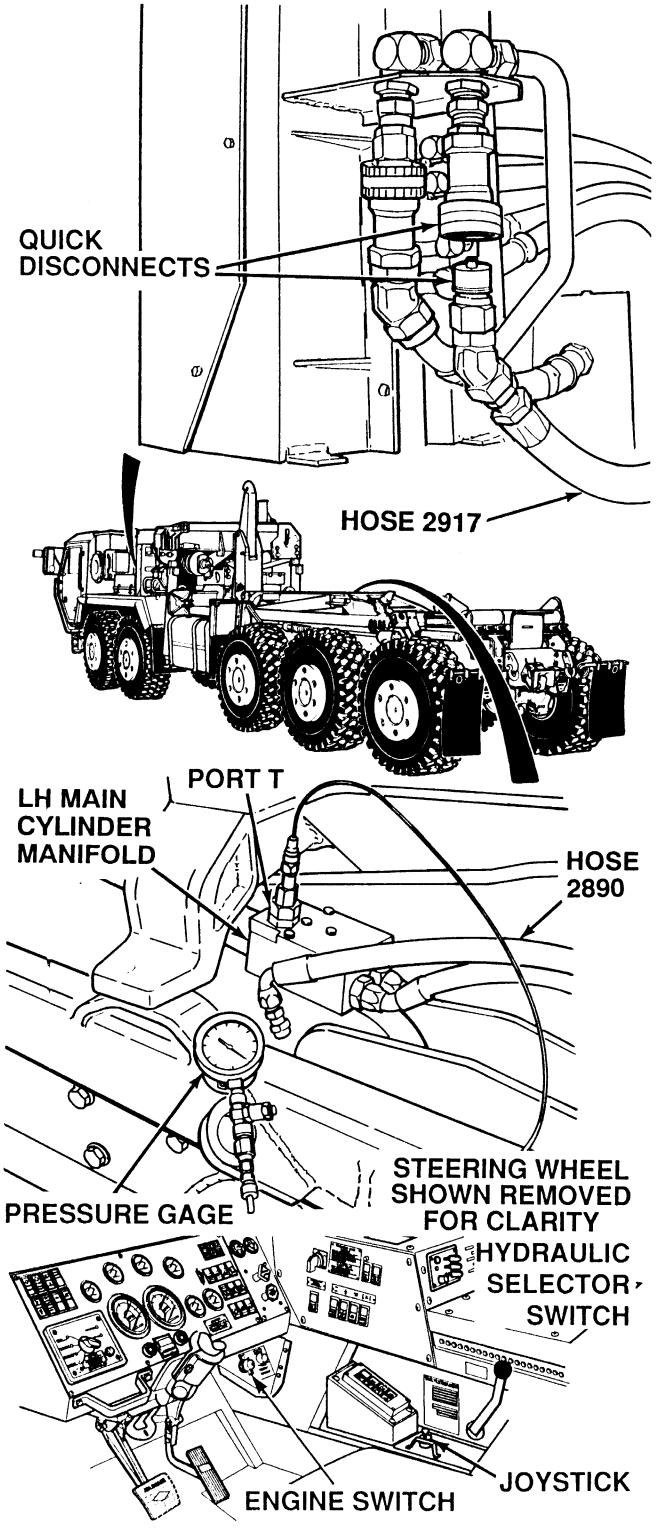


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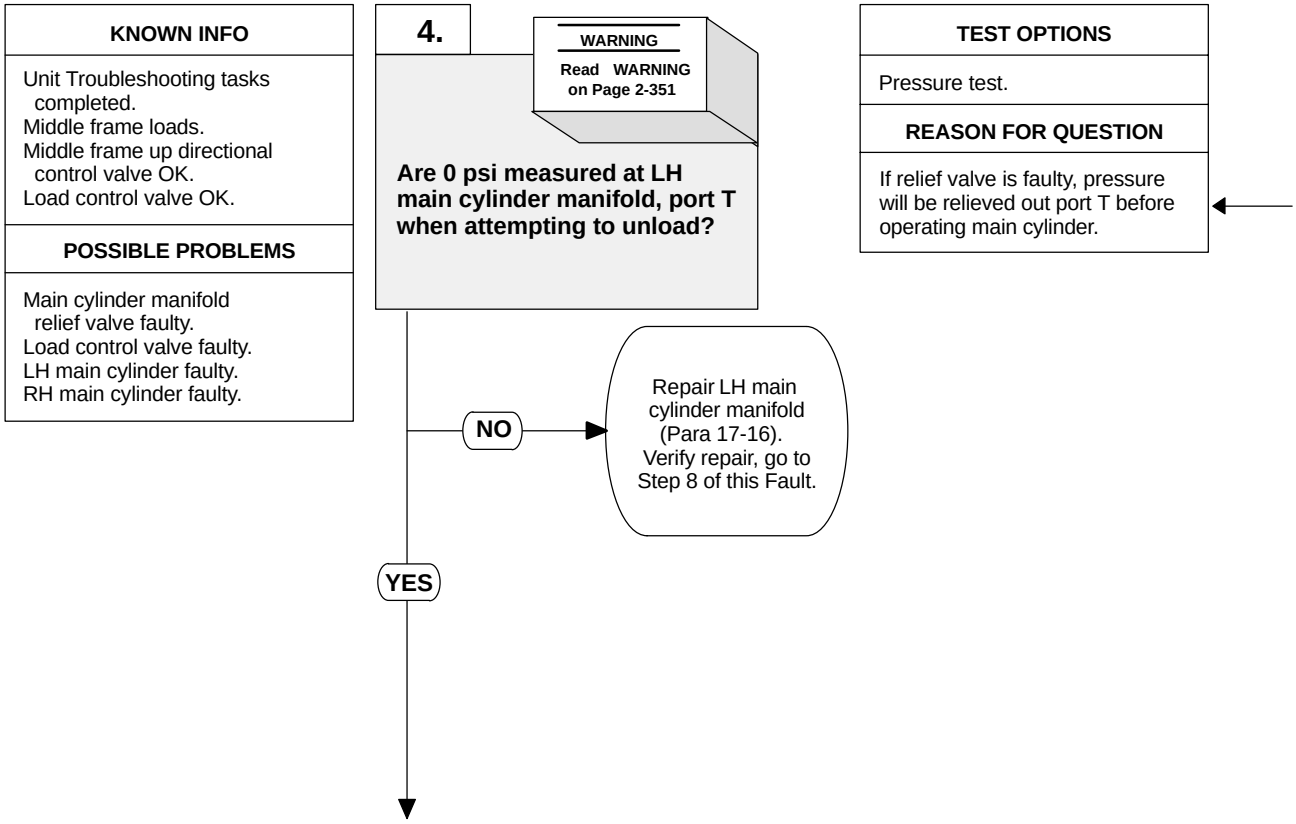
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2890 from adapter at port T of RH main cylinder manifold.
(3) Install metal plug in removed hose.
(4) Connect pressure gage to adapter at main cylinder manifold, port T.
(5) Connect quick disconnect hose 2917.
(6) Start engine (TM 9-2320-364-10).
(7) Set hydraulic selector switch to MAN MF.
(8) With the aid of an assistant, observe gage while holding joystick in UNLOAD position.
    (a) If more than 0 psi (0 kPa) are present, relief valve is faulty. Perform Steps (9) through (13) and (16) below and repair RH main cylinder manifold (Para 17-16).
    (b) If 0 psi (0 kPa) are present, RH main cylinder manifold relief valve is OK.
(9) Put LHS in transit position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(13) Remove gage from adapter.
(14) Remove plug from hose.
(15) Connect hose to adapter.
(16) Connect quick disconnect hose 2917.



7. MIDDLE FRAME DOES NOT UNLOAD (CONT).

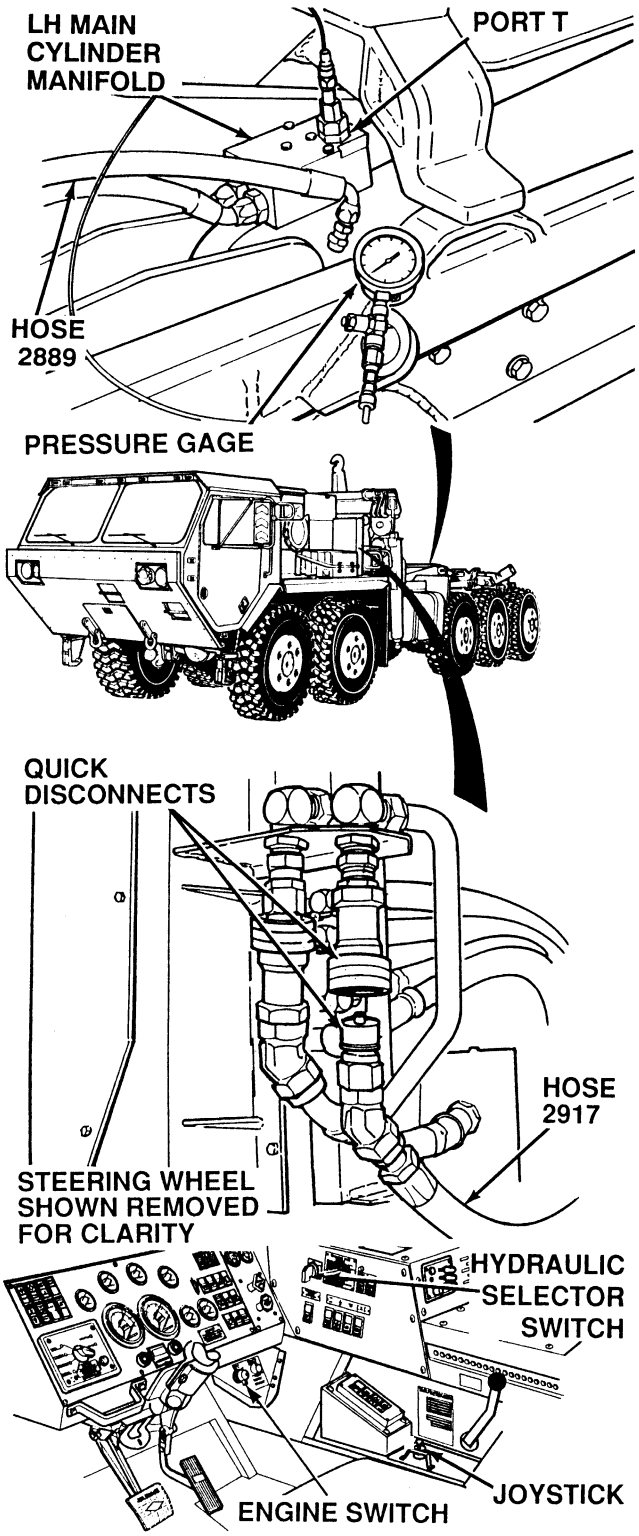


WARNING

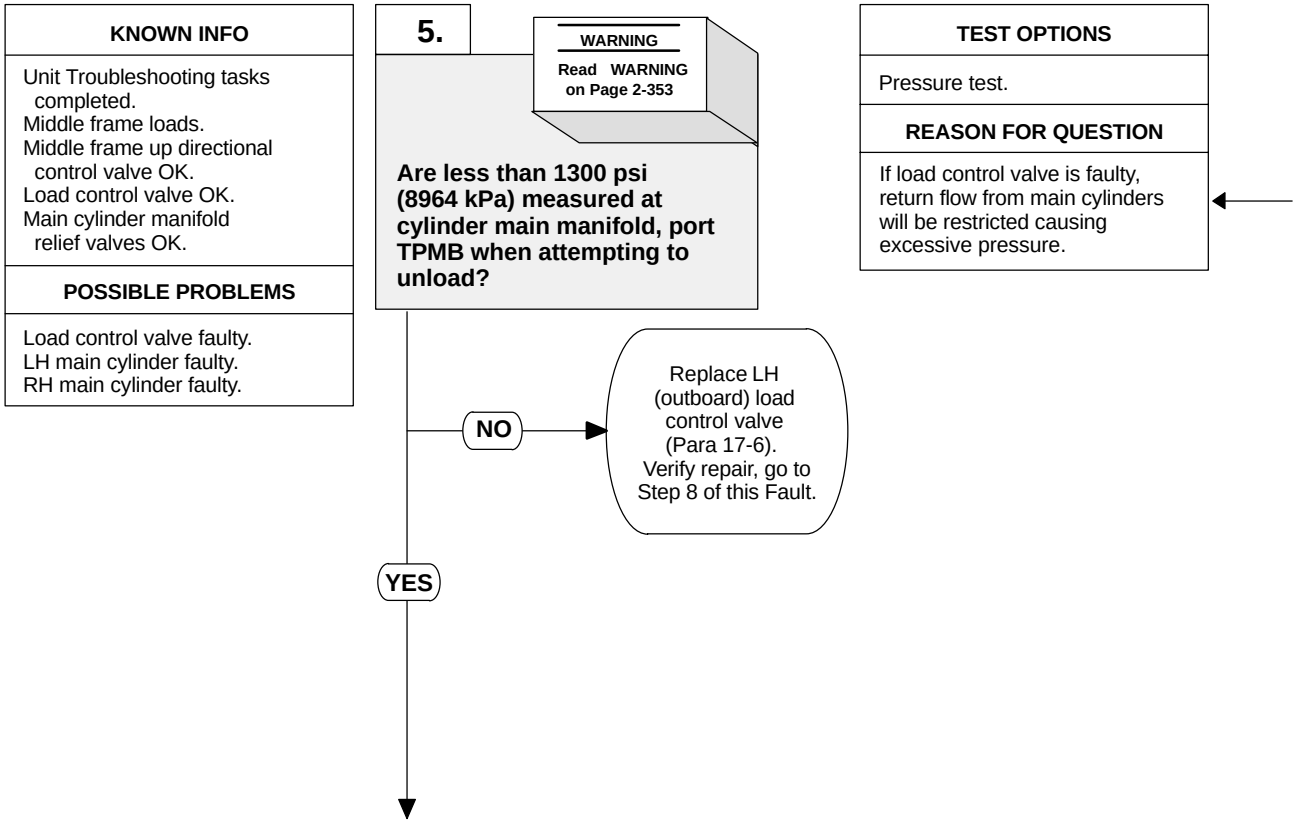
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PRESSURE TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2889 from adapter at port T of LH main cylinder manifold.
(3) Install metal plug in removed hose.
(4) Connect pressure gage to adapter at main cylinder manifold, port T.
(5) Connect quick disconnect hose 2917.
(6) Start engine (TM 9-2320-364-10).
(7) Set hydraulic selector switch to MAN MF.
(8) With the aid an of assistant, observe gage while holding joystick in UNLOAD position.
  (a) If more than 0 psi (0 kPa) are present, relief valve is faulty. Perform Steps (9) through (13) and (16) below and repair LH main cylinder manifold (Para 17-16).
  (b) If 0 psi (0 kPa) are present, LH main cylinder manifold relief valve is OK.
(9) Put LHS in transit position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(13) Remove gage from adapter.
(14) Remove plug from hose 2889.
(15) Connect hose to adapter.
(16) Connect quick disconnect hose 2917.



7. MIDDLE FRAME DOES NOT UNLOAD (CONT).

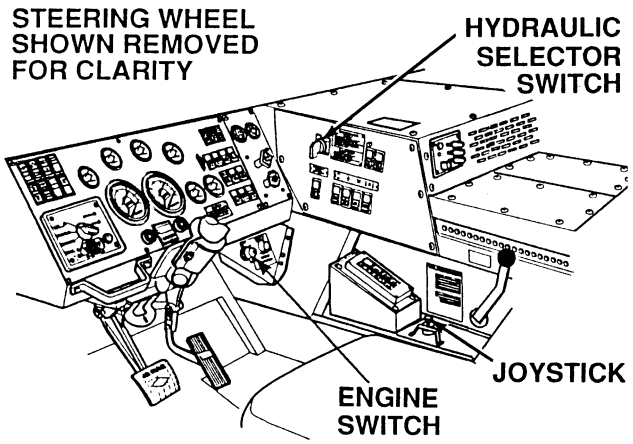


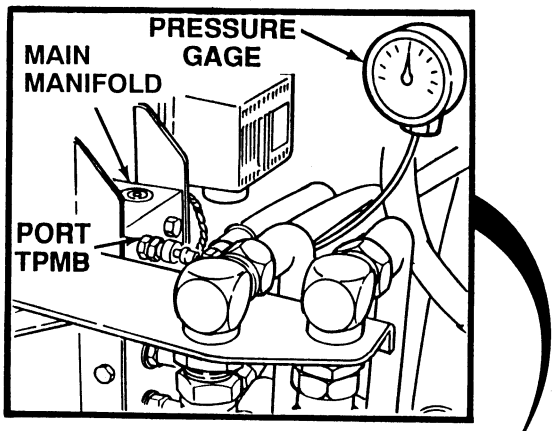
WARNING

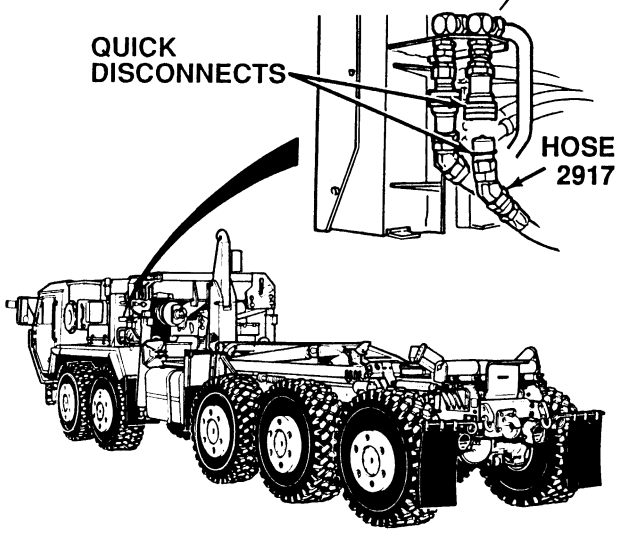
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST

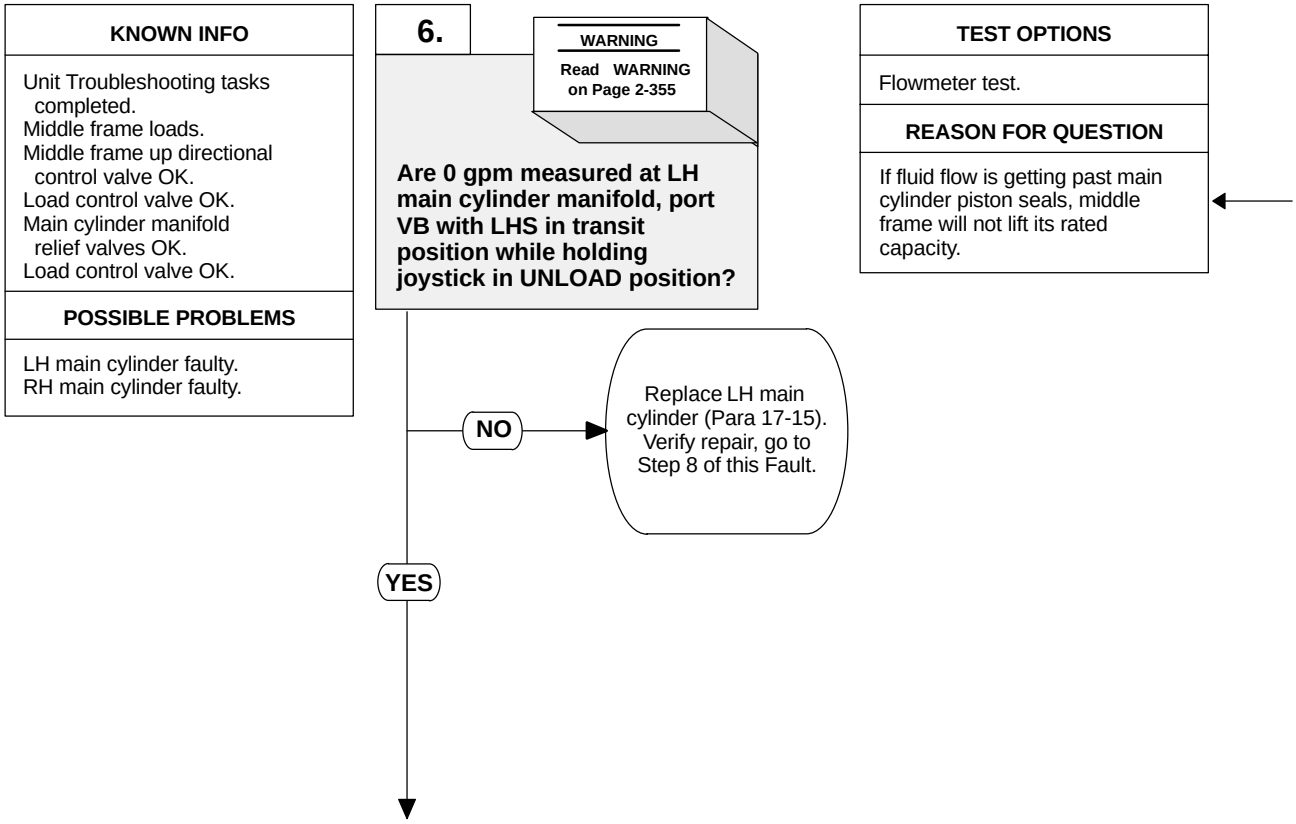
(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Remove plug from main manifold, port TPMB.
(3) Remove preformed packing and backup ring from plug. Discard preformed packing and backup ring.
(4) Connect pressure gage to main manifold, port TPMB.
(5) Connect quick disconnect hose 2917.
(6) Start engine (TM 9-2320-364-10).
(7) Set hydraulic selector switch to MAN MF.
(8) With the aid of an assistant, observe pressure gage while holding joystick in UNLOAD position.
    (a) If more than 1300 psi (8964 kPa) are present, perform Steps (9) through (16) below and replace LH (outboard) load control valve (Para 17-6).
    (b) If 1300 psi (8960 kPa) or less are measured, load control valve is OK.
(9) Put LHS in transit position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(13) Remove pressure gage from main manifold.
(14) Lubricate preformed packing and backup ring with hydraulic oil.
(15) Install preformed packing and backup ring on plug and install plug in main manifold, port TPMB. Tighten to 96 lb-in (11 N·m).
(16) Connect quick disconnect hose 2917.







7. MIDDLE FRAME DOES NOT UNLOAD (CONT).

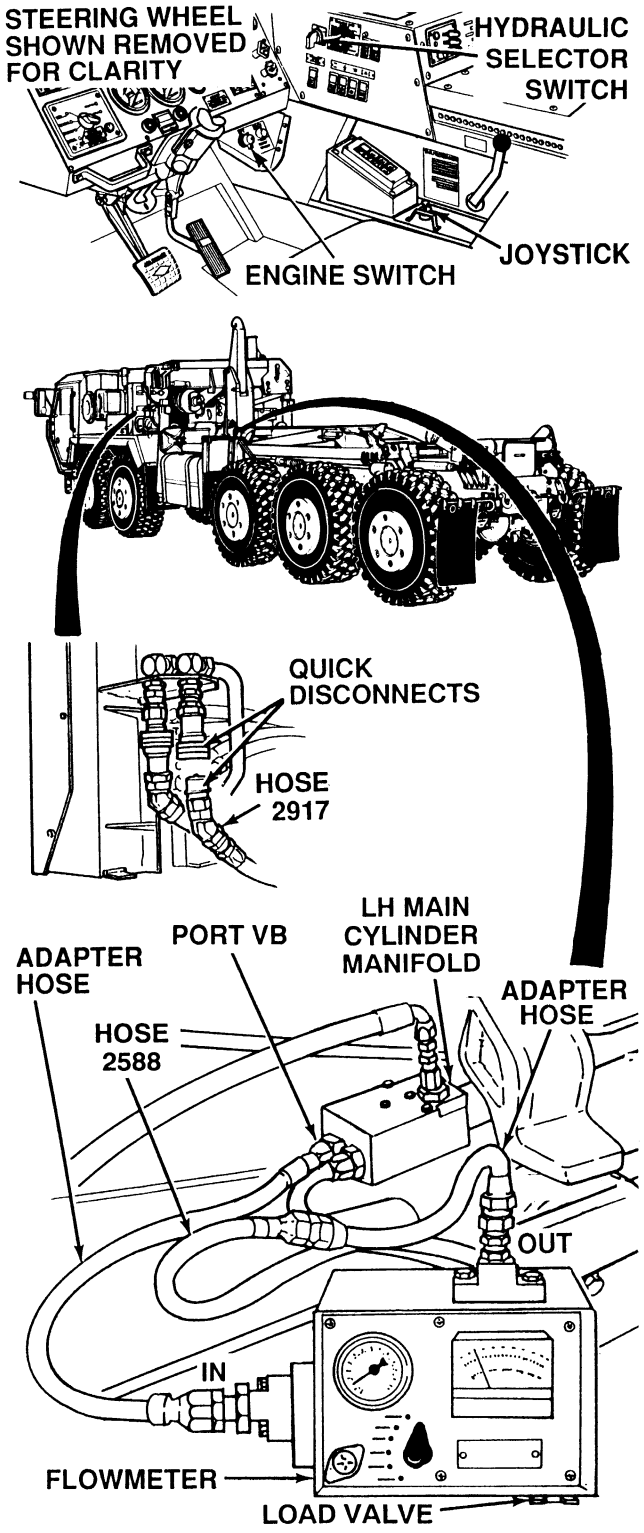


WARNING

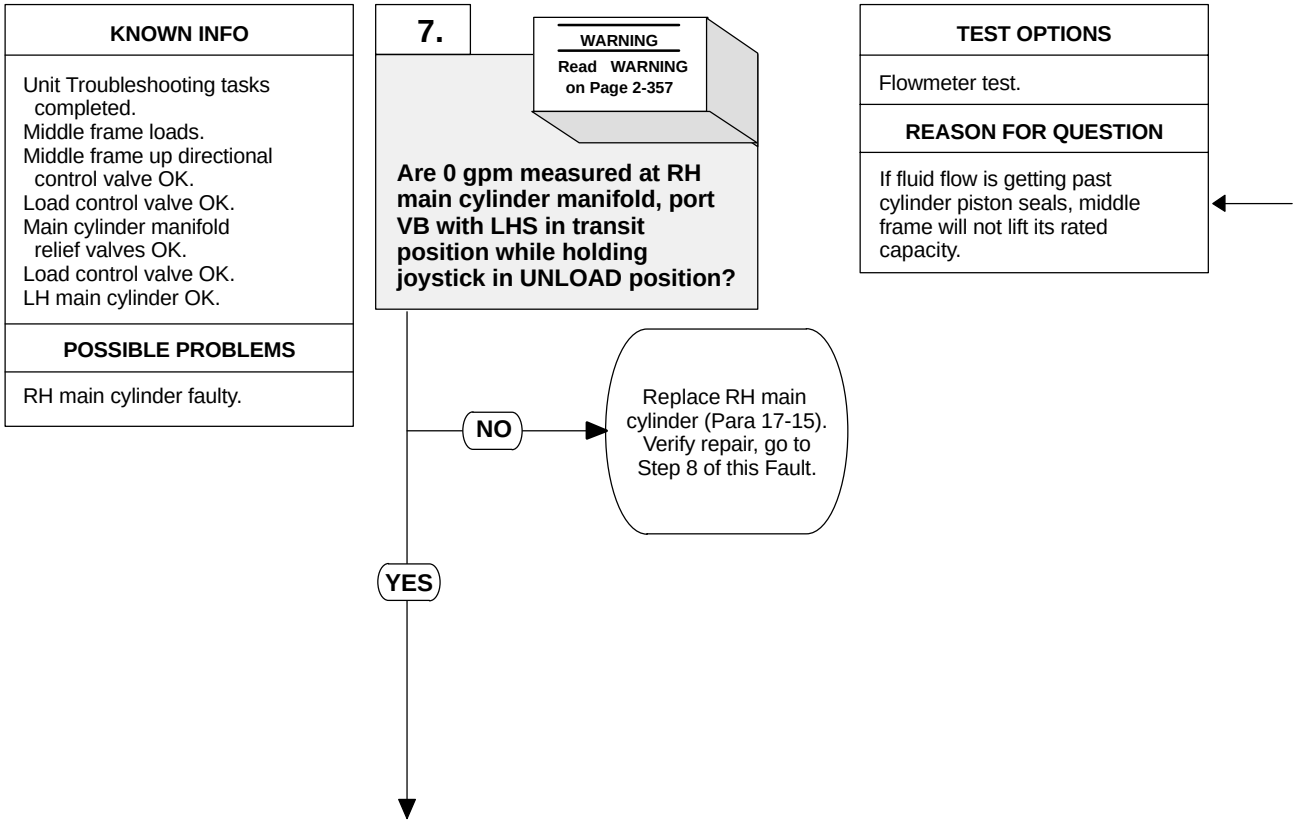
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

FLOWMETER TEST

(1) Raise middle frame completely (TM 9-2320-364-10).
(2) Set hydraulic selector switch to OFF position.
(3) Turn OFF ENGINE switch.
(4) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(5) Disconnect hose 2588 from LH main cylinder manifold adapter port VB.
(6) Connect adapter hose to hose 2588.
(7) Connect adapter hose to main cylinder manifold adapter port VB.
(8) Connect flowmeter OUT port to adapter hose connected to hose 2588.
(9) Connect flowmeter IN port to adapter hose connected to LH main manifold.
(10) Completely open flowmeter load valve.
(11) Set flowmeter to LOW scale.
(12) Connect quick disconnect hose 2917.
(13) Start engine.
(14) Set hydraulic selector switch to MAN MF position.
(15) With the aid of an assistant, observe flowmeter while holding joystick in UNLOAD position.
  (a) If more than 0 gpm (lpm) are present, perform Steps (16) through (24) below and replace LH main cylinder (Para 17-15).
  (b) If 0 gpm (lpm) are present, LH main cylinder is OK.
(16) Put LHS in transit position.
(17) Set hydraulic selector switch to OFF position.
(18) Turn OFF ENGINE switch.
(19) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(20) Disconnect flowmeter from two adapter hoses.
(21) Disconnect adapter hose main cylinder manifold adapter.
(22) Disconnect adapter hose from hose 2588.
(23) Connect hose 2588 to main cylinder manifold adapter port VB.
(24) Connect quick disconnect hose 2917.



7. MIDDLE FRAME DOES NOT UNLOAD (CONT).

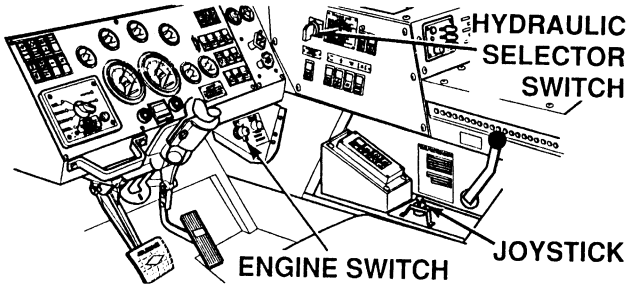


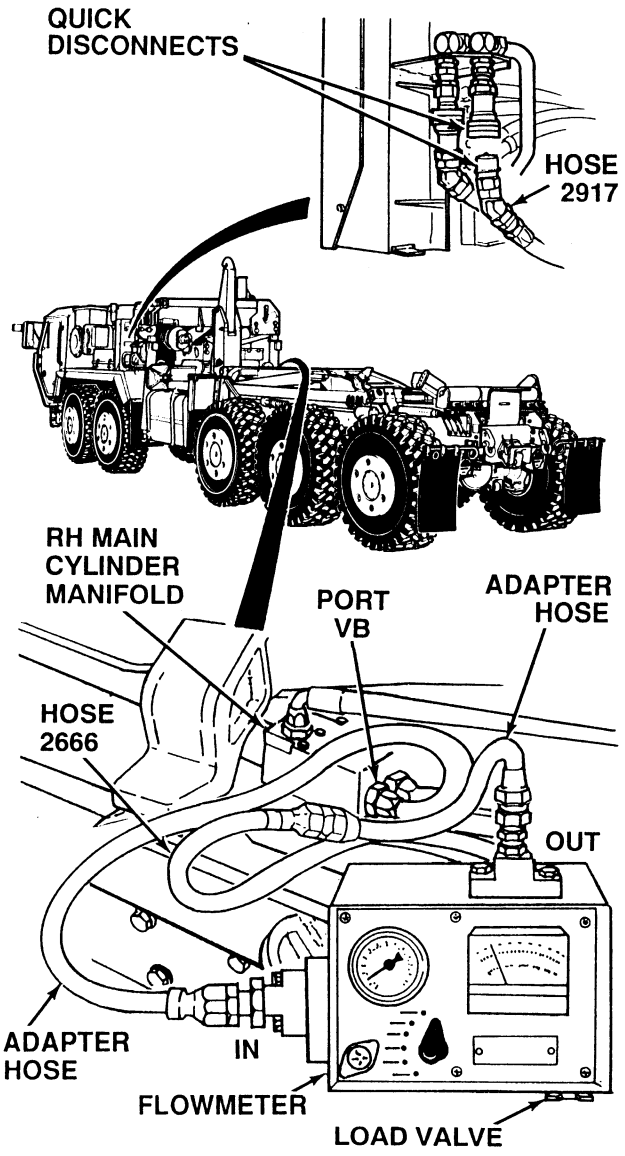
WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

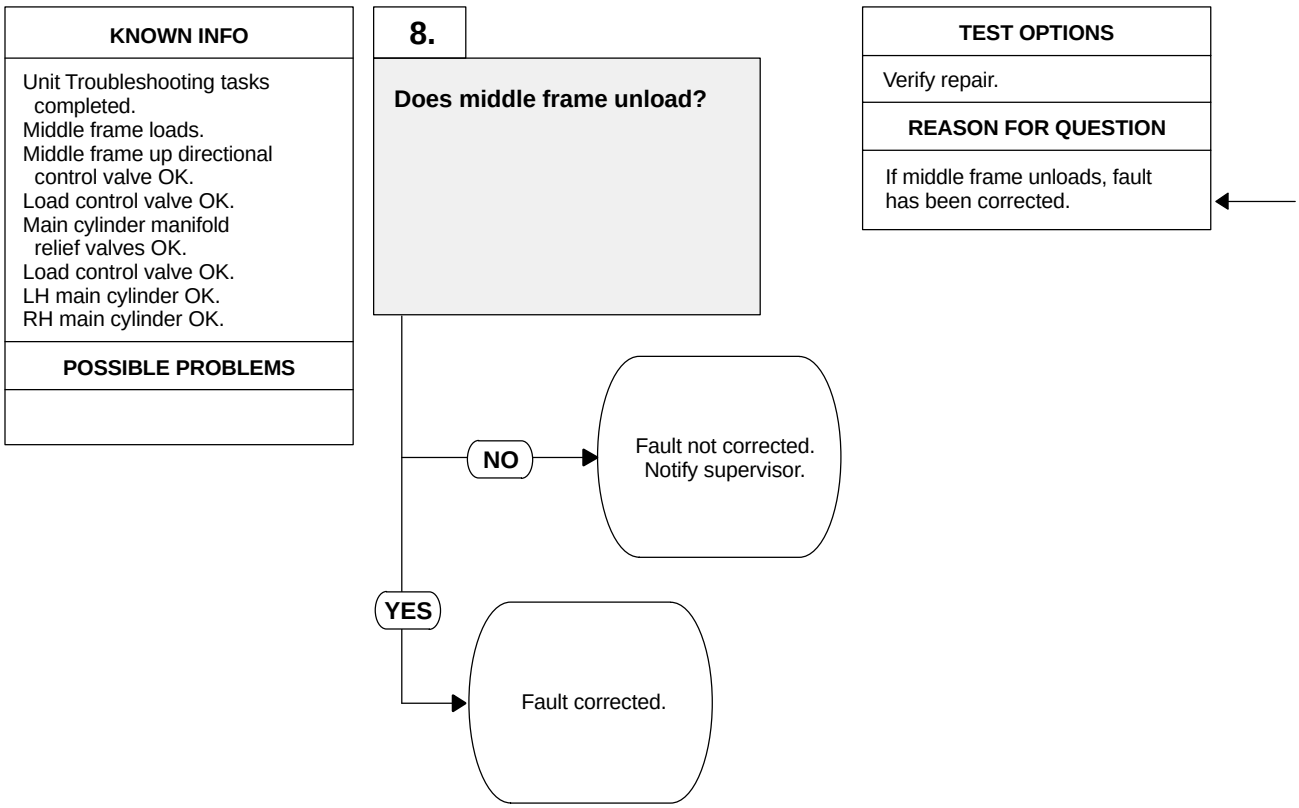
FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2666 from RH main cylinder manifold adapter port VB.
(3) Connect adapter hose to hose 2666.
(4) Connect adapter hose to main cylinder manifold adapter port VB.
(5) Connect flowmeter OUT port to adapter hose connected to hose 2666.
(6) Connect flowmeter IN port to adapter hose connected to RH main cylinder manifold.
(7) Completely open flowmeter load valve.
(8) Set flowmeter to LOW scale.
(9) Connect quick disconnect hose 2917.
(10) Start engine (TM 9-2320-364-10).
(11) Set hydraulic selector switch to MAN MF position.
(12) With the aid of an assistant, observe flowmeter while holding joystick in UNLOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (13) through (21) below and replace RH main cylinder (Para 17-15).
  (b) If 0 gpm (0 lpm) are present, RH main cylinder is OK.
(13) Put LHS in transit position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(17) Disconnect flowmeter from two adapter hoses.
(18) Disconnect adapter hose main cylinder manifold adapter.
(19) Disconnect adapter hose from hose 2666.
(20) Connect hose 2666 to main cylinder manifold adapter port VB.
(21) Connect quick disconnect hose 2917.



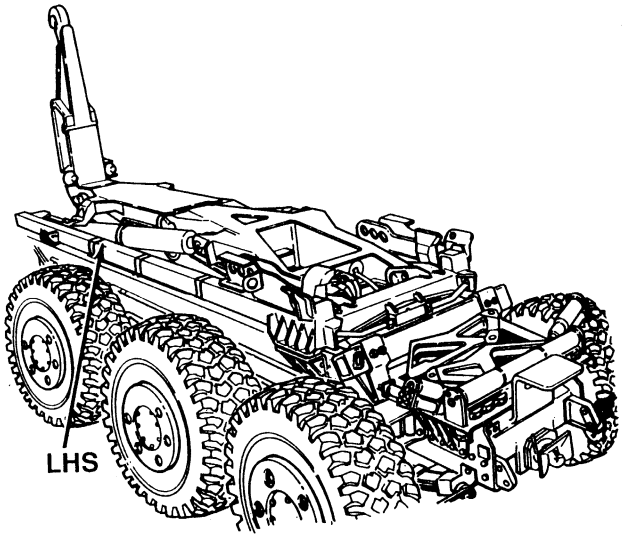


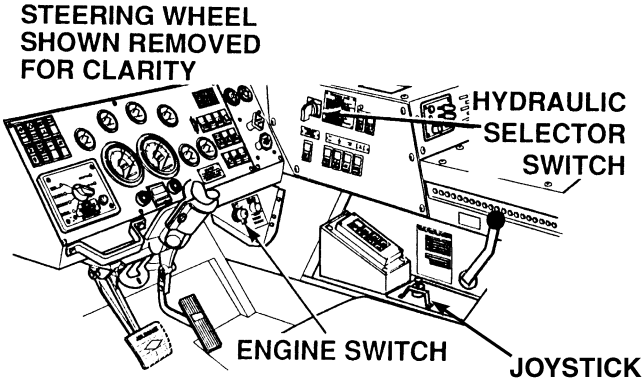
7. MIDDLE FRAME DOES NOT UNLOAD (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to AUTO position.
(3) Hold joystick in UNLOAD position.
  (a) If middle frame does not unload, fault not corrected. Perform Steps (4) through (6) below and notify supervisor.
  (b) If middle frame does unload, fault has been corrected.
(4) Put LHS in transit position.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.





2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESOOTING (CONT).

8. MIDDLE FRAME DOES NOT OPERATE.

INITIAL SETUP

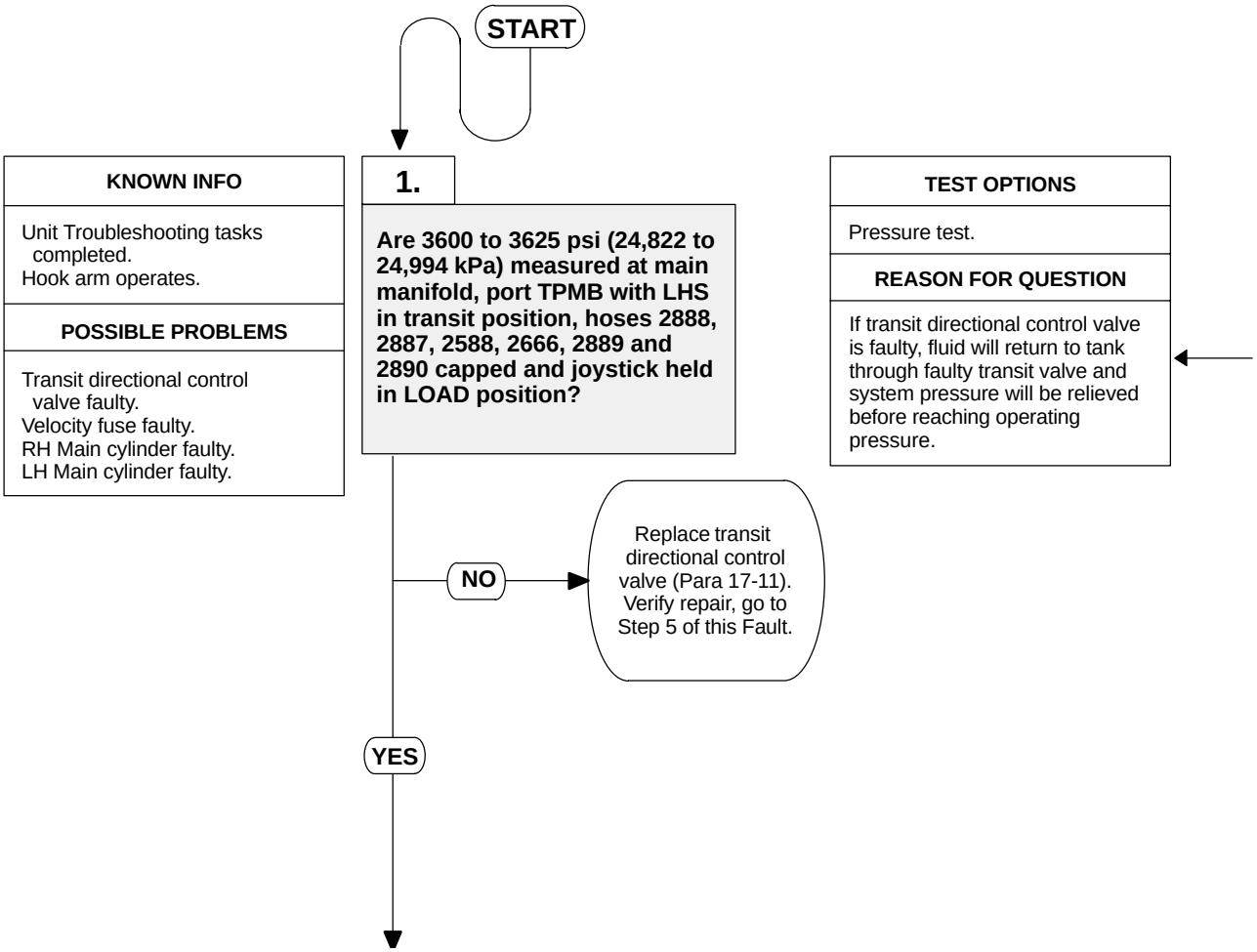
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Goggles, Industrial (Item 83, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench Set, Socket 3/8 in. Drive (Item 273, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)
Wooden Blocks (Appendix C)
Lifting Device, Minimum capacity 2500 lb (1134kg)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Parts Kit, Seal (Item 412, Appendix E)
Parts Kit, Seal (Item 408, Appendix E)

References
TM 9-2320-364-10

Personnel Required
Two

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

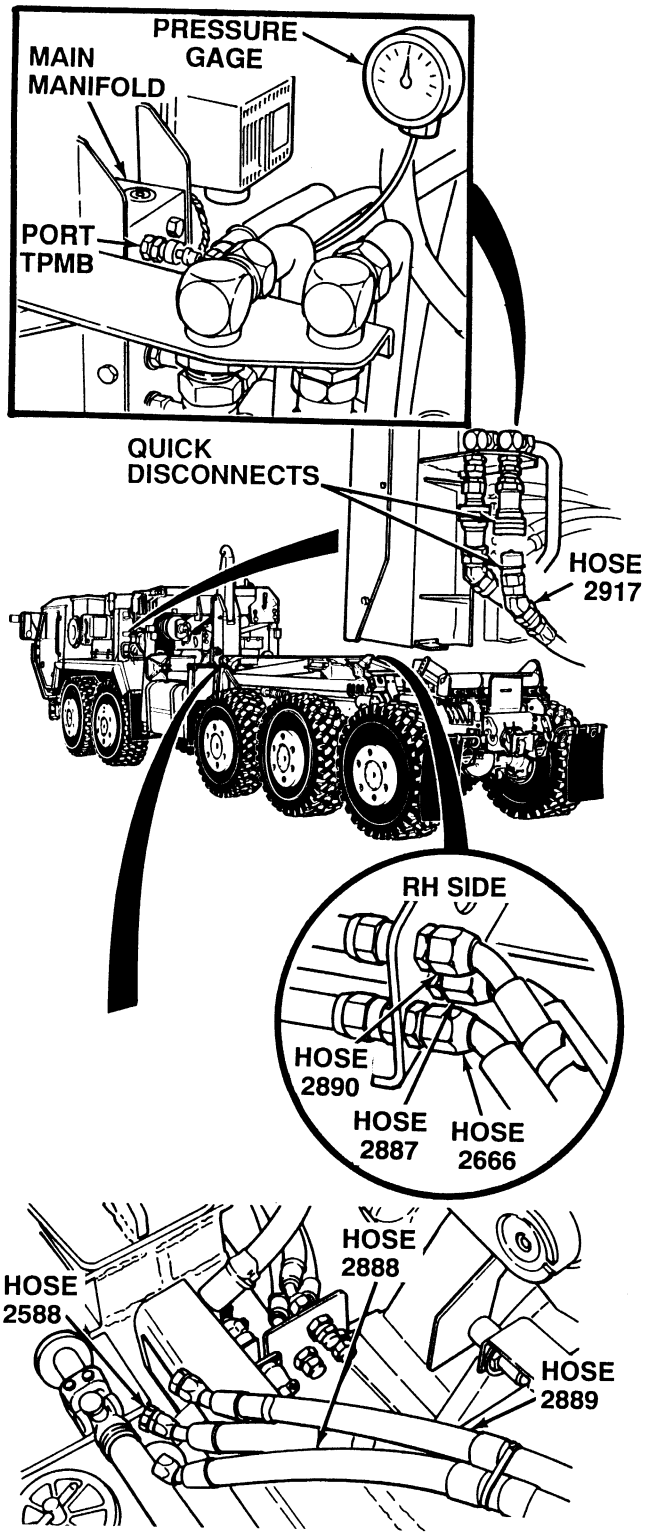


WARNING

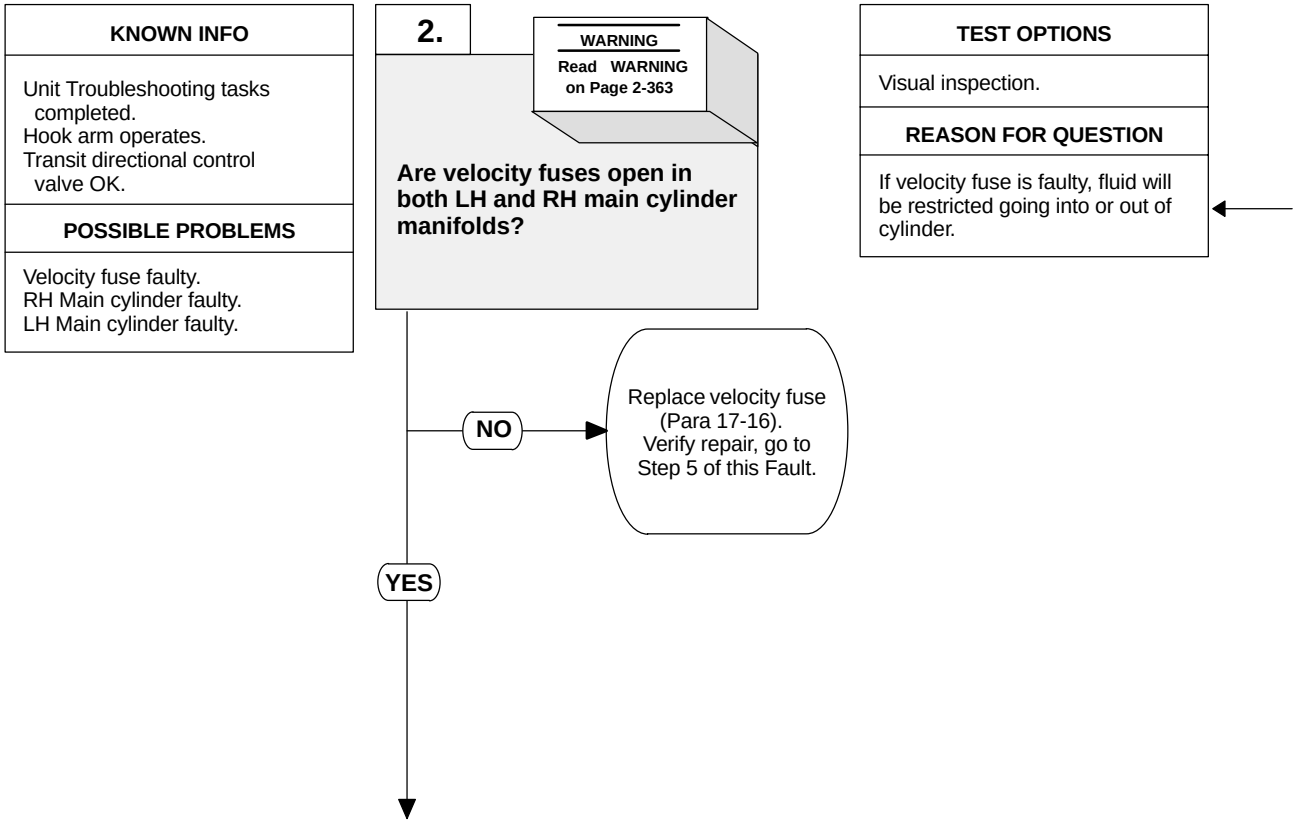
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Remove plug from main manifold, port TPMB.
(3) Remove preformed packing and backup ring from plug. Discard preformed packing and backup ring.
(4) Connect pressure gage to main manifold, port TPMB.
(5) Tag, mark and disconnect hoses 2888, 2887, 2588, 2666, 2889 and 2890 from six compression frame bulkhead fittings.
(6) Cap and plug six hoses and six bulkhead fittings using metal caps and plugs.
(7) Connect quick disconnect hose 2917.
(8) Start engine (TM 9-2320-364-10).
(9) Set hydraulic selector switch to MAN MF.
(10) With the aid of an assistant, observe pressure gage while holding joystick in LOAD position.
  (a) If less than 3600 psi (24,822 kPa) is present, perform Steps (11) through (20) below and replace transit directional control valve (Para 17-11).
  (b) If 3600 psi (24,822 kPa) or more are present, transit directional control valve is OK.
(11) Put LHS in transit position.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(15) Remove pressure gage from main manifold, port TPMB.
(16) Lubricate preformed packing and backup ring with hydraulic oil.
(17) Install preformed packing and backup ring on plug and install plug in main manifold, port TPMB. Tighten to 96 lb-in (11 N·m).
(18) Remove caps and plugs from six bulkhead fittings and hoses.
(19) Connect hoses 2888, 2887, 2588, 2666, 2889 and 2890 to bulkhead fittings.
(20) Connect quick disconnect hose 2917.



8. MIDDLE FRAME DOES NOT OPERATE (CONT).

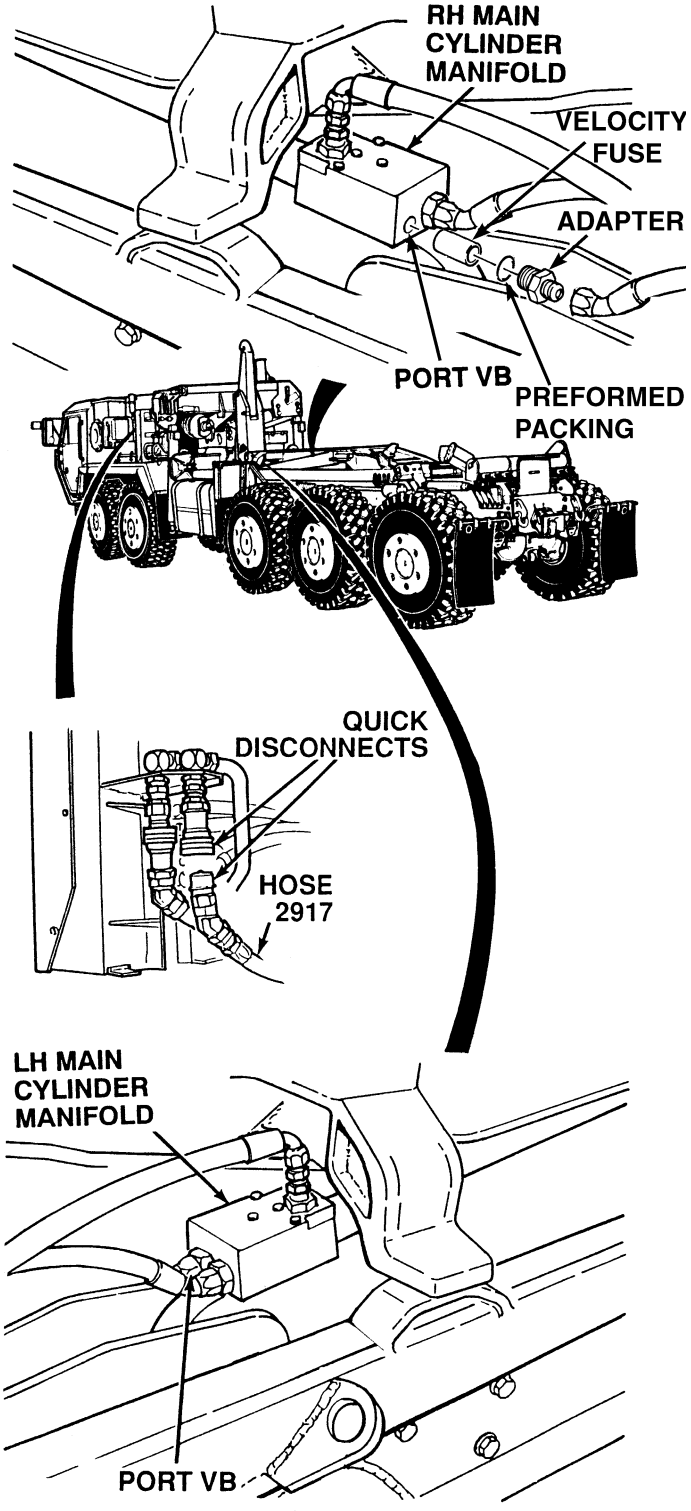


WARNING

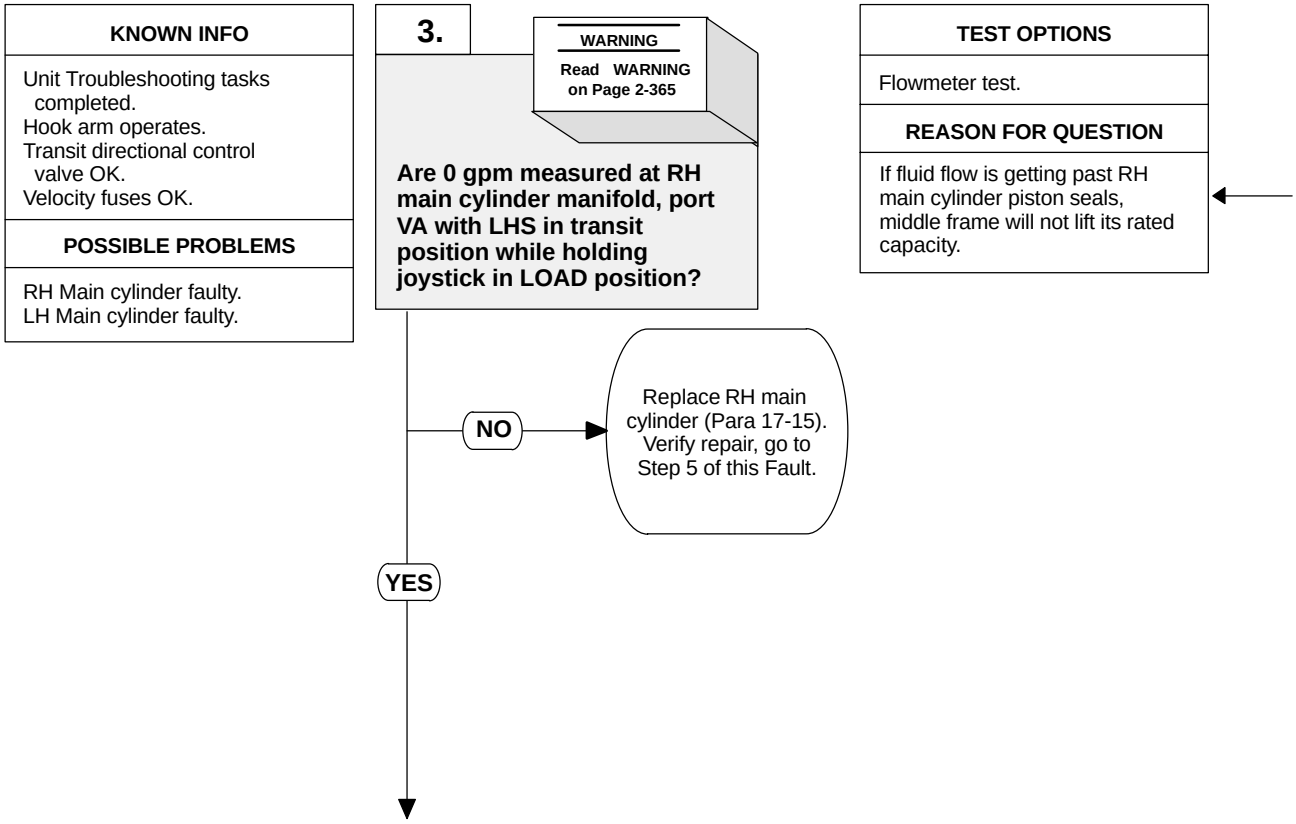
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guard and personal protective equipment (goggles/shield, gloves, etc.). Failure to comply may result in injury to personnel.

VISUAL INSPECTION

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose from LH main cylinder manifold, port VB adapter.
(3) Plug hose using metal plug.
(4) Remove LH main cylinder manifold (Para 17-16).
(5) Remove adapter and velocity fuse from main cylinder manifold, port VB.
(6) Remove preformed packing from adapter. Discard preformed packing.
(7) Blow compressed air into velocity fuse.
    (a) If air cannot be blown through velocity fuse, replace velocity fuse.
    (b) If air can be blown through velocity fuse, velocity fuse is OK.
(8) Lubricate preformed packing with hydraulic oil and install on adapter.
(9) Install velocity fuse and adapter with new preformed packing in main cylinder manifold.
(10) Install main cylinder manifold on main cylinder.
(11) Install hose on main cylinder manifold adapter port VB.
(12) Repeat Steps (2) through (11) above for RH main cylinder manifold.
(13) Connect quick disconnect hose 2917.



8. MIDDLE FRAME DOES NOT OPERATE (CONT).

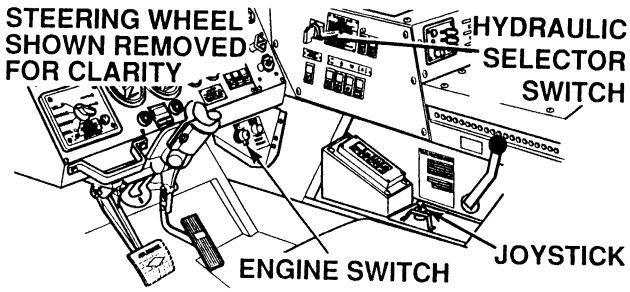


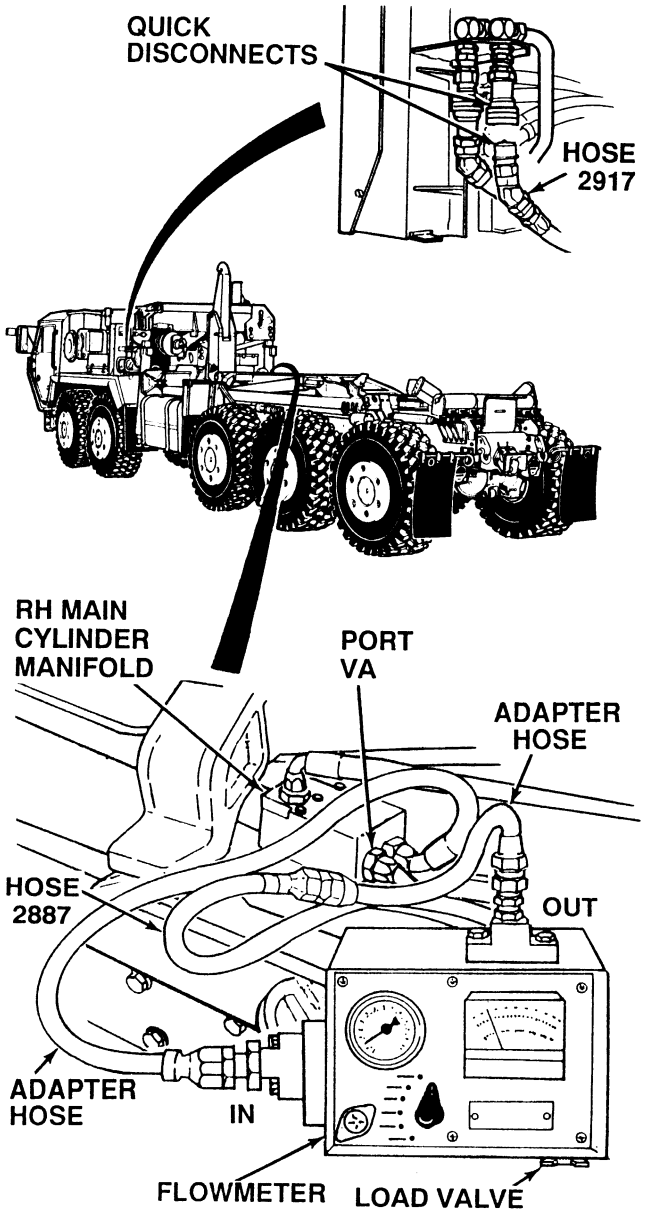
WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

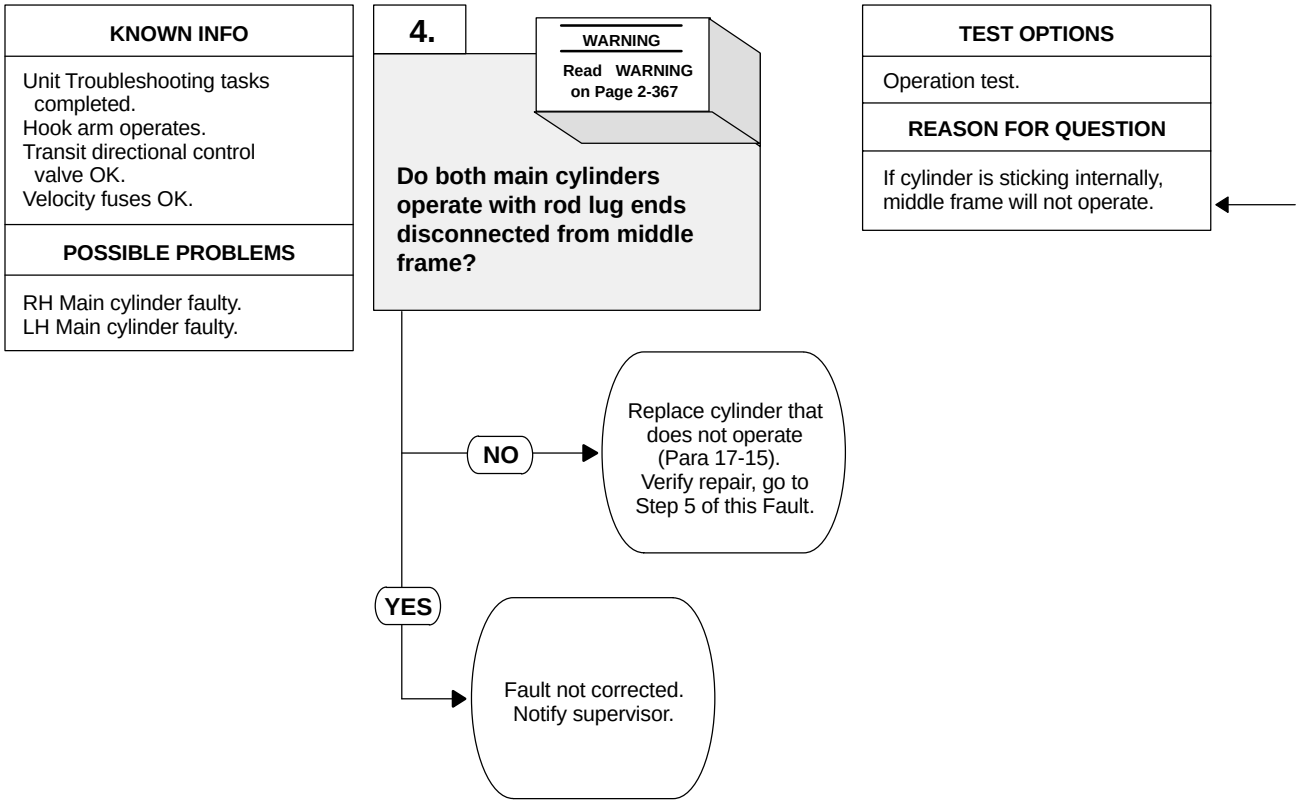
FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2887 from RH main cylinder adapter port VA.
(3) Connect adapter hose to hose 2887.
(4) Connect adapter hose to main cylinder manifold adapter port VA.
(5) Connect flowmeter OUT port to adapter hose connected to hose 2887.
(6) Connect flowmeter IN port to adapter hose connected to main cylinder manifold.
(7) Completely open flowmeter load valve.
(8) Set flowmeter to LOW scale.
(9) Connect quick disconnect hose 2917.
(10) Start engine (TM 9-2320-364-10).
(11) Set hydraulic selector switch to MAN MF position.
(12) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (13) through (20) below and replace RH main cylinder (Para 17-15).
  (b) If 0 gpm (0 lpm) are present, RH main cylinder is OK.
(13) Set hydraulic selector switch to OFF position
(14) Turn OFF ENGINE switch.
(15) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(16) Disconnect flowmeter from two adapter hoses.
(17) Disconnect adapter hose from main cylinder manifold.
(18) Disconnect adapter hose from hose 2887.
(19) Connect hose 2887 to main cylinder manifold adapter port VA.
(20) Connect quick disconnect hose 2917.





8. MIDDLE FRAME DOES NOT OPERATE (CONT).



WARNING

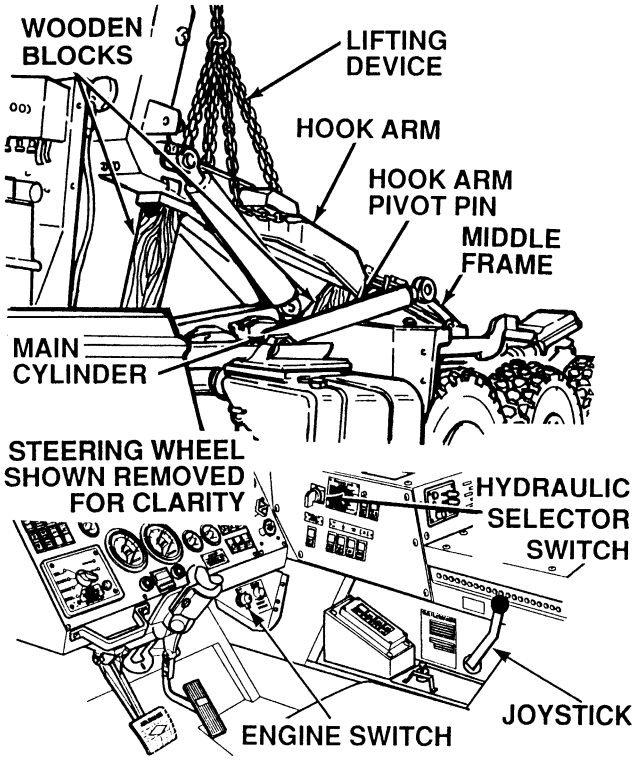
Middle frame and hook arm have a combined weight 2100 lbs (953 kg). Hook arm cylinders weigh 210 lbs (95 kg) each. Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

CAUTION

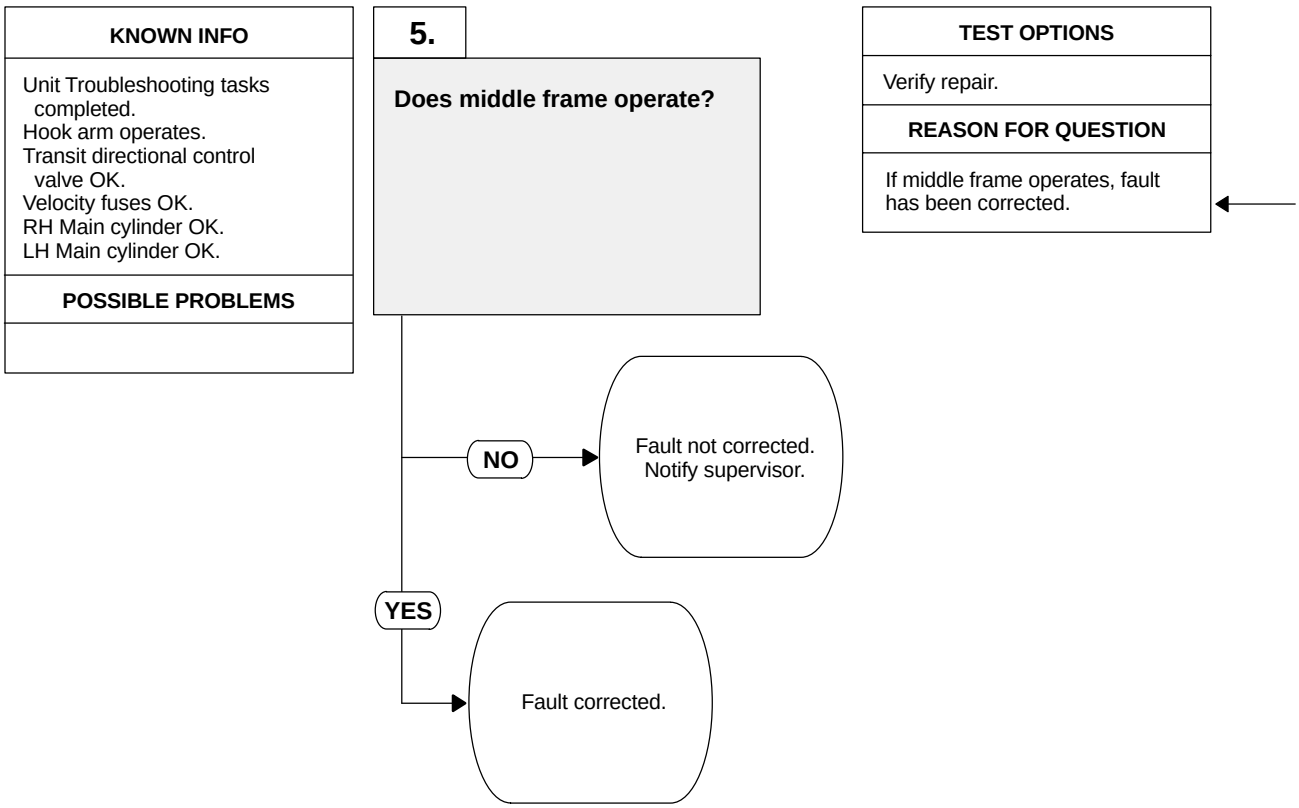
Blocks supporting middle frame can fall when middle frame is supported by a lifting device. Have assistant prevent block from falling or damage to LHS could occur.

OPERATION TEST

(1) Attach lifting device to hook arm.
(2) With the aid of an assistant, lift hook arm with middle frame until middle frame pivot pin is above main cylinder while middle frame safe lowering button is pushed in (TM 9-2320-364-10).
(3) Block middle frame up in two places with wooden blocks.
(4) Remove lifting device from hook arm.
(5) Attach lifting device to LH main cylinder.
(6) Attach lifting device to RH main cylinder.
(7) Remove rod lug end of LH main cylinder from middle frame (Para 17-15).
(8) Remove rod lug end of RH main cylinder from middle frame.
(9) Position LH and RH cylinders using lifting device so that cylinders can extend completely.
(10) Start engine.
(11) Put hydraulic selector switch in MAN MF position.
(12) With the aid of an assistant, hold joystick in UNLOAD position and observe main cylinder operation.
  (a) If one cylinder does not move, replace faulty main cylinder and install other main cylinder.
  (b) If both cylinders operate, fault not corrected. Perform Steps (13) through (19) below and notify supervisor.
(13) Position main cylinders and install rod lug ends to middle frame.
(14) Remove lifting devices from main cylinders.
(15) Raise hook arm.
(16) Remove wooden blocks from hook arm.
(17) Put LHS in transit position.
(18) Set hydraulic selector switch to OFF position.
(19) Turn OFF ENGINE switch.

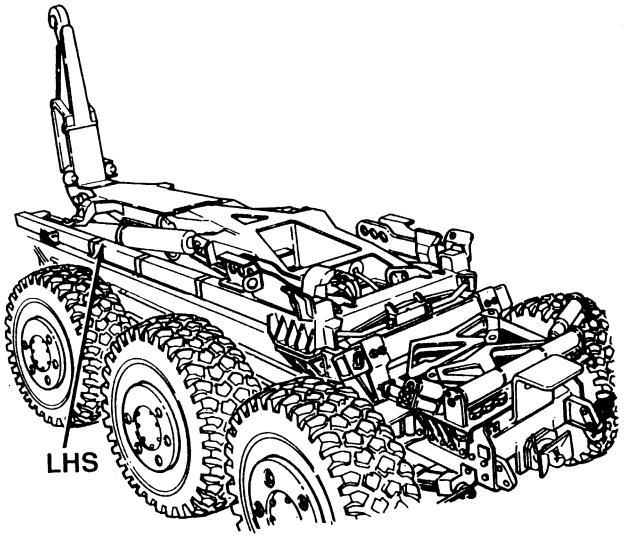


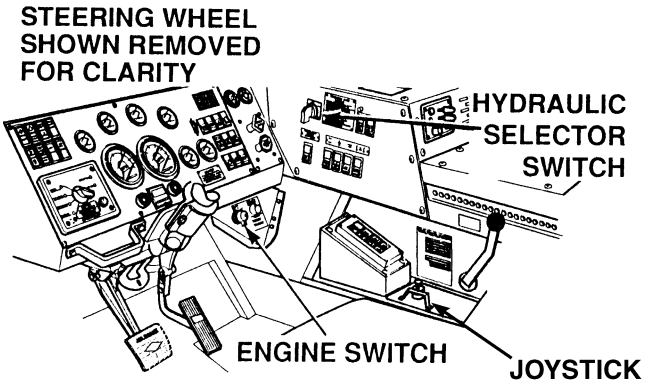
8. MIDDLE FRAME DOES NOT OPERATE (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to AUTO position.
(3) Hold joystick in UNLOAD position and then in the LOAD position.
  (a) If middle frame does not operate, fault not corrected. Perform Steps (4) through (6) below and notify supervisor.
  (b) If middle frame does operate, fault has been corrected.
(4) Place LHS in transit position.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.





2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

9. LHS DOES NOT OPERATE OR OPERATES SLOWLY.

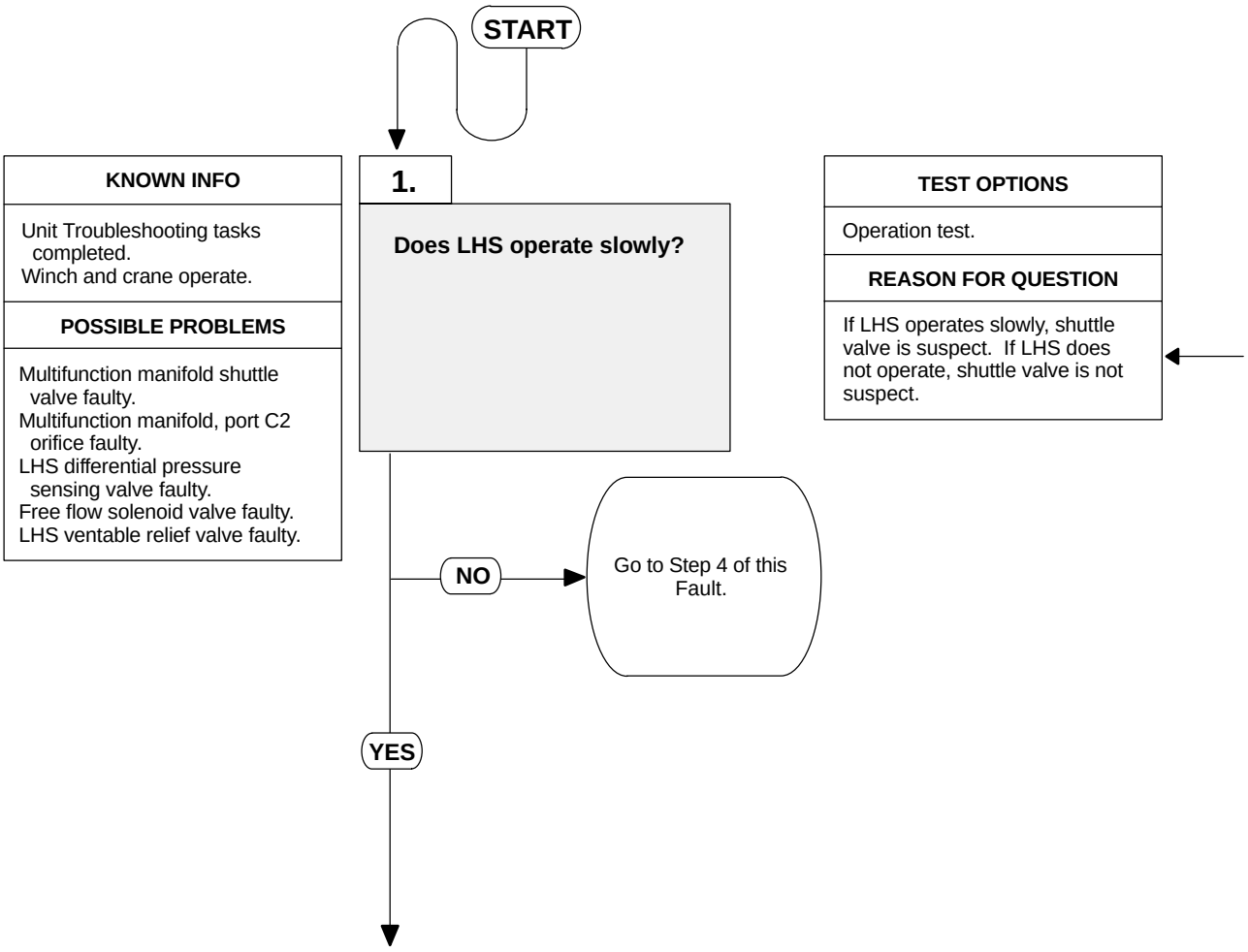
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench, Combination 1-1/2 in.
(Item 260, Appendix F)
Wrench, Combination 1-5/8 in.
(Item 261, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Lockwasher (4) (Item 266, Appendix E)
Lockwasher (8) (Item 282, Appendix E)
Parts Kit, Seal (Item 408, Appendix E)

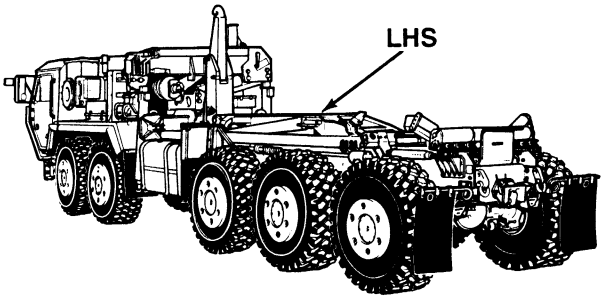
References
TM 9-2320-364-10

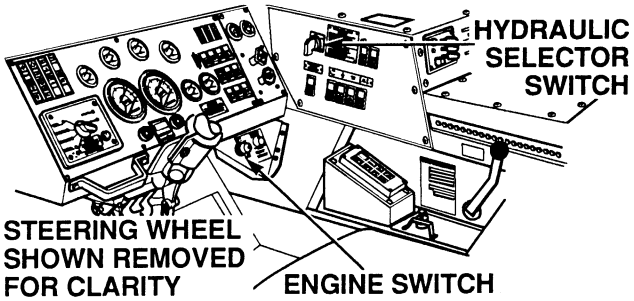
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



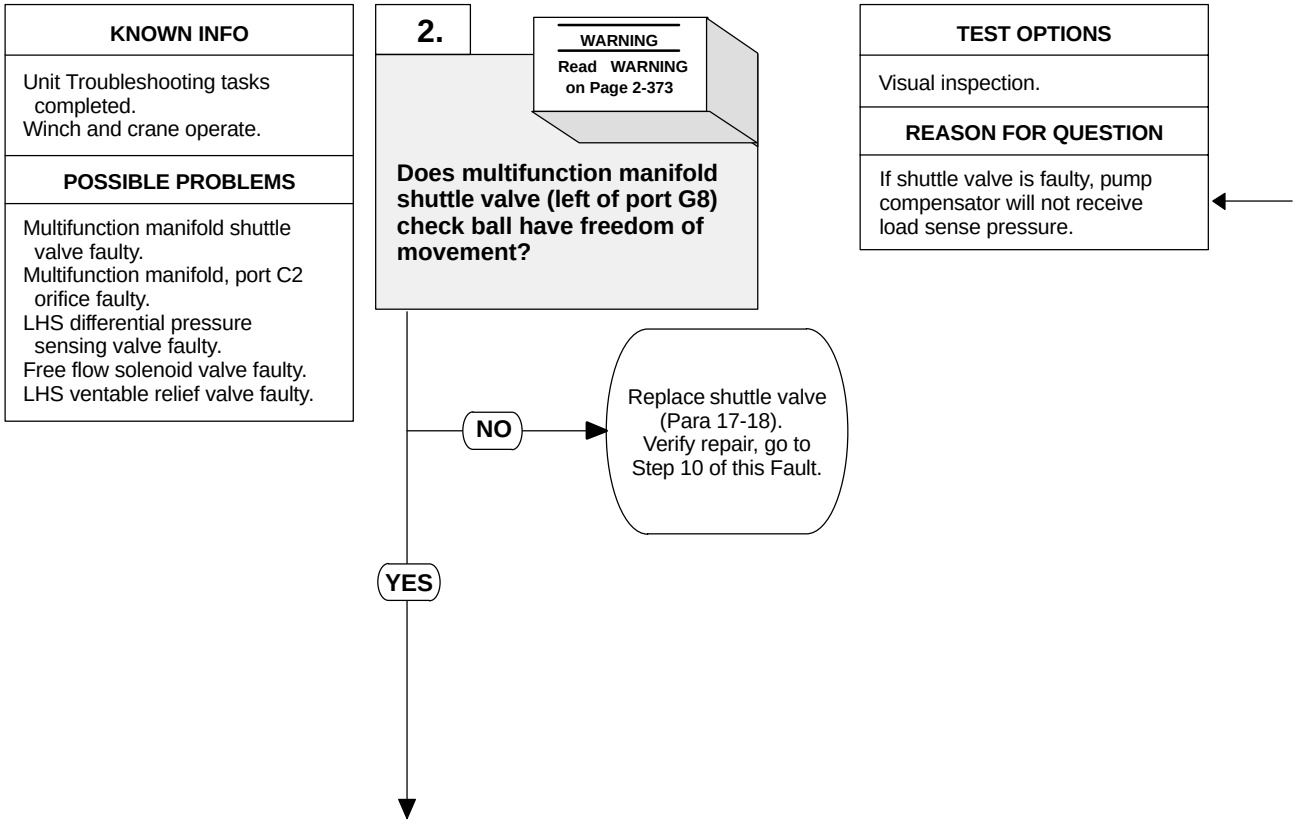
OPERATION TEST

(1) Operate LHS (TM 9-2320-364-10).
  (a) If LHS does not operate, perform Steps (2) through (4) below and go to Step 4 of this Fault.
  (b) If LHS operates slowly, perform Steps (2) through (4) below and go to Step 2 of this Fault.
(2) Put LHS in transit position.
(3) Set hydraulic selector switch to OFF.
(4) Turn OFF ENGINE switch.



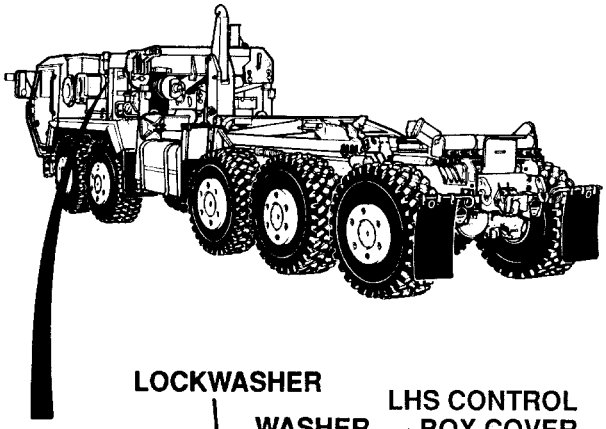


9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

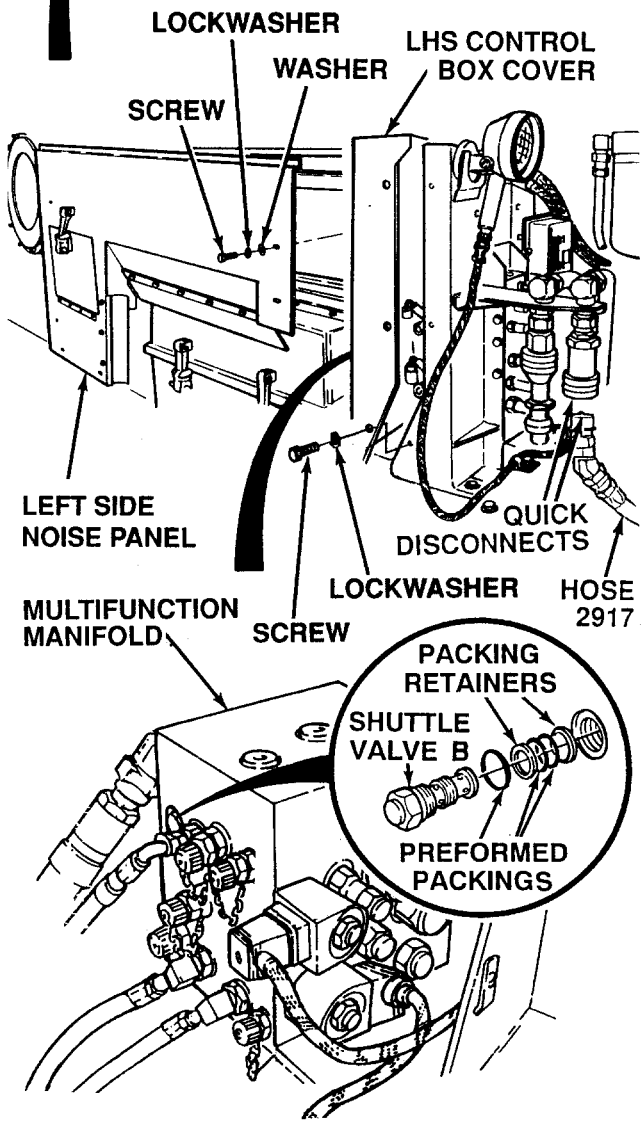


NOTE

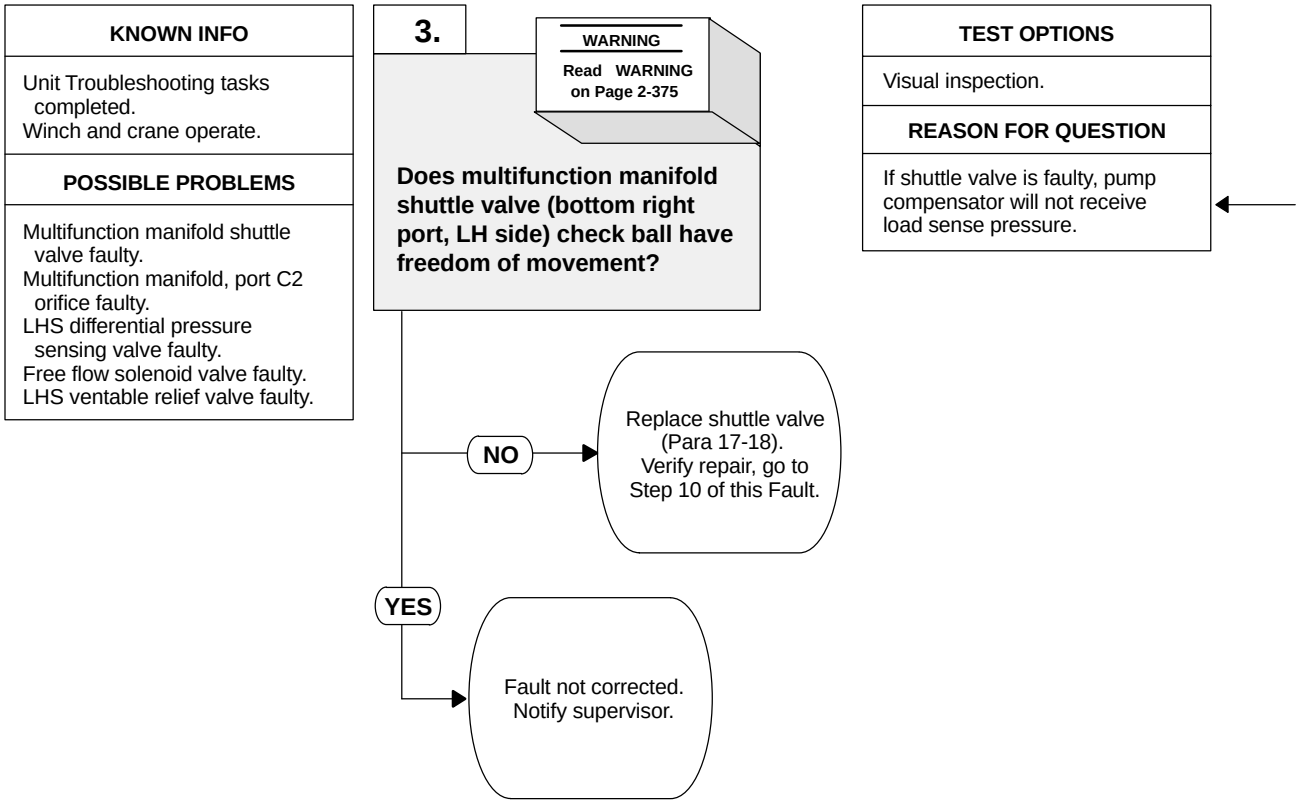
Only remove center screw on engine side of LHS control box cover.

VISUAL INSPECTION

(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(3) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(4) Remove shuttle valve B from multifunction manifold (Para 17-18).
(5) Remove and discard three preformed packings and two packing retainers.
(6) Shake shuttle valve and listen for ball to rattle.
    (a) If check ball does not rattle, clean or replace shuttle valve.
    (b) If check ball does rattle, shuttle valve is OK.
(7) Lubricate three preformed packings and two packing retainers with hydraulic oil and install on shuttle valve.
(8) Install shuttle valve B.

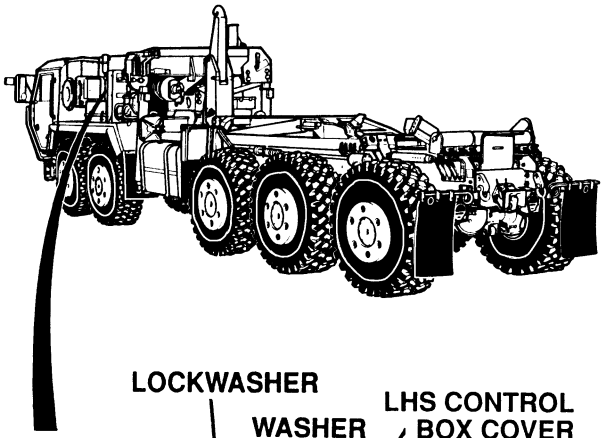


9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



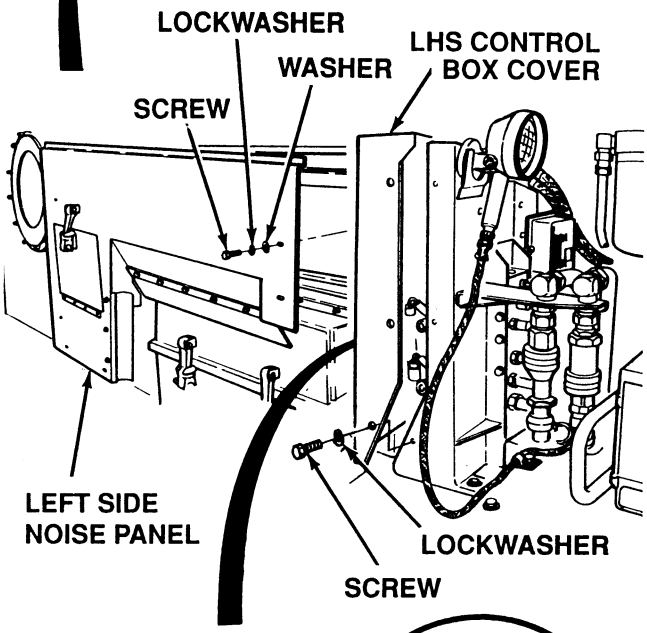
WARNING

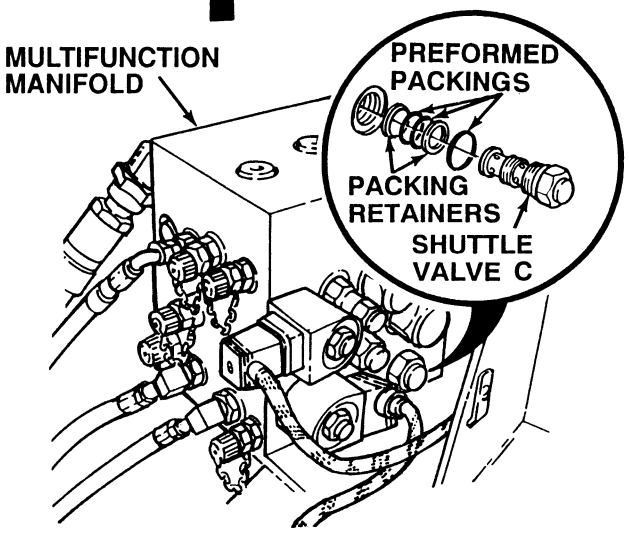
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.



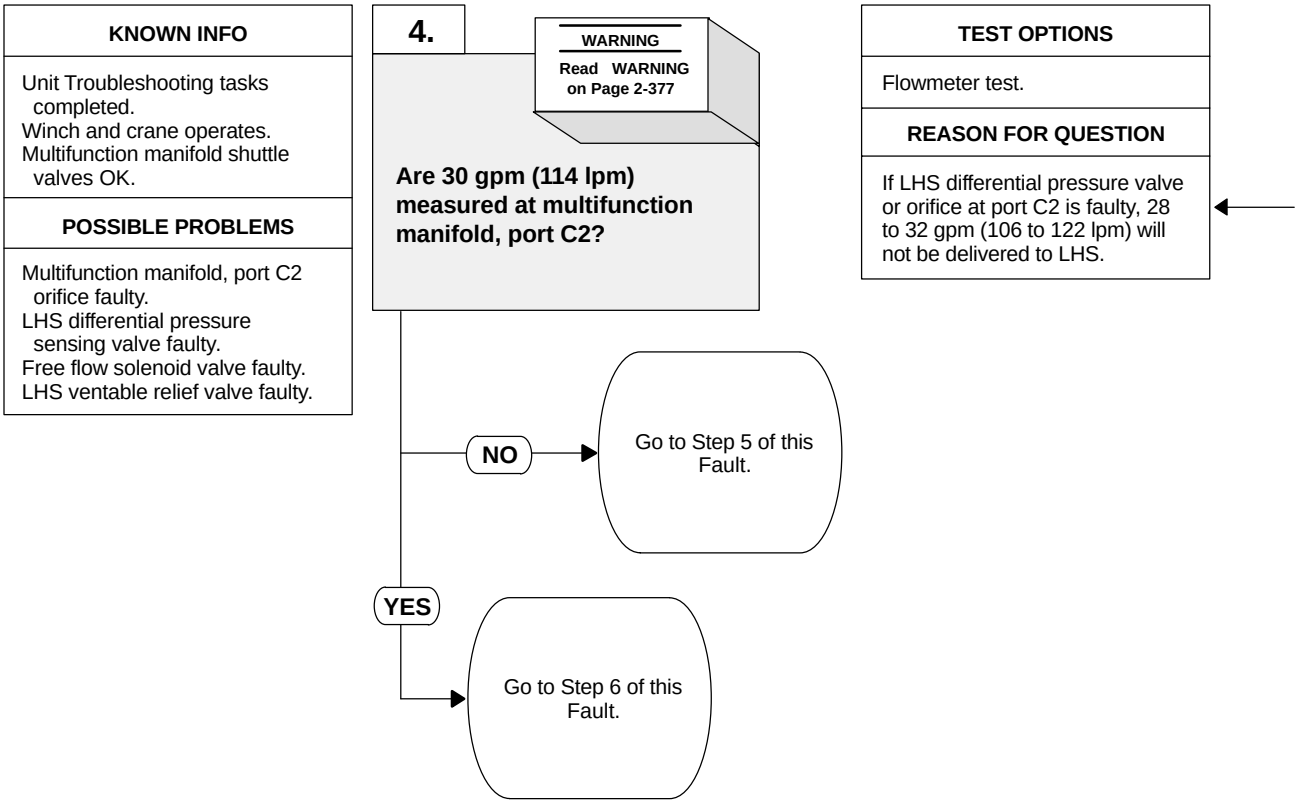
VISUAL INSPECTION

(1) Remove shuttle valve C from multifunction manifold.
(2) Remove and discard three preformed packings and two packing retainers.
(3) Shake shuttle valve and listen for ball to rattle.
  (a) If check ball does not rattle, clean or replace shuttle valve (Para 17-18).
  (b) If check ball does rattle, fault not corrected. Perform Steps (4) through (8) below and notify supervisor.
(4) Lubricate three preformed packings and two packing retainers with hydraulic oil and install on shuttle valve.
(5) Install shuttle valve C.
(6) Connect quick disconnect hose 2917.
(7) Install left side noise panel, eight lockwashers and screws.
(8) Install four screws, lockwashers and LHS control box cover.





9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

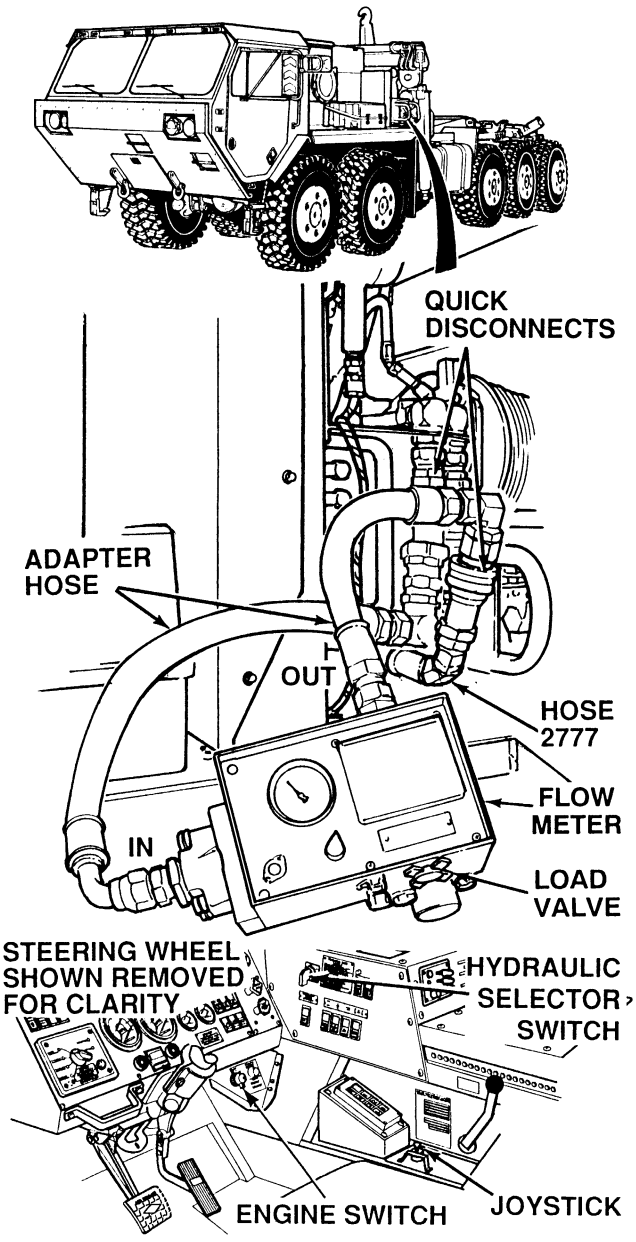


WARNING

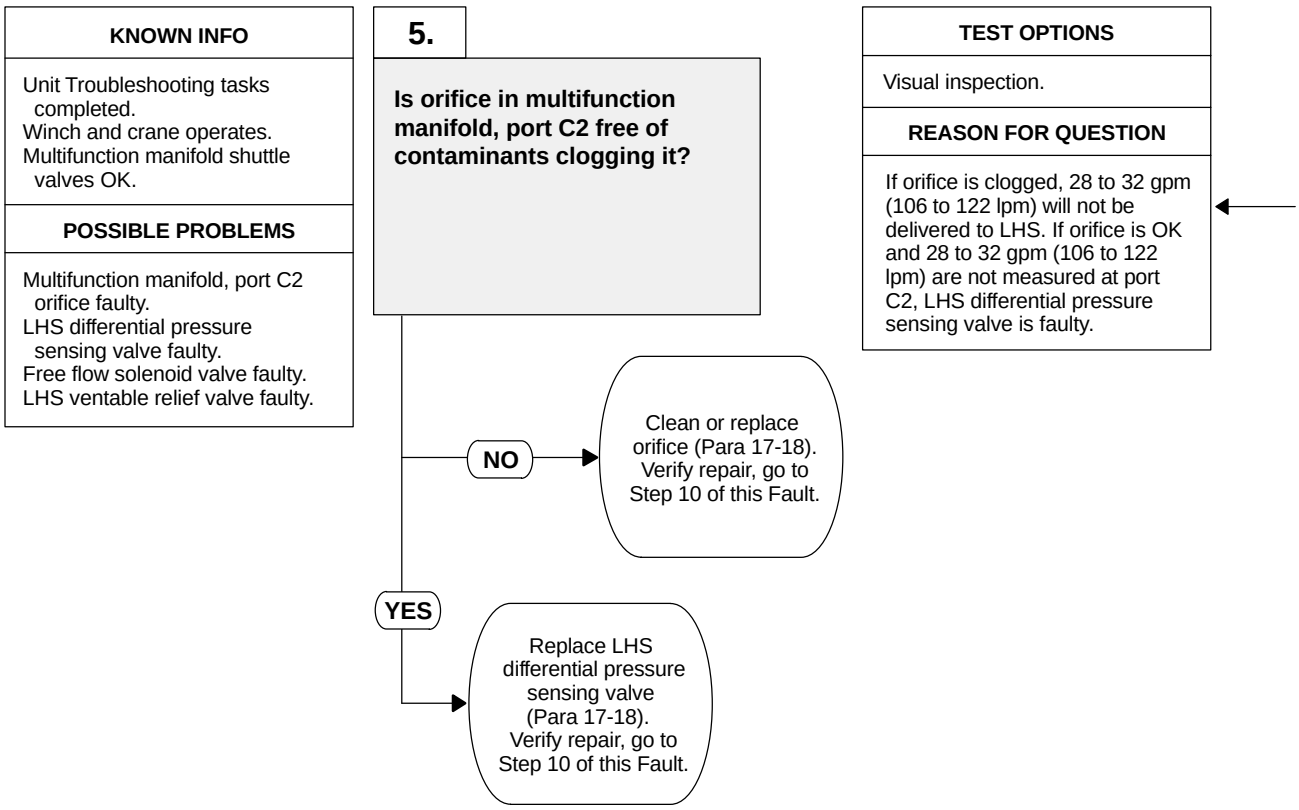
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

FLOWMETER TEST

(1) Disconnect pressure hose 2777 female quick disconnect from LHS control box male quick disconnect.
(2) Connect adapter hose of same size to hose 2777.
(3) Connect adapter hose of same size to LHS control box male quick disconnect.
(4) Connect flowmeter IN port to adapter hose connected to hose 2777.
(5) Connect flowmeter OUT port to adapter hose connected to LHS control box male quick disconnect.
(6) Completely open flowmeter load valve.
(7) Set flowmeter to high.
(8) Start engine (TM 9-2320-364-10).
(9) Set hydraulic selector switch to AUTO position.
(10) Raise engine speed to full throttle and observe flowmeter.
  (a) If 28 to 32 gpm (106 to 121 lpm) are not present, perform Steps (11) and (15) below and go to Step 5 of this Fault.
  (b) If 28 to 32 gpm (106 to 121 lpm) are present, perform Steps (11) and (15) below and go to Step 6 of this Fault.
(11) Set hydraulic selector switch to OFF position.
(12) Turn OFF ENGINE switch.
(13) Remove adapter hose 2777 from female quick disconnect.
(14) Remove adapter hose 2777 from LHS control box male quick disconnect.
(15) Connect quick disconnect hose 2777.

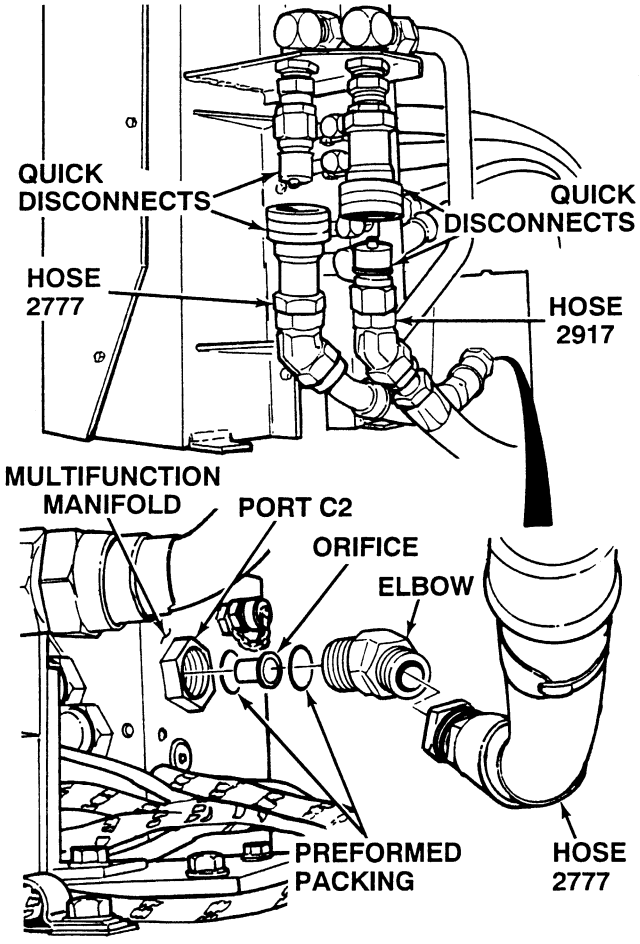


9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

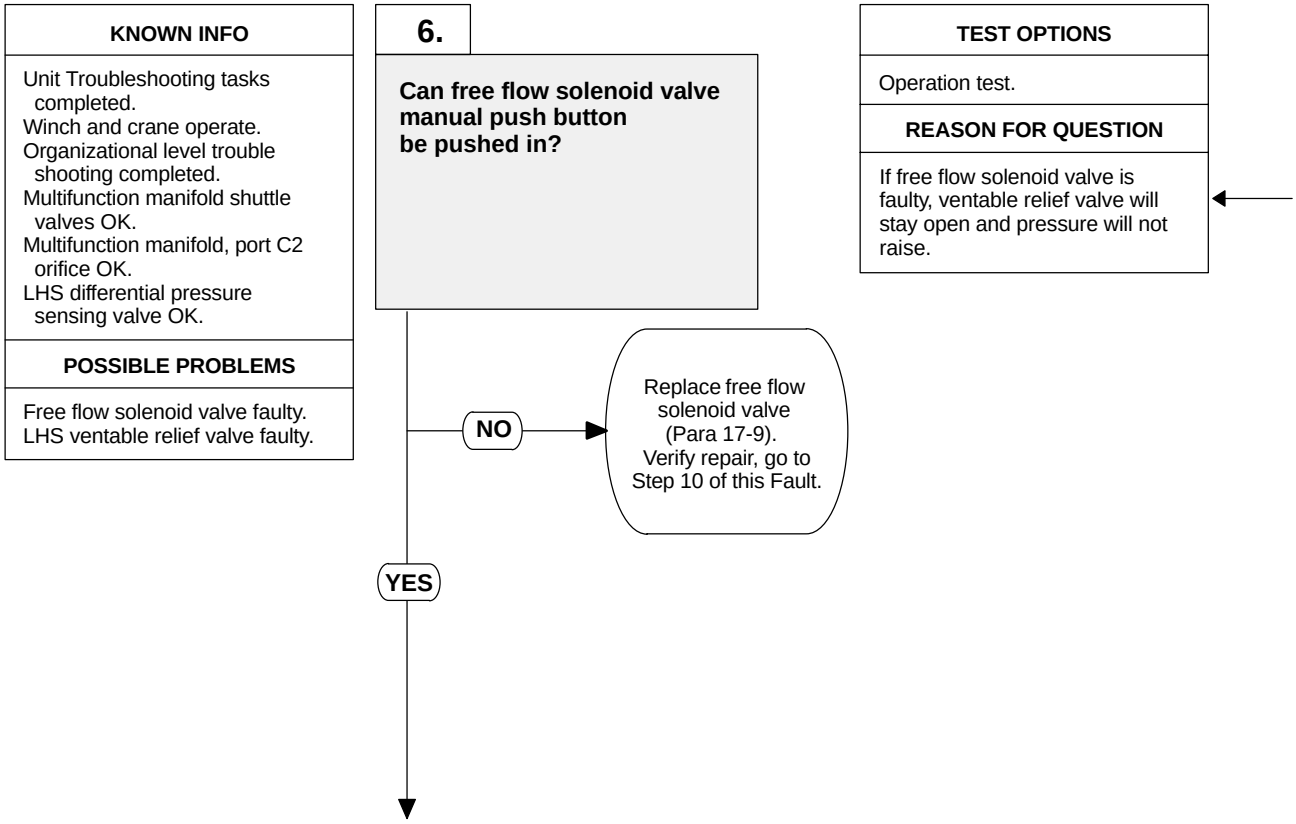


VISUAL INSPECTION

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect pressure hose 2777 female quick disconnect from LHS control box male quick disconnect.
(3) Remove pressure hose 2777 from multifunction manifold, port C2.
(4) Remove fitting and preformed packing from multifunction manifold. Discard preformed packing.
(5) Remove orifice and preformed packing from multifunction manifold, port C2. Discard preformed packing.
(6) Inspect orifice for contaminants or clogging.
    (a) If orifice is plugged or damaged, clean or replace orifice (Para 17-18). Perform Step (10) below.
    (b) If orifice is OK, replace LHS differential pressure sensing valve. Perform Steps (7) through (10) below.
(7) Lubricate orifice preformed packing and install orifice and preformed packing in multifunction manifold.
(8) Lubricate fitting preformed packing and install fitting and preformed packing on multifunction manifold.
(9) Install pressure hose 2777 on fitting.
(10) Connect quick disconnect hoses 2917 and 2777.



9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

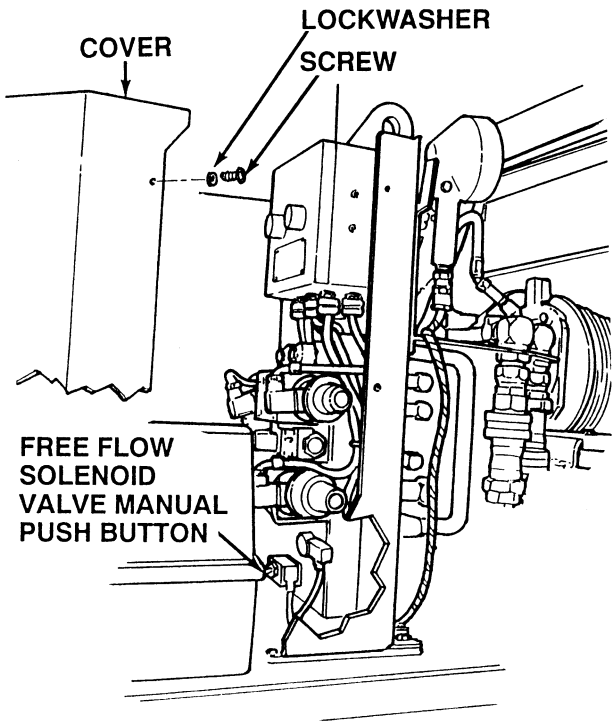


NOTE

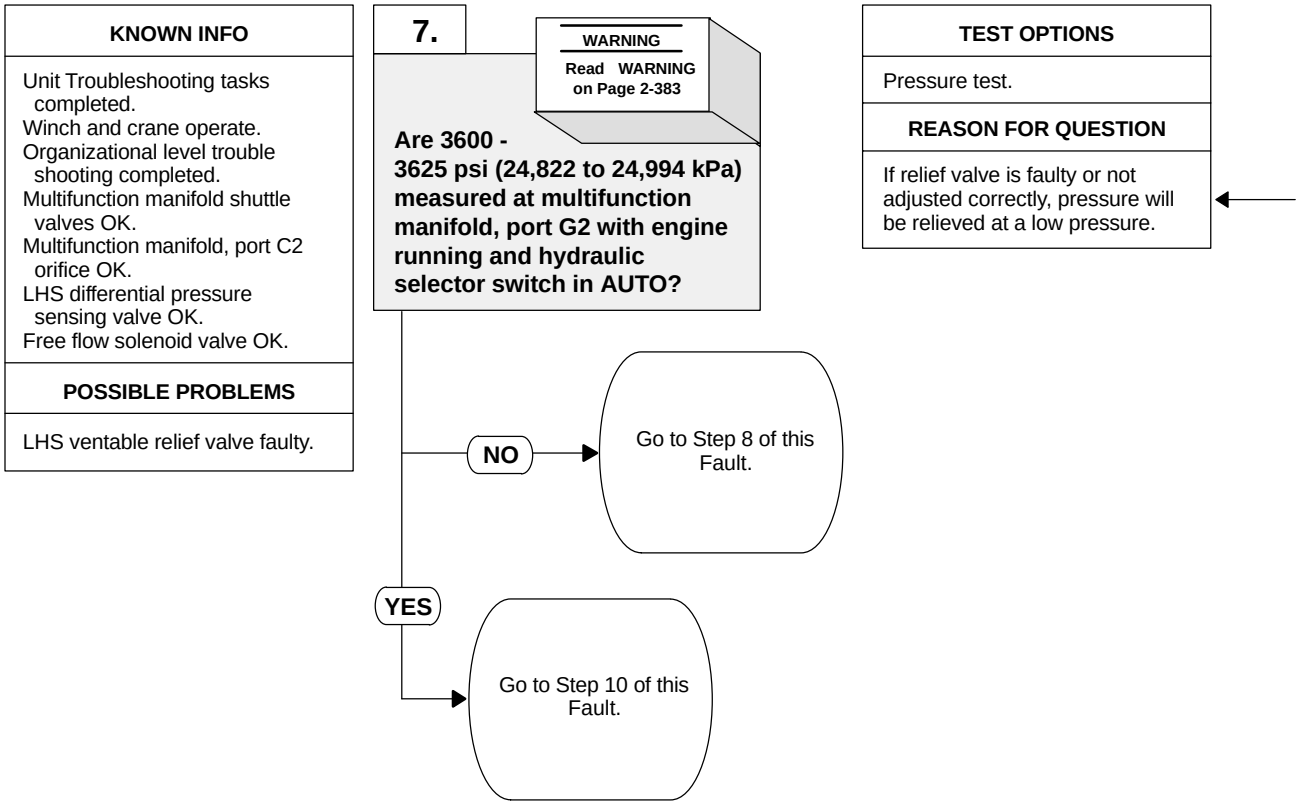
Only remove center screw on engine side of LHS control box cover.

OPERATION TEST

(1) Remove four screws, lockwashers and LHS control box cover. Discard lockwashers.
(2) Push in free flow solenoid valve manual push button (TM 9-2320-364-10).
  (a) If manual push button cannot be pushed in, replace free flow solenoid valve (Para 17-9).
  (b) If manual push button can be pushed in, free flow solenoid valve is OK.
(3) Install LHS control box cover, four lockwashers and screws.



9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

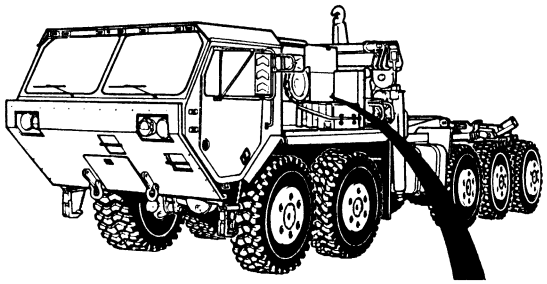
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

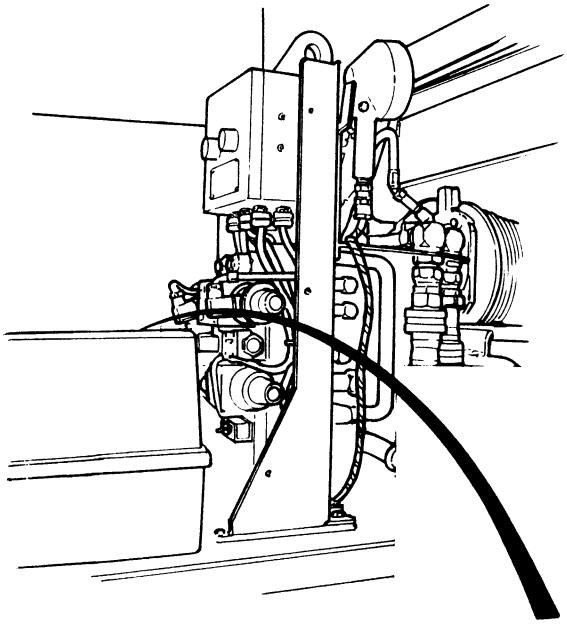
CAUTION

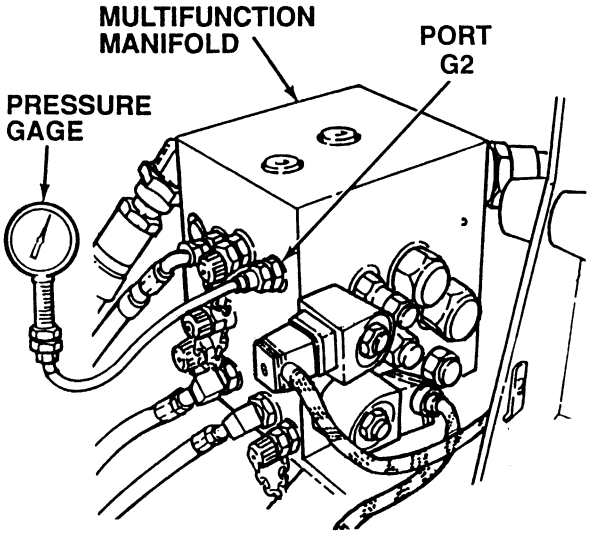
Do not allow valve to go over relief for over 10 seconds, or damage to equipment may result.

PRESSURE TEST

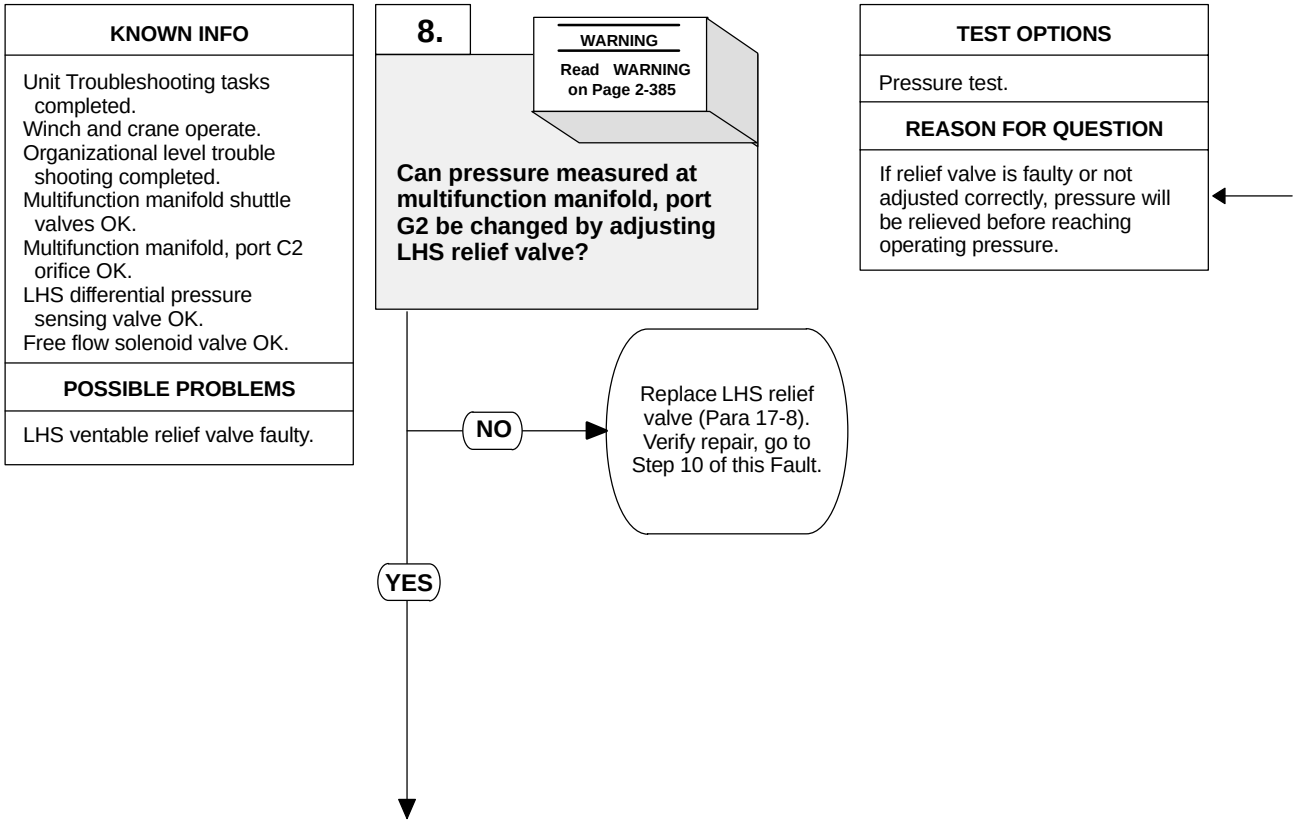
(1) Connect 0 to 6000 psi (0 to 41,370 kPa) pressure gage to multifunction manifold, port G2.
(2) Start engine (TM 9-2320-364-10).
(3) Set hydraulic selector switch to AUTO position.
(4) With the aid of an assistant, observe pressure gage while holding joystick in LOAD position.
  (a) If pressure is not 3600 to 3625 psi (24,822 to 24,994 kPa), perform Steps (5) and (6) below and go to Step 8 of this Fault.
  (b) If pressure is 3600 to 3625 psi (24,822 to 24,994 kPa), relief valve is OK, perform Steps (5) through (7) below and go to Step 10 of this Fault.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.
(7) Disconnect pressure gage from multifunction manifold.







9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

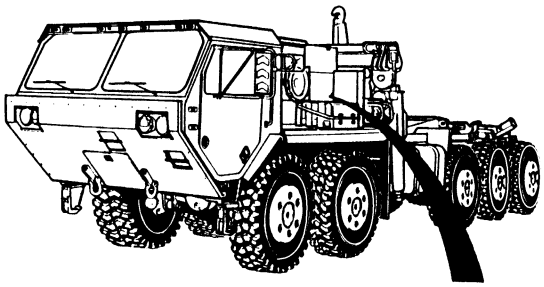
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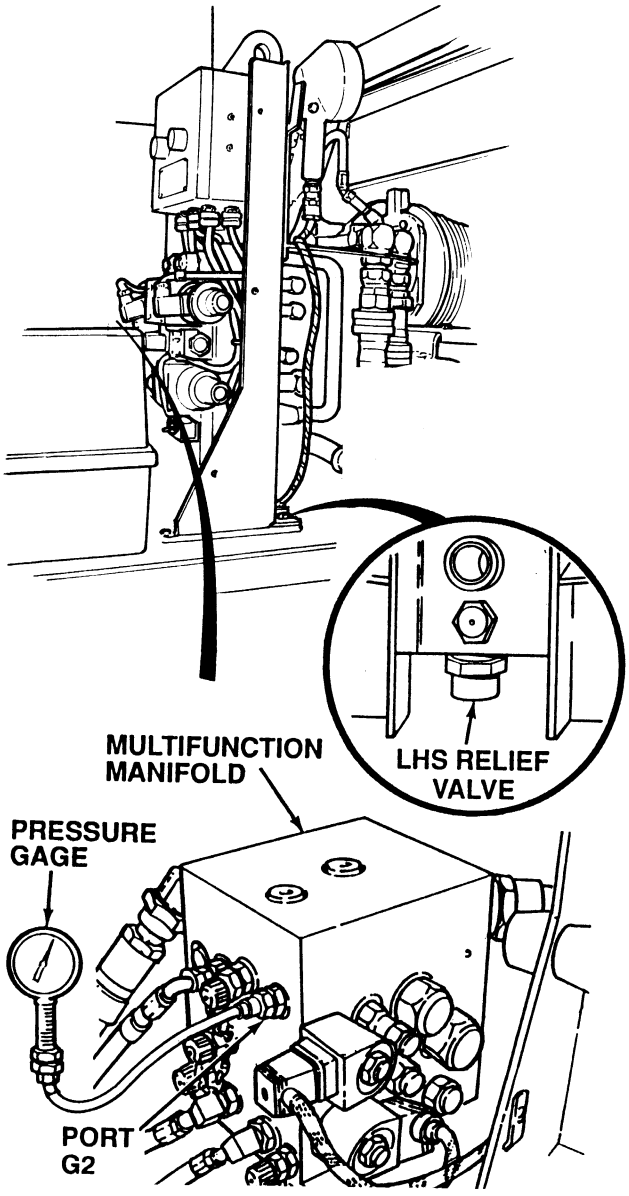
PRESSURE TEST

Adjust LHS relief valve while observing pressure gage connected to multifunction manifold, port G2.

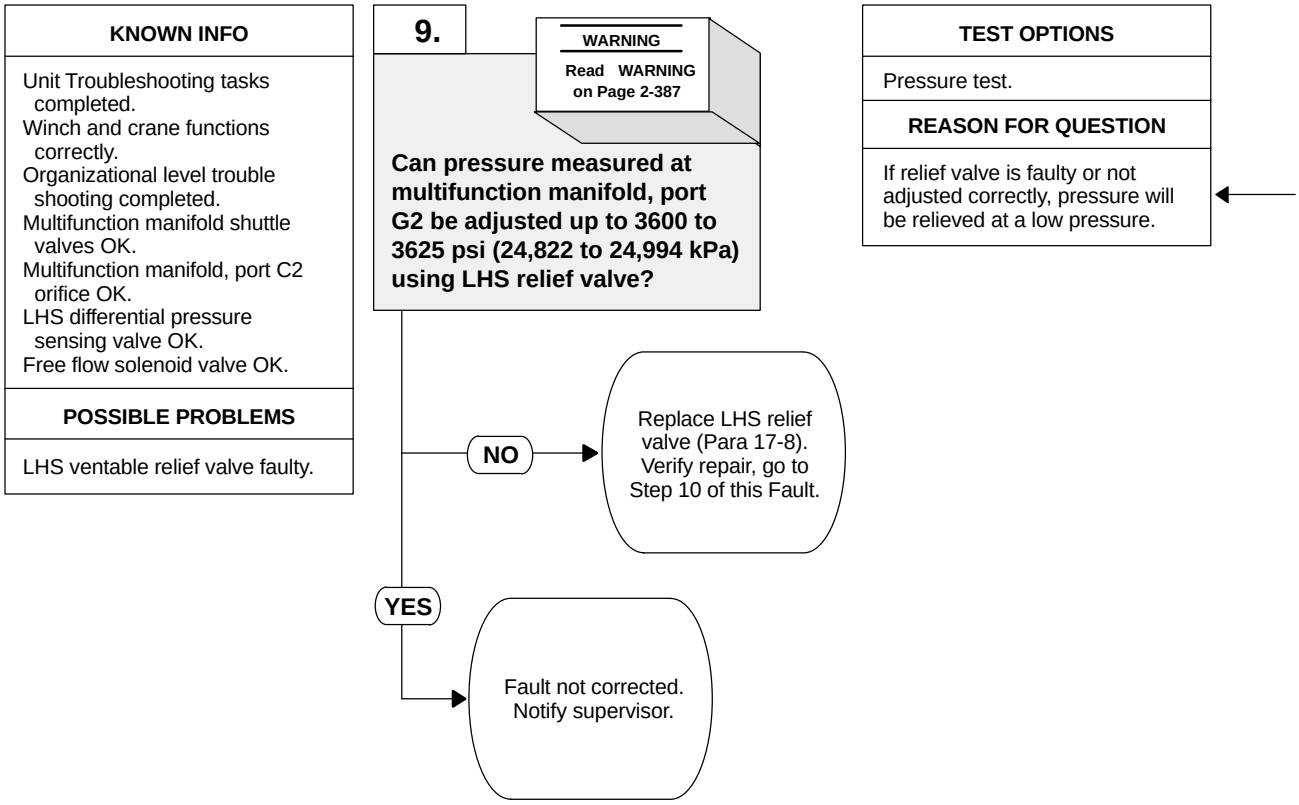
(1) If pressure cannot be changed by adjusting using LHS relief valve, replace relief valve (Para 17-8).

(2) If pressure can be adjusted using LHS relief valve, go to Step 9 of this Fault.





9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

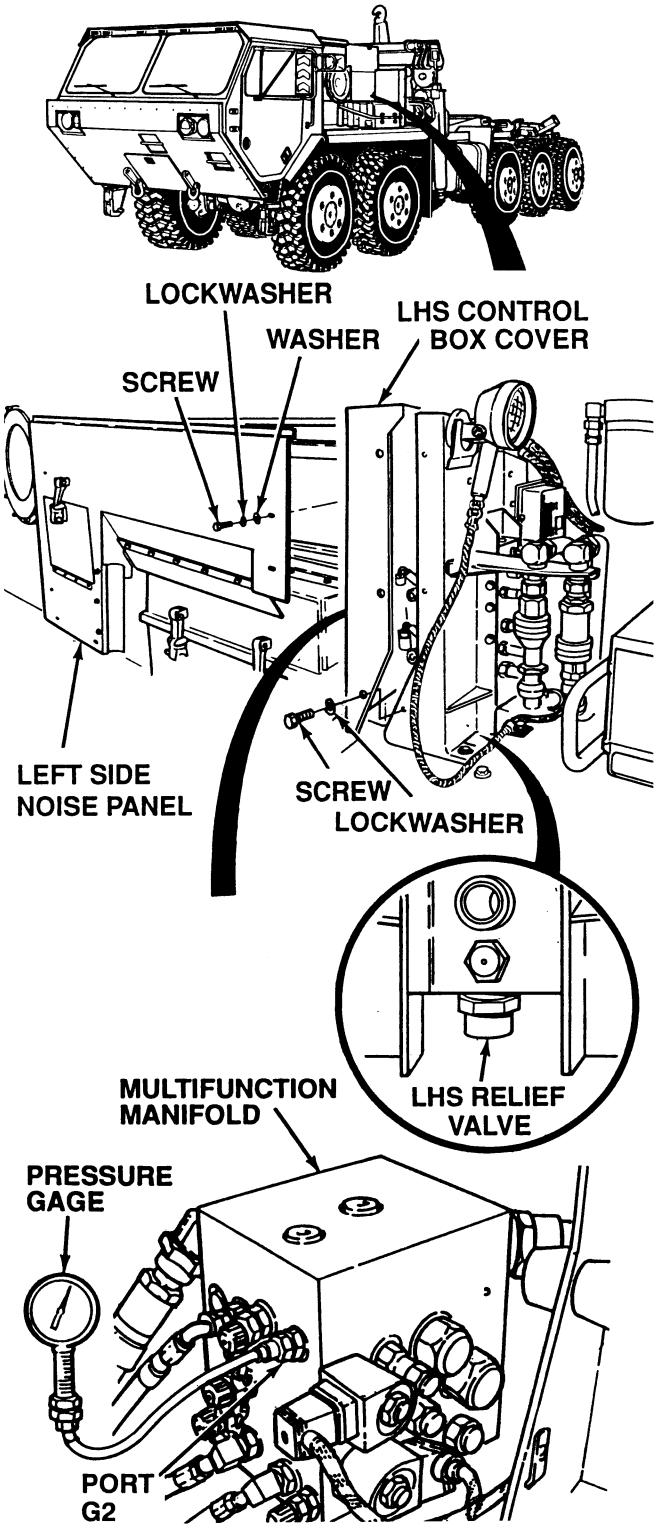


WARNING

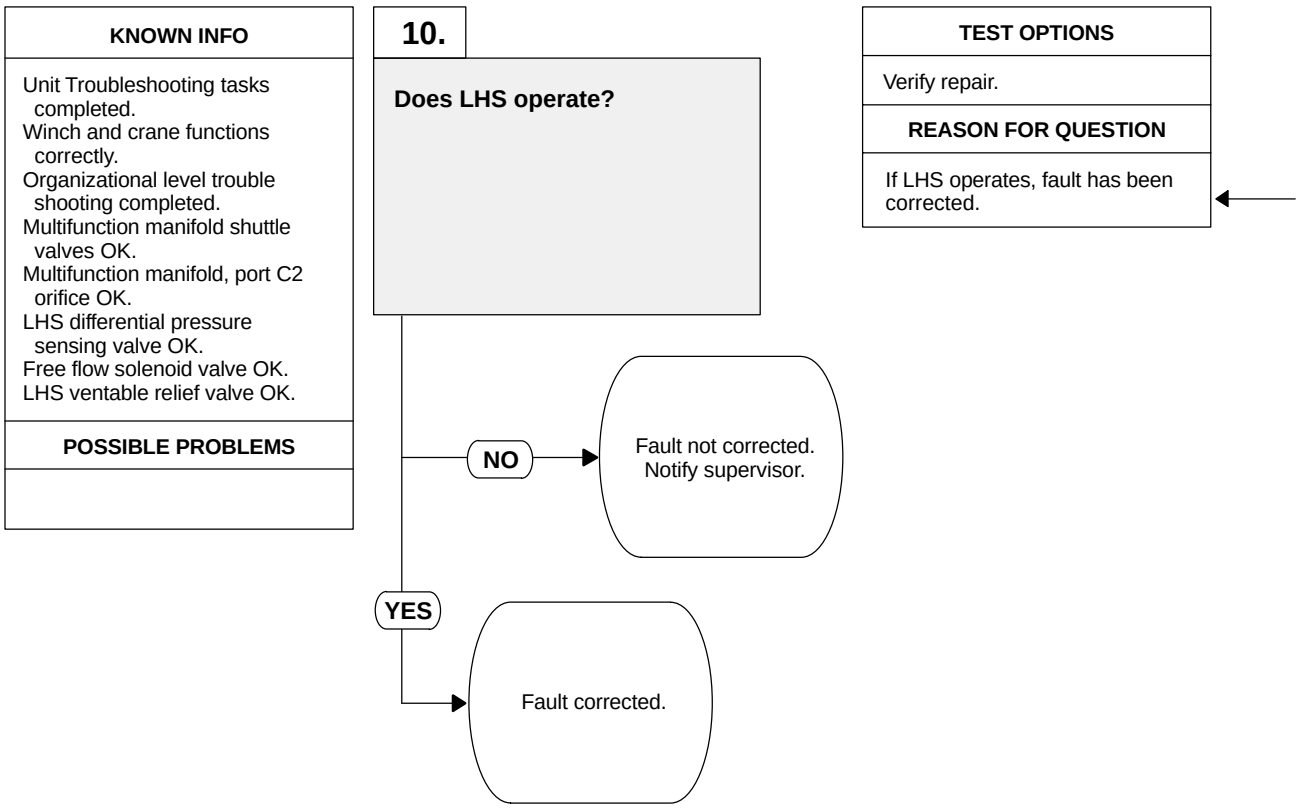
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

PRESSURE TEST

(1) Connect 0 to 6000 psi (0 to 41,370 kPa) pressure gage to multifunction manifold, port G2.
(2) Start engine (TM 9-2320-364-10).
(3) Set hydraulic selector switch to AUTO position.
(4) Adjust LHS relief valve while observing pressure gage connected to port G2.
  (a) If pressure cannot be adjusted up to 3600 to 3625 psi (24,822 to 24,994 kPa) using LHS relief valve, perform Steps (5) through (7) below and replace LHS relief valve (Para 17-8).
  (b) If pressure can be adjusted up using LHS relief valve, fault not corrected. Perform Steps (5) through (9) below and notify supervisor.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.
(7) Disconnect pressure gage from multifunction manifold.
(8) Install left side noise panel, eight washers, lockwashers, and screws.
(9) Install four screws, lockwashers and LHS control box cover.

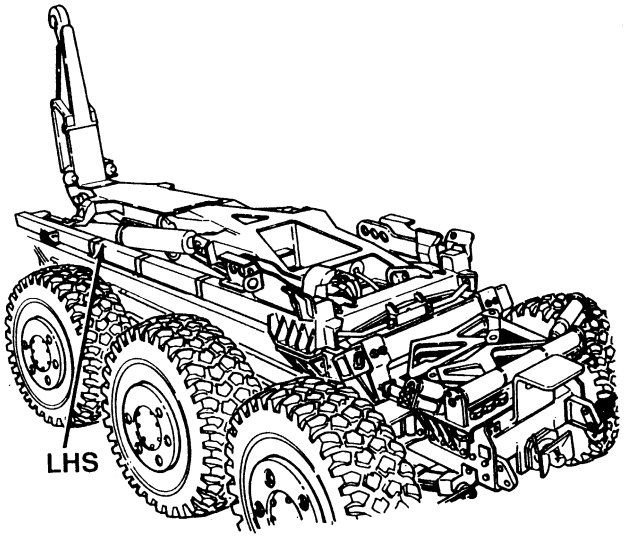


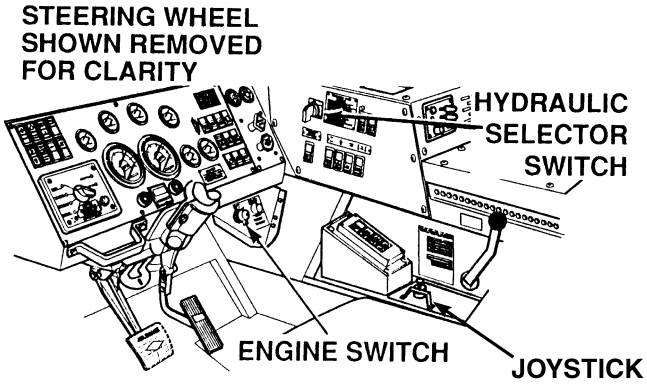
9. LHS DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to AUTO position.
(3) Hold joystick in UNLOAD position and then in LOAD position.
  (a) If LHS does not operate, fault not corrected. Perform Steps (4) through (6) below and notify supervisor.
  (b) If LHS does operate, fault has been corrected.
(4) Put LHS in transit position.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.





2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

10. LOSS OF MIDDLE FRAME LOAD HOLDING.

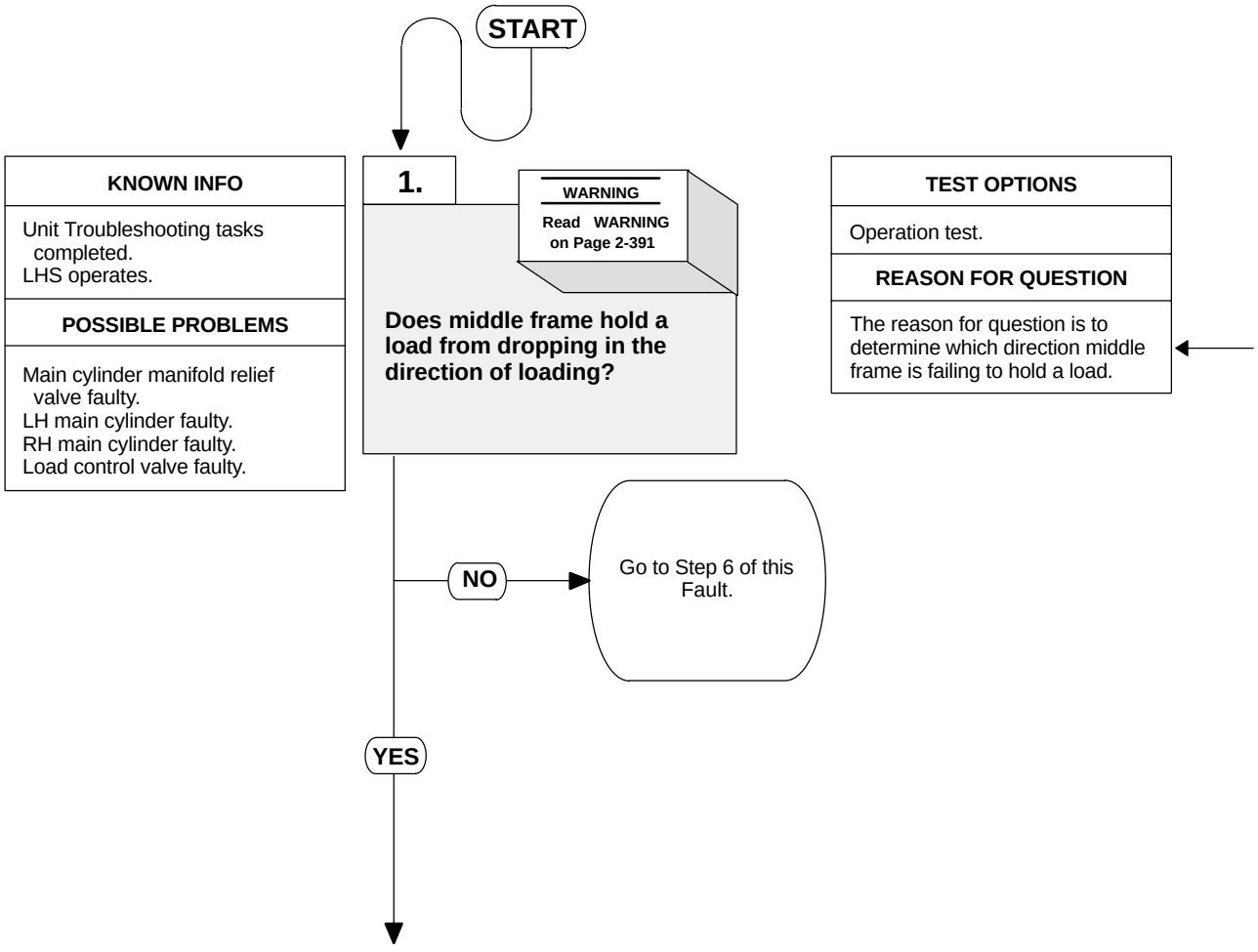
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 34, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Jackstand (2) (Item 132, Appendix F)
Steel Tube (Appendix C)
Load (500 lb [227 kg] minimum)
Chain (Approximately 8 ft)

Personnel Required
Two

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

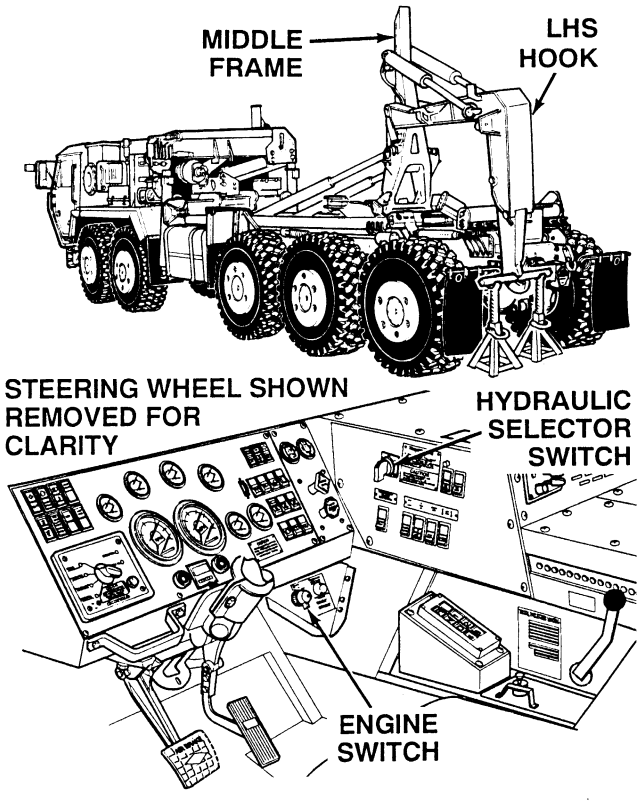


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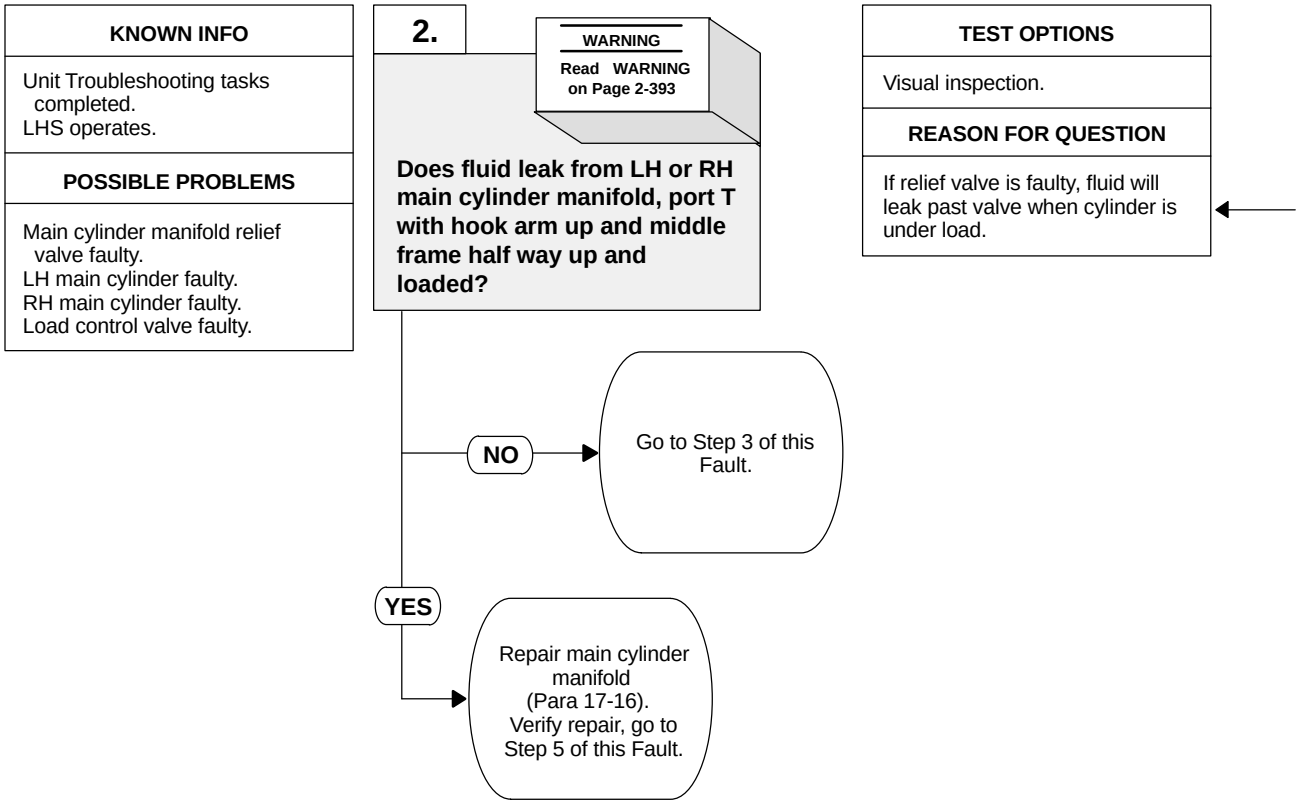
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Position LHS hook to rear of truck and engage hook on steel tube supported by jackstands.
(3) Using LHS, lift truck only enough to lift vehicle weight off suspension. Do not lift tires off ground.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.
  (a) If middle frame does not hold weight off vehicle suspension, perform Steps (5) through (8) below and go to Step 6 of this Fault.
  (b) If middle frame does hold weight off vehicle suspension, perform Steps (5) through (8) below and go to Step 2 of this Fault.
(5) Disengage hook from bar.
(6) Put LHS in transit position.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.



10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).

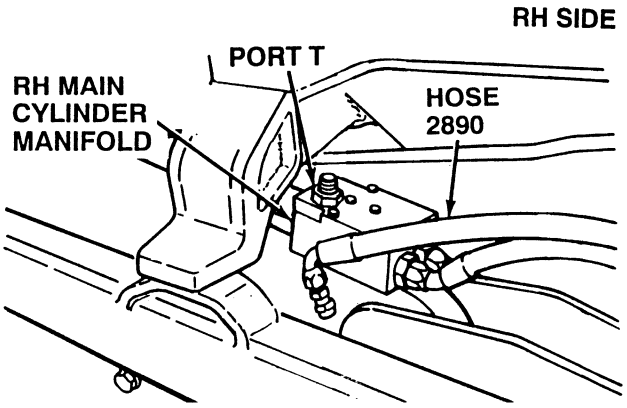


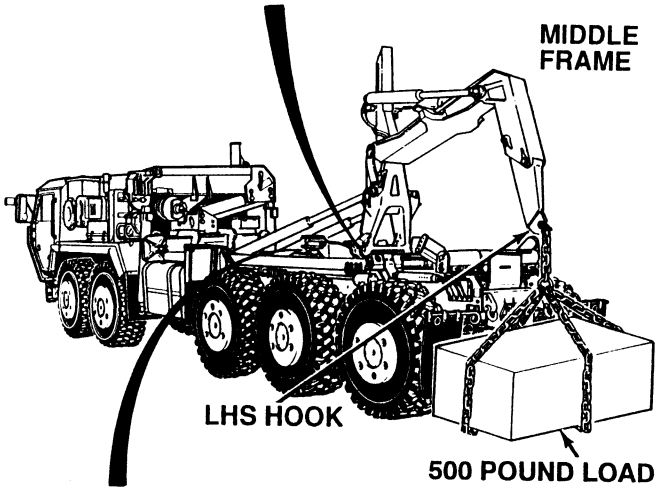
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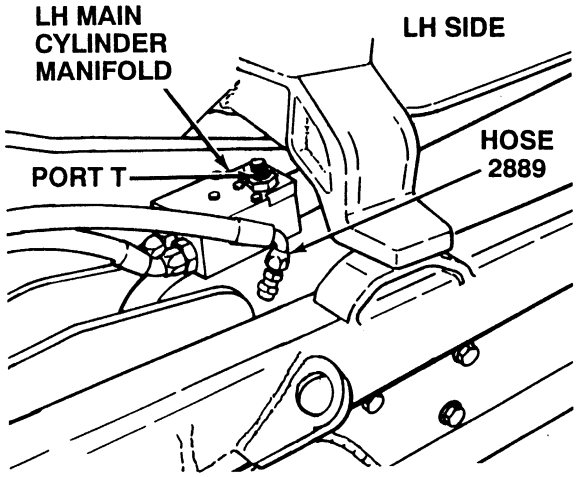
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

VISUAL INSPECTION

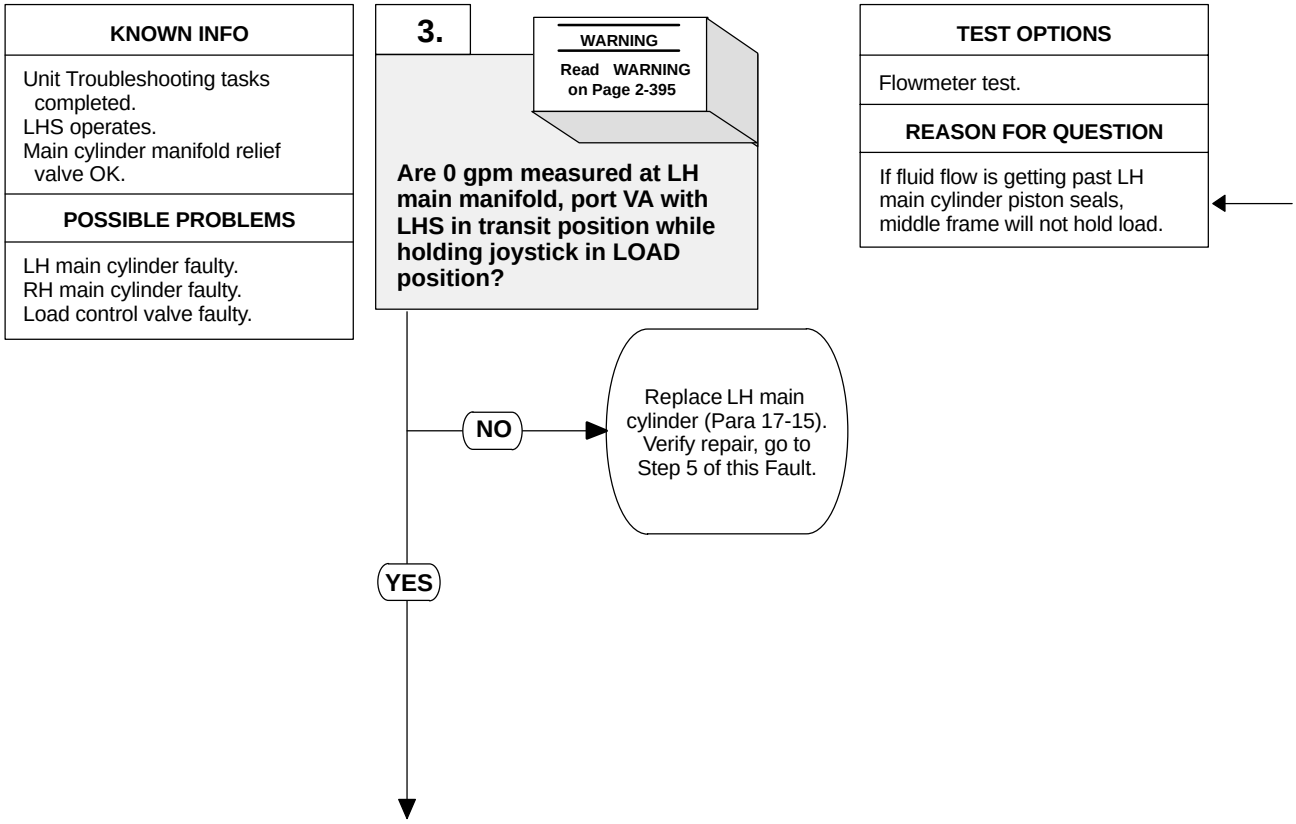
(1) Position LHS hook to rear of truck (TM 9-2320-364-10).
(2) Attach 500 lb (227 kg) minimum load to hook.
(3) Lower middle frame approximately half of its travel.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.
(6) Disconnect hose 2889 from LH main cylinder manifold, port T. Plug disconnected hose.
(7) Disconnect hose 2890 from RH main cylinder manifold, port T. Plug disconnected hose.
    (a) If no fluid leaks from LH or RH main cylinder manifolds where hoses were removed, main cylinder manifold relief valves are OK. Perform Steps (8) through (13) below and go to Step 3 of this Fault.
    (b) If fluid leaks from LH or RH main cylinder manifold where hose is removed, relief valve is faulty. Perform Steps (8) through (13) below and repair main cylinder manifold (Para 17-16).
(8) Remove plug from hose 2890 and connect hose to LH main cylinder manifold, port T.
(9) Remove plug from hose 2889 and connect hose to RH main cylinder manifold, port T.
(10) Remove 500 lb (227 kg) load from LHS hook.
(11) Put LHS in transit position.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF engine.





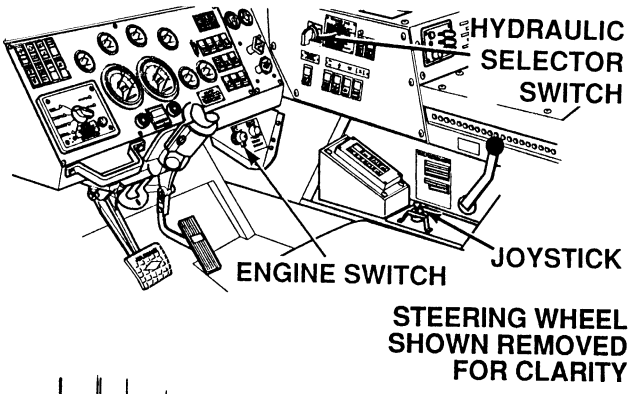


10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).



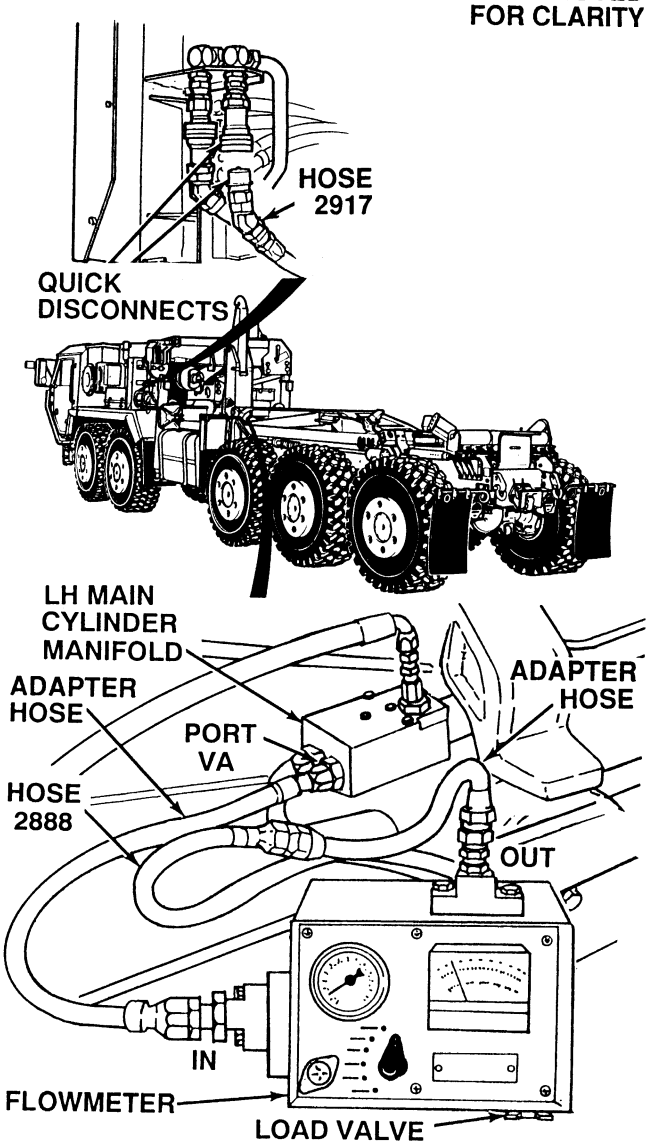
WARNING

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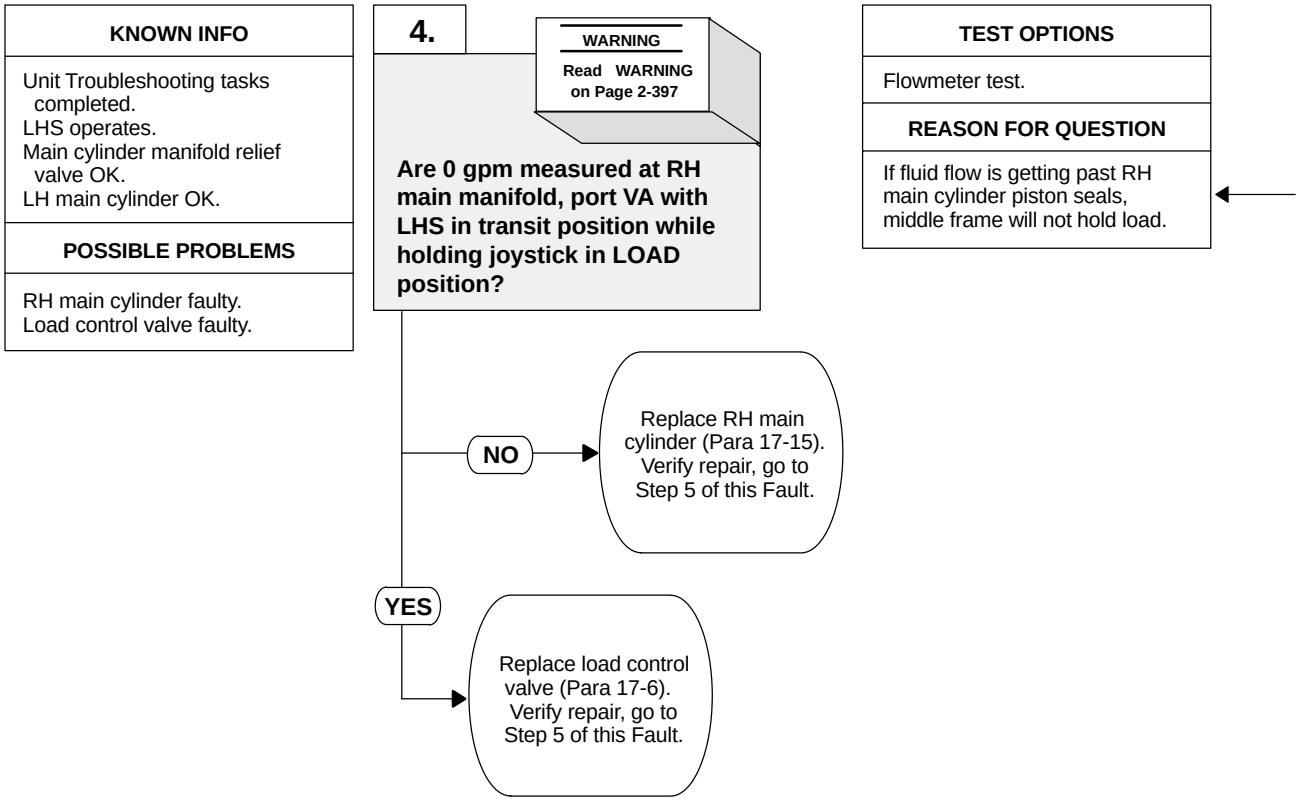


FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2888 from LH main cylinder manifold, port VA.
(3) Connect adapter hose to hose 2888.
(4) Connect adapter hose to main cylinder manifold, port VA.
(5) Connect flowmeter IN port to adapter hose connected to LH main cylinder manifold, port VA.
(6) Connect flowmeter OUT port to adapter hose connected to hose 2888.
(7) Completely open flowmeter load valve.
(8) Connect quick disconnect hose 2917.
(9) Start engine (TM 9-2320-364-10).
(10) Set hydraulic selector switch to MAN MF position.
(11) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (19) below and replace LH main cylinder (Para 17-15).
  (b) If 0 gpm (0 lpm) are present, LH main cylinder is OK.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(15) Disconnect flowmeter from two adapter hoses.
(16) Disconnect adapter hose from LH main cylinder manifold, port VA.
(17) Disconnect adapter hose from hose 2888.
(18) Connect hose 2888 to middle frame bulkhead.
(19) Connect quick disconnect hose 2917.



10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).

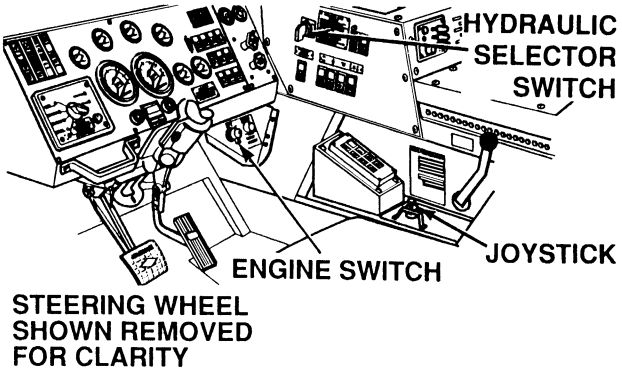


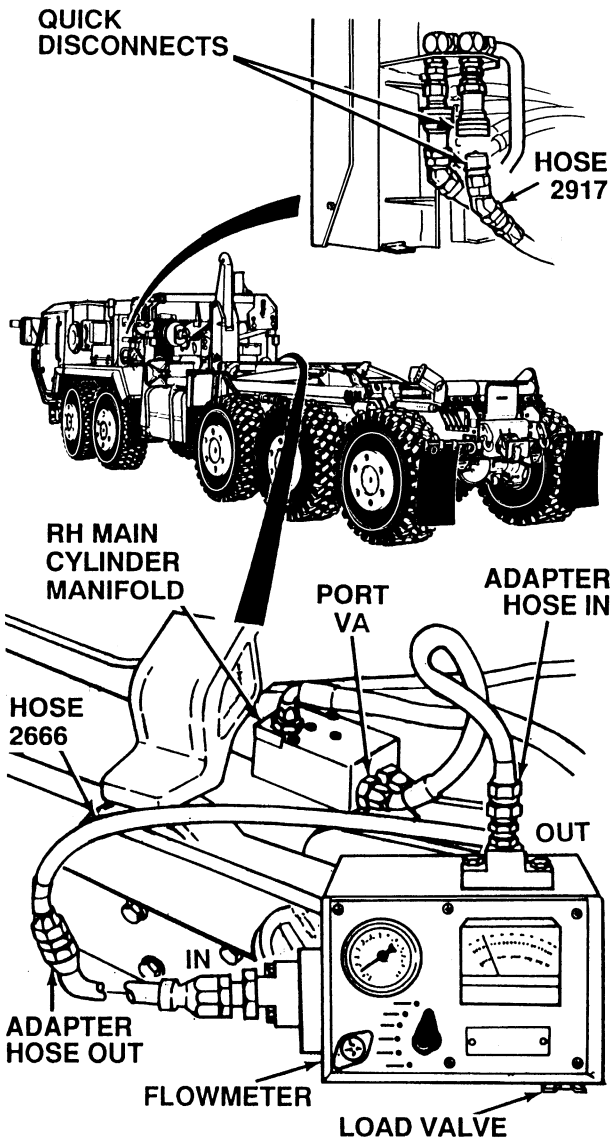
WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

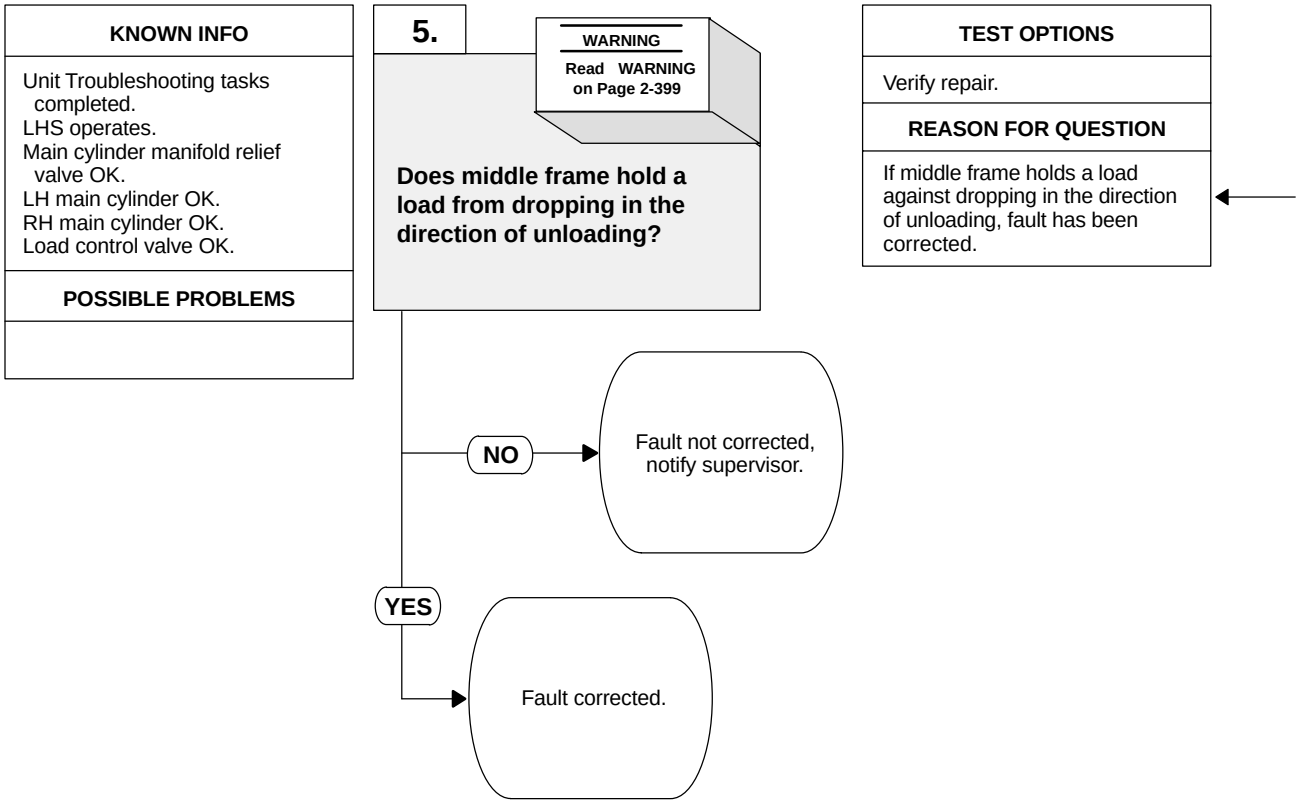
FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2666 from RH main cylinder manifold, port VA.
(3) Connect adapter hose to hose 2666.
(4) Connect adapter hose to main cylinder manifold, port VA.
(5) Connect flowmeter IN port to adapter hose connected to RH main cylinder manifold.
(6) Connect flowmeter OUT port to adapter hose connected to hose 2666.
(7) Completely open flowmeter load valve.
(8) Connect quick disconnect hose 2917.
(9) Start engine (TM 9-2320-364-10).
(10) Set hydraulic selector switch to MAN MF position.
(11) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (19) below and replace RH main cylinder (Para 17-15).
  (b) If 0 gpm (0 lpm) are present, perform Steps (12) through (19) below and replace load control valve (Para 17-6).
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(15) Disconnect flowmeter from two adapter hoses.
(16) Disconnect adapter hose from RH main cylinder manifold, port VA.
(17) Disconnect adapter hose from hose 2666.
(18) Connect hose 2666 to RH main cylinder manifold, port VA.
(19) Connect quick disconnect hose 2917.





10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).

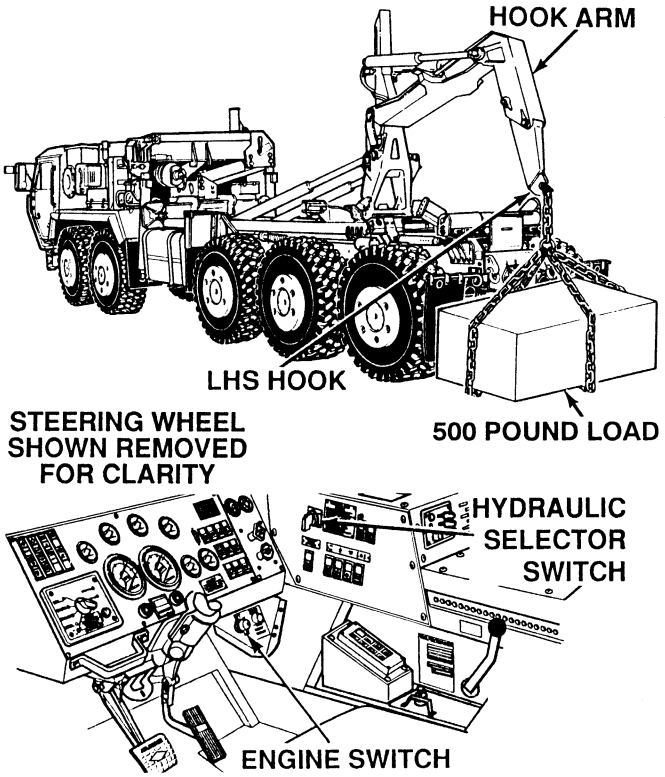


WARNING

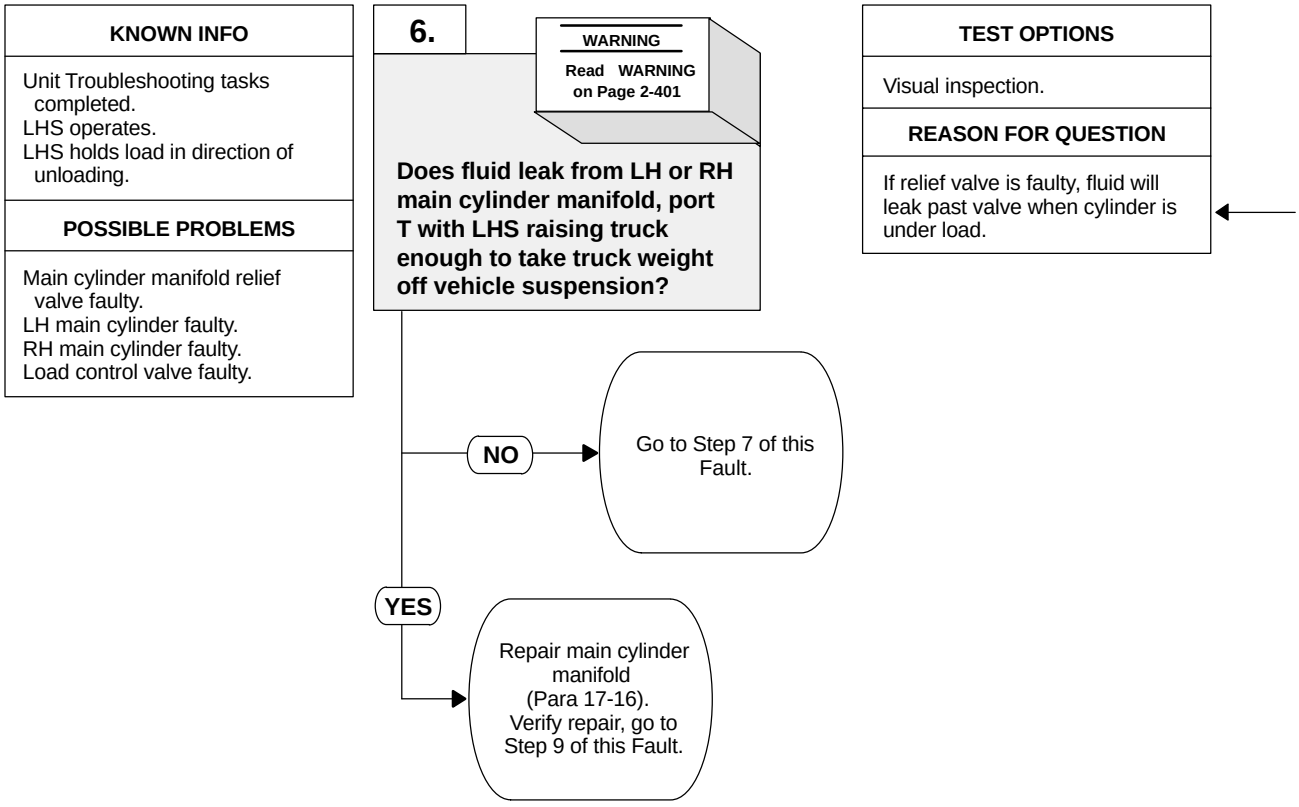
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

VERIFY REPAIR

(1) Position LHS hook to rear of truck (TM 9-2320-364-10).
(2) Attach 500 lb (227 kg) minimum load to hook.
(3) Lower middle frame approximately half of its travel.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.
  (a) If middle frame does not hold load, fault not corrected. Perform Steps (6) through (9) below and notify supervisor.
  (b) If middle frame does hold load, fault has been corrected.
(6) Remove 500 lb (227 kg) load from LHS hook.
(7) Put LHS in transit position.
(8) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.



10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).

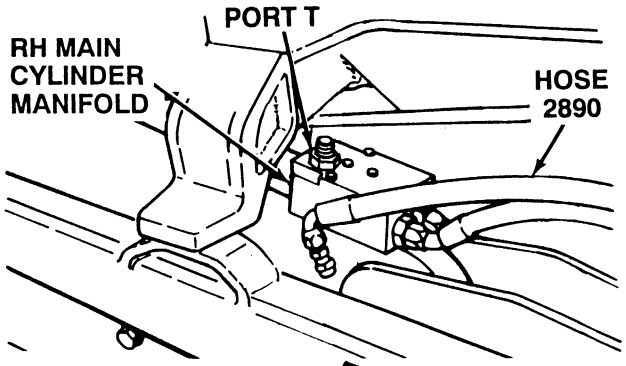


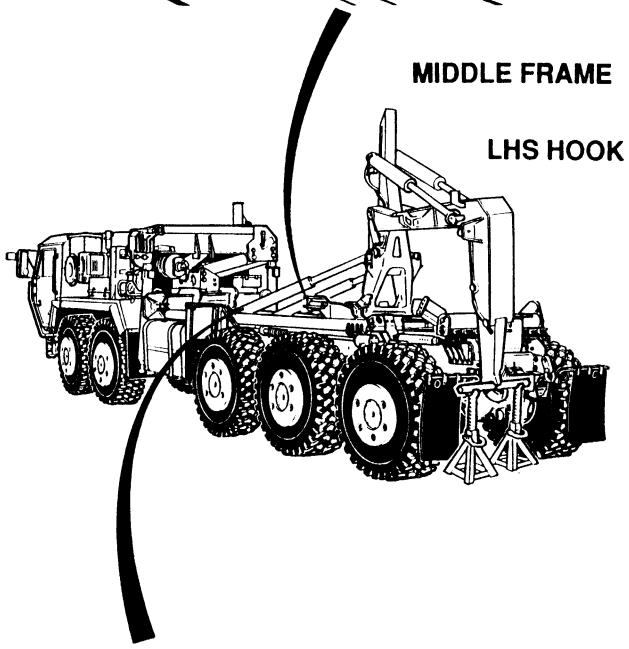
WARNING

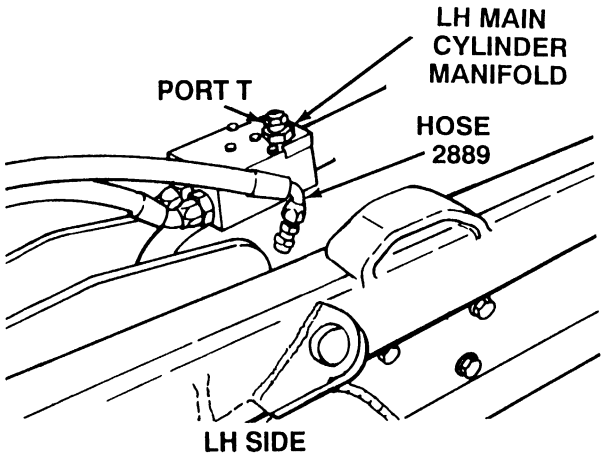
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

VISUAL INSPECTION

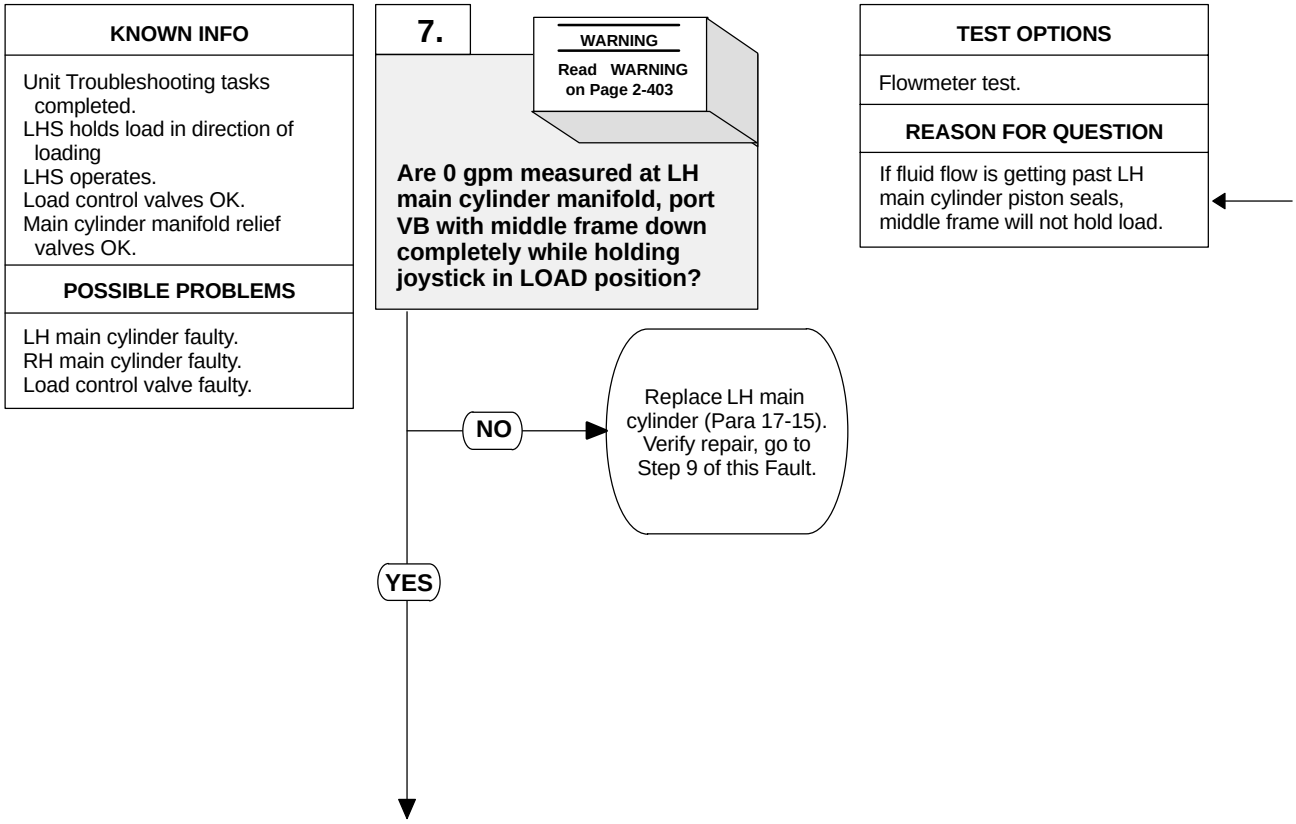
(1) Start engine (TM 9-2320-364-10).
(2) Position LHS hook to rear of truck and engage hook on steel tube supported by jackstands.
(3) Using LHS, lift truck only enough to lift vehicle weight off suspension. Do not lift tires off ground.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.
(6) Disconnect hose 2889 from LH main cylinder manifold, port T. Plug hose.
(7) Disconnect hose 2890 from RH main cylinder manifold, port T. Plug hose.
  (a) If no fluid leaks from LH or RH main cylinder manifolds where hoses were removed, relief valves are OK. Perform Steps (8) through (13) below and go to Step 7 of this Fault.
  (b) If fluid leaks from LH or RH main cylinder manifold where hose is removed, relief valve is faulty. Perform Steps (8) through (13) below and repair main cylinder manifold (Para 17-16).
(8) Remove plug from hose 2890 and connect hose to RH main cylinder manifold, port T.
(9) Remove plug from hose 2889 and connect hose to LH main cylinder manifold, port T.
(10) Disengage hook from steel tube.
(11) Put LHS in transit position.
(12) Set hydraulic selector switch to OFF position.
(13) Turn OFF ENGINE switch.







10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).

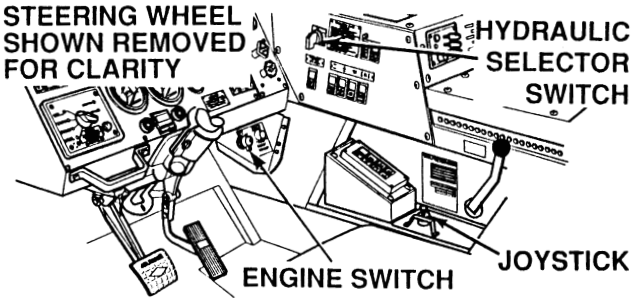


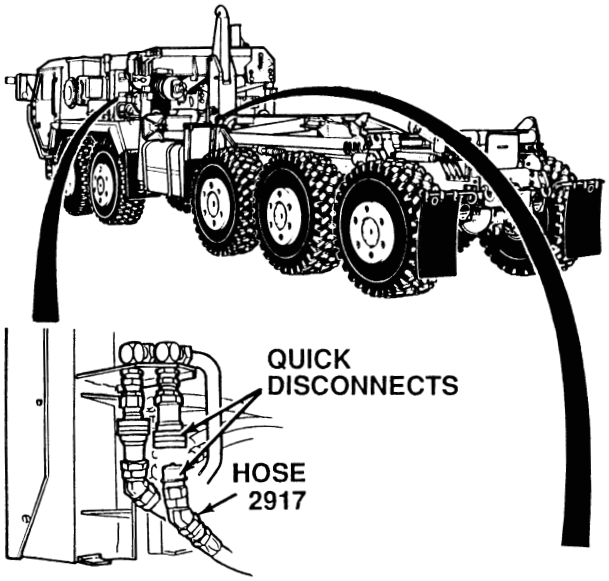
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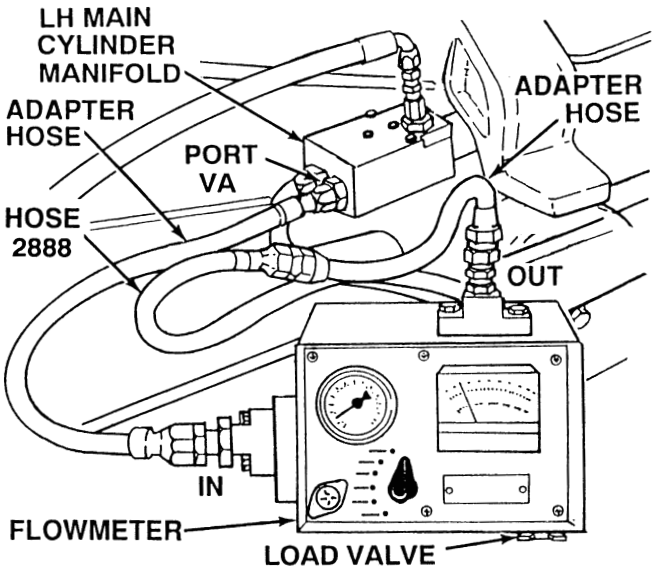
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

FLOWMETER TEST

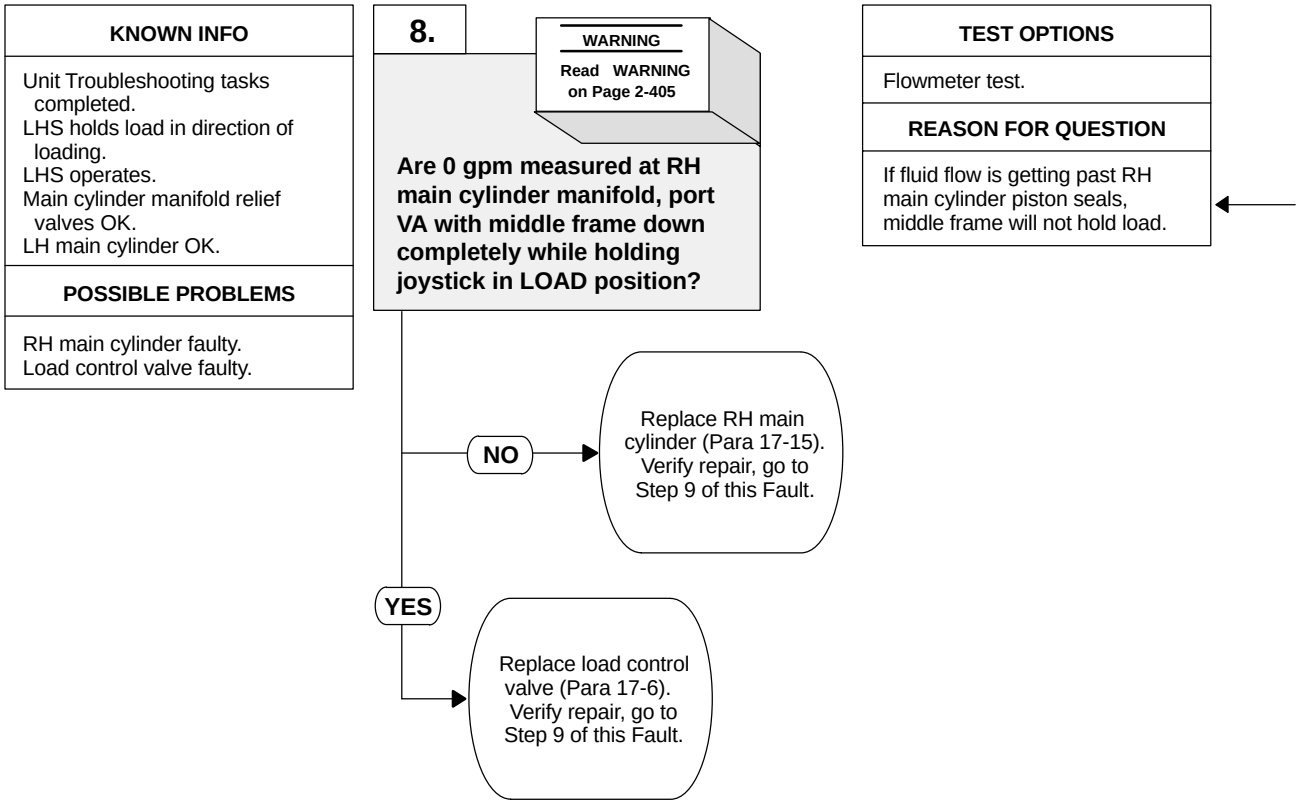
(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2888 from LH main manifold, port VA.
(3) Connect adapter hose to hose 2888.
(4) Connect adapter hose to main cylinder manifold, port VA.
(5) Connect flowmeter IN port to adapter hose connected to LH main cylinder manifold.
(6) Connect flowmeter OUT port to adapter hose connected to hose 2888.
(7) Completely open flowmeter load valve.
(8) Set flowmeter to low scale.
(9) Connect quick disconnect hose 2917.
(10) Start engine (TM 9-2320-364-10).
(11) Set hydraulic selector switch to MAN MF position.
(12) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (13) through (20) below and replace LH main cylinder (Para 17-15).
  (b) If 0 gpm (0 lpm) are present, LH main cylinder is OK.
(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(16) Disconnect flowmeter from two adapter hoses.
(17) Disconnect adapter hose from LH main cylinder manifold, port VA.
(18) Disconnect adapter hose from hose 2888.
(19) Connect hose 2888 to LH main cylinder manifold, port VA.
(20) Connect quick disconnect hose 2917.







10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).



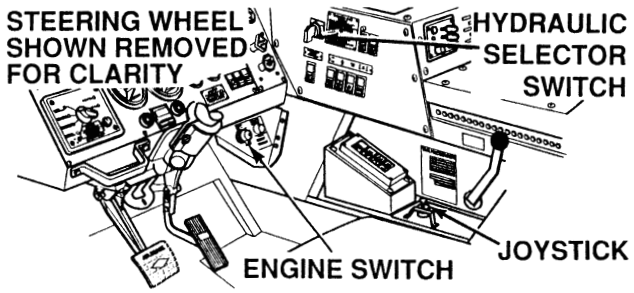
WARNING

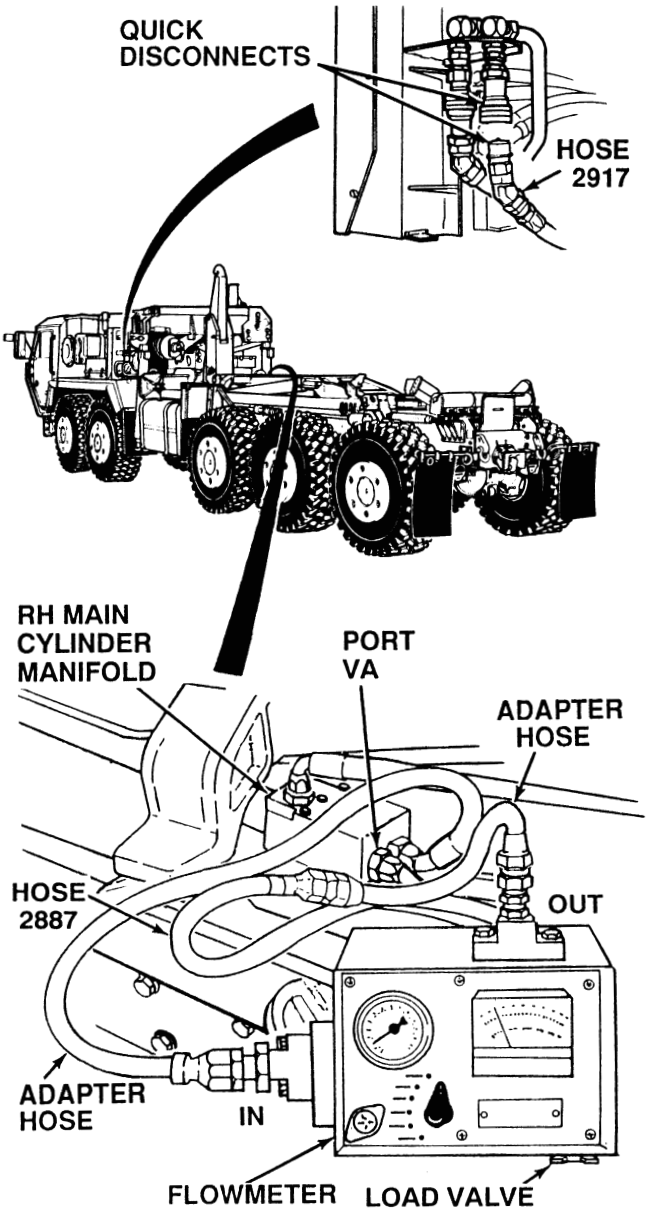
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

FLOWMETER TEST

(1) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(2) Disconnect hose 2887 from RH main cylinder manifold, port VA.
(3) Connect adapter hose to hose 2887.
(4) Connect adapter hose to main cylinder manifold, port VA.
(5) Connect flowmeter IN port to adapter hose connected main cylinder manifold, port VA.
(6) Connect flowmeter OUT port to adapter hose connected to hose 2887.
(7) Completely open flowmeter load valve.
(8) Set flowmeter to LOW scale.
(9) Connect quick disconnect hose 2917.
(10) Start engine (TM 9-2320-364-10).
(11) Set hydraulic selector switch to MAN MF position.

Continued on next page.





10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).

WARNING

- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

FLOWMETER TEST (CONT).

(12) With the aid of an assistant, observe flowmeter while holding joystick in LOAD position.
  (a) If more than 0 gpm (0 lpm) are measured, perform Steps (13) through (20) below and replace RH main cylinder (Para 17-15).
  (b) If 0 gpm (0 lpm) are measured, perform Steps (13) through (20) below and replace load control valve (Para 17-6).

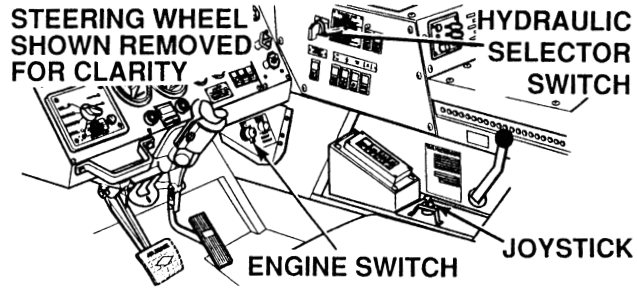
(13) Set hydraulic selector switch to OFF position.

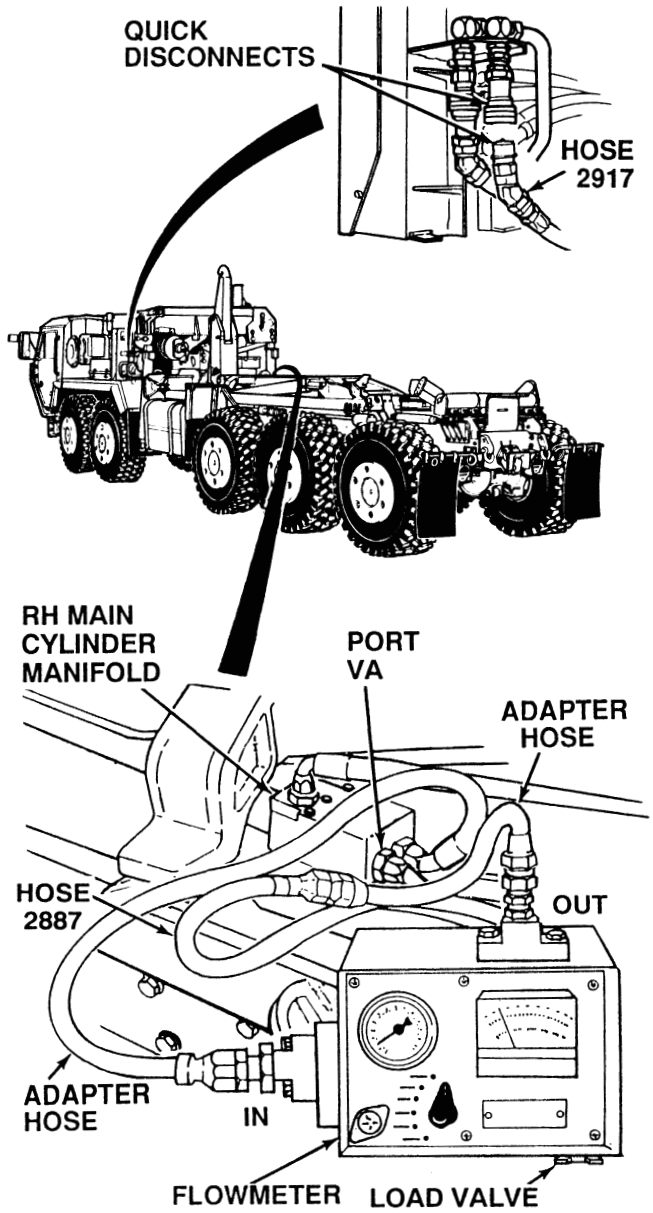
(14) Turn OFF ENGINE switch.

(15) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.

(16) Disconnect flowmeter from two adapter hoses.

Continued on next page.



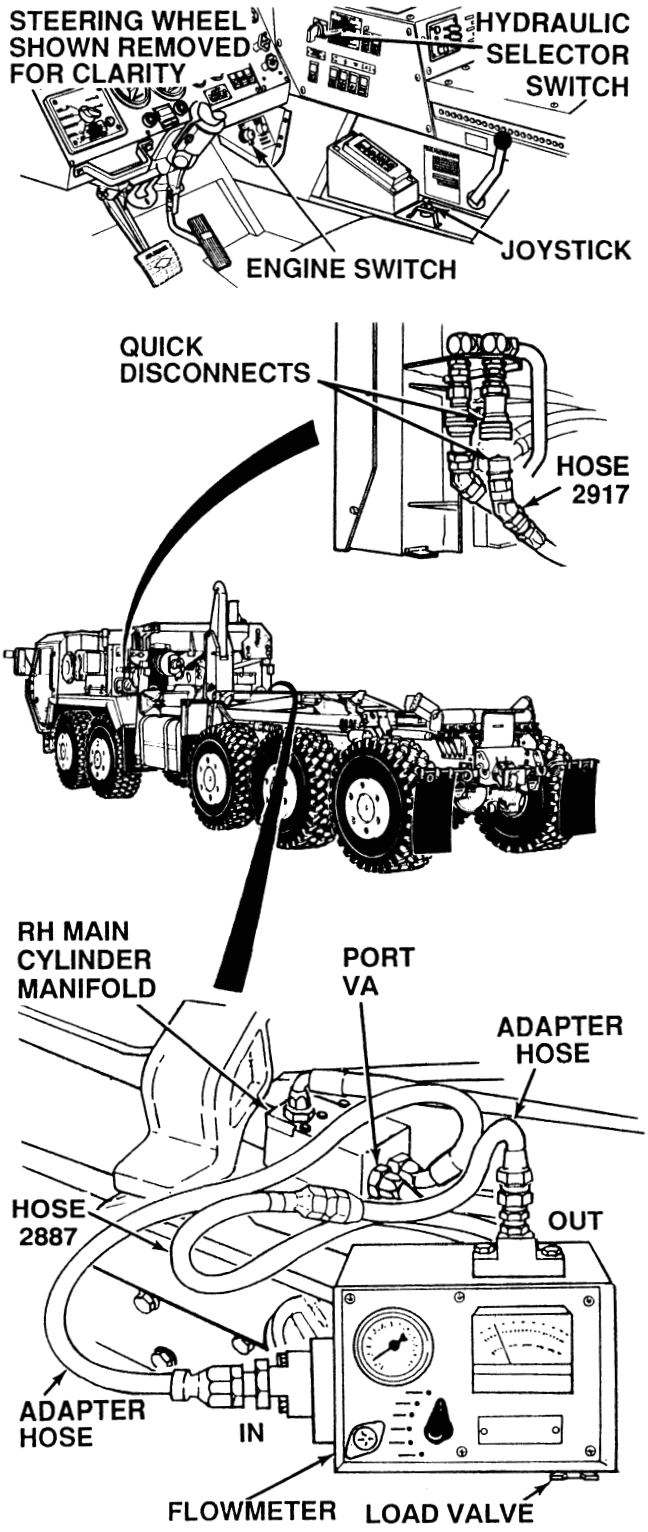


WARNING

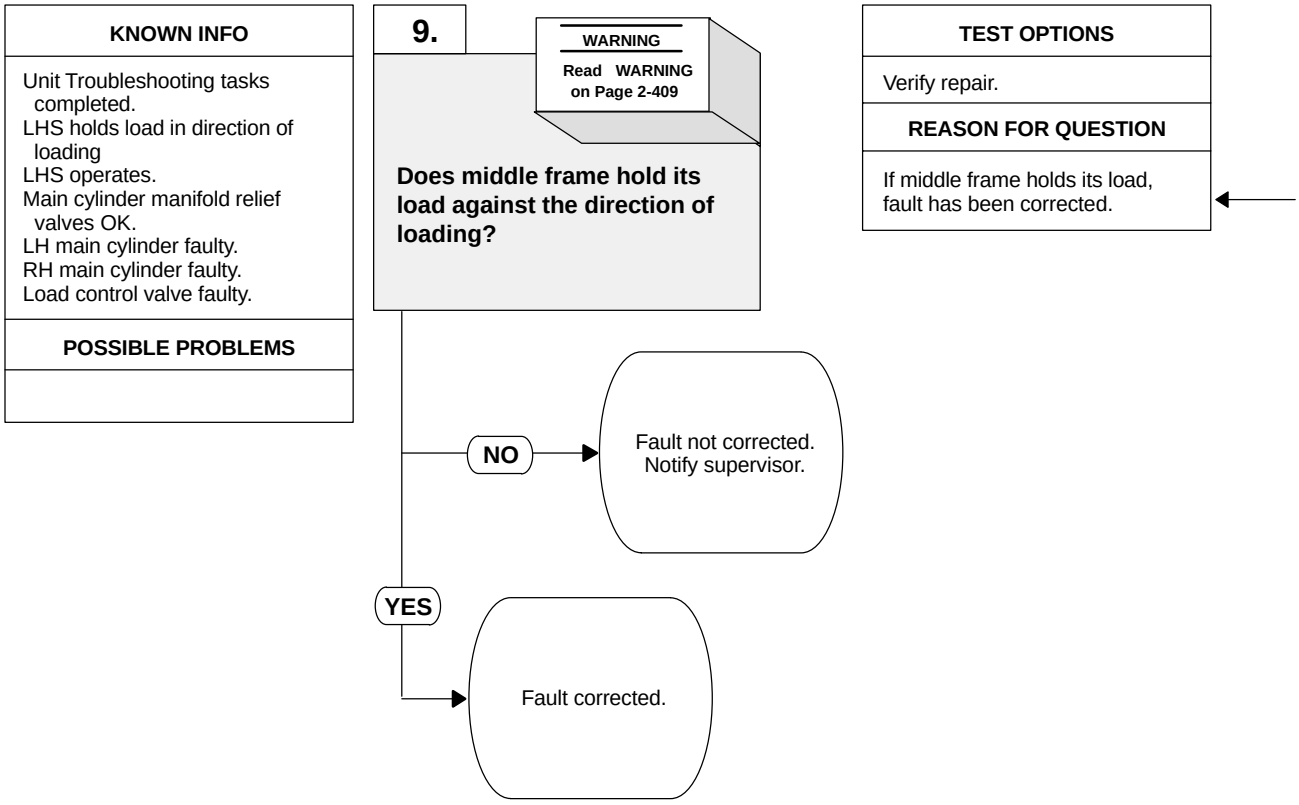
- The LHS hydraulic system operates at oil pressures up to 3675 psi (25,339 kPa). Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

FLOWMETER TEST (CONT).

(17) Disconnect adapter hose from RH main cylinder manifold, port VA.
(18) Disconnect adapter hose from hose 2887.
(19) Connect hose 2887 to RH main cylinder manifold, port VA.
(20) Connect quick disconnect hose 2917.



10. LOSS OF MIDDLE FRAME LOAD HOLDING (CONT).

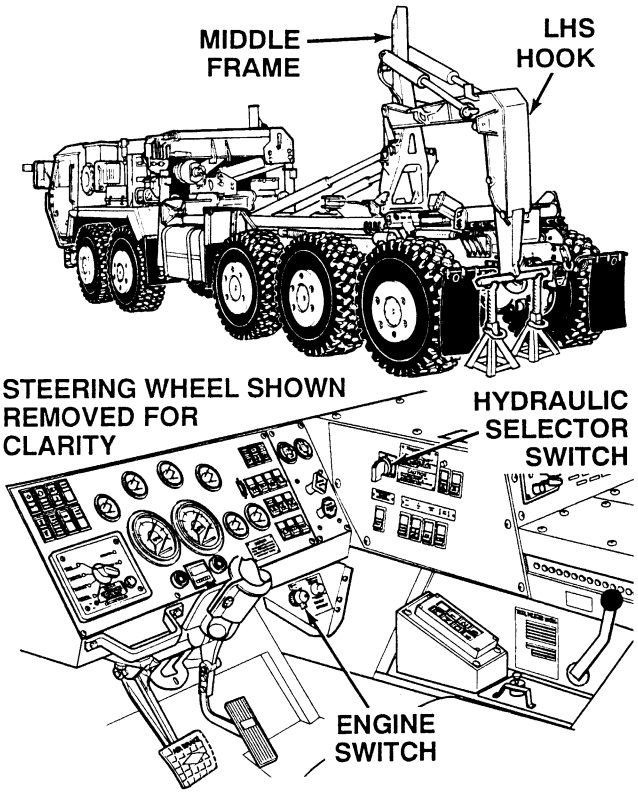


WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

VERIFY REPAIR

(1) Position LHS hook to rear of truck and engage hook on steel tube supported by jackstands.
(2) Using LHS, lift truck only enough to lift vehicle weight off suspension. Do not lift tires off ground.
(3) Set hydraulic selector switch to OFF position (TM 9-2320-364-10).
(4) Turn OFF ENGINE switch.
    (a) If middle frame does not hold weight off vehicle suspension, fault not corrected. Perform Steps (5) through (8) below and notify supervisor.
    (b) If middle frame does hold weight off vehicle suspension, fault has been corrected.
(5) Disengage hook from steel tube.
(6) Put LHS in transit position.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.



2-14. LOAD HANDLING SYSTEM (LHS) TROUBLESHOOTING (CONT).

11. LHS HOOK ARM DISENGAGES FROM FLATRACK WHILE UNLOADING.

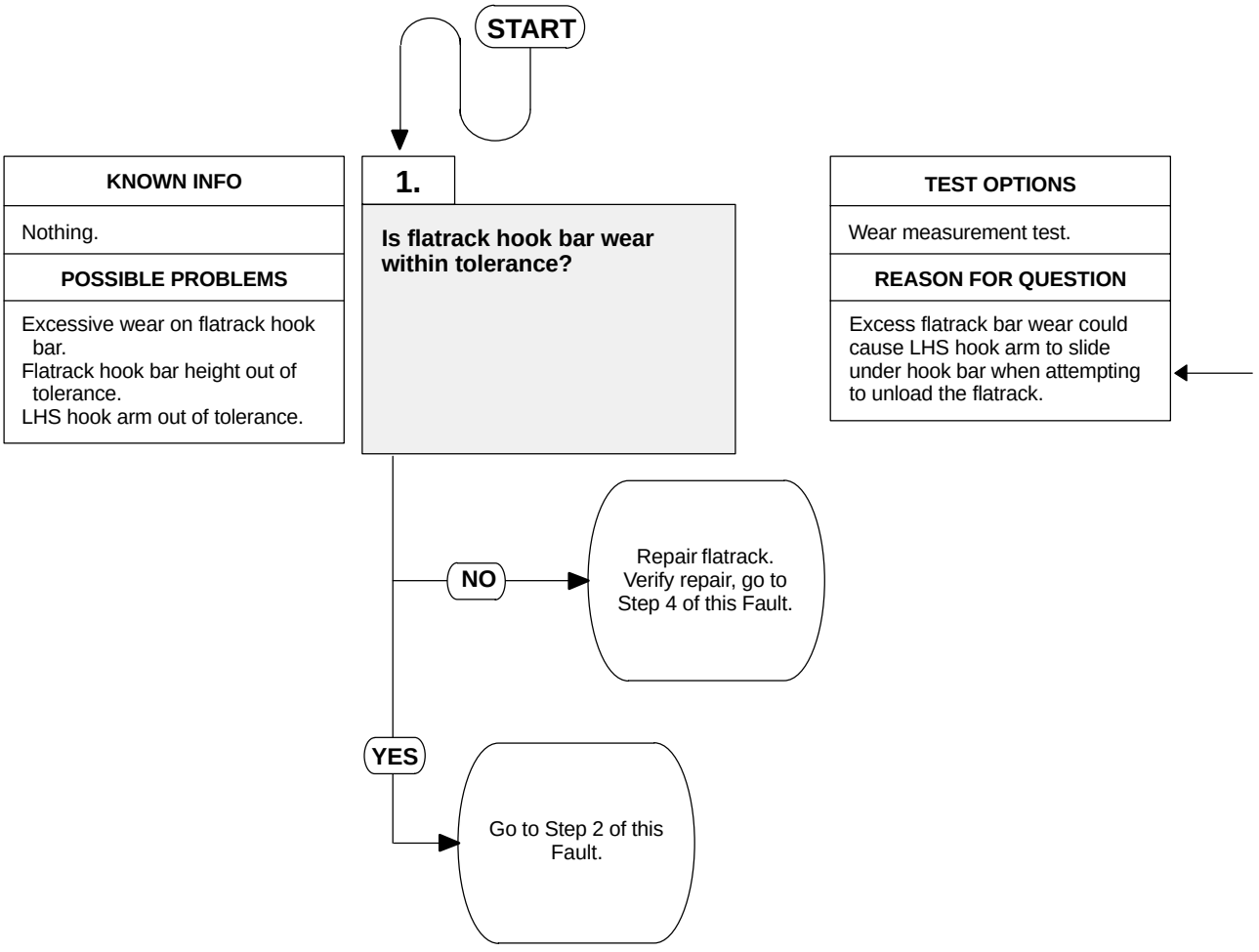
INITIAL SETUP

Tools and Special Tools
- Gage Set, Telescoping (Item 69, Appendix F)
- Level (Item 134, Appendix F)
- Micrometer, Outside, Caliper, Set (Item 139, Appendix F)
- Plumb Bob (Item 161, Appendix F)
- Ruler, Tape (Item 235, Appendix F)
- Wooden Block (4) (Appendix C)

Personnel Required
- Two

References
- TM 9-2320-364-10
- TM 9-3990-206-14&P

Equipment Condition
- Flatrack unloaded, (TM 9-2320-364-10)



NOTE

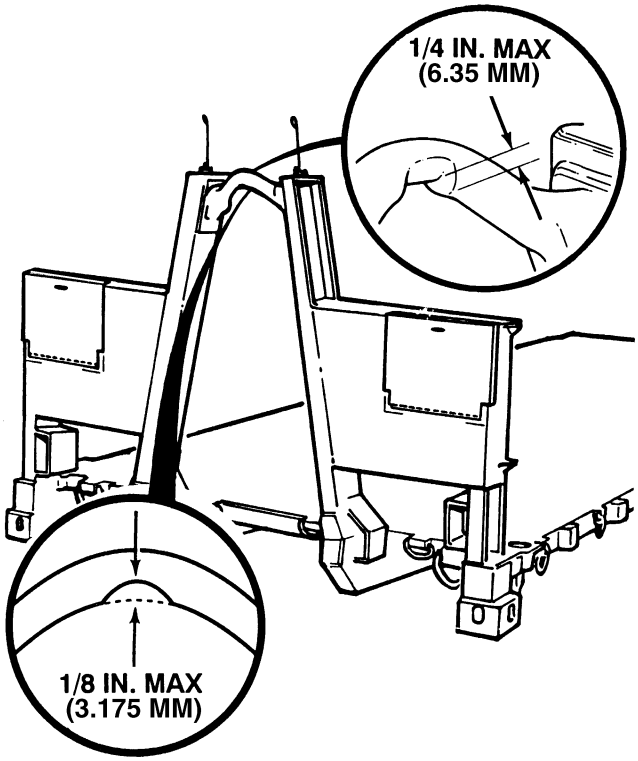
The 1/8 in. (3.175 mm) measurement is for the bottom of the hook bar only.

WEAR MEASUREMENT TEST

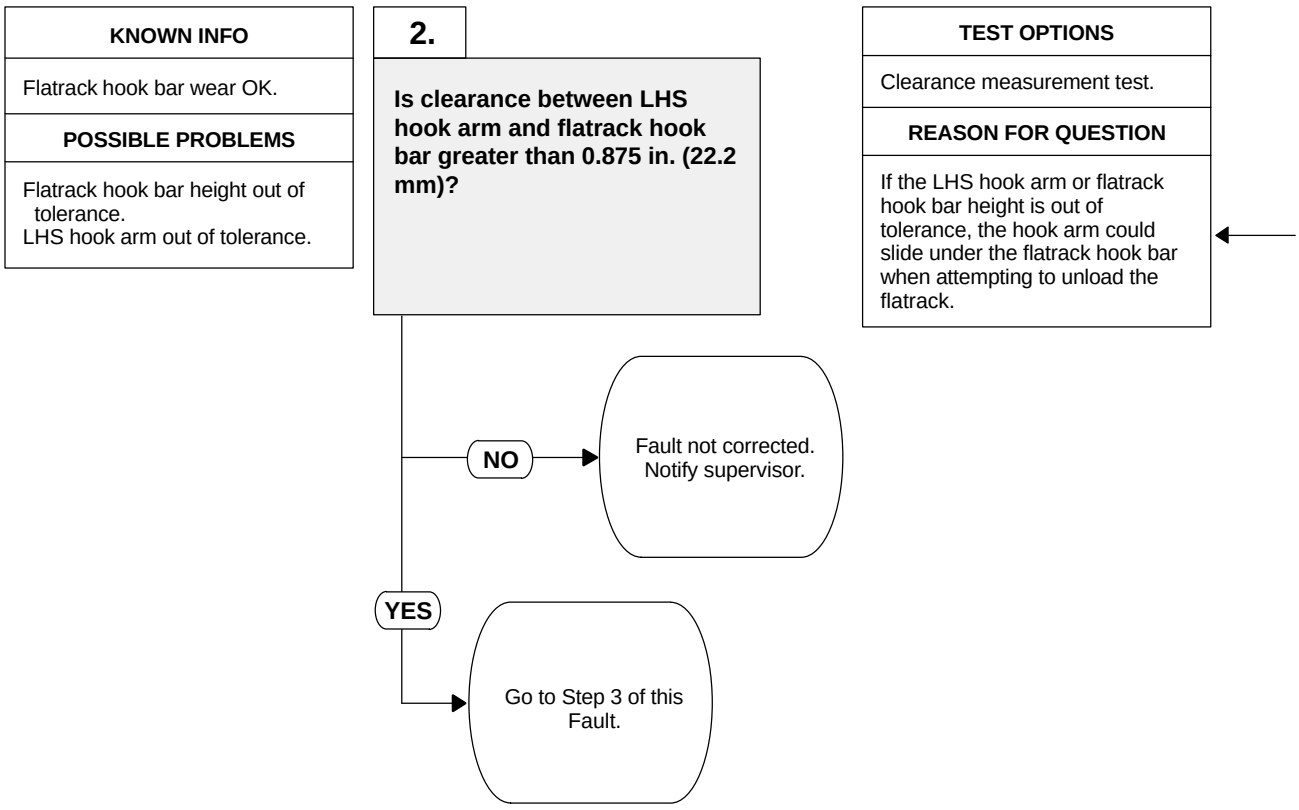
Measure the amount of wear on the hook bar.

(1) If wear at lower back side of hook bar is 1/4 in. (6.35 mm) or less, and 1/8 in. (3.175 mm) or less at bottom of hook bar, hook bar is OK. Go to Step 2 of this Fault.

(2) If wear at lower back side of hook bar is greater than 1/4 in. (6.35 mm) or greater than 1/8 in. (3.175 mm) at bottom of hook bar, repair flatrack hook bar. Refer to TM 9-3990-206-14&P. Verify repair and go to Step 4 of this Fault.



11. LHS HOOK ARM DISENGAGES FROM FLATRACK WHILE UNLOADING (CONT).

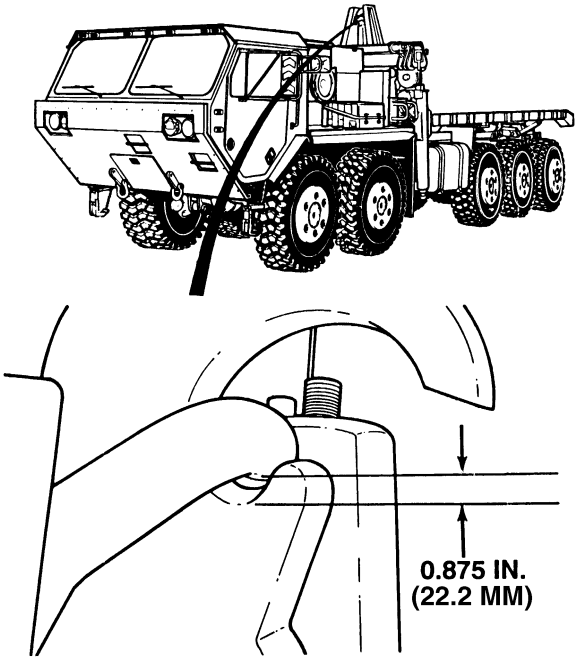


NOTE

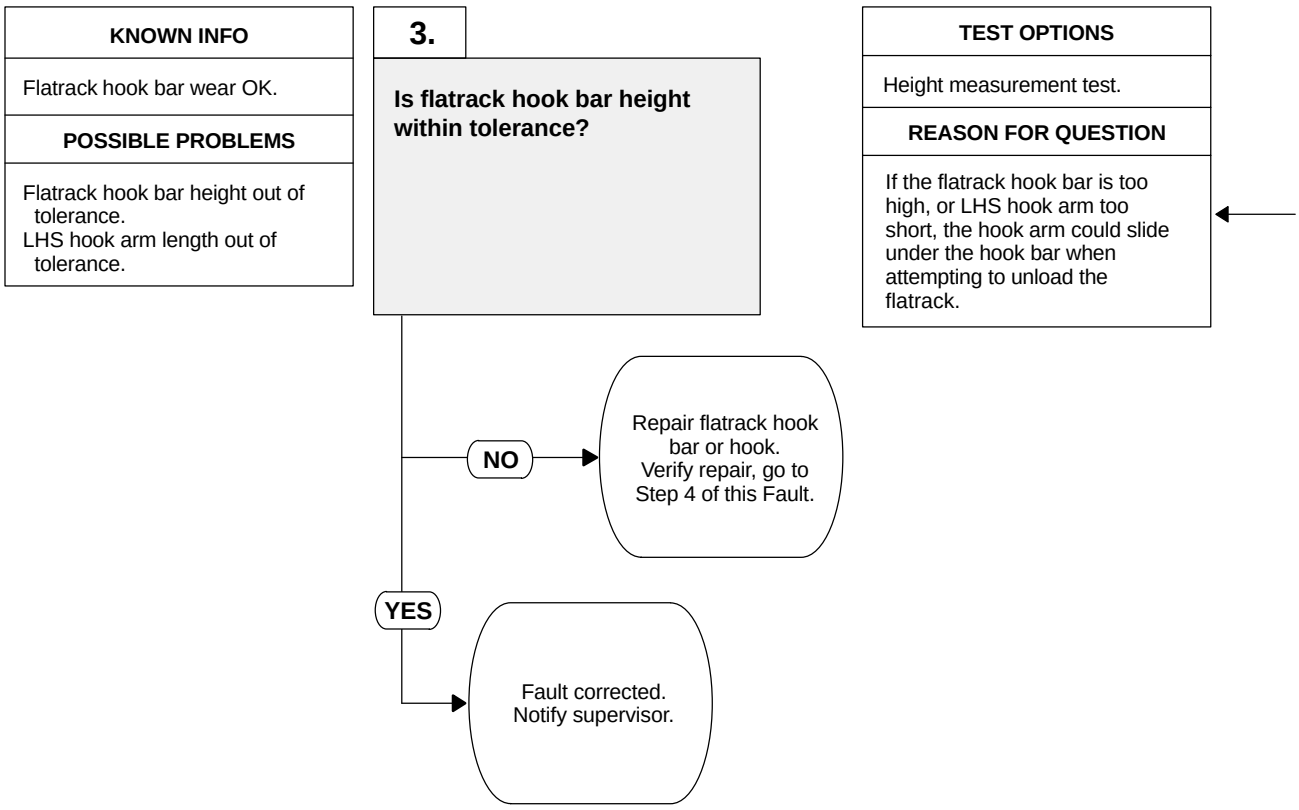
Clearance given is for a hook bar with or without any wear.

CLEARANCE MEASUREMENT TEST

(1) Load flatrack onto truck (TM 9-2320-364-10).
(2) Verify LHS hook arm is in its lowest position.
(3) Verify flatrack is resting squarely on all four LHS support points.
(4) Using a telescoping gage, measure the vertical clearance between the bottom of the flatrack hook bar and the LHS lift hook.
    (a) If clearance is less than 0.875 in. (22.2 mm), fault not corrected, notify the supervisor.
    (b) If clearance is greater than 0.875 in. (22.2 mm), go to Step 3 of this Fault.



11. LHS HOOK ARM DISENGAGES FROM FLATRACK WHILE UNLOADING (CONT).

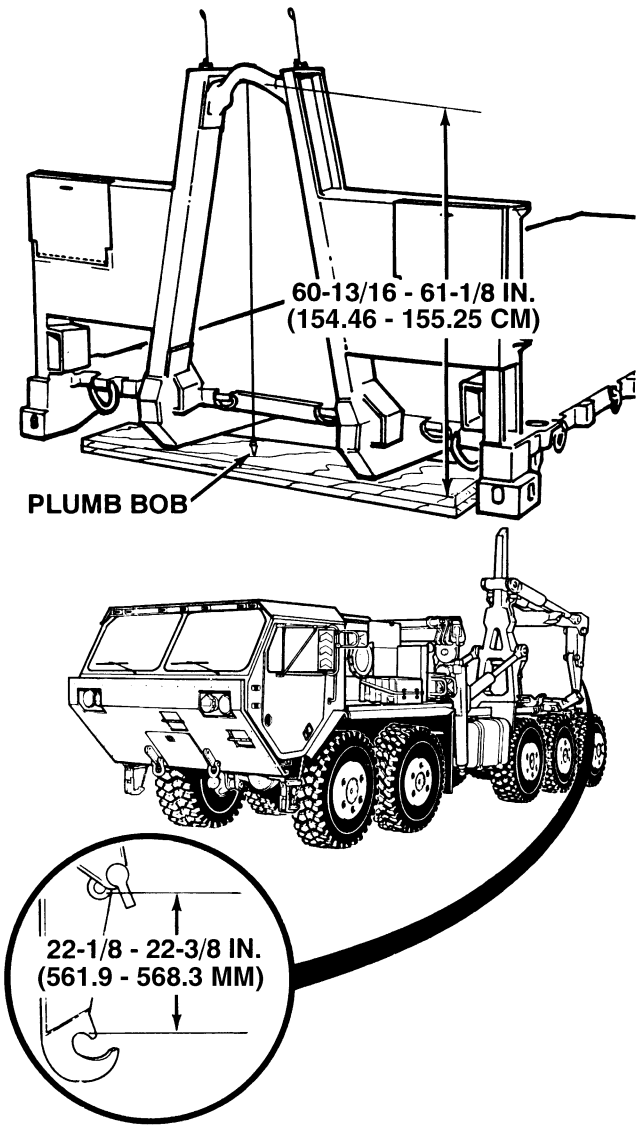


NOTE

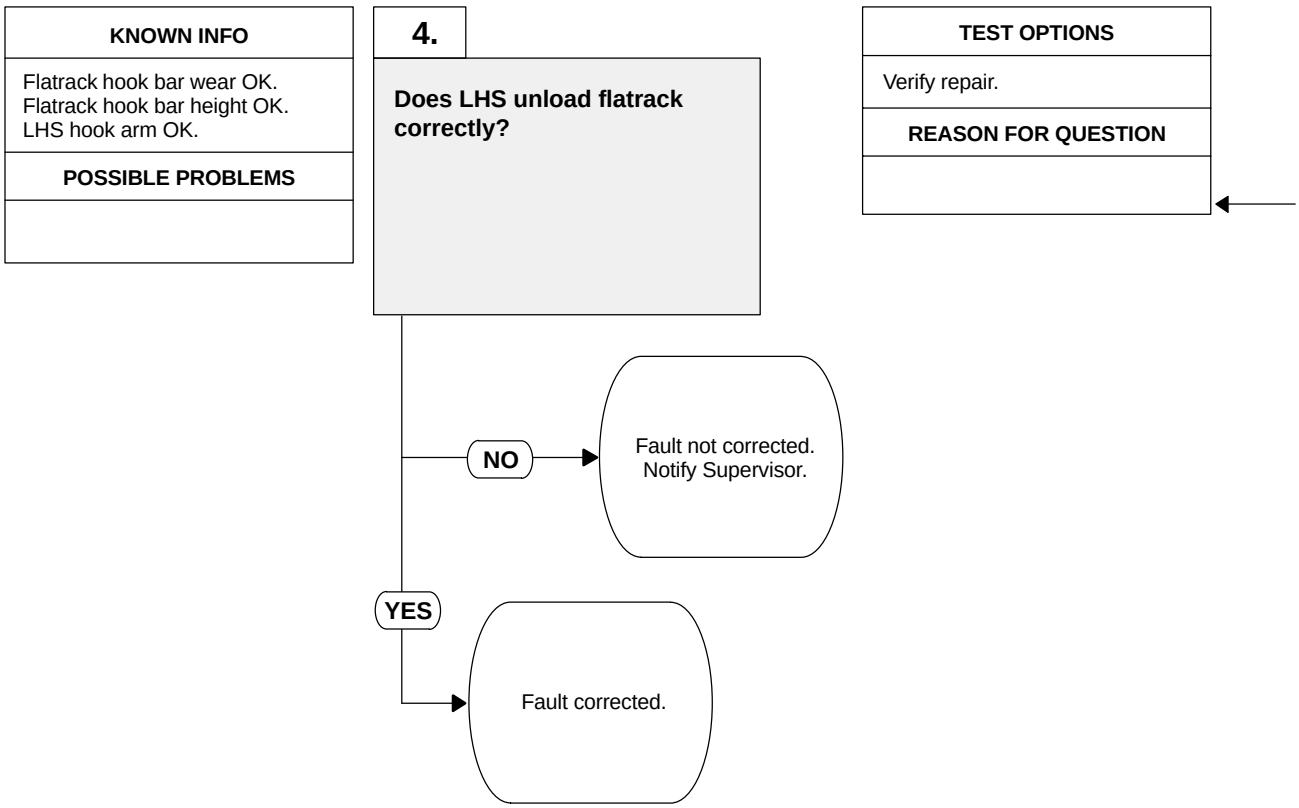
- Front boards will be used to aid in measuring the flatrack hook bar height.
- Boards are used under the front and rear of the flatrack to ensure the main rails will be at the same height.
- Use of a level (3 ft minimum [92 cm]) is required when leveling flatrack.
- Flatrack hook bar height range is given for a hook bar with or without wear.
- If hook does not swing toward truck, push hook toward truck and insert pin to hold in measurement position.

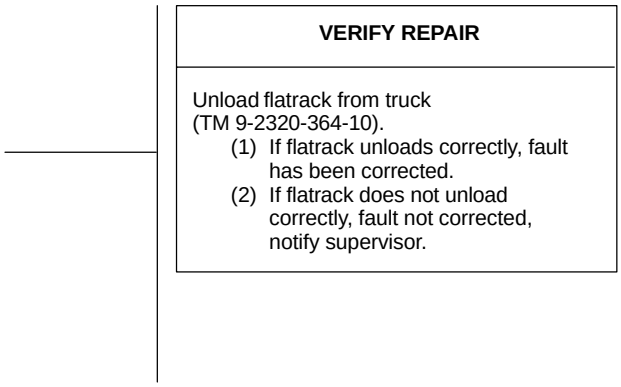
HEIGHT MEASUREMENT TEST

(1) Position flatrack on a flat level surface with 3 in. by 12 in. by 6 ft boards under the frame rails, at the front and rear of the flatrack. Level flatrack as required from side to side and front to back. Place level on outside edge of flatrack frame.
(2) Using a plumb bob, mark a spot on the board to indicate the bottom center of the flatrack hook bar.
(3) With the aid of an assistant, measure vertical distance between the spot on the board and the bottom center of the flatrack hook bar.
  (a) If measurement is not between 60-13/16 in. and 61-1/8 in. (154.46 and 155.25 cm), repair flatrack hook bar, refer to TM 9-3990-206-14&P. Verify repair, go to Step (4) of this Fault.
  (b) If measurement is between 60-13/16 in. and 61-1/8 in. (154.46 and 155.25 cm), go to Step (4) below.
(4) Operate LHS to extended position (TM 9-2320-364-10).
(5) Remove quick pin and pin from hook. Allow hook to swing toward truck.
(6) Measure length of hook arm by measuring from bottom of pin hole to hook thumb radius.
  (a) If hook arm measurement is not between 22-1/8 in. (561.9 mm) and 22-3/8 in. (568.3 mm), replace hook arm. Refer to Para 16-38. Verify repair, go to Step 4 of this Fault.
  (b) If hook arm measurement is between 22-1/8 in. (561.9 mm) and 22-3/8 in. (568.3 mm), fault not corrected, notify supervisor.



11. LHS HOOK ARM DISENGAGES FROM FLATRACK WHILE UNLOADING (CONT).




VERIFY REPAIR
Unload flatrack from truck (TM 9-2320-364-10).
(1) If flatrack unloads correctly, fault has been corrected.
(2) If flatrack does not unload correctly, fault not corrected, notify supervisor.

2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING.

This paragraph covers Material Handling Crane System Troubleshooting. The Material Handling Crane System Fault Index, Table 2-15, lists faults for the crane system of the PLS truck. Refer to the schematics Figures 2-7 through 2-14 when performing tests and corrective actions.

Table 2-15. Material Handling Crane System Fault Index

Fault No.	Description	Page
1.	Outriggers Do Not Operate Or Operate Slowly	2-428
2.	LH Outrigger Does Not Operate	2-446
3.	RH Outrigger Does Not Operate	2-460
4.	Four Valve Bank Functions (Swing, Lift, Telescope And Hoist) Do Not Operate Or Operate Slowly	2-474
5.	Mast Does Not Operate Or Operates Slowly	2-482
6.	Mast Does Not Raise	2-502
7.	Mast Does Not Lower	2-508
8.	Crane Does Not Swing Or Swings Slowly	2-514
9.	Crane Does Not Swing Clockwise (CW)	2-532
10.	Crane Does Not Swing Counter Clockwise (CCW)	2-540
11.	Boom Does Not Telescope In Or Telescopes In Slowly	2-548
12.	Boom Does Not Telescope Out Or Telescopes Out Slowly	2-562
13.	Boom Does Not Telescope Or Telescopes Slowly	2-576
14.	Boom Does Not Raise Or Raises Slowly	2-590
15.	Boom Does Not Lower Or Lowers Slowly	2-604
16.	Boom Does Not Operate Or Operates Slowly	2-614
17.	Boom Creeps Down	2-628
18.	Hoist Does Not Operate Or Operates Slowly	2-640
19.	Hoist Does Not Lower	2-650
20.	Hoist Does Not Raise	2-660
21.	Crane Fails Load Test	2-674
22.	Overload Shutdown System (OSS) Disables Crane Functions, Boom Up, Boom Down, Telescoped Out And Hoist Up	2-708

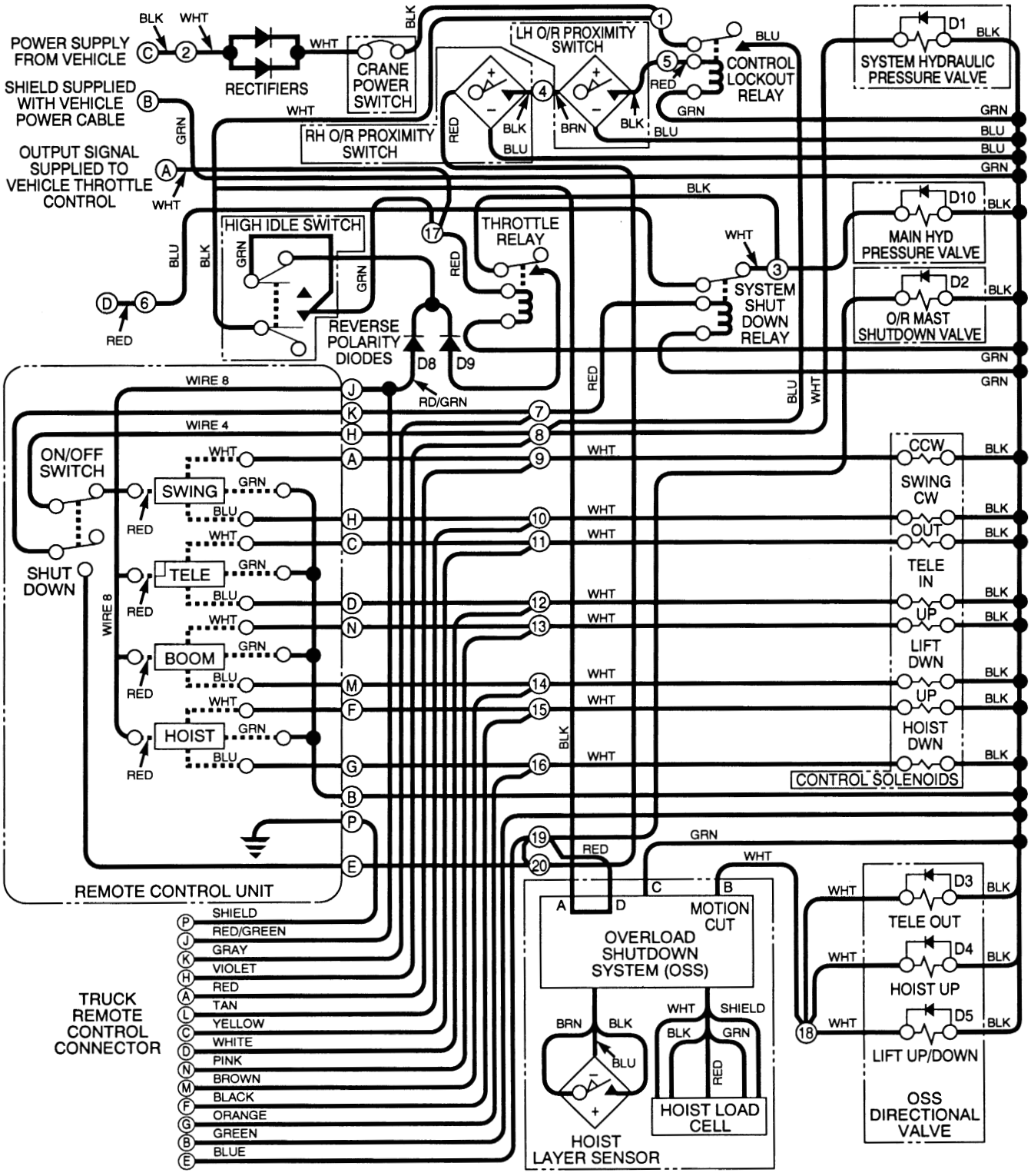


Figure 2-7. Material Handling Crane Wiring Schematic

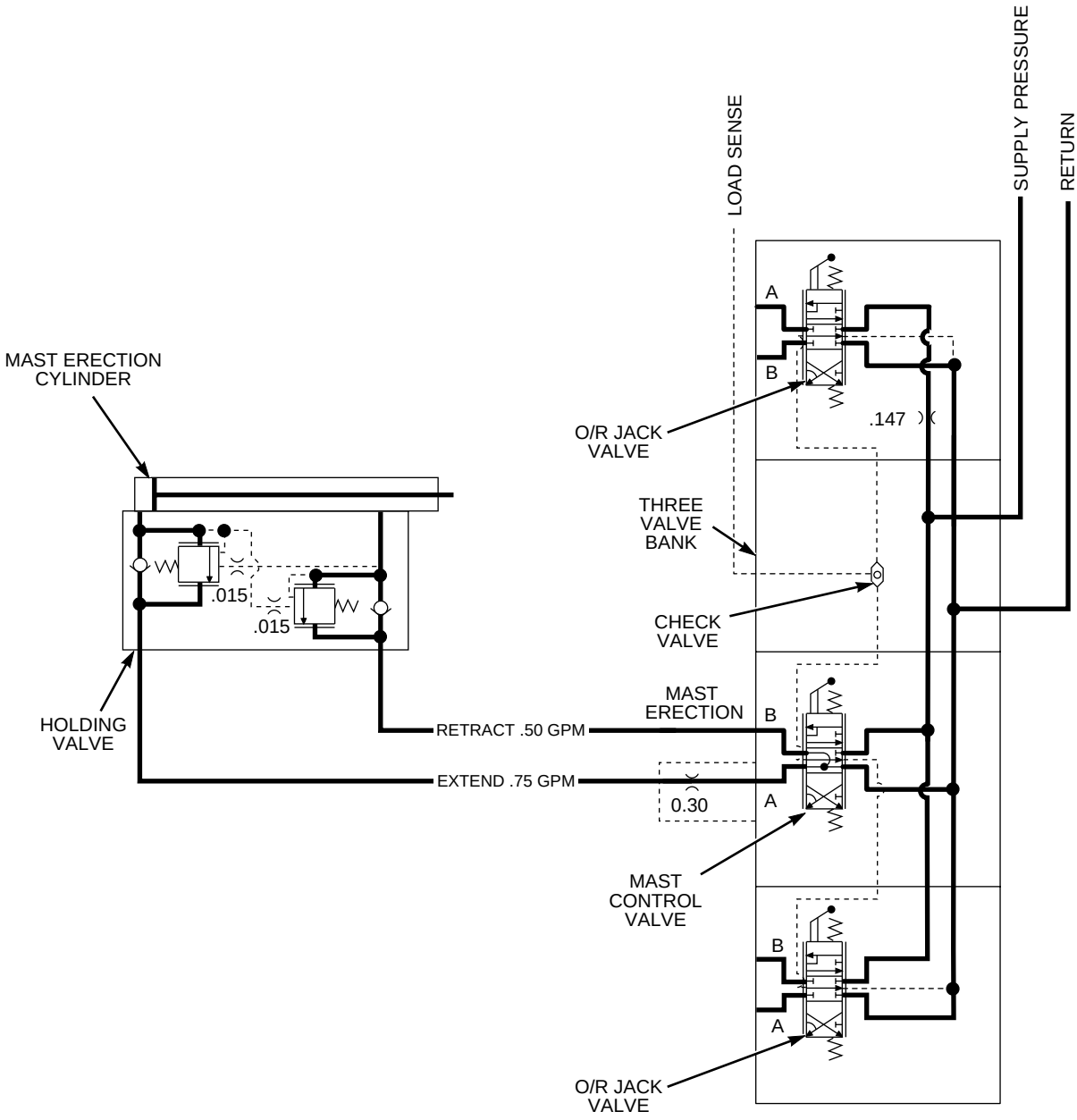


Figure 2-8. Mast Circuit Schematic

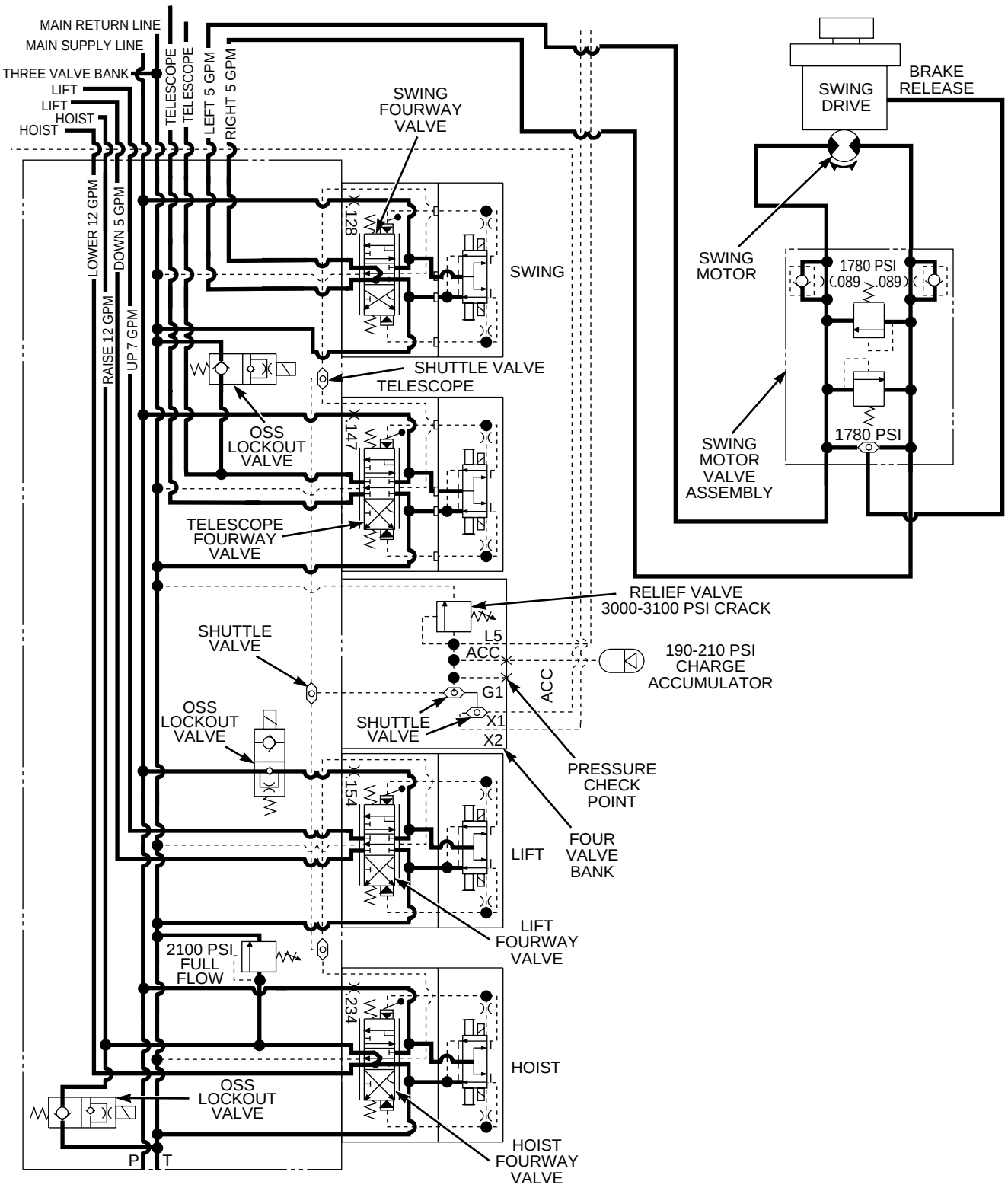


Figure 2-9. Swing Circuit Schematic

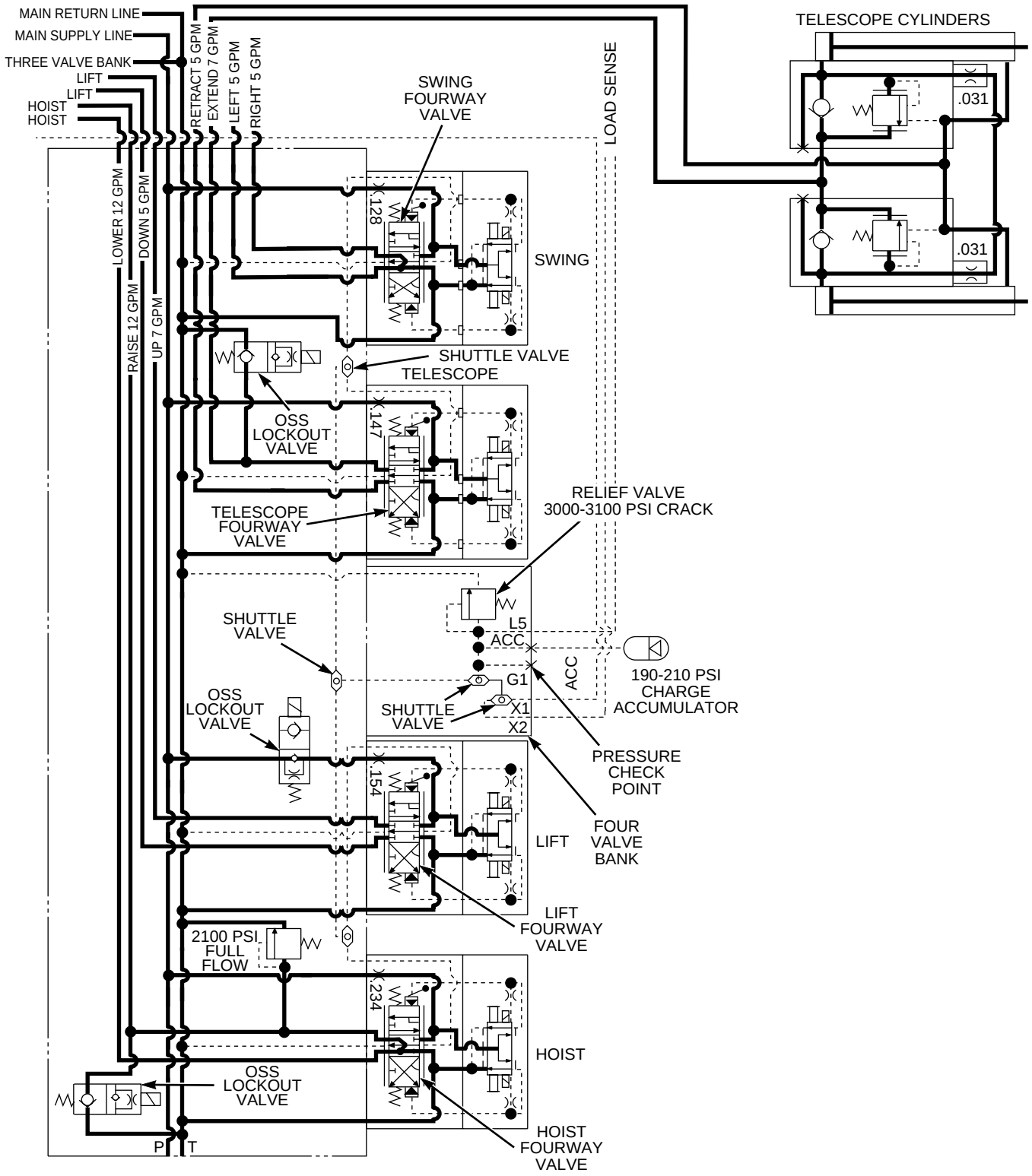


Figure 2-10. Telescope Circuit Schematic

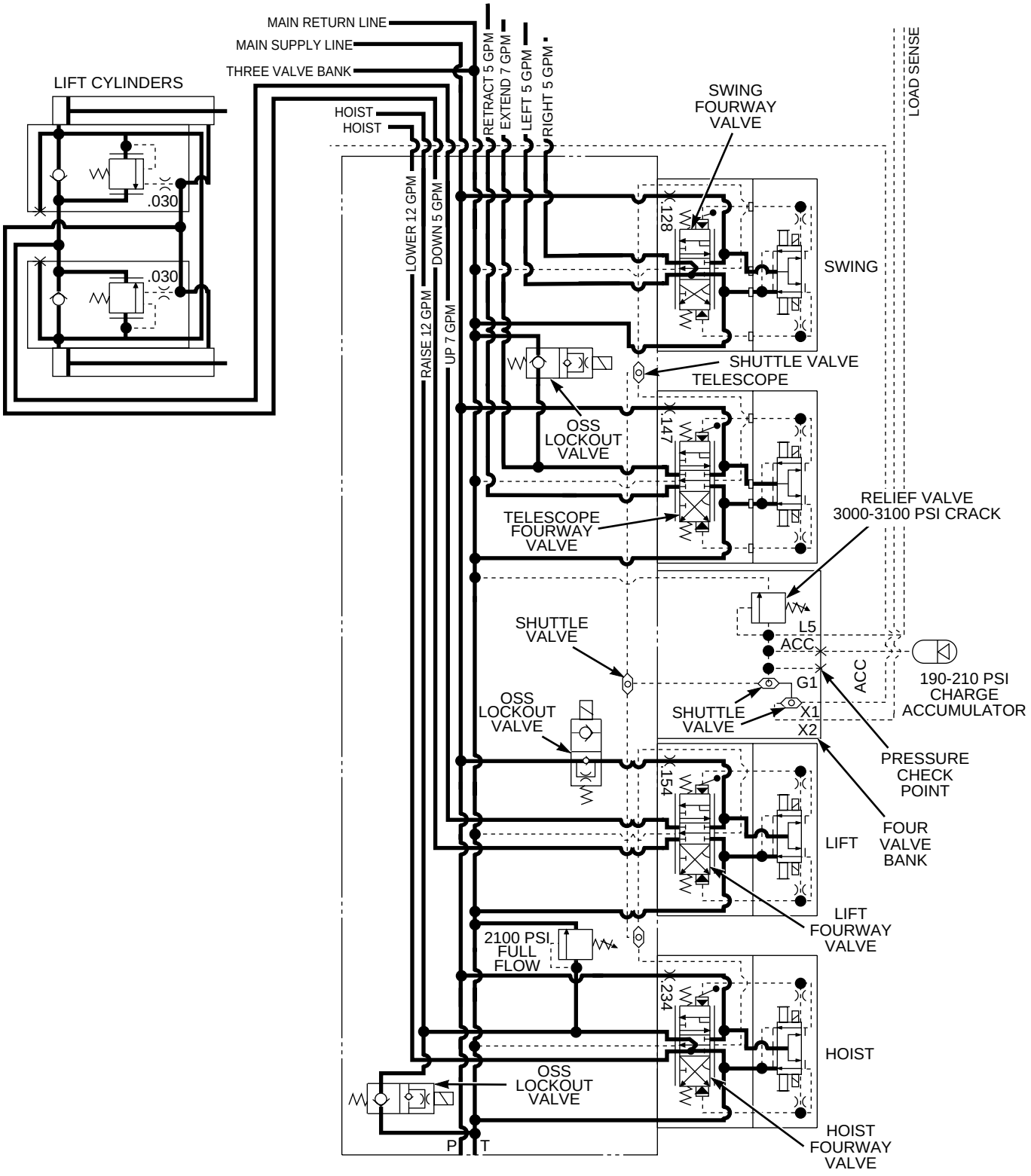


Figure 2-11. Boom Circuit Schematic

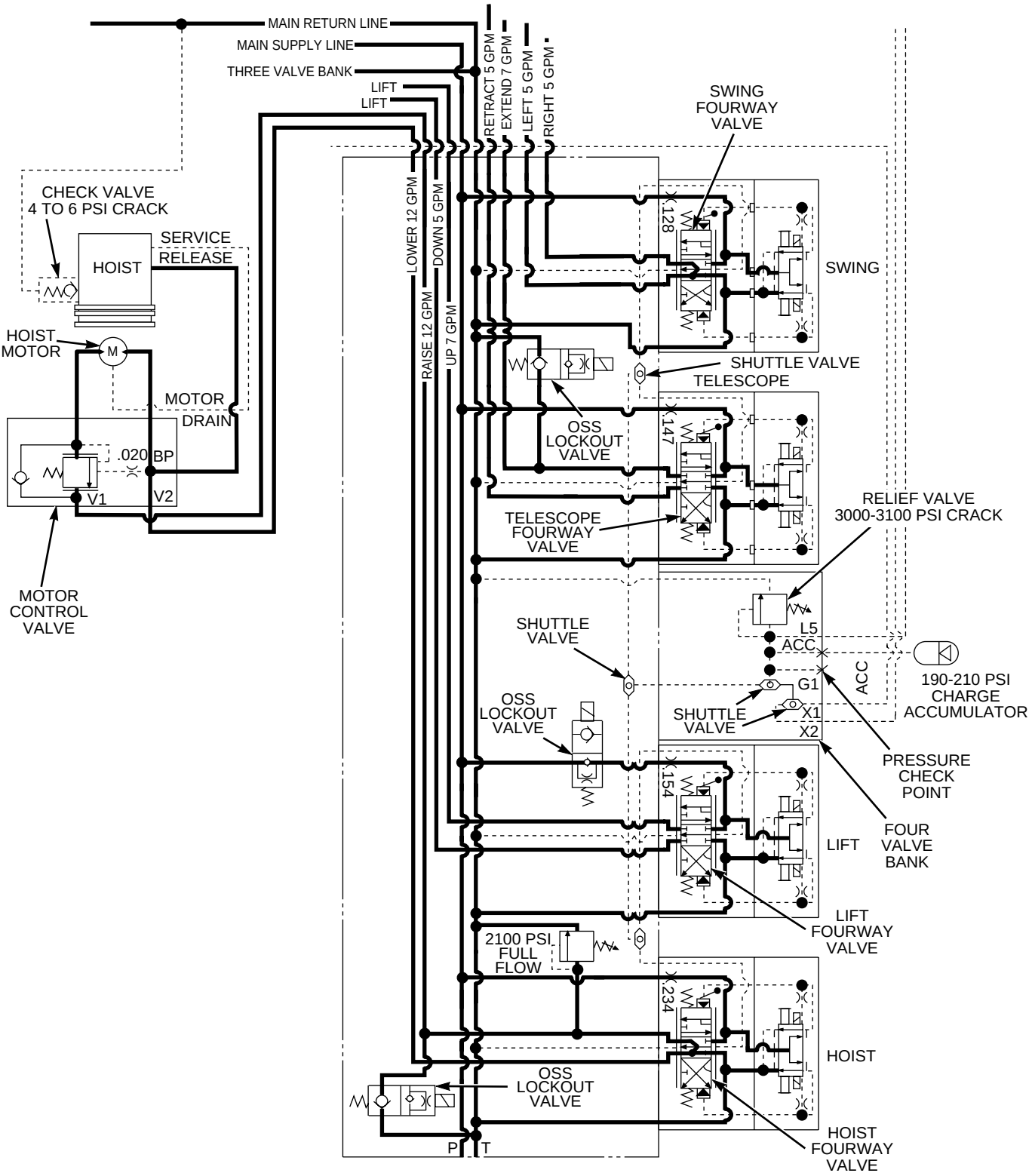


Figure 2-12. Hoist Circuit Schematic

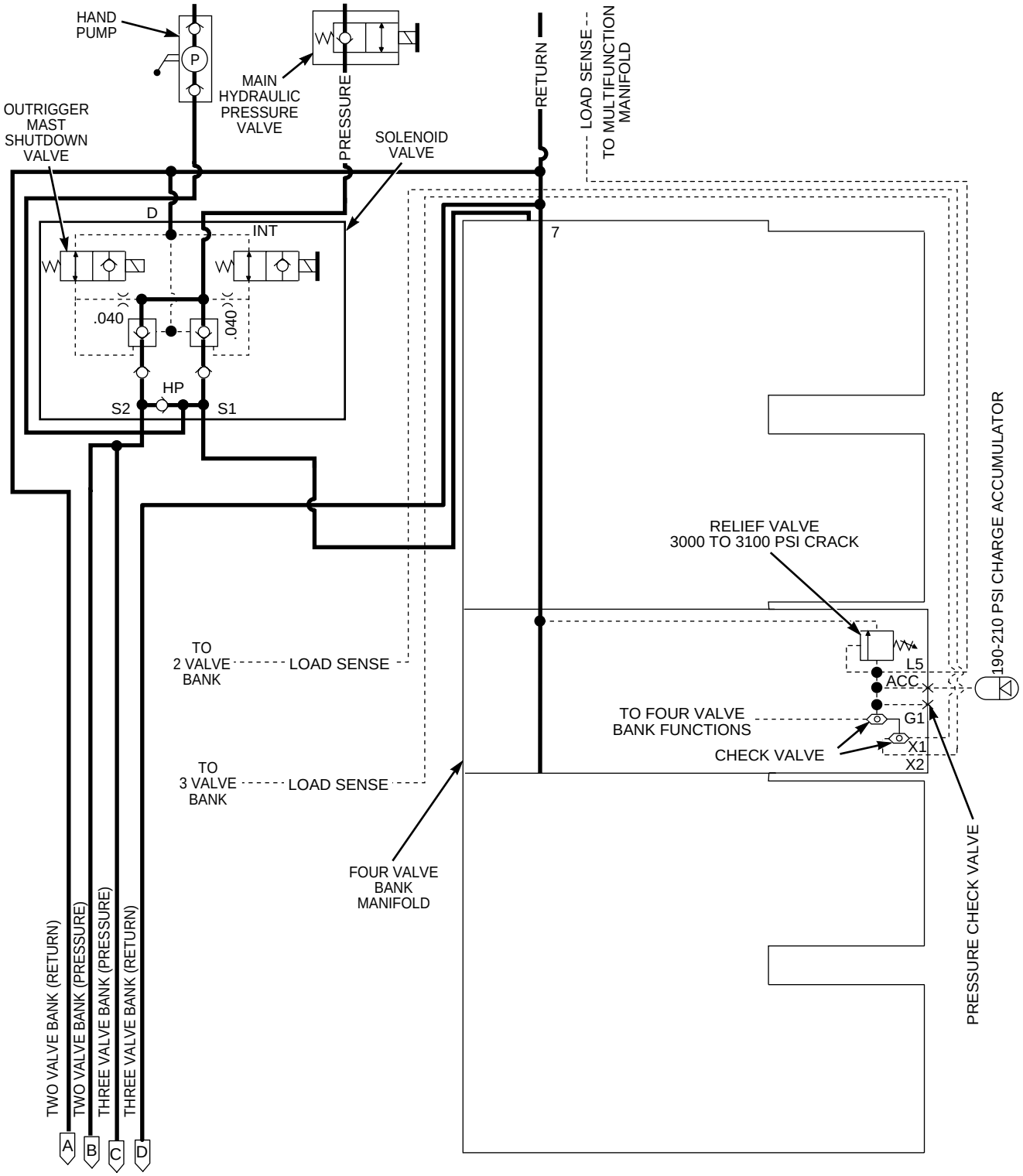


Figure 2-13. Outrigger Circuit Schematic (Sheet 1 of 2)

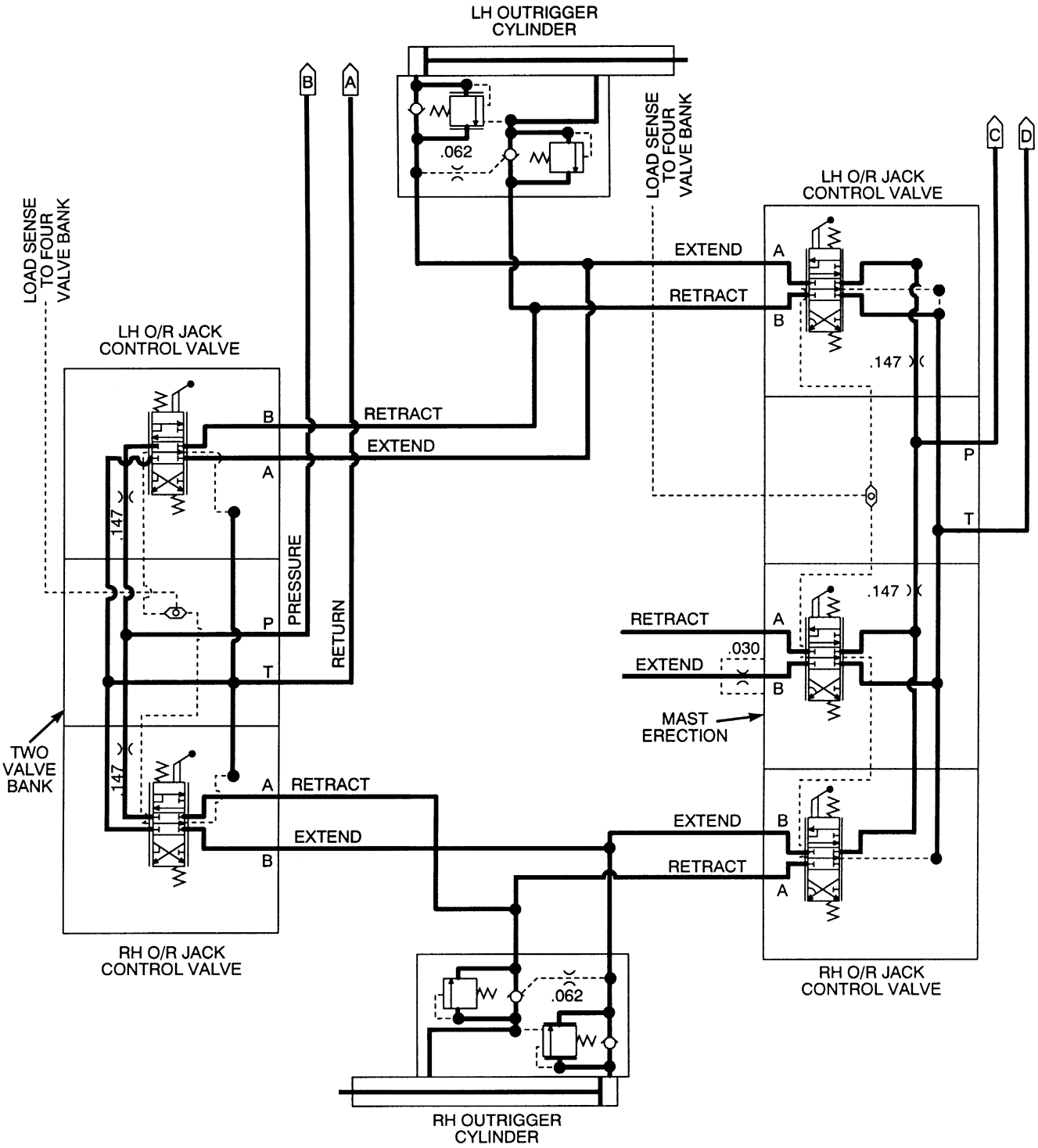


Figure 2-13. Outrigger Circuit Schematic (Sheet 2 of 2)

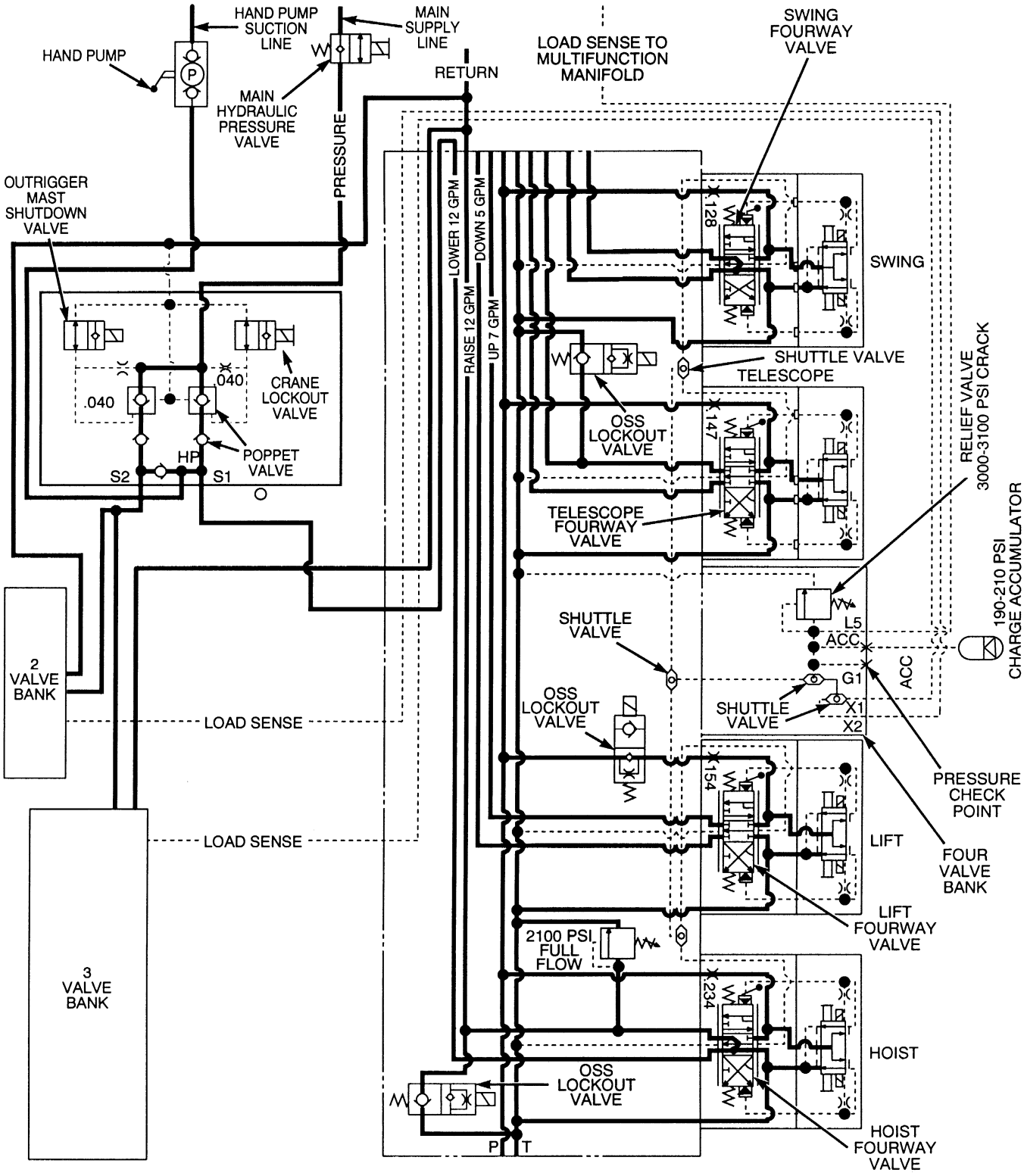


Figure 2-14. Four Bank Valve Hydraulic Schematic

2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY.

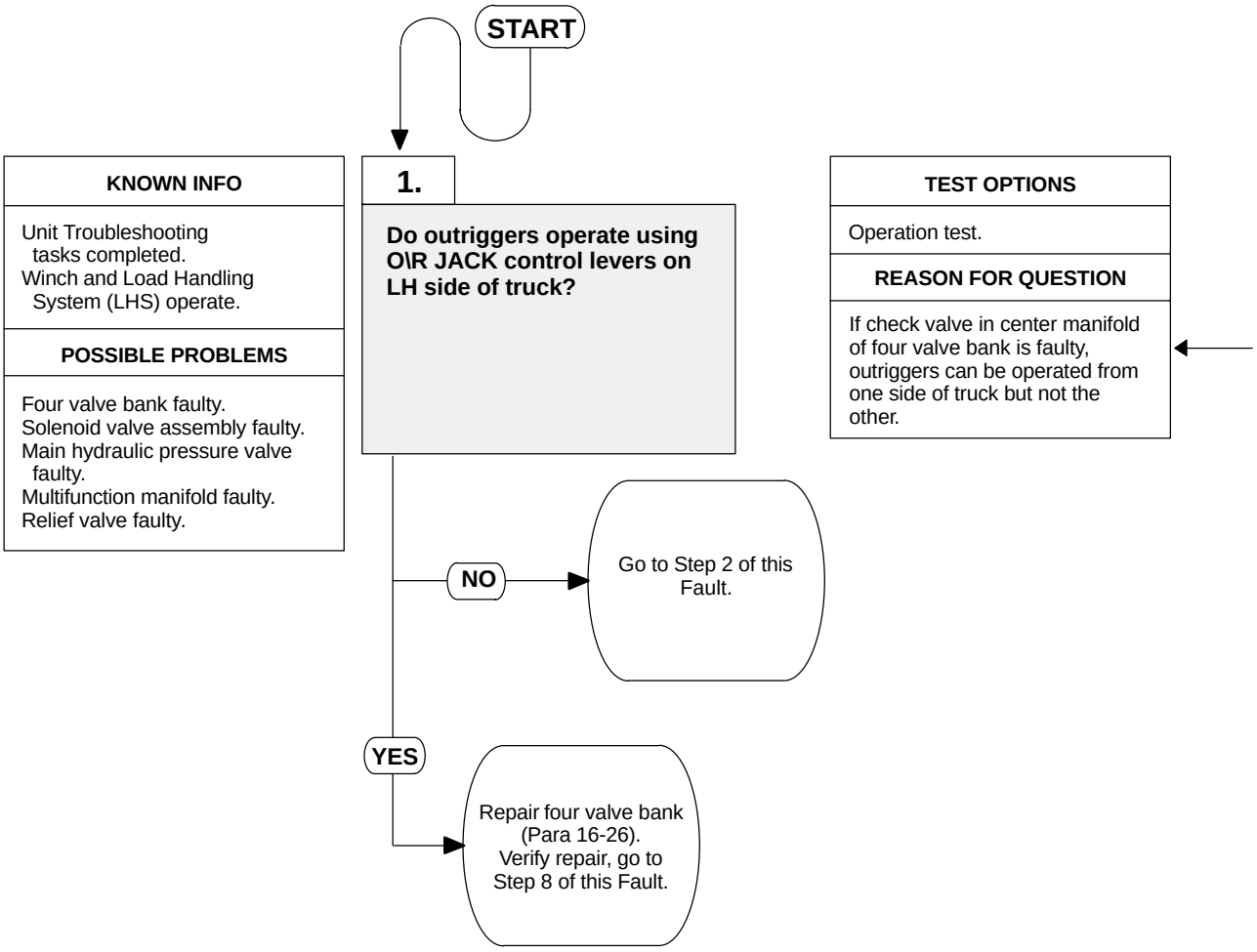
INITIAL SETUP

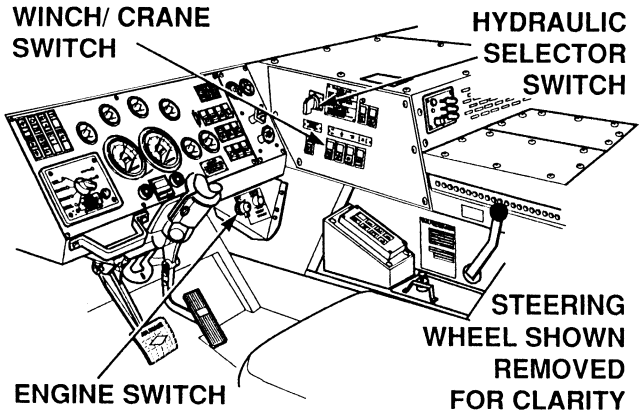
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pan, Drain 6 gal (Item 145, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench, Combination, 1-1/2 in. (Item 260, Appendix F)

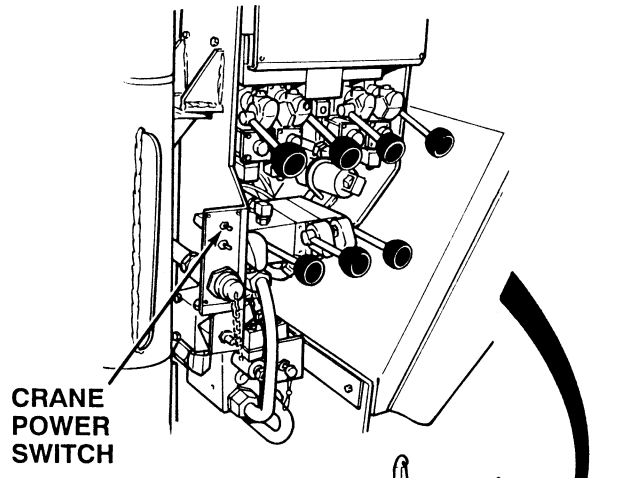
Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Wire, Nonelectrical (Item 79, Appendix B)
Lockwashers (4) (Item 282, Appendix E)
Packing, Preformed (2) (Item 337, Appendix E)
Packing, Preformed (2) (Item 389, Appendix E)
Packing, Preformed (2) (Item 391, Appendix E)

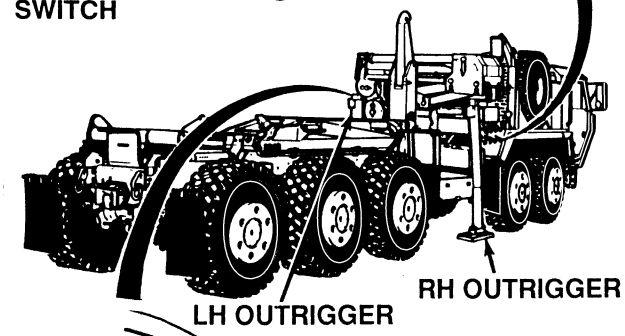
References
TM 9-2320-364-10
TM 9-2320-364-20

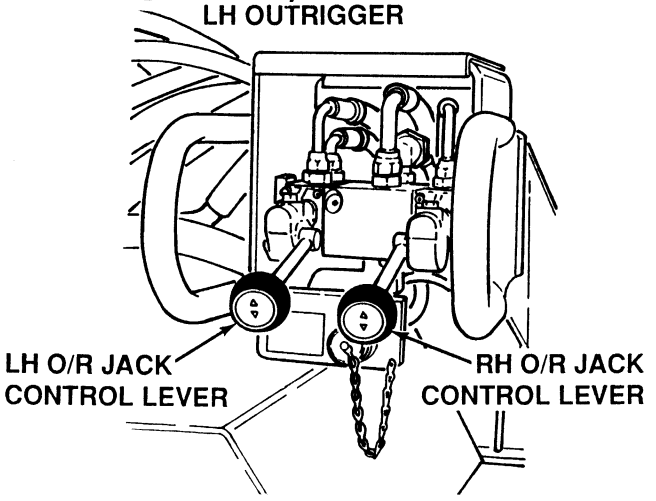
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)







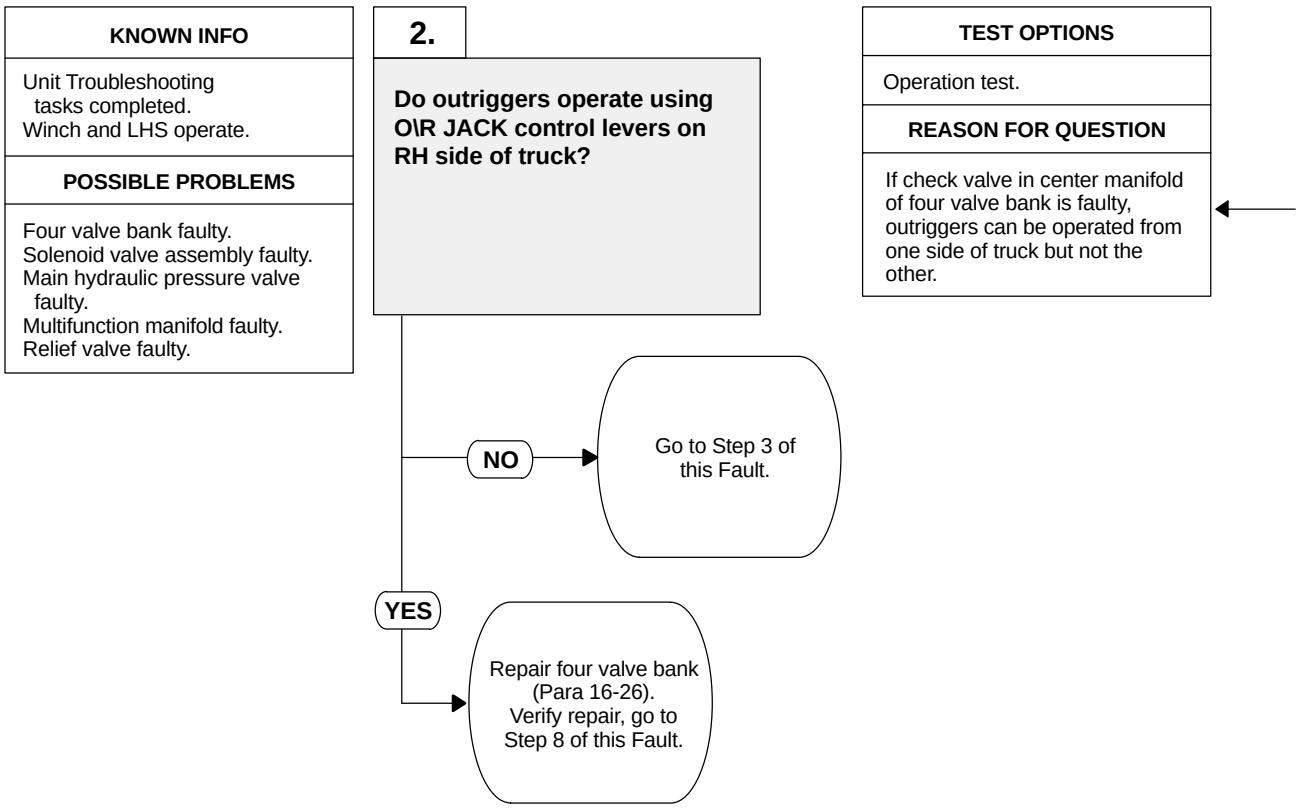




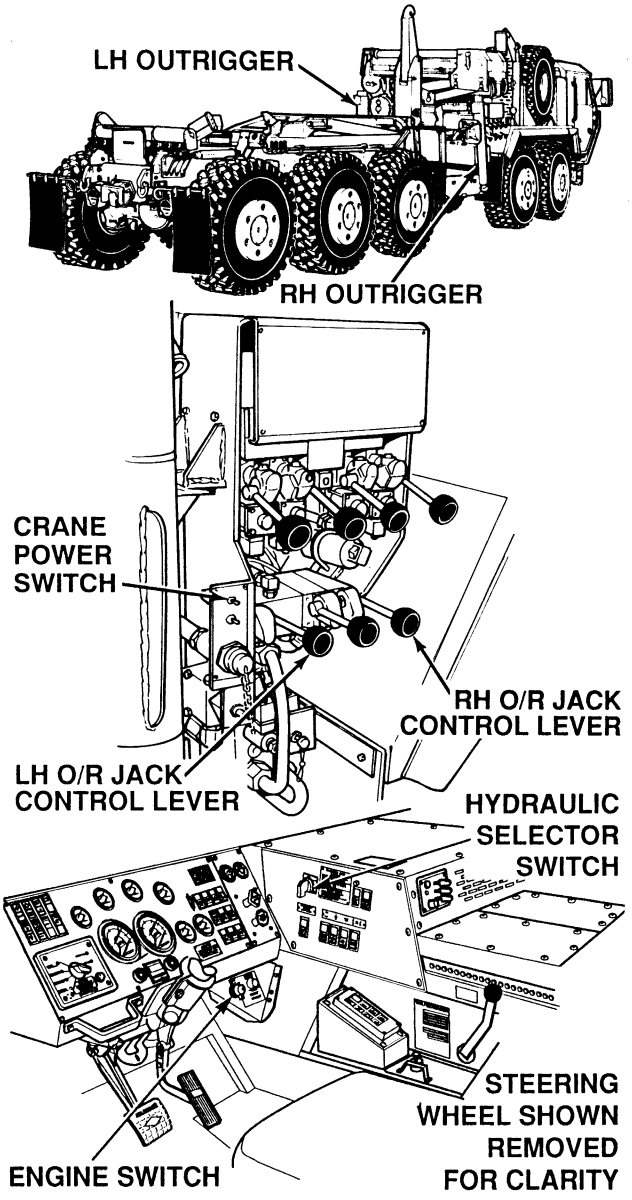
OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Set crane POWER switch to ON position.
(5) Operate outriggers using O/R JACK control levers on LH side of truck.
  (a) If outriggers do not operate, go to Step 2 of this Fault.
  (b) If outriggers operate, perform Steps (6) through (8) below and repair four valve bank (Para 16-26).
(6) Set crane POWER switch to OFF position.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.

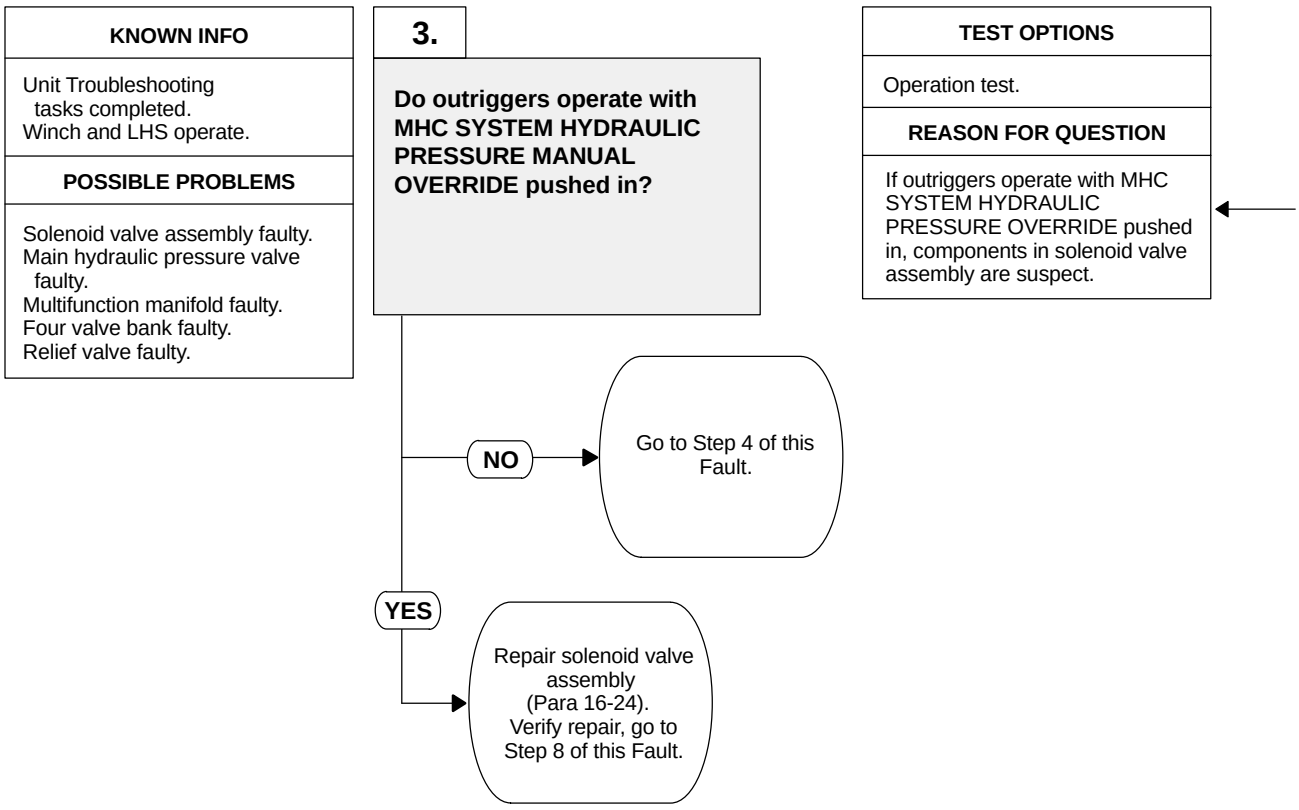
1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).



OPERATION TEST
(1) Operate outriggers using O/R JACK control levers on RH side of truck (TM 9-2320-364-10). (a) If outriggers do not operate, go to Step 3 of this Fault. (b) If outriggers operate, perform Steps (2) through (4) below and repair four valve bank (Para 16-26). (2) Set crane POWER switch to OFF position. (3) Set hydraulic selector switch to OFF position. (4) Turn OFF ENGINE switch.

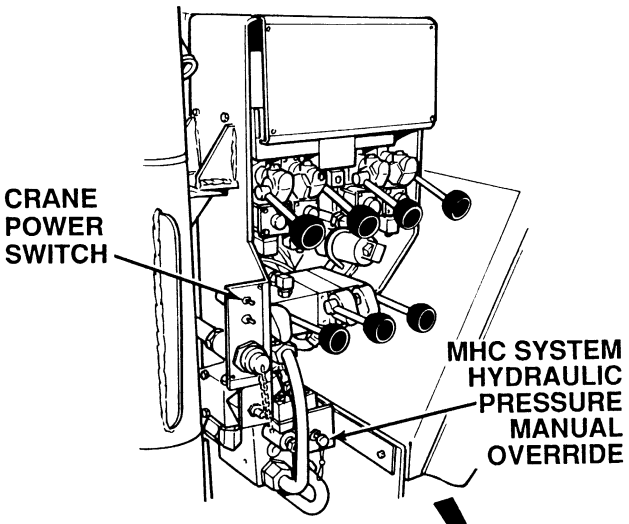


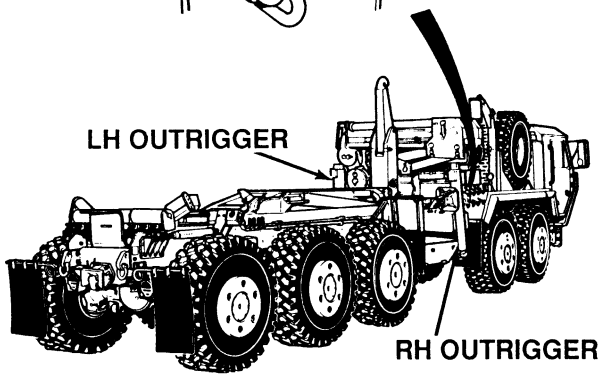
1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).

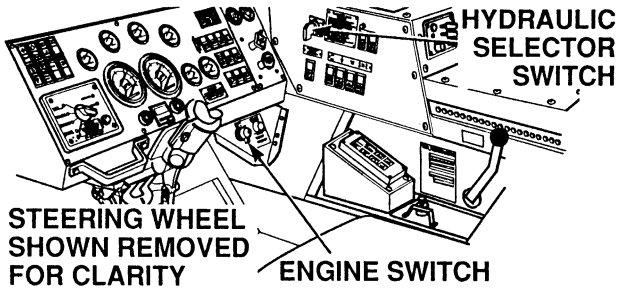


OPERATION TEST

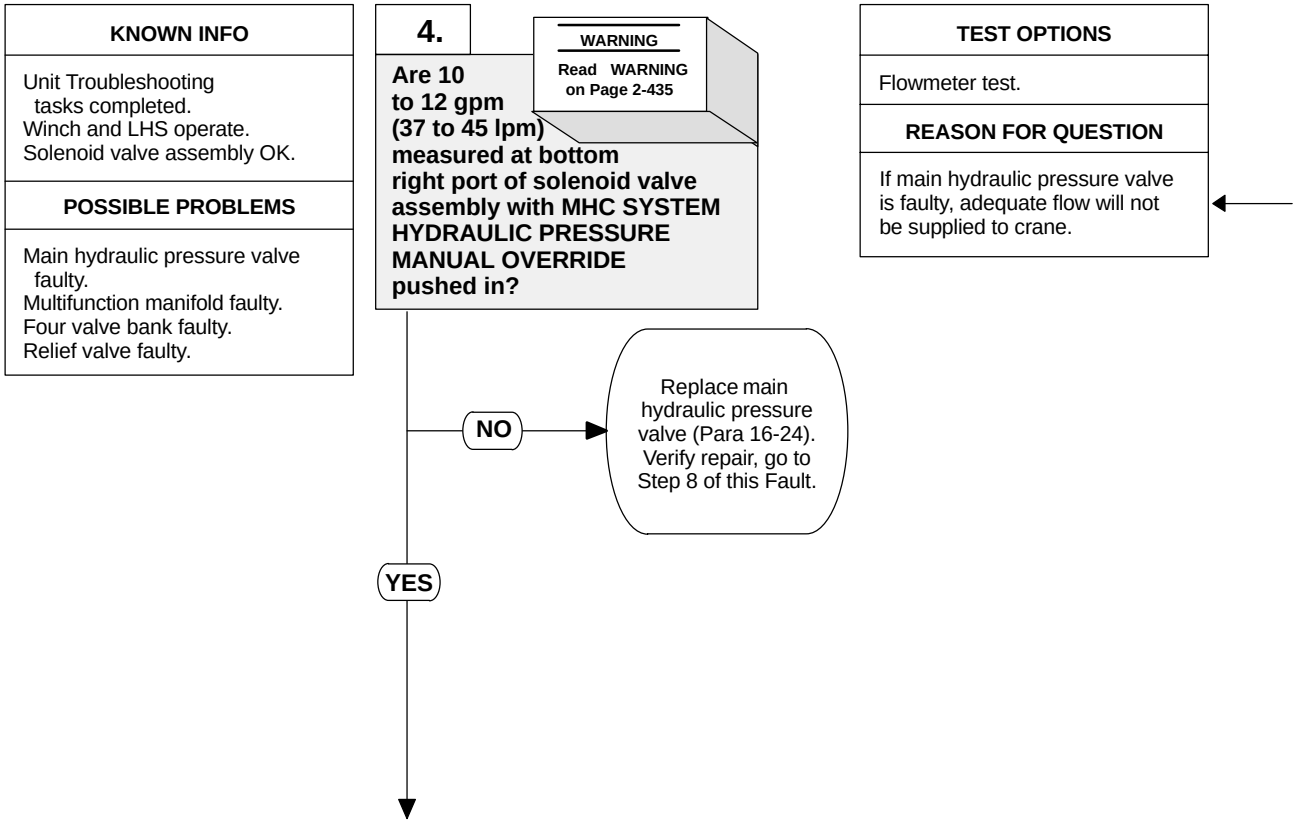
(1) Cut safety wire from MHC SYSTEM HYDRAULIC PRESSURE MANUAL OVERRIDE button.
(2) Push in MHC SYSTEM HYDRAULIC PRESSURE MANUAL OVERRIDE push button.
(3) Attempt to operate outriggers using O/R JACK control levers.
  (a) If outriggers do not operate, perform Steps (4) through (6) below and go Step 4 of this Fault.
  (b) If outriggers operate, perform Steps (4) through (6) below, and repair solenoid valve assembly (Para 16-24).
(4) Set crane POWER switch to OFF position.
(5) Set hydraulic selector switch to OFF position.
(6) Turn OFF ENGINE switch.







1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).



WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

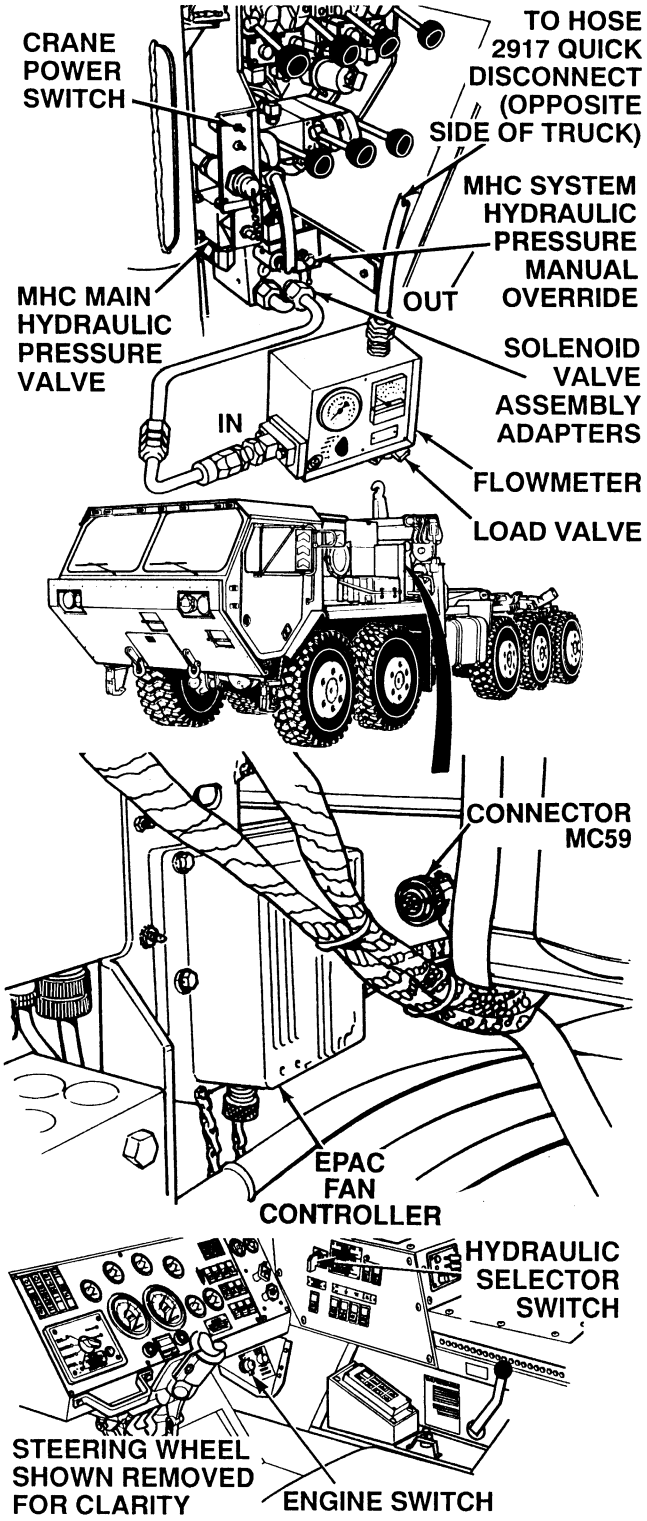
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four screws, lockwashers, nuts, eight washers and cover. Discard lockwashers.
(2) Disconnect tube from four valve bank center manifold elbow. Discard preformed packing.
(3) Disconnect tube from bottom right solenoid valve assembly adapter (below crane hydraulic system manual override). Discard preformed packing.
(4) Install cap on elbow.
(5) Connect adapter hose with preformed packing to solenoid valve assembly adapter.
(6) Connect flowmeter IN port to adapter hose connected to solenoid valve assembly.
(7) Disconnect hose 2917 male quick disconnect from LHS control box female quick disconnect.
(8) Connect adapter hose to hose 2917 quick disconnect.
(9) Connect flowmeter OUT port to adapter hose connected to quick disconnect.
(10) Disconnect high speed fan connector at multifunction valve.
(11) Open flowmeter load valve fully.
(12) Disconnect connector MC59 from EPAC.
(13) Set hydraulic selector switch to CRANE/SRW position.
(14) Start engine (TM 9-2320-364-10).
(15) Set crane POWER switch to ON position.

Continued on next page.



1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).

WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST (CONT).

(16) Push in MHC SYSTEM HYDRAULIC PRESSURE MANUAL OVERRIDE push button.
  (a) If 10 to 12 gpm (38 to 45 lpm) or more are not measured, perform Steps (17) through (25) and replace main hydraulic pressure valve (Para 16-24).
  (b) If 10 to 12 gpm (38 to 45 lpm) are measured, perform Steps (17) through (25) below and go to Step 5 of this Fault.

(17) Set crane POWER switch to OFF position.

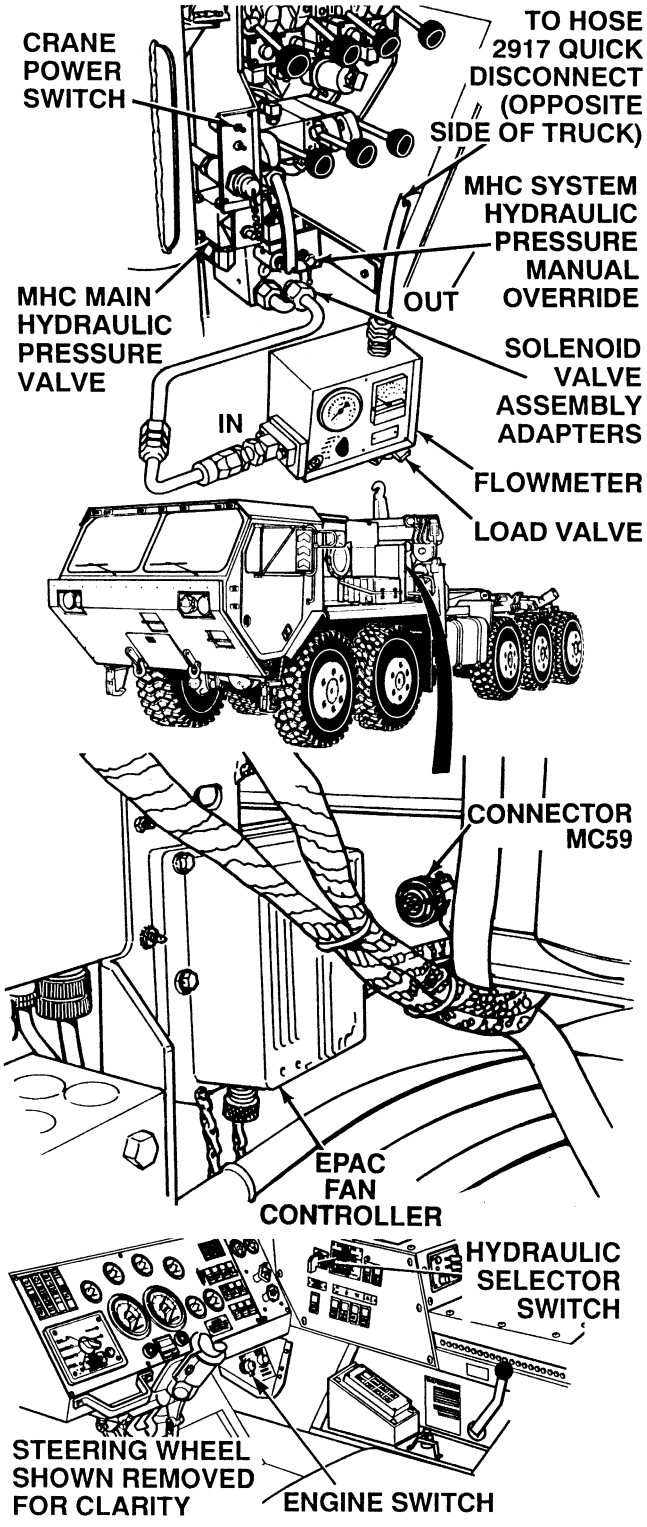
(18) Set hydraulic selector switch to OFF position.

(19) Turn OFF ENGINE switch.

(20) Disconnect adapter hose from hose 2917 quick disconnect.

(21) Connect hose 2917 quick disconnect to LHS control box quick disconnect.

Continued on next page.



WARNING

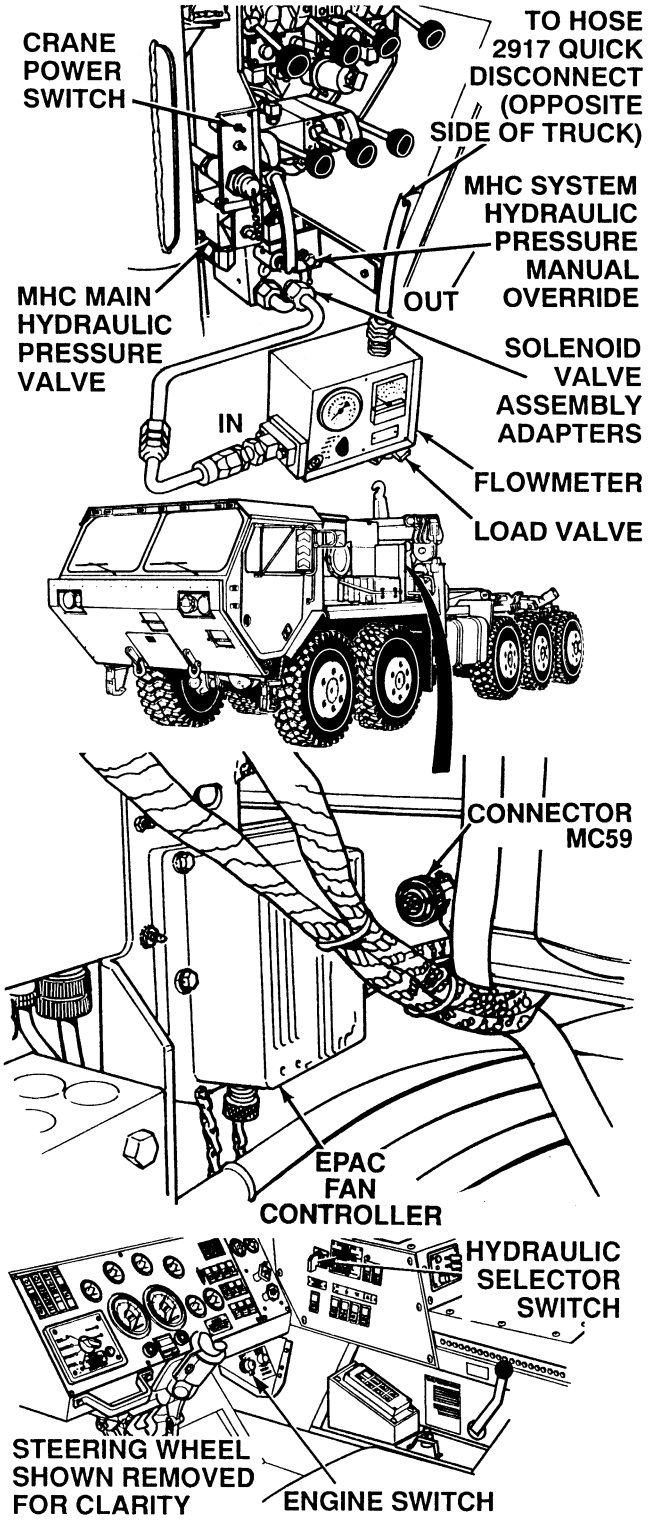
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

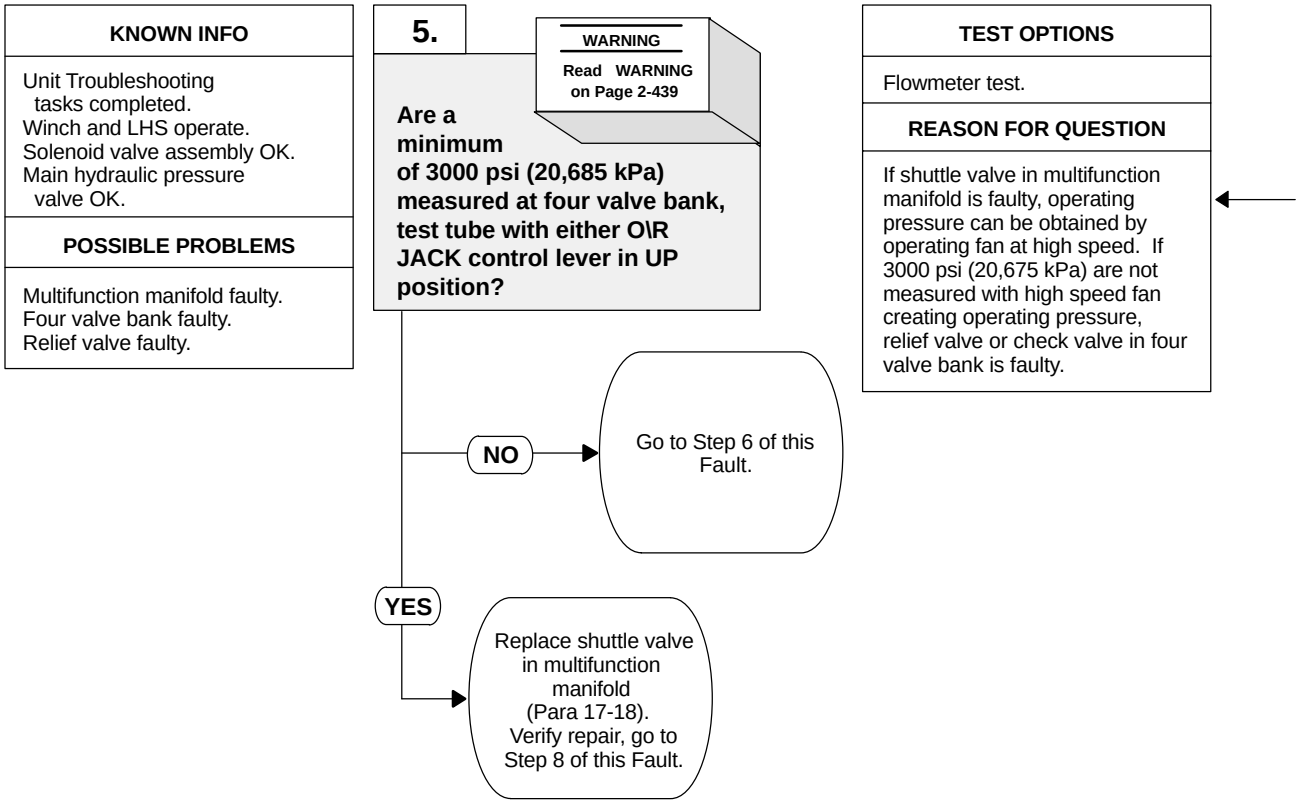
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST (CONT).

(23) Install safety wire on MHC SYSTEM HYDRAULIC PRESSURE MANUAL OVERRIDE button.
(24) Disconnect adapter hose from solenoid valve assembly. Discard preformed packing.
(25) Install tube with preformed packings on solenoid valve adapter and four valve bank elbow.



1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).



WARNING

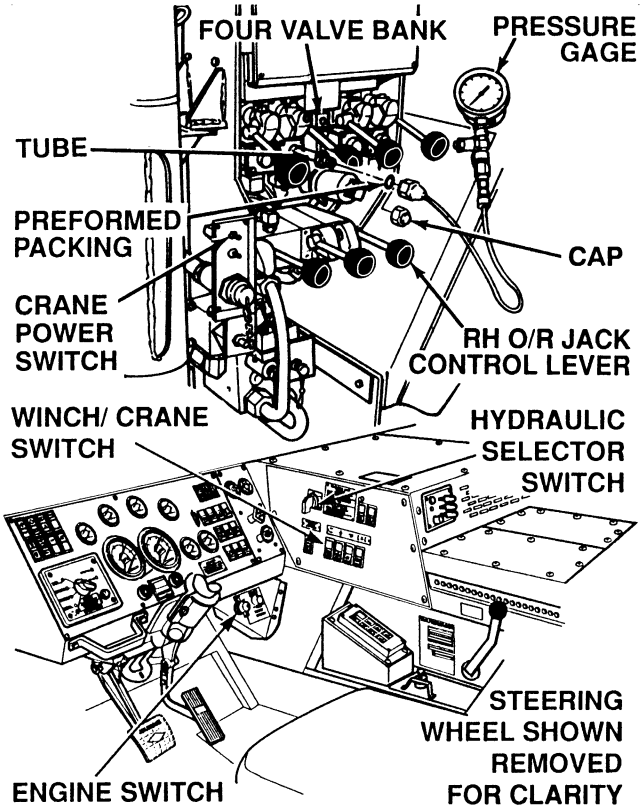
- High pressure hydraulics [oil under 3000 psi (20,675 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

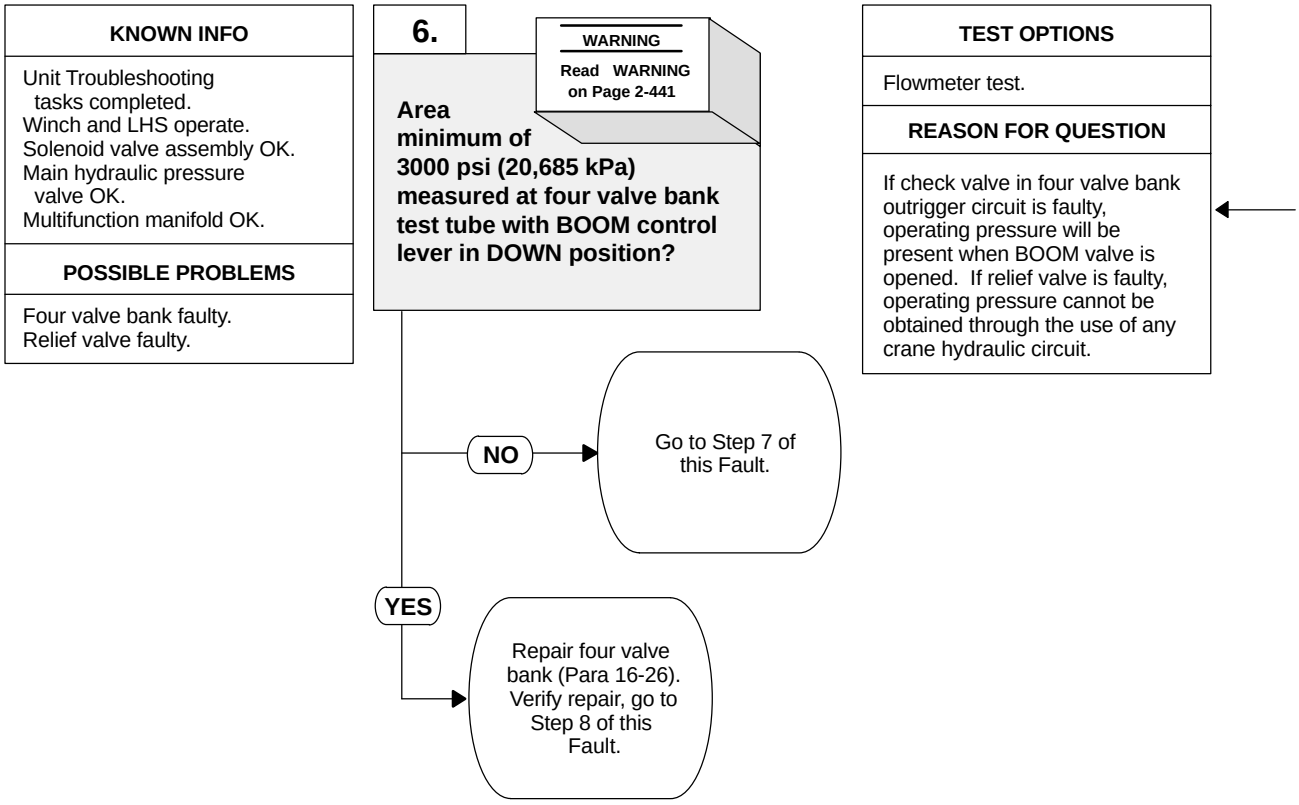
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove cap from tube coming from bottom of four valve bank. Discard preformed packing.
(2) Connect pressure gage with preformed packing to tube.
(3) Set WINCH/CRANE switch to CRANE position (TM 9-2320-364-10).
(4) Start engine.
(5) Set hydraulic selector switch to CRANE/SRW position.
(6) Set crane POWER switch to ON position.
(7) Set crane high idle switch to LATCH.
(8) Hold RH O/R JACK control lever on RH side of truck in UP position.
  (a) If 3000 psi (20,685 kPa) are not measured, go to Step 6 of this Fault.
  (b) If 3000 psi (20,685 kPa) are measured, perform Steps (9) through (13) and replace shuttle valve (Para 17-18).
(9) Set crane POWER switch to OFF position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Disconnect pressure gage from tube. Discard preformed packing.
(13) Install cap with preformed packing on tube.



1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).



WARNING

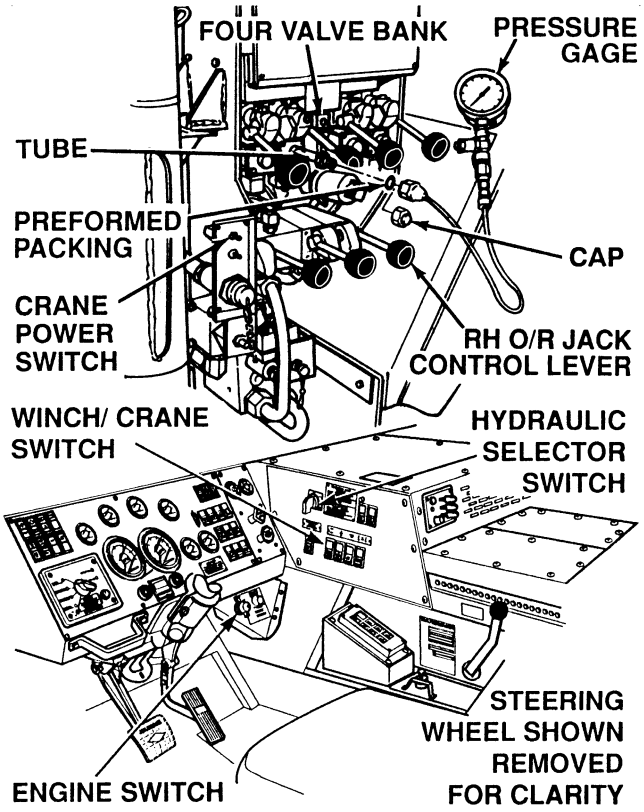
- High pressure hydraulics [oil under 3000 psi (20,675 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

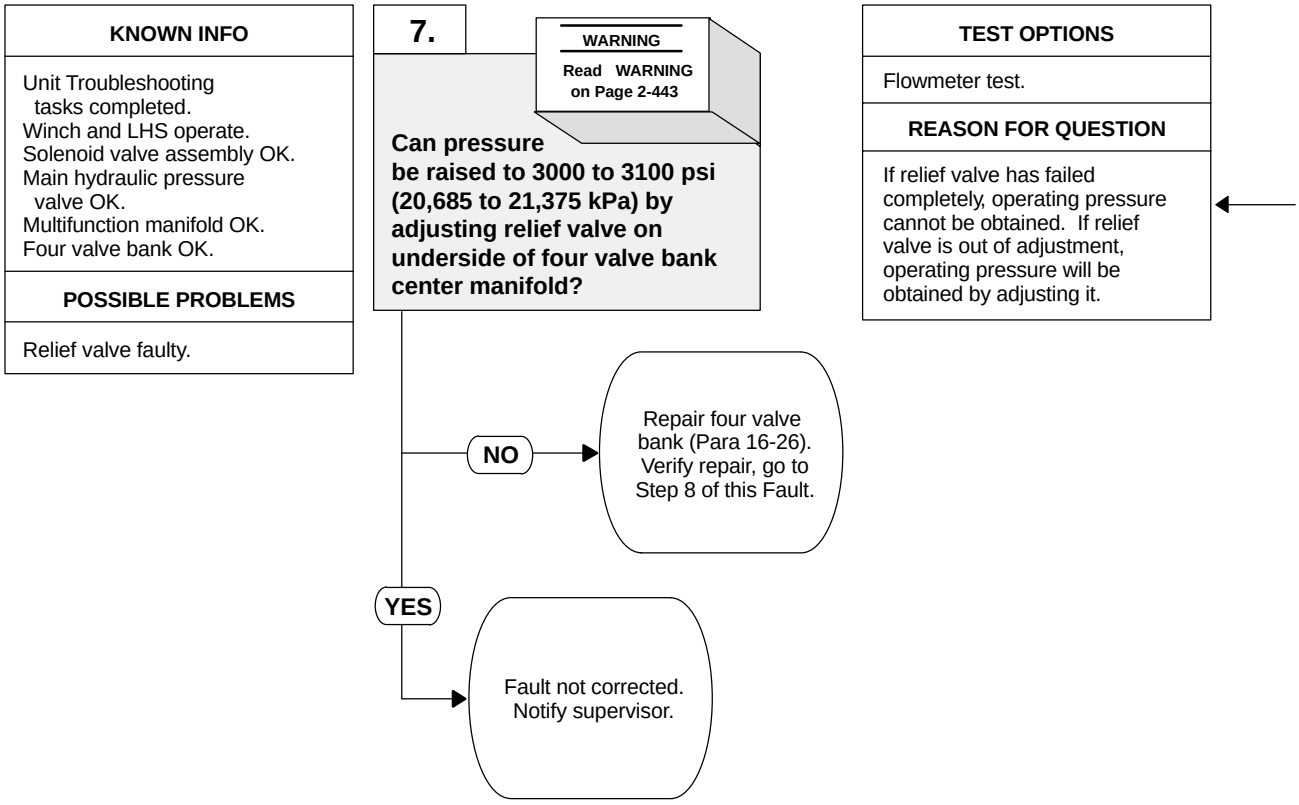
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Hold BOOM control lever in DOWN position (TM 9-2320-364-10).
  (a) If 3000 psi (20,685 kPa) are not measured, go to Step 7 of this Fault.
  (b) If 3000 psi (20,685 kPa) are measured, perform Steps (2) through (6) below and replace check valve in four valve bank center manifold (Para 16-26).
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.
(5) Disconnect pressure gage from tube. Discard preformed packing.
(6) Install cap with preformed packing on tube.



1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).



WARNING

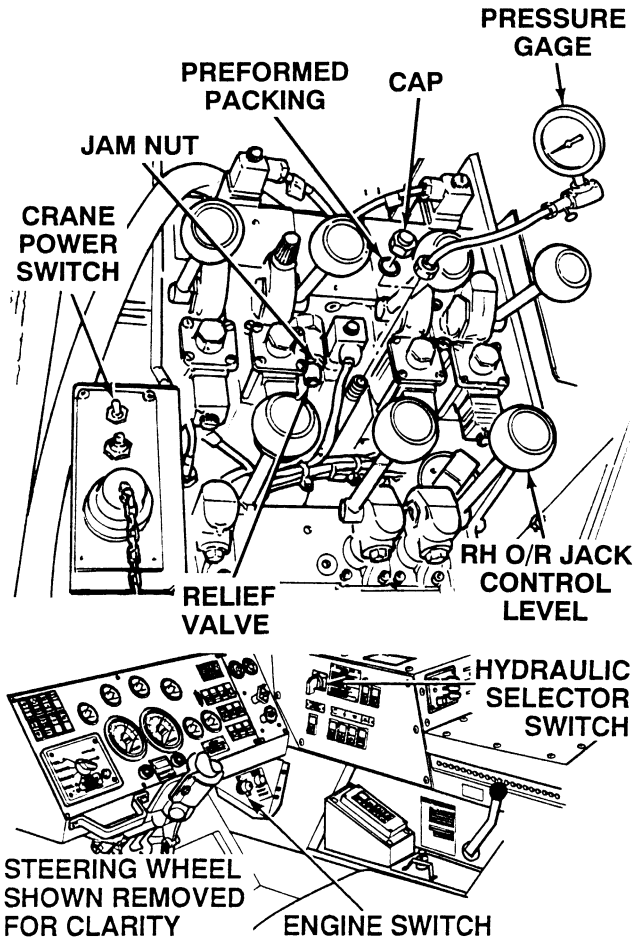
- High pressure hydraulics [oil under 3000 psi (20,675 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

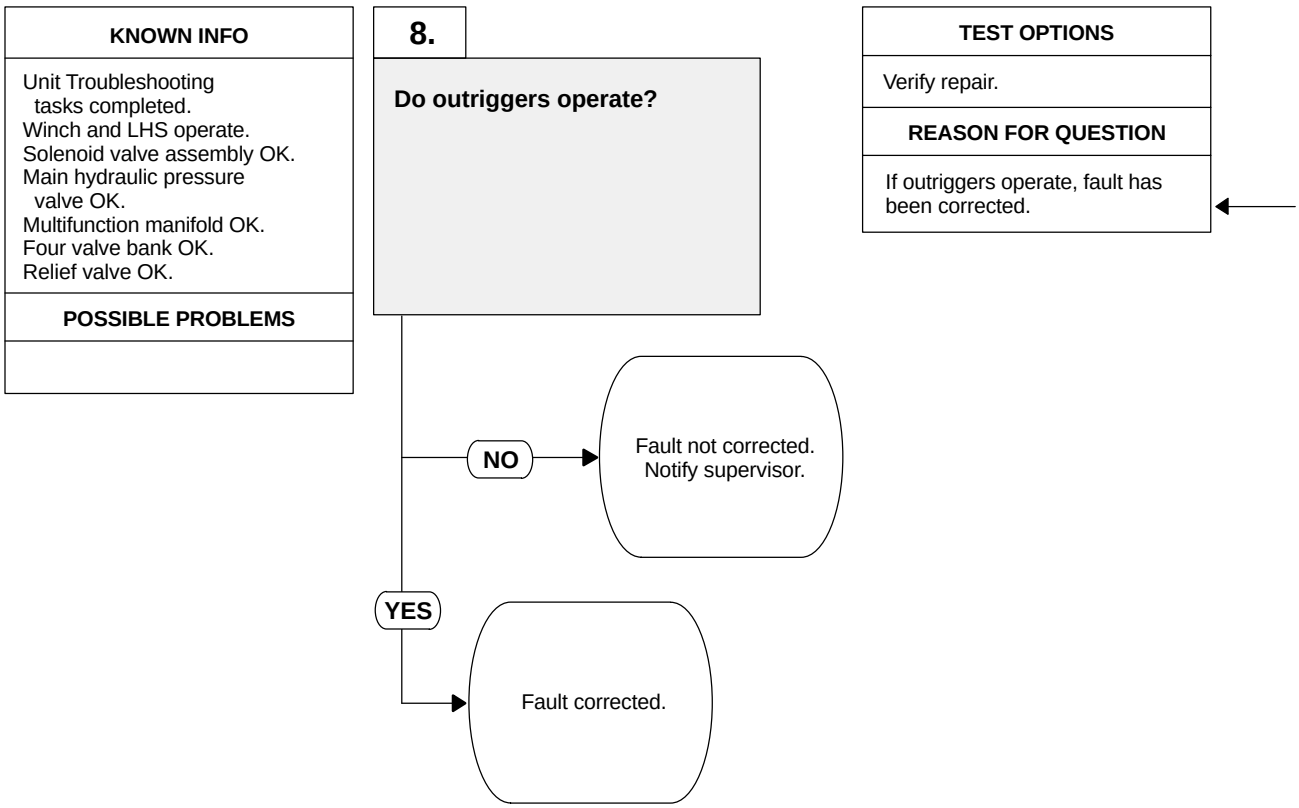
Use a drain pan to catch leaking hydraulic oil.

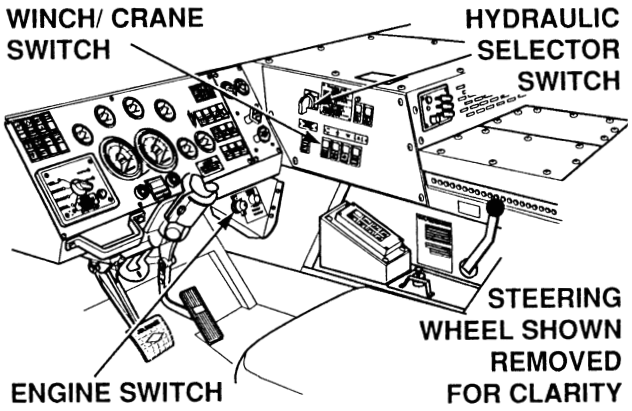
FLOWMETER TEST

(1) Loosen jam nut on relief valve.
(2) Hold RH O/R JACK control lever on RH side of truck in UP position (TM 9-2320-364-10).
(3) Adjust relief valve by turning screw left or right and observe pressure gage.
  (a) If 3000 to 3100 psi (20,685 to 21,375 kPa) cannot be obtained, perform Steps (4) through (9) below and repair four valve bank center manifold (Para 16-26).
  (b) If 3000 to 3100 psi (20,685 to 21,375 kPa) can be obtained, perform Steps (4) through (8) below and notify supervisor.
(4) Tighten jam nut on relief valve.
(5) Set crane POWER switch to OFF position.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.
(8) Disconnect pressure gage from tube. Discard preformed packing.
(9) Install cap with preformed packing on tube.



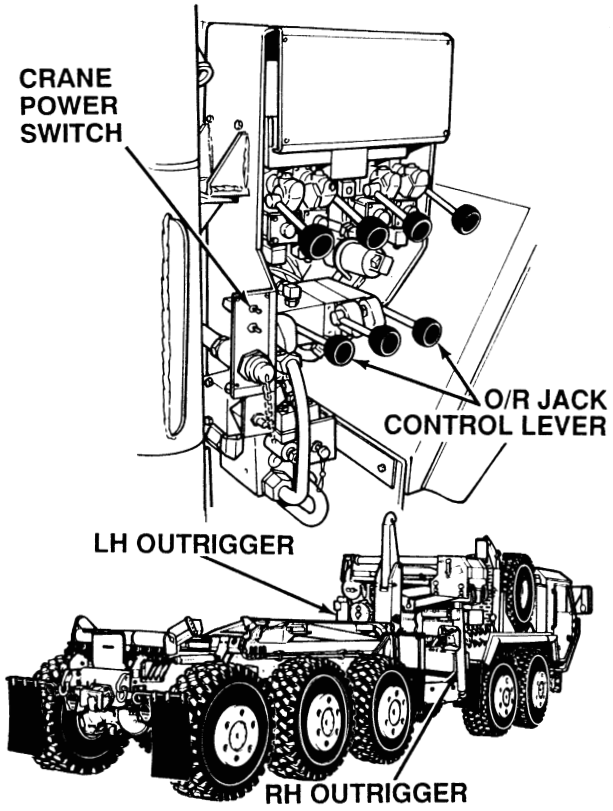
1. OUTRIGGERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).





VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Set WINCH/CRANE switch to CRANE position.
(4) Set hydraulic selector switch to CRANE/SRW position.
(5) Set crane POWER switch to ON position.
(6) Operate outriggers using O/R JACK control levers.
    (a) If outriggers do not operate, fault not corrected. Perform Steps (7) through (10) below and notify supervisor.
    (b) If outriggers operate, fault has been corrected.
(7) Raise outriggers completely.
(8) Set crane POWER switch to OFF position.
(9) Set hydraulic selector switch to OFF position.
(10) Turn OFF ENGINE switch.



2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

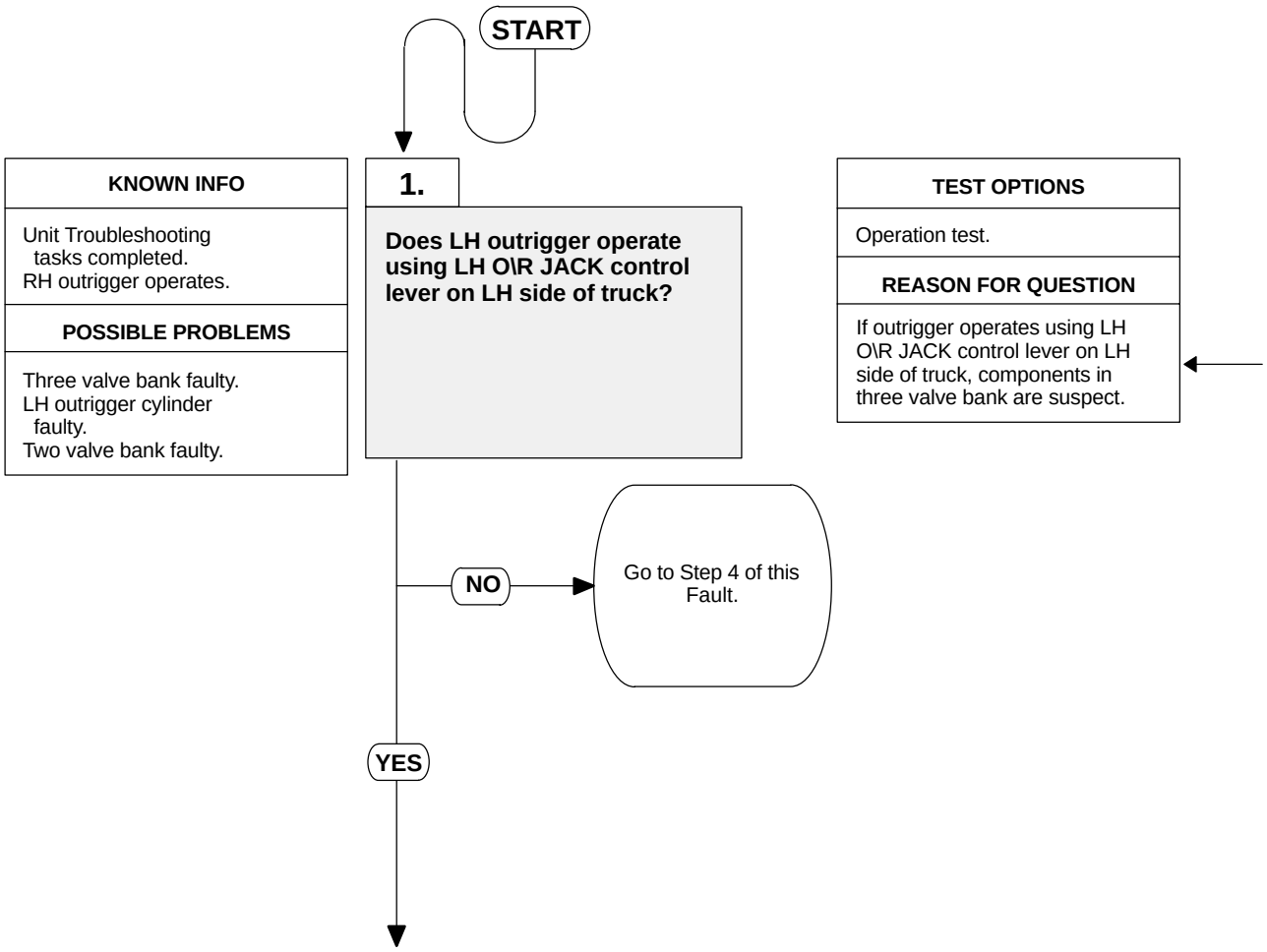
2. LH OUTRIGGER DOES NOT OPERATE.

INITIAL SETUP

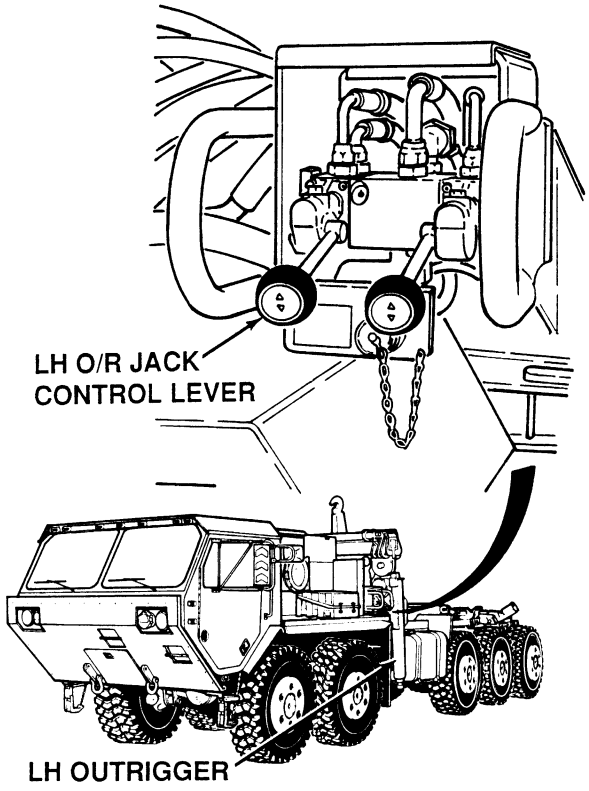
Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)

References
TM 9-2320-364-10

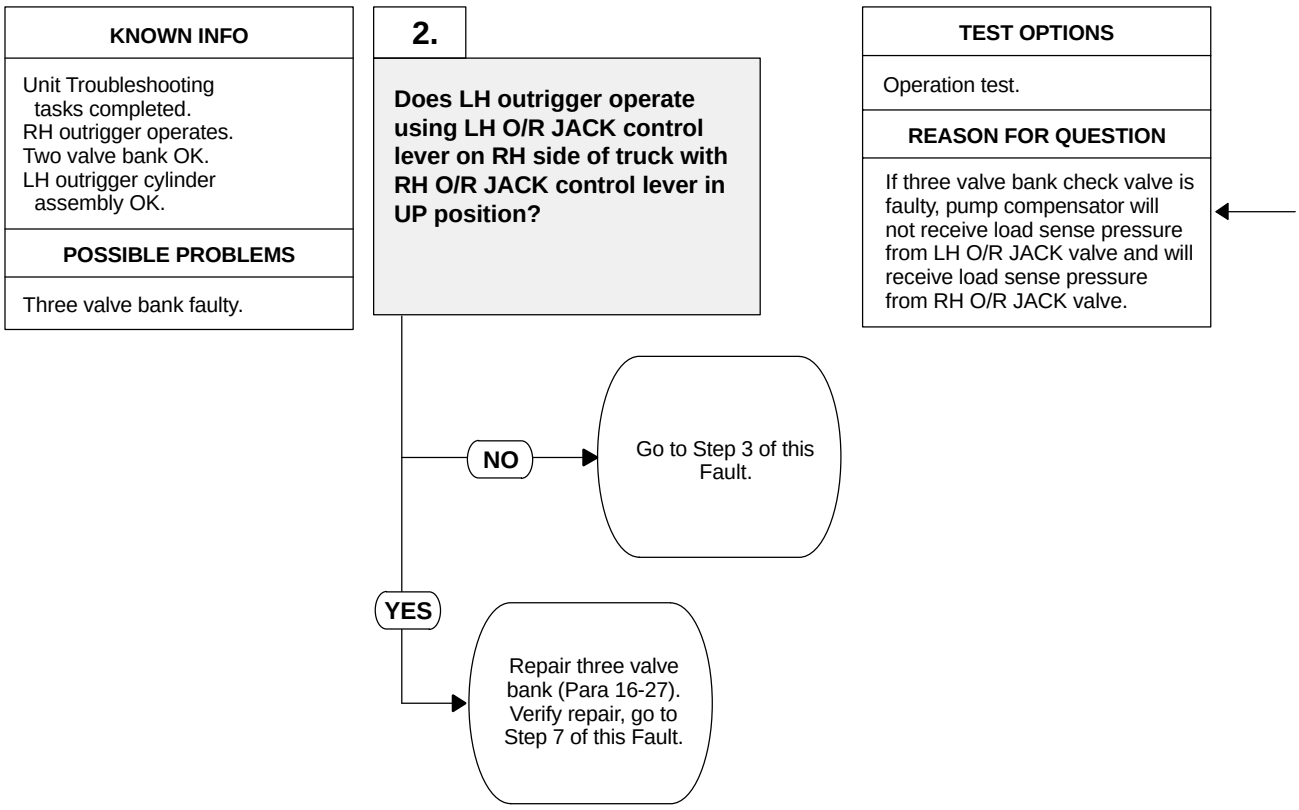
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



OPERATION TEST
Operate LH outrigger using LH O/R JACK control lever on LH side of truck (TM 9-2320-364-10). (1) If LH outrigger does not operate, go to Step 4 of this Fault. (2) If LH outrigger operates, go to Step 2 of this Fault.

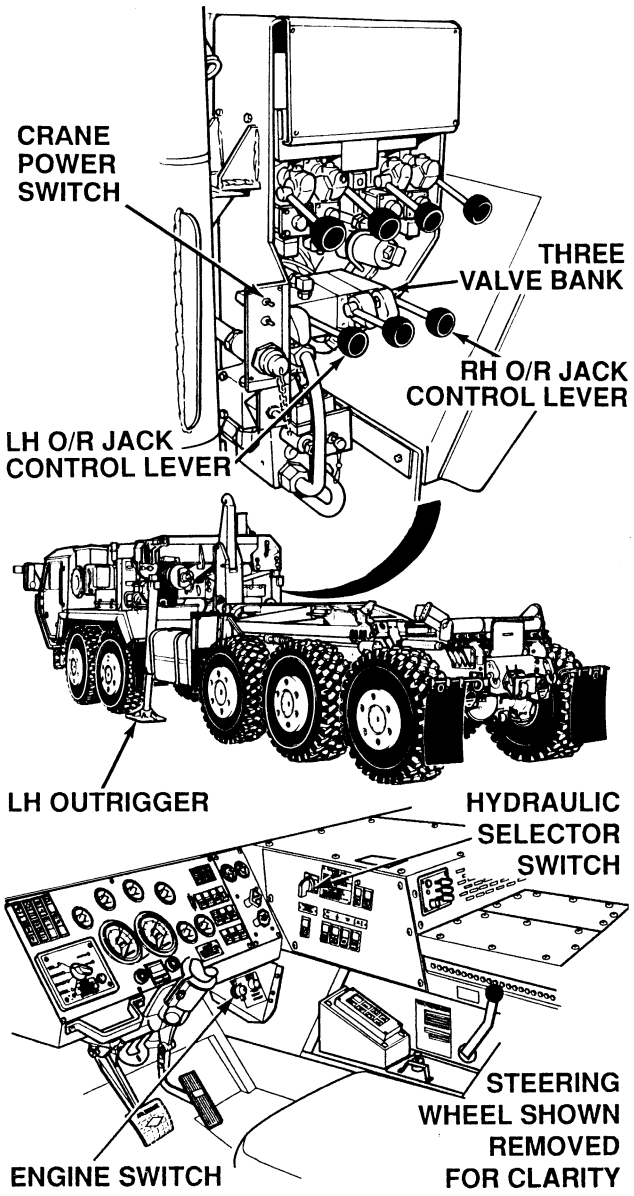


2. LH OUTRIGGER DOES NOT OPERATE (CONT).

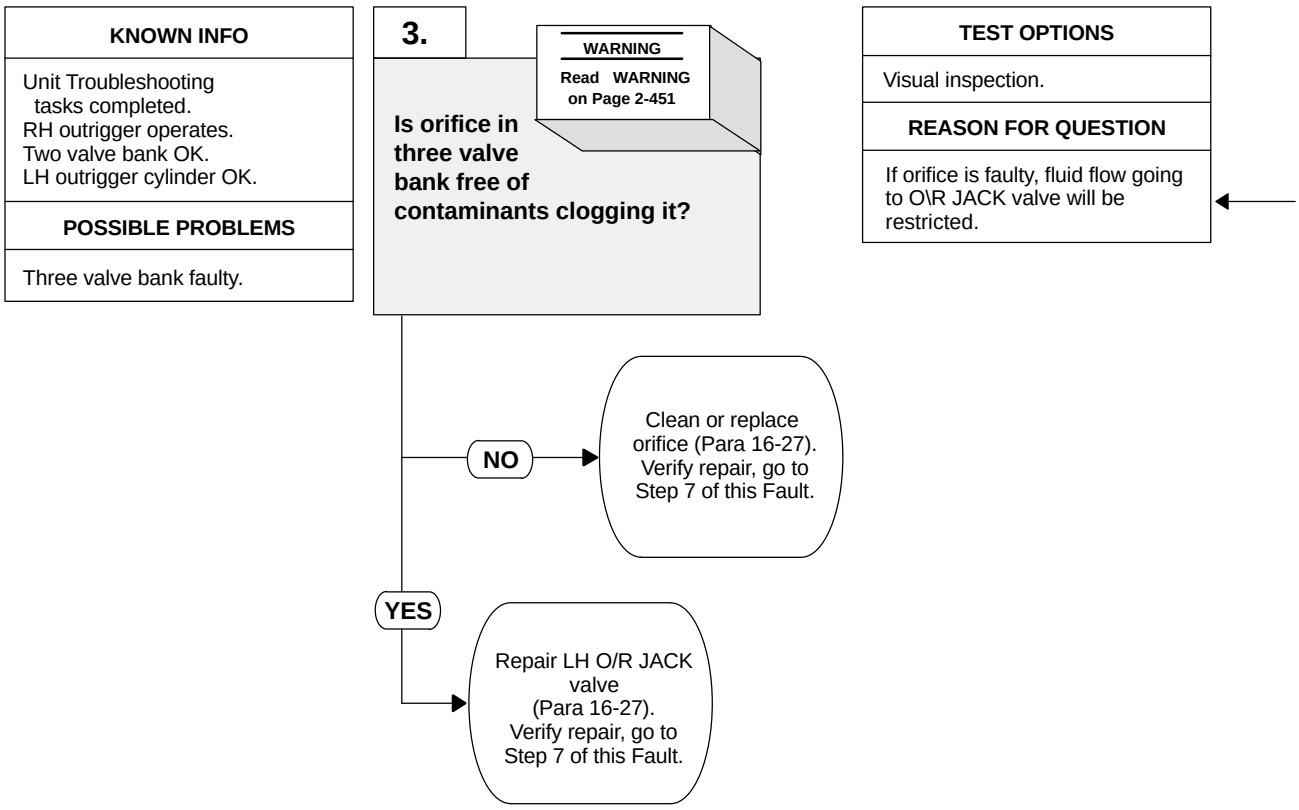


OPERATION TEST

(1) Operate LH outrigger using LH O/R JACK control lever on RH side of truck while holding RH O/R JACK control lever in UP position (TM 9-2320-364-10).
   (a) If LH outrigger does not operate with RH O/R JACK control lever in UP position, perform Steps (2) through (4) below and go to Step 3 of this Fault.
   (b) If LH outrigger operates, check valve in three valve bank is faulty. Perform Steps (2) through (4) below and repair three valve bank (Para 16-27).
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.



2. LH OUTRIGGER DOES NOT OPERATE (CONT).



WARNING

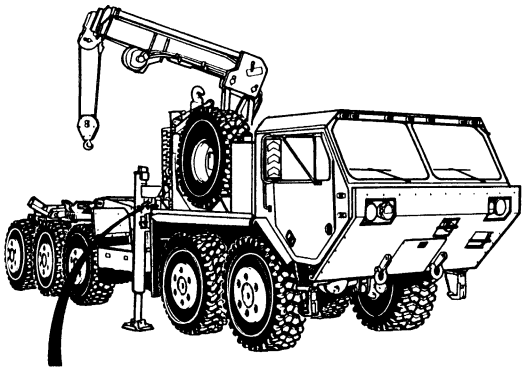
- High pressure hydraulics [oil under 3000 psi (20,675 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

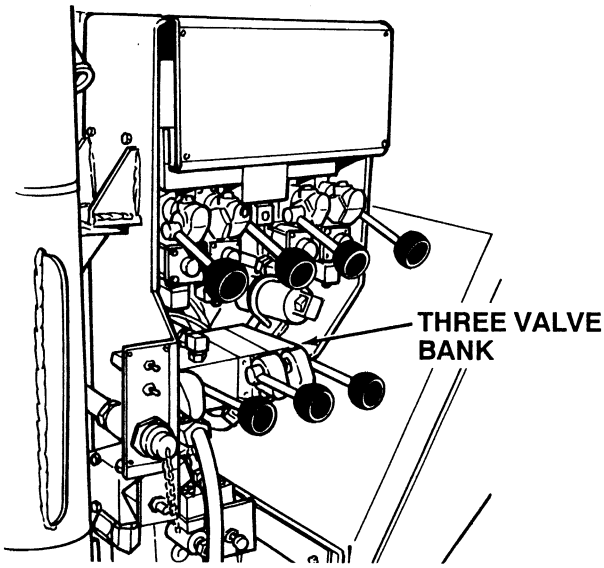
NOTE

Use a drain pan to catch leaking hydraulic oil.

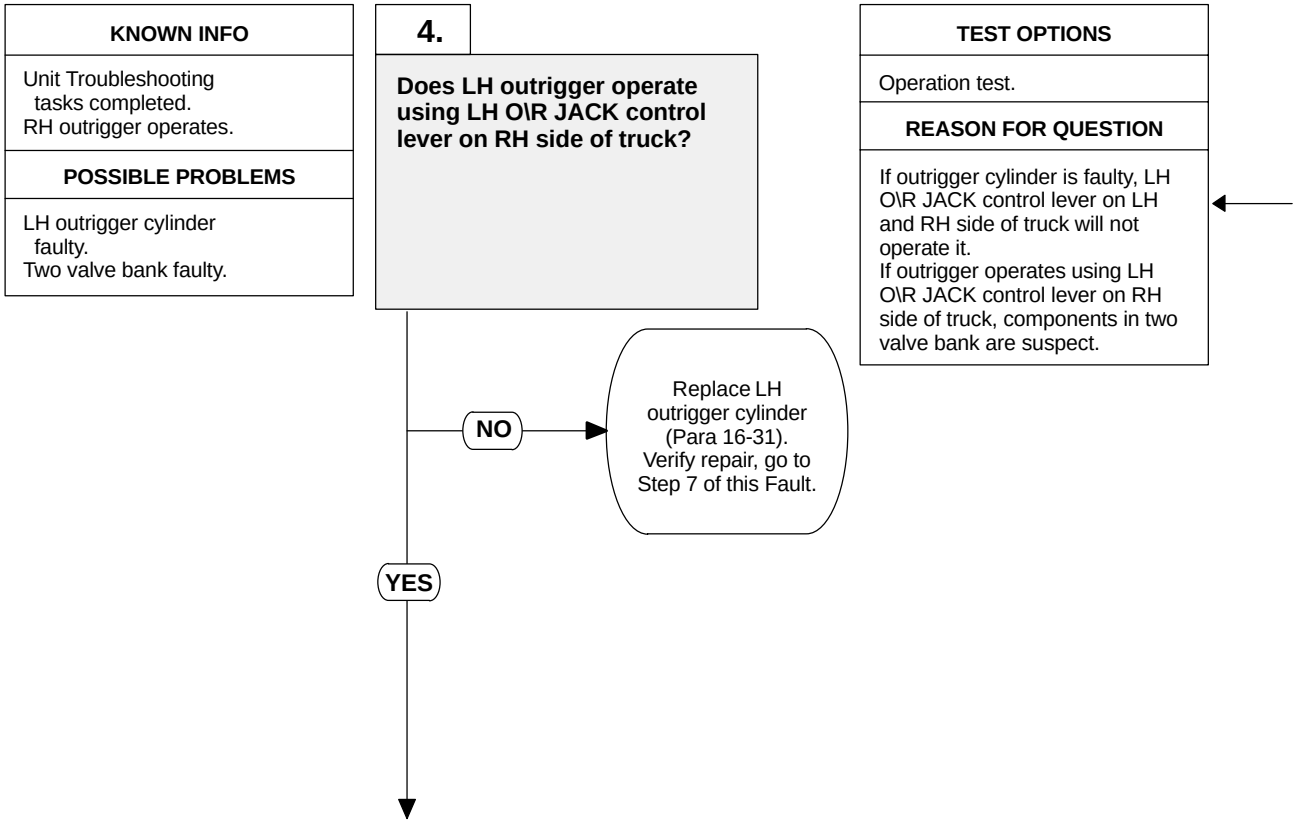
VISUAL INSPECTION

(1) Remove three valve bank from crane (Para 16-27).
(2) Remove valves from three valve bank body (Para 16-27).
(3) Remove orifice from LH O/R JACK control valve (Para 16-27).
  (a) If orifice is clogged or damaged, replace orifice (Para 16-27) and perform Steps (4) and (5) below.
  (b) If orifice is OK, repair LH O/R JACK valve (Para 16-27) and perform Steps (4) and (5) below.
(4) Assemble three valve bank (Para 16-27).
(5) Install three valve bank on crane (Para 16-27).



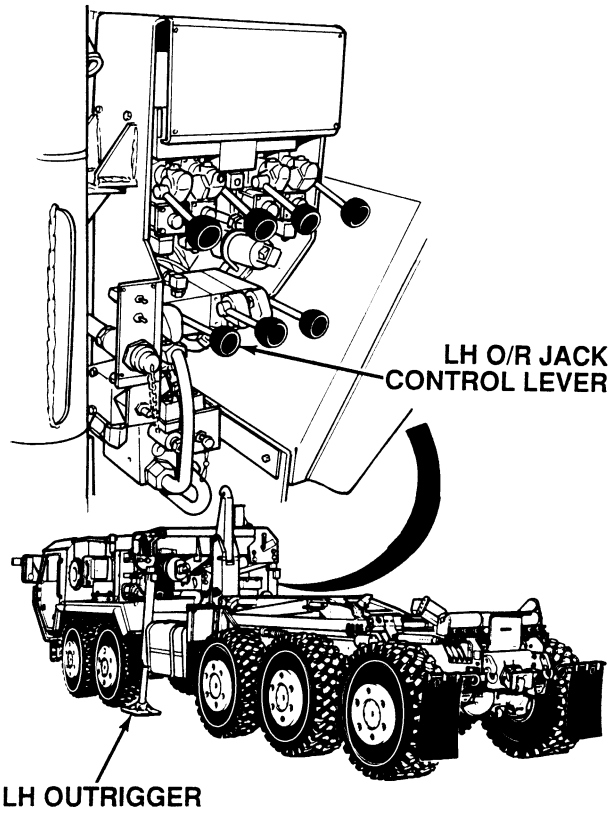


2. LH OUTRIGGER DOES NOT OPERATE (CONT).

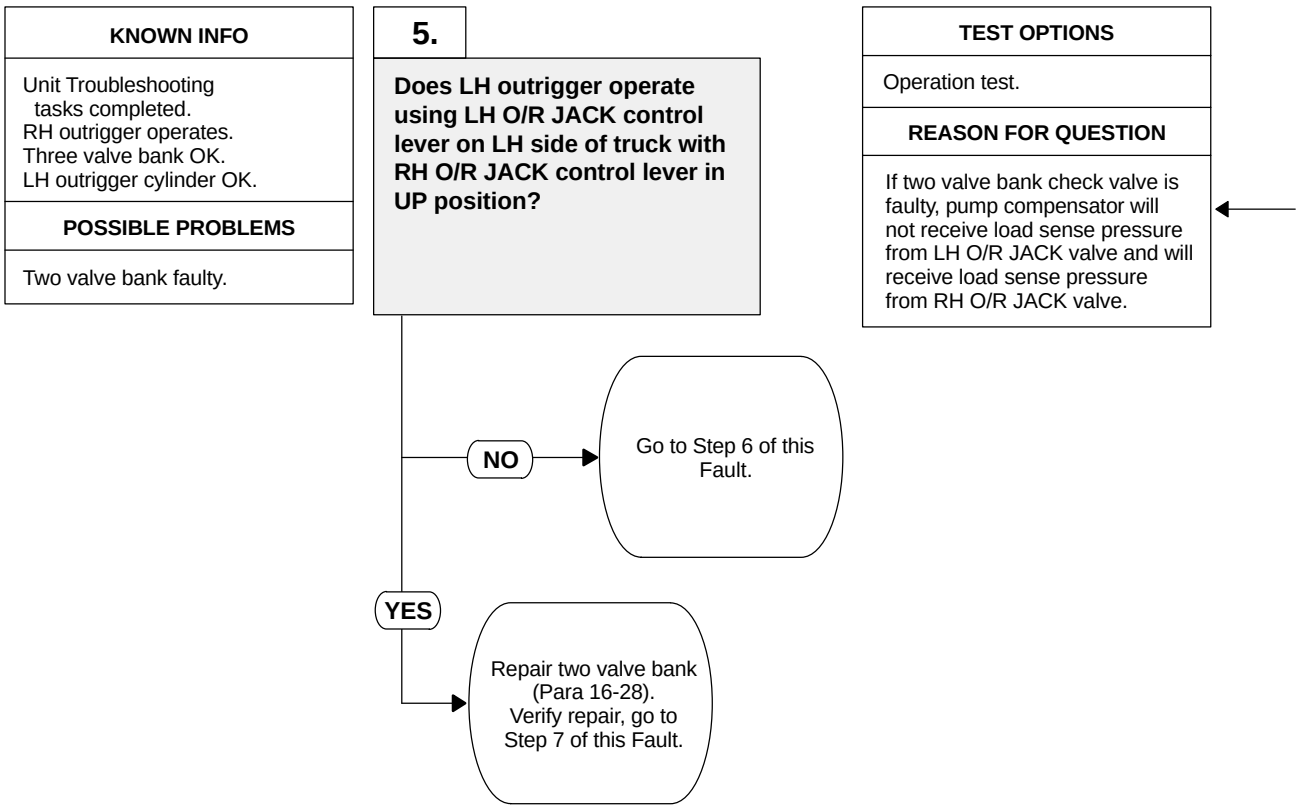


OPERATION TEST

(1) Operate LH outrigger using LH O/R JACK control lever on RH side of truck (TM 9-2320-364-10).
   (a) If LH outrigger does not operate, LH outrigger cylinder is faulty. Perform Steps (2) through (4) below and replace outrigger cylinder (Para 16-31).
   (b) If LH outrigger operates, go to Step 5 of this Fault.
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.

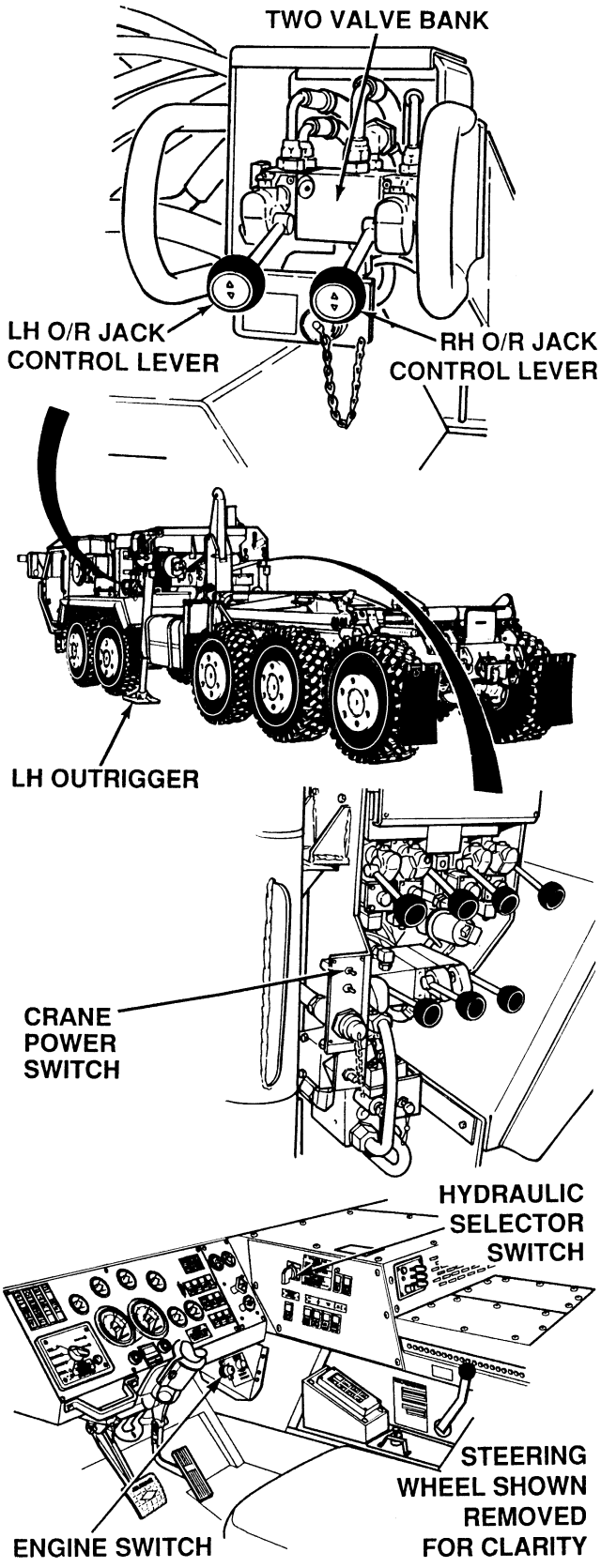


2. LH OUTRIGGER DOES NOT OPERATE (CONT).

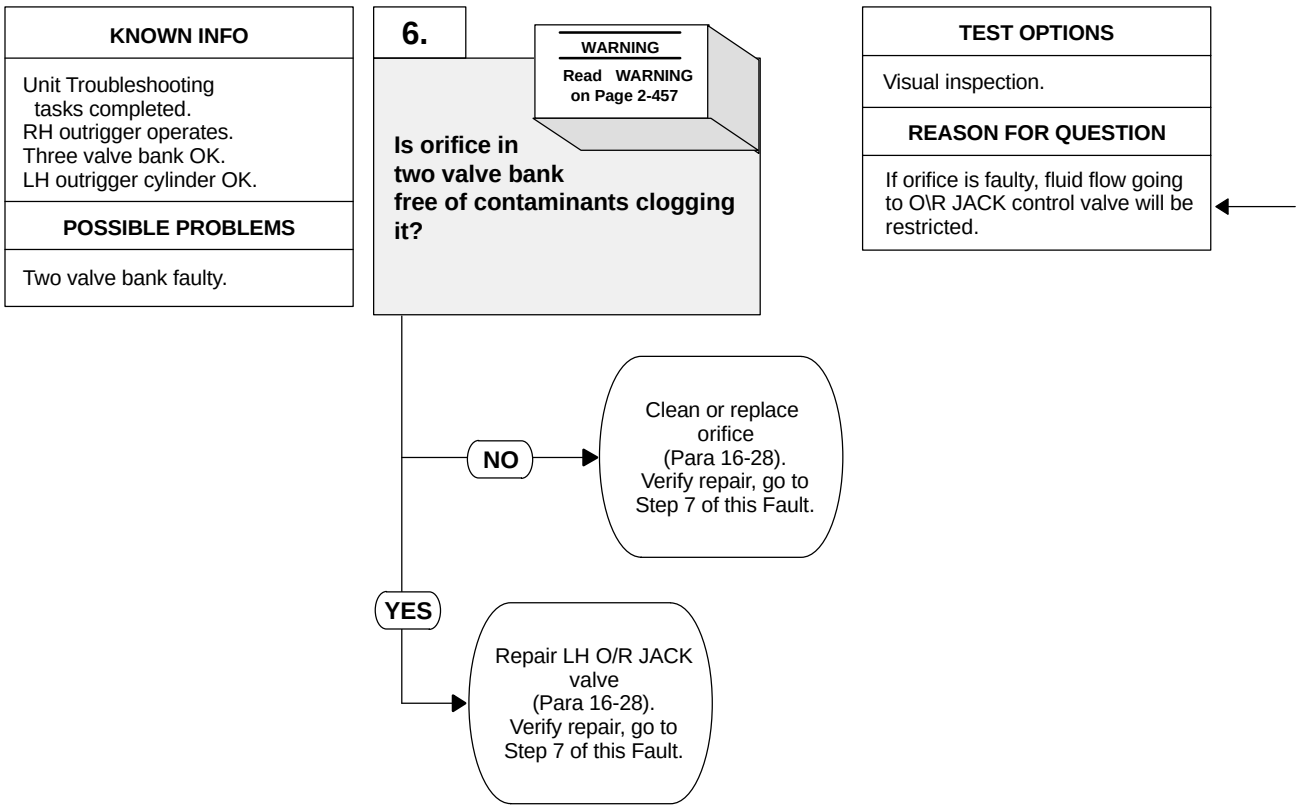


OPERATION TEST

(1) Operate LH outrigger using LH O/R JACK control lever on LH side of truck while holding RH O/R JACK control lever in UP position (TM 9-2320-364-10).
   (a) If LH outrigger does not operate with RH O/R JACK control lever in UP position, perform Steps (2) through (4) below and go to Step 6 of this Fault.
   (b) If LH outrigger operates, check valve in two valve bank is faulty. Perform Steps (2) through (4) below and repair two valve bank (Para 16-28).
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.



2. LH OUTRIGGER DOES NOT OPERATE (CONT).



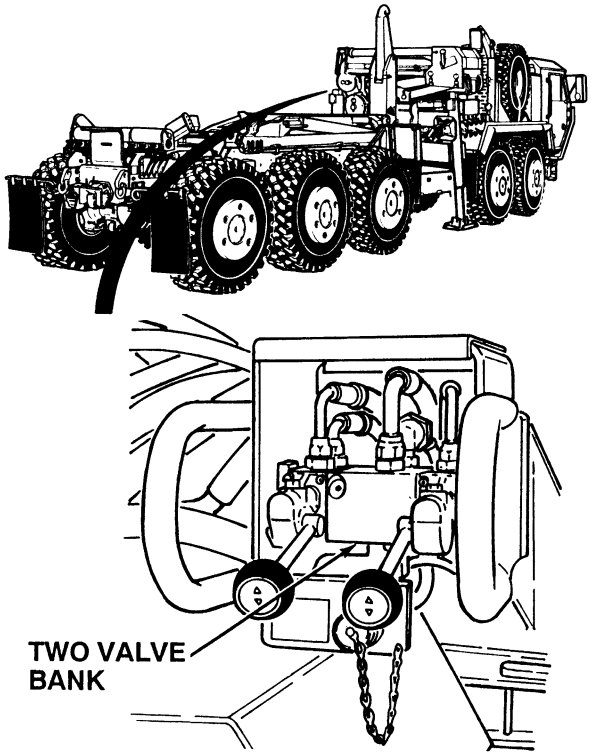
WARNING

- High pressure hydraulics [oil under 3000 psi (20,675 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

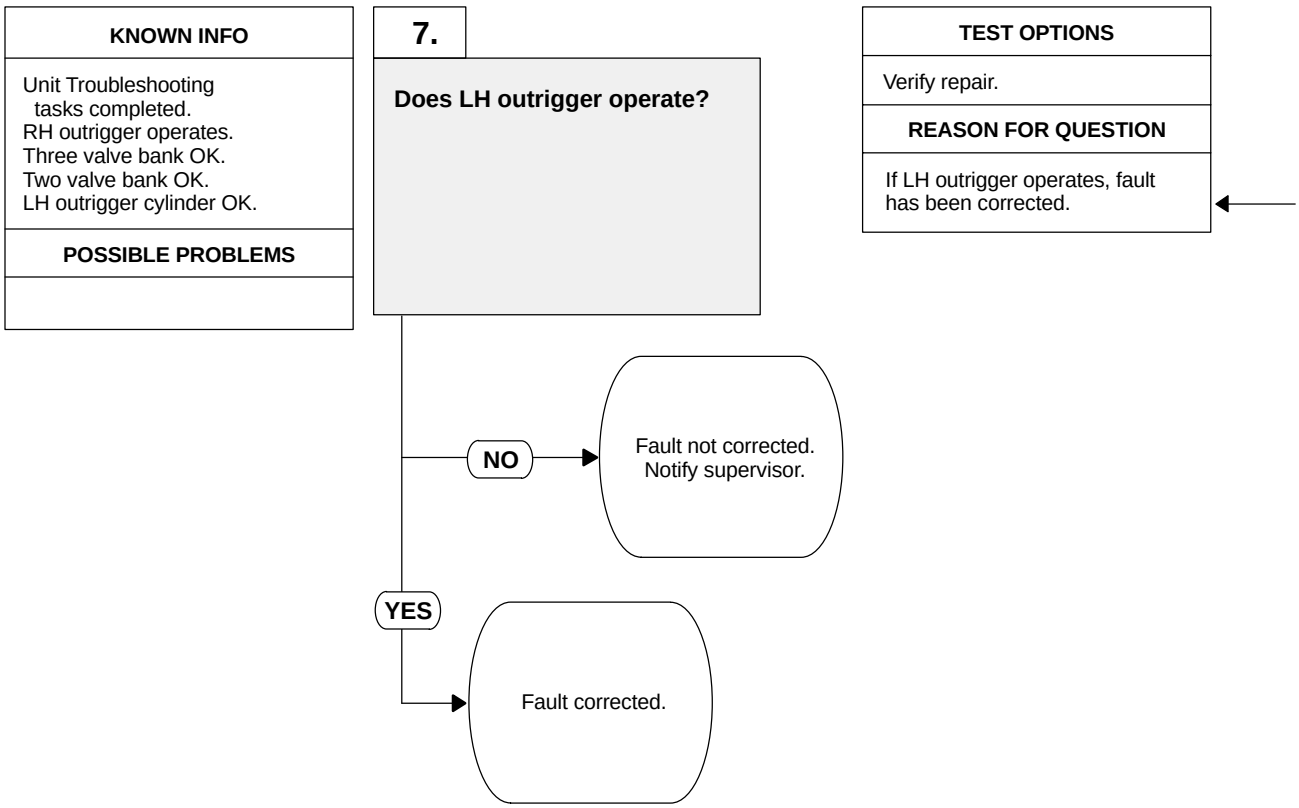
NOTE

Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION
(1) Remove two valve bank from crane (Para 16-28). (2) Remove control valves from two valve bank body (Para 16-28). (3) Remove orifice from LH O/R JACK valve (Para 16-28). (a) If orifice is clogged or damaged, replace orifice (Para 16-28). (b) If orifice is OK, repair LH O/R JACK valve (Para 16-28) and perform Steps (4) and (5) below. (4) Assemble two valve bank (Para 16-28). (5) Install two valve bank on crane (Para 16-28).

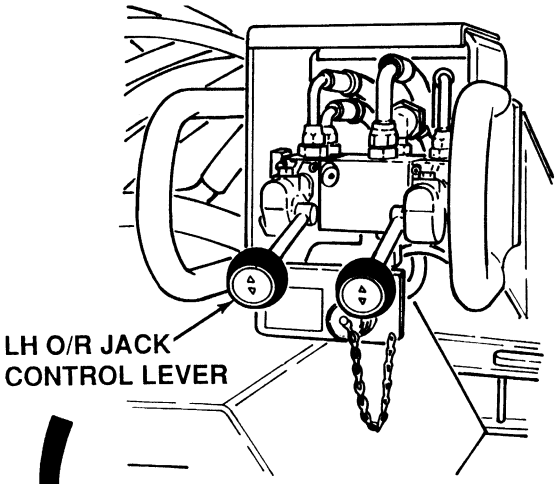


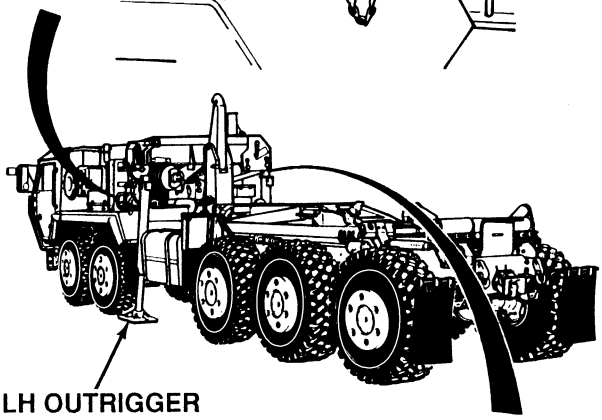
2. LH OUTRIGGER DOES NOT OPERATE (CONT).

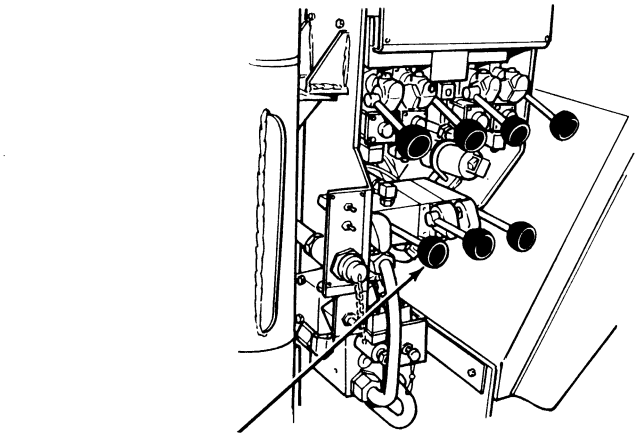


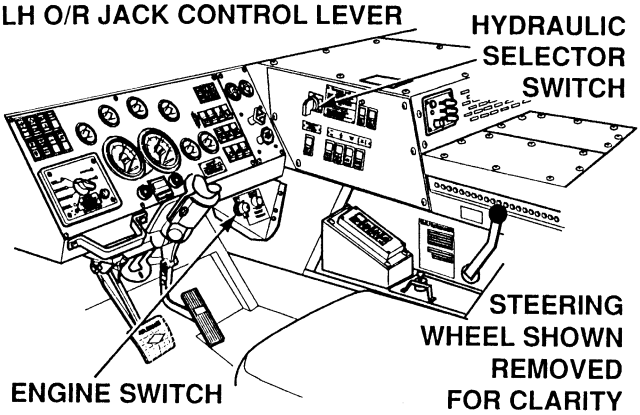
VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to CRANE/SRW position.
(3) Turn ON crane POWER switch.
(4) Operate LH outrigger using LH O/R JACK control levers on both LH and RH sides of truck.
    (a) If LH outrigger does not operate fault not corrected. Perform Steps (5) through (7) below and notify supervisor.
    (b) If LH outrigger operates, fault has been corrected.
(5) Set crane POWER switch to OFF position.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.









2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

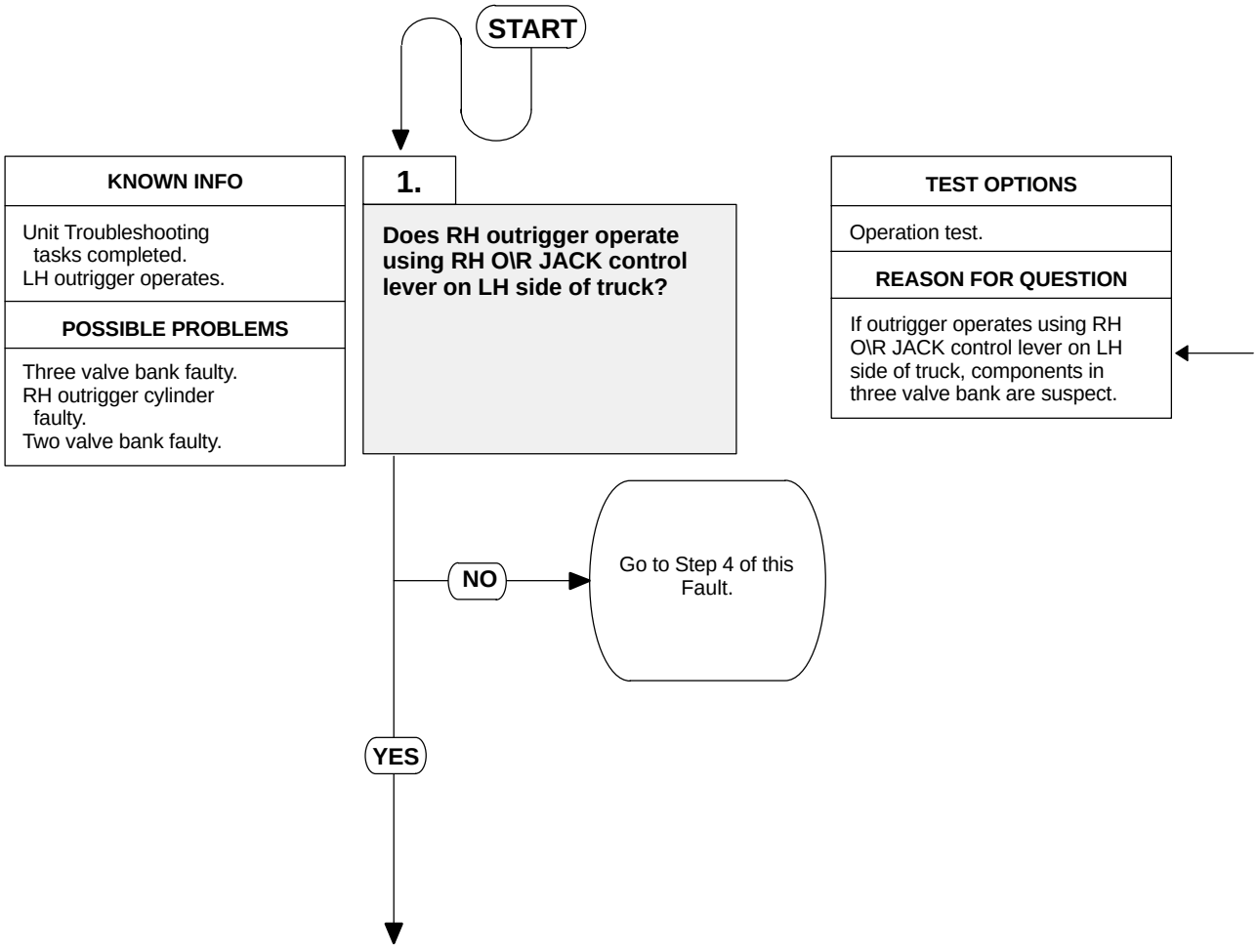
3. RH OUTRIGGER DOES NOT OPERATE.

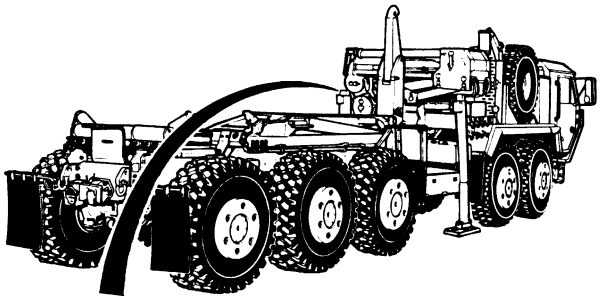
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)

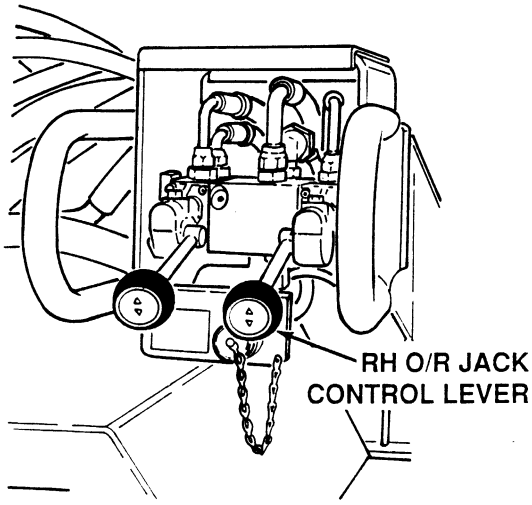




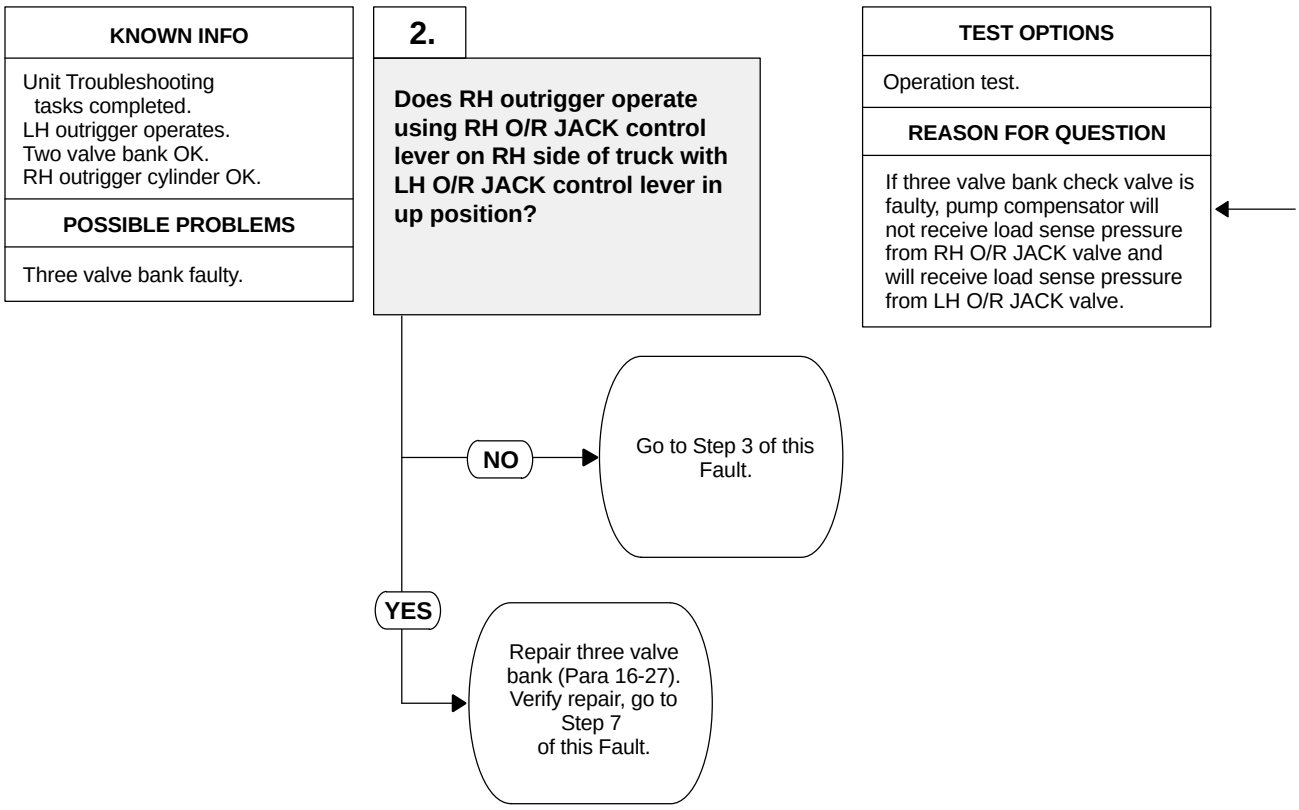
OPERATION TEST

Operate RH outrigger using RH O/R JACK control lever on LH side of truck (TM 9-2320-364-10).

(1) If RH outrigger does not operate, go to Step 4 of this Fault.
(2) If RH outrigger operates, go to Step 2 of this Fault.

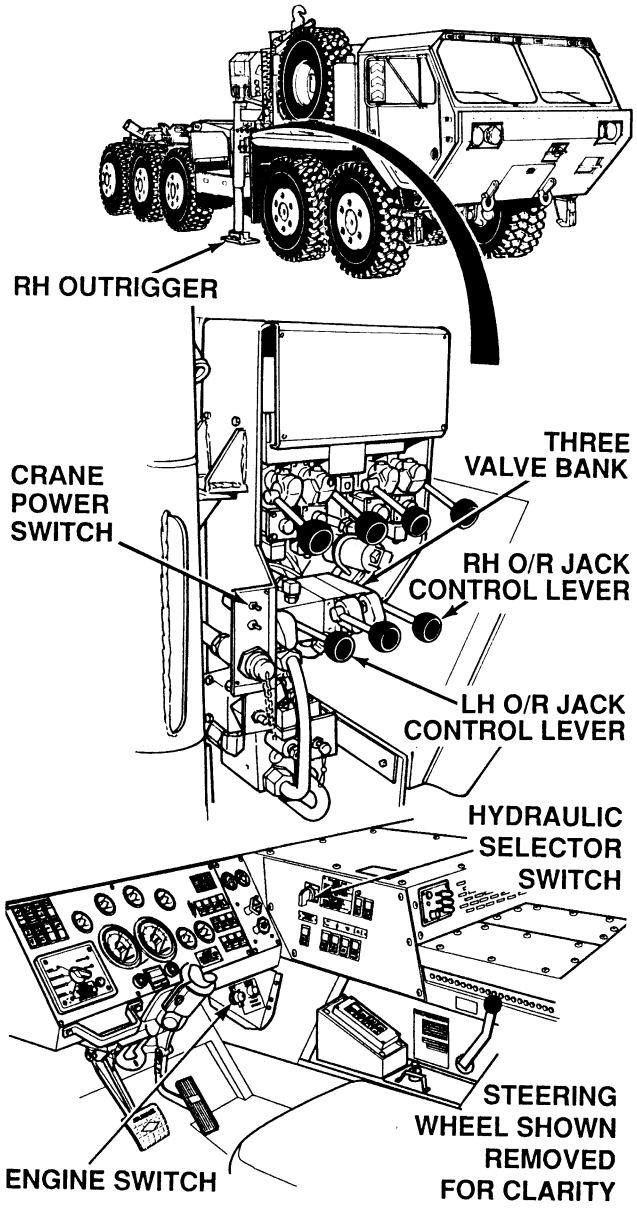


3. RH OUTRIGGER DOES NOT OPERATE (CONT).

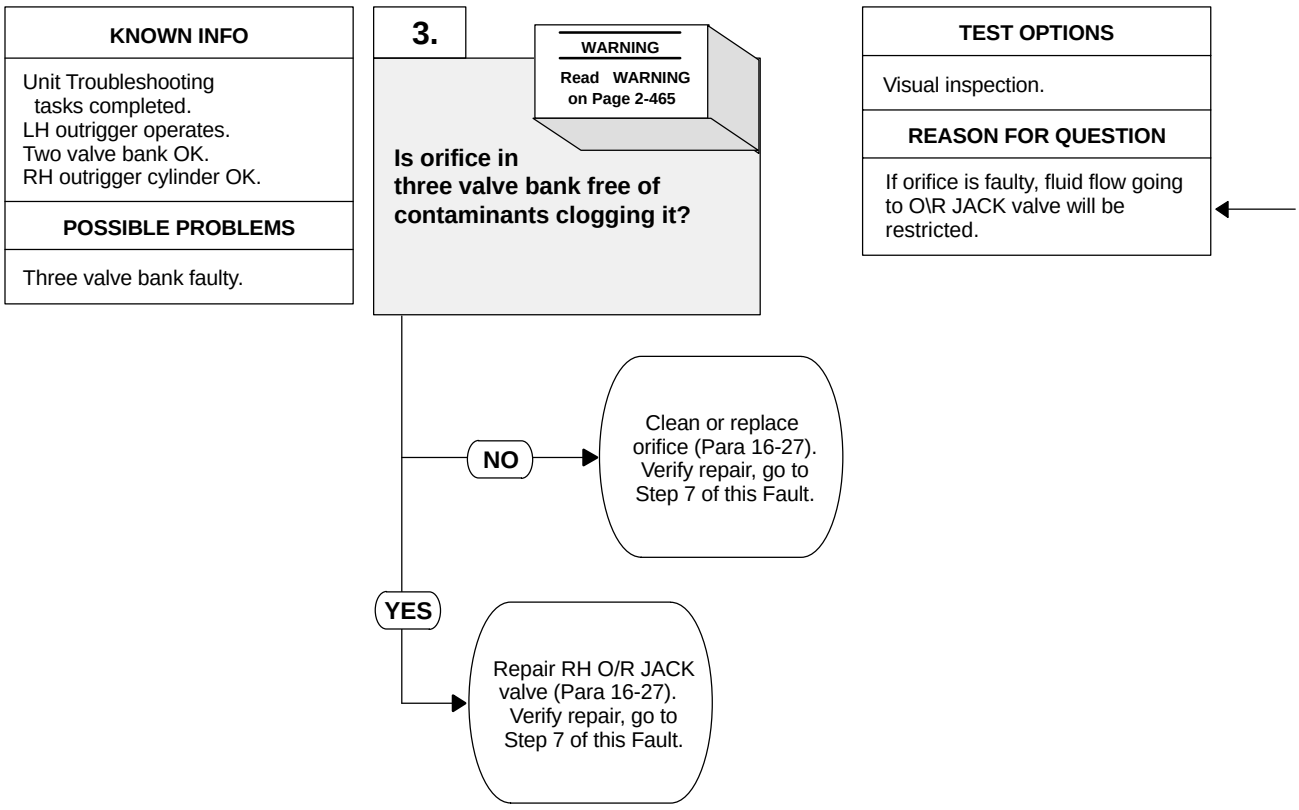


OPERATION TEST

(1) Operate RH outrigger using RH O/R JACK control lever on RH side of truck while holding LH O/R JACK control lever in UP position (TM 9-2320-364-10).
   (a) If RH outrigger does not operate with RH O/R JACK control lever in UP position, perform Steps (2) through (4) below and go to Step 3 of this Fault.
   (b) If RH outrigger operates, check valve in three valve bank is faulty. Perform Steps (2) through (4) below and repair three valve bank (Para 16-27).
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.



3. RH OUTRIGGER DOES NOT OPERATE (CONT).



WARNING

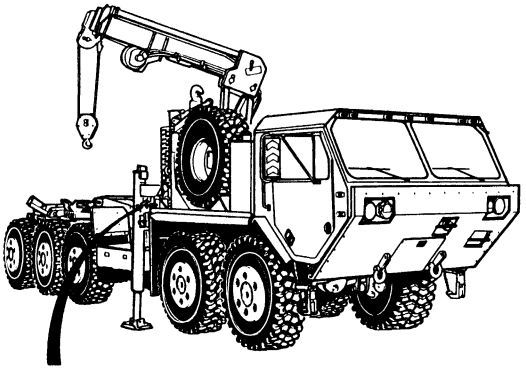
- High pressure hydraulics [oil under 3000 psi (20,675 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

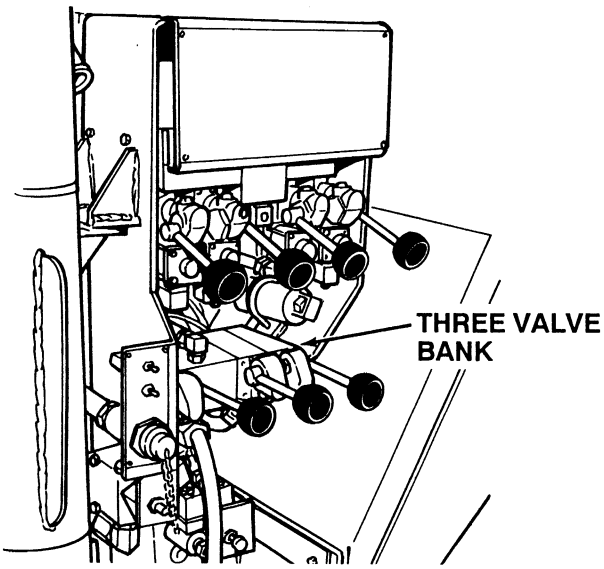
NOTE

Use a drain pan to catch leaking hydraulic oil.

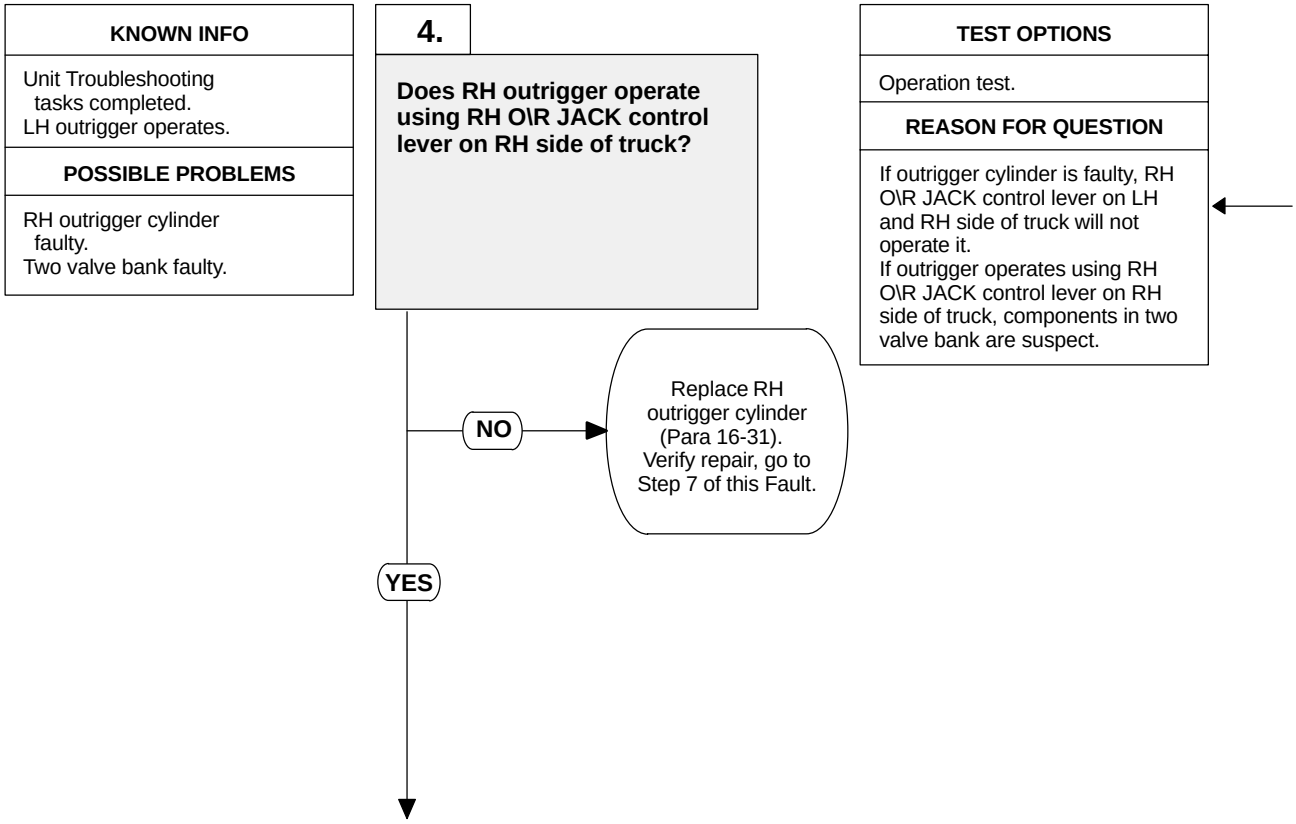
VISUAL INSPECTION

(1) Remove three valve bank from crane (Para 16-27).
(2) Remove valves from three valve bank body (Para 16-27).
(3) Remove orifice from RH O/R JACK valve (Para 16-27).
  (a) If orifice is clogged or damaged, clean or replace orifice (Para 16-27) and perform Steps (4) and (5) below.
  (b) If orifice is OK, repair RH O/R JACK valve (Para 16-27) and perform Steps (4) and (5) below.
(4) Assemble three valve bank (Para 16-27).
(5) Install three valve bank on crane (Para 16-27).



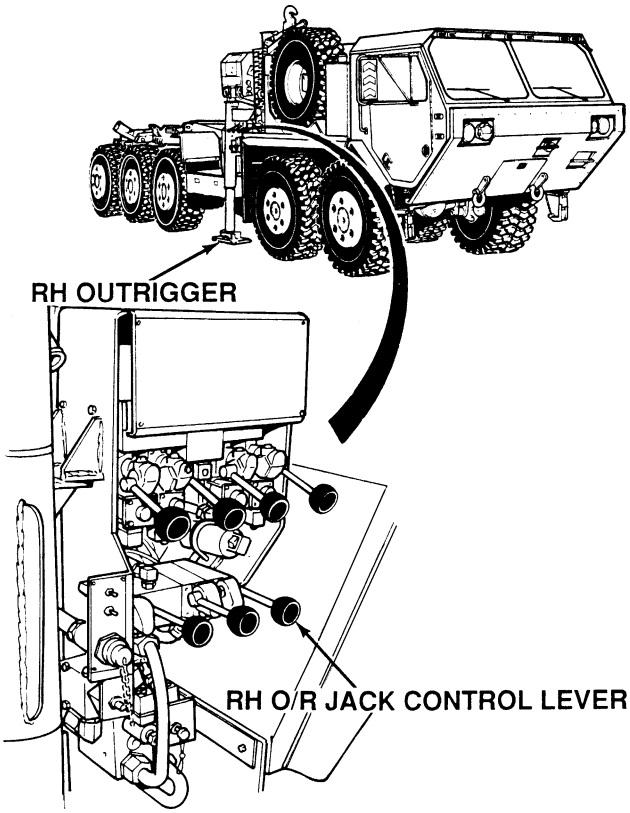


3. RH OUTRIGGER DOES NOT OPERATE (CONT).

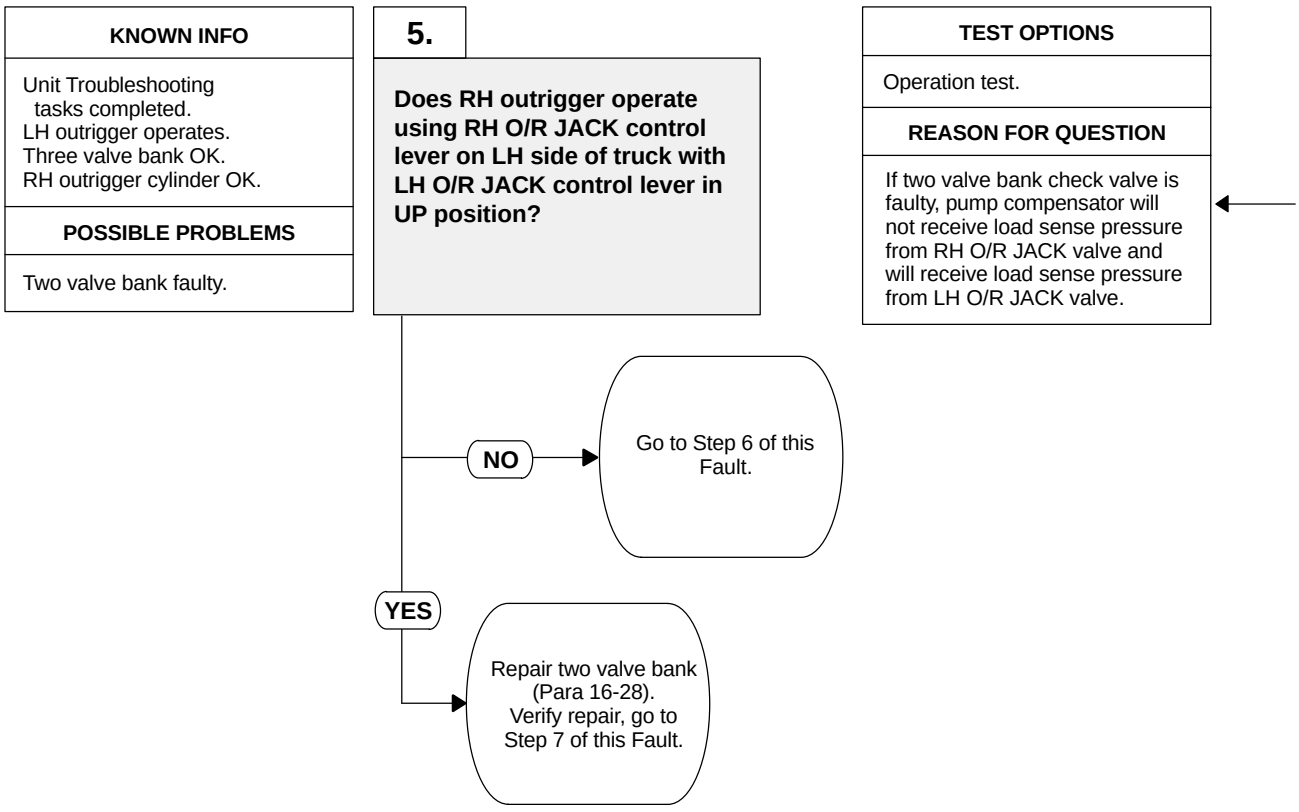


OPERATION TEST

(1) Operate RH outrigger using RH O/R JACK control lever on RH side of truck (TM 9-2320-364-10).
   (a) If RH outrigger does not operate, Perform Steps (2) through (4) below and replace outrigger cylinder (Para 16-31).
   (b) If RH outrigger operates, go to Step 5 of this Fault.
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.

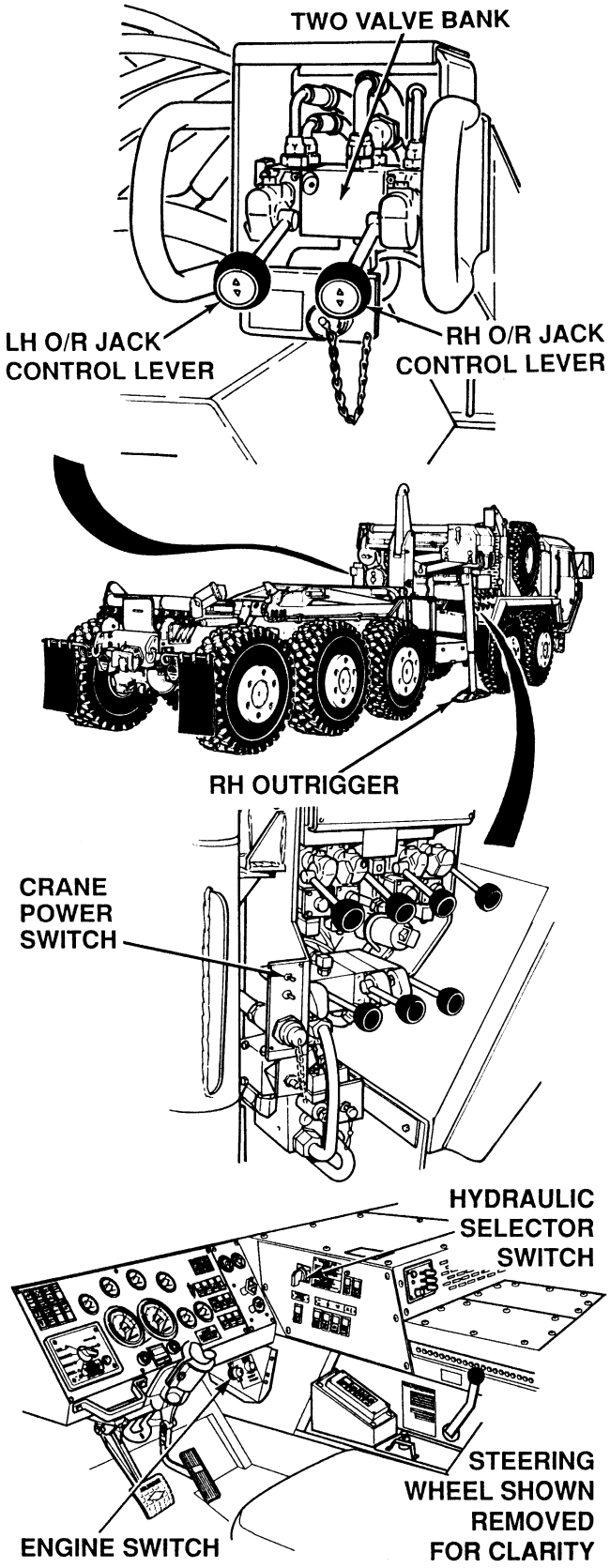


3. RH OUTRIGGER DOES NOT OPERATE (CONT).

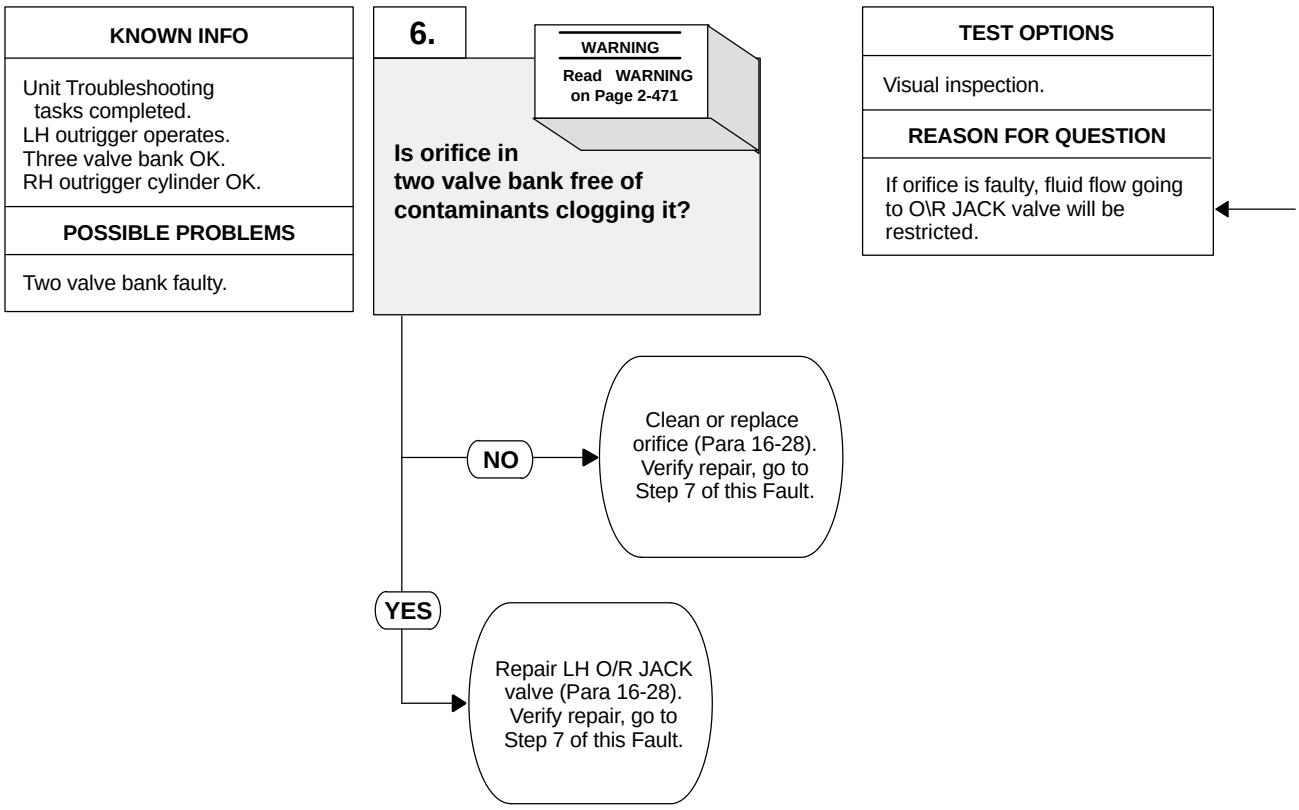


OPERATION TEST

(1) Operate RH outrigger using RH O/R JACK control lever on LH side of truck while holding LH O/R JACK control lever in UP position (TM 9-2320-364-10).
   (a) If RH outrigger does not operate with LH O/R JACK control lever in UP position, perform Steps (2) through (4) below and go to Step 6 of this Fault.
   (b) If RH outrigger operates, check valve in two valve bank is faulty. Perform Steps (2) through (4) below and repair two valve bank (Para 16-28).
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.



3. RH OUTRIGGER DOES NOT OPERATE (CONT).



WARNING

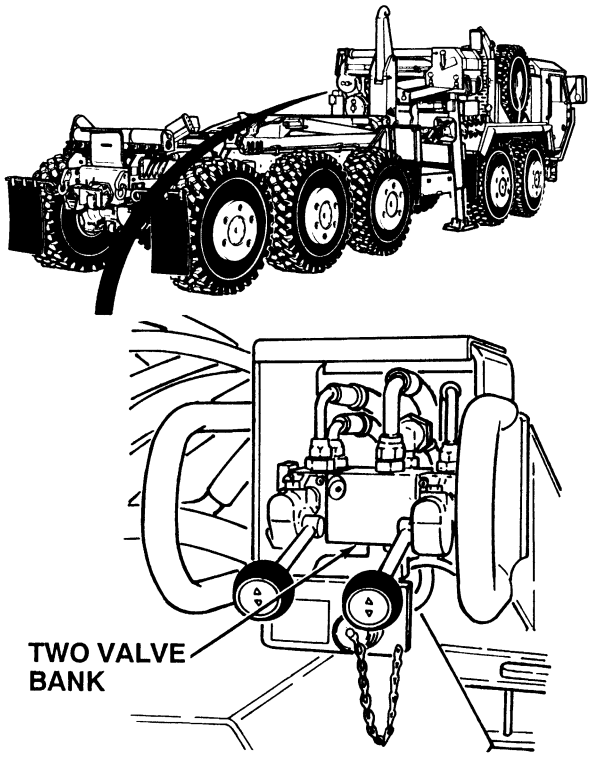
- High pressure hydraulics [oil under 3000 psi (20,675 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

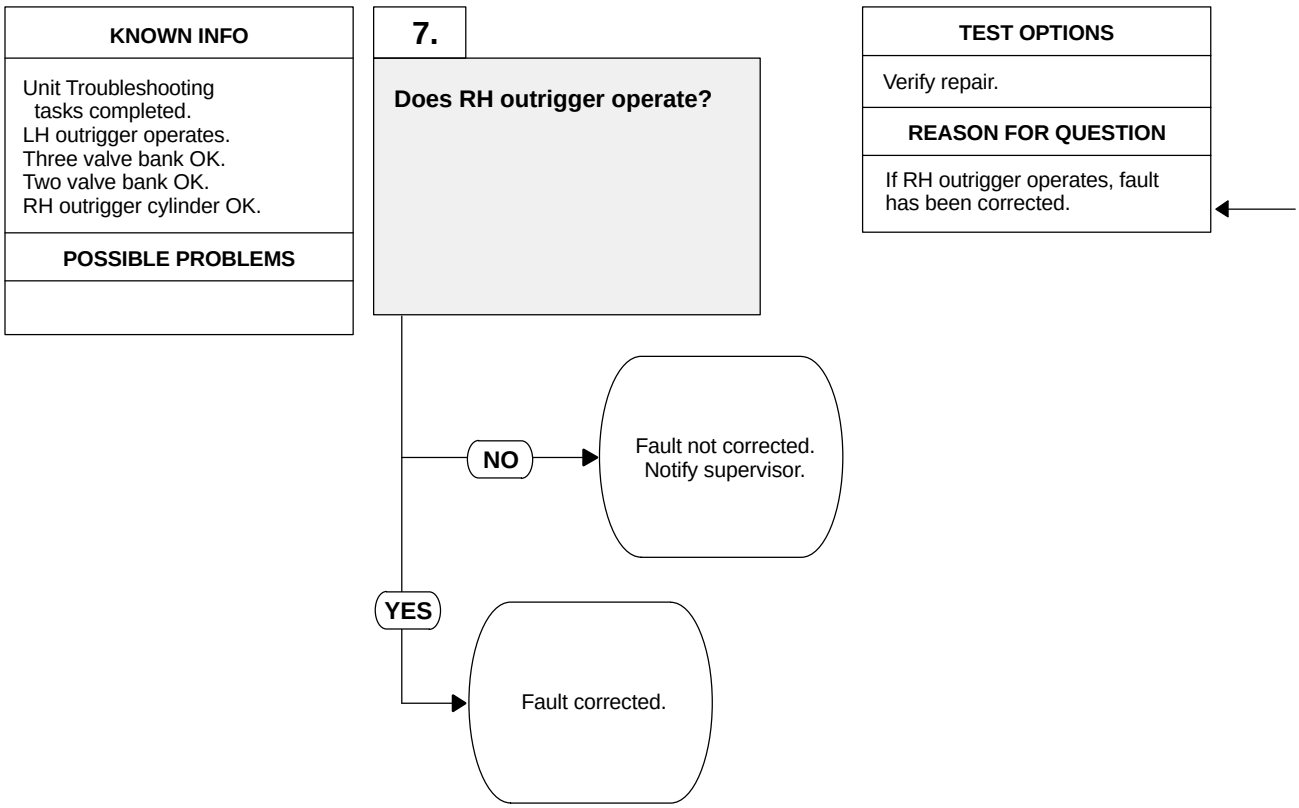
Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove two valve bank from crane (Para 16-28).
(2) Remove control valves from two valve bank body (Para 16-28).
(3) Remove orifice from RH O/R JACK valve (Para 16-28).
  (a) If orifice is clogged or damaged, clean or replace orifice (Para 16-28) and perform Steps (4) and (5) below.
  (b) If orifice is OK, repair RH O/R JACK valve (Para 16-28) and perform Steps (4) and (5) below.
(4) Assemble two valve bank (Para 16-28).
(5) Install two valve bank on crane (Para 16-28).

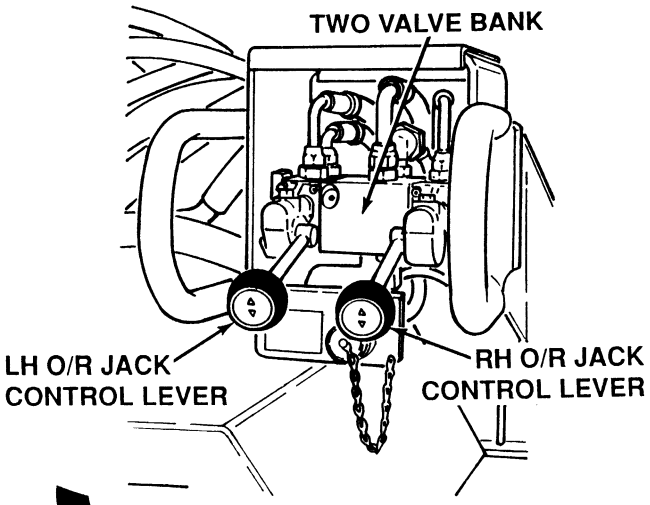


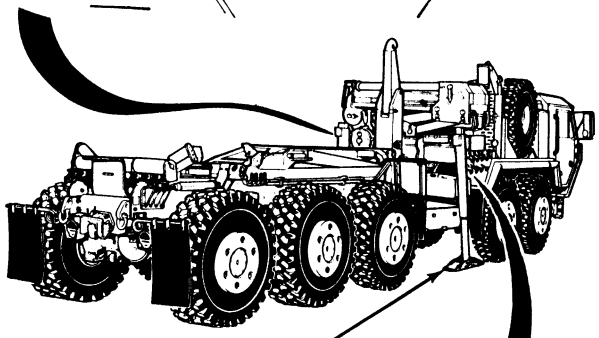
3. RH OUTRIGGER DOES NOT OPERATE (CONT).

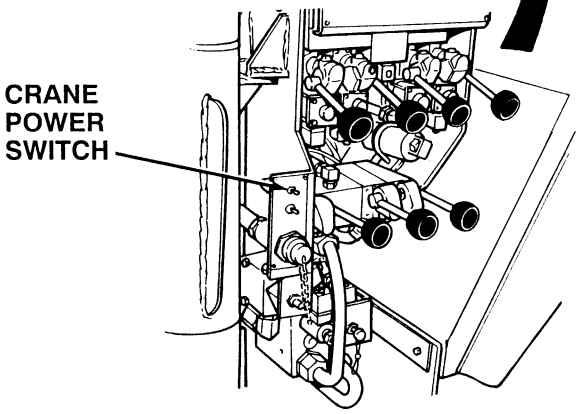


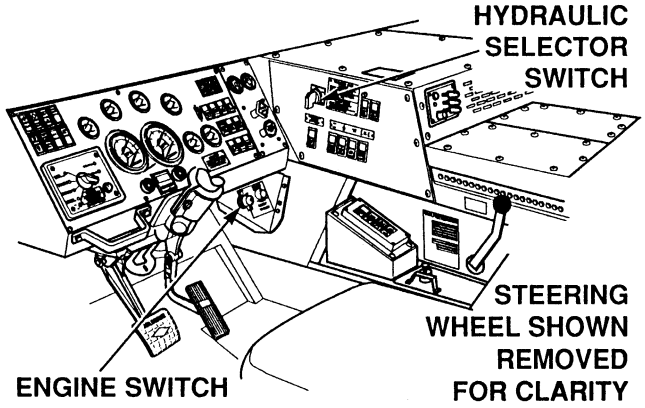
VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set hydraulic selector switch to CRANE/SRW position.
(3) Turn ON crane POWER switch.
(4) Operate RH outrigger using RH O/R JACK control levers on both LH and RH sides of truck.
    (a) If RH outrigger does not operate, fault not corrected. Perform Steps (5) through (7) below and notify supervisor.
    (b) If RH outrigger operates, fault has been corrected.
(5) Set crane POWER switch to OFF position.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.









2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

4. FOUR VALVE BANK FUNCTIONS (SWING, LIFT, TELESCOPE AND HOIST) DO NOT OPERATE OR OPERATE SLOWLY.

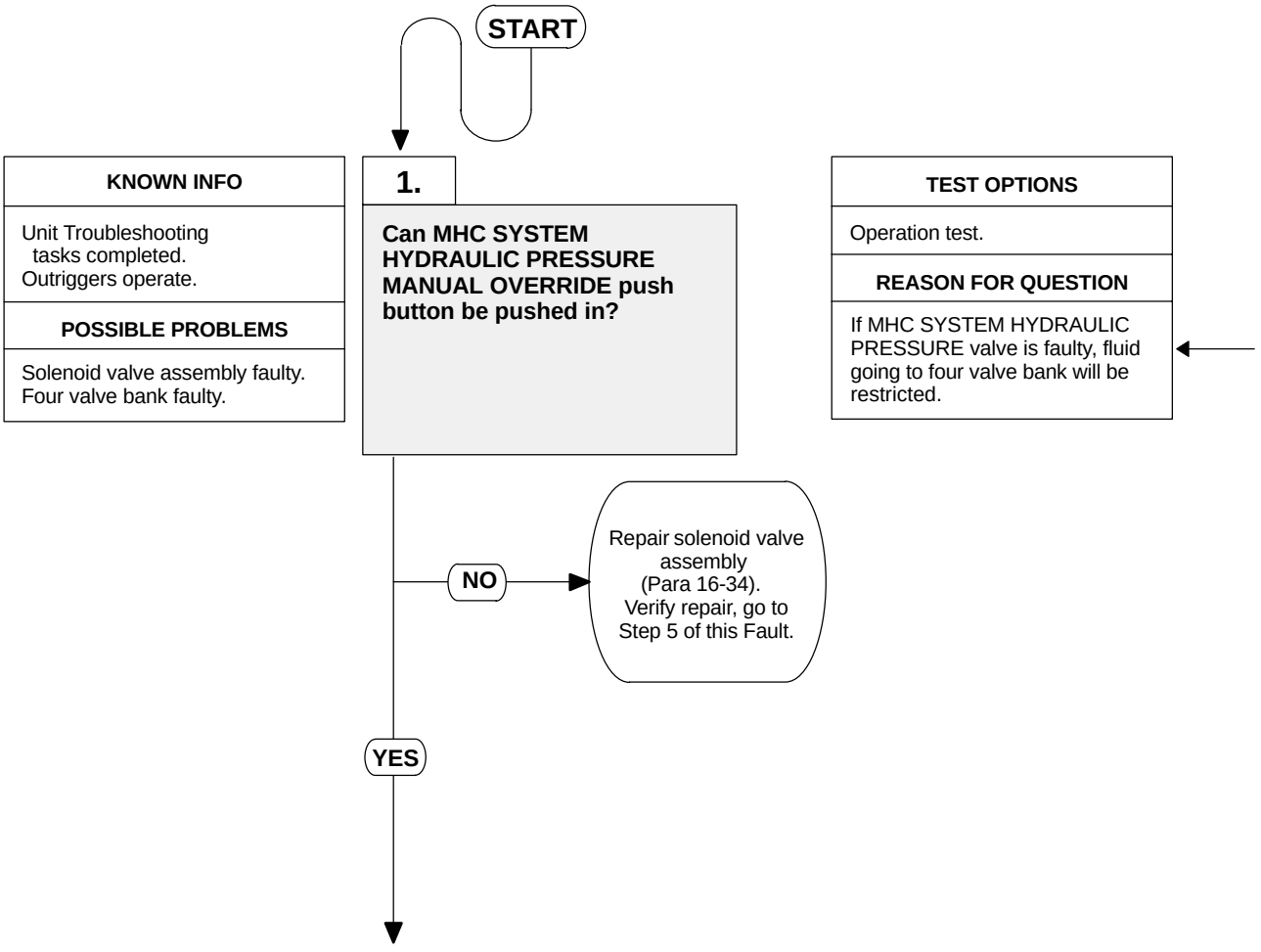
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)

Materials/Parts
Wire, Nonelectrical (Item 79, Appendix B)

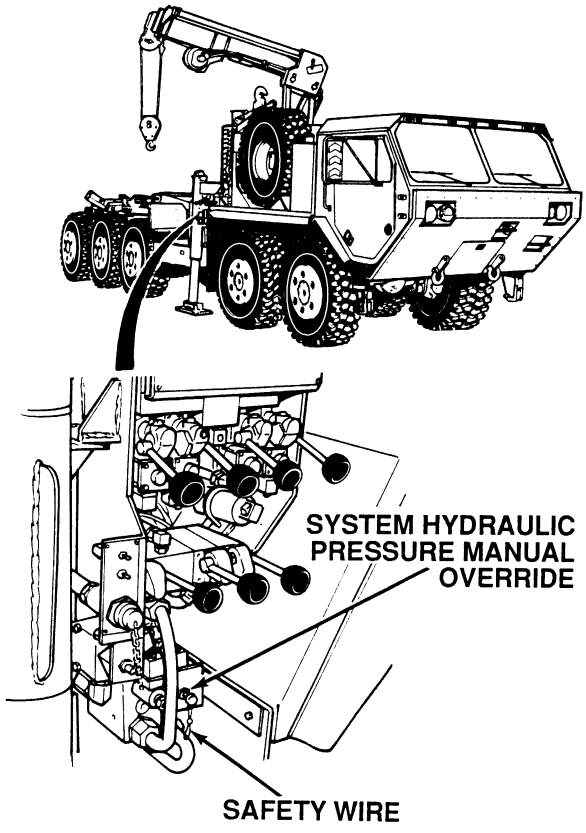
References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off
vehicle suspension, (TM 9-2320-364-10)

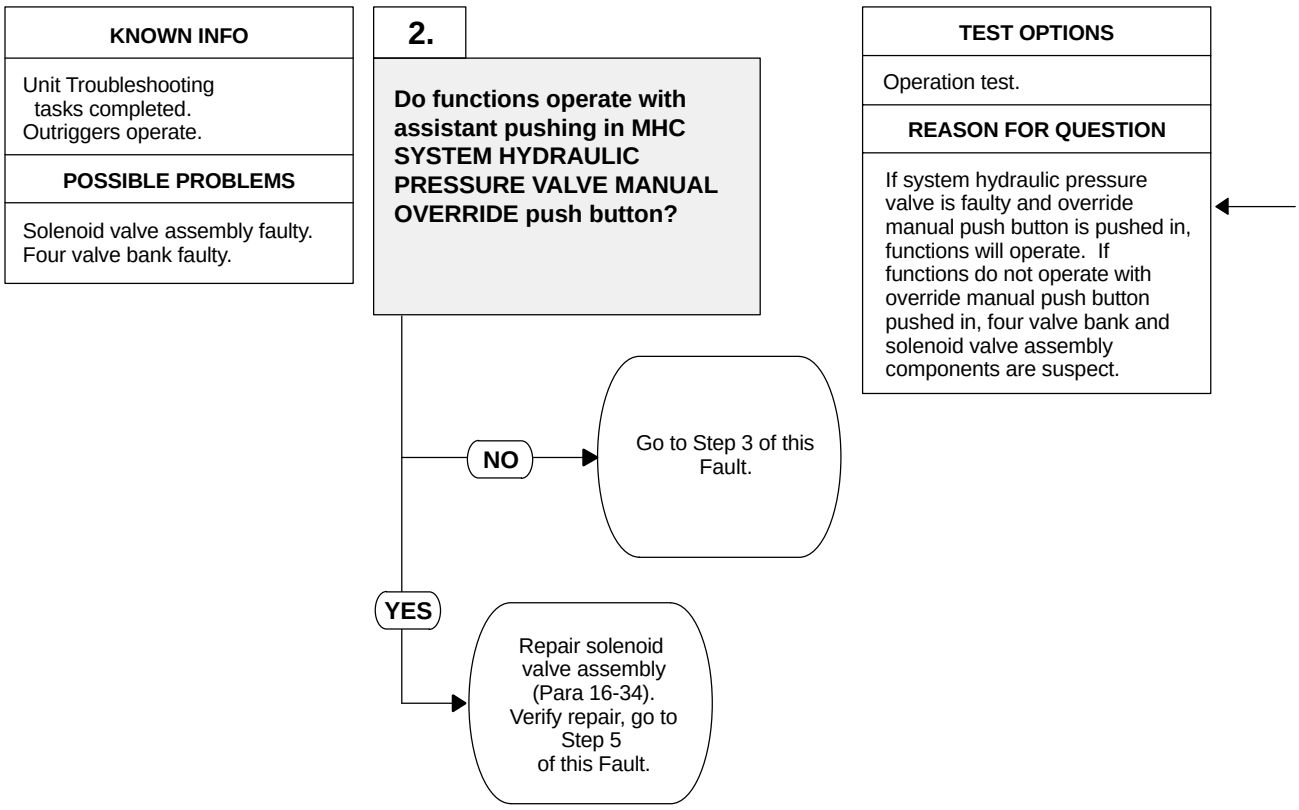


OPERATION TEST

(1) Remove safety wire from MHC SYSTEM HYDRAULIC PRESSURE MANUAL OVERRIDE push button (TM 9-2320-364-10).
(2) Push in manual override push button.
  (a) If manual push button cannot be pushed in, repair solenoid valve assembly (Para 16-34).
  (b) If manual push button can be pushed in, go to Step 2 of this Fault.

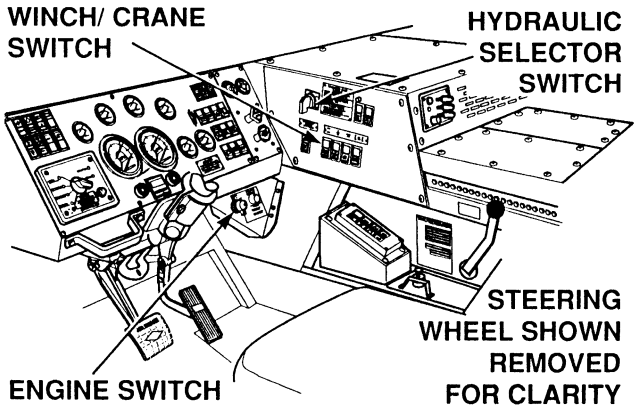


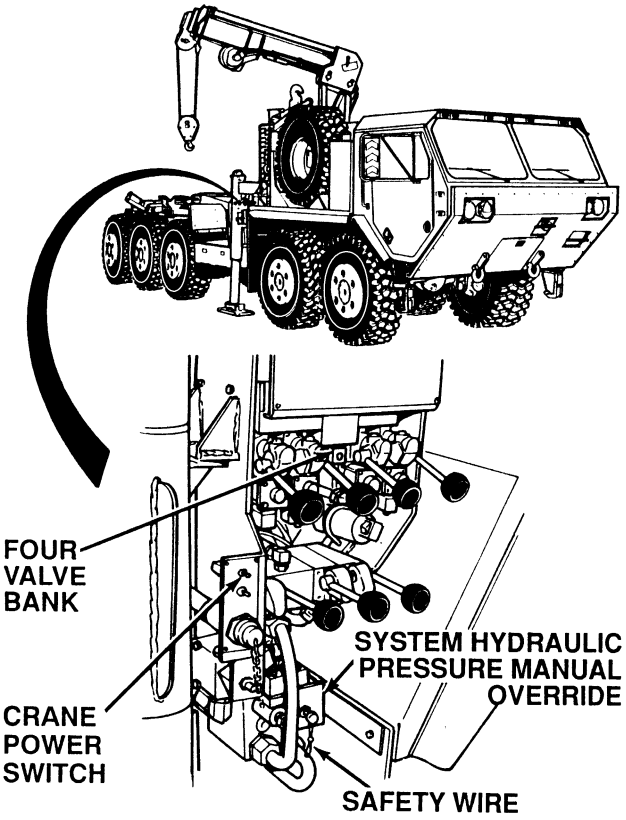
4. FOUR VALVE BANK FUNCTIONS DO NOT OPERATE OR OPERATE SLOWLY (CONT).



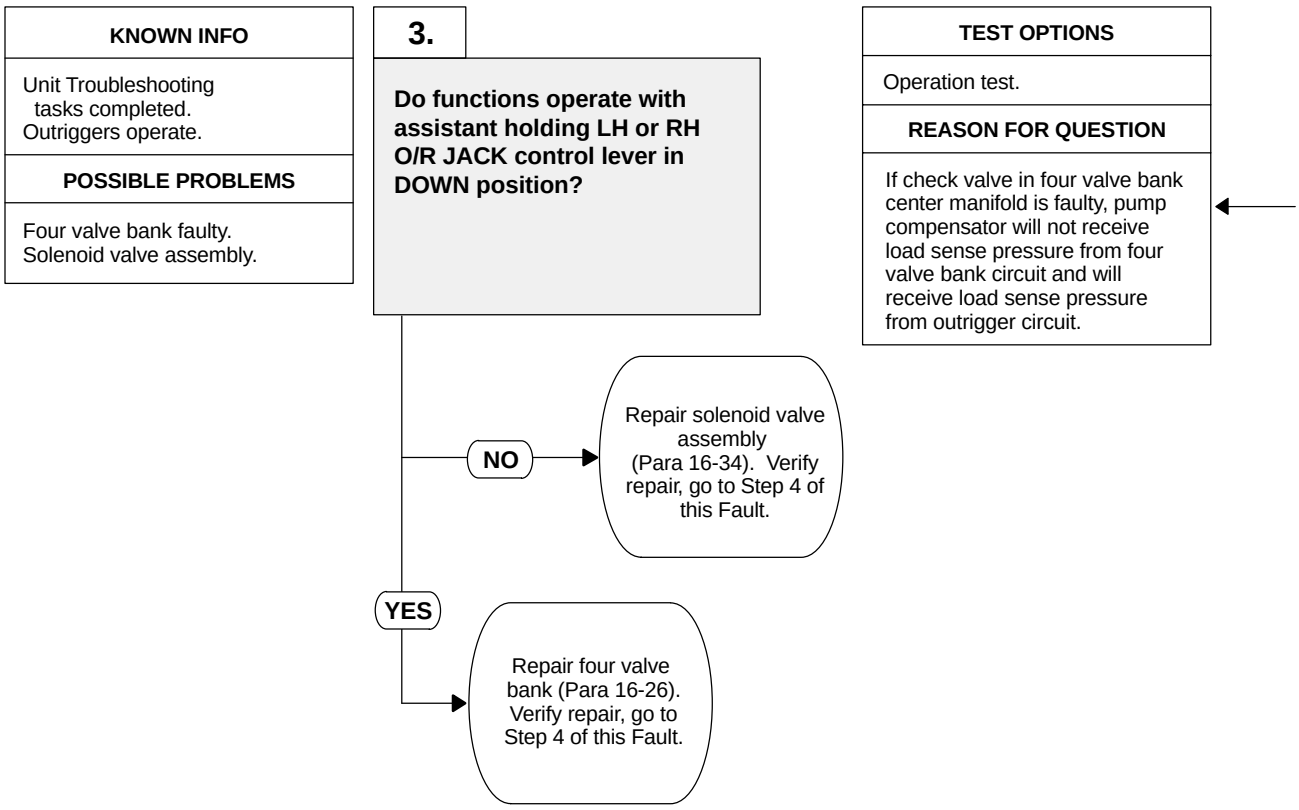
OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Operate one of the four functions on the four valve bank while pushing in the MHC SYSTEM HYDRAULIC PRESSURE VALVE MANUAL OVERRIDE push button.
    (a) If function does not operate, solenoid valve assembly and four valve bank are suspect. Perform Steps (5) through (8) below and go to Step 3 of this Fault.
    (b) If function operates, system hydraulic pressure valve is faulty. Perform Steps (5) through (8) below and repair solenoid valve assembly (Para 16-34).
(5) Set crane POWER switch to OFF position.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.
(8) Install safety wire on MHC SYSTEM HYDRAULIC PRESSURE MANUAL OVERRIDE push button.



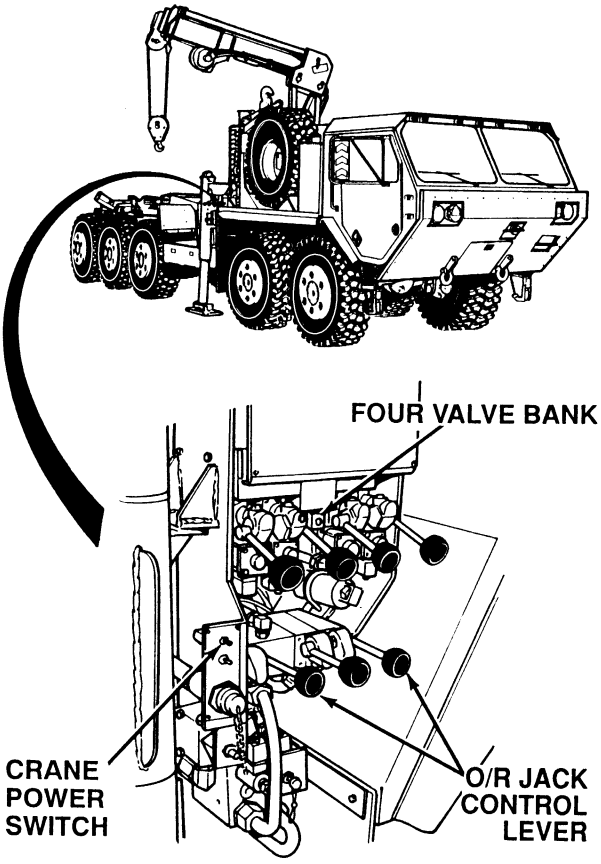


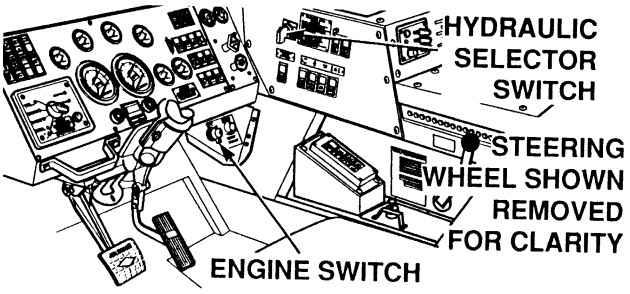
4. FOUR VALVE BANK FUNCTIONS DO NOT OPERATE OR OPERATE SLOWLY (CONT).



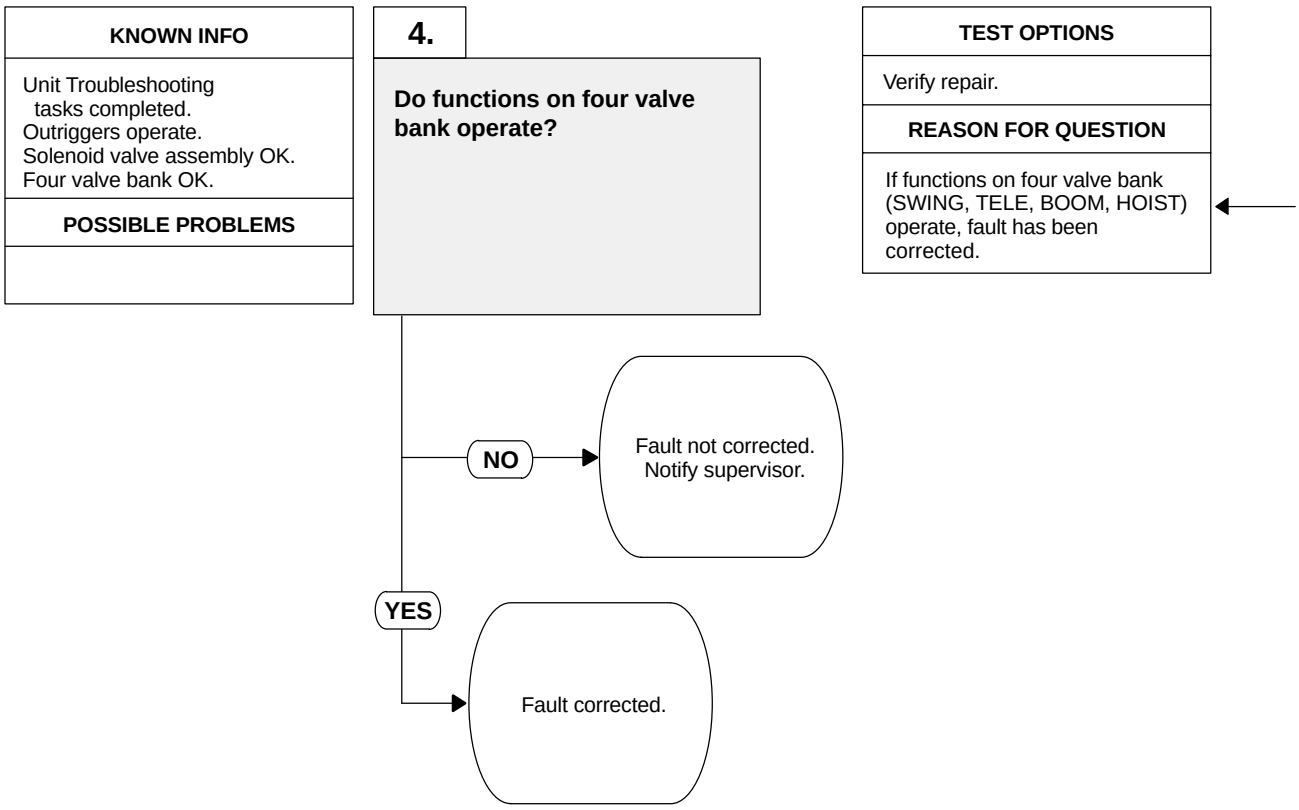
OPERATION TEST

(1) Operate one of the four functions (SWING, TELE, BOOM, HOIST) on the four valve bank while holding LH or RH O/R JACK control lever in the DOWN position (TM 9-2320-364-10).
   (a) If function does not operate, perform Steps (2) through (4) below and repair solenoid valve assembly (Para 16-34).
   (b) If function operates, perform Steps (2) through (4) below and repair four valve bank center manifold (Para 16-26).
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.



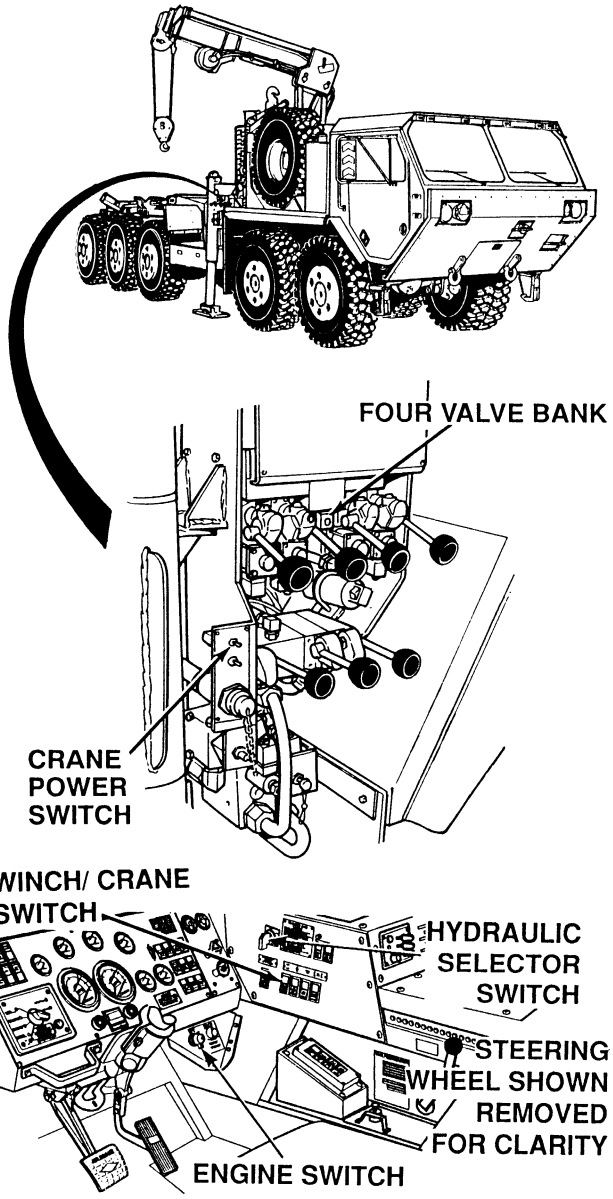


4. FOUR VALVE BANK FUNCTIONS DO NOT OPERATE OR OPERATE SLOWLY (CONT).



VERIFY REPAIR

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Operate the four functions on the four valve bank.
    (a) If functions do not operate, fault not corrected. Perform Steps (5) through (7) below and notify supervisor.
    (b) If functions operate, fault has been corrected.
(5) Set crane POWER switch to OFF position.
(6) Set hydraulic selector switch to OFF position.
(7) Turn OFF ENGINE switch.



2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

5. MAST DOES NOT OPERATE OR OPERATES SLOWLY.

INITIAL SETUP

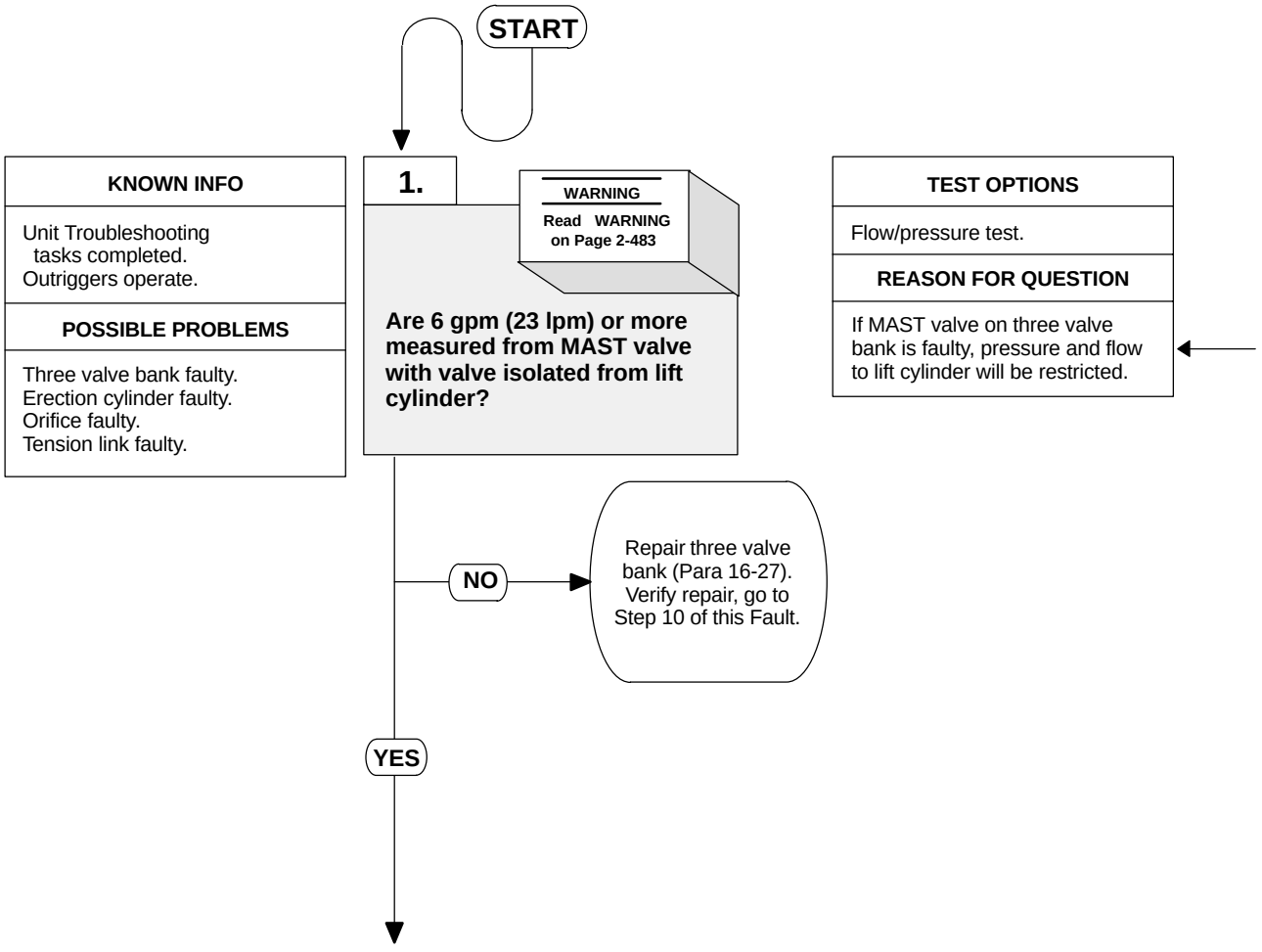
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulics (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Preformed Packing (2) (Item 336, Appendix E)
Preformed Packing (5) (Item 337, Appendix E)
Preformed Packing (3) (Item 389, Appendix E)

Personnel Required
Two

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

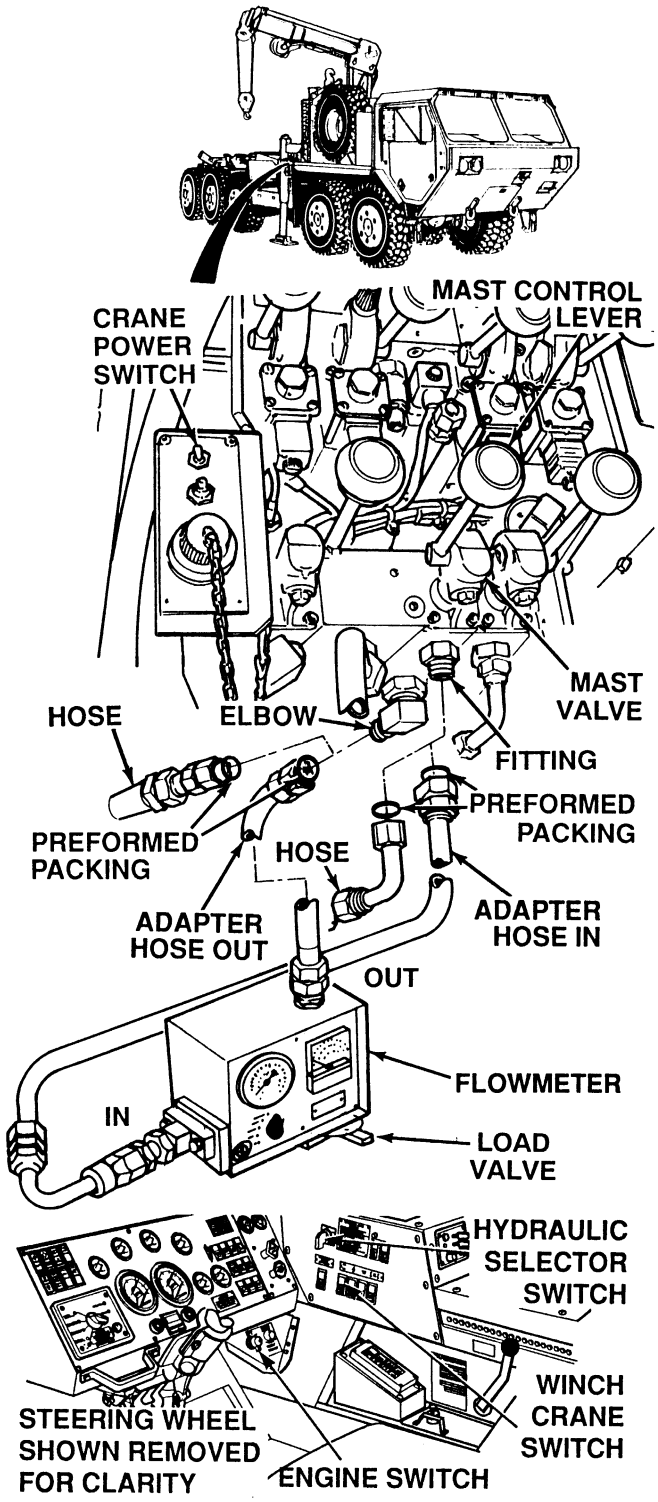
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

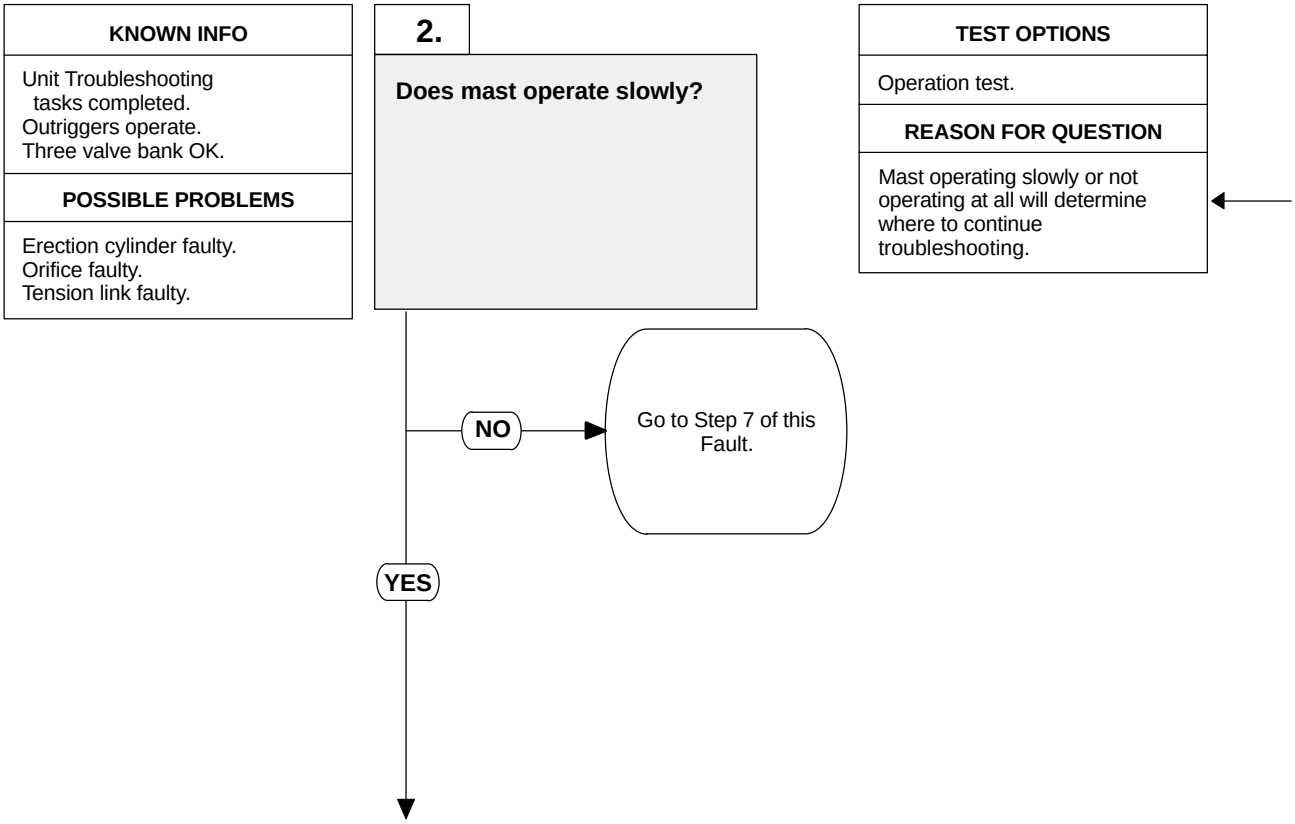
Use a drain pan to catch leaking hydraulic oil.

FLOW/PRESSURE TEST

(1) Tag, mark and disconnect hose from fitting at bottom of MAST valve. Discard preformed packing.
(2) Plug hose with metal plug.
(3) Tag, mark and disconnect hose from elbow at bottom of MAST valve. Discard preformed packing.
(4) Plug hose with metal plug.
(5) Connect adapter hose with preformed packing to elbow.
(6) Connect adapter hose to flowmeter OUT port.
(7) Connect adapter hose with preformed packing to fitting.
(8) Connect adapter hose to flowmeter IN port.
(9) Open flowmeter load valve.
(10) Start engine (TM 9-2320-364-10).
(11) Set WINCH/CRANE switch to CRANE position.
(12) Set hydraulic selector switch to CRANE/SRW position.
(13) Set crane POWER switch to ON position.
(14) Hold MAST control lever in UP position.
  (a) If 6 gpm (23 lpm) or more are not present, perform Steps (15) through (20) below and replace MAST valve on three valve bank (Para 16-27).
  (b) If at least 6 gpm (23 lpm) are present, three valve bank is OK.
(15) Set crane POWER switch to OFF position.
(16) Set hydraulics selector switch to OFF position.
(17) Turn OFF ENGINE switch.
(18) Disconnect adapter hoses from elbow and fitting. Discard preformed packings.
(19) Remove plugs from hoses.
(20) Connect two hoses with preformed packings to elbow and fitting.

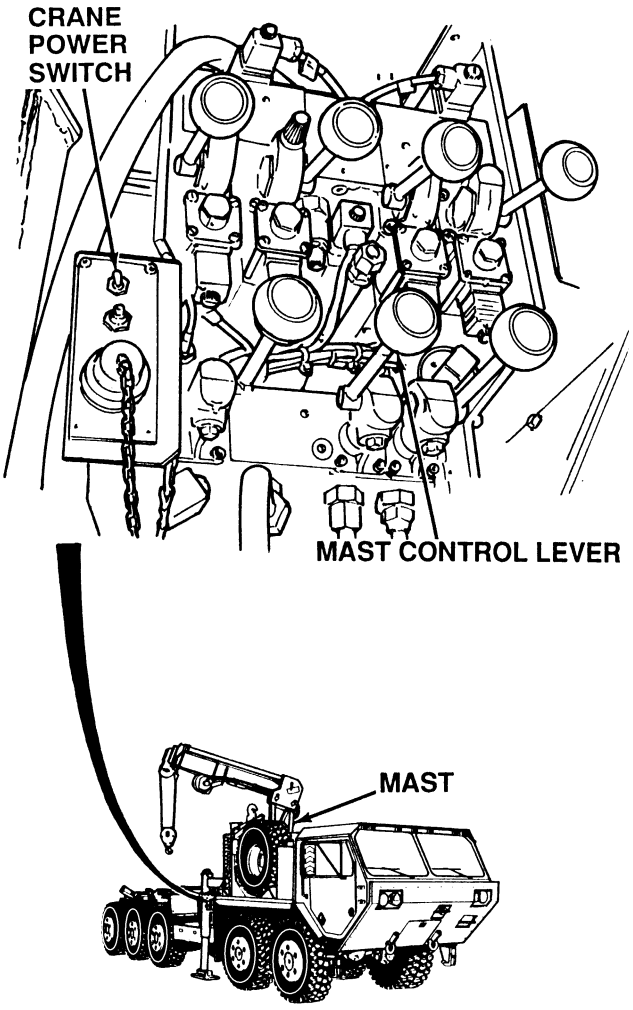


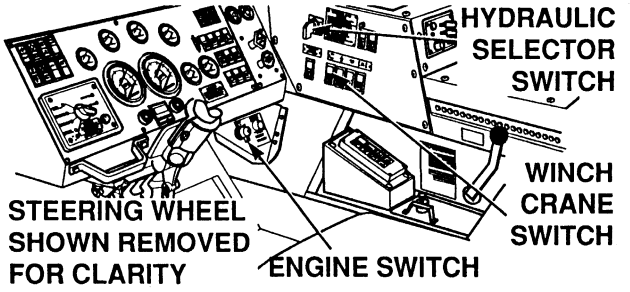
5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



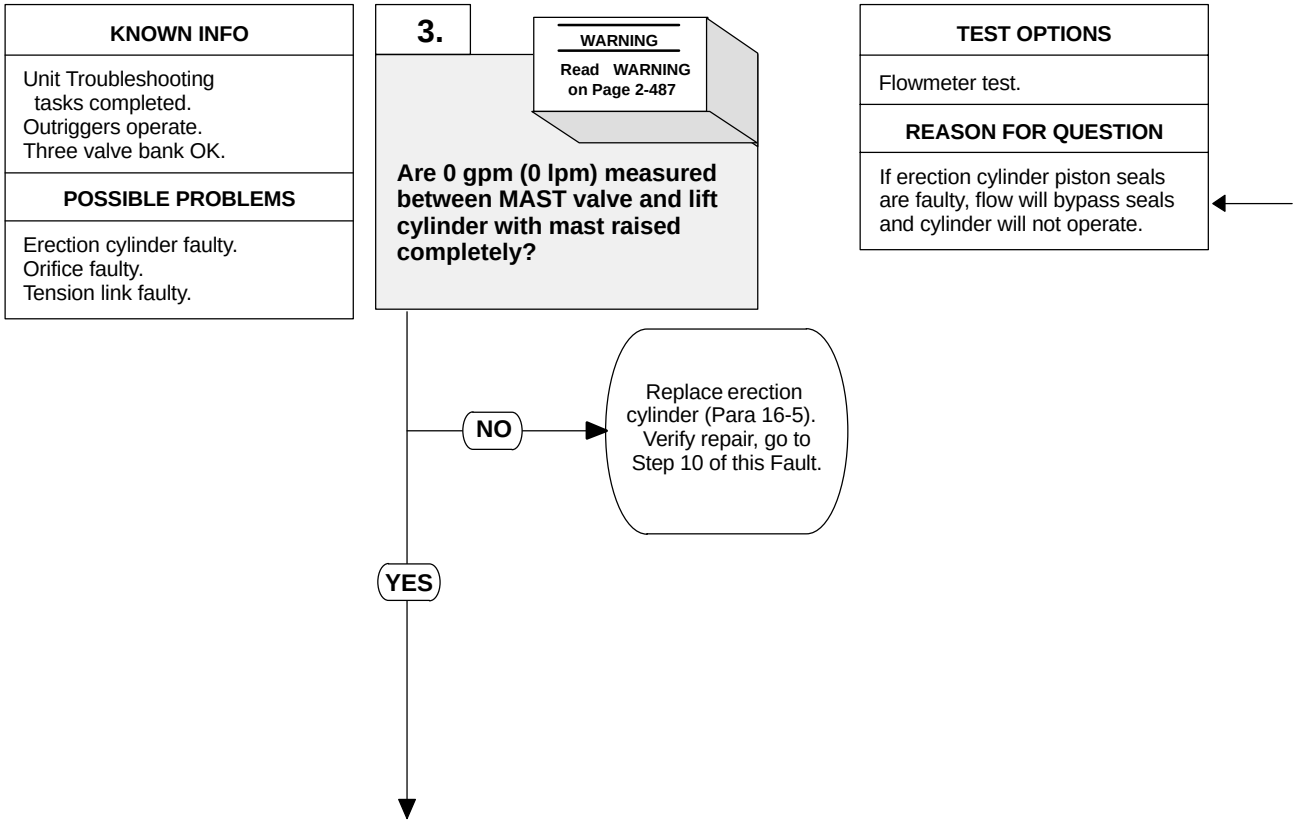
OPERATION TEST

(1) Operate crane mast using MAST control lever (TM 9-2320-364-10).
  (a) If mast does not operate, perform Steps (2) through (4) below and go to Step 7 of this Fault.
  (b) If mast operates slowly, perform Steps (2) through (4) below and go to Step 3 of this Fault.
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.





5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

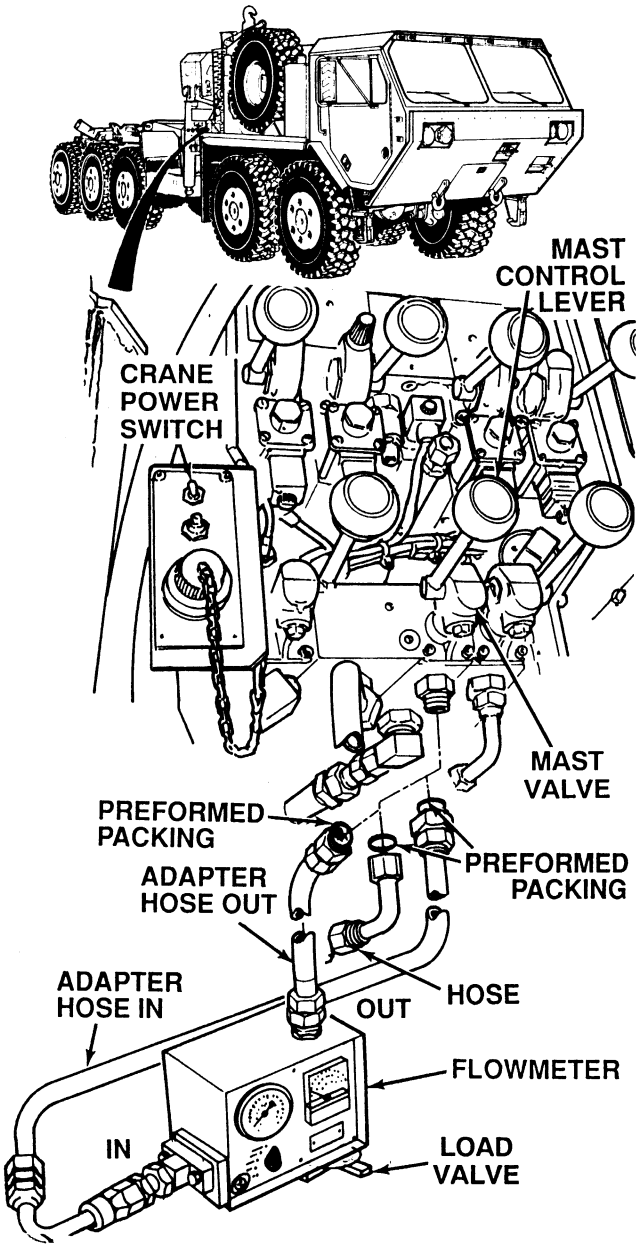
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

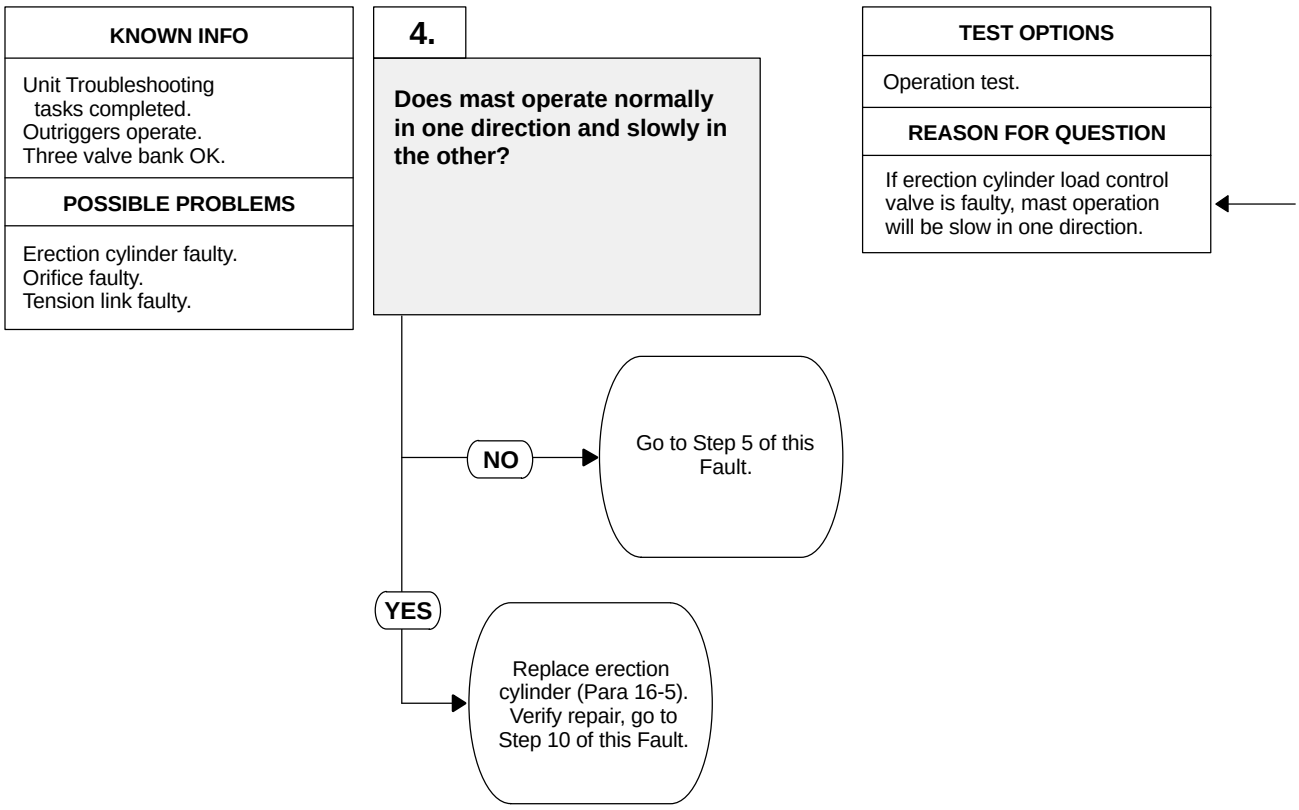
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Tag, mark and disconnect hose from fitting at bottom of MAST four way valve. Discard preformed packing.
(2) Connect adapter hose with preformed packing to disconnected hose.
(3) Connect adapter hose to flowmeter OUT port.
(4) Connect adapter hose with preformed packing to fitting.
(5) Connect adapter hose to flowmeter IN port.
(6) Open flowmeter load valve.
(7) Start engine (TM 9-2320-364-10).
(8) Set WINCH/CRANE switch to CRANE.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Turn ON crane POWER switch.
(11) Raise mast completely using MAST control lever.
(12) Hold MAST control lever in UP position while observing flowmeter.
  (a) If more than 0 gpm (0 lpm) are present, lift cylinder piston seals are faulty. Perform Steps (13) through (19) below and replace erection cylinder (Para 16-5).
  (b) If 0 gpm (0 lpm) are present, lift cylinder piston seals are OK.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hose from crane hose. Discard preformed packing.
(17) Disconnect adapter hose from fitting. Discard preformed packing.
(18) Lubricate preformed packing.
(19) Connect crane hose with preformed packing to fitting.

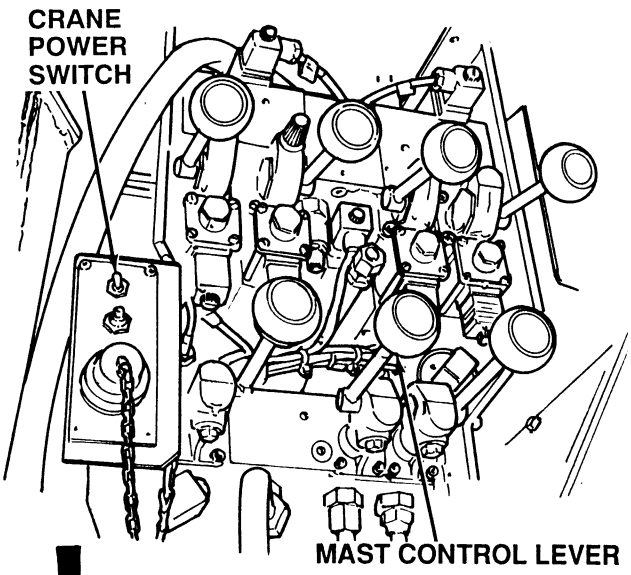


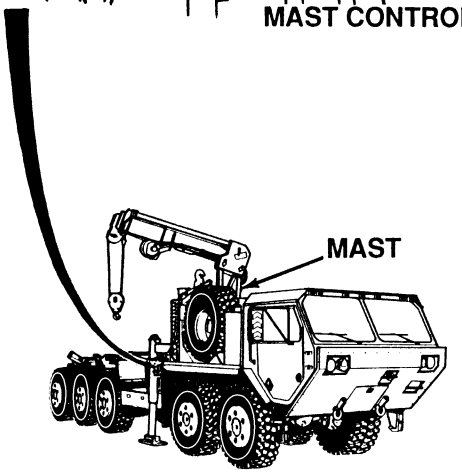
5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

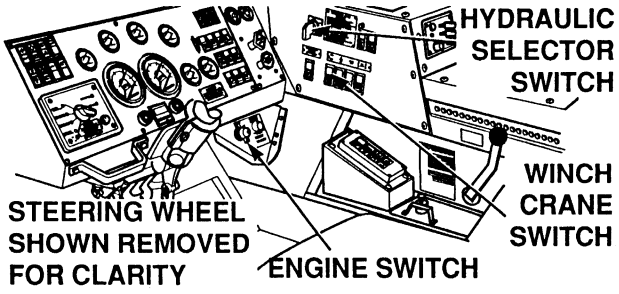


OPERATION TEST

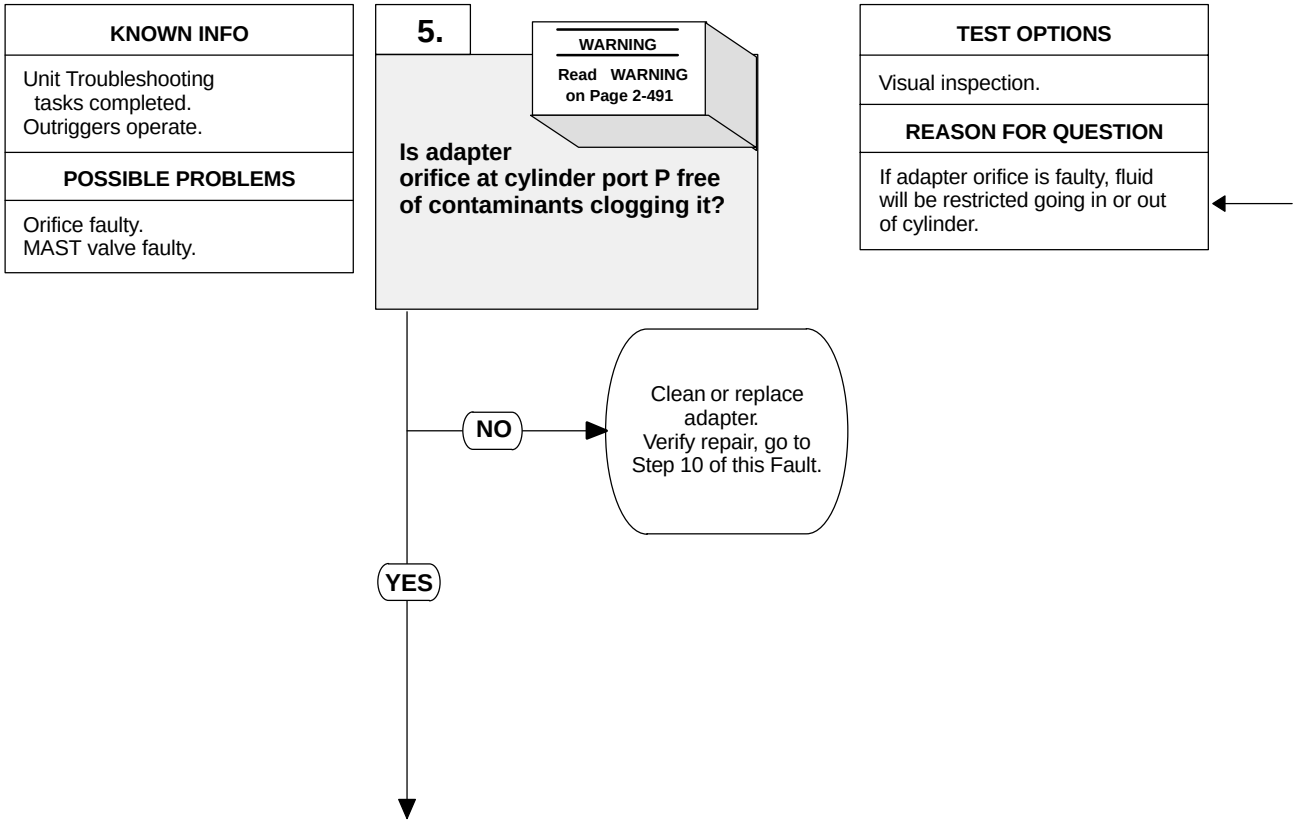
(1) Operate crane mast using MAST control lever (TM 9-2320-364-10).
  (a) If mast operates slowly in both directions, perform Steps (2) through (4) below and go to Step 5 of this Fault.
  (b) If mast operates slowly in one direction and normally in the other, cylinder is faulty. Replace erection cylinder (Para 16-5).
(2) Set crane POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.







5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

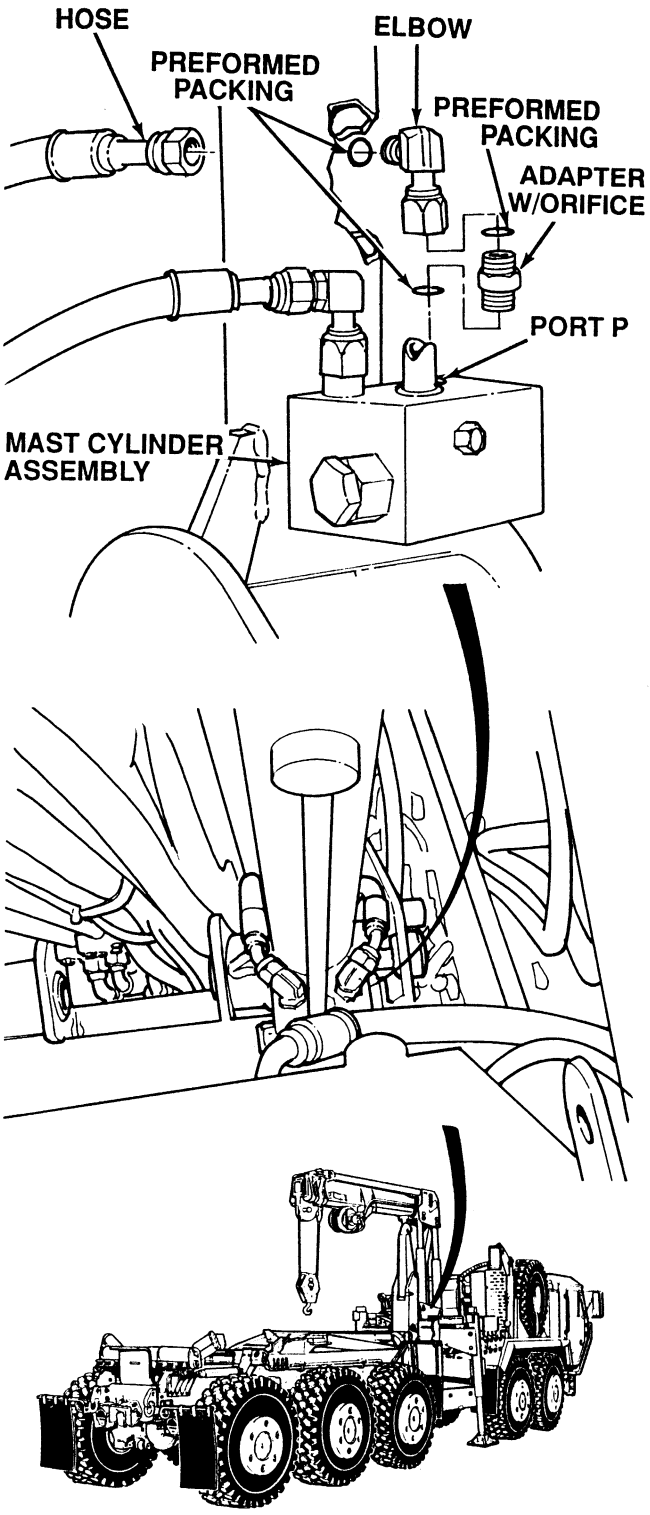
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

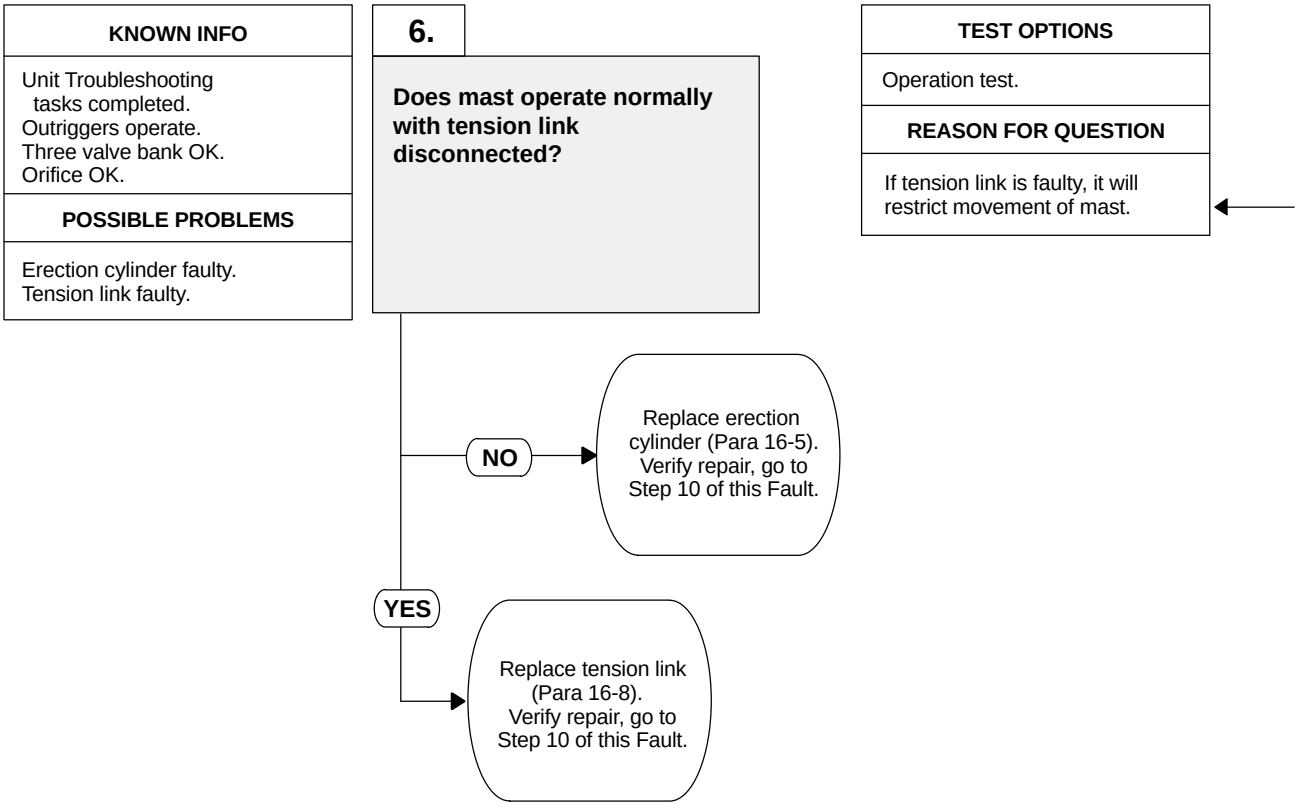
Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Disconnect hose from elbow at port P of cylinder. Discard preformed packing.
(2) Remove elbow from adapter at port P of cylinder. Discard preformed packing.
(3) Remove adapter from cylinder port P. Discard preformed packing.
  (a) If orifice is adapter is clogged or damaged, clean or replace adapter and perform Steps (4) through (6) below.
  (b) If orifice is OK, perform Steps (4) through (6) below and go to Step 6 of this Fault.
(4) Install adapter with preformed packing on cylinder.
(5) Install elbow with preformed packing on adapter.
(6) Connect hose with preformed packing on elbow.

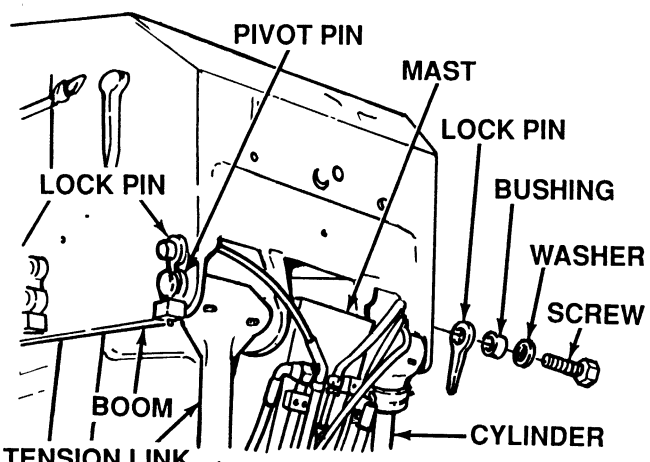


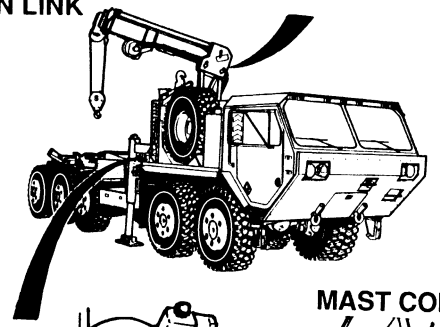
5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

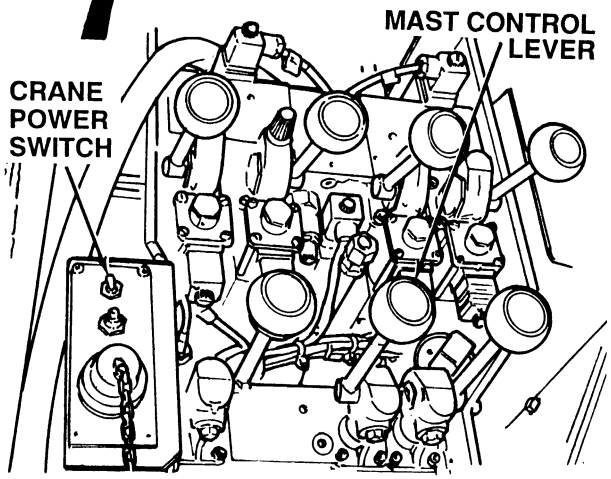


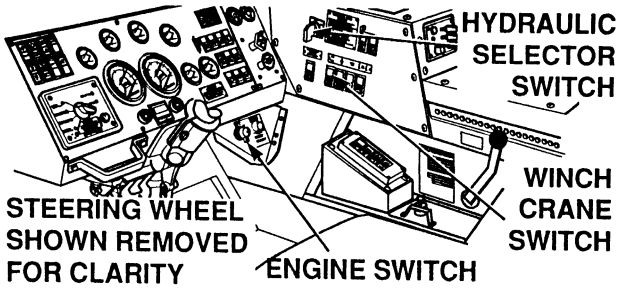
OPERATION TEST

(1) Remove two screws, washers and bushings from lockpins and boom.
(2) Remove two lock pins from pivot pin.
(3) With aid of assistant, drive pivot pin out of boom and tension link only enough so that tension link can be removed from boom. Do not drive pivot pin through mast.
(4) Operate mast using MAST control lever.
    (a) If mast does not operate normally, replace erection cylinder (Para 16-5).
    (b) If mast does operate normally, replace tension link (Para 16-8).

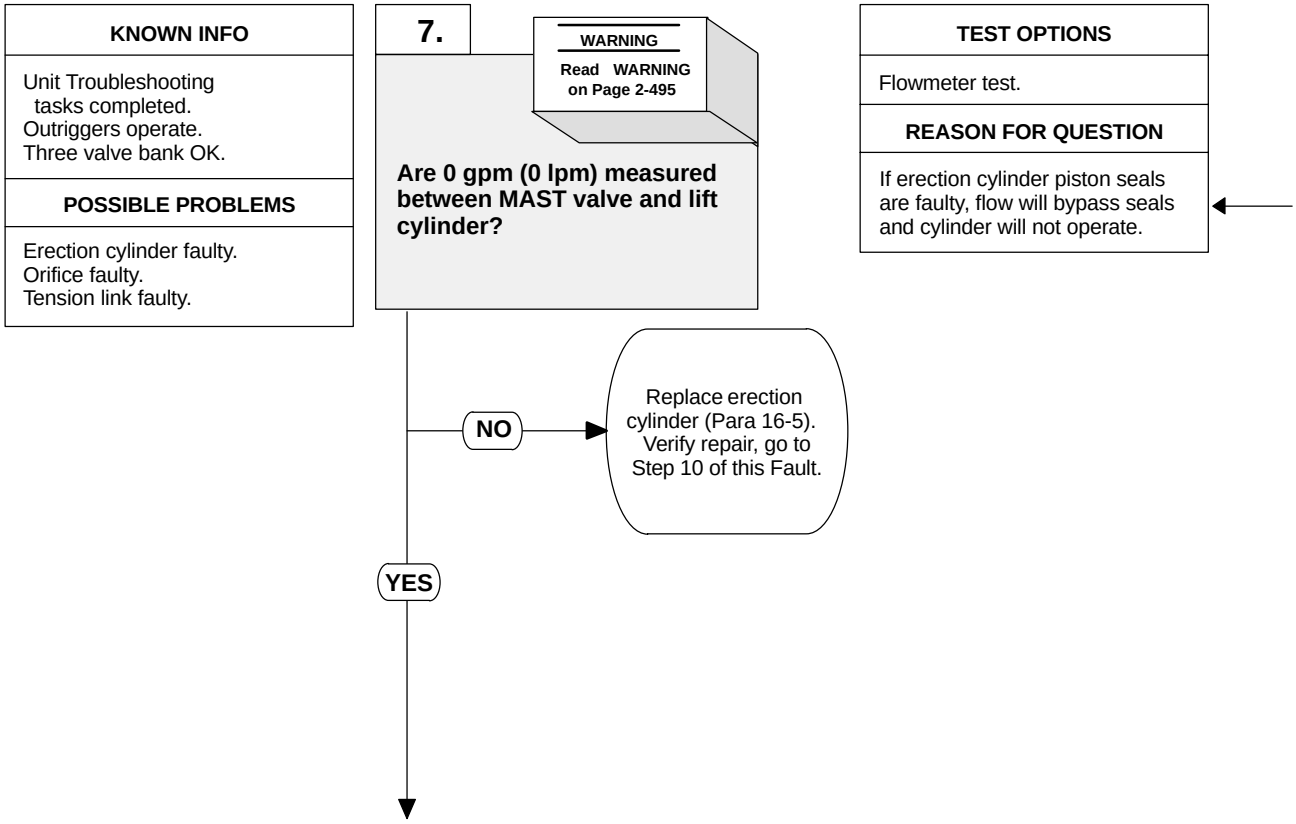








5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

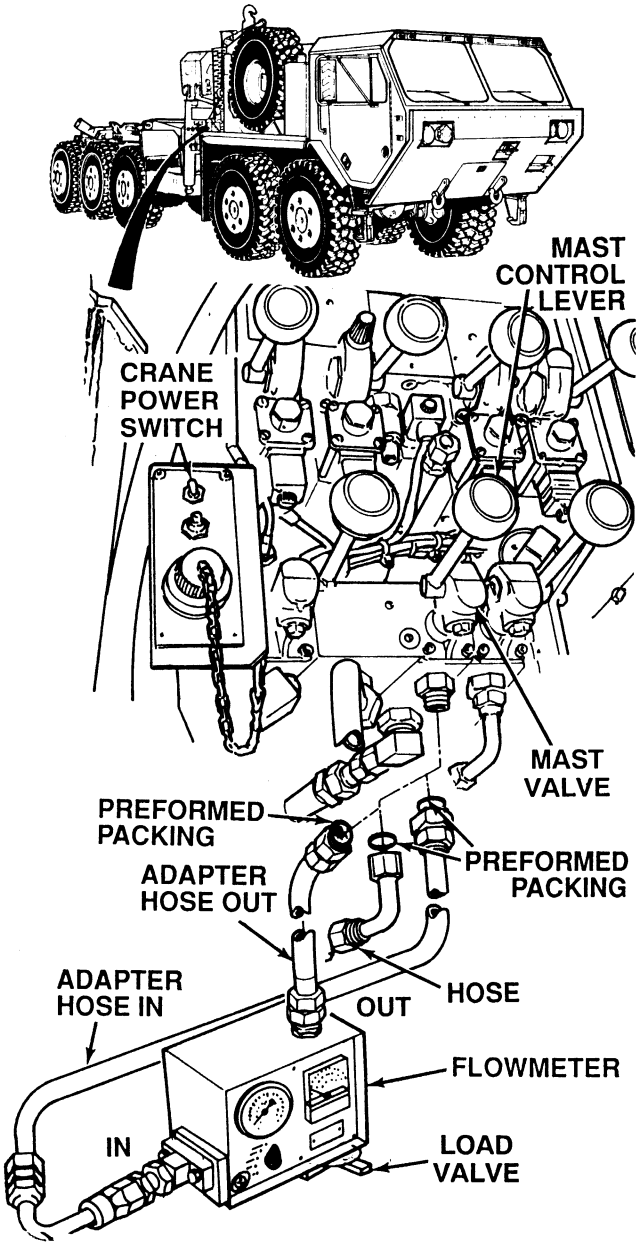
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

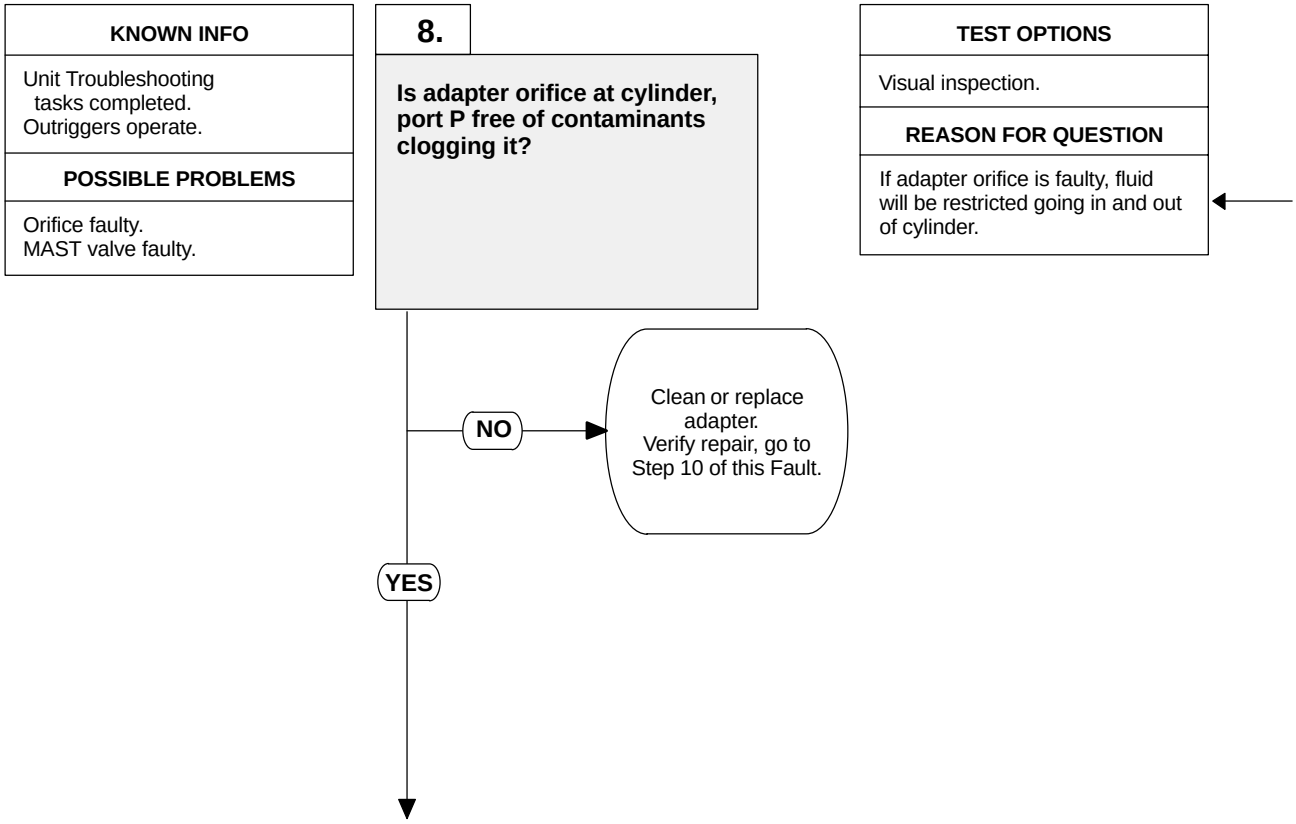
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Tag, mark and disconnect hose from fitting at bottom of MAST four way valve. Discard preformed packing.
(2) Connect adapter hose with preformed packing to disconnected hose.
(3) Connect adapter hose to flowmeter OUT port.
(4) Connect adapter hose with preformed packing to fitting.
(5) Connect adapter hose to flowmeter IN port.
(6) Open flowmeter load valve.
(7) Start engine (TM 9-2320-364-10).
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Turn ON crane POWER switch.
(11) Hold MAST control lever in UP position while observing flowmeter.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (17) and replace erection cylinder (Para 16-5).
  (b) If 0 gpm (0 lpm) are present, cylinder piston seals are OK.
(12) Set crane POWER switch to OFF position.
(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Disconnect adapter hose from crane hose. Discard preformed packing.
(16) Disconnect adapter hose from fitting. Discard preformed packing.
(17) Connect crane hose with preformed packing to fitting.



5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

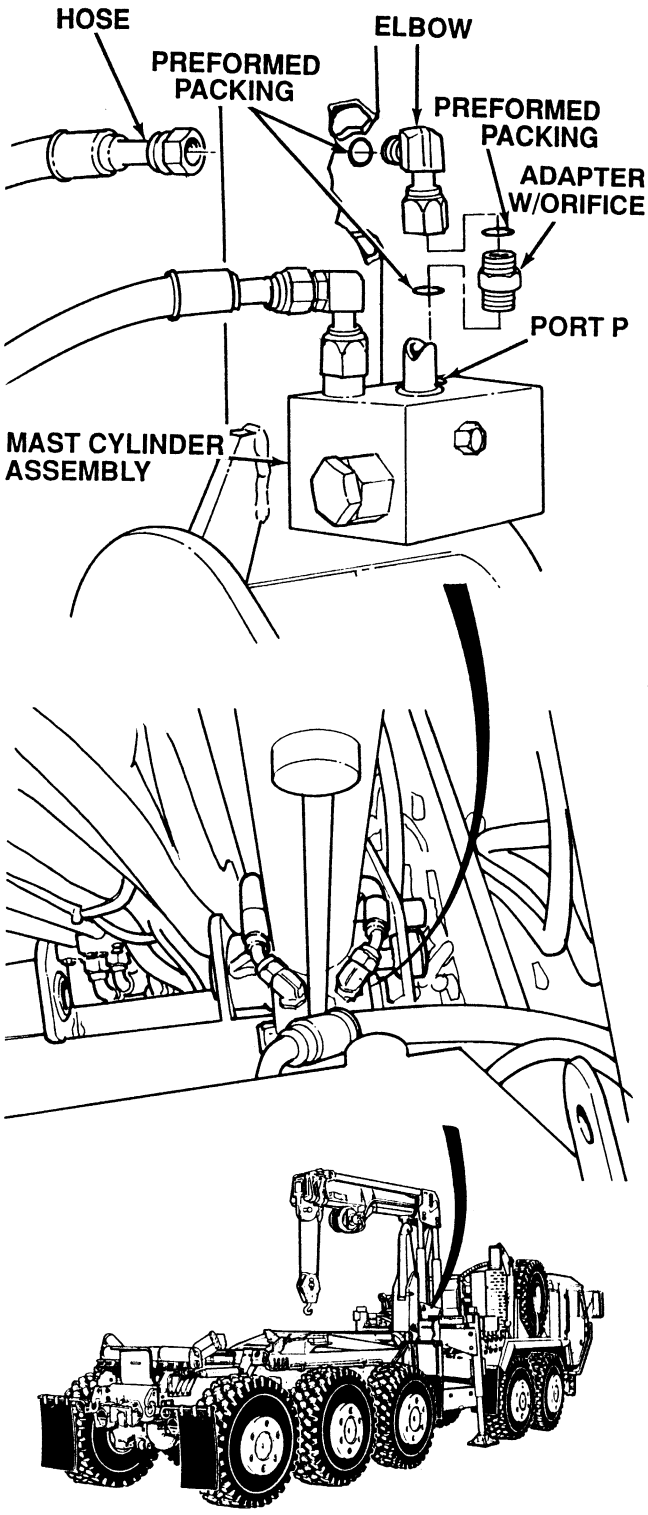
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

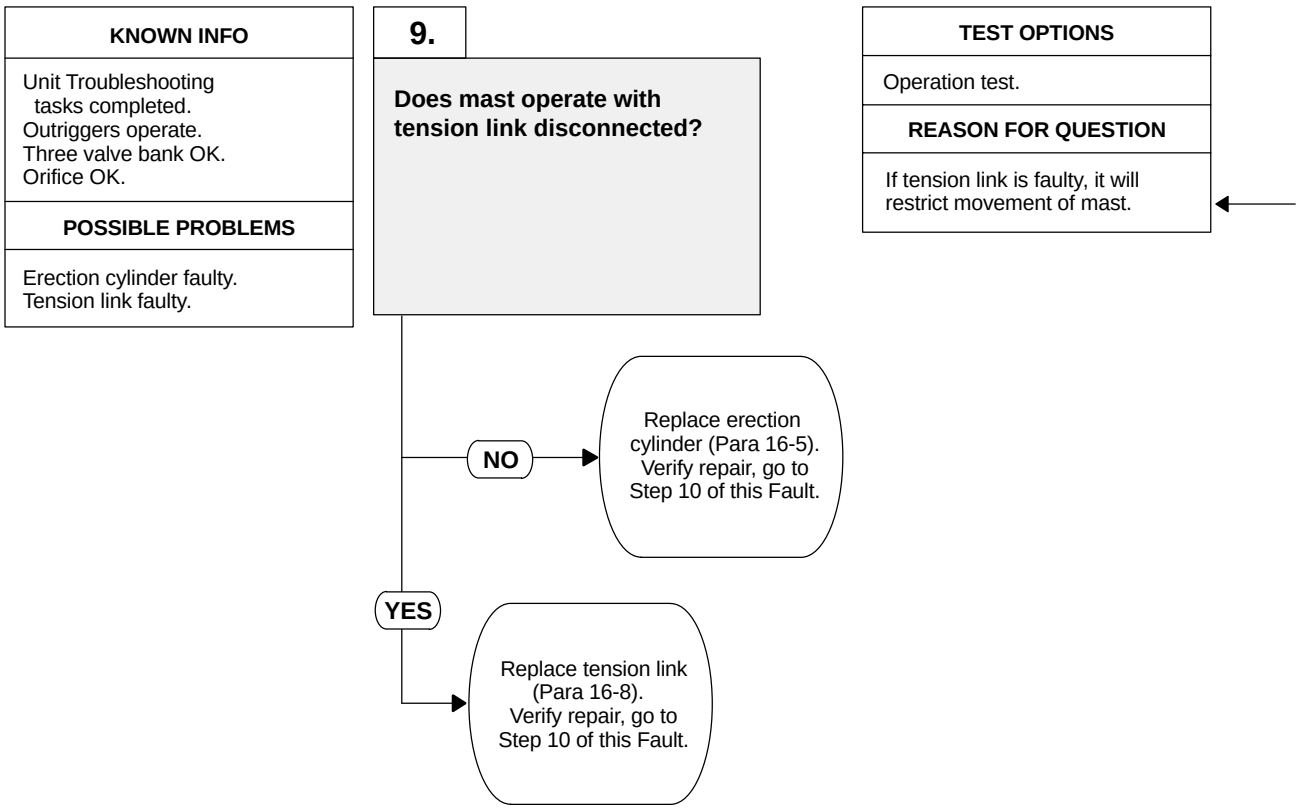
Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Disconnect hose from elbow at port P of cylinder. Discard preformed packing.
(2) Remove elbow from adapter at port P of cylinder. Discard preformed packing.
(3) Remove adapter from cylinder port P. Discard preformed packing.
  (a) If orifice in adapter is clogged or damaged, clean or replace adapter and perform Steps (4) through (6) below.
  (b) If orifice is OK, perform Steps (4) through (6) below and go to Step 9 of this Fault.
(4) Install adapter with preformed packing on cylinder.
(5) Install elbow with preformed packing on adapter.
(6) Connect hose with preformed packing on elbow.

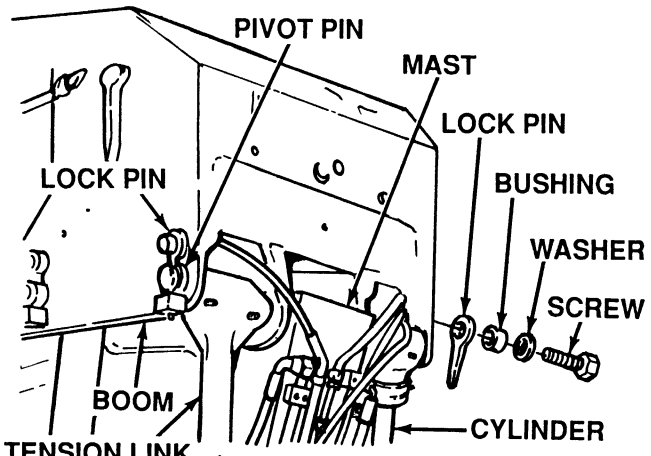


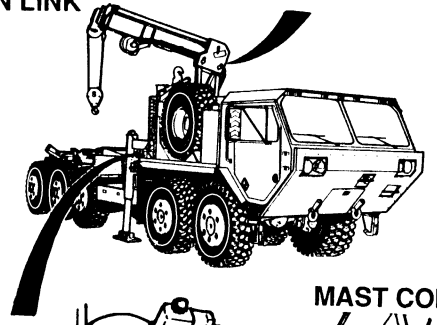
5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

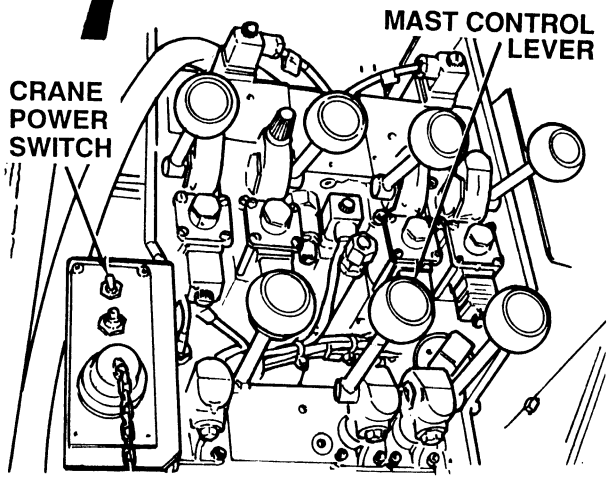


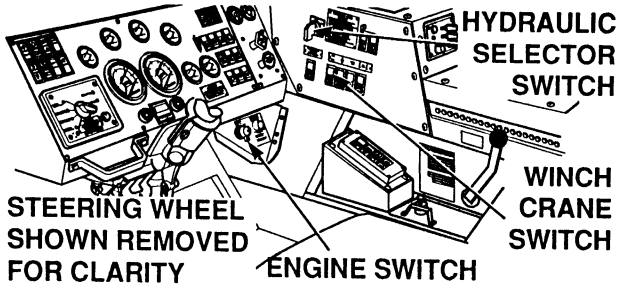
OPERATION TEST

(1) Remove two screws, washers, bushings from lockpins and boom.
(2) Remove two lock pins from pivot pin.
(3) With aid of assistant, drive pivot pin out of boom and tension link only enough so that tension link can be removed from boom. Do not drive pivot pin through mast.
(4) Operate mast using MAST control lever.
    (a) If mast does not operate normally, replace erection cylinder (Para 16-5).
    (b) If mast does operate normally, replace tension link (Para 16-8).

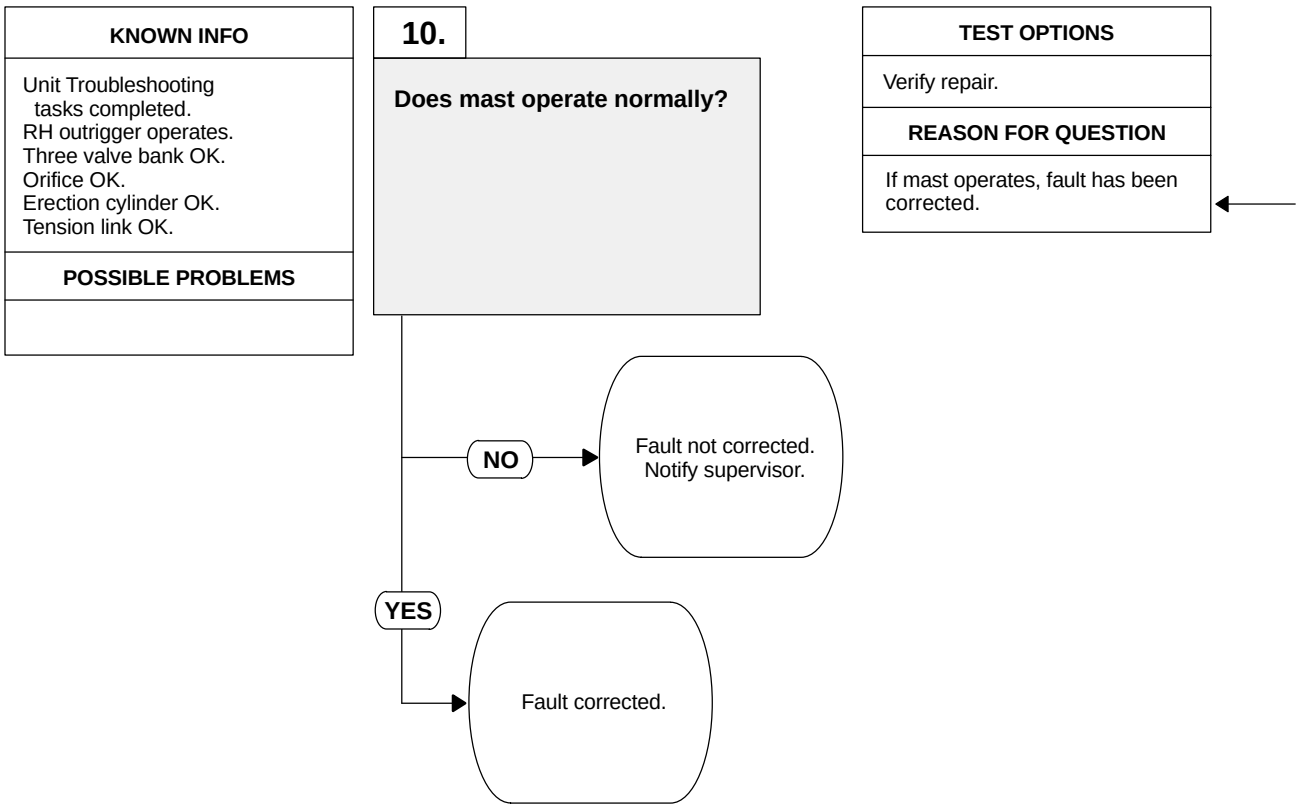


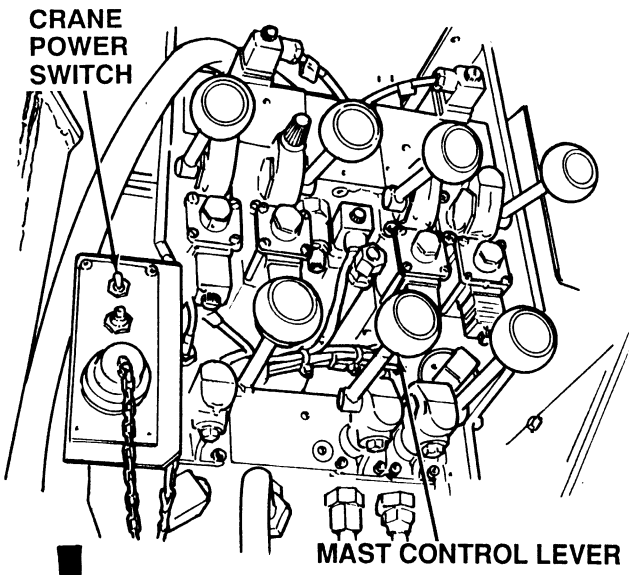






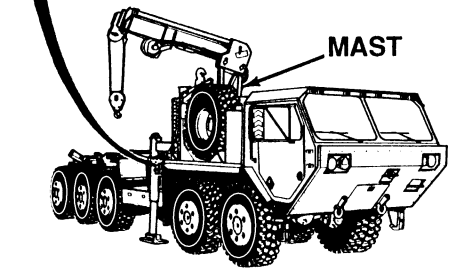
5. MAST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

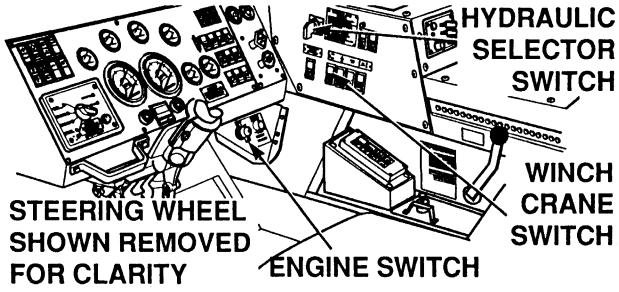




VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Operate crane mast using MAST control lever.
  (a) If mast does not operate, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
  (b) If mast operates, fault has been corrected.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.





2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

6. MAST DOES NOT RAISE.

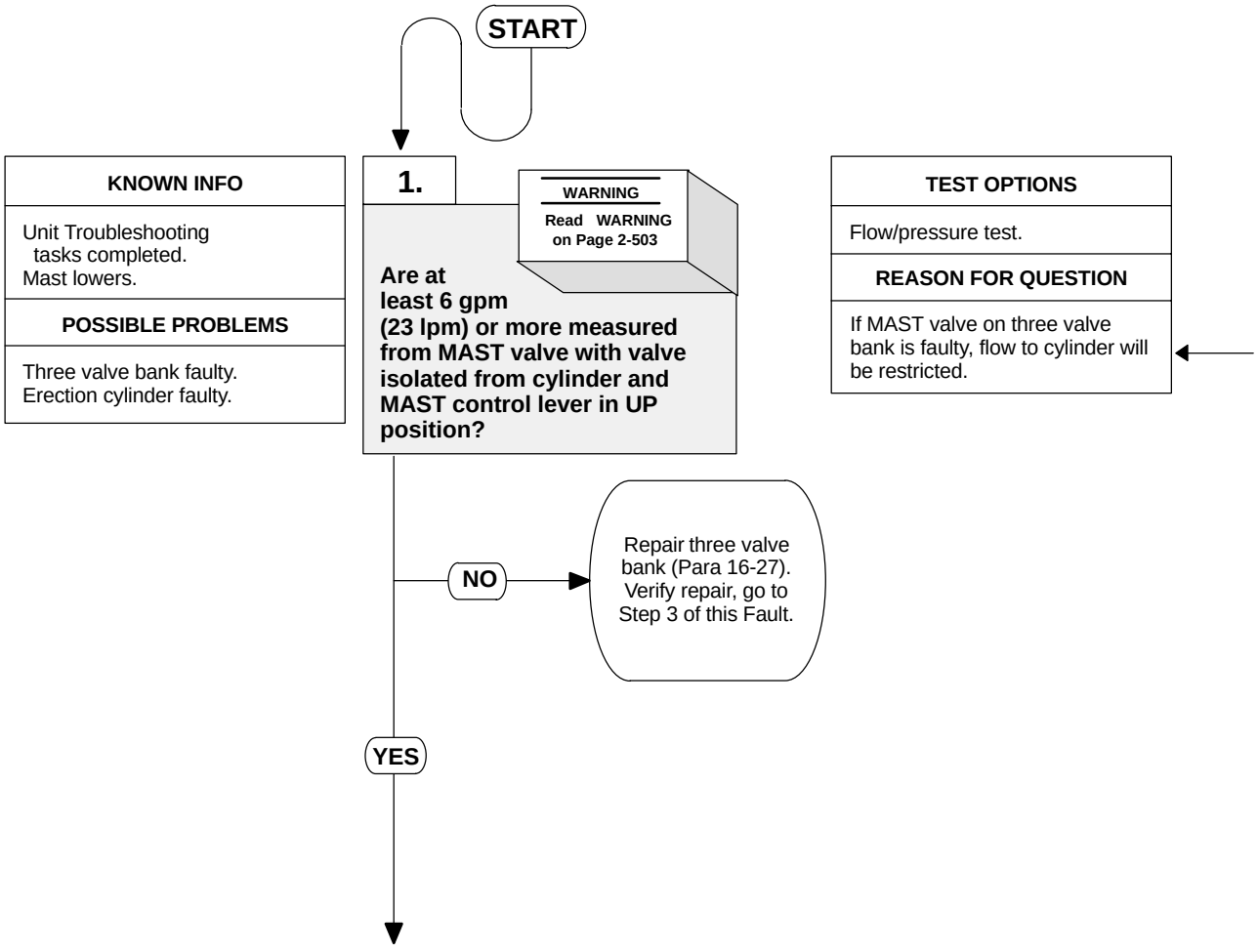
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Packing, Preformed (5) (Item 337, Appendix E)
Packing, Preformed (2) (Item 389, Appendix E)

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off
vehicle suspension, (TM 9-2320-364-10)



WARNING

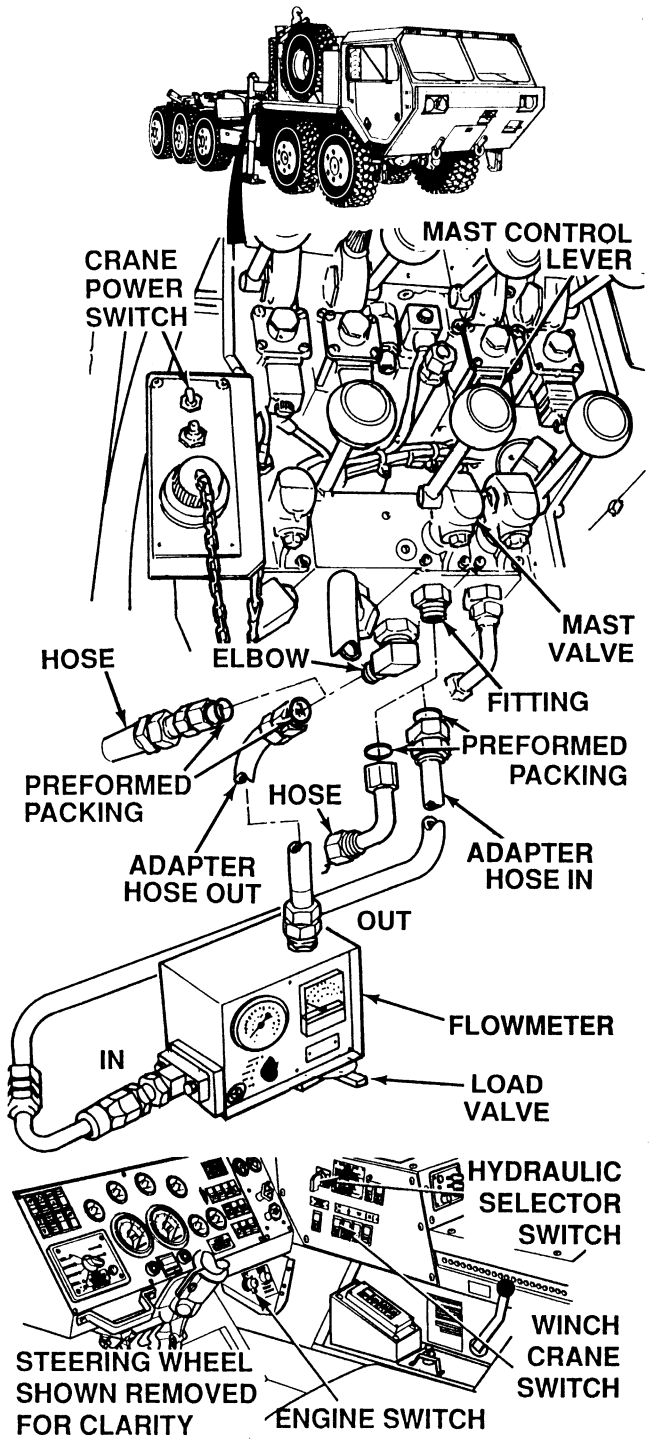
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

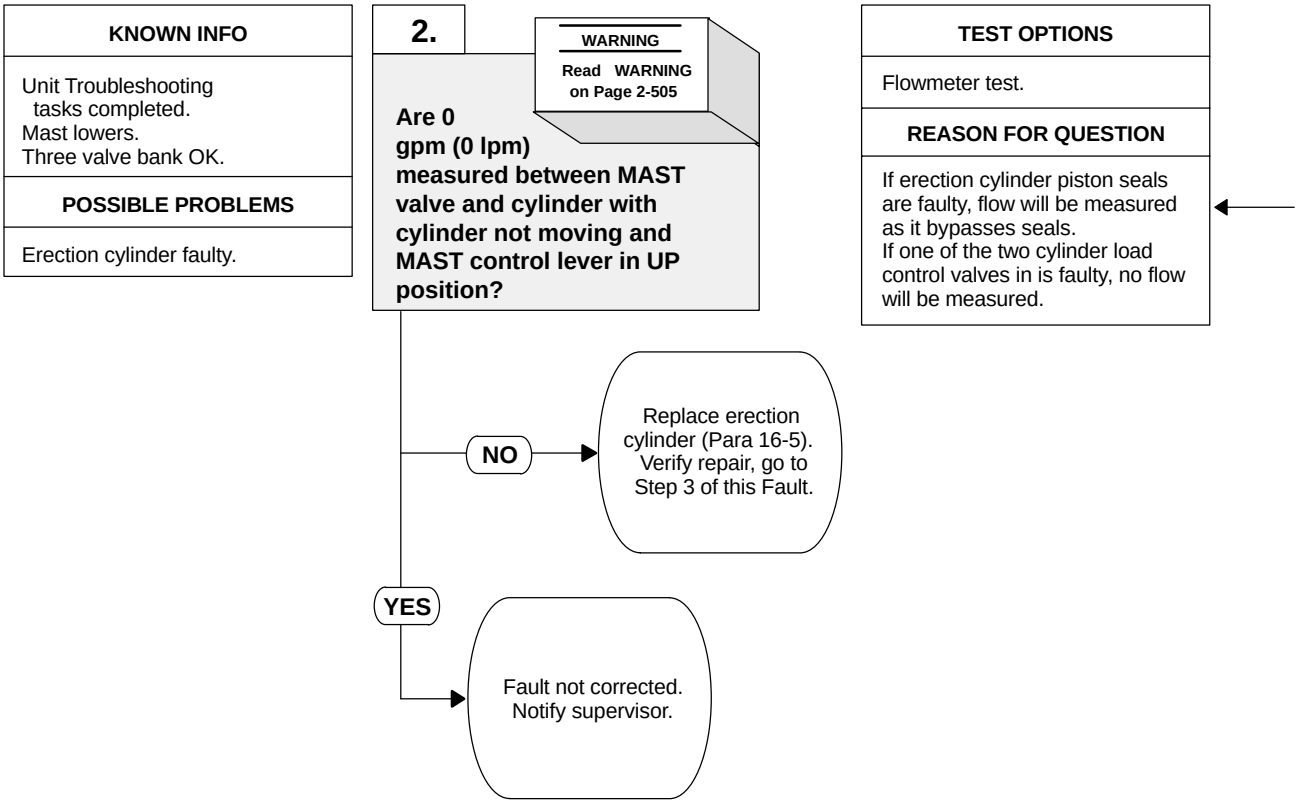
Use a drain pan to catch leaking hydraulic oil.

FLOW/PRESSURE TEST

(1) Tag, mark and disconnect hose from fitting at bottom of MAST control valve. Discard preformed packing.
(2) Plug hose with metal plug.
(3) Tag, mark and disconnect hose from elbow at bottom of MAST control valve. Discard preformed packing.
(4) Plug hose with metal plug.
(5) Connect adapter hose with preformed packing to elbow.
(6) Connect adapter hose to flowmeter OUT port.
(7) Connect adapter hose with preformed packing to fitting.
(8) Connect adapter hose to flowmeter IN port.
(9) Open flowmeter load valve.
(10) Start engine (TM 9-2320-364-10).
(11) Set WINCH/CRANE switch to CRANE position.
(12) Set hydraulic selector switch to CRANE/SRW position.
(13) Set crane POWER switch to ON position.
(14) Hold MAST control lever in UP position.
  (a) If 6 gpm (23 lpm) or more are not present, perform Steps (15) through (20) below and replace MAST valve on three valve bank (Para 16-27).
  (b) If at least 6 gpm (23 lpm) are present, three valve bank is OK.
(15) Set crane POWER switch to OFF position.
(16) Set hydraulics selector switch to OFF position.
(17) Turn OFF ENGINE switch.
(18) Disconnect adapter hoses from elbow and fitting. Discard preformed packings.
(19) Remove metal plugs from two hoses.
(20) Connect two hoses with preformed packings to elbow and fitting.



6. MAST DOES NOT RAISE (CONT).



WARNING

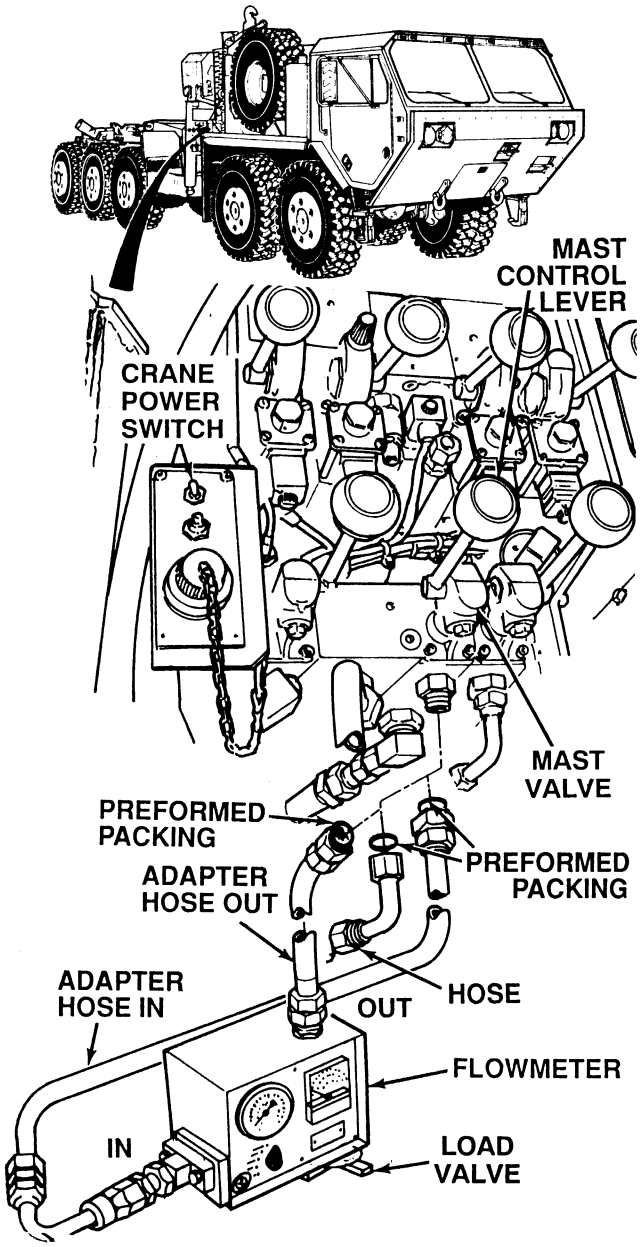
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

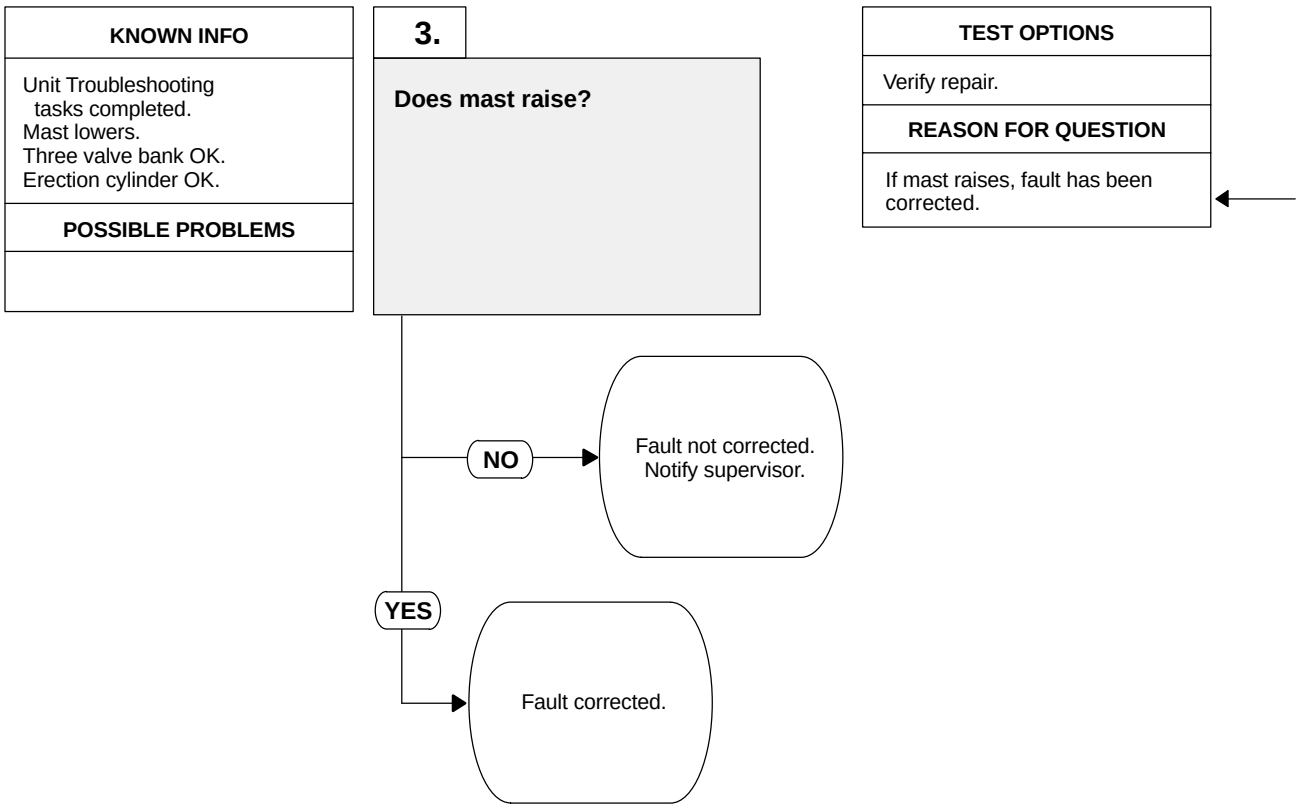
Use a drain pan to catch leaking hydraulic oil.

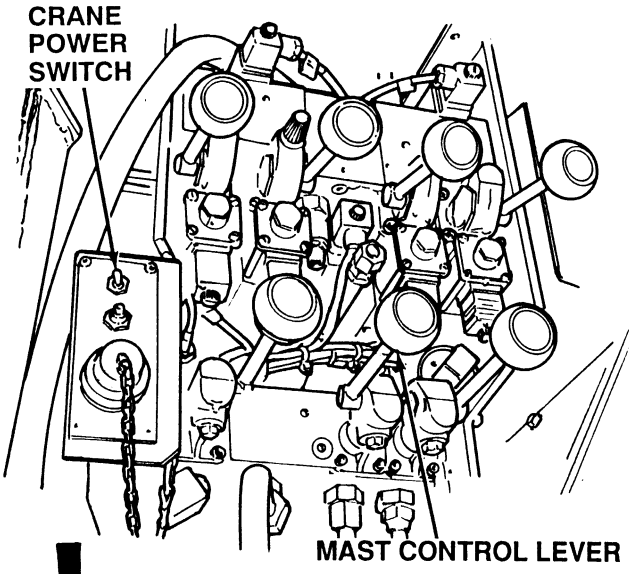
FLOWMETER TEST

(1) Tag, mark and disconnect hose from fitting at bottom of MAST four way valve. Discard preformed packing.
(2) Connect adapter hose with preformed packing to disconnected hose.
(3) Connect adapter hose to flowmeter OUT port.
(4) Connect adapter hose with preformed packing to fitting.
(5) Connect adapter hose to flowmeter IN port.
(6) Open flowmeter load valve.
(7) Start engine (TM 9-2320-364-10).
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Raise mast completely using MAST control lever.
(11) Hold MAST control lever in UP position while observing flowmeter.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (17) below and replace erection cylinder (Para 16-5).
  (b) If 0 gpm (0 lpm) are present, cylinder piston seals are OK. Fault not corrected. Perform Steps (12) through (17) below and notify supervisor.
(12) Set crane POWER switch to OFF position.
(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Disconnect adapter hose from crane hose. Discard preformed packing.
(16) Disconnect adapter hose from fitting. Discard preformed packing.
(17) Connect crane hose with preformed packing to fitting.



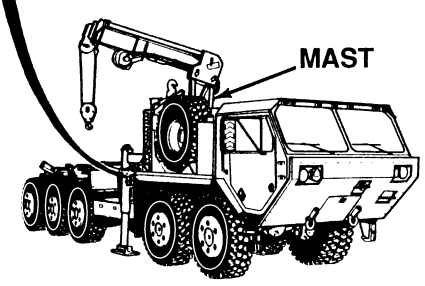
6. MAST DOES NOT RAISE (CONT).

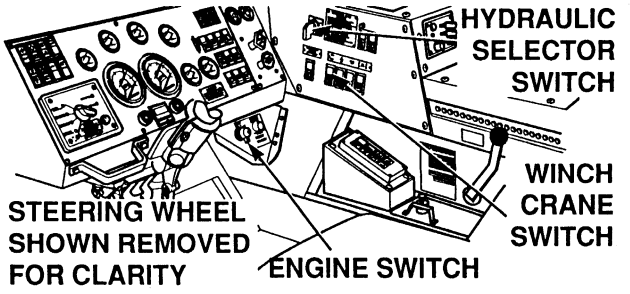




VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Operate crane mast using MAST control lever (TM 9-2320-364-10).
  (a) If mast does not raise, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
  (b) If mast raises, fault has been corrected.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.





2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

7. MAST DOES NOT LOWER.

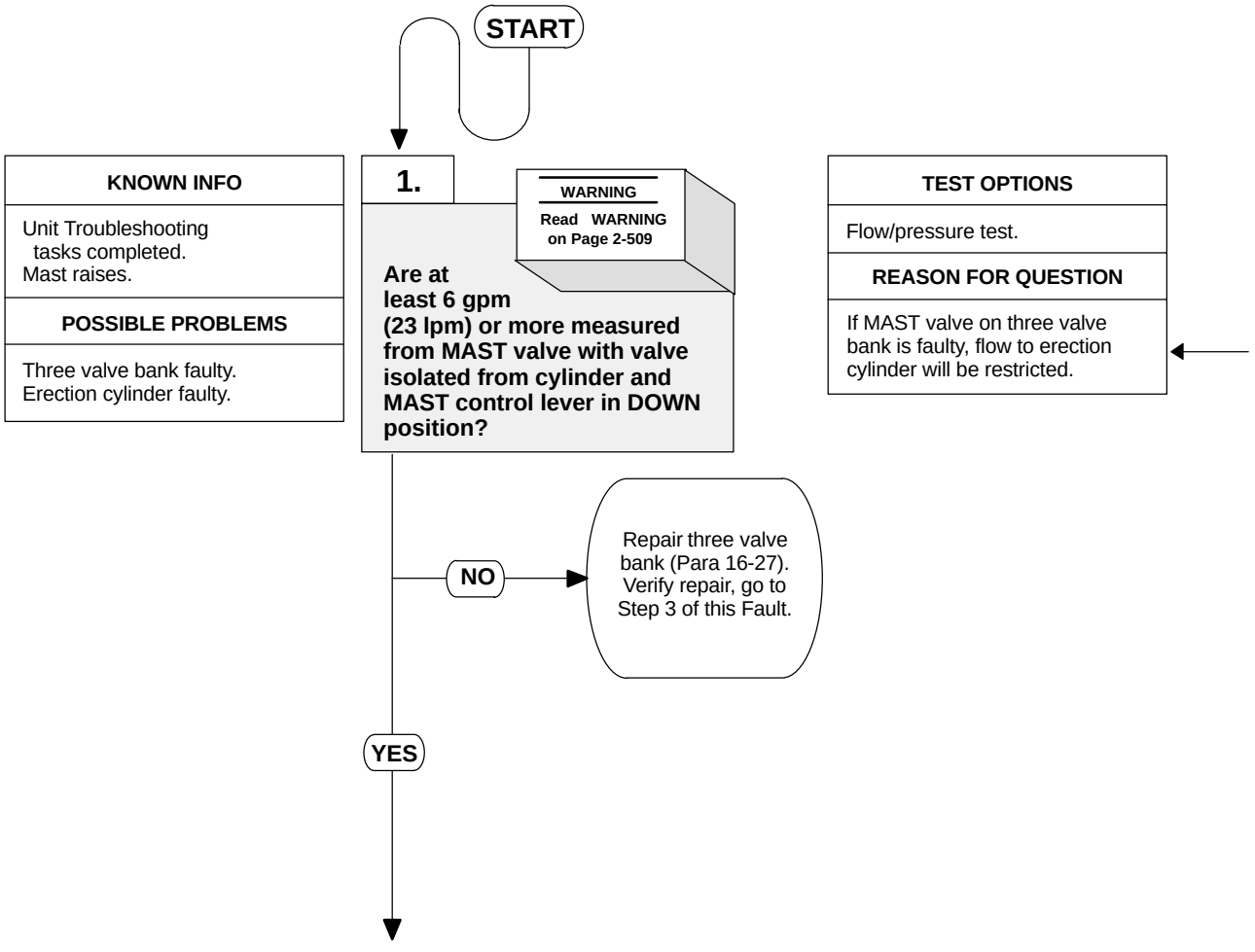
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Packing, Preformed (5) (Item 337, Appendix E)
Packing, Preformed (2) (Item 389, Appendix E)

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off
vehicle suspension, (TM 9-2320-364-10)



WARNING

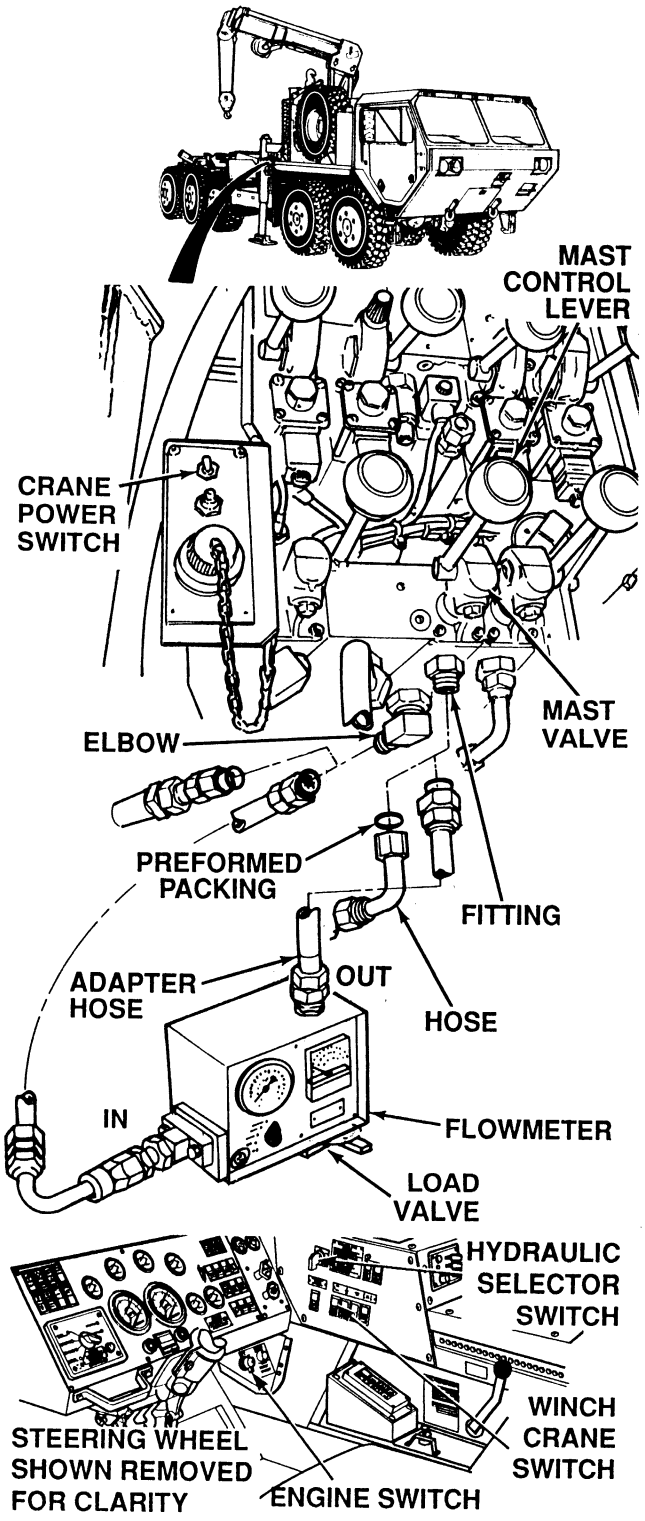
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

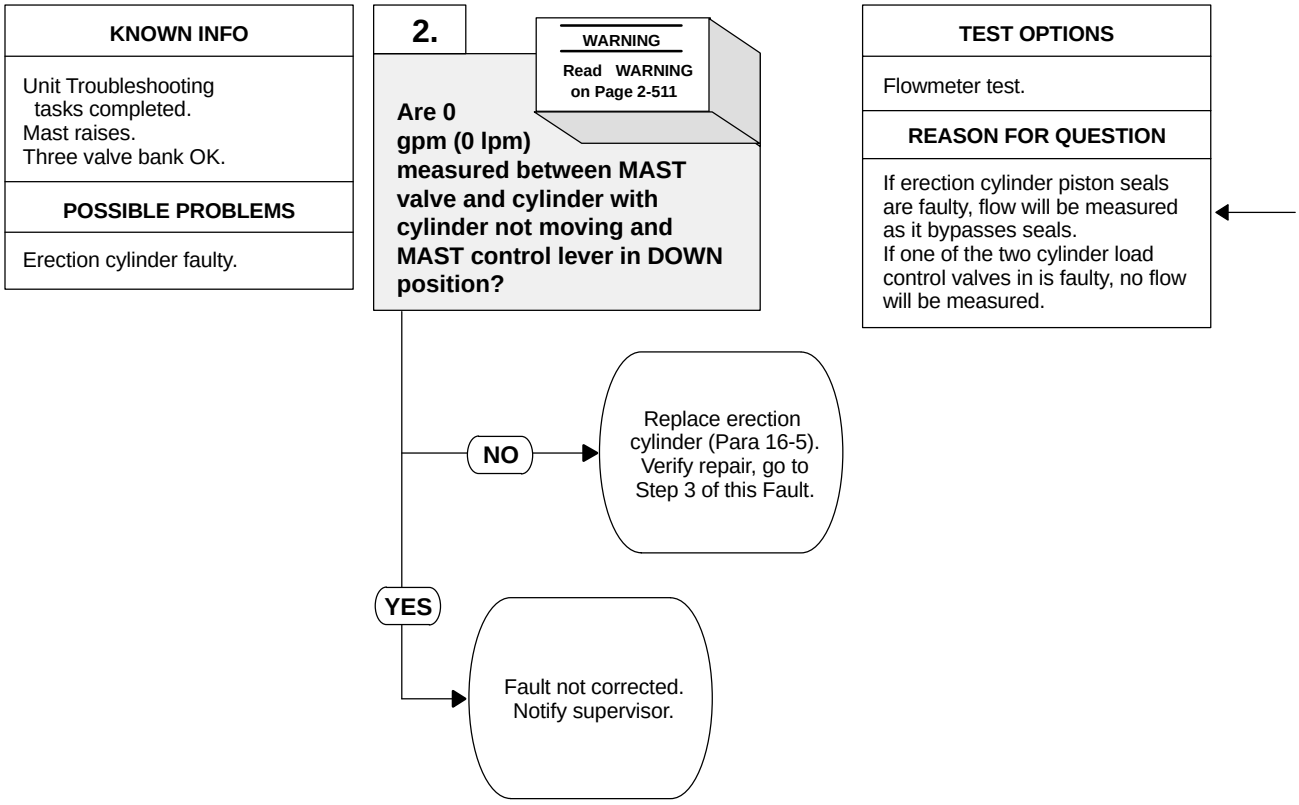
Use a drain pan to catch leaking hydraulic oil.

FLOW/PRESSURE TEST

(1) Tag, mark and disconnect hose from fitting at bottom of MAST valve. Discard preformed packing.
(2) Plug hose with metal plug.
(3) Tag, mark and disconnect hose from elbow at bottom of MAST valve. Discard preformed packing.
(4) Plug hose with metal plug.
(5) Connect adapter hose with preformed packing to elbow.
(6) Connect adapter hose to flowmeter IN port.
(7) Connect adapter hose with preformed packing to fitting.
(8) Connect adapter hose to flowmeter OUT port.
(9) Open flowmeter load valve.
(10) Start engine (TM 9-2320-364-10).
(11) Set WINCH/CRANE switch to CRANE position.
(12) Set hydraulic selector switch to CRANE/SRW position.
(13) Set crane POWER switch to ON position.
(14) Hold MAST control lever in DOWN position.
  (a) If 6 gpm (23 lpm) or more are not present, perform Steps (15) through (20) below and replace MAST valve on three valve bank (Para 16-27).
  (b) If at least 6 gpm (23 lpm) are present, three valve bank is OK.
(15) Set crane POWER switch to OFF position.
(16) Set hydraulics selector switch to OFF position.
(17) Turn OFF ENGINE switch.
(18) Disconnect adapter hoses from elbow and fitting. Discard preformed packings.
(19) Remove metal plugs from two hoses.
(20) Connect two hoses with preformed packings to elbow and fitting.



7. MAST DOES NOT LOWER (CONT).



WARNING

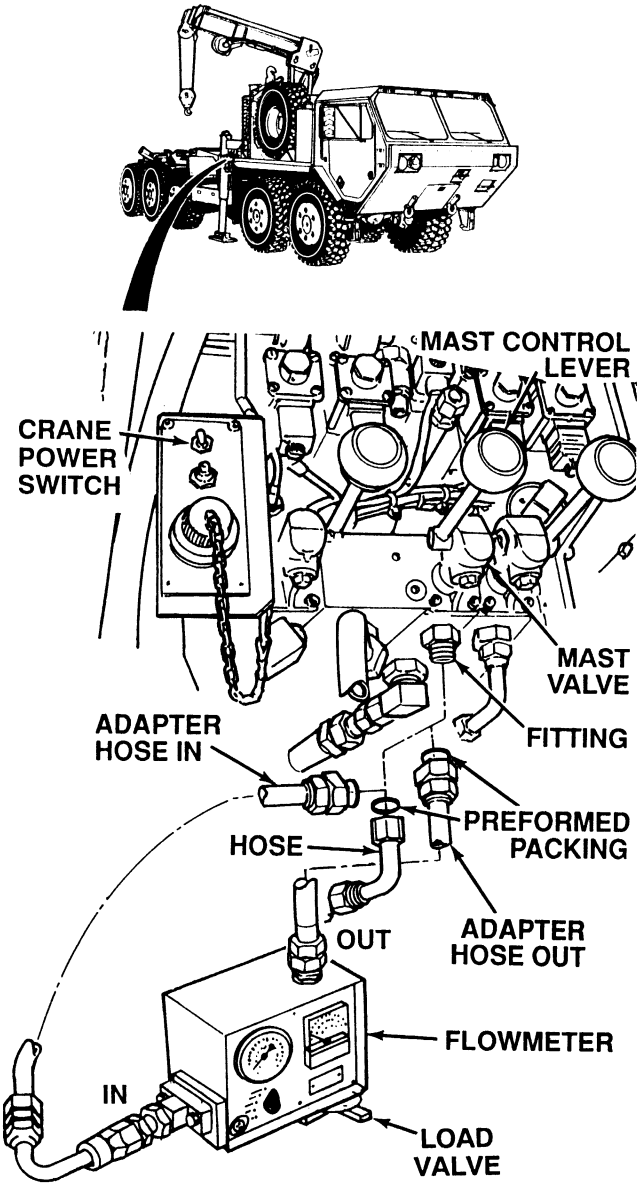
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

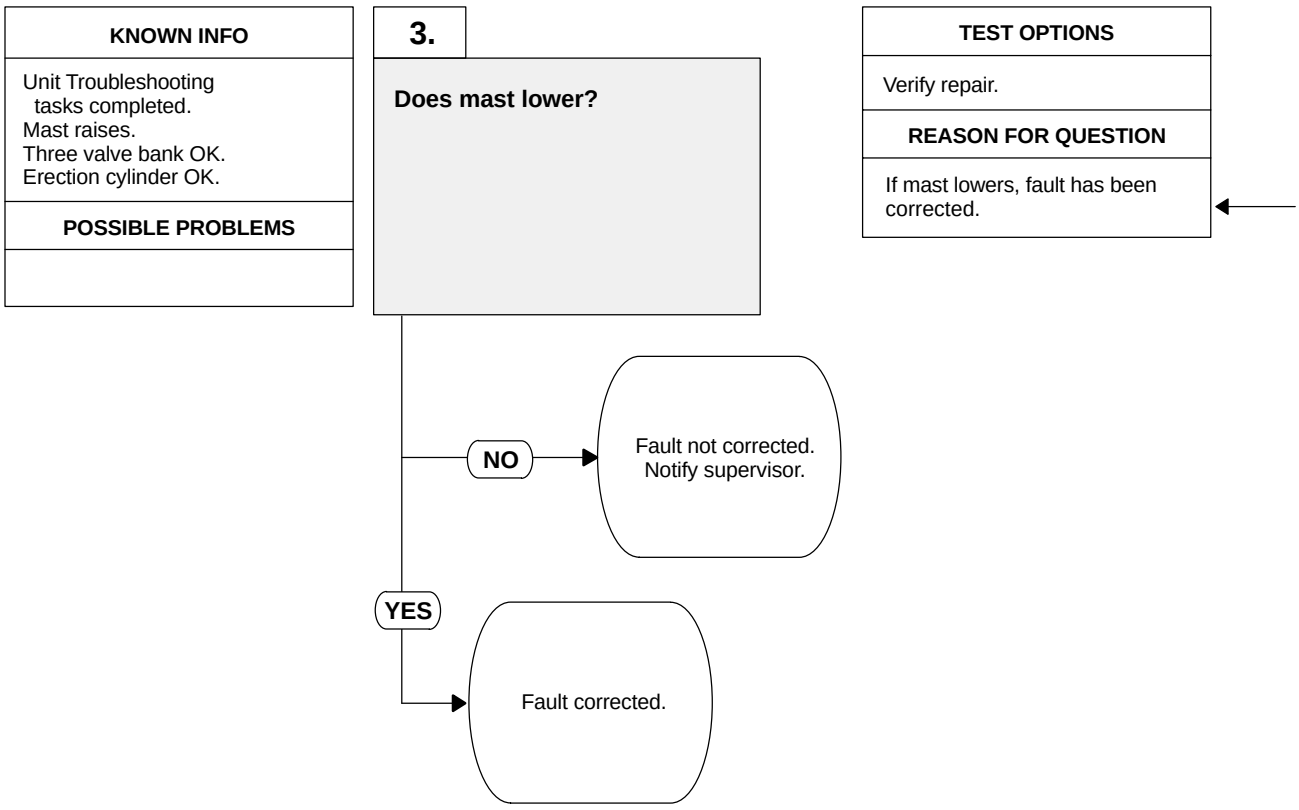
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Tag, mark and disconnect hose from fitting at bottom of MAST valve. Discard preformed packing.
(2) Connect adapter hose with preformed packing to disconnected hose.
(3) Connect adapter hose to flowmeter IN port.
(4) Connect adapter hose with preformed packing to fitting.
(5) Connect adapter hose to flowmeter OUT port.
(6) Open flowmeter load valve.
(7) Start engine (TM 9-2320-364-10).
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Turn ON crane POWER switch.
(11) Hold MAST control lever in DOWN position while observing flowmeter.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (17) below and replace erection cylinder (Para 16-5).
  (b) If 0 gpm (0 lpm) are present, cylinder piston seals are OK. Fault not corrected. Perform Steps (12) through (17) below and notify supervisor.
(12) Set crane POWER switch to OFF position.
(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Disconnect adapter hose from crane hose. Discard preformed packing.
(16) Disconnect adapter hose from fitting. Discard preformed packing.
(17) Connect crane hose with preformed packing to fitting.

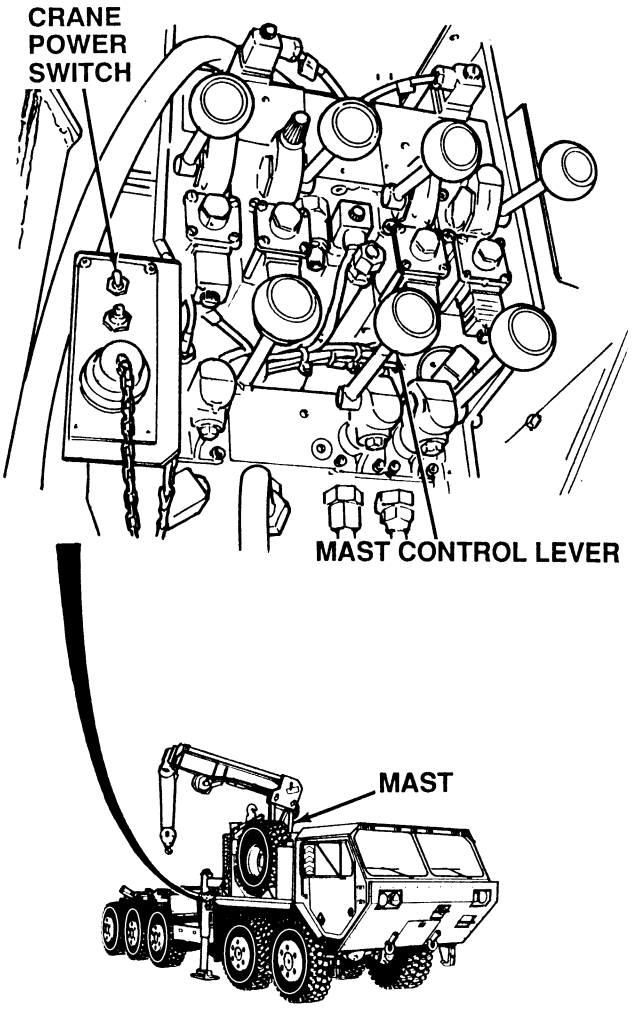


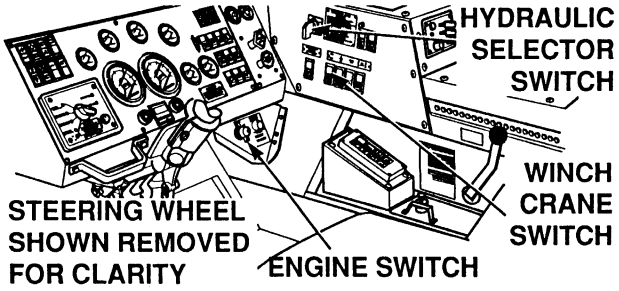
7. MAST DOES NOT LOWER (CONT).



VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Operate crane mast using MAST control lever (TM 9-2320-364-10).
  (a) If mast does not lower, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
  (b) If mast lowers, fault has been corrected.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.





2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

8. CRANE DOES NOT SWING OR SWINGS SLOWLY.

INITIAL SETUP

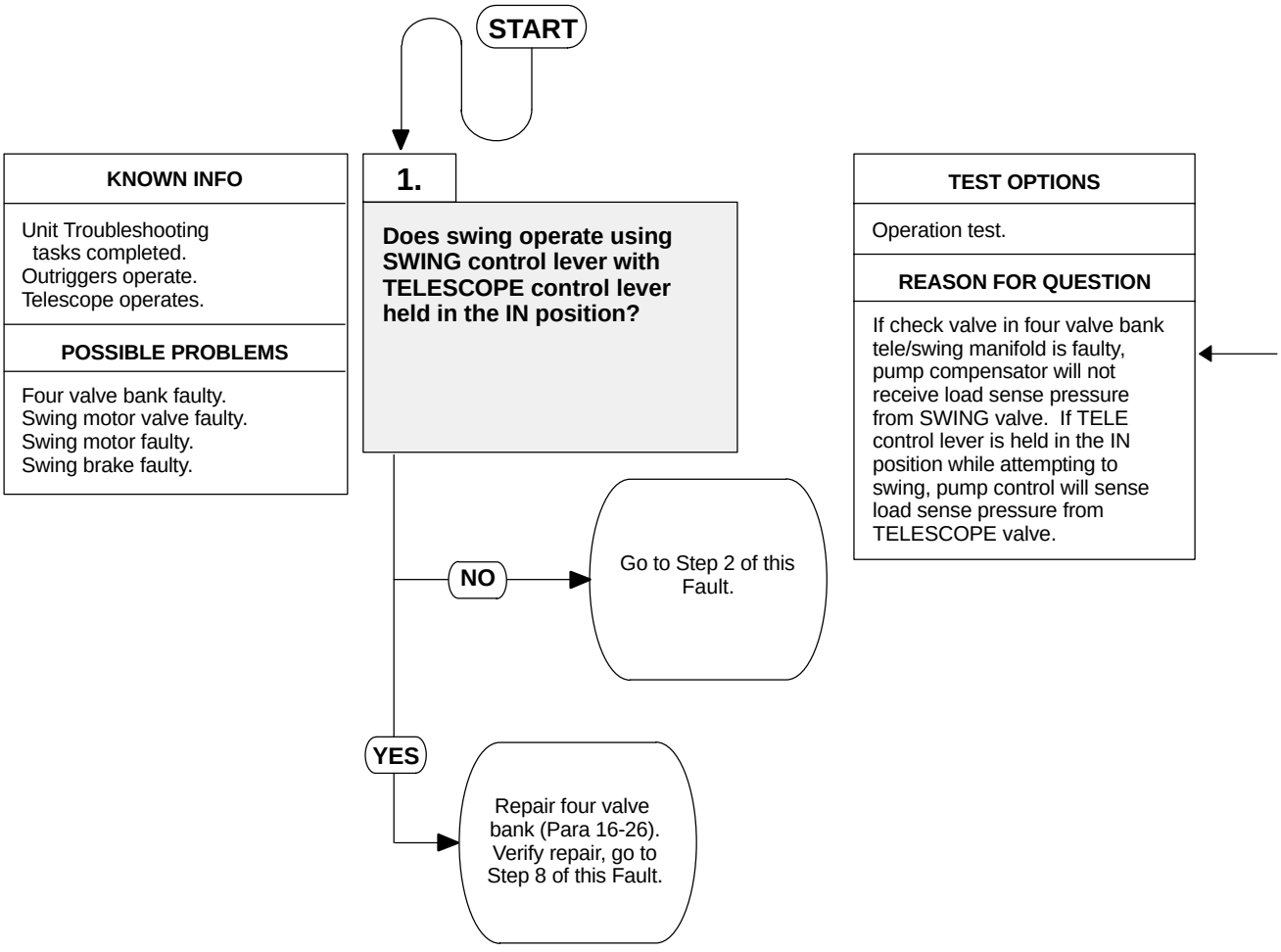
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Lockwasher (2) (Item 269, Appendix E)
Lockwasher (4) (Item 282, Appendix E)
Packing, Preformed (9) (Item 347, Appendix E)
Packing, Preformed (8) (Item 389, Appendix E)

Personnel Required
Two

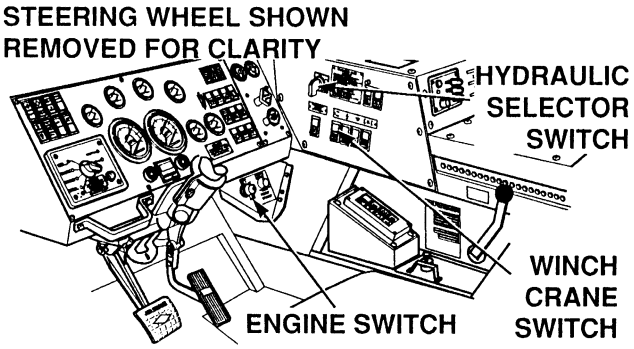
References
TM 9-2320-364-10
TM 9-2320-364-20

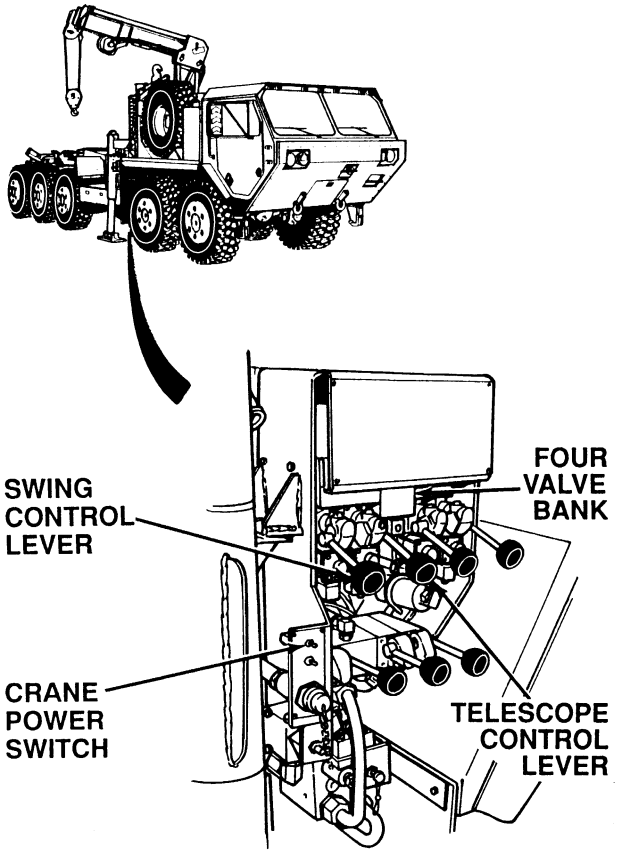
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



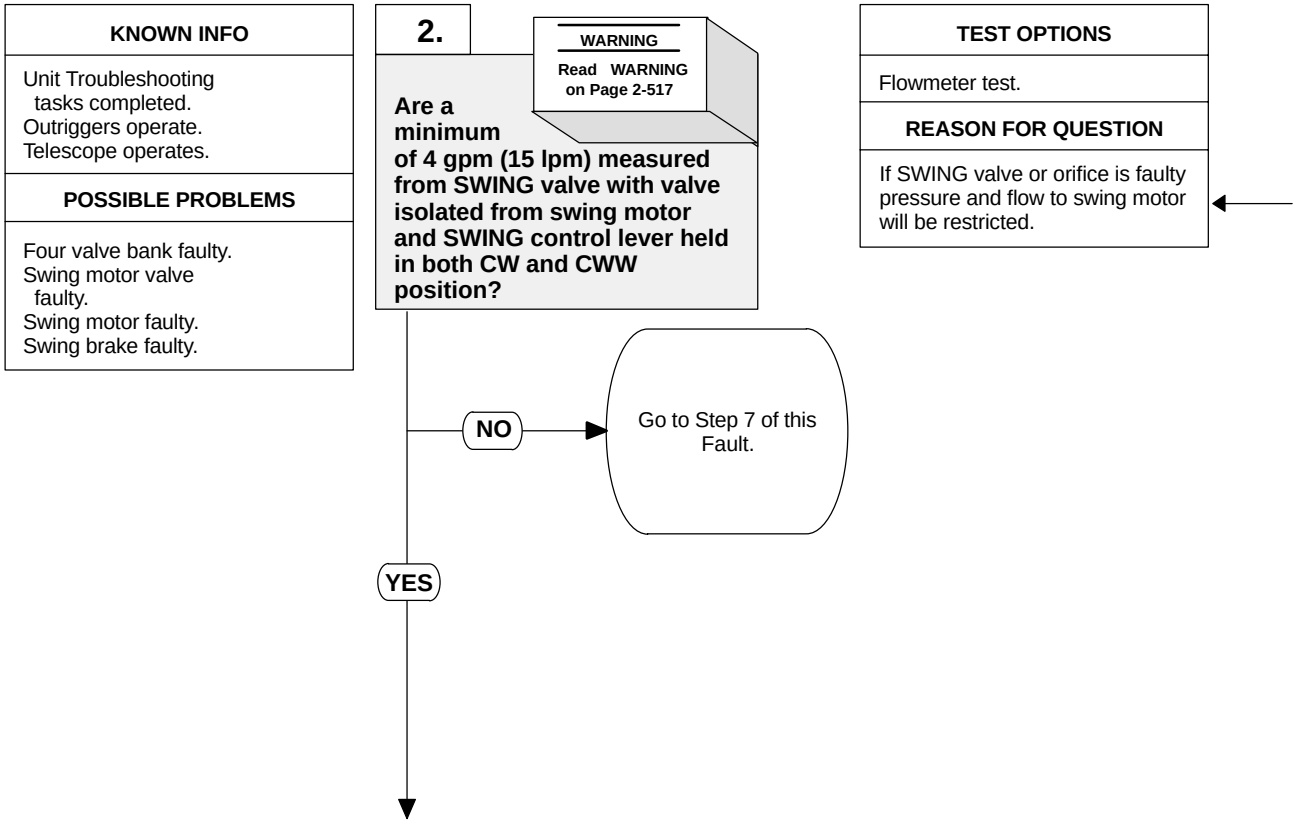
OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Set crane POWER switch to ON position.
(5) Attempt to swing crane using SWING control lever while holding TELE control lever in the IN position.
    (a) If crane does not swing, perform Steps (6) through (8) below and go to Step 2 of this Fault.
    (b) If crane swings, check valve in four valve bank tele/swing manifold is faulty. Perform Steps (6) through (8) below and repair four valve bank (Para 16-26).
(6) Set crane POWER switch to OFF position.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.





8. CRANE DOES NOT SWING OR SWINGS SLOWLY (CONT).



WARNING

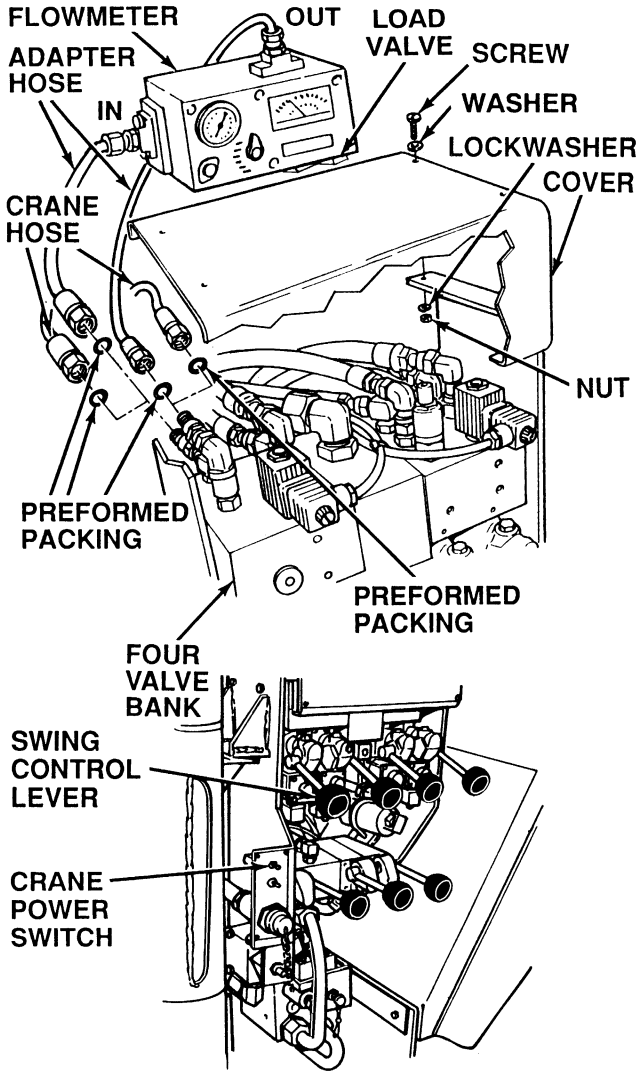
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

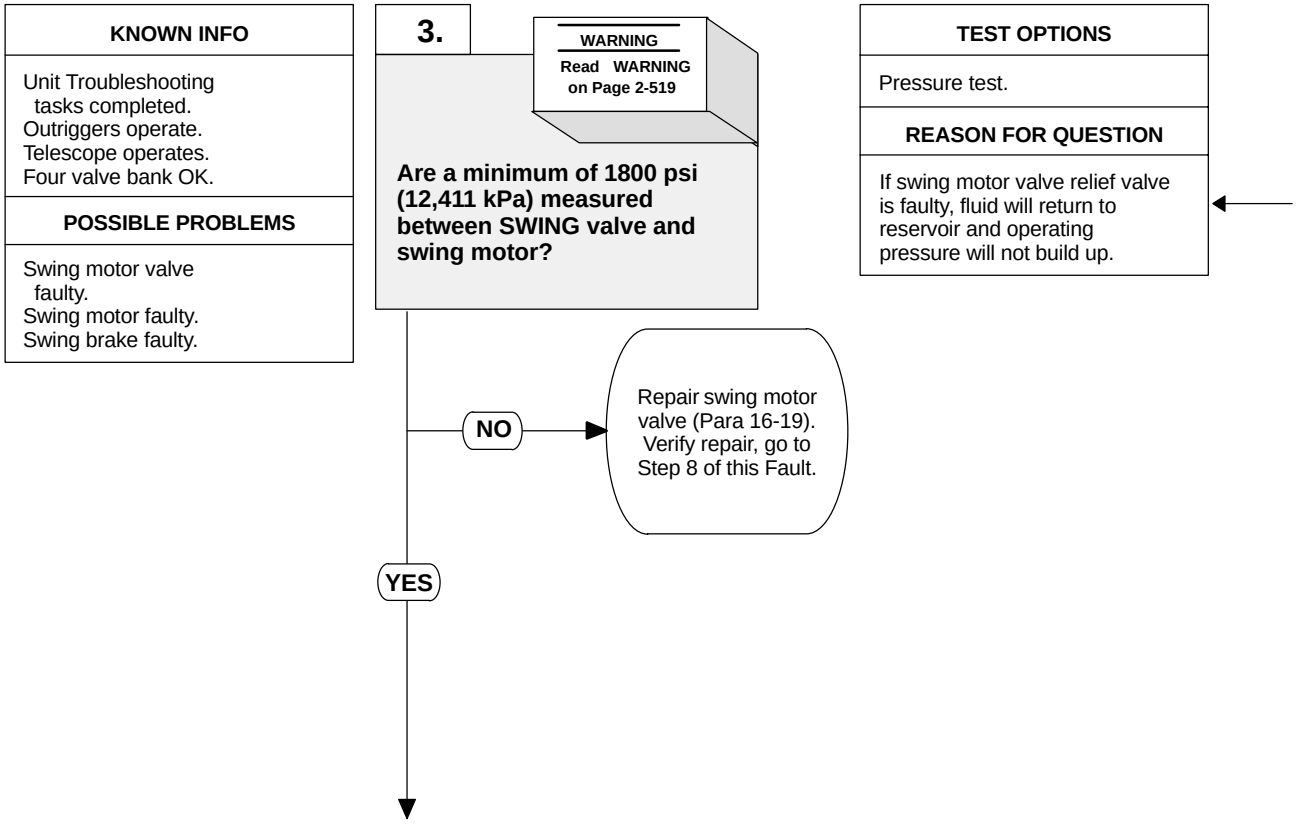
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four nuts, lockwashers, screws and washers and cover from crane. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at left side of four valve bank. Discard preformed packings.
(3) Plug hoses with metal plugs.
(4) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(5) Connect adapter hose to flowmeter OUT port.
(6) Connect adapter hose with preformed packing to outboard (taller) elbow.
(7) Connect adapter hose to flowmeter IN port.
(8) Open flowmeter load valve.
(9) Start engine (TM 9-2320-364-10).
(10) Set WINCH/CRANE switch to CRANE position.
(11) Set hydraulic selector switch to CRANE/SRW position.
(12) Set crane POWER switch to ON position.
(13) Hold SWING control lever in CW and CCW positions and observe flowmeter.
  (a) If 4 gpm (15 lpm) or more are not present, perform Steps (14) through (19) below and go to Step 7 of this Fault.
  (b) If at least 4 gpm (15 lpm) are present, perform Steps (14) through (19) below and go to Step 3 of this Fault.
(14) Set crane POWER switch to OFF position.
(15) Set hydraulic selector switch to OFF position.
(16) Turn OFF ENGINE switch.
(17) Disconnect adapter hoses from elbows. Discard preformed packings.
(18) Remove plugs from hoses.
(19) Connect two hoses with preformed packings to elbows.



8. CRANE DOES NOT SWING OR SWINGS SLOWLY (CONT).



WARNING

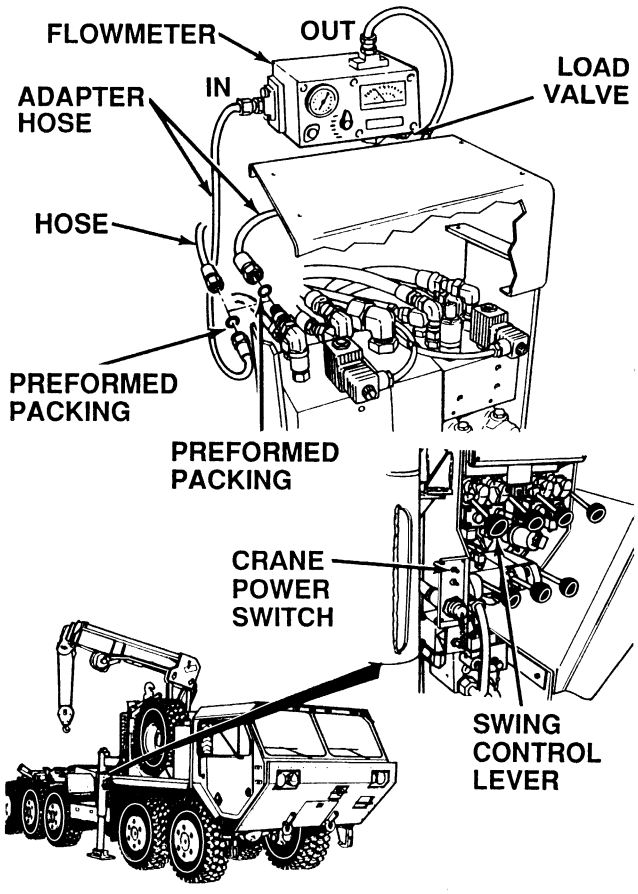
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

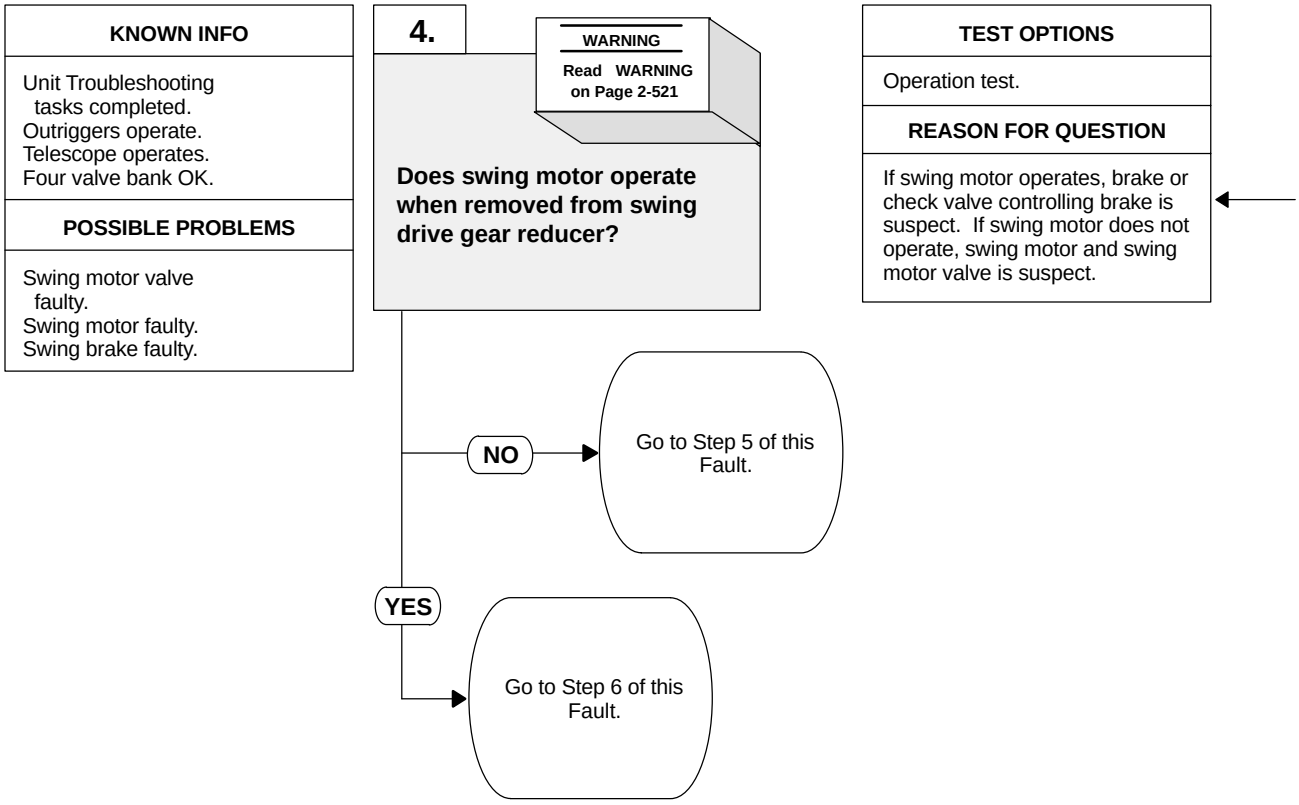
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) Tag, mark and disconnect hose from taller elbow at left of four valve bank. Discard preformed packing.
(2) Connect flowmeter IN port adapter hose with preformed packing to elbow.
(3) Connect flowmeter OUT port adapter hose with preformed packing to disconnected crane hose.
(4) Open flowmeter load valve.
(5) Start engine (TM 9-2320-364-10).
(6) Set WINCH/CRANE switch to CRANE position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Set crane POWER switch to ON position.
(9) Hold SWING control lever in CW position and observe flowmeter.
    (a) If a minimum of 1800 psi (12,411 kPa) are not present, perform Steps (10) through (14) below and repair swing motor valve (Para 16-19).
    (b) If 1800 psi (12,411 kPa) or more are present, perform Steps (10) through (14) below and go to Step 4 of this Fault.
(10) Set crane POWER switch to OFF position.
(11) Set hydraulic selector switch to OFF position.
(12) Turn OFF ENGINE switch.
(13) Disconnect adapter hoses from elbow and hose. Discard preformed packings.
(14) Connect crane hose with preformed packing to elbow.



8. CRANE DOES NOT SWING OR SWINGS SLOWLY (CONT).



WARNING

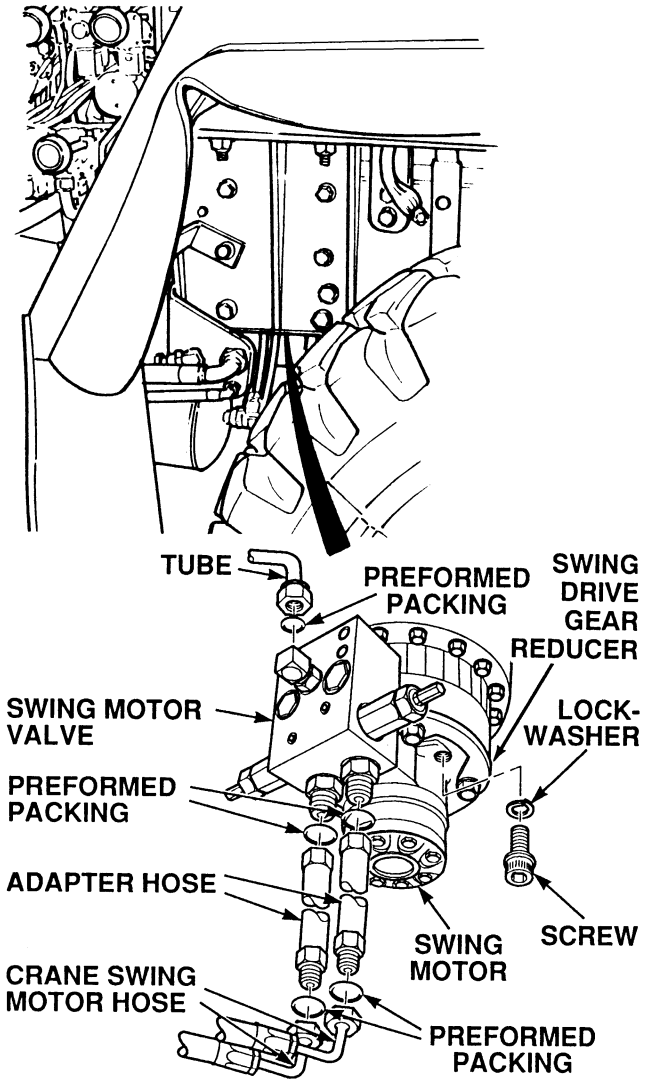
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

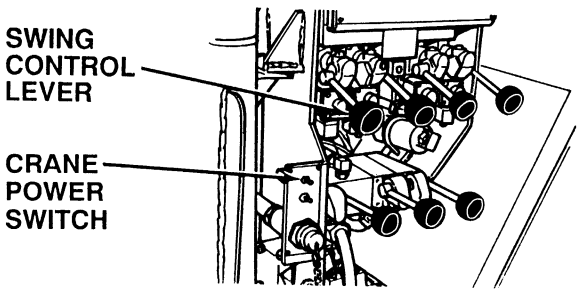
NOTE

Use a drain pan to catch leaking hydraulic oil.

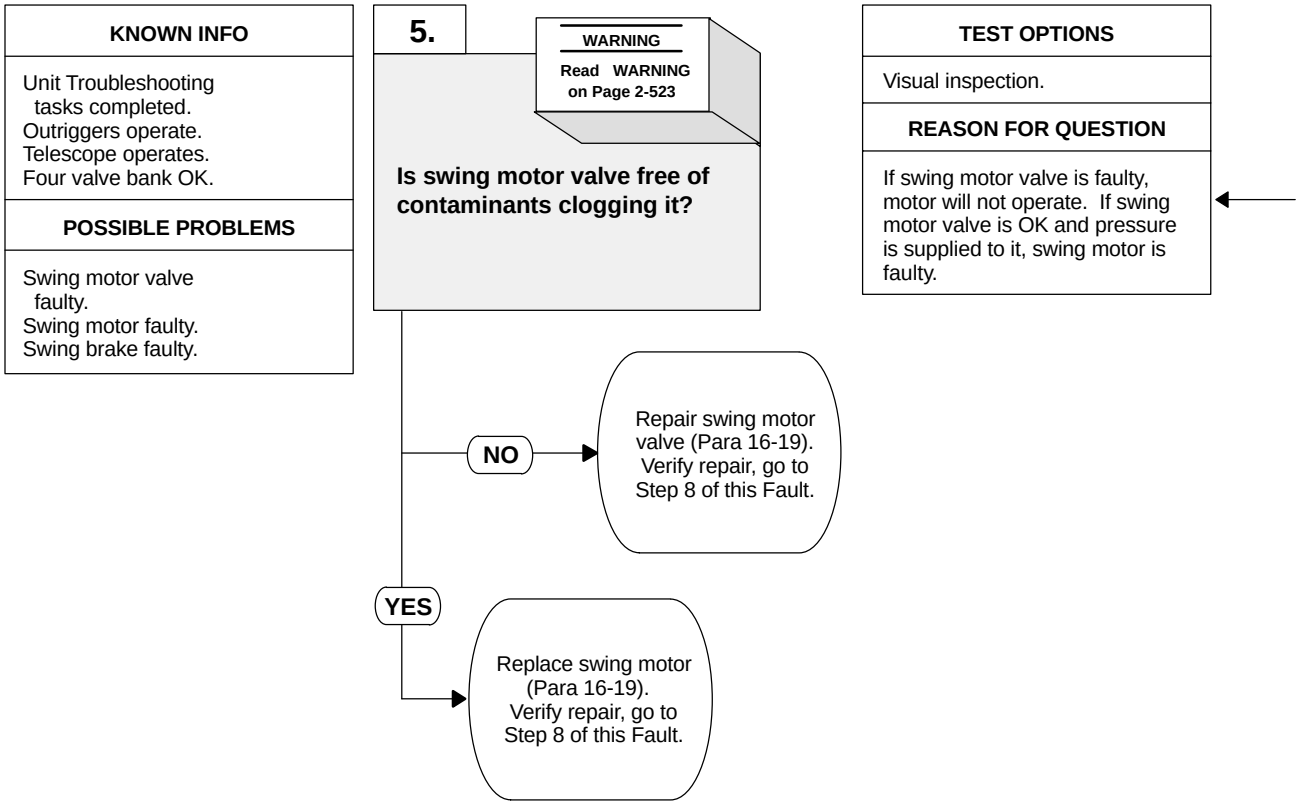
OPERATION TEST

(1) Tag, mark and disconnect two hoses from swing motor valve. Discard preformed packings.
(2) Connect adapter hoses with preformed packings to swing motor hoses.
(3) Connect adapter hoses with preformed packings to swing motor.
(4) Disconnect tube from swing motor valve assembly. Discard preformed packings.
(5) With aid of assistant, remove two screws, lockwashers and swing motor from swing drive gear reducer. Discard lockwashers.
(6) Install cap on swing brake motor valve assembly where tube was removed from.
(7) Start engine (TM 9-2320-364-10).
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Set crane POWER switch to ON position.
(11) Operate swing motor using SWING control lever.
  (a) If swing motor does not operate, perform Steps (12) through (14) below and go to Step 5 of this Fault.
  (b) If swing motor operates, perform Steps (12) through (14) below and go to Step 6 of this Fault.
(12) Set crane POWER switch to OFF position.
(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.





8. CRANE DOES NOT SWING OR SWINGS SLOWLY (CONT).



WARNING

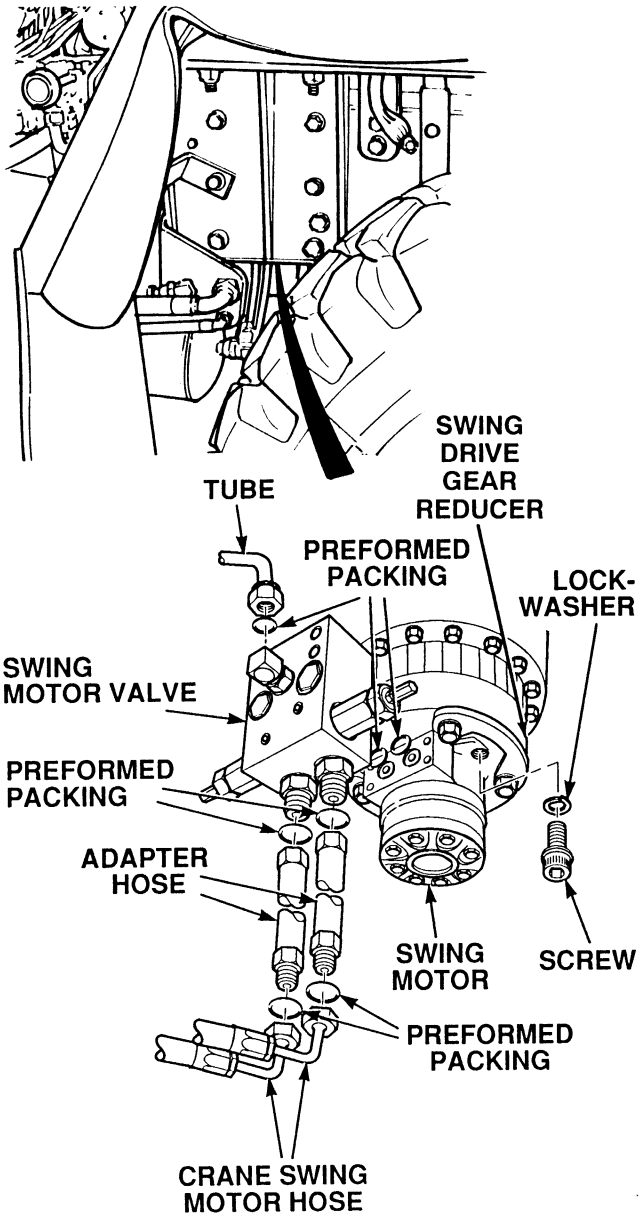
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

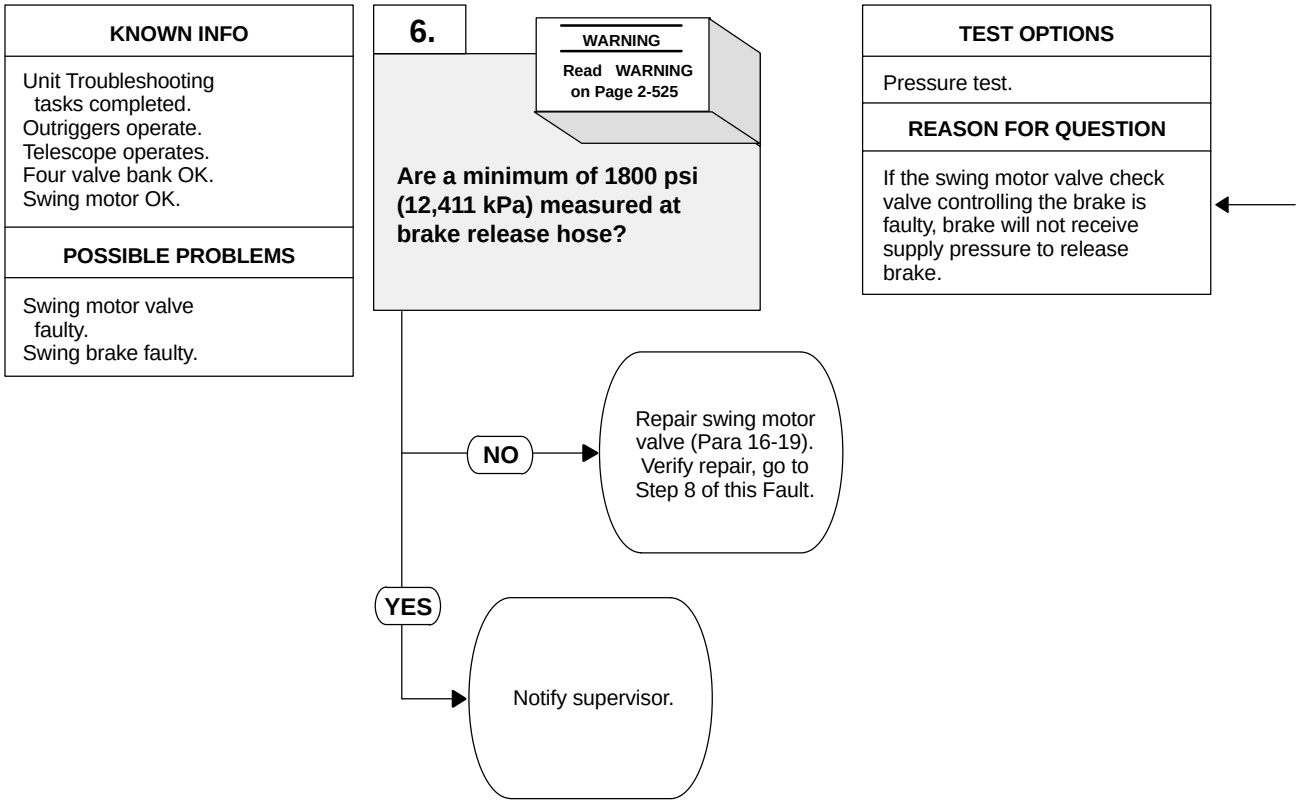
Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Disconnect adapter hoses from swing motor valve and from crane hoses. Discard preformed packings.
(2) Remove swing motor valve from swing motor (Para 16-19).
(3) Disassemble swing motor valve assembly (Para 16-19).
  (a) If valve assembly is damaged or clogged, repair swing motor valve (Para 16-19).
  (b) If swing motor valve is OK, swing motor is faulty. Replace swing motor (Para 16-19) and perform Steps (4) through (9) below.
(4) Assemble swing motor valve (Para 16-19).
(5) Install swing motor valve on swing motor (Para 16-19).
(6) Remove cap from swing motor valve assembly. Discard preformed packing.
(7) Install swing motor on swing drive gear reducer with two lockwashers and screws.
(8) Install two hoses with preformed packings on swing motor valve.
(9) Install tube with preformed packing on swing motor valve.



8. CRANE DOES NOT SWING OR SWINGS SLOWLY (CONT).



WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

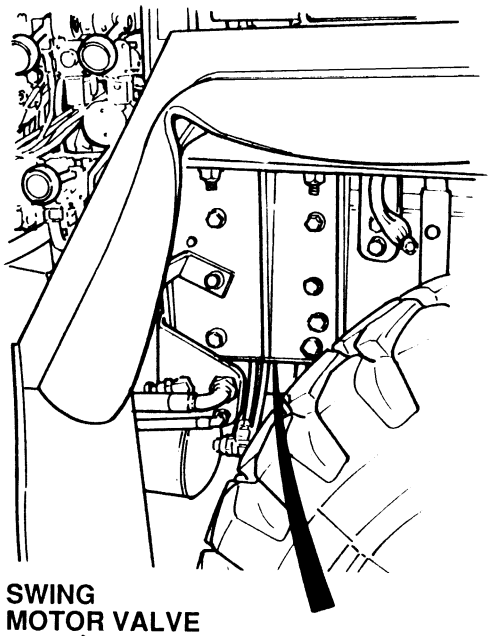
NOTE

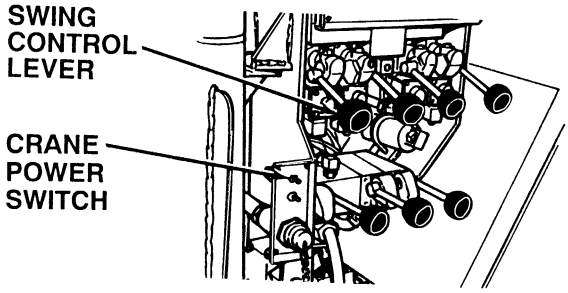
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) Remove cap from swing motor valve elbow. Discard preformed packing.
(2) Connect pressure gage with preformed packing to elbow.
(3) Start engine (TM 9-2320-364-10).
(4) Set WINCH/CRANE switch to CRANE position.
(5) Set hydraulic selector switch to CRANE/SRW position.
(6) Set crane POWER switch to ON position.
(7) Operate swing motor using SWING control lever.
  (a) If 1800 psi (12,411 kPa) or more are not present, repair swing motor valve (Para 16-19) and perform Steps (8) through (15) below.
  (b) If 1800 psi (12,411 kPa) or more are present, swing brake is faulty. Perform Steps (8) through (15) below and notify supervisor.

Continued on next page.





8. CRANE DOES NOT SWING OR SWINGS SLOWLY (CONT).

WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

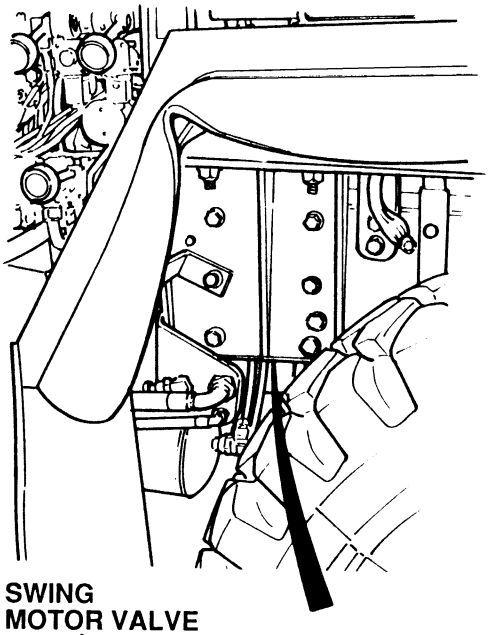
NOTE

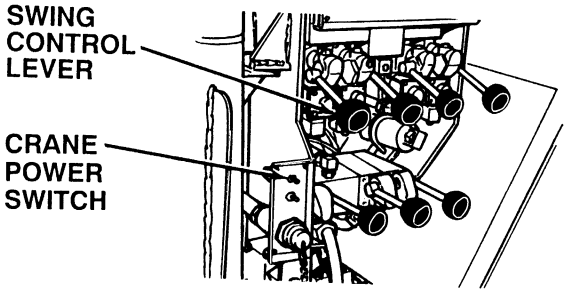
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST (CONT).

(8) Set crane POWER switch to OFF position.
(9) Set hydraulic selector switch to OFF position.
(10) Turn OFF ENGINE switch.
(11) Disconnect pressure gage from elbow. Discard preformed packing.
(12) Disconnect two adapter hoses from swing motor valve and crane hoses. Discard preformed packings.

Continued on next page.





WARNING

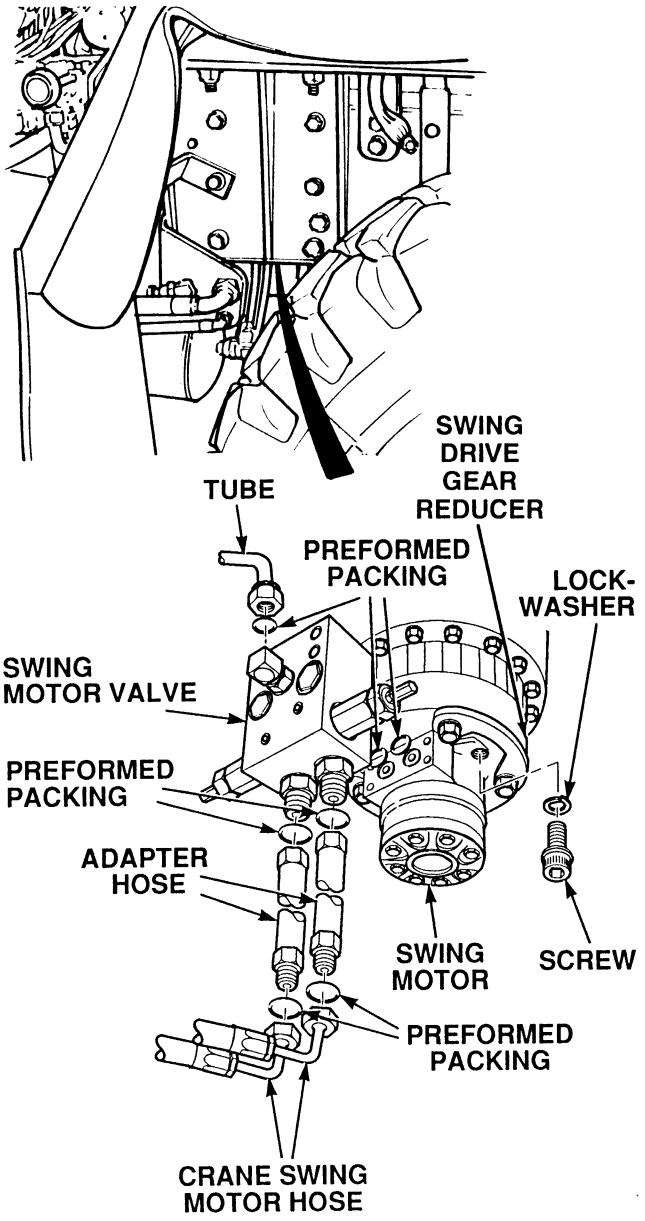
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

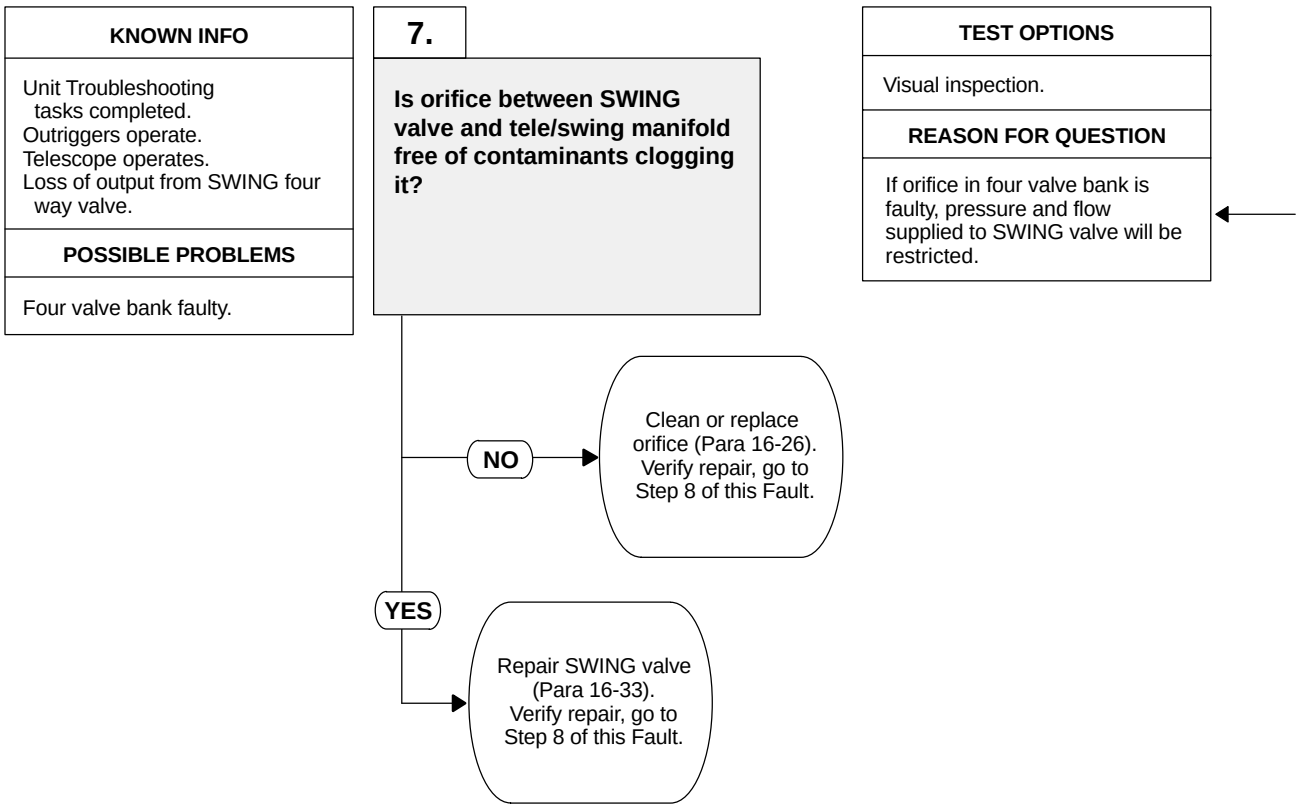
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST (CONT).

(13) Install swing motor on swing drive gear reducer with two lockwashers and screws.
(14) Install two hoses with preformed packings on swing motor valve.
(15) Install tube with preformed packing on swing motor valve.



8. CRANE DOES NOT SWING OR SWINGS SLOWLY (CONT).



WARNING

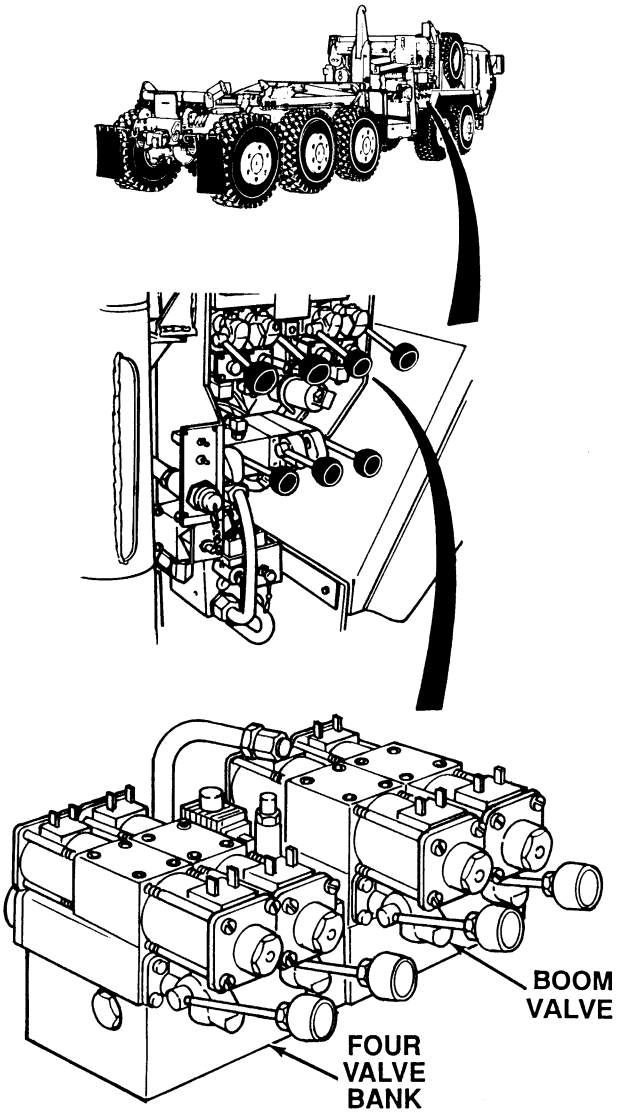
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

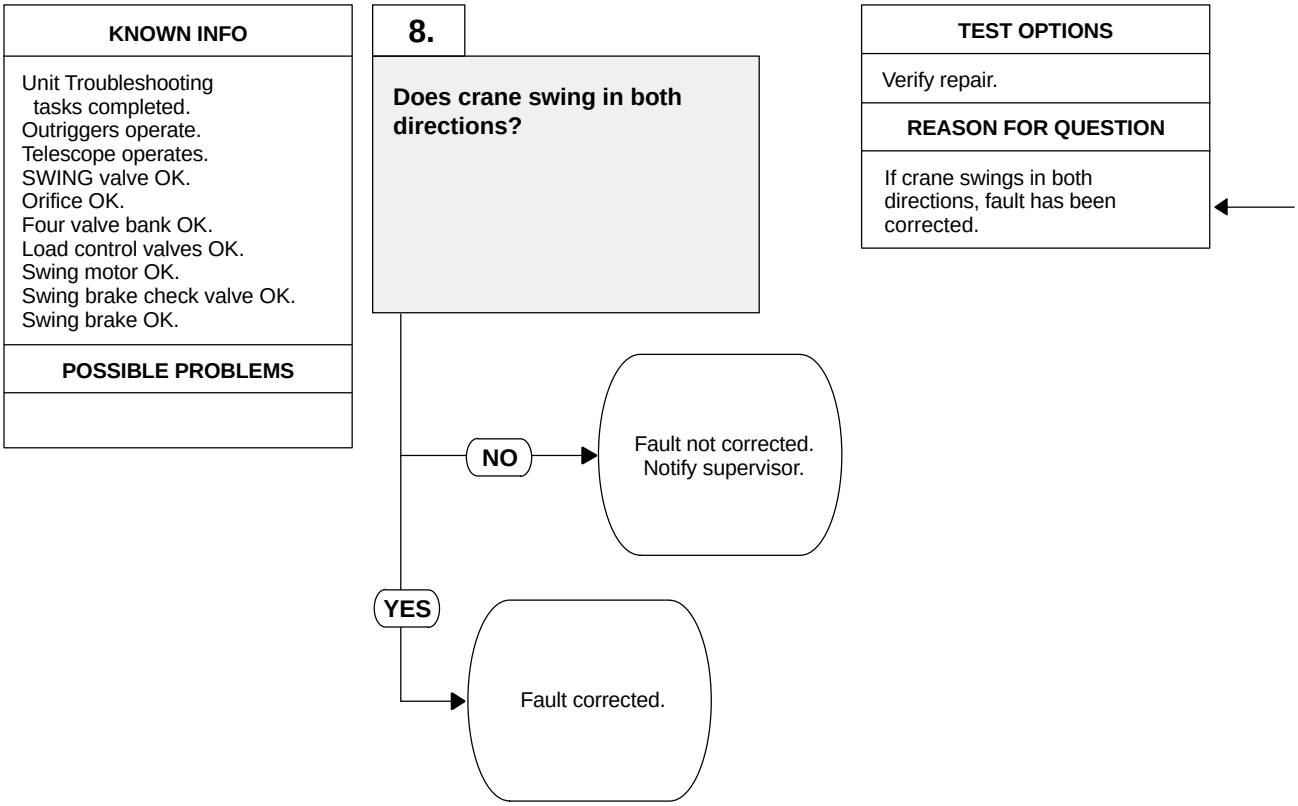
Use a drain pan to catch leaking hydraulic oil.

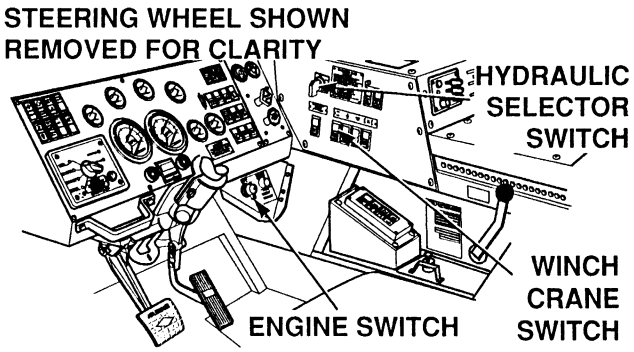
VISUAL INSPECTION

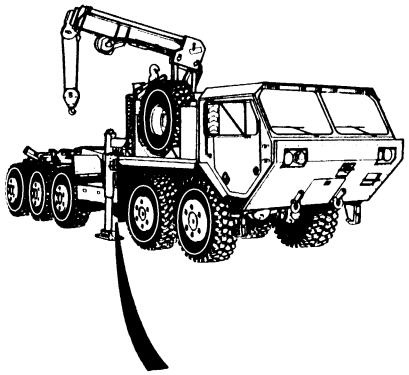
(1) Remove four valve bank from crane (Para 16-26).
(2) Remove SWING valve from four valve bank (Para 16-26).
(3) Remove orifice from four valve bank where SWING valve was removed from.
(4) Inspect orifice for contamination clogging it.
  (a) If orifice is contaminated, clean or replace orifice and inspect bores in four valve bank for additional contamination (Para 16-26).
  (b) If orifice is OK, repair SWING valve (Para 16-33).
(5) Install orifice on four valve bank (Para 16-26).
(6) Install SWING valve on four valve bank (Para 16-26).
(7) Install four valve bank on crane (Para 16-26).



8. CRANE DOES NOT SWING OR SWINGS SLOWLY (CONT).

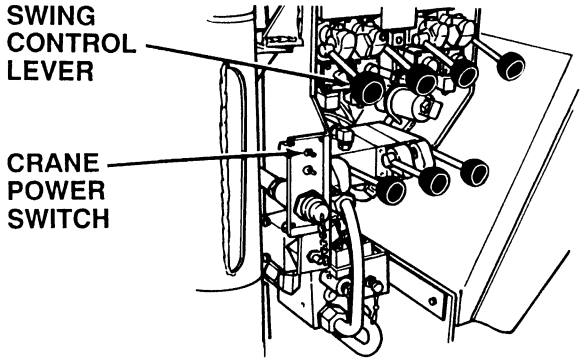


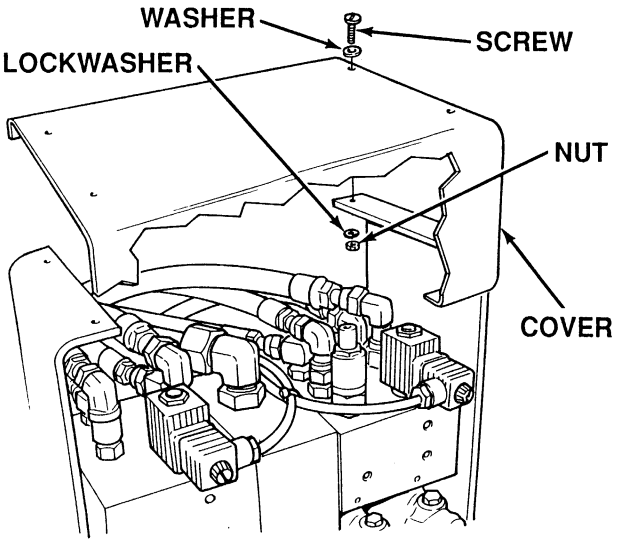




VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Set WINCH/CRANE switch to CRANE position.
(4) Set hydraulic selector switch to CRANE/SRW position.
(5) Set crane POWER switch to ON position.
(6) Swing crane using SWING control lever.
    (a) If crane does not swing, fault not corrected. Perform Steps (7) through (10) below and notify supervisor.
    (b) If crane does swing, fault has been corrected.
(7) Set crane POWER switch to OFF position.
(8) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.
(10) Install cover with four screws, washers, lockwashers and nuts on crane.





2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

9. CRANE DOES NOT SWING CLOCKWISE (CW).

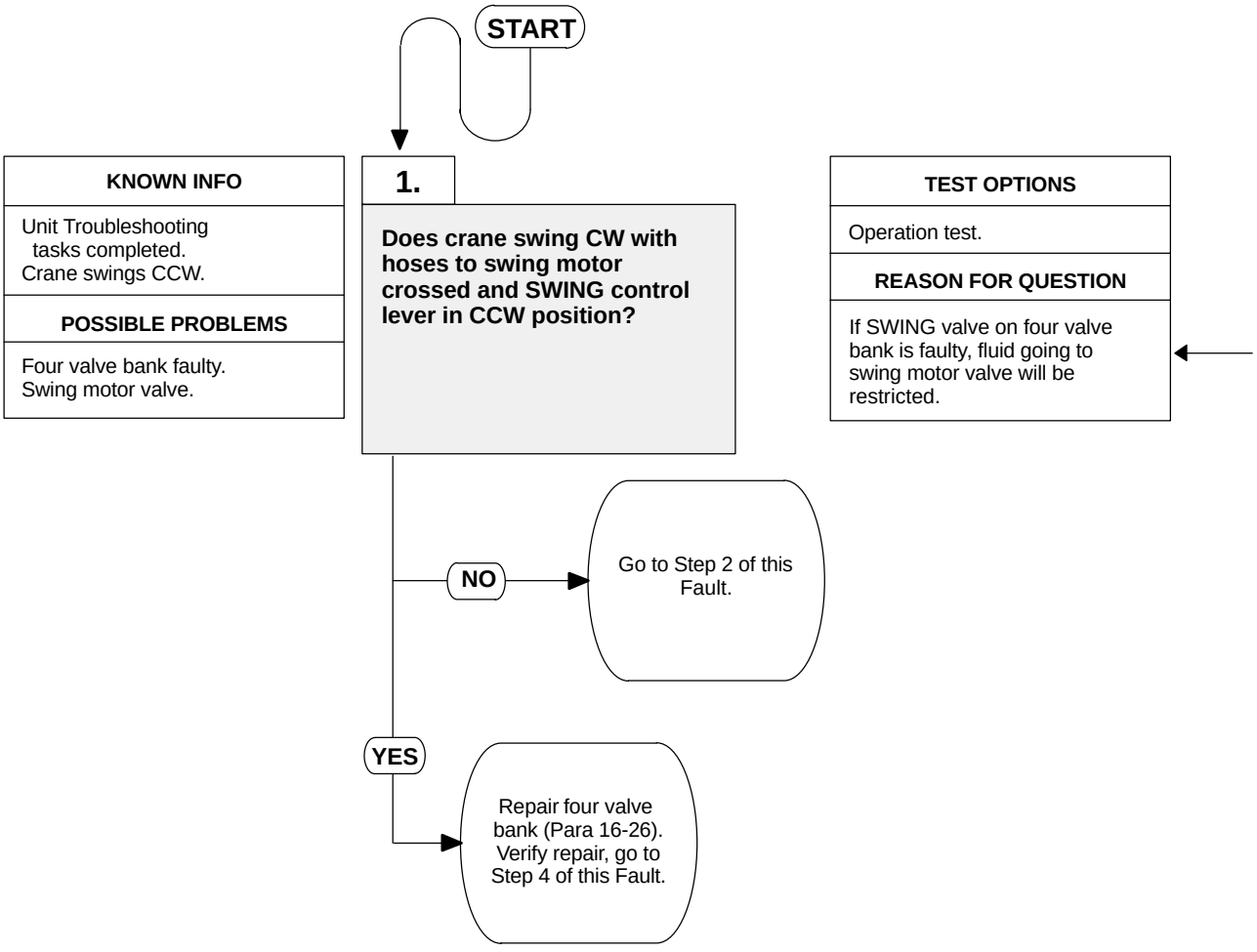
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Lockwasher (4) (Item 282, Appendix E)
Packings, Preformed (11) (Item 347, Appendix E)
Packings, Preformed (3) (Item 389, Appendix E)

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

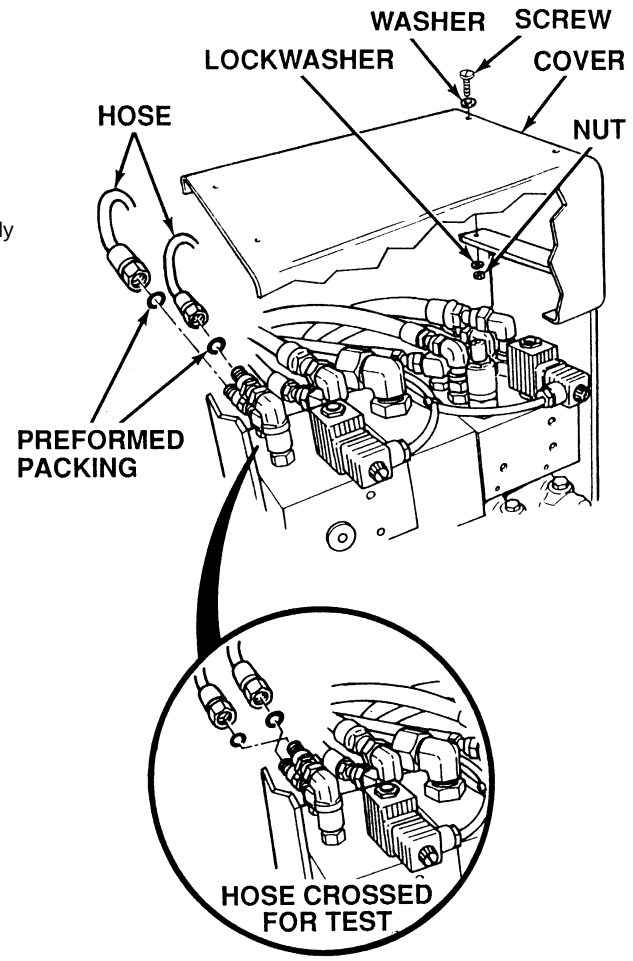
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

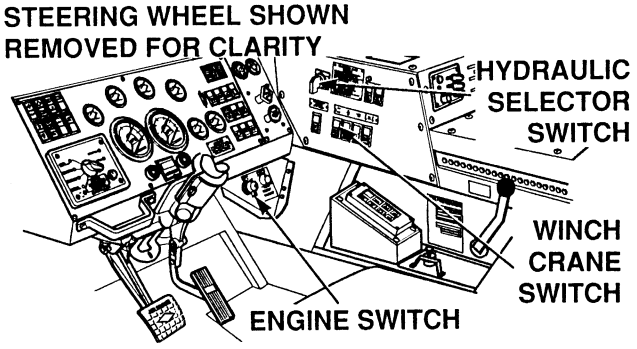
NOTE

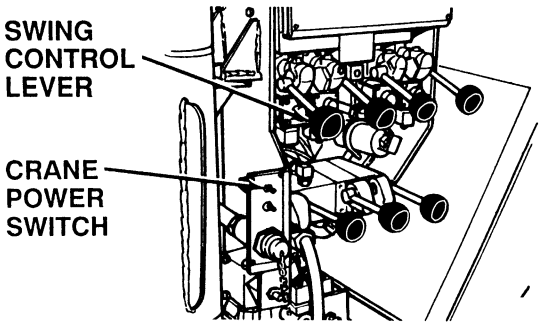
Use a drain pan to catch leaking hydraulic oil.

OPERATION TEST

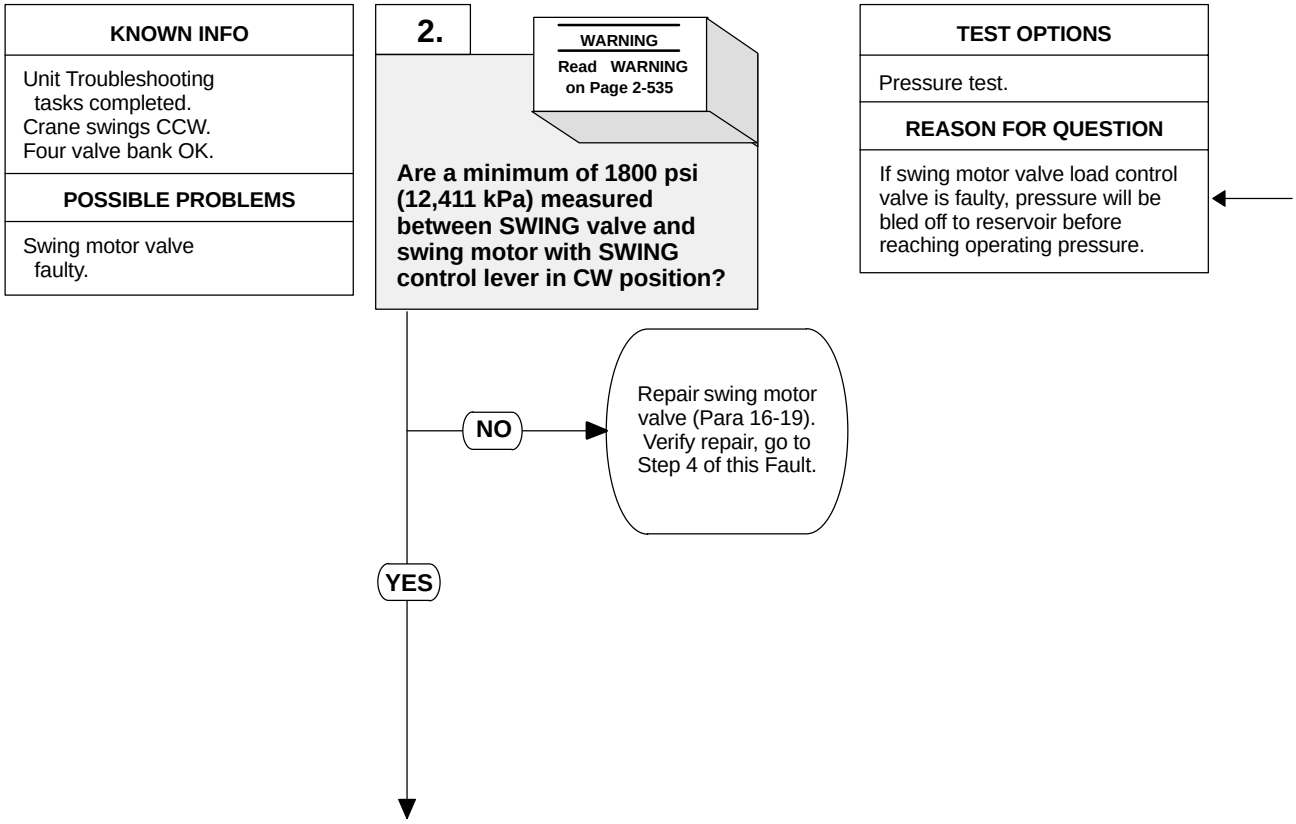
(1) Remove four nuts, lockwashers, washers and nuts and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from two elbows at left of four valve bank. Discard preformed packings.
(3) Connect each removed hose with preformed packing to the elbow the other was removed from (cross them).
(4) Start engine (TM 9-2320-364-10).
(5) Set WINCH/CRANE switch to CRANE position.
(6) Set hydraulic selector switch to CRANE/SRW position.
(7) Set crane POWER switch to ON position.
(8) Swing crane CW by moving SWING control lever to CCW position.
  (a) If crane does not swing, perform Steps (9) through (13) below and go to Step 2 of this Fault.
  (b) If crane does swing, perform Steps (9) through (11) below and replace SWING valve on four valve bank (Para 16-26).
(9) Set crane POWER switch to OFF position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Disconnect two hoses from elbows. Discard preformed packings.
(13) Install hoses with preformed packings on elbows using tags and marks to install correctly.







9. CRANE DOES NOT SWING CW (CONT).



WARNING

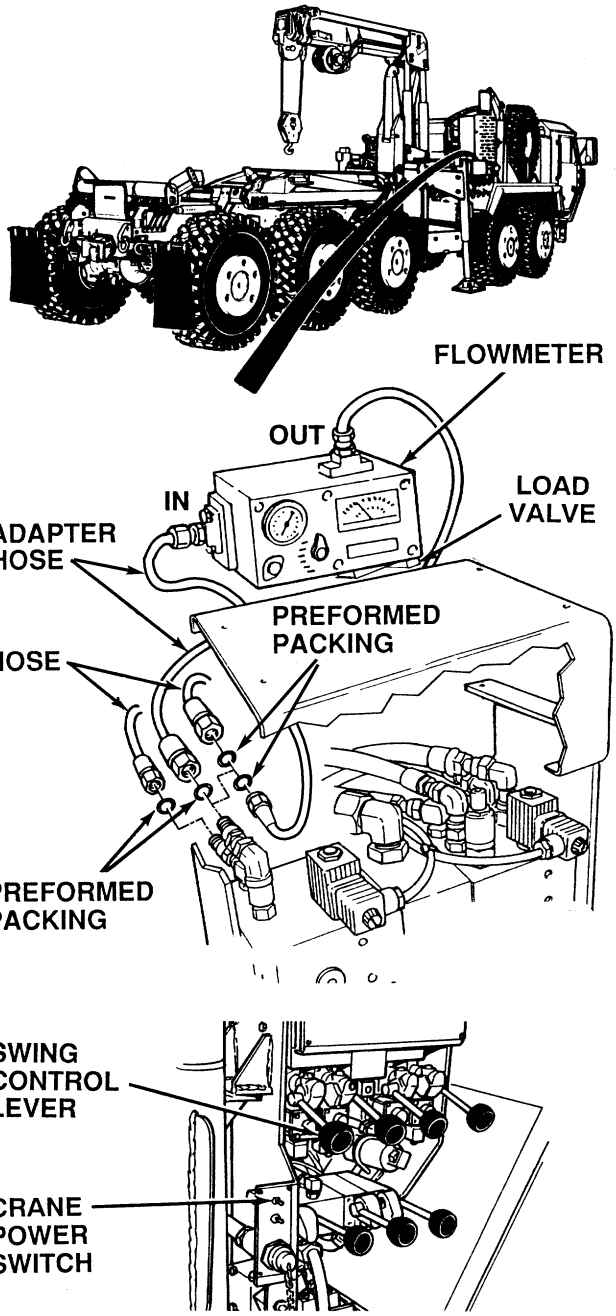
- High pressure hydraulics [oil under 3,000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

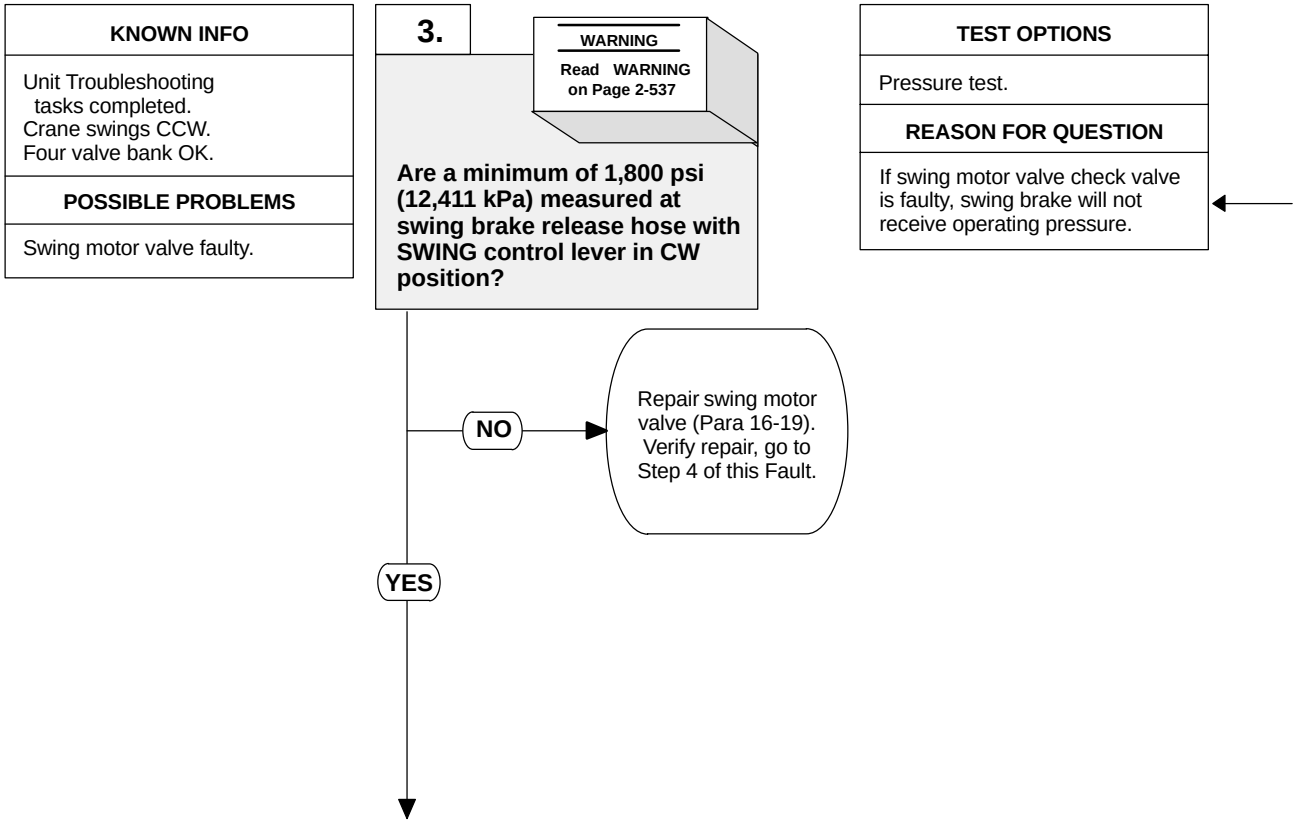
Use a drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) Disconnect hose from outboard (taller) elbow at left of four valve bank. Discard preformed packing.
(2) Disconnect hose from inboard (shorter) elbow at left of four valve bank. Discard preformed packing.
(3) Connect adapter hose to flowmeter IN port.
(4) Connect IN port adapter hose with preformed packing to outboard (taller) elbow.
(5) Connect adapter hose to flowmeter OUT port.
(6) Connect OUT port adapter hose with preformed packing to crane hose disconnected from outboard (taller) elbow).
(7) Connect hose to inboard (shorter) elbow.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold SWING control lever in CW position.
  (a) If a minimum of 1,800 psi (12,411 kPa) are not present, perform Steps (13) through (18) below and replace relief valve at rear (left) side of swing motor valve assembly (Para 16-19).
  (b) If 1,800 psi (12,411 kPa) or more are present, perform Steps (13) through (18) below and go to Step 3 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect hose from outboard (taller) elbow on four valve bank. Discard preformed packings.
(17) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(18) Connect crane hoses with preformed packing to elbow.



9. CRANE DOES NOT SWING CW (CONT).



WARNING

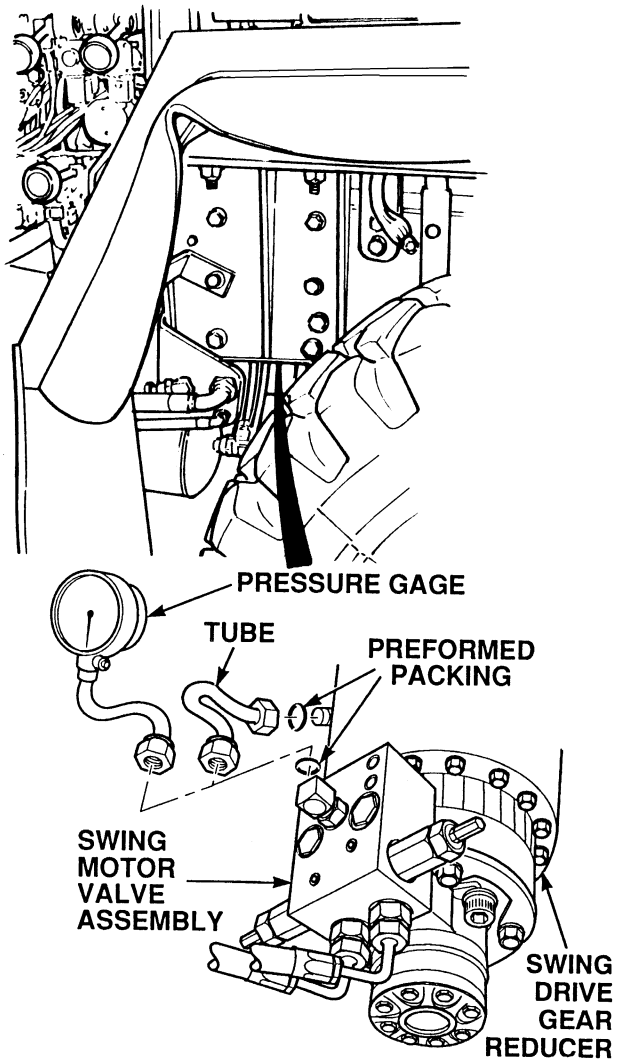
- High pressure hydraulics [oil under 3,000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

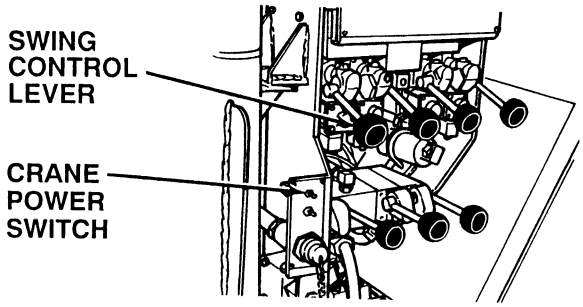
NOTE

Use a drain pan to catch leaking hydraulic oil.

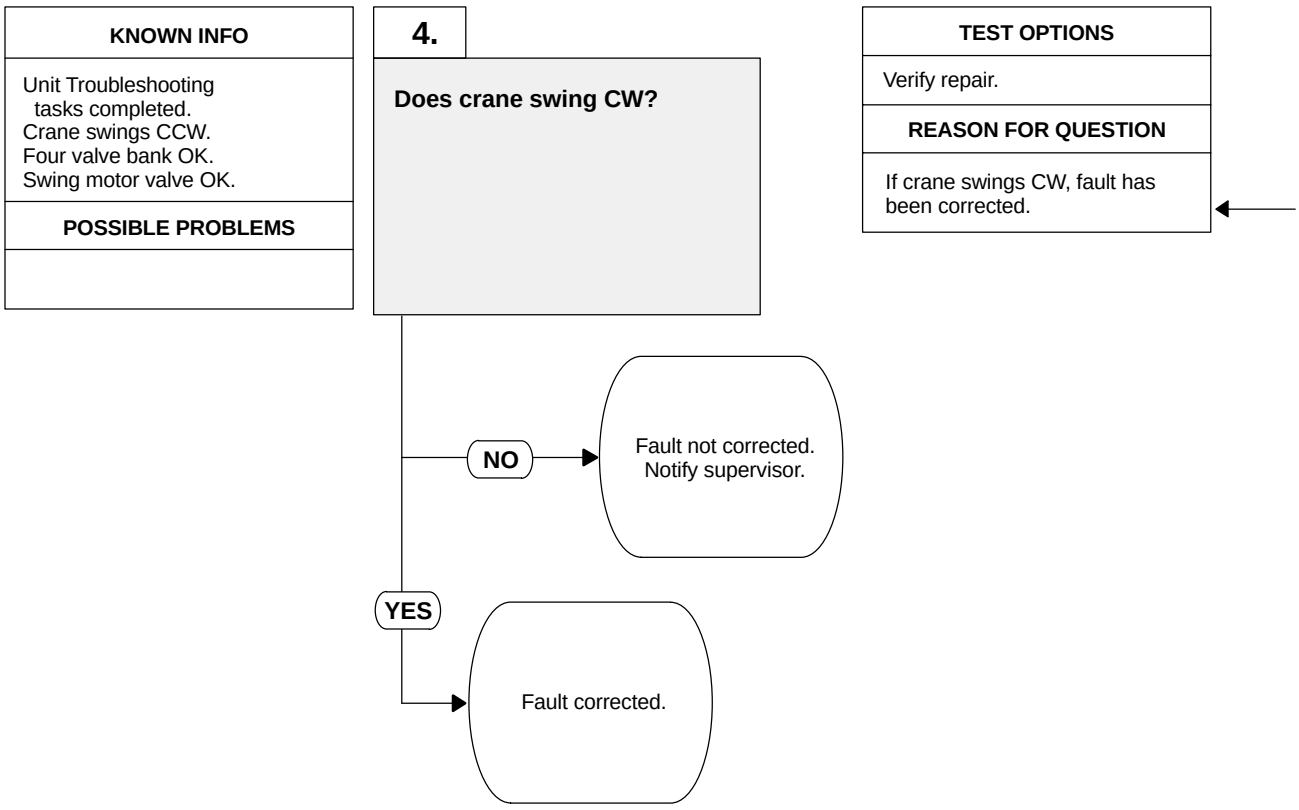
PRESSURE TEST

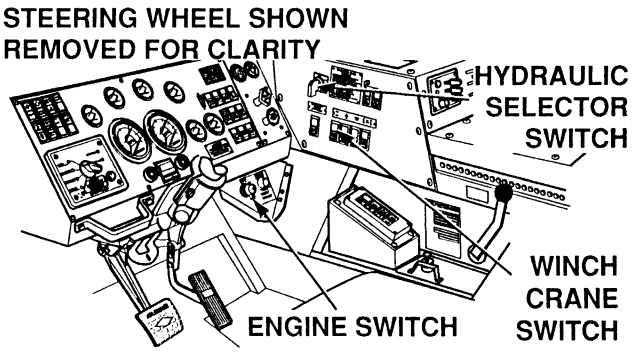
(1) Disconnect tube from swing brake and swing motor valve. Discard preformed packings.
(2) Install pressure gage with preformed packing to elbow on swing motor valve.
(3) Start engine (TM 9-2320-364-10).
(4) Set WINCH/CRANE switch to CRANE position.
(5) Set hydraulic selector switch to CRANE/SRW position.
(6) Set crane POWER switch to ON position.
(7) Hold SWING control lever in CW position.
  (a) If 1,800 psi (12,411 kPa) or more are not present, perform Steps (8) through (12) below and repair swing motor valve (Para 16-19).
  (b) If 1,800 psi (12,411 kPa) or more are present, perform Steps (8) through (12) below and go to Step 4 of this Fault.
(8) Set crane POWER switch to OFF position.
(9) Set hydraulic selector switch to OFF position.
(10) Turn OFF ENGINE switch.
(11) Disconnect pressure gage from swing motor valve. Discard preformed packing.
(12) Connect tube with two preformed packings to swing drive gear reducer and swing motor valve.

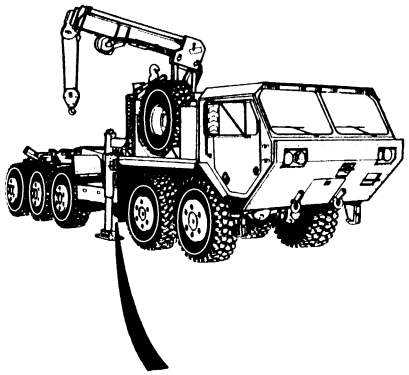




9. CRANE DOES NOT SWING CW (CONT).

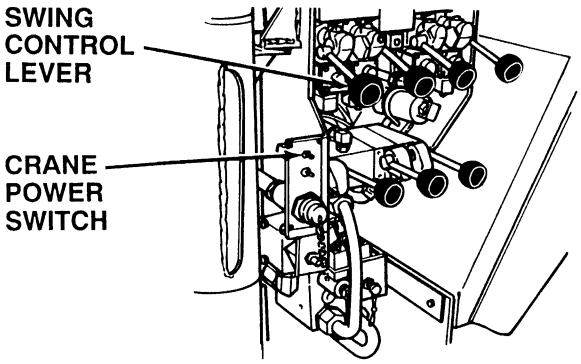


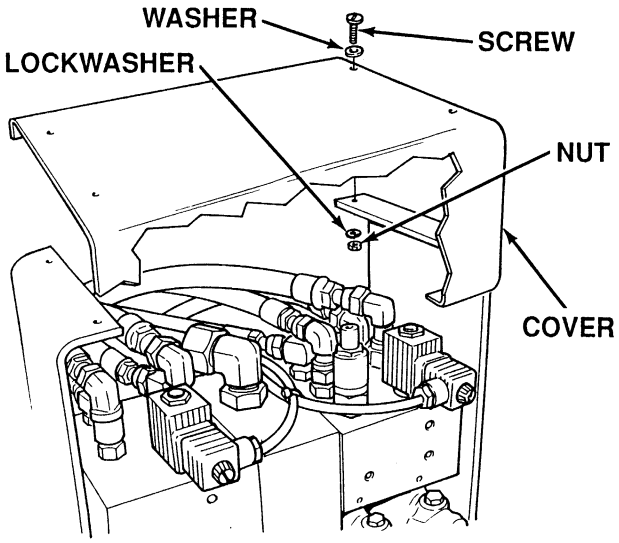




VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Set WINCH/CRANE switch to CRANE position.
(4) Set hydraulic selector switch to CRANE/SRW position.
(5) Set crane POWER switch to ON position.
(6) Swing crane CW using SWING control lever.
    (a) If crane does not swing, fault not corrected. Perform Steps (7) through (10) below and notify supervisor.
    (b) If crane does swing, fault has been corrected.
(7) Set crane POWER switch to OFF position.
(8) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.
(10) Install cover with four screws, washers, lockwashers and nuts.





2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

10. CRANE DOES NOT SWING COUNTER CLOCKWISE (CCW).

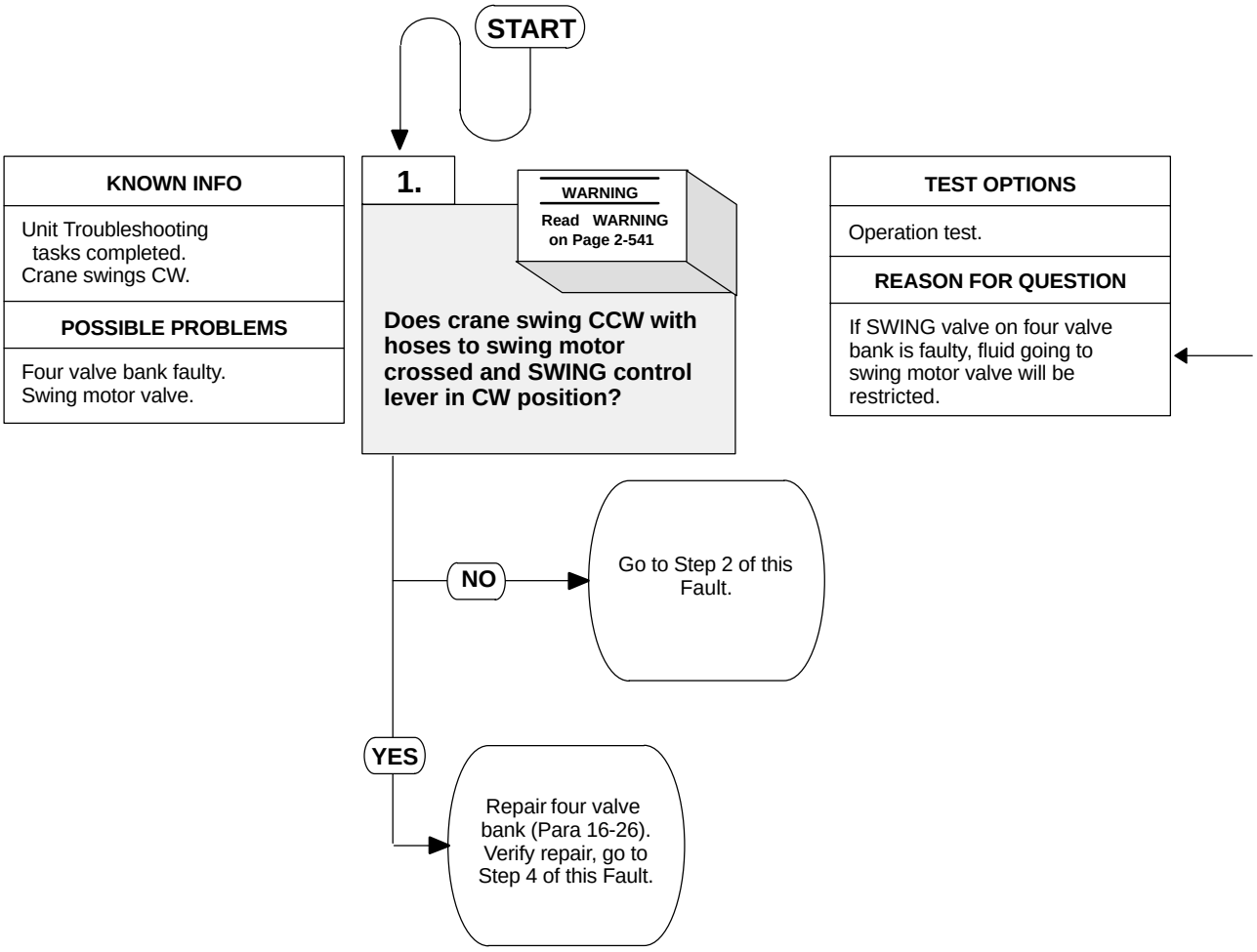
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's
(Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Lockwasher (4) (Item 282, Appendix E)
Packings, Preformed (11) (Item 347, Appendix E)
Packings, Preformed (3) (Item 389, Appendix E)

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off
vehicle suspension, (TM 9-2320-364-10)



WARNING

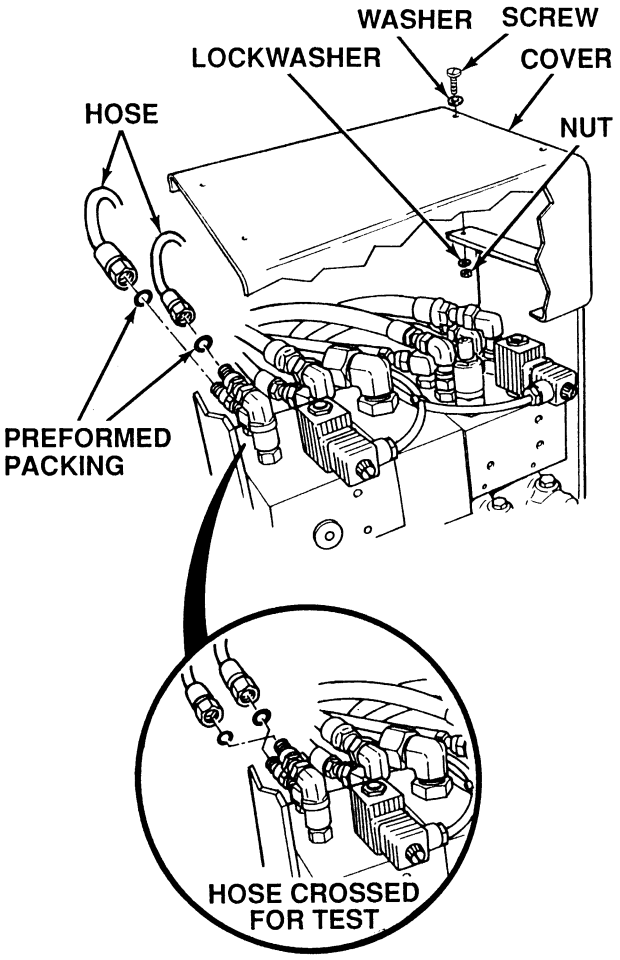
- High pressure hydraulics [oil under 3,000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

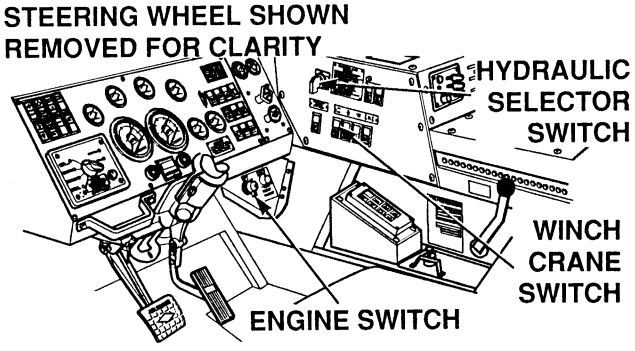
NOTE

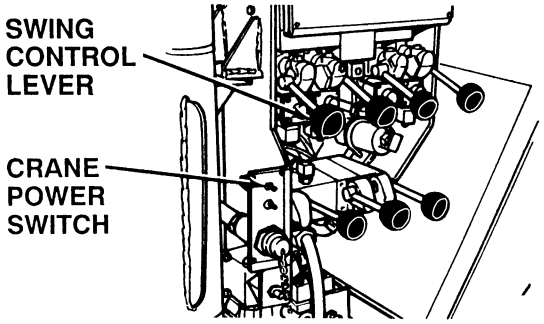
Use a drain pan to catch leaking hydraulic oil.

OPERATION TEST

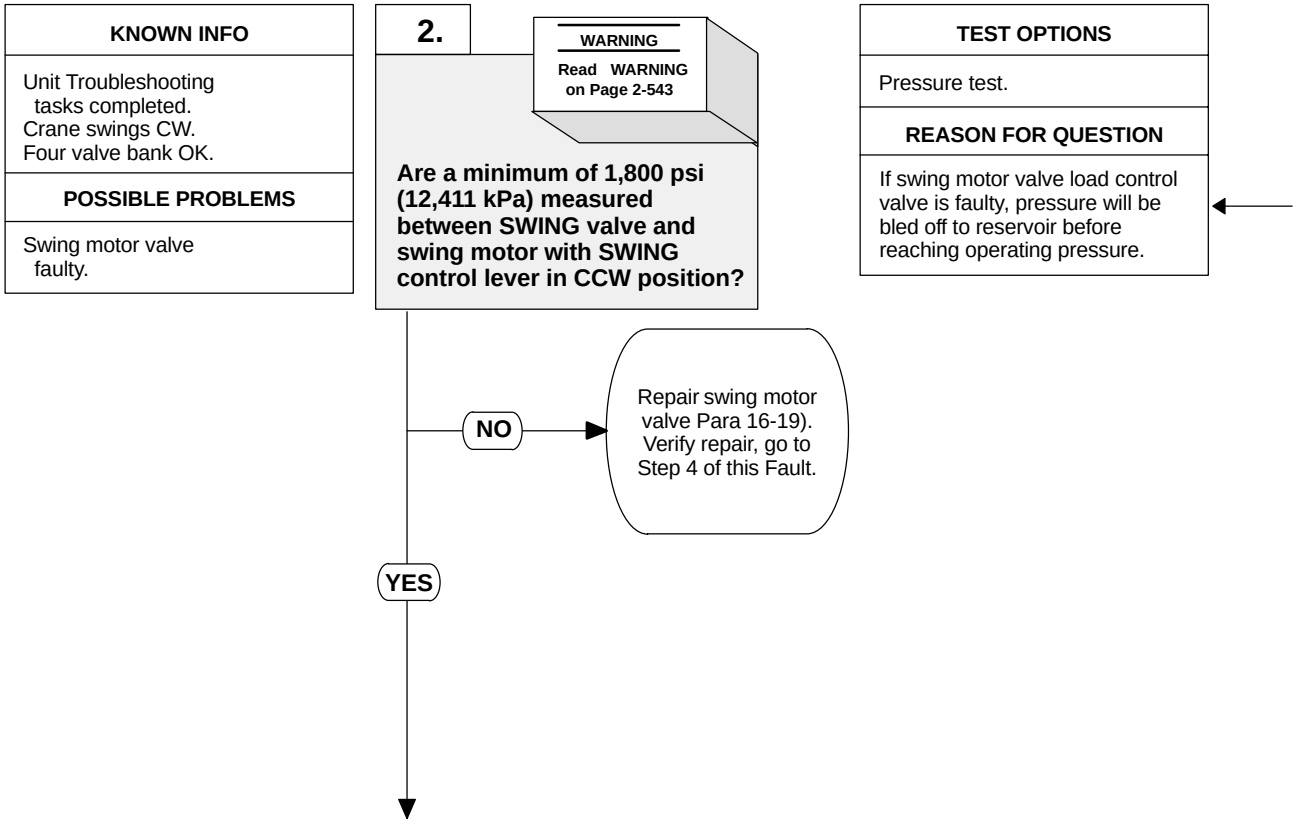
(1) Remove four nuts, lockwashers, washers and nuts and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from two elbows at left of four valve bank. Discard preformed packings.
(3) Connect each removed hose with preformed packing to the elbow the other was removed from (cross them).
(4) Start engine (TM 9-2320-364-10).
(5) Set WINCH/CRANE switch to CRANE position.
(6) Set hydraulic selector switch to CRANE/SRW position.
(7) Set crane POWER switch to ON position.
(8) Swing crane CCW by moving SWING control lever to CW position.
  (a) If crane does not swing, perform Steps (9) through (13) below and go to Step 2 of this Fault.
  (b) If crane does swing, perform Steps (9) through (13) below and replace SWING valve on four valve bank (Para 16-26).
(9) Set crane POWER switch to OFF position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Disconnect two hoses from elbows. Discard preformed packings.
(13) Install hoses with preformed packings on elbows using tags and marks to install correctly.







10. CRANE DOES NOT SWING CCW (CONT).



WARNING

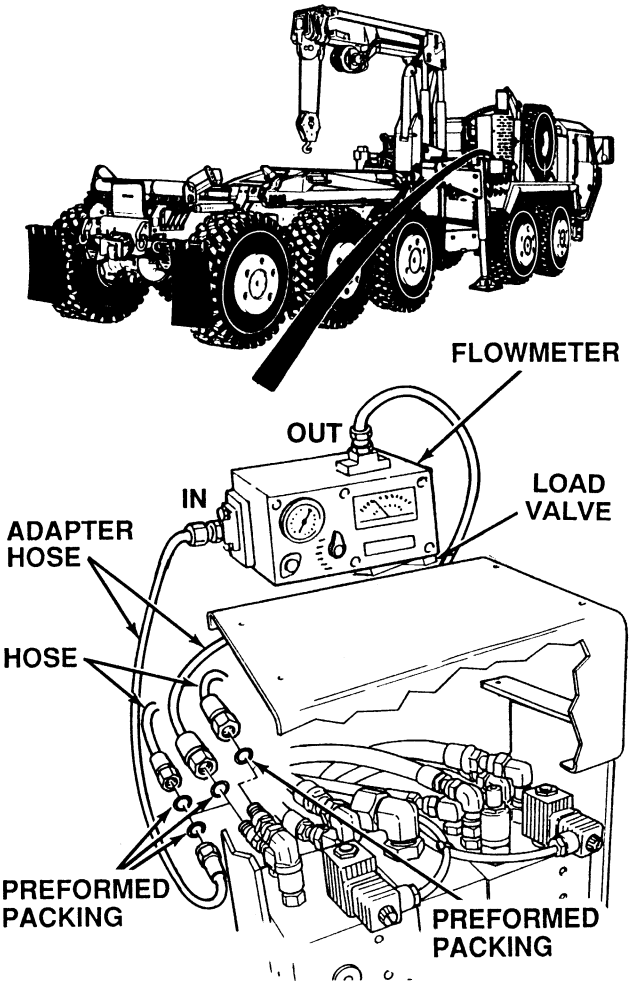
- High pressure hydraulics [oil under 3,000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

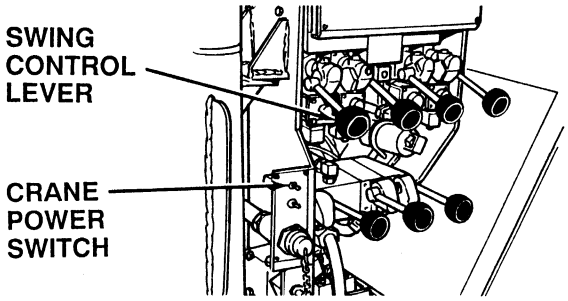
NOTE

Use a drain pan to catch leaking hydraulic oil.

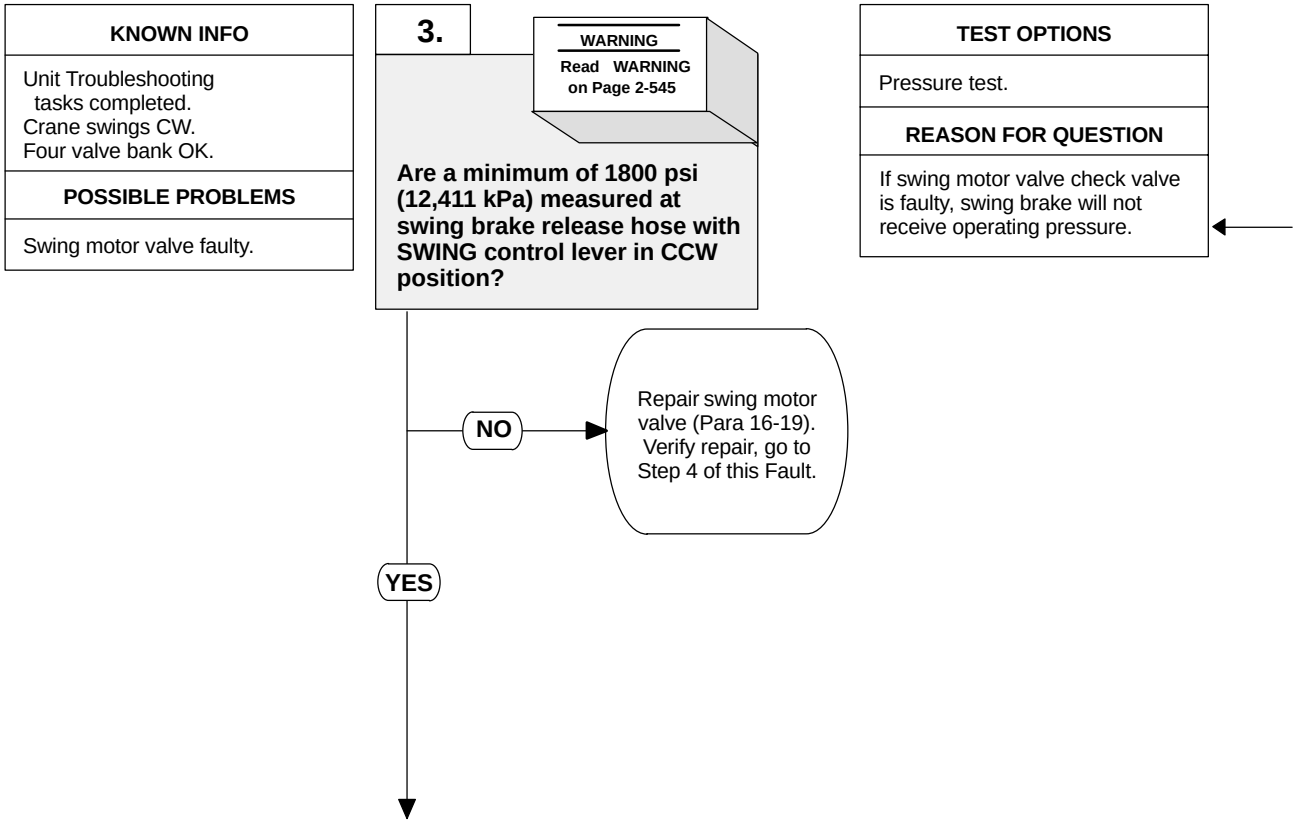
PRESSURE TEST

(1) Disconnect hose from outboard (taller) elbow at left of four valve bank. Discard preformed packing.
(2) Disconnect hose from inboard (shorter) elbow at left of four valve bank. Discard preformed packing.
(3) Connect adapter hose to flowmeter IN port.
(4) Connect IN port adapter hose with preformed packing to inboard (shorter) elbow.
(5) Connect adapter hose to flowmeter OUT port.
(6) Connect OUT port adapter hose with preformed packing to crane hose disconnected from inboard (shorter) elbow.
(7) Connect hose to outboard (taller) elbow.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold SWING control lever in CCW position.
  (a) If a minimum of 1800 psi (12,411 kPa) are not present, perform Steps (13) through (18) below and replace relief valve at rear (left) side of swing motor valve assembly (Para 16-19).
  (b) If 1800 psi (12,411 kPa) or more are present, perform Steps (13) through (18) below and go to Step 3 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect hose from outboard (taller) elbow on four valve bank. Discard preformed packing.
(17) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(18) Connect crane hoses with preformed packing to elbows.





10. CRANE DOES NOT SWING CCW (CONT).



WARNING

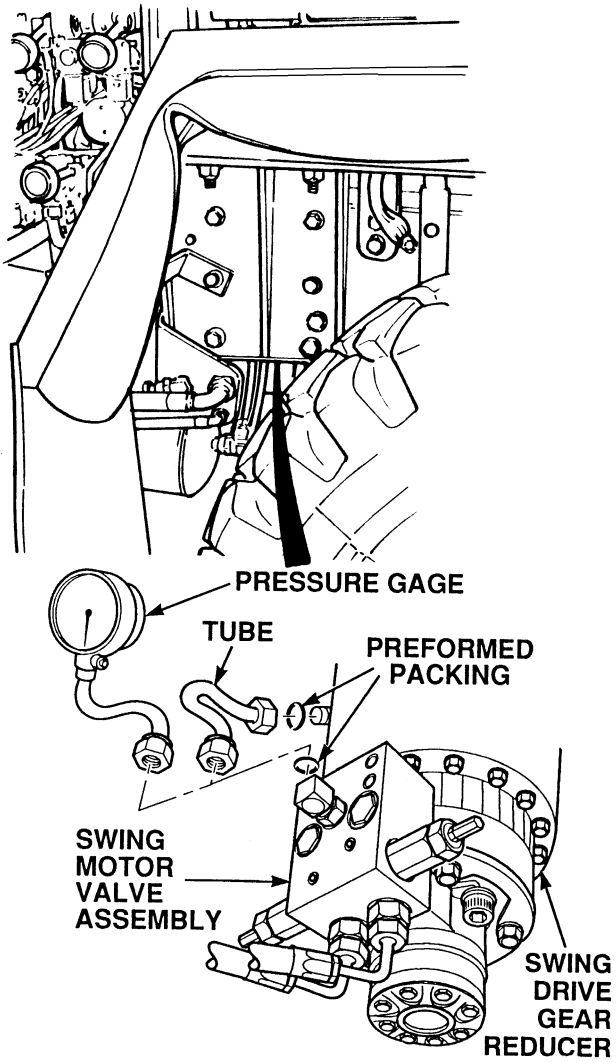
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

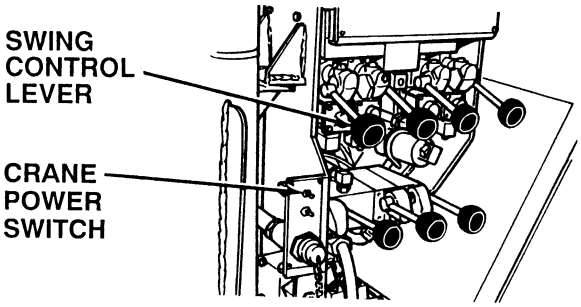
NOTE

Use a drain pan to catch leaking hydraulic oil.

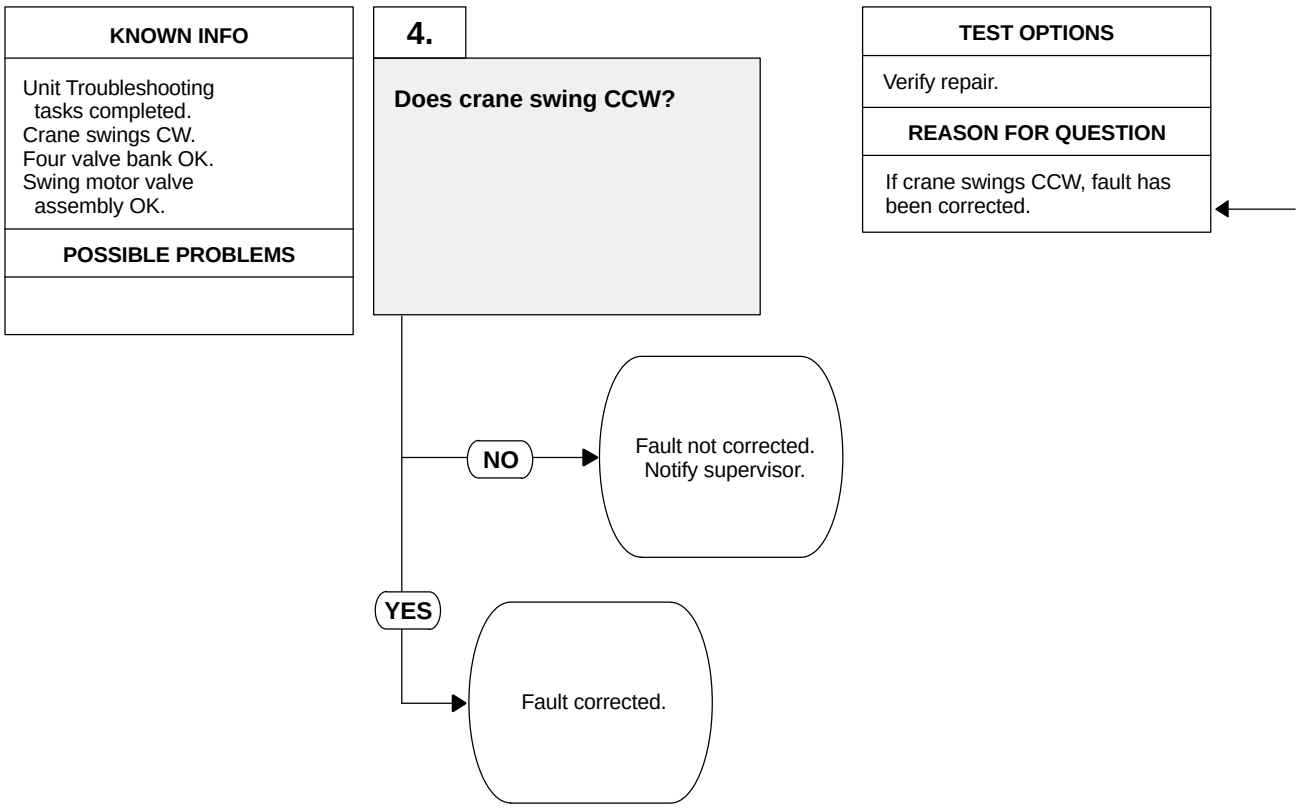
PRESSURE TEST

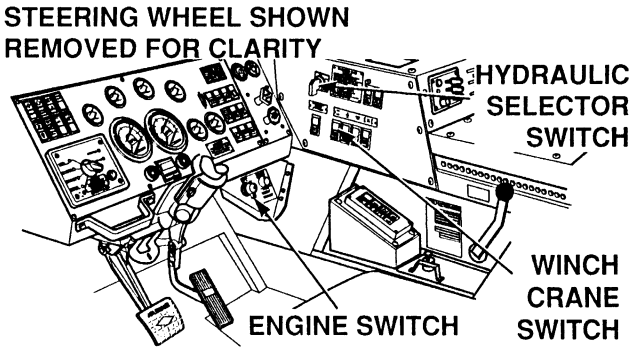
(1) Disconnect tube from swing brake and swing motor valve. Discard preformed packings.
(2) Install pressure gage with preformed packing to elbow on swing motor valve.
(3) Start engine (TM 9-2320-364-10).
(4) Set WINCH/CRANE switch to CRANE position.
(5) Set hydraulic selector switch to CRANE/SRW position.
(6) Set crane POWER switch to ON position.
(7) Hold SWING control lever in CCW position.
  (a) If 1800 psi (12,411 kPa) or more are not present, perform Steps (8) through (12) below and repair swing motor valve (Para 16-19).
  (b) If 1800 psi (12,411 kPa) or more are present, perform Steps (8) through (12) below and go to Step 4 of this Fault.
(8) Set crane POWER switch to OFF position.
(9) Set hydraulic selector switch to OFF position.
(10) Turn OFF ENGINE switch.
(11) Disconnect pressure gage from swing motor valve. Discard preformed packing.
(12) Connect tube with two preformed packings to swing brake and swing motor valve.





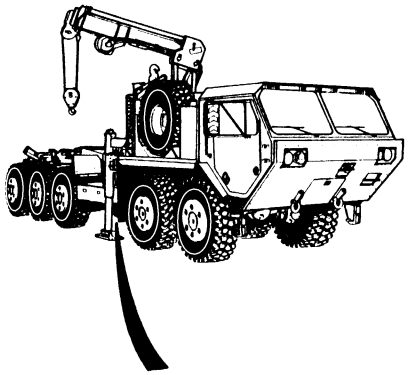
10. CRANE DOES NOT SWING CCW (CONT).

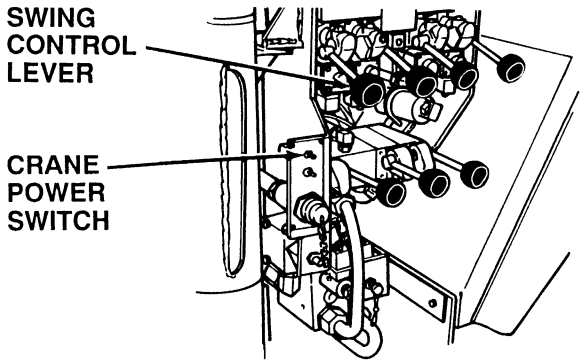


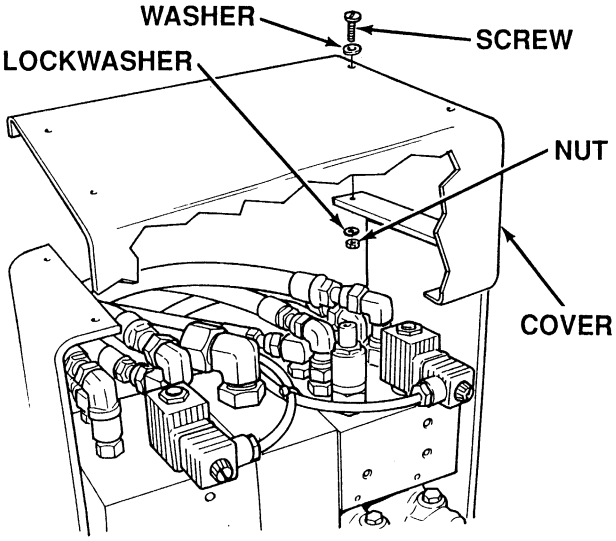


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Set WINCH/CRANE switch to CRANE position.
(4) Set hydraulic selector switch to CRANE/SRW position.
(5) Set crane POWER switch to ON position.
(6) Swing crane CCW using SWING control lever.
    (a) If crane does not swing, fault not corrected. Perform Steps (7) through (10) below and notify supervisor.
    (b) If crane swings, fault has been corrected.
(7) Set crane POWER switch to OFF position.
(8) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.
(10) Install cover with four screws, washers, lockwashers and nuts.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

11. BOOM DOES NOT TELESCOPE IN OR TELESCOPES IN SLOWLY.

INITIAL SETUP

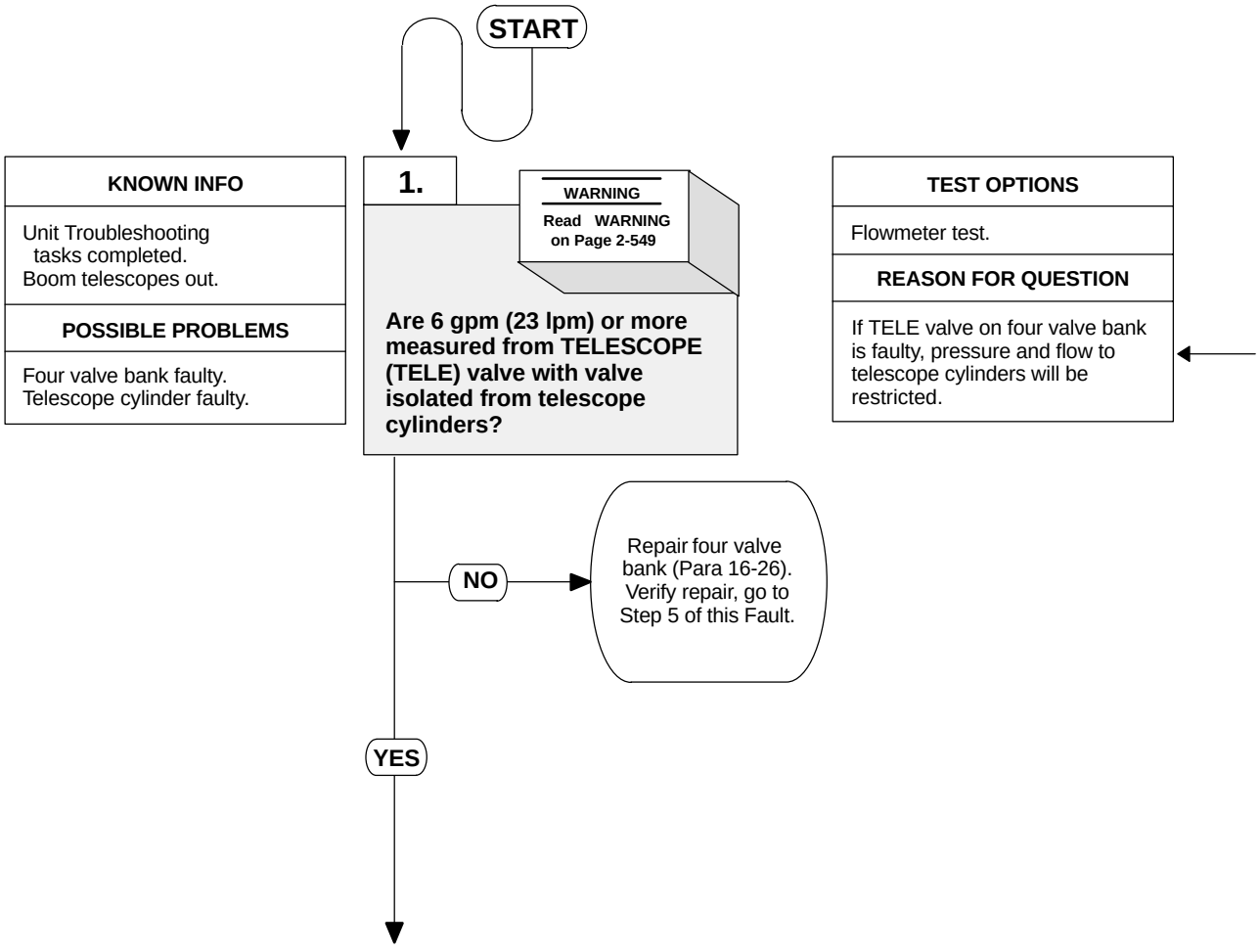
Tools and Special Tools
Tool Kit, General Mechanic (Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Lifting Device (Minimum Capacity 200 lbs/91 kg)

Materials/Parts
Oil Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Lockwasher (4) (Item 282, Appendix E)
Packing, Preformed (9) (Item 337, Appendix E)
Packing, Preformed (8) (Item 396, Appendix E)
Packing, Preformed (3) (Item 398, Appendix E)

Materials/Parts - Continued
Pin, Cotter (2) (Item 417, Appendix E)

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

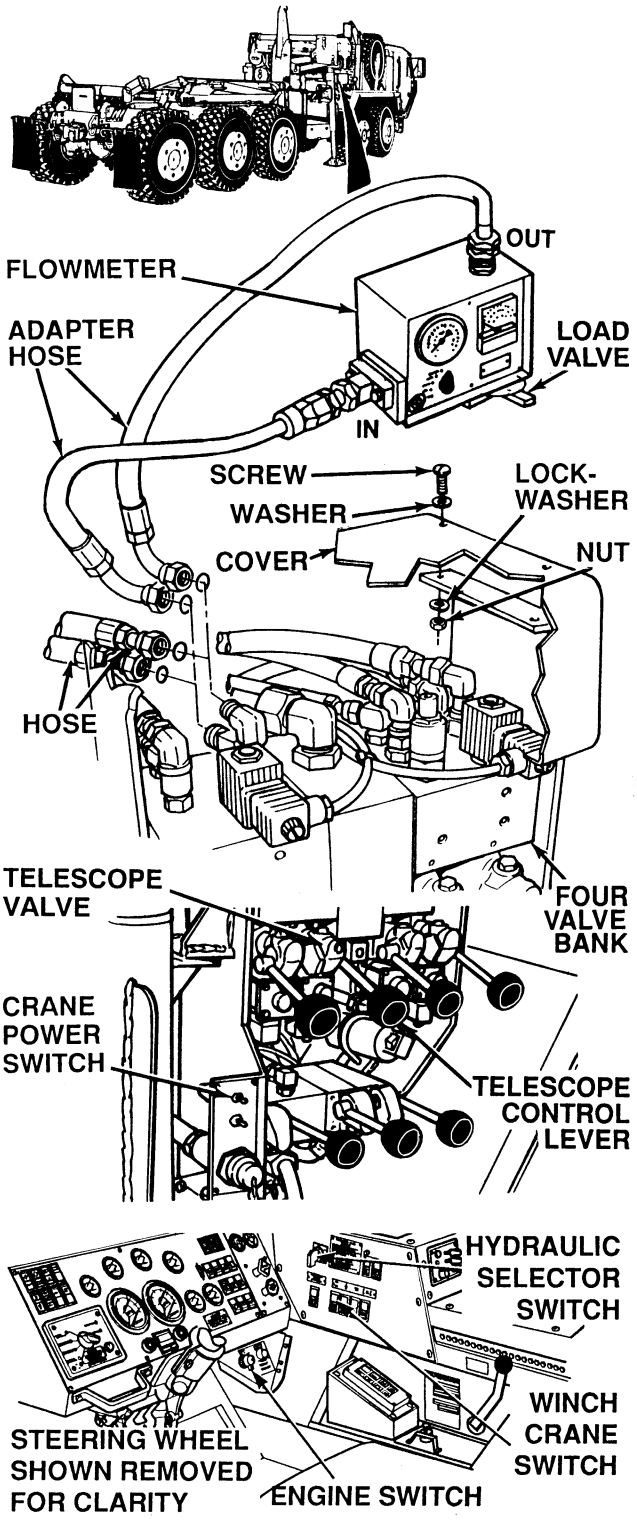
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

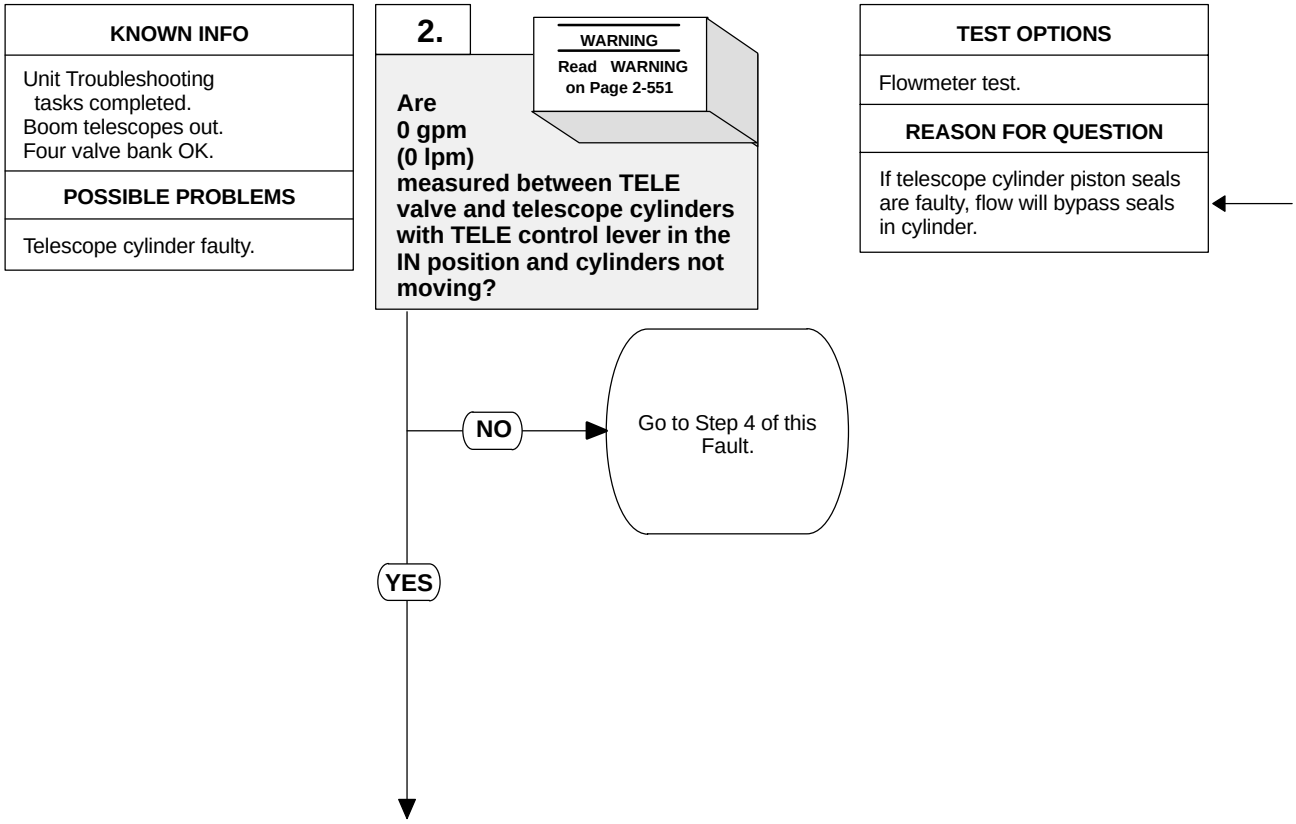
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above TELE valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(4) Connect adapter hose to flowmeter IN port.
(5) Connect adapter hose with preformed packing to outboard (taller) elbow.
(6) Connect adapter hose to flowmeter OUT port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold TELE control lever in the IN position.
  (a) If 6 gpm (23 lpm) or more are not present, repair four valve bank (Para 16-26).
  (b) If 6 gpm (15 lpm) or more are present, go to Step 2 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulics selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows. Discard preformed packings.
(17) Connect two hoses with preformed packings to elbows.



11. BOOM DOES NOT TELESCOPE IN OR TELESCOPES IN SLOWLY (CONT).



WARNING

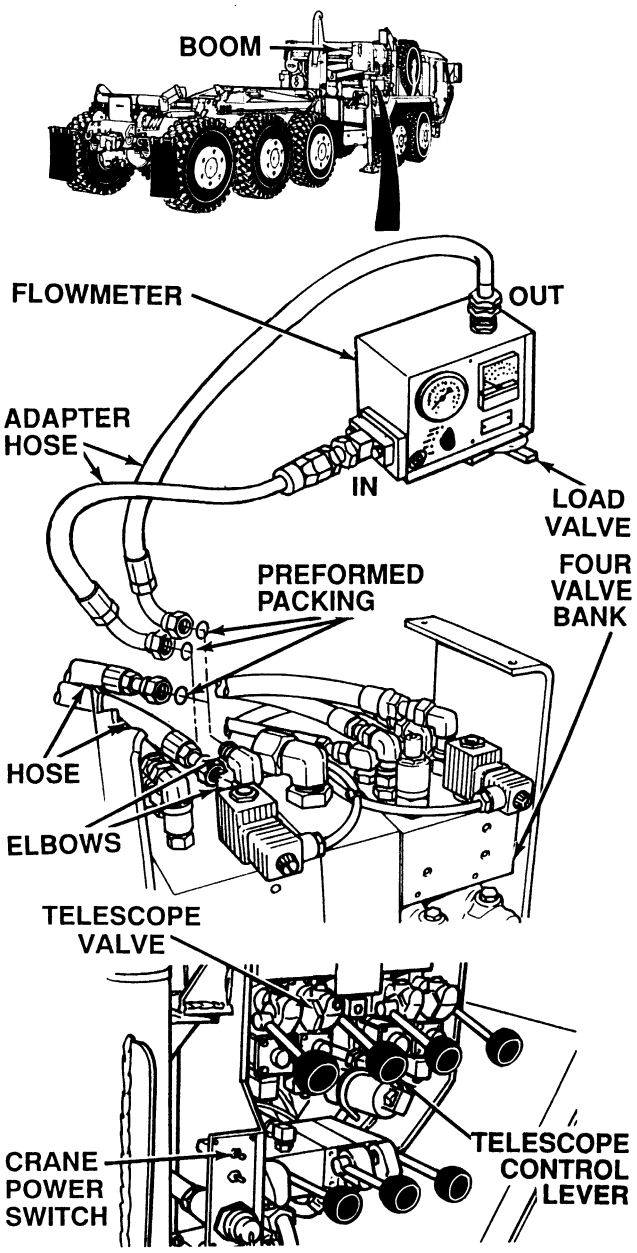
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

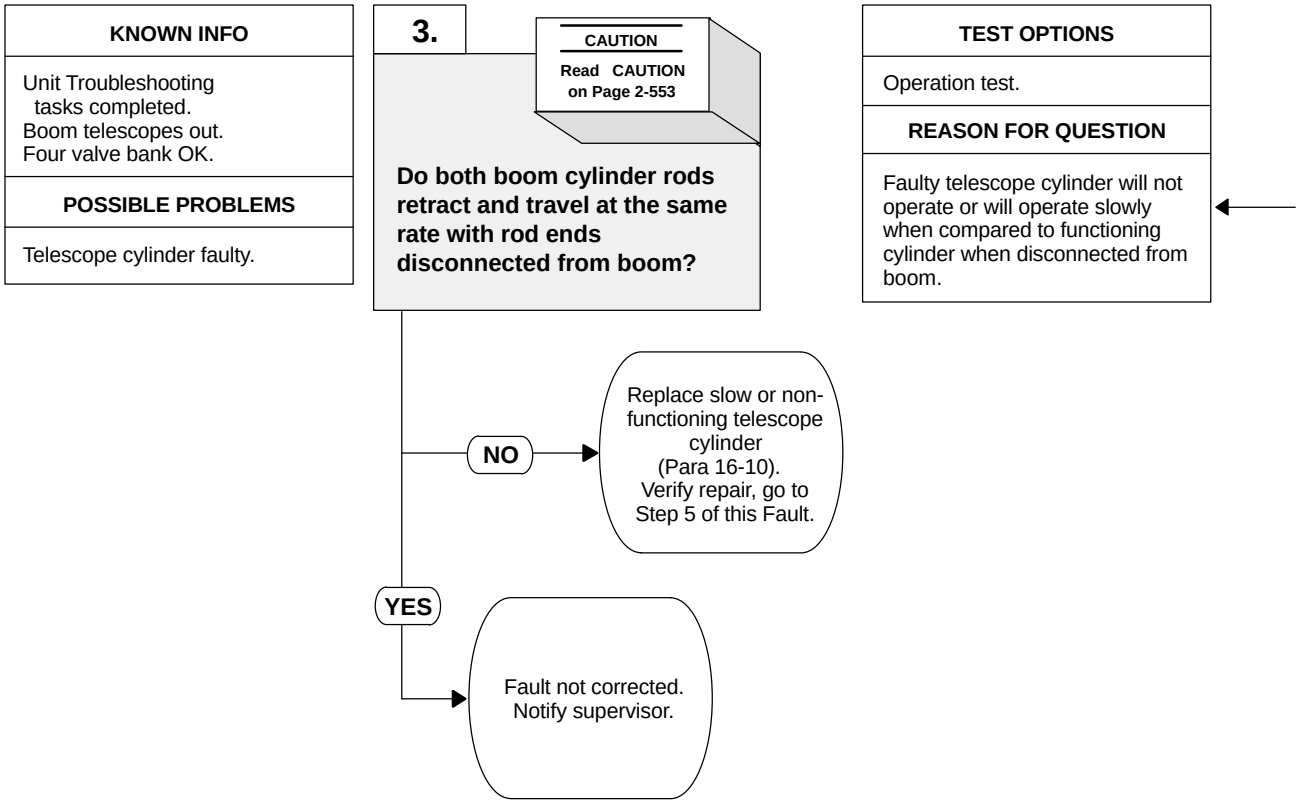
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Set crane POWER switch to OFF position (TM 9-2320-364-10).
(2) Set hydraulics selector switch to OFF position.
(3) Turn OFF ENGINE switch.
(4) Remove adapter hose from outboard (taller) elbow. Discard preformed packing.
(5) Connect adapter hose with preformed packing to the crane hose removed from inboard (shorter) elbow.
(6) Install crane hose with preformed packing on outboard (taller) elbow.
(7) Open flowmeter load valve.
(8) Start engine.
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Telescope boom in completely if boom operates slowly.
(13) Hold TELE control lever in the IN position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (14) through (19) below and go to Step 4 of this Fault.
  (b) If 0 gpm (0 lpm) are present, perform Steps (14) through (19) below and go to Step 3 of this Fault.
(14) Set crane POWER switch to OFF position.
(15) Set hydraulics selector switch to OFF position.
(16) Turn OFF ENGINE switch.
(17) Tag, mark and disconnect crane hose from outboard (taller) elbow. Discard preformed packing.
(18) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(19) Connect two crane hoses with preformed packings to elbows.



11. BOOM DOES NOT TELESCOPE IN OR TELESCOPES IN SLOWLY (CONT).



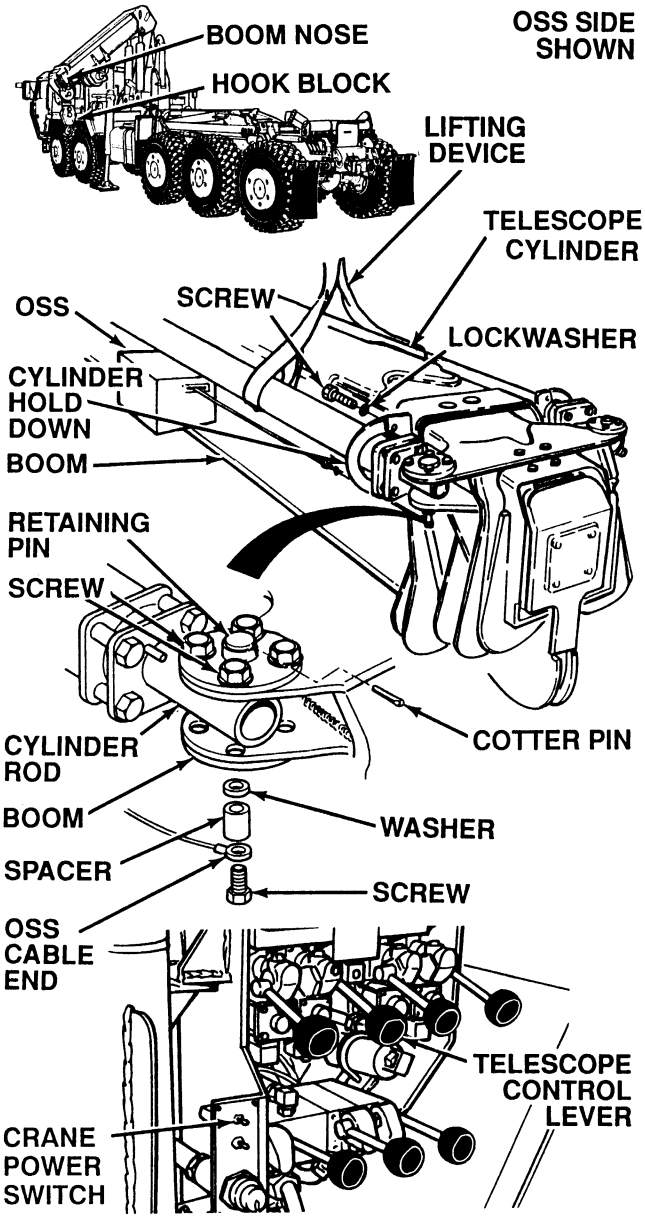
CAUTION

Cable must be held when disconnected and allowed to retract slowly by hand. Failure to do so may result in equipment damage.

OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE rocker switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Turn ON crane POWER switch.
(5) Position end of crane boom on LH side of truck and lower it so that telescope retaining pins can be easily reached.
(6) Raise hoist hook block until it contacts boom nose.
(7) Remove two screws, lockwashers and RH cylinder hold down.
(8) Remove two screws, lockwashers and LH cylinder hold down.
(9) Attach lifting device to telescope cylinders.
(10) Remove screw, overload sensing system (OSS) cable end, spacer, and washer from retaining pin and carefully let cable retract.
(11) Remove two cotter pins from retaining pin and retaining pin from cylinder rod and boom on OSS side of boom. Discard cotter pins.
(12) Loosen two screws enough to allow cylinder rod to be pulled out away from boom.
(13) Remove cotter pin from retaining pin and retaining pin from cylinder rod on other side of boom.
(14) Loosen two screws enough to allow cylinder rod to be pulled out away from boom.
(15) Swing both telescope cylinders out enough that cylinder rods can be extended without contacting boom.

Continued on next page.



11. BOOM DOES NOT TELESCOPE IN OR TELESCOPES IN SLOWLY (CONT).

CAUTION

Cable must be held when disconnected and allowed to retract slowly by hand. Failure to do so may result in equipment damage.

OPERATION TEST (CONT).

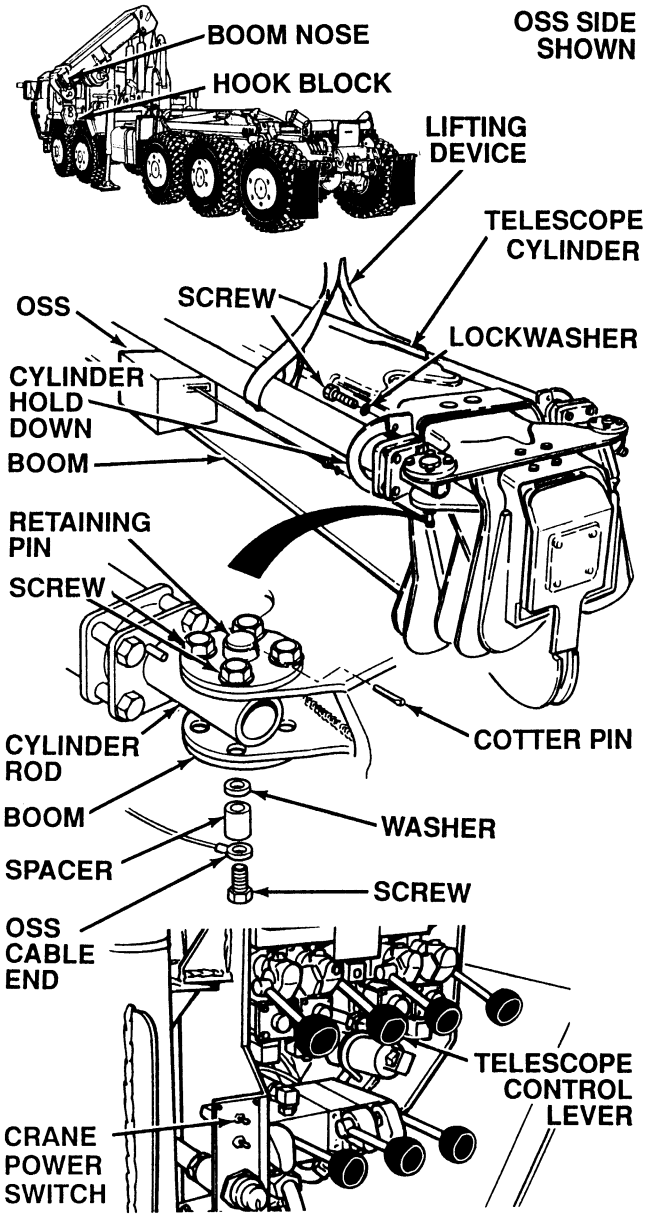
(16) Operate telescope cylinders using TELE control lever.
  (a) If one cylinder does not operate or operates slowly, perform Steps (17) through (25) below and replace telescope cylinder (Para 16-10).
  (b) If both cylinders operate equally or both do not operate, fault not corrected. Perform Steps (17) through (25) and notify supervisor.

(17) Set crane POWER switch to OFF position (TM 9-2320-364-10).

(18) Set hydraulics selector switch to OFF position.

(19) Turn OFF ENGINE switch.

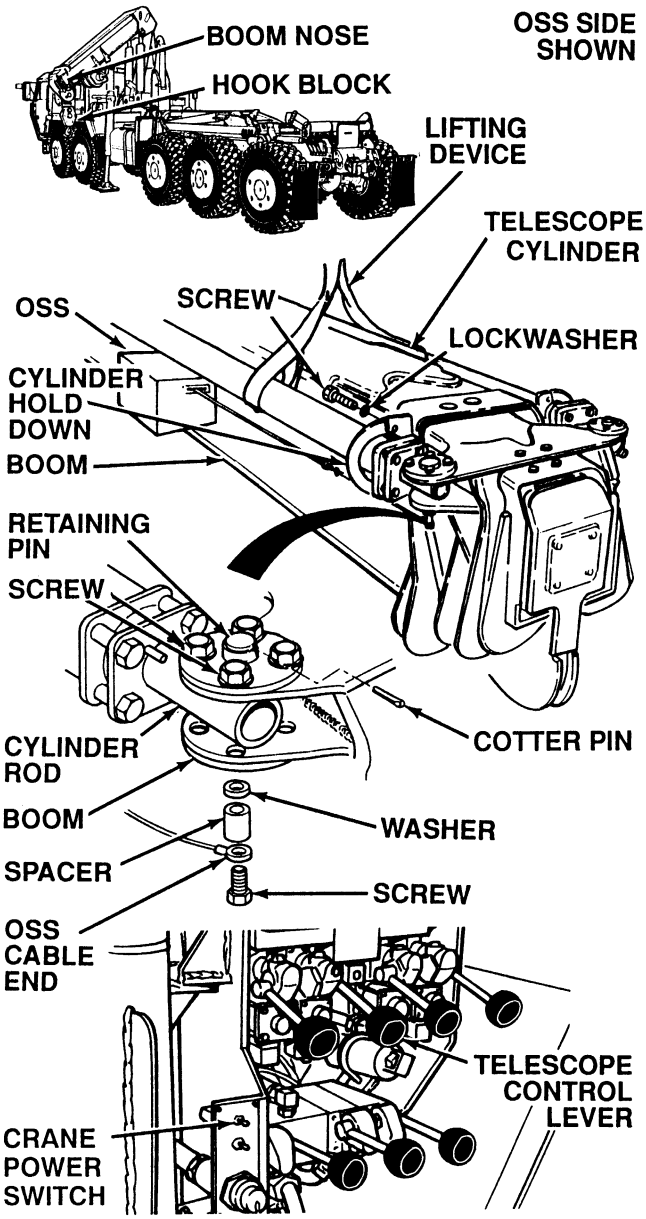
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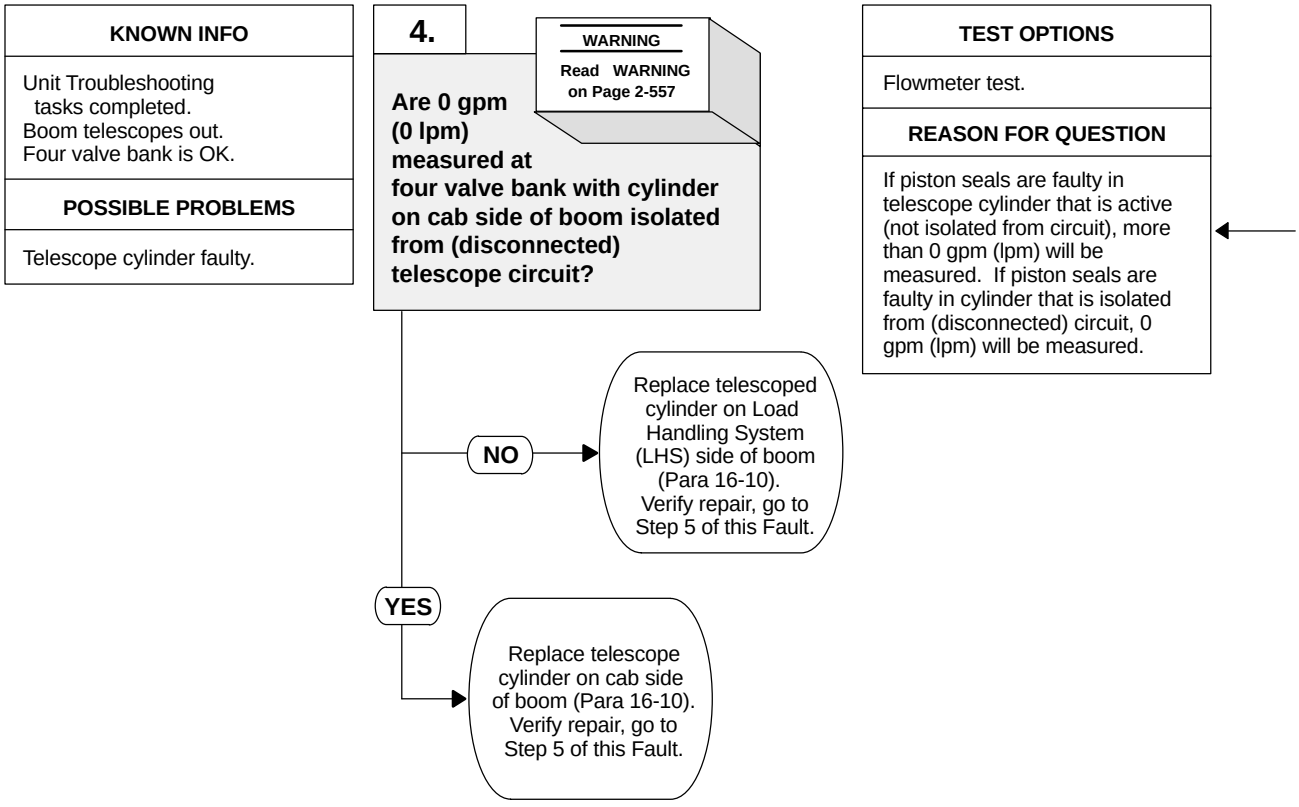
CAUTION

Cable must be held when disconnected and allowed to retract slowly by hand. Failure to do so may result in equipment damage.

OPERATION TEST (CONT).
(20) Install cylinder rod on OSS side of boom with retain pin and cotter pin. (21) Install washer, spacer, and OSS cable end with screw. (22) Tighten two screws. (23) Install other cylinder rod with retaining pin and cotter pin. (24) Tighten two screws. (25) Install LH and RH cylinder holddowns with two screws and lockwashers each. (25) Remove lifting device.



11. BOOM DOES NOT TELESCOPE IN OR TELESCOPES IN SLOWLY (CONT).



WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

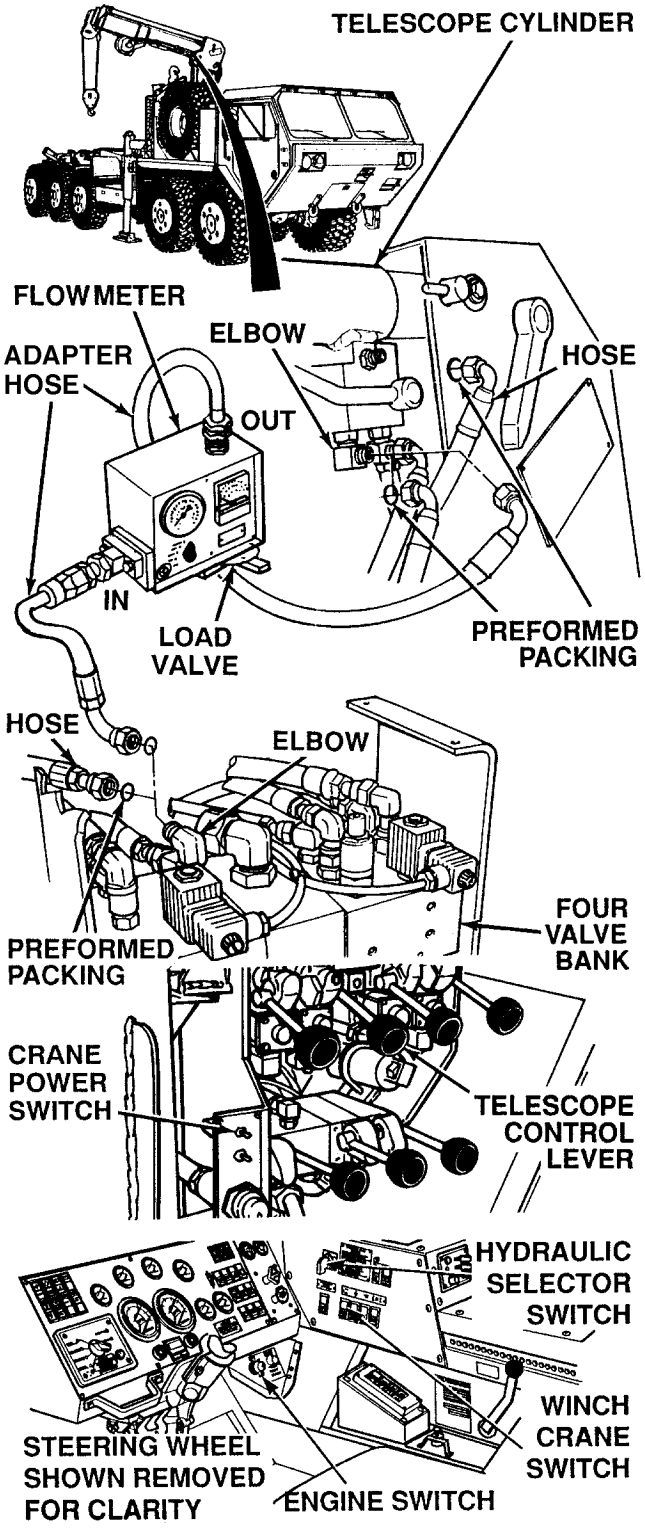
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Tag, mark and disconnect two hoses from telescope cylinder fitting and elbow. Discard preformed packings.
(2) Install plugs with preformed packings on disconnected hoses.
(3) Install cap with preformed packings on fitting.
(4) Connect flowmeter OUT port adapter hose with preformed packing to telescope elbow.
(5) Disconnect hose from outboard (taller) elbow above TELE valve. Discard preformed packings.
(6) Install plug with preformed packing in crane hose.
(7) Connect flowmeter IN port adapter to four valve bank elbow.
(8) Open flowmeter load valve.
(9) Start engine (TM 9-2320-364-10).
(10) Set WINCH/CRANE switch to CRANE position.
(11) Set hydraulic selector switch to CRANE/SRW position.
(12) Set crane POWER switch to ON position.
(13) Hold TELE control lever in the IN position.
  (a) If more than 0 gpm (0 lpm) are measured, perform Steps (14) through (23) and replace telescope cylinder (Para 16-10) on LHS side of boom.
  (b) If 0 gpm (0 lpm) are measured, perform Steps (14) through (23) and replace telescope cylinder (Para 16-10) on cab side of boom.

Continued on next page.



11. BOOM DOES NOT TELESCOPE IN OR TELESCOPES IN SLOWLY (CONT).

WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

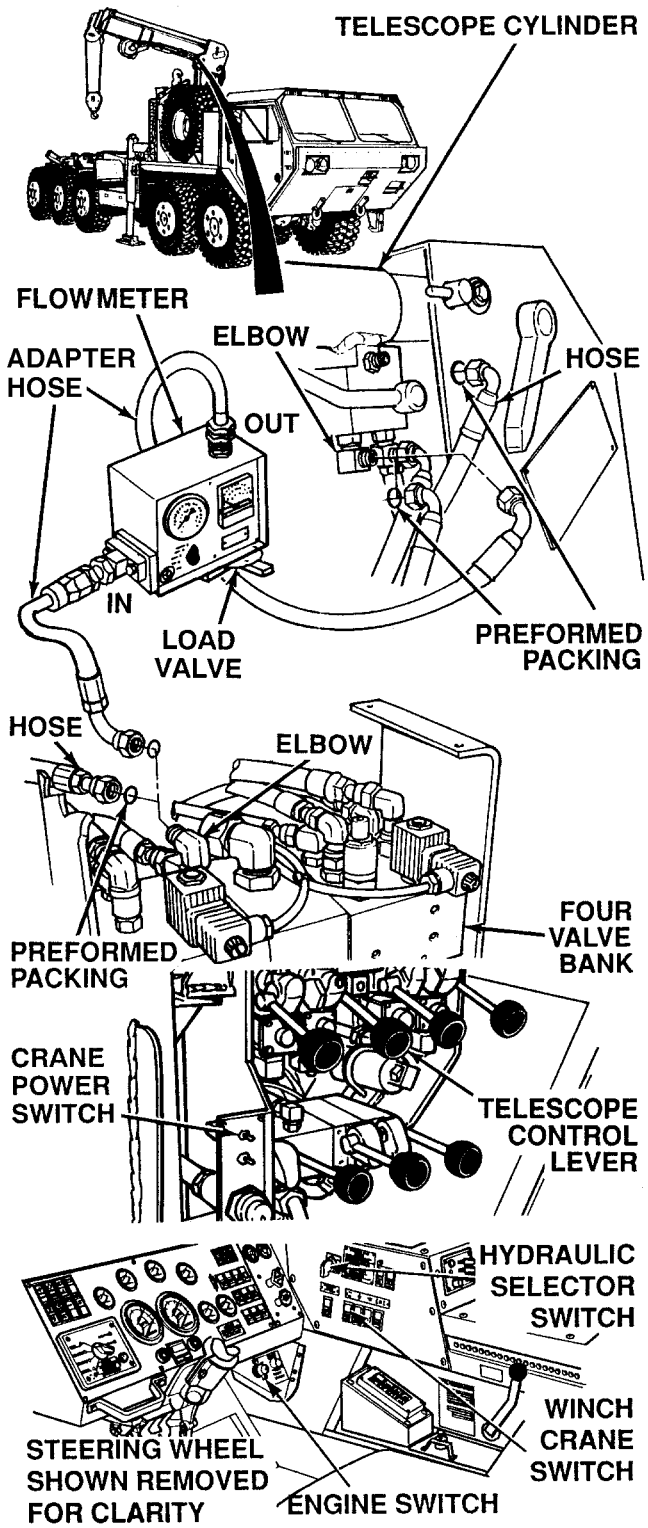
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST (CONT).

(14) Set crane POWER switch to OFF position (TM 9-2320-364-10).
(15) Set hydraulics selector switch to OFF position.
(16) Turn OFF ENGINE switch.
(17) Disconnect adapter hose from elbow.
(18) Remove two plugs from hoses. Discard preformed packings.
(19) Remove two caps from elbow and adapter. Discard preformed packings.

Continued on next page.



WARNING

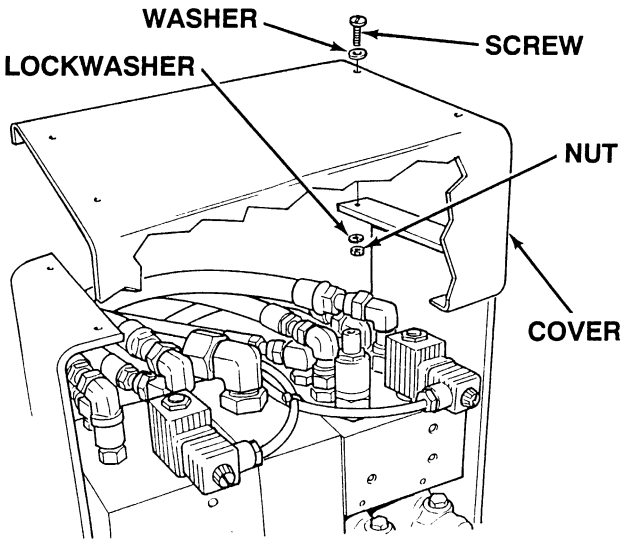
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

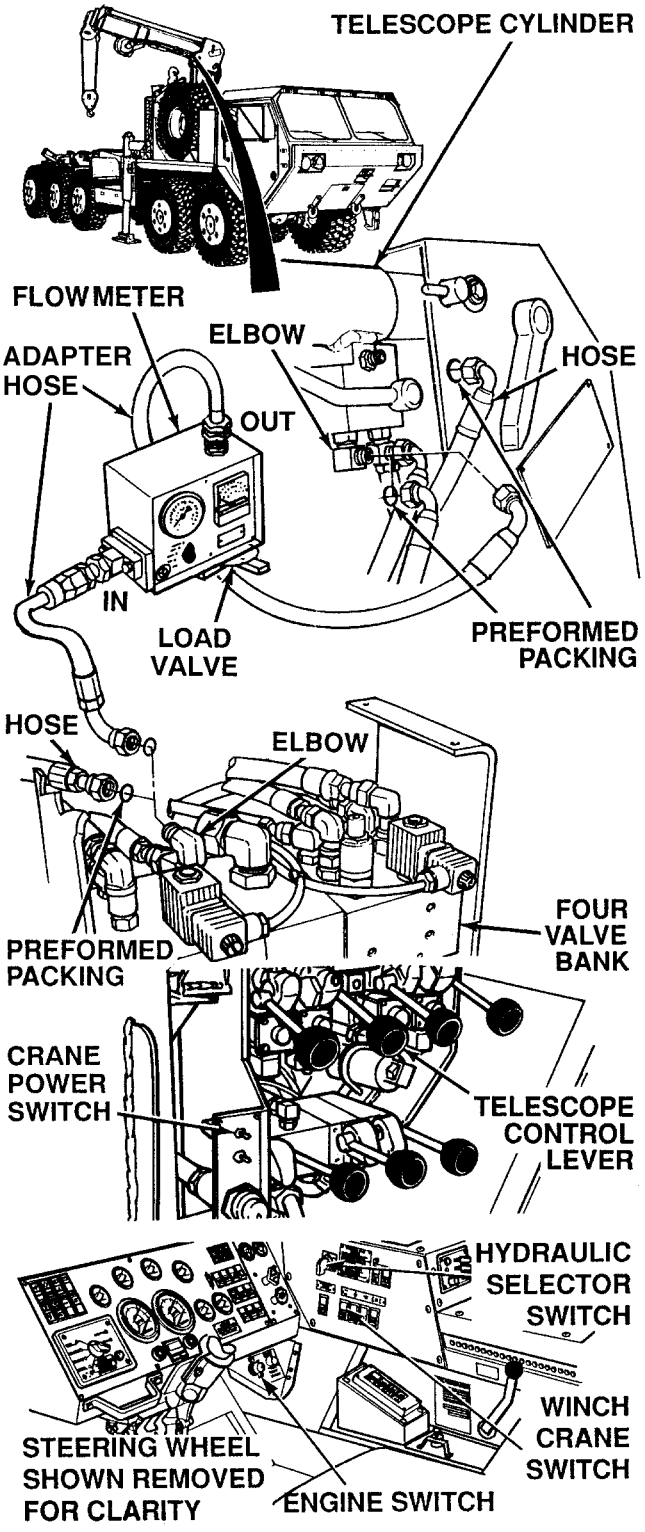
NOTE

Use a drain pan to catch leaking hydraulic oil.

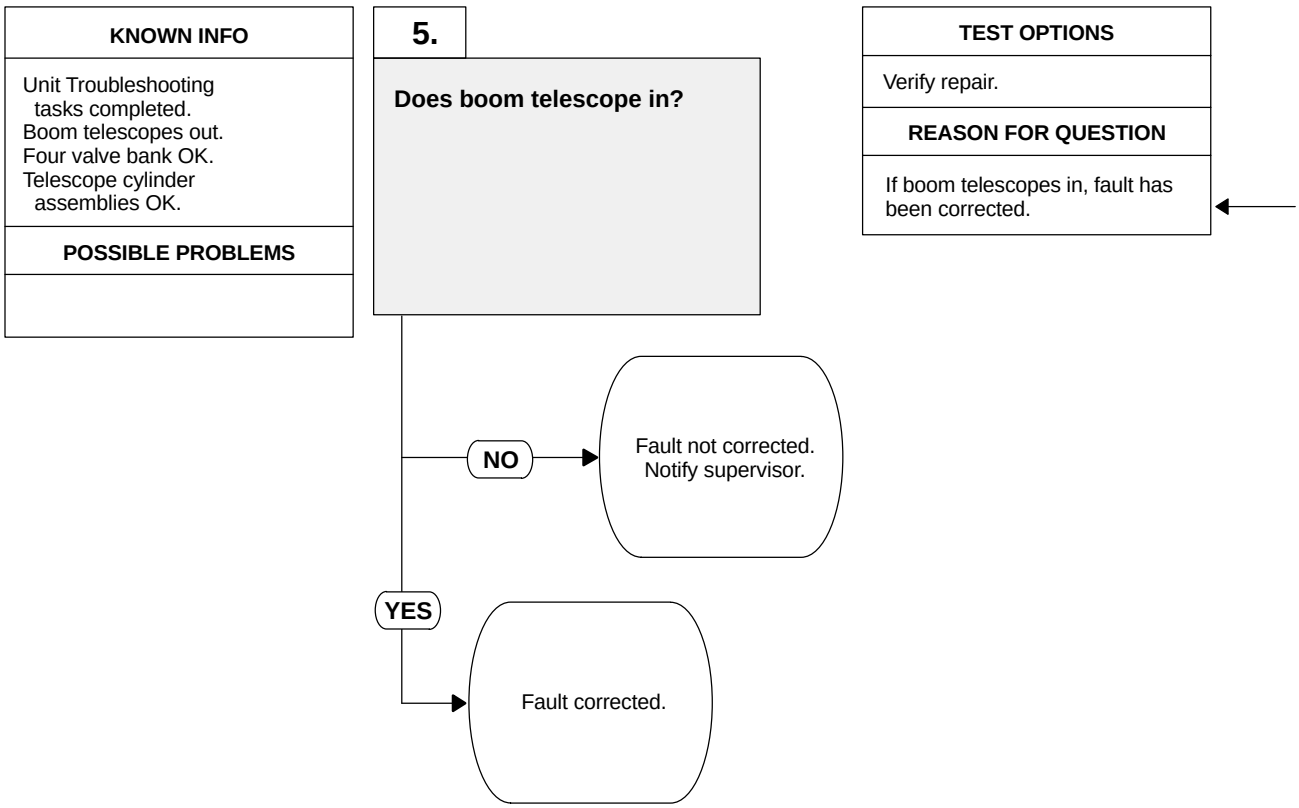
FLOWMETER TEST (CONT).

(20) Connect hose with preformed packing to elbow.
(21) Connect hose with preformed packing to fitting.
(22) Connect hose to elbow on four valve bank.
(23) Install cover with four screws, washers, lockwashers and nuts.



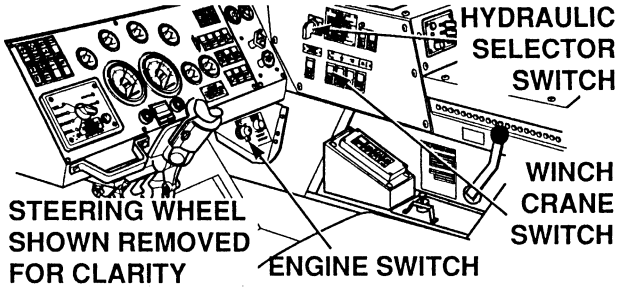


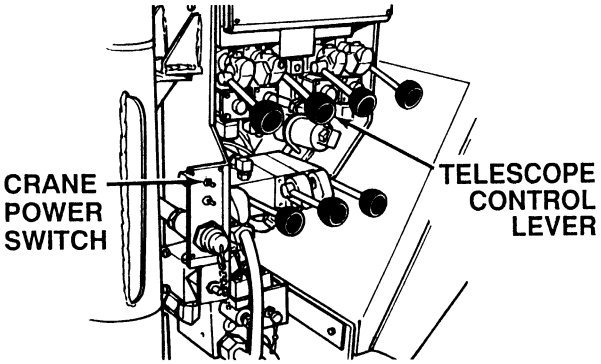
11. BOOM DOES NOT TELESCOPE IN OR TELESCOPES IN SLOWLY (CONT).

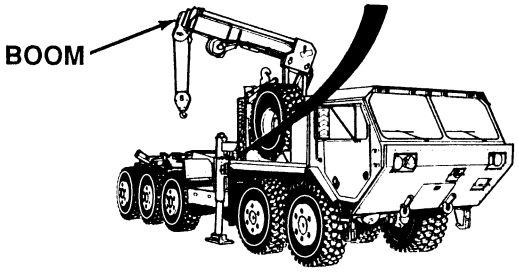


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Telescope boom in using TELE control handle (TM 9-2320-364-10).
  (a) If boom does not telescope in, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
  (b) If boom telescopes in, fault has been corrected.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

12. BOOM DOES NOT TELESCOPE OUT OR TELESCOPES OUT SLOWLY.

INITIAL SETUP

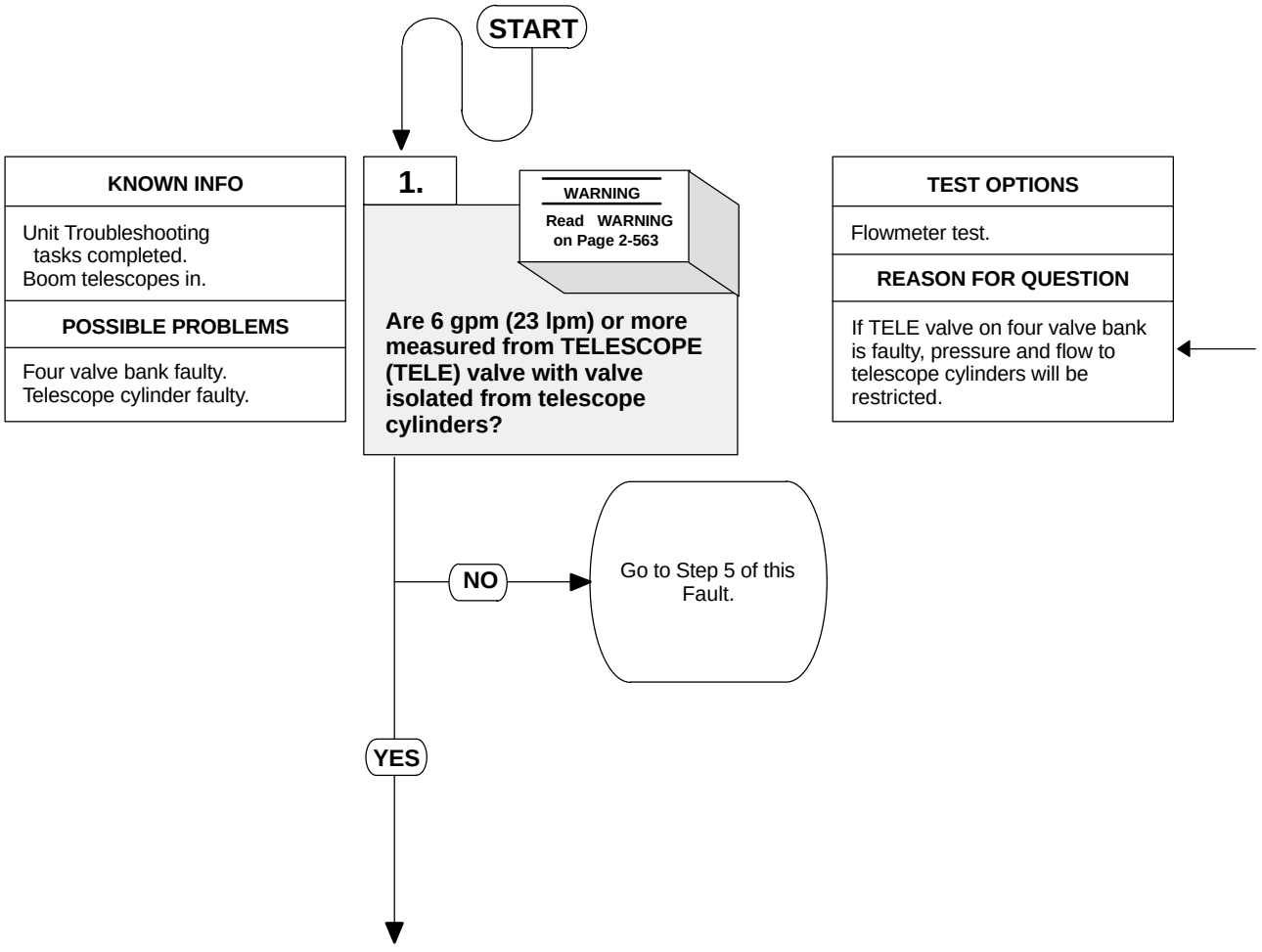
Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Cap and Plug Set (Item 26, Appendix F)
- Pan, Drain 4 gal (Item 144, Appendix F)
- Pressure Test Kit (Item 165, Appendix F)
- Lifting Device (Minimum Capacity 200 lbs [91 kg])

Materials/Parts
- Oil Hydraulic (Item 34, Appendix B)
- Tags, Identification (Item 72, Appendix B)
- Lockwasher (4) (Item 282, Appendix E)
- Packing, Preformed (9) (Item 337, Appendix E)
- Packing, Preformed (9) (Item 347, Appendix E)

Materials/Parts - Continued
- Packing, Preformed (2) (Item 363, Appendix E)
- Packing, Preformed (3) (Item 389, Appendix E)
- Packing, Preformed (3) (Item 398, Appendix E)
- Pin, Cotter (2) (Item 417, Appendix E)

References
- TM 9-2320-364-10
- TM 9-2320-364-20

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

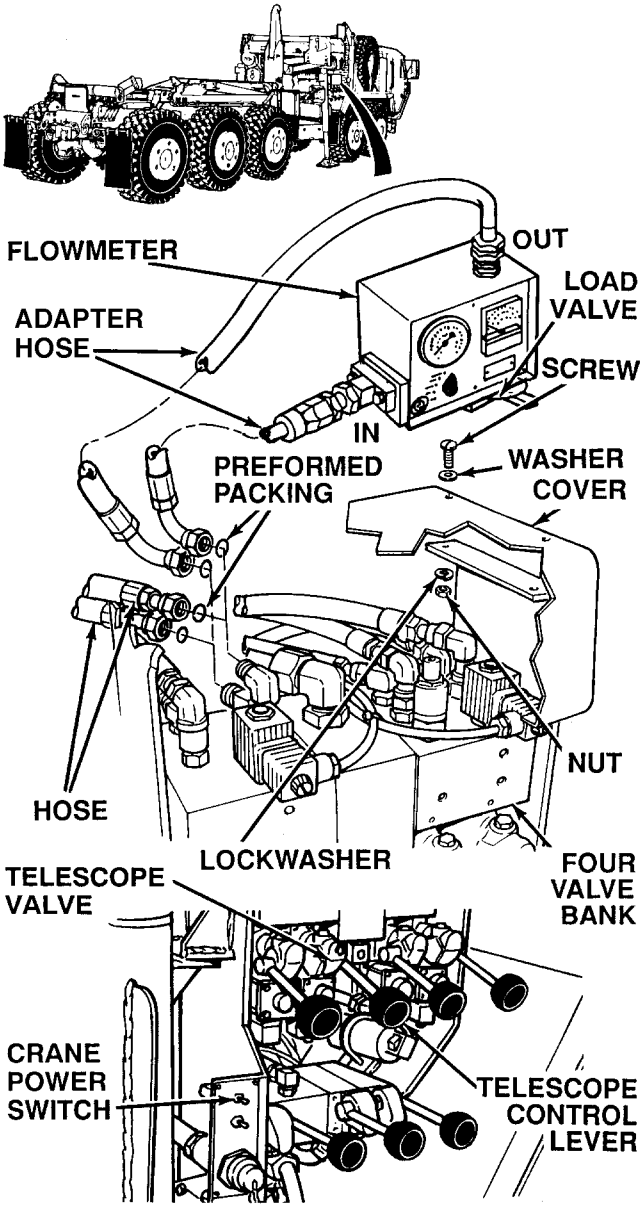
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

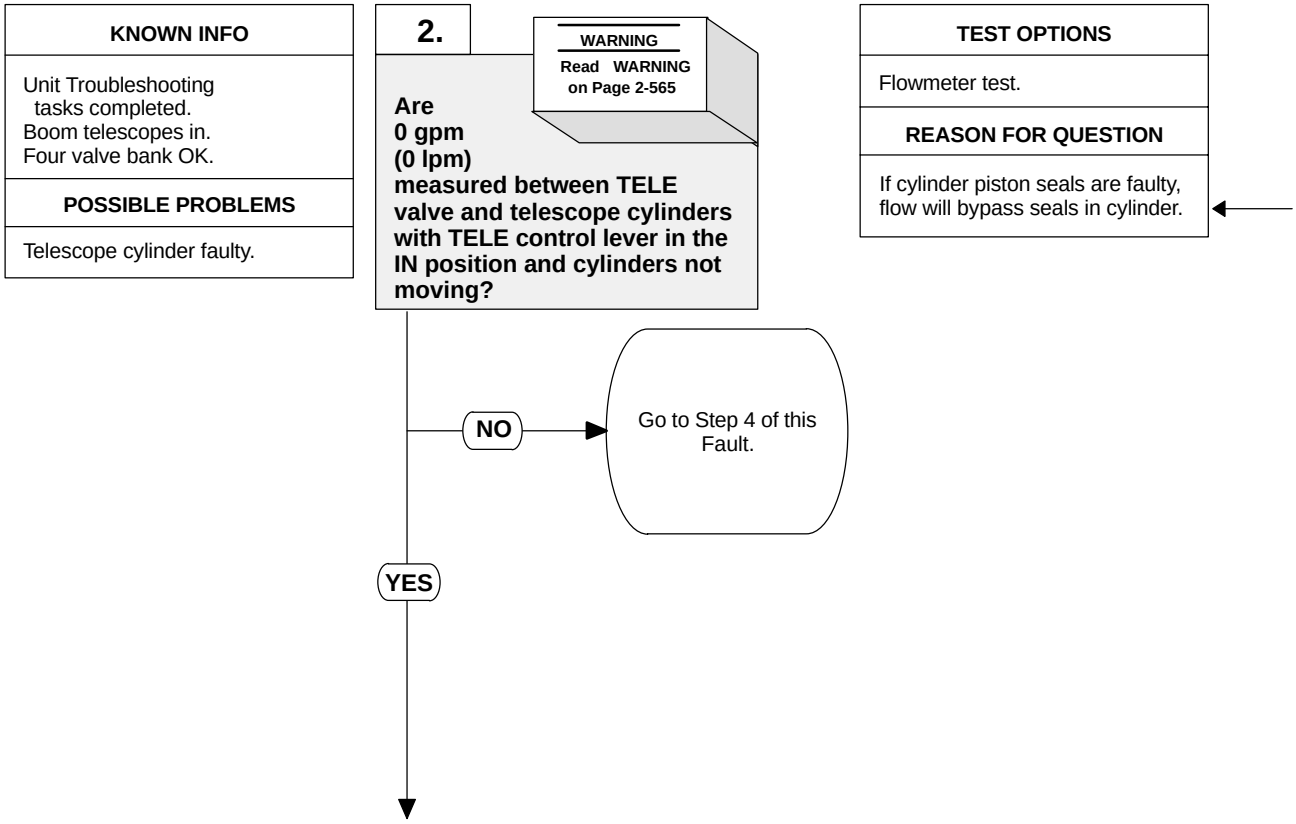
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above TELE valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(4) Connect adapter hose to flowmeter OUT port.
(5) Connect adapter hose with preformed packing to outboard taller) elbow.
(6) Connect adapter hose to flowmeter IN port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold TELE control lever in the IN position.
  (a) If 6 gpm (23 lpm) or more are not present, perform Steps (13) through (17) below and go to Step 5 of this Fault.
  (b) If at least 6 gpm (23 lpm) are present, go to Step 2 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulics selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows. Discard preformed packings.
(17) Connect two hoses with preformed packings to elbows.



12. BOOM DOES NOT TELESCOPE OUT OR TELESCOPES OUT SLOWLY (CONT).



WARNING

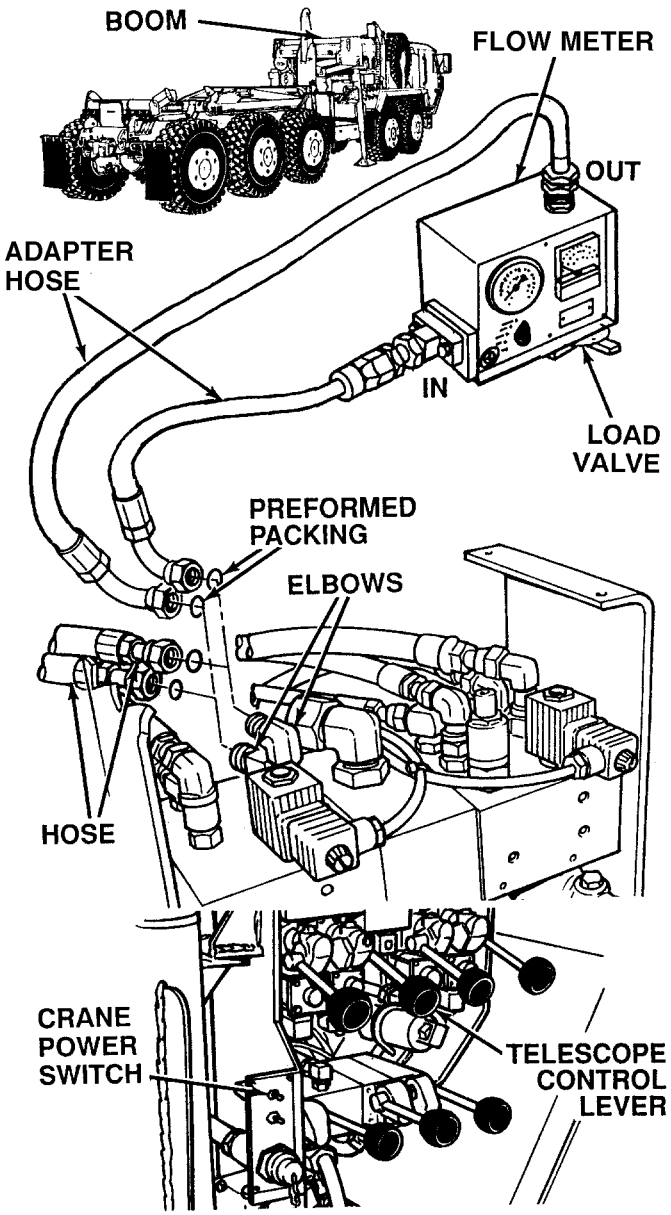
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

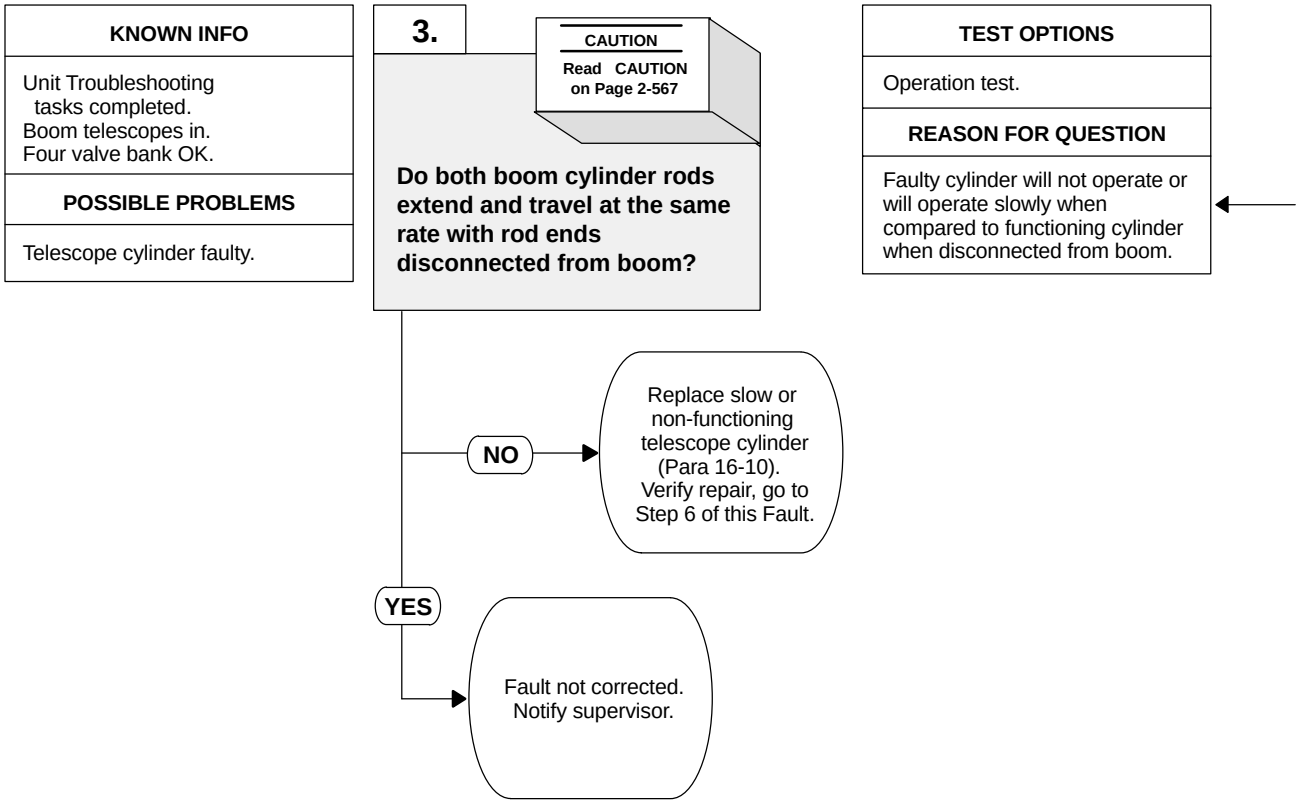
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove adapter hoses from elbows. Discard preformed packings.
(2) Connect flowmeter IN port adapter hose with preformed packing to the crane hose removed from inboard (shorter) elbow.
(3) Connect flowmeter OUT port adapter hose with preformed packing to inboard (shorter) elbow.
(4) Install crane hose with preformed packing on outboard (taller) elbow.
(5) Open flowmeter load valve.
(6) Start engine (TM 9-2320-364-10).
(7) Set WINCH/CRANE switch to CRANE position.
(8) Set hydraulic selector switch to CRANE/SRW position.
(9) Set crane POWER switch to ON position.
(10) Telescope boom in completely if boom operates slowly.
(11) Hold TELE control lever in the OUT position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (12) through (17) below and go to Step 4 of this Fault.
  (b) If 0 gpm (0 lpm) are present, perform Steps (12) through (17) below and go to Step 3 of this Fault.
(12) Set crane POWER switch to OFF position.
(13) Set hydraulics selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Tag, mark and disconnect crane hose from outboard (taller) elbow. Discard preformed packing.
(16) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(17) Connect two crane hoses with preformed packings to elbows.



12. BOOM DOES NOT TELESCOPE OUT OR TELESCOPES OUT SLOWLY (CONT).



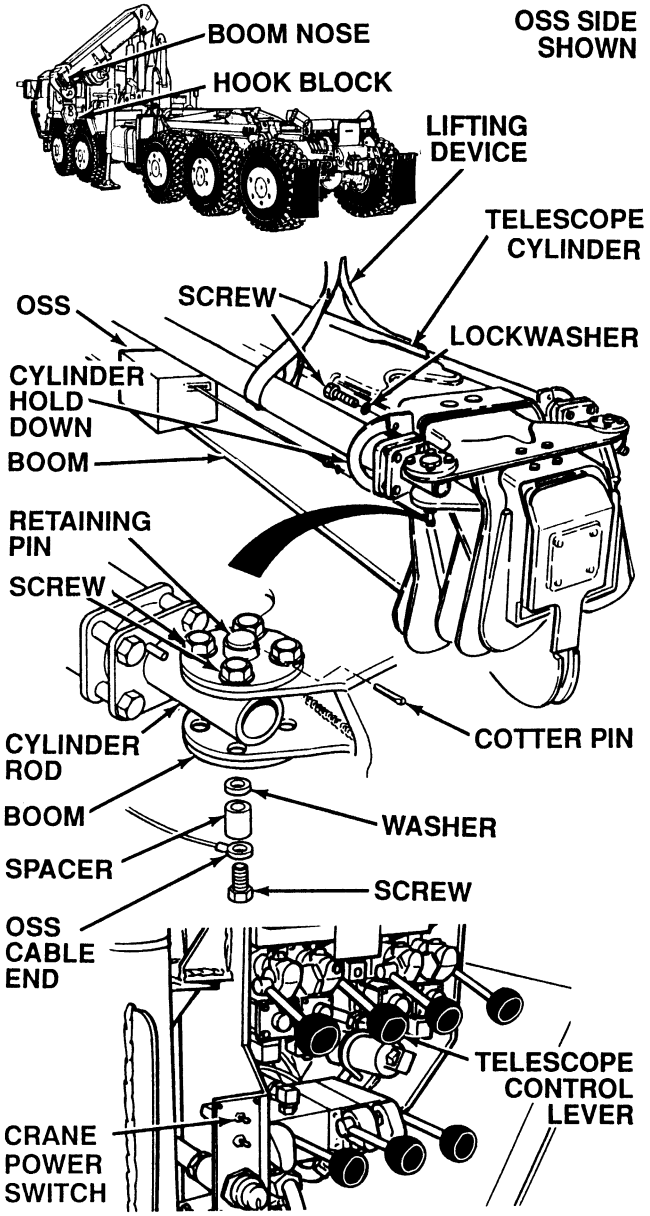
CAUTION

Cable must be held when disconnected and allowed to retract slowly by hand. Failure to do so may result in equipment damage.

OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE rocker switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Turn ON crane POWER switch.
(5) Position end of crane boom on LH side of truck and lower it so that telescope retaining pins can be easily reached.
(6) Raise hoist hook block until it contacts boom nose.
(7) Remove two screws, lockwashers and RH cylinder hold down.
(8) Remove two screws, lockwashers and LH cylinder hold down.
(9) Attach lifting device to telescope cylinders.
(10) Remove screw, overload sensing system (OSS) cable end, spacer, and washer from retaining pin and carefully let cable retract.
(11) Remove two cotter pins from retaining pin and retaining pin from cylinder rod and boom on OSS side of boom. Discard cotter pins.
(12) Loosen two screws enough to allow cylinder rod to be pulled out away from boom.
(13) Remove cotter pin from retaining pin and retaining pin from cylinder rod on other side of boom.
(14) Loosen two screws enough to allow cylinder rod to be pulled out away from boom.
(15) Swing both telescope cylinders out enough that cylinder rods can be extended without contacting boom.

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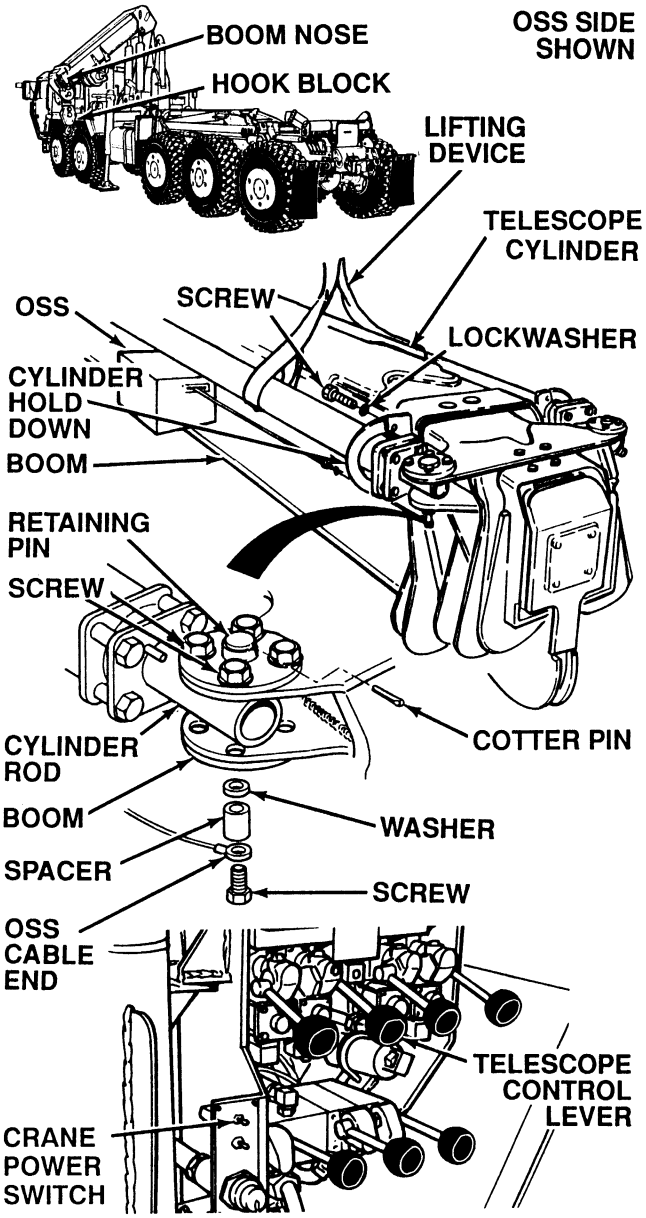


12. BOOM DOES NOT TELESCOPE OUT OR TELESCOPES OUT SLOWLY (CONT).

OPERATION TEST (CONT).

(16) Operate telescope cylinders using TELE control lever.
  (a) If one cylinder does not operate or operates slowly, perform Steps (17) through (25) below and replace telescope cylinder (Para 16-10).
  (b) If both cylinders operate equally, fault not corrected. Perform Steps (17) through (25) and notify supervisor.
(17) Set crane POWER switch to OFF position (TM 9-2320-364-10).
(18) Set hydraulics selector switch to OFF position.
(19) Turn OFF ENGINE switch.

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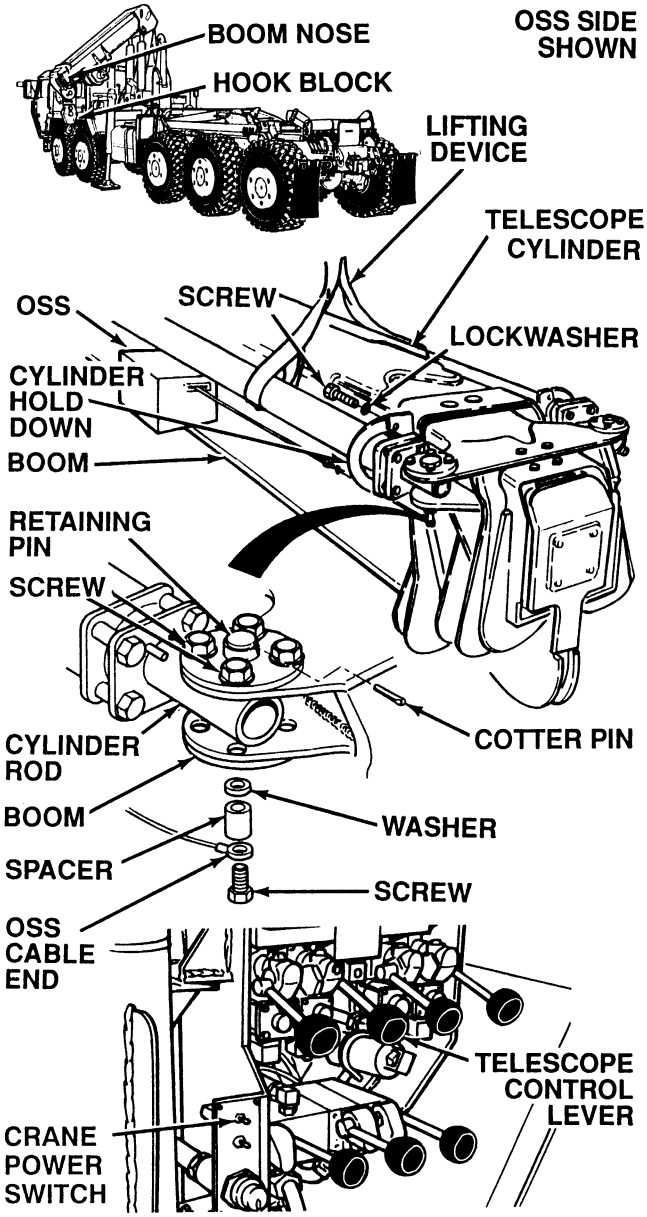


CAUTION

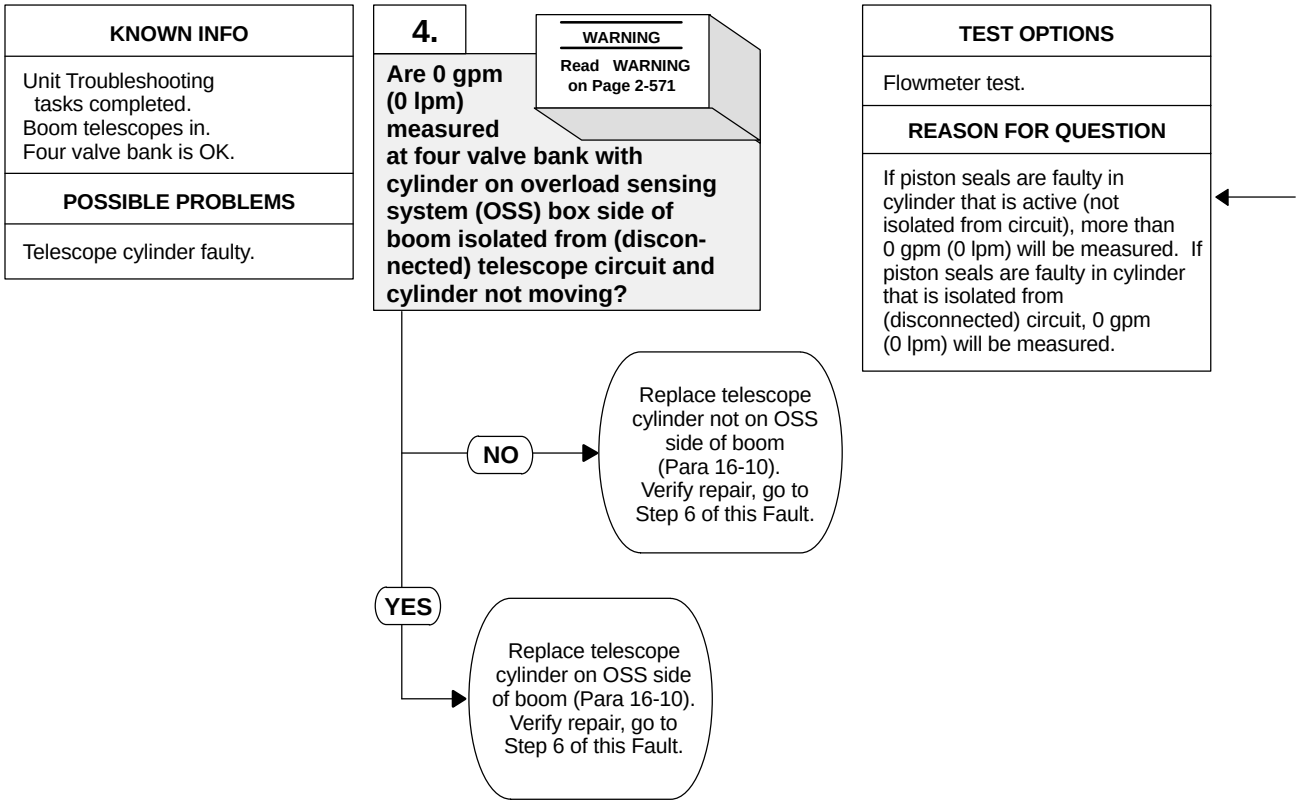
Cable must be held when disconnected and allowed to retract slowly by hand. Failure to do so may result in equipment damage.

OPERATION TEST (CONT).

(20) Install cylinder rod on OSS side of boom with retain pin and cotter pin.
(21) Install washer, spacer, and OSS cable end with screw.
(22) Tighten two screws.
(23) Install other cylinder rod with retaining pin and cotter pin.
(24) Tighten two screws.
(25) Install LH and RH cylinder holddowns with two screws and lockwashers each.
(25) Remove lifting device.



12. BOOM DOES NOT TELESCOPE OUT OR TELESCOPES OUT SLOWLY (CONT).



WARNING

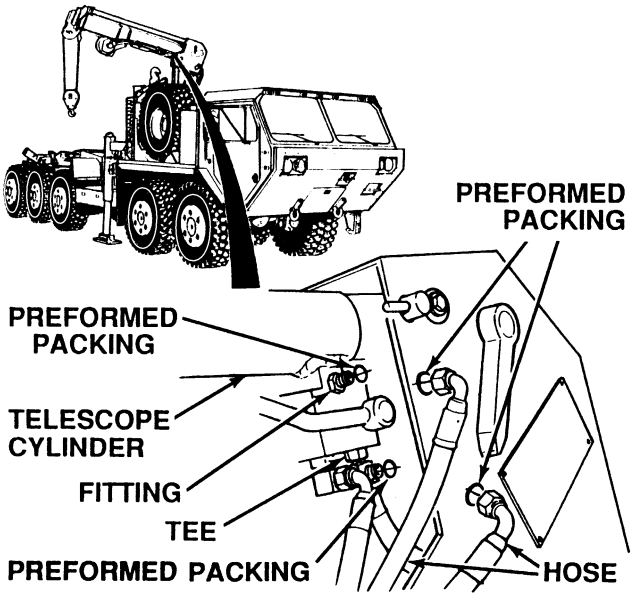
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

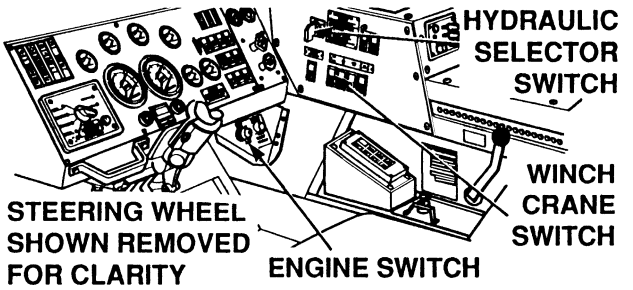
NOTE

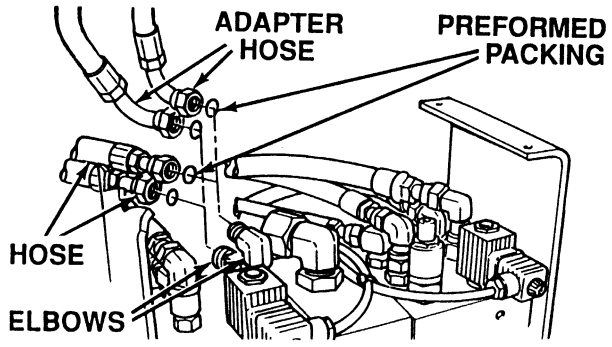
Use a drain pan to catch leaking hydraulic oil.

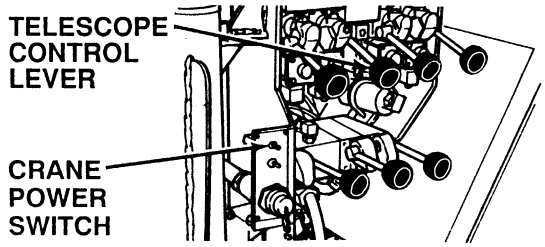
FLOWMETER TEST

(1) Tag, mark and disconnect two hoses from telescope cylinder fitting and tee on side of boom without OSS box. Discard preformed packings.
(2) Install plugs with preformed packings on disconnected hoses.
(3) Install caps with preformed packings on fitting and tee.
(4) Start engine (TM 9-2320-364-10).
(5) Set WINCH/CRANE switch to CRANE position.
(6) Set hydraulic selector switch to CRANE/SRW position.
(7) Set crane POWER switch to ON position.
(8) Hold TELE control lever in the IN position.
  (a) If more than 0 gpm (0 lpm) are measured, perform Steps (9) through (18) below and replace telescope cylinder (Para 16-10) that is not on the OSS side of the boom.
  (b) If 0 gpm (0 lpm) are measured, perform Steps (9) through (18) below and replace telescope cylinder (Para 16-10) that is on OSS side of boom.
(9) Set crane POWER switch to OFF position.
(10) Set hydraulics selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Remove two plugs from hoses. Discard preformed packings.
(13) Remove two caps from tee and adapter. Discard preformed packings.
(14) Connect hose with preformed packing to tee.
(15) Connect hose with preformed packing to fitting.
(16) Disconnect hose from outboard (taller) elbow above TELE valve. Discard preformed packing.
(17) Disconnect adapter hoses from elbow and hose. Discard preformed packing.
(18) Connect two hoses with preformed packings to elbows.

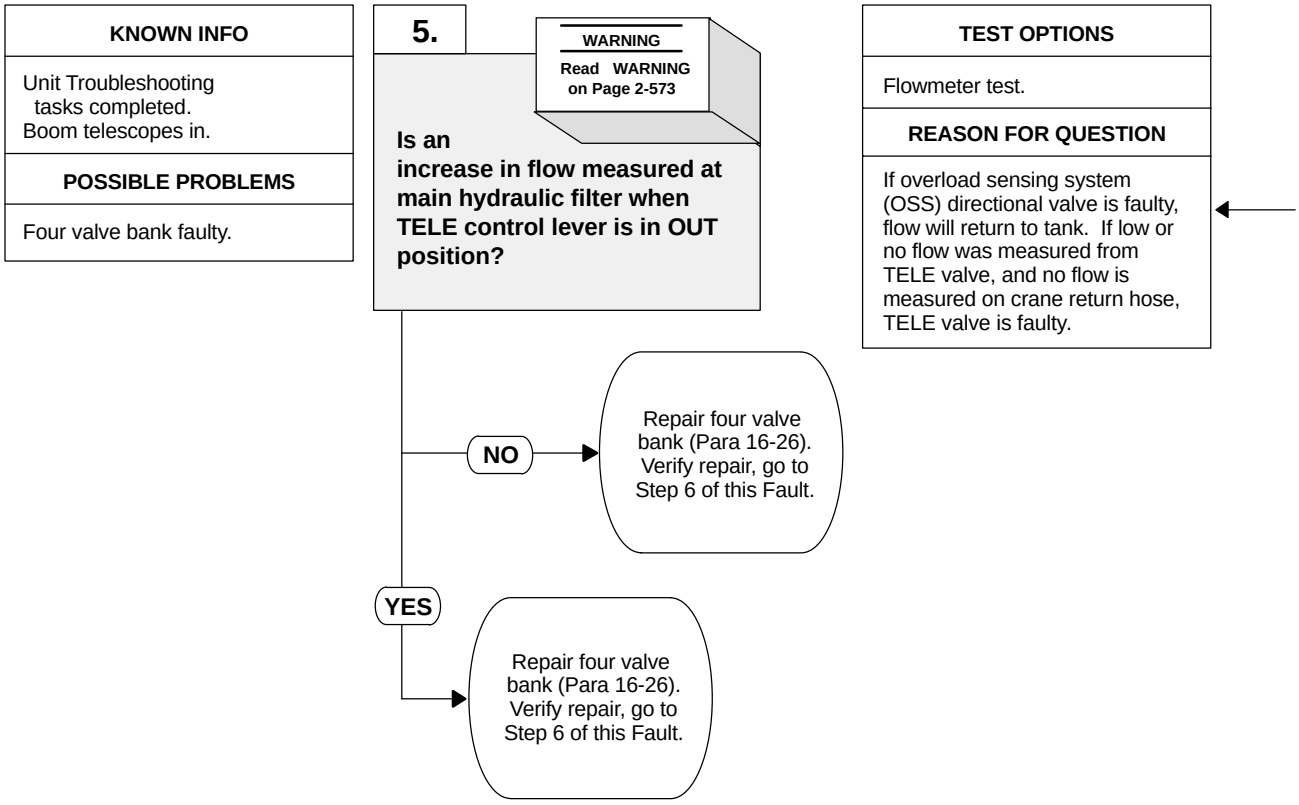








12. BOOM DOES NOT TELESCOPE OUT OR TELESCOPES OUT SLOWLY (CONT).



WARNING

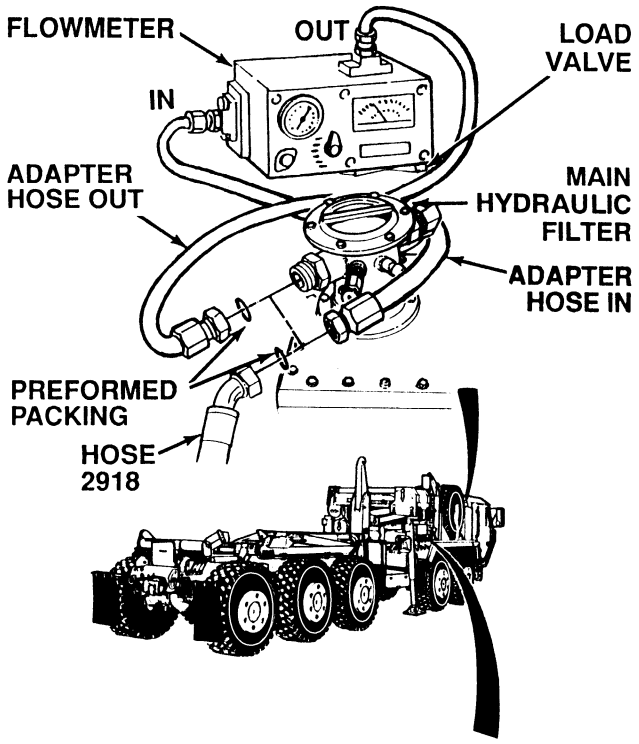
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

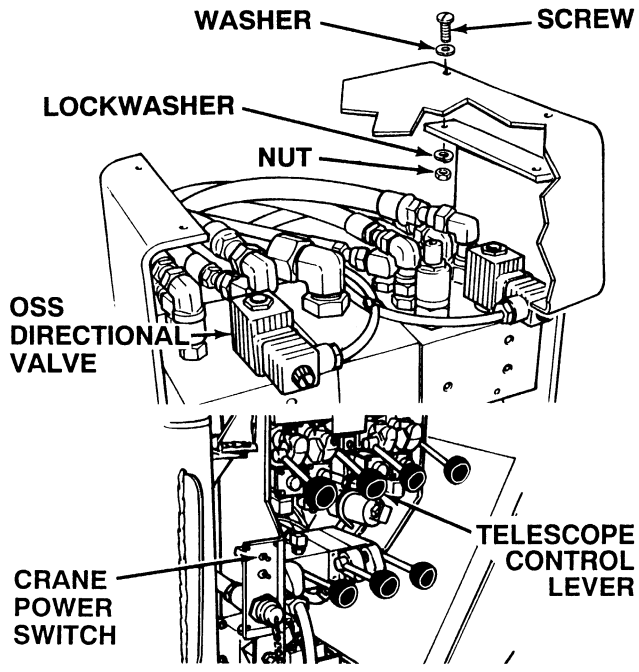
NOTE

Use a drain pan to catch leaking hydraulic oil.

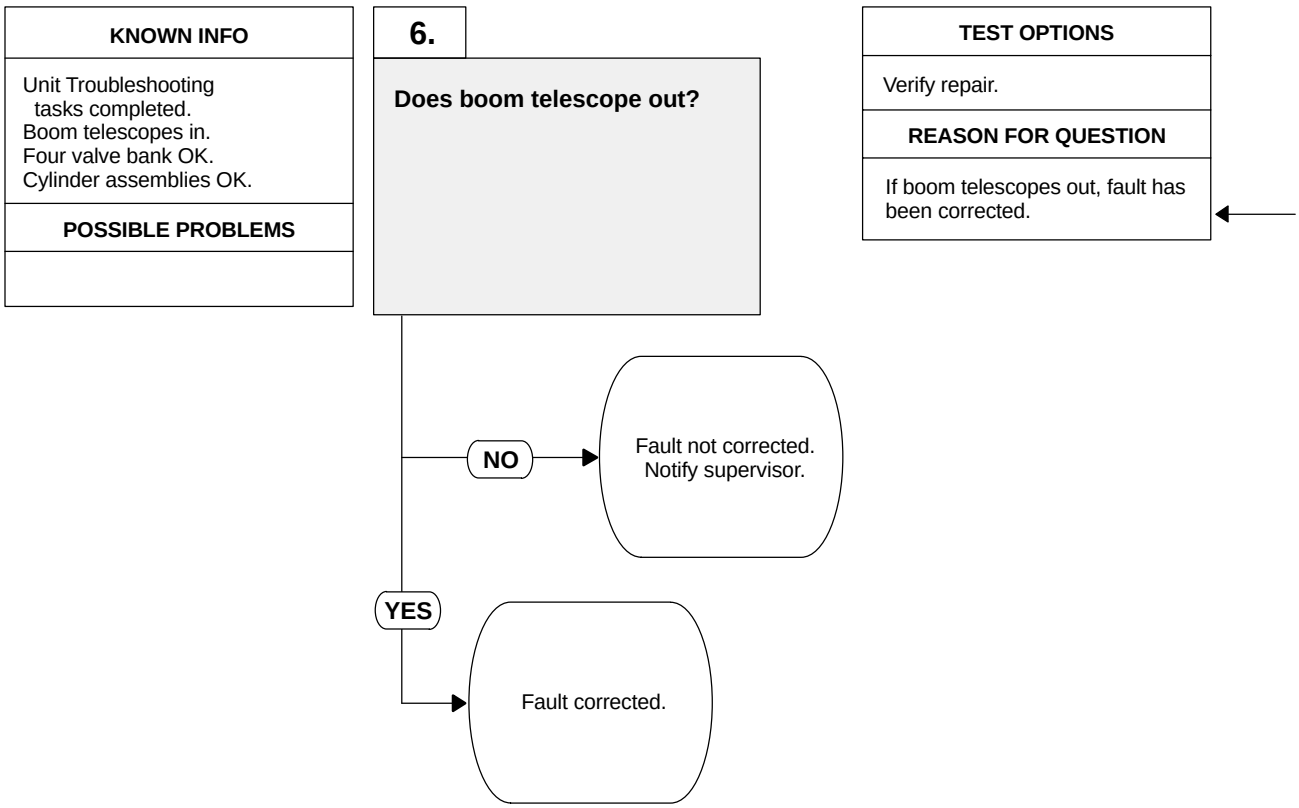
FLOWMETER TEST

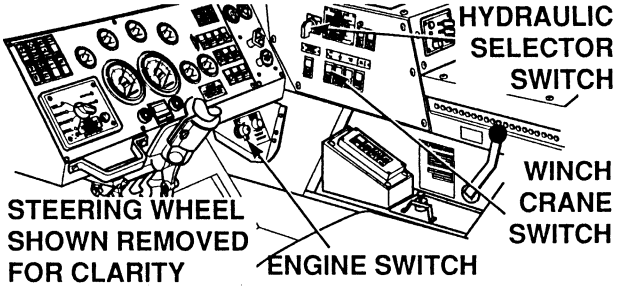
(1) Disconnect hose 2918 from main hydraulic filter.
(2) Connect adapter hose to return filter.
(3) Connect adapter hose to flowmeter OUT port.
(4) Connect adapter hose to hose 2918.
(5) Connect adapter hose to flowmeter IN port.
(6) Open flowmeter load valve.
(7) Start engine (TM 9-2320-364-10).
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Set crane POWER switch to ON position.
(11) Observe and record flowmeter gpm (lpm) measured.
(12) Hold TELE control lever in OUT position.
  (a) If gpm (lpm) present are not more than gpm (lpm) measured in Step (11) above, perform Steps (13) through (19) below and replace TELE valve on four valve bank (Para 16-26).
  (b) If gpm (lpm) measured are more than gpm (lpm) measured in Step (11) above, perform Steps (13) through (19) below and replace OSS directional valve on four valve bank (Para 16-26).
(13) Set crane POWER switch to OFF position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hose from hose 2918. Discard preformed packing.
(17) Disconnect adapter hose from return filter. Discard preformed packing.
(18) Connect hose 2918 with preformed packing to filter.
(19) Install cover with four screws, washers, lockwashers and nuts.





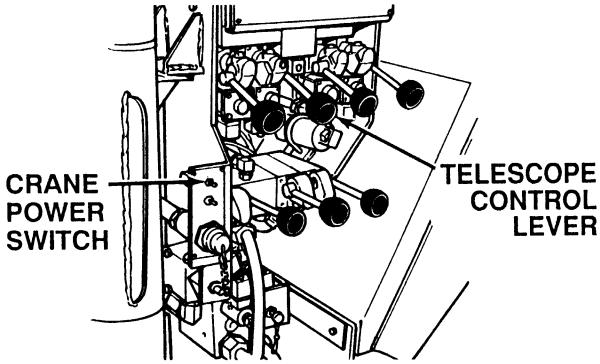
12. BOOM DOES NOT TELESCOPE OUT OR TELESCOPES OUT SLOWLY (CONT).

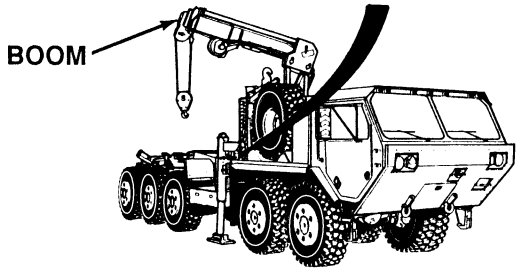




VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Telescope boom out using TELE control handle.
  (a) If boom does not telescope out, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
  (b) If boom telescopes out, fault has been corrected.
(3) Set crane POWER switch to OFF position (TM 9-2320-364-10).
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.





2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

13. BOOM DOES NOT TELESCOPE OR TELESCOPES SLOWLY.

INITIAL SETUP

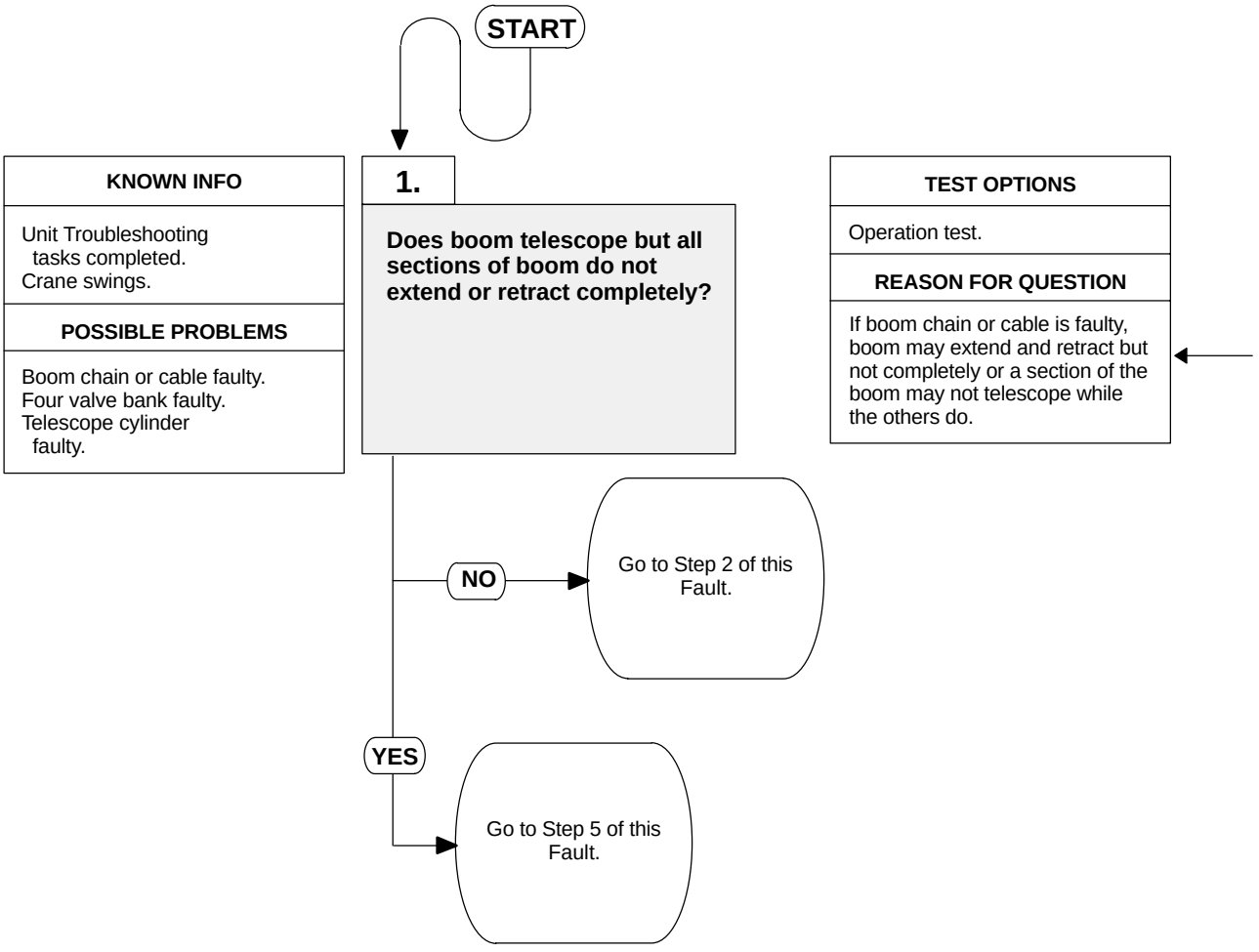
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Lifting Device (Minimum Capacity 200 lbs/91 kg)

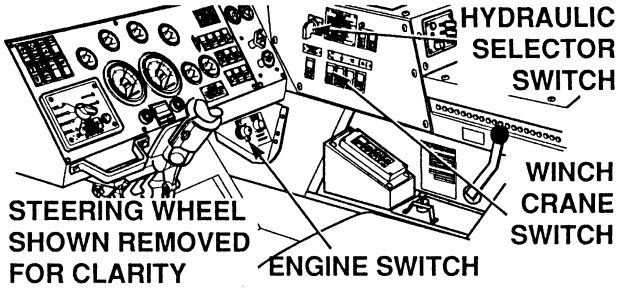
Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Lockwasher (4) (Item 282, Appendix E)
Packing, Preformed (2) (Item 337, Appendix E)
Packing, Preformed (2) (Item 347, Appendix E)

Materials/Parts - Continued
Pin, Cotter (2) (Item 417, Appendix E)

References
TM 9-2320-364-10
TM 9-2320-364-20

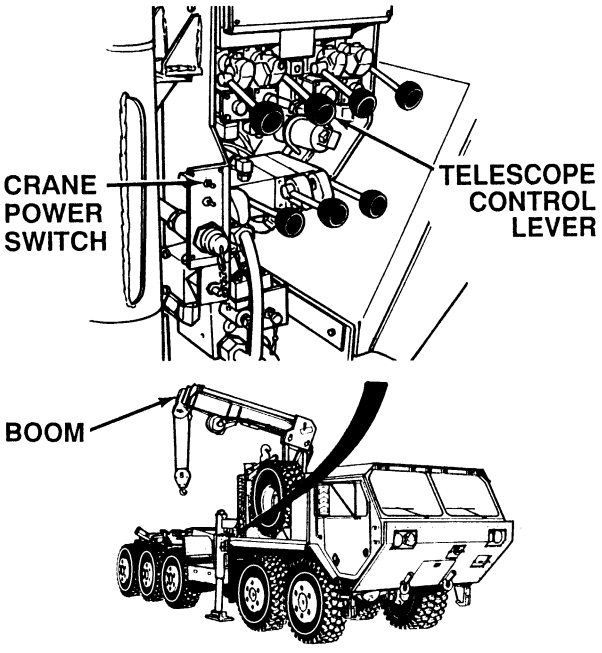
Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



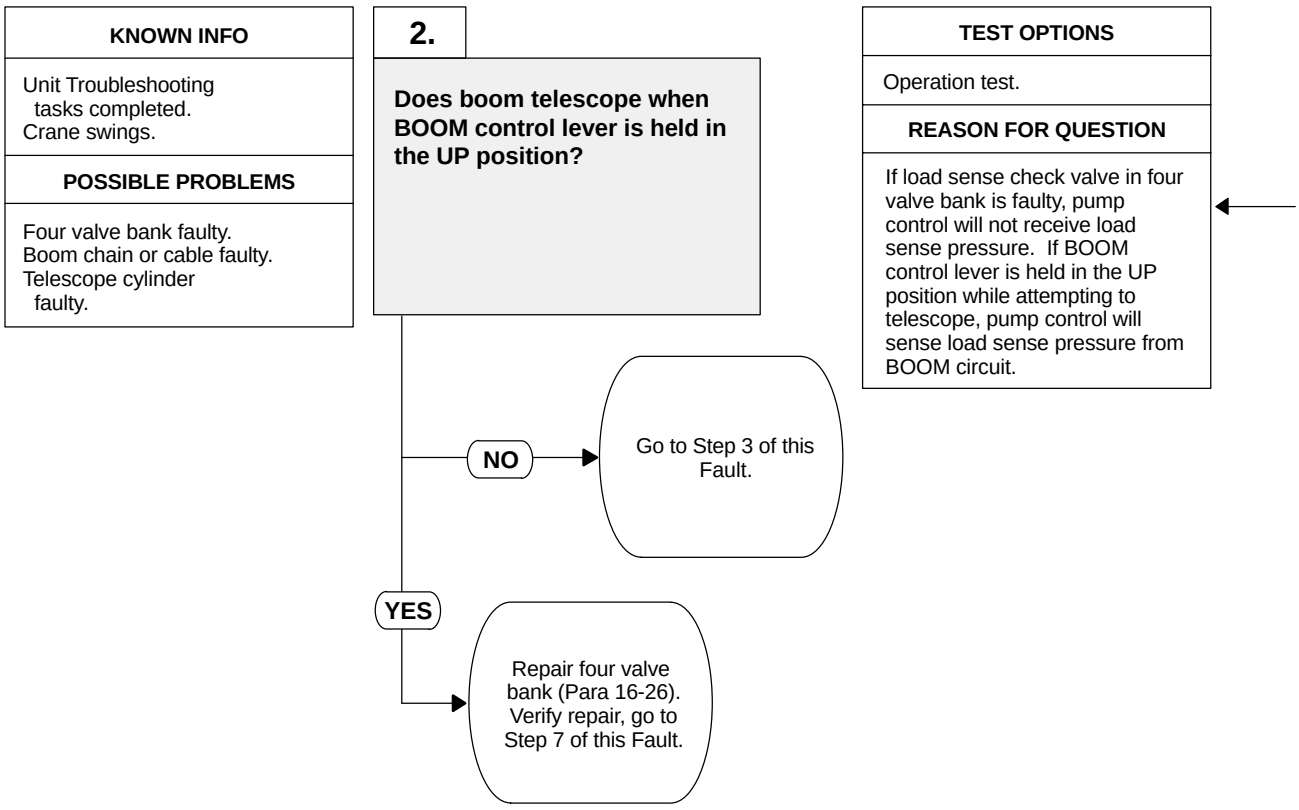


OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Set crane POWER switch to ON position.
(5) Attempt to telescope boom using TELE control lever.
  (a) If boom does not telescope, perform Steps (6) through (8) below and go to Step 2 of this Fault.
  (b) If boom does telescope some but not completely, perform Steps (6) through (8) below and go to Step 5 of this Fault.
(6) Set crane POWER switch to OFF position.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.

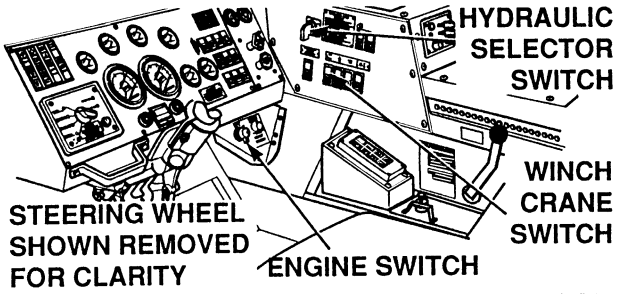


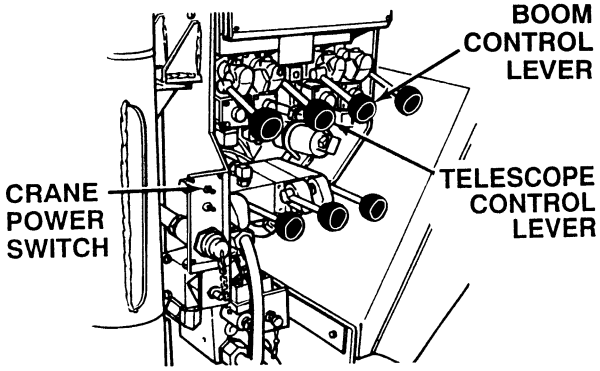
13. BOOM DOES NOT TELESCOPE OR TELESCOPES SLOWLY (CONT).

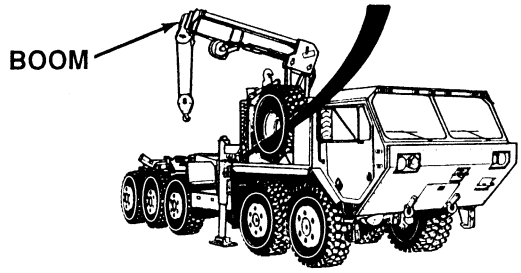


OPERATION TEST

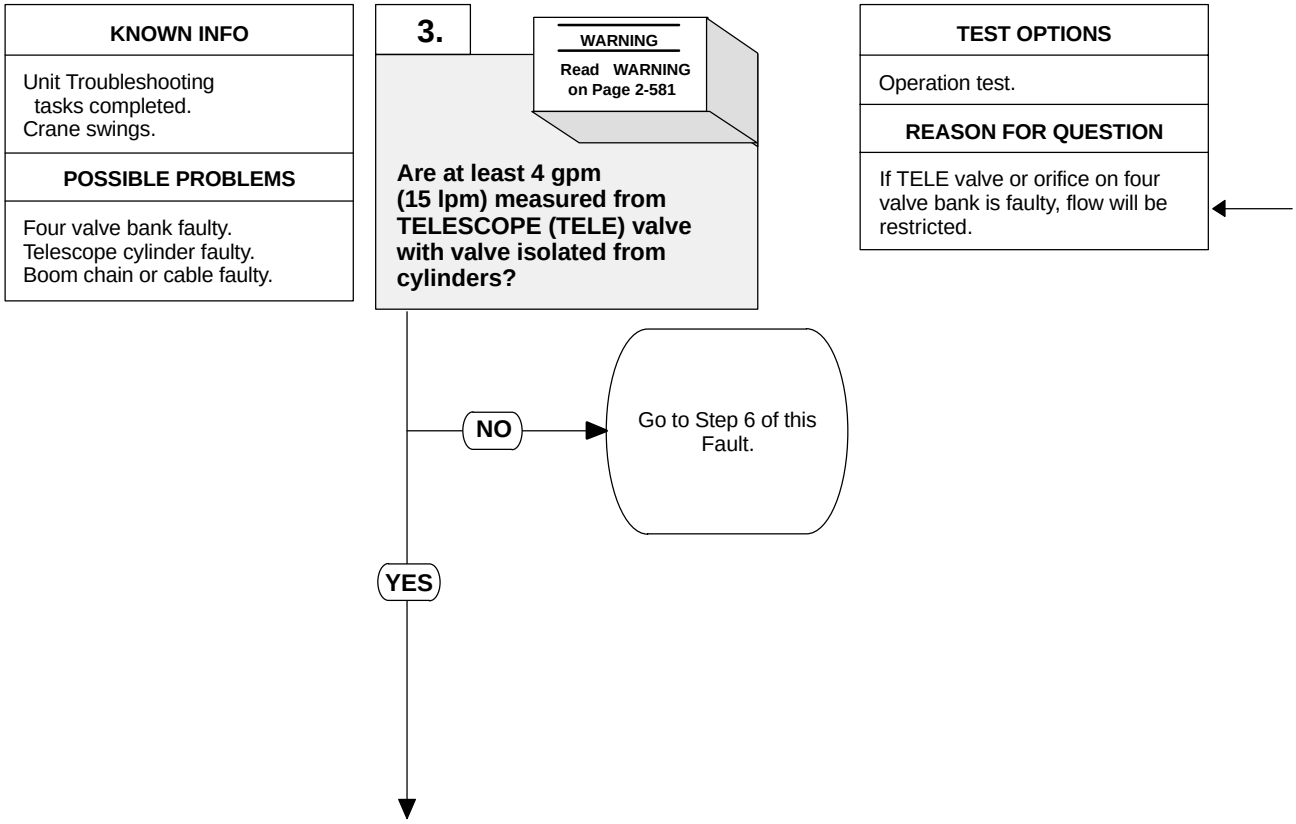
(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Set crane POWER switch to ON position.
(5) Attempt to telescope while holding BOOM control lever in UP position.
  (a) If boom does not telescope, perform Steps (6) through (8) below and go to Step 3 of this Fault.
  (b) If boom telescopes, perform Steps (6) through (8) below and repair four valve bank (Para 16-26).
(6) Set crane power switch to OFF position.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.







13. BOOM DOES NOT TELESCOPE OR TELESCOPES SLOWLY (CONT).



WARNING

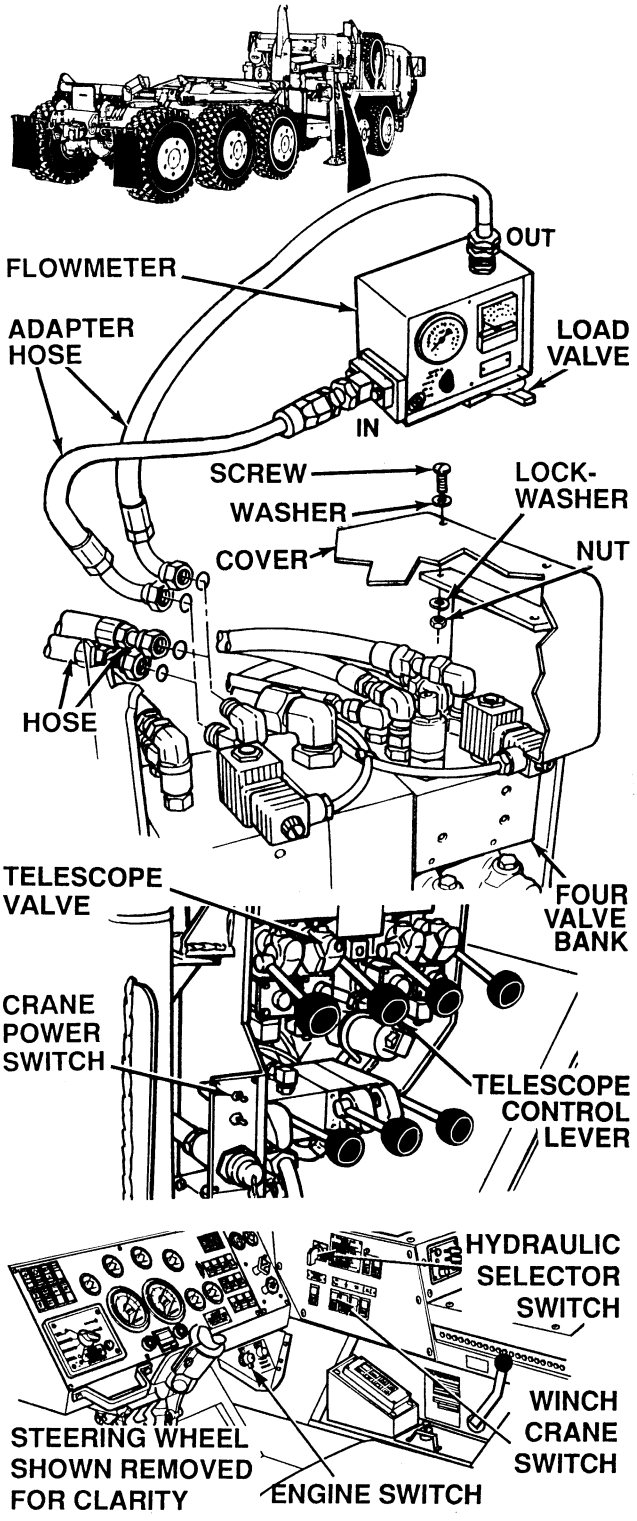
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

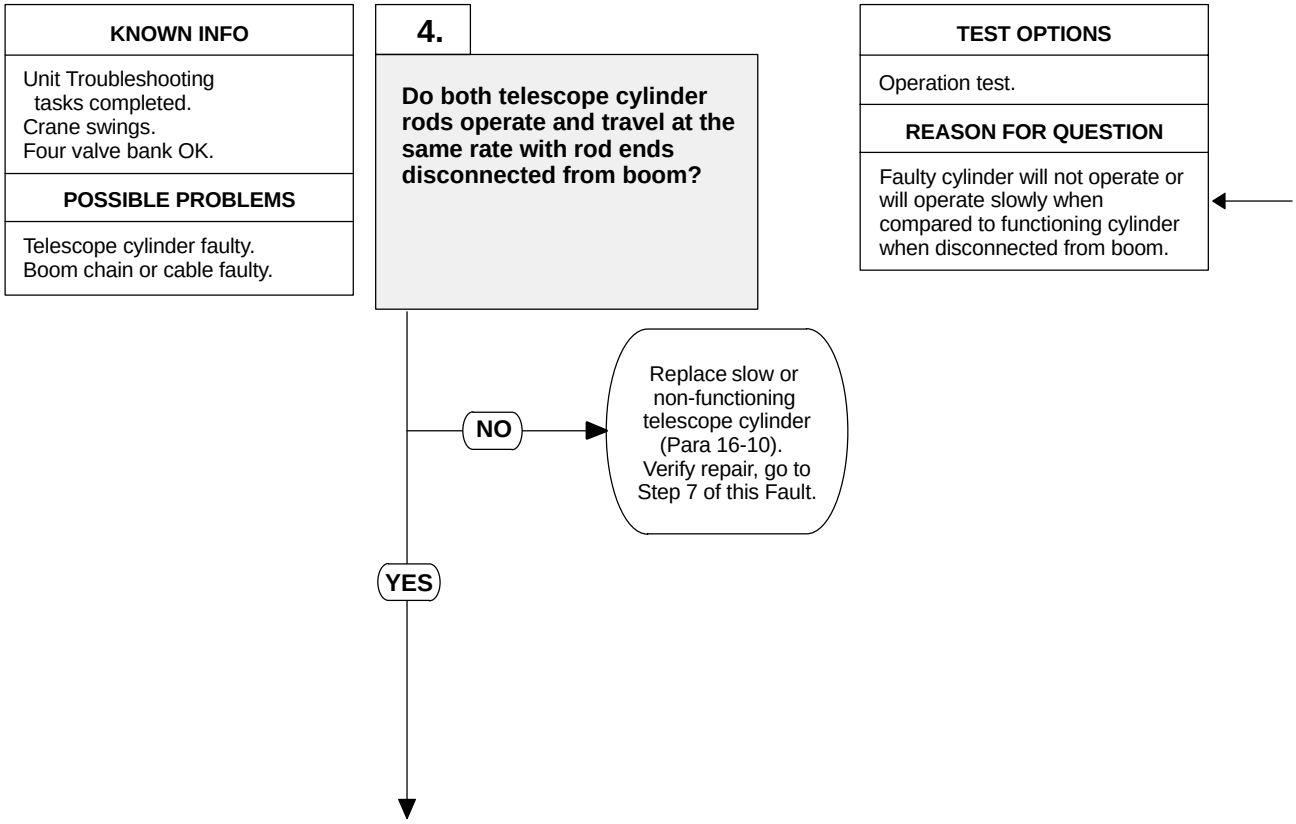
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above TELE valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(4) Connect adapter hose to flowmeter IN port.
(5) Connect adapter hose with preformed packing to outboard taller) elbow.
(6) Connect adapter hose to flowmeter OUT port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold TELE control lever in the IN position.
  (a) If 4 gpm (15 lpm) or more are not present, perform Steps (13) through (17) below and go to Step 6 of this Fault.
  (b) If at least 4 gpm (15 lpm) are present, perform Steps (13) through (17) below and go to Step 4 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulics selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows. Discard preformed packings.
(17) Connect two hoses with preformed packings to elbows.



13. BOOM DOES NOT TELESCOPE OR TELESCOPES SLOWLY (CONT).

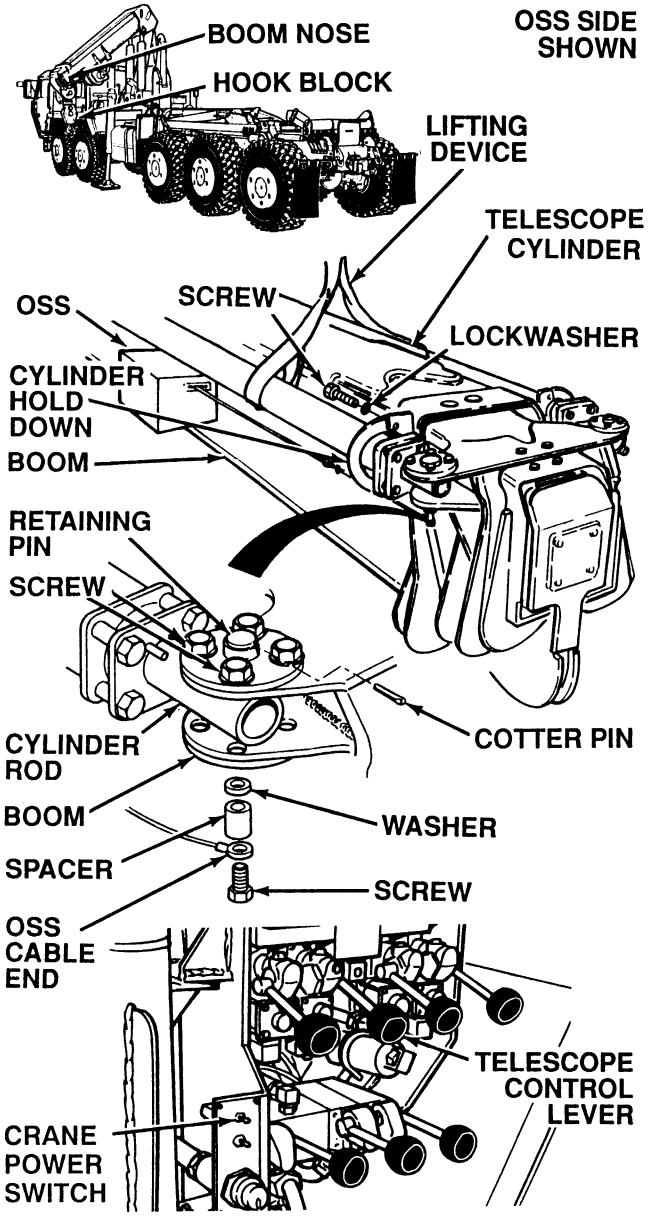


CAUTION

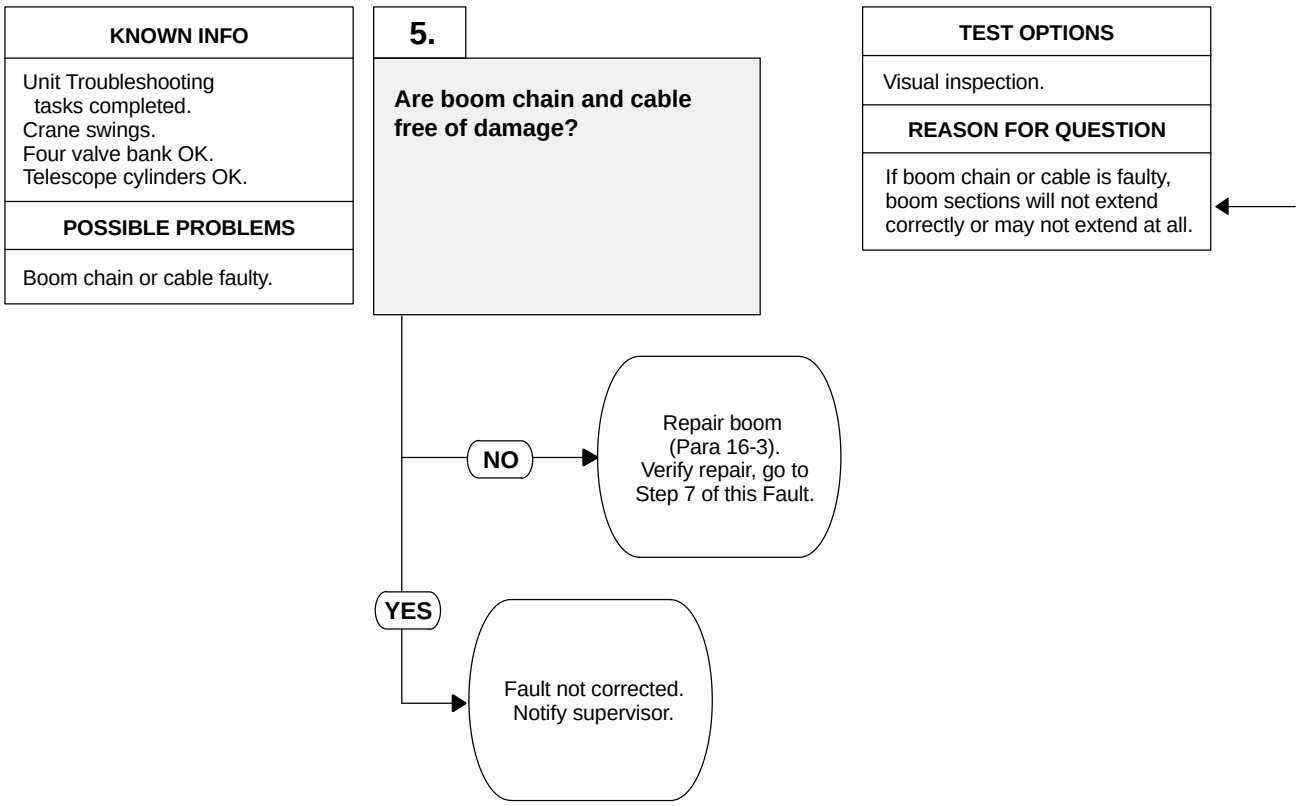
Cable must be held when disconnected and allowed to retract slowly by hand. Failure to do so may result in equipment damage.

OPERATION TEST

(1) Attach lifting device to telescope cylinders.
(2) Remove screw, OSS cable end, spacer, and washer from retaining pin and carefully let cable retract.
(3) Remove two cotter pins from retaining pin and retaining pin from cylinder rod and boom on OSS side of boom. Discard cotter pins.
(4) Loosen two screws enough to allow cylinder rod to be pulled out away from boom.
(5) Remove cotter pin from retaining pin and retaining pin from cylinder rod on other side of boom.
(6) Loosen two screws enough to allow cylinder rod to be pulled out away from boom.
(7) Swing both telescope cylinders out enough that cylinder rods can be extended without contact truck.
(8) Start engine.
(9) Set WINCH/CRANE rocker switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Turn ON crane POWER switch.
(12) Operate telescope cylinders using TELE control lever.
  (a) If one cylinder does not operate or operates slowly, cylinder assembly is faulty. Replace telescope cylinder (Para 16-10).
  (b) If both cylinders operate equally, cylinders are OK.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulics selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Install cylinder rod on OSS side of boom with retain pin and cotter pin.
(17) Install washer, spacer, and OSS cable end with screw.
(18) Tighten two screws.
(19) Install other cylinder rod with retaining pin and cotter pin.
(20) Tighten two screws.
(21) Remove lifting device.

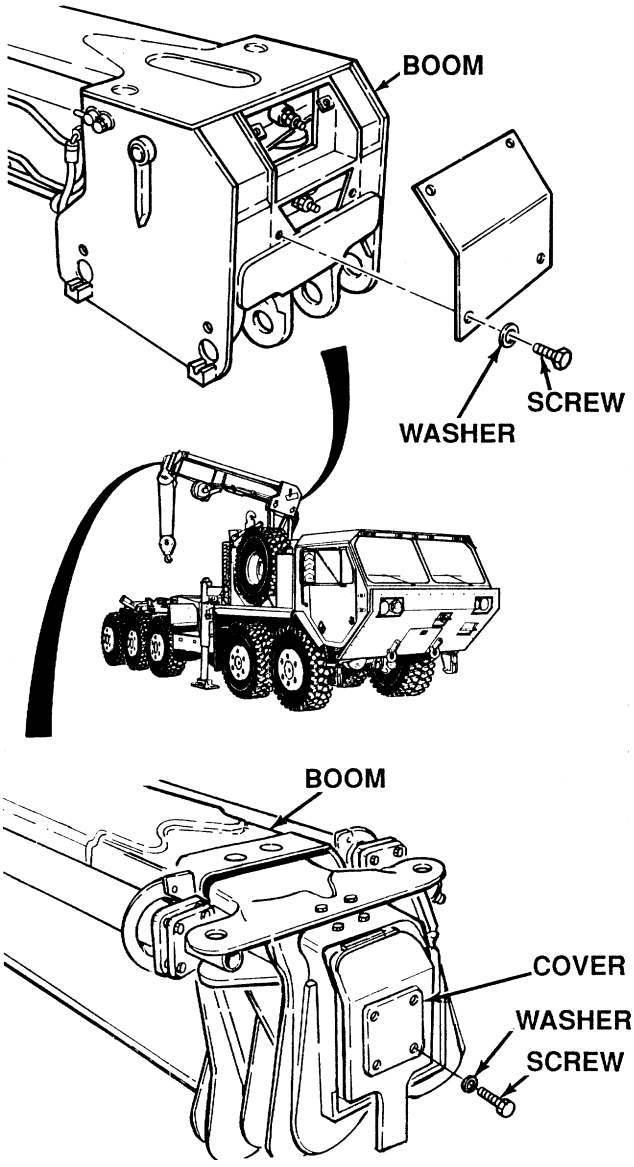


13. BOOM DOES NOT TELESCOPE OR TELESCOPES SLOWLY (CONT).

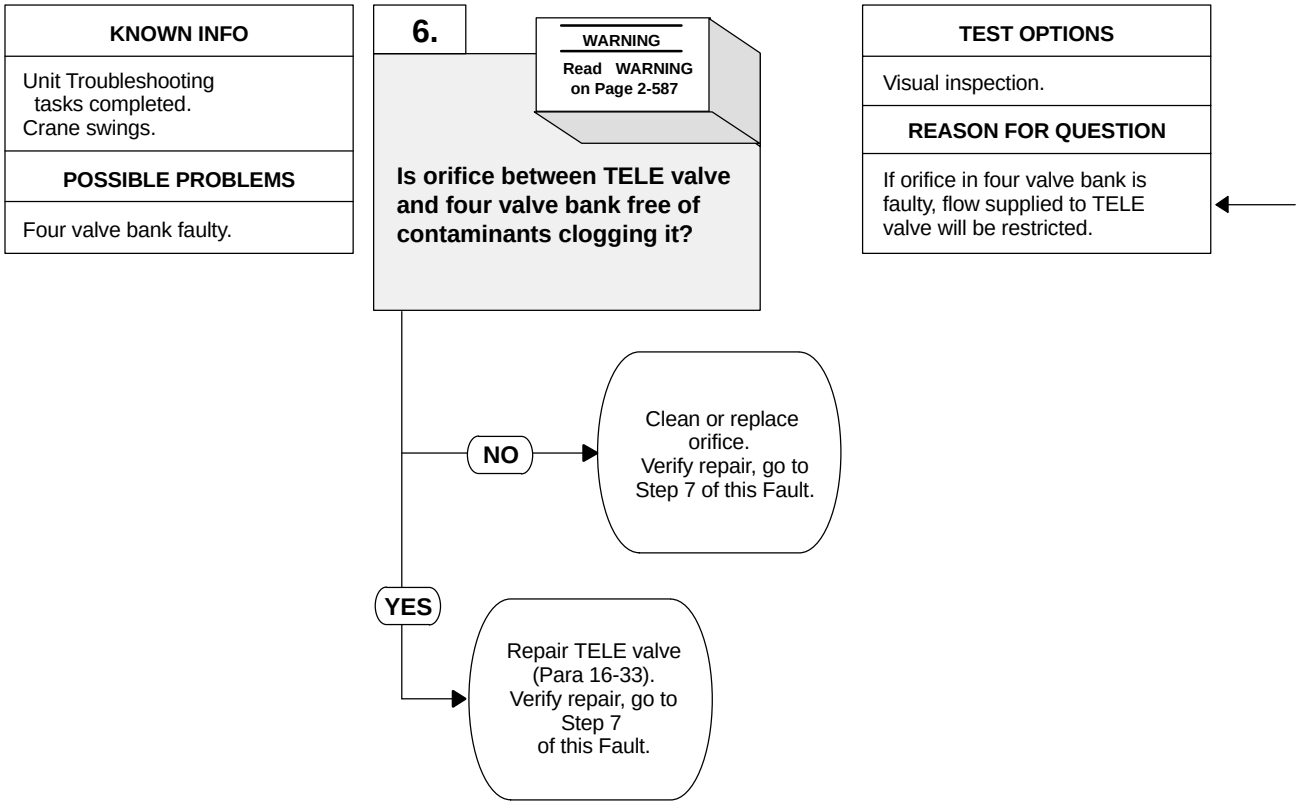


VISUAL INSPECTION

(1) Remove four screws, washers and cover from rear of boom.
(2) Inspect cable and chain for damage and incorrect routing (binding).
(3) Remove four screws, washers and cover from front of boom.
(4) Inspect cable and chain for damage and incorrect routing.
  (a) If cable or chain are faulty, repair boom (Para 16-3).
  (b) If cable and chain are OK, fault not corrected. Perform Steps (5) and (6) below and notify supervisor.
(5) Install cover on front of boom with four screws and washers.
(6) Install cover on rear of boom with four screws and washers.



13. BOOM DOES NOT TELESCOPE OR TELESCOPES SLOWLY (CONT).



WARNING

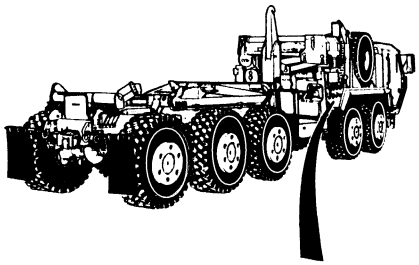
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

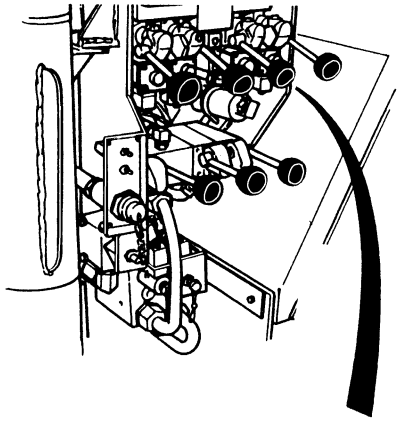
NOTE

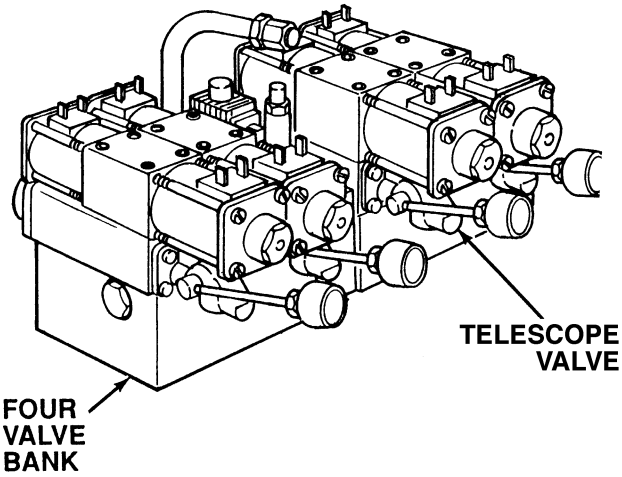
Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

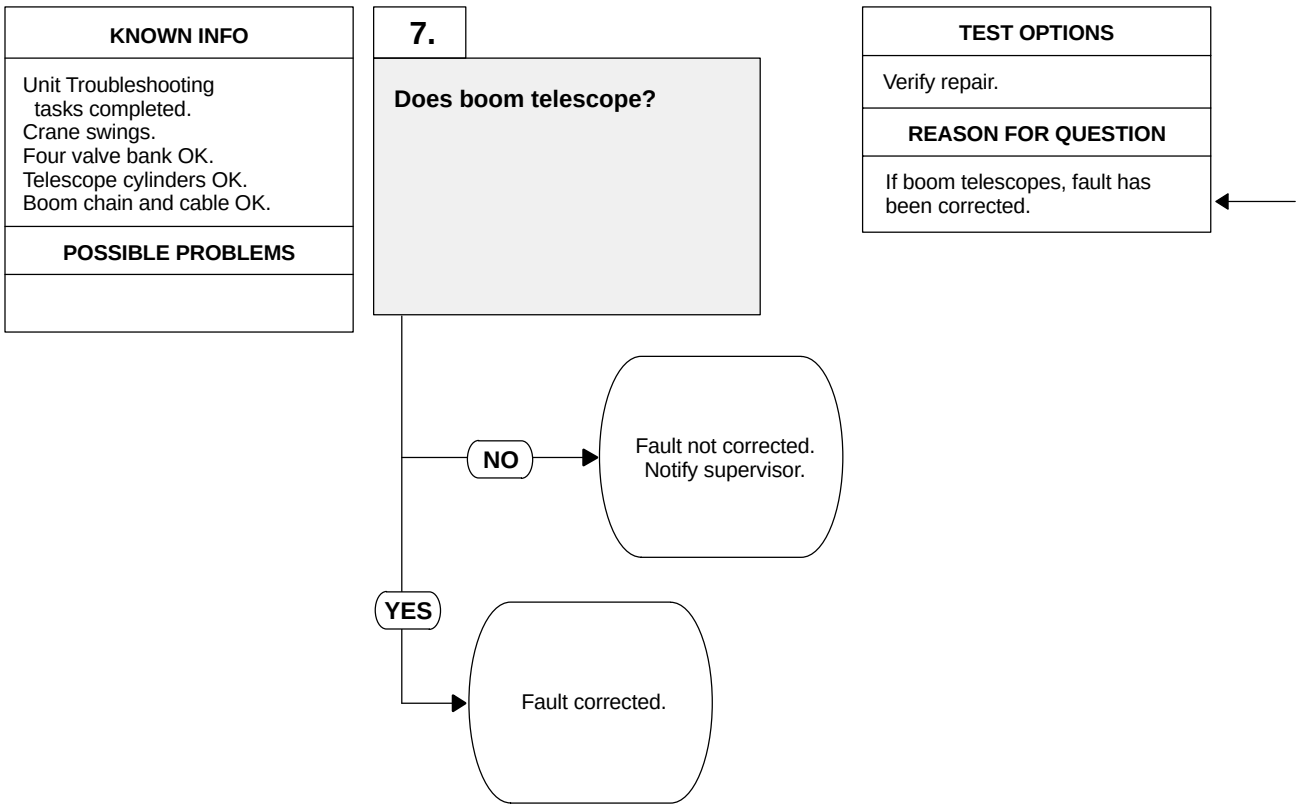
(1) Remove four valve bank from crane (Para 16-26).
(2) Remove TELE valve from four valve bank (Para 16-33).
(3) Remove orifice from four valve bank where TELE valve was removed from (Para 16-33).
(4) Inspect orifice for contamination clogging it.
  (a) If orifice is contaminated, clean or replace orifice and inspect bores in four valve bank for additional contaminants.
  (b) If orifice is OK, TELE valve is faulty. Repair TELE valve on four valve bank (Para 16-33).
(5) Install orifice on four valve bank (Para 16-26).
(6) Install TELE valve on four valve bank (Para 16-33).
(7) Install four valve bank on crane (Para 16-26).





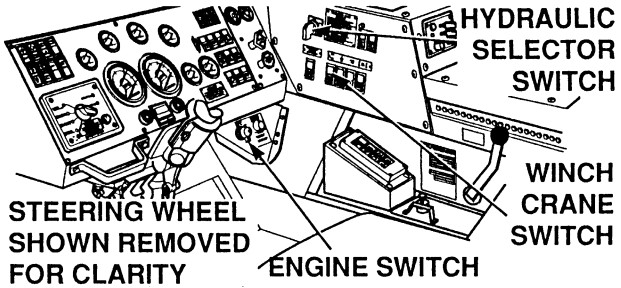


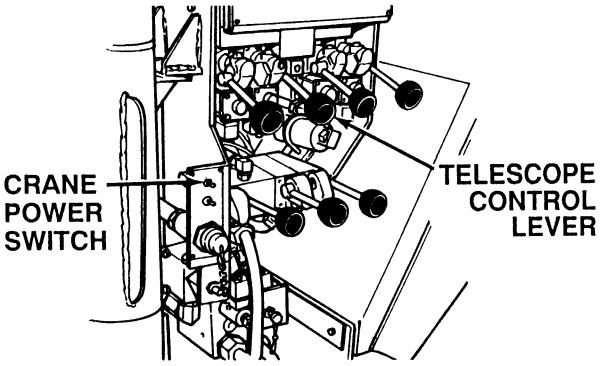
13. BOOM DOES NOT TELESCOPE OR TELESCOPES SLOWLY (CONT).

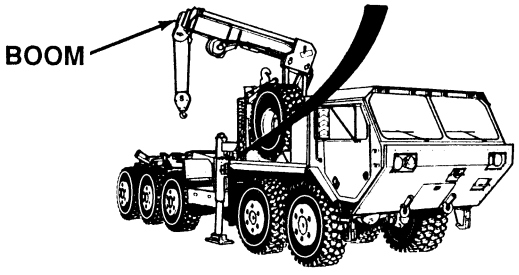


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Set WINCH/CRANE switch to CRANE position.
(4) Set hydraulic selector switch to CRANE/SRW position.
(5) Set crane power switch to ON position.
(6) Telescope boom using TELE control lever.
    (a) If boom does not telescope, fault not corrected. Perform Steps (7) through (9) below and notify supervisor.
    (b) If boom telescopes, fault has been corrected.
(7) Set crane power switch to OFF position.
(8) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

14. BOOM DOES NOT RAISE OR RAISES SLOWLY.

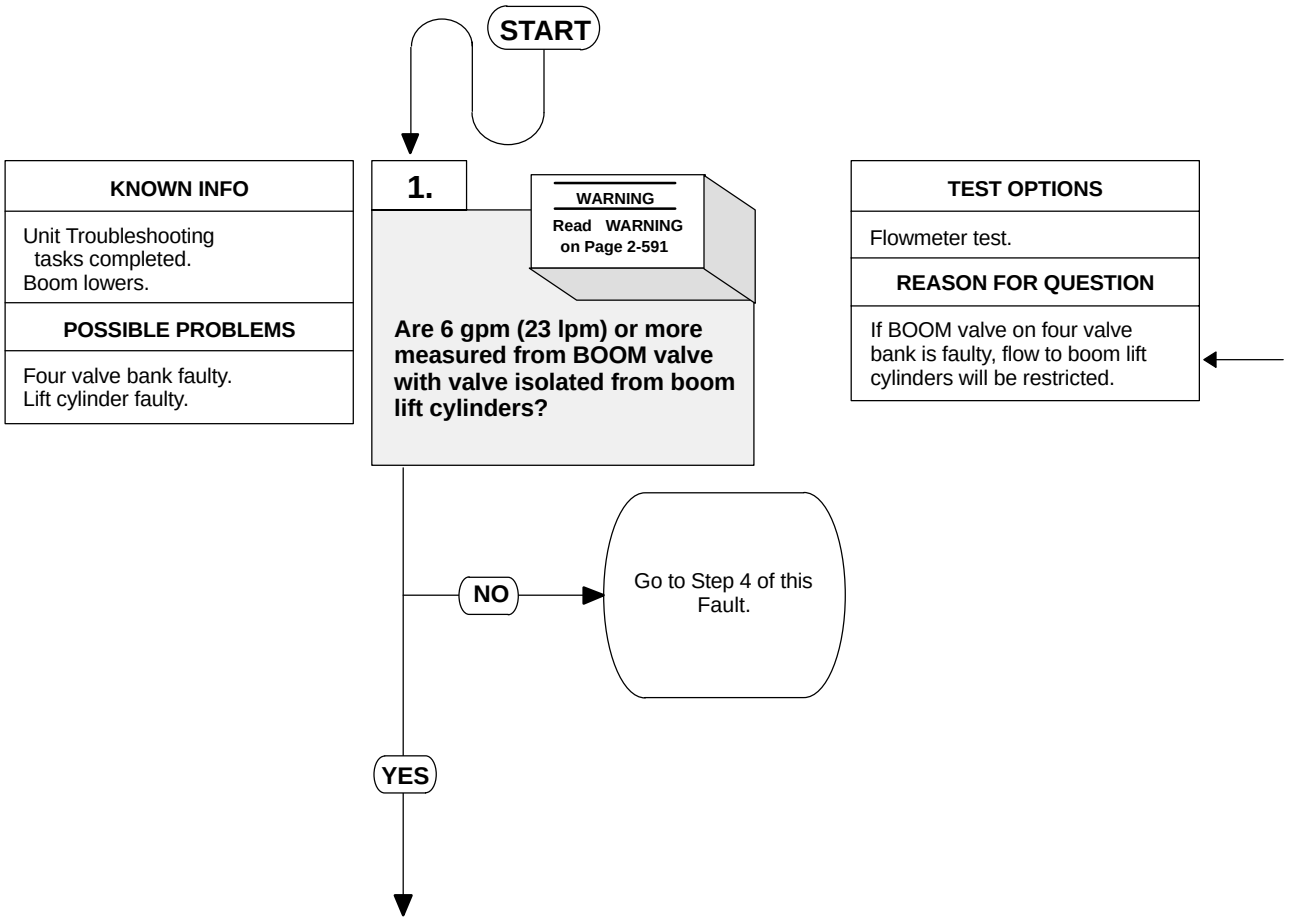
INITIAL SETUP

Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Cap and Plug Set (Item 26, Appendix F)
- Pan, Drain 4 gal (Item 144, Appendix F)
- Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
- Oil, Hydraulic (Item 34, Appendix B)
- Tags, Identification (Item 72, Appendix B)
- Lockwasher (4) (Item 282, Appendix E)
- Packing, Preformed (3) (Item 335, Appendix E)
- Packing, Preformed (6) (Item 336, Appendix E)
- Packing, Preformed (2) (Item 363, Appendix E)
- Packing, Preformed (8) (Item 389, Appendix E)
- Wooden Block (Appendix C)
- Wooden Block (Appendix C)

References
- TM 9-2320-364-10
- TM 9-2320-364-20

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

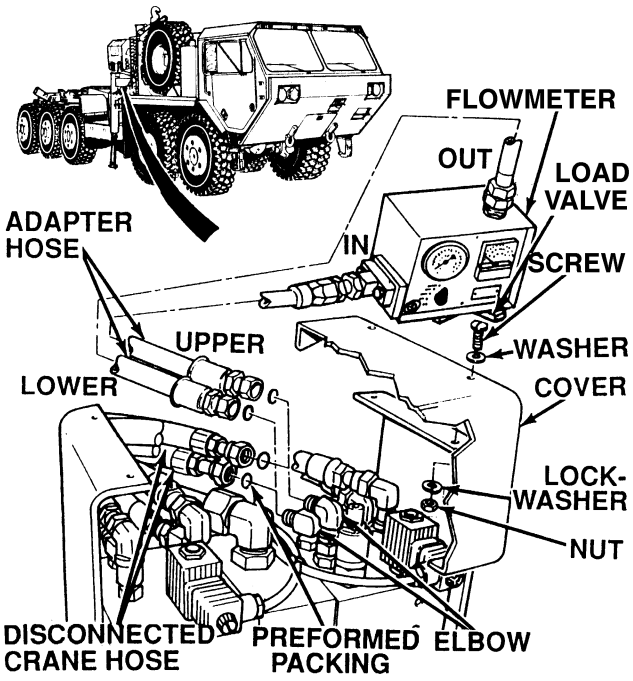
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

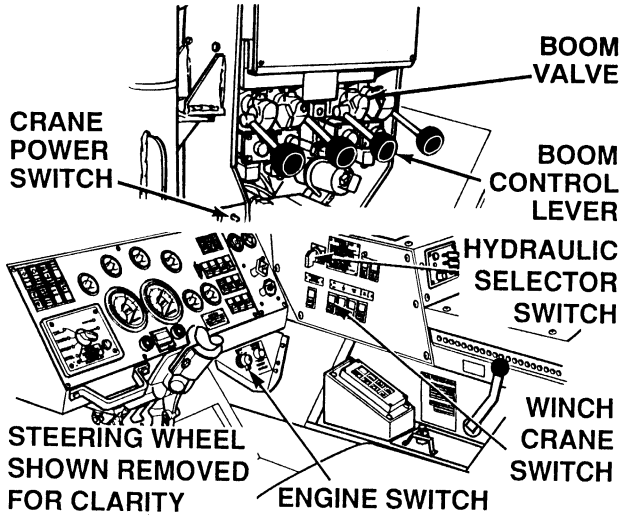
NOTE

Use a drain pan to catch leaking hydraulic oil.

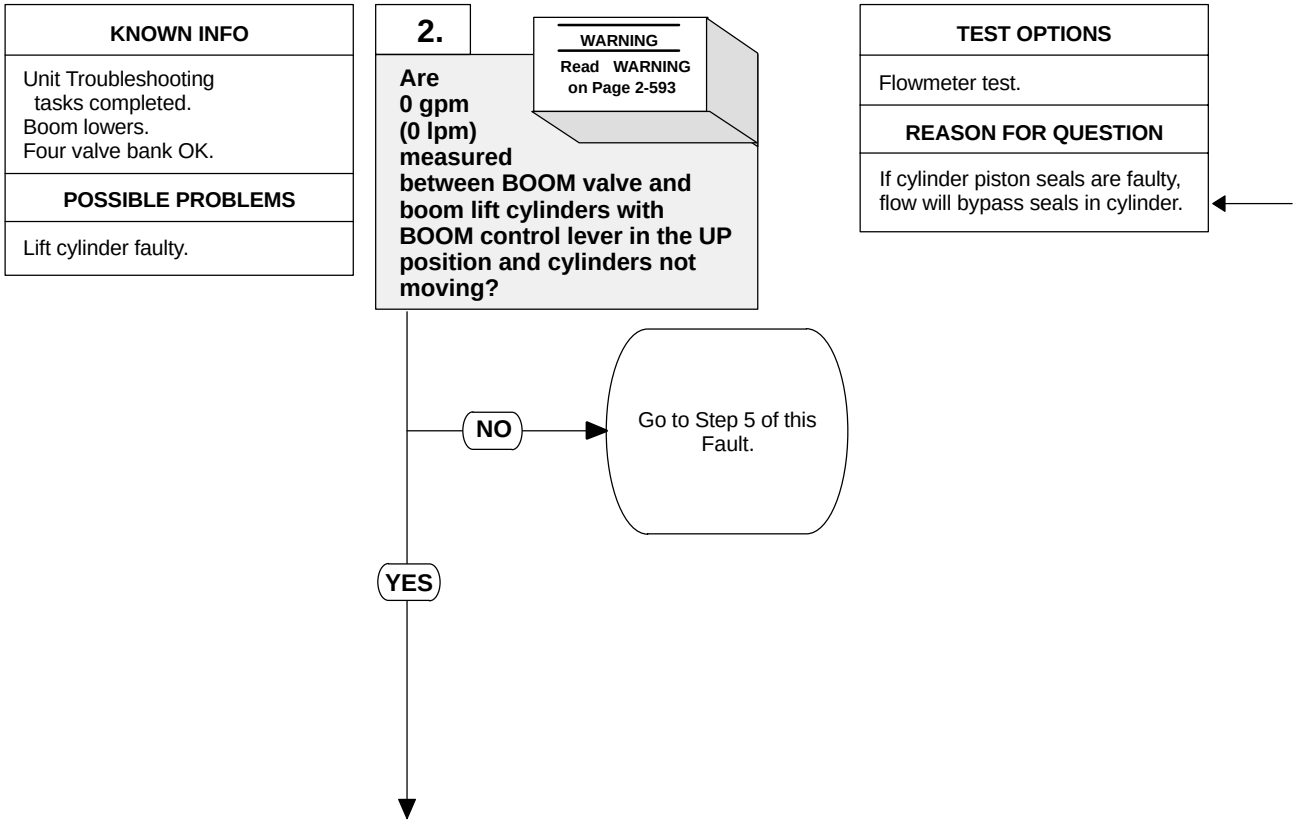
FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above BOOM valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(4) Connect adapter hose to flowmeter OUT port.
(5) Connect adapter hose with preformed packing to outboard (taller) elbow.
(6) Connect adapter hose to flowmeter IN port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold BOOM control lever in the UP position.
  (a) If 6 gpm (23 lpm) or more are not present, perform Steps (13) through (18) below and go to Step 4 of this Fault.
  (b) If 6 gpm (23 lpm) or more are present, perform Steps (13) through (15) below and go to Step 2 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulics selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows. Discard preformed packings.
(17) Lubricate preformed packings.
(18) Connect two hoses with preformed packings to elbows.





14. BOOM DOES NOT RAISE OR RAISES SLOWLY (CONT).



WARNING

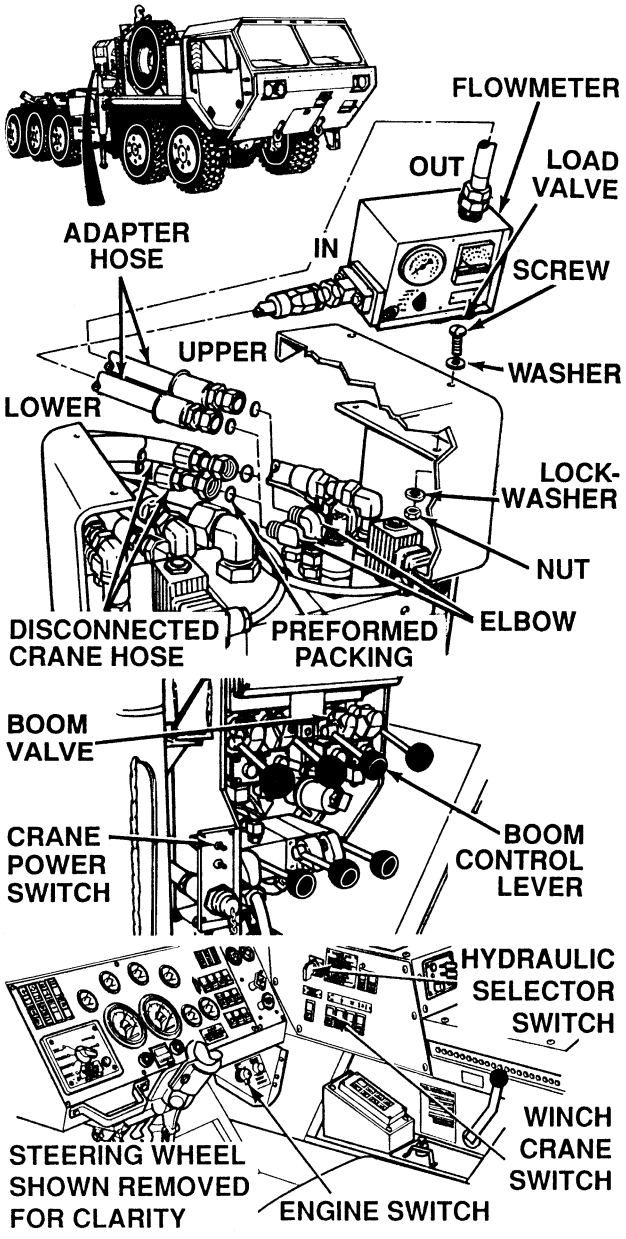
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

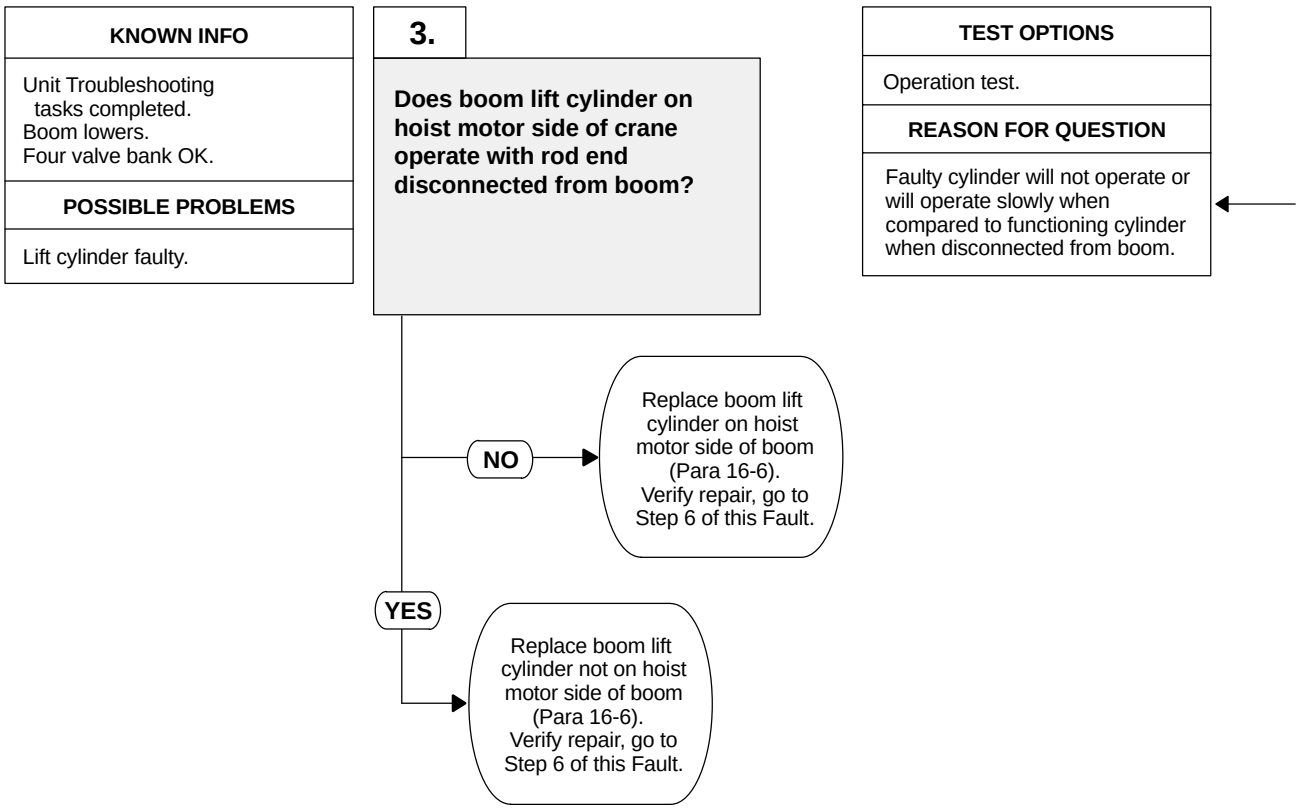
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Disconnect adapter hoses from elbows. Discard preformed packings.
(2) Install crane hose with preformed packing on inboard (shorter) elbow.
(3) Connect flowmeter OUT port adapter hose with preformed packing to the crane hose removed from outboard (taller) elbow.
(4) Connect flowmeter IN port adapter hose with preformed packing to outboard (taller) elbow.
(5) Start engine.
(6) Set WINCH/CRANE switch to CRANE position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Set crane POWER switch to ON position.
(9) Extend boom lift cylinders completely if boom raise slowly.
(10) Hold BOOM control lever in the UP position.
  (a) If more than 0 gpm (0 lpm) are present, perform Steps (11) through (13) below and go to Step 5 of this Fault.
  (b) If 0 gpm (0 lpm) are present, perform Steps (11) through (15) below and go to Step 3 of this Fault.
(11) Set crane POWER switch to OFF position.
(12) Set hydraulics selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(15) Connect crane hoses with preformed packing to elbow.

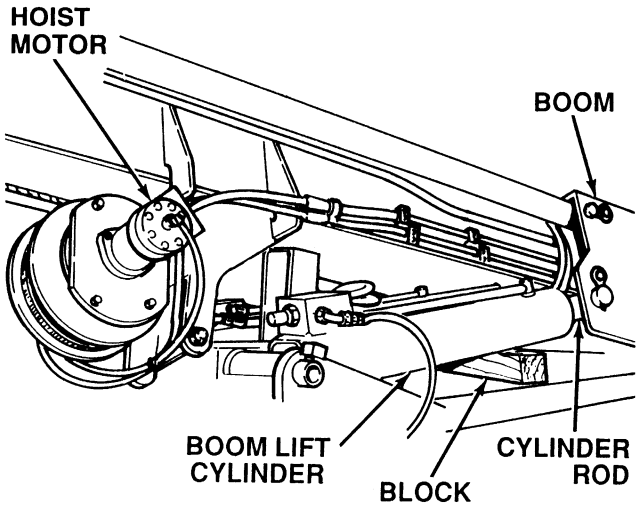


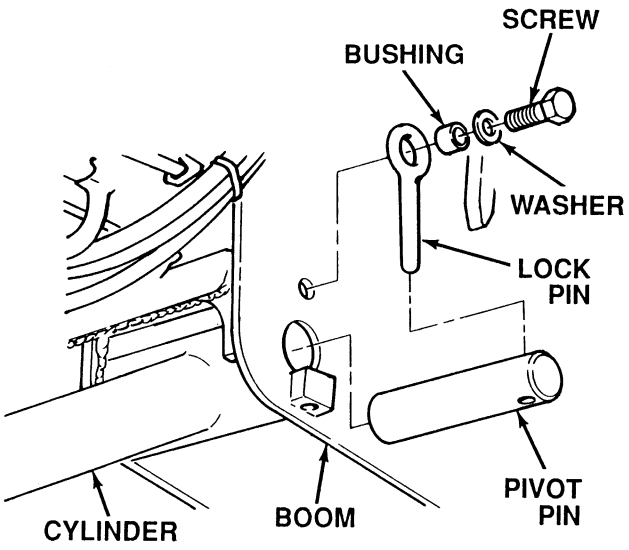
14. BOOM DOES NOT RAISE OR RAISES SLOWLY (CONT).

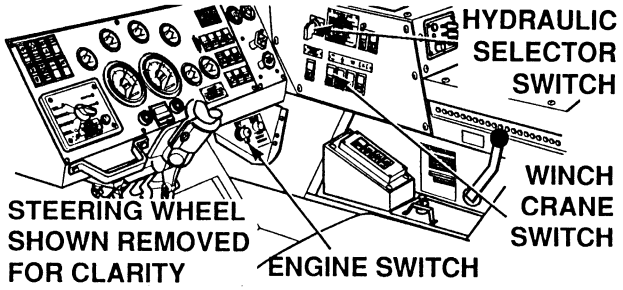


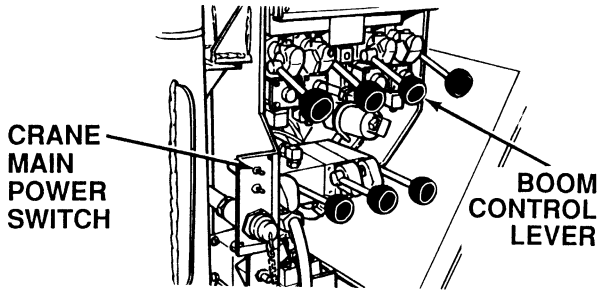
OPERATION TEST

(1) Block up boom lift cylinder on side of boom with hoist motor.
(2) Remove screw, washer and bushing from lock pin.
(3) Remove lock pin from pivot pin.
(4) Remove pivot pin from boom lift cylinder and boom.
(5) Start engine (TM 9-2320-364-10).
(6) Set WINCH/CRANE switch to CRANE position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Turn ON crane POWER switch.
(9) Operate boom lift cylinder using BOOM control lever.
    (a) If cylinder does not operate, perform Steps (10) through (12) below and replace cylinder (Para 16-6) on hoist motor side of crane.
    (b) If cylinder operates, perform Steps (10) through (12) and replace boom lift cylinder (Para 16-6) not on hoist motor side of boom.
(10) Set crane POWER switch to OFF position.
(11) Set hydraulics selector switch to OFF position.
(12) Turn OFF ENGINE switch.

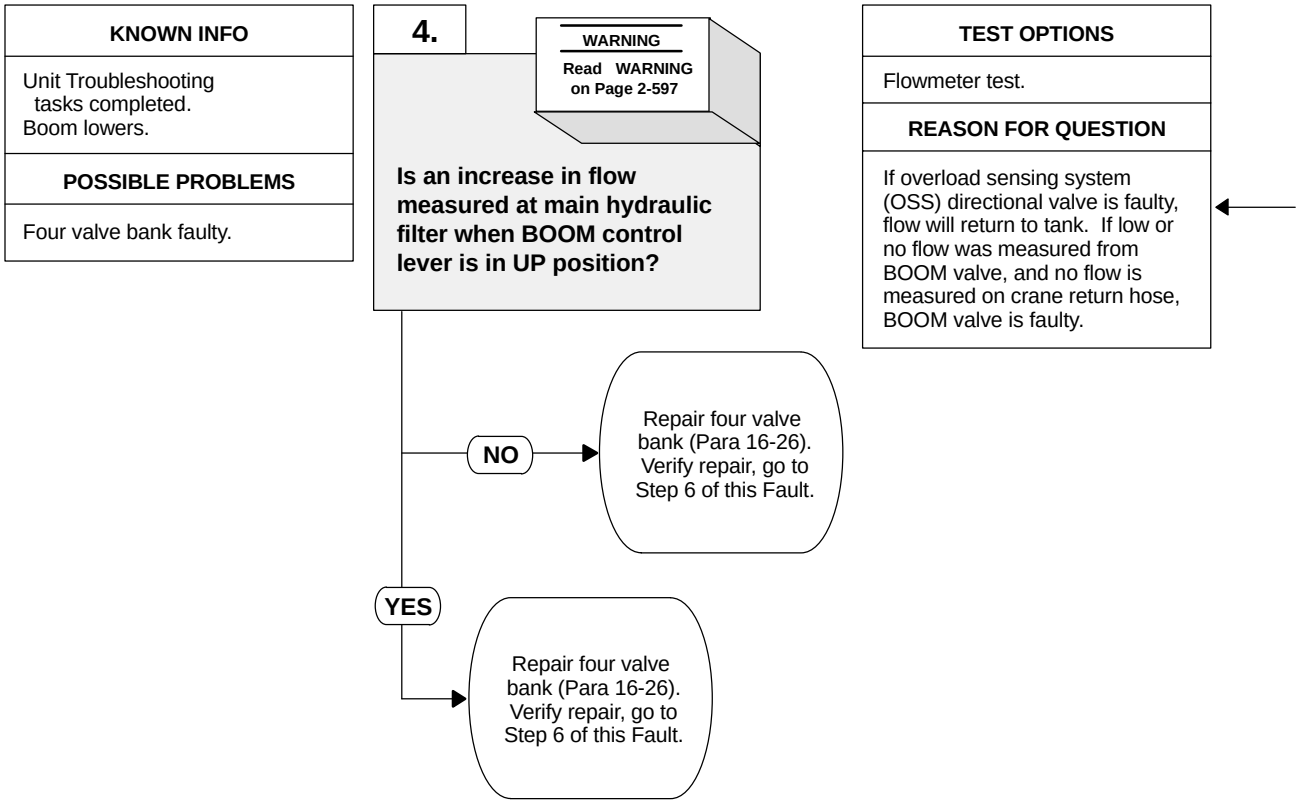








14. BOOM DOES NOT RAISE OR RAISES SLOWLY (CONT).



WARNING

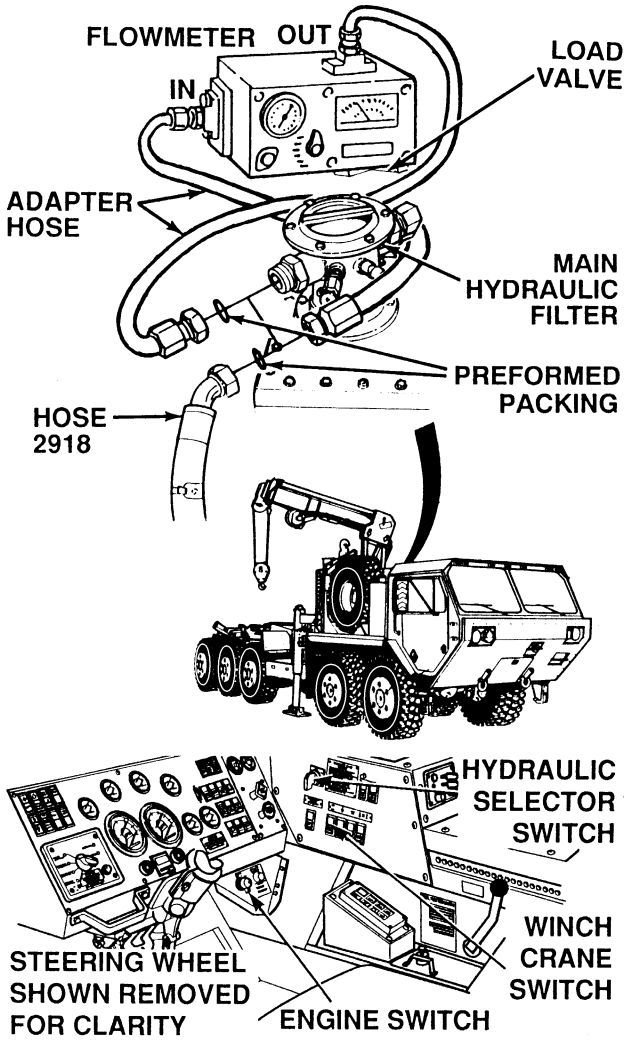
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

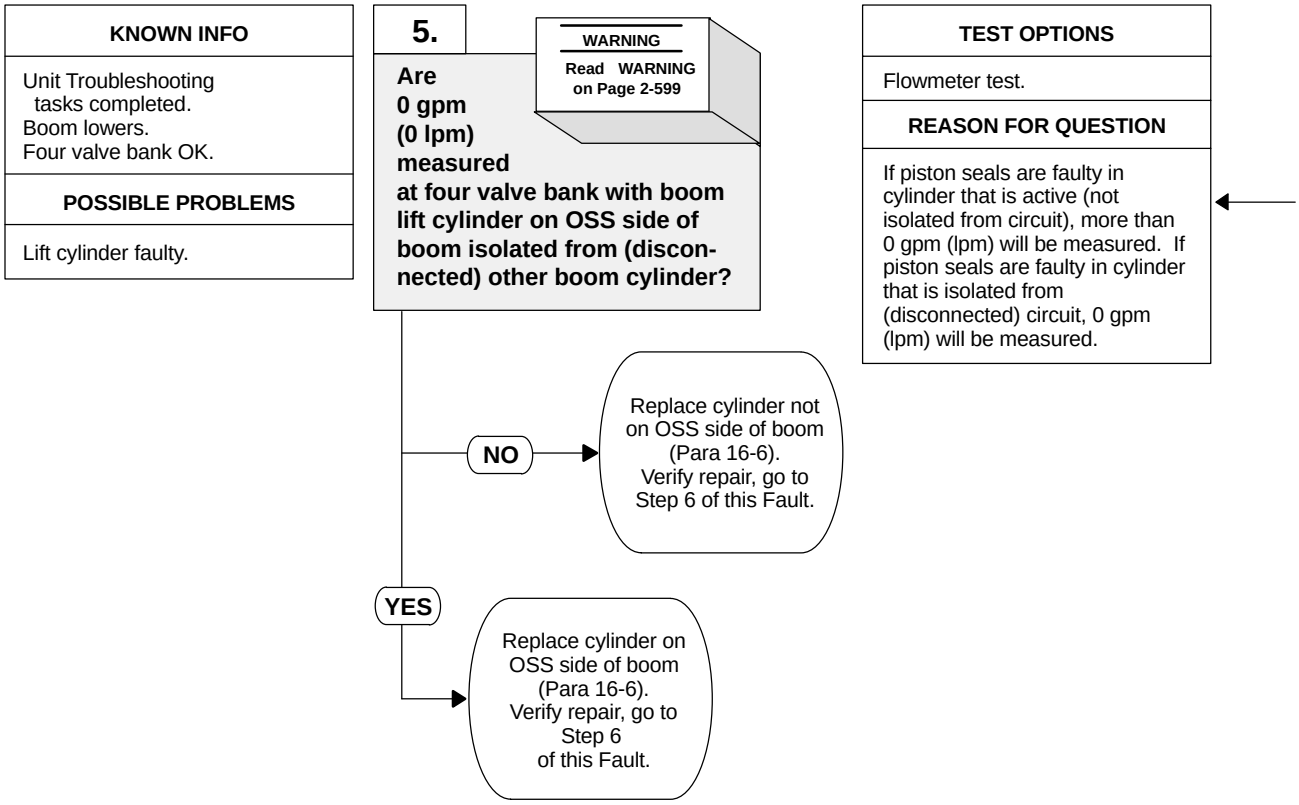
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Disconnect hose 2918 from main hydraulic filter.
(2) Connect adapter hose to filter.
(3) Connect adapter hose to flowmeter OUT port.
(4) Connect adapter hose to hose 2918.
(5) Connect adapter hose to flowmeter IN port.
(6) Open flowmeter load valve.
(7) Start engine (TM 9-2320-364-10).
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Set crane POWER switch to ON position.
(11) Observe and record gpm (lpm) measured.
(12) Hold BOOM control lever in UP position.
  (a) If an increase in flow is not present, perform Steps (13) through (18) below and replace BOOM valve on four valve bank (Para 16-26).
  (b) If an increase in flow is measured, perform Steps (13) through (18) below and replace OSS directional valve on four valve bank (Para 16-26).
(13) Set crane POWER switch to OFF position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hose from hose 2918. Discard preformed packing.
(17) Disconnect adapter hose from return filter. Discard preformed packing.
(18) Connect hose 2918 with preformed packing to filter.



14. BOOM DOES NOT RAISE OR RAISES SLOWLY (CONT).



WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

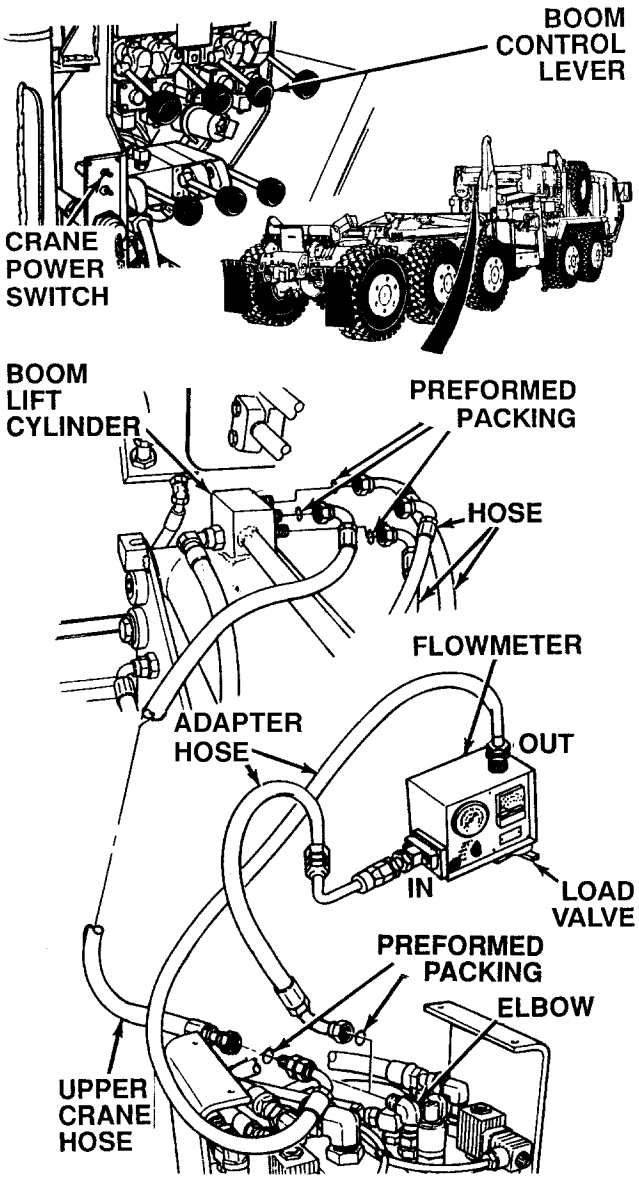
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Tag, mark and disconnect three hoses from boom lift cylinder on side of boom without OSS box. Discard preformed packings.
(2) Install plugs with preformed packings on disconnected hoses.
(3) Install caps with preformed packings on two cylinder fittings closest to four valve bank.
(4) Disconnect flowmeter OUT port adapter hose from crane hose. Discard preformed packing.
(5) Install plug with preformed packing in crane hose.
(6) Connect adapter hose with preformed packing to remaining fitting on boom lift cylinder.
(7) Start engine.
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Set crane POWER switch to ON position.
(11) Hook hoist block on ring and take out slack in cable to prevent boom from raising.
(12) Hold BOOM lever in UP position.
  (a) If more than 0 gpm (0 lpm) are measured, perform Steps (13) through (22) below and replace cylinder that is not on the OSS side of the boom (Para 16-6).
  (b) If 0 gpm (0 lpm) are measured, perform Steps (13) through (22) below replace cylinder that is on OSS side of boom (Para 16-6).
(13) Set crane POWER switch to OFF position.
(14) Set hydraulics selector switch to OFF position.
(15) Turn OFF ENGINE switch.

Continued on next page.



14. BOOM DOES NOT RAISE OR RAISES SLOWLY (CONT).

WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

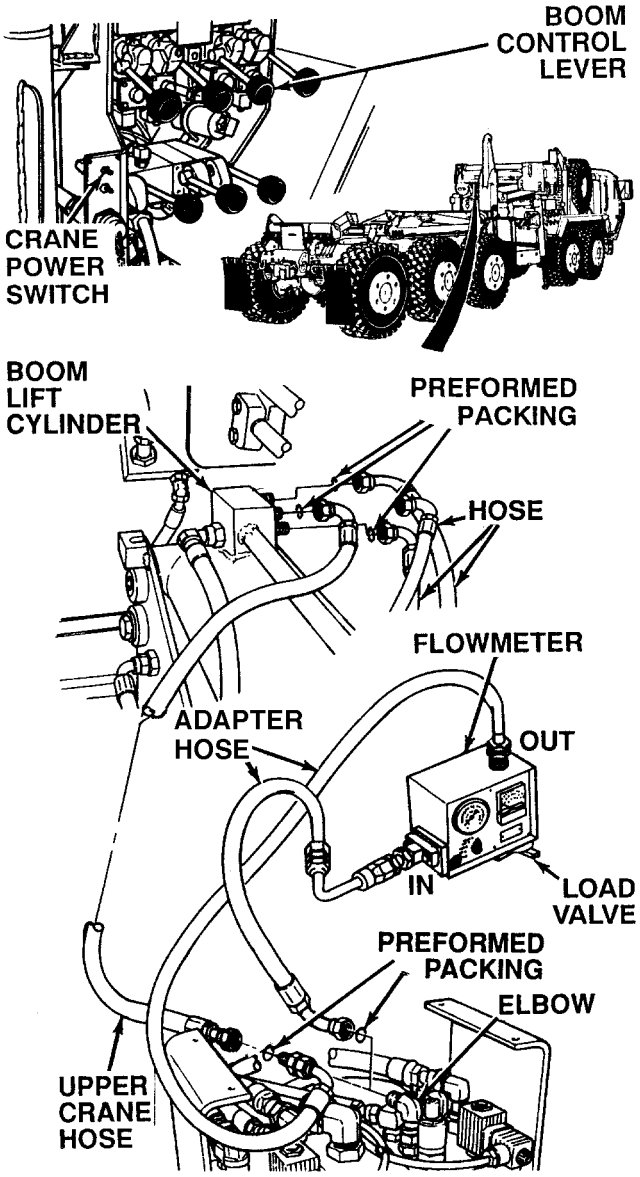
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST (CONT).

(16) Disconnect adapter hose and two caps from cylinder. Discard preformed packing.
(17) Remove three plugs from hoses. Discard preformed packings.
(18) Lubricate preformed packings with hydraulic oil.

Continued on next page.



WARNING

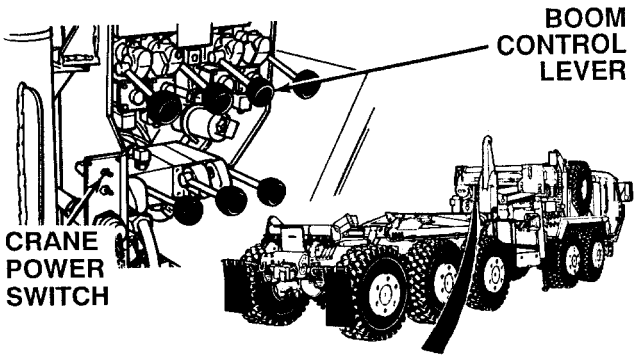
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

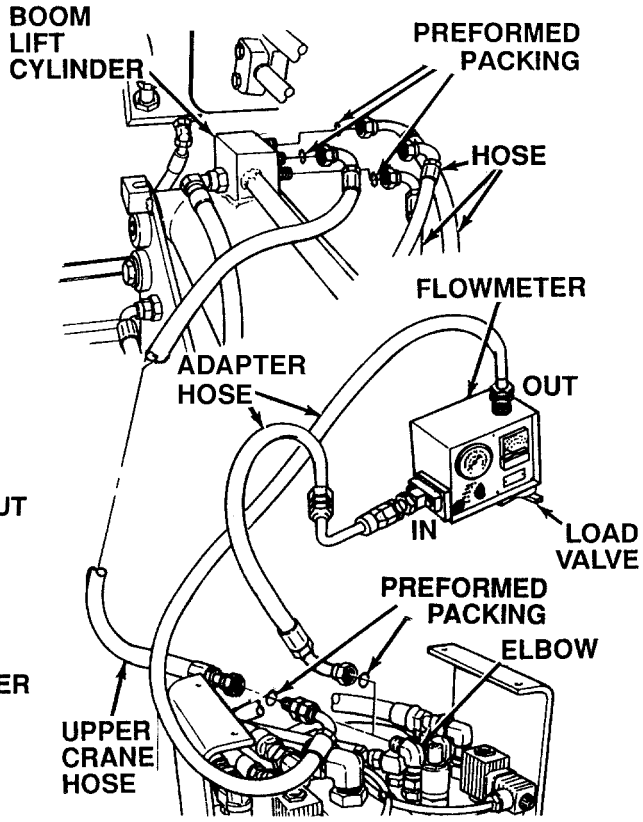
NOTE

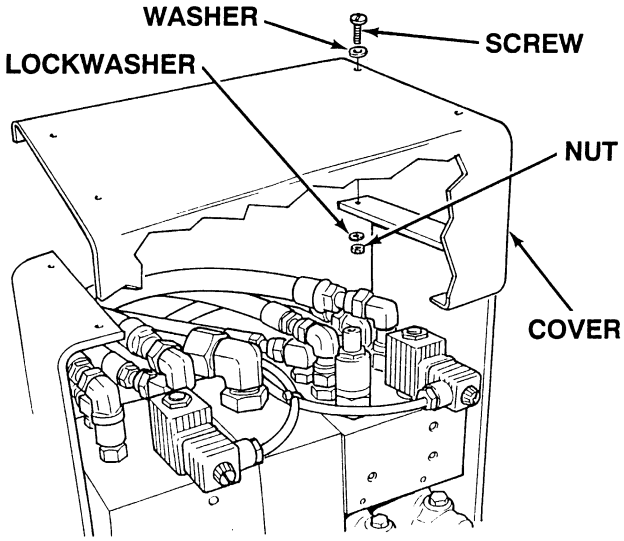
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST (CONT).

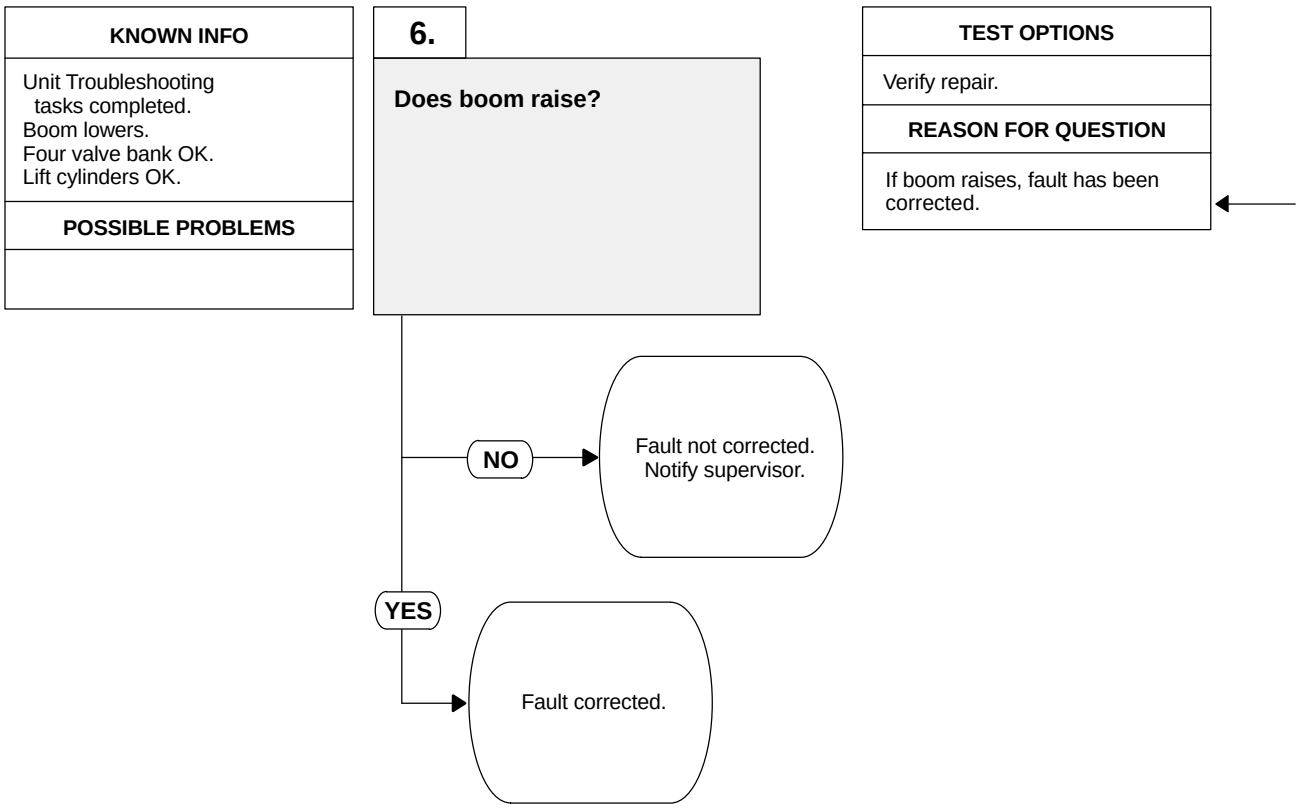
(19) Connect three hoses with preformed packings to boom lift cylinder.
(20) Disconnect adapter hose from elbow. Discard preformed packings.
(21) Connect crane hose with preformed packing to elbow.
(22) Install cover with four screws, washers, lockwashers and nuts.





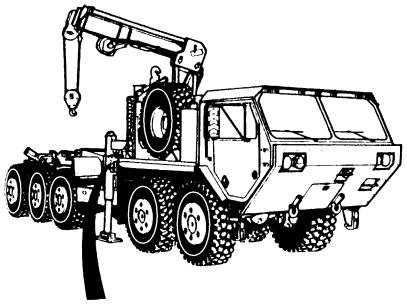


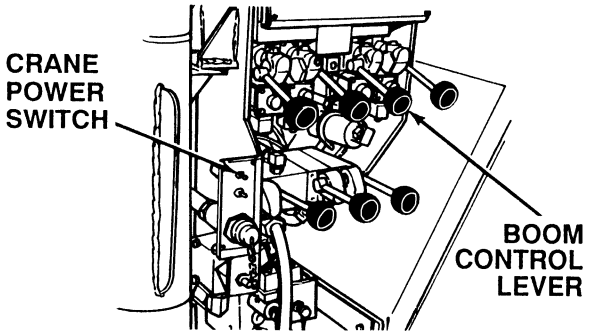
14. BOOM DOES NOT RAISE OR RAISES SLOWLY (CONT).

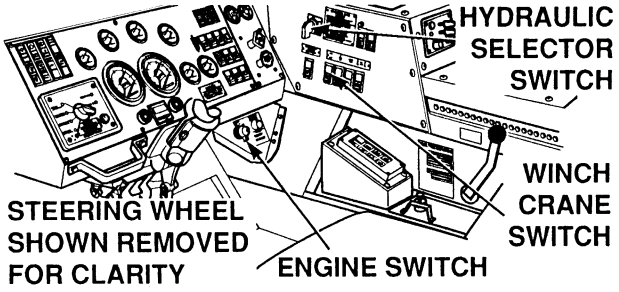


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Raise boom up using BOOM control lever.
    (a) If boom does not raise, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
    (b) If boom does raise, fault has been corrected.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

15. BOOM DOES NOT LOWER OR LOWERS SLOWLY.

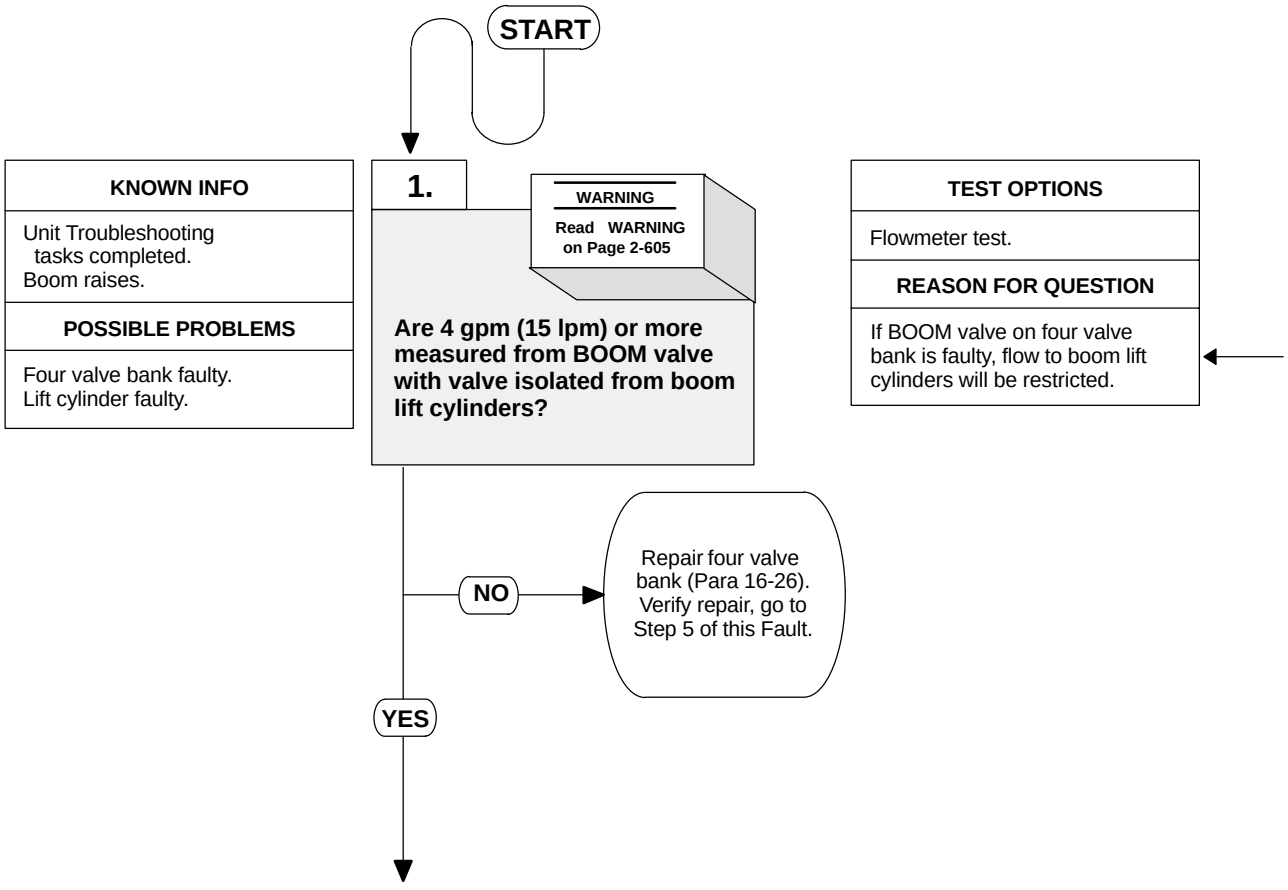
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Lifting Device (Minimum Capacity 2500 lbs/1135 kg)

References
TM 9-2320-364-10
TM 9-2320-364-20

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Tags, Identification (Item 72, Appendix B)
Lockwasher (4) (Item 282, Appendix E)
Preformed Packing (4) (Item 389, Appendix E)
Wooden Block (Appendix C)
Wooden Block (Appendix C)

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

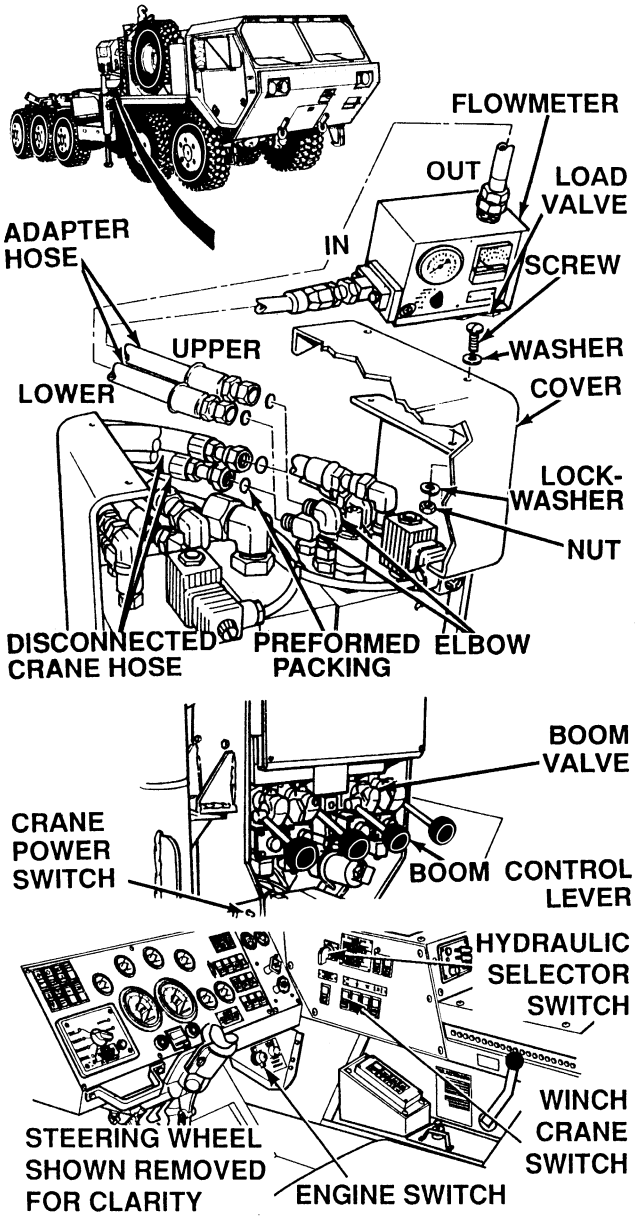
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

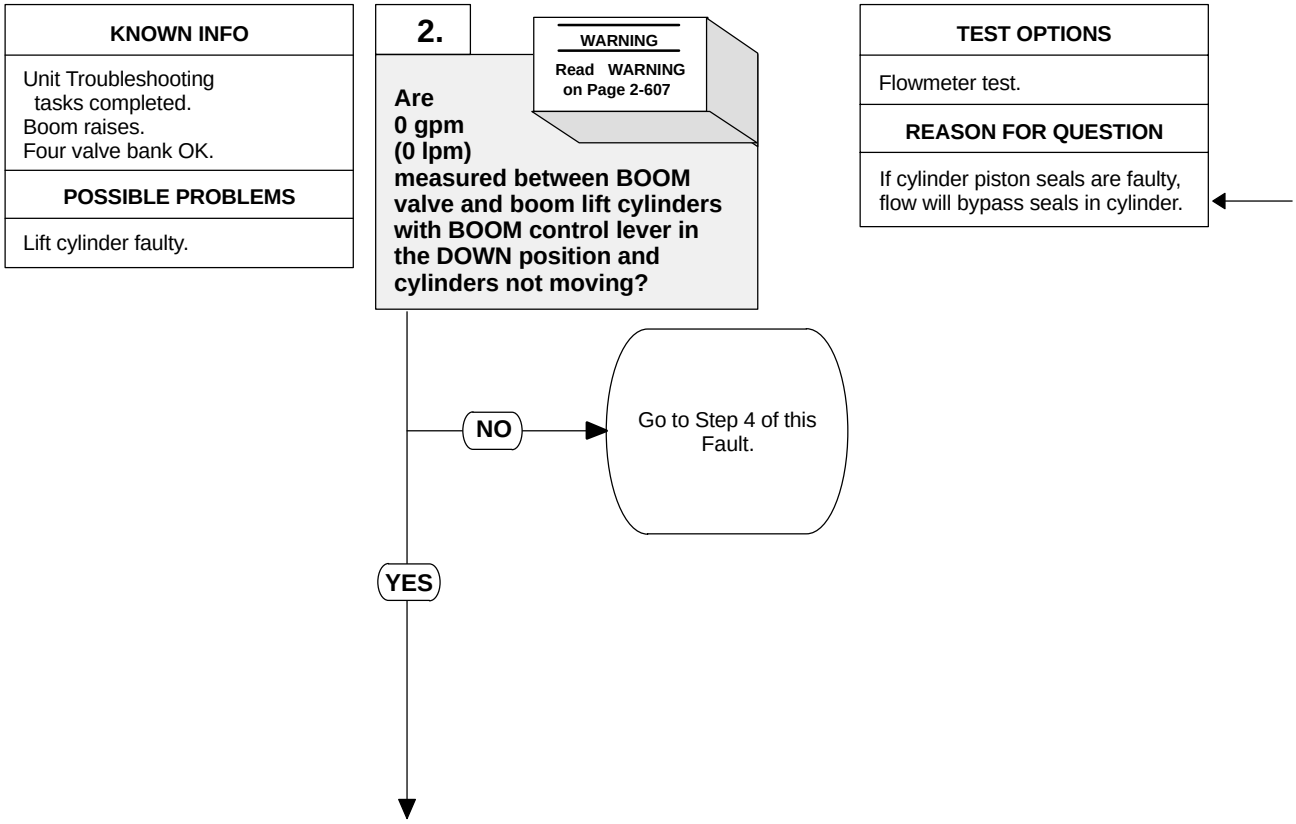
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above BOOM valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (shorter) elbow.
(4) Connect adapter hose to flowmeter IN port.
(5) Connect adapter hose with preformed packing to outboard (taller) elbow.
(6) Connect adapter hose to flowmeter OUT port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold BOOM control lever in the DOWN position.
  (a) If 4 gpm (15 lpm) or more are not present, perform Steps (13) through (17) below and replace BOOM valve on four valve bank (Para 16-26).
  (b) If 4 gpm (15 lpm) or more are present, perform Steps (13) through (15) below and go to Step 2 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulics selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows. Discard preformed packings.
(17) Connect two hoses with preformed packings to elbows.



15. BOOM DOES NOT LOWER OR LOWERS SLOWLY (CONT).



WARNING

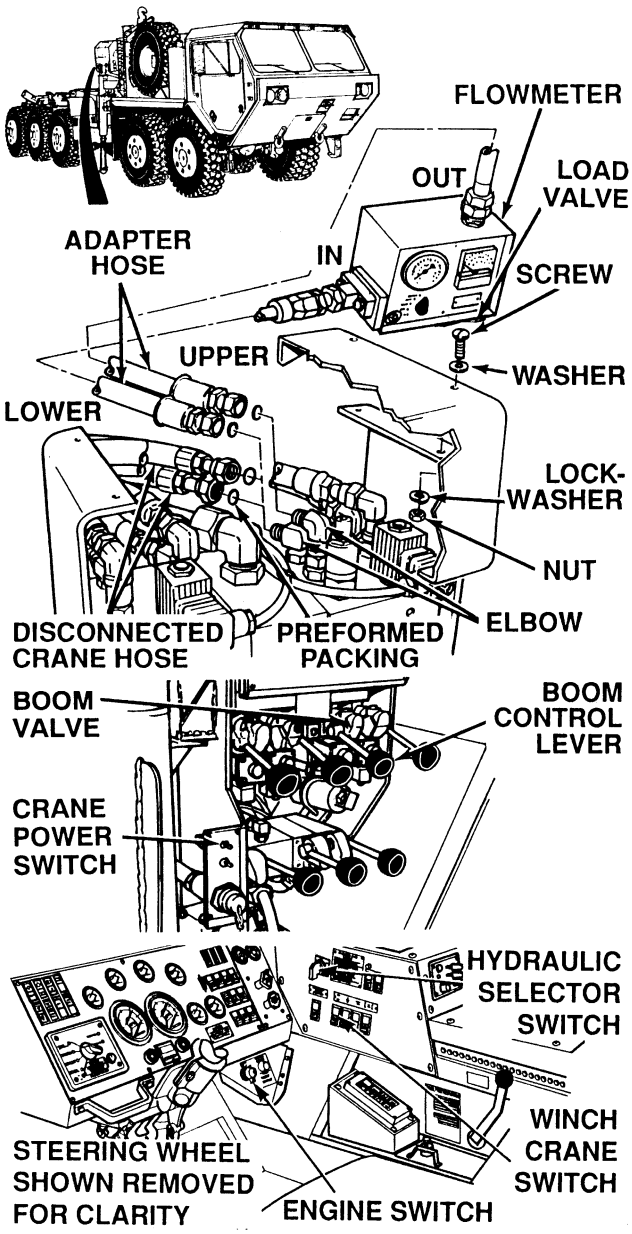
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

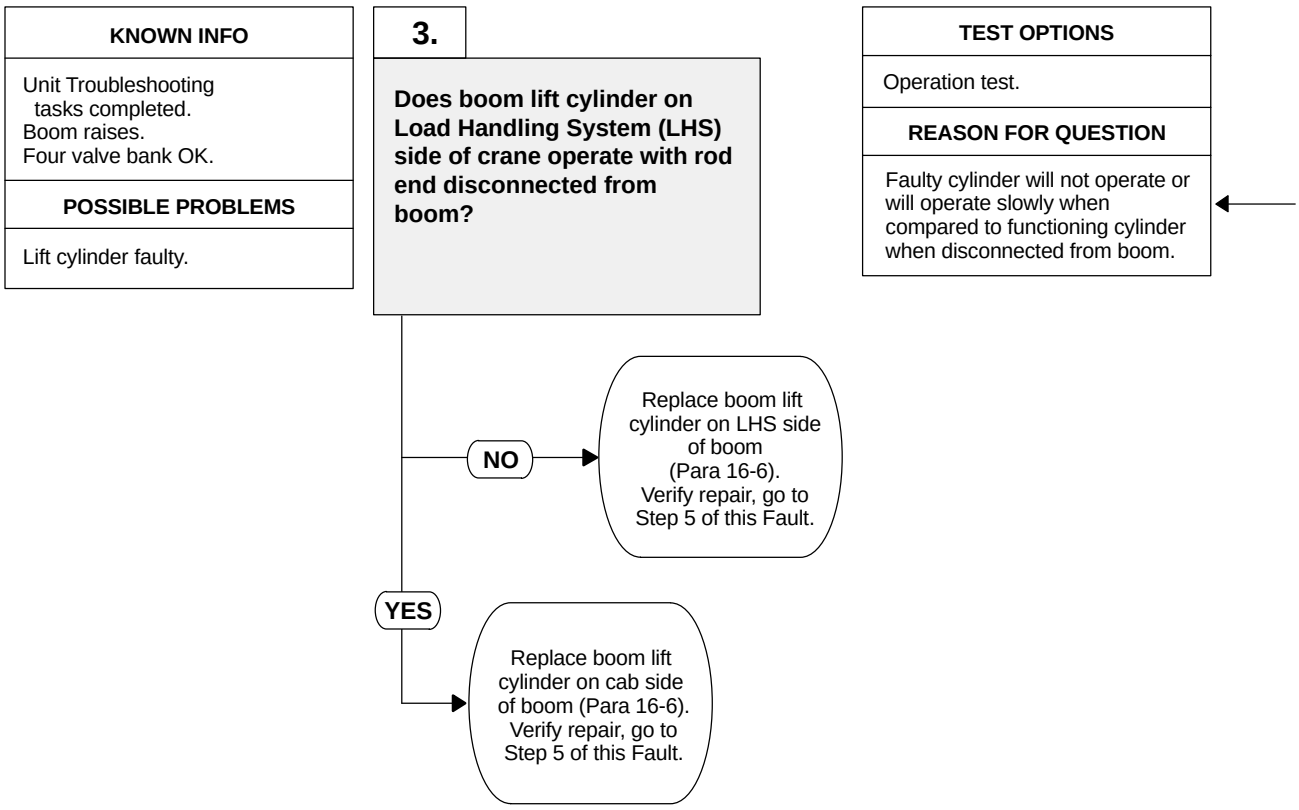
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Disconnect adapter hoses from elbows. Discard preformed packings.
(2) Install crane hose with preformed packing on inboard (shorter) elbow.
(3) Connect flowmeter IN port adapter hose with preformed packing to the crane hose removed from outboard (taller) elbow.
(4) Connect flowmeter OUT port adapter hose with preformed packing to outboard (taller) elbow.
(5) Start engine.
(6) Set WINCH/CRANE switch to CRANE position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Set crane POWER switch to ON position.
(9) Hold BOOM control lever in the DOWN position.
    (a) If more than 0 gpm (0 lpm) are present, go to Step 4 of this Fault.
    (b) If 0 gpm (0 lpm) are present, perform Steps (10) through (14) below and go to Step 3 of this Fault.
(10) Set crane POWER switch to OFF position.
(11) Set hydraulics selector switch to OFF position.
(12) Turn OFF ENGINE switch.
(13) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(14) Connect crane hose with preformed packing to elbow.

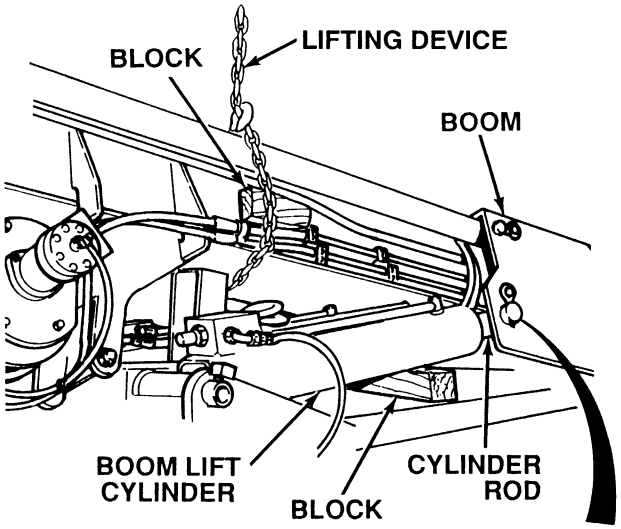


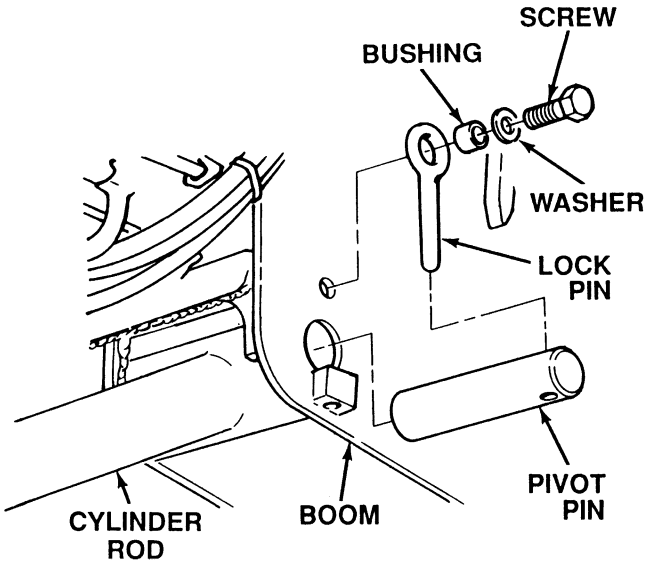
15. BOOM DOES NOT LOWER OR LOWERS SLOWLY (CONT).

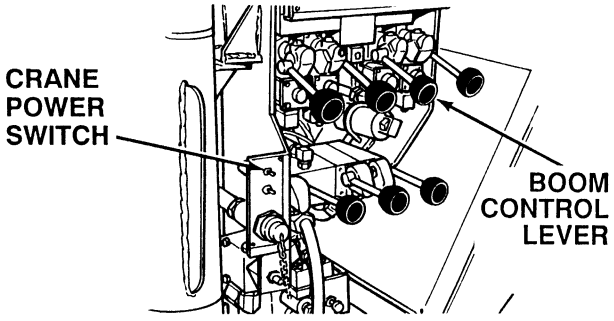


OPERATION TEST

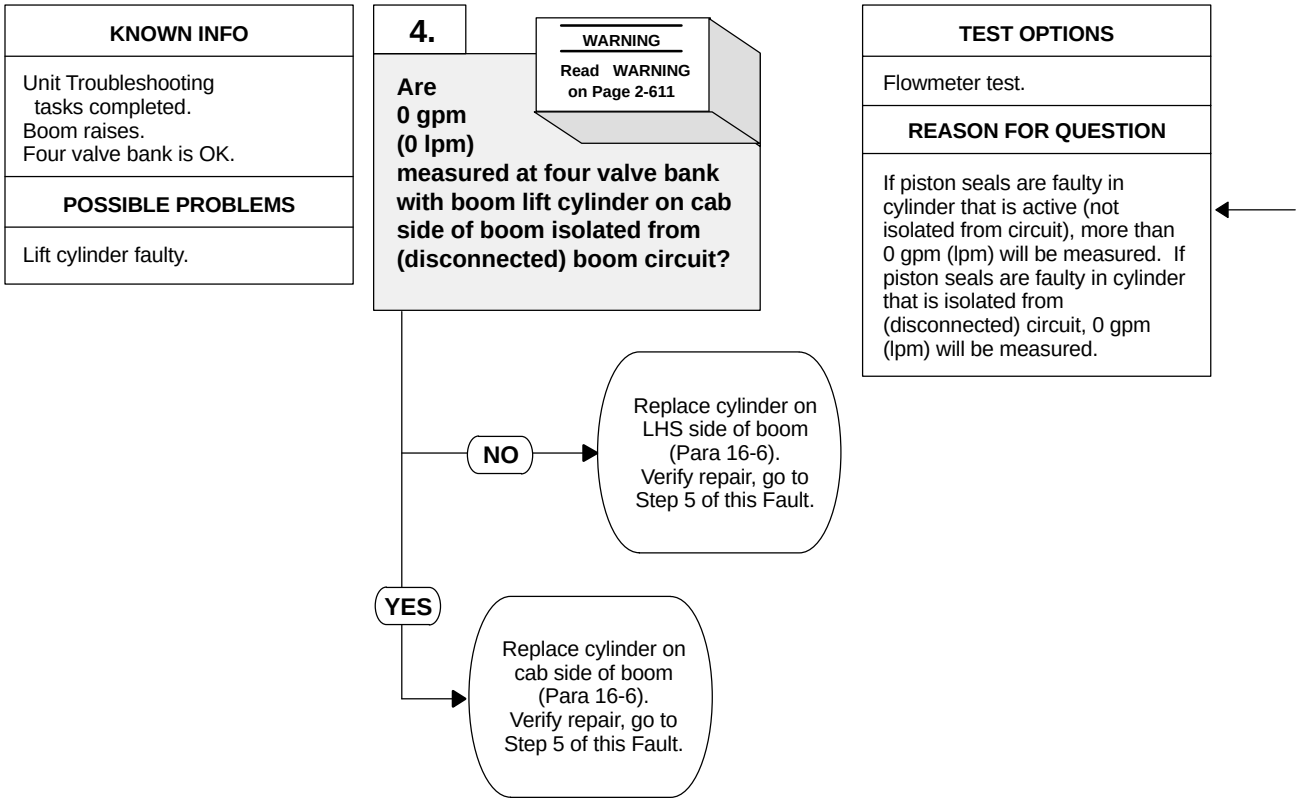
(1) Attach lifting device and blocks to boom and support boom.
(2) Block up boom lift cylinder on LHS side of boom.
(3) Remove screw, washer and bushing from lock pin.
(4) Remove lock pin from pivot pin.
(5) Remove pivot pin from boom lift cylinder and boom.
(6) Start engine (TM 9-2320-364-10).
(7) Set WINCH/CRANE switch to CRANE position.
(8) Set hydraulic selector switch to CRANE/SRW position.
(9) Turn ON crane POWER switch.
(10) Operate boom lift cylinder using BOOM control lever.
  (a) If cylinder does not operate, perform Steps (11) through (13) below and replace cylinder on LHS side of boom (Para 16-6).
  (b) If cylinder operates, perform Steps (11) through (13) below and replace cylinder on cab side of boom (Para 16-6).
(11) Set crane POWER switch to OFF position.
(12) Set hydraulics selector switch to OFF position.
(13) Turn OFF ENGINE switch.







15. BOOM DOES NOT LOWER OR LOWERS SLOWLY (CONT).



WARNING

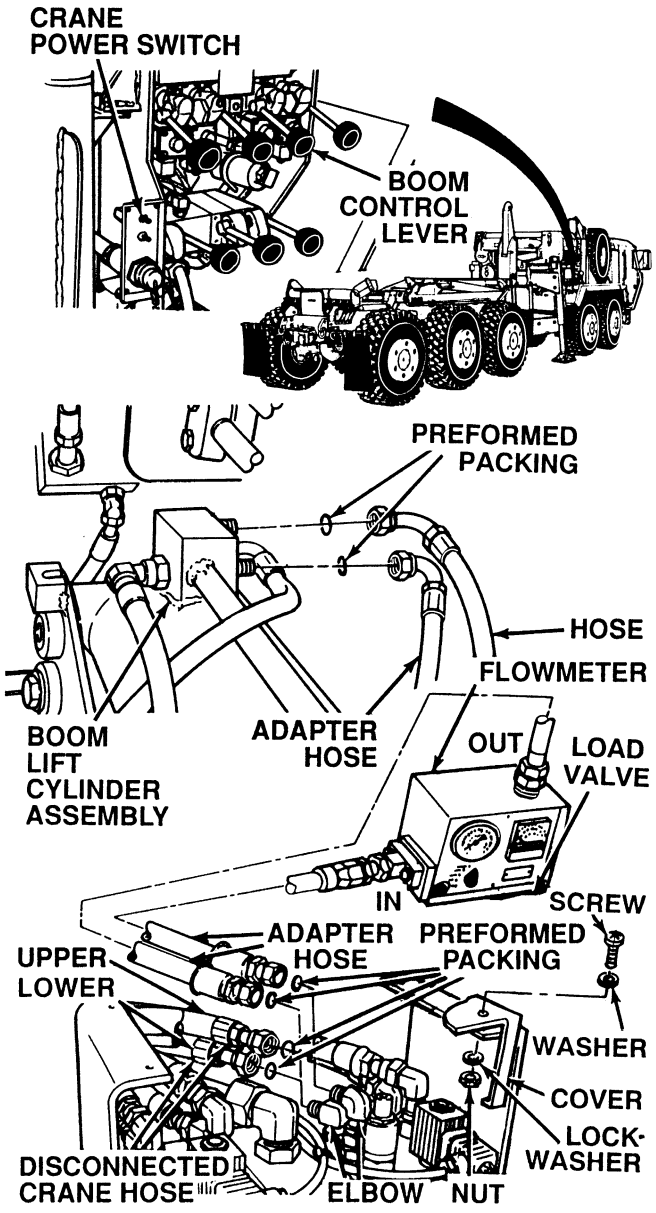
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

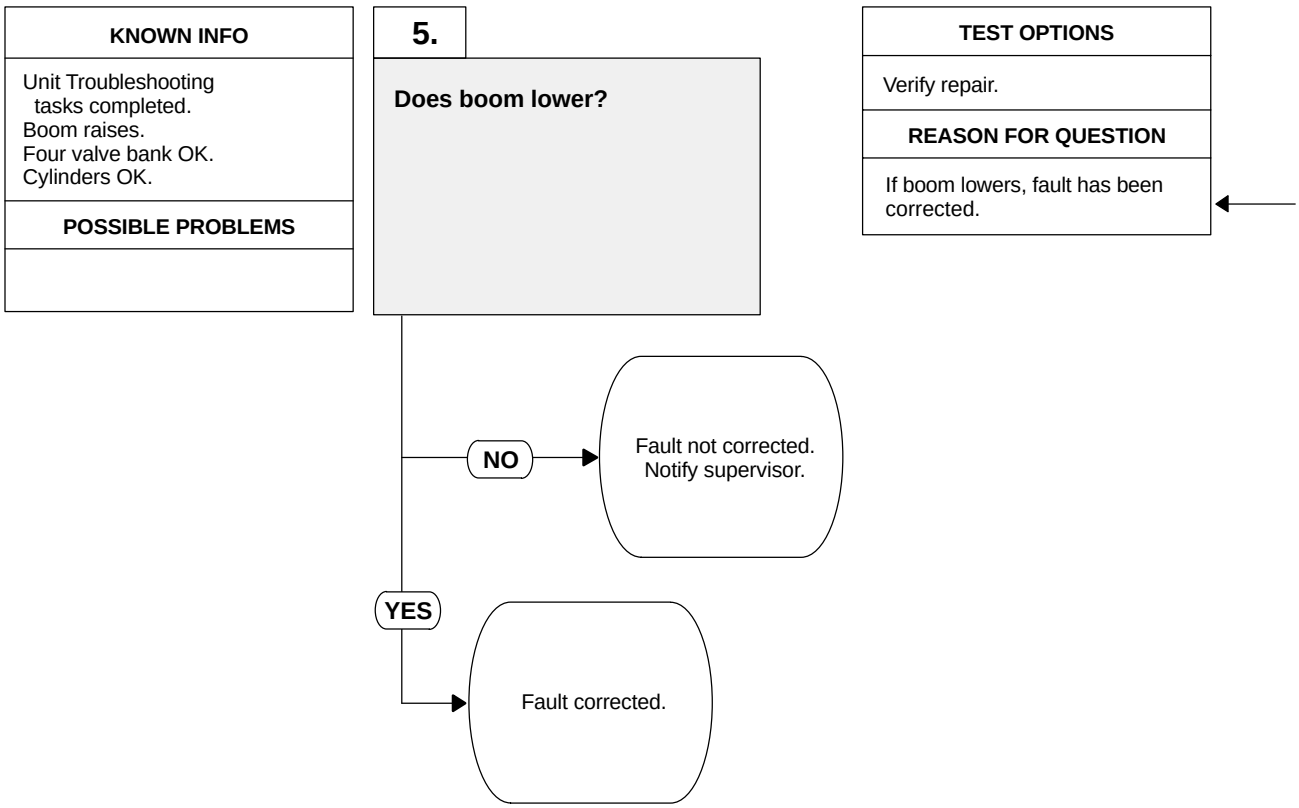
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Set crane POWER switch to OFF position (TM 9-2320-364-10).
(2) Set hydraulic selector switch to OFF position.
(3) Turn OFF ENGINE switch.
(4) Tag, mark and disconnect two hoses from boom lift cylinder on LHS side of boom. Discard preformed packings.
(5) Install plugs with preformed packings on disconnected hoses.
(6) Install caps with preformed packings on two cylinder fittings.
(7) Start engine.
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Set crane POWER switch to ON position.
(11) Hold BOOM lever in DOWN position.
  (a) If more than 0 gpm (0 lpm) are measured, perform Steps (12) through (20) below and replace cylinder that is on the LHS side of the boom (Para 16-6).
  (b) If 0 gpm (0 lpm) are measured, perform Steps (12) through (20) below and replace cylinder that is on cab side of boom (Para 16-6).
(12) Set crane POWER switch to OFF position.
(13) Set hydraulics selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Remove two caps from cylinder assemblies. Discard preformed packings.
(16) Remove two plugs from hoses. Discard preformed packings.
(17) Connect two hoses with preformed packings to boom lift cylinder.
(18) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(19) Connect crane hose with preformed packing to elbow.
(20) Install cover with four screws, washers, lockwashers and nuts.

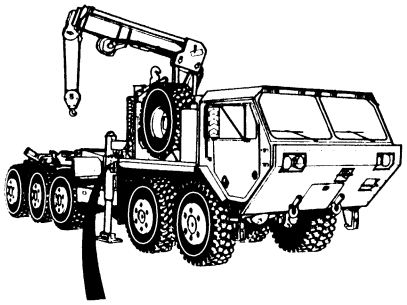


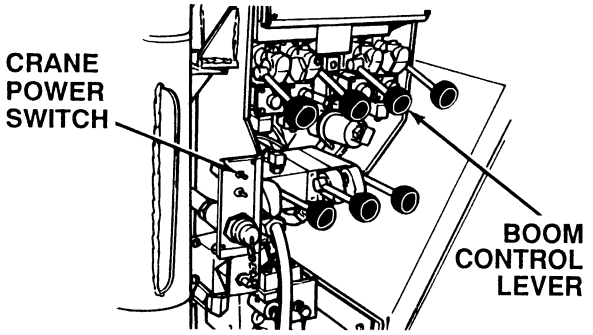
15. BOOM DOES NOT LOWER OR LOWERS SLOWLY (CONT).

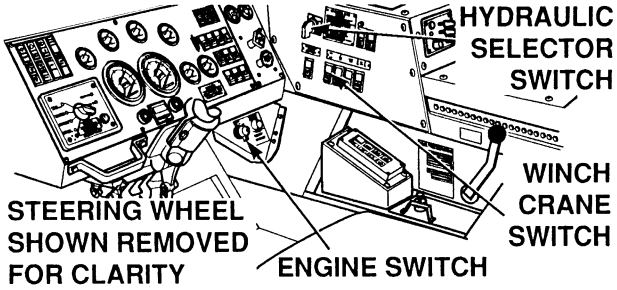


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Lower boom using BOOM control lever.
  (a) If boom does not lower, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
  (b) If boom lowers, fault has been corrected.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

16. BOOM DOES NOT OPERATE OR OPERATES SLOWLY.

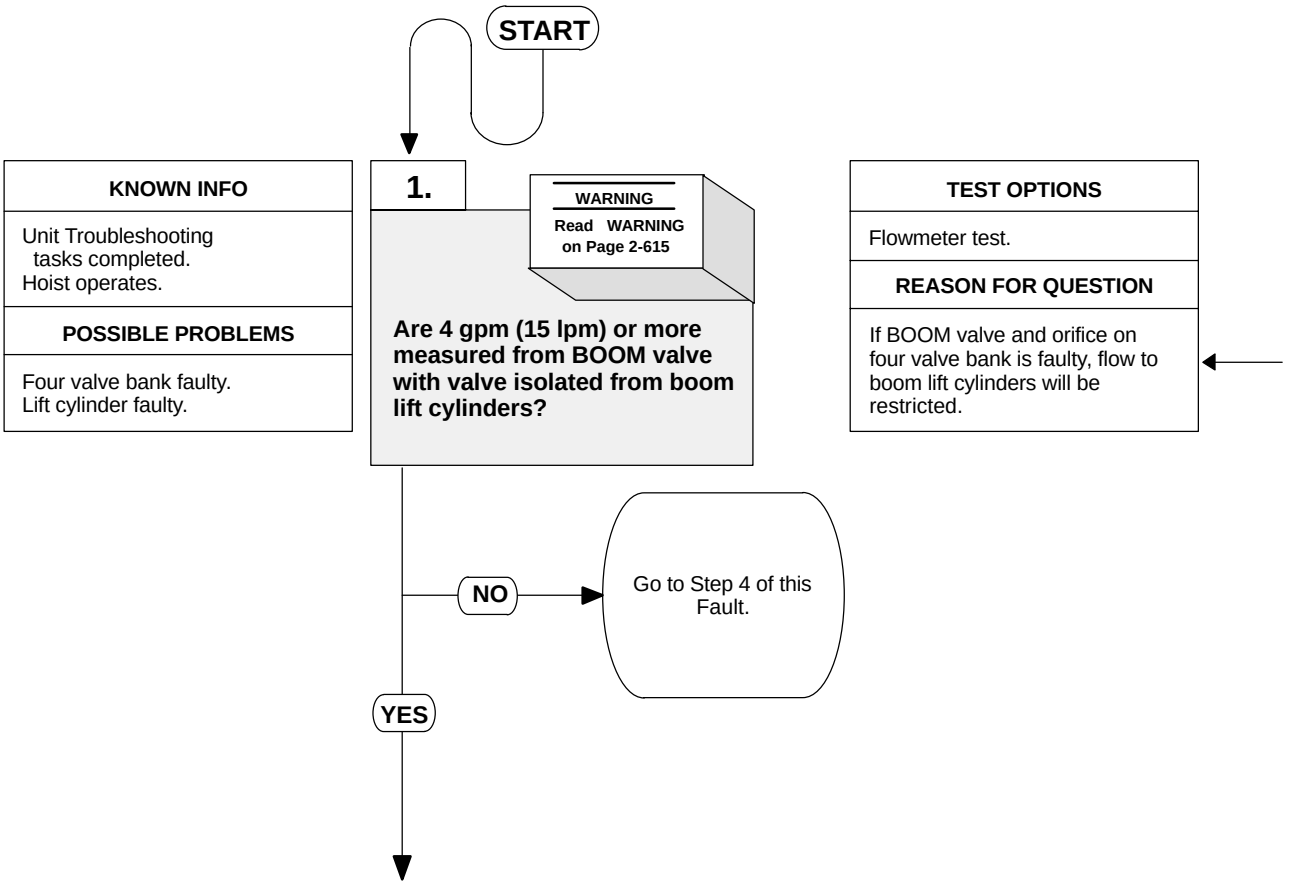
INITIAL SETUP

Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Cap and Plug Set (Item 26, Appendix F)
- Pan, Drain 4 gal (Item 144, Appendix F)
- Pressure Test Kit (Item 165, Appendix F)
- Lifting Device (Minimum Capacity 2500 lbs/1134 kg)

Materials/Parts
- Oil, Hydraulic (Item 34, Appendix B)
- Tags, Identification (Item 72, Appendix B)
- Lockwasher (4) (Item 282, Appendix E)
- Preformed Packing (3) (Item 335, Appendix E)
- Preformed Packing (6) (Item 336, Appendix E)
- Preformed Packing (8) (Item 389, Appendix E)
- Wooden Block (Appendix C)
- Wooden Block (Appendix C)

References
- TM 9-2320-364-10
- TM 9-2320-364-20

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

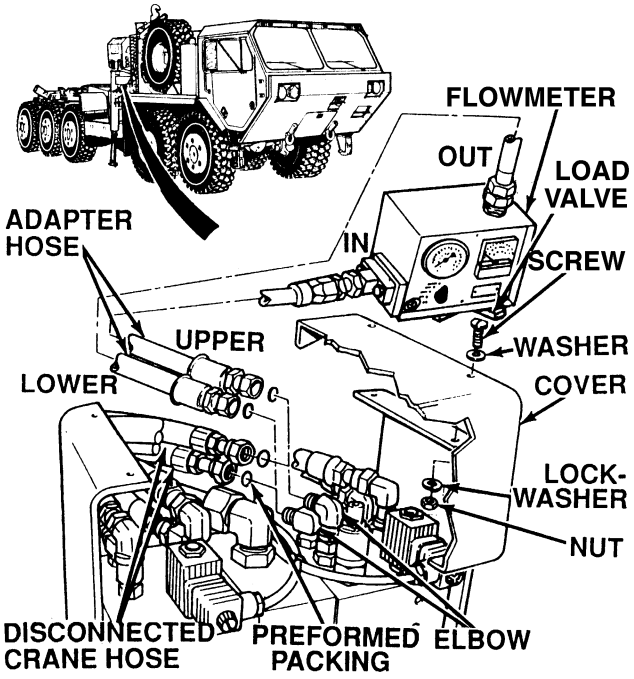
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

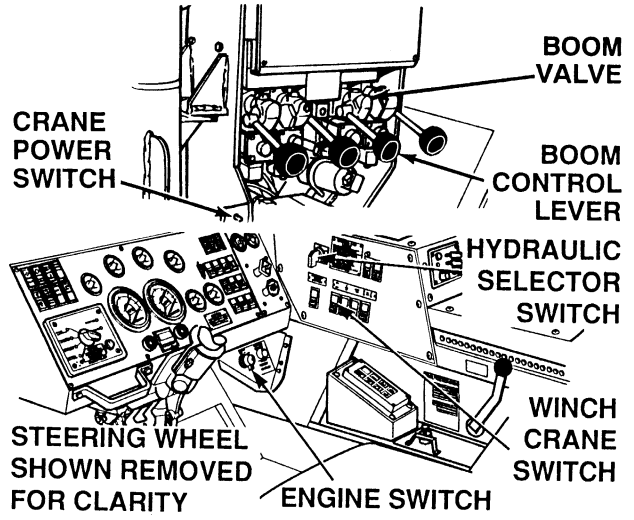
NOTE

Use a drain pan to catch leaking hydraulic oil.

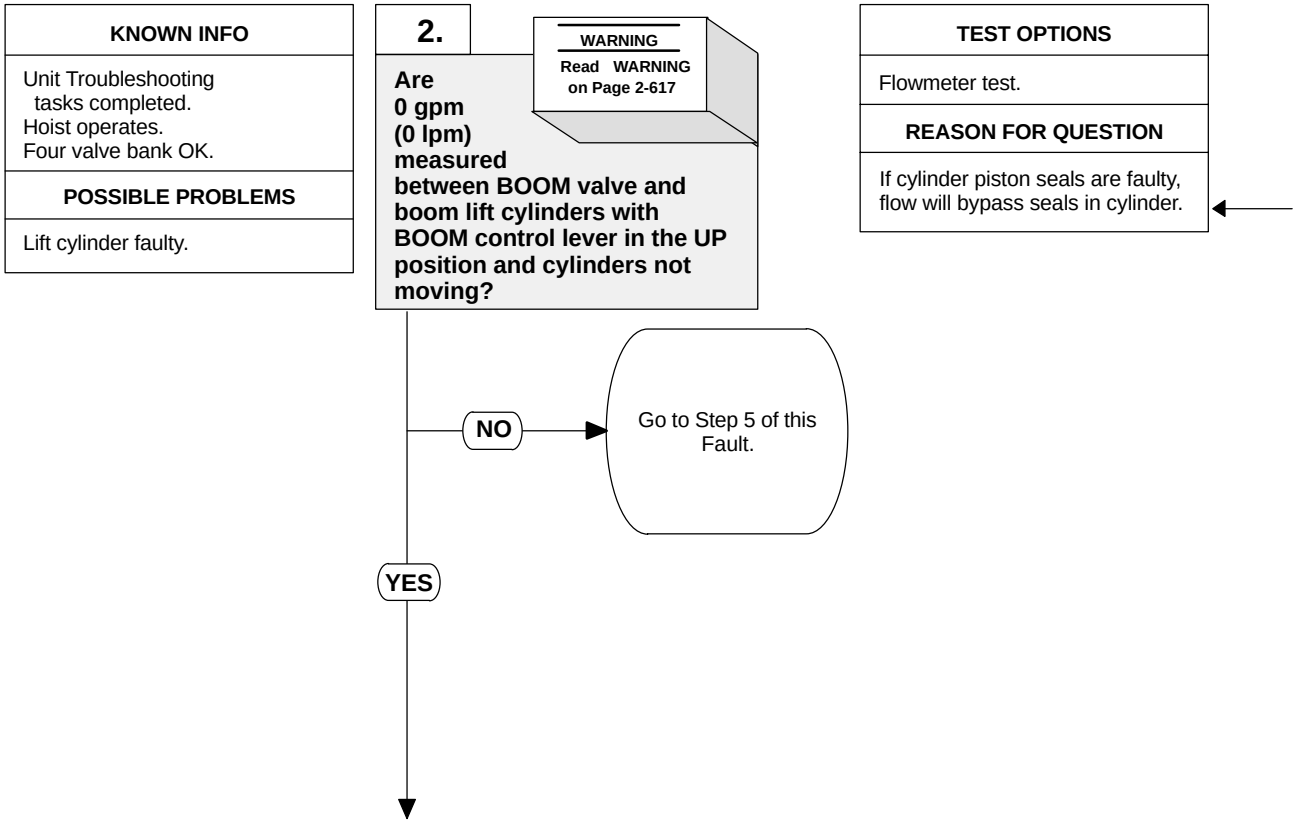
FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above BOOM valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(4) Connect adapter hose to flowmeter OUT port.
(5) Connect adapter hose with preformed packing to outboard (taller) elbow.
(6) Connect adapter hose to flowmeter IN port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold BOOM control lever in the UP position and then in the DOWN position.
  (a) If 4 gpm (15 lpm) or more are not present, perform Steps (13) through (17) below and go to Step 4 of this Fault.
  (b) If 4 gpm (15 lpm) or more are present, perform Steps (13) through (15) below and go to Step 2 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulics selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows. Discard preformed packings.
(17) Connect two hoses with preformed packings to elbows.





16. BOOM DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

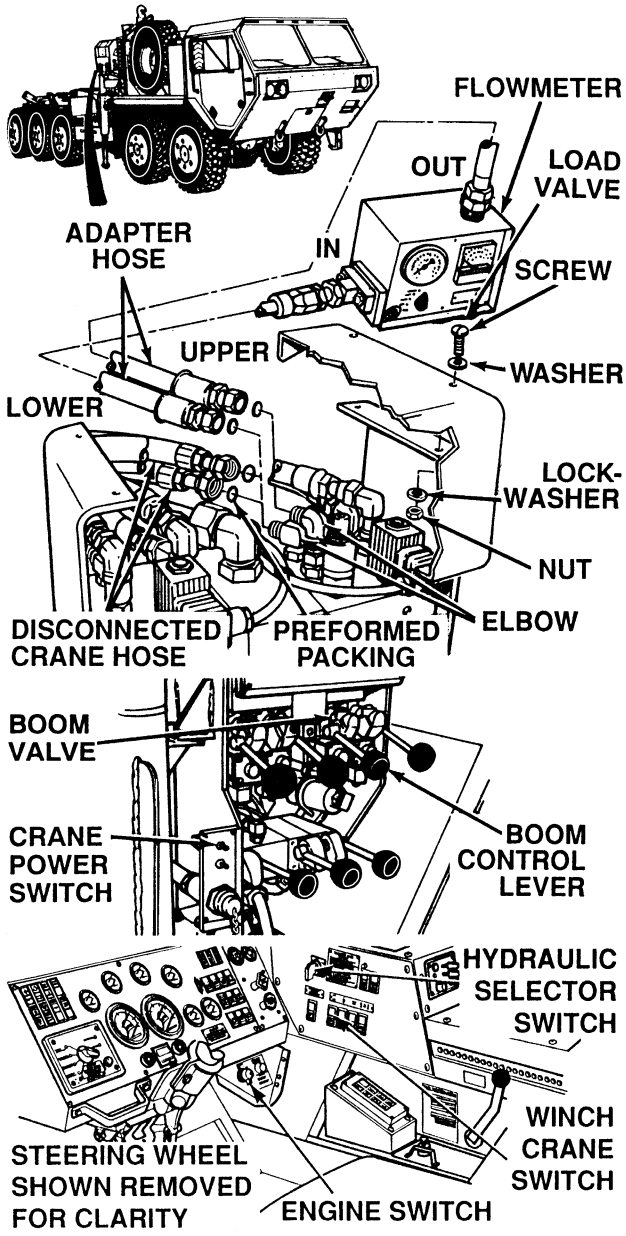
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

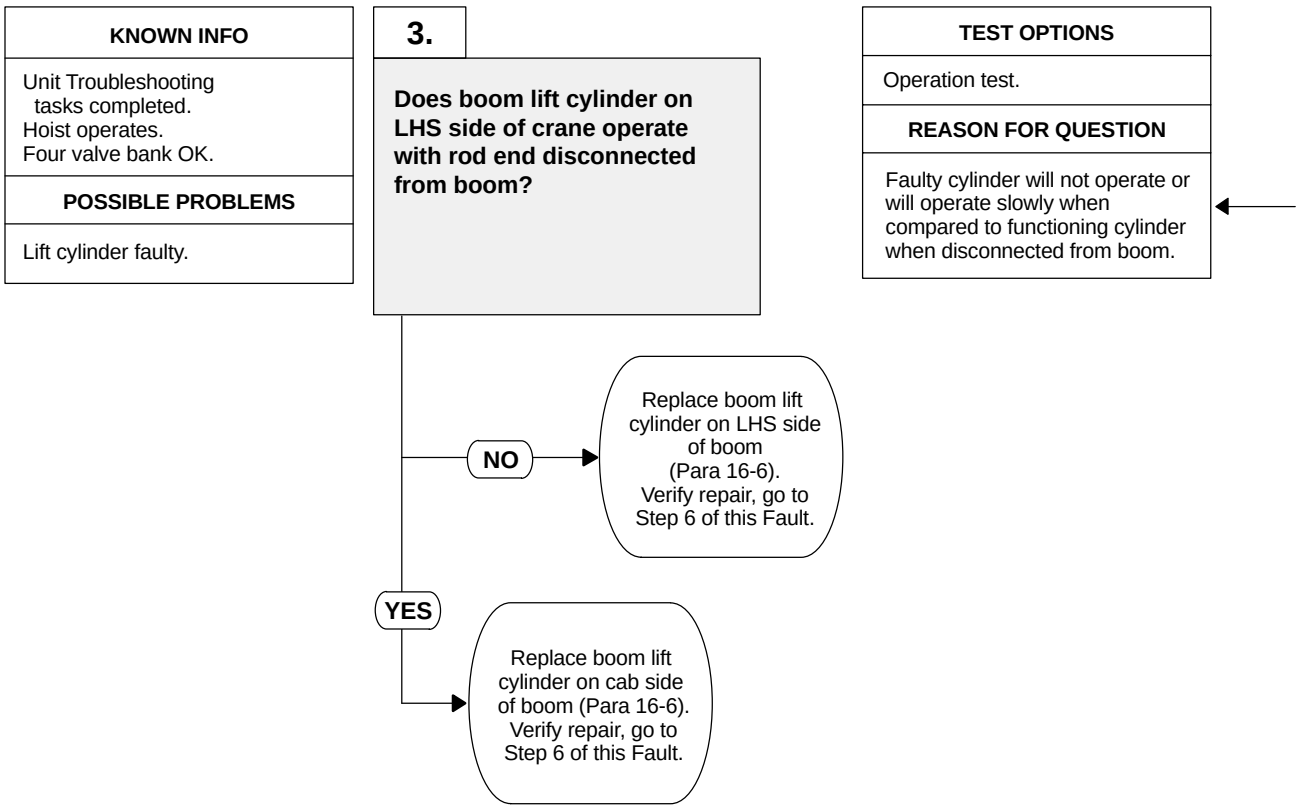
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Disconnect adapter hoses from elbows. Discard preformed packings.
(2) Install crane hose with preformed packing on inboard (shorter) elbow.
(3) Connect flowmeter OUT port adapter hose with preformed packing to the crane hose removed from outboard (taller) elbow.
(4) Connect flowmeter IN port adapter hose with preformed packing to outboard (taller) elbow.
(5) Start engine.
(6) Set WINCH/CRANE switch to CRANE position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Set crane POWER switch to ON position.
(9) Extend boom lift cylinders completely if boom raise slowly.
(10) Hold BOOM control lever in the UP position.
  (a) If more than 0 gpm (0 lpm) are present, go to Step 5 of this Fault.
  (b) If 0 gpm (0 lpm) are present, perform Steps (11) through (15) below and go to Step 3 of this Fault.
(11) Set crane POWER switch to OFF position.
(12) Set hydraulics selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(15) Connect crane hoses with preformed packing to elbow.

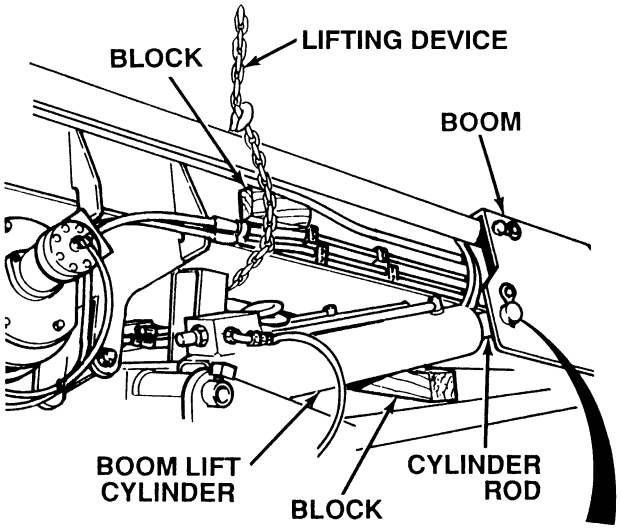


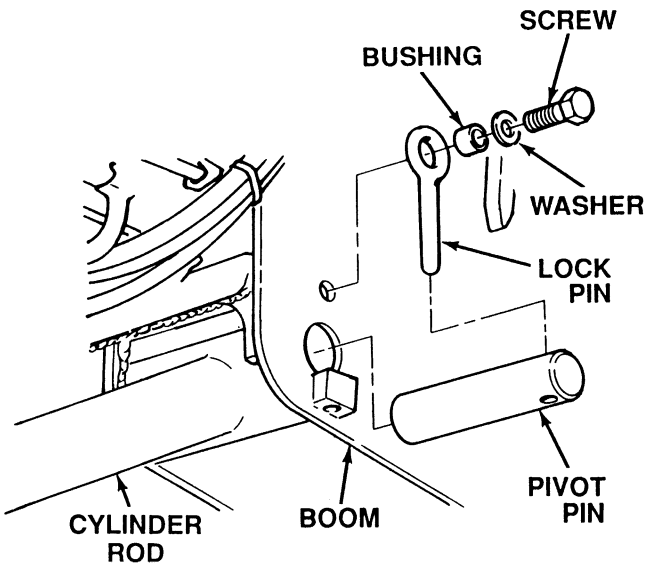
16. BOOM DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

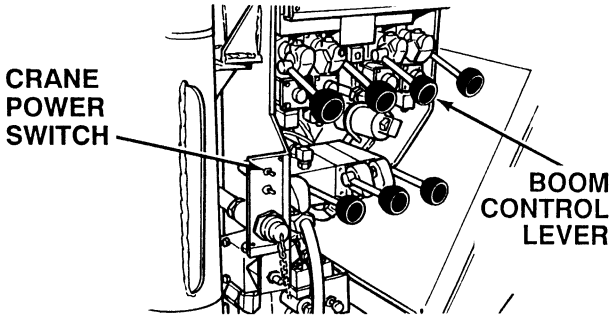


OPERATION TEST

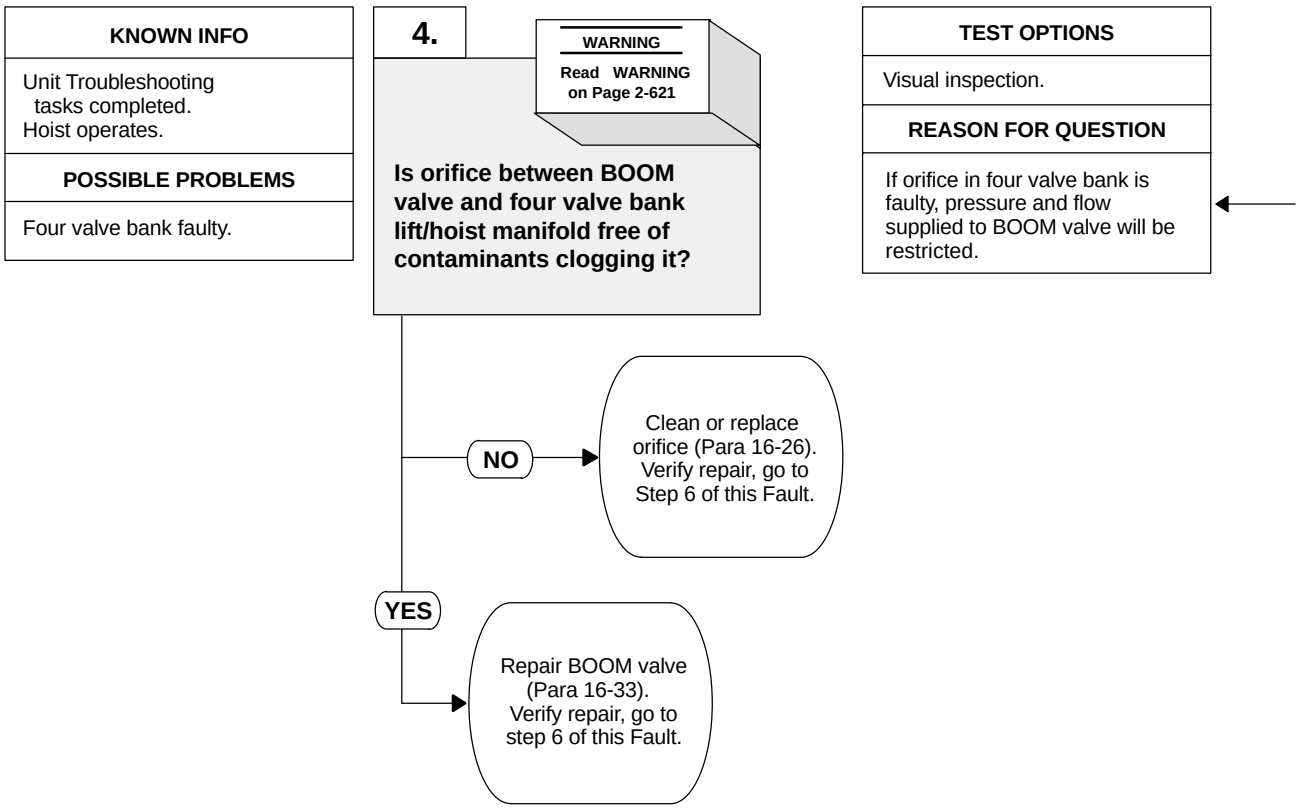
(1) Attach lifting device and wooden blocks to boom and support boom.
(2) Block up boom lift cylinder on hoist motor side of boom.
(3) Remove screw, washer and bushing from lock pin.
(4) Remove lock pin from pivot pin.
(5) Remove pivot pin from boom lift cylinder and boom.
(6) Start engine (TM 9-2320-364-10).
(7) Set WINCH/CRANE rocker switch to CRANE position.
(8) Set hydraulic selector switch to CRANE/SRW position.
(9) Turn ON crane POWER switch.
(10) Operate boom lift cylinder using BOOM control lever.
  (a) If cylinder does not operate, perform Steps (11) through (13) below and replace cylinder on LHS side of boom (Para 16-6).
  (b) If cylinder operates, perform Steps (11) through (13) below and replace cylinder on cab side of boom (Para 16-6).
(11) Set crane POWER switch to OFF position.
(12) Set hydraulics selector switch to OFF position.
(13) Turn OFF ENGINE switch.







16. BOOM DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

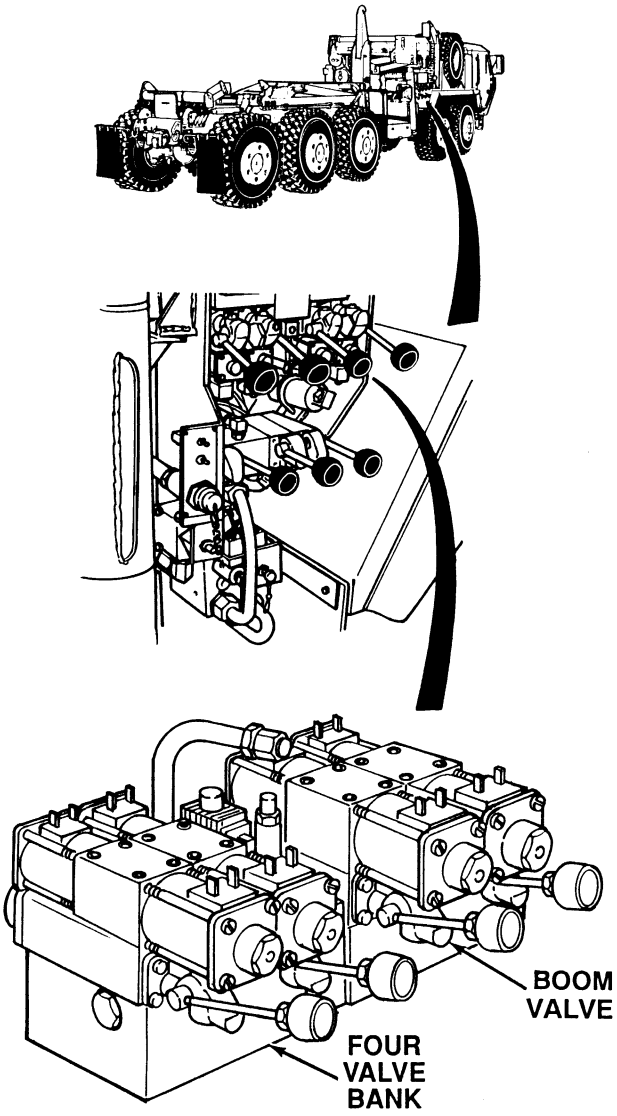
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

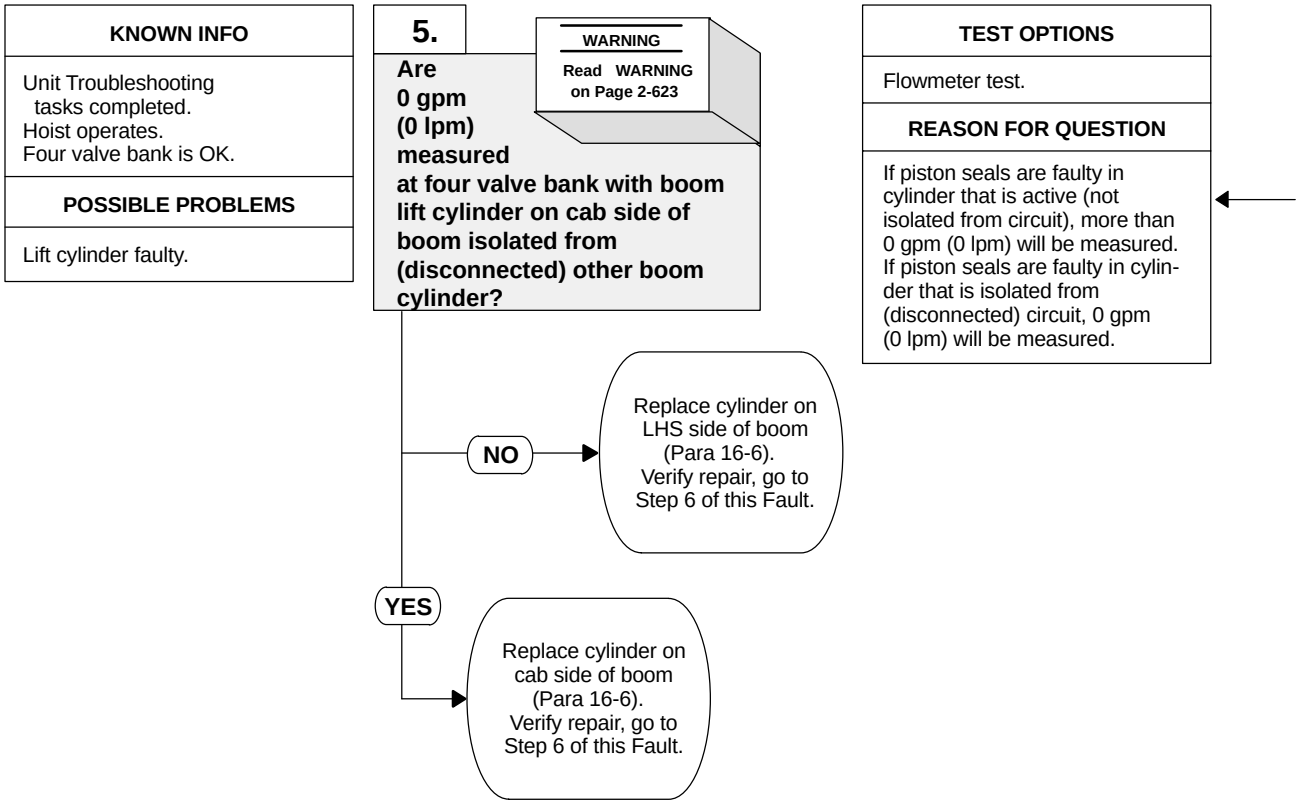
Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove four valve bank from crane (Para 16-26).
(2) Remove BOOM valve from four valve bank (Para 16-26).
(3) Remove orifice from four valve bank where BOOM valve was removed from (Para 16-26).
(4) Inspect orifice for contamination clogging it.
  (a) If orifice is contaminated, clean or replace orifice and inspect bores in BOOM valve for additional contaminants.
  (b) If orifice is OK, repair BOOM valve on four valve bank (Para 16-33).
(5) Install orifice on four valve bank (Para 16-26).
(6) Install BOOM valve on four valve bank (Para 16-26).
(7) Install four valve bank on crane (Para 16-26).



16. BOOM DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

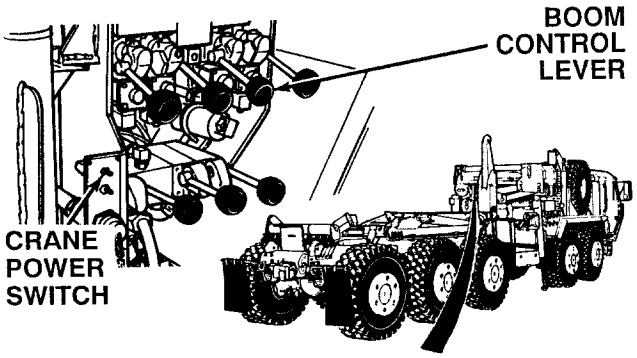
NOTE

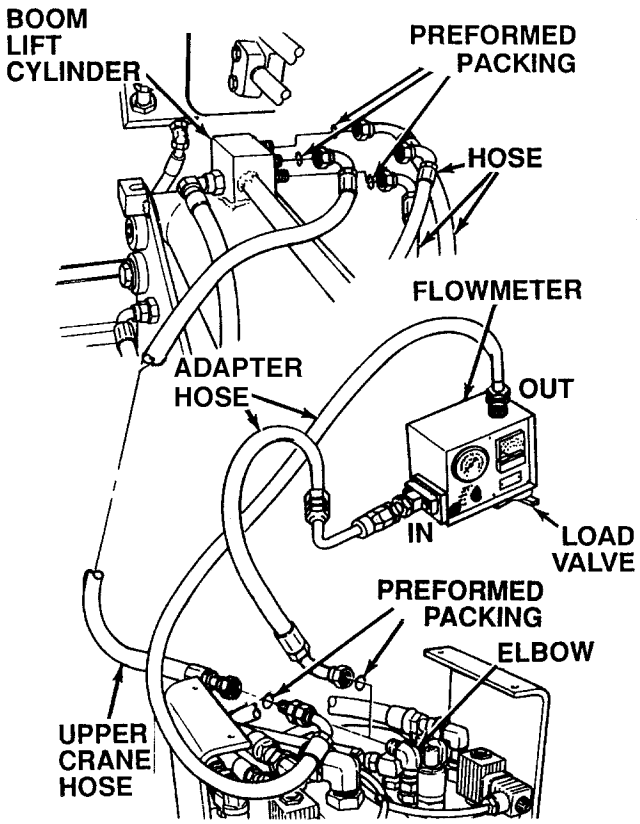
- Use a drain pan to catch leaking hydraulic oil.
- Ensure hook block is hooked on ring and slack is taken out of cable, to prevent boom from raising.

FLOWMETER TEST

(1) Set crane POWER switch to OFF position.
(2) Set hydraulic selector switch to OFF position.
(3) Turn OFF ENGINE switch.
(4) Tag, mark and disconnect three hoses from boom lift cylinder on LHS side of boom. Discard preformed packings.
(5) Install plugs with preformed packings on disconnected hoses.
(6) Install caps with preformed packings on two cylinder fittings closest to four valve bank.
(7) Disconnect flowmeter OUT port adapter hose from crane hose. Discard preformed packing.
(8) Install plug with preformed packing in crane hose.
(9) Connect adapter hose with preformed packing to remaining fitting on boom lift cylinder.
(10) Start engine (TM 9-2320-364-10).
(11) Set WINCH/CRANE switch to CRANE position.
(12) Set hydraulic selector switch to CRANE/SRW position.
(13) Set crane POWER switch to ON position.
(14) Hold BOOM lever in UP position.
  (a) If more than 0 gpm (0 lpm) are measured, perform Steps (15) through (23) below and replace boom lift cylinder (Para 16-6) (Para 16-3) on LHS side of boom.
  (b) If 0 gpm (0 lpm) are measured, perform Steps (15) through (23) below and replace boom lift cylinder (Para 16-6) on cab side of boom.

Continued on next page.





16. BOOM DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

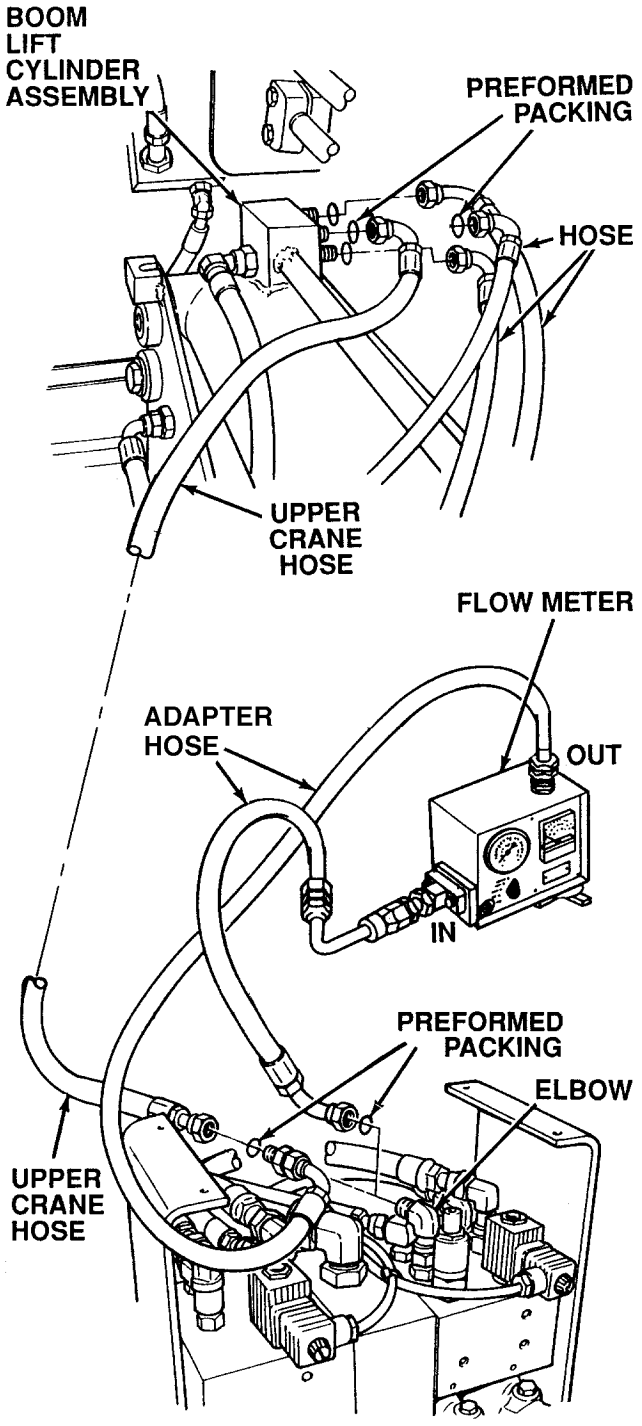
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST (CONT).

(15) Set crane POWER switch to OFF position.
(16) Set hydraulics selector switch to OFF position.
(17) Turn OFF ENGINE switch.
(18) Disconnect adapter hose and two caps from cylinder. Discard preformed packing.
(19) Remove three plugs from hoses. Discard preformed packings.

Continued on next page.



WARNING

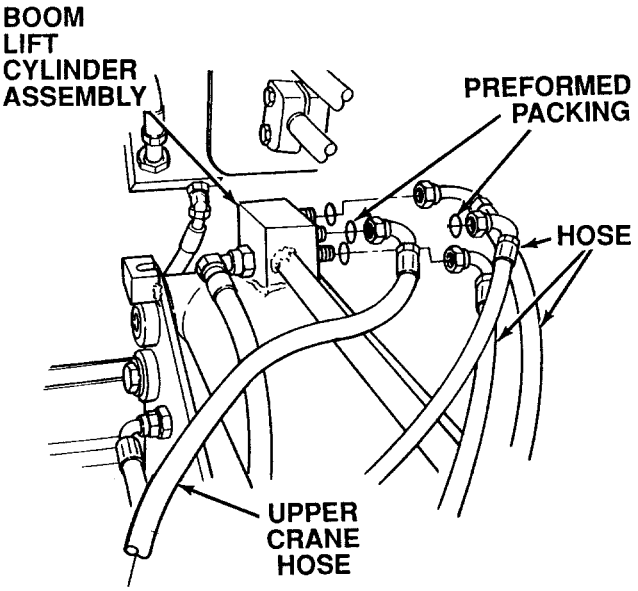
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

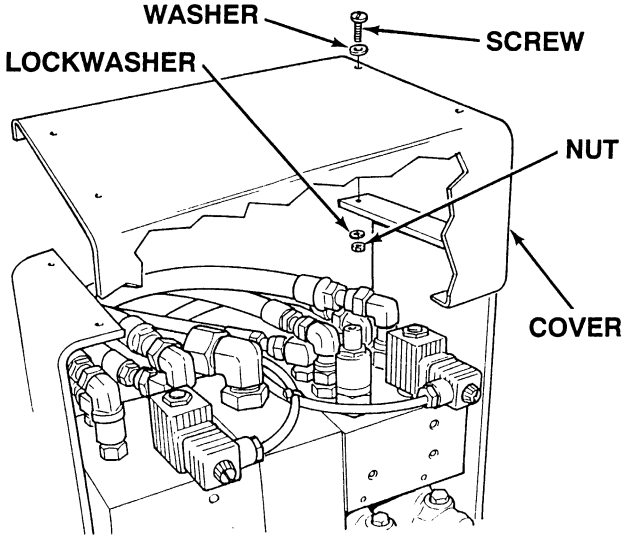
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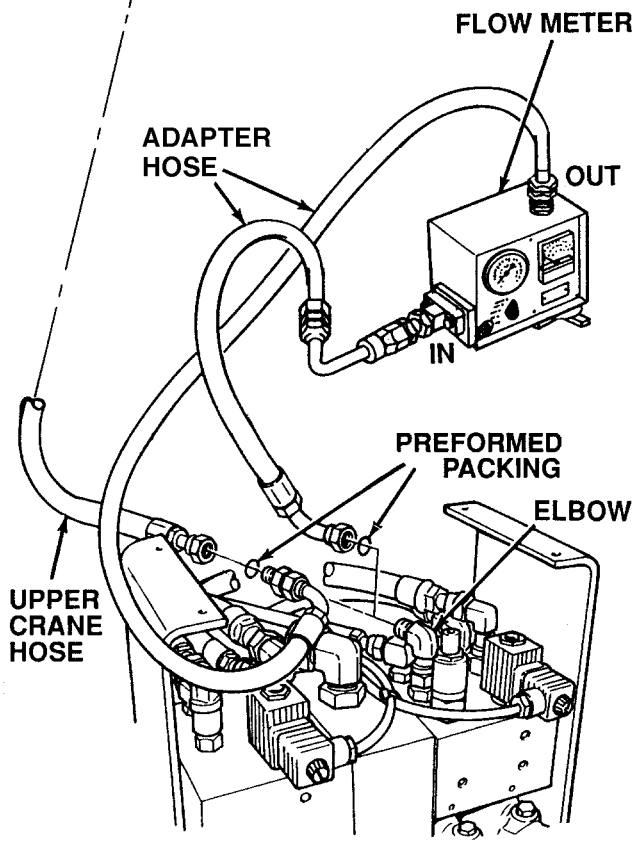
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST (CONT).

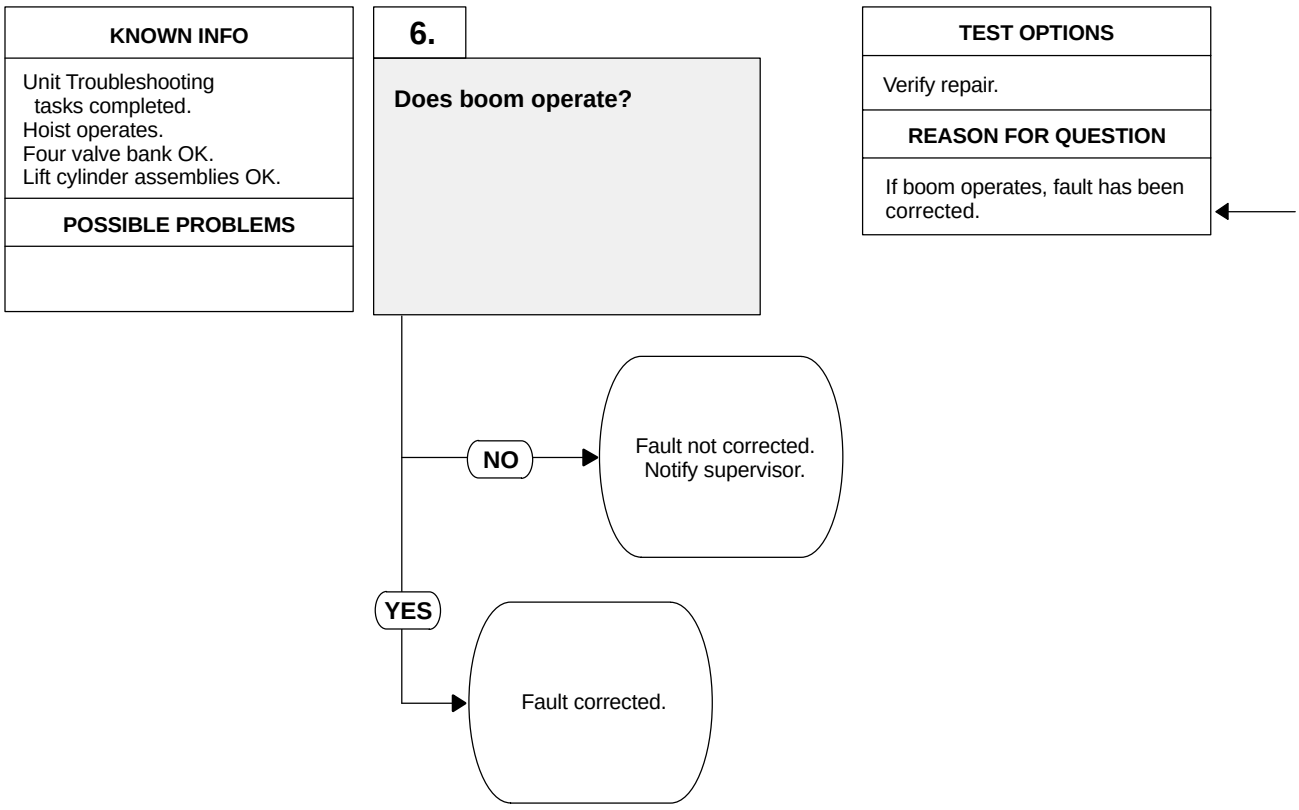
(20) Connect three hoses with preformed packings to boom lift cylinder.
(21) Disconnect adapter hose from elbow. Discard preformed packings.
(22) Connect crane hose with preformed packing to elbow.
(23) Install cover with four screws, washers, lockwashers and nuts.





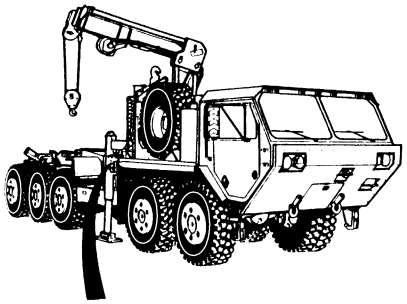


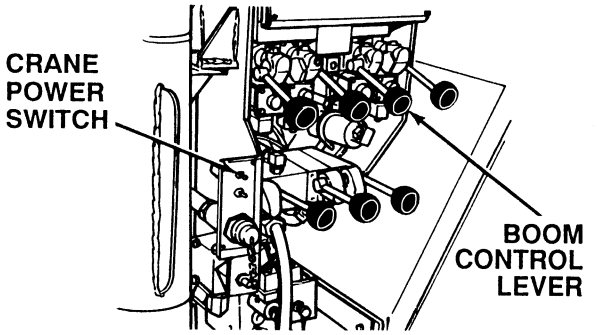
16. BOOM DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

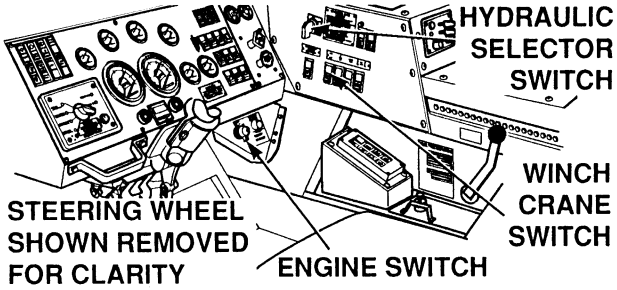


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Operate boom using BOOM control lever.
    (a) If boom does not operate, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
    (b) If boom operates, fault has been corrected.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

17. BOOM CREEPS DOWN.

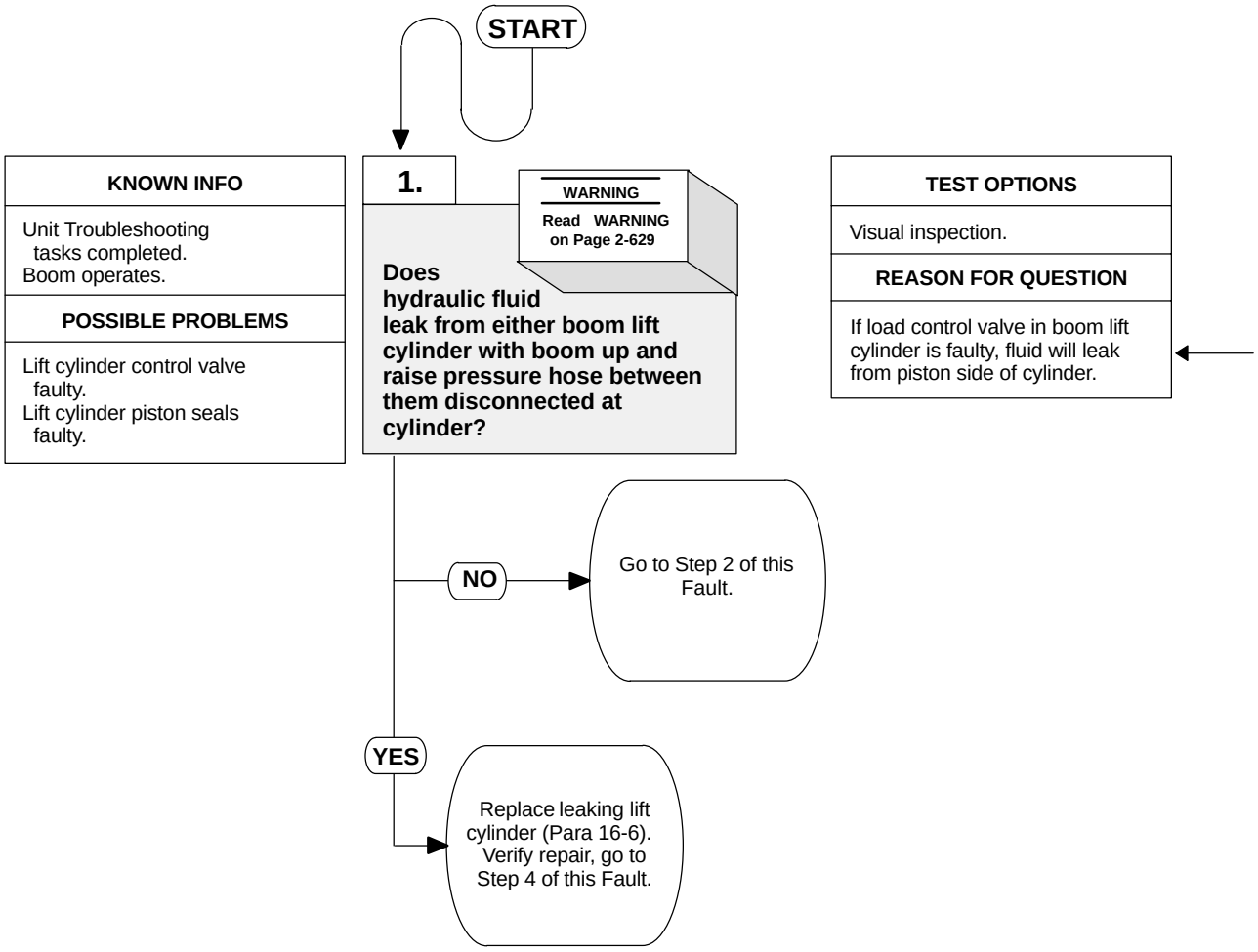
INITIAL SETUP

Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Cap and Plug Set (Item 26, Appendix F)
- Pan, Drain 4 gal (Item 144, Appendix F)
- Pressure Test Kit (Item 165, Appendix F)
- Wrench, Torque (0-175 lb-ft) (Item 277, Appendix F)
- Lifting Device (Minimum Capacity 2500 lbs/1135 kg)

References
- TM 9-2320-364-10
- TM 9-2320-364-20

Materials/Parts
- Oil, Hydraulic (Item 34, Appendix B)
- Tags, Identification (Item 72, Appendix B)
- Lockwasher (4) (Item 282, Appendix E)
- Packing, Preformed (3) (Item 335, Appendix E)
- Packing, Preformed (7) (Item 336, Appendix E)
- Packing, Preformed (4) (Item 389, Appendix E)

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.

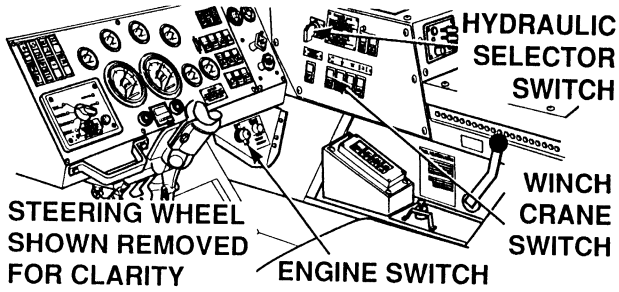
NOTE

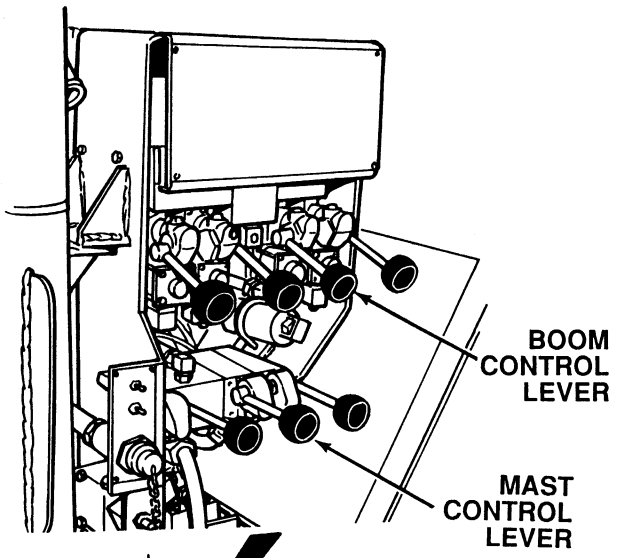
- Use a drain pan to catch leaking hydraulic oil.
- Fluid laying in hose and fitting should drain quickly and then stop. Hose may drain more fluid for a longer period of time than fitting.

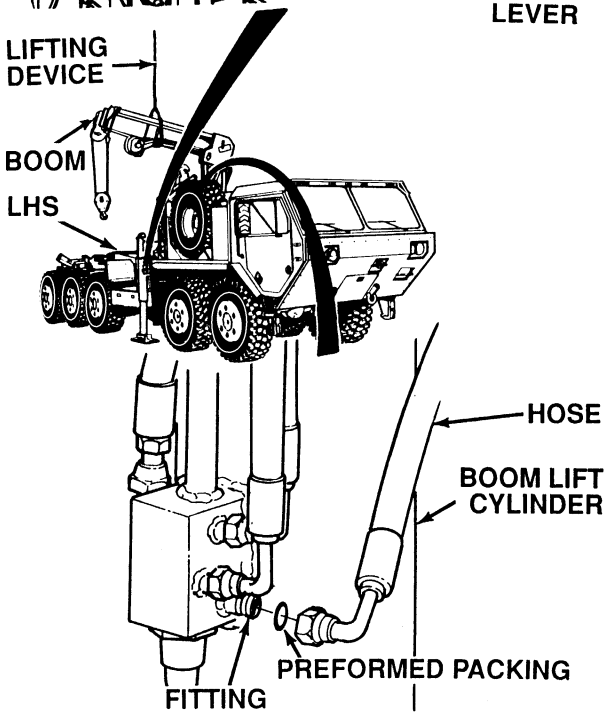
VISUAL INSPECTION

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Set crane POWER switch to ON position.
(5) Raise boom until approximately level with ground using BOOM control lever.
(6) Raise mast completely using MAST control lever.
(7) Attach lifting device to boom and support boom.
(8) Disconnect hose from fitting at bottom of boom lift cylinder on LHS side of crane. Discard preformed packing.
(9) Allow boom to creep down with lifting device. Do not remove lifting device from boom.
(10) Allow fluid laying in hose and fitting to drain out.
  (a) If no hydraulic fluid drains from fitting or hose after fluid laying in fitting and hose has drained out, perform Steps (11) through (18) below and go to Step 2 of this Fault.
  (b) If fluid continues to drain from fitting or hose as boom creeps down, that cylinder is faulty. Fluid from leaking load control valve will continue to leak from hose or fitting as long as cylinder is allowed to creep down. Perform Steps (11) through (18) below and replace boom lift cylinder assembly that continues to leak hydraulic fluid (Para 16-6).

Continued on next page.







17. BOOM CREEPS DOWN (CONT).

WARNING

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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.

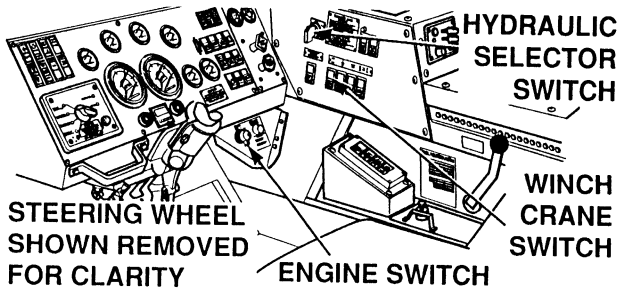
NOTE

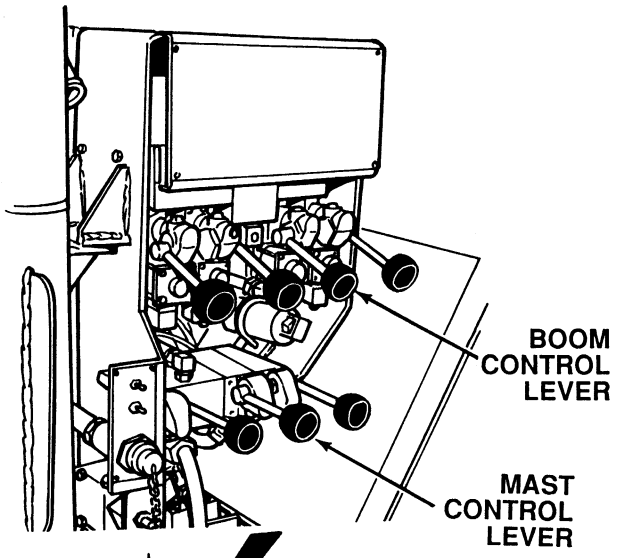
- Use a drain pan to catch leaking hydraulic oil.
- Fluid laying in hose and fitting should drain quickly and then stop. Hose may drain more fluid for a longer period of time than fitting.

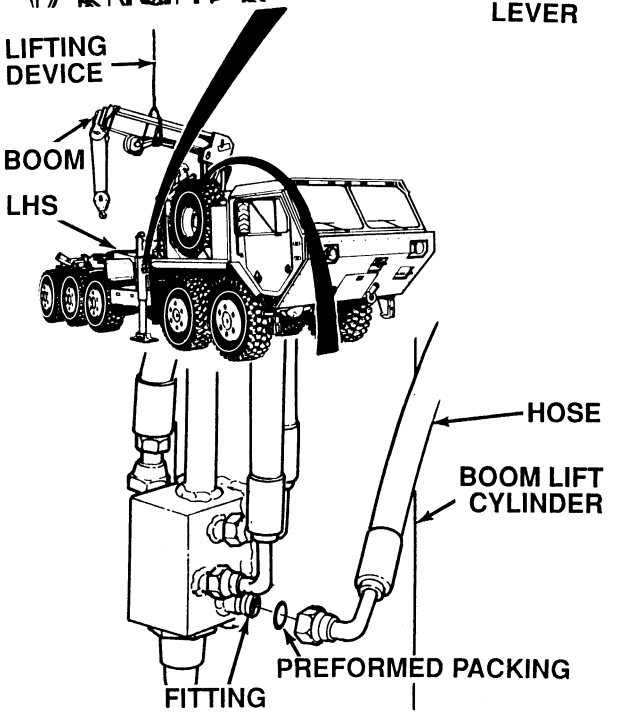
OPERATION TEST (CONT).

(11) Support boom with lifting device.
(12) Connect hose with preformed packing fitting.
(13) Remove lifting device from boom.
(14) Operate boom lift cylinders using BOOM control lever to remove any air that may be in cylinders.
(15) Place crane in stowed position (TM 9-2320-364-10).

Continued on next page.

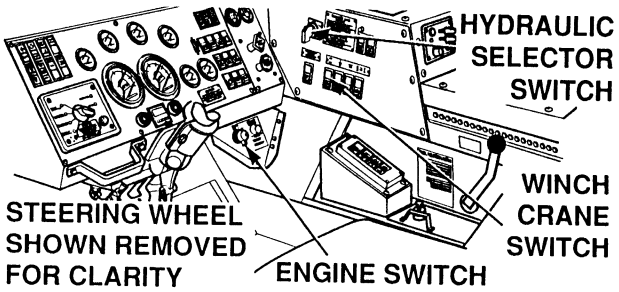


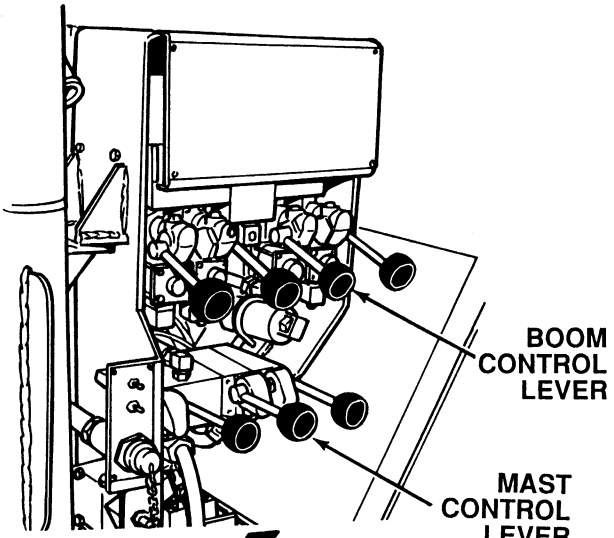




WARNING

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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.

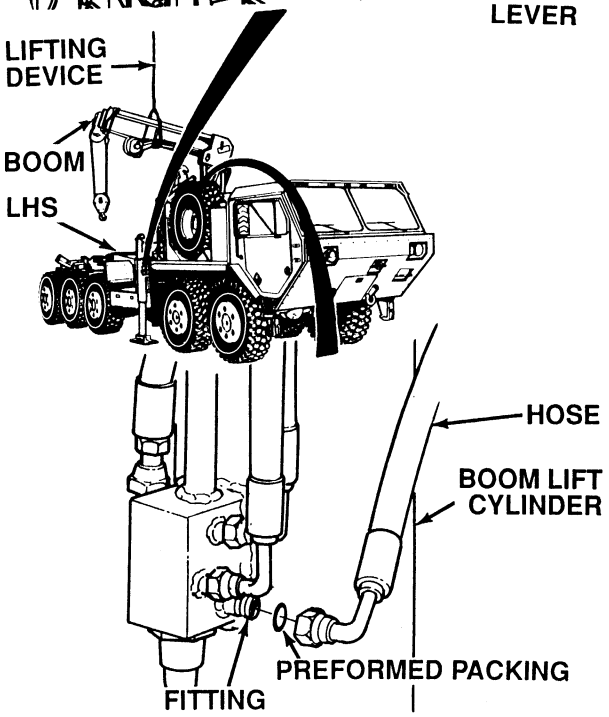




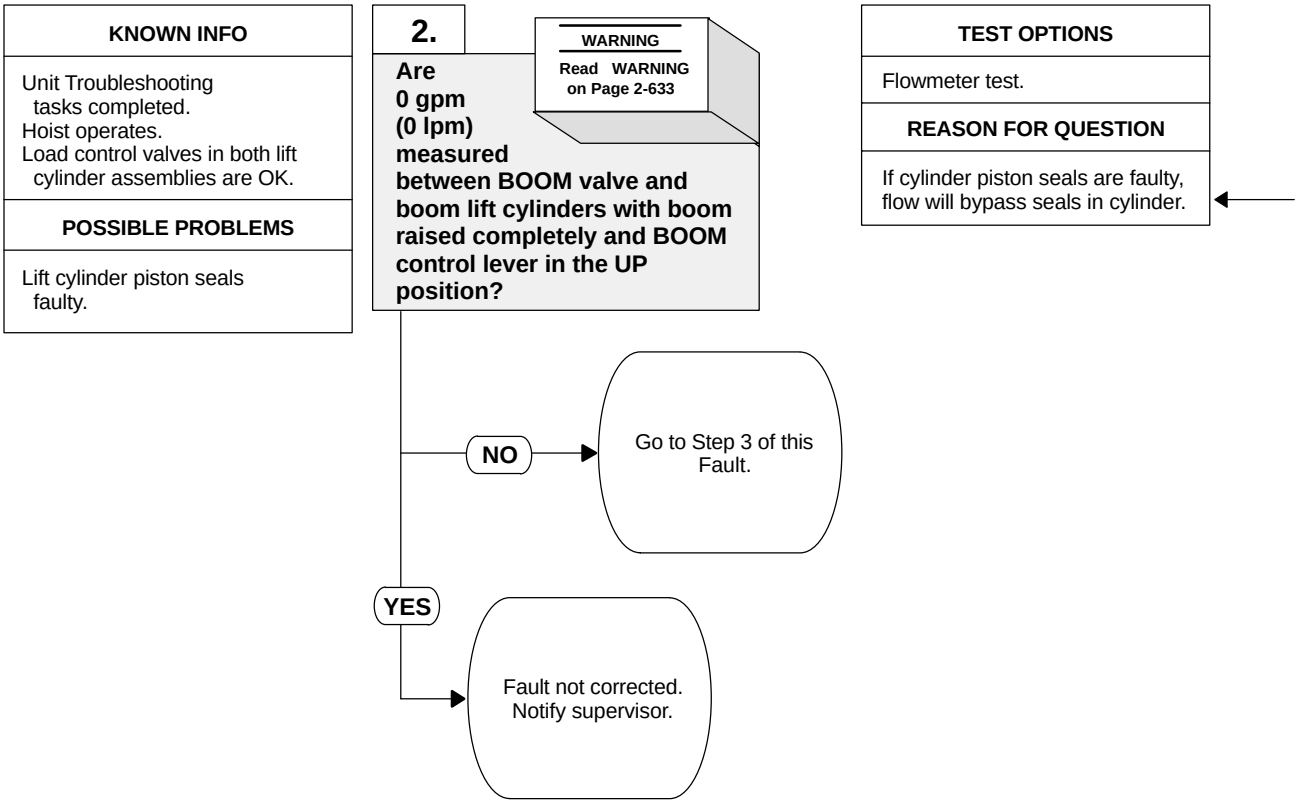
NOTE

- Use a drain pan to catch leaking hydraulic oil.
- Fluid laying in hose and fitting should drain quickly and then stop. Hose may drain more fluid for a longer period of time than fitting.

OPERATION TEST (CONT).
(16) Place crane power switch to OFF position. (17) Set hydraulic selector switch to OFF position. (18) Turn OFF ENGINE switch.



17. BOOM CREEPS DOWN (CONT).



WARNING

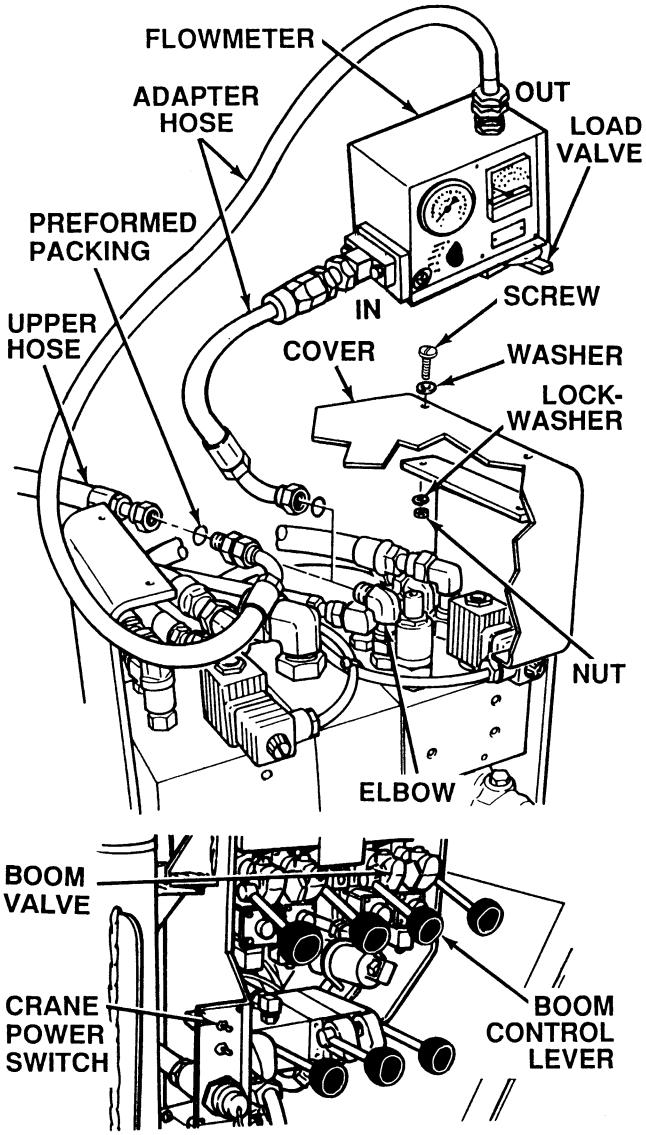
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

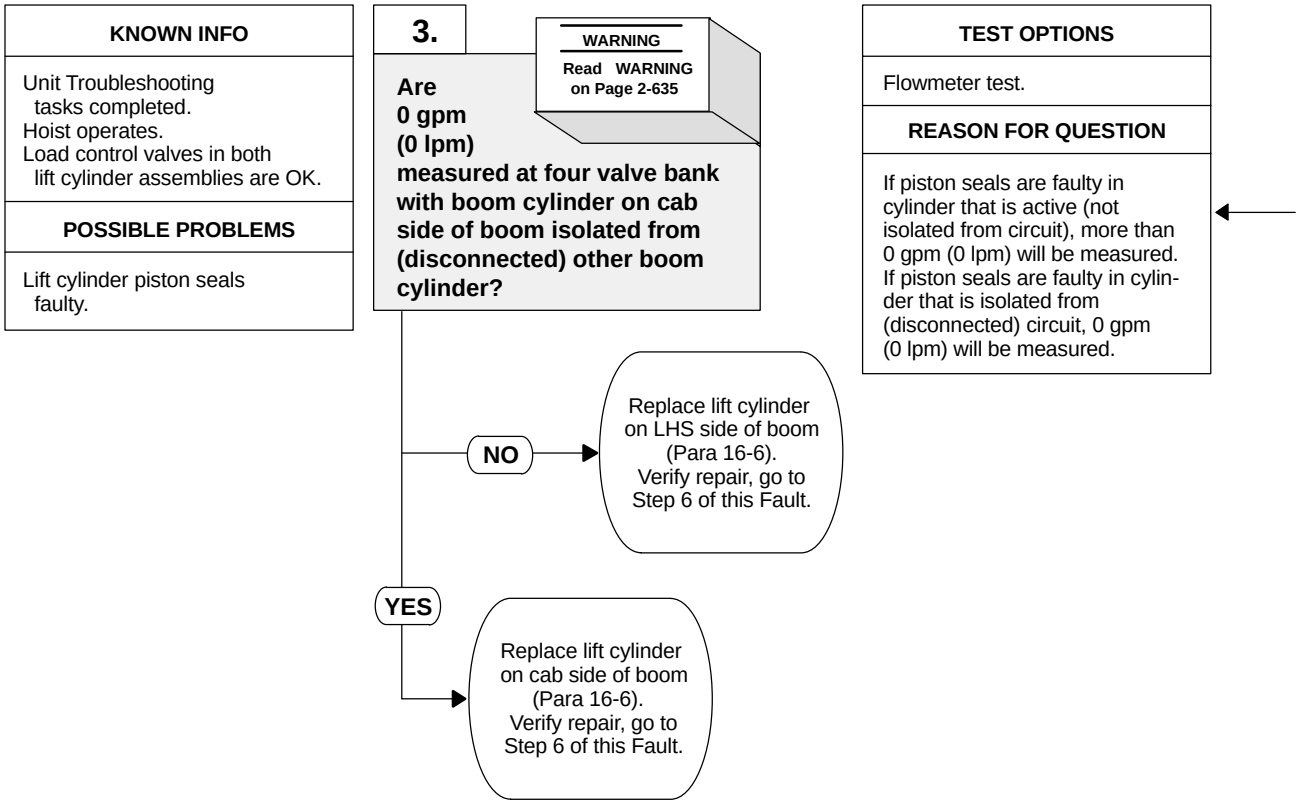
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers, screws and cover. Discard lockwashers.
(2) Disconnect upper hose from outboard (taller) elbow above BOOM valve. Discard preformed packings.
(3) Connect flowmeter OUT port adapter hose with preformed packing to the crane hose removed from outboard (taller) elbow.
(4) Connect flowmeter IN port adapter hose with preformed packing to outboard (taller) elbow.
(5) Start engine (TM 9-2320-364-10).
(6) Set WINCH/CRANE switch to CRANE position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Set crane POWER switch to ON position.
(9) Extend boom lift cylinders completely.
(10) Hold BOOM control lever in the UP position.
  (a) If more than 0 gpm (0 lpm) are present, go to Step 3 of this Fault.
  (b) If 0 gpm (0 lpm) are present, fault not corrected. Perform Steps (11) through (15) below and notify supervisor.
(11) Set crane POWER switch to OFF position.
(12) Set hydraulics selector switch to OFF position.
(13) Turn OFF ENGINE switch.
(14) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(15) Connect crane hose with preformed packing to elbow.



17. BOOM CREEPS DOWN (CONT).



WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

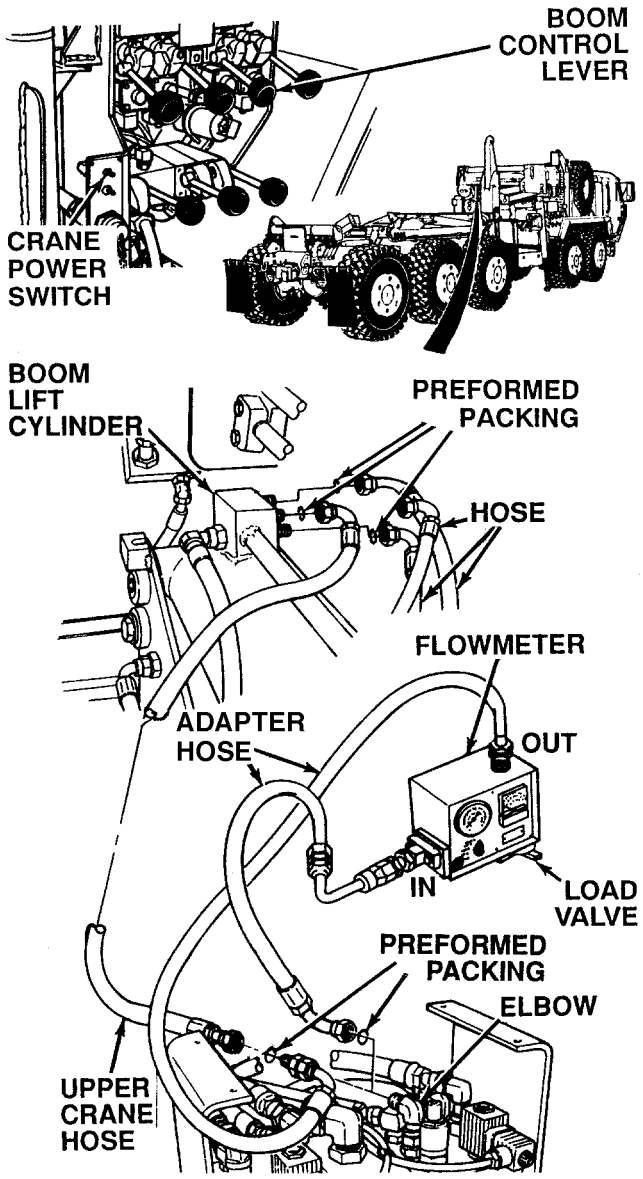
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Set crane POWER switch to OFF position (TM 9-2320-364-10).
(2) Set hydraulic selector switch to OFF position.
(3) Turn OFF ENGINE switch.
(4) Disconnect flowmeter OUT port adapter hose from crane hose. Discard preformed packing.
(5) Install plug with preformed packing in crane hose.
(6) Tag, mark and disconnect three hoses from boom lift cylinder on side of boom without OSS box. Discard preformed packings.
(7) Install plugs with preformed packings on disconnected hoses.
(8) Install caps with preformed packings on two cylinder fittings closest to four valve bank.
(9) Connect adapter hose with preformed packing to remaining fitting on boom lift cylinder.
(10) Start engine.
(11) Set WINCH/CRANE switch to CRANE position.
(12) Set hydraulic selector switch to CRANE/SRW position.
(13) Set crane POWER switch to ON position.
(14) Hook hoist block on ring and take out slack in cable to prevent boom from raising.
(15) Hold BOOM lever in UP position.
  (a) If more than 0 gpm (0 lpm) are measured, perform Steps (16) through (23) below and replace boom lift cylinder (Para 16-6) on LHS side of boom.
  (b) If 0 gpm (0 lpm) are measured, perform Steps (16) through (23) below and replace boom cylinder (Para 16-6) on cab side of boom.

Continued on next page.



17. BOOM CREEPS DOWN (CONT).

WARNING

- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

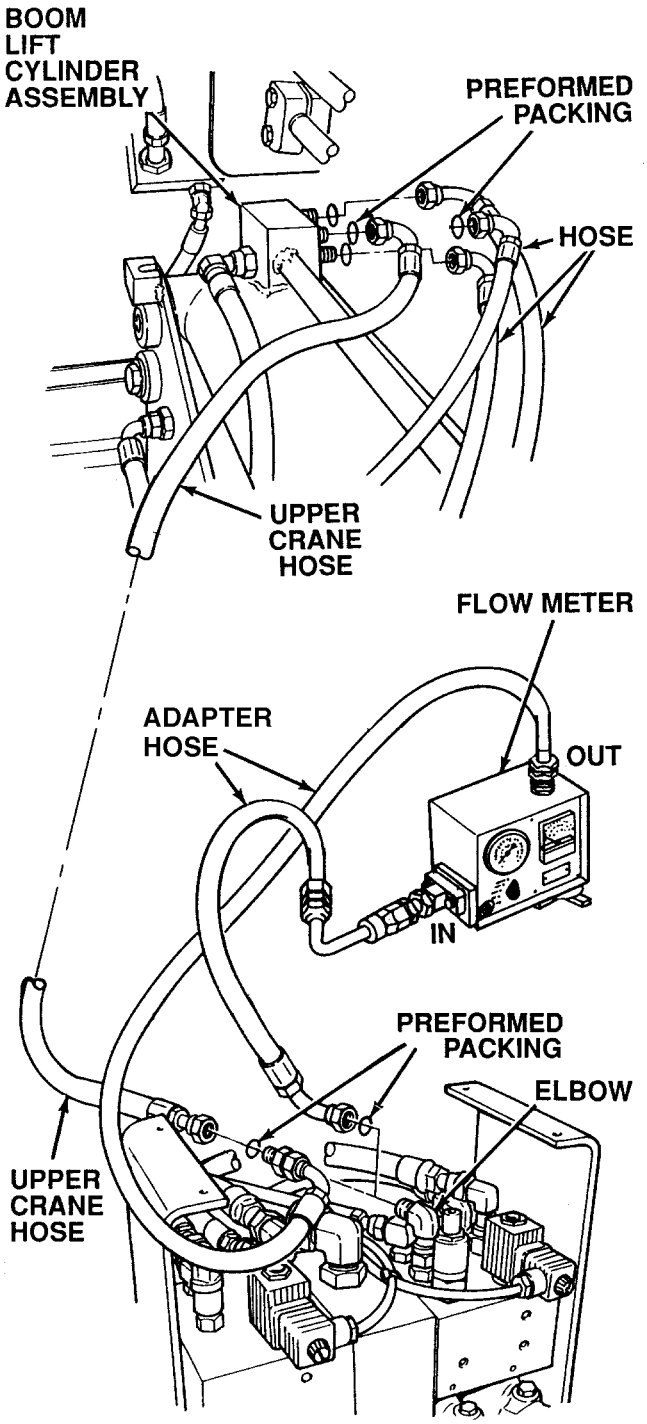
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST (CONT).

(16) Set crane POWER switch to OFF position.
(17) Set hydraulics selector switch to OFF position.
(18) Turn OFF ENGINE switch.
(19) Disconnect adapter hose and two caps from cylinder. Discard preformed packing.
(20) Remove three plugs from hoses. Discard preformed packings.

Continued on next page.



WARNING

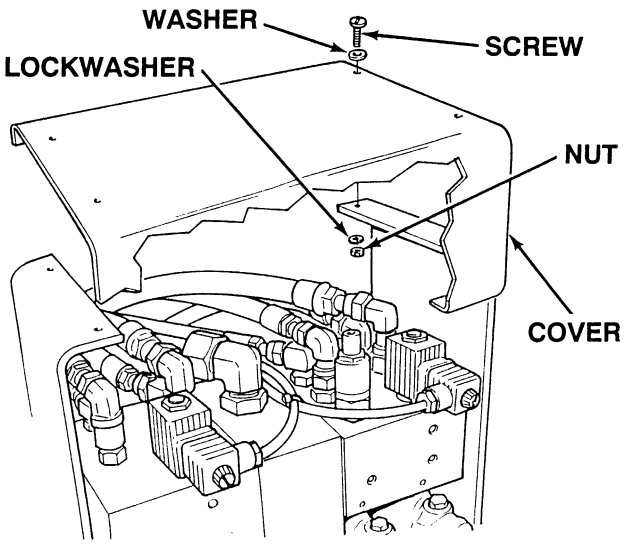
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

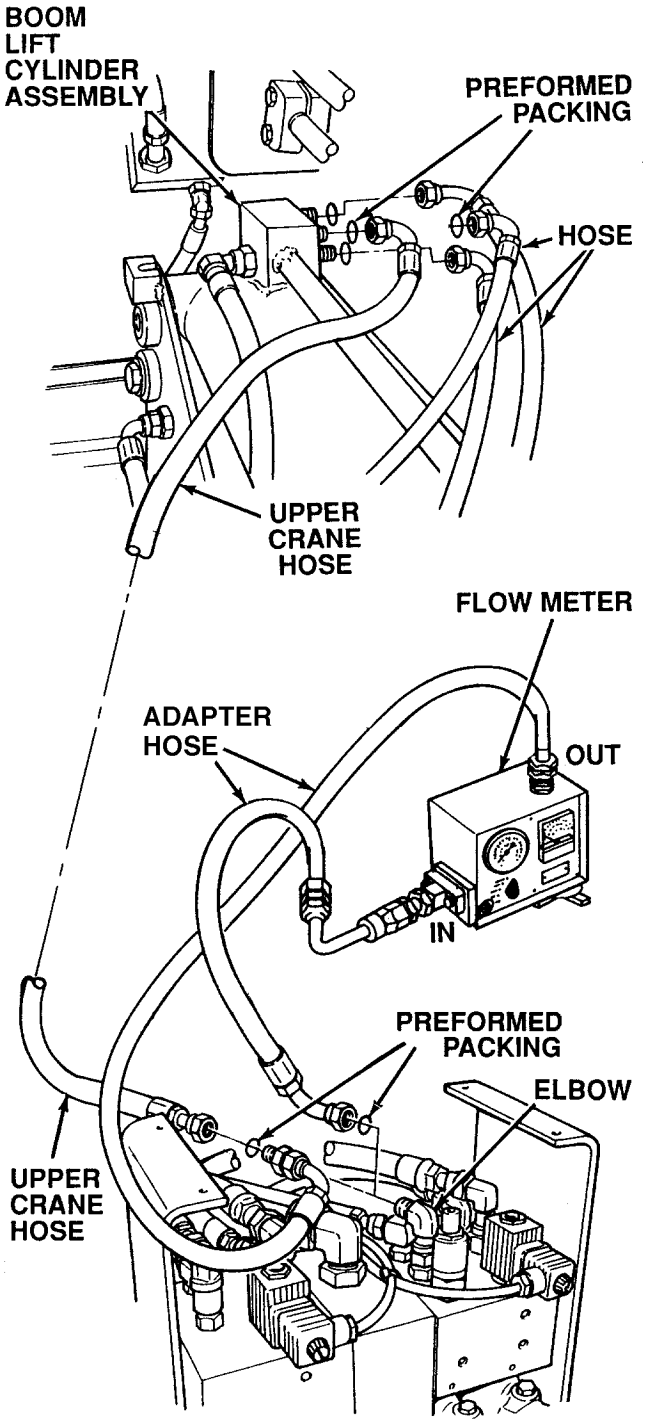
NOTE

Use a drain pan to catch leaking hydraulic oil.

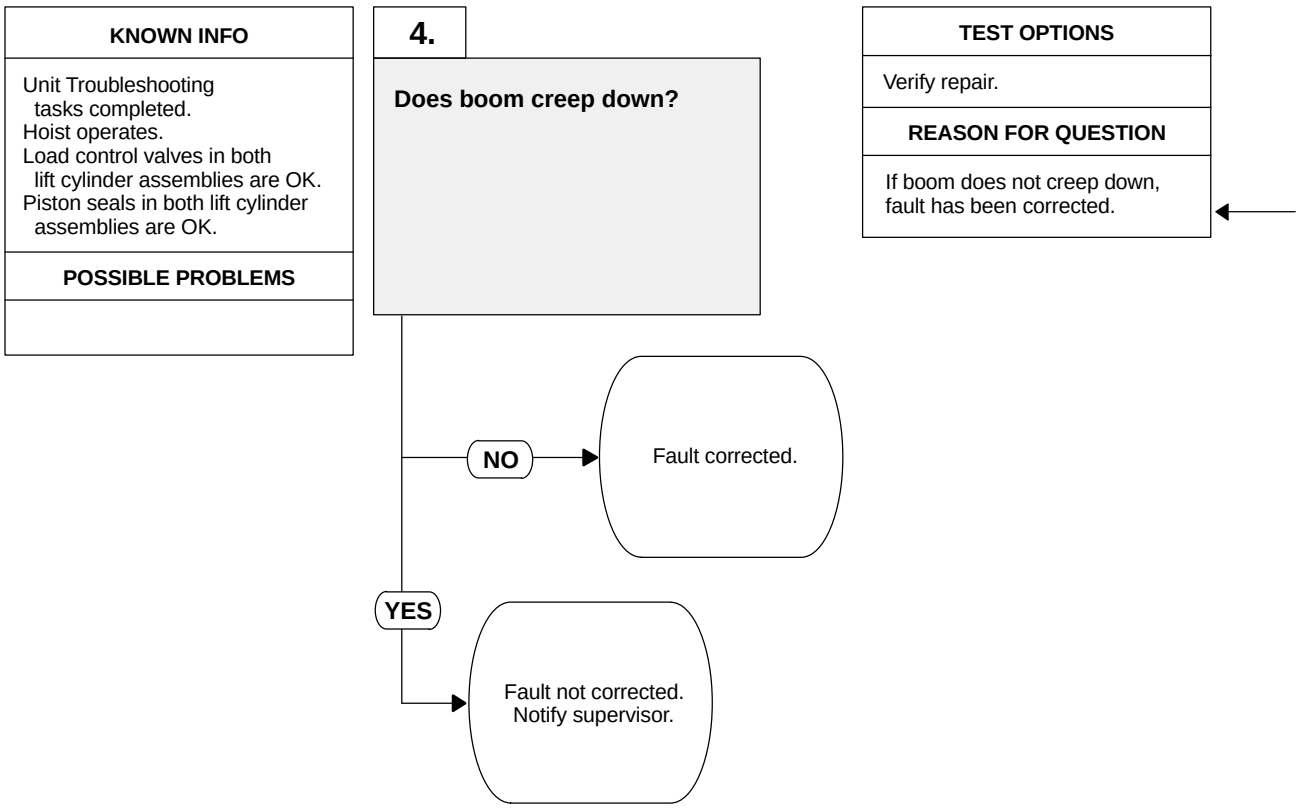
FLOWMETER TEST (CONT).

(21) Connect three hoses with preformed packings to boom lift cylinder.
(22) Disconnect adapter hoses from elbow and crane hose. Discard preformed packings.
(22) Connect crane hose with preformed packing to elbow.
(23) Install cover with four screws, washers, lockwashers and nuts.



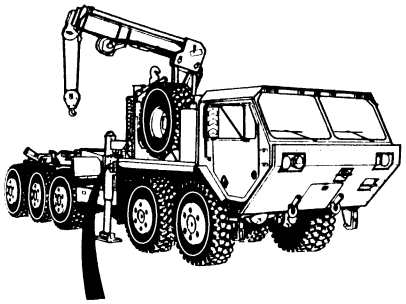


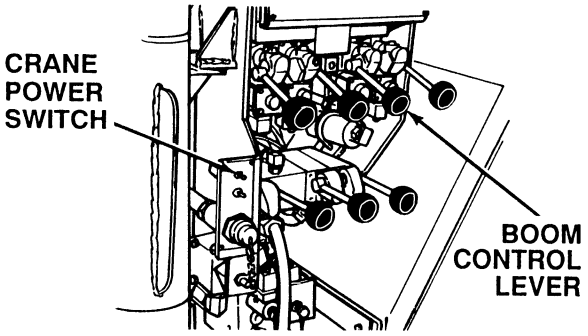
17. BOOM CREEPS DOWN (CONT).

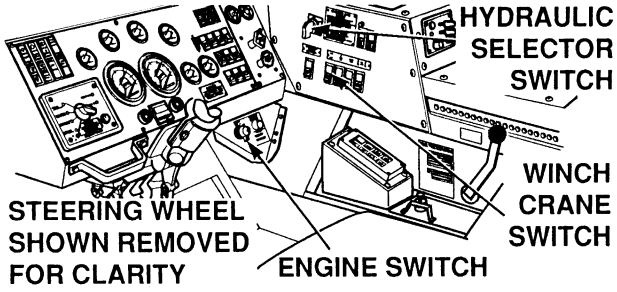


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Set WINCH/CRANE switch to CRANE position.
(4) Set hydraulic selector switch to CRANE/SRW position.
(5) Raise boom using BOOM control lever.
(6) Set crane POWER switch to OFF position.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.
    (a) If boom creeps down, fault not corrected. Notify supervisor.
    (b) If boom does not creep down, fault has been corrected.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

18. HOIST DOES NOT OPERATE OR OPERATES SLOWLY.

INITIAL SETUP

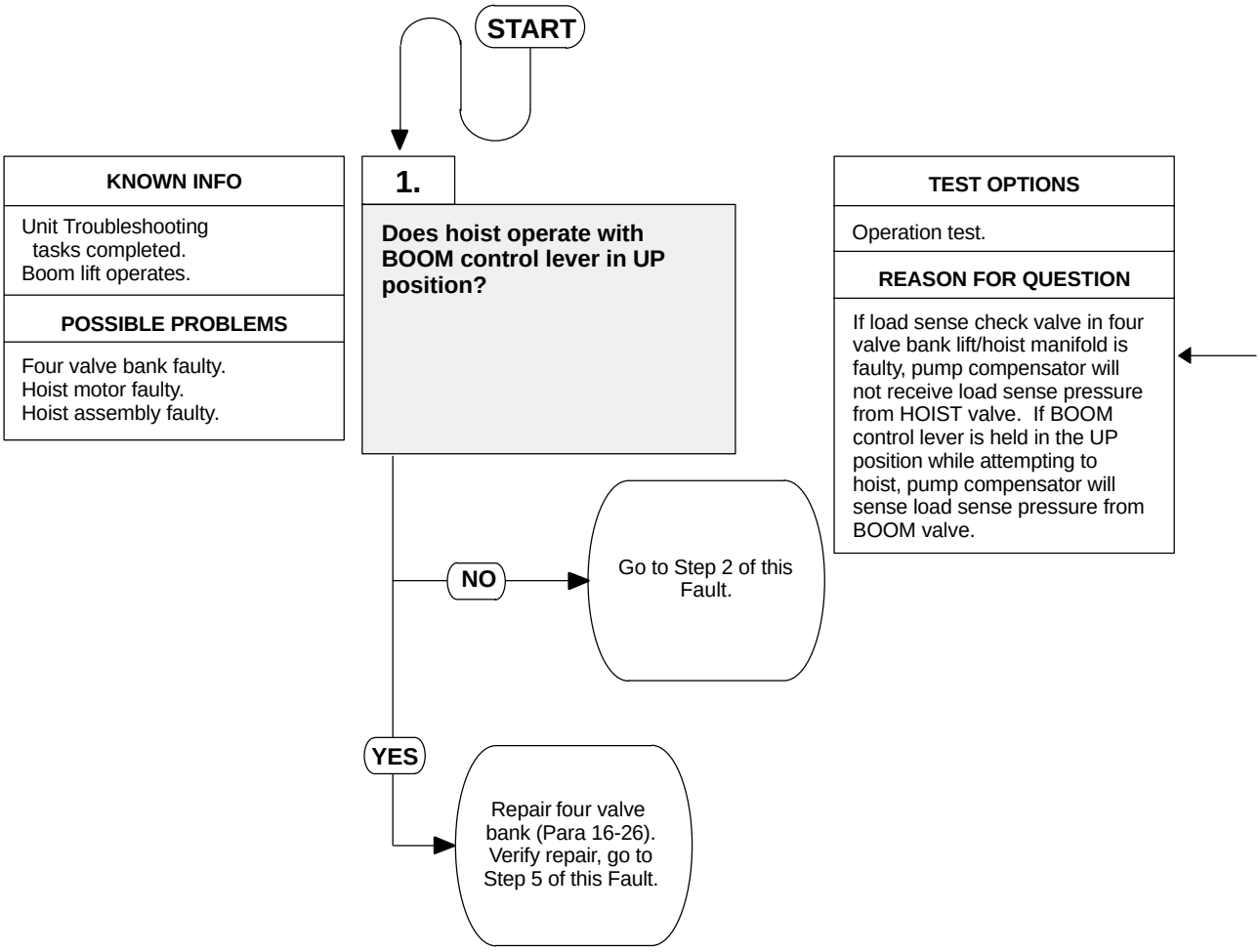
Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Cap and Plug Set (Item 26, Appendix F)
- Pan, Drain 4 gal (Item 144, Appendix F)
- Pressure Test Kit (Item 165, Appendix F)
- Wrench, Torque (0-175 lb-ft) (Item 277, Appendix F)
- Lifting Device (Minimum Capacity 200 lbs/91 kg)

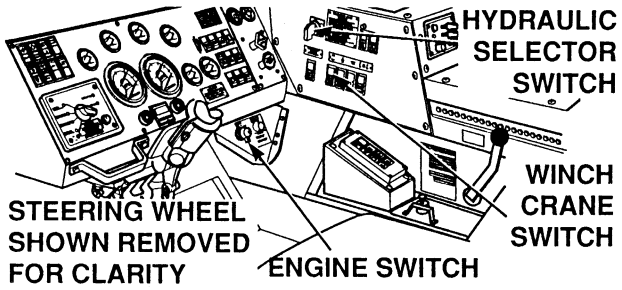
Materials/Parts
- Oil, Hydraulic (Item 34, Appendix B)
- Tags, Identification (Item 72, Appendix B)
- Gasket (Item 106, Appendix E)

Materials/Parts - Continued
- Lockwasher (4) (Item 282, Appendix E)
- Lockwasher (2) (Item 286, Appendix E)
- Packing, Preformed (2) (Item 337, Appendix E)
- Packing, Preformed (2) (Item 345, Appendix E)

References
- TM 9-2320-364-10
- TM 9-2320-364-20

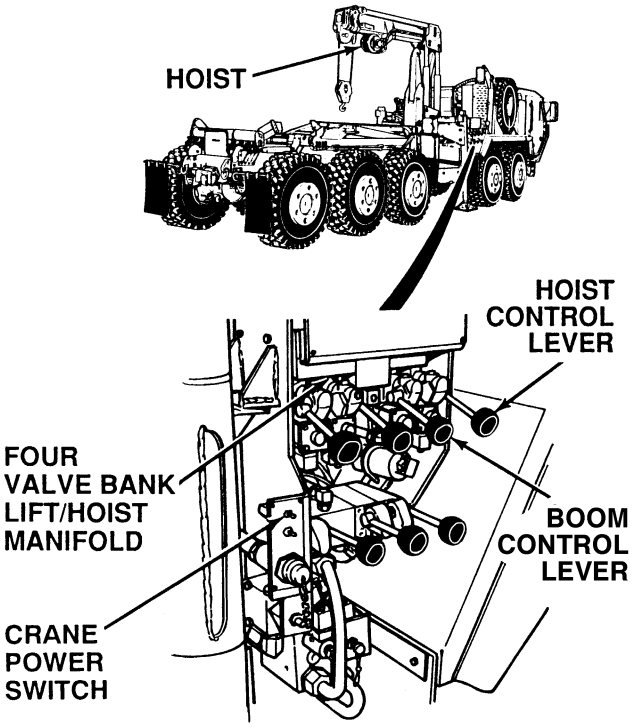
Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



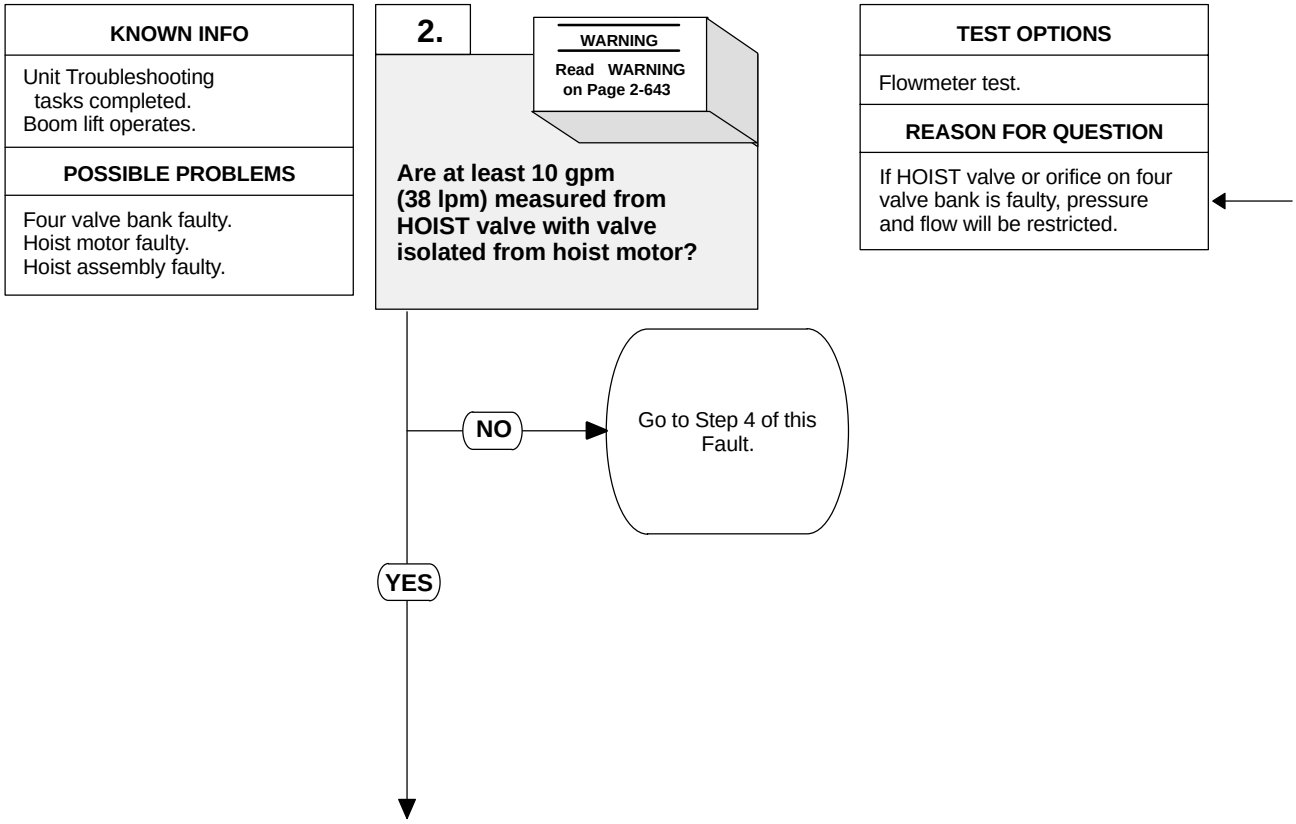


OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Set crane POWER switch to ON position.
(5) Attempt to operate hoist while holding BOOM control lever in UP position.
  (a) If hoist does not operate, perform Steps (6) through (8) below and go to Step 2 of this Fault.
  (b) If hoist operates, perform Steps (6) through (8) below and repair check valve in four valve bank lift/hoist manifold (Para 16-26).
(6) Set crane POWER switch to OFF position.
(7) Set hydraulic selector switch to OFF position.
(8) Turn OFF ENGINE switch.



18. HOIST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

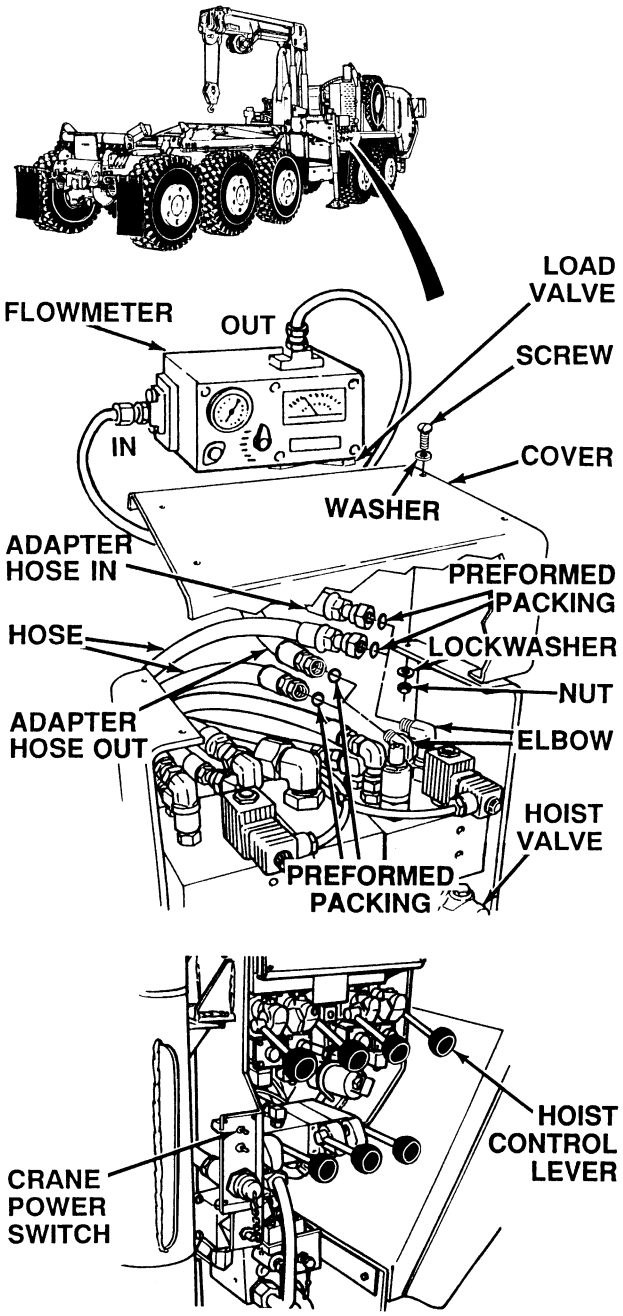
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

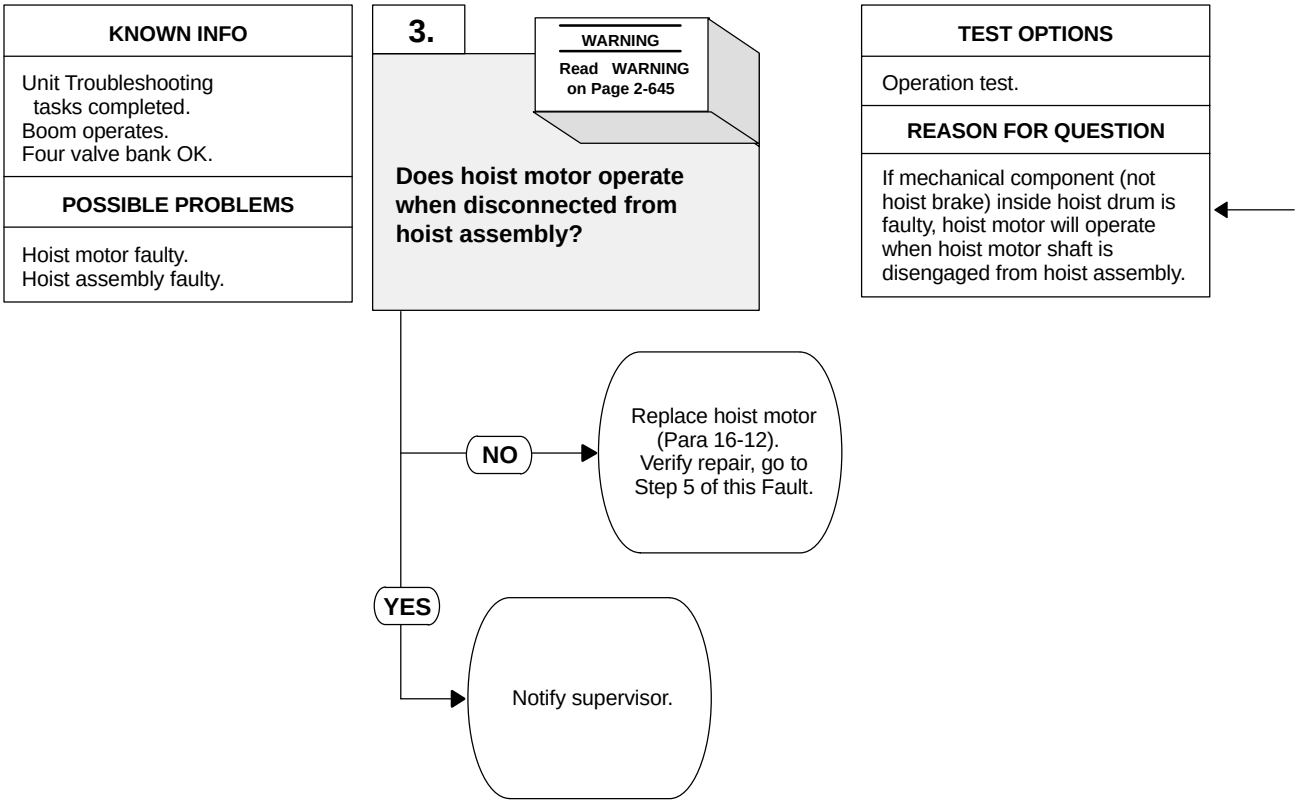
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above HOIST valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(4) Connect adapter hose to flowmeter OUT port.
(5) Connect adapter hose with preformed packing to outboard (taller) elbow.
(6) Connect adapter hose to flowmeter IN port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold HOIST control lever in UP position and observe flowmeter.
  (a) If 10 gpm (38 lpm) or more are not present, perform Steps (13) through (17) below and go to Step 4 of this Fault.
  (b) If 10 gpm (38 lpm) or more are present, perform Steps (13) through (17) below and go to Step 3 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows. Discard preformed packings.
(17) Connect two hoses with preformed packings to elbows.



18. HOIST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

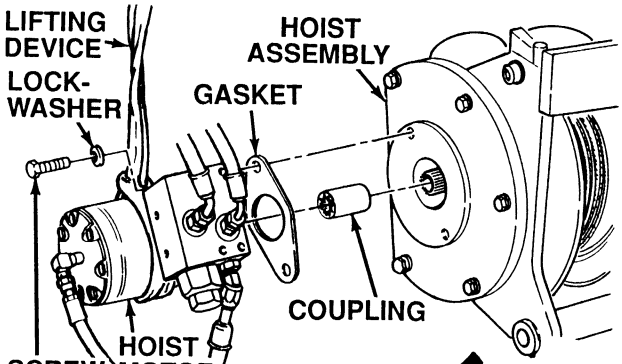


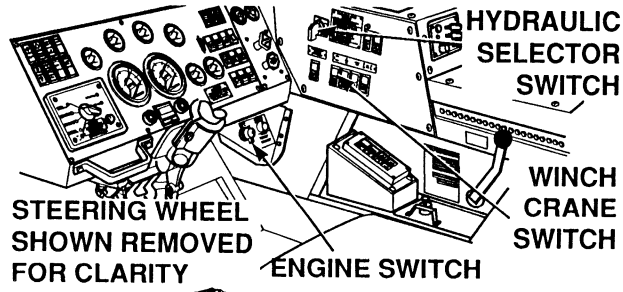
WARNING

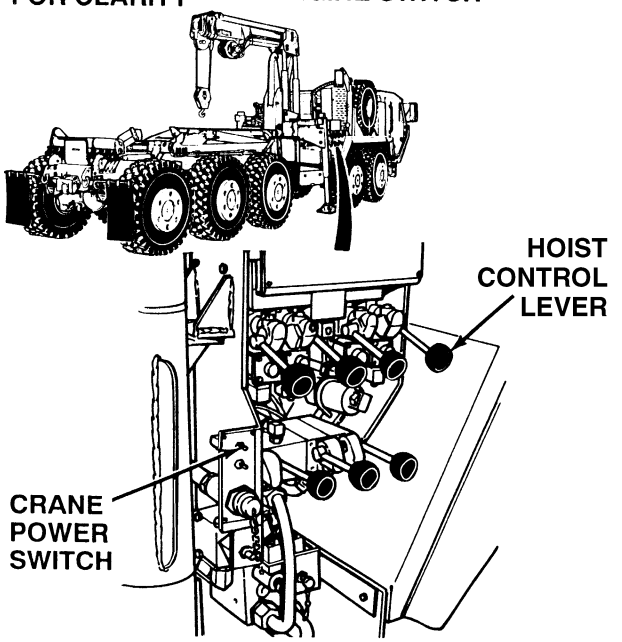
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

OPERATION TEST

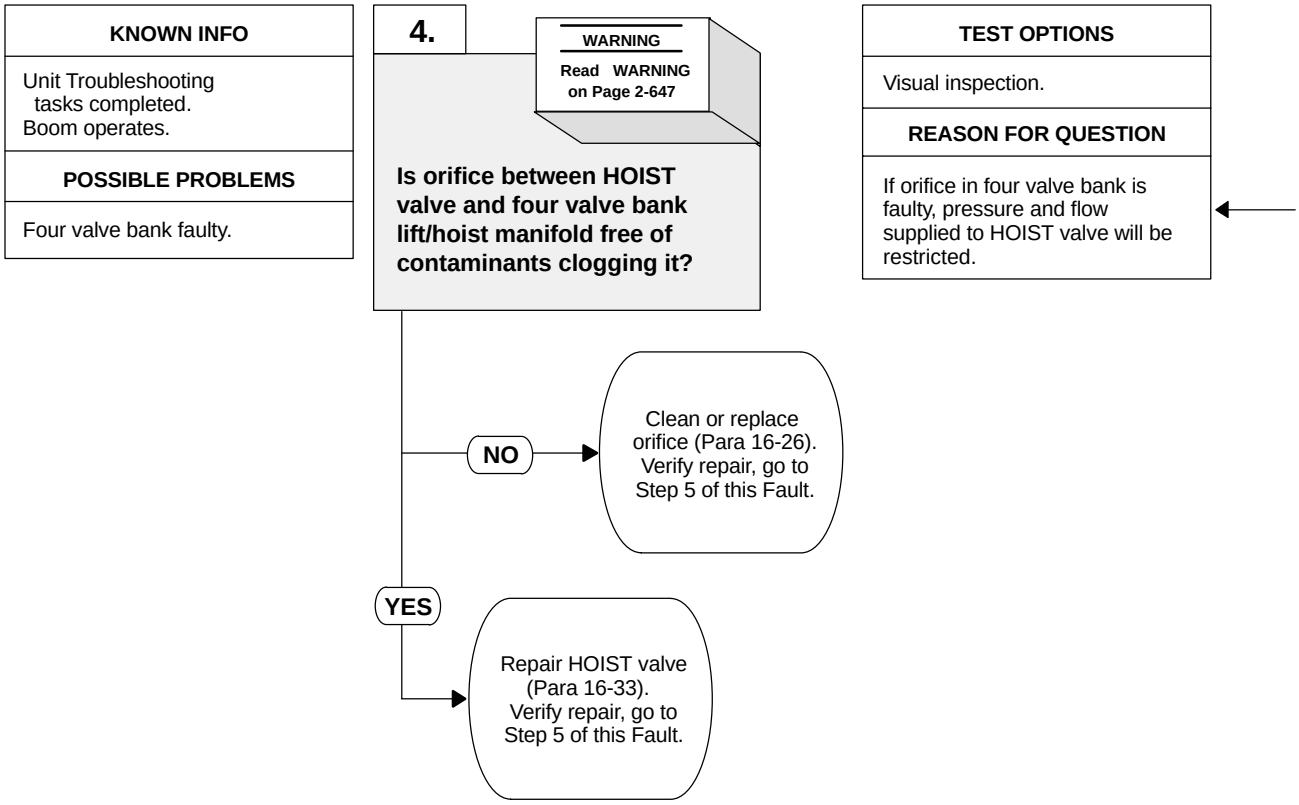
(1) Attach lifting device to hoist motor.
(2) Remove two screws, lockwashers and hoist motor from hoist assembly. Discard lockwashers.
(3) Remove gasket and coupler from hoist assembly. Discard gasket.
(4) Start engine (TM 9-2320-364-10).
(5) Set WINCH/CRANE switch to CRANE position.
(6) Set hydraulic selector switch to CRANE/SRW position.
(7) Set crane POWER switch to ON position.
(8) Hold HOIST control lever in UP position.
  (a) If hoist motor does not operate, perform Steps (9) through (13) below and replace hoist motor (Para 16-12).
  (b) If hoist motor does operate, hoist assembly (not hoist brake) is faulty. Perform Steps (9) through (13) below and notify supervisor.
(9) Set crane POWER switch to OFF position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Install gasket and coupler on hoist assembly.
(13) Install hoist motor on hoist assembly with two screws and lockwashers. Tighten screws to 75 lb-ft (102 N·m).







18. HOIST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).



WARNING

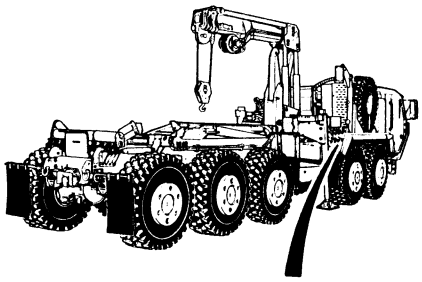
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

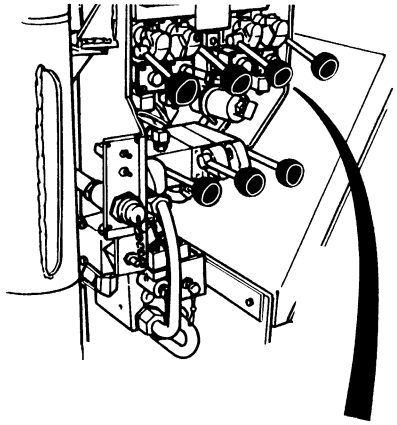
NOTE

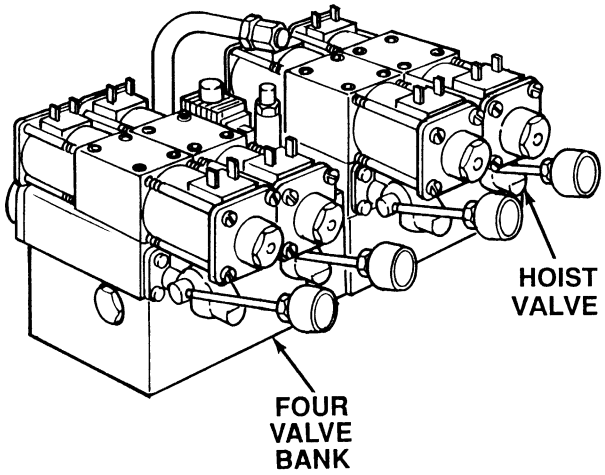
Use a drain pan to catch leaking hydraulic oil.

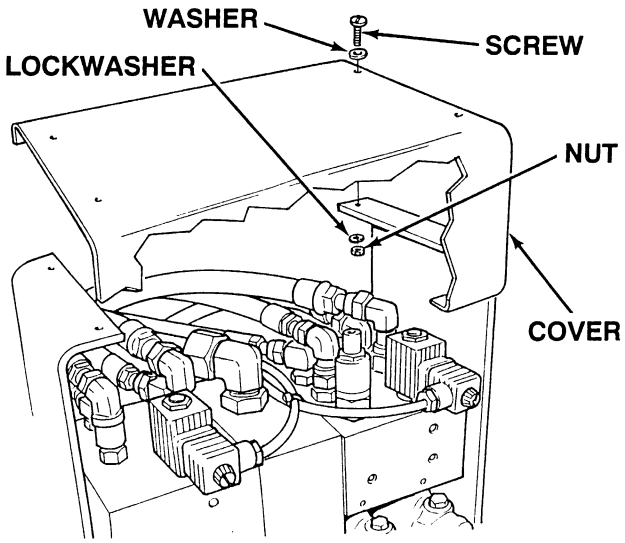
VISUAL INSPECTION

(1) Remove four valve bank from crane (Para 16-26).
(2) Remove HOIST valve from four valve bank (Para 16-26).
(3) Remove orifice from four valve bank where HOIST valve was removed from (Para 16-26).
(4) Inspect orifice for contamination clogging it.
  (a) If orifice is contaminated, clean or replace orifice and inspect bores in HOIST valve for additional contaminants (Para 16-26).
  (b) If orifice is OK, repair HOIST valve on four valve bank (Para 16-26).
(5) Install orifice on four valve bank (Para 16-26).
(6) Install HOIST valve on four valve bank (Para 16-26).
(7) Install four valve bank on crane (Para 16-26).
(8) Install cover with four screws, washers, lockwashers, and nuts.

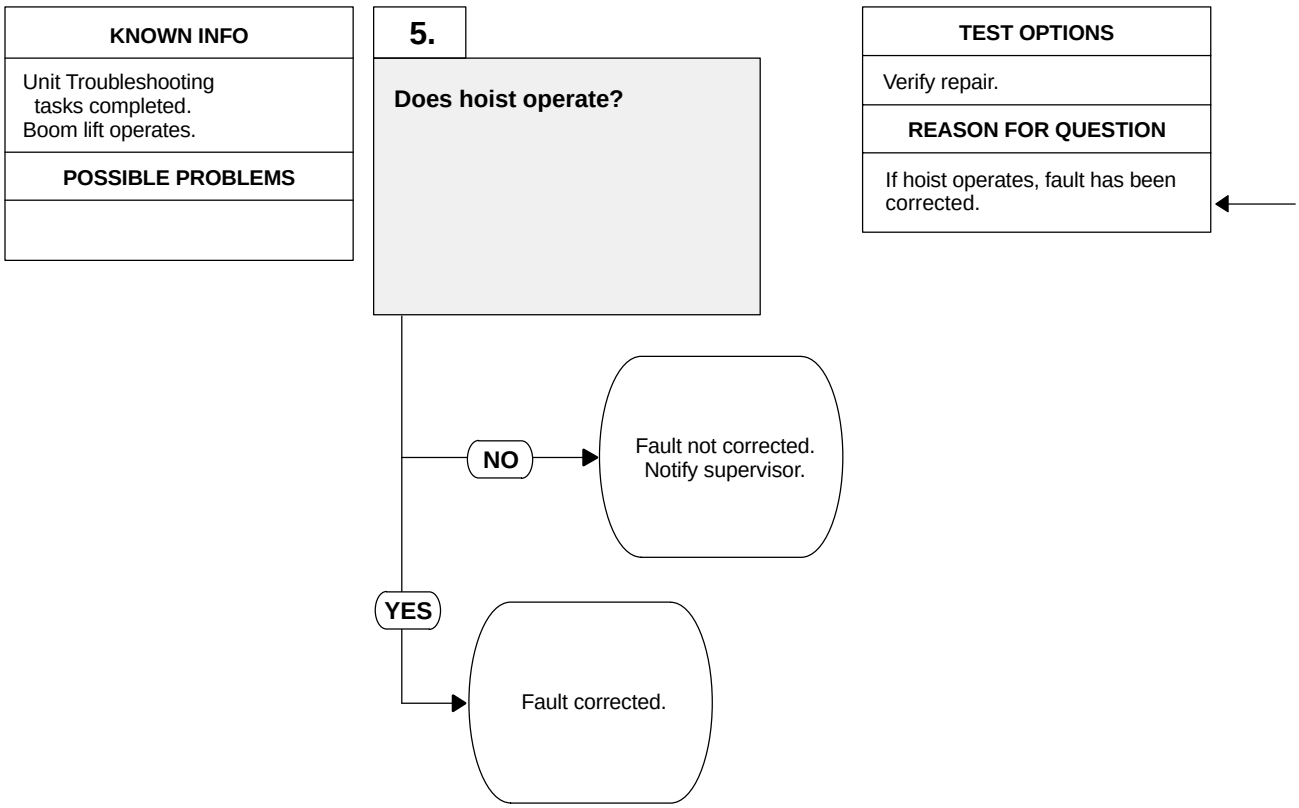






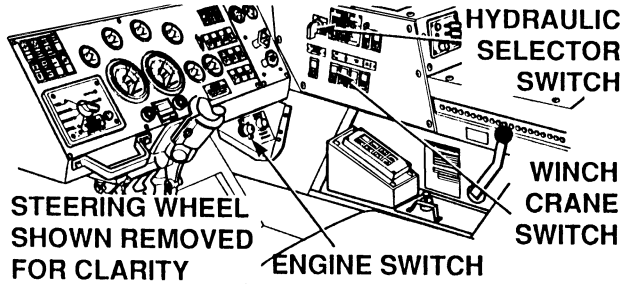


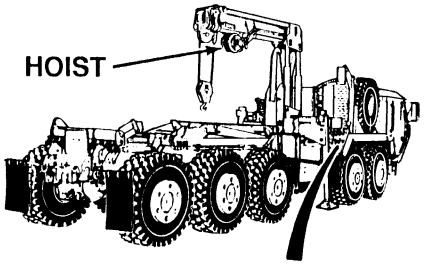
18. HOIST DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

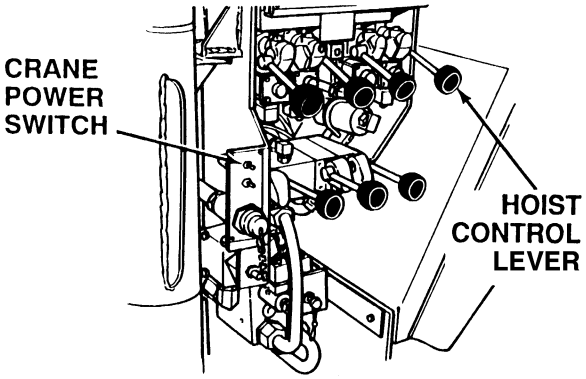


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Start engine (TM 9-2320-364-10).
(3) Set WINCH/CRANE switch to CRANE position.
(4) Set hydraulic selector switch to CRANE/SRW position.
(5) Set crane POWER switch to ON position.
(6) Operate hoist using HOIST control lever.
    (a) If hoist does not operate, fault not corrected. Perform Steps (7) through (9) below and notify supervisor.
    (b) If hoist operates, fault has been corrected.
(7) Set crane POWER switch to OFF position.
(8) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

19. HOIST DOES NOT LOWER.

INITIAL SETUP

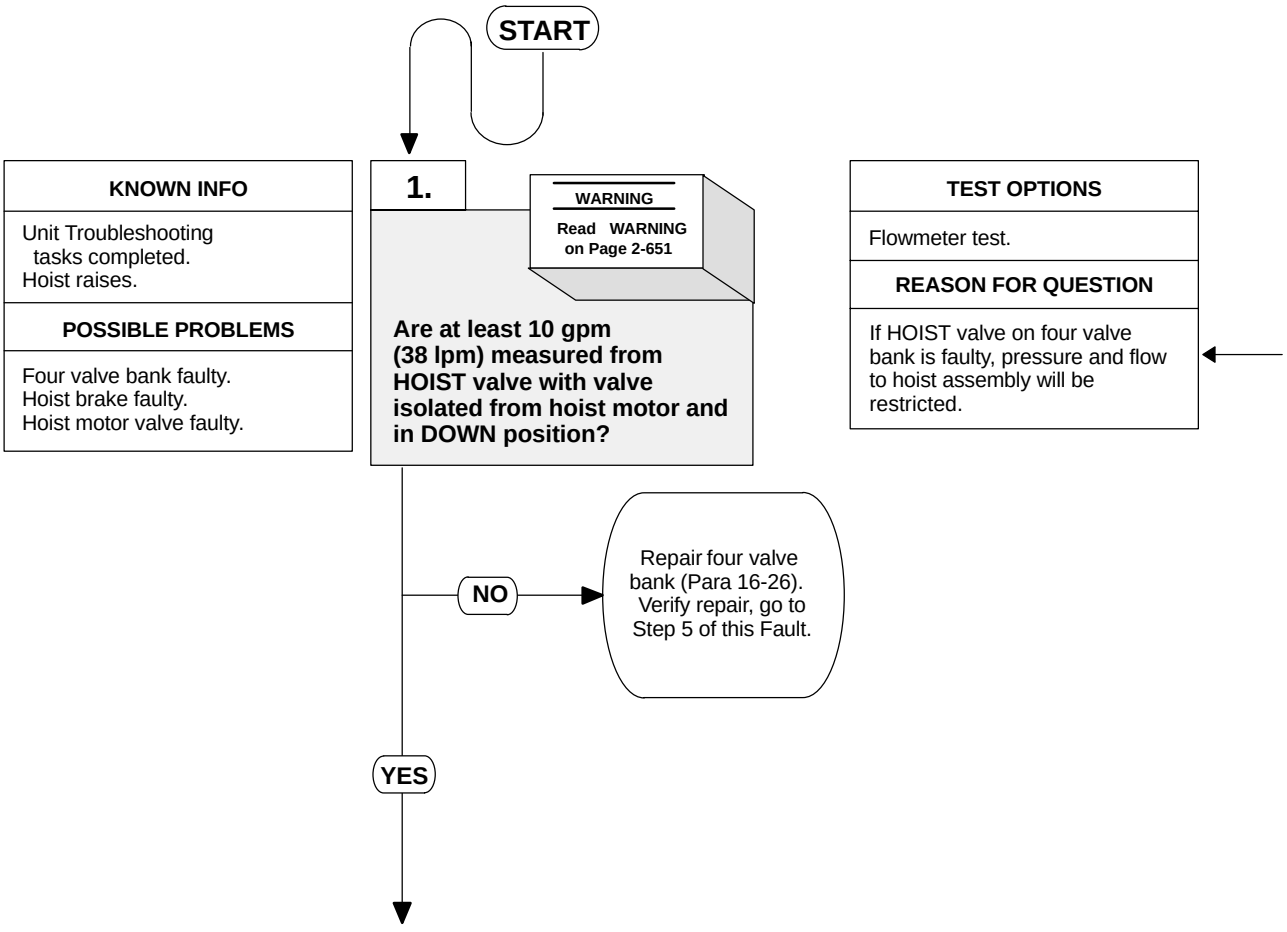
Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Cap and Plug Set (Item 26, Appendix F)
- Pan, Drain 4 gal (Item 144, Appendix F)
- Pressure Test Kit (Item 165, Appendix F)
- Wrench, Torque (0-175 lb-ft) (Item 277, Appendix F)
- Lifting Device (Minimum Capacity 200 lbs/91 kg)

Materials/Parts
- Oil, Hydraulic (Item 34, Appendix B)
- Sealing Compound (Item 53, Appendix B)
- Tags, Identification (Item 72, Appendix B)
- Gasket (Item 106, Appendix E)
- Kit, Repair (Item 153, Appendix E)
- Lockwasher (4) (Item 282, Appendix E)

Materials/Parts - Continued
- Lockwasher (2) (Item 286, Appendix E)
- Packing, Preformed (Item 336, Appendix E)
- Packing, Preformed (2) (Item 337, Appendix E)
- Packing, Preformed (2) (Item 343, Appendix E)
- Packing, Preformed (2) (Item 345, Appendix E)
- Packing, Preformed (2) (Item 348, Appendix E)
- Packing, Preformed (Item 383, Appendix E)

References
- TM 9-2320-364-10
- TM 9-2320-364-20

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)



WARNING

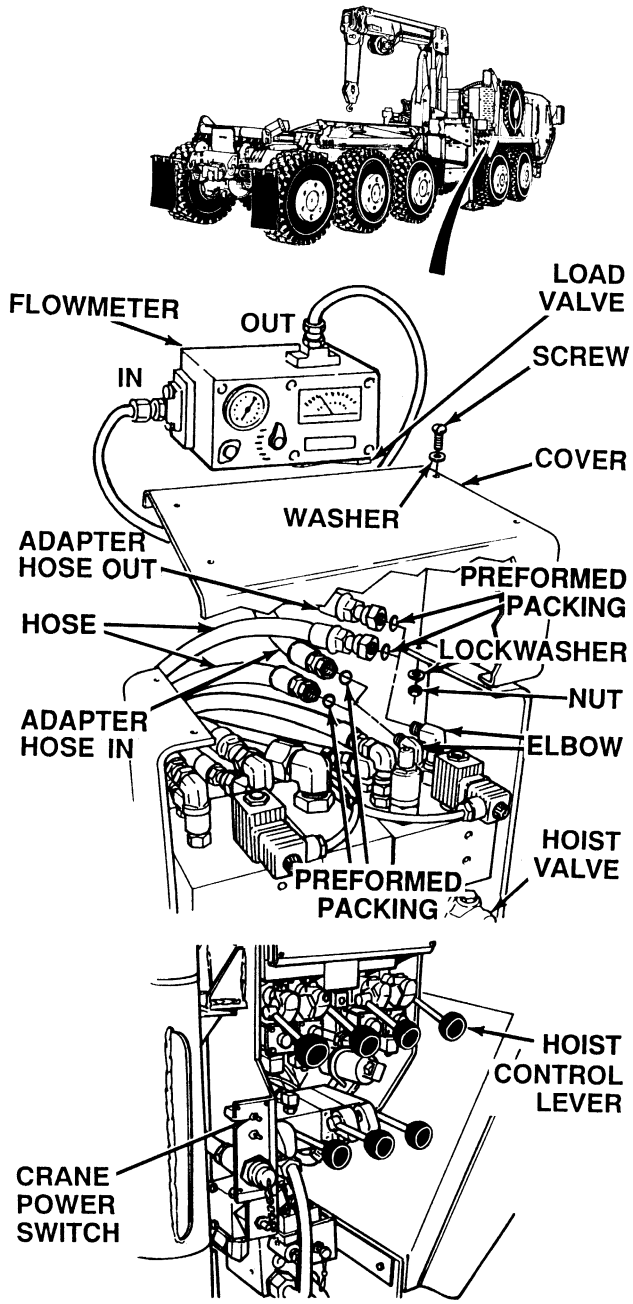
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

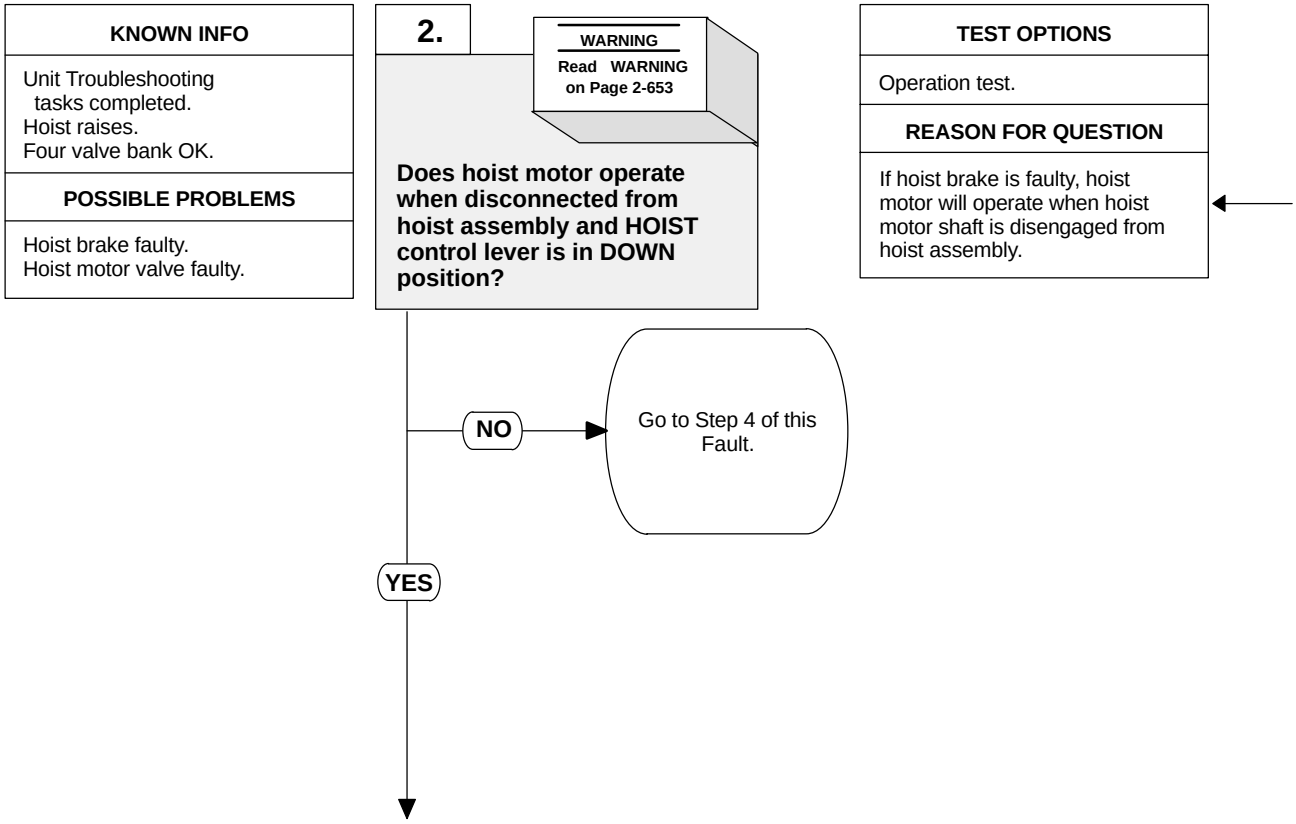
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above HOIST valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(4) Connect adapter hose to flowmeter IN port.
(5) Connect adapter hose with preformed packing to outboard (taller) elbow.
(6) Connect adapter hose to flowmeter OUT port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold HOIST control lever in DOWN position and observe flowmeter.
  (a) If 10 gpm (38 lpm) or more are not present, perform Steps (13) through (17) below and replace HOIST valve on four valve bank (Para 16-26).
  (b) If at least 10 gpm (38 lpm) are present, perform Steps (13) through (17) below and go to Step 2 of this Fault.
(13) Set crane POWER switch to OFF position
(14) Set hydraulic selector switch to OFF position
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows. Discard preformed packings.
(17) Connect two hoses with preformed packings to elbows.
(18) Install cover with four screws, washers, lockwashers and nuts.



19. HOIST DOES NOT LOWER (CONT).

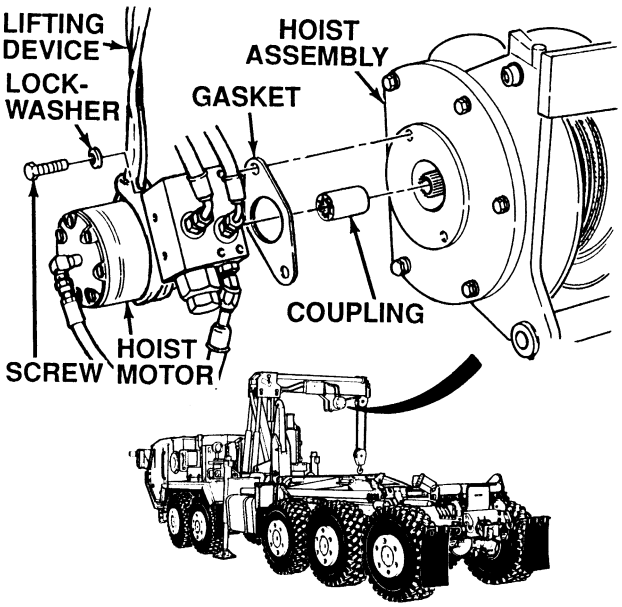


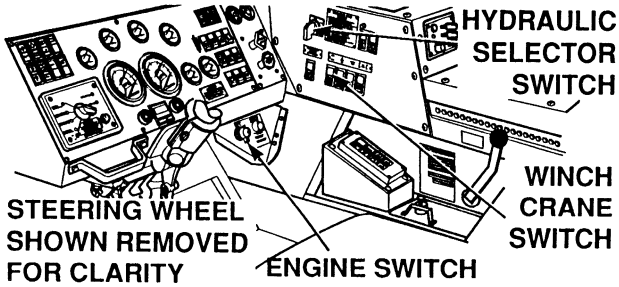
WARNING

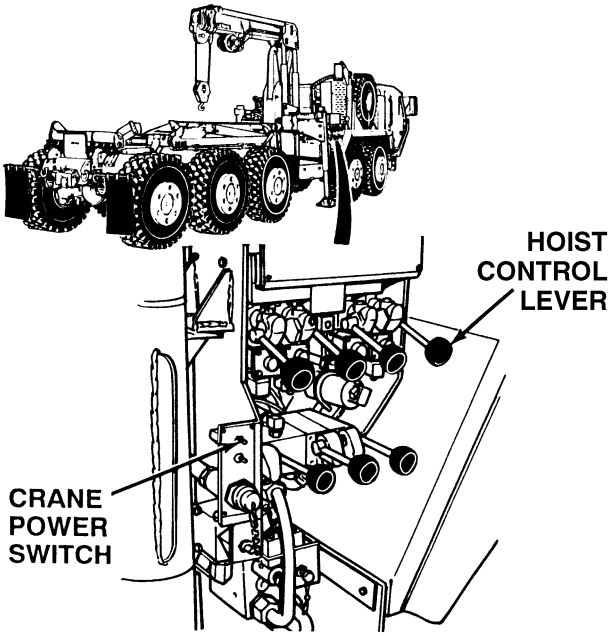
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

OPERATION TEST

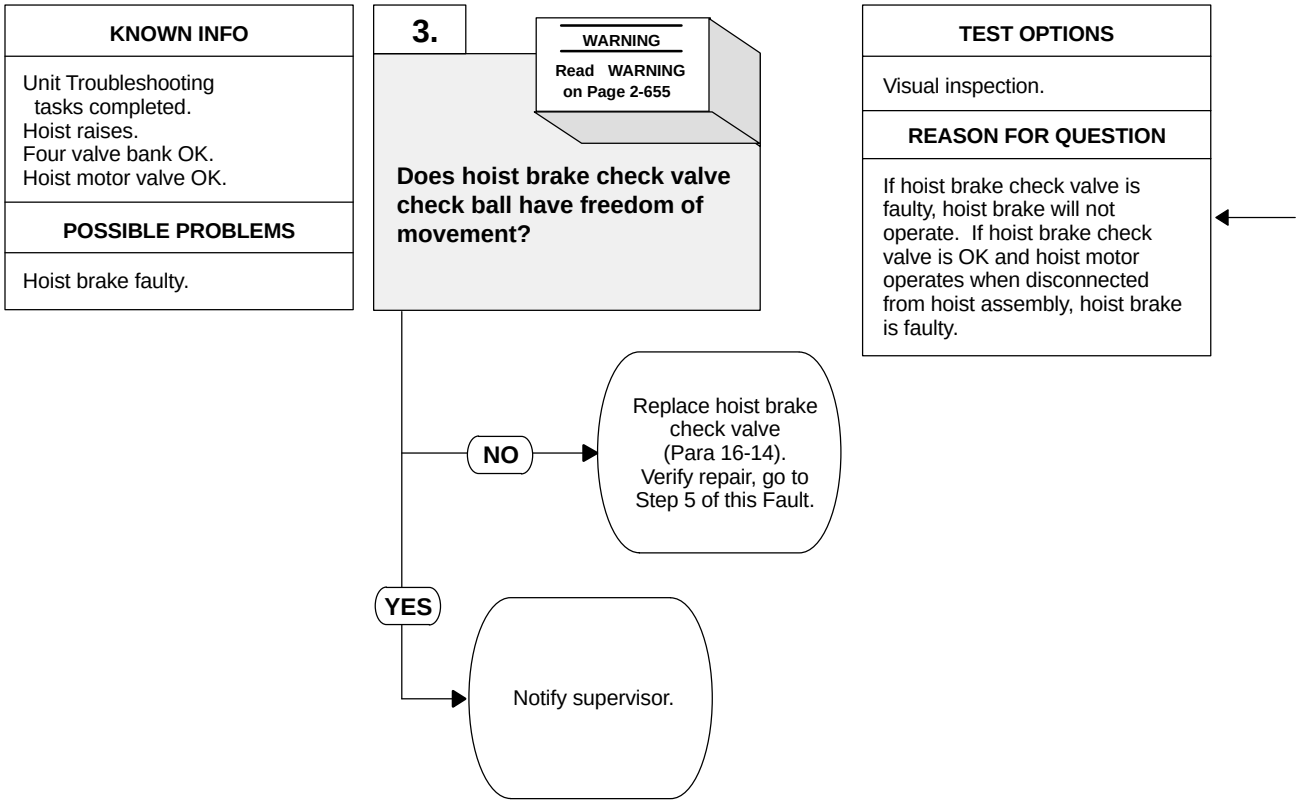
(1) Attach lifting device to hoist motor.
(2) Remove two screws, lockwashers and hoist motor from hoist assembly. Discard lockwashers.
(3) Remove gasket and coupler from hoist assembly. Discard gasket.
(4) Start engine (TM 9-2320-364-10).
(5) Set WINCH/CRANE switch to CRANE position.
(6) Set hydraulic selector switch to CRANE/SRW position.
(7) Set crane POWER switch to ON position.
(8) Hold HOIST control lever in DOWN position.
    (a) If hoist motor does not operate, perform Steps (9) through (13) below and go to Step 4 of this Fault.
    (b) If hoist motor does operate, perform Steps (9) through (13) below and go to Step 3 of this Fault.
(9) Set crane POWER switch to OFF position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Install gasket and coupler on hoist assembly.
(13) Install hoist motor on hoist assembly with two screws and lockwashers. Tighten screws to 75 lb-ft (102 N·m).







19. HOIST DOES NOT LOWER (CONT).



WARNING

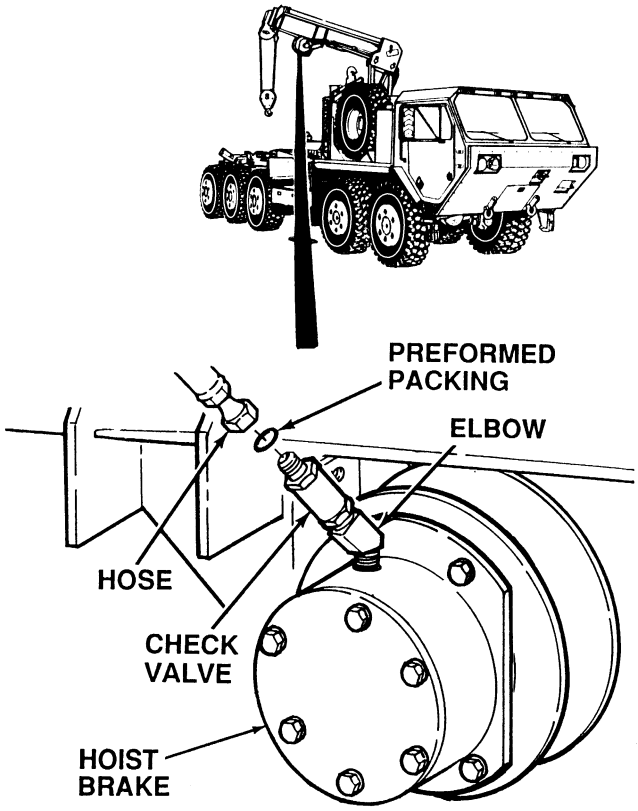
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

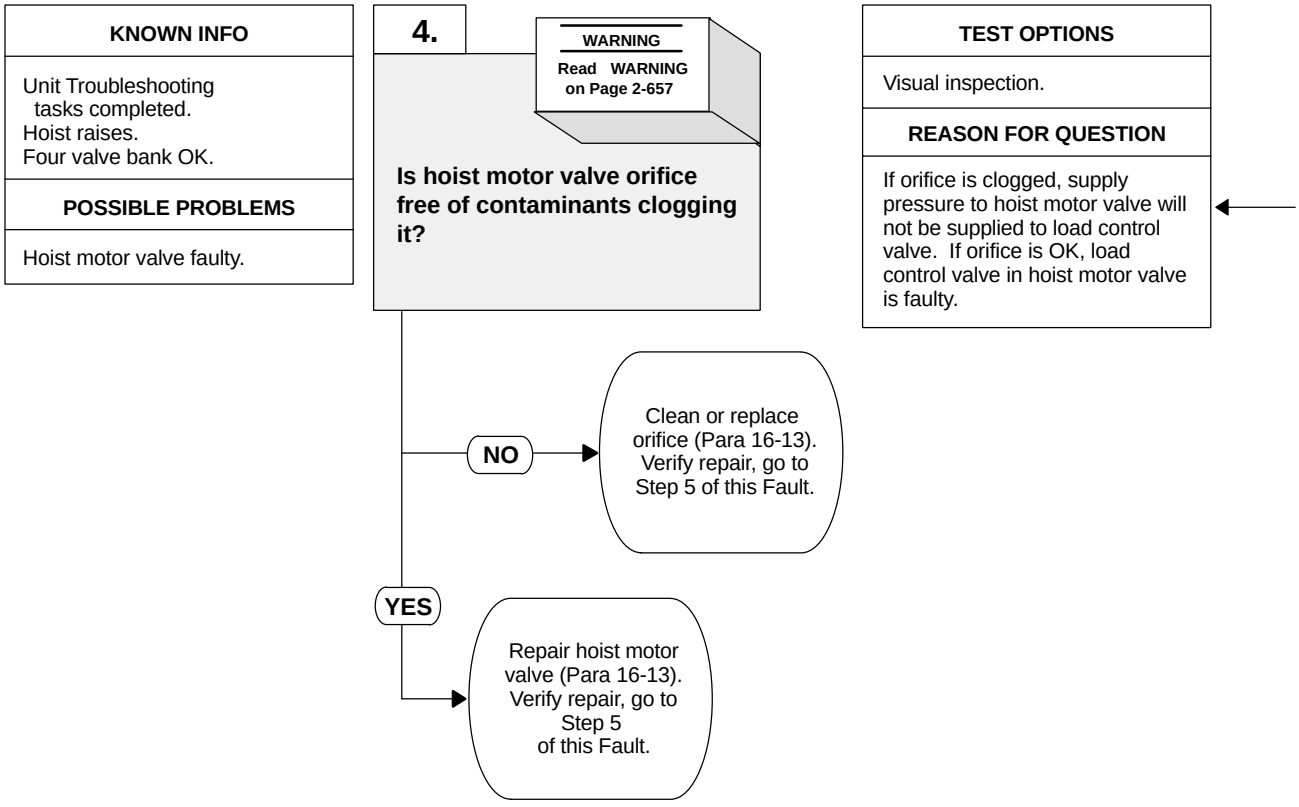
Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Disconnect hose from hoist brake check valve. Discard preformed packing.
(2) Remove check valve from hoist brake elbow.
(3) Using a non metallic rod, push on check ball inside check valve.
  (a) If check valve check ball is stuck open, check valve is faulty. Replace hoist brake check valve (Para 16-14).
  (b) If check valve check ball has freedom of movement inside check valve, hoist brake is faulty. Perform Steps (4) through (7) below and notify supervisor.
(4) Coat check valve threads that will be installed into hoist brake elbow with pipe sealant.
(5) Install check valve on hoist brake elbow.
(6) Coat preformed packing with oil.
(7) Install hose with preformed packing on hoist brake check valve.



19. HOIST DOES NOT LOWER (CONT).



WARNING

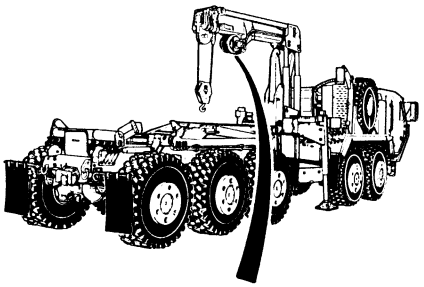
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

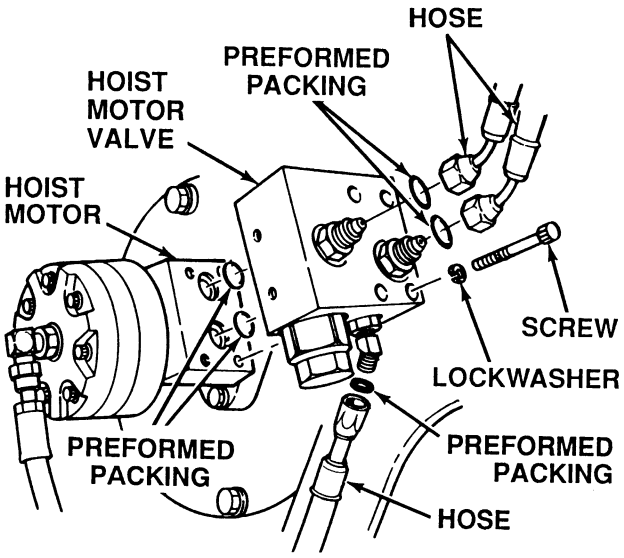
NOTE

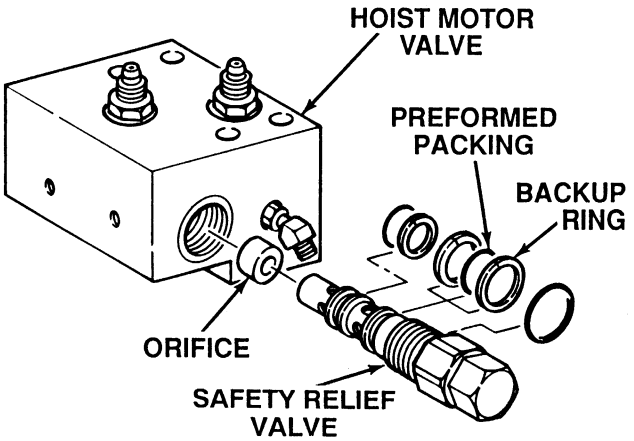
Use a drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

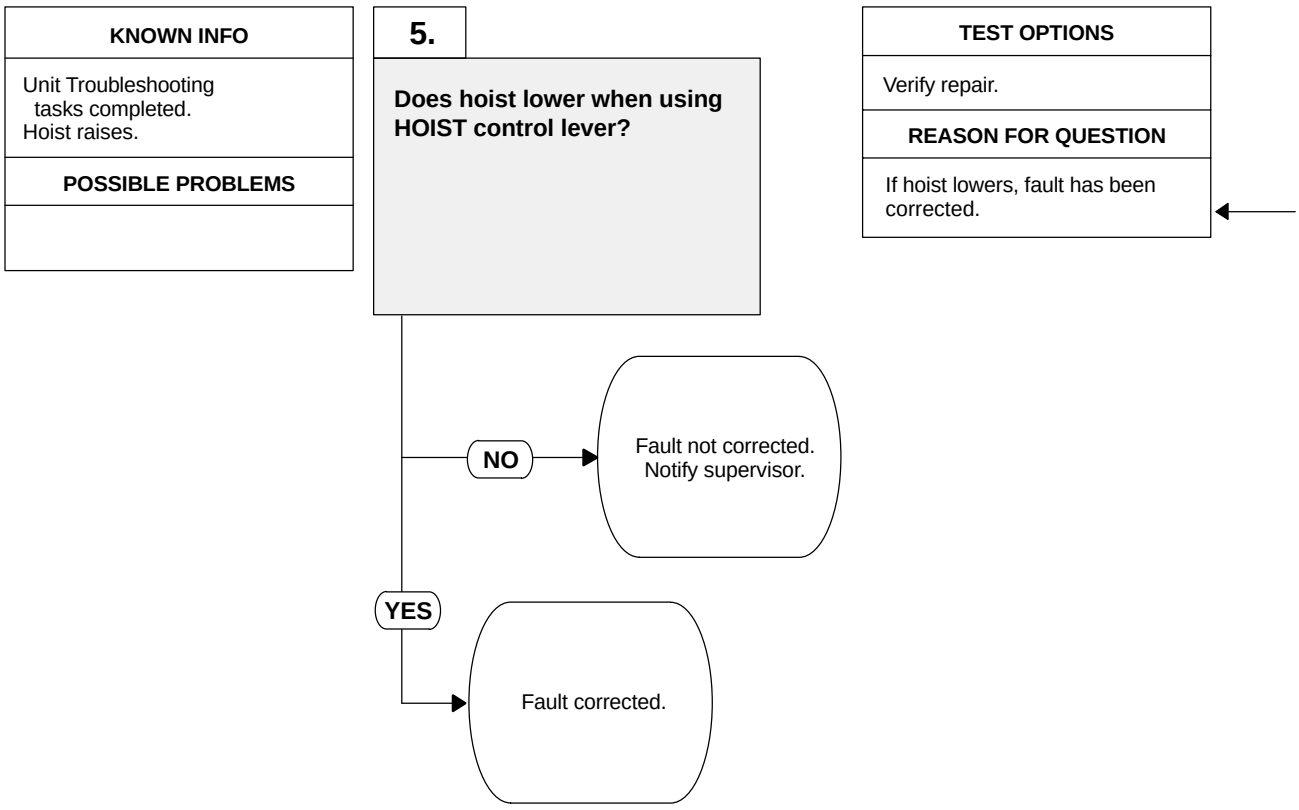
(1) Tag, mark and disconnect three hoses from hoist motor valve. Discard preformed packings.
(2) Remove four screws, lockwashers, hoist motor valve and two preformed packings from hoist motor. Discard preformed packings and lockwashers.
(3) Remove safety relief (holding) valve, three preformed packings, backup rings and orifice from hoist motor valve. Discard three preformed packings and backup rings.
  (a) If orifice is clogged with contaminants, clean or replace orifice (Para 16-13) and perform Steps (4) through (7) below.
  (b) If orifice is OK, safety relief valve is faulty. Replace safety relief valve in hoist motor valve (Para 16-13) and perform Steps (4) through (7) below.
(4) Install preformed packing, backup ring, preformed packing, two backup rings and preformed packing on safety relief valve.
(5) Install orifice and safety relief valve in hoist motor valve.
(6) Install hoist motor valve with two preformed packings and four screws and lockwashers.
(7) Install three hoses with preformed packings on hoist motor valve.





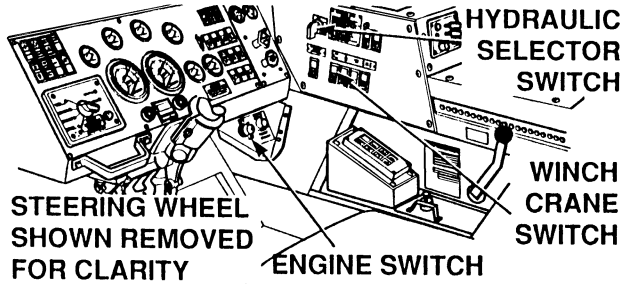


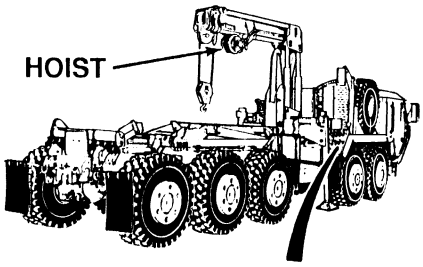
19. HOIST DOES NOT LOWER (CONT).

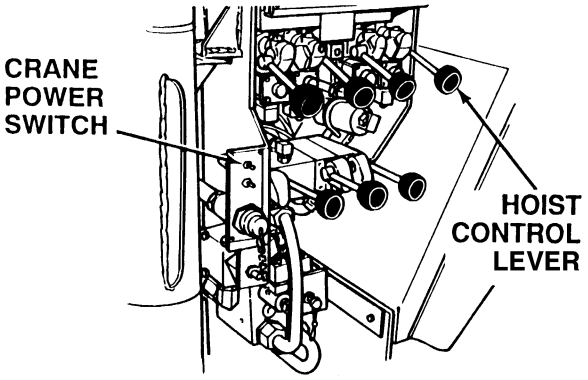


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Operate hoist using HOIST control lever (TM 9-2320-364-10).
  (a) If hoist does not lower, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
  (b) If hoist lowers, fault has been corrected.
(3) Turn OFF crane POWER switch.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

20. HOIST DOES NOT RAISE.

INITIAL SETUP

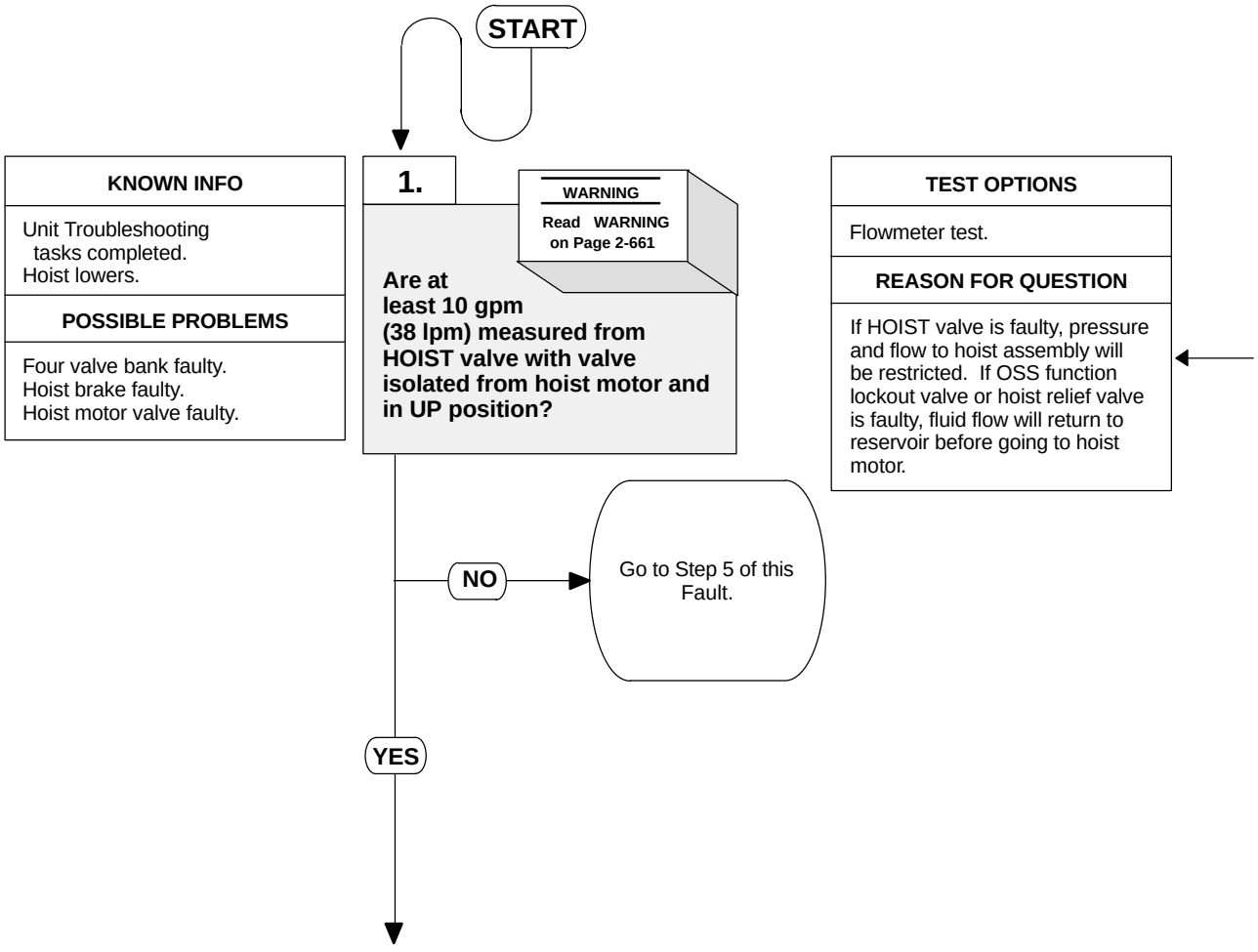
Tools and Special Tools
- Tool Kit, General Mechanic's (Item 240, Appendix F)
- Cap and Plug Set (Item 26, Appendix F)
- Pan, Drain 4 gal (Item 144, Appendix F)
- Pressure Test Kit (Item 165, Appendix F)
- Wrench, Torque (0-175 lb-ft) (Item 277, Appendix F)
- Lifting Device (Minimum Capacity 200 lbs/91 kg)

Materials/Parts
- Oil, Hydraulic (Item 34, Appendix B)
- Tag, Identification (Item 72, Appendix B)
- Gasket (Item 106, Appendix E)

Materials/Parts- Continued
- Lockwasher (4) (Item 282, Appendix E)
- Lockwasher (2) (Item 286, Appendix E)
- Packing, Preformed (2) (Item 337, Appendix E)
- Packing, Preformed (2) (Item 345, Appendix E)
- Packing, Preformed (2) (Item 363, Appendix E)

References
- TM 9-2320-364-10
- TM 9-2320-364-20

Equipment Condition
- Engine OFF, (TM 9-2320-364-10)
- Parking brake applied, (TM 9-2320-364-10)
- Wheels chocked, (TM 9-2320-364-10)
- Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

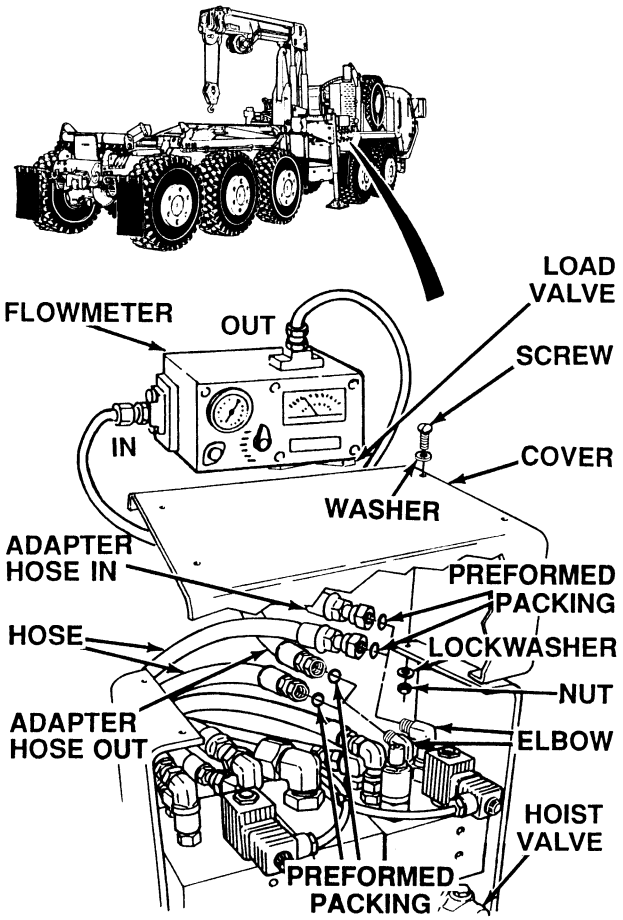
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

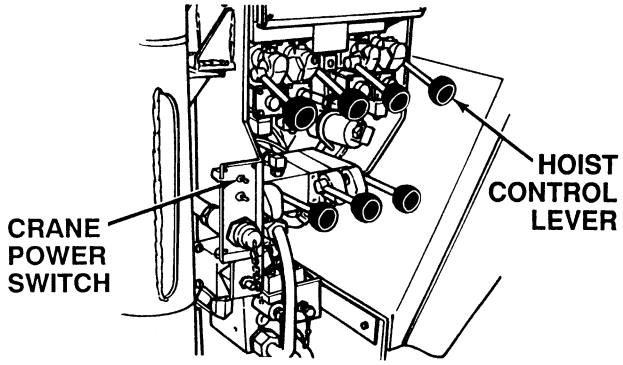
NOTE

Use a drain pan to catch leaking hydraulic oil.

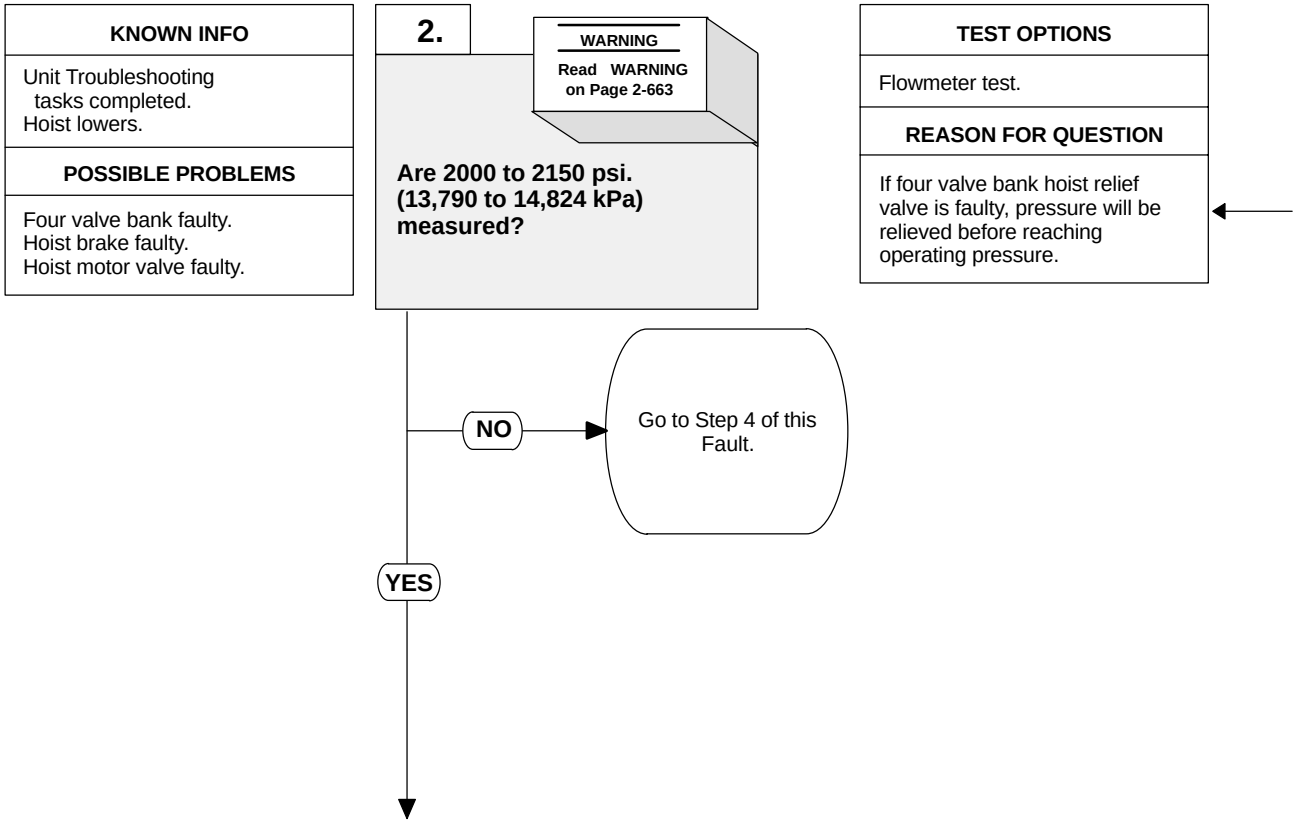
FLOWMETER TEST

(1) Remove four nuts, lockwashers, washers and screws and cover. Discard lockwashers.
(2) Tag, mark and disconnect two hoses from elbows at top of four valve bank above HOIST valve. Discard preformed packings.
(3) Connect adapter hose with preformed packing to inboard (smaller) elbow.
(4) Connect adapter hose to flowmeter OUT port.
(5) Connect adapter hose with preformed packing to outboard (taller) elbow.
(6) Connect adapter hose to flowmeter IN port.
(7) Open flowmeter load valve.
(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane POWER switch to ON position.
(12) Hold HOIST control lever in UP position and observe flowmeter.
  (a) If 10 gpm (38 lpm) or more are not present, perform Steps (13) through (17) below and go to Step 5 of this Fault.
  (b) If 10 gpm (38 lpm) or more are present, go to Step 2 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hoses from elbows.
(17) Connect two hoses with preformed packings to elbows.





20. HOIST DOES NOT RAISE (CONT).



WARNING

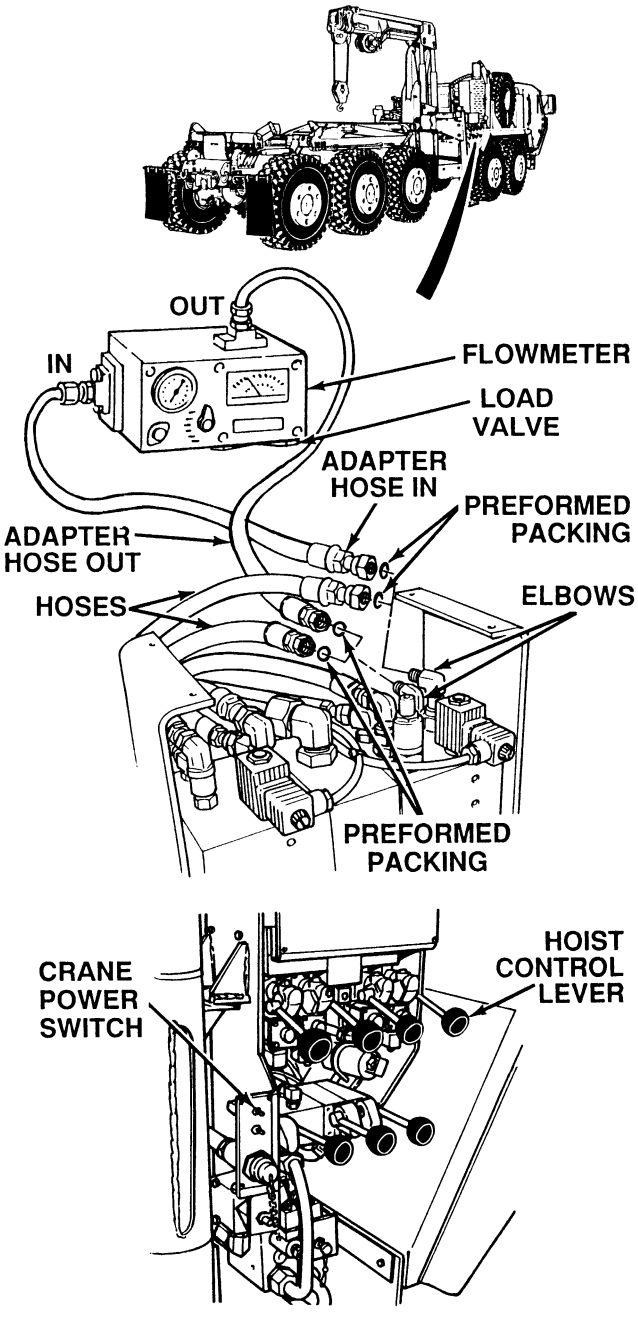
- High pressure hydraulics [oil under 3000 psi (20,685 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

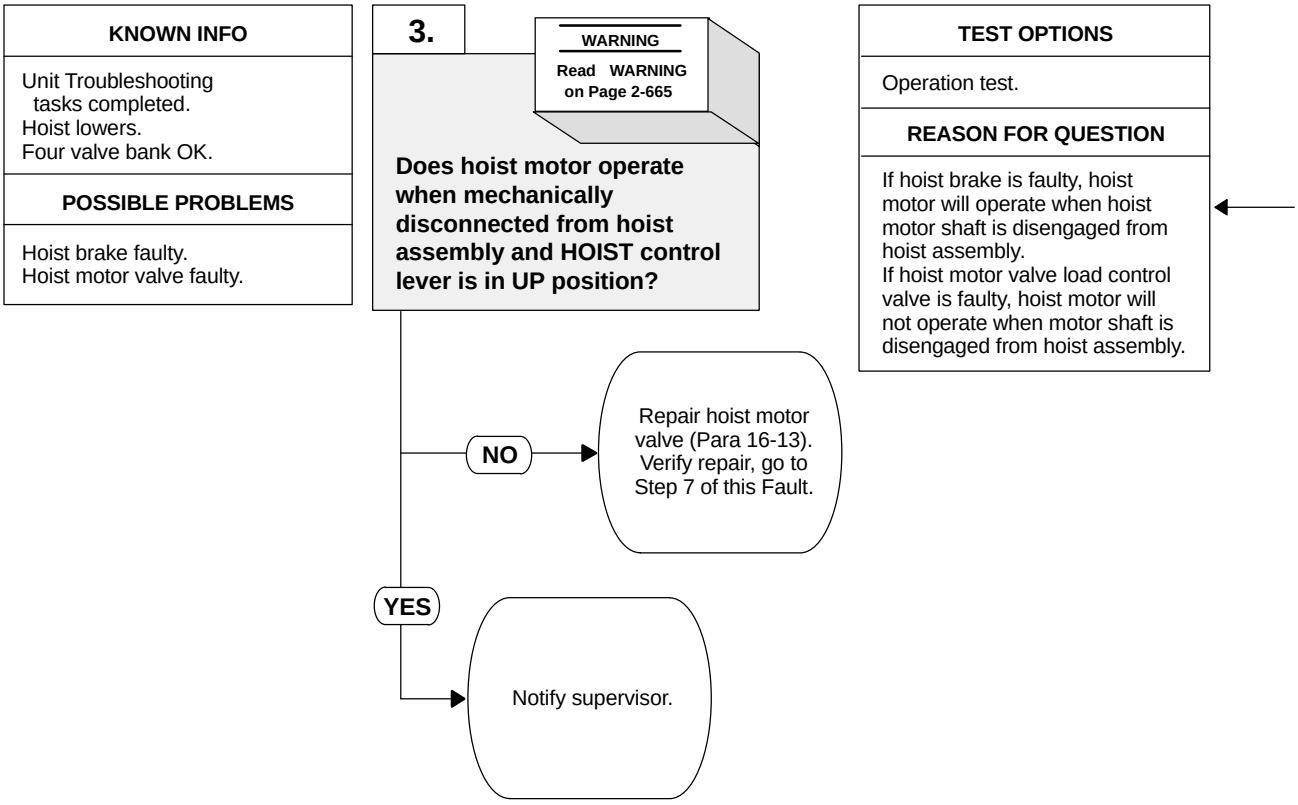
Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Hold HOIST control lever in UP position while closing flowmeter load valve.
  (a) If 2000 to 2150 psi (13,790 to 14,824 kPa) are not present, go to Step 4 of this Fault.
  (b) If 2000 to 2150 psi (13,790 to 14,824 kPa) are present, perform Steps (2) through (7) below and go to Step 3 of this Fault.
(2) Open flowmeter load valve.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.
(6) Disconnect adapter hoses from elbows. Discard preformed packings.
(7) Connect two hoses with preformed packings to elbows.



20. HOIST DOES NOT RAISE (CONT).

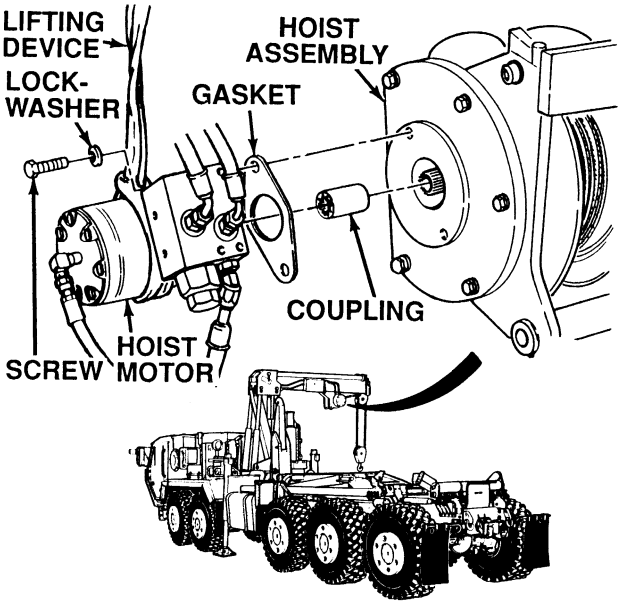


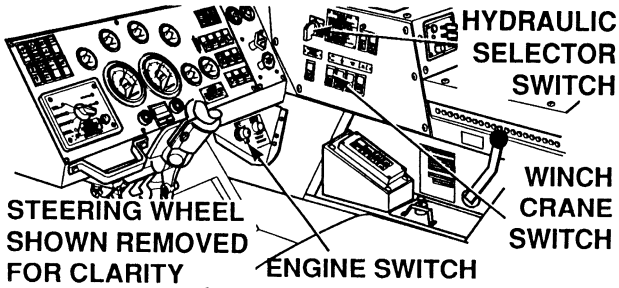
WARNING

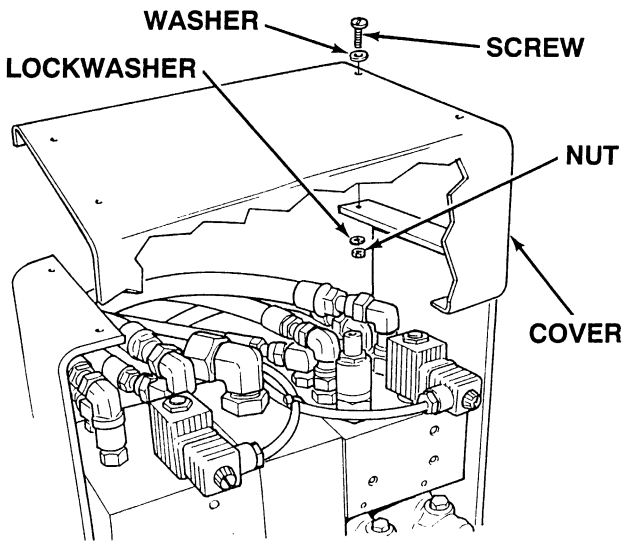
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

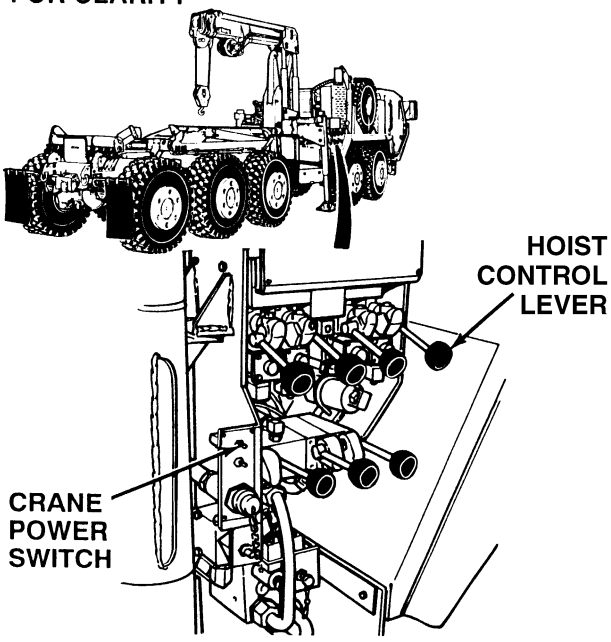
OPERATION TEST

(1) Attach lifting device to hoist motor.
(2) Remove two screws, lockwashers and hoist motor from hoist assembly. Discard lockwashers.
(3) Remove gasket and coupler from hoist assembly. Discard gasket.
(4) Start engine (TM 9-2320-364-10).
(5) Set WINCH/CRANE switch to CRANE position.
(6) Set hydraulic selector switch to CRANE/SRW position.
(7) Set crane POWER switch to ON position.
(8) Hold HOIST control lever in UP position.
    (a) If hoist motor does not operate, perform Steps (9) through (14) below and replace safety relief valve on hoist motor valve (Para 16-13).
    (b) If hoist motor does operate, hoist brake is faulty. Perform Steps (9) through (14) below and notify supervisor.
(9) Set crane POWER switch to OFF position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.
(12) Install gasket and coupler on hoist assembly.
(13) Install hoist motor on hoist assembly with two screws and lockwashers. Tighten screws to 75 lb-ft (102 N·m).
(14) Install cover with four screws, washers, lockwashers and nuts.

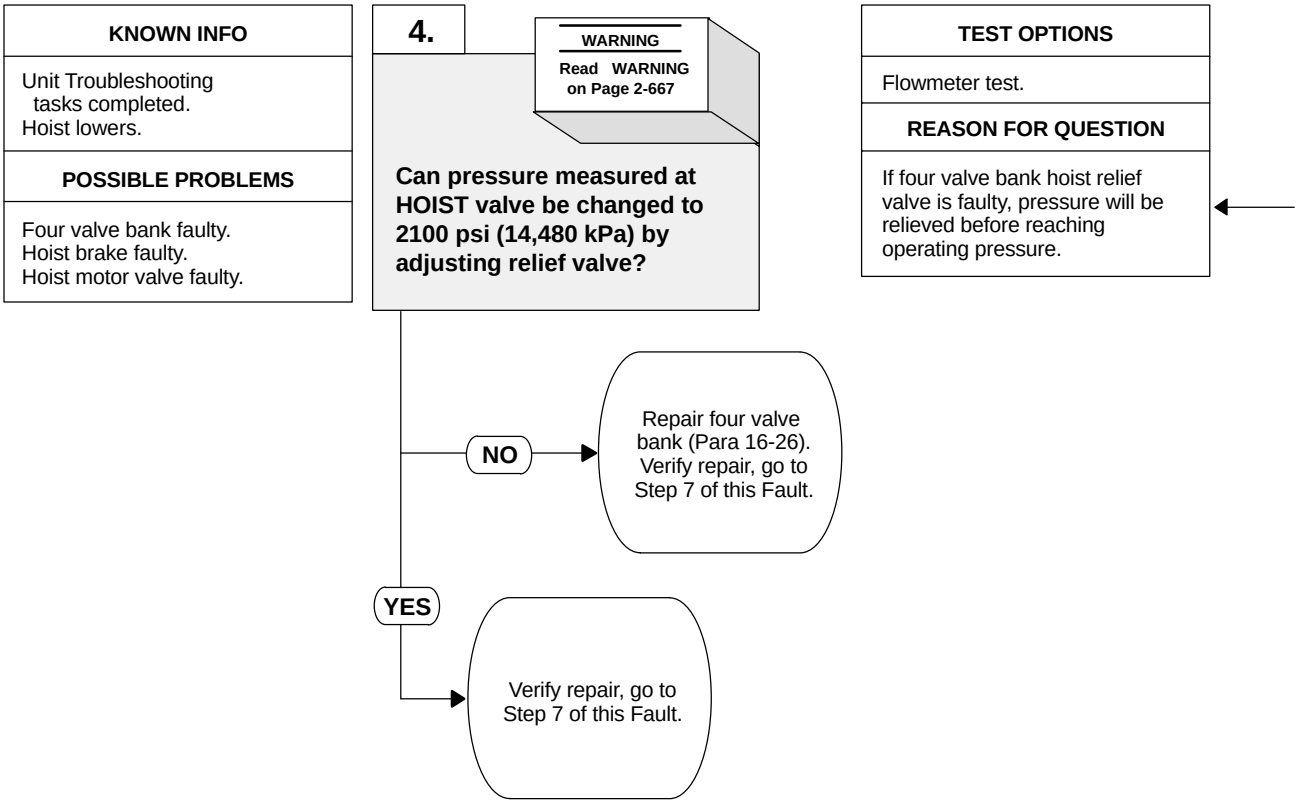








20. HOIST DOES NOT RAISE (CONT).



WARNING

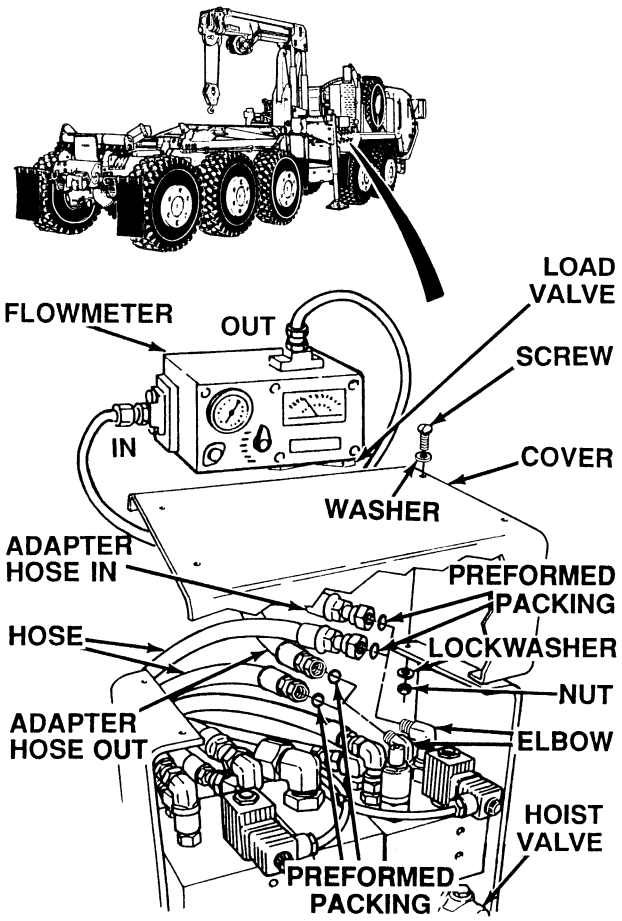
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

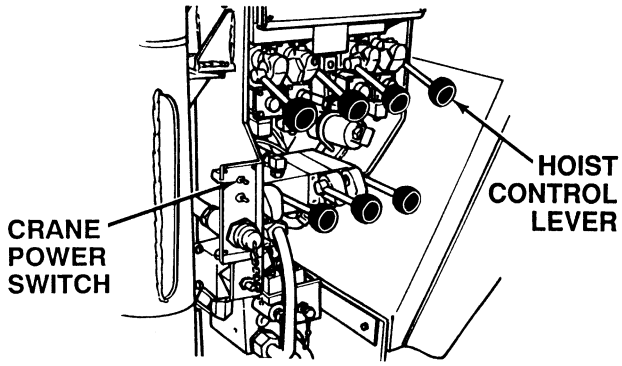
NOTE

Use a drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Loosen jam nut on hoist relief valve.
(2) Attempt to adjust hoist relief valve to 2100 psi (14,480 kPa) with flowmeter pressure control valve closed and HOIST control lever in UP position.
  (a) If pressure cannot be adjusted to 2100 psi (14,480 kPa), perform Steps (2) through (7) below and repair relief valve in four valve bank lift/hoist manifold (Para 16-26).
  (b) If pressure can be adjusted to 2100 psi (14,480 kPa), tighten jam nut on relief valve and perform Steps (2) through (7) below.
(2) Open flowmeter load valve.
(3) Set crane POWER switch to OFF position.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.
(6) Disconnect adapter hoses from elbows. Discard preformed packings.
(7) Connect two hoses with preformed packings to elbows.
(8) Install cover with four screws, washers, lockwashers and nuts.





20. HOIST DOES NOT RAISE (CONT).

KNOWN INFO
Unit Troubleshooting tasks completed. Hoist lowers.
POSSIBLE PROBLEMS
Four valve bank faulty.

5.

WARNING

Read WARNING on Page 2-669

Is an increase in flow measured at hydraulic reservoir return filter when HOIST control lever is in UP position?

NO → Repair HOIST valve (Para 16-33). Verify repair, go to Step 7 of this Fault.

YES → Replace OSS directional valve in four valve bank (Para 16-26). Go to Step 6 of this Fault.

TEST OPTIONS
Flowmeter test.
REASON FOR QUESTION
If overload sensing system (OSS) directional valve or hoist relief valve is faulty, flow will return to tank before going to hoist motor. If low or no flow was measure from HOIST valve, and no flow is present on return hose, HOIST valve is faulty.

WARNING

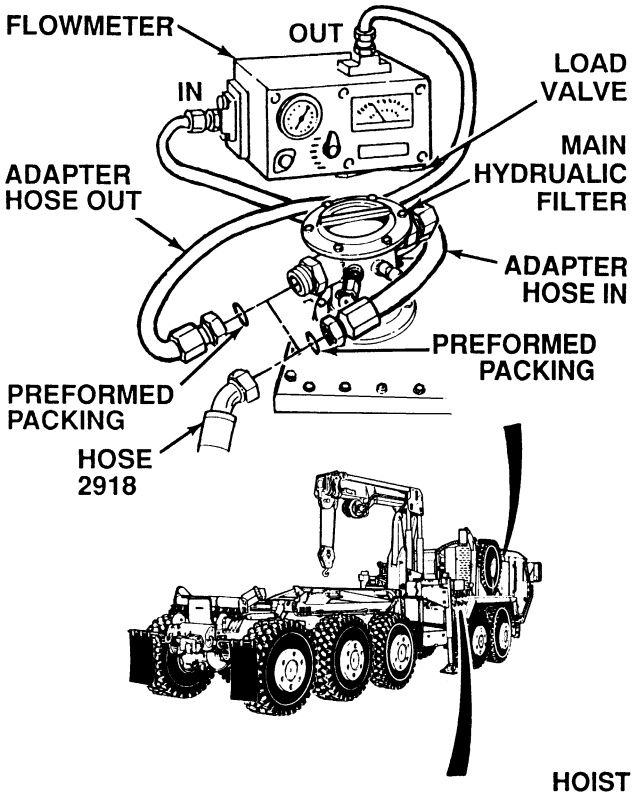
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- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

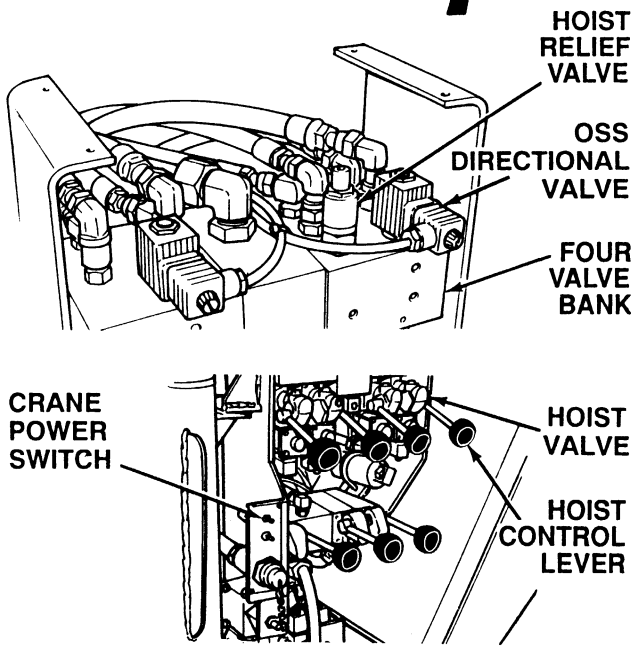
NOTE

Use a drain pan to catch leaking hydraulic oil.

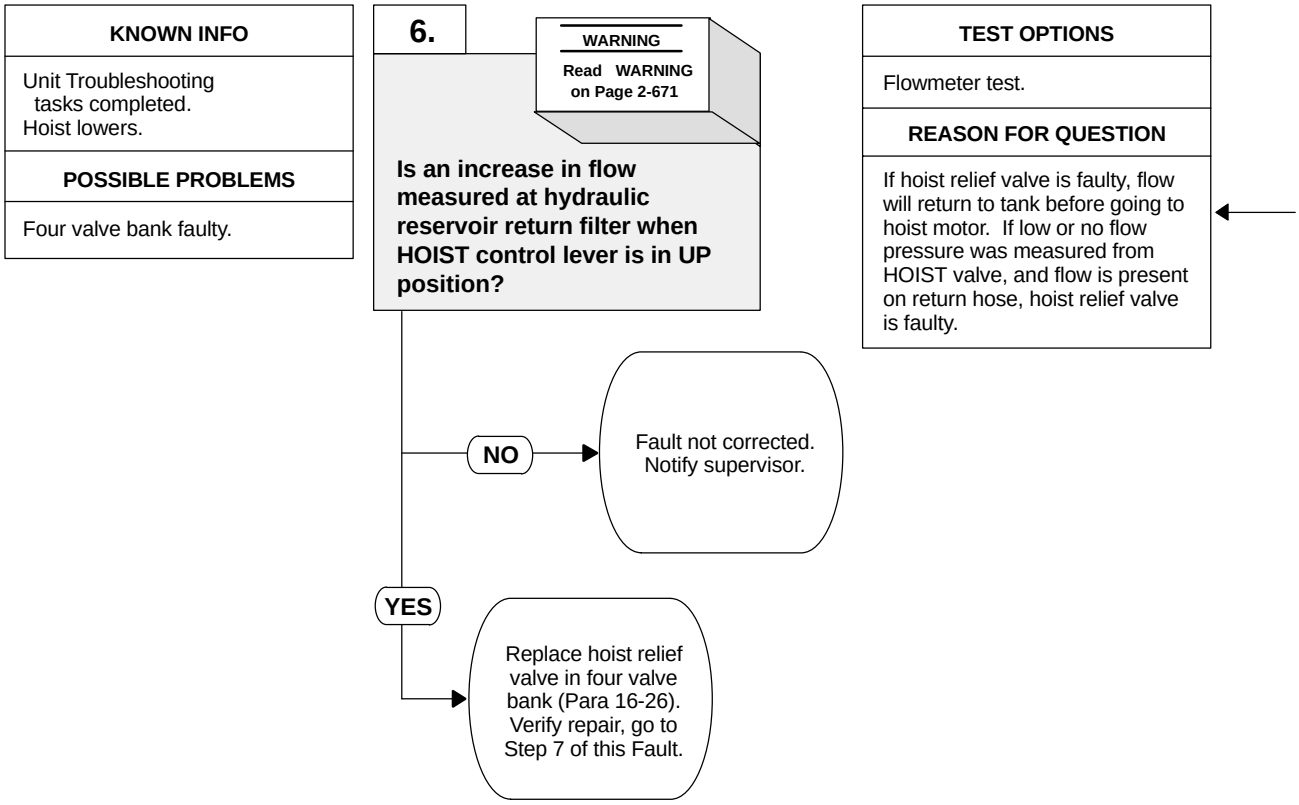
FLOWMETER TEST

(1) Disconnect hose 2918 from main hydraulic filter.
(2) Connect adapter hose to filter.
(3) Connect adapter hose to flowmeter OUT port.
(4) Connect adapter hose to hose 2918.
(5) Connect adapter hose to flowmeter IN port.
(6) Open flowmeter load valve.
(7) Start engine (TM 9-2320-364-10).
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Turn ON crane POWER switch.
(11) Observe and record gpm (lpm) measured.
(12) Hold HOIST control lever in UP position.
  (a) If an increase in flow is not measured, perform Steps (13) through (18) below and repair HOIST valve on four valve bank (Para 16-33).
  (b) If an increase in flow is measured, hoist relief valve or OSS directional valve is faulty. Replace hoist OSS directional valve in four valve bank (Para 16-26). Perform Steps (13) through (15) and go to Step 6 of this Fault.
(13) Set crane POWER switch to OFF position.
(14) Set hydraulic selector switch to OFF position.
(15) Turn OFF ENGINE switch.
(16) Disconnect adapter hose from hose 2918. Discard preformed packing.
(17) Disconnect adapter hose from return line filter. Discard preformed packing.
(18) Connect hose 2918 to adapter.





20. HOIST DOES NOT RAISE (CONT).



WARNING

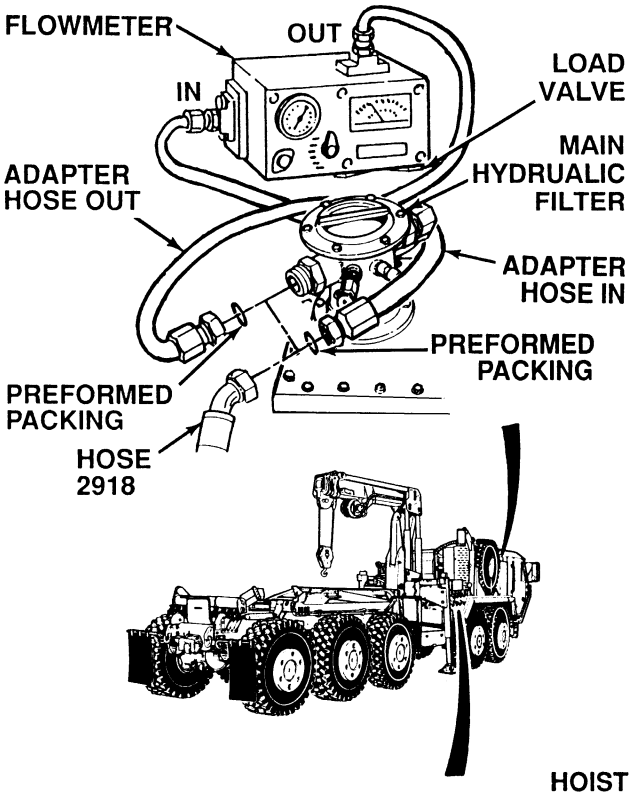
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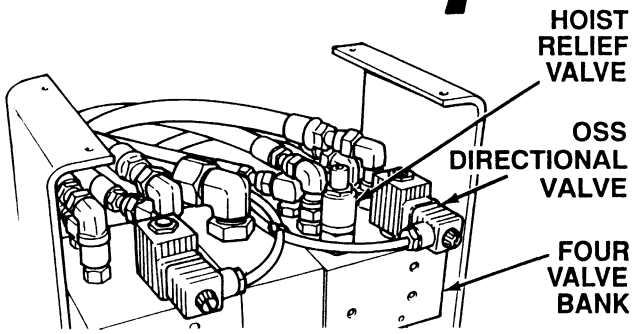
NOTE

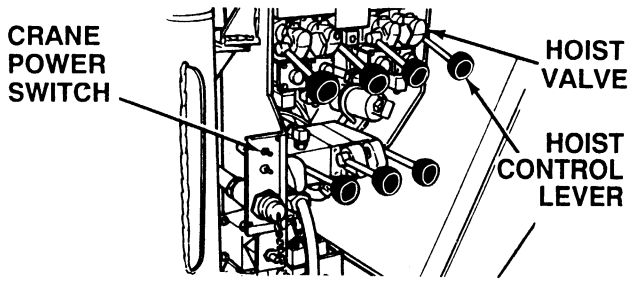
Use a drain pan to catch leaking hydraulic oil.

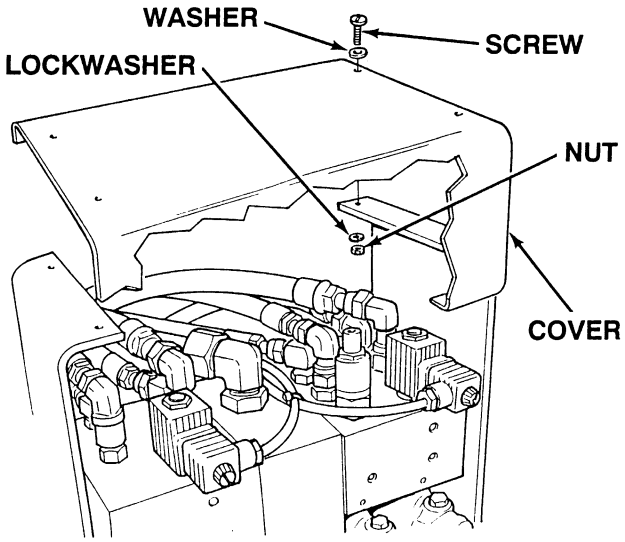
FLOWMETER TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to CRANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Turn ON crane POWER switch.
(5) Observe flowmeter to compare gpm (lpm) with gpm (lpm) measured in Step (6).
(6) Hold HOIST control lever in UP position.
  (a) If an increase in flow is not measured, fault not corrected. Perform Steps (7) through (12) below and notify supervisor.
  (b) If an increase in flow is measured, perform Steps (7) through (12) below and replace hoist relief valve on four valve bank (Para 16-26).
(7) Set crane POWER switch to OFF position.
(8) Set hydraulic selector switch to OFF position.
(9) Turn OFF ENGINE switch.
(10) Disconnect adapter hose from hose 2918. Discard preformed packing.
(11) Disconnect adapter hose from return line filter. Discard preformed packing.
(12) Connect hose 2918 to adapter.
(13) Install cover with screws, washers, lockwashers and nuts.

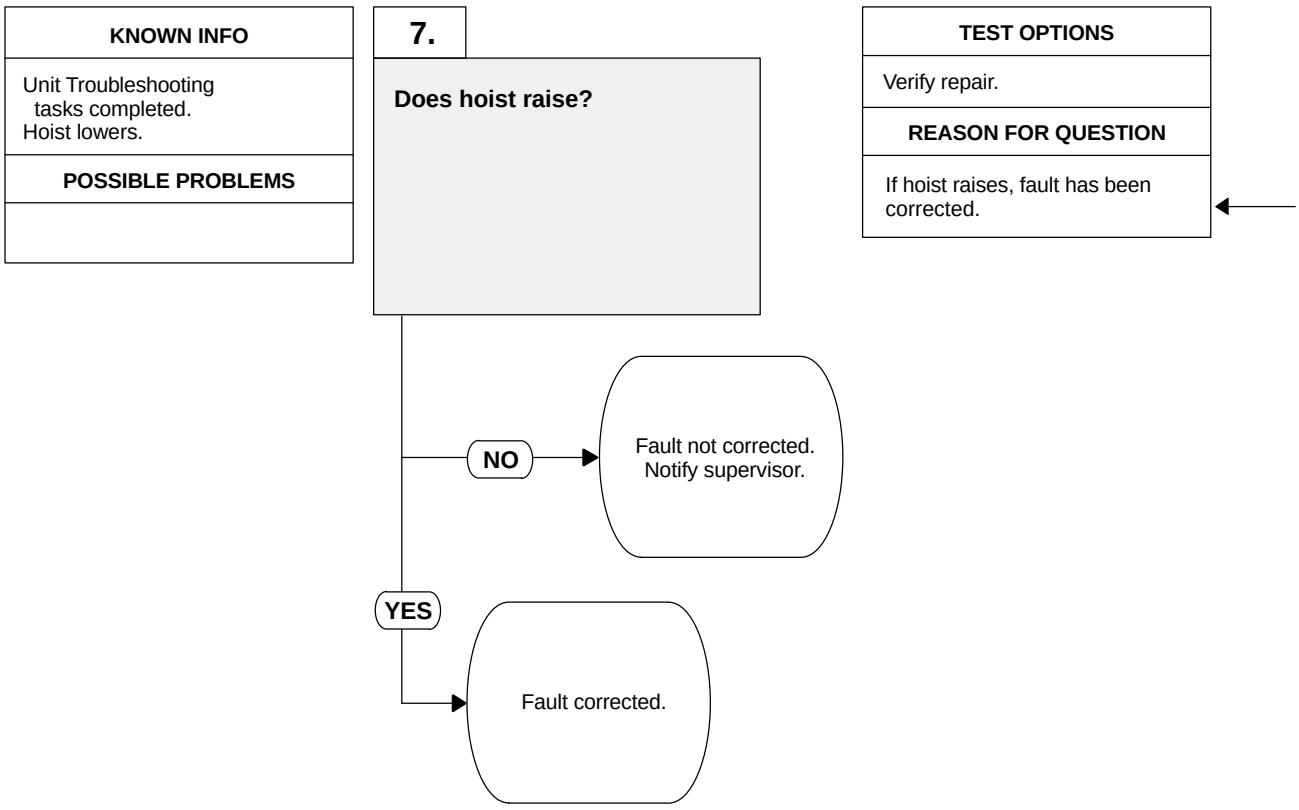






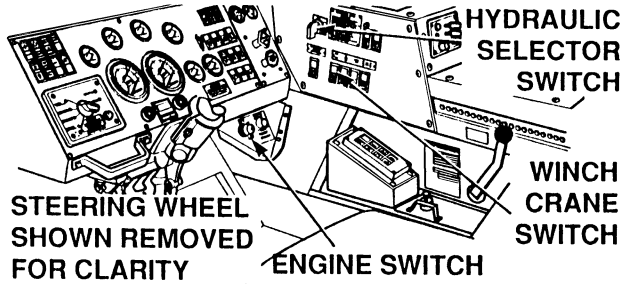


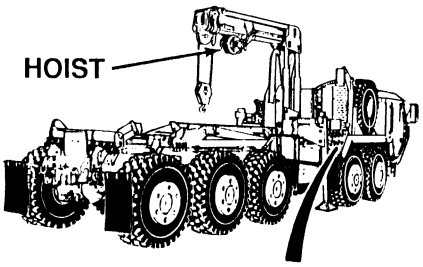
20. HOIST DOES NOT RAISE (CONT).

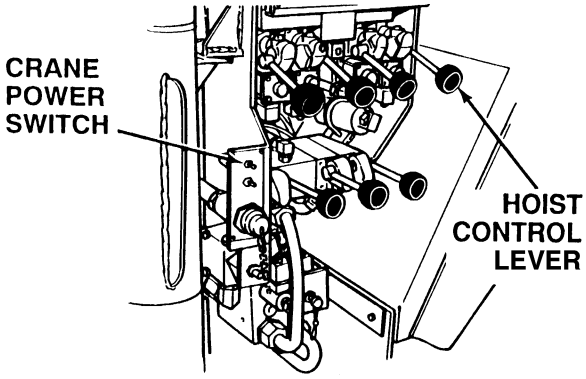


VERIFY REPAIR

(1) Check hydraulic oil level and add oil as necessary (TM 9-2320-364-20).
(2) Operate hoist using HOIST control lever (TM 9-2320-364-10).
  (a) If hoist does not raise, fault not corrected. Perform Steps (3) through (5) below and notify supervisor.
  (b) If hoist raises, fault has been corrected.
(3) Turn OFF crane POWER switch.
(4) Set hydraulic selector switch to OFF position.
(5) Turn OFF ENGINE switch.







2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

21. CRANE FAILS LOAD TEST.

INITIAL SETUP

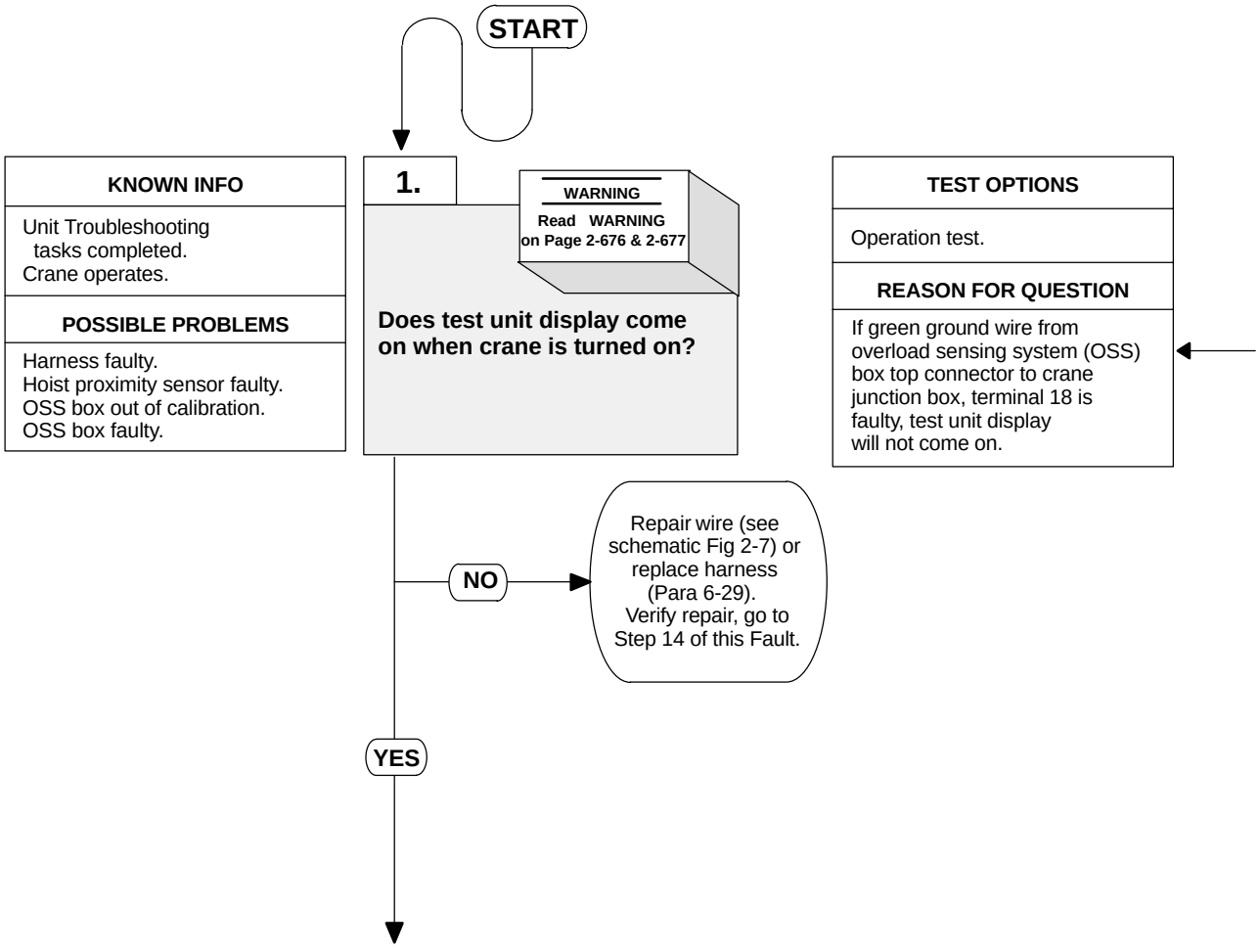
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
OSS Tester (Item 142, Appendix F)
Protractor, Magnetic (Item 170, Appendix F)
Tape Measuring (Item 235, Appendix F)
Test Weight, 3890 to 3910 lbs (1766 kg)
Test Weight, 4280 to 4300 lbs (1943 kg)

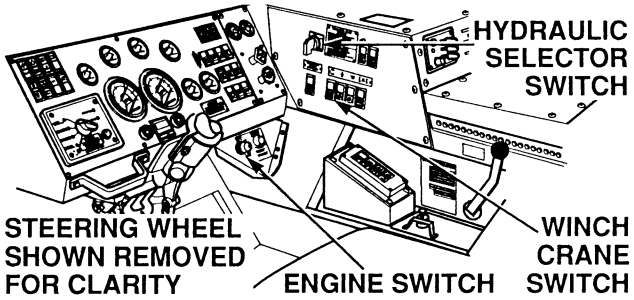
Materials/Parts
Cable Tie (2) (Item 9, Appendix B)
Sealing Compound (Item 62, Appendix B)
Wire, Nonelectrical (Item 79, Appendix B)
Packing, Preformed (4) (Item 357, Appendix E)

Personnel Required
Two

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)





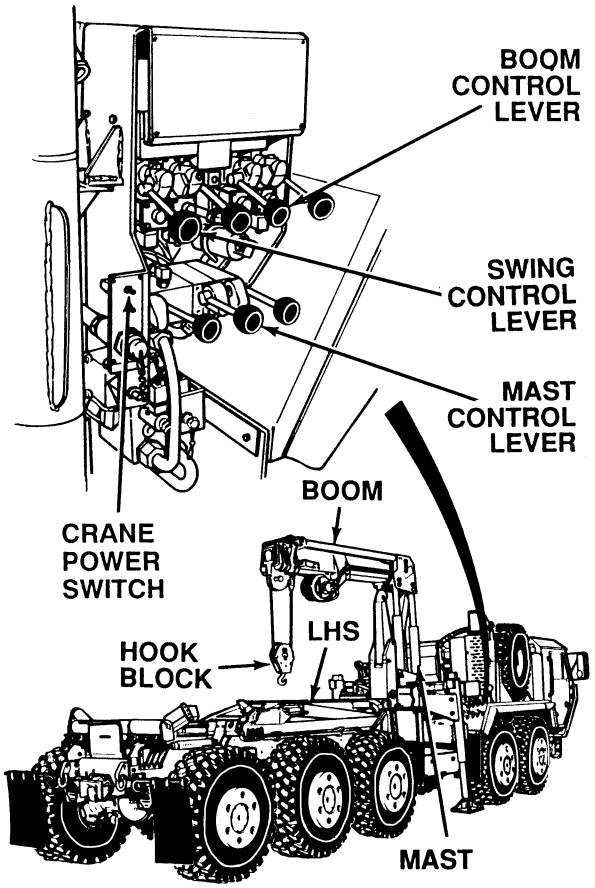
NOTE

Flatrack may be on Load Handling System (LHS) for ease of testing.

OPERATION TEST

(1) Start engine (TM 9-2320-364-10).
(2) Set WINCH/CRANE switch to RANE position.
(3) Set hydraulic selector switch to CRANE/SRW position.
(4) Set crane main POWER switch to ON position.
(5) Disconnect hook block from truck.
(6) Raise boom and mast using BOOM nd MAST control levers.
(7) Swing crane CCW using SWING control lever until boom is over LHS.
(8) Position boom so that OSS box is easily reached when standing on LHS.
(9) Set crane main POWER switch to OFF position.
(10) Set hydraulic selector switch to OFF position.
(11) Turn OFF ENGINE switch.

Continued on next page.



21. CRANE FAILS LOAD TEST (CONT).

WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

CAUTION

Hooked test unit connector must not contact other transistor wire or damage to OSS and test unit will result.

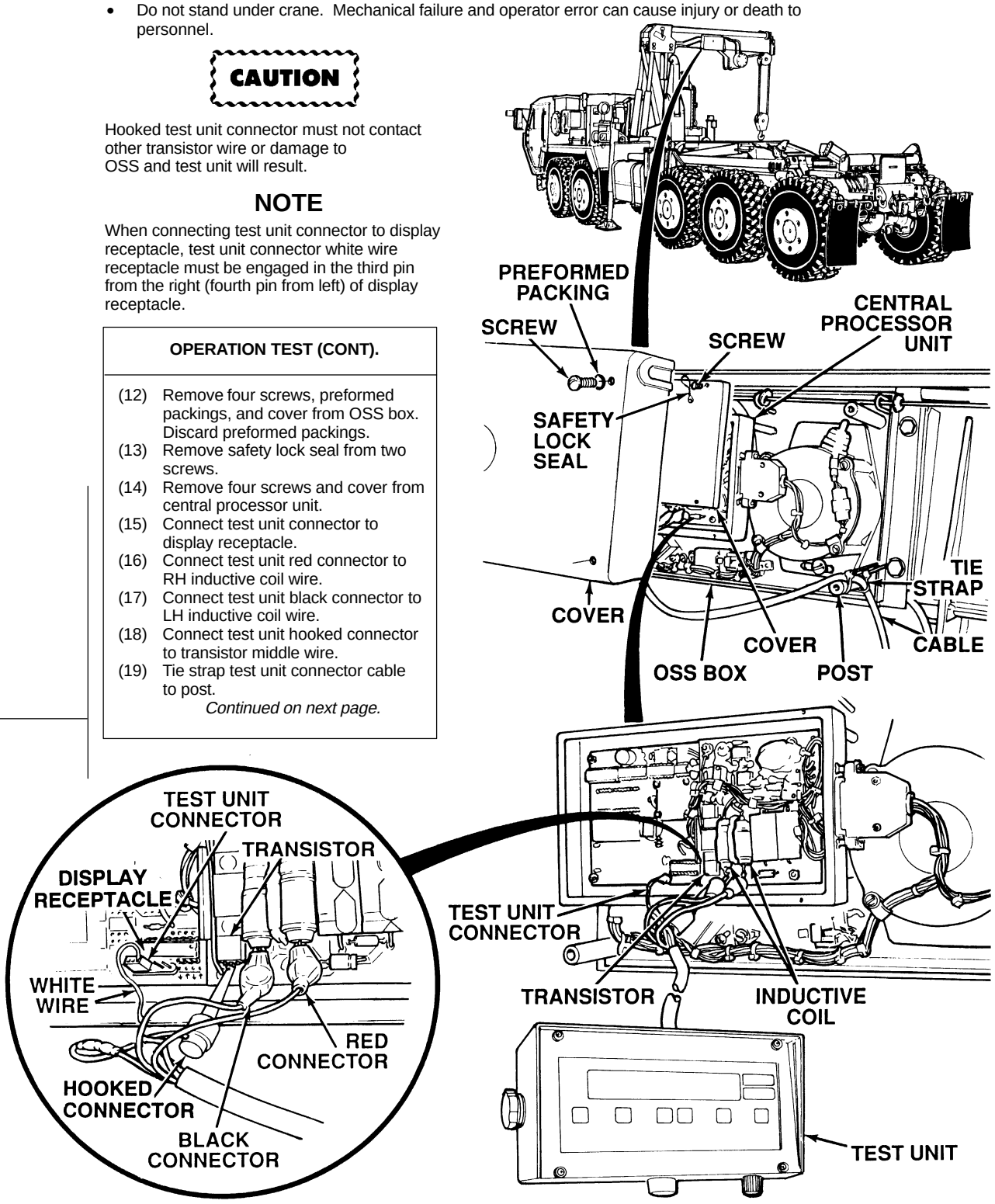
NOTE

When connecting test unit connector to display receptacle, test unit connector white wire receptacle must be engaged in the third pin from the right (fourth pin from left) of display receptacle.

OPERATION TEST (CONT).

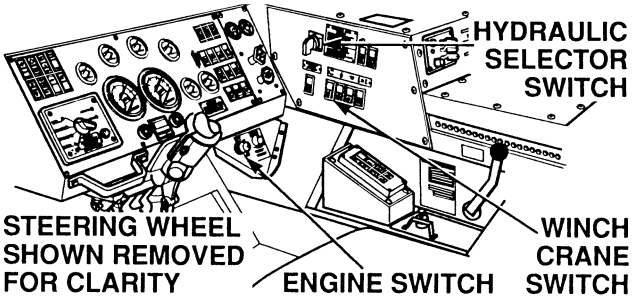
(12) Remove four screws, preformed packings, and cover from OSS box. Discard preformed packings.
(13) Remove safety lock seal from two screws.
(14) Remove four screws and cover from central processor unit.
(15) Connect test unit connector to display receptacle.
(16) Connect test unit red connector to RH inductive coil wire.
(17) Connect test unit black connector to LH inductive coil wire.
(18) Connect test unit hooked connector to transistor middle wire.
(19) Tie strap test unit connector cable to post.

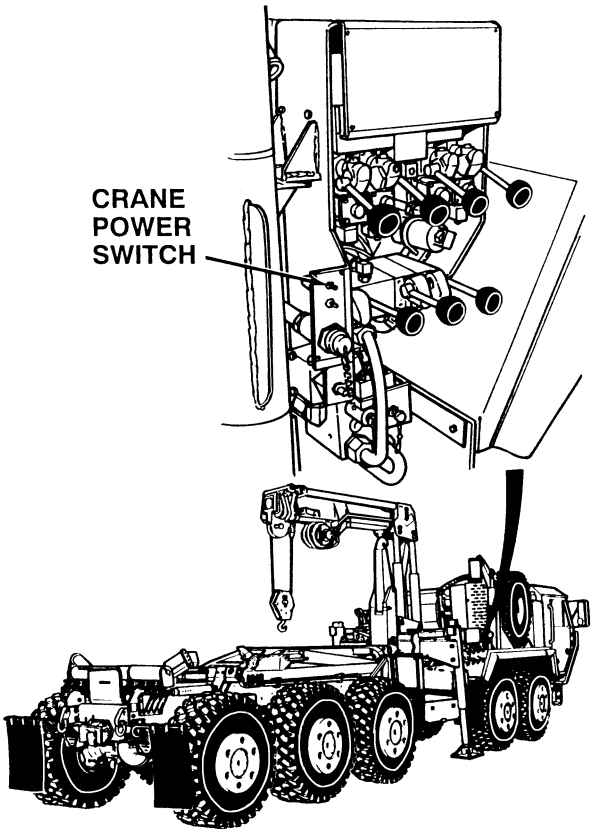
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WARNING

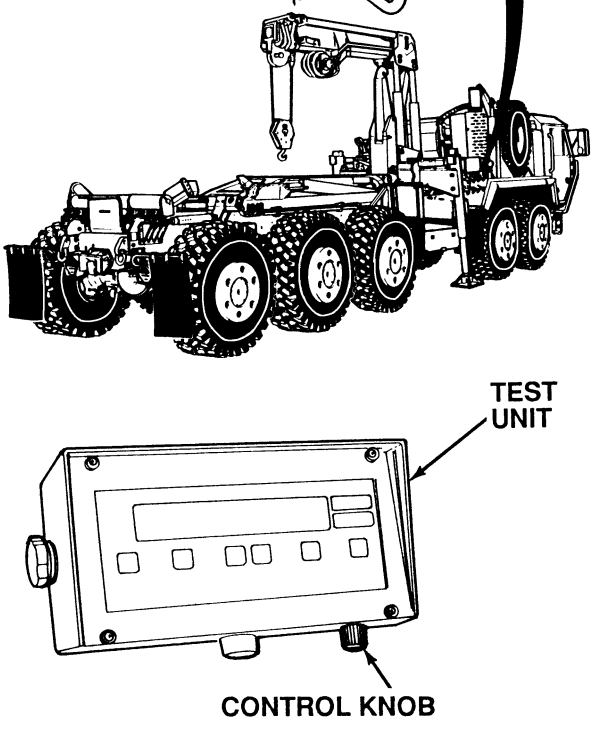
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.



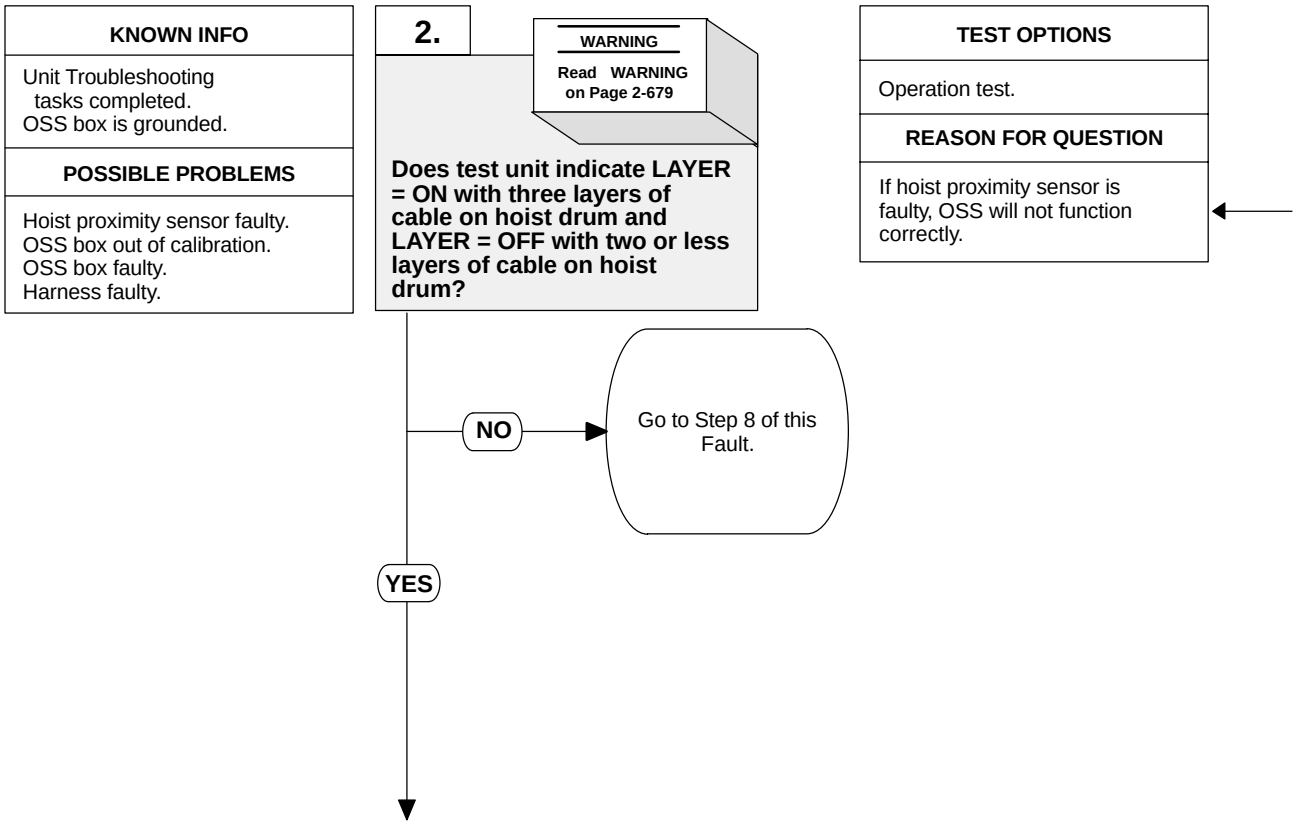


OPERATION TEST (CONT).

(20) Start engine (TM 9-2320-364-10).
(21) Set WINCH/CRANE switch to CRANE position.
(22) Set hydraulic selector switch to CRANE/SRW position.
(23) Turn ON crane main POWER switch.
(24) Adjust clarity of display using control knob on bottom of test unit.
  (a) If display does not come on, perform Steps (25) through (27) and repair green wire (see schematic Fig 2-7) or replace harness (Para 6-29) from OSS box top connector to crane main junction box.
  (b) If display comes on, go to Step 2 of this Fault.
(25) Set crane main POWER switch to OFF position.
(26) Set hydraulic selector switch to OFF position.
(27) Turn OFF ENGINE switch.



21. CRANE FAILS LOAD TEST (CONT).



WARNING

Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

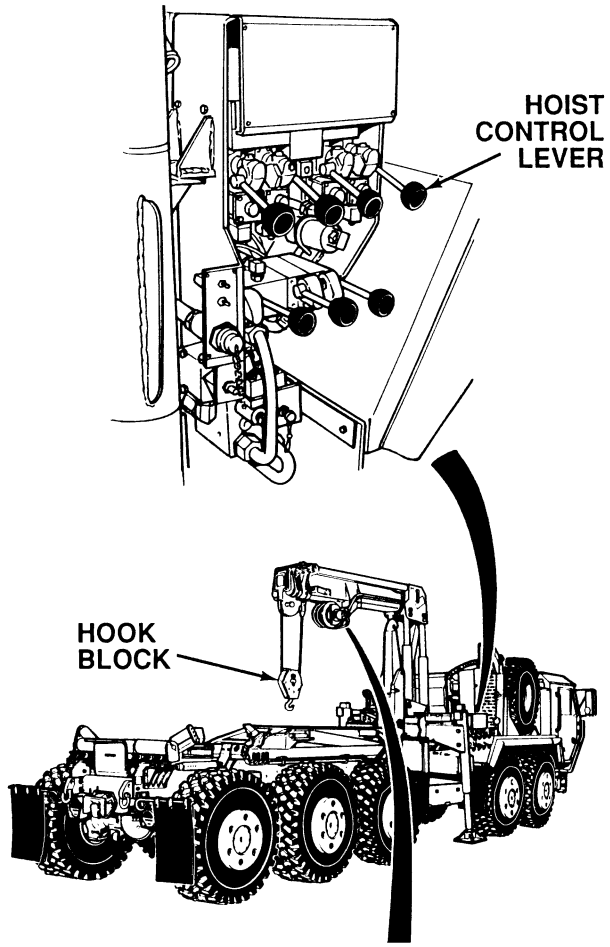
NOTE

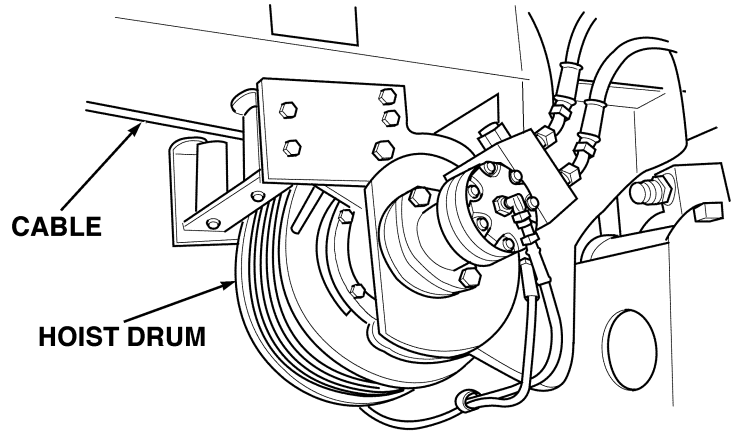
Hoist drum has three layers of cable on it with hook block raised completely and boom telescoped out completely.

OPERATION TEST

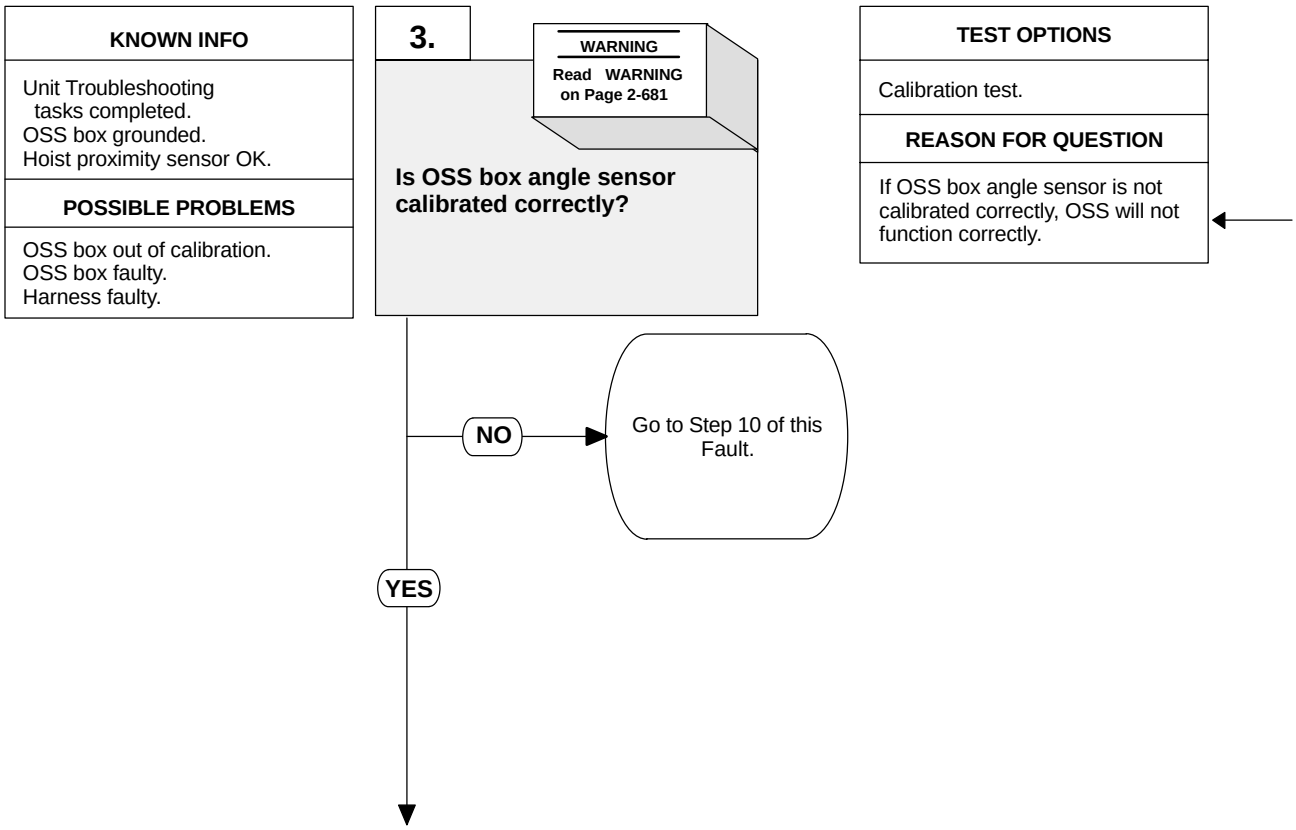
(1) Raise hoist hook block completely using HOIST control lever (TM 9-2320-364-10).
   (a) If test unit display indicates LAYER = OFF, go to Step 8 of this Fault.
   (b) If test unit display indicates LAYER = ON, go to Step (2) below.

(2) With the aid of an assistant observing hoist drum, lower hoist hook block using HOIST control lever.
   (a) If test unit does not indicate LAYER = OFF the instant the third layer of cable is off the hoist drum and only two layers remain, go to Step 8 of this Fault.
   (b) If test unit indicates LAYER = OFF the instant the third layer of cable is off the hoist drum and only two layers remain, hoist proximity sensor is OK. Go to Step 3 of this Fault.





21. CRANE FAILS LOAD TEST (CONT).

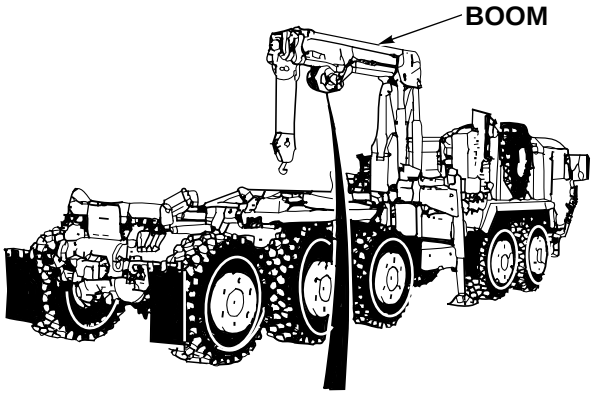


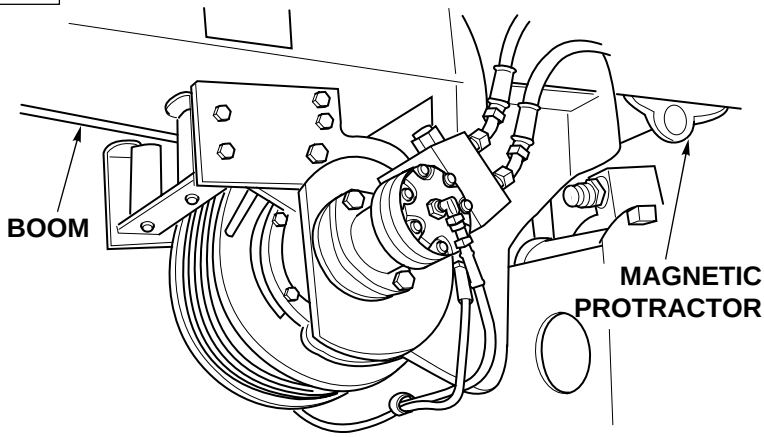
WARNING

Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

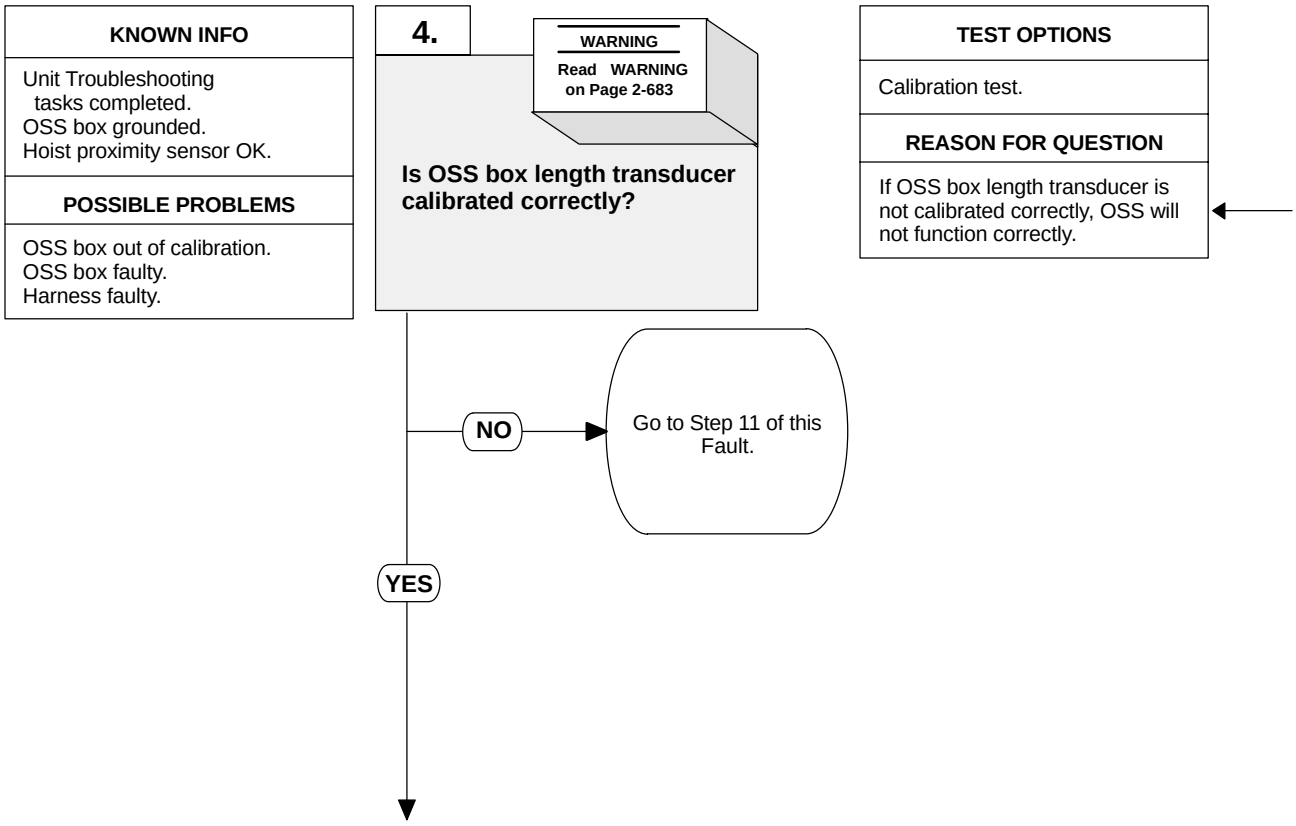
CALIBRATION TEST

(1) Attach magnetic protractor to underside of boom.
(2) Compare actual angle indicated by magnetic protractor to angle indicated on test unit display.
   (a) If indicated angles are not within 1 degree of each other, go to Step 10 of this Fault.
   (b) If indicated angles are within 1 degree of each other, remove magnetic protractor from boom and go to Step 4 of this Fault.





21. CRANE FAILS LOAD TEST (CONT).

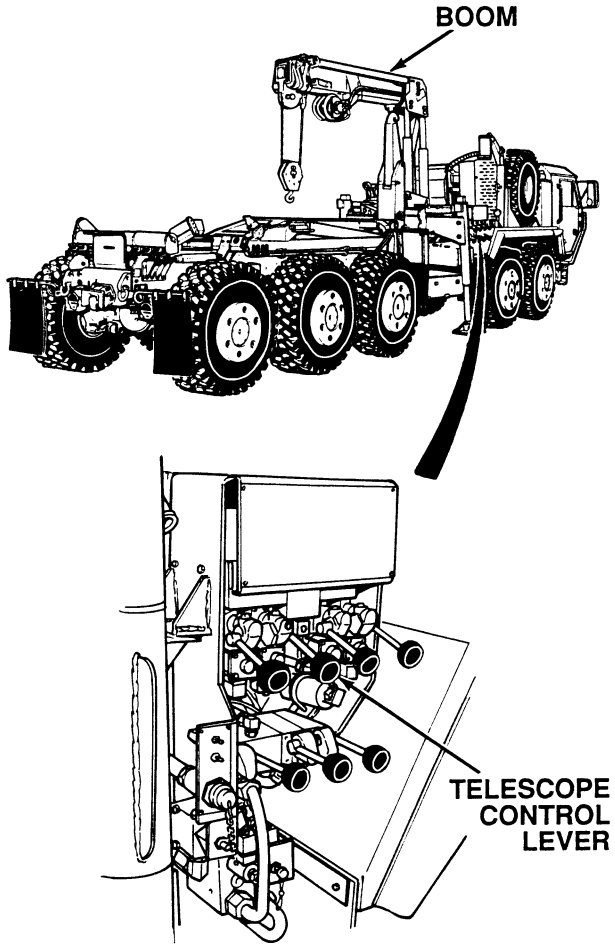


WARNING

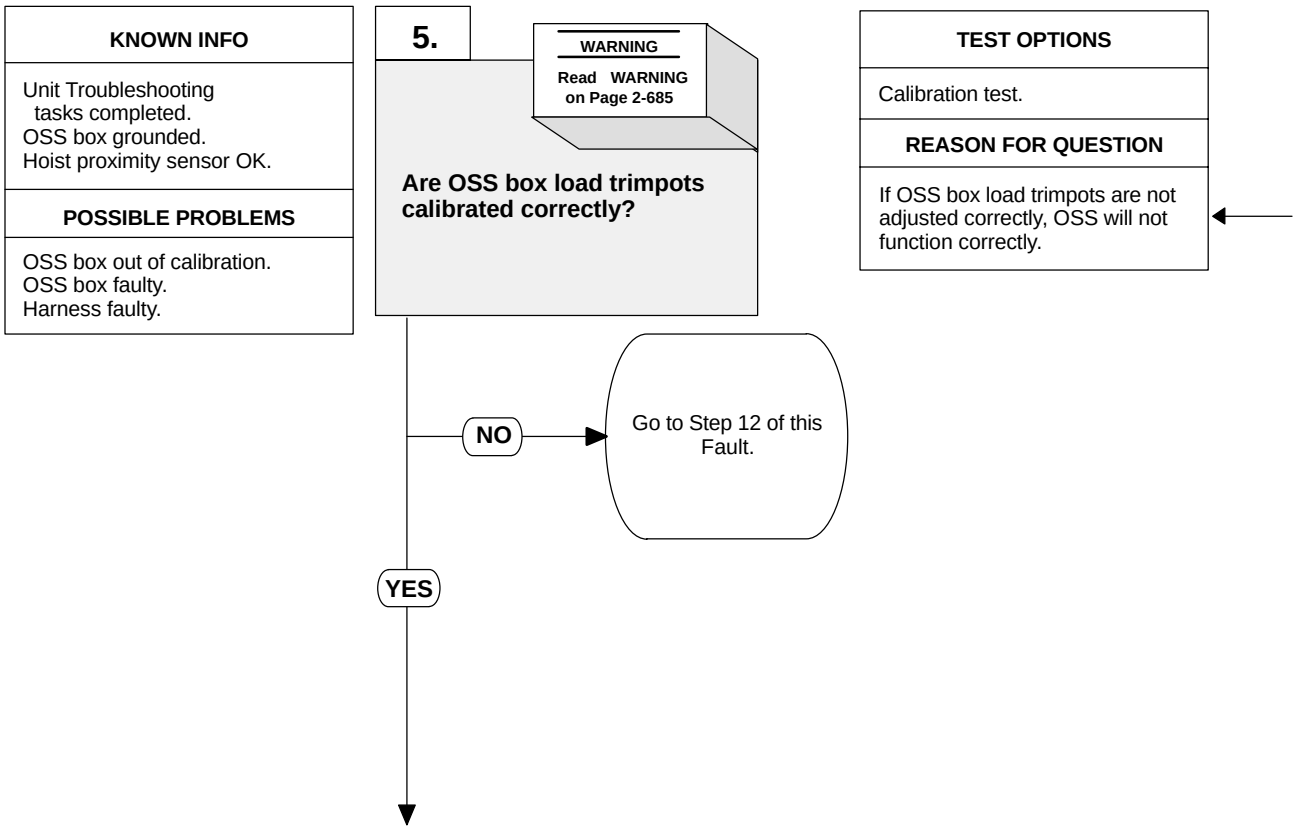
Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

CALIBRATION TEST

(1) Using TELE control lever, extend boom completely (TM 9-2320-364-10).
   (a) If test unit does not indicate 22.5 ft (6.86 m), go to Step 11 of this Fault.
   (b) If test unit indicates 22.5 ft (6.86 m), go to Step (2) below.
(2) Using TELE control lever, retract boom completely.
   (a) If test unit does not indicate 7.3 ft (2.22 m), go to Step 11 of this Fault.
   (b) If test unit indicates 7.3 ft (2.22 m), go to Step 5 of this Fault.



21. CRANE FAILS LOAD TEST (CONT).



WARNING

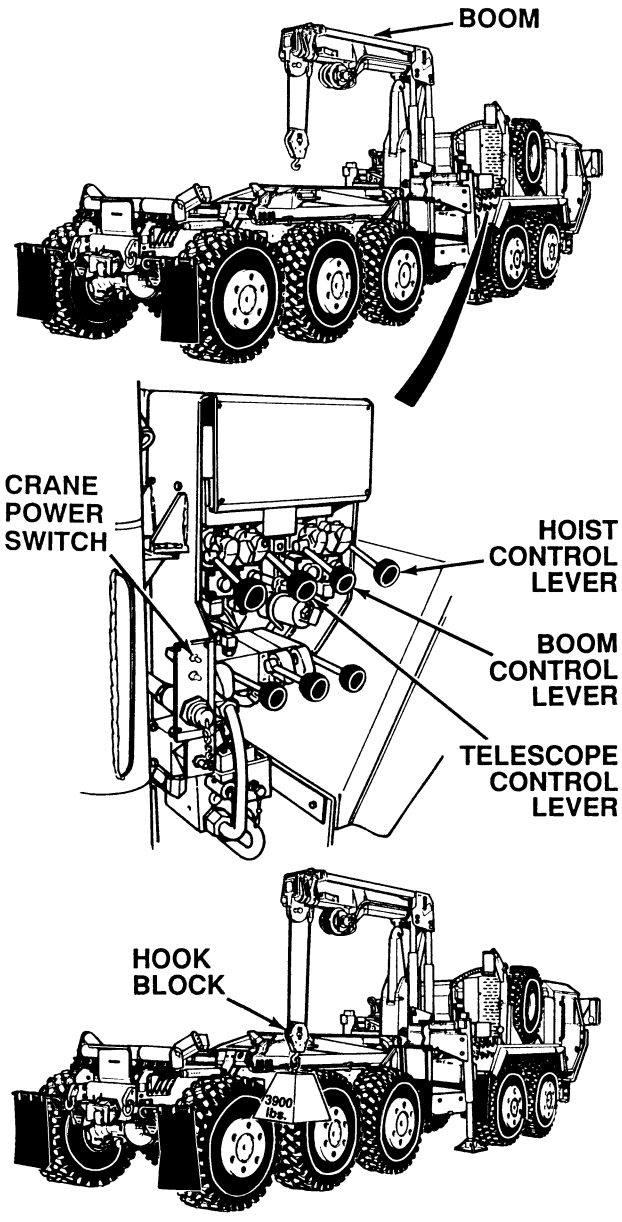
All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

NOTE

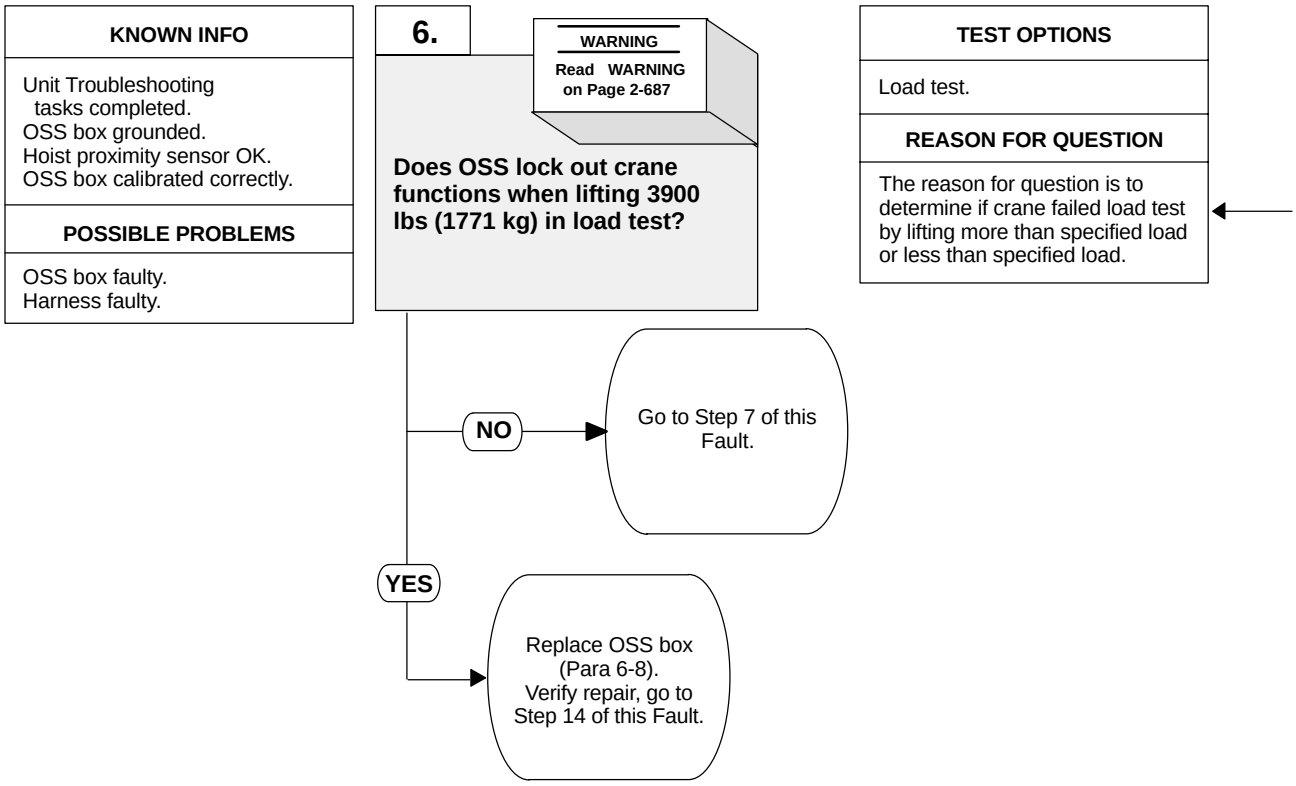
Test weight can be ± 10 lbs (4.5 kg).

CALIBRATION TEST

(1) Using BOOM control lever, operate boom until test unit indicates a 15 degree angle (TM 9-2320-364-10).
(2) Using TELE control lever, telescope boom out completely.
(3) Using HOIST control lever, operate hoist until hoist hook block is 3.5 ft. (1 m) above the ground.
  (a) If test unit does not indicate WT = 0, go to Step 12 of this Fault.
  (b) If test unit indicates WT = 0, go to Step (4) below.
(4) Using BOOM control lever, lower boom until test unit indicates 5 degrees.
(5) Connect hook block to 3900 lb. (1771 kg) load.
(6) Using HOIST control lever, lift load from ground 3 to 4 ft. (91 to 122 cm).
  (a) If test unit does not indicate WT = 3900 (1770 kg), lower load and go to Step 12 of this Fault.
  (b) If test unit indicates WT = 3900 (1770 kg) go to Step 6 of this Fault.

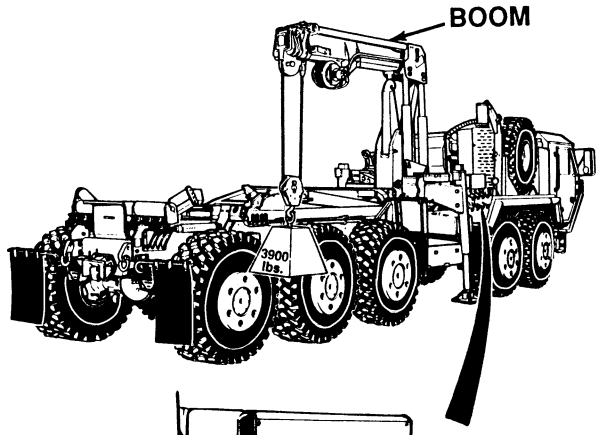


21. CRANE FAILS LOAD TEST (CONT).



WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

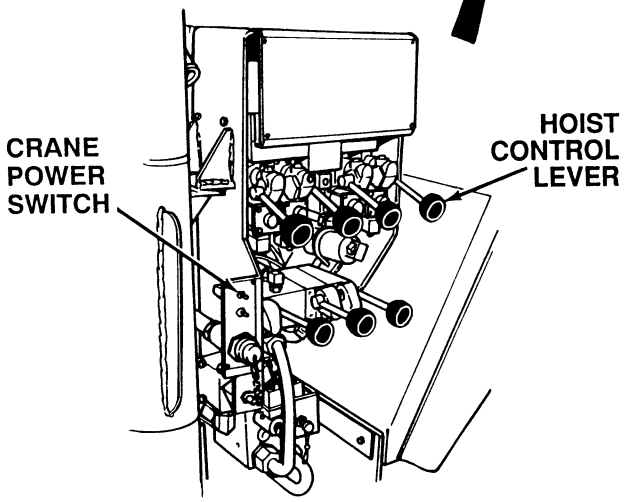


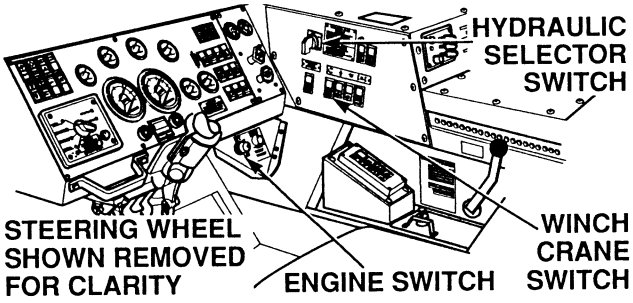
NOTE

- Boom should be telescoped out completely and at five degrees. Check that mast is up completely.
- Test weight can be ± 10 lbs (4.5 kg).

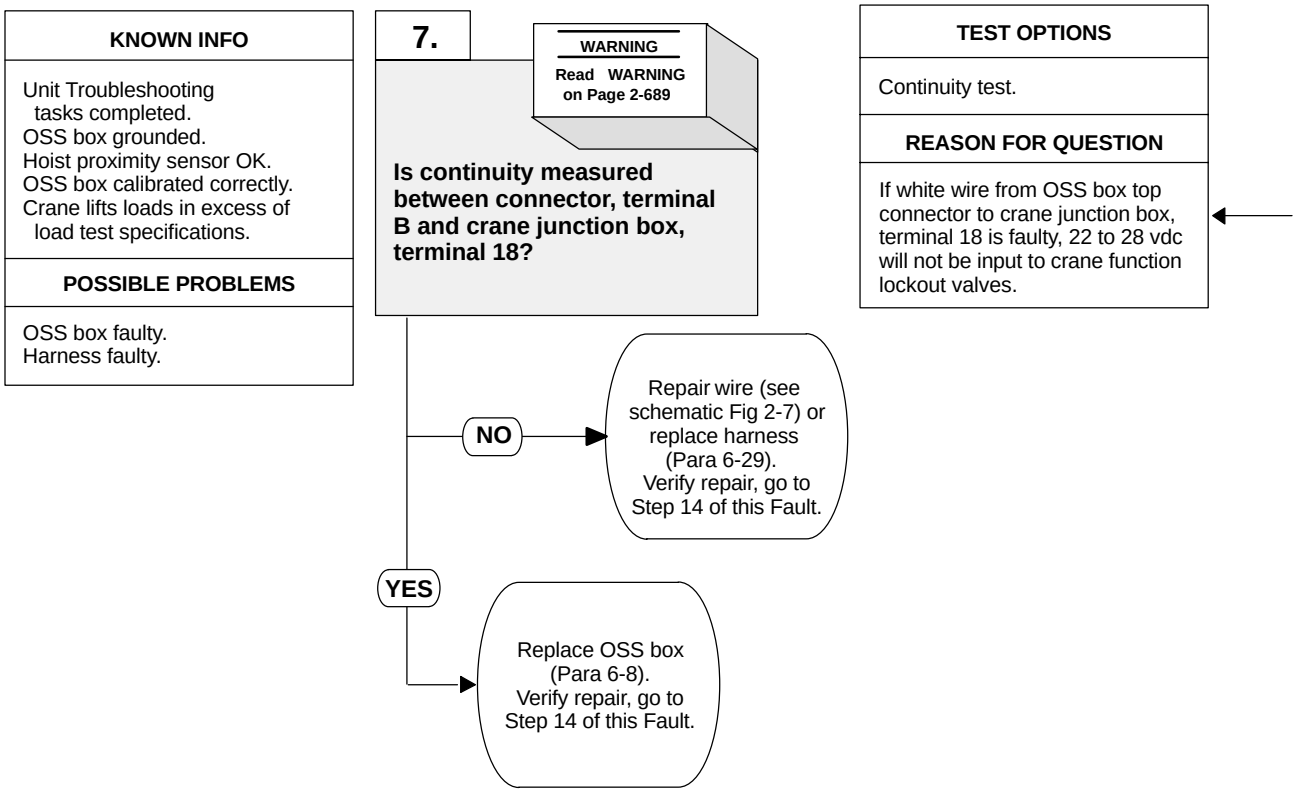
LOAD TEST

(1) Using HOIST control lever, lift 3900 lb (1771 kg) load from ground (TM 9-2320-364-10).
  (a) If crane lifts load and OSS does not lock out crane functions, stow crane, perform Steps (2) through (4) and go to Step 7 of this Fault.
  (b) If OSS locks out crane functions, perform Steps (2) through (4) and replace OSS box (Para 6-8).
(2) Set crane main POWER switch to OFF position.
(3) Set hydraulic selector switch to OFF position.
(4) Turn OFF ENGINE switch.





21. CRANE FAILS LOAD TEST (CONT).

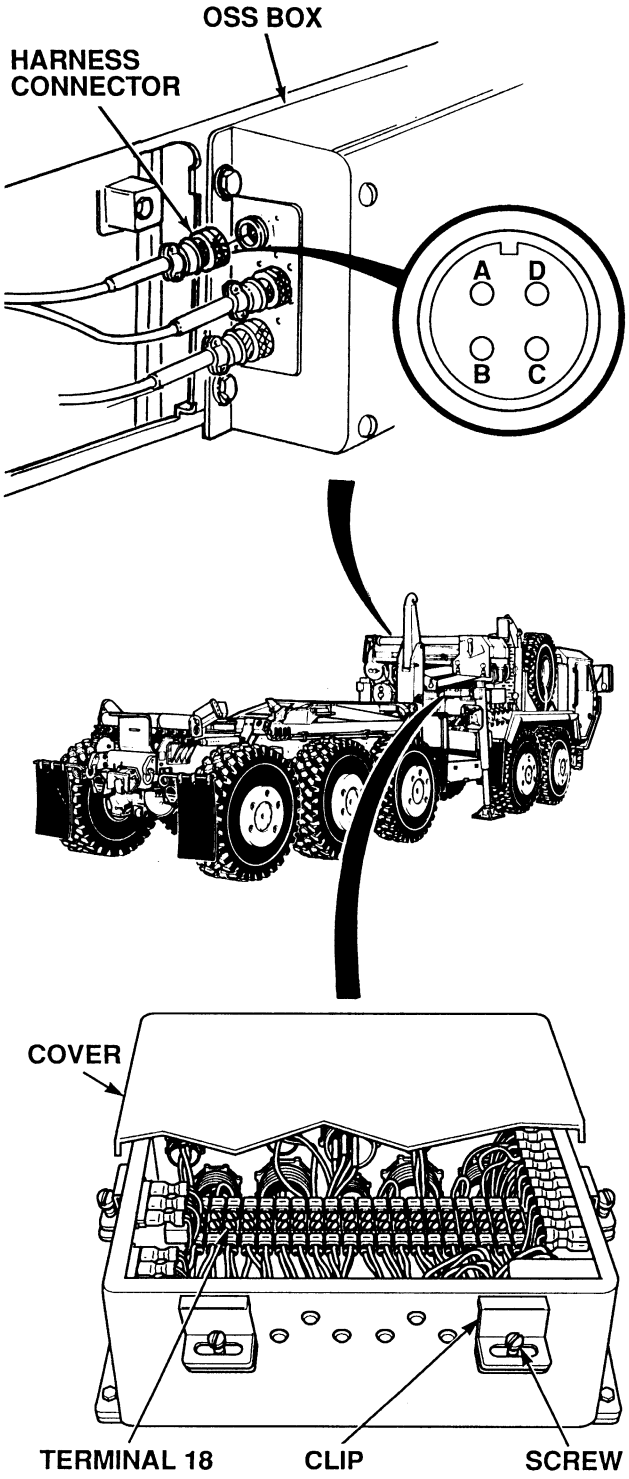


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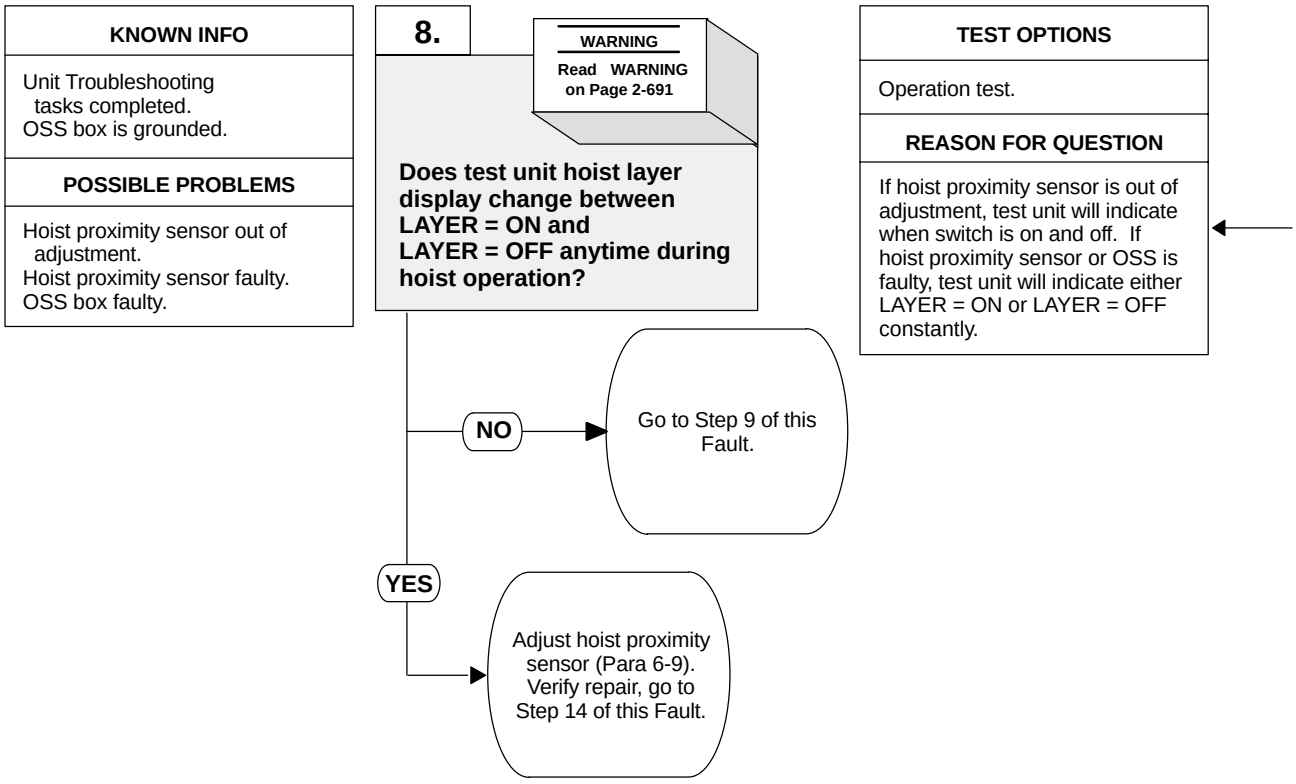
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.

CONTINUITY TEST

(1) Disconnect top harness connector from OSS box.
(2) Loosen six screws and remove six clips from crane main junction box cover.
(3) Remove cover from junction box.
(4) Set multimeter to ohms scale.
(5) Check continuity between harness connector, terminal B and junction box, terminal 18.
    (a) If no continuity is present, repair harness (Para 6-29).
    (b) If continuity is present, perform Step (6) below and replace OSS box (Para 6-8).
(6) Install cover on junction box with six screws and clips.



21. CRANE FAILS LOAD TEST (CONT).

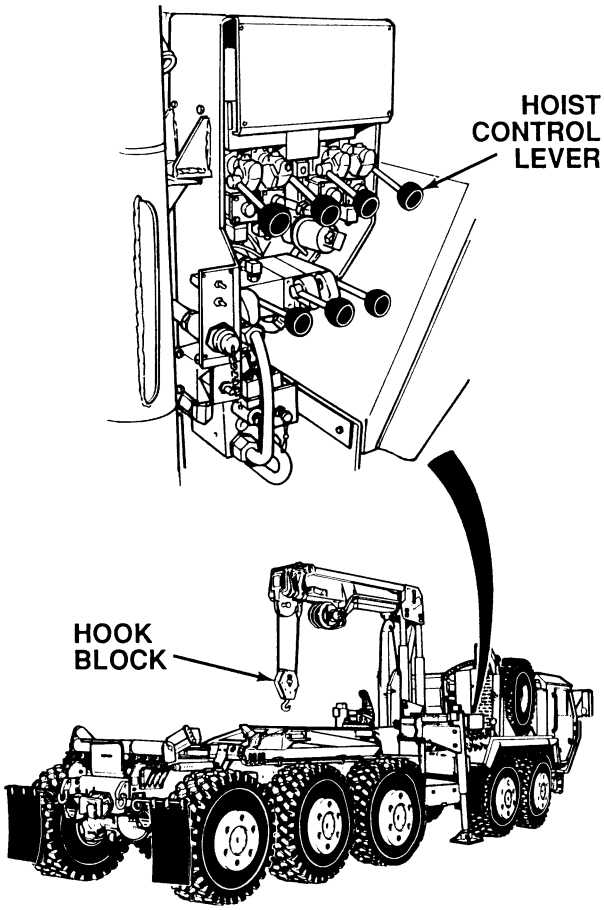


WARNING

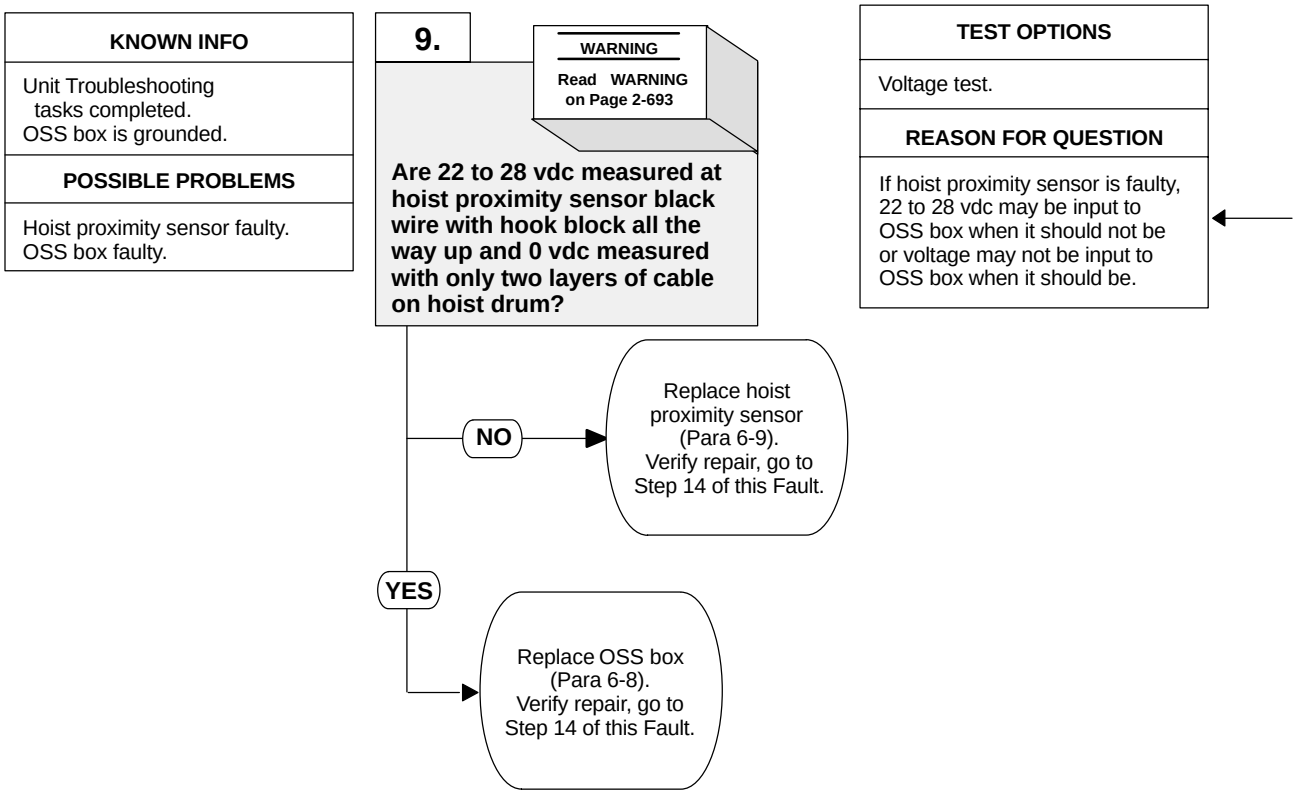
Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

OPERATION TEST

(1) Using HOIST control lever, raise hoist hook block completely.
(2) Using HOIST control lever, lower hook block until only one layer of cable remains on hoist drum.
   (a) If test unit does not indicate both LAYER = ON and LAYER = OFF, go to Step 9 of this Fault.
   (b) If test unit indicates both LAYER = OFF and LAYER = ON, adjust hoist proximity sensor (Para 6-9).
(3) Using HOIST control lever, raise hook block. Test unit should indicate that proximity sensor turns on when third layer of cable starts.
   (a) If test unit does not indicate the proximity sensor is ON, recheck hoist proximity sensor adjustment (Para 6-9).
   (b) If test unit indicates that proximity sensor is on, go to Step 12 of this Fault.



21. CRANE FAILS LOAD TEST (CONT).



WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

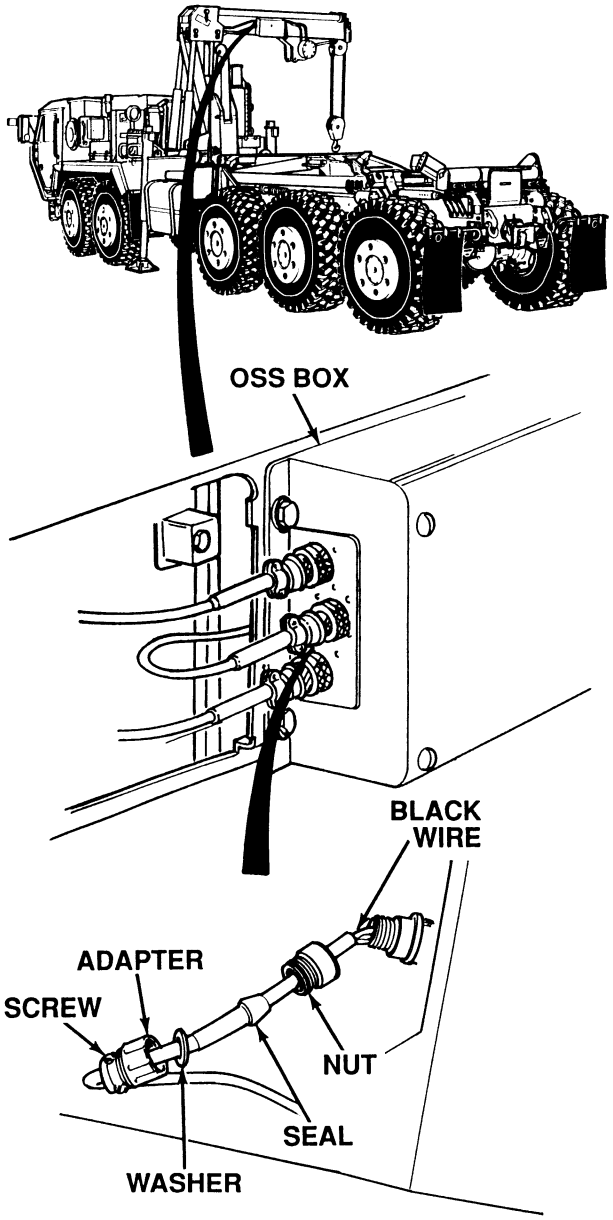
NOTE

It may be necessary to crack and remove paint from harness.

VOLTAGE TEST

(1) Loosen two screws on adapter.
(2) Remove adapter and washer from nut. Slide adapter and washer down harness and away from nut.
(3) Pull seal from nut while holding harness to prevent pulling harness out of connector.
(4) Remove nut from connector.
(5) Set multimeter to volts dc.
(6) Connect positive multimeter lead to black wire.
(7) Connect negative multimeter lead to known good ground.

Continued on next page.



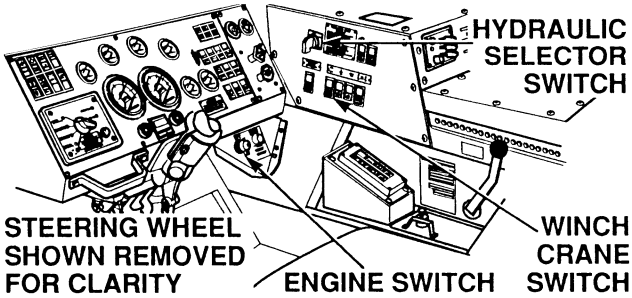
21. CRANE FAILS LOAD TEST (CONT).

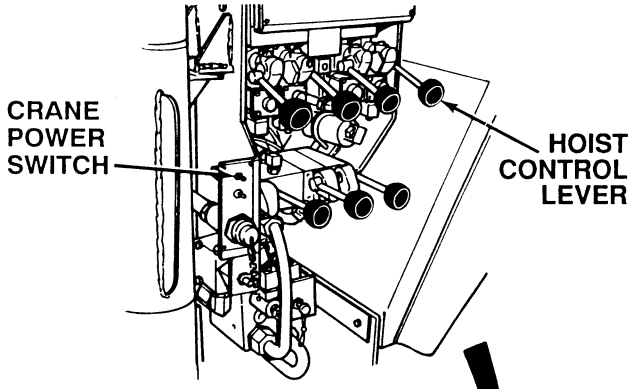
WARNING

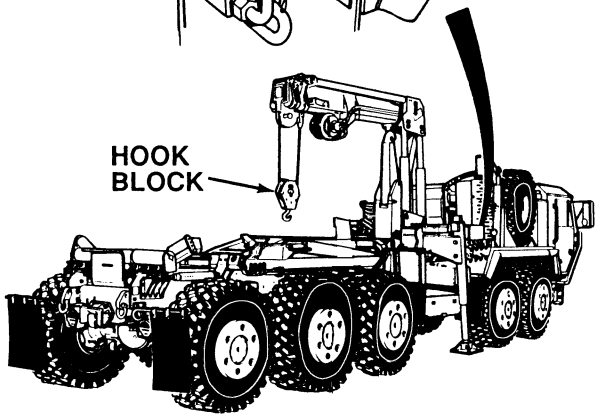
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

VOLTAGE TEST (CONT).

(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane main POWER switch to ON position.
(12) Using HOIST control lever, raise hoist hook block completely.
  (a) If 0 vdc are present, perform Steps (14) through (20) and replace hoist proximity sensor (Para 6-9).
  (b) If 22 to 28 vdc are present, go to Step (13) below.
(13) With the aid of an assistant, hold HOIST control lever in down position until only two even layers of cable remains on hoist cable drum.
  (a) If 22 to 28 vdc are present, perform Steps (14) through (20) below and replace hoist proximity sensor (Para 6-9).
  (b) If 0 vdc are present, replace OSS box (Para 6-8).
(14) Set crane main POWER switch to OFF position.
(15) Set hydraulic selector switch to OFF position.
(16) Turn OFF ENGINE switch.
Continued on next page.





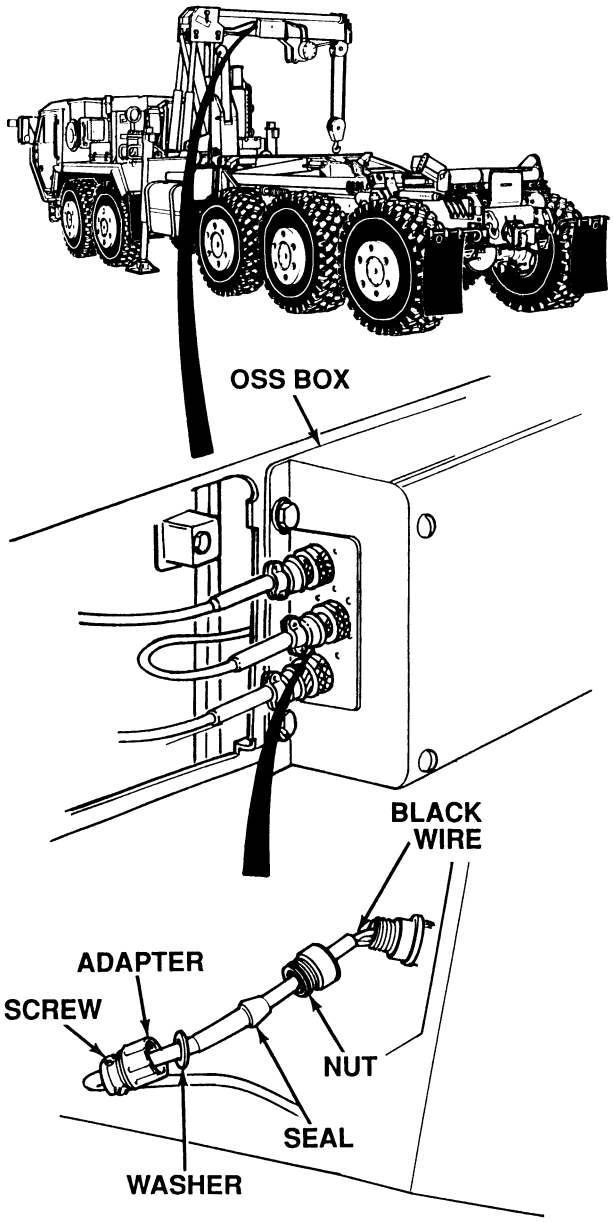


WARNING

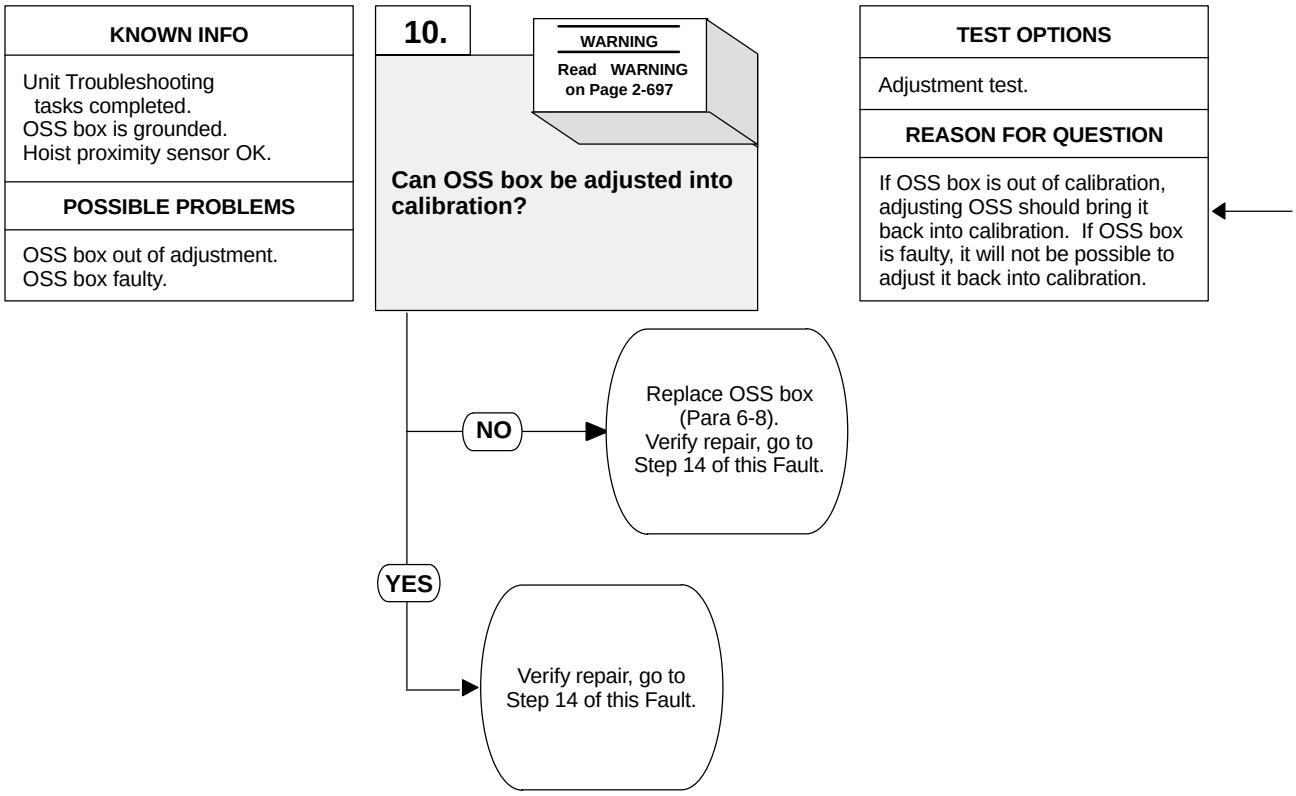
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

VOLTAGE TEST (CONT).

(17) Disconnect multimeter leads.
(18) Install nut on connector.
(19) Slide seal into nut.
(20) Install washer and adapter on connector and tighten two screws.

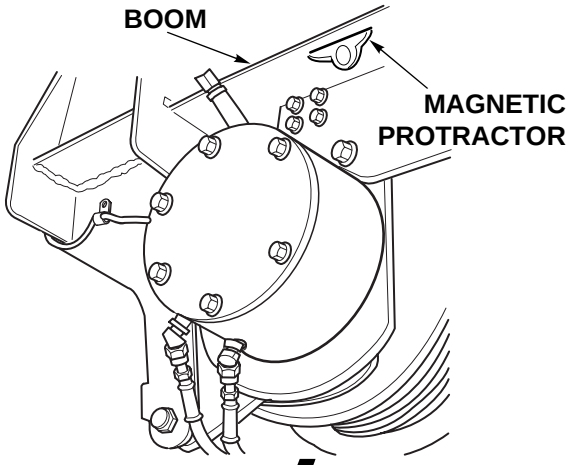


21. CRANE FAILS LOAD TEST (CONT).



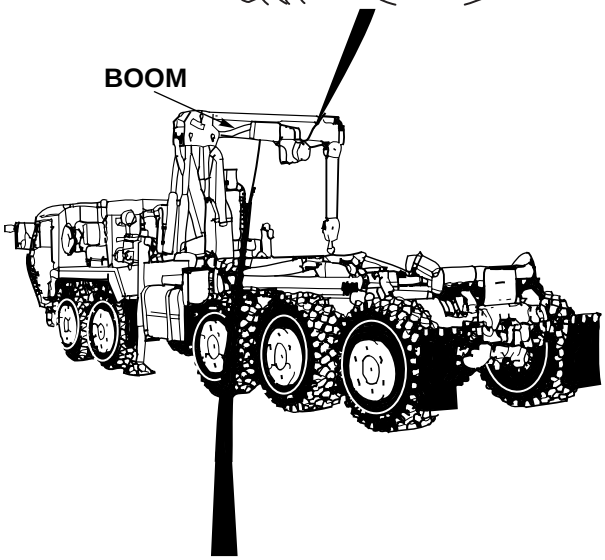
WARNING

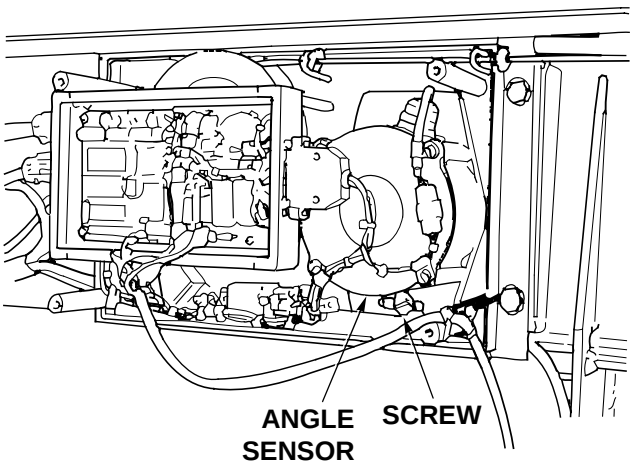
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.



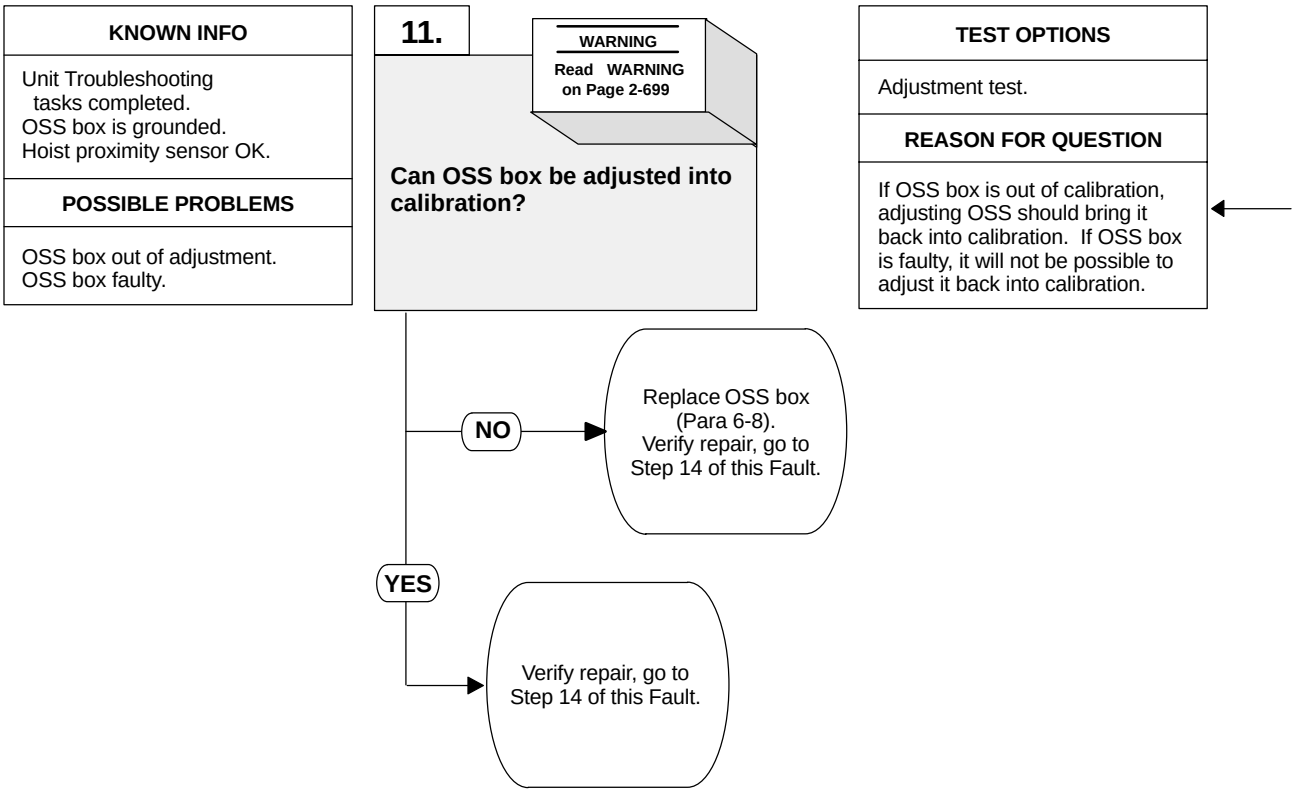
ADJUSTMENT TEST

(1) Loosen screw at bottom of angle sensor.
(2) Attempt to adjust angle sensor so that actual angle (indicated by magnetic protractor) and angle indicated on test unit display are the same.
(3) Tighten screw.
  (a) If it is not possible to adjust angle sensor enough that test unit indicates actual angle, remove magnetic protractor from boom and replace OSS box (Para 6-8).
  (b) If test unit indicates actual angle, angle sensor is OK. Remove magnetic protractor from boom and go to Step 14 of this Fault.





21. CRANE FAILS LOAD TEST (CONT).



WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

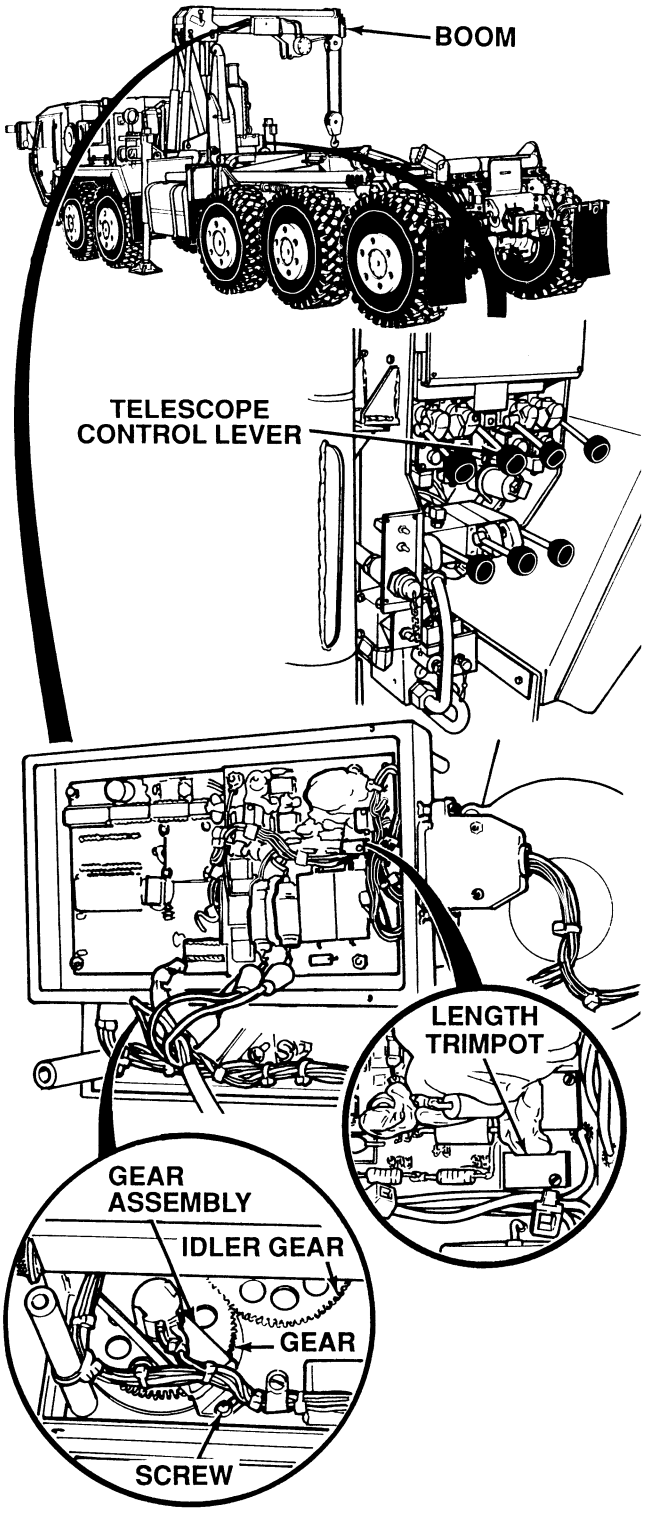
NOTE

- Record any adjustment made to gear assembly and length trimpot. The number of gear teeth moved or turns of trimpot screw may be necessary information for later steps.
- Adjustment made in Step (3) may be affected by adjustment made in Step (6).

ADJUSTMENT TEST

(1) Using TELE control lever, retract boom completely (TM 9-2320-364-10).
  (a) If test unit does not indicate 7.3 ft (2.22 m), go to Step (2) below.
  (b) If test unit indicates 7.3 ft (2.22 m), go to Step (5) below.
(2) Loosen screw on gear assembly and slide gear assembly away from idler gear being careful not to move gears in relation to each other.
(3) Rotate gear assembly gear to the right to increase test unit reading or to the left to decrease test unit reading. Moving the gear one to two teeth in a particular direction will increase or decrease test unit reading 0.1 to 0.2 ft (.03 to .06 m).
(4) Mesh gear assembly gear and idler gear and tighten screw when test unit indicates 7.3 ft (2.22 m).
  (a) If it is not possible to adjust gear assembly enough that test unit indicates 7.3 ft (2.22 m), replace OSS box (Para 6-8).
  (b) If test unit indicates 7.3 ft (2.22 m), go to Step (5) below.
(5) Using TELE control lever, extend boom completely.
  (a) If test unit does not indicate 22.5 ft (6.86 m), go to Step (6) below.
  (b) If test unit indicates 22.5 ft (6.86 m) go to Step 14 of this Fault.
(6) Adjust length trimpot until test unit indicates 22.5 ft (6.86 m).
  (a) If it is not possible to adjust length trimpot enough that test unit indicates 22.5 ft (6.86 m), replace OSS box (Para 6-8).
  (b) If test unit indicates 22.5 ft (6.86 m), go to Step (7) below.
(7) Repeat Steps (1) through (6) a maximum of two more times to achieve a consistent reading of 7.3 ft (2.22 m) (retracted) and 22.5 ft (6.86 m) (extended) without needing adjustment.

Continued on next page.



21. CRANE FAILS LOAD TEST (CONT).

WARNING

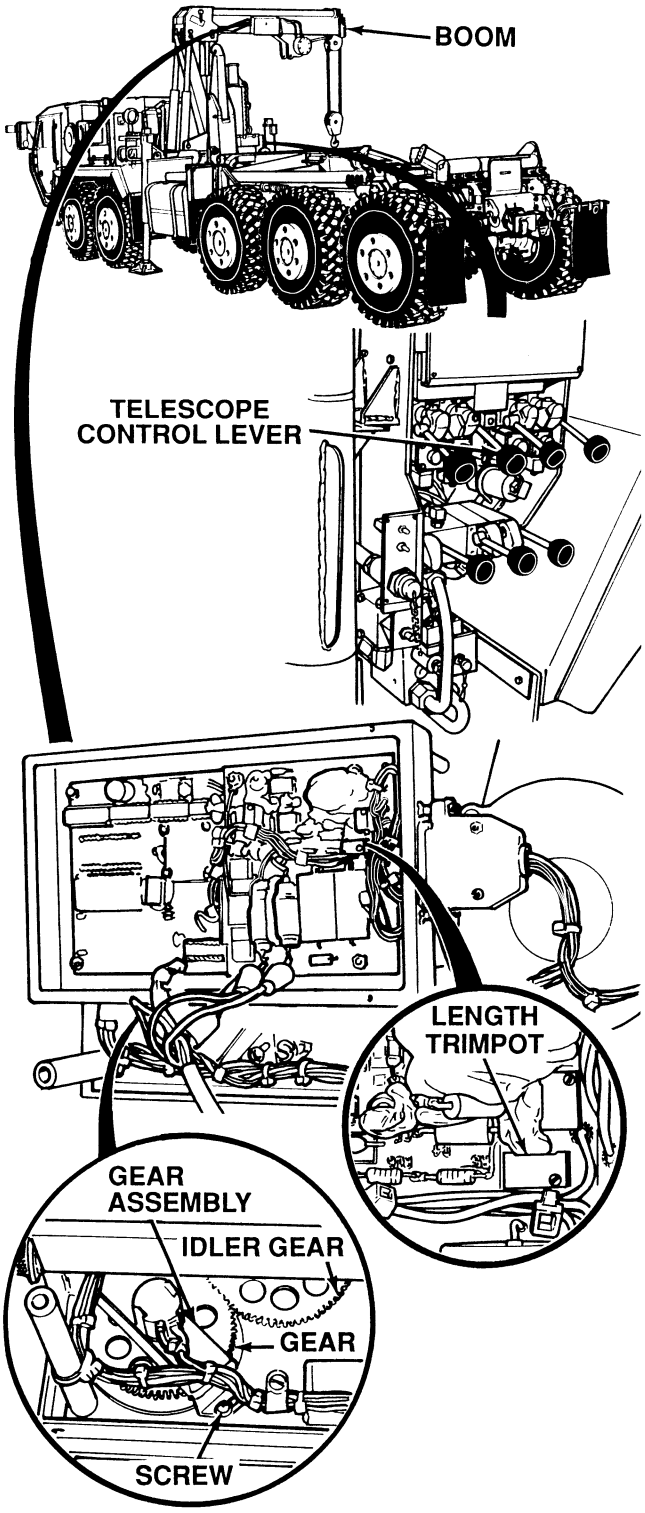
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

ADJUSTMENT TEST (CONT).

(a) If Steps (1) through (6) have been completed three times and it is still necessary to adjust trimpot or gear every time boom is fully extended or retracted, go to Step (8) below.
(b) If, after repeating Steps (1) through (6), the boom can be extended and retracted and test unit will indicate 22.5 ft (6.86 m) and 7.3 ft (2.22 m) without adjustment, go to Step 14 of this Fault.

(8) Loosen screw on gear assembly and slide gear assembly away from idler gear being careful not to move gears in relation to each other.
(9) Rotate gear assembly gear back three teeth past the position it was in prior to any adjustment (if gear was turned seven teeth to the right during adjustment, then turn gear 10 teeth to the left).
(10) Mesh gear assembly gear and idler gear and tighten screw.
(11) Using TELE control lever, retract boom completely (TM 9-2320-364-10).

Continued on next page.

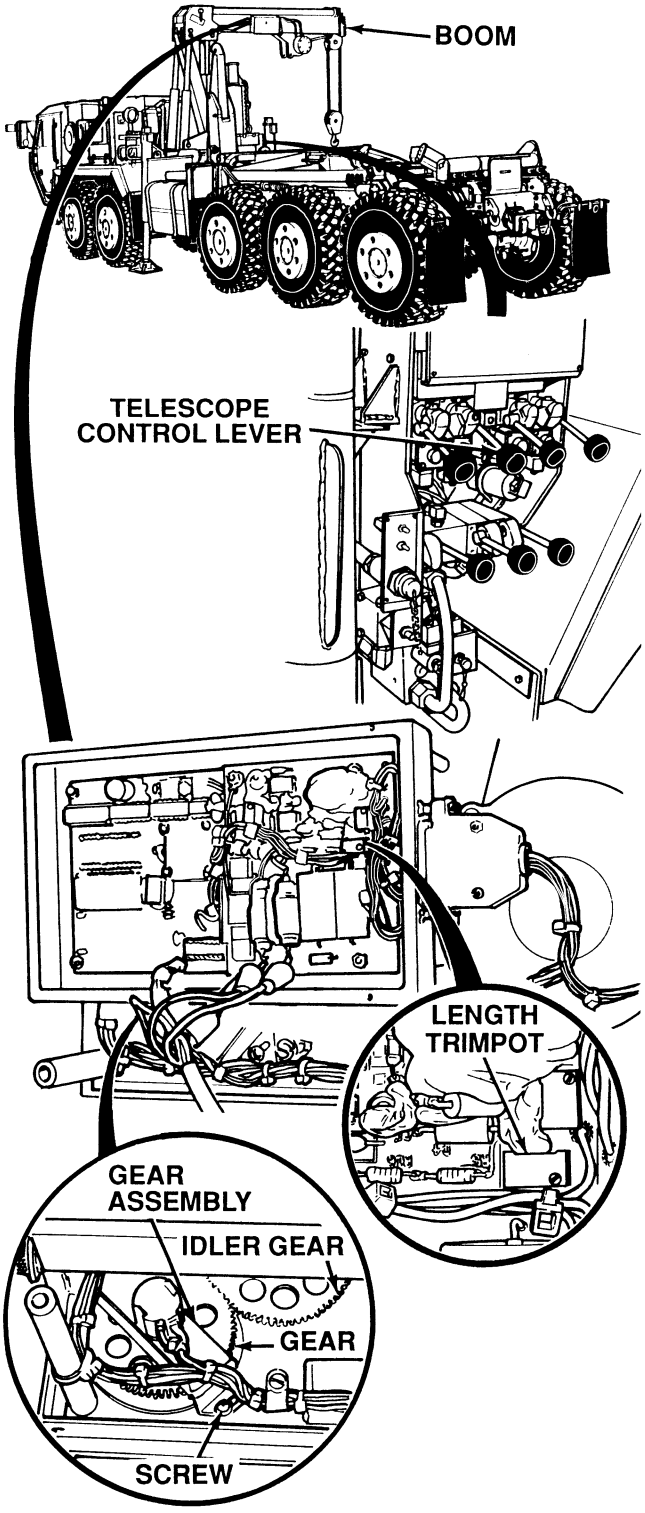


WARNING

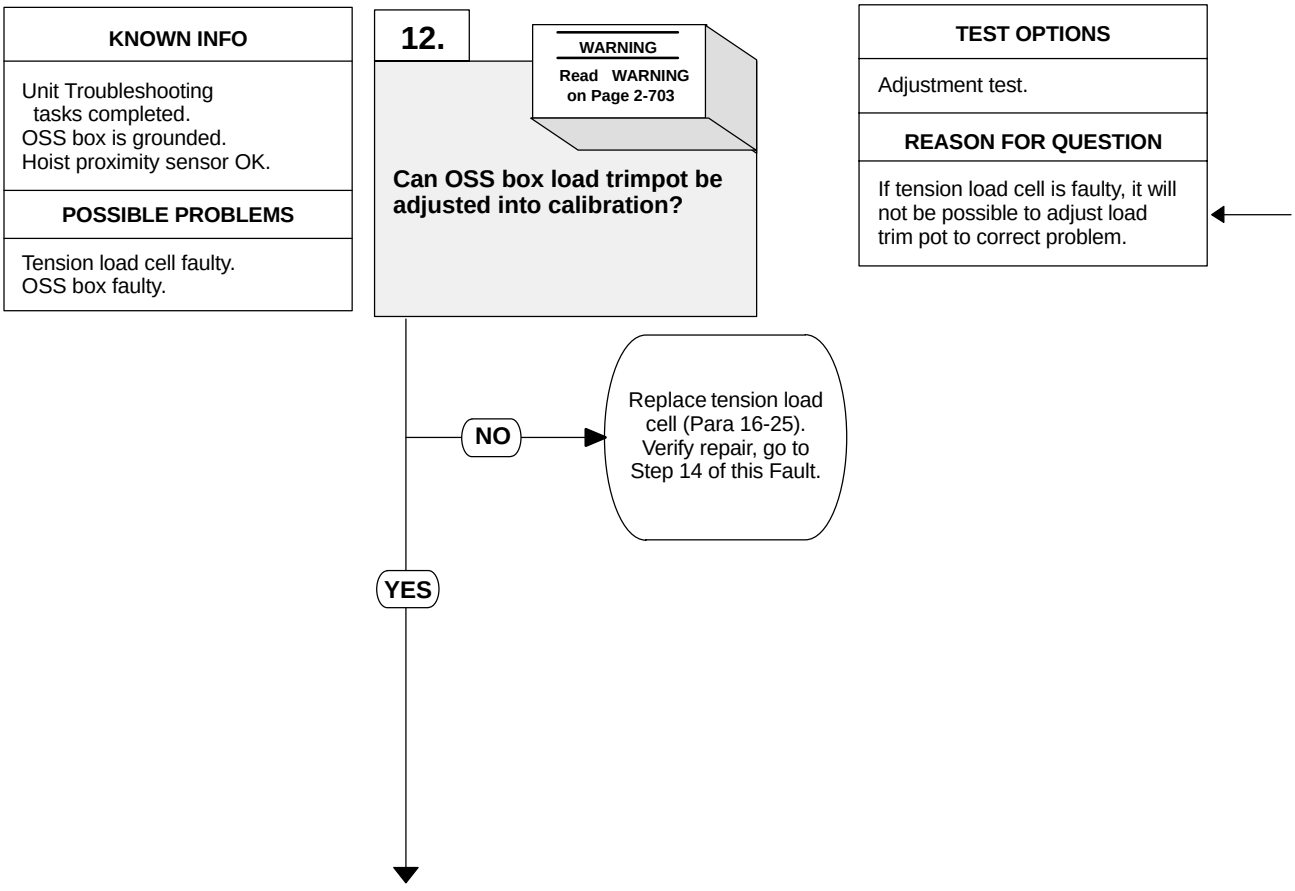
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

ADJUSTMENT TEST (CONT).

(12) Adjust length trimpot until test unit indicates 7.3 ft (2.22 m)
(13) Using TELE control lever, extend boom completely.
  (a) If test unit does not indicate 22.5 ft (6.86 m), go to Step (14) below.
  (b) If test unit indicates 22.5 ft (6.86 m) go to Step 14 of this Fault.
(14) Loosen screw on gear assembly and slide gear assembly away from idler gear being careful not to move gears in relation to each other.
(15) Rotate gear assembly gear to the right to increase test unit reading or to the left to decrease test unit reading. Moving the gear 1 to 2 teeth in a particular direction will increase or decrease test unit reading 0.1 to 0.2 ft (.03 to .06 m).
(16) Mesh gear assembly gear and idler gear and tighten screw when test unit indicates 22.5 ft (6.86 m).
(17) Repeat Steps (8) through (17) until boom can be extended and retracted with test unit indicating 22.5 ft (6.86 m) and 7.3 ft (2.22 m) without adjustment and then go to Step 14 of this Fault.



21. CRANE FAILS LOAD TEST (CONT).



WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

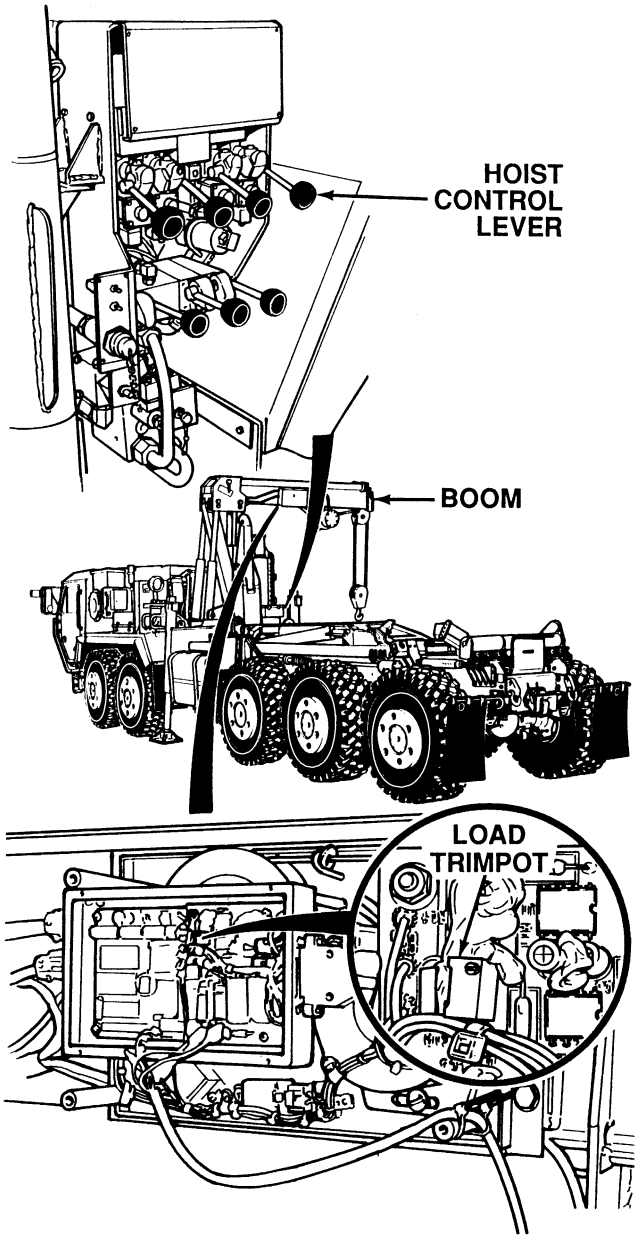
NOTE

- Boom should be telescoped out completely and at 5 degrees. Check that mast is up completely.
- Test weight can be ± 10 lbs (4.5 kg).
- Turn screw to right to increase display weight indication and to the left to decrease display weight indication.

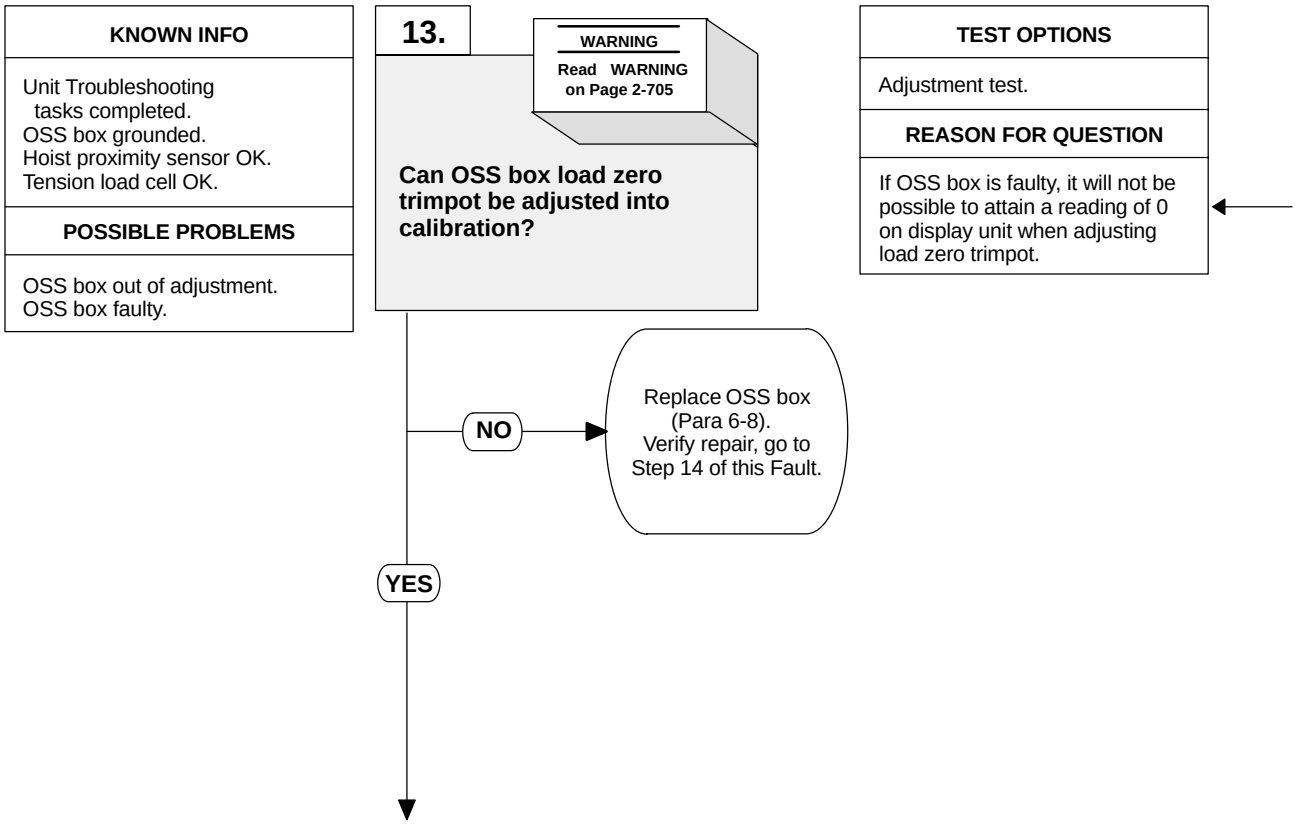
ADJUSTMENT TEST

(1) Using HOIST control lever, lift 3900 lbs (1771 kg) load from ground.
  (a) If test unit does not indicate 3900 lbs (1770 kg), go to Step (2) below.
  (b) If test unit indicates 3900 lbs (1770 kg), lower load to the ground and go to Step 13 of this Fault.

(2) Attempt to adjust load trimpot until test unit display indicates 3900 lbs (1770 kg).
  (a) If it is not possible to adjust trimpot enough that test unit indicates 3900 lbs (1770 kg), lower load to the ground and replace tension load cell (Para 16-25).
  (b) If test unit indicates 3900 lbs, (1770 kg) lower load to the ground and go to Step 13 of this Fault.



21. CRANE FAILS LOAD TEST (CONT).

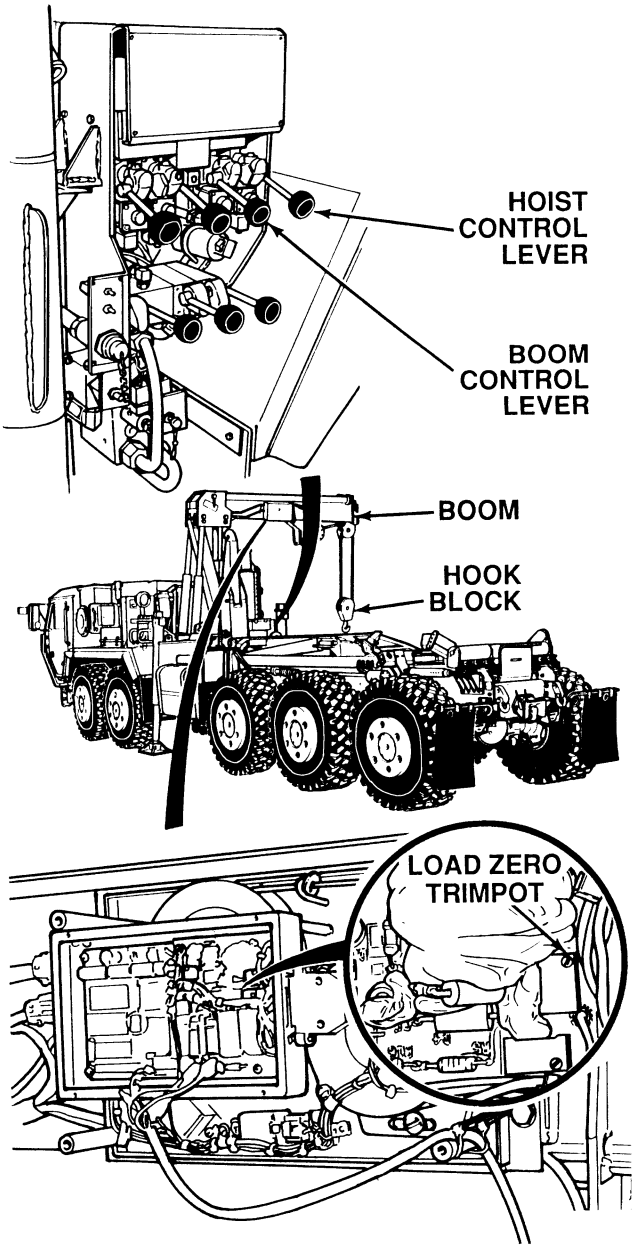


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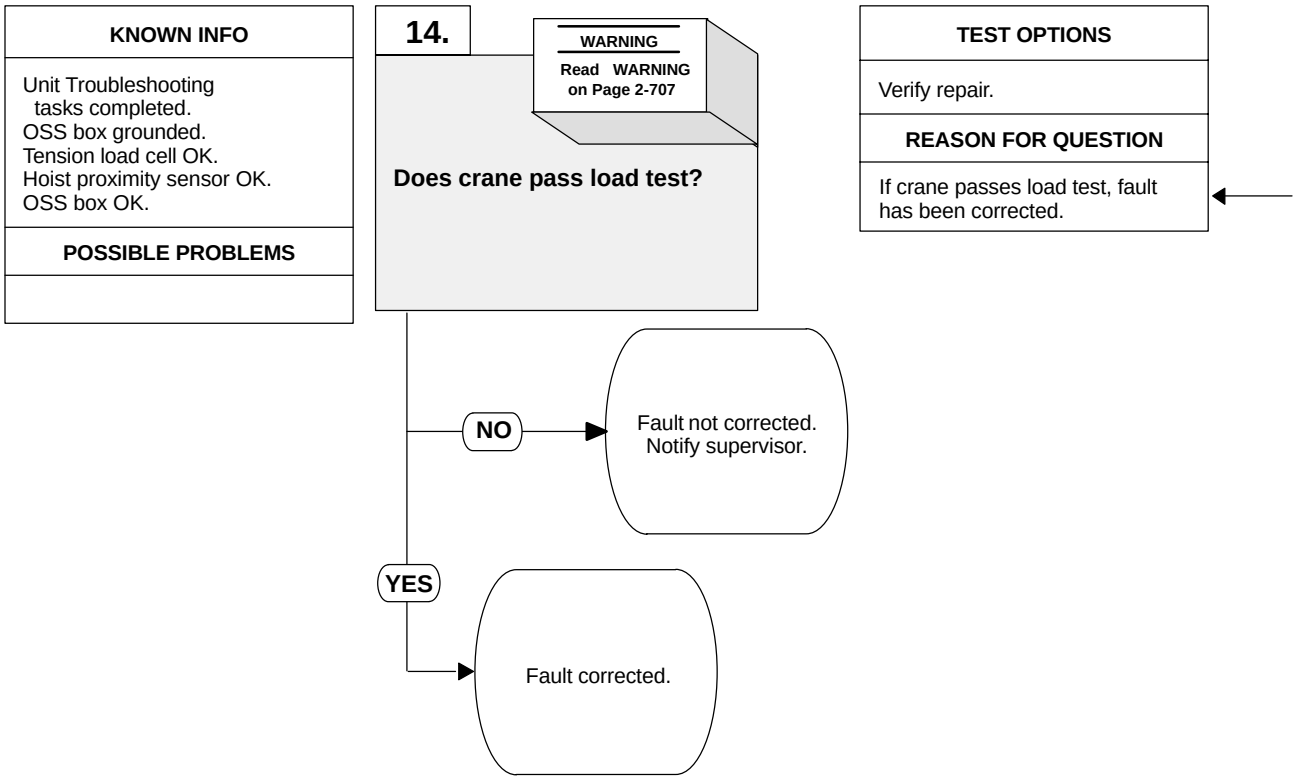
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

ADJUSTMENT TEST

(1) Disconnect hook block from load.
(2) Using LIFT control lever, move boom to 15 degrees (TM 9-2320-364-10).
(3) Using HOIST control lever, position hook block 3.5 ft. (1 m) above ground.
(4) Attempt to adjust load zero trimpot until test unit display indicates 0 lbs (0 kg).
    (a) If it is not possible to adjust trimpot enough that test unit indicates 0 lbs (0 kg), replace OSS box (Para 6-8).
    (b) If test unit indicates 0 lbs (0 kg), go to Step 14 of this Fault.

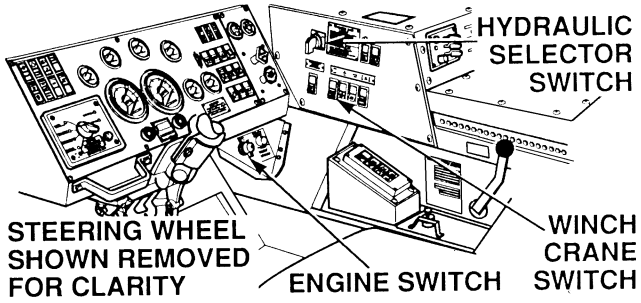


21. CRANE FAILS LOAD TEST (CONT).



WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

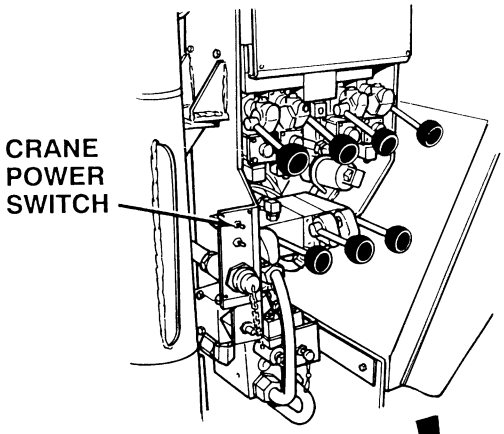


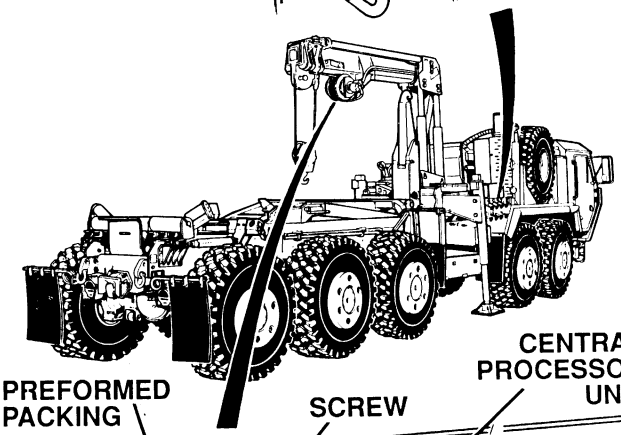
CAUTION

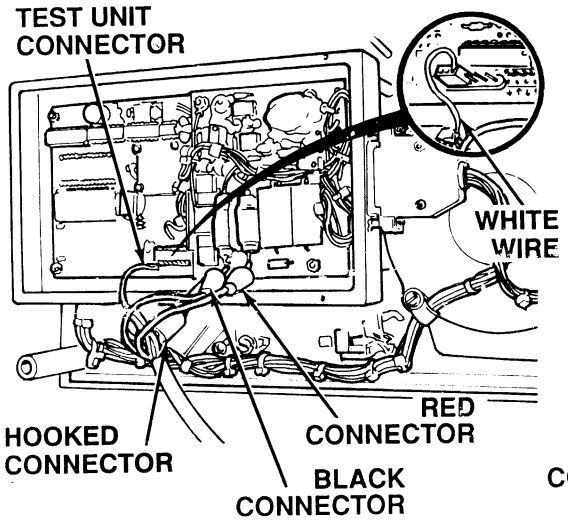
Hooked test unit connector must not contact other transistor wire or damage to OSS and test unit will result.

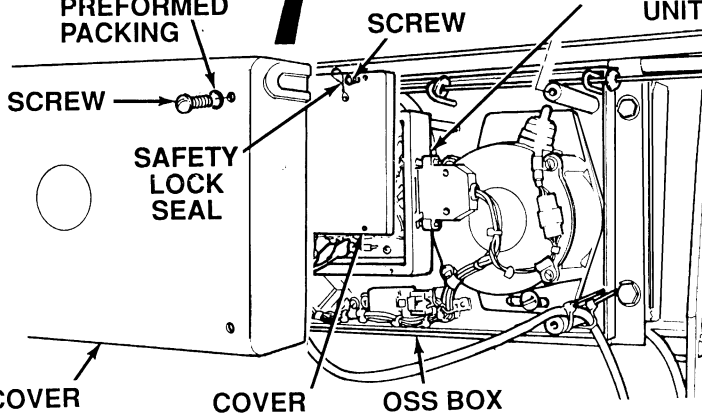
VERIFY REPAIR

(1) Set crane main POWER switch to OFF position.
(2) Set hydraulic selector switch to OFF position.
(3) Turn OFF engine switch.
(4) Disconnect four connectors from OSS box.
(5) Install cover on central processor unit with four screws.
(6) Install safety lock seal on two screws.
(7) Install cover on OSS box with four screws and preformed packings.
(8) Apply bead of sealant to edge of cover where it is against OSS box.
(9) Perform load test (Para 16-32).
  (a) If crane does not pass load test, fault not corrected. Notify supervisor.
  (b) If crane passes load test, fault has been corrected.









2-15. MATERIAL HANDLING CRANE TROUBLESHOOTING (CONT).

22. OVERLOAD SHUTDOWN SYSTEM (OSS) DISABLES CRANE FUNCTIONS, BOOM UP, BOOM DOWN, TELESCOPE OUT AND HOIST UP.

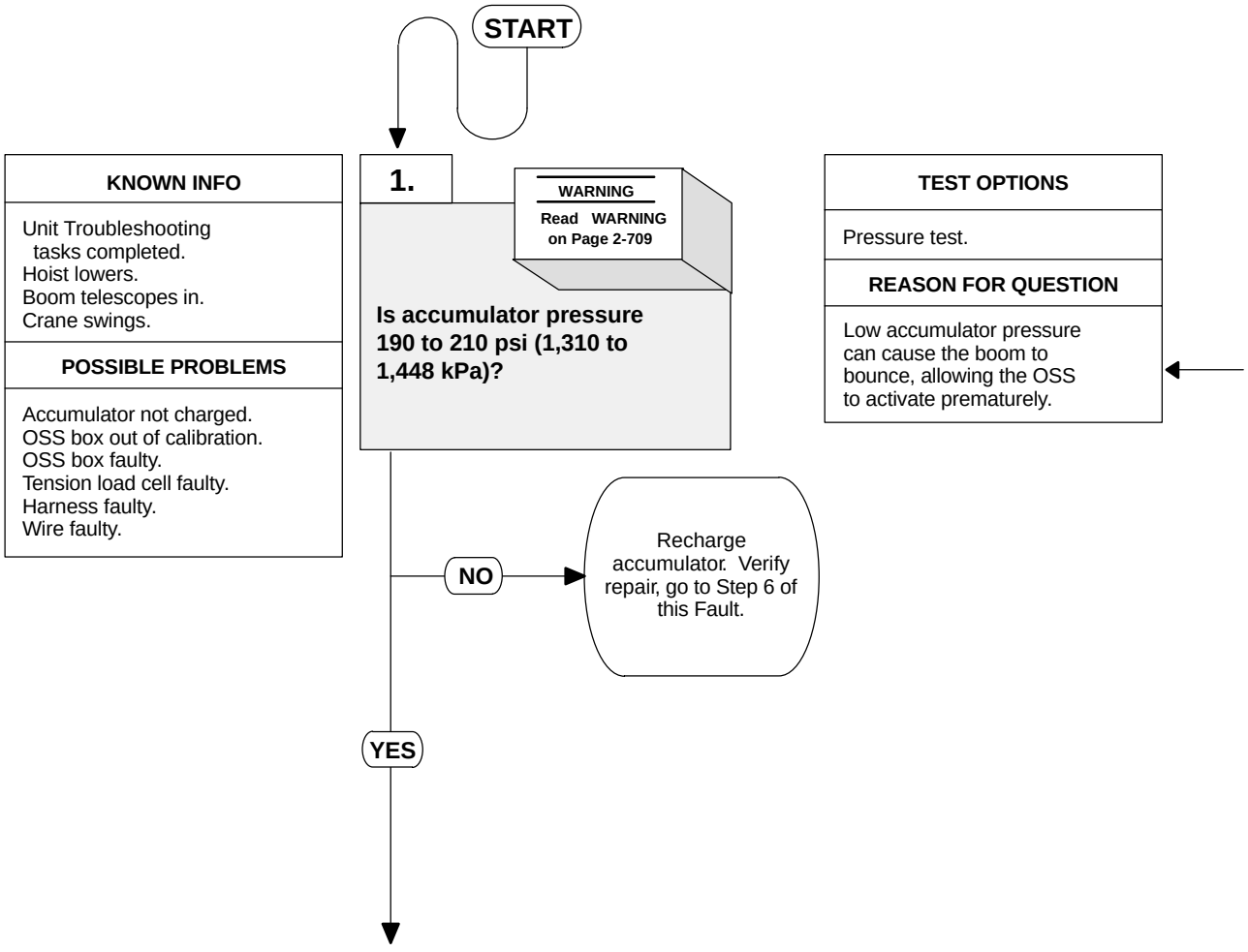
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
OSS Tester (Item 142, Appendix F)

Materials/Parts
Cable Ties (2) (Item 9, Appendix B)
Sealing Compound (Item 62, Appendix B)
Wire, Nonelectrical (Item 79, Appendix B)
Packing, Preformed (4) (Item 357, Appendix E)

References
TM 9-2320-364-10

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)
Outriggers down with weight off vehicle suspension, (TM 9-2320-364-10)



WARNING

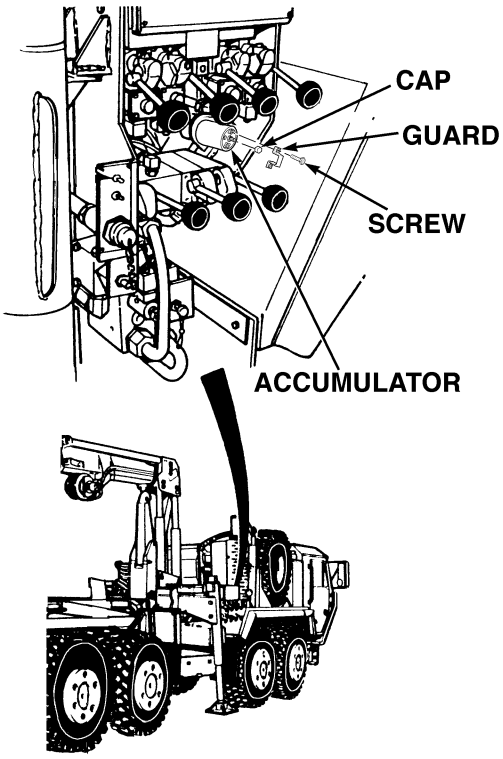
Accumulator testing and charging can expose personnel to high pressure nitrogen. Use of proper safety equipment is required to prevent serious injury or death.

NOTE

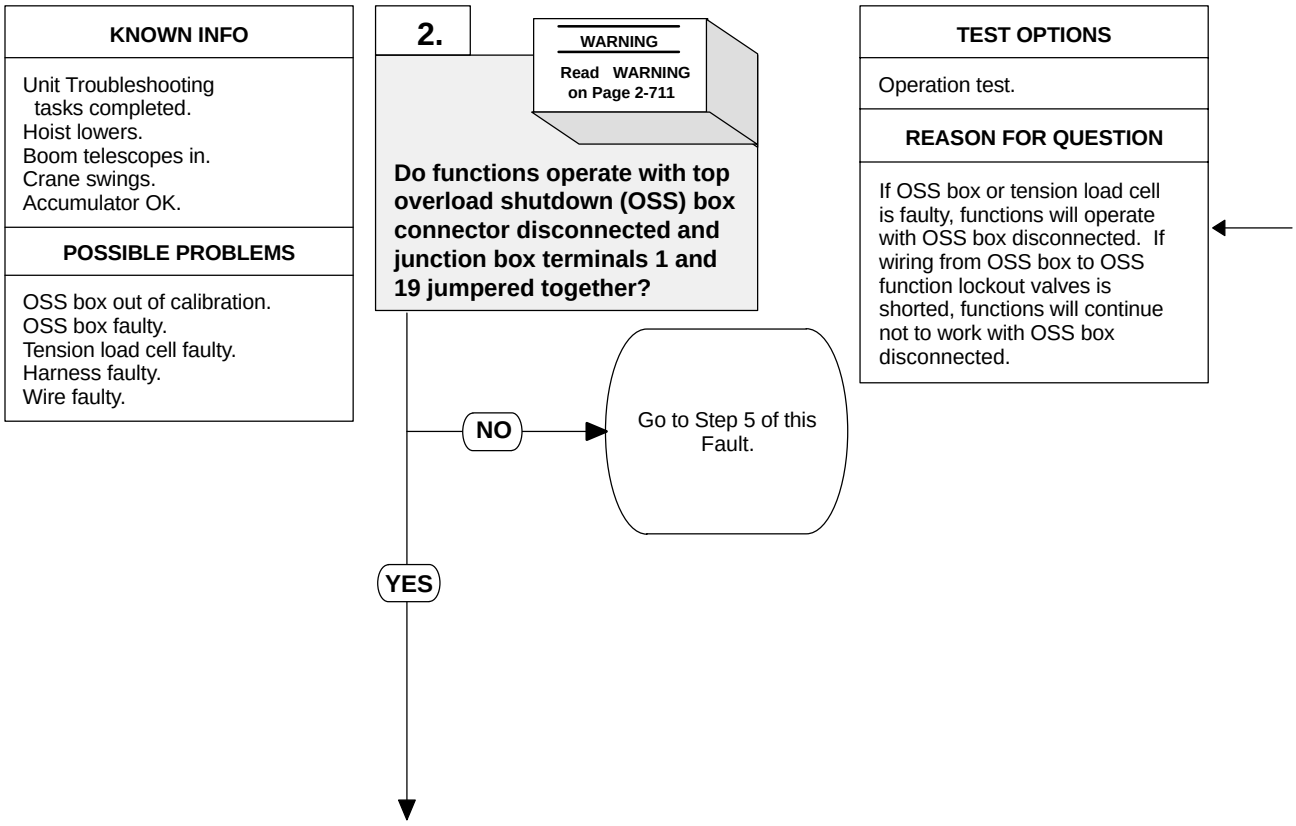
- Accumulator can only be accurately charged when there is 0 psi (0 kPa) present in all crane hydraulic circuits.
- Ensure that all crane control levers are manually operated to the full up and down positions. Failure to comply could result in trapped hydraulic pressure, resulting in incorrect accumulator charge readings.

PRESSURE TEST

(1) Manually operate all crane control levers fully up and down.
(2) Remove two screws and guard.
(3) Remove valve stem cap from accumulator fitting.
(4) Attach accumulator pressure test hose to accumulator fitting.
(5) Read accumulator charge pressure.
  (a) If there is not 190 to 210 psi (1,310 to 1,448 kPa) present, recharge accumulator (Para 16-22).
  (b) If there is 190 to 210 psi (1,310 to 1,448 kPa) present, perform Steps (6) through (8) below, and go to Step 2 of this Fault.
(6) Remove accumulator pressure test hose from accumulator fitting.
(7) Install valve stem cap on accumulator fitting.
(8) Install guard with two screws.

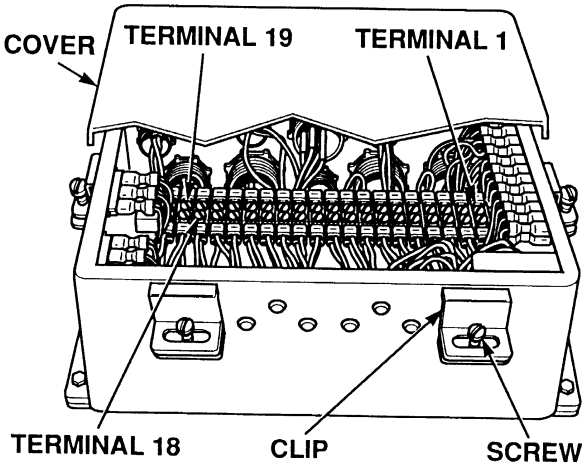


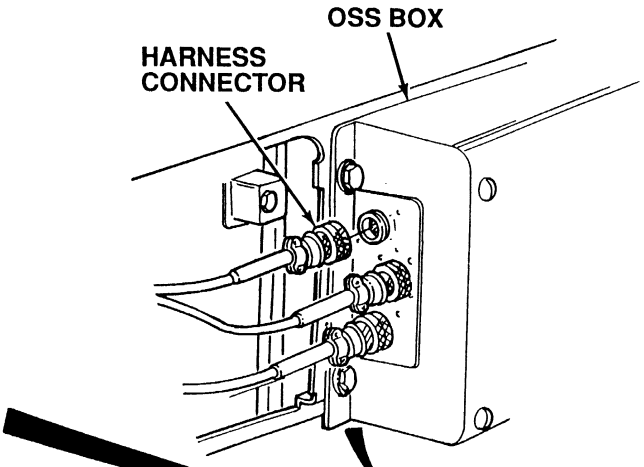
22. OSS DISABLES FUNCTIONS (CONT).

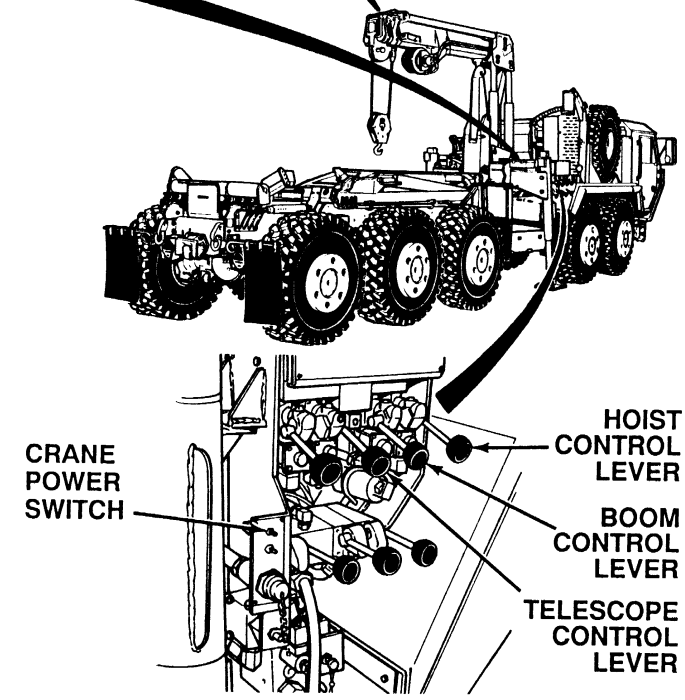


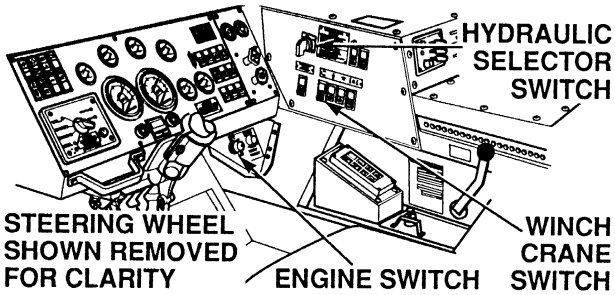
WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.





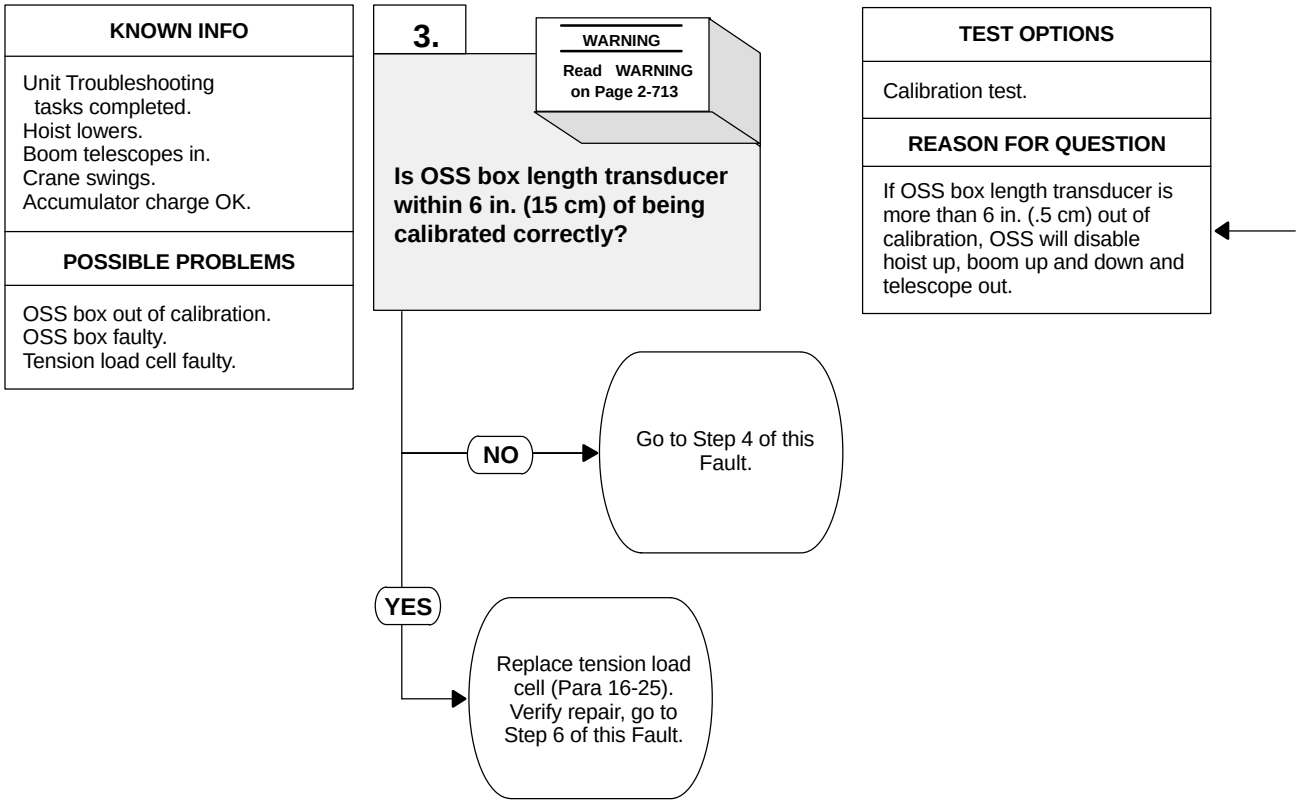




OPERATION TEST

(1) Loosen six screws and remove six clips from crane main junction box cover.
(2) Remove cover from junction box.
(3) Connect junction box terminals 1 and 19 using jumper wire.
(4) Disconnect top connector from OSS box.
(5) Start engine (TM 9-2320-364-10).
(6) Set WINCH/CRANE switch to CRANE position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Set crane main POWER switch to ON position.
(9) Attempt to operate boom and hoist functions using BOOM, TELESCOPE and HOIST control levers.
    (a) If functions do not operate, perform Steps (12) through (15) below and go to Step 5 of this Fault.
    (b) If functions operate, perform Steps (10) through (17) below and go to Step 3 of this Fault.
(10) Position boom so that OSS box is accessible for repairs.
(11) Telescope boom out completely.
(12) Set crane main POWER switch to OFF position.
(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.
(15) Remove two screws and disconnect four white wires from crane main junction box, terminal 18.
(16) Disconnect jumper wire from crane main junction box terminals 1 and 19.
(17) Connect connector to OSS box.

22. OSS DISABLES FUNCTIONS (CONT).



WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

CAUTION

Hooked test unit connector must not contact other transistor wire or damage to OSS and test unit will result.

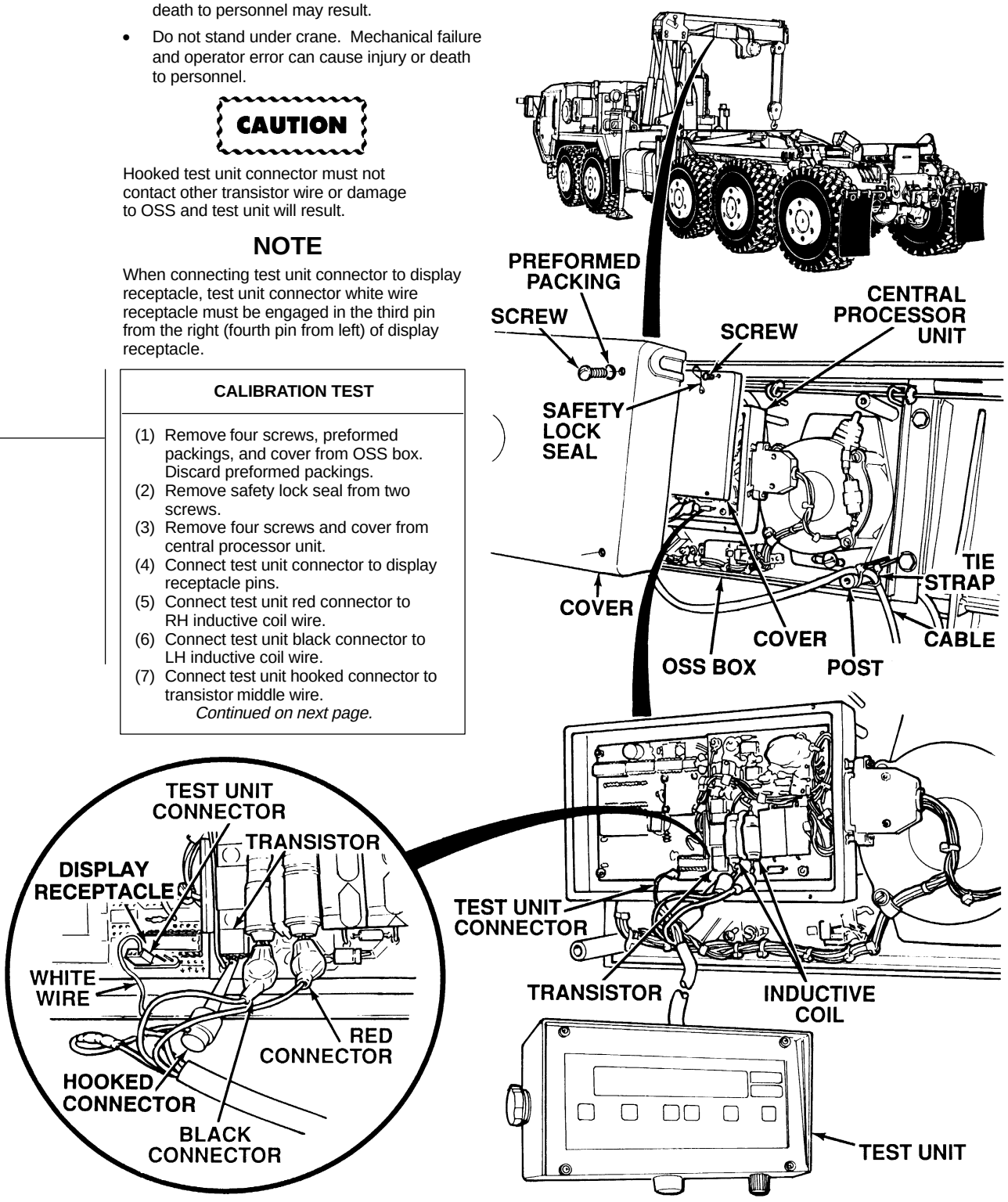
NOTE

When connecting test unit connector to display receptacle, test unit connector white wire receptacle must be engaged in the third pin from the right (fourth pin from left) of display receptacle.

CALIBRATION TEST

(1) Remove four screws, preformed packings, and cover from OSS box. Discard preformed packings.
(2) Remove safety lock seal from two screws.
(3) Remove four screws and cover from central processor unit.
(4) Connect test unit connector to display receptacle pins.
(5) Connect test unit red connector to RH inductive coil wire.
(6) Connect test unit black connector to LH inductive coil wire.
(7) Connect test unit hooked connector to transistor middle wire.

Continued on next page.



22. OSS DISABLES FUNCTIONS (CONT).

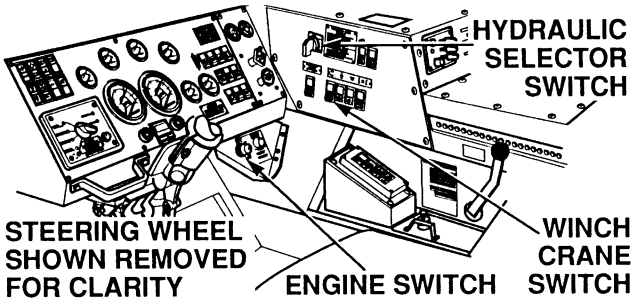
WARNING

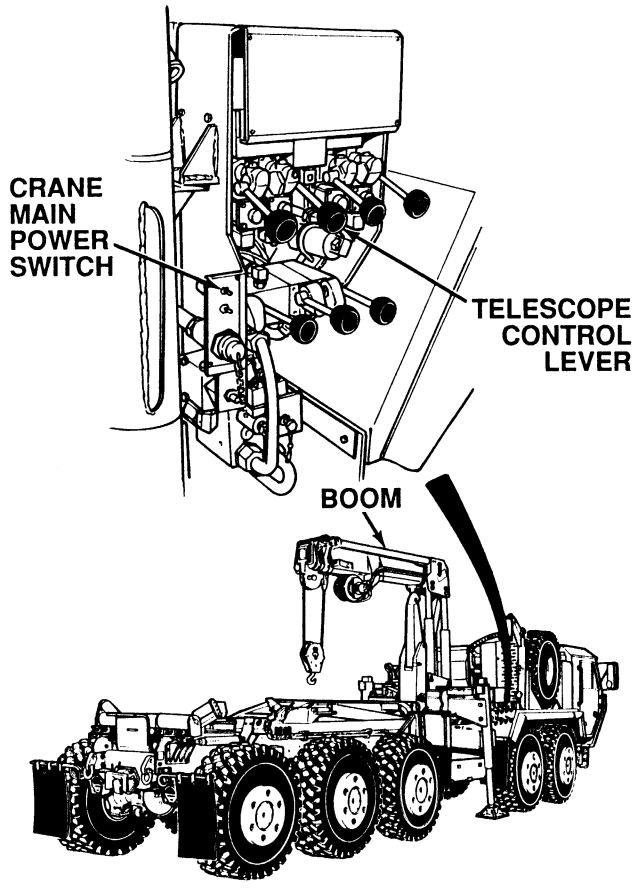
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

CALIBRATION TEST (CONT).

(8) Start engine (TM 9-2320-364-10).
(9) Set WINCH/CRANE switch to CRANE position.
(10) Set hydraulic selector switch to CRANE/SRW position.
(11) Set crane main POWER switch to ON position.
(12) Using TELE control lever, telescope boom out completely.
(13) Adjust clarity of test unit display using control knob on bottom of test unit.
  (a) If test unit does not indicate between 22.0 and 23.0 ft (6.7 to 7 m), go to Step 4 of this Fault.
  (b) If test unit indicates between 22.0 and 23.0 ft (6.7 to 7 m), go to Step (14) below.
(14) Using TELE control lever, retract boom completely.
  (a) If test unit does not indicate between 6.8 and 7.8 ft (2.1 to 2.4 m), go to Step 4 of this Fault.
  (b) If test unit indicates between 6.8 and 7.8 ft (2.1 to 2.4 m), perform Steps (15) through (22) below and replace tension load cell (Para 16-25).

Continued on next page.





WARNING

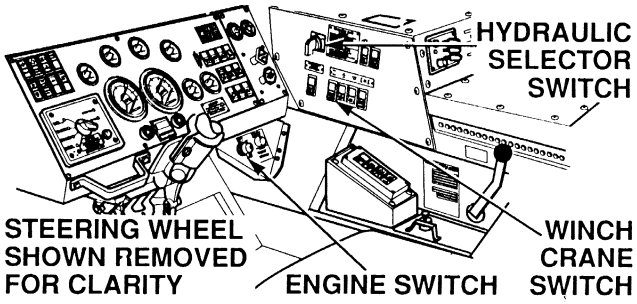
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

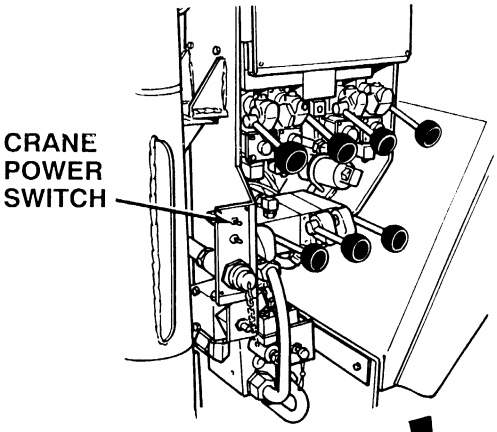
CAUTION

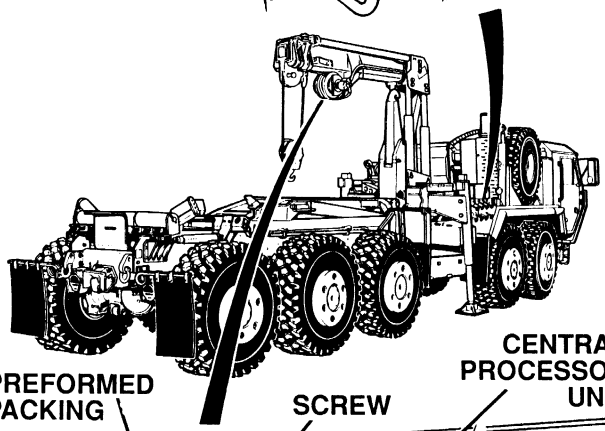
Hooked test unit connector must not contact other transistor wire or damage to OSS and test unit will result.

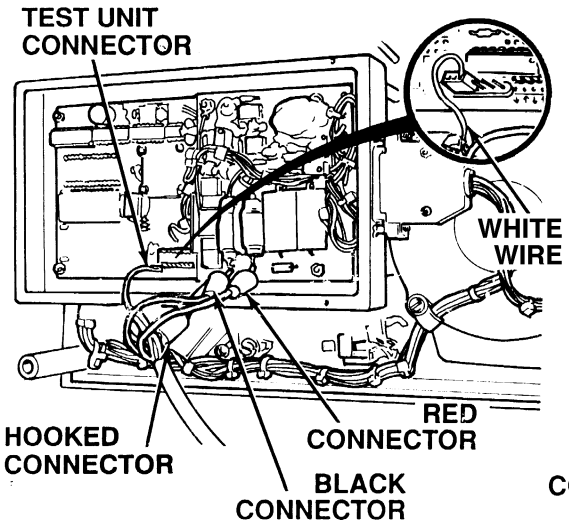
CALIBRATION TEST (CONT).

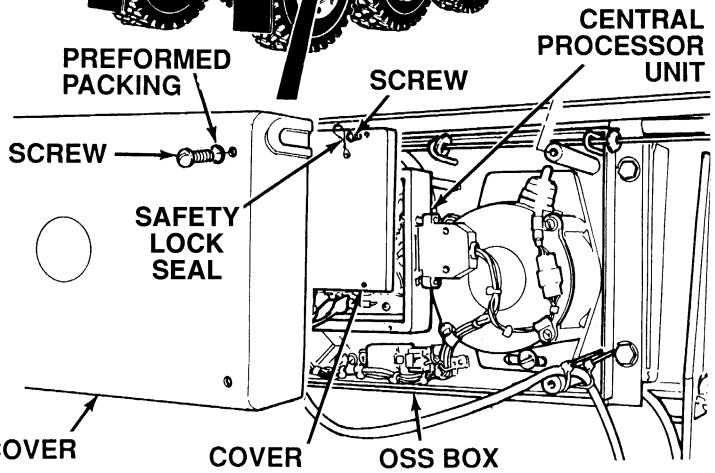
(15) Set crane main POWER switch to OFF position (TM 9-2320-364-10).
(16) Set hydraulic selector switch to OFF position.
(17) Turn OFF engine switch.
(18) Disconnect four connectors from OSS box.
(19) Install cover on central processor unit with four screws.
(20) Install safety lock seal on two screws.
(21) Install cover on OSS box with four screws and preformed packings.
(22) Apply bead of sealant to edge of cover where it is against OSS box.



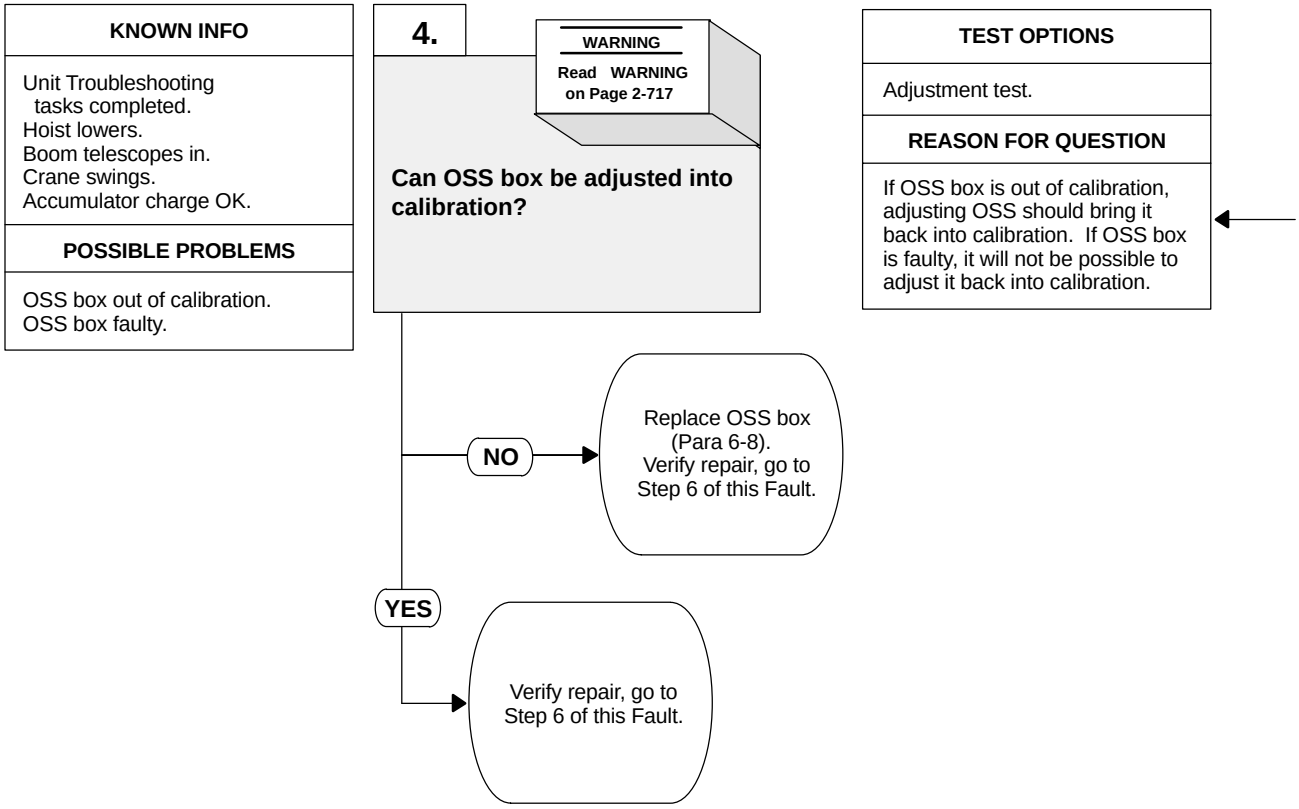








22. OSS DISABLES FUNCTIONS (CONT).



WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

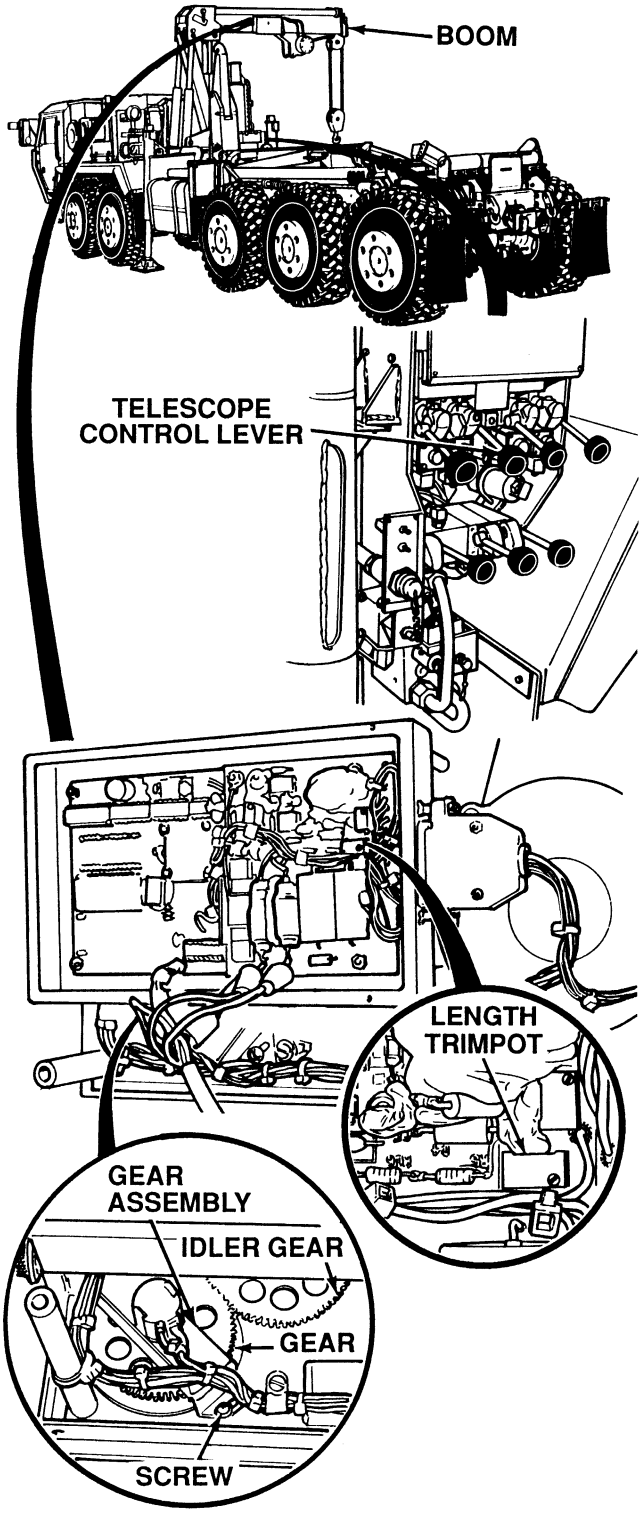
NOTE

- Record any adjustment made to gear assembly and length trimpot. The number of gear teeth moved or turns of trimpot screw may be necessary information for later steps.
- Adjustment made in Step (3) may be affected by adjustment made in Step (6).

ADJUSTMENT TEST

(1) Using TELE control lever, retract boom completely if not already done (TM 9-2320-364-10).
  (a) If test unit does not indicate 7.3 ft (2.2 m), go to Step (2) below.
  (b) If test unit indicates 7.3 ft (2.2 m), go to Step (5) below.
(2) Loosen screw on gear assembly and slide gear assembly away from idler gear being careful not to move gears in relation to each other.
(3) Rotate gear assembly gear to the right to increase test unit reading or to the left to decrease test unit reading. Moving the gear one to two teeth in a particular direction will increase or decrease test unit reading 0.1 to 0.2 ft (.03 to .06 m).
(4) Mesh gear assembly gear and idler gear and tighten screw when test unit indicates 7.3 ft (2.2 m).
  (a) If it is not possible to adjust gear assembly enough that test unit indicates 7.3 ft (2.2 m), replace OSS box (Para 6-8).
  (b) If test unit indicates 7.3 ft (2.2 m), go to Step (5) below.
(5) Using TELE control lever, extend boom completely.
  (a) If test unit does not indicate 22.5 ft (6.86 m), go to Step (6) below.
  (b) If test unit does indicate 22.5 ft (6.86 m) go to Step 14 of this Fault.
(6) Adjust length trimpot until test unit indicates 22.5 ft (6.86 m).
  (a) If it is not possible to adjust length trim pot enough that test unit indicates 22.5 ft (6.86 m), replace OSS box (Para 6-8).
  (b) If test unit indicates 22.5 ft (6.86 m), go to Step (7) below.
(7) Repeat Steps (1) through (6) a maximum of two more times to achieve a consistent reading of 7.3 ft (2.2 m) (retracted) and 22.5 ft (6.86 m) (extended) without needing adjustment.

Continued on next page.



22. OSS DISABLES FUNCTIONS (CONT).

WARNING

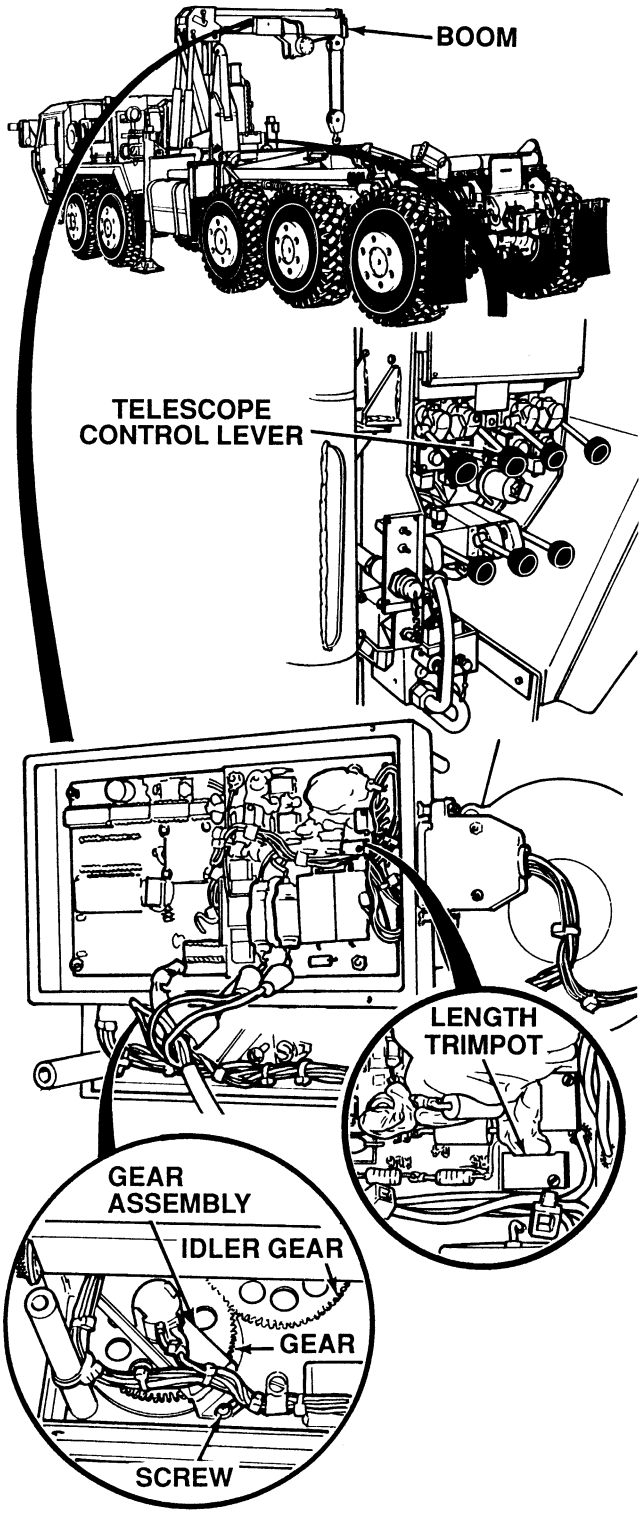
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

ADJUSTMENT TEST (CONT).

(a) If Steps (1) through (6) have been completed three times and it is still necessary to adjust trimpot or gear every time boom is fully extended or retracted, go to Step (8) below.
(b) If, after repeating Steps (1) through (6), the boom can be extended and retracted and test unit will indicate 22.5 ft (6.86 m) and 7.3 ft (2.2 m) without adjustment, go to Step 6 of this Fault.

(8) Loosen screw on gear assembly and slide gear assembly away from idler gear being careful not to move gears in relation to each other.
(9) Rotate gear assembly gear back three teeth past the position it was in prior adjustment (if gear was turned seven teeth to the right during adjustment, then turn gear 10 teeth to the left).
(10) Mesh gear assembly gear and idler gear and tighten screw.
(11) Using TELE control lever, retract boom completely (TM 9-2320-364-10).

Continued on next page.

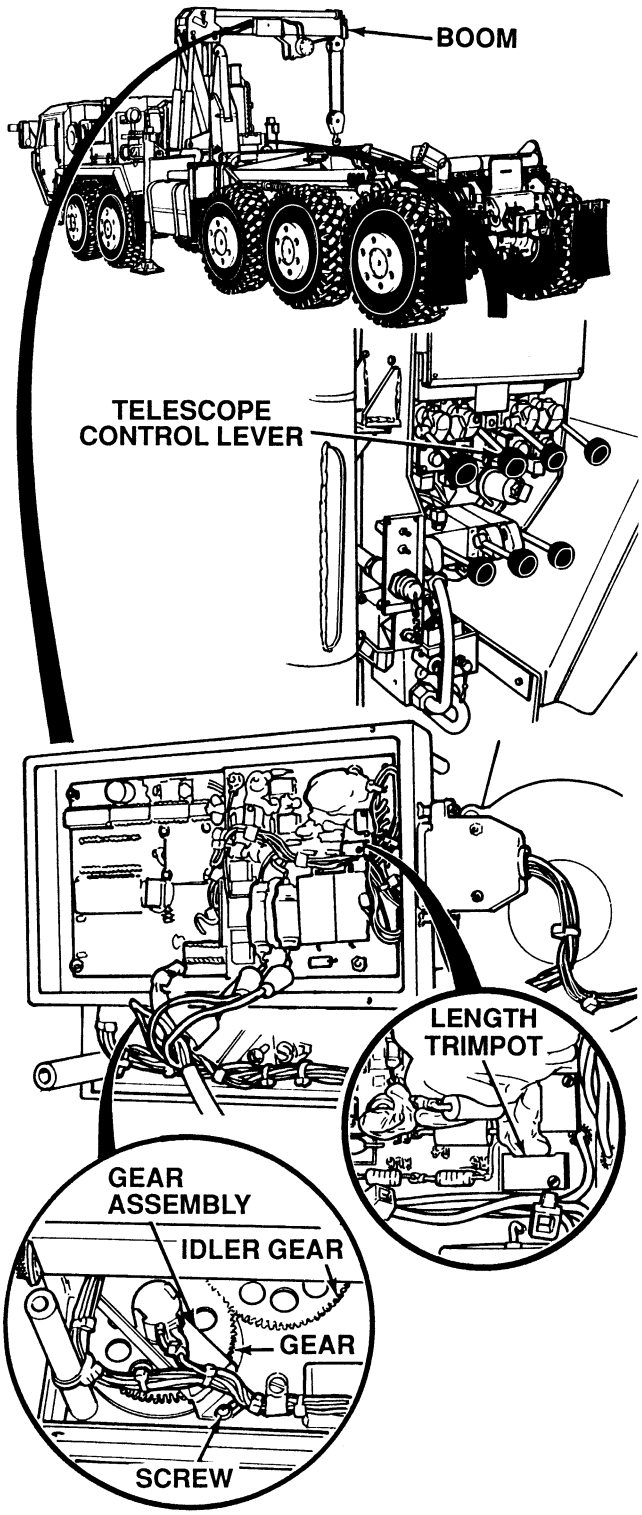


WARNING

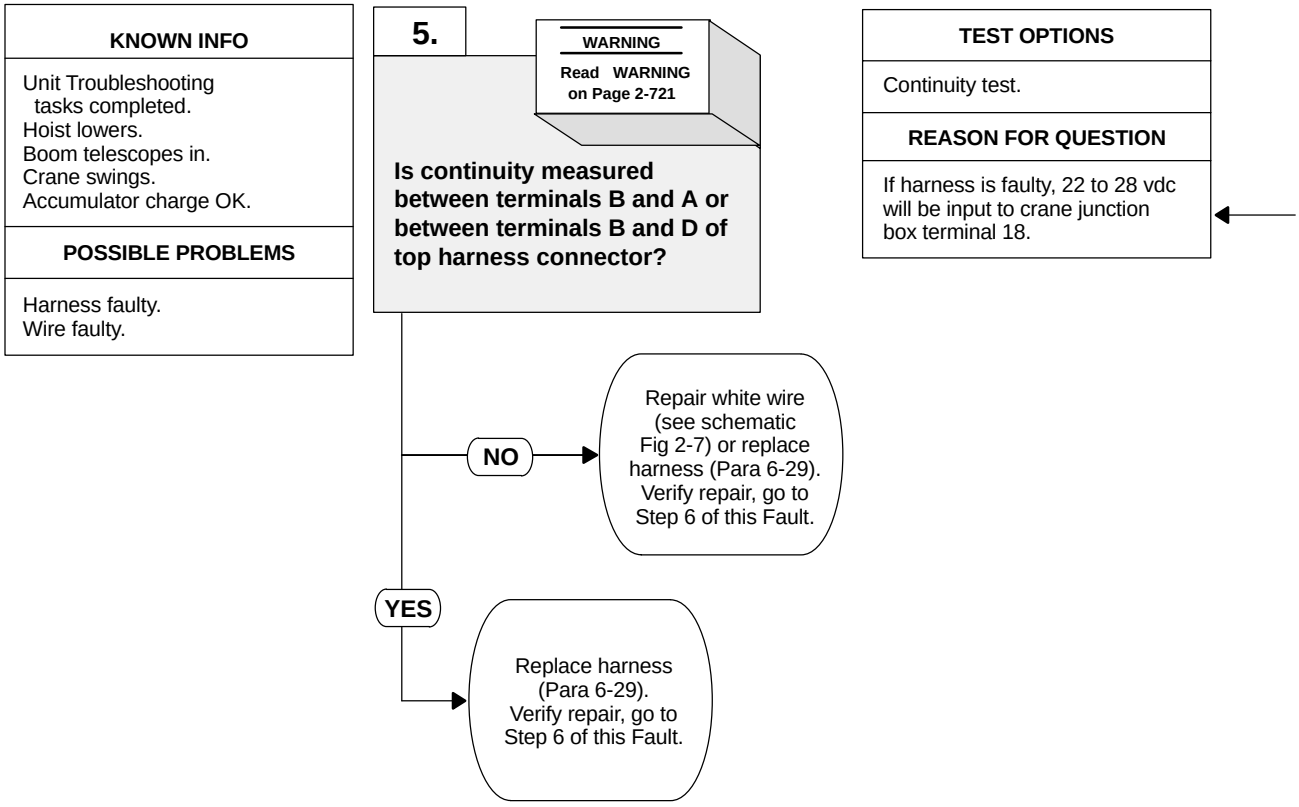
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

ADJUSTMENT TEST (CONT).

(12) Adjust length trimpot until test unit indicates 7.3 ft (2.2 m).
(13) Using TELE control lever, extend boom completely.
  (a) If test unit does not indicate 22.5 ft (6.86 m), go to Step (14) below.
  (b) If test unit does indicate 22.5 ft, (6.86 m) go to Step 6 of this Fault.
(14) Loosen screw on gear assembly and slide gear assembly away from idler gear being careful not to move gears in relation to each other.
(15) Rotate gear assembly gear to the right to increase test unit reading or to the left to decrease test unit reading. Moving the gear one to two teeth in a particular direction will increase or decrease test unit reading 0.1 to 0.2 ft (.03 to .06 m).
(16) Mesh gear assembly gear and idler gear and tighten screw when test unit indicates 22.5 ft (6.86 m).
(17) Repeat Steps (8) through (17) until boom can be extended and retracted with test unit indicating 22.5 ft (6.86 m) and 7.3 ft (2.2 m) without adjustment and then go to Step 6 of this Fault.



22. OSS DISABLES FUNCTIONS (CONT).



WARNING

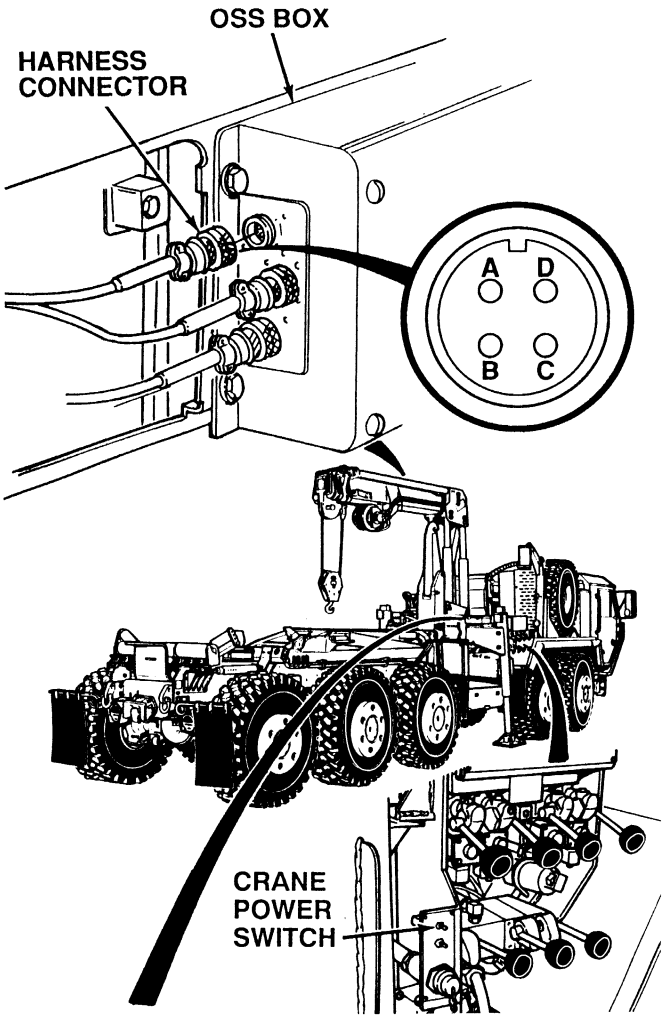
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.

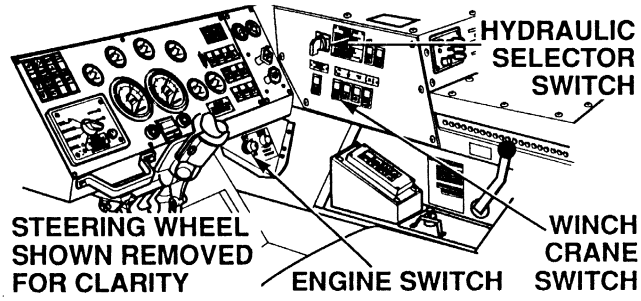
NOTE

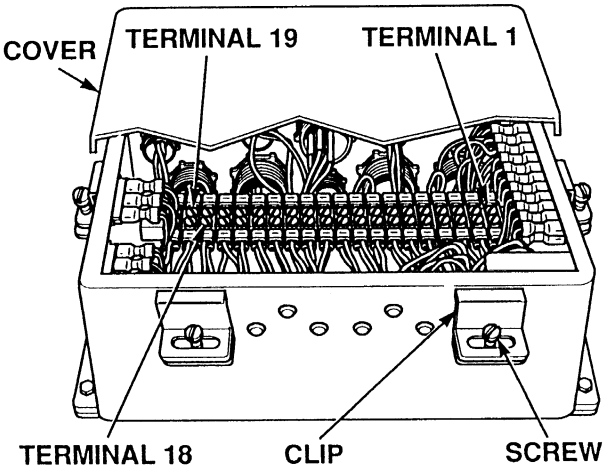
- Disconnected white wires should not be in contact.
- Steps (4) through (14) are for crane junction box.
- White wires should have 0 vdc present when OSS is not activated. Faulty wire is shorted to a wire with 22 to 28 vdc present.

CONTINUITY TEST

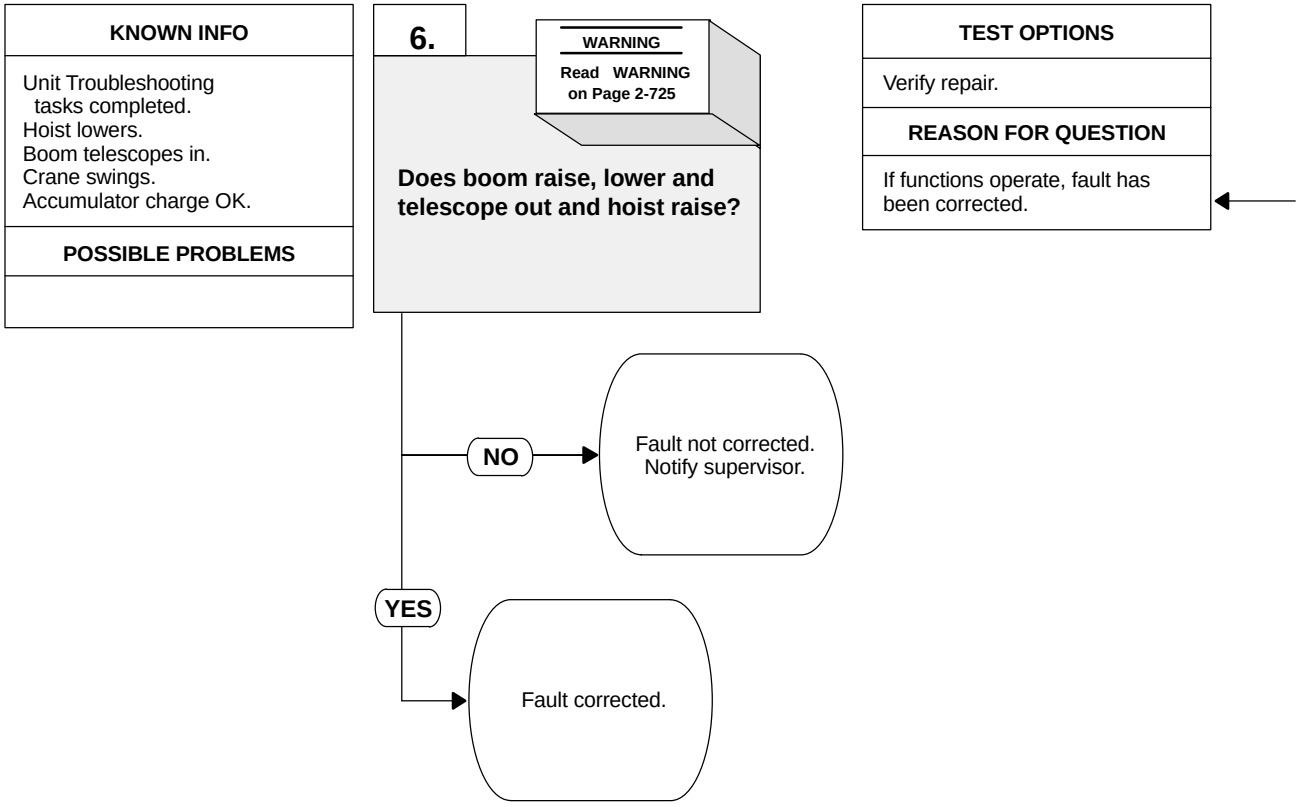
(1) Check disconnected harness connector for continuity between terminals B and A.
  (a) If continuity is present, replace harness (Para 6-29).
  (b) If continuity is not present, go to Step (2) below.
(2) Check disconnected harness connector for continuity between terminals B and D.
  (a) If continuity is present, replace harness (Para 6-29).
  (b) If continuity is not present, go to Step (3) below.
(3) Connect harness connector to OSS box.
(4) Set multimeter to volts dc.
(5) Connect multimeter negative lead to known good ground.
(6) Connect multimeter positive lead to one of the four white wires disconnected from terminal 18 with ENGINE switch OFF (TM 9-2320-364-10).
(7) Turn ON ENGINE switch.
(8) Set WINCH/CRANE switch to CRANE position.
(9) Set hydraulic selector switch to CRANE/SRW position.
(10) Set crane main POWER switch to ON position.
(11) Repeat Steps (6) through (10) until wire with 22 to 28 vdc present is found. Repair white wire (Fig 2-7) with 22 to 28 vdc present or replace harness after completing Steps (12) through (14) below.
(12) Set crane main power switch to OFF position.
(13) Set hydraulic selector switch to OFF position.
(14) Turn OFF ENGINE switch.







22. OSS DISABLES FUNCTIONS (CONT).



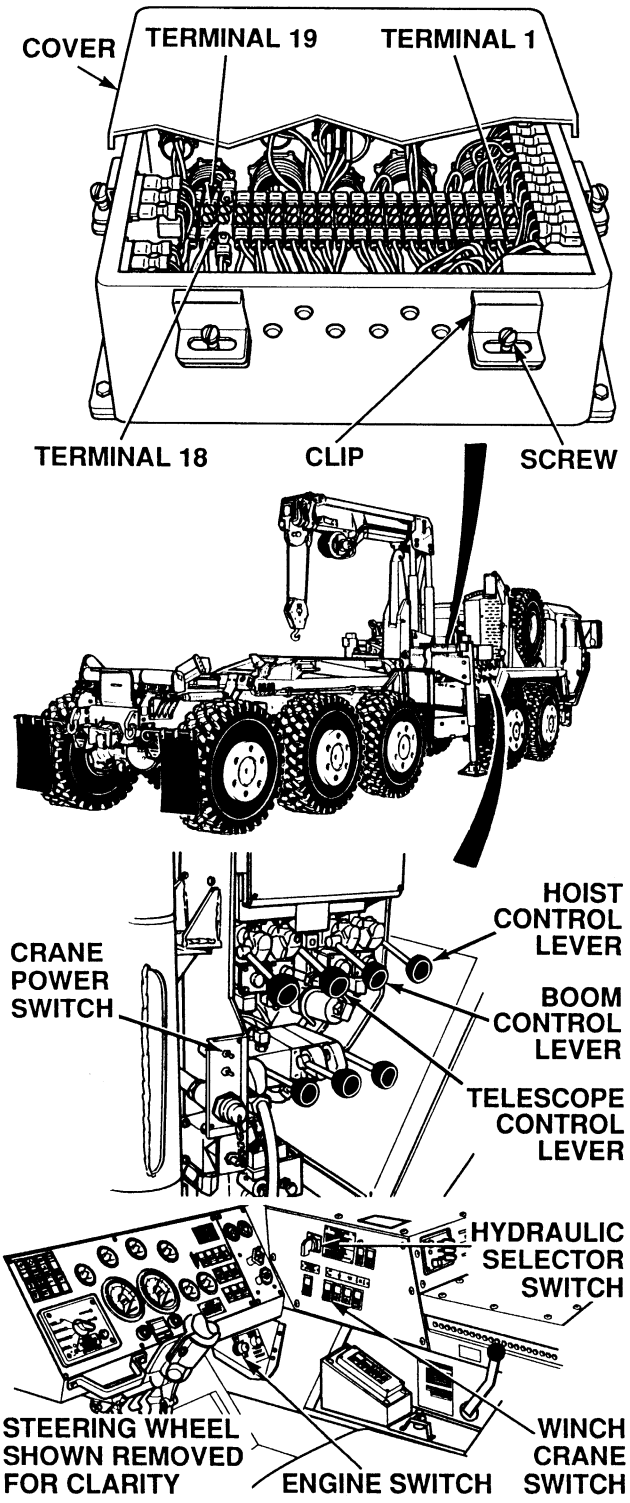
WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

VERIFY REPAIR

(1) Connect four white wires on crane junction box, terminal 18 with two screws.
(2) Disconnect jumper wire from crane junction box, terminals 1 and 19.
(3) Start engine (TM 9-2320-364-10).
(4) Set WINCH/CRANE switch to CRANE position.
(5) Set hydraulic selector switch to CRANE/SRW position.
(6) Turn ON crane main POWER switch.
(7) Attempt to operate boom and hoist functions using BOOM, TELESCOPE and HOIST control levers.
    (a) If functions do not operate, fault not corrected. Notify supervisor and perform Steps (8) through (17) below.
    (b) If functions operate, fault has been corrected. Perform Steps (8) through (17) below.

Continued on next page.



22. OSS DISABLES FUNCTIONS (CONT).

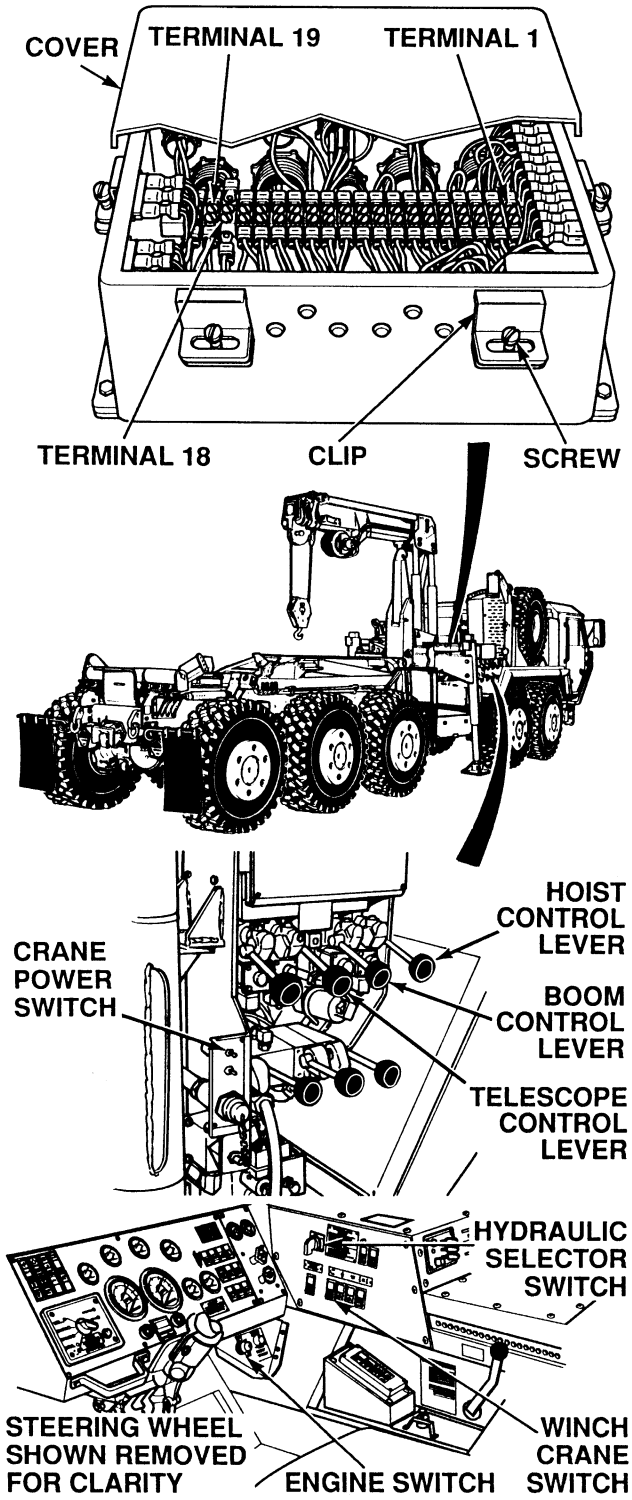
WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.

VERIFY REPAIR (CONT).

(8) Set crane main POWER switch to OFF position.
(9) Set hydraulic selector switch to OFF position.
(10) Turn OFF ENGINE switch.
(11) Install cover on crane main junction box.
(12) Place six clips on edge of cover and tighten six screws.

Continued on next page.



WARNING

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may result.
- Do not stand under crane. Mechanical failure and operator error can cause injury or death to personnel.
- Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesives, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

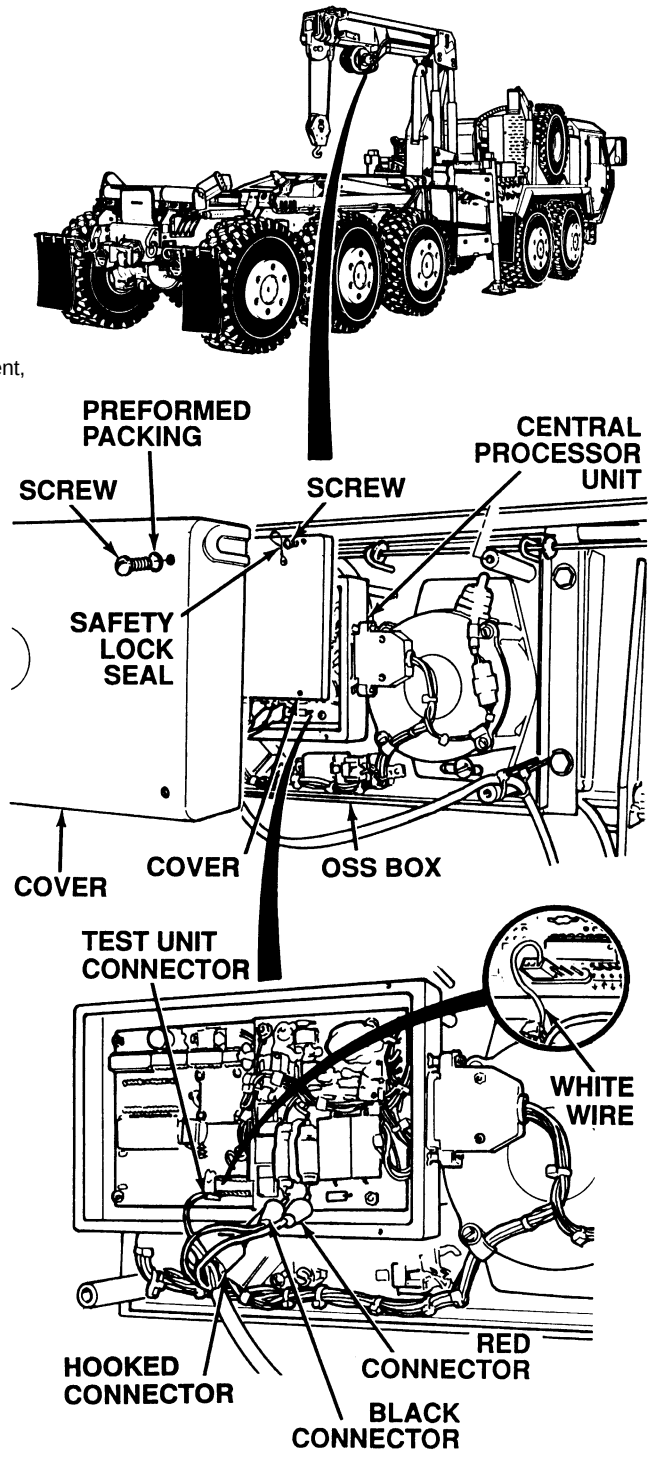
Hooked test unit connector must not contact other transistor wire or damage to OSS and test unit will result.

NOTE

If OSS box cover is installed, do not perform Steps (13) through (17) below.

VERIFY REPAIR (CONT).

(13) Disconnect four connectors from OSS box.
(14) Install cover on central processor unit with four screws.
(15) Install safety lock seal on two screws.
(16) Install cover on OSS box with four screws and preformed packings.
(17) Apply bead of sealant to edge of cover where it is against OSS box.



2-16. SELF-RECOVERY WINCH TROUBLESHOOTING.

This paragraph covers Self-Recovery Winch Troubleshooting. The Self-Recovery Winch Fault Index, Table 2-16, lists faults for the Self-Recovery Winch system of the PLS truck. Refer to schematic Figure 2-15 when performing tests and corrective actions.

Table 2-16. Self-Recovery Winch Fault Index

Fault No.	Description	Page
1.	Self-Recovery Winch (SRW) Does Not Operate	2-728

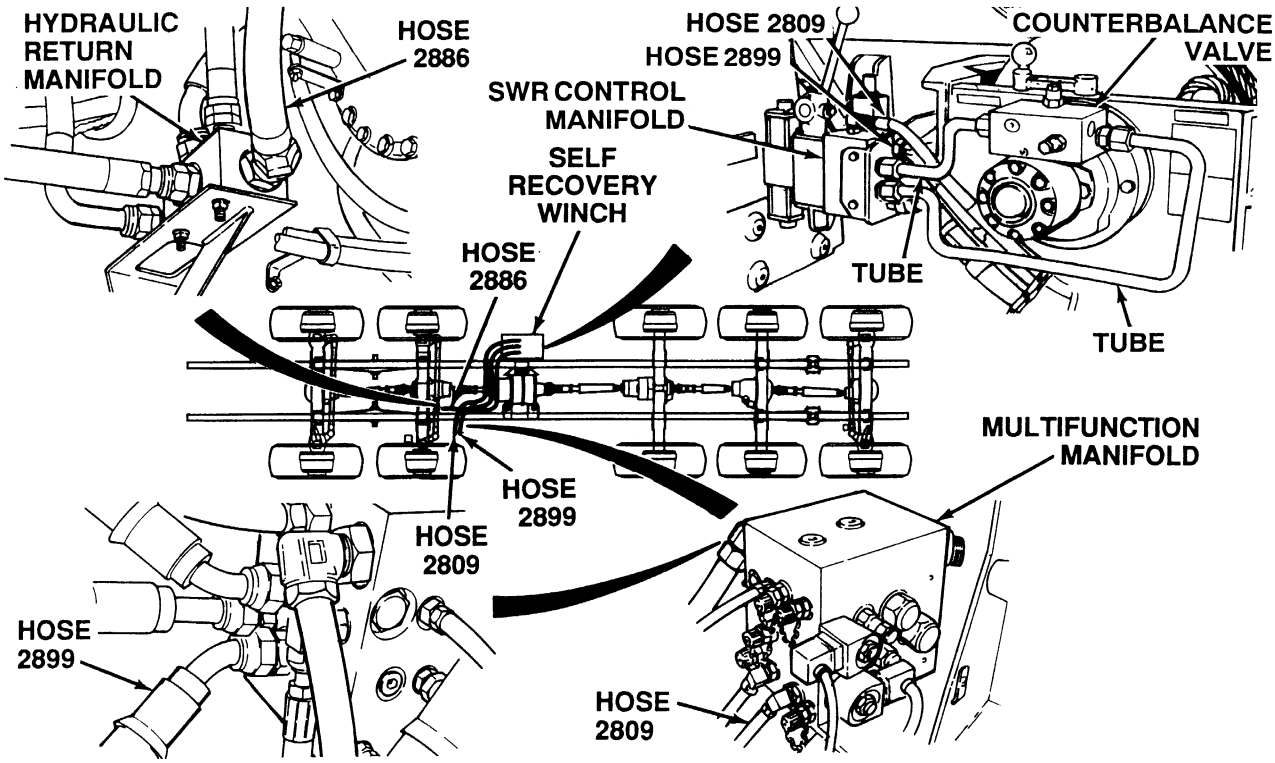


Figure 2-15. Self-Recovery Winch Hydraulic Diagram

2-16. SELF-RECOVERY WINCH TROUBLESHOOTING (CONT).

1. SELF-RECOVERY WINCH (SRW) DOES NOT OPERATE.

INITIAL SETUP

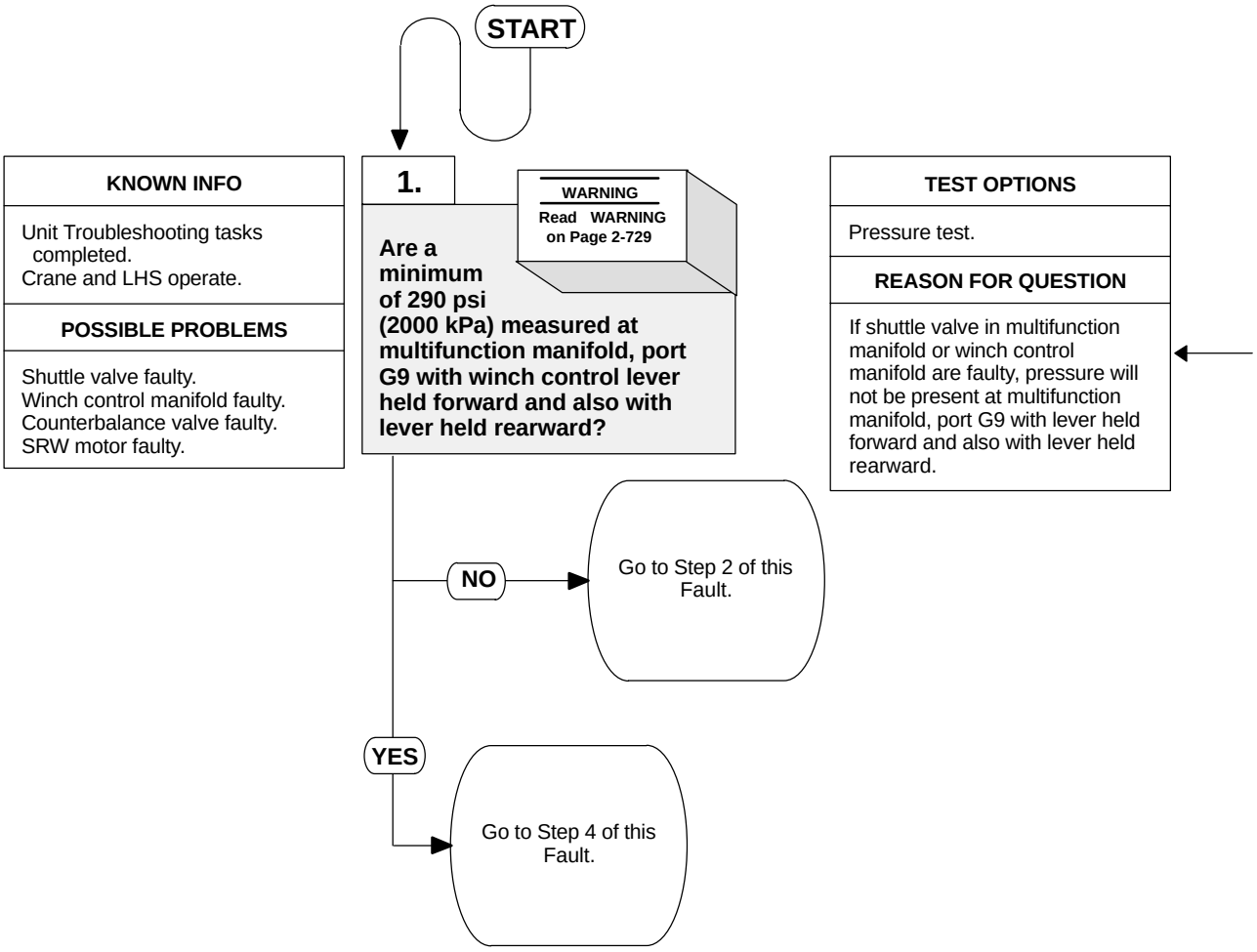
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Plug and Cap Set (Item 26, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)
Wrench, Torque (0-60 N·m) (Item 276, Appendix F)

Materials/Parts
Lockwashers (6) (Item 266, Appendix E)
Lockwashers (8) (Item 282, Appendix E)
Parts Kit, Seal (Item 410, Appendix E)
Parts Kit, Seal (Item 411, Appendix E)
Parts Kit, Seal (Item 412, Appendix E)

Personnel Required
Two

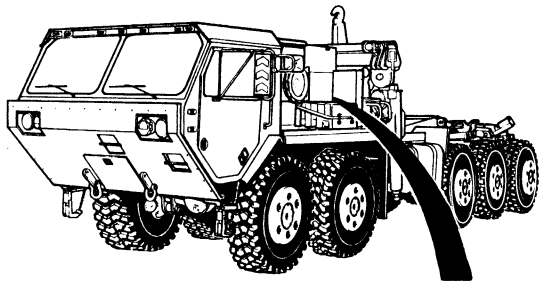
References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



WARNING

- High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.



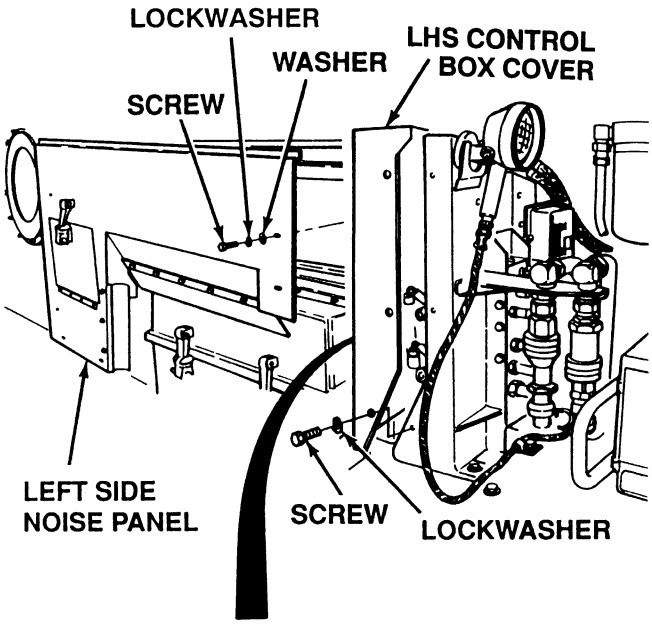
NOTE

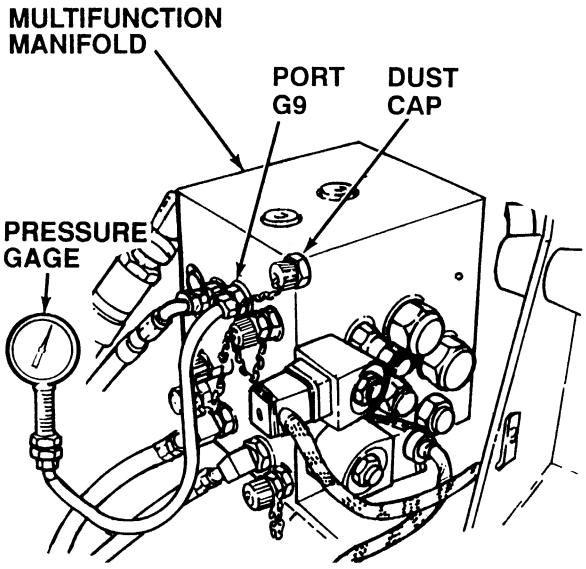
Use drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) Remove eight screws, lockwashers, washers and left side noise panel. Discard lockwashers.
(2) Remove six screws, lockwashers and LHS control box cover. Discard lockwashers.
(3) Remove dust cap from multifunction manifold, port G9.
(4) Connect pressure gauge to multifunction manifold, port G9.

Continued on next page.





1. SELF-RECOVERY WINCH (SRW) DOES NOT OPERATE (CONT).

WARNING

- High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

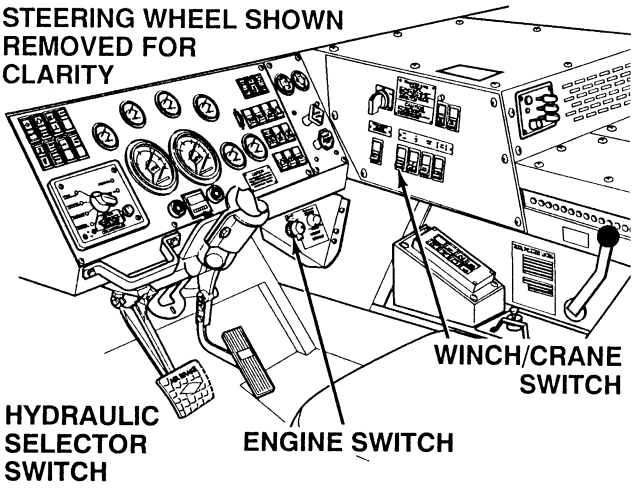
NOTE

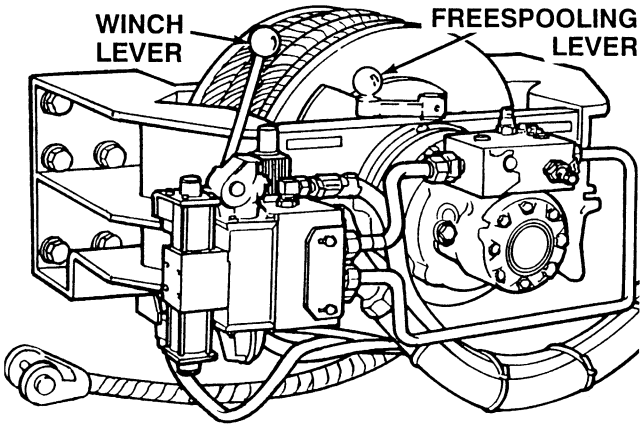
Use drain pan to catch leaking hydraulic oil.

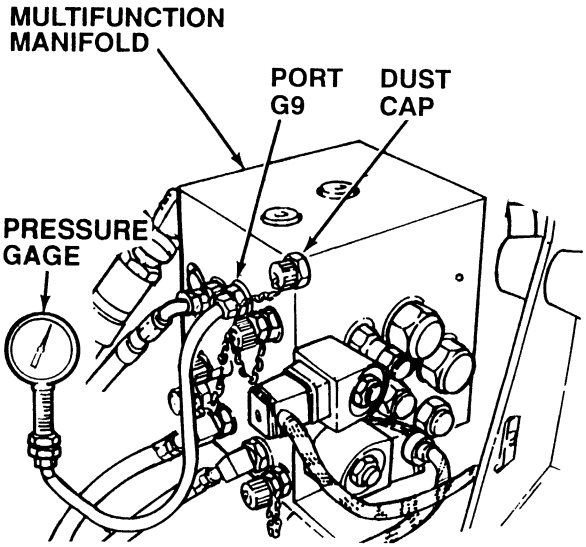
PRESSURE TEST (CONT).

(5) Start engine (TM 9-2320-364-10).
(6) Set WINCH/CRANE switch to WINCH position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Move freespooling lever to disengage position.
(9) With the aid of an assistant, hold winch lever in the forward position while observing pressure gauge.
(10) With the aid of an assistant, hold winch lever in the rearward position while observing pressure gage.
  (a) If 290 psi (2000 kPa) or more are not measured with lever forward and also with lever rearward, go to Step 2 of this Fault.
  (b) If 290 psi (2000 kPa) or more are measured with lever held in forward position and also with lever held in rearward position, perform Steps (11) through (14) below and go to Step 4 of this Fault.
(11) Set hydraulic selector switch to OFF position.
(12) Turn OFF ENGINE switch.

Continued on next page.

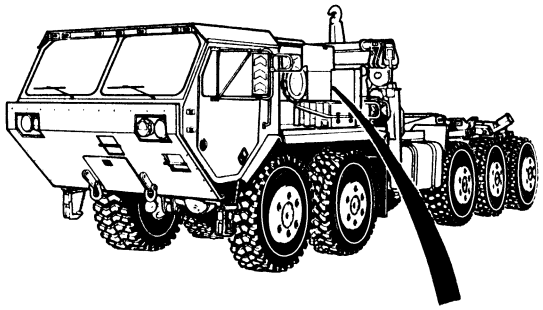


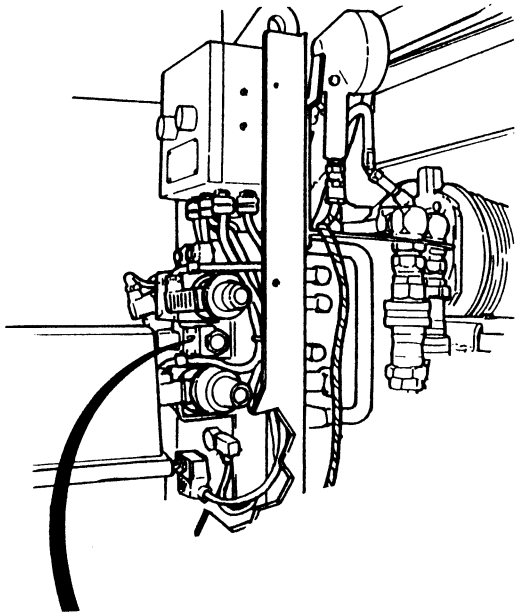




WARNING

- High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

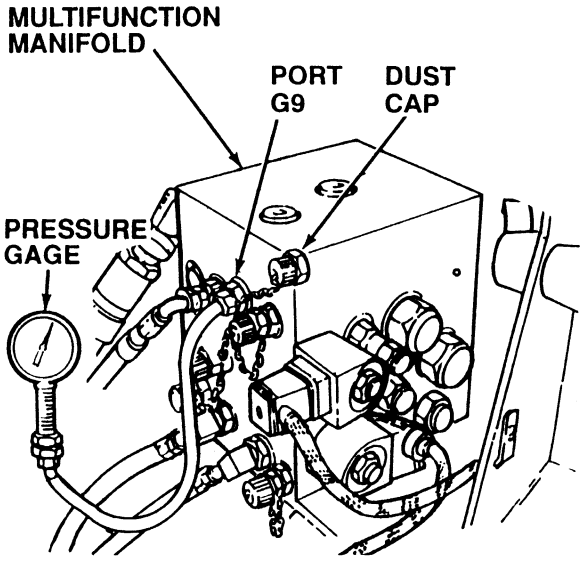




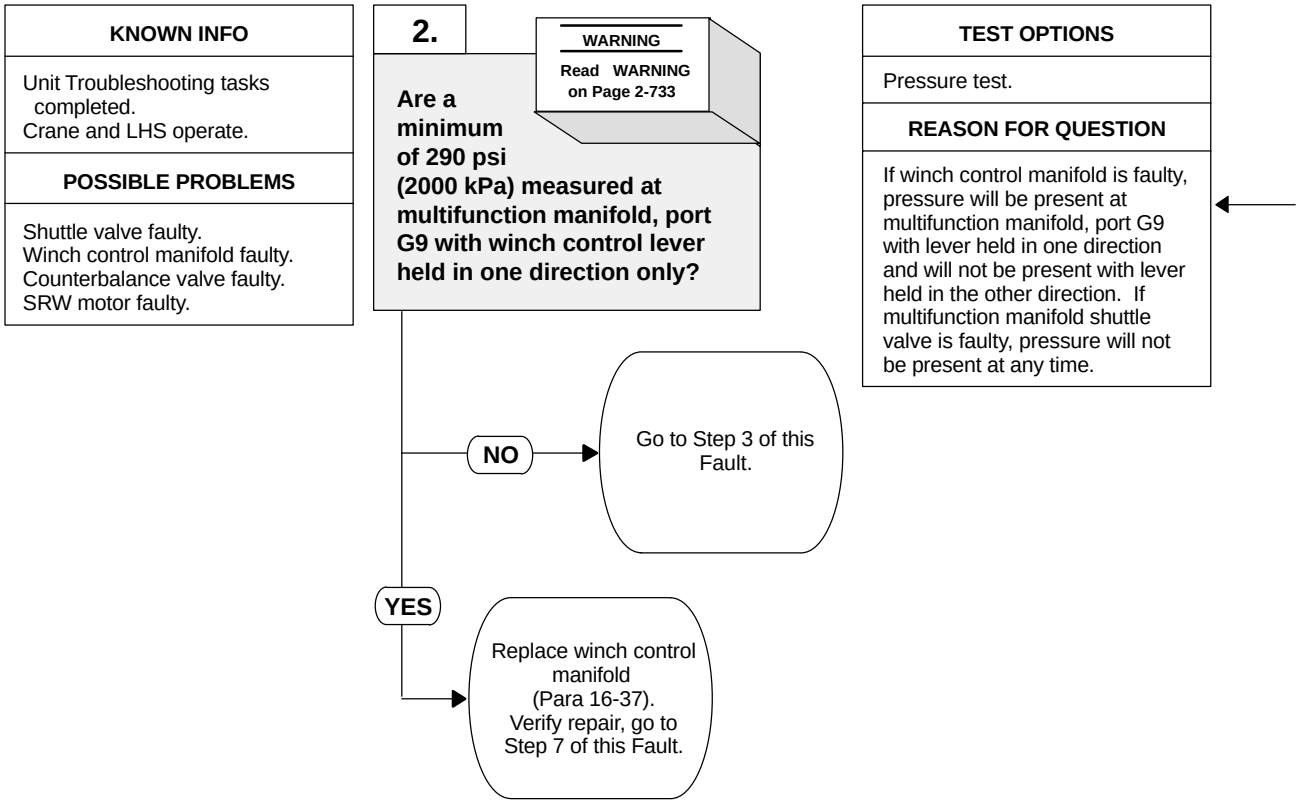
NOTE

Use drain pan to catch leaking hydraulic oil.

PRESSURE TEST (CONT).
(13) Disconnect pressure gage from multifunction manifold. (14) Install dust cap on multifunction manifold, port G9.



1. SELF-RECOVERY WINCH (SRW) DOES NOT OPERATE (CONT).



WARNING

- High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

Use drain pan to catch leaking hydraulic oil.

PRESSURE TEST

(1) With the aid of an assistant, hold winch lever in the forward position while observing pressure gage.
  (a) If 290 psi (2000 kPa) or more are not present, Step (2) below.
  (b) If 290 psi (2000 kPa) or more are measured, perform Steps (3) through (6) below and replace winch control manifold (Para 16-37).

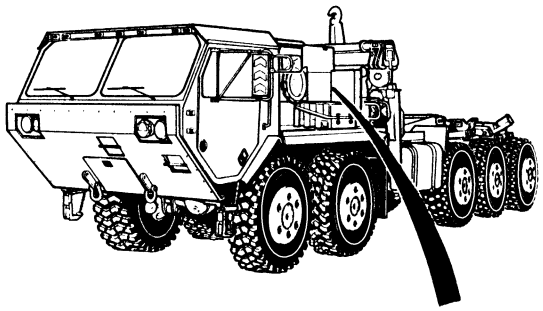
(2) With the aid of an assistant, hold winch lever in the rearward position while observing pressure gauge.
  (a) If 290 psi (2000 kPa) or more are not measured, perform Steps (3) through (6) below and go to Step 3 of this Fault.
  (b) If 290 psi (2000 kPa) or more are measured, perform Steps (3) through (6) below and replace winch control manifold (Para 16-37).

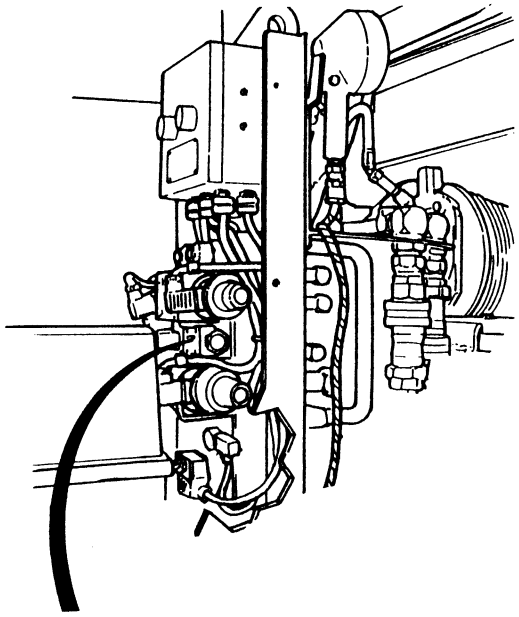
(3) Set hydraulic selector switch to OFF position.

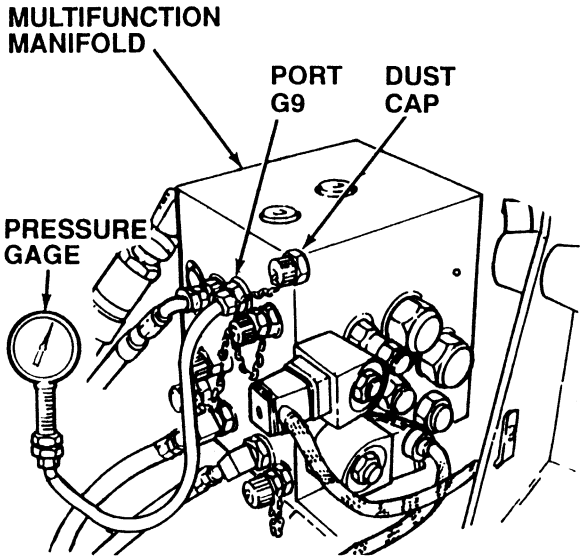
(4) Turn OFF ENGINE switch.

(5) Disconnect pressure gage from multifunction manifold.

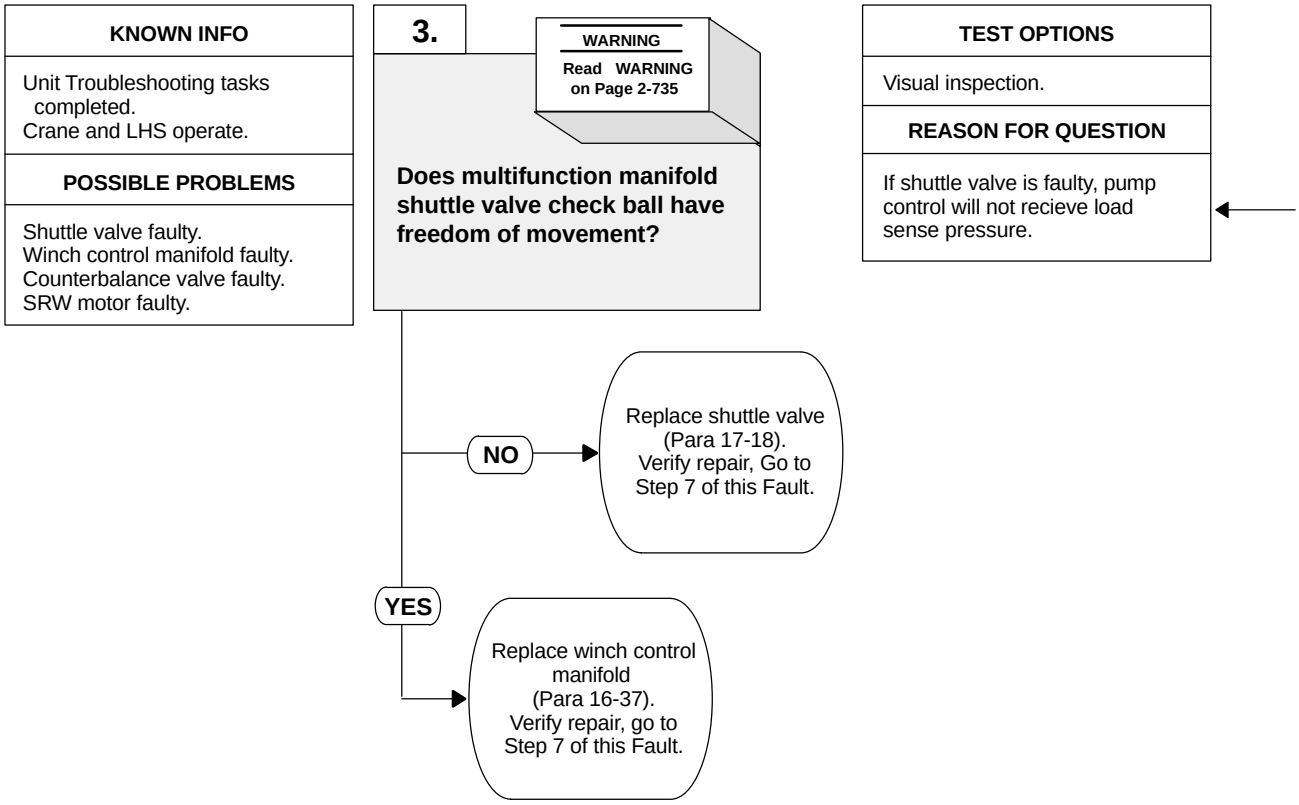
(6) Install dust cap on multifunction manifold, port G9.







1. SELF-RECOVERY WINCH (SRW) DOES NOT OPERATE (CONT).



WARNING

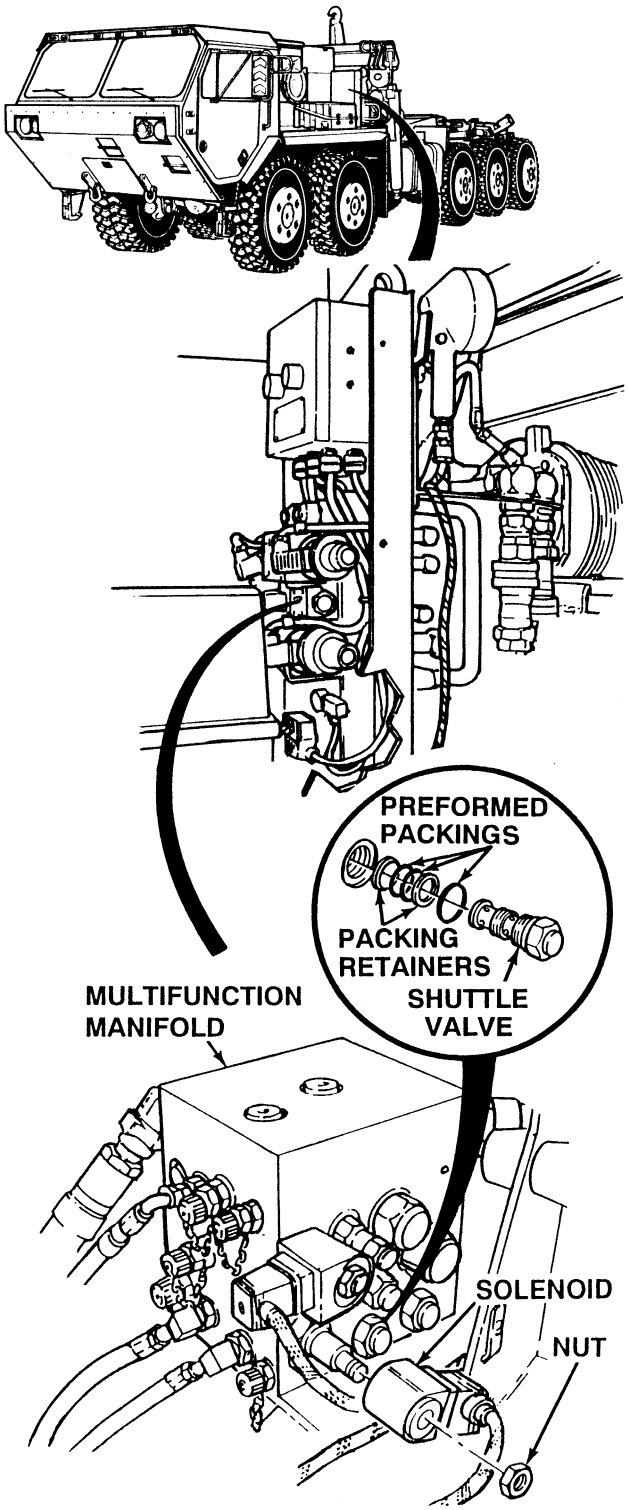
- High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

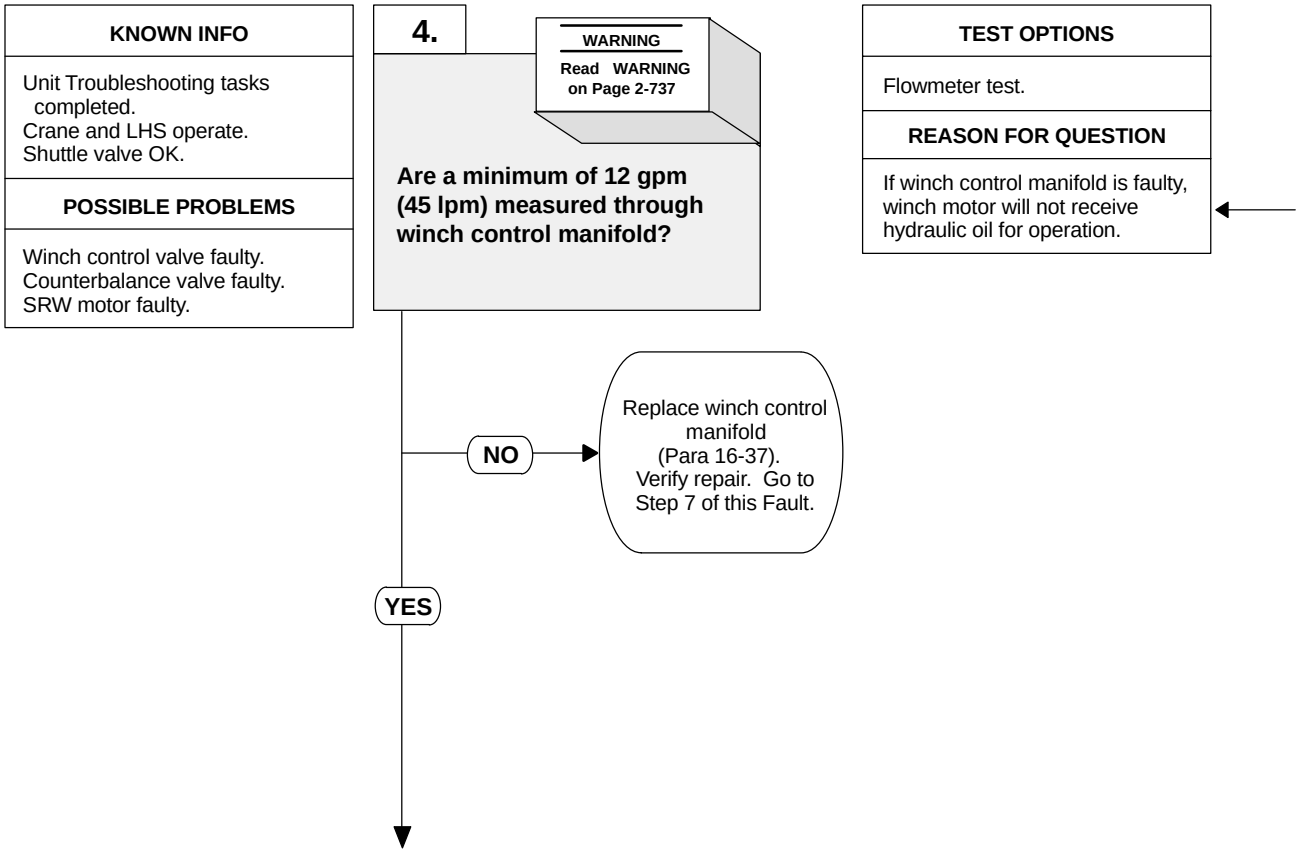
Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove nut and solenoid from valve.
(2) Remove shuttle valve from multifunction manifold.
(3) Remove three preformed packings and two packing retainers from shuttle valve. Discard preformed packings and packing retainers.
(4) Shake shuttle valve hard enough to hear check ball rattle.
  (a) If shuttle valve check ball does not rattle, replace shuttle valve (Para 17-18) and perform Step (7) below.
  (b) If shuttle valve check ball rattles, perform Steps (5) through (7) below and replace winch control manifold (Para 16-37).
(5) Install three preformed packings and two packing retainers on the shuttle valve that was removed from multifunction manifold.
(6) Install shuttle valve in multifunction manifold.
(7) Install solenoid and nut on valve.



1. SELF-RECOVERY WINCH (SRW) DOES NOT OPERATE (CONT).



WARNING

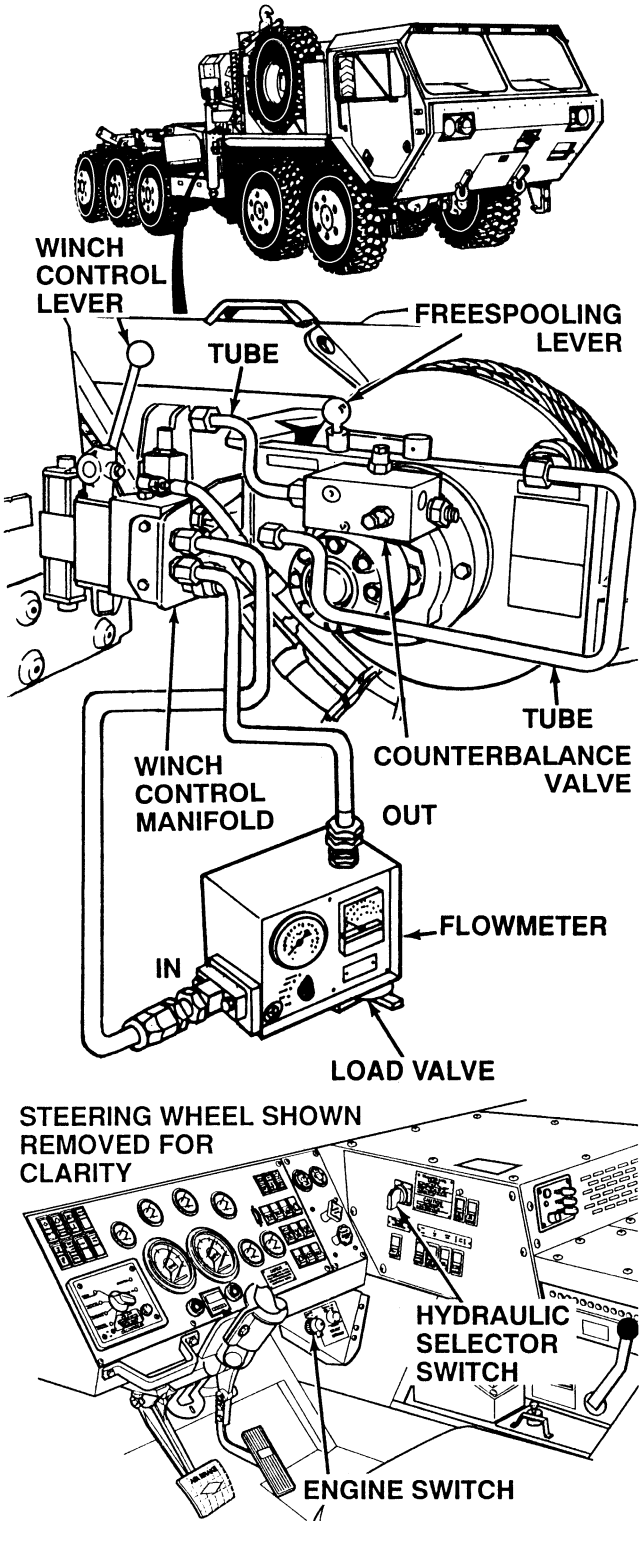
- High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

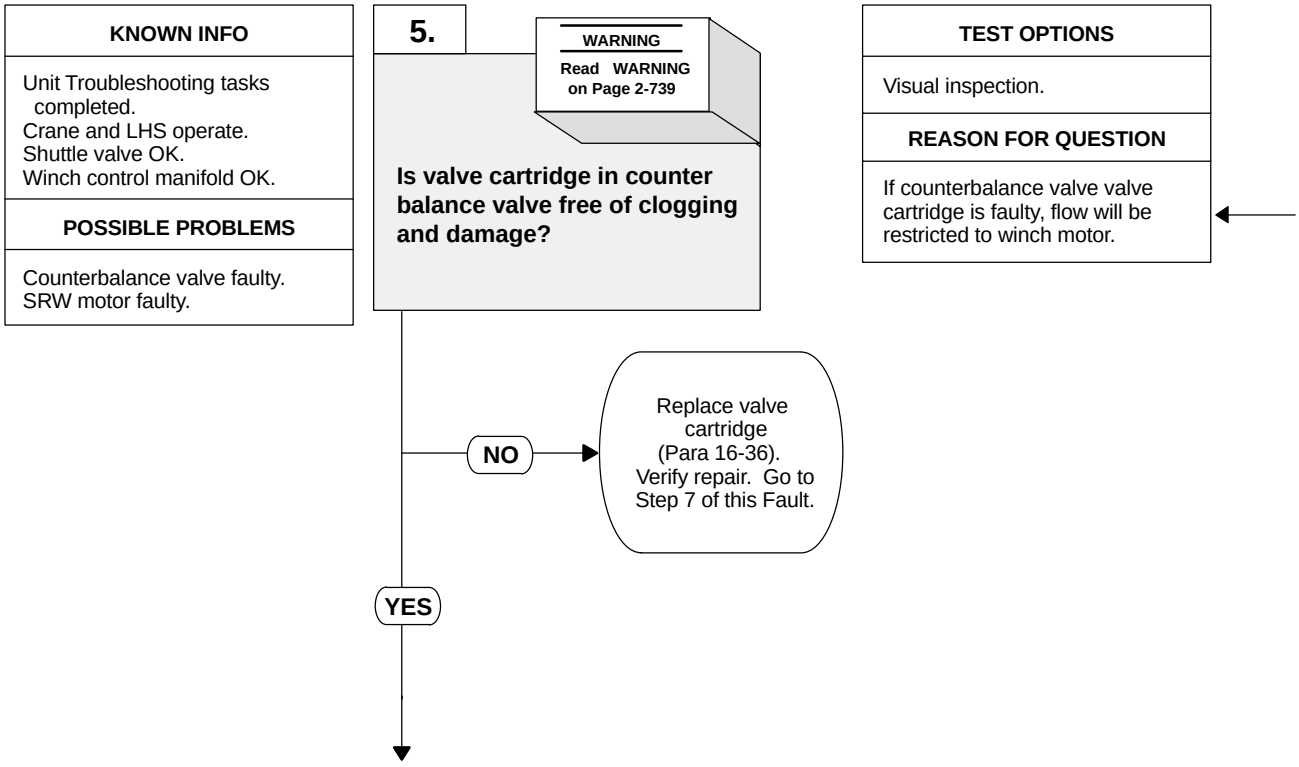
Use drain pan to catch leaking hydraulic oil.

FLOWMETER TEST

(1) Remove two tubes from between winch control manifold and counterbalance valve.
(2) Connect flowmeter IN hose to top winch control manifold port.
(3) Connect flowmeter OUT hose to bottom winch control manifold port.
(4) Open flowmeter load valve.
(5) Set lever in DISENGAGE position (TM 9-2320-364-10).
(5) Start engine.
(6) Set WINCH/CRANE switch to WINCH position.
(7) Set hydraulic selector switch to CRANE/SRW position.
(8) Observe flowmeter while holding winch control lever forward and then rearward.
  (a) If 12 gpm (45 lpm) or more are not present, perform Steps (9) through (12) below and replace winch control manifold (Para 16-37).
  (b) If 12 gpm (45 lpm) or more are present, perform Steps (9) through (12) below and go to Step 5 of this Fault.
(9) Set hydraulic selector switch to OFF position.
(10) Turn OFF ENGINE switch.
(11) Disconnect adapter hoses from winch control manifold.
(12) Install tubes between winch control manifold and counterbalance valve.



1. SELF-RECOVERY WINCH (SRW) DOES NOT OPERATE (CONT).



WARNING

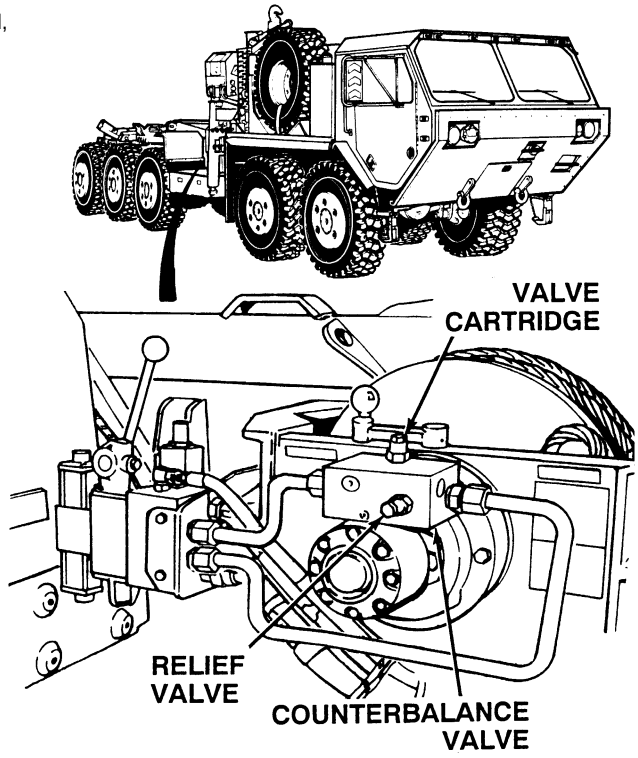
- High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

NOTE

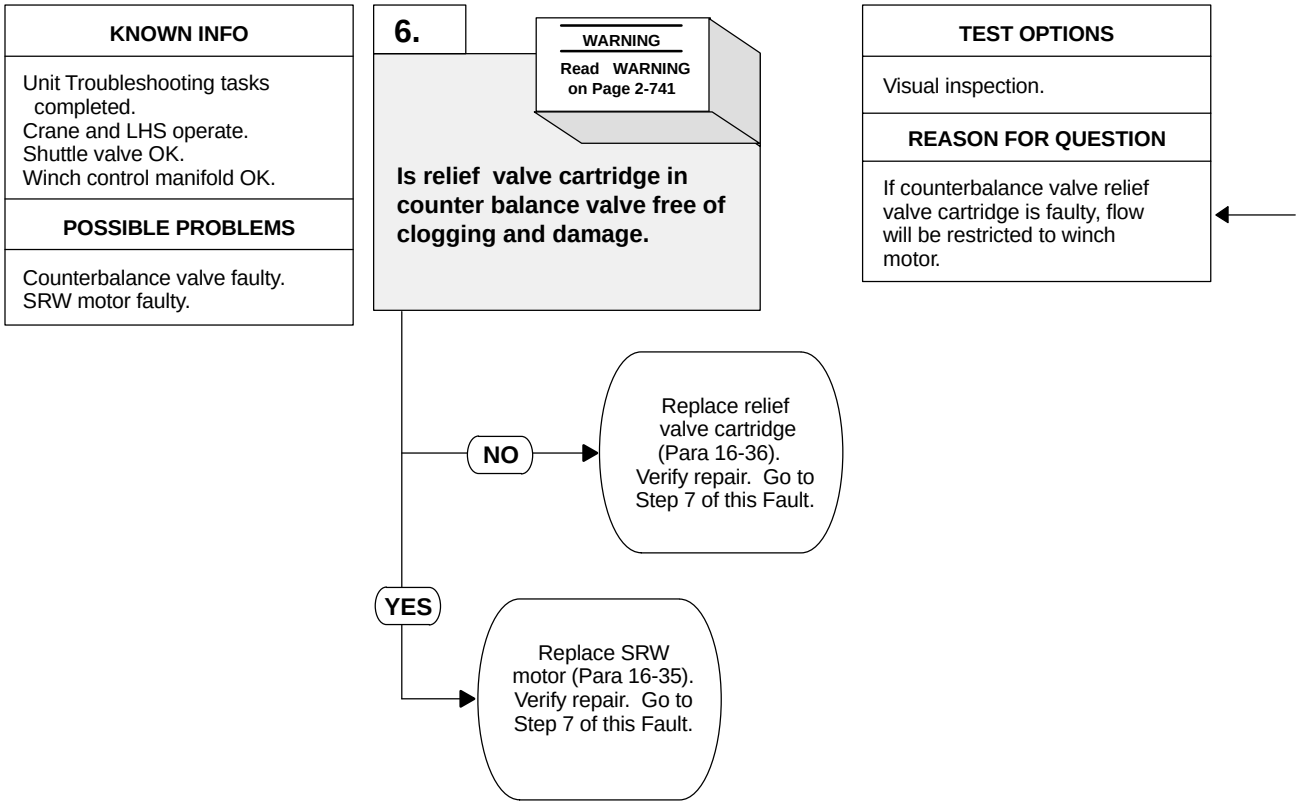
Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove valve cartridge from counterbalance valve.
(2) Remove preformed packings and backup rings from valve cartridge. Discard preformed packings and backup rings.
(3) Clean cartridge with drycleaning solvent P-D-680.
(4) Using a non-metallic probe, manually operate moving parts inside valve.
    (a) If valve parts do not operate, replace valve cartridge (Para 16-36).
    (b) If valve cartridge parts operate, perform Steps (5) and (6) below and go to Step 6 of this fault.
(5) Install preformed packings on valve valve cartridge.
(6) Install valve cartridge in counter-balance valve.



1. SELF-RECOVERY WINCH (SRW) DOES NOT OPERATE (CONT).



WARNING

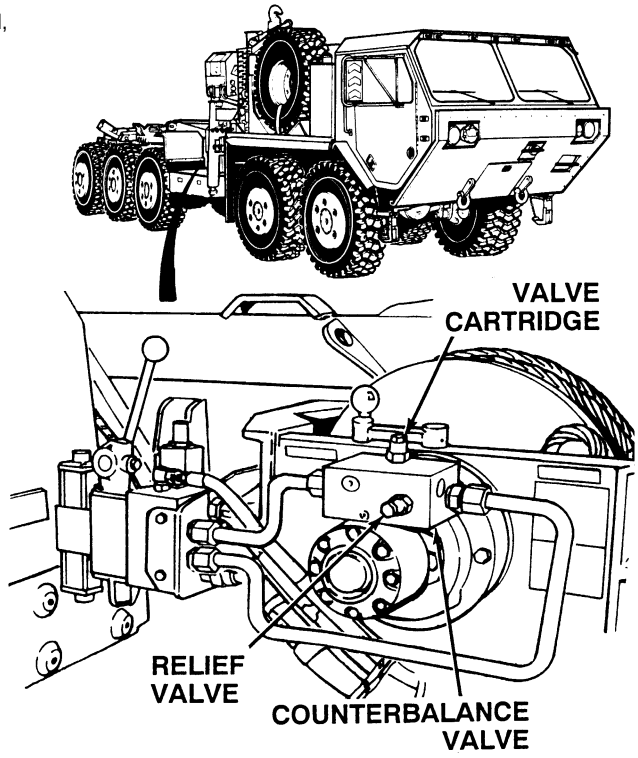
- High pressure hydraulics [oil under 3700 psi (25,512 kPa) pressure] operate this equipment. Refer to truck operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

NOTE

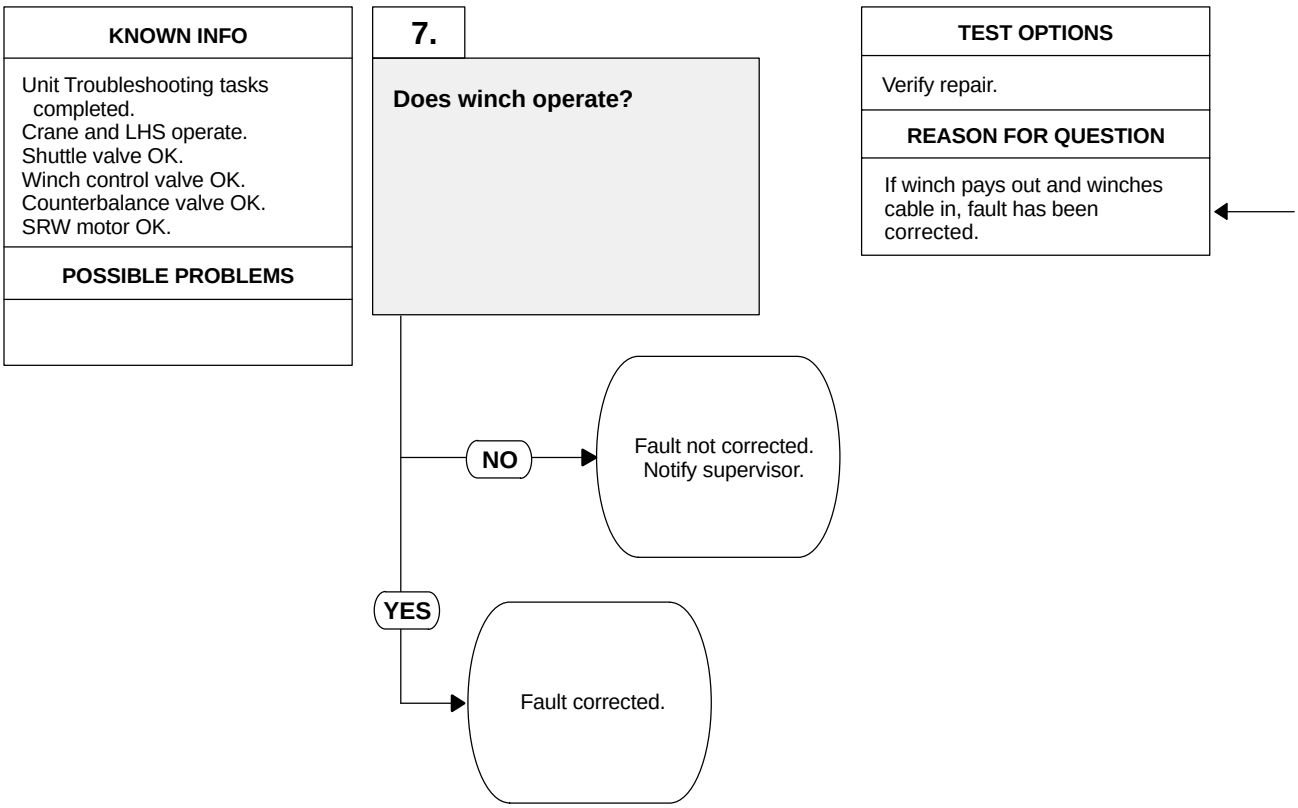
Use drain pan to catch leaking hydraulic oil.

VISUAL INSPECTION

(1) Remove relief valve from counterbalance valve.
(2) Remove preformed packings and backup rings from relief valve. Discard preformed packings and backup rings.
(3) Clean releif valve with drycleaning solvent P-D-680.
(4) Using a non-metallic probe, manually operate moving parts inside valve.
  (a) If valve parts do not operate, replace valve cartridge (Para 16-36).
  (b) If valve cartridge parts operate, perform Steps (5) and (6) below and replace SRW motor (Para 16-35).
(5) Install preformed packings on relief valve cartridge.
(6) Install relief valve cartridge in counter-balance valve.

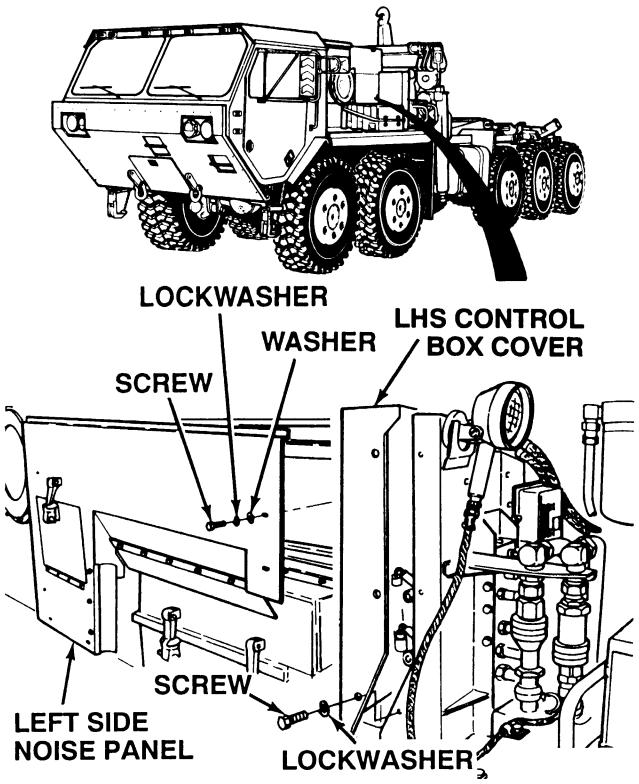


1. SELF-RECOVERY WINCH (SRW) DOES NOT OPERATE (CONT).



VERIFY REPAIR

(1) Operate winch (TM 9-2320-364-10).
   (a) If winch does not pay out or winch in winch cable, fault not corrected. Perform Steps (2) and (3) and notify supervisor.
   (b) If winch pays out and winches in winch cable, fault has been corrected.
(2) Install LHS control box cover with six screws and lockwashers.
(3) Install left side noise panel with eight screws, lockwashers and washers.



2-17. STEERING SYSTEM TROUBLESHOOTING.

This paragraph covers Steering System Troubleshooting. The Steering System Fault Index, Table 2-17, lists faults for the steering system of the PLS truck. Refer to schematic Figure 2-16 when performing tests and corrective actions.

Table 2-17. Steering System Fault Index

Fault No.	Description	Page
1.	Truck Is Hard To Steer	2-746

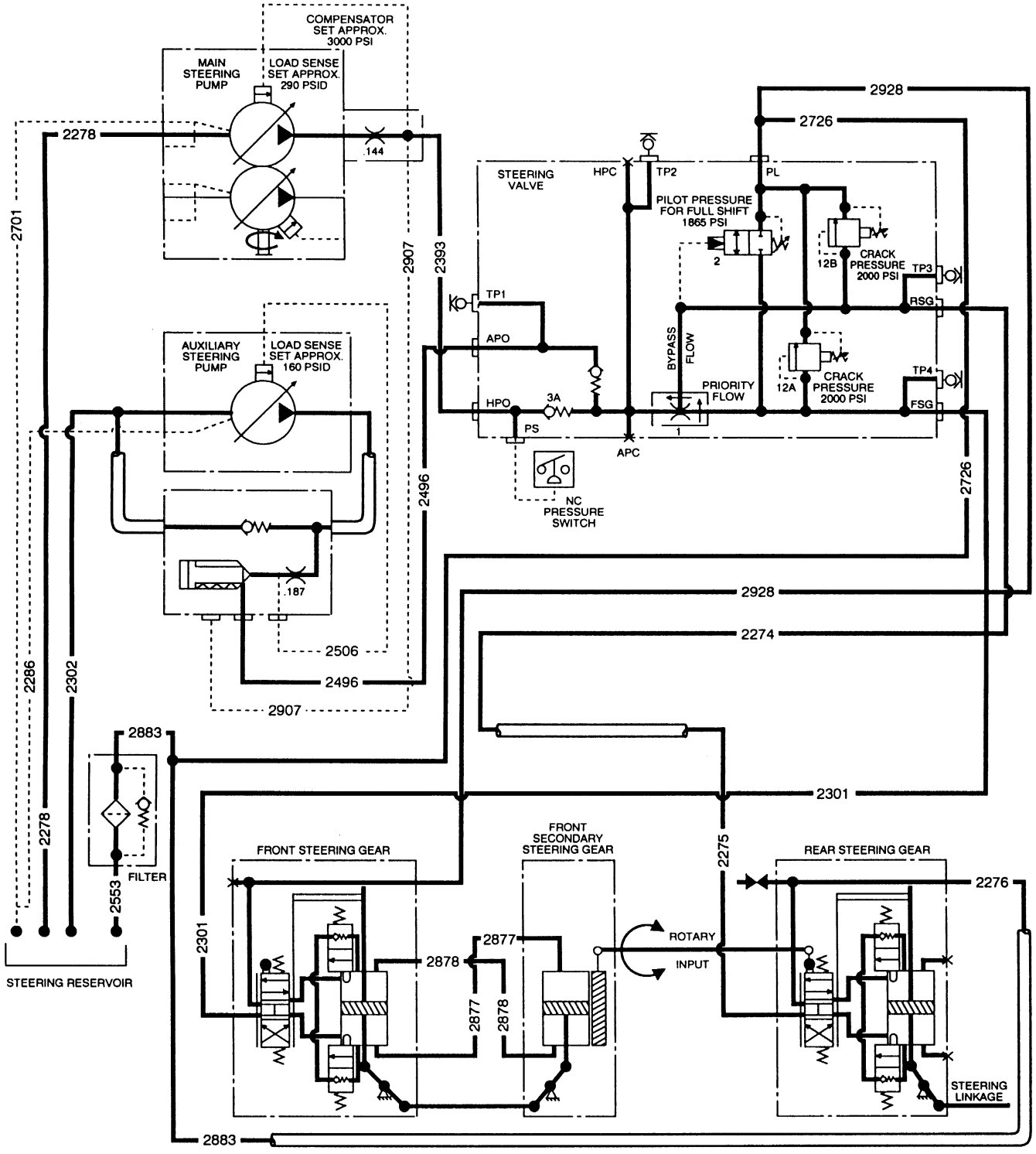


Figure 2-16. Steering System Hydraulic Diagram

2-17. STEERING SYSTEM TROUBLESHOOTING (CONT).

1. TRUCK IS HARD TO STEER.

INITIAL SETUP

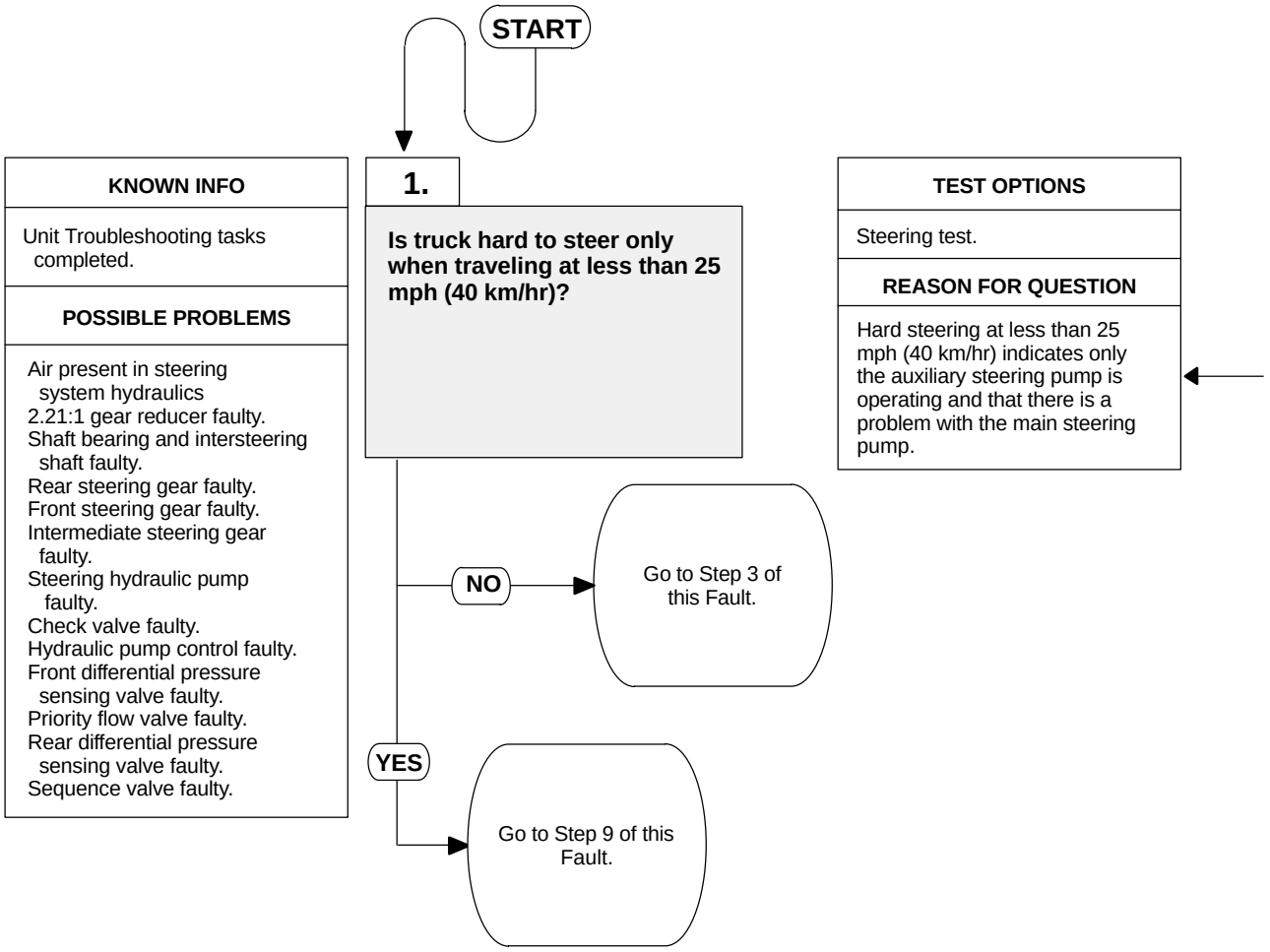
Tools and Special Tools
Tool Kit, General Mechanic's (Item 240, Appendix F)
Cap and Plug Set (Item 26, Appendix F)
Jackstand (Item 132, Appendix F)
Pan, Drain 4 gal (Item 144, Appendix F)
Pressure Test Kit (Item 165, Appendix F)

Materials/Parts
Oil, Hydraulic (Item 34, Appendix B)
Key (Item 137, Appendix E)
Locknut (3) (Item 213, Appendix E)
Lockwasher (2) (Item 249, Appendix E)

Personnel Required
Two

References
TM 9-2320-364-10
TM 9-2320-364-20

Equipment Condition
Engine OFF, (TM 9-2320-364-10)
Parking brake applied, (TM 9-2320-364-10)
Wheels chocked, (TM 9-2320-364-10)



STEERING TEST

(1) If hard steering occurs over 25 mph (40 km/hr), go to Step 3 of this Fault.
(2) If hard steering occurs at less than 25 mph (40 km/hr), go to Step 9 of this Fault.

1. TRUCK IS HARD TO STEER (CONT).

KNOWN INFO

Unit Troubleshooting tasks completed.

POSSIBLE PROBLEMS

Air present in steering system hydraulics.
2.21:1 gear reducer faulty.
Shaft bearing and intersteering shaft faulty.
Rear steering gear faulty.
Front steering gear faulty.
Intermediate steering gear faulty.
Steering hydraulic pump faulty.
Check valve faulty.
Hydraulic pump control faulty.
Front differential pressure sensing valve faulty.
Priority flow valve faulty.
Rear differential pressure sensing valve faulty.
Sequence valve faulty.

2.

WARNING
Read WARNING on Page 2-749

Is steering system hydraulic oil free from air?

TEST OPTIONS

Purge steering system hydraulics.

REASON FOR QUESTION

If there is air in steering hydraulic system, truck will be hard to steer.

NO → Purge air from steering hydraulic system (Para 12-14). Verify repair and go to Step 13 of this fault.

YES

KNOWN INFO

Unit Troubleshooting tasks completed.
Steering system hydraulics free of air.

POSSIBLE PROBLEMS

2.21:1 gear reducer faulty.
Shaft bearing and intersteering shaft faulty.
Rear steering gear faulty.
Front steering gear faulty.
Intermediate steering gear faulty.
Steering hydraulic pump faulty.
Check valve faulty.
Hydraulic pump control faulty.
Front differential pressure sensing valve faulty.
Priority flow valve faulty.
Rear differential pressure sensing valve faulty.
Sequence valve faulty.

3.

Does 2.21:1 gear reducer turn freely without binding?

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If 2.21:1 gear reducer binds or does not turn freely, truck will be hard to steer.

NO → Replace 2.21:1 gear reducer (Para 12-6). Verify repair, go to Step 13 of this Fault.

YES

WARNING

The truck steering operates with 3000 psi (20,685 kPa) hydraulic pressure. A high pressure hydraulic oil stream can pierce a body and cause severe injury to personnel. Never disconnect any high pressure hydraulic oil line or fitting without first dropping pessure to zero.

PURGE STEERING SYSTEM

Perform steering system purging procedure (Para 12-13).

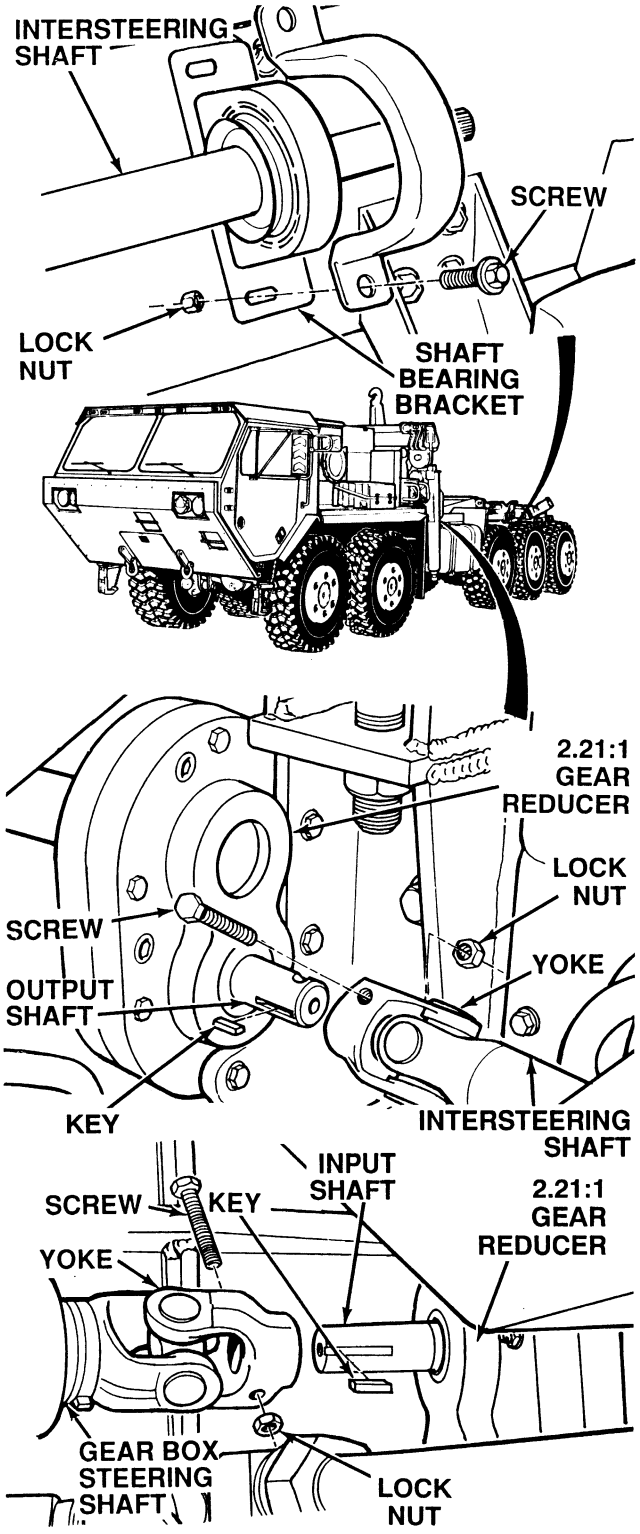
(1) If there is air present in steering hydraulic system, continue to purge system (Para 12-14) and go to Step 13 of this fault.
(2) If there is no air in steering hydraulic system go to Step 3 of this fault.

NOTE

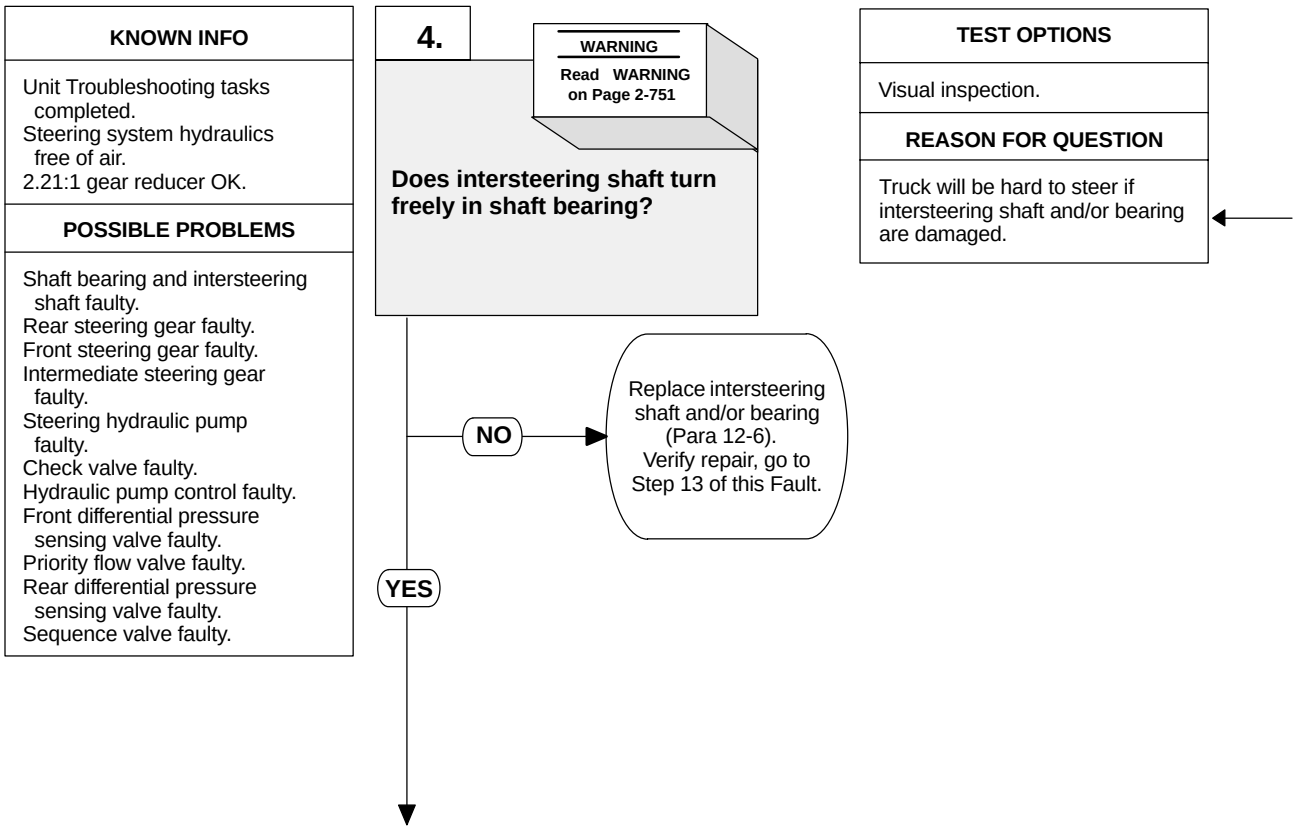
Leave input shaft and steering shaft disconnected. They will be reconnected later in this task.

VISUAL INSPECTION

(1) Remove two screws and locknuts from shaft bearing mounting bracket. Discard locknuts. Support steering shaft to keep it from falling.
(2) Remove screw and locknut from intersteering shaft yoke at gear reducer. Discard locknut.
(3) Slide intersteering shaft to the rear until yoke is free of gear reducer output shaft.
(4) Remove screw and locknut from gear box steering shaft yoke. Discard locknut.
(5) Slide gear box shaft forward until yoke is free of gear reducer input shaft. Support steering shaft to keep it form falling.
(6) Turn 2.21:1 gear reducer input shaft by hand.
    (a) If shaft binds or does not turn freely, replace 2.21:1 gear reducer (Para 12-6).
    (b) If shaft turns freely without binding, 2.21:1 gear reducer is OK.
(7) Install gear box steering shaft yoke on gear reducer input shaft.
(8) Install screw and locknut on gear box steering shaft yoke.
(9) Install intersteering shaft yoke on gear reducer output shaft.
(10) Install shaft bearing mounting bracket, two screws and locknuts.



1. TRUCK IS HARD TO STEER (CONT).

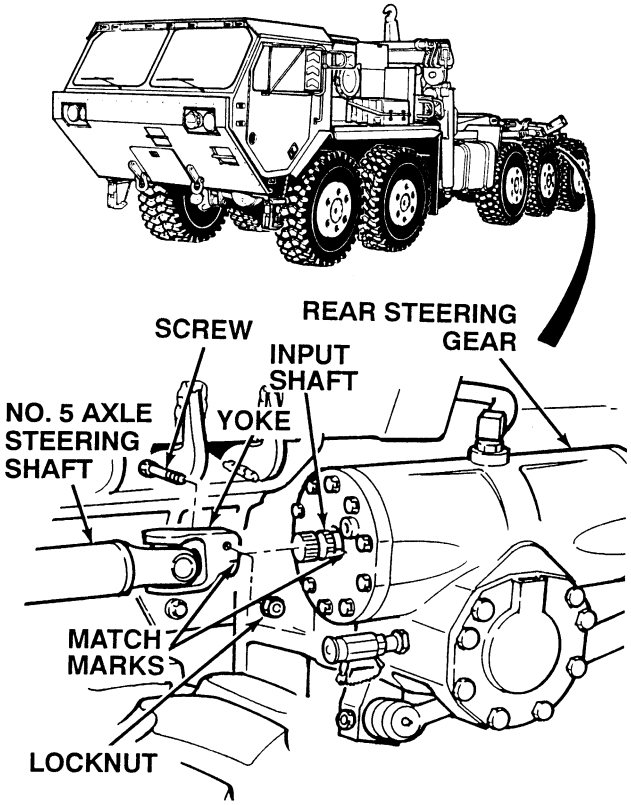


WARNING

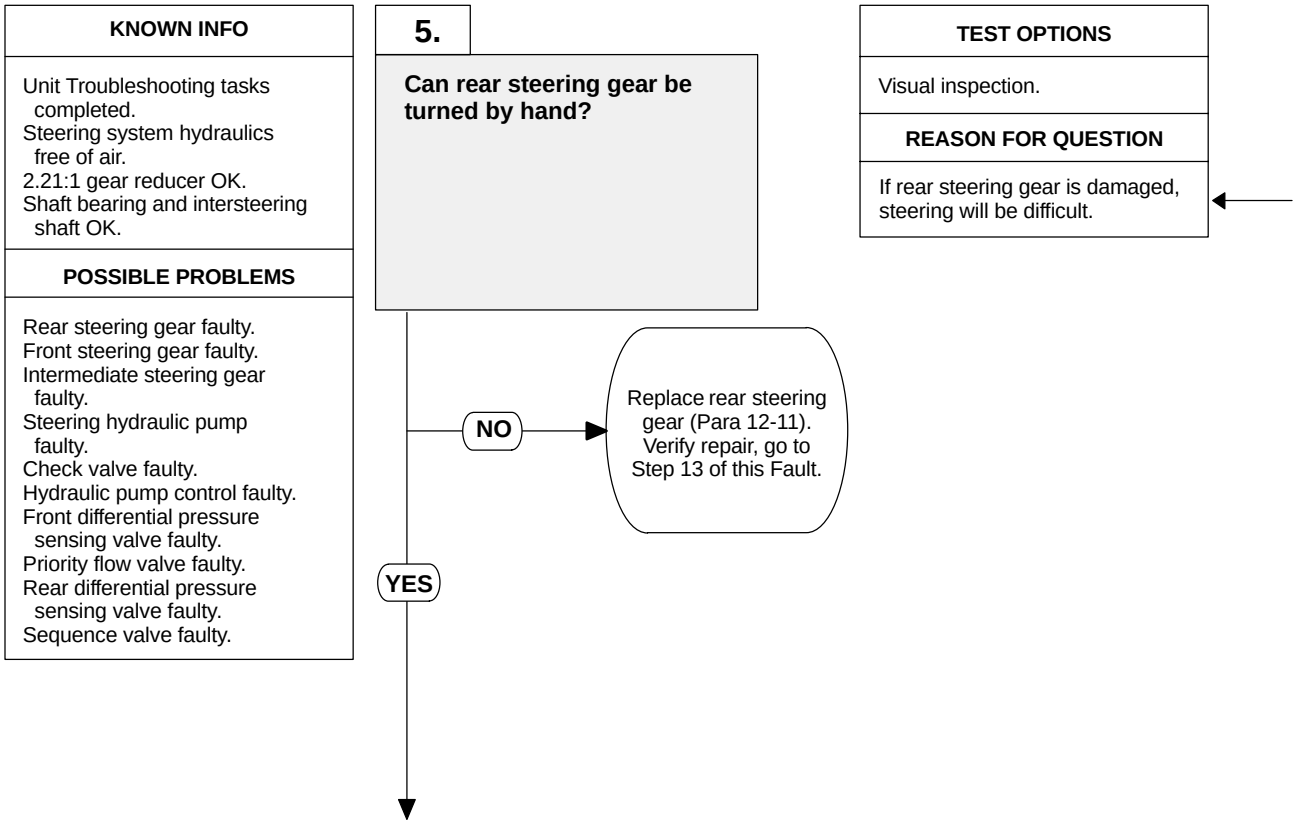
If matchmarks are not aligned during installation of yoke, erratic steering will result. Erratic steering can cause serious injury or death to personnel.

VISUAL INSPECTION

(1) Match mark Axle No. 5 steering shaft yoke and rear steering gear.
(2) Remove screw, and locknut from Axle No. 5 steering shaft yoke. Discard locknut.
(3) Slide Axle No. 5 steering shaft forward until yoke is free of rear steering gear input shaft. Support steering shaft to keep it from falling.
(4) Turn Axle No. 5 steering shaft by hand.
    (a) If shaft bearing binds and does not turn freely or shaft is bent, replace bearing and/or shaft (Para 12-6).
    (b) If shaft bearing turns freely and shaft is OK, perform Steps (5) and (6) below and go to Step 5 of this Fault.
(5) Align match marks on yoke and rear steering gear.
(6) Slide yoke onto steering gear input shaft and install screw and locknut.

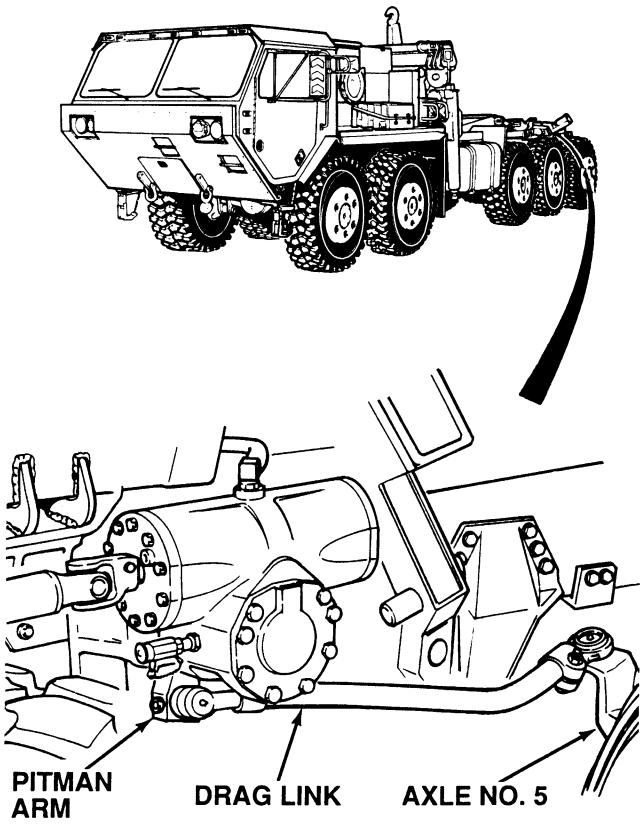


1. TRUCK IS HARD TO STEER (CONT).

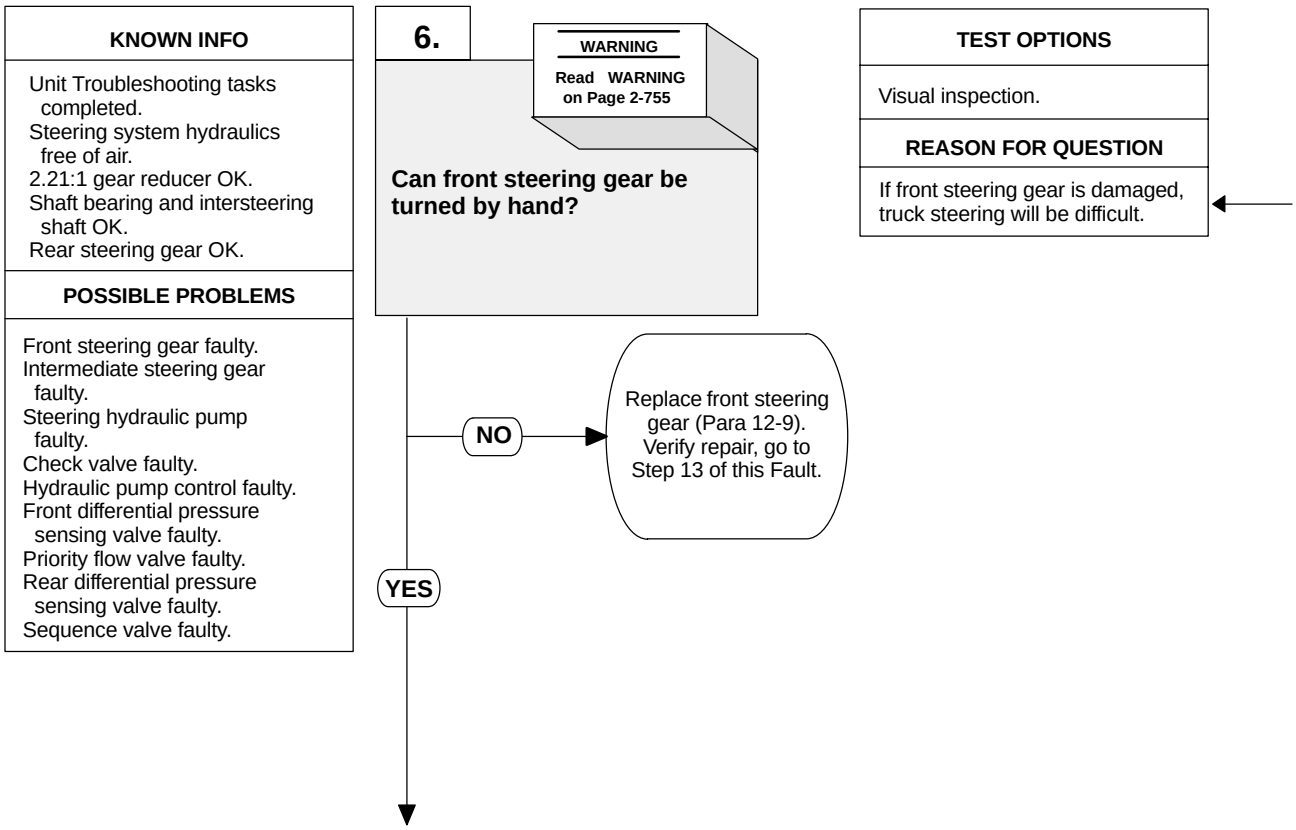


VISUAL INSPECTION

(1) Jack up rear axle until both wheels are off the ground (TM 9-2320-364-10).
(2) Turn Axle No. 5 steering shaft by hand.
  (a) If rear steering gear binds and does not turn freely, replace rear steering gear (Para 12-11).
  (b) If rear steering gear turns freely without interference, rear steering gear is OK.

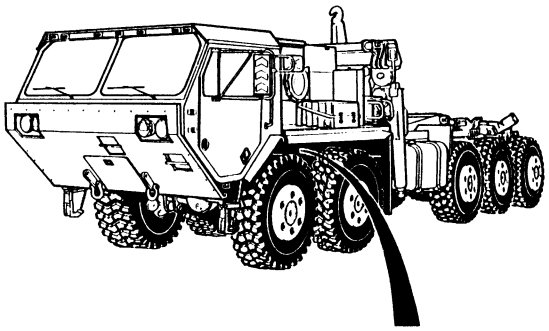


1. TRUCK IS HARD TO STEER (CONT).



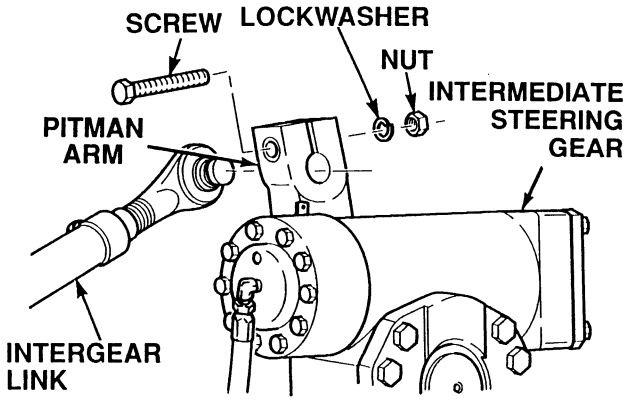
WARNING

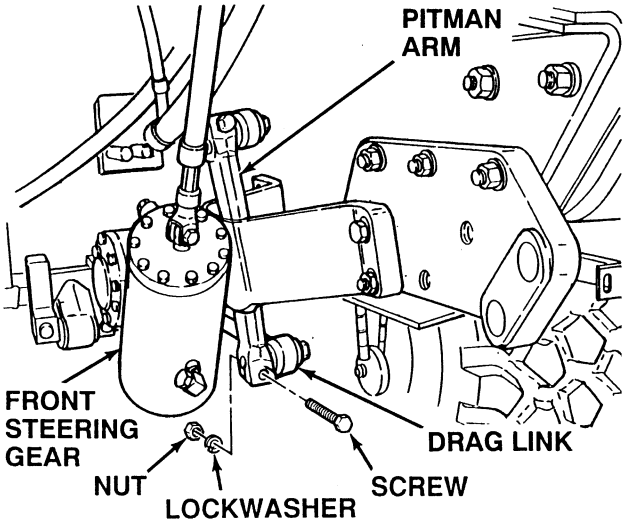
Use care when disconnecting intergear link. If it falls, it will cause injury to personnel.



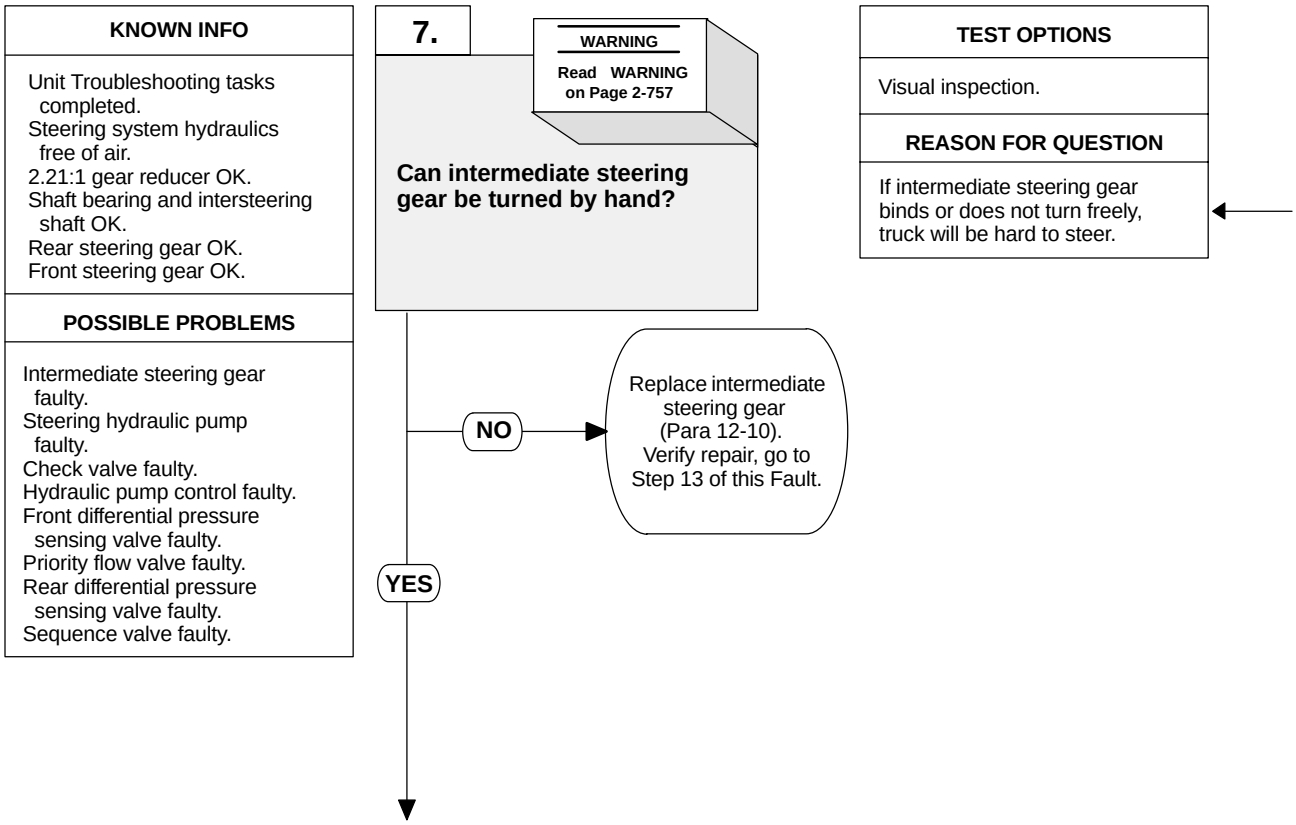
VISUAL INSPECTION

(1) Jack up Axles No. 1 and No. 2 until all four wheels are off the ground (TM 9-2320-364-10).
(2) Remove screw, nut and lockwasher and disconnect intergear link from intermediate steering gear pitman arm. Discard lockwasher. Support intergear link to keep it from falling.
(3) Remove screw, nut and draglink from front steering gear.
(4) Turn steering wheel by hand.
  (a) If steering gear binds and does not turn freely, replace front steering gear (Para 12-9).
  (b) If steering gear turns freely without interference, go to Step 7 of this Fault.





1. TRUCK IS HARD TO STEER (CONT).

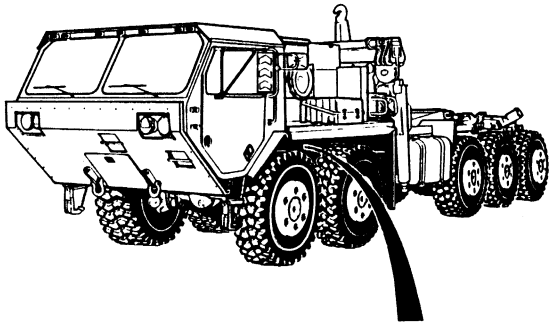


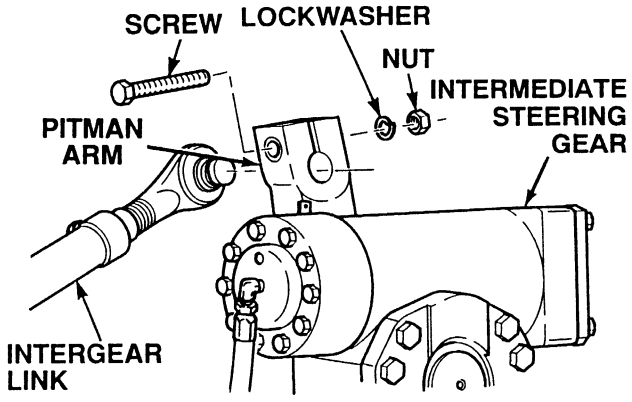
WARNING

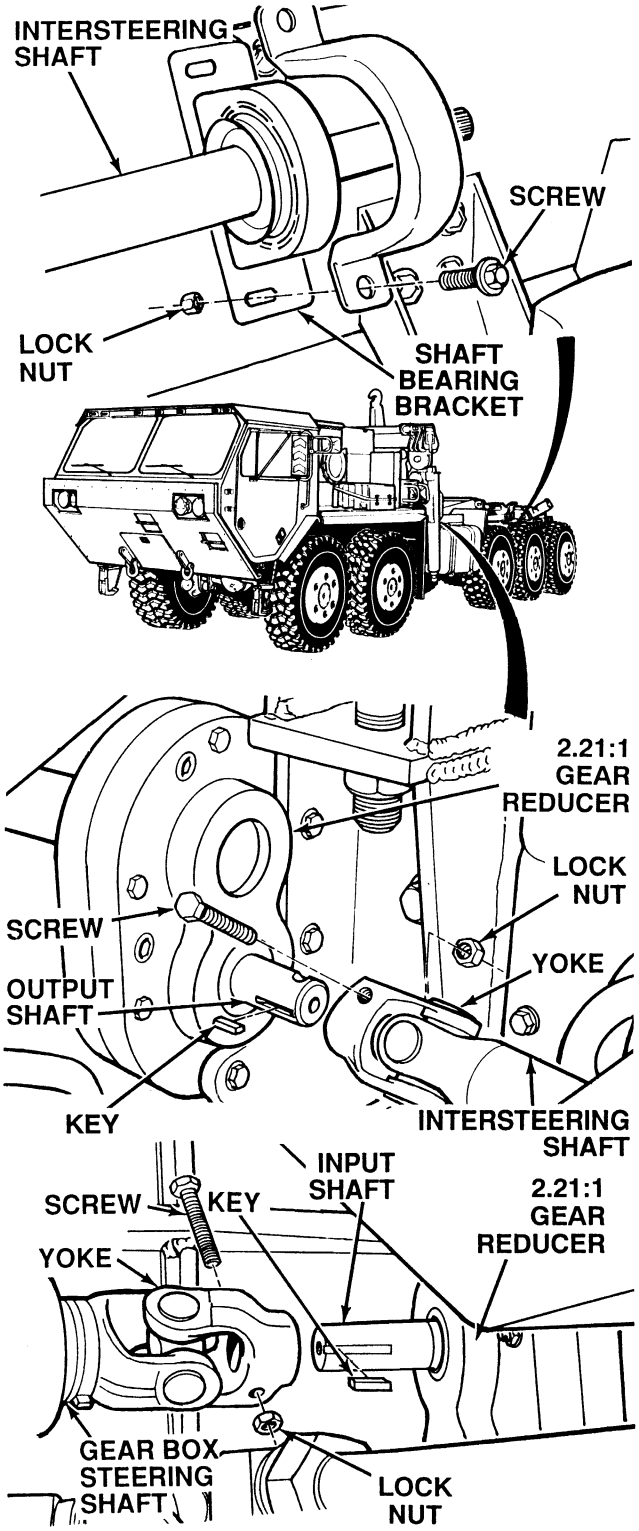
Use care when disconnecting intergear link.
If it falls, it will cause injury to personnel.

VISUAL INSPECTION

(1) Turn intermediate steering gear pitman arm by hand.
  (a) If intermediate steering gear binds and does not turn freely, replace intermediate steering gear (Para 12-10).
  (b) If intermediate steering gear turns freely, go to Step 9 of this Fault.
(2) Slide intergear link into intermediate steering gear pitman arm and install screw, lockwasher and nut.
(3) Install bolt, locknut, and draglink in pitman arm.
(4) Install key and slide gear box steering shaft onto 2.21:1 gear reducer input shaft and install screw and locknut.
(5) Lower Axles No. 1, No. 2, and No. 5 until all wheels are on the ground.







1. TRUCK IS HARD TO STEER (CONT).

KNOWN INFO

Unit Troubleshooting tasks completed.
Steering system hydraulics free of air.
2.21:1 gear reducer OK.
Shaft bearing and intersteering shaft OK.
Rear steering gear OK.
Front steering gear OK.
Intermediate steering gear OK.

POSSIBLE PROBLEMS

Steering hydraulic pump faulty.
Check valve faulty.
Hydraulic pump control faulty.
Front differential pressure sensing valve faulty.
Priority flow valve faulty.
Rear differential pressure sensing valve faulty.
Sequence valve faulty.

8.

Does steering hydraulic pump make excessive noise when operating?

NO → Go to Step 9 of this Fault.

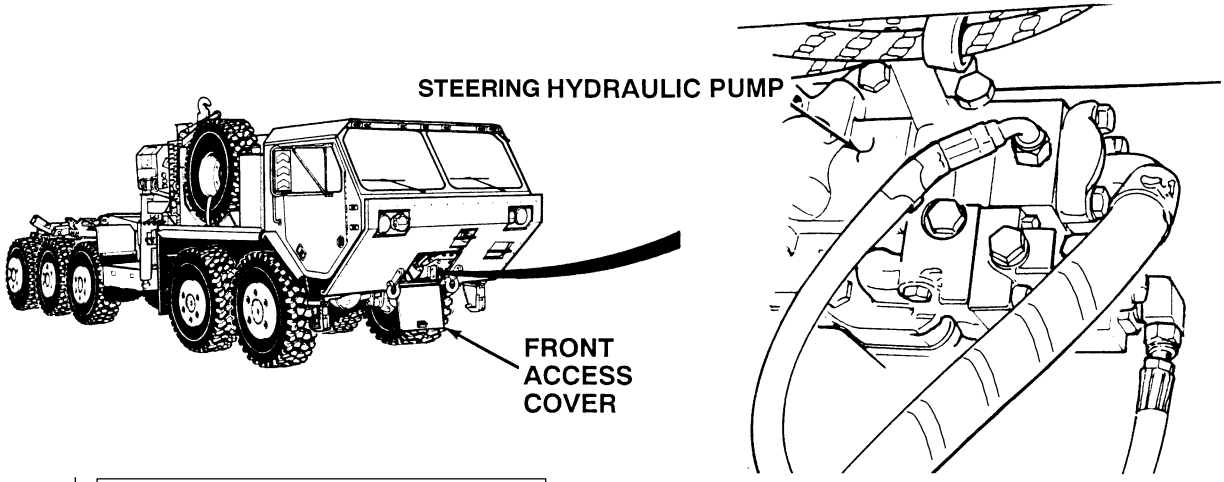
YES → Replace steering hydraulic pump (Para 17-2). Verify repair, go to Step 10 of this Fault.

TEST OPTIONS

Audible Inspection.

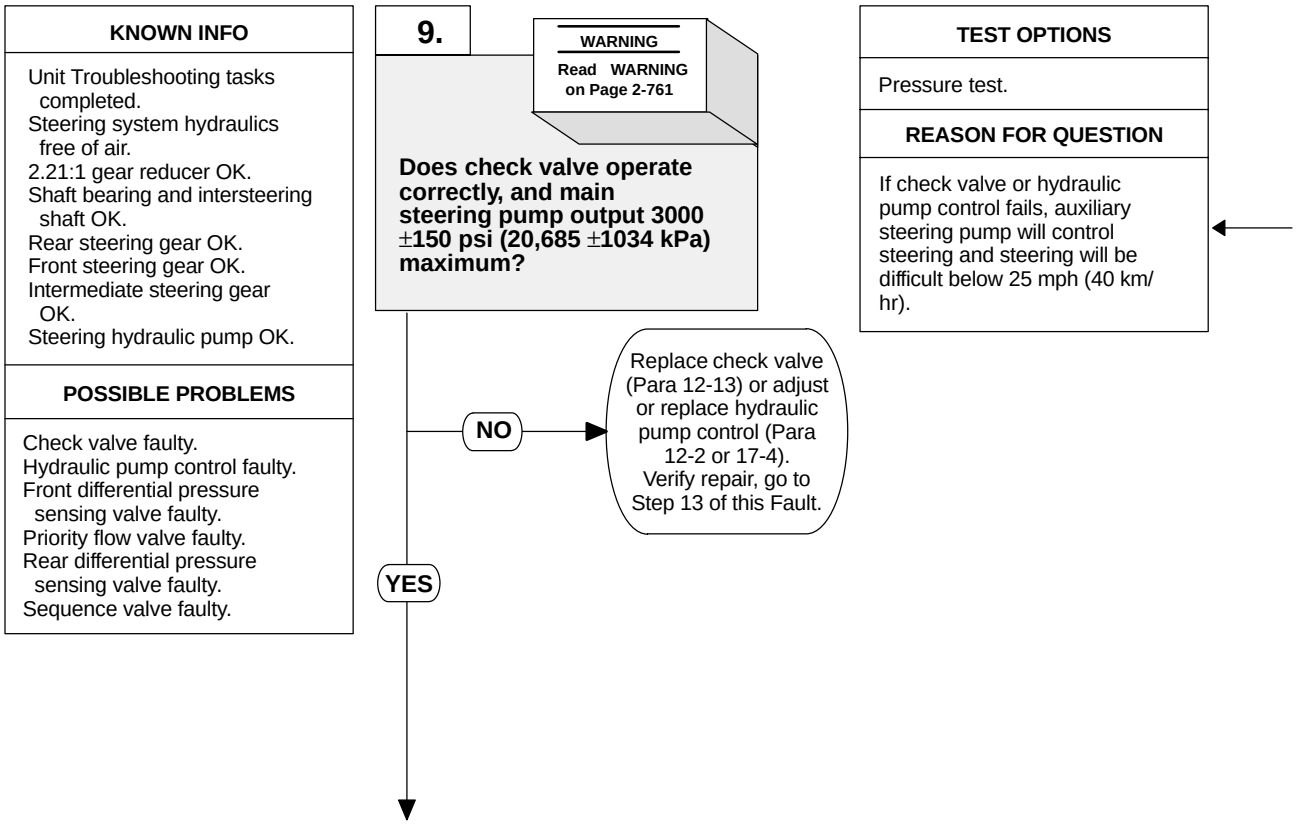
REASON FOR QUESTION

If steering hydraulic pump makes excessive noise during operation, internal components are faulty and pump will not supply fluid for correct hydraulic system operation.



AUDIBLE INSPECTION
(1) Start engine (TM 9-2320-364-10). (2) Open front access cover. (3) Listen to steering hydraulic pump operation. (a) If pump does not make excessive noise, turn OFF ENGINE switch and go to Step 9 of this Fault. (b) If pump make excessive noise while operating, turn OFF ENGINE switch and replace steering hydraulic pump (Para 17-2).

1. TRUCK IS HARD TO STEER (CONT).



WARNING

The truck steering operates with 3000 psi (20,685 kPa) hydraulic pressure. A high pressure hydraulic oil stream can pierce a body and cause severe injury to personnel. Never disconnect any high pressure hydraulic oil line or fitting without first dropping pressure to zero.

CAUTION

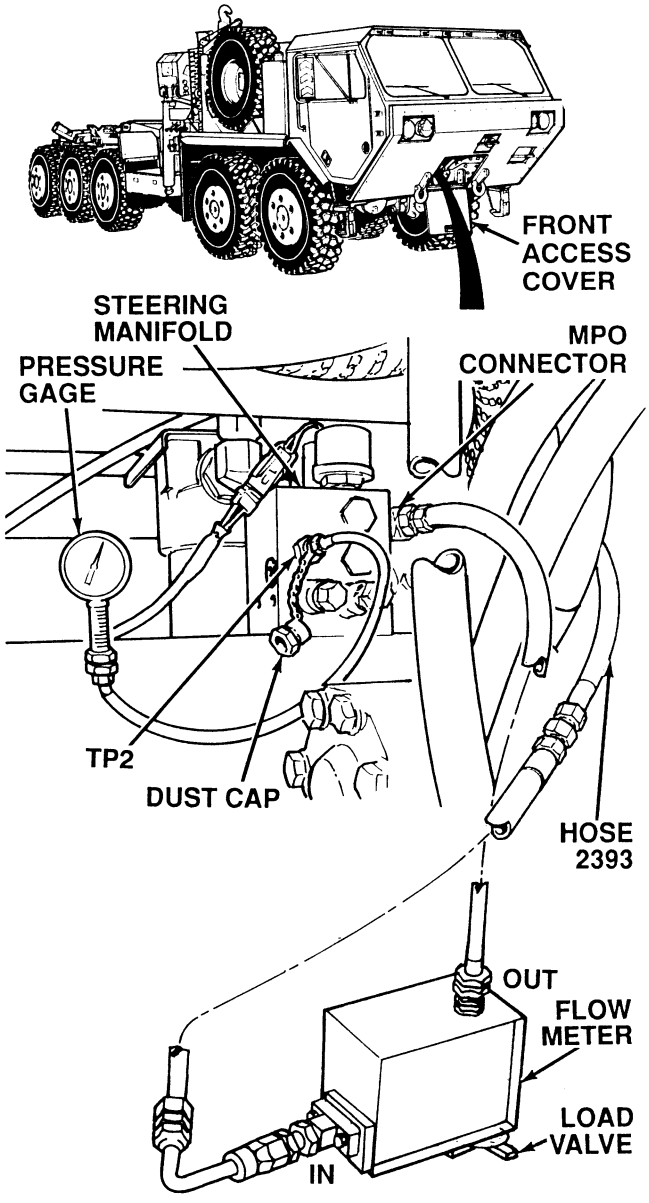
Damage to main steering pump or hydraulic pump control will occur if load valve is closed for more than10 seconds.

NOTE

Use a drain pan to catch spilling hydraulic oil.

PRESSURE TEST

(1) Open front access cover (TM 9-2320-364-10).
(2) Remove dust cover from test point TP2.
(3) Connect a 6000 psi (41,370 kPa) pressure gage to test point TP2.
(4) Disconnect hose 2393 from MPO port on steering manifold.
(5) Install a flowmeter in line between hose 2393 and MPO port on steering manifold.
(6) Fully open flowmeter load valve.
(7) Start engine.
  (a) If 0 psi (0 kPa) are present at test point TP2 while 280 to 300 psi (1931 to 2069 kPa) are present on flowmeter, replace check valve (Para 17-7).
  (b) If the pressure measured at test point TP2 is equal to the pressure measured at hose 2393, check valve is OK.
(8) Slowly close load valve on flowmeter until flow drops to 0 gpm (0 lpm).
  (a) If 3000 ±150 psi (20,685 ± 1034 kPa) are not present when flow is 0 gpm (0 lpm), adjust hydraulic pump control (Para 12-2). If hydraulic pump control adjust ment does not change the pump output, perform Steps (9) through (13) below and replace hydraulic pump control (Para 17-4).
  (b) If 3000 ±150 psi (20,685 ±1034 kPa) are present when flow is 0 gpm (0 lpm), hydraulic pump control adjustment is OK.
(9) Fully open load valve.
(10) Turn OFF ENGINE switch
(11) Remove pressure/flow valve.
(12) Connect hose 2393 to MPO port on steering manifold.
(13) Check steering oil level and add oil as necessary (TM 9-2320-364-20).



1. TRUCK IS HARD TO STEER (CONT).

KNOWN INFO

Unit Troubleshooting tasks completed.
Steering system hydraulics free of air.
2.21:1 gear reducer OK.
Shaft bearing and intersteering shaft OK.
Rear steering gear OK.
Front steering gear OK.
Intermediate steering gear OK.
Steering hydraulic pump OK.
Check valve OK.
Hydraulic pump control OK.

POSSIBLE PROBLEMS

Front differential pressure sensing valve faulty.
Priority flow valve faulty.
Rear differential pressure sensing valve faulty.
Sequence valve faulty.

10.

WARNING

Read WARNING on Page 2-763

Are priority flow valve and front differential pressure sensing valve adjusted correctly?

NO → Adjust front sensing valve (Para 12-2) and/or replace priority flow valve or front flow valve (Para 12-13). Verify repair, go to Step 13 of this Fault.

YES

TEST OPTIONS

Flow/pressure test.

REASON FOR QUESTION

If the priority flow valve fails, flow to the front steering gear will cut off, and steering will be difficult.

WARNING

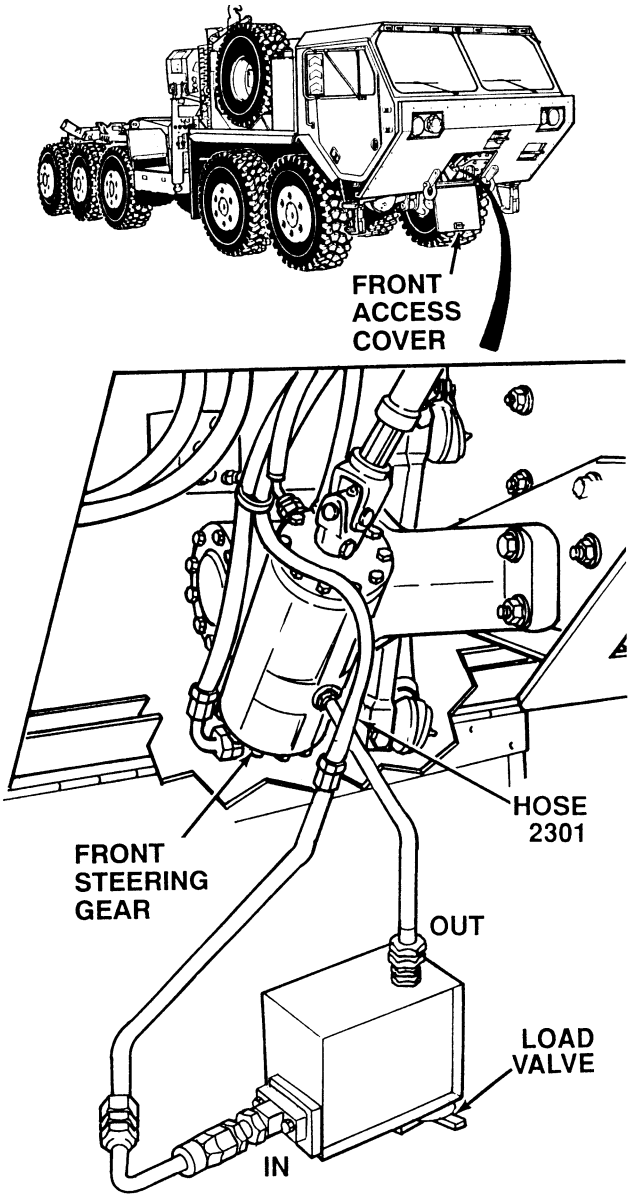
The truck steering operates with 3000 psi (20,685 kPa) hydraulic pressure. A high pressure hydraulic oil stream can pierce a body and cause severe injury to personnel. Never disconnect any high pressure hydraulic oil line or fitting without first dropping pressure to zero.

CAUTION

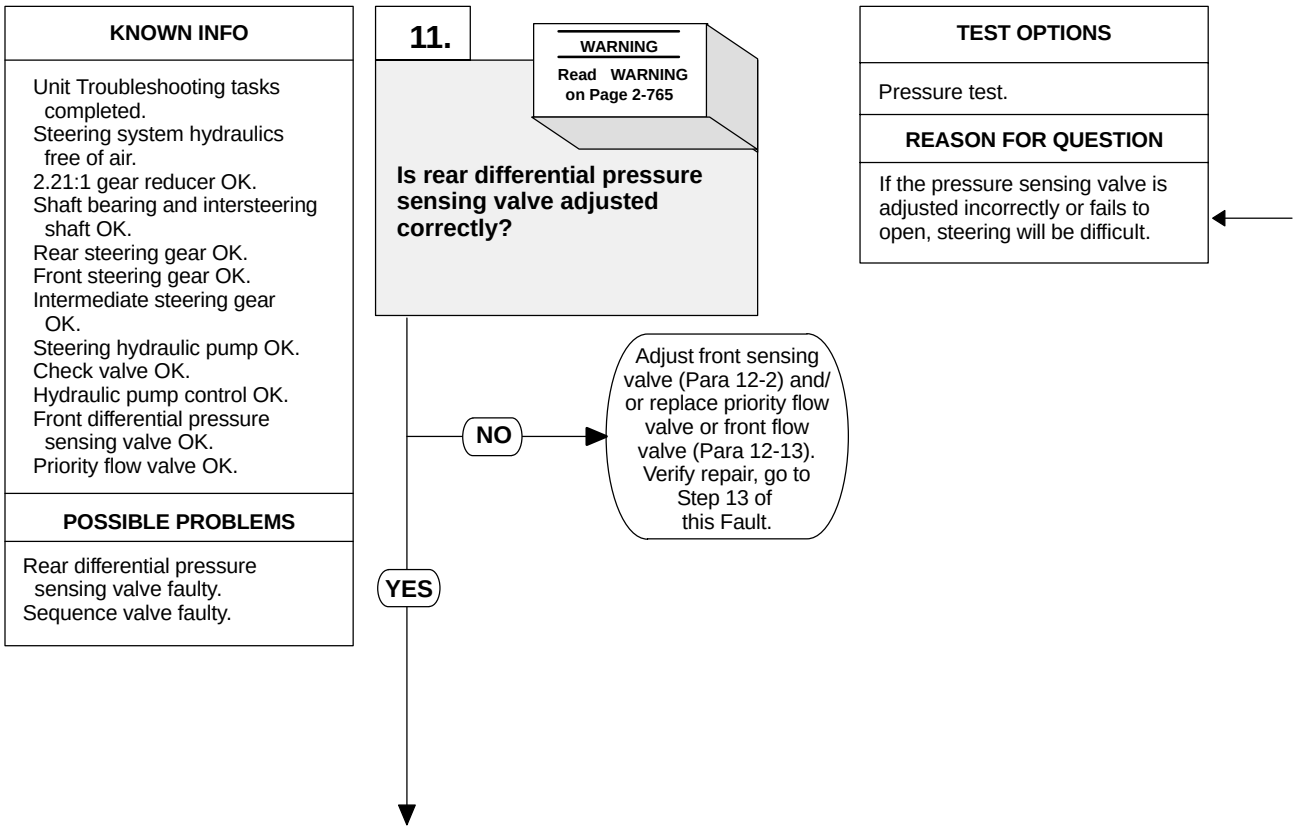
Damage to main steering pump or hydraulic pump control will occur if load valve is closed for more than 10 seconds.

FLOW/PRESSURE TEST

(1) Disconnect hose 2301 from front steering gear.
(2) Install a flowmeter in line between hose 2301 and rear steering gear.
(3) Fully open flowmeter load valve.
(4) Start engine (TM 9-2320-364-10).
  (a) If less than 6 gpm (23 lpm) are present, replace priority flow valve (Para 12-13).
  (b) If 6 gpm (23 lpm) are present, priority flow valve is OK.
(5) Slowly close load valve on meter.
  (a) If 2000 to 2025 psi (13,790 to 13,962 kPa) are not present when flow drops to 0 gpm (0 lpm), adjust pressure sensing valve (Para 12-2).
  (b) If 2000 to 2025 psi (13,790 to 13,962 kPa) are present, pressure sensing valve is adjusted correctly.
(6) Open load valve fully.
(7) Turn OFF ENGINE switch.
(8) Install pressure sensing valve cover.
(9) Connect hose 2301 to front steering gear.
(10) Check steering oil level and add oil as necessary (TM 9-2320-364-20).
(11) Close front access cover.



1. TRUCK IS HARD TO STEER (CONT).



WARNING

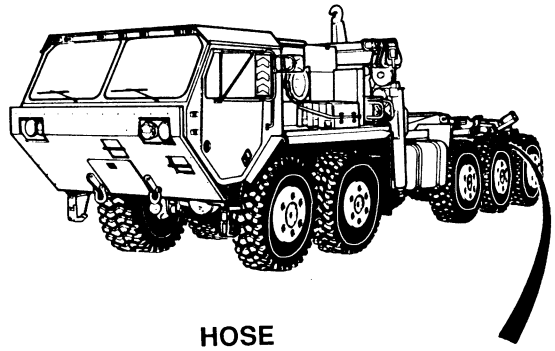
The truck steering operates with 3000 psi (20,685 kPa) hydraulic pressure. A high pressure hydraulic oil stream can pierce a body and cause severe injury to personnel. Never disconnect any high pressure hydraulic oil line or fitting without first dropping pressure to zero.

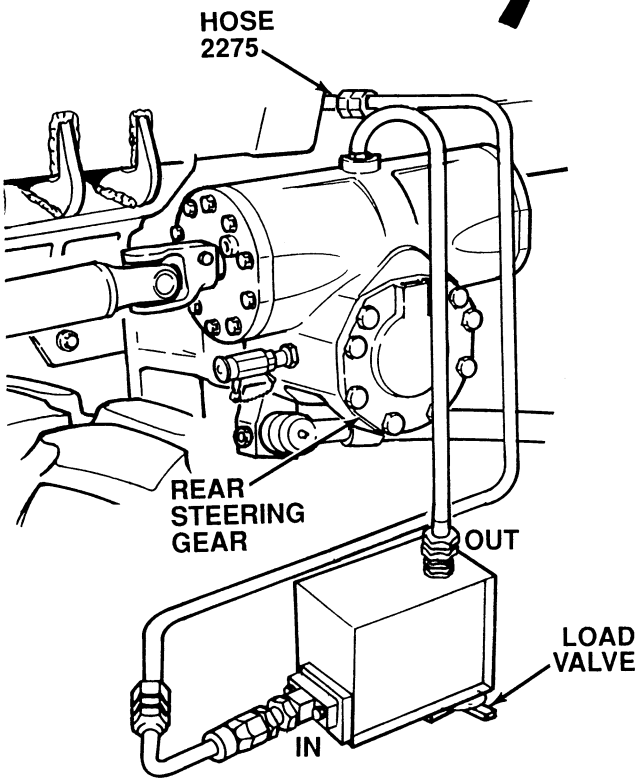
CAUTION

Damage to main steering pump or hydraulic pump control will occur if load valve is closed for more than 10 seconds.

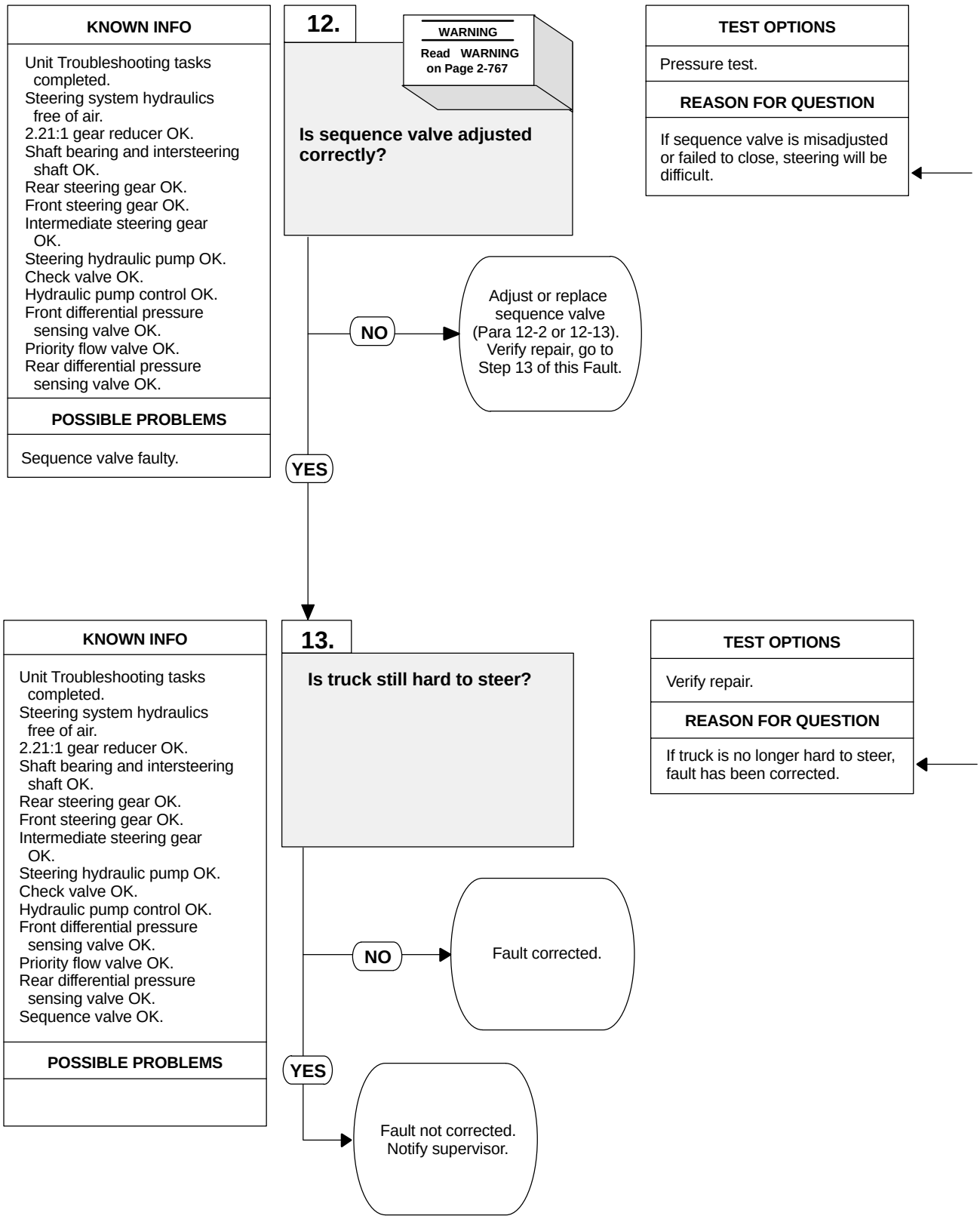
PRESSURE TEST

(1) Disconnect hose 2275 from rear steering gear.
(2) Install a flowmeter in line between hose 2275 and rear steering gear.
(3) Open load valve on flowmeter fully.
(4) Start engine (TM 9-2320-364-10).
  (a) If less than 3 gpm (11 lpm) are present, perform Steps (6) and (7) below and replace priority flow valve (Para 12-13).
  (b) If at least 3 gpm (11 lpm) are present, priority flow valve is OK.
(5) Slowly close load valve on meter.
  (a) If 2000 to 2025 psi (13,790 to 13,962 kPa) are not present when flow drops to 0 gpm (0 lpm), adjust pressure sensing valve (Para 12-13).
  (b) If 2000 to 2025 psi (13,790 to 13,962 kPa) are present, pressure relief valve is adjusted correctly.
(6) Open load valve fully.
(7) Turn OFF ENGINE switch.





1. TRUCK IS HARD TO STEER (CONT).



WARNING

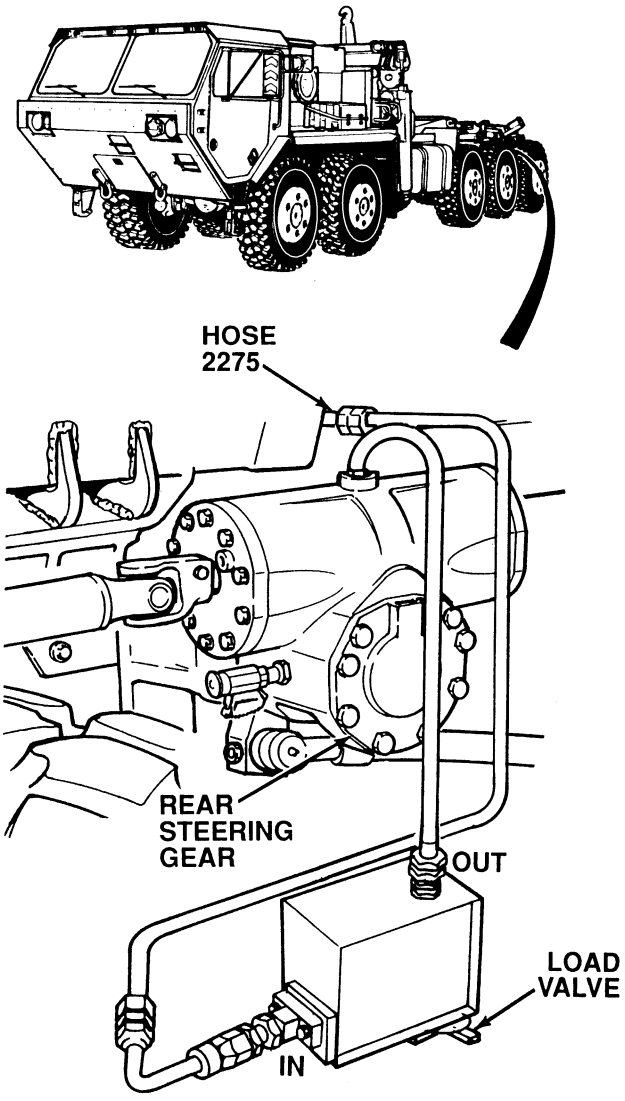
The truck steering operates with 3000 psi (20,685 kPa) hydraulic pressure. A high pressure hydraulic oil stream can pierce a body and cause severe injury to personnel. Never disconnect any high pressure hydraulic oil line or fitting without first dropping pressure to zero.

CAUTION

Damage to main steering pump or hydraulic pump control will occur if relief pressure is held for more than 10 seconds.

PRESSURE TEST

(1) Start engine (TM 9-2320-364-10).
(2) While assistant slowly turns steering wheel in one direction, slowly close load valve. Pressure should be 1800 psi (12,411 kPa) and flow will drop to zero and front axles will not steer.
  (a) If 1800 to 1825 psi (12,411 to 12,583 kPa) are not present, adjust sequence valve (Para 12-2) or replace sequence valve (Para 12-13).
  (b) If 1800 to 1825 psi (12,411 to 12,583 kPa) are present, sequence valve is adjusted correctly.
(3) Turn OFF ENGINE switch.
(4) Remove flowmeter.
(5) Connect hose 2275 to rear steering gear.



VERIFY REPAIR

(1) Check steering oil level and add oil as necessary (TM 9-2320-364-20).
(2) Check steering while truck is moving at less than 25 mph (40 km/hr).
(3) Check steering while truck is moving at greater than 25 mph (40 km/hr).
  (a) If steering is still difficult, fault not corrected. Notify supervisor.
  (b) If steering is no longer difficult, fault has been corrected.

Section IV. MAINTENANCE PROCEDURES

2-18. MAINTENANCE INTRODUCTION.

This section provides general procedures to be followed for the Direct and General Support Maintenance level as specified in the Maintenance Allocation Chart (MAC). When a special procedure is used, the detailed procedure will be in the section covering that component.

2-19. GROUND HANDLING.

a. Towing. Two towing eyes are located at front and two located at rear of truck.

b. Parking. Parking brakes are designed to hold vehicle GVW on a minimum of 7-9 percent grade, pointing either uphill or downhill per Federal Motor Carrier Safety Regulation 393.41.

c. Mooring and Transport. For forward, aft, lateral, and upward movements, truck has four tiedown rings. Refer to TM 9-2320-364-10 for mooring condition and tiedown locations.

d. Hoisting. Sling assembles and towing eyes used for hoisting are found on the truck.

2-20. GENERAL REMOVAL INSTRUCTIONS.

a. Work Required. Remove parts if repair or replacement is required. Do not disassemble a component any further than needed.

b. Preparation. Before removal of any electrical, hydraulic, or air system components, ensure system component is not energized or pressurized. Disconnect battery ground cables. On those trucks equipped with a battery disconnect switch, the switch may be used to disconnect batteries. Relieve air system pressure. Before removal of fasteners (nuts, locknuts), remove any paint on threads to prevent binding of fastener.

c. Identification. To ease assembly and installation, tag and mark shims, connectors, wires, and mating ends of lines before disconnecting them. Identify similar parts to ensure correct assembly.

d. Position of Valves. Before removing valve handles, mark or diagram their positions when open and closed. This will help during assembly.

e. Location. Before removing cable ties, cushion clamps, hoses, tubing, wiring, etc., note the location, position and routing to ensure correct assembly.

2-21. GENERAL DISASSEMBLY INSTRUCTIONS.

CAUTION

Self-locking fasteners that are loosened must be replaced, not tightened.

a. Cleanliness. Work area must be as clean as possible to prevent contamination to components.

b. Locking Parts. Replace all lockwire, lockwashers, cotter pins, and locknuts at time of reassembly.

c. Expendable Parts. All gaskets, packings, and seals removed during repair must be discarded and replaced with new parts.

d. Removing Seals. Be sure all traces of oil, gaskets, and sealants are removed from components. When possible, use wood or plastic probes and scrapers to prevent damage to machined surfaces.

CAUTION

Do not use tape to close off fuel or oil openings. Sticky surface of tape can mix with fuel and oil and cause engine malfunctions.

e. Parts Protection. To keep dust, dirt, moisture, and other objects out of internal parts of systems or components, cap or tape over all open tubes, hoses, fittings, air lines and component openings as soon as part is removed. Wrap all removed parts in clean paper or dip parts in preservation oil.

2-22. GENERAL CLEANING INSTRUCTIONS.

WARNING

- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.
- Never use fuel to clean parts. Fuel is highly flammable. Serious injury to personnel could result if fuel ignites during cleaning.

a. Cleaning Solvents. Use only approved cleaning solvents to clean parts. Drycleaning solvent, P-D-680, is commonly used. Always work in a well-ventilated area.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc). Failure to comply may result in injury to personnel.

b. Removing Deposits. Soak parts in dry cleaning solvent, and wash away deposits by flushing or spraying. When necessary, brush with a soft bristle brush (not wire) moistened in solvent. Use compressed air to dry parts, except bearings, after cleaning. Bearings must drip and air dry.

c. Tools. Do not use wire brushes, abrasive wheels, or compounds to clean parts unless specifically approved in the detailed procedures. Parts may be scratched or altered, and may weaken a highly stressed part.

2-22. GENERAL CLEANING INSTRUCTIONS (CONT).

d. Ball and Roller Bearings. When cleaning ball or roller bearings, place them in a basket and suspend them in a container of drycleaning solvent. If needed, use a brush to remove caked grease, chips, etc. Avoid rotating bearing before solid particles are removed to prevent damaging races and balls. When bearings have been cleaned, coat them lightly with lubricating oil to remove solvent.

CAUTION

Do not clean tires, lubricant seals, rubber hoses, or electrical components with solvent mixture.

e. Rubber Parts. Do not clean preformed packings or rubber parts in drycleaning solvent. Wipe parts clean with a dry, lint-free cloth.

WARNING

Steam cleaning creates hazardous noise levels and severe burn potential. Eye, skin, and ear protection is required. Failure to comply may result in injury to personnel.

f. Exterior Parts. Steam clean all exterior parts thoroughly before removing. This will make inspection and disassembly easier.

WARNING

Solvents used with a spray gun must be used in a spray booth with filter. Face shield must be used by personnel operating spray gun. Failure to comply may result in injury to personnel.

g. Engine, Cab, and Body. Use a spray gun and solvent mixture for cleaning exterior of engine, cab, and body. Allow mixture to remain on item surface for 10 minutes before rinsing. Rinse with hot water under 80 to 120 pounds of pressure, if available. An ordinary garden hose with nozzle may be used if other equipment is not available. Rinse thoroughly.

WARNING

To prevent corrosion, parts should be dipped in rust preventive within two hours of degreasing.

h. Degreasing Machine. A degreasing machine may be used to remove heavy grease and oil from metal parts.

i. Passages. After degreasing, check all oil passages and cavities for dirt or blockage before coating with rust preventive. Run a thin, flexible wire through oil passages to make sure they are not clogged. Use a pressure spray gun and drycleaning solvent to clean dirty passages.

j. Electrical Parts. Electrical parts, such as coils, junction blocks, and switches should not be soaked or sprayed with cleaning solutions. Clean these parts with a clean, lint-free cloth moistened with drycleaning solvent.

CAUTION

Do not use soap or alkalies for cleaning tank interiors.

k. Oil and Fuel Tanks. Pay special attention to all warnings and cautions when working on truck's fuel tank. Oil tanks and fuel tanks should be flushed, using a spray gun and drycleaning solvent.

l. Battery. Exterior surfaces of the electrical system and battery should be cleaned with a weak solution of baking soda and water. Apply solution with a bristle brush to remove corrosion. Pay special attention to all warnings and cautions when working on batteries.

WARNING

- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

CAUTION

Never use gasoline or other petroleum base products to clean or preserve hydraulic system parts.

m. Hydraulic System. When cleaning hydraulic system parts use drycleaning solvent, P-D-680. Clean and dry parts thoroughly to make sure no residue remains. If a coating preservative is required before assembly, apply a light film of preservative oil. If petroleum-free solvents are not available, use the same hydraulic fluid as used in the truck's system.

2-23. GENERAL INSPECTION INSTRUCTIONS.

a. Cleaning. Clean all parts before inspection. Check for defects such as physical distortion, wear, cracks, and pitting.

b. Sealing Surfaces. Inspect all surfaces in contact with gaskets, packings, or seals for nicks and burrs. If any defect is found, remove it before assembly.

c. Bearings. Inspect bearings for rusted or pitted balls, races, or separators. Inspect balls and races for brinnelling, abrasion and serious discoloration. The following are conditions for bearing rejection:

(1) Cuts or grooves parallel to ball or roller rotation.

(2) Fatigue pits (not minor machine marks or scratches).

(3) Cracks.

2-23. GENERAL INSPECTION INSTRUCTIONS (CONT).

d. Gears and Splined Shafts. Inspect gears and splined shafts for wear, pittings, rolling, peening, scoring, burning, brinnelling, and fatigue cracks.

e. Tubing, Hoses and Fittings. Inspect all hose surfaces for broken or frayed fabric. Check for breaks caused by sharp kinks or contact with other parts of the truck. Inspect copper tubing lines for kinks. Inspect fittings and tubing and mating surfaces and threads for nicks, cracks, scratches and other damage. Replace any defective part. After assembly and during initial truck operation period, check for leaks.

f. Electrical Parts. Inspect all wiring harnesses for broken, chafed, or burned wiring. Inspect all terminal connectors for loose connections and broken parts.

g. Metal Parts. Visually inspect all castings and weldments for cracks. Parts that carry a great load should receive magnetic particle inspection. Critical non-ferrous parts may be inspected with fluorescent penetrant.

h. Drain Plugs. When removing drain plugs from transmission, engine, hydraulic system components, or axle differential and planetary hubs, check amount of sediment on plugs. Accumulations of grit or fine metal particles may indicate actual or potential component failure. A few fine particles are normal. This inspection helps to determine if there are defective parts prior to internal inspection of the component, and to predict degradation of the equipment.

2-24. GENERAL WELDING INSTRUCTIONS.

WARNING

- CARC paint contains isocyanate (HDI) which is highly irritating to skin and respiratory system. High concentrations of HDI can produce symptoms of itching and reddening of skin, a burning sensation in throat and nose and watering of the eyes. In extreme concentrations, HDI can cause cough, shortness of breath, pain during respiration, increased sputum production, and chest tightness. The following precautions must be taken whenever using CARC paint:
- ALWAYS use air line respirators when using CARC paint unless air sampling shows exposure to be below standards. Use chemical cartridge respirator if air sampling is below standards.
- DO NOT let skin or eyes come in contact with CARC paint. Always wear protective equipment (gloves, ventilation mask, safety goggles, etc.).
- DO NOT use CARC paint without adequate ventilation.
- NEVER weld or cut CARC-coated materials.
- DO NOT grind or sand painted equipment without high-efficiency air purifying respirators in use.
- BE AWARE of CARC paint exposure symptoms; symptoms can occur a few days after initial exposure. Seek medical help immediately if symptoms are detected.
- Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC 9-237. Protective clothing and goggles must be worn; adequate protective equipment used, a suitable fire extinguisher kept nearby, and requirements of TC 9-237 strictly followed.

CAUTION

PLS truck must be properly prepared before welding or damage to equipment may result. To prepare PLS truck for welding, refer to Para 6-39.

Thoroughly inspect all weldments for cracks, chips, or other damage. Areas of concern include the frame, radiator, LHS, Material Handling Crane, and cab assembly.

2-25. GENERAL REPAIR INSTRUCTIONS.

a. Burrs. Remove burrs from surface teeth with a fine-cut file or cross cloth.

b. Exterior Parts. Chassis and exterior painted parts may be resurfaced when paint is damaged, or where parts have been repaired.

NOTE

Polished or machined steel parts not protected by cadmium, tin, copper, or other plating or surface treatments require protection. Bare metal surfaces must be free of moisture when protective coating is applied.

c. Protecting Parts. Protect bare steel surfaces from rust when not actually undergoing repair work. Dip parts in, or spray them with corrosion preventive compound. Aluminum parts may require protection in atmospheres having a high salt content.

d. Screws, Nuts, and Fittings. Replace any screw, nut, or fitting with damaged threads. Inspect tapped holes for thread damage. If cross-threading is evident retap the hole for the next oversize screw or stud. If the retapping will weaken the part, or if the cost of the part makes retapping impractical, replace the part. Chasing the threads with proper size tap or die may be adequate.

e. Stud Installation. When installing studs use a proper driver. A worn stud driver may damage the end thread. Then a chasing die must be used before a nut can be screwed on. This procedure will remove cadmium plating and allow corrosion. Before installing a stud, inspect the hole for chips. Blow out foreign matter and start stud by hand. Before final insertion, coat thread with a film of antiseize compound. Install stud to proper “setting height”, which is the total projecting length.

f. Dents. Straighten minor body dents by bumping with a soft-faced hammer while using a wooden block backing.

g. Sheet Metal Repair. Repair minor skin cracks by installing patches.

2-26. GENERAL ASSEMBLY INSTRUCTIONS.

a. Preparation. Remove protective grease coatings from new parts before installation.

b. Preformed Packing Installation. Lubricate all preformed packings with a thin coat of light mineral oil before installing. To install a preformed packing, first clean the groove, then stretch packing and place into position. Place component on flat surface and uniformly press packing into position. Ensure preformed packings are not nicked or torn during assembly.

2-26. GENERAL ASSEMBLY INSTRUCTIONS (CONT).

CAUTION

Use sealing compound sparingly and only on male threads. Do not apply compound on first two threads to avoid contamination of system from compound. Do not apply compound to hose connections or fittings with preformed packings. Damage to equipment may result.

c. Pipe Joints and Fittings. Use sealing compound sealant or adhesive as indicated in each maintenance task. Refer to Para 2-27 for tightening procedure.

d. Oil Seals. Coat oil seals evenly with oil or grease before installing. Install oil seals with seal lip facing toward lubricant, applying an even force to outer edge of seal. If oil seals are to be installed over keyed or splined shafts, use a guide to prevent sharp edge of keyway or splines from cutting the leather or neoprene seal. Construct guides of very thin gage sheet metal and shape to the required diameter. Make certain guide edges are not sharp and are bent slightly inward so they do not cut the seal.

e. Bearings and Shafts. When mounting bearings on shafts always apply force to the inner races. When mounting bearings into housing always apply the force to the outer race.

f. Bearing Lubrication. Lubricate bearings before assembly with lubricant used in the related housing or container to provide the first run-in until lubricant from the system can reach the bearings.

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

g. Silicone Sealant. Silicone sealant is often used instead of a gasket to seal mating parts. The mating parts must be clean, dry, and free of oil or grease for proper adhesion. After silicone sealant has been applied, the mating parts must be assembled immediately. Silicone sealant starts to set-up in 15 minutes and takes 24 hours to completely set. Excess silicone sealant should be wiped off after assembling the mating parts.

h. Gaskets. Remove all traces of previous gasket and sealant before installing new gasket. Coat both sides of gasket with sealant to provide added sealing.

2-27. GENERAL INSTALLATION INSTRUCTIONS.

a. Preparation. When unpacking items, remove all packing material, barrier paper, tape, plastic bags, protective caps, and protective grease coatings. Handle and store removed components carefully.

CAUTION

Use sealing compound sparingly and only on male threads. Do not apply compound on first two threads to avoid contamination of system from compound. Do not apply compound to hose connections or fittings with preformed packings. Damage to equipment may result.

b. Sealing Compounds. Use sealing compounds as required in each maintenance task.

c. Torquing. Tighten bolts, screws, washers, hoses and fittings as required in Appendix D or in each maintenance task.

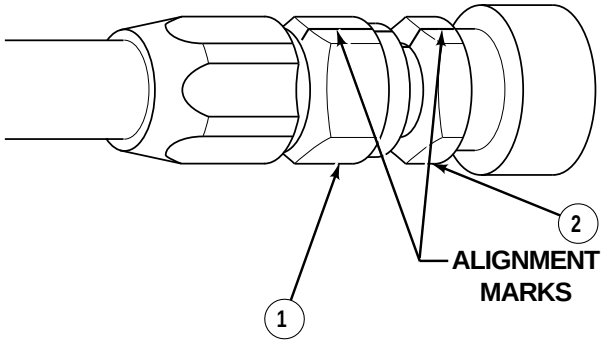
d. Identification Tags. Put hoses, tubes, lines, and electrical wiring in place by matching identification tags and markings on equipment.

e. Hoses, Airline and Wiring. After installing hoses, air lines and wiring, ensure that they do not contact moving parts or components edges. Secure in place, out of way with cable ties and cushion clips.

f. Hose and Fitting Tightening Procedure.

NOTE

Tighten hoses and fittings as required in Appendix D or in each maintenance task. If a torque wrench and crowsfoot are not available or cannot be used, use the following procedure.



(1) Install hose nut (1) on fitting (2).

NOTE

When turning effort increases, hose nut seat is in contact with adapter seat.

(2) Tighten hose nut (1) until seated on fitting (2).

NOTE

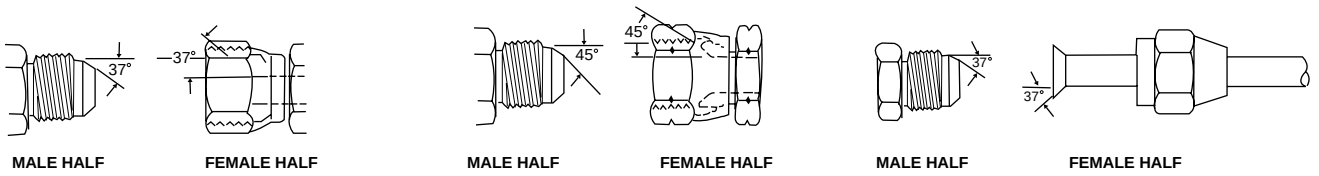
Alignment marks allow the mechanic to count the number of flats the hose nut has rotated during tightening.

(3) Scribe alignment mark on hose nut (1) and fitting (2).

(4) Tighten hose nut (1) until mark on hose nut has rotated correct number of flats (Refer to Table 2-18).

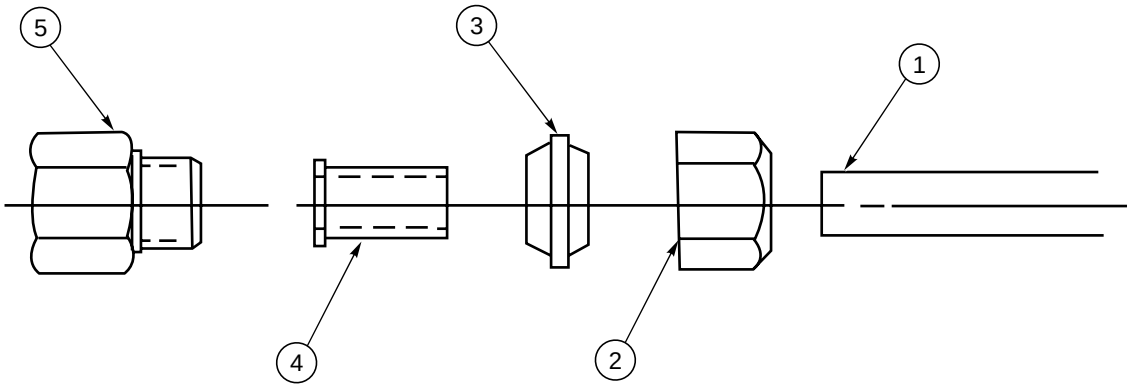
2-27. GENERAL INSTALLATION INSTRUCTIONS (CONT).

Table 2-18. Recommended Flats Rotation.



Dash No.	SAE 37 Degree Flared Hose and Fitting Machined Seat	SAE 45 Degree Flared Hose and Fitting Machined Seat	37 Degree Flared Tube
-4	1 1/2 - 1 3/4	1 - 1 1/4	2 1/4 - 2 3/4
-5	1 - 1 1/2	1 - 1 1/4	2 1/4 - 2 3/4
-6	1 - 1 1/2	3/4 - 1	2 1/4 - 2 3/4
-8	1 1/4 - 1 3/4	1 - 1 1/4	2 1/4 - 2 3/4
-10	1 1/4 - 1 3/4	1 - 1 1/4	2 - 2 1/2
-12	1 - 1 1/2	1 - 1 1/4	2 - 2 1/2
-16	3/4 - 1	-----	2 1/4 - 2 3/4
-20	1/2 - 3/4	-----	1 1/4 - 1 3/4
-24	1/2 - 3/4	-----	3/4 - 1 1/4
-32	3/4	-----	1 - 1 1/4

g. Air Line Tightening Procedure.



(1) Ensure end of air line (1) is cut square.

(2) Remove nut (2), ferrule (3) and tube support (4) from fitting (5).

(3) Position nut (2), ferrule (3) and tube support (4) on air line (1).

NOTE

Air line is properly seated when tube support bottoms out in fitting.

(4) Install air line (1) in fitting (5) hand tight.

NOTE

Alignment mark allows mechanic to count the number of times the nut has rotated during tightening.

(5) Scribe mark on nut (2) and fitting (5).

(6) Tighten nut (2) until mark on nut (2) has rotated correct number of turns. (Refer to Table 2-19).

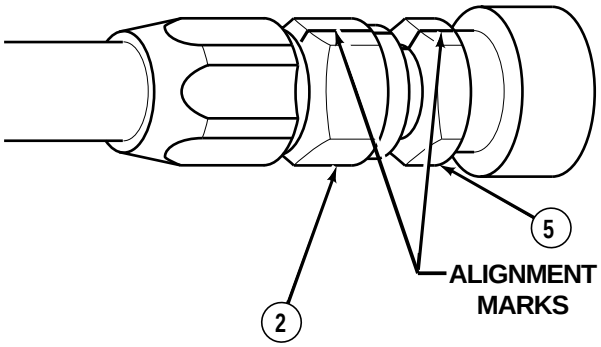


Table 2-19. Air Line Tightening.

Air Line O.D. Size	Additional Number of Turns from Hand-Tight
1/4	3
3/8 and 1/2	4
5/8 and 3/4	3 1/2

2-27. GENERAL INSTALLATION INSTRUCTIONS (CONT).

h. Pipe Thread Tightening Procedures.

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use sealing compound sparingly and only on male threads. Do not apply compound on first two threads to avoid contamination of system from compound. Do not apply compound to hose connections or fittings with preformed packings. Damage to equipment may result.

(1) Coat threads of male fitting with sealing compound, sealant or adhesive as indicated in each maintenance task.

(2) Position male fitting on female fitting finger tight.

(3) Scribe alignment mark on both fittings.

CAUTION

- It may be necessary to tighten fitting slightly more or less than 2 1/2 turns to match position noted prior to removal. Do not loosen fitting to arrive at proper position or a leak may occur.
- Over tightening may cause pipe fitting to deform and damage to the joining fitting, flange or component.

(4) Tighten male fitting 2 1/2 (3 maximum) full turns past hand tight position.

i. Fastener Tightening Sequence Procedures.

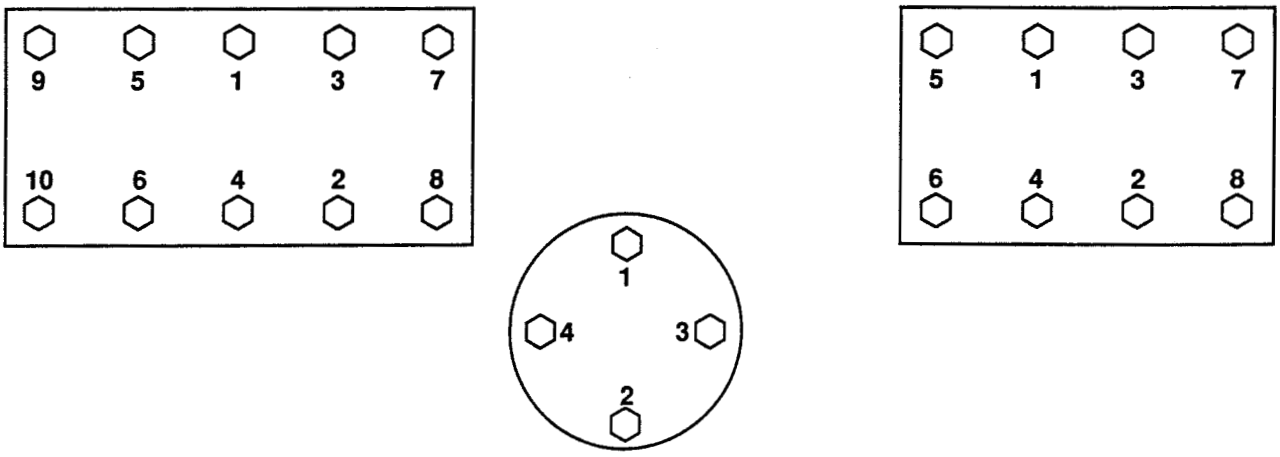


Figure 2-17. General Tightening Sequences.

NOTE

If a component has a critical tightening sequence it will be illustrated in that particular task; otherwise, use the general sequence charts provided (Figure 2-17).

(1) Installation Torque.

(a) Tighten nuts twice in a criss-cross pattern using a torque wrench. The first time nut is torqued apply approximately 75 percent of the final torque value.

(b) Repeat the sequence a second time until 100 percent of the final torque value has been obtained for each nut.

(2) Checking Torque.

NOTE

When one or more screws are loose, check torque for all bolts on the component.

Tighten nuts in a criss-cross pattern using a torque wrench. Apply 100 percent of the final torque value.

2-28. PREPARATION FOR STORAGE OR SHIPMENT INTRODUCTION.

Refer to (TM 9-2320-364-20) for introduction to preparation for storage and shipment.

2-29. PREPARATION FOR STORAGE OR SHIPMENT.

Refer to (TM 9-2320-364-20) for preparation for storage and shipment.

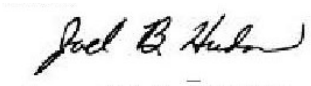
2-30. STORAGE MAINTENANCE PROCEDURES.

Refer to (TM 9-2320-364-20) for Storage Maintenance Procedures.

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:



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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE
1 Centimeter=10 Millimeters=0.01 Meters=0.3937 Inches
1 Meter=100 Centimeters=1000 Millimeters=39.37 Inches
1 Kilometer=1000 Meters=0.621 Miles

WEIGHTS
1 Gram=0.001 Kilograms=1000 Milligrams=0.035 Ounces
1 Kilogram=1000 Grams=2.2 Lb
1 Metric Ton=1000 Kilograms=1 Megagram=1.1 Short Tons

LIQUID MEASURE
1 Milliliter=0.001 Liters=0.0338 Fluid Ounces
1 Liter=1000 Milliliters=33.82 Fluid Ounces

SQUARE MEASURE
1 Sq Centimeter=100 Sq Millimeters=0.155 Sq Inches
1 Sq Meter=10,000 Sq Centimeters=10.76 Sq Feet
1 Sq Kilometer=1,000,000 Sq Meters=0.386 Sq Miles

CUBIC MEASURE
1 Cu Centimeter=1000 Cu Millimeters=0.06 Cu Inches
1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

TEMPERATURE
5/9 (°F − 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° + 32 = F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds/Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Km per Liter	Miles per Gallon	2.354
Km per Hour	Miles per Hour	0.621

