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- Make certain there is adequate light and ventilation.
- Remove any foreign substances (i.e. oil, grease, water, snow, ice) to eliminate any slippery surfaces and to remove all contaminants from the area.
- Use only the correct tools to perform the maintenance or repair.
- Make sure all jacks, hoists, jack stands, or blocks are stable and strong enough to handle the weight of the forklift or component that you will be working on.
- Remove only the guards or covers that provide access to the area being serviced and replace all guards or covers when work is complete.

Note: *Keep bystanders away if access doors are open or guards are removed. NEVER leave the forklift unattended with open access doors or any guards removed.*

Fuel Hazards

Observe the following practices to reduce the possibility of an explosion when working with fuel.

- Never fill the tank with the engine running. Shut off engine and ignition during refueling.
- Make sure you have adequate ventilation during refueling.
- Do not permit anyone to be on the machine during refueling.
- Always ground the fuel nozzle against the filler neck to avoid sparks.
- Never use an open flame when checking the fuel level in the tank.
- Keep sparks and open flames away from fuel.
- Do not smoke while refueling or when handling fuel containers.
- Never cut or weld on or near fuel lines, tanks, or containers.
- Never overfill the tank or spill fuel. If you spill fuel, clean it up immediately. Spilled fuel must be completely absorbed or evaporated before starting the engine.
- Make sure the fuel cap is in place before starting the engine.

Engine Coolant Hazards

Liquid cooling systems build up extreme heat and pressure as the engine gets hot. Use care when servicing the system.

Take the following precautions before removing the radiator cap:

- Stop the engine and wait for the system to cool down.
- Wear protective clothing and safety glasses.
- Turn the radiator cap slowly to the first stop position to allow the pressure to escape before removing the cap completely.

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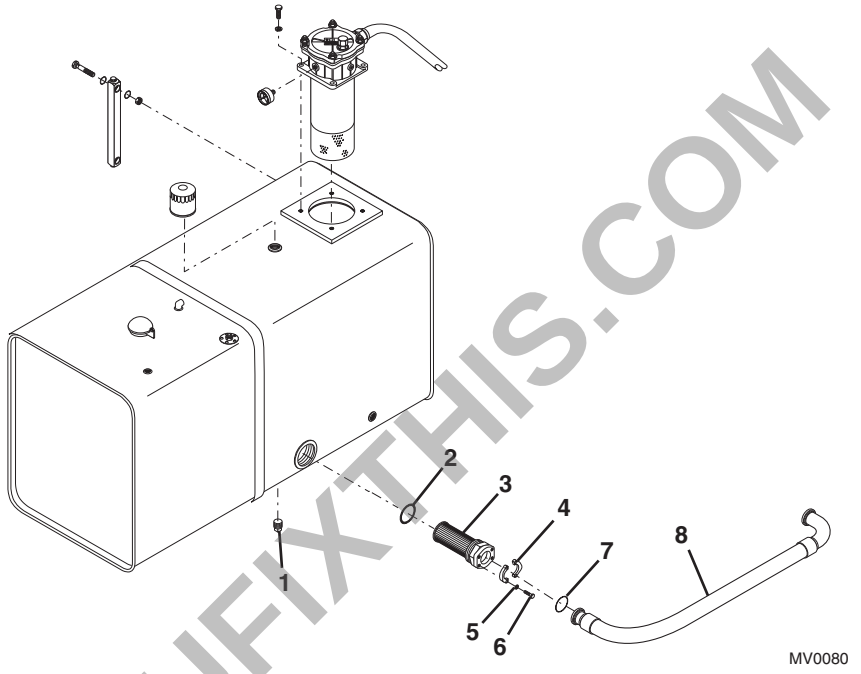
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Suction Strainer

Description



#	Description	#	Description
1	Drain Plug	5	Lockwasher
2	O-Ring	6	Capscrew
3	Hydraulic Oil Strainer	7	O-Ring
4	Flange Half	8	Hydraulic Suction Hose

Fig. 5-11: Suction Strainer Installation

(Ref. Fig. 5-11) The suction strainer is located behind the hydraulic reservoir. It removes contaminants as oil is pumped out of the hydraulic reservoir.

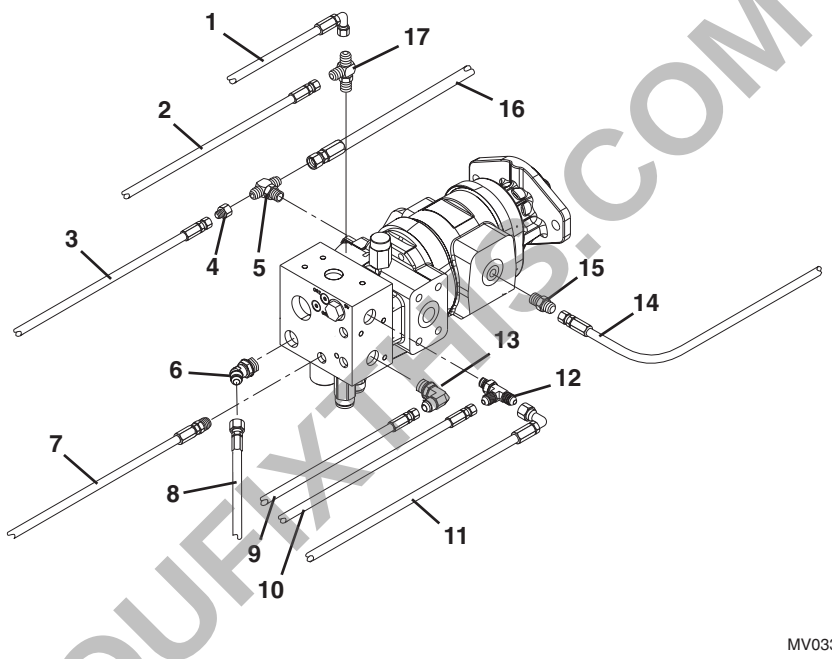
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Removal

Hydraulic Pump

.



#	Description
1	Hydraulic Hose to Test Port
2	Hydraulic Hose to Accumulator
3	Hydraulic Hose to Test Port
4	Reducer Adapter
5	Branch Tee
6	Elbow
7	Hydraulic Hose to Steer Motor
8	Hydraulic Hose to Steer Motor
9	Hydraulic Hose to Accumulator
10	Hydraulic Hose to Steer Motor

#	Description
11	Hydraulic Hose to Test Port
12	Run Tee
13	Elbow
14	Hydraulic Hose to Elbow on Rear Axle Stabilizer Valve
15	Connector
16	Hyd. Hose to Connector on Rear Axle Stabilizer Valve
17	Run Tee

Fig. 5-22: Hydraulic Pump Hoses – Mid-Inlet Hydraulics

(Ref. Fig. 5-22) The following describes initial steps for removal of the hydraulic pump.

1. Follow preparation procedures as outlined in Section 3 of this manual. Be sure to follow the guidelines in this section detailed under “General Hydraulic Maintenance Practices” on page 5-3.
2. Install brake pressure diagnostic port test gauge into brake diagnostic port (see page 5-49).

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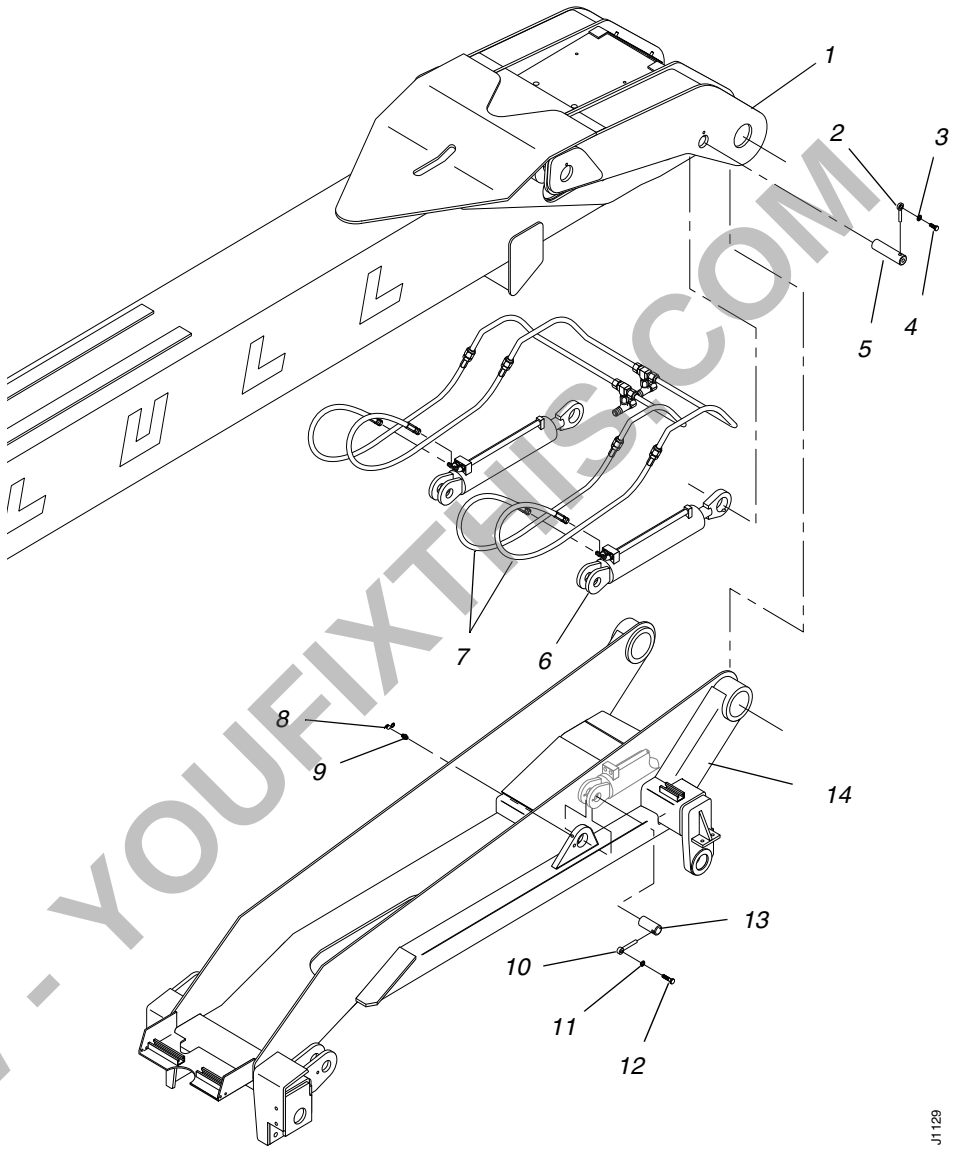
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Removal

Rear Carriage Tilt Cylinder



#	Description
1	Outer Boom
2	Lock Pin
3	Lockwasher
4	Hex Head Capscrew
5	Cylinder Pivot Pin - Rod End
6	Rear Carriage Tilt Cylinder
7	Hydraulic Hose

#	Description
8	Grease Fitting Cover
9	Grease Fitting
10	Lock Pin
11	Lockwasher
12	Hex Head Capscrew
13	Cylinder Pivot Pin - Base End
14	Transfer Carriage/Boom Cradle

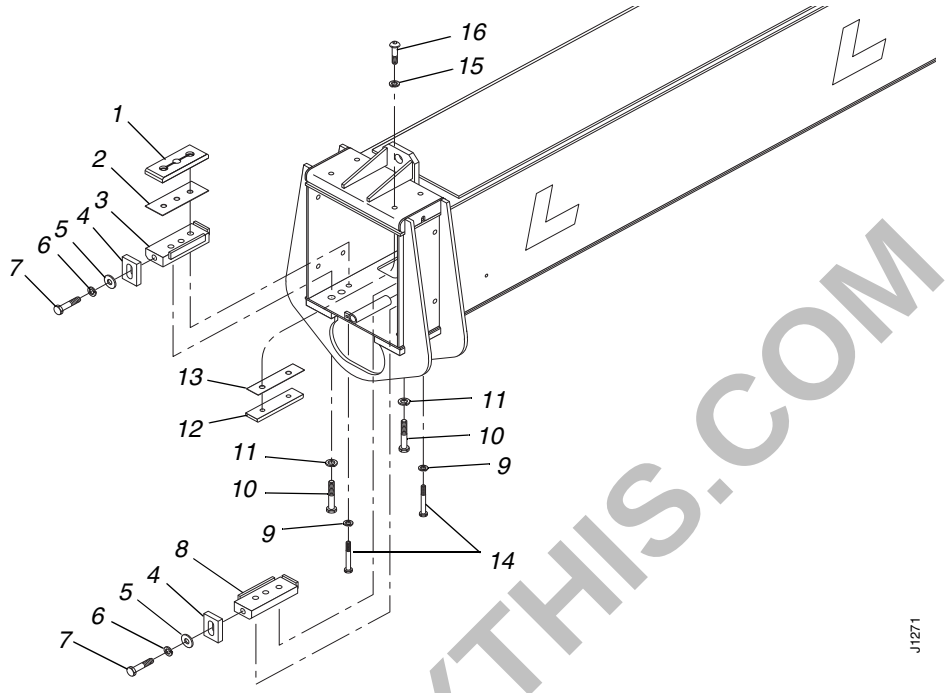
Fig. 6-14: Rear Carriage Tilt Cylinder Installation

(Ref. Fig. 6-14) The following steps are required to remove rear carriage tilt cylinders.

1. Follow preparation procedures as outlined in Section 3.
2. Lower the boom to the ground, apply the park brake, retract the cylinder, and stop the engine.

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#	Description	#	Description
1	Lower Slide Pad	9	Lockwasher
2	Shim	10	Capscrew
3	Right Hand Retainer Block	11	Lockwasher
4	Pad Retainer	12	Upper Slide Pad
5	Flatwasher	13	Shim
6	Lockwasher	14	Capscrew
7	Capscrew	15	Lockwasher
8	Left Hand Retainer Block	16	Button-Head Socket Capscrew

Fig. 6-67: Slide Pad Removal – Outer Boom Section

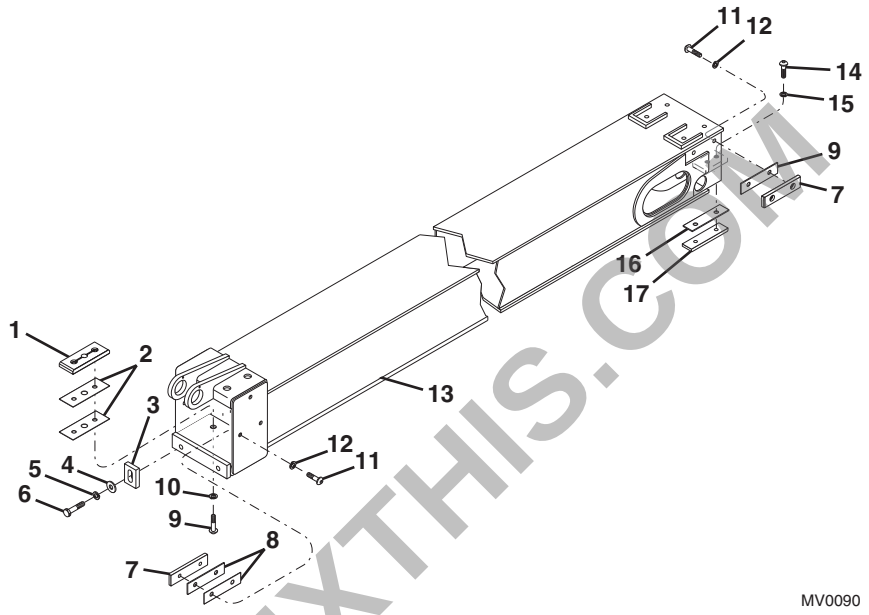
3. (Ref. Fig. 6-67) Remove the lower slide pads from outer boom section as follows:

   a. Remove two (2) each capscrews (Item 7), lockwashers (Item 6), flatwashers (Item 5), and pad retainers (Item 4) from retainer blocks (Items 3 and 8).

   b. Remove four (4) capscrews (Items 10 and 14) and lockwashers (Items 9 and 11) securing retainer blocks to outer boom section. Remove two (2) each lower slide pads (Item 1), shims (Item 2) and retainer blocks.

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#	Description
1	Front Bottom Slide Pad
2	Shim
3	Pad Retainer
4	Flatwasher
5	Lockwasher
6	Capscrew
7	Side Slide Pad
8	Shim
9	Button-Head Socket Capscrew
10	Lockwasher

#	Description
11	Button-Head Socket Capscrew
12	Lockwasher
13	Middle (Forward) Boom Assy
14	Button-Head Socket Capscrew
15	Lockwasher
16	Shim
17	Rear Bottom Slide Pad
18	Pad Retainer

Fig. 6-78: Slide Pad Removal – Middle (Forward) Boom Section

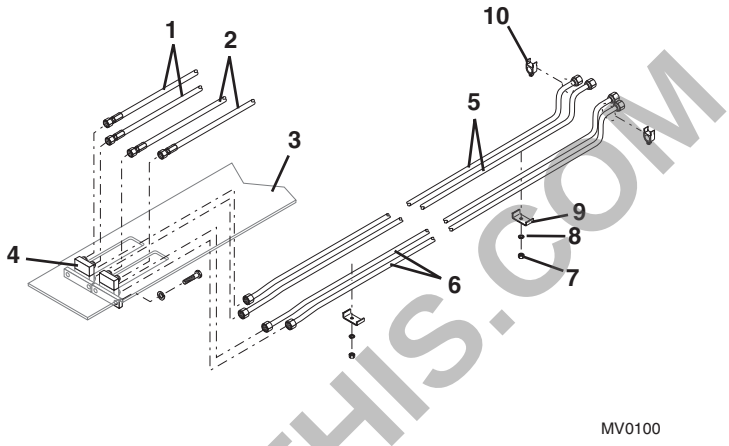
20. (Ref. Fig. 6-78) Remove remaining slide pads from middle (forward) boom section as follows:

    a. Remove four (4) capscrews (Item 11) and lockwashers (Item 12) securing two (2) side slide pads (Item 7) to front of middle (forward) boom section (Item 13). Remove slide pads and shims (Item 8). Repeat this step for the rear side slide pads.

    b. (Ref. Fig. 6-78) Remove two (2) each capscrews (Item 6), lockwashers (Item 5), flatwashers (Item 4), and pad retainers (Item 3) from front of middle (forward) boom section.

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#	Description
1	Auxiliary Hydraulic Hose
2	Carriage Tilt Hydraulic Hose
3	Middle (Rear) Boom Section
4	Hydraulic Manifold Block
5	Auxiliary Hydraulic Tube
6	Carriage Tilt Hydraulic Tube

#	Description
7	Nut
8	Lockwasher
9	Clamp
10	Cushion Clamp

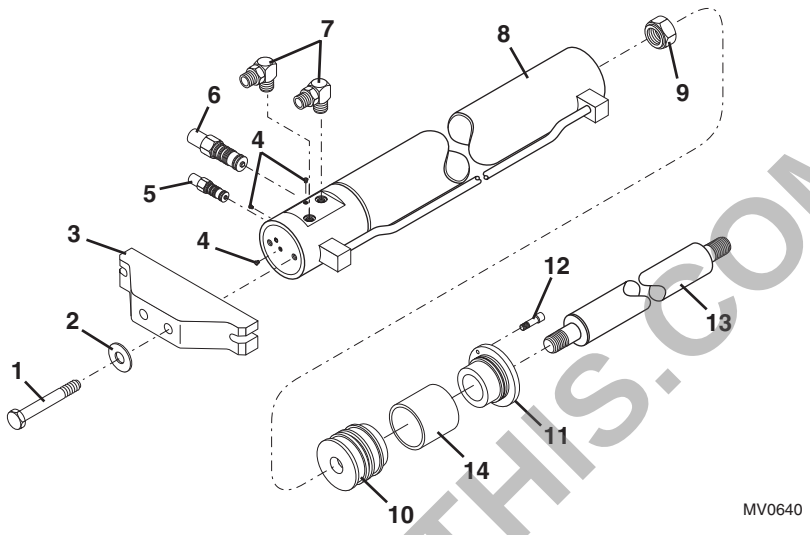
Fig. 6-87: Tubes and Hoses – Middle (Rear) and Outer Boom Sections

38. (Ref. Fig. 6-87) Remove middle (rear) boom section hoses as follows:
    a. Loosen and remove two (2) auxiliary and two (2) carriage tilt hydraulic hoses (Items 1 and 2) from hydraulic manifold block (Item 4).
    b. Bleed any remaining oil into a suitable container and remove hoses from inside middle (rear) boom section (Item 3). Tag and cap hoses and fittings.
39. Flip middle (rear) boom section upside down and place on work stands.
40. (Ref. Fig. 6-87) Remove hydraulic tubes from bottom of middle (rear) boom section as follows:

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Overhaul, Extension Cylinder



#	Description	#	Description
1	Bolt	8	Cylinder Barrel
2	Flatwasher	9	Rod Nut
3	Extension Cylinder Base Mount	10	Piston
4	Hollow Hex O-ring Plug	11	Rod Bearing Head
5	Counterbalance Valve Cartridge	12	Capscrew
6	Counterbalance Valve Cartridge	13	Rod Bearing Head
7	90° O-ring Elbow	14	Tube

Fig. 6-118: 4-Section Boom Extension Cylinder Assembly

(Ref. Fig. 6-118) The following steps are required to overhaul the boom extension cylinder.

1. Remove base mount from the cylinder barrel as follows:

   Remove two (2) each capscrews (Item 1) and flatwashers (Item 2) along with the extension cylinder base mount (Item 3) from the cylinder barrel (Item 8).

2. Mount or support cylinder vertically with rod end down. Hydraulic oil in cylinder will drain out during disassembly. Place a suitable pan or tray under the cylinder.

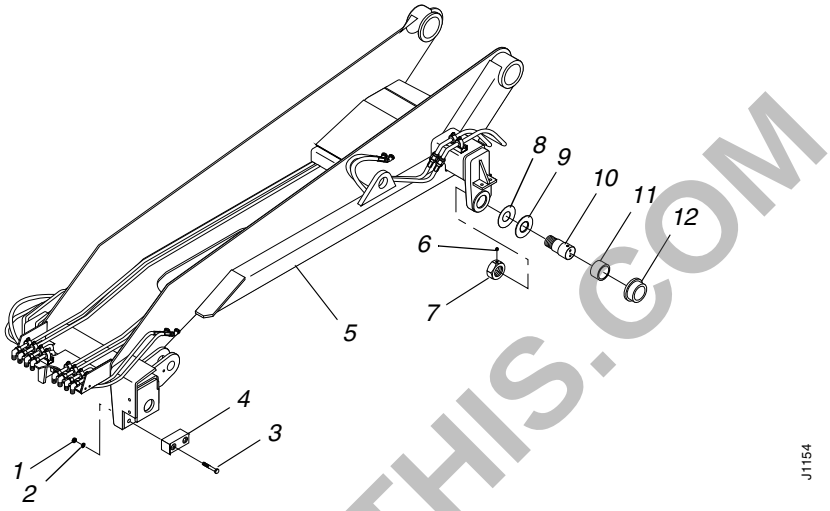
3. Release pressure in counterbalance valve cartridges (Items 5 and 6) as follows:

WARNING: Counterbalance valve cartridges trap hydraulic pressure in the cylinder. Wear proper eye and hand protection when removing counterbalance valve cartridges. Hydraulic fluid under pressure can be injected under skin or into eyes, resulting in serious personal injury or death.

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e. Slowly lift the boom and transfer carriage assembly up and away from the machine. Place the assembly on support blocks on a firm level surface.



#	Description	#	Description
1	Nut	7	Spindle Nut
2	Lockwasher	8	Spacer Washer
3	Capscrew	9	Thrust Washer
4	Front Slide Block	10	Spindle
5	Transfer Carriage	11	Roller Bushing
6	Setscrew	12	Transfer Roller

Fig. 6-130: Transfer Carriage Installation

13. The following steps are required if the boom is being removed separately from the transfer carriage.
    a. Remove the boom hoist cylinder (See page 6-13).
    b. Remove the rear carriage tilt cylinder (See page 6-25).
    c. Remove the boom (see this section).
    d. Use sling(s), crane, or other suitable means to support the transfer carriage assembly.

WARNING: To avoid personal and/or equipment damage, support the transfer carriage assembly before removing any additional mounting hardware. Use suitable blocking and lifting devices when removing heavy machine components.

    e. (Ref. Fig. 6-130) Remove the four (4) each nuts (Item 1) and lockwashers (Item 2) securing the two (2) front slide blocks (Item 4) to the transfer carriage (Item 5). Remove the four (4) capscrews (Item 3) and the slide blocks.
    f. (Ref. Fig. 6-130) Loosen the two (2) setscrews (Item 6) in each spindle nut (Item 7).

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Disassembly, Frame Tilt Cylinder

(Ref. Fig. 7-7) The following steps are required to disassemble the frame tilt cylinder.

1. Mount or support cylinder vertically, with rod end down. Hydraulic oil in cylinder will drain out during disassembly. Place a suitable pan or tray under the cylinder.
2. Remove counterbalance valve (Item 3).

WARNING: The counterbalance valve cartridges trap hydraulic pressure in the frame tilt cylinder. Wear proper eye and hand protection when removing counterbalance valve cartridges. Hydraulic fluid under pressure can be injected under skin or into eyes, resulting in serious personal injury or death.

3. Slowly extend and retract cylinder by hand to remove most of the hydraulic oil.
4. Remove one (1) set screw (Item 7) securing head (Item 12) to barrel (Item 2).
5. Pull rod (Item 11) out to help remove head. Support rod and head during removal to prevent damage. Do not wiggle rod or head back and forth to remove; this may damage the components.
6. Remove rod nut (Item 10), piston (Item 9), tube (Item 8), and head from rod.
7. Remove two (2) O-ring plugs (Item 4).
8. Remove fittings (Item 6).
9. Using a large, flat bladed screw driver, remove two (2) orifices (Item 5).
10. If the bushings need to be replaced, see “Bushing Replacement” below.

Cleaning and Inspection, Frame Tilt Cylinder

1. Remove all O-rings, wear rings, and backup rings from cylinder components and discard.
2. Thoroughly wash components in solvent and dry with compressed air.
3. Inspect inner surface of barrel, outer surface of piston, and length of the rod for scratches and scoring. If barrel, piston, or rod is damaged, it must be replaced.
4. Check condition of threads on rod, nut, and capscrews. Replace as necessary. Do not attempt to repair damaged threads.

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Transmission-to-Axle Drive Shaft

1. Level the machine, ground the carriage, place the travel select lever in the (N) NEUTRAL position, engage the parking brake switch and shut the engine OFF.
2. Place an Accident Prevention Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated. (Refer to Section 1.5, “Accident Prevention Tags.”)
3. Open the engine compartment access door. Allow the engine, transmission and hydraulic fluid to cool.
4. Disconnect the battery negative (-) ground cable at the battery negative (-) terminal to prevent the engine from starting accidentally.
5. The drive shaft assembly is a balanced assembly. Mark the yoke and axle, transmission and the shaft and slip yoke so that these components can be returned to their original positions when reinstalled. Yokes at both ends of the drive shaft must be in the same plane to help prevent excessive vibration.
6. Remove the four capscrews and two straps securing the bearing cross to the transmission output shaft flange.
7. Remove the four capscrews and two straps securing the bearing crosses to the axle.
8. Remove the front drive shaft assembly.
9. Repeat the above procedure on the rear drive shaft.

Drive Shaft Disassembly

Important: *To help ensure optimum performance, the drive shaft assemblies are specially balanced as a unit at the factory. When servicing any flange yoke, slip yoke, or drive shaft tube, order a complete assembly if components are bent or damaged. Refer to the appropriate Parts Manual for ordering information.*

1. Use an approved, non-flammable cleaning fluid to thoroughly clean the drive shaft assembly with a brush. Wipe dry before disassembling.



CAUTION: Avoid using excess force when clamping the drive shaft in a vise. Apply only enough force to hold the drive shaft securely. Excessive force can damage the drive shaft, resulting in an unbalanced condition.

2. Place the drive shaft assembly in a bench vise.
3. Use a pair of pliers to pinch the ends of the snap rings securing the cross and bearing assemblies to the yoke. Remove the snap rings from their grooves in the yoke.

Note: *If the snap rings fail to readily snap out of their grooves in the yokes, tap the end of the bearing cap lightly to help relieve pressure against the snap rings.*

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Section 1 — Safety

General

Observing basic safety rules and precautions can eliminate accidents when operating, maintaining, and repairing the forklift. The Operator's Manual contains detailed information regarding safety practices when driving and operating the forklift. Always be alert to potential hazardous situations that could result in injury to yourself or bystanders. Care should also be taken to avoid damage to the equipment. Maintenance should always be done by trained personnel using proper tools.

Caution, Warning, and Danger



W1049

Hazards are identified by the "Safety Alert Symbol" and followed by a signal word: Caution, Warning, or Danger.



CAUTION: Means that a situation COULD be hazardous and MAY result in personal injury if not avoided. CAUTION is also used to alert against unsafe practices that could result in equipment damage.



WARNING: Means that a situation COULD be hazardous and MAY result in serious injury or death if not avoided.



DANGER: Means that a situation IS HAZARDOUS and WILL result in serious injury or death if not avoided.

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