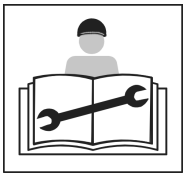
Lull®

Service Manual

Models 644B, 6K, 844C, 8K, 1044C, 10K

10709790

Revised
February 18, 2005



NQA ISO9001 REGISTERED COMPANY UKAS QUALITY MANAGEMENT 015

JLG®

An Oshkosh Truck Corporation Company

Quick Reference

Revision Record

Rev. No.	Inserted By	Date
001	Lull (initial release)	12/97
B	JLG(replace branding with JLG)	02/05

Rev. No.	Inserted By	Date

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Section 1 — Safety

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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.

Safety Standard

The ASME/ANSI B56.6 safety standard for rough terrain forklift trucks defines safety requirements relating to the design, operation, and maintenance of these vehicles. For a copy of this standard write to:

The American Society of Mechanical Engineers
United Engineering Center
345 East 47th Street
New York, NY 10017

Maintenance Safety

General

DO NOT attempt machine operation or maintenance until you have read and fully understand the safety instructions in this section. Only trained and authorized personnel should be permitted to operate or maintain the machine.

Mounting and Dismounting

Mount and dismount the machine only where steps and handholds are provided. Keep steps, handholds and the cab floor free of debris, mud, and other foreign matter. Replace damaged, loose, or excessively worn no-slip surfacing on cab floor.

Face the machine when mounting and dismounting. Do not attempt to get off the machine while it is moving. Never jump off the machine. Do not mount or dismount the machine when carrying tools, equipment, etc.

Before Servicing the Machine

Before servicing the machine, position the forklift in a level area out of any traffic lanes and follow safe shutdown procedures as described in the Owners/Operators Manual supplied with each machine.

Wear all the protective clothing and personal safety gear necessary to perform the job safely. This may include:

- Aprons
- Heavy gloves
- Safety glasses or goggles
- Safety shoes
- Welding helmet
- Filter mask or respirator.

Check the following items:

- If the forklift should not be started, attach a “**DO NOT OPERATE**” warning tag to the steering wheel and remove the ignition key.

- 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.

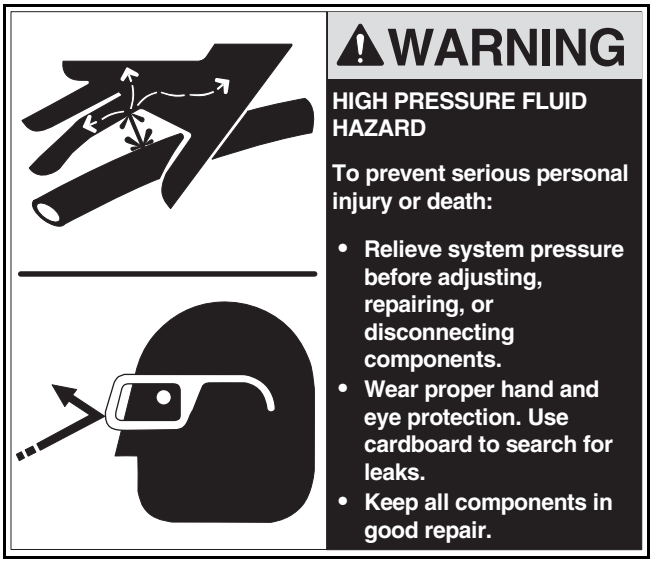
Engine Coolant Hazards

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.

Hydraulic System Hazards



W1047

The hydraulic system is under pressure whenever the engine is running and can hold pressure after the engine is shut down. After forks or attachments are resting on the ground or support, make sure pressure is relieved from all hydraulic lines and components before removing them from the circuit.

Remember the following during inspection of the hydraulic system:

- Wait for fluid to cool down before disconnecting lines.
- **DO NOT** use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks.
- Wear appropriate eye protection.
- If any hydraulic fluid is injected into the skin, get medical attention immediately.
- When venting or filling the hydraulic system, loosen the filler cap slowly and remove it gradually.
- **NEVER** reset any relief valve in the hydraulic system to a pressure higher than that specified in this manual.

Electrical System Hazards

Be aware of the following safety issues when working with batteries.

Explosive gases are always present around batteries. This is especially true when the battery is being charged.

To avoid explosion…

- **DO NOT** use smoking materials near batteries.
- Keep arcs, sparks, and open flames away from batteries.
- Provide adequate ventilation.

To avoid personal injury…

- Electrolyte in batteries contains sulfuric acid which is a poison and can cause severe chemical burns. Wear a face shield and safety glasses to prevent contact with your eyes and face.
- Wear chemical resistant gloves and clothing to keep acid off your skin and regular clothing.

Important: *If electrolyte is ever ingested or splashed into your eyes, get medical attention immediately.* ***NEVER*** *give fluids that would induce vomiting. Eyes should be flushed with clean water as soon as possible. If electrolyte comes in contact with your skin or clothing, immediately wash it off with a large quantity of clean water.*

- Before working on the electrical system, disconnect the battery cable(s). **NEVER** check the battery by placing a metal object across the battery posts; the resulting spark could ignite anything flammable, causing a fire or an explosion.
- Always disconnect the battery before welding on the machine.

CAUTION: When removing the battery, always remove the negative (–) cable first. When installing, connect the positive (+) cable first.

Tire and Wheels Hazards

The stability of the forklift can be dramatically affected by incorrect inflation or the lack of ballast fill. It is good practice to check your tires and wheels on a daily basis.

Check tires for…

- The correct pressure
- Cuts or bulges
- Nails or punctures
- The proper ballast required
- Uneven or excessive wear.

Check wheels for…

- Condition of valve stems and caps, making sure valve caps are kept on
- Damage to the rims
- Missing or loose lug nuts or bolts
- Obvious misalignment.

All tire service should be performed by a qualified tire service center or by an authorized person. This person must be properly trained in the procedures and use of safety equipment designed for tire servicing.

When servicing wheels and tires, remember…

- **NEVER** over inflate a tire. Over inflation could result in an explosion.
- Punctures that could have allowed the ballast fill in a tire to leak out must be repaired and the tire refilled with ballast before the forklift is put back in operation.

- **NEVER** reinflate a tire that has been run flat or seriously under inflated **WITHOUT** removing the tire from the wheel. Have the tire and rim closely inspected for damage before remounting.
- Clean the area around all wheel lug nuts or bolts. Periodically check the torque per the specifications until the torque value stabilizes; then check at regularly scheduled intervals.

Rollover Protective Structure (ROPS) and Falling Object Protective Structure (FOPS)

The machines are equipped with a Rollover Protective Structure (ROPS) to guard the operator if the machine tips over. The Falling Object Protective Structure (FOPS) is built into the ROPS. The FOPS protects the operator from falling objects.

Despite the protection of the ROPS/FOPS, it cannot protect the operator from every possible hazard. Do not consider the ROPS/FOPS a substitute for safe practices and good common sense.

Any modification to a ROPS/FOPS, such as welding or drilling holes in the structural members for mounting brackets, will affect the ROPS/FOPS capability to provide the required protection.

Any modification or repair without the specific written approval of JLG will void the ROPS/FOPS certification. Contact your authorized JLG dealer before making any modifications or repairs. Failure to do so may void the ROPS/FOPS certification.

Decals and Placards

General

The decals on the machine provide instructions for safe and correct operation. Never make modifications affecting safe operation or capacity without the expressed written approval of JLG. When approved modifications are made, the user is responsible for seeing that appropriate decals, load charts, and instructions are changed.

All plates and decals must be in place and legible at all times. Damaged placards and decals should be replaced. Clean dirty decals.

In California, the machine MUST be equipped with a Proposition 65 Warning decal.

Cleaning Decals

If soiled with dirt, clean decals with mild soap. Use a mild alcohol solution if soiled with grease. Do not use solvents that may damage the decal. Replace all damaged, missing, or painted decals that cannot be read. On refurbished or replaced parts, all missing decals must be replaced. See your JLG dealer for replacement decals and placards.

Attaching Decals

The surface on which a decal is to be attached must be dry and free of all dirt and grease. Remove the backing from the decal and apply decal in its correct location. Once in place, rub entire surface of the decal with your thumb, applying sufficient pressure to ensure good adhesion of the decal to the mounting surface.

Decal Locations

Decals and placards that provide information, instructions, and address safety issues include the following:

- Attachment Capacity Plate (Fig. 1-7)
- Boom Extension Indicator Decal (Fig. 1-1)
- Boom Movement Control Decal (Fig. 1-3)
- Cab Transfer Extension Decal (Fig. 1-1)
- California Proposition 65 Warning Decal (Fig. 1-1)
- Carriage Safety Decal (Fig. 1-7)
- Carry Load Low Caution Decal (Fig. 1-2)
- Caution Plate (Fig. 1-1)
- Diesel Fuel Only Decal (Fig. 1-6)
- Disconnect Battery Decal (Fig. 1-4)
- Don’t Be Careless Decal (Fig. 1-2)
- Forklift Signals Decal (Fig. 1-1)
- Frame Tilt Control Decal (Fig. 1-3)
- Frame Transfer Extension Decal (Fig. 1-1)
- Hydraulic Breather Decal (Fig. 1-6)
- Hydraulic Oil Only Decal (Fig. 1-6)
- Load Chart Capacities Flip Card (Fig. 1-1)
- Low Brake Pressure Decal (Fig. 1-2)
- Lubrication Schedule Flip Card (Fig. 1-1)
- Notice Decal (General Operating Instructions) (Fig. 1-1)
- Outrigger Caution Decal (Fig. 1-2)
- Outrigger Control Decal (Fig. 1-3)
- Parking Brake Decal (Fig. 1-2)
- Pressure Test Ports Decal (Fig. 1-1)
- Rear Oscillation Lock Light Decal (Fig. 1-2)
- Slow Moving Vehicle Sign (Fig. 1-4)
- Steer Selector Plate (Fig. 1-5)
- Tire Ballast Required Decal (Fig. 1-1)
- Transfer and Fork Tilt Control Decal (Fig. 1-3)
- Transmission Declutch Decal (Fig. 1-2)

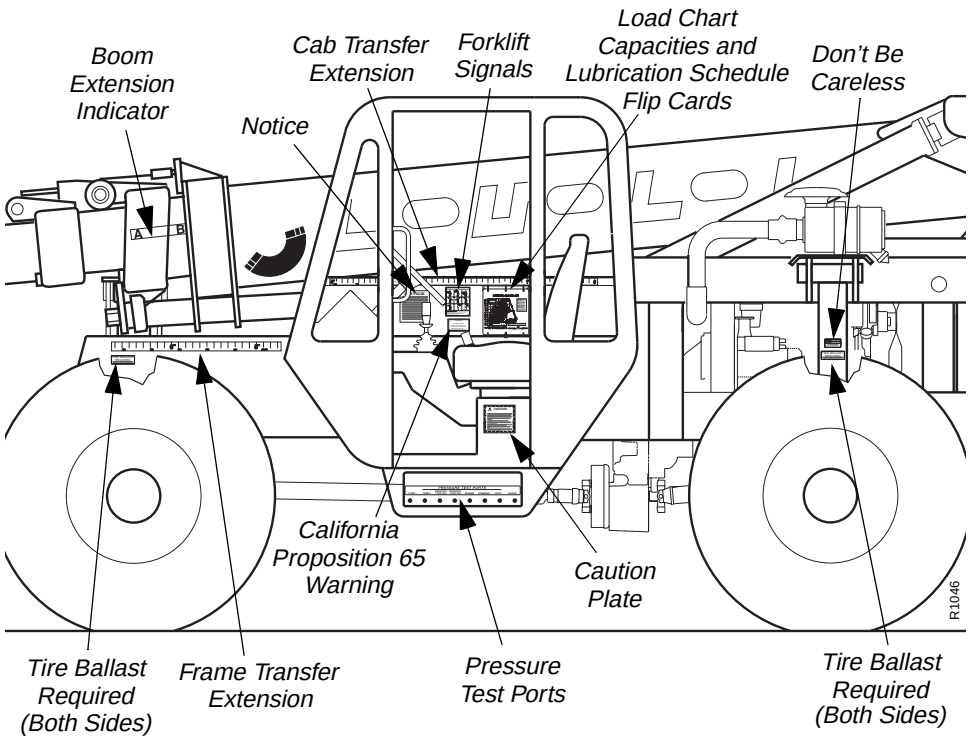


Fig. 1-1: Decals and Placards

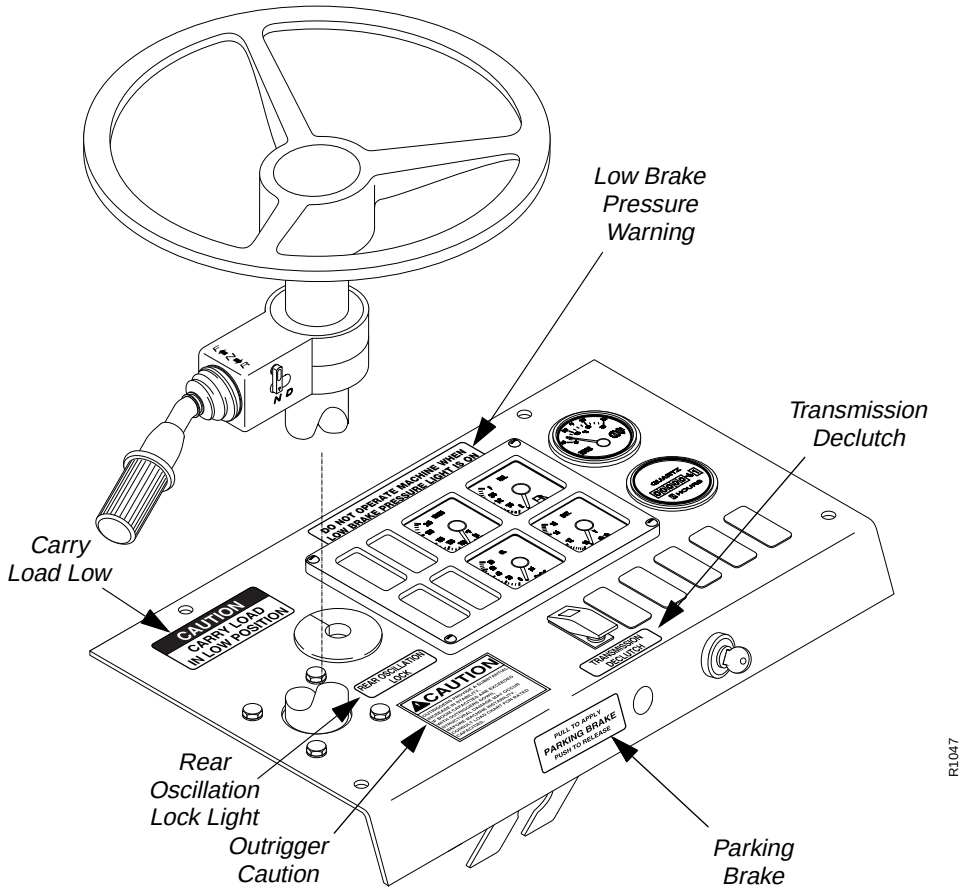


Fig. 1-2: Instrument Panel Decals

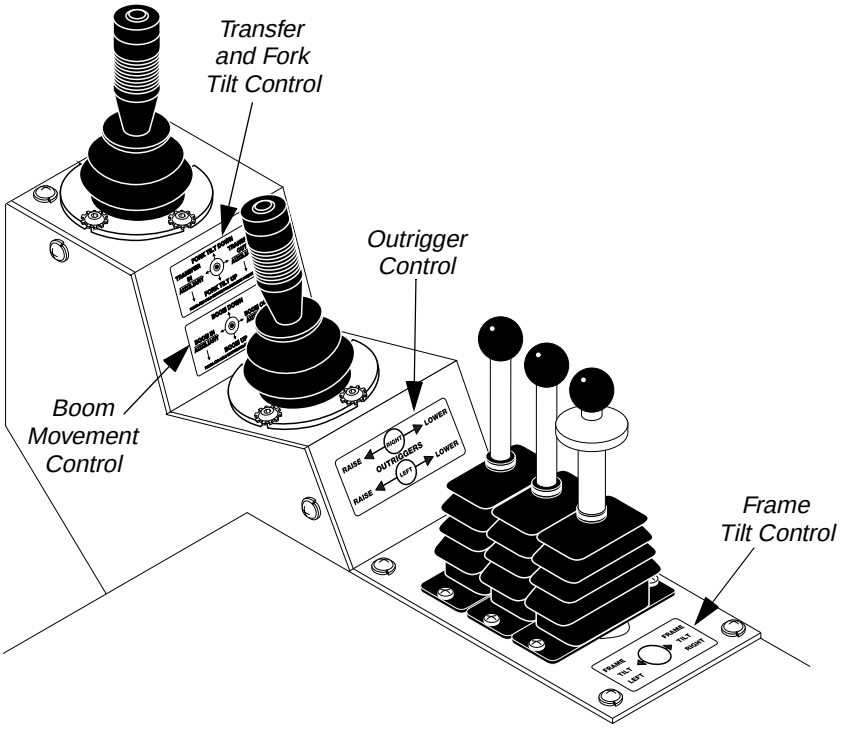


Fig. 1-3: Control Decals

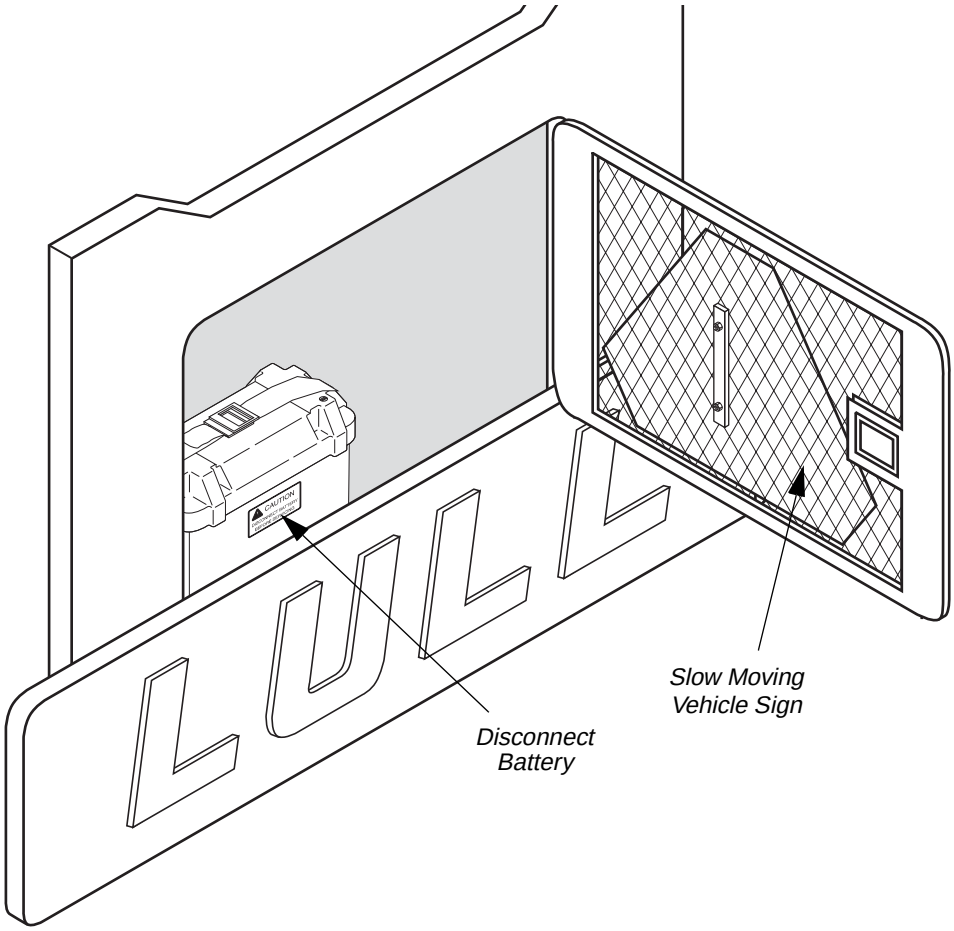


Fig. 1-4: Disconnect Battery Decal and Slow Moving Vehicle Sign

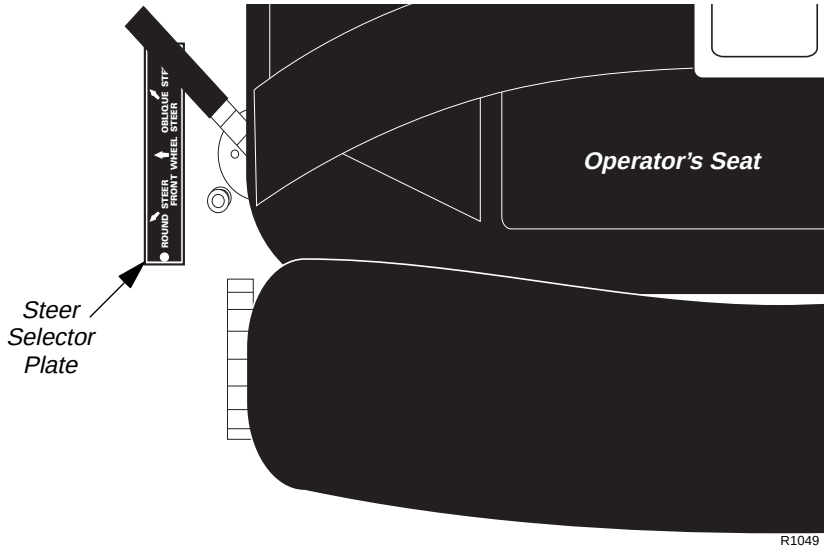


Fig. 1-5: Steer Selector Plate

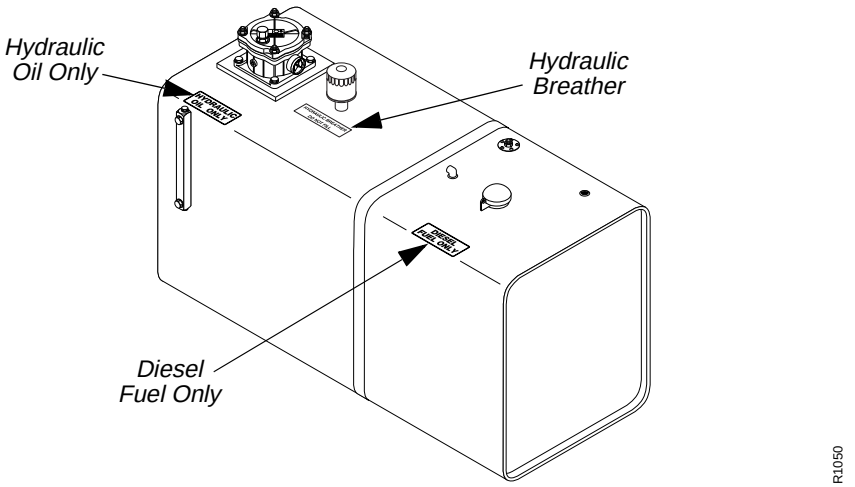


Fig. 1-6: Hydraulic Reservoir/Fuel Tank Decals

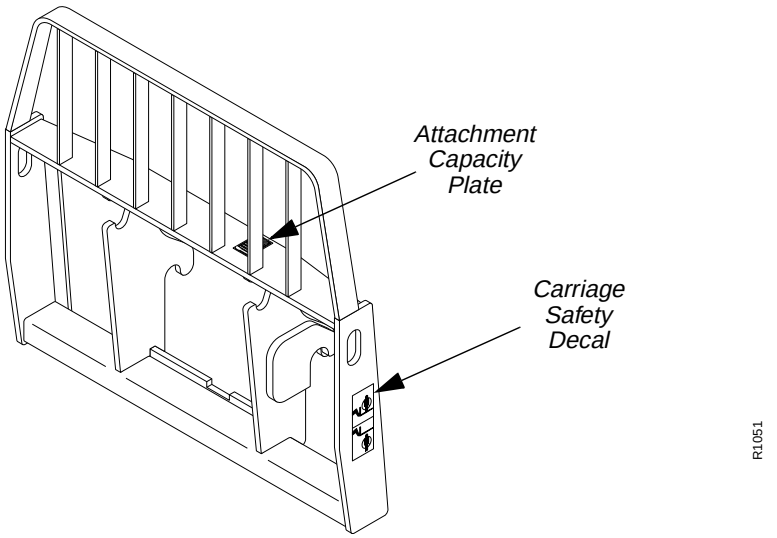


Fig. 1-7: Fork Carriage Decals

Section 2 — Identification and Specifications

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Section 2 — Identification and Specifications

Serial Number Locations

Machine Serial Number

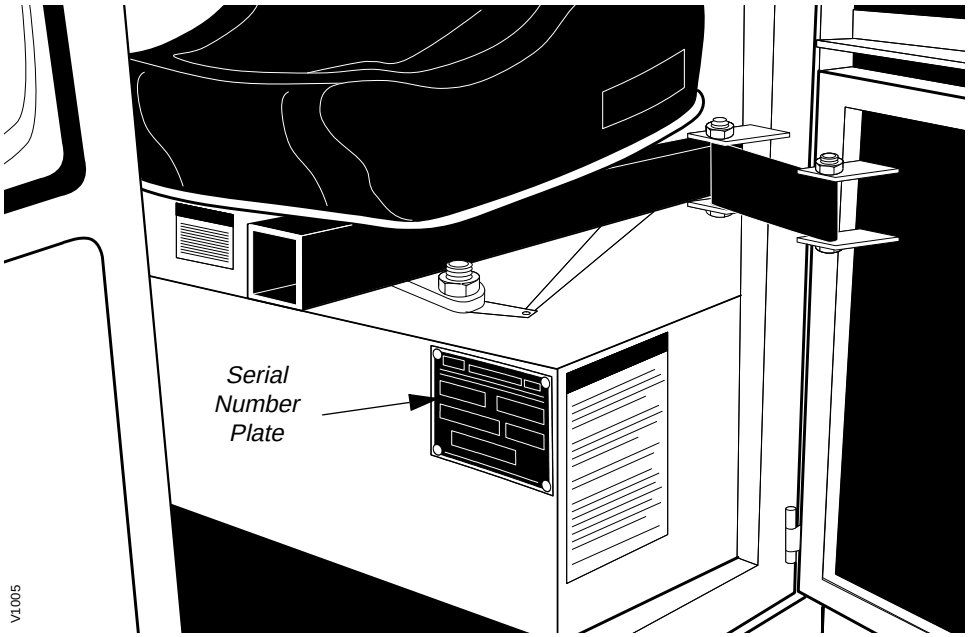

Fig. 2-1: Machine Serial Number Plate

(Ref. Fig. 2-1) The machine serial number plate is mounted in the cab below the seat.

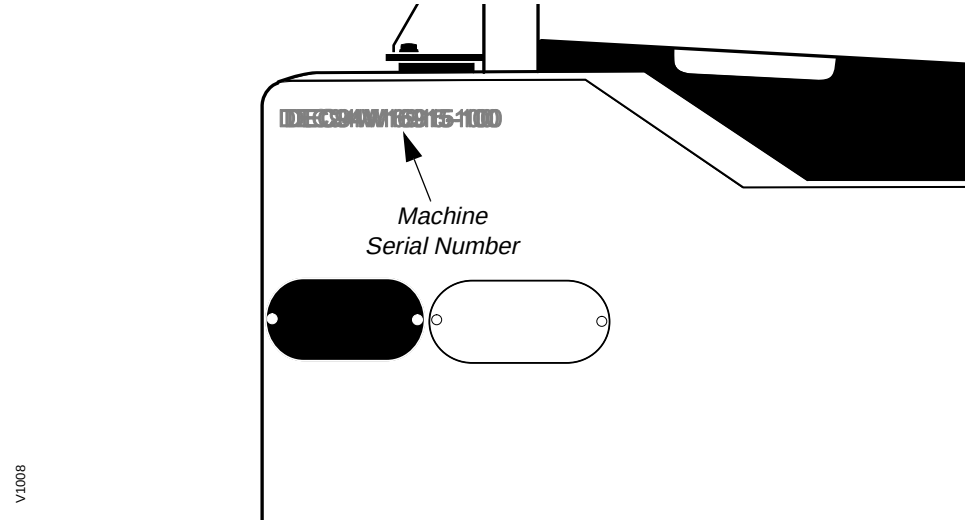

Fig. 2-2: Stamped Machine Serial Number

(Ref. Fig. 2-2) The machine serial number is also stamped into the frame on the left rear corner of the machine.

Engine Serial Number, John Deere

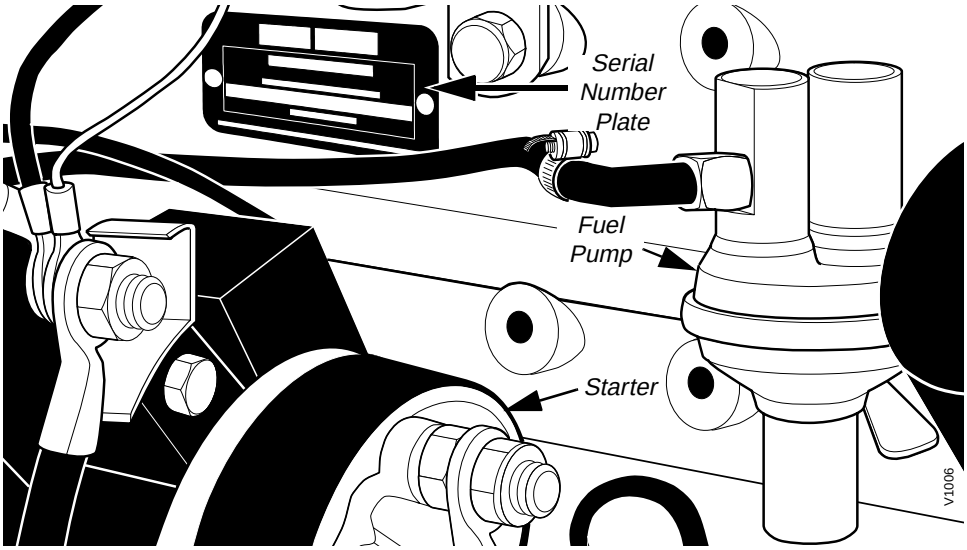

Fig. 2-3: Engine Serial Number — John Deere

(Ref. Fig. 2-3) The engine serial number plate is located on the left side of the engine near the starter and fuel pump.

John Deere engines include an options code decal located on top of the engine manifold cover. Do not damage, remove, or paint over this decal. It is recommended that this information be written down for future reference.

Engine Serial Number, Cummins

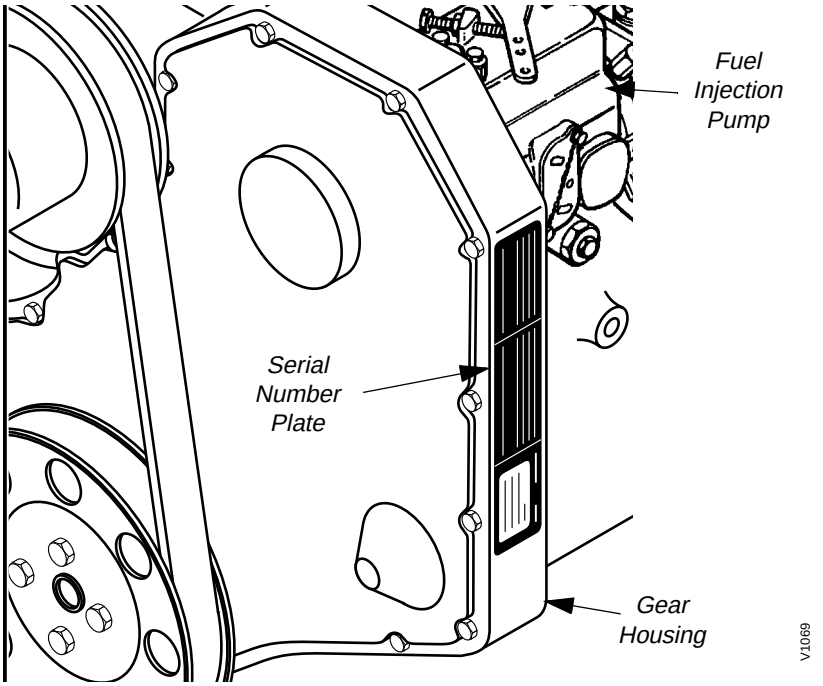

Fig. 2-4: Engine Serial Number — Cummins

(Ref. Fig. 2-4) The engine serial number plate is located on the right side of the engine on the gear housing near the fuel injection pump.

Axle Serial Number

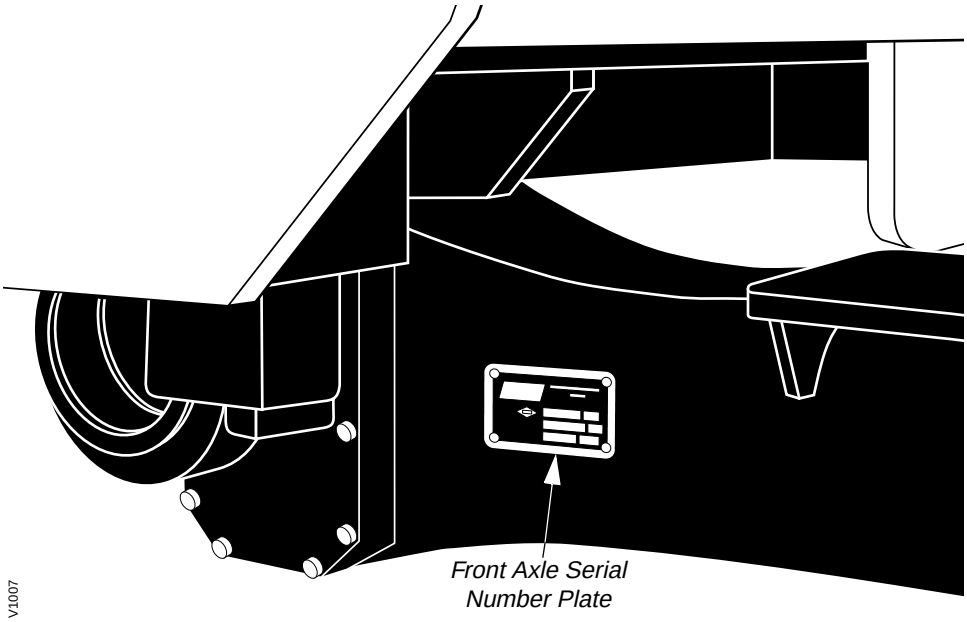

Fig. 2-5: Axle Serial Number

(Ref. Fig. 2-5) The front axle serial number plate is located on the left front side of the axle housing. The rear axle serial number plate is located on the right rear side of the axle housing.

Attachment Serial Number Plate

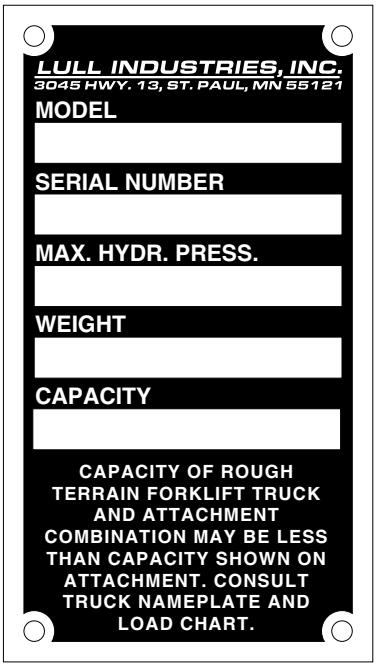

Fig. 2-6: Attachment Serial Number Plate

(Ref. Fig. 2-6) The location of this plate varies with each attachment.

Models 644B-37 and 6K-37

Identification

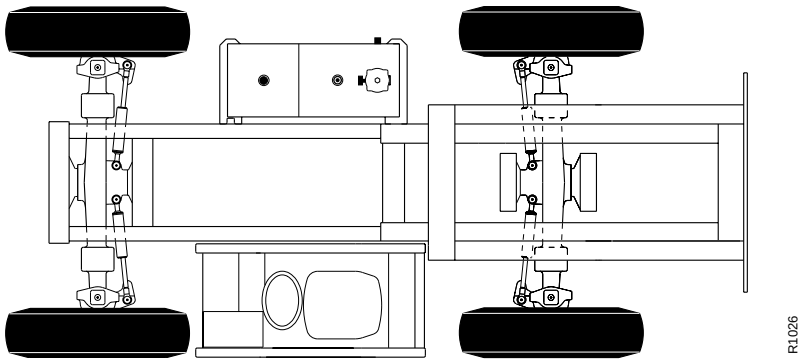

Fig. 2-7: Top View — Models 644B-37 and 6K-37

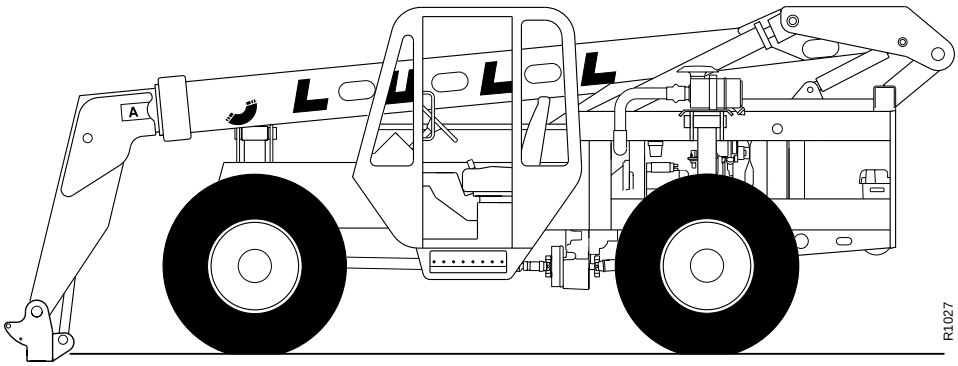

Fig. 2-8: Left Side View — Models 644B-37 and 6K-37

Models 644B-37 and 6K-37 (cont'd.)

Specifications

General Operating Specifications

Lift and Carry Capacity	6000 lbs.
Maximum Lift Height (and "Landing Height" for 644B-37)	37 Feet
Boom Elevation Angle	-5° to +70°
TransAction (644B-37)	80 Inches
Maximum Horizontal Forward Reach:	
644B-37	27 Feet
6K-37	20 Feet
Maximum Reach at Maximum Lift (644B-37)	8 Feet
Capacity at Maximum Reach	
644B-37	1000 lbs.
6K-37	3000 lbs.
Below Grade	16 Inches
Drive	4-Wheel
Steer Modes	Front Wheel, 4-Wheel Round, 4-Wheel Oblique
Frame Tilt	12.5° Right and Left
Empty Vehicle Weight:	
644B-37	Approximately 20,860 lbs.
6K-37	Approximately 20,500 lbs.

Dimensions

Note: *Dimensions listed are for forklift with all components fully retracted in travel mode.*

Overall Height	95 Inches
Overall Width	8 Feet
Overall Length	25 Feet, 9 Inches (w/42" Fork)
Wheelbase	124 Inches
Outside Turning Radius	13 Feet, 8 Inches
Ground Clearance	16 Inches

Capacities

Hydraulic System (Including Reservoir)	65 Gallons
Hydraulic Reservoir	44 Gallons
Fuel Tank	40 Gallons
Cooling System	18 Quarts
Engine Crankcase Oil w/Filter (John Deere)	14 Quarts
Transmission Total Capacity	17 Quarts
Drain and Refill	11 Quarts
Differential	12.8 Quarts
Planetary Hubs	3.6 Pints
Friction Modifier	4 Ounces

Models 644B-37 and 6K-37 (cont'd.)

Pressures

Hydraulic:
- Control Manifold System:
  - Boom Hoist and Extend Valve Relief . . . . . 2650 psi
  - 4- or 5-Section Relief Valve . . . . . 2800 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2200 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 450 psi
  - Hydraulic Return Filter . . . . . 0–15 psi
- Mid-Inlet Valve System:
  - Boom Hoist and Extend Valve Relief:
    - Turbo Engines . . . . . 3000 psi
    - Natural Engines . . . . . 2750 psi
  - 4- or 5-Section Relief Valve:
    - Turbo Engines . . . . . 3150 psi
    - Natural Engines . . . . . 3175 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2375 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 450 psi
  - Hydraulic Return Filter . . . . . 0–15 psi

Accumulator:
- Control Manifold System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1200 (Low Limit), 1600 (High Limit)
- Mid-Inlet Valve System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1075 (Low Limit), 1950 (High Limit)

Transmission

Manufacturer. . . . . Zahnradfabrik (ZF)
Model 3 WG-100
Type . . . . . 3-Speed Electric Powershift with Torque Converter
Speeds . . . . . 3 Forward, 3 Reverse
Filter . . . . . Cartridge

Travel Speeds

1st Gear . . . . . 2.8 mph
2nd Gear. . . . . 6.6 mph
3rd Gear . . . . . 15.0 mph

Axles

Manufacturer. . . . . Dana Spicer
Model PS-7036
Type . . . . . Off-Highway with Drive and Steering Functions

Wheels/Tires

Lugs . . . . . 10 (Torque to 320 ft-lbs)
Tire Size . . . . . 13 × 24
Water . . . . . 33 Gallons
Sodium Chloride. . . . . 115 lbs
Pressure . . . . . 55 psi

Models 644B-37 and 6K-37 (cont'd.)

Service Brakes	Manufacturer . . . . . Dana Spicer Type . . . . . Hydraulically Actuated, Wheel End, Wet Disc
Parking Brake	Manufacturer . . . . . Zahnradfabrik (ZF) Type . . . . . Drum at Transmission Output, Spring Actuated, Hydraulically Released
Engine Models	(See "Engine Specifications" on page 2-24) John Deere 4039D . . . . . 80 HP @ 2500 rpm John Deere 4039T . . . . . 110 HP @ 2500 rpm John Deere 4045T (Replacement for 4039T) . . . . . 100 HP @ 2500 rpm Cummins 4B3.9 . . . . . 75 HP @ 2500 rpm Cummins 4BT3.9 (6K-37) . . . . . 102 HP @ 2500 rpm Cummins 4BT3.9 (644B-37) . . . . . 110 HP @ 2500 rpm
Hydraulic Pump	Type . . . . . Tandem Gear
Electrical System	System Voltage . . . . . 12-Volt, Negative Ground Battery . . . . . 12-Volt, 925 CCA Alternator: Delco-Remy . . . . . 78 Amp Bosch . . . . . 63 Amp
Working Temperatures	Hydraulic Oil . . . . . 140–180°F Transmission Oil . . . . . 104–230°F Engine Oil . . . . . See Engine Manual Engine Coolant . . . . . 180–185°F

Models 644B-42 and 6K-42

Identification

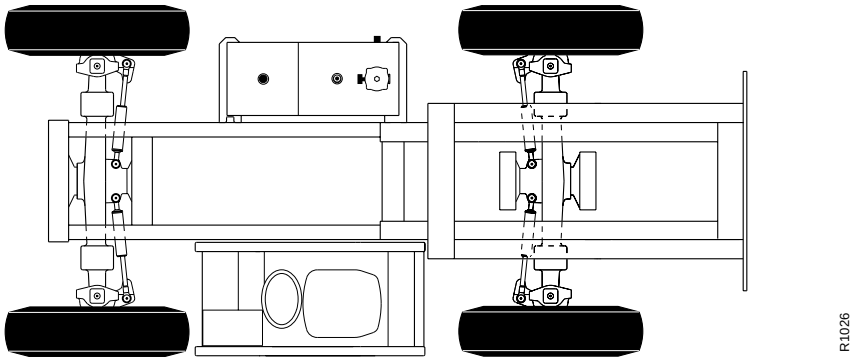

Fig. 2-9: Top View — Models 644B-42 and 6K-42

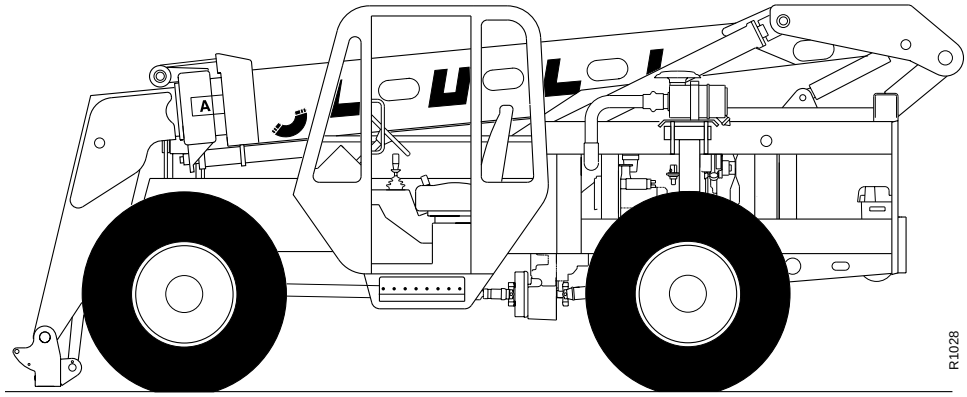

Fig. 2-10: Left Side View — Models 644B-42 and 6K-42

Models 644B-42 and 6K-42 (cont'd.)

Specifications

General Operating Specifications

Lift and Carry Capacity	6000 lbs.
Maximum Lift Height (and "Landing Height" for 644B-42)	42 Feet
Boom Elevation Angle	-5° to +70°
TransAction (644B-42)	80 Inches
Maximum Horizontal Forward Reach:	
644B-42	32 Feet
6K-42	25 Feet, 6 Inches
Maximum Reach at Maximum Lift (644B-42)	9 Feet, 8 Inches
Capacity at Maximum Reach:	
644B-42	400 lbs.
6K-42	1500 lbs.
Below Grade	23 Inches
Drive	4-Wheel
Steer Modes	Front Wheel, 4-Wheel Round, 4-Wheel Oblique
Frame Tilt	12.5° Right and Left
Empty Vehicle Weight	
644B-42	Approximately 22,700 lbs.
6K-42	Approximately 22,300 lbs.

Dimensions

Note: *Dimensions listed are for forklift with all components fully retracted in travel mode.*

Overall Height	95 Inches
Overall Width	8 Feet
Overall Length	23 Feet, 7 Inches (w/42" Fork)
Wheelbase	124 Inches
Outside Turning Radius	13 Feet, 8 Inches
Ground Clearance	16 Inches

Capacities

Hydraulic System (Including Reservoir)	65 Gallons
Hydraulic Reservoir	44 Gallons
Fuel Tank	40 Gallons
Cooling System	18 Quarts
Engine Crankcase Oil w/Filter (John Deere)	14 Quarts
Transmission Total Capacity	17 Quarts
Drain and Refill	11 Quarts
Differential	12.8 Quarts
Planetary Hubs	3.6 Pints
Friction Modifier	4 Ounces

Models 644B-42 and 6K-42 (cont'd.)

Pressures

Hydraulic:
- Control Manifold System:
  - Boom Hoist and Extend Valve Relief . . . . . 2650 psi
  - 4- or 5-Section Relief Valve . . . . . 2800 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2200 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 450 psi
  - Hydraulic Return Filter . . . . . 0–15 psi
- Mid-Inlet Valve System:
  - Boom Hoist and Extend Valve Relief:
    - Turbo Engines . . . . . 3000 psi
    - Natural Engines . . . . . 3050 psi
  - 4- or 5-Section Relief Valve:
    - Turbo Engines . . . . . 3150 psi
    - Natural Engines . . . . . 3175 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2375 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 460 psi
  - Hydraulic Return Filter . . . . . 0–15 psi

Accumulator:
- Control Manifold System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1200 (Low Limit), 1600 (High Limit)
- Mid-Inlet Valve System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1075 (Low Limit), 1950 (High Limit)

Transmission

Manufacturer. . . . . Zahnradfabrik (ZF)
Model 3 WG-100
Type . . . . . 3-Speed Electric Powershift with Torque Converter
Speeds . . . . . 3 Forward, 3 Reverse
Filter . . . . . Cartridge

Travel Speeds

1st Gear . . . . . 2.8 mph
2nd Gear. . . . . 6.6 mph
3rd Gear . . . . . 15.0 mph

Axles

Manufacturer. . . . . Dana Spicer
Model PS-7036
Type . . . . . Off-Highway with Drive and Steering Functions

Wheels/Tires

Lugs . . . . . 10 (Torque to 320 ft-lbs)
Tire Size . . . . . 13 × 24
Water . . . . . 33 Gallons
Sodium Chloride. . . . . 115 lbs
Pressure . . . . . 55 psi

Models 644B-42 and 6K-42 (cont'd.)

Service Brakes	Manufacturer . . . . . Dana Spicer Type . . . . . Hydraulically Actuated, Wheel End, Wet Disc
Parking Brake	Manufacturer . . . . . Zahnradfabrik (ZF) Type . . . . . Drum at Transmission Output, Spring Actuated Hydraulically Released
Engine Models	(See "Engine Specifications" on page 2-24) John Deere 4039D . . . . . 80 HP @ 2500 rpm John Deere 4039T . . . . . 110 HP @ 2500 rpm John Deere 4045T (Replacement for 4039T) . . . . . 100 HP @ 2500 rpm Cummins 4B3.9 . . . . . 75 HP @ 2500 rpm Cummins 4BT3.9 (6K-42) . . . . . 102 HP @ 2500 rpm Cummins 4BT3.9 (644B-42) . . . . . 110 HP @ 2500 rpm
Hydraulic Pump	Type . . . . . Tandem Gear
Electrical System	System Voltage . . . . . 12-Volt, Negative Ground Battery . . . . . 12-Volt, 925 CCA Alternator: Delco-Remy . . . . . 78 Amp Bosch . . . . . 63 Amp
Working Temperatures	Hydraulic Oil . . . . . 140–180°F Transmission Oil . . . . . 104–230°F Engine Oil . . . . . See Engine Manual Engine Coolant . . . . . 180–185°F

Models 844C-42 and 8K-42

Identification

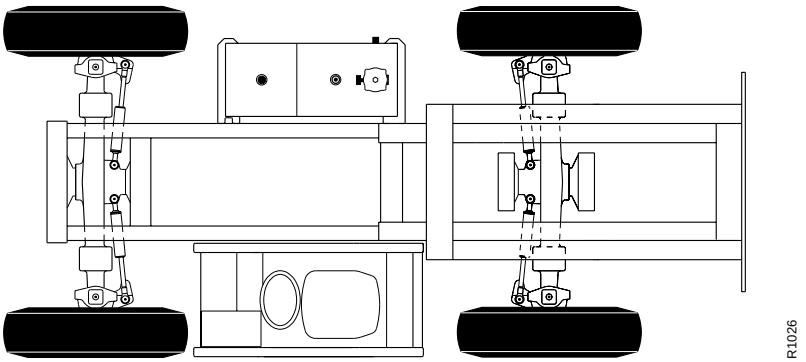

Fig. 2-11: Top View — Models 844C-42 and 8K-42

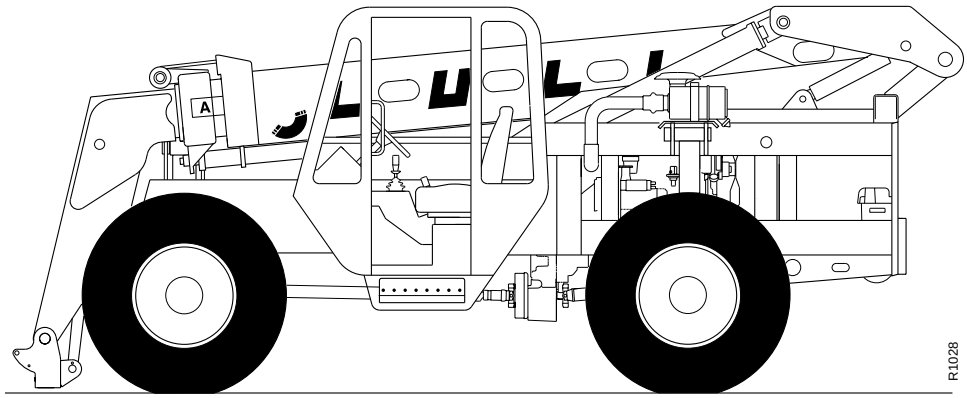

Fig. 2-12: Left Side View — Models 844C-42 and 8K-42

Models 844C-42 and 8K-42 (cont'd.)

Specifications

General Operating Specifications

Lift and Carry Capacity	8000 lbs.
Maximum Lift Height (and "Landing Height" for 844C-42)	42 Feet
Boom Elevation Angle	-5° to +70°
TransAction (844C-42)	80 Inches
Maximum Horizontal Forward Reach:	
844C-42	32 Feet
8K-42	25 Feet, 6 Inches
Maximum Reach at Maximum Lift (844C-42)	9 Feet, 8 Inches
Capacity at Maximum Reach:	
844C-42	500 lbs.
8K-42	2000 lbs.
Below Grade	23 Inches
Drive	4-Wheel
Steer Modes	Front Wheel, 4-Wheel Round, 4-Wheel Oblique
Frame Tilt	12.5° Right and Left
Empty Vehicle Weight:	
844C-42	Approximately 23,320 lbs.
8K-42	Approximately 23,160 lbs.
Ground Clearance	16 Inches

Dimensions

Note: *Dimensions listed are for forklift with all components fully retracted in travel mode.*

Overall Height	95 Inches
Overall Width	8 Feet
Overall Length	23 Feet, 7 Inches(w/42" Fork)
Wheelbase	124 Inches
Outside Turning Radius	13 Feet, 8 Inches
Ground Clearance	16 Inches

Capacities

Hydraulic System (Including Reservoir)	65 Gallons
Hydraulic Reservoir	44 Gallons
Fuel Tank	40 Gallons
Cooling System	18 Quarts
Engine Crankcase Oil w/Filter (John Deere)	14 Quarts
Transmission Total Capacity	17 Quarts
Drain and Refill	11 Quarts
Differential	12.8 Quarts
Planetary Hubs	3.6 Pints
Friction Modifier	4 Ounces

Models 844C-42 and 8K-42 (cont'd.)

Pressures

Hydraulic:
- Control Manifold System:
  - Boom Hoist and Extend Valve Relief . . . . . 3000 psi
  - 4- or 5-Section Relief Valve . . . . . 3150 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2200 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 450 psi
  - Hydraulic Return Filter . . . . . 0–15 psi
- Mid-Inlet Valve System:
  - Boom Hoist and Extend Valve Relief . . . . . 3050 psi
  - 4- or 5-Section Relief Valve . . . . . 3175 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2375 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 460 psi
  - Hydraulic Return Filter . . . . . 0–15 psi

Accumulator:
- Control Manifold System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1200 (Low Limit), 1600 (High Limit)
- Mid-Inlet Valve System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1075 (Low Limit), 1950 (High Limit)

Transmission

Manufacturer. . . . . Zahnradfabrik (ZF)
Model 4 WG-100
Type . . . . . 4-Speed Electric Powershift with Torque Converter
Speeds . . . . . 4 Forward, 3 Reverse
Filter . . . . . Cartridge

Travel Speeds

1st Gear . . . . . 2.7 mph
2nd Gear. . . . . 6.4 mph
3rd Gear . . . . . 14.5 mph
4th Gear (Forward Only). . . . . 21.5 mph

Axles –Front and Rear

Manufacturer. . . . . Dana Spicer
Model PS-7036
Type . . . . . Off-Highway with Drive and Steering Functions

Wheels/Tires

Lugs . . . . . 10 (Torque to 320 ft-lbs)
Tire Size . . . . . 13 × 24
Water . . . . . 33 Gallons
Sodium Chloride. . . . . 115 lbs
Pressure . . . . . 55 psi

Models 844C-42 and 8K-42 (cont'd.)

Service Brakes	Manufacturer . . . . . Dana Spicer Type . . . . . Hydraulically Actuated, Wheel End, Wet Disc
Parking Brake	Manufacturer . . . . . Zahnradfabrik (ZF) Type . . . . . Drum at Transmission Output, Spring Actuated, Hydraulically Released
Engine Models	(See "Engine Specifications" on page 2-24) John Deere 4039T . . . . . 110 HP @ 2500 rpm John Deere 4045T (Replacement for 4039T) . . . . . 100 HP @ 2500 rpm Cummins 4BT3.9 (8K-42) . . . . . 102 HP @ 2500 rpm Cummins 4BT3.9 (844C-42) . . . . . 110 HP @ 2500 rpm
Hydraulic Pump	Type . . . . . Tandem Gear
Electrical System	System Voltage . . . . . 12-Volt, Negative Ground Battery . . . . . 12-Volt, 925 CCA Alternator: Delco-Remy . . . . . 78 Amp Bosch . . . . . 63 Amp
Working Temperatures	Hydraulic Oil . . . . . 140–180°F Transmission Oil . . . . . 104–230°F Engine Oil . . . . . See Engine Manual Engine Coolant . . . . . 180–185°F

Models 1044C-42 and 10K-42

Identification

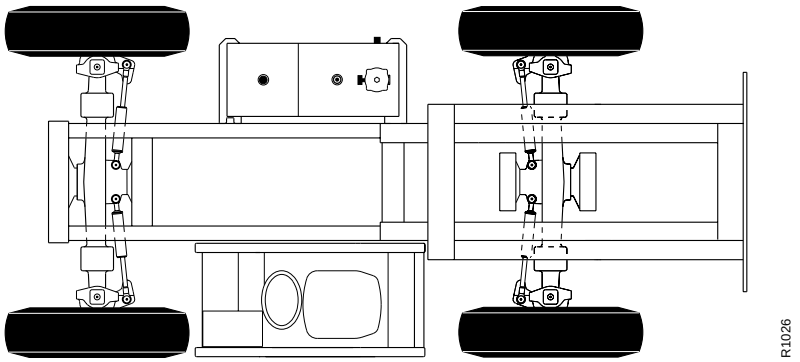

Fig. 2-13: Top View — Models 1044C-42 and 10K-42

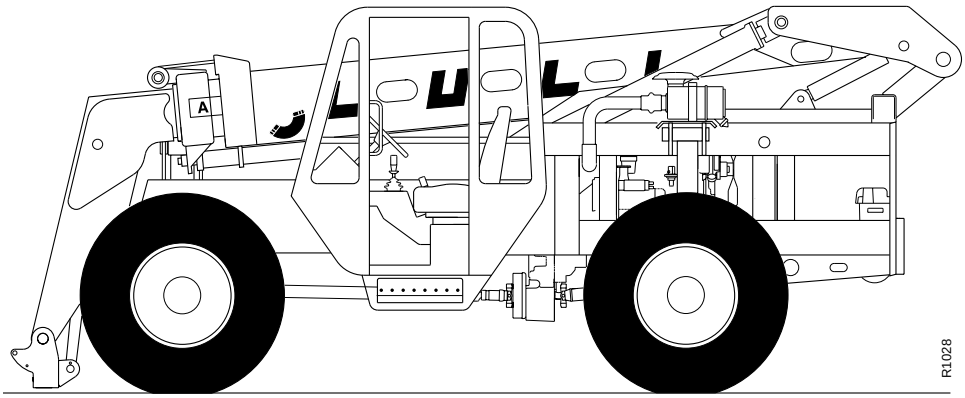

Fig. 2-14: Left Side View — Models 1044C-42 and 10K-42

Models 1044C-42 and 10K-42 (cont'd.)

Specifications

General Operating Specifications

Lift and Carry Capacity	10,000 lbs.
Maximum Lift Height (and "Landing Height" for 1044C-42)	42 Feet
Boom Elevation Angle	-5° to +70°
TransAction (1044C-42)	80 Inches
Maximum Horizontal Forward Reach:	
1044C-42	32 Feet
10K-42	25 Feet, 6 Inches
Maximum Reach at Maximum Lift (1044C-42)	9 Feet, 8 Inches
Capacity at Maximum Reach:	
1044C-42	500 lbs.
10K-42	2000 lbs.
Below Grade	23 Inches
Drive	4-Wheel
Steer Modes	Front Wheel, 4-Wheel Round, 4-Wheel Oblique
Frame Tilt	12.5° Right and Left
Empty Vehicle Weight:	
1044C-42	Approximately 24,800 lbs.
10K-42	Approximately 24,600 lbs.

Dimensions

Note: *Dimensions listed are for forklift with all components fully retracted in travel mode.*

Overall Height	95 Inches
Overall Width	100 Inches
Overall Length	23 Feet, 7 Inches (w/42" Fork)
Wheelbase	124 Inches
Outside Turning Radius	13 Feet, 8 Inches
Ground Clearance	16 Inches

Capacities

Hydraulic System (Including Reservoir)	65 Gallons
Hydraulic Reservoir	44 Gallons
Fuel Tank	40 Gallons
Cooling System	18 Quarts
Engine Crankcase Oil w/Filter (John Deere)	14 Quarts
Transmission Total Capacity	17 Quarts
Drain and Refill	11 Quarts
Differential	12.8 Quarts
Planetary Hubs	3.6 Pints
Friction Modifier	4 Ounces

Models 1044C-42 and 10K-42 (cont'd.)

Pressures

Hydraulic:
- Control Manifold System:
  - Boom Hoist and Extend Valve Relief . . . . . 3000 psi
  - 4- or 5-Section Relief Valve . . . . . 3150 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2200 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 450 psi
  - Hydraulic Return Filter . . . . . 0–15 psi
- Mid-Inlet Valve System:
  - Boom Hoist and Extend Valve Relief . . . . . 3050 psi
  - 4- or 5-Section Relief Valve . . . . . 3175 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2375 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 460 psi
  - Hydraulic Return Filter . . . . . 0–15 psi

Accumulator:
- Control Manifold System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1200 (Low Limit), 1600 (High Limit)
- Mid-Inlet Valve System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1075 (Low Limit), 1950 (High Limit)

Transmission

Manufacturer. . . . . Zahnradfabrik (ZF)
Model 4 WG-100
Type . . . . . 4-Speed Electric Powershift with Torque Converter
Speeds . . . . . 4 Forward, 3 Reverse
Filter . . . . . Cartridge

Travel Speeds

1st Gear . . . . . 2.7 mph
2nd Gear. . . . . 6.4 mph
3rd Gear . . . . . 14.5 mph
4th Gear (Forward Only). . . . . 21.5 mph

Axles

Manufacturer. . . . . Dana Spicer
Model PS-8036
Type . . . . . Off-Highway with Drive and Steering Functions

Models 1044C-42 and 10K-42 (cont'd.)

Wheels/Tires	Lugs . . . . . 10 (Torque to 320 ft-lbs) Tire Size . . . . . 14 × 24 Water . . . . . 38 Gallons Sodium Chloride . . . . . 134 lbs Pressure . . . . . 60 psi
Service Brakes	Manufacturer . . . . . Dana Spicer Type . . . . . .Hydraulically Actuated, Wheel End, Wet Disc
Parking Brake	Manufacturer . . . . . Zahnradfabrik (ZF) Type . . . . . Drum at Transmission Output, Spring Actuated Hydraulically Released
Engine Models	(See "Engine Specifications" on page 2-24) John Deere 4039T . . . . . .110 HP @ 2500 rpm John Deere 4045T (Replacement for 4039T) . . . . . .100 HP @ 2500 rpm Cummins 4BT3.9 (10K-42) . . . . . .102 HP @ 2500 rpm Cummins 4BT3.9 (1044C-42) . . . . . .110 HP @ 2500 rpm Cummins 6B5.9 . . . . . .115 HP @ 2500 rpm
Hydraulic Pump	Type . . . . . Tandem Gear
Electrical System	System Voltage . . . . . 12-Volt, Negative Ground Battery . . . . . 12-Volt, 925 CCA Alternator: Delco-Remy . . . . . 78 Amp Bosch . . . . . 63 Amp
Working Temperatures	Hydraulic Oil . . . . . 140–180°F Transmission Oil . . . . . 104–230°F Engine Oil . . . . . .See Engine Manual Engine Coolant . . . . . 180–185°F

Models 1044C-54 and 10K-54

Identification

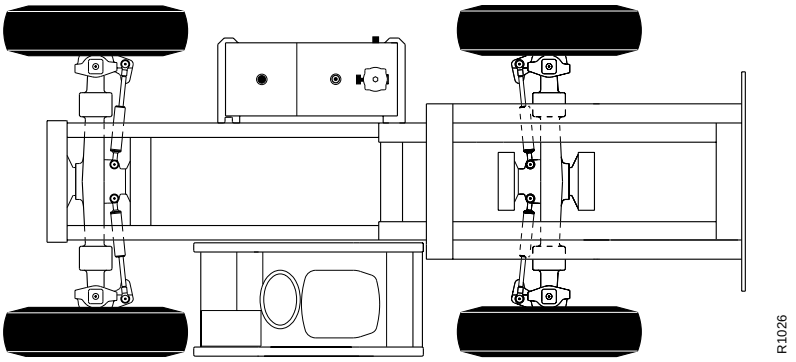

Fig. 2-15: Top View — Models 1044C-54 and 10K-54

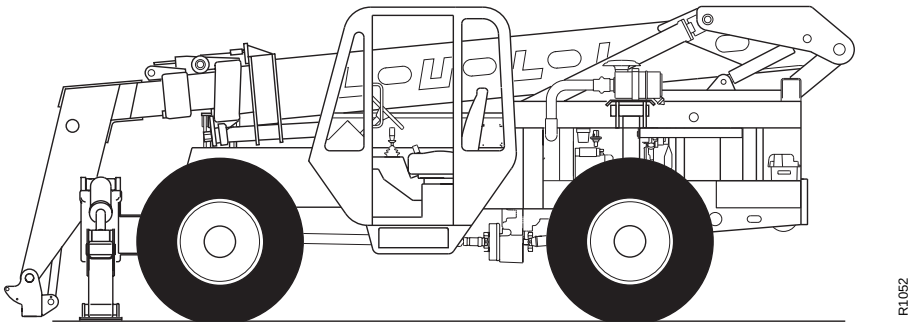

Fig. 2-16: Left Side View — Models 1044C-54 and 10K-54

Models 1044C-54 and 10K-54 (cont'd.)

Specifications

General Operating Specifications

Lift and Carry Capacity	10,000 lbs.
Maximum Lift Height (and "Landing Height" for 1044C-54)	54 Feet
Boom Elevation Angle	-5° to +69°
TransAction (1044C-54)	80 Inches
Maximum Horizontal Forward Reach:	
1044C-54	45 Feet
10K-54	38 Feet, 4 Inches
Maximum Reach at Maximum Lift (1044C-42)	14 Feet
Capacity at Maximum Reach:	
1044C-54	2000 lbs.
10K-54	3000 lbs.
Below Grade	40 Inches
Drive	4-Wheel
Steer Modes	Front Wheel, 4-Wheel Round, 4-Wheel Oblique
Frame Tilt	12.5° Right and Left
Empty Vehicle Weight:	
1044C-54	Approximately 29,200 lbs.
10K-54	Approximately 28,700 lbs.

Dimensions

Note: *Dimensions listed are for forklift with all components fully retracted in travel mode.*

Overall Height	95 Inches
Overall Width	100 Inches
Overall Length	24 Feet, 10 Inches (w/42" Fork)
Wheelbase	124 Inches
Outside Turning Radius	13 Feet, 8 Inches
Ground Clearance	16 Inches

Capacities

Hydraulic System (Including Reservoir)	65 Gallons
Hydraulic Reservoir	44 Gallons
Fuel Tank	40 Gallons
Cooling System	18 Quarts
Engine Crankcase Oil w/Filter (John Deere)	14 Quarts
Transmission Total Capacity	17 Quarts
Drain and Refill	11 Quarts
Differential	12.8 Quarts
Planetary Hubs	3.6 Pints
Friction Modifier	4 Ounces

Models 1044C-54 and 10K-54 (cont'd.)

Pressures

Hydraulic:
- Control Manifold System:
  - Boom Hoist and Extend Valve Relief . . . . . 3000 psi
  - 4- or 5-Section Relief Valve . . . . . 3150 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2200 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 450 psi
  - Hydraulic Return Filter . . . . . 0–15 psi
- Mid-Inlet Valve System:
  - Boom Hoist and Extend Valve Relief . . . . . 3000 psi
  - 4- or 5-Section Relief Valve . . . . . 3150 psi
  - Carriage Tilt Valve Section, Up Port Relief . . . . . 2800 psi
  - Carriage Tilt Valve Section, Down Port Relief. . . . . 2800 psi
  - Steering . . . . . 2375 psi
  - Brakes. . . . . 330 psi
  - Joystick Control Pilot. . . . . 460 psi
  - Hydraulic Return Filter . . . . . 0–15 psi

Accumulator:
- Control Manifold System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1200 (Low Limit), 1600 (High Limit)
- Mid-Inlet Valve System:
  - Dry Nitrogen Pre-Charge . . . . . 400 psi
  - Accumulator Charge Valve . . . 1075 (Low Limit), 1950 (High Limit)

Transmission

Manufacturer. . . . . Zahnradfabrik (ZF)
Model 4 WG-100
Type . . . . . 4-Speed Electric Powershift with Torque Converter
Speeds . . . . . 4 Forward, 3 Reverse
Filter . . . . . Cartridge

Travel Speeds

1st Gear . . . . . 2.7 mph
2nd Gear. . . . . 6.4 mph
3rd Gear . . . . . 14.5 mph
4th Gear (Forward Only). . . . . 21.5 mph

Axles

Manufacturer. . . . . Dana Spicer
Model PS-8036
Type . . . . . Off-Highway with Drive and Steering Functions

Models 1044C-54 and 10K-54 (cont'd.)

Wheels/Tires	Lugs . . . . . 10 (Torque to 320 ft-lbs)
	14 × 24 Tires:
	Tire Size . . . . . 14 × 24
	Water . . . . . 38 Gallons
	Sodium Chloride . . . . . 134 lbs
	Pressure . . . . . 60 psi
	17.50 × 25 Tires:
	Tire Size . . . . . 17.50 × 25
	Water . . . . . 49 Gallons
	Sodium Chloride . . . . . 170 lbs
	Pressure . . . . . 60 psi
Service Brakes	Manufacturer . . . . . Dana Spicer
	Type . . . . . Hydraulically Actuated, Wheel End, Wet Disc
Parking Brake	Manufacturer . . . . . Zahnradfabrik (ZF)
	Type . . . . . Drum at Transmission Output, Spring Actuated Hydraulically Released
Engine Models	(See "Engine Specifications" on page 2-24)
	John Deere 4039T . . . . . 110 HP @ 2500 rpm
	John Deere 4045T (Replacement for 4039T) . . . . . 115 HP @ 2500 rpm
	John Deere 6068D . . . . . 125 HP @ 2500 rpm
	Cummins 6B5.9 (10K-54) . . . . . 115 HP @ 2500 rpm
	Cummins 4BT3.9 (1044C-54) . . . . . 110 HP @ 2500 rpm
Hydraulic Pump	Type . . . . . Tandem Gear
Electrical System	System Voltage . . . . . 12-Volt, Negative Ground
	Battery . . . . . 12-Volt, 925 CCA
	Alternator:
	Delco-Remy . . . . . 78 Amp
	Bosch . . . . . 63 Amp
Working Temperatures	Hydraulic Oil . . . . . 140–180°F
	Transmission Oil . . . . . 104–230°F
	Engine Oil . . . . . See Engine Manual
	Engine Coolant . . . . . 180–185°F

Engine Specifications

John Deere 4039D

Fuel	Diesel
Aspiration	Naturally Aspirated
Cooling	Liquid
Horsepower	80 HP @ 2500 rpm
Maximum Torque	190 ft-lbs @ 1400 rpm
Piston Displacement	239 Cubic Inches
Number of Cylinders	4 Vertical In-Line
Cycle	4 Stroke
Combustion System	Direct Injection
Compression Ratio	17.8:1
Oil Filter	Spin-On
Air Cleaner	Dry Cartridge
High rpm	2700
Idle rpm	800-850

John Deere 4039T

Fuel	Diesel
Aspiration	Turbocharged
Cooling	Liquid
Horsepower	110 HP @ 2500 rpm
Maximum Torque	270 ft-lbs @ 1600 rpm
Piston Displacement	239 Cubic Inches
Number of Cylinders	4 Vertical In-Line
Cycle	4 Stroke
Combustion System	Direct Injection
Compression Ratio	17.8:1
Oil Filter	Spin-On
Air Cleaner	Dry Cartridge
High rpm	2700
Idle rpm	800-850

John Deere 4045T

Fuel	Diesel
Aspiration	Turbocharged
Cooling	Liquid
Horsepower	100 or 115 HP @ 2500 rpm
Maximum Torque	274 ft-lbs @ 1600 rpm
Piston Displacement	276 Cubic Inches
Number of Cylinders	4
Cycle	4 Stroke
Combustion System	Direct Injection
Compression Ratio	17.2:1
Oil Filter	Spin-On
Air Cleaner	Dry Cartridge
High rpm	2600
Idle rpm	800-850

Engine Specifications (cont'd.)

John Deere 6068D

Fuel	Diesel
Aspiration	Naturally Aspirated
Cooling	Liquid
Horsepower	125 HP @ 2500 rpm
Maximum Torque	330 ft-lbs @ 1200 rpm
Piston Displacement	414 Cubic Inches
Number of Cylinders	6
Cycle	4 Stroke
Combustion System	Direct Injection
Compression Ratio	17.8:1
Oil Filter	Spin-On
Air Cleaner	Dry Cartridge
High rpm	2600
Idle rpm	800-850

Cummins 4B3.9

Fuel	Diesel
Aspiration	Naturally Aspirated
Cooling	Liquid
Horsepower	75 HP @ 2500 rpm
Maximum Torque	186 ft-lbs @ 1200 rpm
Piston Displacement	239 Cubic Inches
Number of Cylinders	4
Cycle	4 Stroke
Combustion System	Direct Injection
Compression Ratio	18.5:1
Oil Filter	Spin-On
Air Cleaner	Dry Cartridge
High rpm	2650
Idle rpm	750–800

Cummins 4BT3.9

Fuel	Diesel
Aspiration	Turbocharged
Cooling	Liquid
Horsepower	102 or 110 HP @ 2500 rpm
Maximum Torque	260 ft-lbs @ 1500 rpm
Piston Displacement	239 Cubic Inches
Number of Cylinders	4 Vertical In-Line
Cycle	4 Stroke
Combustion System	Direct Injection
Compression Ratio	17.5:1
Oil Filter	Spin-On
Air Cleaner	Dry Cartridge
High rpm	2650
Idle rpm	750–800

Engine Specifications (cont'd.)

Cummins 4BT3.9 (EPA)

Fuel	Diesel
Aspiration	Turbocharged
Cooling	Liquid
Horsepower	110 HP @ 2500 rpm
Maximum Torque	260 ft-lbs @ 1500 rpm
Piston Displacement	239 Cubic Inches
Number of Cylinders	4 Vertical In-Line
Cycle	4 Stroke
Combustion System	Direct Injection
Compression Ratio	17.5:1
Oil Filter	Spin-On
Air Cleaner	Dry Cartridge
High rpm	2650
Idle rpm	750–800

Cummins 6B5.9

Fuel	Diesel
Aspiration	Naturally Aspirated
Cooling	Liquid
Horsepower	115 HP @ 2500 rpm
Maximum Torque	313 ft-lbs @ 1600 rpm
Piston Displacement	359 Cubic Inches
Number of Cylinders	6
Cycle	4 Stroke
Combustion System	Direct Injection
Compression Ratio	18.5:1
Oil Filter	Spin-On
Air Cleaner	Dry Cartridge
High rpm	2650
Idle rpm	750–800

Section 3 — General Maintenance

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Section 3 — General Maintenance

General Instructions

Performance of your machine is dependent on proper maintenance and lubrication at designated intervals. Proper operating procedures and a regularly scheduled maintenance and lubrication program will increase the life of machine components and reduce machine down time.

Should a defect or failure occur to your machine, take it out of service immediately. The machine must not continue to operate under any circumstances as serious damage to the machine or personal injury may result.

Attach a warning tag to the steering wheel of the forklift. If the forklift should not be started, remove the ignition key.

Before doing any maintenance or repair work, get permission. Do not perform any maintenance without authorization.

If you have been authorized to do maintenance, read the service manual, study the instructions, and examine all the instructions and messages on the machine.

When performing inspection, maintenance, lubrication, or adjustments to the machine, be alert to evidence of excessive wear including odors and noises that may indicate damage, malfunction, or other maintenance problems.

Service Preparation Procedures

- Choose a clean, level work area. Check clearances and make sure you have sufficient room. Make certain there is adequate light and ventilation.
- Park machine on level surface, set the parking brake, level the frame, and shut off the engine.
- Clean the walking and working surfaces. Remove oil, grease, ice, snow, mud, and water to eliminate slippery areas. Sand any remaining slippery areas.
- Make sure you have the correct tools. Keep tools clean and inspect power cords.
- Make sure jacks and hoists are available and in good condition. Never use jacks with cracked, bent, or twisted parts. Never use frayed, twisted, or pinched cables. Never use bent or distorted hooks.
- Make use of mechanical assists. To protect your back from possible injury, use proper lifting methods.

Service And Repair Procedures

CAUTION: Unless specifically told not to, lower the boom to the ground, apply the parking brake, and stop the engine before servicing, adjusting, or repairing the machine.

WARNING: Release all hydraulic pressure before doing any maintenance or repairs to the hydraulic system.

WARNING: Liquid cooling systems build up pressure as the engine gets hot. Before removing the radiator cap, stop the engine and let the system cool. Remove the radiator cap only after the coolant is cold.

- Be careful not to damage machined and polished surfaces.
- Tighten all bolts, fittings and connections to specifications.
- Avoid fires and explosive hazards.
- Handle all solvents and dry chemicals according to procedures identified on manufacturers' containers. Work in a well-ventilated area. Make sure you know where fire extinguishers are kept and how to use them.
- Use an approved solvent to clean parts. Never use gasoline or diesel fuel.
- Shut off the engine and electrical equipment while filling the fuel tank. Use extra caution when fueling while the engine is hot. Always ground the fuel nozzle against the filler neck to avoid sparks.

WARNING: Never smoke while handling fuel or working on the fuel system. The fumes in an empty fuel container are explosive. Never cut or weld on fuel lines, tanks, or containers.

- Avoid spilling fuel. If a spill occurs, wipe it up immediately.
- Never weld on forks, boom, support frame or overhead guard without written consent from JLG.
- Install all guards, covers and shields after servicing. Repair or replace any that are damaged.
- Refill systems with approved or recommended fluids. Start the engine and check for leaks

WARNING: Diesel fuel or hydraulic fluid under pressure can penetrate the skin or damage eyes. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks but do not use your hand. Wear appropriate eye protection. If fluid enters skin or eye, get medical attention immediately.

- Operate all controls and make sure the forklift is functioning properly. Road test the machine if necessary. After testing, shut down and recheck the work you performed. Recheck all fluid levels before releasing machine for operation.

Replacement Parts

General

Record the machine model, serial number, and component serial numbers for reference when ordering replacement parts. See “Serial Number Locations” in Section 2.

Use only JLG authorized replacement parts and fluids. Use of parts other than JLG authorized parts may adversely effect machine reliability, performance, and safety and may void the warranty.

JLG assumes no liability for equipment damages caused by the use of unauthorized replacement parts.

Lubrication

General

For best machine performance, follow the instructions found on the machine’s service lubrication schedule.

- Clean around all oil fill holes before checking or adding oil.
- Keep all lubricants and lubricating equipment clean and free of foreign matter both while in use and while in storage.
- Wipe off any excess lubricants that spill or overflow. Oily or greasy surfaces tend to collect dirt and foreign matter which can work its way into bearings and gears.

Fluid and Lubricant Specifications

General Specifications

Table 3-1: General Fluid and Lubricant Specifications

SYSTEM OR COMPONENT	FLUID OR LUBRICATION	SPECIFICATION
Fuel System[1]	See "Fuel Requirements"	
Hydraulic System	Heavy Duty Hydraulic Fluid	Amoco Rykon MV or Equivalent
Engine Cooling System[1]	See engine manufacturer's operator's manual.	
Engine Oil[1]	See "Engine Oil Specifications"	
Transmission	See "Transmission Oil Selection Chart"	
Differential (Front & Rear)	Gear Lubrication	SAE 90 API GL-5
Planetary Hub (Each)	Use 58 oz. SAE 90 API GL-5 and 4 oz. Friction Modifier, Lull® P26720	
Grease Points	Grease	Lithium-based Extreme Pressure (E.P.)

R1044

[1] Consult engine manufacturer's operator manual for additional information.

Engine Oil Specifications

John Deere Engines

Use the table below to select the oil viscosity based on expected air temperature range during the period between oil changes. Consult the John Deere Operator's Manual for additional information.

Note: *New John Deere engines use special break-in oil for the initial period of operation. Consult engine Operator's Manual for additional information.*

Table 3-2: John Deere Engine Oil Specifications

ENGINE OIL, DEERE		
Oil Grade	**Temperature Range ° F**	**Temperature Range ° C**
SAE 5W-30	-22 to +86 °F	-30 to +30 °C
SAE 10W-30	-4 to +86 °F	-20 to +30 °C
SAE 15W-40	+5 to +122 °F	-15 to +50 °C
SAE 30W	+32 to +86 °F	0 to +30 °C
SAE 40W	-50 to +104 °F	+10 to +40 °C
Arctic oil (e.g. MIL-L-46167B)	Below -22 °F	Below -30 °F
Approved Engine Oil Specifications		
API CD/CE CCMC Specifications D4, D5 SAE 5W-30 SAE 10W-30 SAE 15W-40 SAE 30W SAE 40W		

Cummins Engines

Use the table below to select the oil viscosity based on expected air temperature range during the period between oil changes. Consult the Cummins Operator's Manual for additional information.

Table 3-3: Cummins Engine Oil Specifications

ENGINE OIL, CUMMINS		
Oil Grade	**Temperature Range ° F**	**Temperature Range ° C**
SAE 15W-40	+12 to +112 °F	-12 to +45 °C
SAE 10W-30	-10 to +68 °F	-25 to +20 °C
SAE 5W-30	-40 to +68 °F	-40 to +20 °C
Approved Engine Oil Specifications		
API CE/SG SAE 5W-30 SAE 10W-30 SAE 15W-40		

Transmission Oil Specifications

The following table shows approved lubricants and associated temperature ranges for use with ZF 3WG and 4WG series transmissions.

Table 3-4: ZF Transmission Oil Specifications

ZF 3WG-100 & 4WG-100 TRANSMISSIONS		
Oil Grade	**Minimum Oil Temperature for Starting Engine**	**Minimum Oil Temperature for Engaging Transmission**
Engine Oils		
SAE 20W-20	+14 °F (-10 °C)	+41 °F (+5 °C)
SAE 15W-40	+5 °F (-15 °C)	+32 °F (0 °C)
SAE 10W, 10W-30, 10W-40	-4 °F (-20 °C)	+23 °F (-5 °C)
Automatic Transmission Fluid (ATF)		
ATF	-22 °F (-30 °C)	+14 °F (-10 °C)
Approved Lubricants (Engine Oils) API CD/ CE/ CF/ SF/ SG MIL-L-2104 C/ D/ E MIL-L-46152 C/ D/ E SAE 10W SAE 10W-30 SAE 10W-40 SAE 15W-40 SAE 20W-20		
Automatic Transmission Fluid (ATF) may only be used at ambient temperatures below +14 °F (-10 °C)		

Fuel Requirements

Diesel fuels are blended to meet the local temperature requirements. The standard grades are:

1. 1D for temperatures -22 to +86 °F (-30 to +30 °C)
2. 2D for temperatures +14 to +122 °F (-10 to +50 °C).

There are two main classifications of diesel fuel in general use:

1. Low-sulphur, “on-highway” diesel fuel
2. Medium-sulfur, “off-highway” diesel fuel. This fuel contains blue dye.

The engine manufacturer specifies the diesel fuel requirements. Additional information can be found in the engine manufacturer’s Operator’s Manual.

Consult your local fuel distributor for the properties of the diesel fuels available in your area

Grease

- Use a lithium base grease with E.P. additives and rust inhibitors. A #2 grade should be used at temperatures above 32° F (0° C) and #1 grade at or below 32° F (0° C).
- Wipe off all fittings before applying grease. Dirt on the fitting can be forced through the opening in the fitting and cause premature bearing failure.

- Lubricate all grease fittings with the specified grease.

Hydraulic Oil

Hydraulic oil selected for use with JLG forklifts should be a premium quality anti-wear hydraulic oil. Characteristics of the oil selected should include:

- Viscosity: Maximum at cold start temperature — 6000 SUS
  Minimum at high temperature operation — 50 SUS
- Viscosity Index: Minimum — 100
  Optimum — Greater than 200
- Oxidation inhibited
- Rust inhibited
- Anti-wear additive
- Anti-foam additive
- Seal conditioning (compatible with Buna-N).

JLG recommends Amoco Rykon MV or its equivalent.

Your best assurance of selecting a quality product is the assistance that can be obtained from a fluid supplier. Most of the major oil companies are capable of providing suitable products if you provide them with the specifications above.

Care and Cleaning

Wash the machine regularly. A clean well-maintained machine helps prevent safety hazards and makes problem areas more recognizable.

Remove all items that do not belong on the machine. Secure all loose items such as lunch boxes, tools, and additional equipment.

Cleaning Exterior Surfaces

- High pressure water or steam may be used to clean the exterior. Give extra attention to the underside.
- **DO NOT** damage or wash off decals when using high pressure water or steam. See “Cleaning Decals” below.
- Clean the mirror carefully.
- **DO NOT** allow mud or snow to accumulate on engine or transmission.
- Make sure radiator and transmission oil cooler fins are clean.
- Commercial engine degreasers may be used to clean the engine and transmission. Follow the product instructions closely.
- **NEVER** spray water or cleaner on a hot engine or transmission, especially on a hot turbocharger.
- Commercial general purpose degreasers and detergents may be used to help clean thick deposits. Do not use chemicals that can damage paint or decals.

- **Avoid** spraying water on electrical components such as the alternator, starter, gauges, and electrical items under the dash.
- Be careful around the fuel fill and hydraulic reservoir breather. Water may get into tanks and damage fuel and/or hydraulic components.
- To help prevent freezing, allow water to drain or dry before operating in cold weather.

Cleaning the Cab

- Clean dust and dirt from all areas of the cab. Be careful to keep water spray away from electrical components under the dash.
- Clean vinyl items with commercial vinyl cleaner. Treat with vinyl protectant to guard against ultraviolet damage. Do not use vinyl protectant on rubber or plastic controls if it will leave them slippery.
- Clean the windows inside and out. Remove any decals from windows that are not original equipment.
- Carefully clean plastic gauge and indicator lenses. Use a soft cloth and a cleaner suitable for plastic. Dust and dirt can scratch the clear plastic.
- Make sure step and hand holds are clean.
- Remove accumulated dirt from brake and accelerator pedals.

Cleaning Decals

If soiled with dirt, clean decals with mild soap. Use a mild alcohol solution if soiled with grease. Do not use solvents that may damage the decal. Replace all damaged, missing, or painted decals that cannot be read. On refurbished or replaced parts, all missing decals must be replaced.

See your JLG dealer for replacement decals and placards.

Attaching Decals

The surface on which a decal is to be attached must be dry and free of all dirt and grease. Remove the backing from the decal and apply decal in its correct location. Once in place, rub entire surface of the decal with your thumb, applying sufficient pressure to ensure good adhesion of the decal to the mounting surface.

Storage

The following procedures are to be used if the machine will not be operated for a long period of time.

Preparing the Machine for Long-Term Storage

Prior to placing the machine into storage, perform the following:

1. Wash off the entire machine.
2. Lubricate all grease fittings as instructed in “Grease” on page 3-6 of this section
3. Change engine oil according to specifications described in Table 3-2 or Table 3-3 on page 5.
4. Apply grease to all exposed hydraulic cylinder rod areas.
5. Disconnect battery cables. If the machine is to be stored under cold conditions, remove the battery and store it in a heated area.
6. Check engine coolant level and make sure it has an adequate coolant-to-water ratio for the conditions it will be stored in.
7. Check transmission fluid level and fill if necessary according to the guidelines described in Table 3-4 on page 6 of this section.
8. Preferable, store the machine inside where it will remain dry. If it must be stored outside, park it on a concrete slab or on lumber laid on flat, level ground and cover it with a tarp.

Preparing the Machine After Long-Term Storage

After removing the machine from storage and before placing it back in service, perform the following:

1. If covered with a tarp, remove it.
2. Wipe off grease from cylinder rods.
3. Loosen drain plug from bottom of fuel tank and drain into suitable container until fluid is clean.
4. Loosen drain plug on bottom of hydraulic oil reservoir and drain into suitable container until fluid is clean.
5. Loosen drain on fuel/water separator on engine and drain into suitable container until fluid is clean.
6. Check nitrogen recharge.
7. Check engine coolant and hydraulic fluid levels. Add fluids if necessary.
8. If battery was stored separately from the machine, install it.
9. Connect battery cables.
10. Start engine using start safety procedures as described in the Owner/Operator Manual.
11. After the engine has warmed up, test all hydraulic functions and controls.
12. Check transmission operation.

13. Shut the machine down and check for any hydraulic leaks and repair, as necessary.

WARNING: Hydraulic fluid under pressure can penetrate the skin or damage eyes. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks but do not use your hand. Wear appropriate eye protection. If fluid enters skin or eye, get medical attention immediately.

14. Check for any other leaks and repair as necessary.
15. Check other fluid levels and replenish as necessary. Refer to your service/lubrication charts.

Torque Specifications

General Torques for Standard Bolts, Capscrews, and Nuts

Table 3-5 and Table 3-6 lists torque values for standard bolts and nuts. They are intended as a guide for typical applications. Values for specific applications take precedence over those in the following tables.

Note: *Values are for plated or lubricated bolts and nuts.*

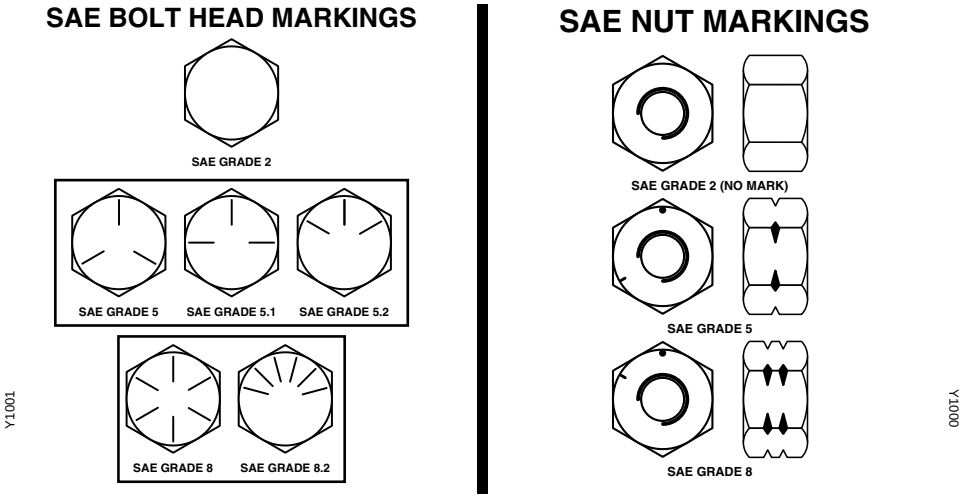

Fig. 3-1: SAE Grade Identification

Table 3-5: General Torques for Standard Bolts, Capscrews, and Nuts

Size	SAE Grade 2		SAE Grade 5, 5.1, 5.2		SAE Grade 8, 8.2	
8-32	14	in-lbs	22	in-lbs	31	in-lbs
8-36	15	"	23	"	32	"
10-24	21	"	32	"	45	"
10-32	23	"	36	"	51	"
1/4-20	50	"	75	"	108	"
1/4-28	56	"	86	"	120	"
5/16-18	96	"	156	"	216	"
5/16-24	108	"	168	"	240	"
3/8-16	180	"	276	"	35	ft-lbs
3/8-24	204	"	300	"	35	"
7/16-14	288	"	35	ft-lbs	55	"
7/16-20	324	"	40	"	60	"
1/2-13	35	ft-lbs	55	"	80	"
1/2-20	40	"	65	"	90	"
9-16-12	55	"	80	"	110	"
9/16-18	60	"	90	"	130	"
5/8-11	75	"	110	"	170	"
5/8-18	85	"	130	"	180	"
3/4-10	130	"	200	"	280	"
3/4-16	150	"	220	"	320	"
7/8-9	125	"	320	"	460	"
7/8-14	140	"	360	"	500	"
1-8	190	"	480	"	680	"
1-12	210	"	530	"	740	"
UNC Threads in White Rows						
UNF Threads in Gray Rows						

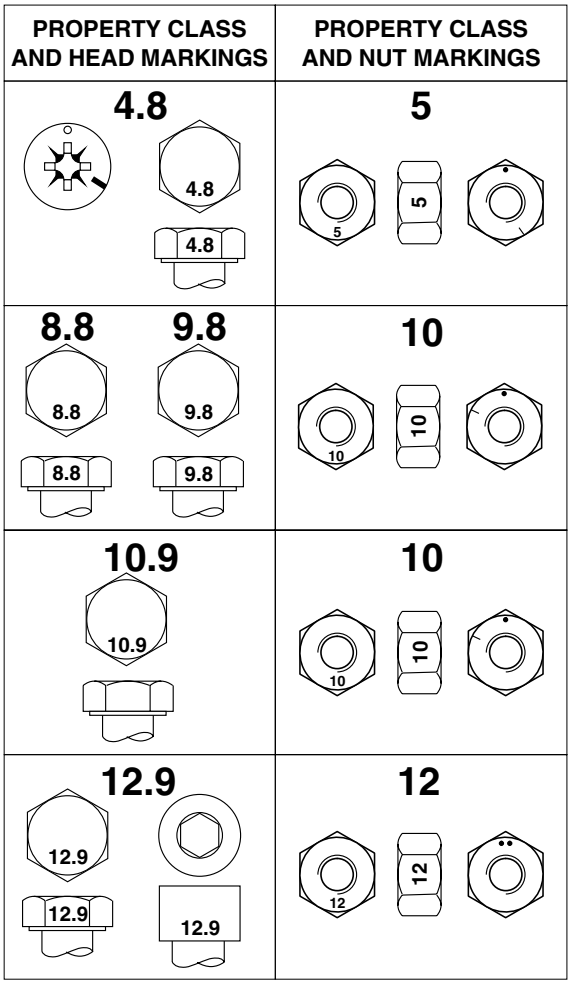

Fig. 3-2: Metric Class Identification

Table 3-6: General Torques for Metric Bolts, Capscrews, and Nuts

Size	Class 4.8		Class 8.8 or 9.8		Class 10.9		Class 12.9	
	Ft-lbs	Nm	Ft-lbs	Nm	Ft-lbs	Nm	Ft-lbs	Nm
M6	3.5	4.8	6.5	9	9.5	13	11.5	15
M8	8.5	12	16	22	24	32	28	37
M10	17	23	32	43	47	63	55	75
M12	29	40	55	75	80	110	95	130
M14	47	63	88	120	130	175	150	205
M16	73	100	140	190	200	275	240	320
M18	100	135	195	260	275	375	325	440
M20	140	190	275	375	400	530	460	625
M22	190	260	375	510	540	725	625	850
M24	250	330	475	650	675	925	800	1075
M27	360	490	700	950	1000	1350	1150	1600
M30	490	675	950	1300	1350	1850	1600	2150
M33	675	900	1300	1750	1850	2500	2150	2900
M36	850	1150	1650	2250	2350	3200	2750	3750

Hydraulic Fitting Torques

JIC and SAE Female Swivel Nuts

It is recommended that the nut be torqued to the approximate minimum value. If leakage occurs, tighten nut without exceeding maximum torque value.

Note: *Use two wrenches to tighten hydraulic line nuts.*

Table 3-7: Torque for JIC and SAE Female Swivel Nuts

Size	SAE Port Thread Size	Approx. Min. Torque		Max. Torque		Flats[1]
-4	7/16-20	130	in-lbs	150	in-lbs	2
-5	1/2-20	165	"	195	"	2
-6	9/16-18	235	"	265	"	1 1/4
-8	3/4-16	44	ft-lbs	48	ft-lbs	1
-10	7/8-14	50	"	58	"	1
-12	1 1/16-12	79	"	88	"	1
-16	1 5/16-12	117	"	125	"	1
-20	1 5/8-12	158	"	175	"	1
-24	1 7/8-12	188	"	213	"	1
-32	2 1/2-12	250	"	283	"	1

1. Number of flats on nut to be turned past finger tight. This method will produce the approximate torque.

Non-adjustable O-ring Fittings

To install straight thread, non-adjustable O-ring fittings:

1. Check condition of O-ring and replace as necessary. Do not install a fitting with a damaged O-ring.
2. Lubricate O-ring with clean hydraulic fluid and torque per Table 3-8.

Table 3-8: Torque for Non-adjustable O-ring Fittings

Size	SAE Port Thread Size	Min. Torque		Max. Torque	
-2	5/16-24	85	in-lbs	95	in-lbs
-4	7/16-20	205	"	235	"
-6	9/16-18	25	ft-lbs	29	ft-lbs
-8	3/4-16	46	"	50	"
-10	7/8-14	85	"	95	"
-12	1 1/16-12	105	"	115	"
-16	1 5/16-12	154	"	166	"
-20	1 5/8-12	213	"	237	"
-24	1 7/8-12	238	"	262	"

Adjustable O-ring Fittings

To install straight thread, adjustable O-ring fittings:

1. Check condition of O-ring and replace as necessary. Do not install a fitting with a damaged O-ring.
2. Lubricate O-ring with clean hydraulic fluid.
3. Back off the locknut fully.
4. Screw fitting into port until backup washer contacts face of port.
5. Position fitting by unscrewing a maximum of one turn.
6. Hold the fitting in position with a wrench and torque locknut per Table 3-9.

Table 3-9: Torque for Adjustable O-ring Fittings

Size	SAE Port Thread Size	Min. Torque		Max. Torque	
-2	5/16-24	60	in-lbs	70	in-lbs
-4	7/16-20	160	"	180	"
-6	9/16-18	25	ft-lbs	29	ft-lbs
-8	3/4-16	40	"	44	"
-10	7/8-14	58	"	63	"
-12	1 1/16-12	75	"	85	"
-16	1 5/16-12	109	"	121	"
-20	1 5/8-12	213	"	237	"
-24	1 7/8-12	238	"	262	"

O-ring Plugs

To install straight thread O-ring plugs:

1. Check condition of O-ring and replace as necessary. Do not install a plug with a damaged O-ring.
2. Lubricate O-ring with clean hydraulic fluid and torque per Table 3-10.

Table 3-10: Torque for O-ring Plugs

	SAE Port	Hollow Hex Head				Hex Head			
Size	Thread Size	Min. Torque		Max. Torque		Min. Torque		Max. Torque	
-2	5/16-24	30	in-lbs	40	in-lbs	85	in-lbs	95	in-lbs
-4	7/16-20	125	"	145	"	205	"	235	"
-6	9/16-18	210	"	230	"	25	ft-lbs	29	ft-lbs
-8	3/4-16	44	ft-lbs	48	ft-lbs	46	"	50	"
-10	7/8-14	70	"	80	"	85	"	95	"
-12	1 1/16-12	80	"	90	"	105	"	115	"
-16	1 5/16-12	129	"	141	"	154	"	166	"
-20	1 5/8-12	213	"	237	"	213	"	237	"
-24	1 7/8-12	238	"	262	"	238	"	262	"

Pipe Thread Fittings

To install National Pipe Thread (NPT) fittings:

1. Apply sealant sparingly to male pipe threads only, avoiding the first few threads at the end of the fitting.

Note: *Do not use Teflon tape or excessive amounts of sealant. System contamination will result.*

2. Install fitting and tighten per Table 3-11.

Table 3-11: Pipe Thread Fittings (Steel)

Fitting Size	Thread Size (NPT)	Turns[1]
-2	1/8-27	2–3
-4	1/8-27	2–3
-6	1/4-18	1.5–3
-8	3/8-18	2–3
-10	1/2-14	2–3
-12	3/4-14	2–3
-16	1-11.5	1.5–2.5
-20	1 1/4-11.5	1.5–2.5
-24	1 1/2-11.5	1.5–2.5

1.Turns past finger tight

Jump Starting Procedures

CAUTION:

- Improper jump starting procedures can cause an explosion resulting in personal injury.
- Sparks near batteries can cause explosions.
- Do not allow jump cable ends to touch each other or the machine.
- Battery acid can cause personal injury if it contacts skin or eyes. Always wear eye protection when jump starting a machine.
- Always connect battery positive (+) to battery positive (+) and battery negative (-) to ground on the machine. Make the final ground connection away from the battery.
- Allowing the two machines to touch during jump starting can cause damage to bearings and electrical circuits.
- This machine has a 12 volt starting system. Use the same voltage (12 volts) for jump starting. Use of higher voltage can damage the electrical system.
- Never charge a frozen battery.

1. Move the boost start machine (or auxiliary power source) close enough to the stalled machine for the cables to reach without allowing the machines to touch. Place the transmission shift selector in NEUTRAL, engage the park brake, and turn off engine (or shut off auxiliary power source).
2. On the stalled machine, turn the ignition switch to OFF.
3. Connect the positive (+) jumper cable to the positive (+) cable terminal of the discharged battery on the stalled machine. Ensure a solid connection. DO NOT allow positive cable clamps to touch ANYTHING other than the battery terminal.
4. Connect the other end of the positive (+) jumper cable to the positive (+) terminal of the boost battery (or auxiliary power source).
5. Connect one end of the negative (–) jumper cable to the negative (–) terminal of the boost battery (or auxiliary power source).
6. Make the final connection of the negative (–) jumper cable to the frame of the stalled machine away from the battery, fuel and hydraulic lines, and moving parts.
7. Start the engine on the boost machine or energize the auxiliary power source.
8. Wait at least two minutes for the battery in the stalled machine to partially charge.
9. Attempt to start the stalled machine (see “Starting Procedures” in your Owner/Operator Manual).
10. Immediately after the stalled machine starts, disconnect the jumper cables in reverse order.

Conversion Charts

Table 3-12: Inch Fraction, Decimal, and Metric Conversion Chart

Inch Fract.	Inch Dec.	mm	Inch Fract.	Inch Dec.	mm
1/64	0.0156	*0.40*	33/64	0.5156	*13.10*
1/32	0.0313	*0.79*	17/32	0.5313	*13.49*
3/64	0.0469	*1.19*	35/64	0.5469	*13.89*
1/16	**0.0625**	***1.59***	**9/16**	**0.5625**	***14.29***
5/64	0.0781	*1.98*	37/64	0.5781	*14.68*
3/32	0.0938	*2.38*	19/32	0.5938	*15.08*
7/64	0.1094	*2.78*	39/64	0.6094	*15.48*
1/8	**0.1250**	***3.18***	**5/8**	**0.6250**	***15.88***
9/64	0.1406	*3.57*	41/64	0.6406	*16.27*
5/32	0.1563	*3.97*	21/32	0.6563	*16.67*
11/64	0.1719	*4.37*	43/64	0.6719	*17.07*
3/16	**0.1875**	***4.76***	**11/16**	**0.6875**	***17.46***
13/64	0.2031	*5.16*	45/64	0.7031	*17.86*
7/32	0.2188	*5.56*	23/32	0.7188	*18.26*
15/64	0.2344	*5.95*	47/64	0.7344	*18.65*
1/4	**0.2500**	***6.35***	**3/4**	**0.7500**	***19.05***
17/64	0.2656	*6.75*	49/64	0.7656	*19.45*
9/32	0.2813	*7.14*	25/32	0.7813	*19.84*
19/64	0.2969	*7.54*	51/64	0.7969	*20.24*
5/16	**0.3125**	***7.94***	**13/16**	**0.8125**	***20.64***
21/64	0.3281	*8.33*	53/64	0.8281	*21.03*
11/32	0.3438	*8.73*	27/32	0.8438	*21.43*
23/64	0.3594	*9.13*	55/64	0.8594	*21.83*
3/8	**0.3750**	***9.53***	**7/8**	**0.8750**	***22.23***
25/64	0.3906	*9.92*	57/64	0.8906	*22.62*
13/32	0.4063	*10.32*	29/32	0.9063	*23.02*
27/64	0.4219	*10.72*	59/64	0.9219	*23.42*
7/16	**0.4375**	***11.11***	**15/16**	**0.9375**	***23.81***
29/64	0.4531	*11.51*	61/64	0.9531	*24.21*
15/32	0.4688	*11.91*	31/32	0.9688	*24.61*
31/64	0.4844	*12.30*	63/64	0.9844	*25.00*
1/2	**0.5000**	***12.70***	**1**	**1.0000**	***25.40***

V1070

Table 3-13: Miscellaneous Conversions

Multiply	By	To Get or Multiply	By	To Get
International System (IS) Unit	**Conversion Factor**	**Non-IS Unit**	**Conversion Factor**	**IS Unit**
		Torque		
Newton Meter (N•m)	x 8.9	= in-lb.	x 0.113	= Nm
Newton Meter (N•m)	x 0.74	= ft-lb.	x 1.36	= Nm
		Pressure (Pa = N/m^2)		
Kilopascal (kPa)	x 4.0	= in H_2O	x 0.249	= kPa
Kilopascal (kPa)	x 0.30	= in. Hg	x 3.38	= kPa
Kilopascal (kPa)	x 0.145	= psi	x 6.89	= kPa
bar	x 14.5	= psi	x 0.069	= bar
Newton/mm^2	x 145.04	= psi	x 0.0069	= bar
		Stress (Pa = N/m^2)		
Megapascal (mPa)	x 145	**= psi**	x 0.00689	= MPa
		Power (W = J/s)		
Kilowatt (kW)	x 1.36	= PS(cv)	x 0.736	= kW
Kilowatt (kW)	x 1.34	= HP	x 0.746	= kW
Kilowatt (kW)	x 0.948	= Btu/s	x 1.055	= kW
Watt (W)	x 0.74	= ft-lb/s	x 1.36	= W
		Energy (J = (N•m)		
Kilojoulè (kJ)	x 0.948	= Btu	x 1.055	= kJ
Joule (J)	x 0.239	= calorie	x 4.19	= J
		Velocity and Acceleration		
Meter per sec^2 (m/s^2)	x 3.28	= ft/s^2	x 0.305	= m/s^2
Meter per sec (m/s)	x 3.28	= ft/s	x 0.305	= m/s
Kilometer per hour (km/h)	x 0.62	= mph	x 1.61	= km/h
		Flow Rate		
Leter/mn (dm^3/mn)	x 0.264	= US gal/min	x 3.785	= L/min
		Horse Power/Torque		
(BHP x 5252) ÷ rpm = TQ (ft-lb.)		(TQ x R.P.M.) ÷ 5252 = B.H.P.		
Metric HP x 0.9863 = U.S. HP				
U.S. HP x 1.014 = Metric HP				
		Temperature		
°C = (°F-32) ÷ 1.8		°F = (°C x 1.8) + 32		
		Miles		
Nautical Mile	x 1.15078	= Statute Mile		
Statute Mile	x 0.86897	= Nautical Mile		

Section 4 — Reference Diagrams

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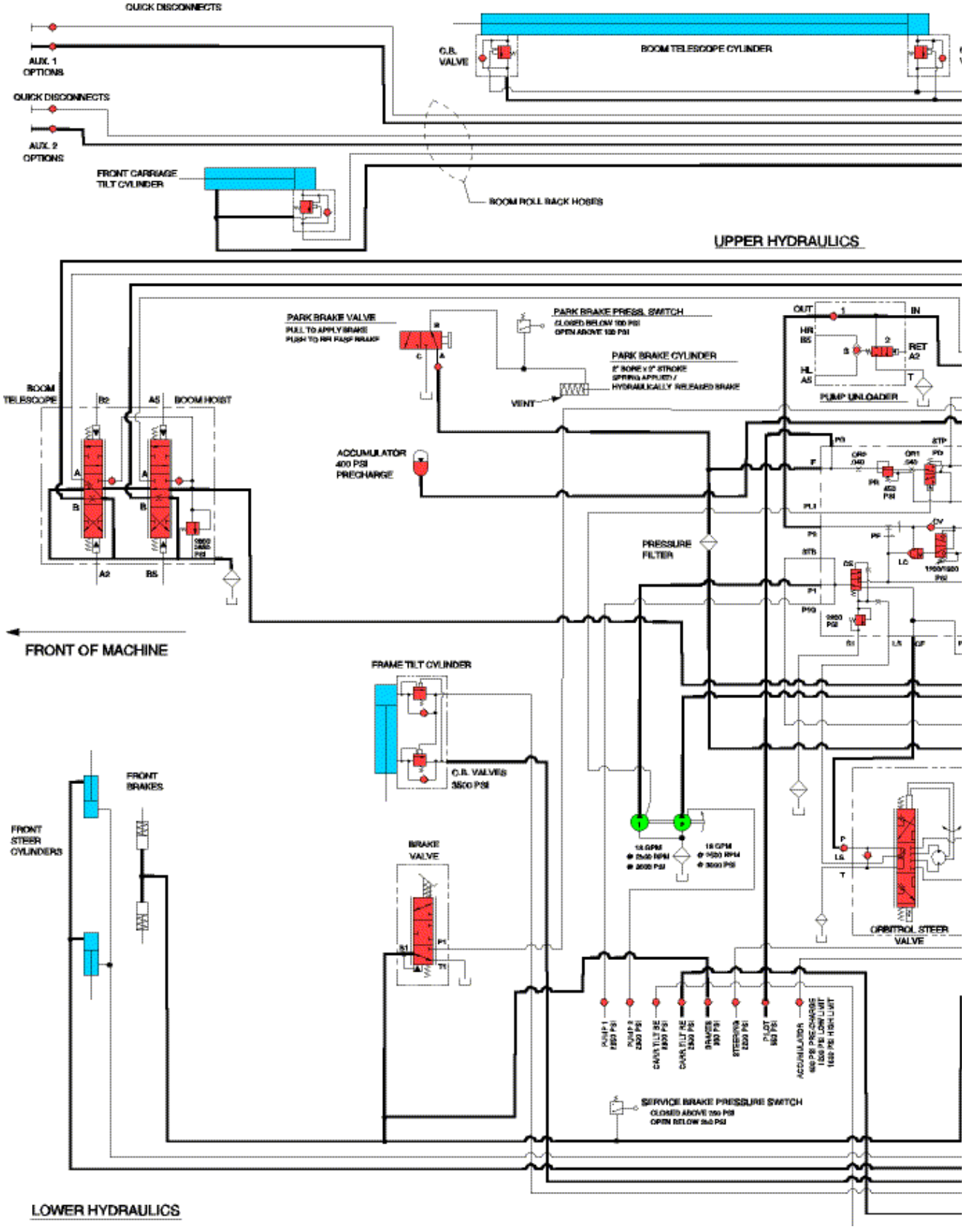
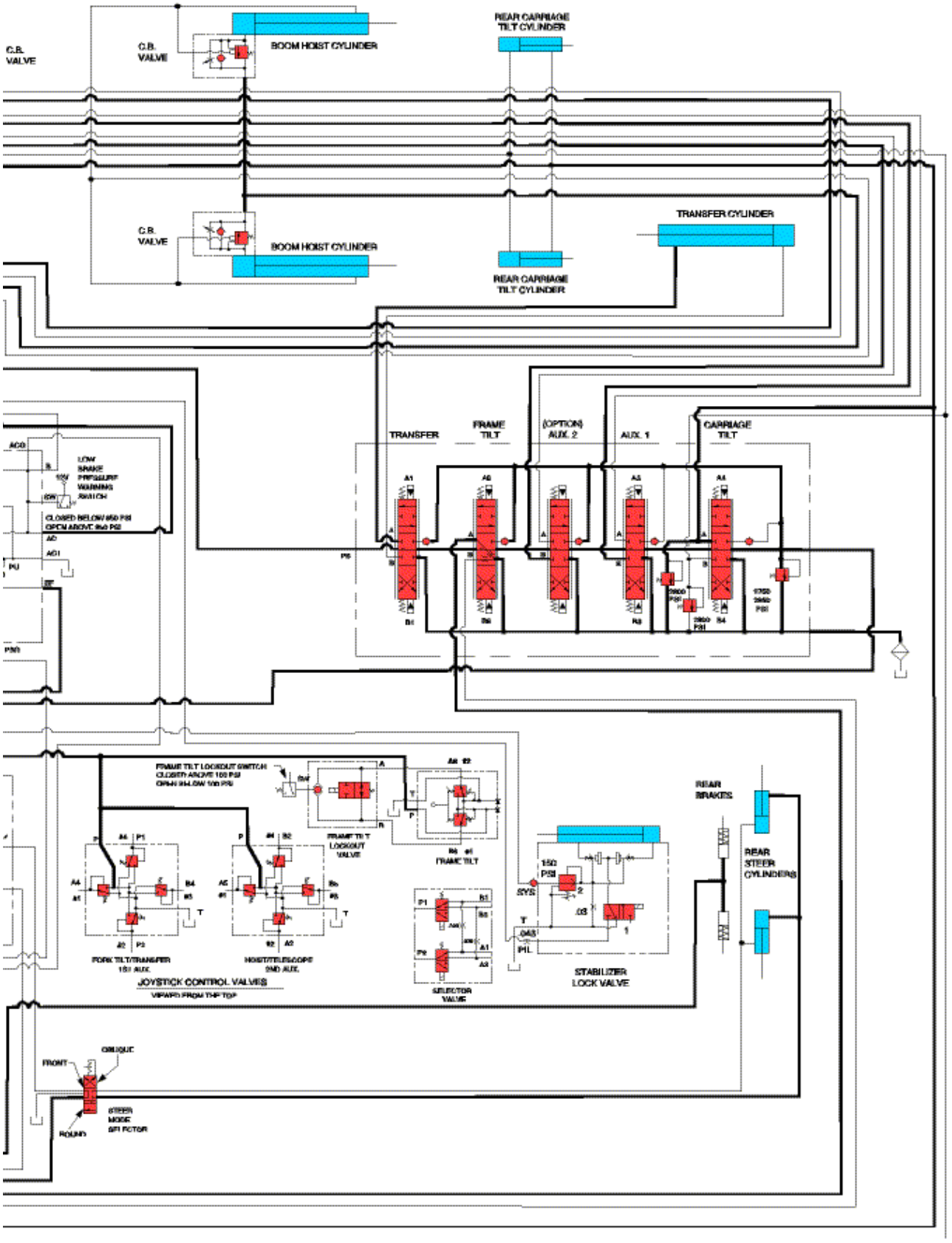
Section 4 — Reference Diagrams

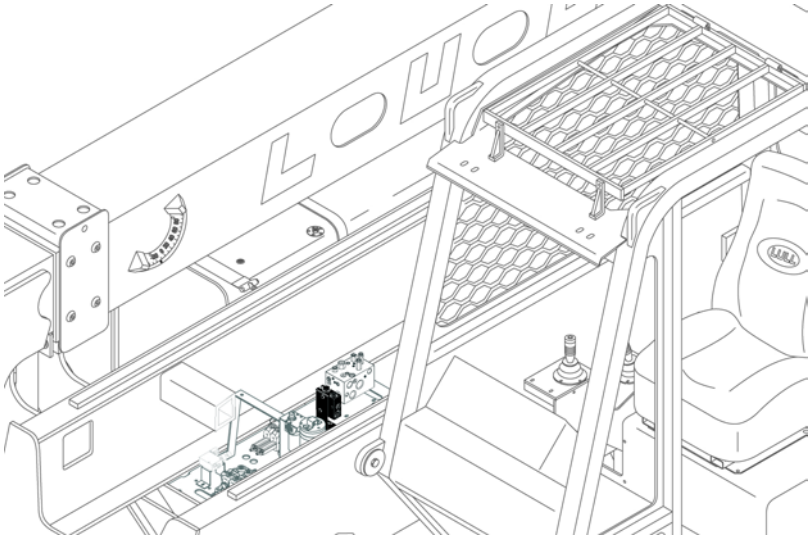
Schematic, Model 644B w/Naturally Aspirated Engine, Control Manifold Hydraulic System-Diagram 1

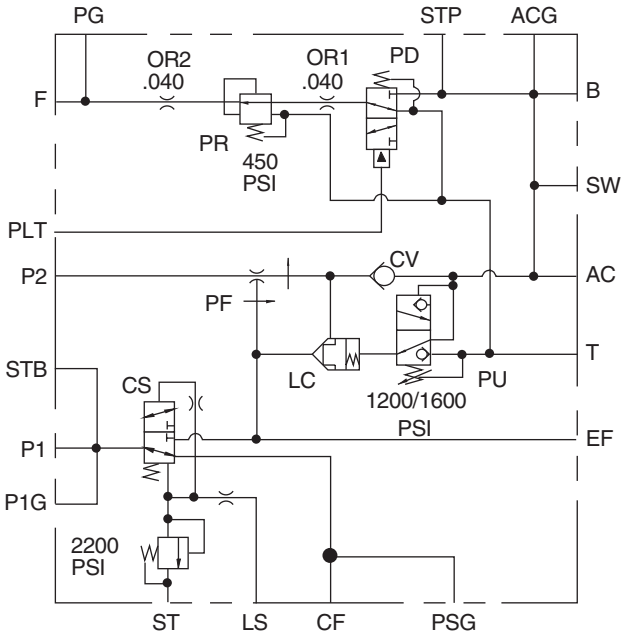


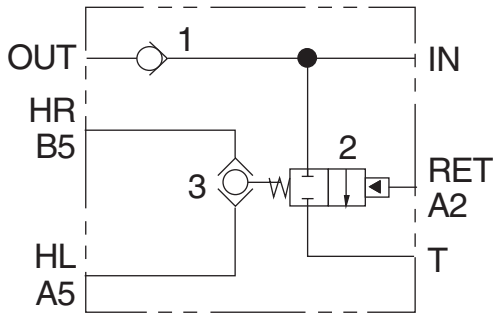
Schematic, Model 644B w/Naturally Aspirated Engine, Control Manifold Hydraulic System-Diagram 1



Schematic, Model 644B w/Naturally Aspirated Engine, Control Manifold Hydraulic System-Diagram 1



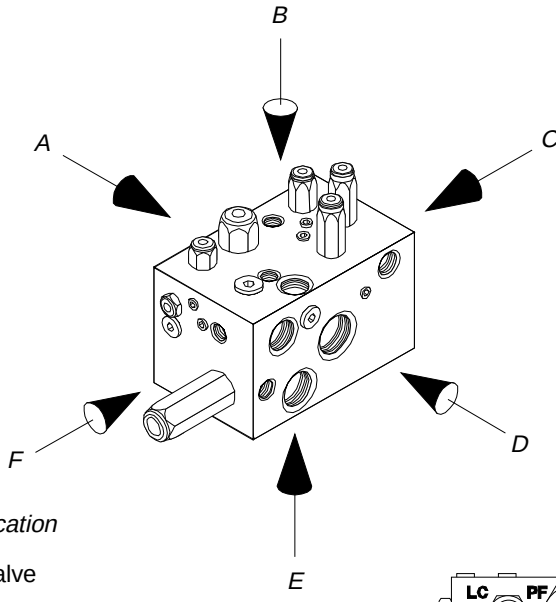


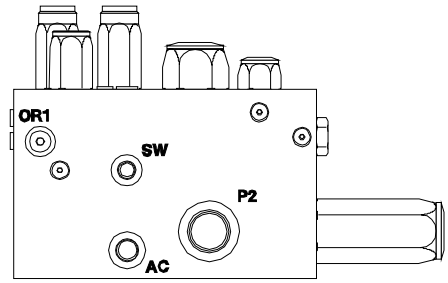


This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 428, 429, 485-590, 592-666
644B-42 ..... S/N: 137-207

Schematic, Model 644B w/Naturally Aspirated Engine, Control Manifold Hydraulic System-Diagram 1

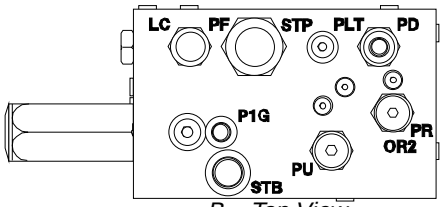




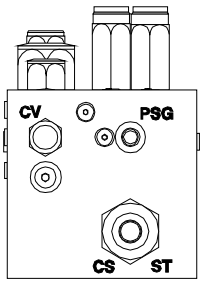
A – Left Side View

Cartridge Identification

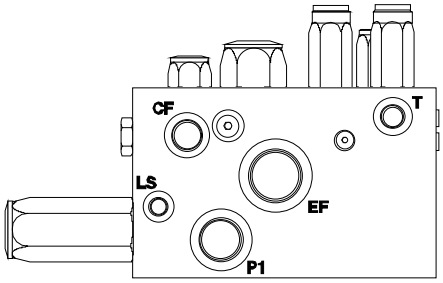
CS Compensator Valve
CV Check Valve
LC Logic Valve
PD Pilot Directional Valve
PF Priority Flow Control
PR Pressure Reducing Valve
PU Pilot Unloading Valve



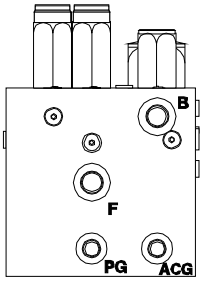
B – Top View



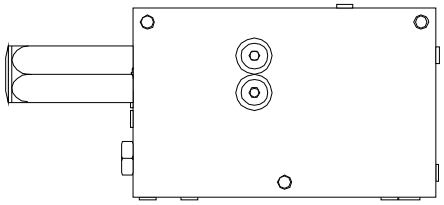
F – Front View



D – Right Side View

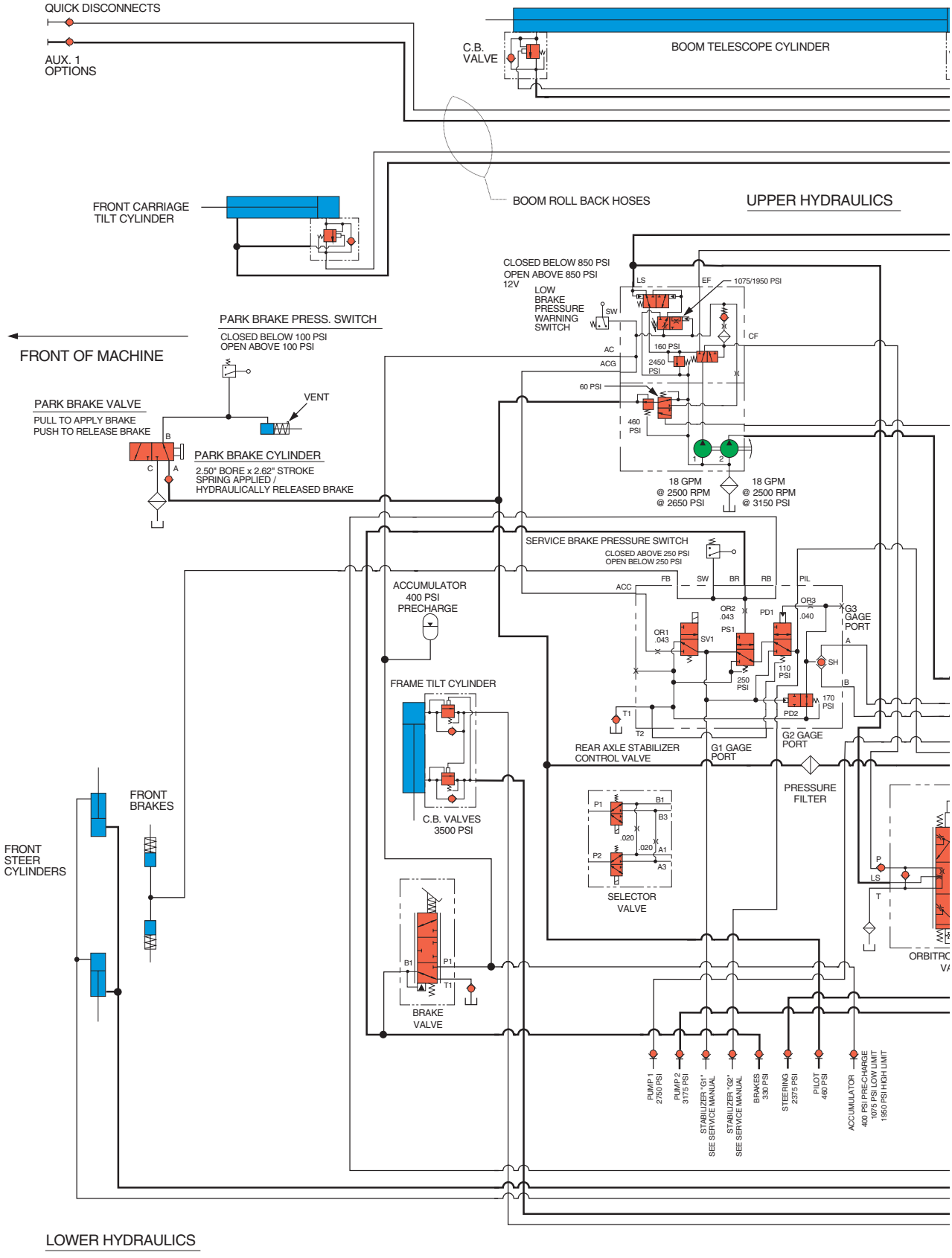


C – Back View

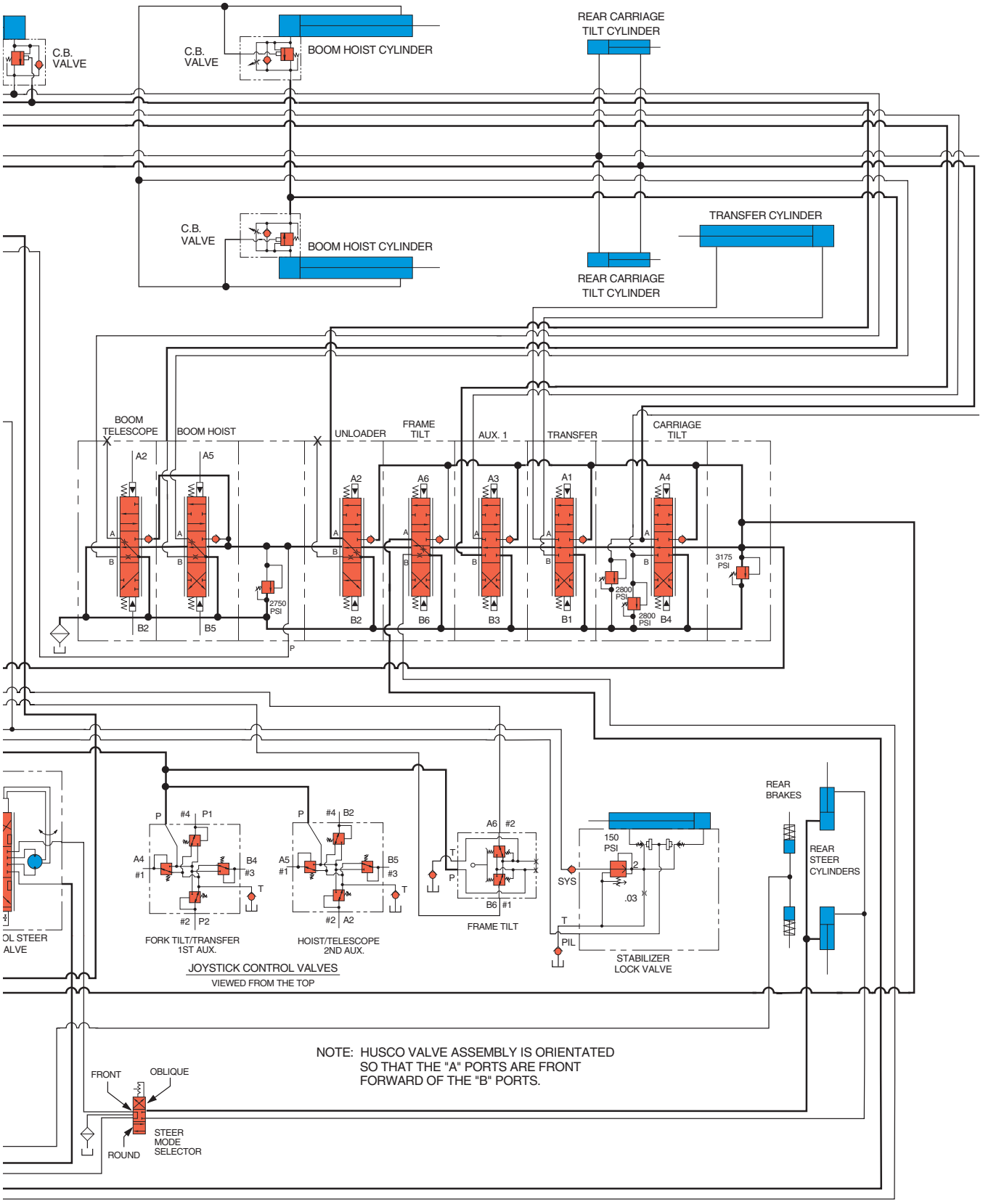


E – Bottom View

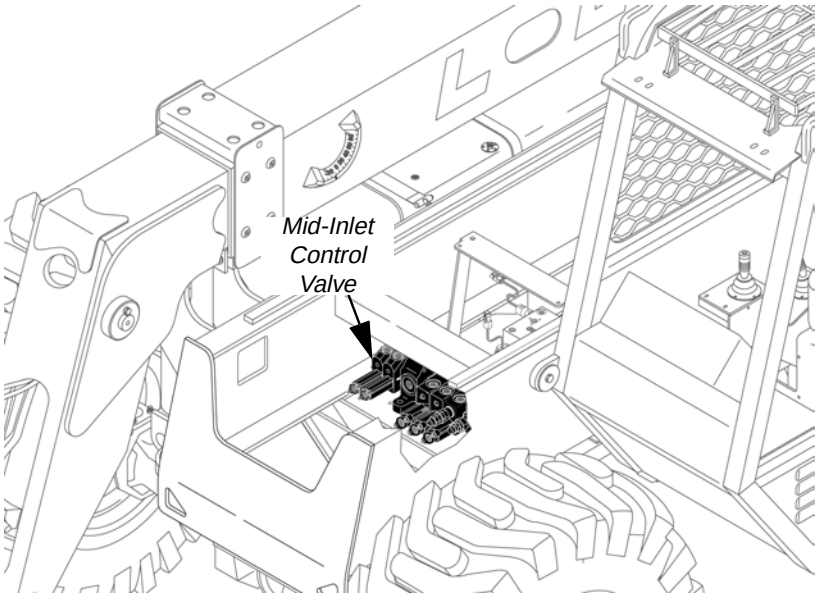
Schematic, Model 644B w/Naturally Aspirated Engine, Mid-Inlet Hydraulic System - Diagram 2

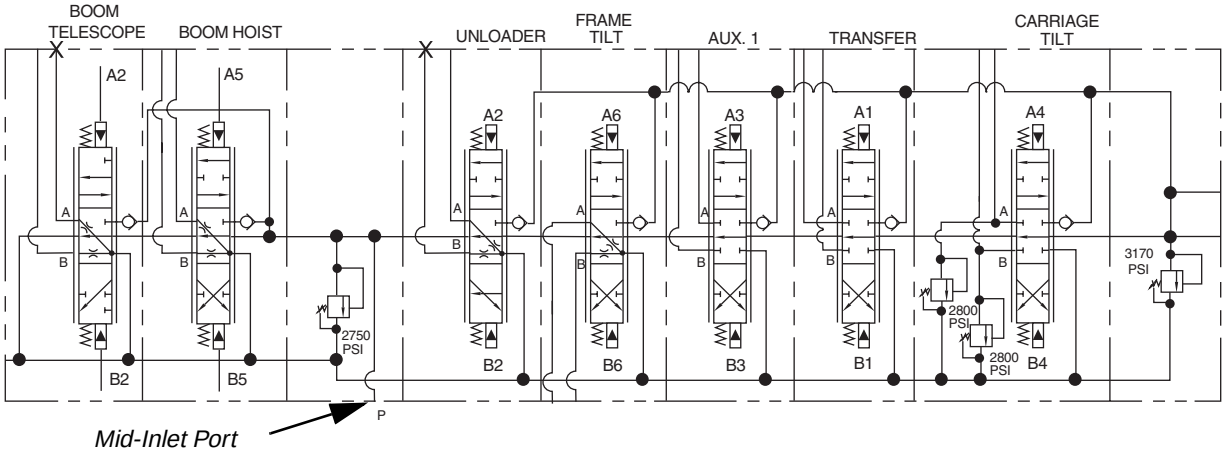


Schematic, Model 644B w/Naturally Aspirated Engine, Mid-Inlet Hydraulic System - Diagram 2



Schematic, Model 644B w/Naturally Aspirated Engine, Mid-Inlet Hydraulic System - Diagram 2





Schematic Symbol for Mid-Inlet Control Valve

This diagram applies to the following Model(s) and serial numbers:

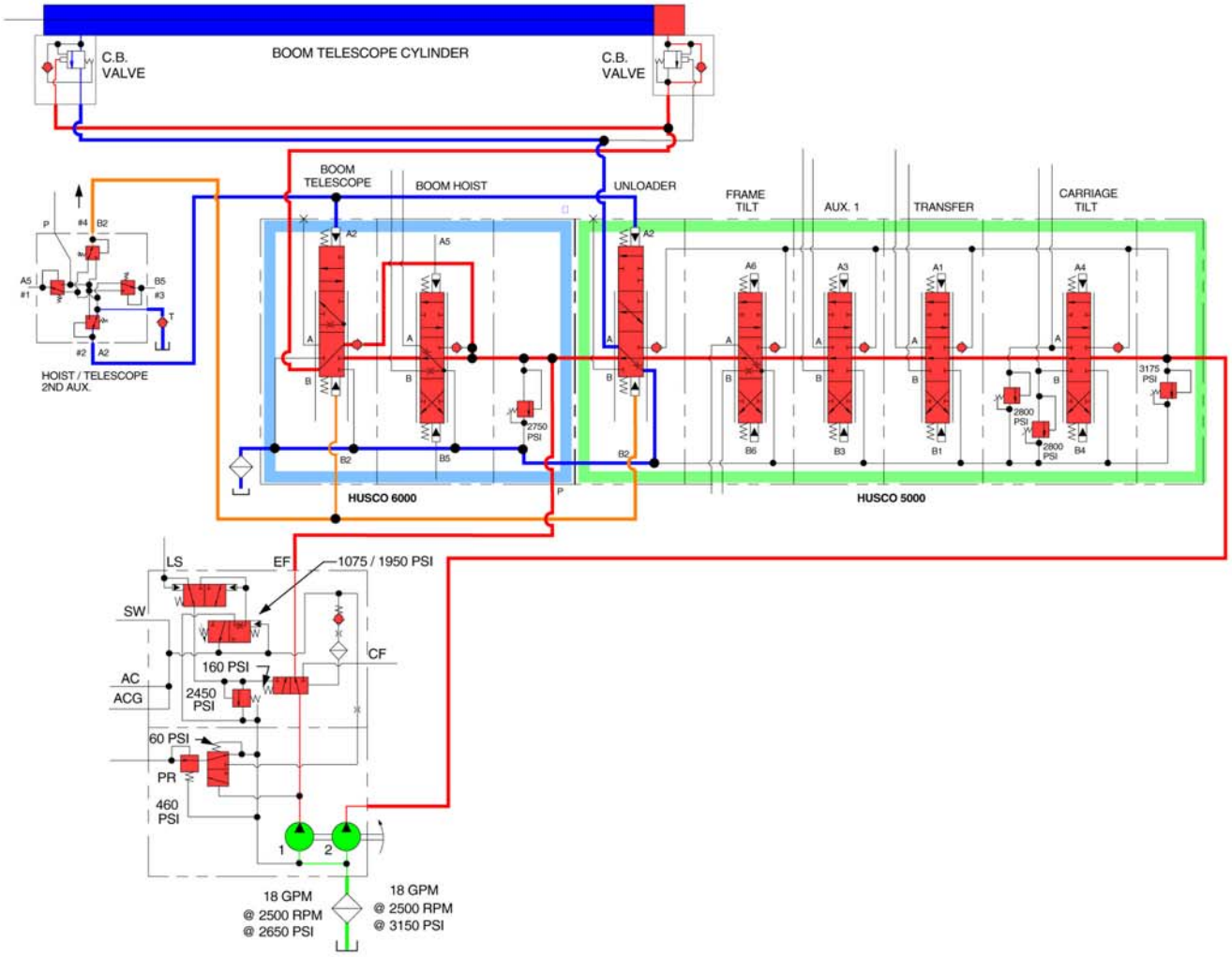
644B-37 ..... S/N: 591, 667-
644B-42 ..... S/N: 208-

Schematic, Model 644B w/Naturally Aspirated Engine, Mid-Inlet Hydraulic System - Diagram 2

NOTES

Pump Unloader Valve Operation, Mid - Inlet Hydraulic System _Diagram 3

PUMP UNLOADER VALVE OPERATION

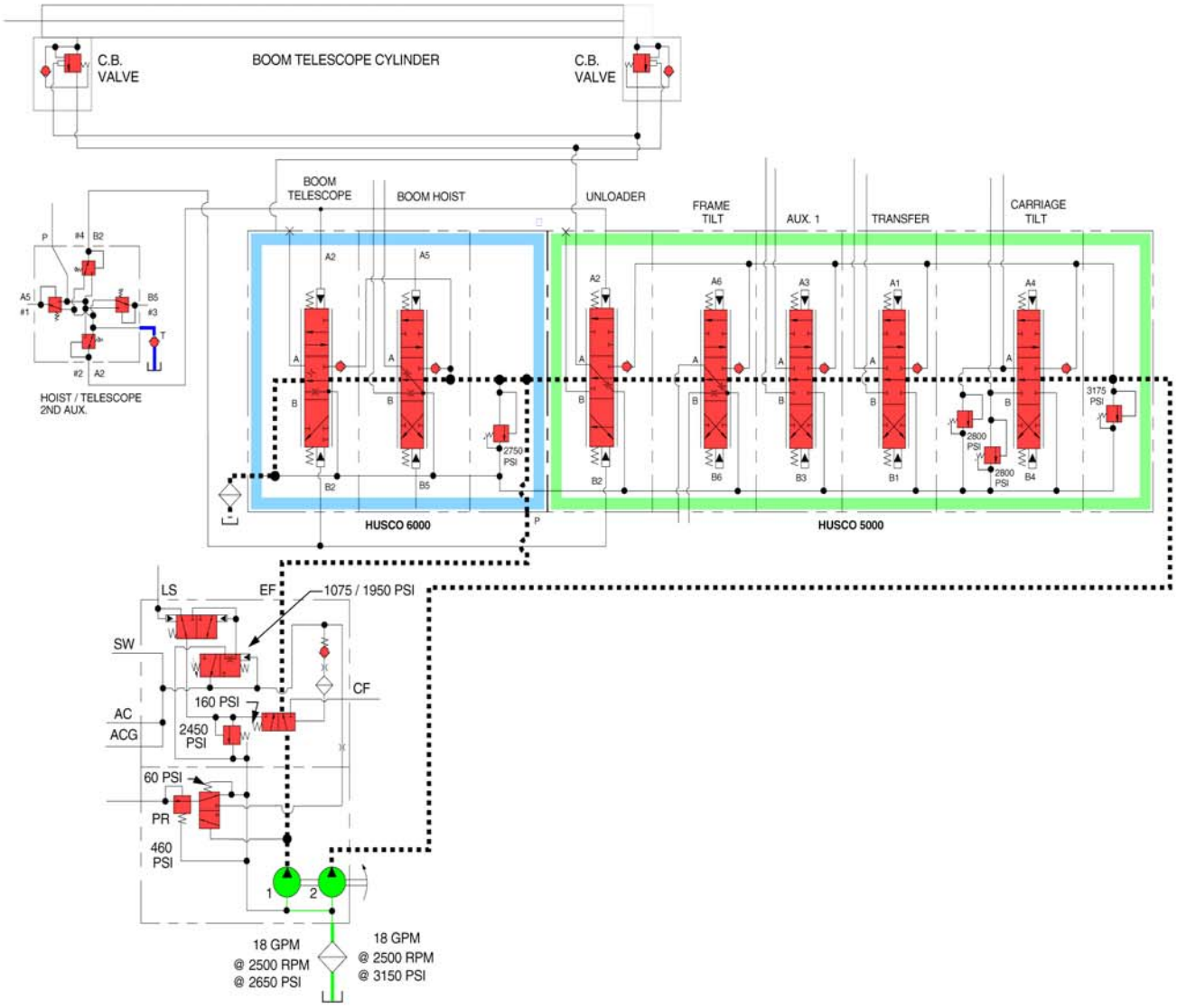


EXTENDING CYLINDER

1. Joystick is moved right to extend boom. Pilot lines to Husco "B2" ports are pressurized, shifting boom extend spool and unloader section spool simultaneously.
2. Husco 5000 unloader section shifts, but 3-way spool does not block center. Oil from this pump joins output from other pump section so full flow is available to extend boom. The "A" port on unloader section opens to tank so cylinder rod end oil has a path to tank.
3. Husco 6000 boom extend 3-way spool shifts blocking center. Oil is routed out "B" port to cylinder base end, extending cylinder.

Pump Unloader Valve Operation, Mid - Inlet Hydraulic System _Diagram 3

PUMP UNLOADER VALVE OPERATION

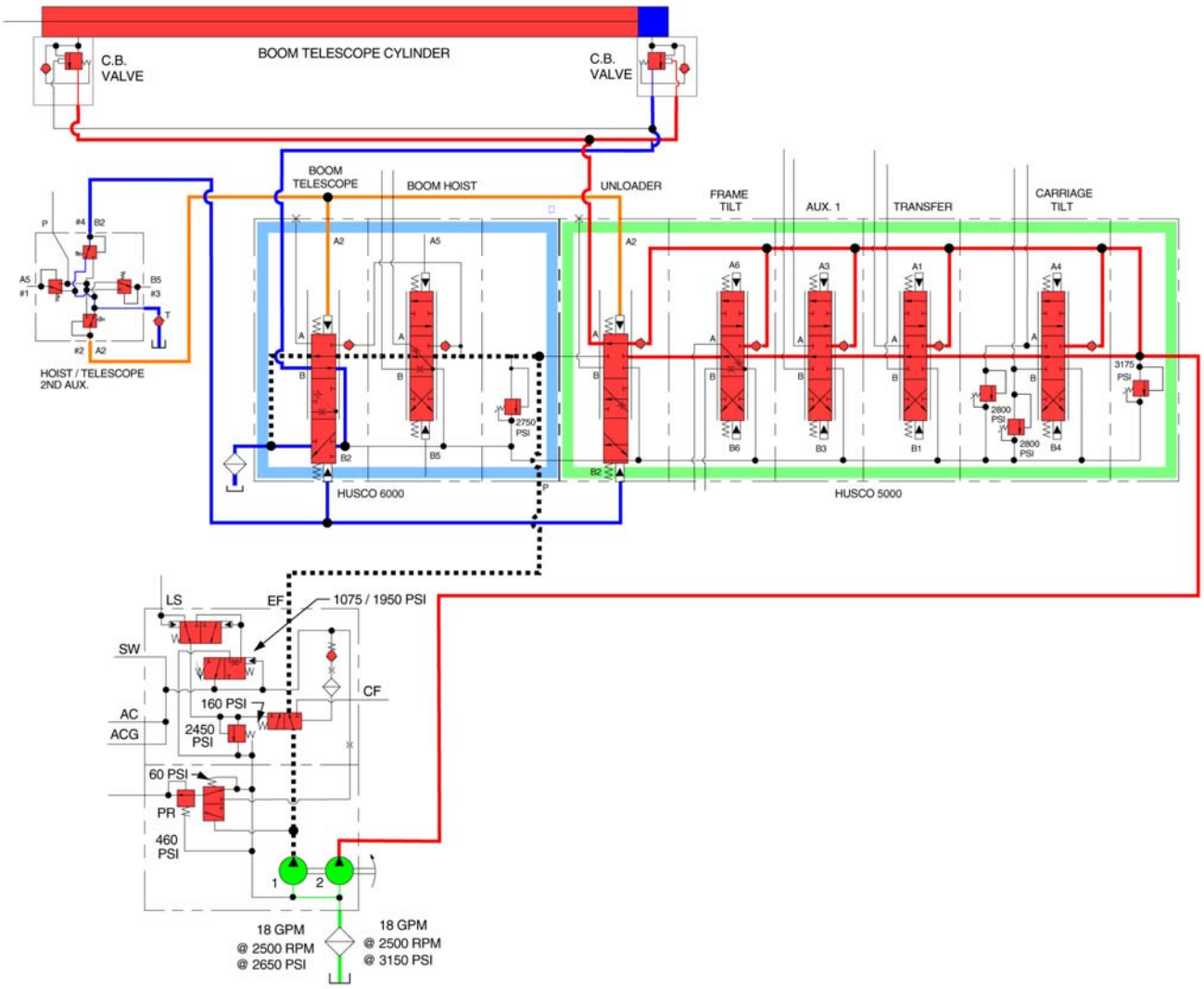


VALVE IN NEUTRAL

OPEN CENTER CORE REMAINS OPEN – PUMP OUTPUT GOES THROUGH VALVE, RETURN FILTER AND BACK INTO RESERVOIR.

Pump Unloader Valve Operation, Mid - Inlet Hydraulic System _Diagram 3

PUMP UNLOADER VALVE OPERATION



RETRACTING CYLINDER

1. Joystick is moved left to retract boom. Pilot lines to Husco "A2" ports are pressurized, shifting boom extend spool and unloader section spool simultaneously.
2. Husco 5000 unloader 3-way spool shifts, blocking center. Oil from pump 2 is routed out the "A" port to cylinder rod end, retracting the cylinder.
3. Husco 6000 boom extend 3-way spool shifts, but spool does **not** block center. Oil from pump 1 goes back to tank at low pressure. This conserves engine horsepower while retracting boom. The boom extend "B" port opens to tank so cylinder base end oil has a path to tank. Boom retraction speed is not effected using only one pump section because rod end has just over half the area of the base end. Because the boom retract operates off the Husco 5000 valve, 3175 psi is available for retracting loads.

Pump Unloader Valve Operation, Mid - Inlet Hydraulic System _Diagram 3

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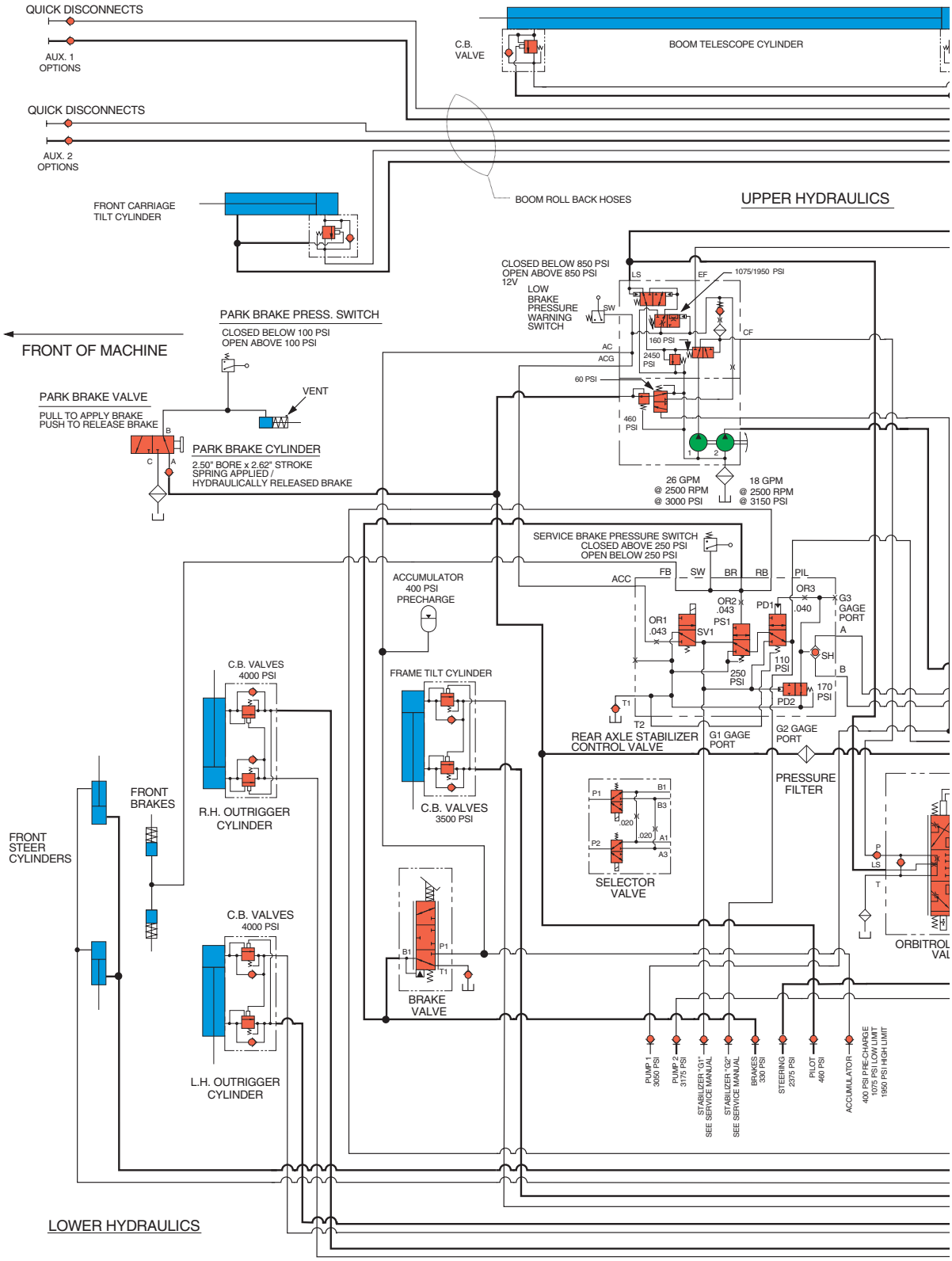
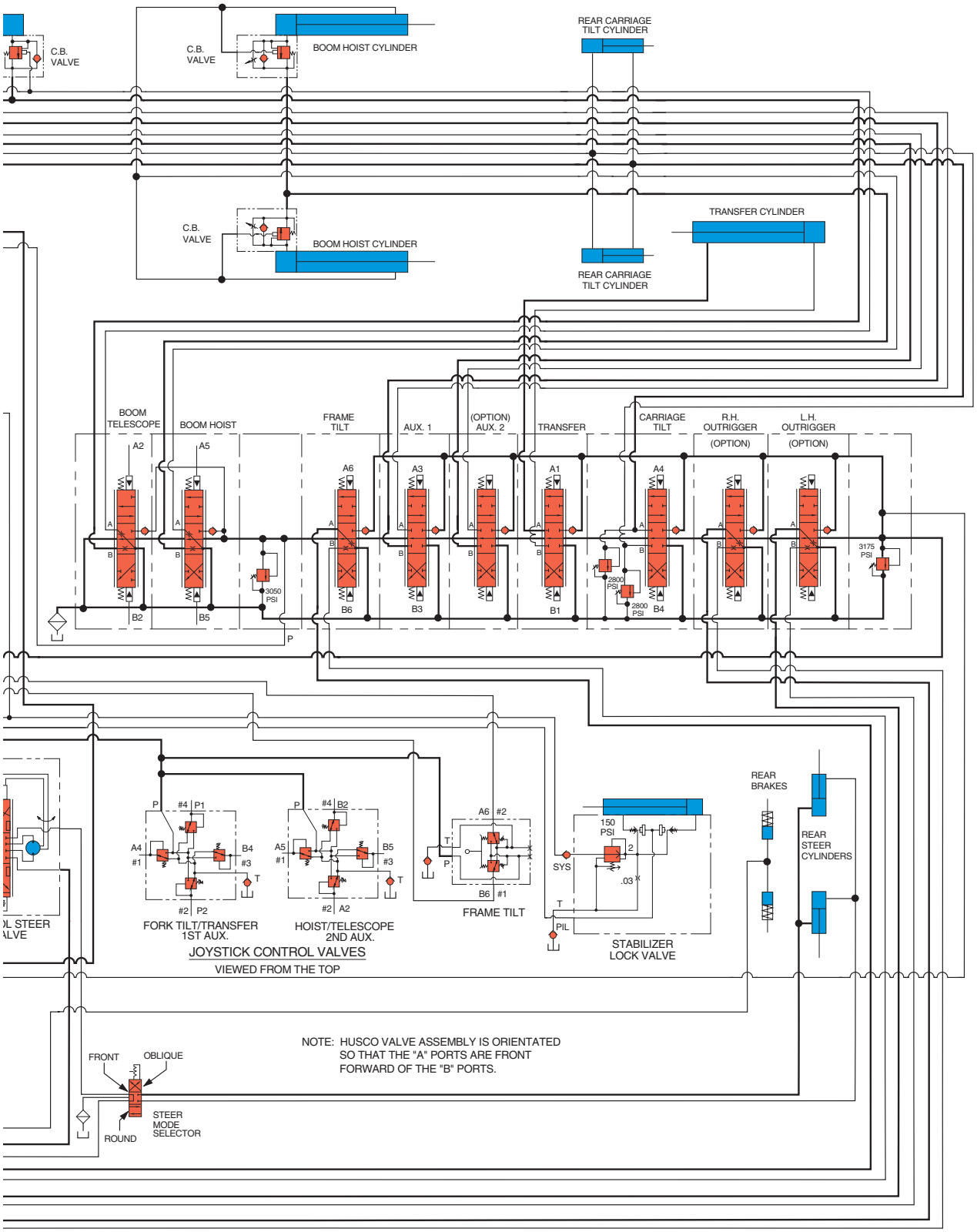
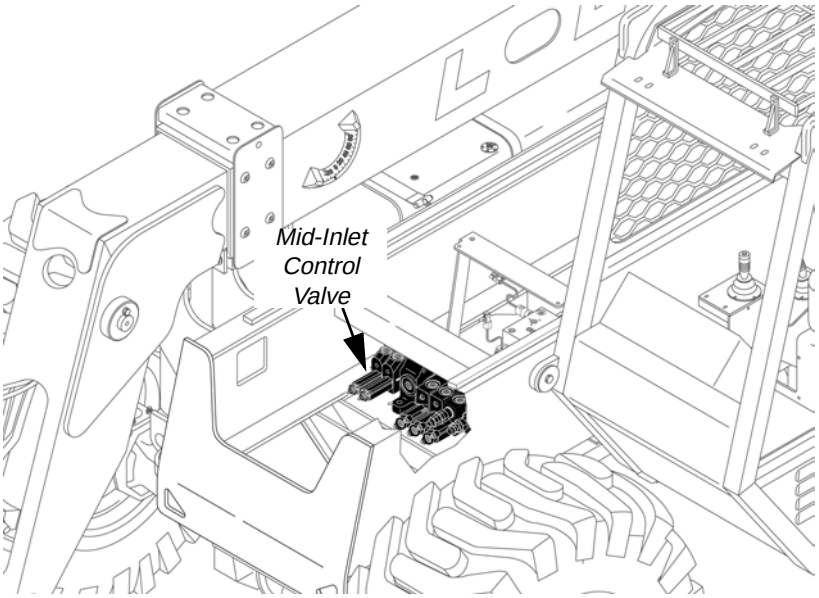
Schematic, Models 644B, 844C, 1044C-42 w/Turbocharged Engine, Mid-Inlet Hydraulic Sys.-Diagram 4

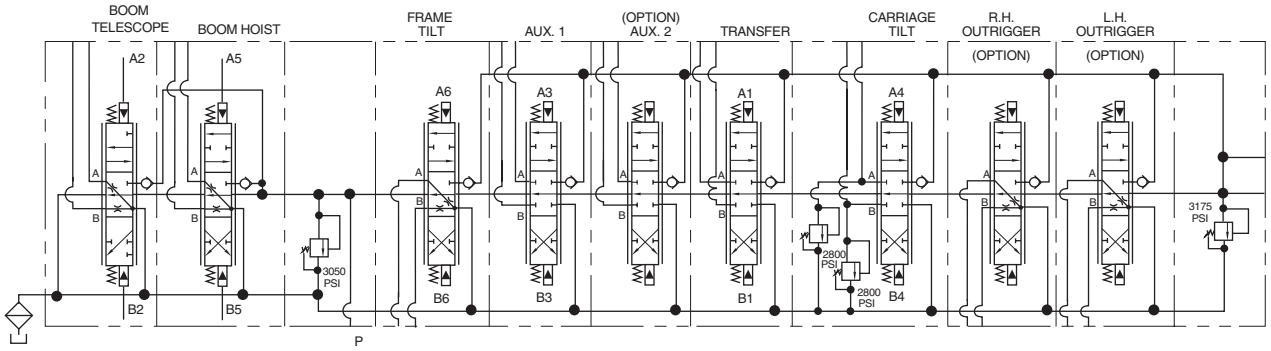


Schematic, Models 644B, 844C, 1044C-42 w/Turbocharged Engine, Mid-Inlet Hydraulic Sys.-Diagram 4



Schematic, Models 644B, 844C, 1044C-42 w/Turbocharged Engine, Mid-Inlet Hydraulic Sys.-Diagram 4





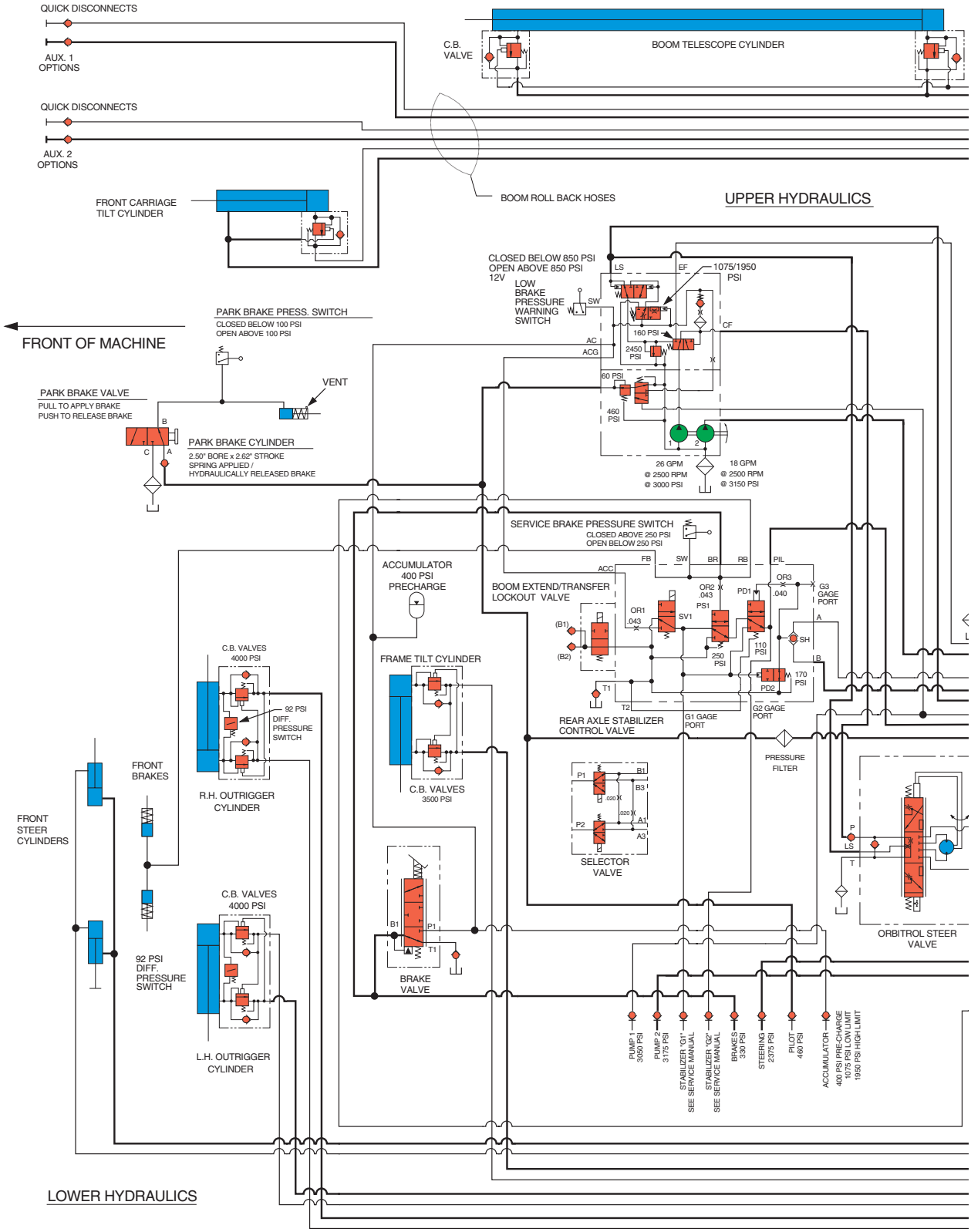
This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 591, 667-
644B-42 ..... S/N: 208-
844C-42 ..... S/N: 622-
1044C-42 ..... S/N: 117-

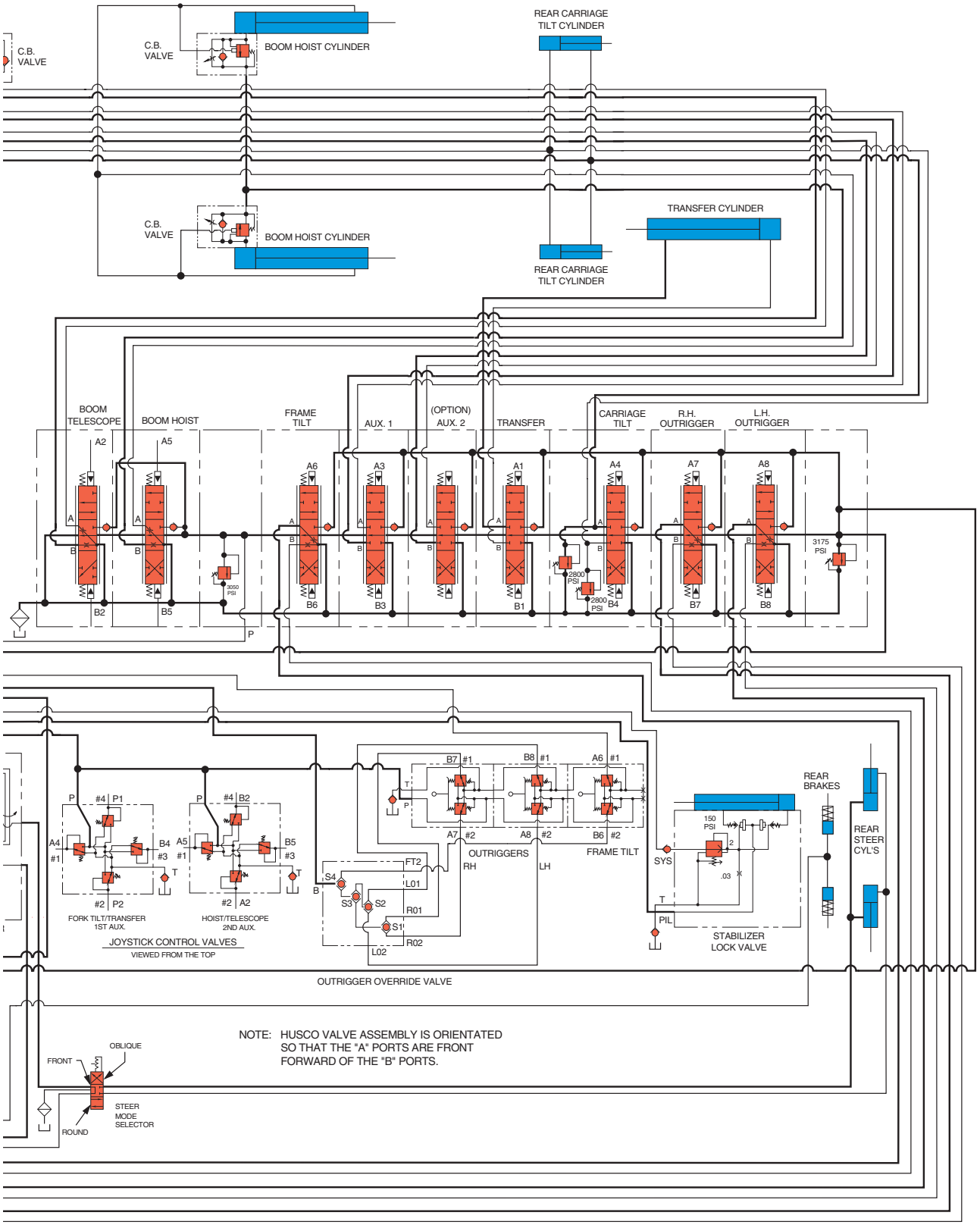
Schematic, Models 644B, 844C, 1044C-42 w/Turbocharged Engine, Mid-Inlet Hydraulic Sys.-Diagram 4

NOTES

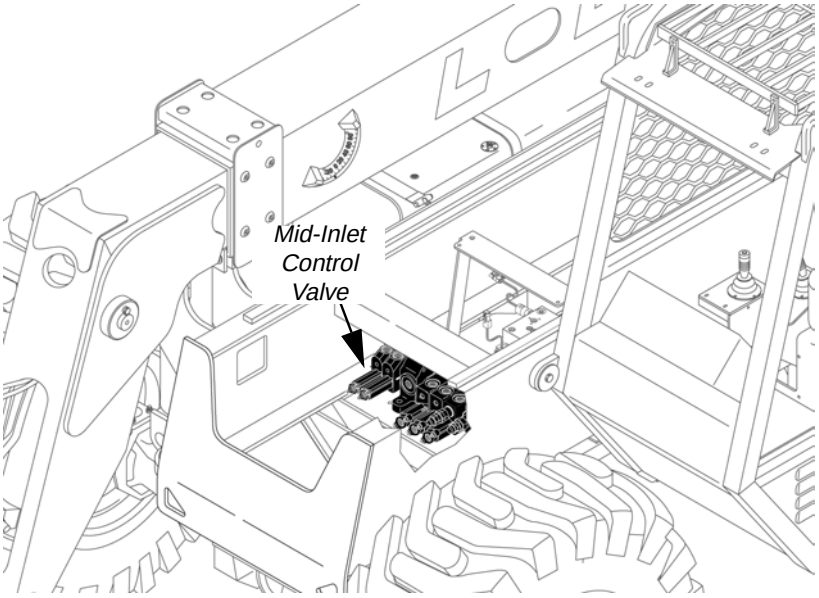
Schematic, Model 1044C-54, Mid-Inlet Hydraulic System - Diagram 5

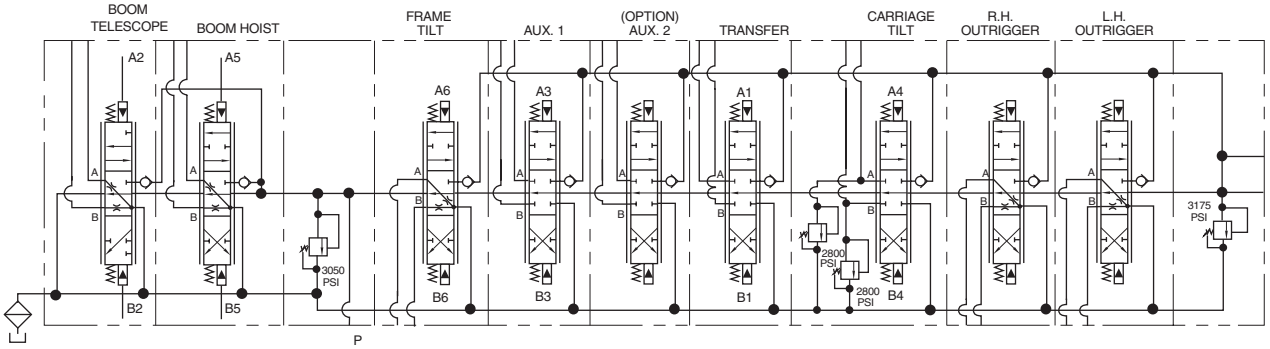


Schematic, Model 1044C-54, Mid-Inlet Hydraulic System - Diagram 5



Schematic, Model 1044C-54, Mid-Inlet Hydraulic System - Diagram 5





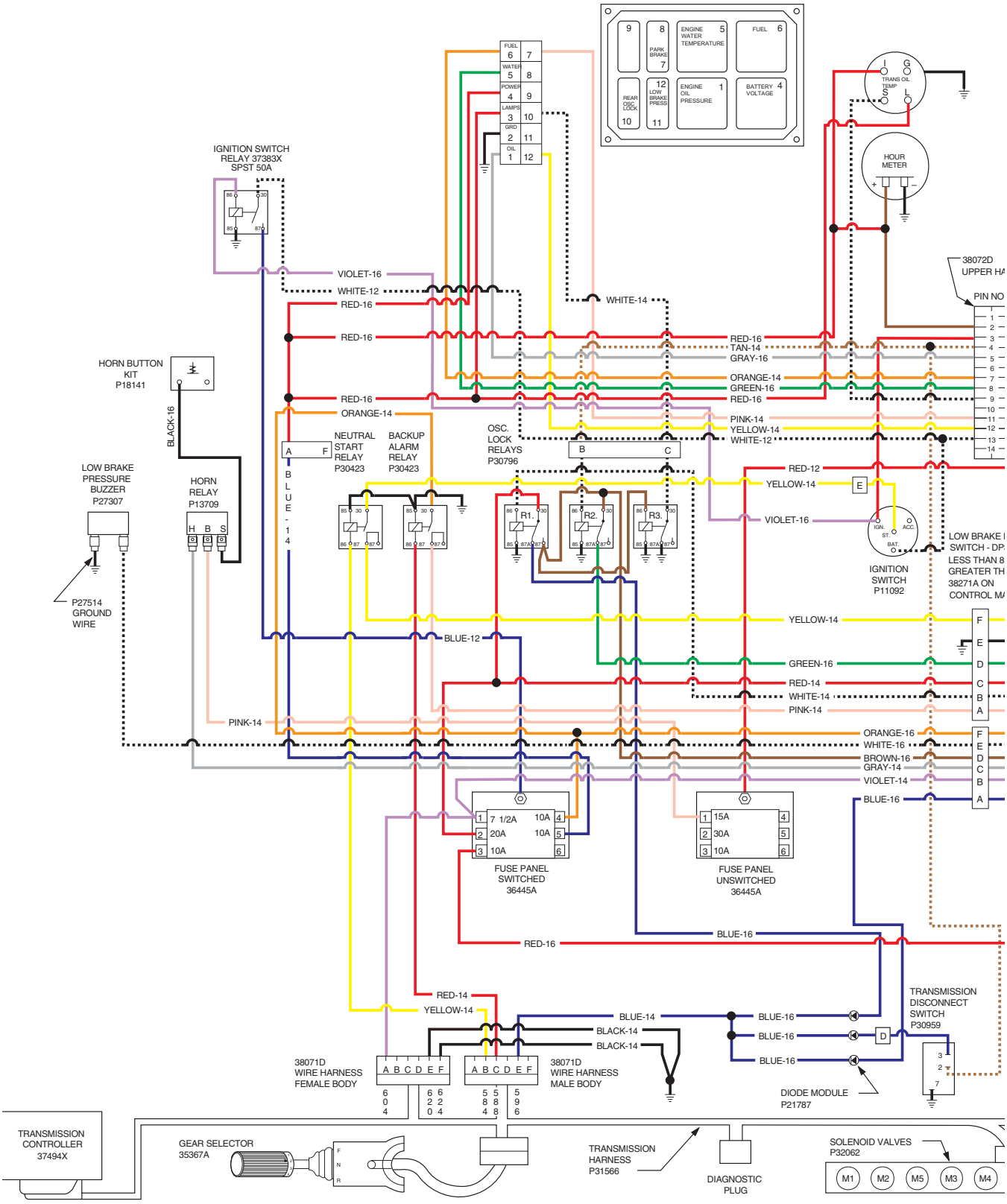
This diagram applies to the following Model(s) and serial numbers:

1044C-54 ..... S/N: 155-

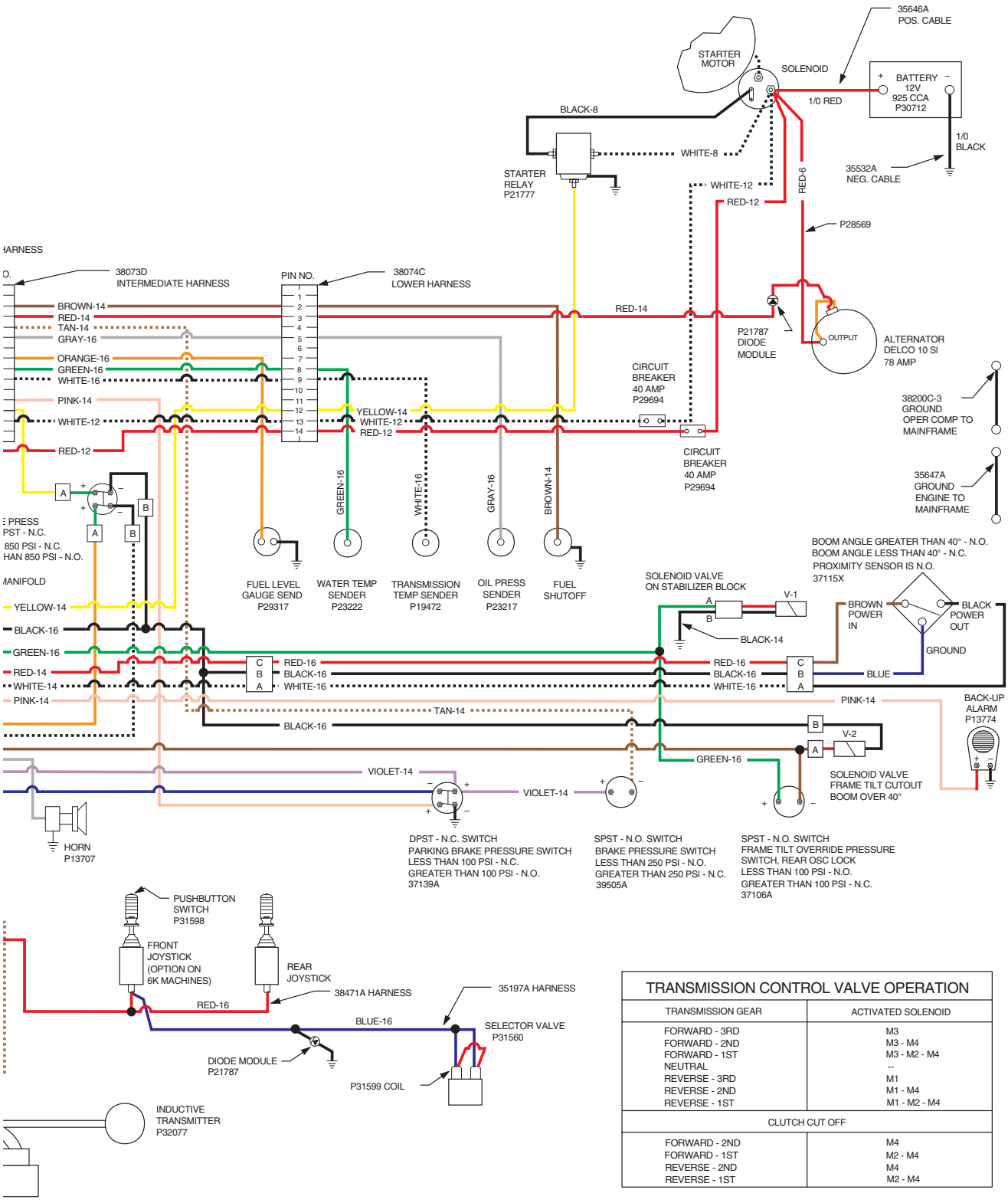
Schematic, Model 1044C-54, Mid-Inlet Hydraulic System - Diagram 5

NOTES

Electrical Diagram, Models 644B and 6K w/Control Manifold Hydraulic System - Diagram 6



Electrical Diagram, Models 644B and 6K w/Control Manifold Hydraulic System - Diagram 6



TRANSMISSION CONTROL VALVE OPERATION

TRANSMISSION GEAR	ACTIVATED SOLENOID
FORWARD - 3RD	M3
FORWARD - 2ND	M3 - M4
FORWARD - 1ST	M3 - M2 - M4
NEUTRAL	--
REVERSE - 3RD	M1
REVERSE - 2ND	M1 - M4
REVERSE - 1ST	M1 - M2 - M4
CLUTCH CUT OFF	
FORWARD - 2ND	M4
FORWARD - 1ST	M2 - M4
REVERSE - 2ND	M4
REVERSE - 1ST	M2 - M4

Electrical Diagram, Models 644B and 6K w/Control Manifold Hydraulic System - Diagram 6

NOTES

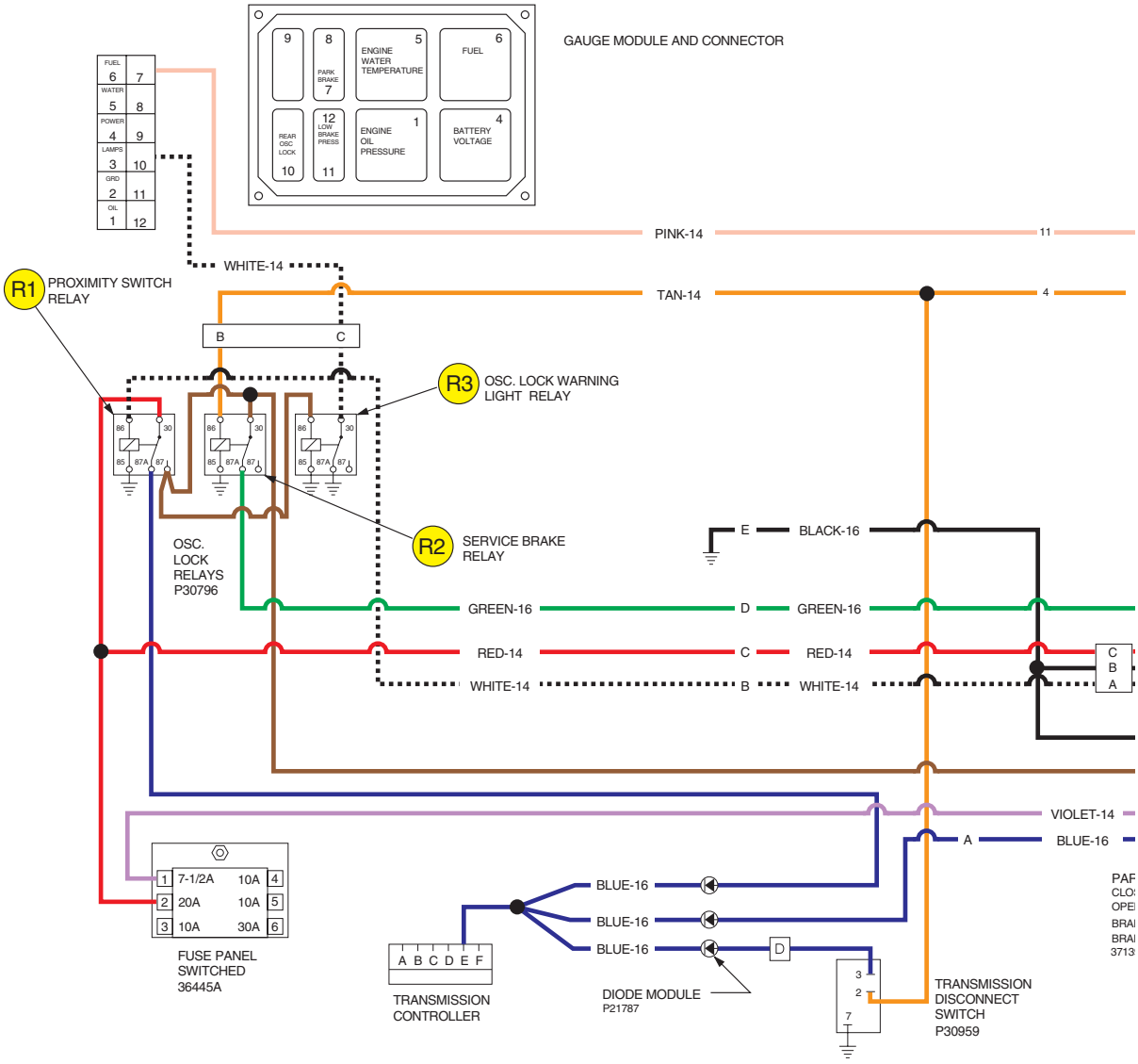
This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 101–590, 592–666
644B-42 ..... S/N: 101–207
6K-37 ..... S/N: 101–317
6K-42 ..... S/N: 101–119

Electrical Diagram, Models 644B and 6K w/Control Manifold Hydraulic System - Diagram 6

NOTES

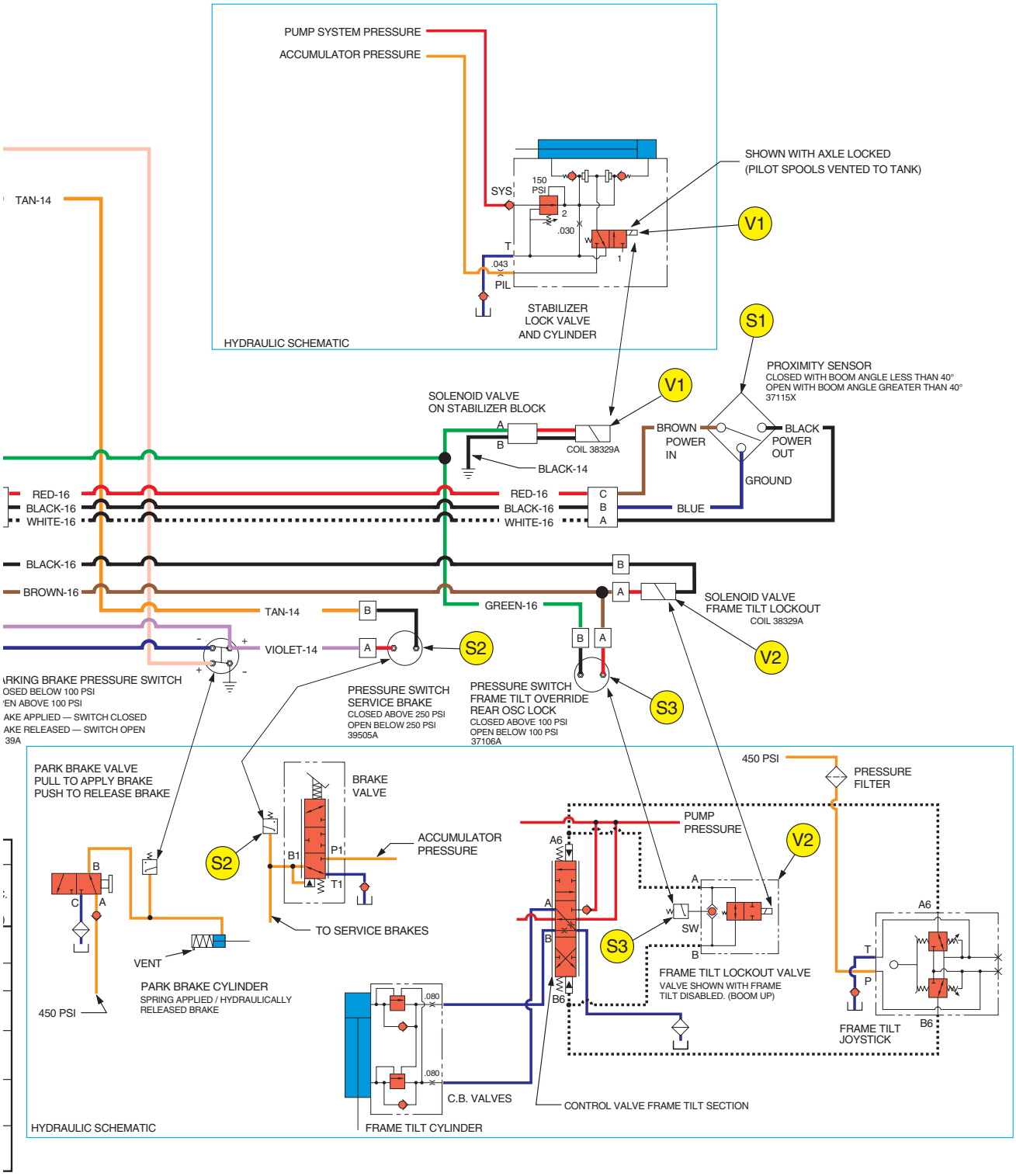
Rear Oscillation Lock System Operation, Control Manifold Hydraulic System - Diagram 7



REAR OSCILLATION LOCK SYSTEM OPERATION / TROUBLESHOOTING GUIDE

OPERATING PARAMETERS	(S1) PROXIMITY SWITCH	(S2) SERVICE BRAKE SWITCH	(S3) FRAME TILT OVER-RIDE SWITCH	(R1) RELAY #1 PIN #86	(R2) RELAY #2 PIN #86	(R3) RELAY #3 PIN #86	(V1) STABILIZER SOLENOID	(V2) FRAME TILT LOCKOUT SOLENOID	REAR OSC. LOCKED LIGHT (10)
BOOM BELOW 40° SERVICE BRAKE RELEASED	CLOSED	OPEN	OPEN	12 VOLTS	0 VOLTS	12 VOLTS	ENERGIZED (UNLOCKED)	ENERGIZED FRAME TILT ALLOWED	OFF
BOOM BELOW 40° SERVICE BRAKE APPLIED	CLOSED	CLOSED	OPEN	12 VOLTS	12 VOLTS	12 VOLTS	DE-ENERGIZED (LOCKED)	ENERGIZED FRAME TILT ALLOWED	OFF
BOOM BELOW 40° SERVICE BRAKE APPLIED OPERATING FRAME TILT	CLOSED	CLOSED	CLOSED	12 VOLTS	12 VOLTS	12 VOLTS	ENERGIZED (UNLOCKED)	ENERGIZED- WHILE FRAME TILTING	OFF
BOOM ABOVE 40° SERVICE BRAKE RELEASED	OPEN	OPEN	OPEN	0 VOLTS	0 VOLTS	0 VOLTS	DE-ENERGIZED (LOCKED)	DE-ENERGIZED FRAME TILT DISABLED	ON
BOOM ABOVE 40° SERVICE BRAKE APPLIED	OPEN	CLOSED	OPEN	0 VOLTS	12 VOLTS	0 VOLTS	DE-ENERGIZED (LOCKED)	DE-ENERGIZED FRAME TILT DISABLED	ON
BOOM ABOVE 40° (ATTEMPTING TO FRAME TILT)	OPEN	DEPENDS ON BRAKE POSITION	OPEN	0 VOLTS	DEPENDS ON BRAKE POSITION	0 VOLTS	DE-ENERGIZED (LOCKED)	DE-ENERGIZED FRAME TILT DISABLED	ON

Rear Oscillation Lock System Operation, Control Manifold Hydraulic System - Diagram 7



Rear Oscillation Lock System Operation, Control Manifold Hydraulic System - Diagram 7

NOTES

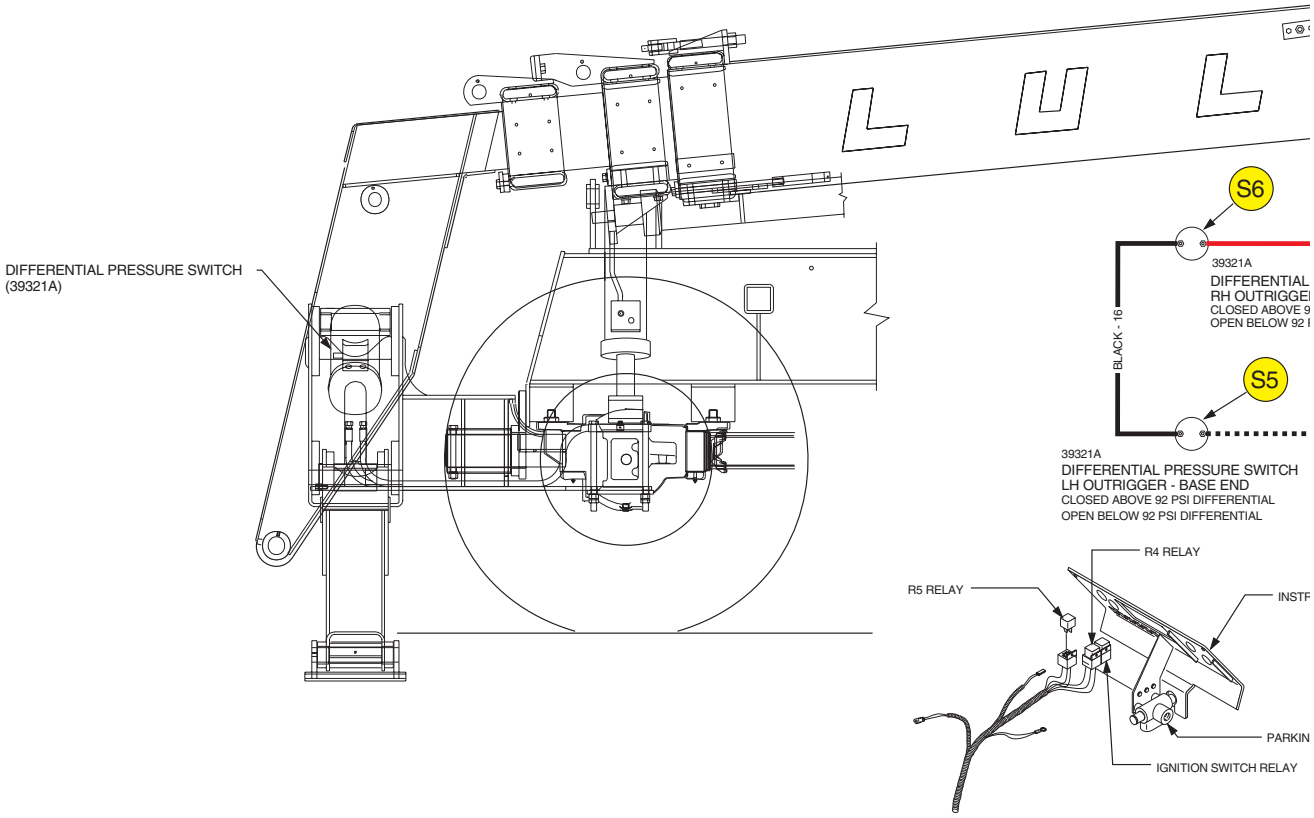
This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 101–590, 592–666
644B-42 ..... S/N: 101–207
844C-42 ..... S/N: 101-621
1044C-42 ..... S/N: 101-116
1044C-54 ..... S/N: 101-154
6K-37 ..... S/N: 101–317
6K-42 ..... S/N: 101–119
8K-42 ..... S/N: 101-220
10K-42 ..... S/N: 101-106
10K-54 ..... S/N: 101-103

Rear Oscillation Lock System Operation, Control Manifold Hydraulic System - Diagram 7

NOTES

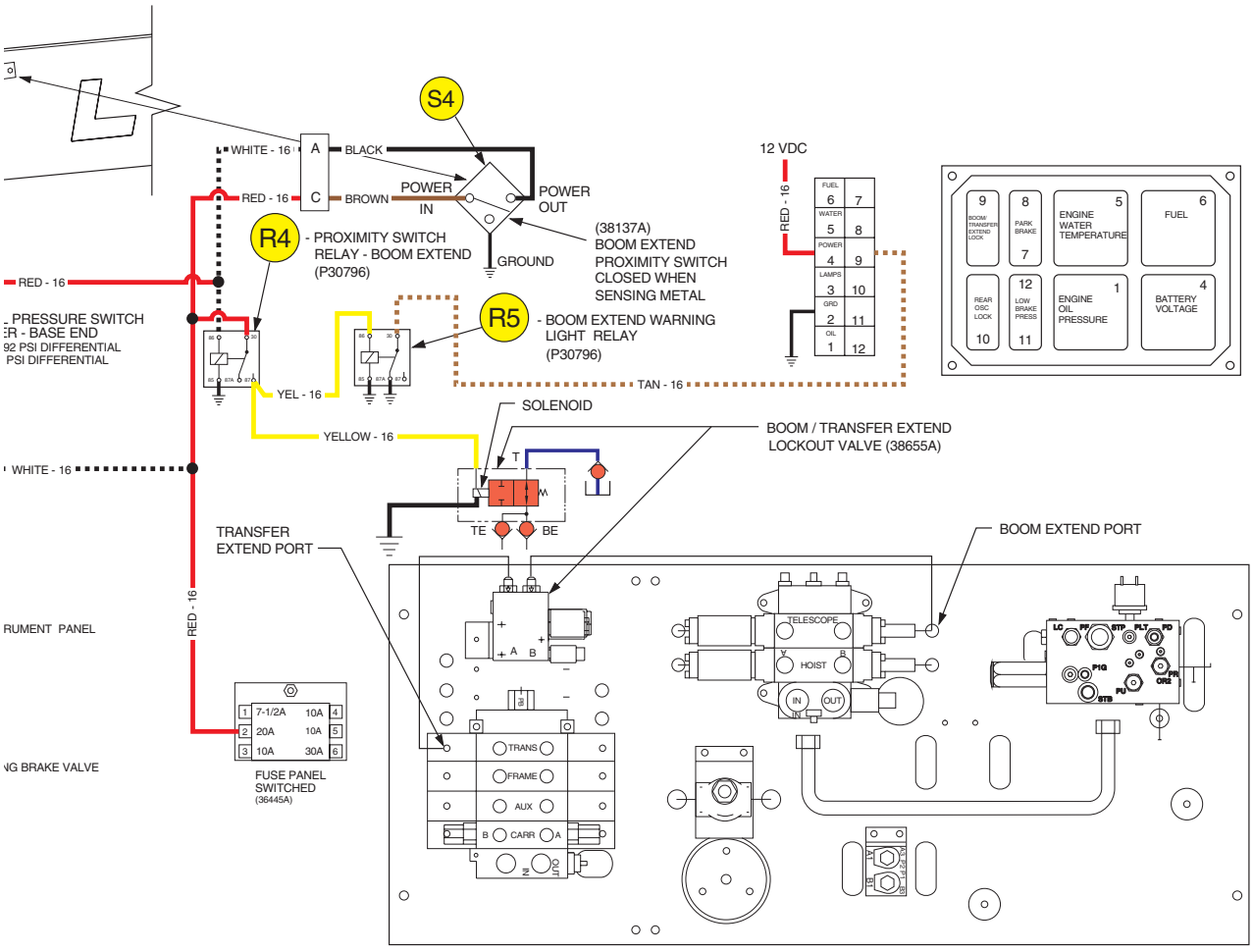
Boom/Transfer Extend Lockout Circuit Operation, Control Manifold Hydraulic System - Diagram 8



BOOM/TRANSFER EXTEND LOCKOUT CIRCUIT OPERATION

OPERATING PARAMETERS	(S4) PROXIMITY SWITCH	(S6) LH OUTRIGGER SWITCH	(S6) RH OUTRIGGER SWITCH	(R4) RELAY #4 PIN #86	(R5) RELAY #5 PIN #86	BOOM / TI EXTEND L VALVE S(
BOOM EXTENDED LESS THAN 21' - OUTRIGGERS UP	CLOSED	OPEN	OPEN	12 VOLTS	12 VOLTS	ENERGIZED - BC & TRANSFER EX
BOOM EXTENDED TO 21' OUTRIGGERS UP	OPEN	OPEN	OPEN	0 VOLTS	0 VOLTS	DE-ENERGIZED & TRANSFER EX
BOOM EXTENDED TO 21' OR FURTHER OUTRIGGERS DOWN	OPEN	CLOSED	CLOSED	12 VOLTS	12 VOLTS	ENERGIZED - BC & TRANSFER EX
BOOM EXTENDED LESS THAN 21' OUTRIGGERS DOWN	CLOSED	CLOSED	CLOSED	12 VOLTS	12 VOLTS	ENERGIZED - BC & TRANSFER EX
BOOM EXTENDED TO 21' LH OUTRIGGER UP RH OUTRIGGER DOWN	OPEN	OPEN	CLOSED	0 VOLTS	0 VOLTS	DE-ENERGIZED & TRANSFER EX
BOOM EXTENDED TO 21' LH OUTRIGGER DOWN RH OUTRIGGER UP	OPEN	CLOSED	OPEN	0 VOLTS	0 VOLTS	DE-ENERGIZED & TRANSFER EX

Boom/Transfer Extend Lockout Circuit Operation, Control Manifold Hydraulic System - Diagram 8



TOP VIEW - VALVE PLATE

TRANSFER LOCKOUT SOLENOID	BOOM EXTEND WARNING LIGHT (#9)
OOM EXT. KT. ALLOWED	OFF
- BOOM EXT. KT. DISABLED	ON
OOM EXT. KT. ALLOWED	OFF
OOM EXT. KT. ALLOWED	OFF
- BOOM EXT. KT. DISABLED	ON
- BOOM EXT. KT. DISABLED	ON

BOOM/TRANSFER EXTEND LOCKOUT CIRCUIT

The boom extend / lockout circuit is designed to increase stability of the machine by limiting how far the boom can be extended with the outriggers up. The system will disable the boom extend and transfer extend functions at a boom extension of 21 feet and turns on warning light #9 on the cluster gauge. The left and right outriggers must be lowered to the ground to allow the boom or transfer carriage to be extended further. Normally open differential pressure switches in the outrigger cylinders close when the base end pressure exceeds the rod end pressure by 92 PSI. When both pressure switches close, this completes the circuit allowing the boom and transfer carriage to be extended and turns off light #9. The system is fail-safe because it requires an electrical signal to enable the boom to be extended beyond 21 feet.

Boom/Transfer Extend Lockout Circuit Operation, Control Manifold Hydraulic System - Diagram 8

NOTES

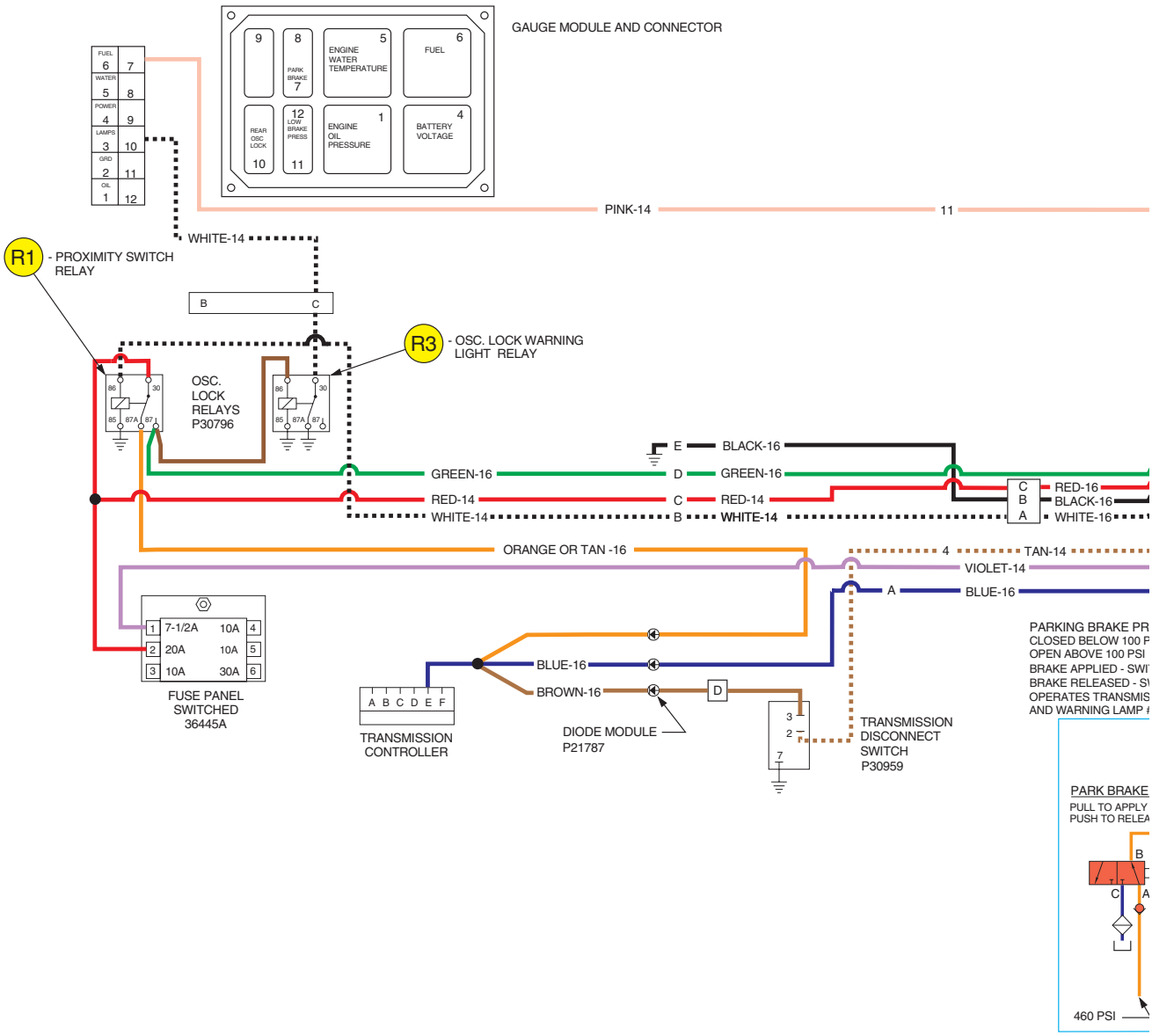
This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 101–590, 592–666
644B-42 ..... S/N: 101–207
844C-42 ..... S/N: 101-621
1044C-42 ..... S/N: 101-116
1044C-54 ..... S/N: 101-154
6K-37 ..... S/N: 101–317
6K-42 ..... S/N: 101–119
8K-42 ..... S/N: 101-220
10K-42 ..... S/N: 101-106
10K-54 ..... S/N: 101-103

Boom/Transfer Extend Lockout Circuit Operation, Control Manifold Hydraulic System - Diagram 8

NOTES

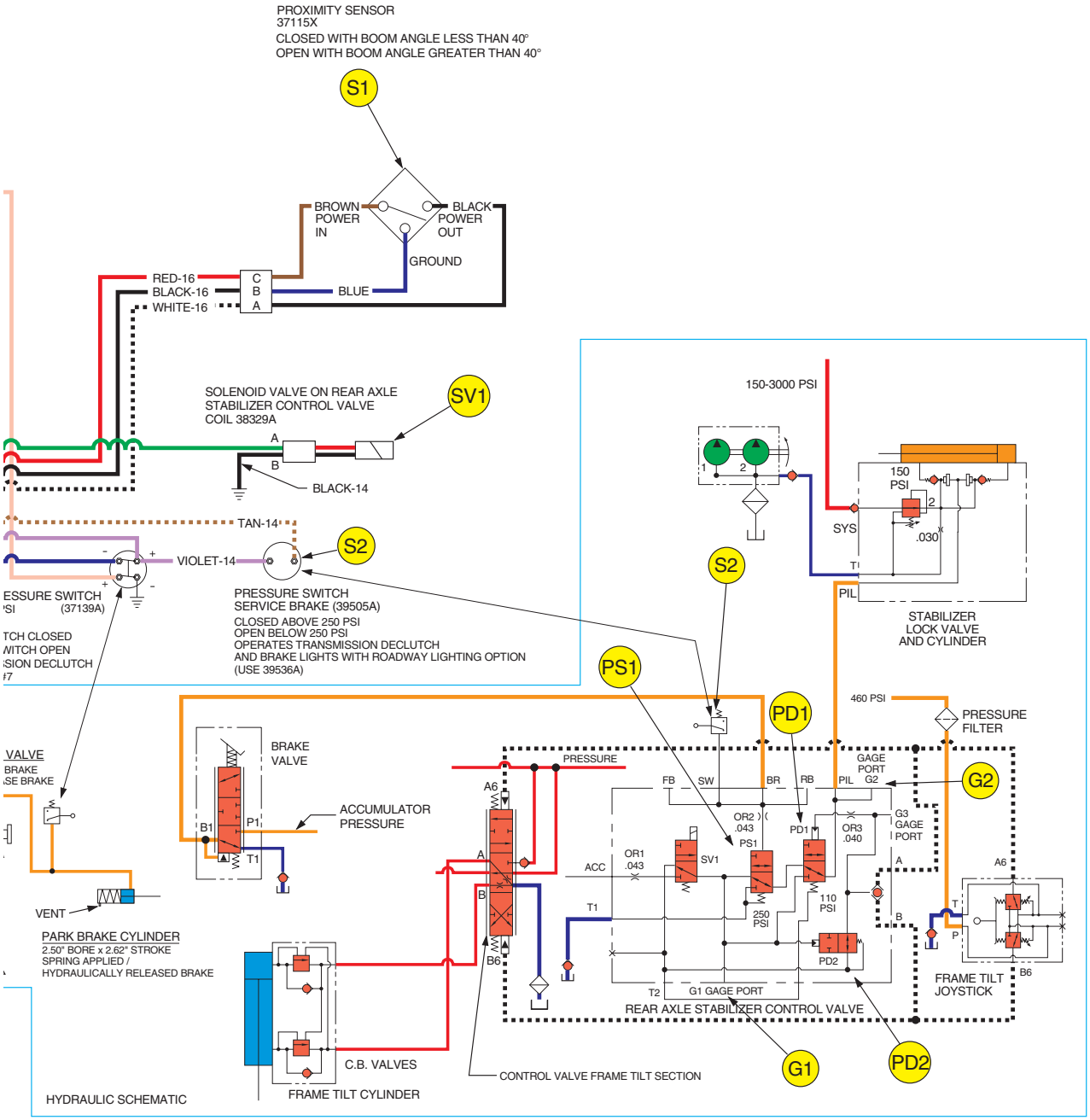
Rear Oscillation Lock System Operation, Mid-Inlet Hysraulic System - Diagram 9



REAR OSCILLATION LOCK SYSTEM OPERATION / TROUBLESHOOTING GUIDE

OPERATING PARAMETERS	S1 PROXIMITY SWITCH	SV1 SOLENOID VALVE	R1 RELAY #1 PIN #86	G1 GAUGE PORT PRESSURE	REAR OSC. LOCKED LIGHT (10)	PD2 FRAME TILT LOCKOUT PILOTED VALVE	PS1 SERVICE BRAKE AXLE LOCK PILOTED VALVE	PD1 FRAME TILT LOCKOUT OVERRIDE PILOTED VALVE	G2 GAUGE PORT PRESSURE	REAR STABILIZER CYLINDER
BOOM BELOW 40° SERVICE BRAKE RELEASED	CLOSED	ENERGIZED	12 VOLTS	1000 PSI MINIMUM	OFF	PILOTED FRAME TILT ALLOWED	UNPILOTED	UNPILOTED	1000 PSI MINIMUM	UNLOCKED
BOOM BELOW 40° SERVICE BRAKE APPLIED	CLOSED	ENERGIZED	12 VOLTS	1000 PSI MINIMUM	OFF	PILOTED FRAME TILT ALLOWED	PILOTED	UNPILOTED	0–5 PSI	LOCKED
BOOM BELOW 40° SERVICE BRAKE APPLIED OPERATING FRAME TILT	CLOSED	ENERGIZED	12 VOLTS	1000 PSI MINIMUM	OFF	PILOTED FRAME TILT ALLOWED	PILOTED FRAME TILT ALLOWED	PILOTED FRAME TILT ALLOWED	1000 PSI MINIMUM	UNLOCKED WHILE FRAME TILTING
BOOM ABOVE 40° SERVICE BRAKE RELEASED	OPEN	DE-ENERGIZED	0 VOLTS	0-5 PSI	ON	UNPILOTED FRAME TILT DISABLED	UNPILOTED	UNPILOTED	0–5 PSI	LOCKED
BOOM ABOVE 40° SERVICE BRAKE APPLIED	OPEN	DE-ENERGIZED	0 VOLTS	0-5 PSI	ON	UNPILOTED FRAME TILT DISABLED	PILOTED	UNPILOTED	0–5 PSI	LOCKED
BOOM ABOVE 40° (ATTEMPTING TO FRAME TILT)	OPEN	DE-ENERGIZED	0 VOLTS	0-5 PSI	ON	UNPILOTED FRAME TILT DISABLED	UNPILOTED	UNPILOTED FRAME TILT DISABLED	0–5 PSI	LOCKED

Rear Oscillation Lock System Operation, Mid-Inlet Hysraulic System - Diagram 9



NOTE: VALVE PSI SETTING IS 1000 PSI
ON DRY DISC BRAKE MACHINES

Rear Oscillation Lock System Operation, Mid-Inlet Hysraulic System - Diagram 9

NOTES

This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 591, 667-
644B-42 ..... S/N: 208-
844C-42 ..... S/N: 622-
1044C-42 ..... S/N: 117-
1044C-54 ..... S/N: 155-
6K-37 ..... S/N: 318-
6K-42 ..... S/N: 120-
8K-42 ..... S/N: 221-
10K-42 ..... S/N: 107-
10K-54 ..... S/N: 104-

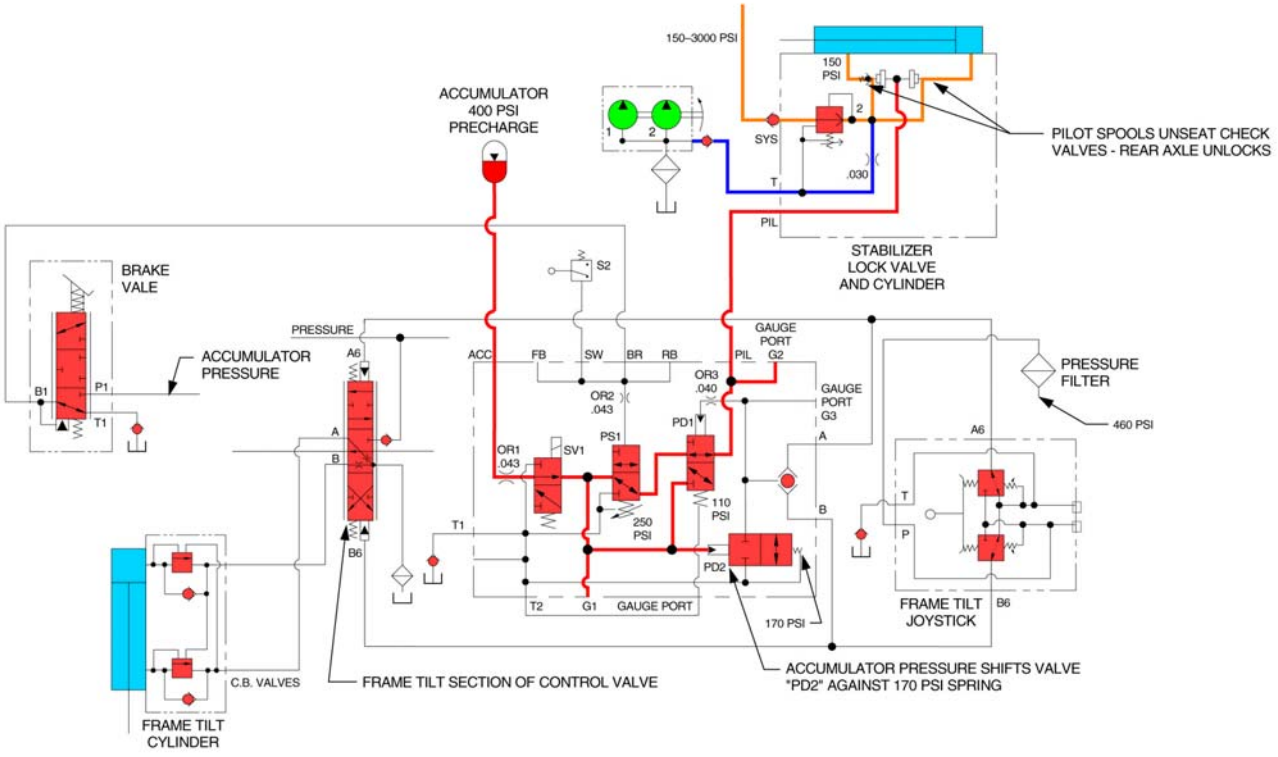
Rear Oscillation Lock System Operation, Mid-Inlet Hysraulic System - Diagram 9

NOTES

Rear Axle Stabilizer Control Valve Operation, Mid-Inlet Hydraulic System - Diagram 10

REAR AXLE STABILIZER CONTROL VALVE OPERATION

(Mid-Inlet Hydraulic Systems)



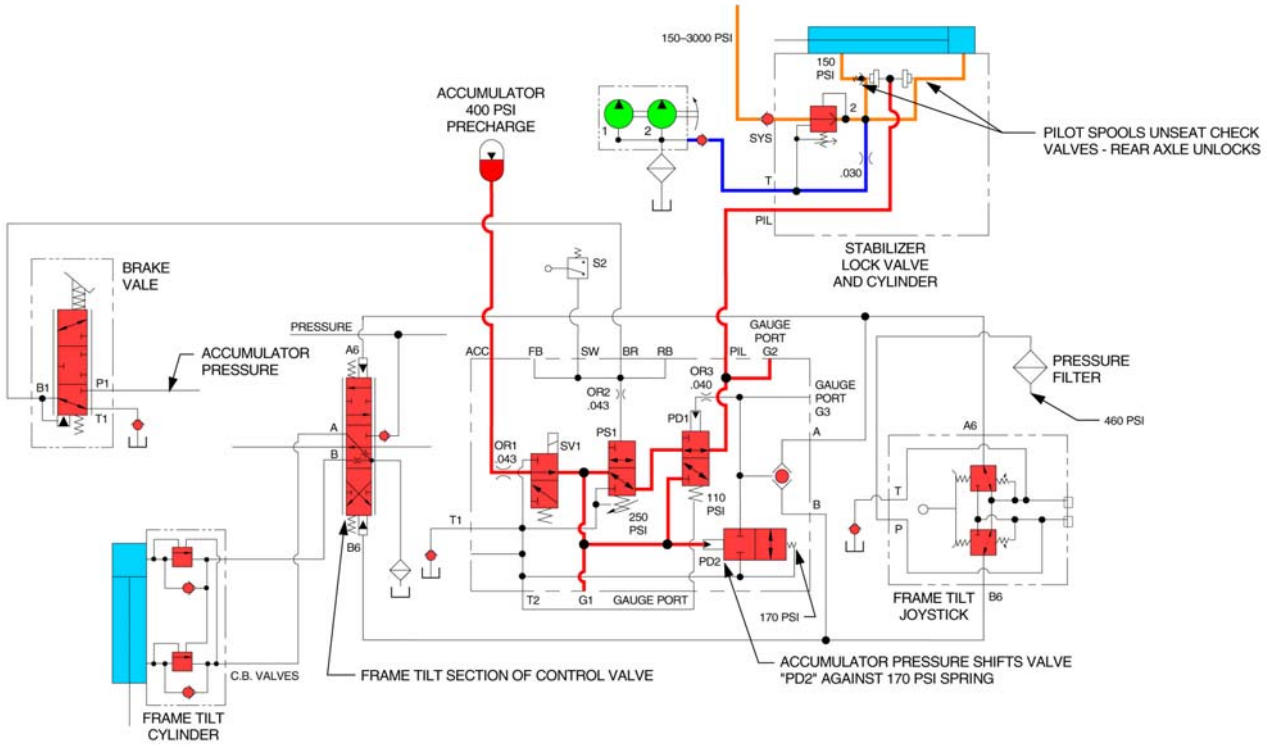
BOOM BELOW 40°

1. Proximity switch senses metal and closes; solenoid valve "SV1" is energized, shifting cartridge*.
2. Accumulator pressure is routed through valves "PS1" and "PD1" to pilot check valves on rear axle stabilizer lock valve.
3. Accumulator pressure also shifts cartridge "PD2" closed. This makes the frame tilt function operational.
4. "G1" and "G2" gauge ports read accumulator pressure (1100–2500 PSI).

Rear Axle Stabilizer Control Valve Operation, Mid-Inlet Hydraulic System - Diagram 10

REAR AXLE STABILIZER CONTROL VALVE OPERATION

(Mid-Inlet Hydraulic Systems)



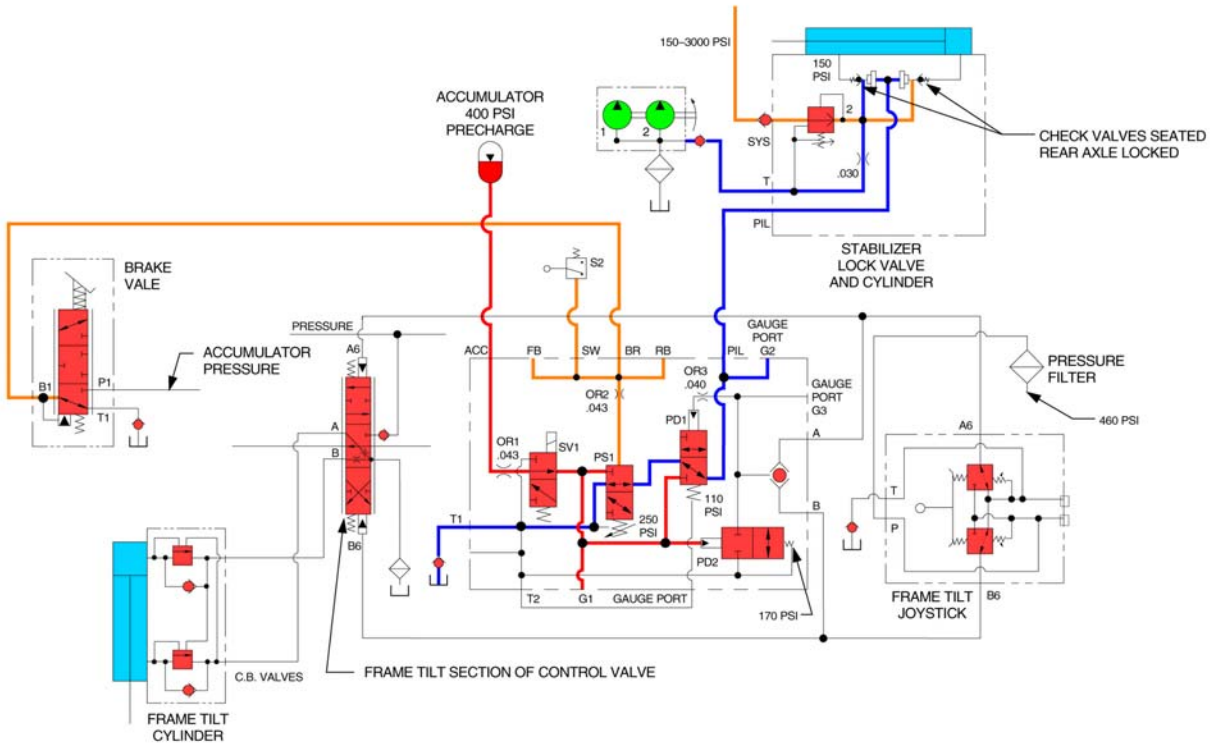
BOOM BELOW 40°

1. Proximity switch senses metal and closes; solenoid valve "SV1" is energized, shifting cartridge*.
2. Accumulator pressure is routed through valves "PS1" and "PD1" to pilot check valves on rear axle stabilizer lock valve.
3. Accumulator pressure also shifts cartridge "PD2" closed. This makes the frame tilt function operational.
4. "G1" and "G2" gauge ports read accumulator pressure (1100–2500 PSI).

Rear Axle Stabilizer Control Valve Operation, Mid-Inlet Hydraulic System - Diagram 10

REAR AXLE STABILIZER CONTROL VALVE OPERATION

(Mid-Inlet Hydraulic Systems)



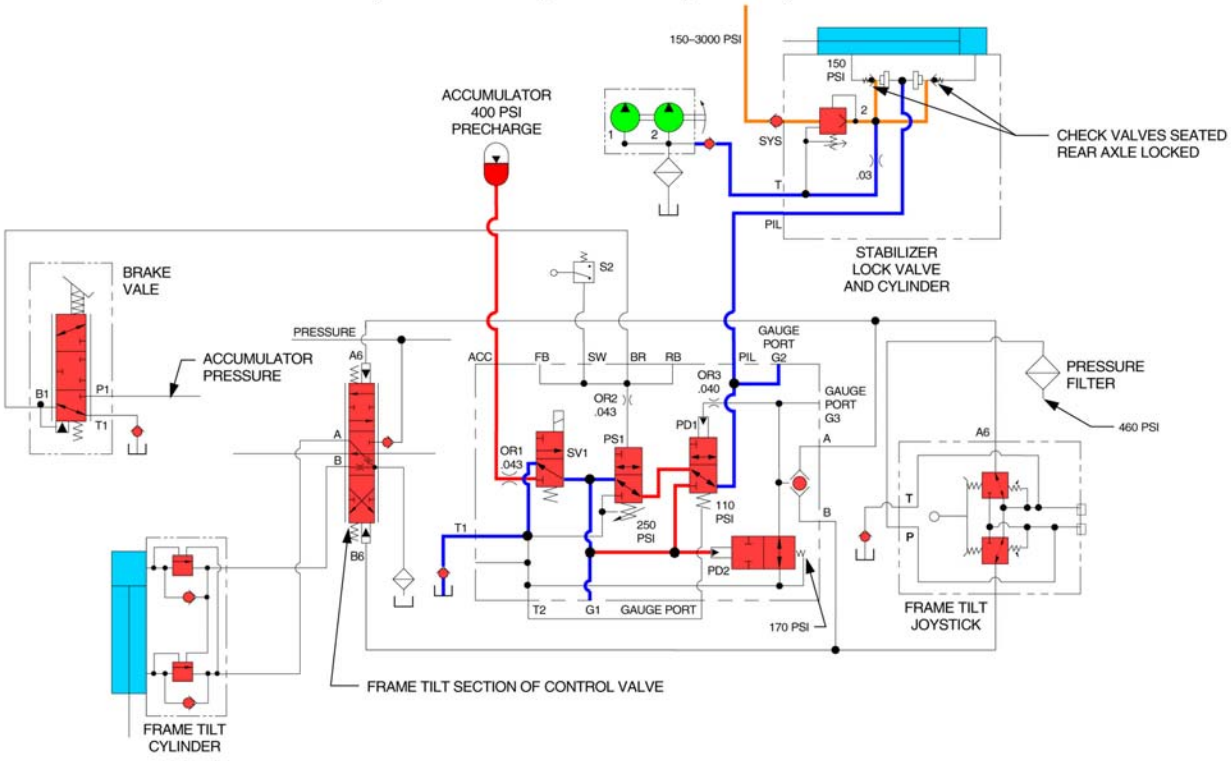
BOOM BELOW 40° WITH SERVICE BRAKE APPLIED

1. Proximity switch senses metal and closes; solenoid valve "SV1" is energized, shifting cartridge*.
2. Accumulator pressure is routed through valve "SV1". When brake line pressure exceeds 250 PSI, valve "PS1" shifts; this vents pilot line to tank. Rear axle stabilizer check valves close, locking axle.
3. "G1" gauge port reads accumulator pressure (1100–2500 PSI).
4. "G2" gauge port reads 0 PSI.

Rear Axle Stabilizer Control Valve Operation, Mid-Inlet Hydraulic System - Diagram 10

REAR AXLE STABILIZER CONTROL VALVE OPERATION

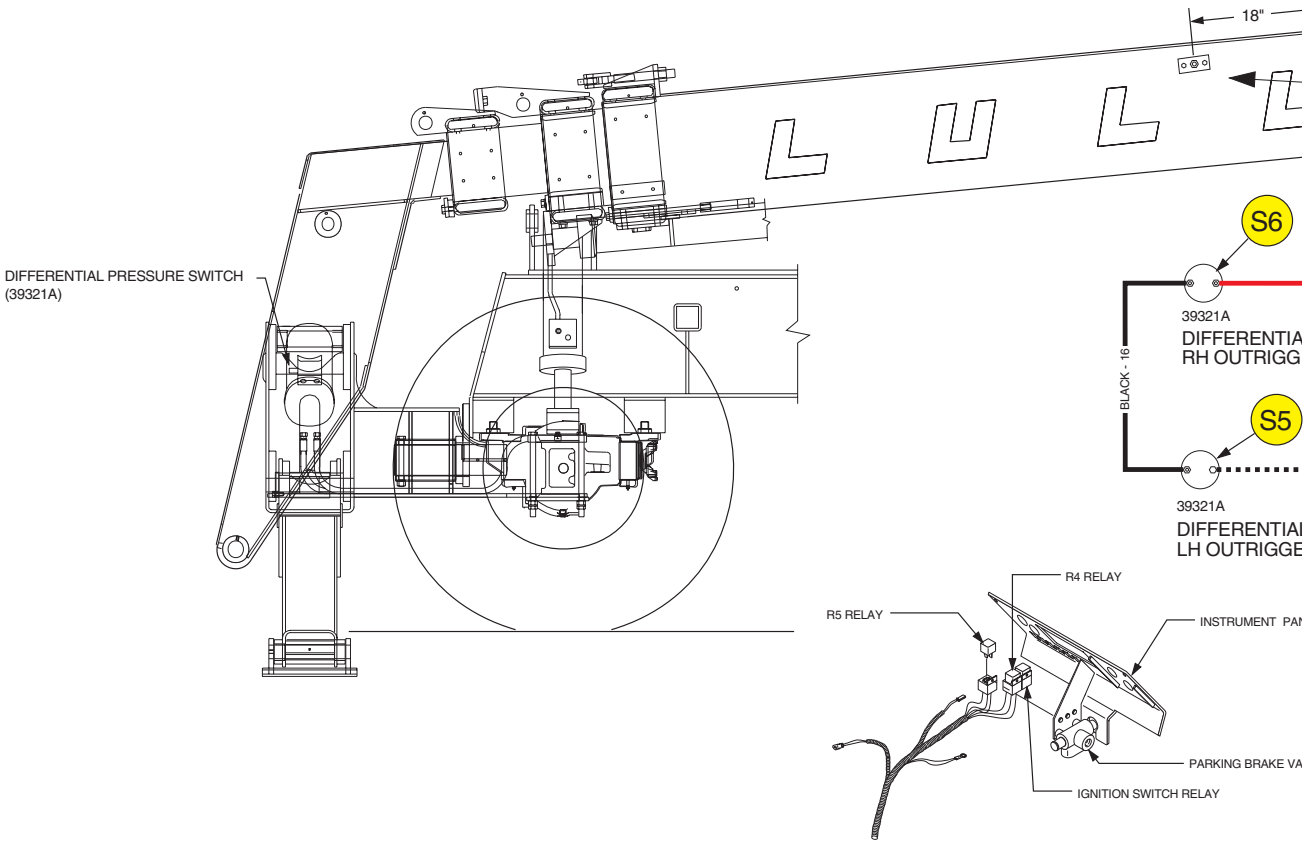
(Mid-Inlet Hydraulic Systems)



BOOM RAISED ABOVE 40°

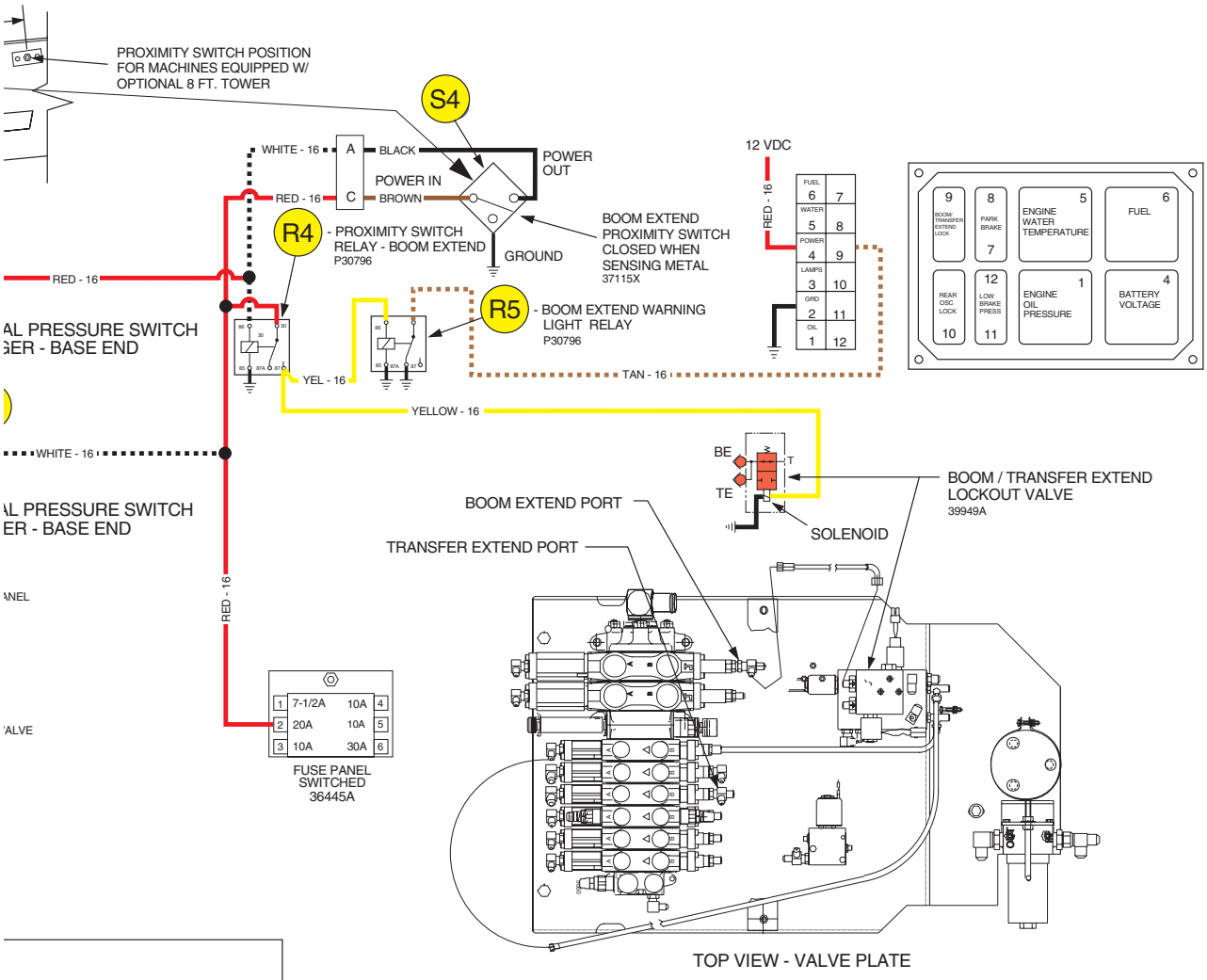
1. Proximity switch no longer senses metal and opens.
2. Relay R1 loses signal, transmission declutches, and dash light comes on*. Solenoid valve "SV1" loses signal and cartridge valve shifts. Pilot line pressure is vented to tank.
3. Valve "PD2" loses pilot pressure and shifts back to its normally open position – venting pressure lines to tank. This disables the frame tilt function.
4. "G1" and "G2" gauge ports read 0 PSI.

Boom/Transfer Extend Lockout Circuit Operation, Mid-Inlet Hydraulic System - Diagram 11



BOOM/TRANSFER EXTEND LOCKOUT CIRCUIT OPERATION						
OPERATING PARAMETERS	S4 PROXIMITY SWITCH	S5 LH OUTRIGGER SWITCH	S6 RH OUTRIGGER SWITCH	R4 RELAY #4 PIN #86	R5 RELAY #5 PIN #86	BOOM/TRANSF EXTEND LOCK VALVE SOLEN
BOOM EXTENDED LESS THAN 21' - OUTRIGGERS UP	CLOSED	OPEN	OPEN	12 VOLTS	12 VOLTS	ENERGIZED - BOOM & TRANSFER EXT. A
BOOM EXTENDED TO 21' OUTRIGGERS UP	OPEN	OPEN	OPEN	0 VOLTS	0 VOLTS	DE-ENERGIZED - BO & TRANSFER EXT. D
BOOM EXTENDED TO 21' OR FURTHER OUTRIGGERS DOWN	OPEN	CLOSED	CLOSED	12 VOLTS	12 VOLTS	ENERGIZED - BOOM & TRANSFER EXT. A
BOOM EXTENDED LESS THAN 21' OUTRIGGERS DOWN	CLOSED	CLOSED	CLOSED	12 VOLTS	12 VOLTS	ENERGIZED - BOOM & TRANSFER EXT. A
BOOM EXTENDED TO 21' LH OUTRIGGER UP RH OUTRIGGER DOWN	OPEN	OPEN	CLOSED	0 VOLTS	0 VOLTS	DE-ENERGIZED - BO & TRANSFER EXT. D
BOOM EXTENDED TO 21' LH OUTRIGGER DOWN RH OUTRIGGER UP	OPEN	CLOSED	OPEN	0 VOLTS	0 VOLTS	DE-ENERGIZED - BO & TRANSFER EXT. D

Boom/Transfer Extend Lockout Circuit Operation, Mid-Inlet Hydraulic System - Diagram 11



TOP VIEW - VALVE PLATE

SFER KOUT NOID	BOOM EXTEND WARNING LIGHT (#9)
M EXT. ALLOWED	OFF
OOM EXT. DISABLED	ON
M EXT. ALLOWED	OFF
M EXT. ALLOWED	OFF
OOM EXT. DISABLED	ON
OOM EXT. DISABLED	ON

BOOM/TRANSFER EXTEND LOCKOUT CIRCUIT

The boom/transfer extend lockout circuit is designed to increase stability of the machine by limiting how far the boom can be extended with the outriggers up. The system will disable the boom extend and transfer extend functions at a boom extension of 21 feet, and turns on warning light #9 on the cluster gauge. The left and right outriggers must be lowered to the ground to allow the boom or transfer carriage to be extended further. Normally open differential pressure switches in the outrigger cylinders close when the base end pressure exceeds the rod end pressure by 92 PSI. When both pressure switches close, this completes the circuit allowing the boom and transfer carriage to be extended and turns off light #9. The system is fail-safe because it requires an electrical signal to enable the boom to be extended beyond 21 feet.

Boom/Transfer Extend Lockout Circuit Operation, Mid-Inlet Hydraulic System - Diagram 11

NOTES

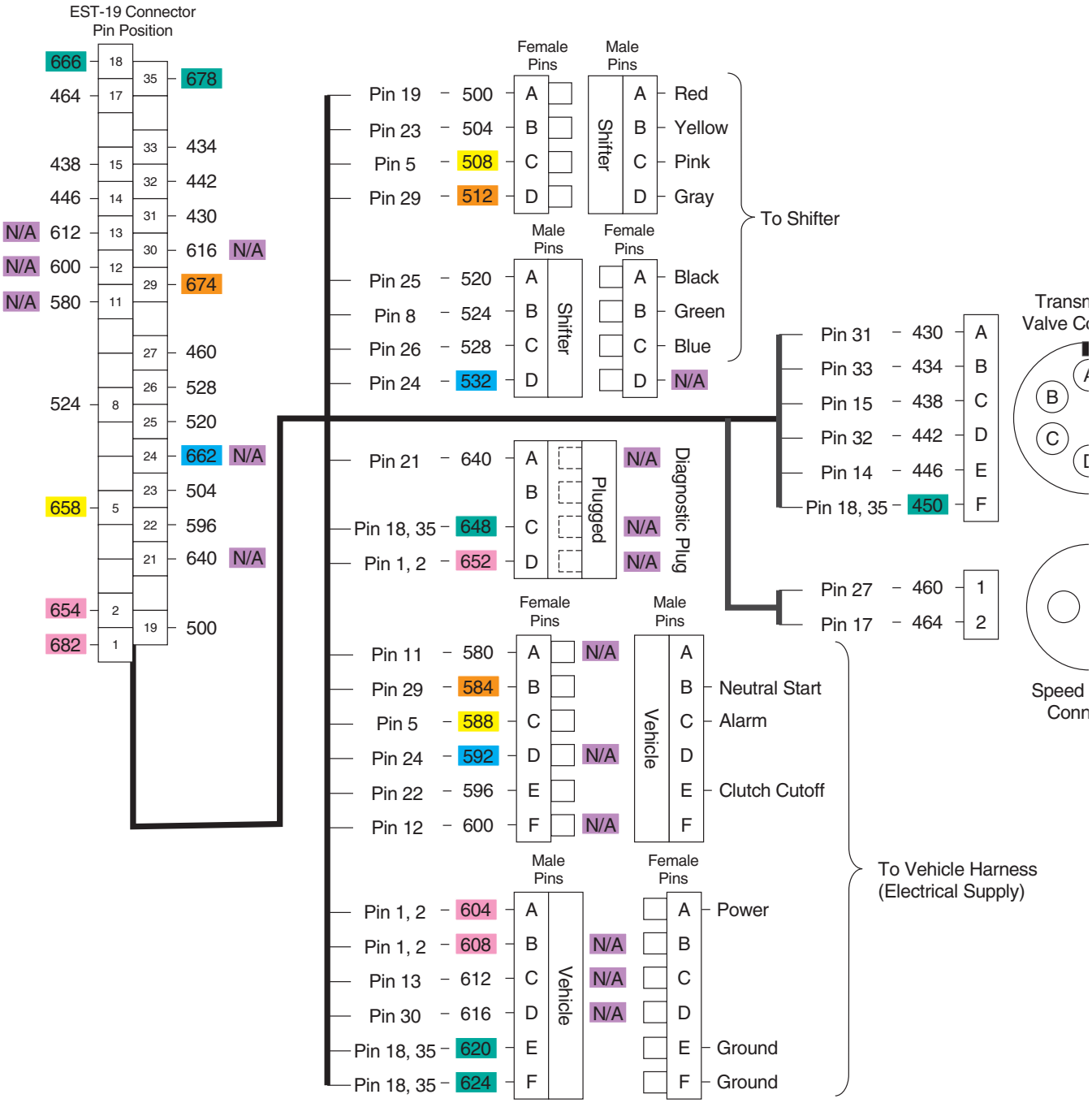
This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 591, 667-
644B-42 ..... S/N: 208-
844C-42 ..... S/N: 622-
1044C-42 ..... S/N: 117-
1044C-54 ..... S/N: 155-
6K-37 ..... S/N: 318-
6K-42 ..... S/N: 120-
8K-42 ..... S/N: 221-
10K-42 ..... S/N: 107-
10K-54 ..... S/N: 104-

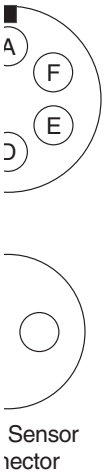
Boom/Transfer Extend Lockout Circuit Operation, Mid-Inlet Hydraulic System - Diagram 11

NOTES

Electrical Diagram, ZF DW-2/EST-19 System Harness - Diagram 12



Electrical Diagram, ZF DW-2/EST-19 System Harness - Diagram 12



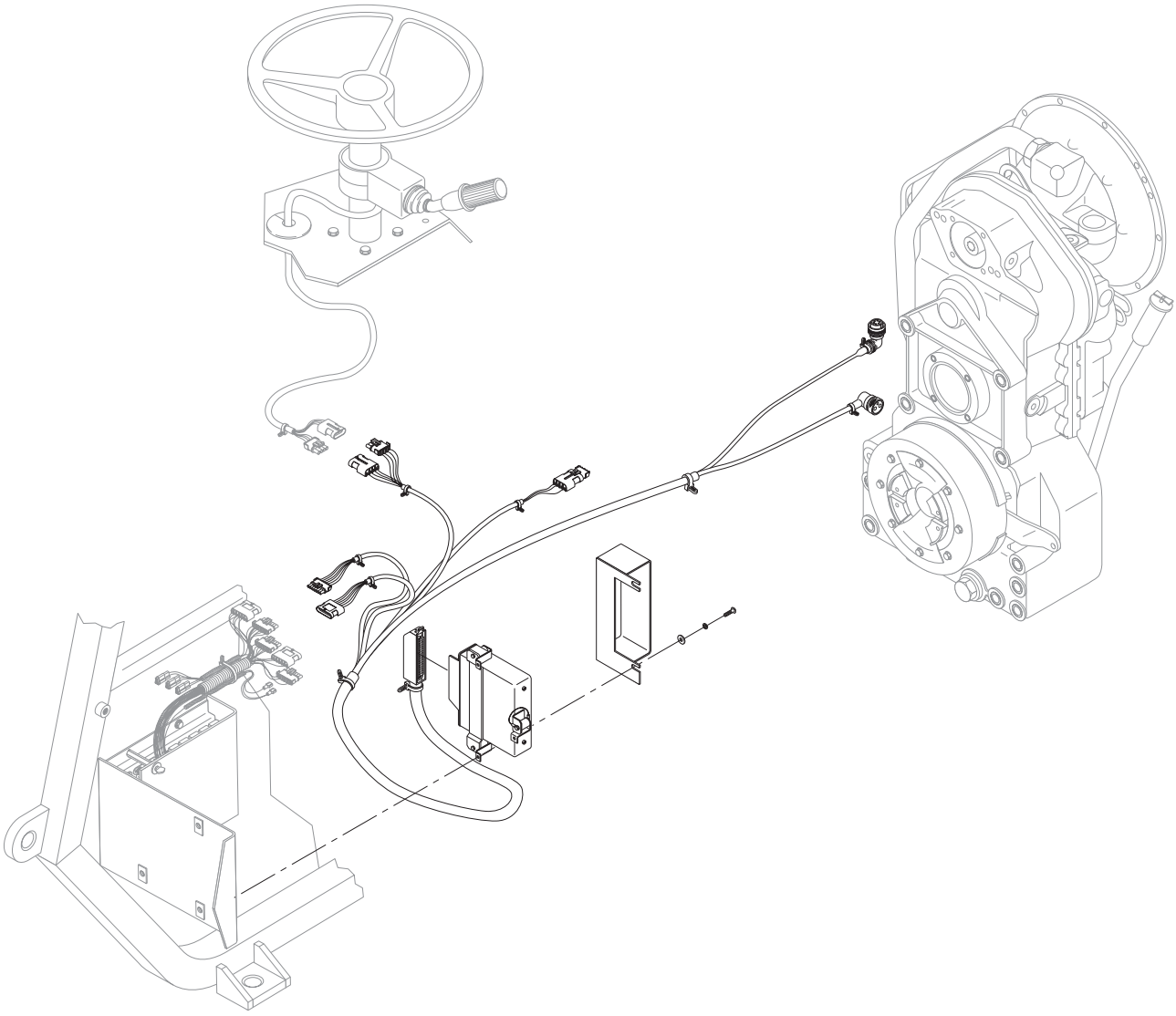
EST-19 Plug Pin Position	Harness Wire Number	Description
1.	682	Power In — In common with wires 604, 608, 652, and 654
2.	654	Power In — In common with wires 604, 608, 652, and 682
3.		
4.		
5.	658	To shifter Pink wire and backup alarm relay — In common with wires 508 and 588
6.		
7.		
8.	524	To shifter Green wire
9.		
10.		
11.	580	N/A — Designated for speedometer
12.	600	N/A — Designated for kickdown light
13.	612	N/A — Designated for operating indicator
14.	446	To M4 solenoid
15.	438	To M2 solenoid
16.		
17.	464	To speed sensor
18.	666	Ground — In common with wires 450, 620, 624, 648, and 678
19.	500	To shifter Red wire
20.		
21.	640	N/A — To diagnostic plug
22.	596	Clutch cutoff
23.	504	To shifter Yellow wire
24.	662	N/A — Shifter Violet wire — In common with wires 532 and 592
25.	520	To shifter Black wire
26.	528	To shifter Blue wire
27.	460	To speed sensor
28.		
29.	674	To shifter Gray wire and neutral start relay — In common with wires 512 and 584
30.	616	N/A — Designated for relay option
31.	430	To M5 solenoid
32.	442	To M3 solenoid
33.	434	To M1 solenoid
34.		
35.	678	Ground — In common with wires 450, 620, 624, 648, and 666

Harness Connector Location	Harness Wire Number	EST-19 Connector Location
Shifter Plug Female Pins		
A	500	Pin 19
B	504	Pin 23
C	508	Pin 5
D	512	Pin 29
Shifter Plug Male Pins		
A	520	Pin 25
B	524	Pin 8
C	528	Pin 26
D	532	Pin 24
Diagnostic Plug		
A	640	Pin 21
B		
C	648	Pin 18, 35
D	652	Pin 1, 2
Vehicle Harness Plug Female Pins		
A	580	Pin 11
B	584	Pin 29
C	588	Pin 5
D	592	Pin 24
E	596	Pin 22
F	600	Pin 12
Vehicle Harness Plug Male Pins		
A	604	Pin 1, 2
B	608	Pin 1, 2
C	612	Pin 13
D	616	Pin 30
E	620	Pin 18, 35
F	624	Pin 18, 35
Transmission Valve Connector Female Pins		
A	430	Pin 31
B	434	Pin 33
C	438	Pin 15
D	442	Pin 32
E	446	Pin 14
F	450	Pin 18, 35
Speed Sensor Connector Female Pins		
1	460	Pin 27
2	464	Pin 17

Wire Groups Having Common Wires				
604 608 652 654 682	450 620 624 648 666 678	658 508 588	662 532 592	674 512 584
(+) Pin 1, 2	(–) Pin 18, 35	Pin 5 Reverse Circuit	Pin 24 N/A	Pin 29 Neutral Start Circuit

N/A = Wires Not Applicable

Electrical Diagram, ZF DW-2/EST-19 System Harness - Diagram 12



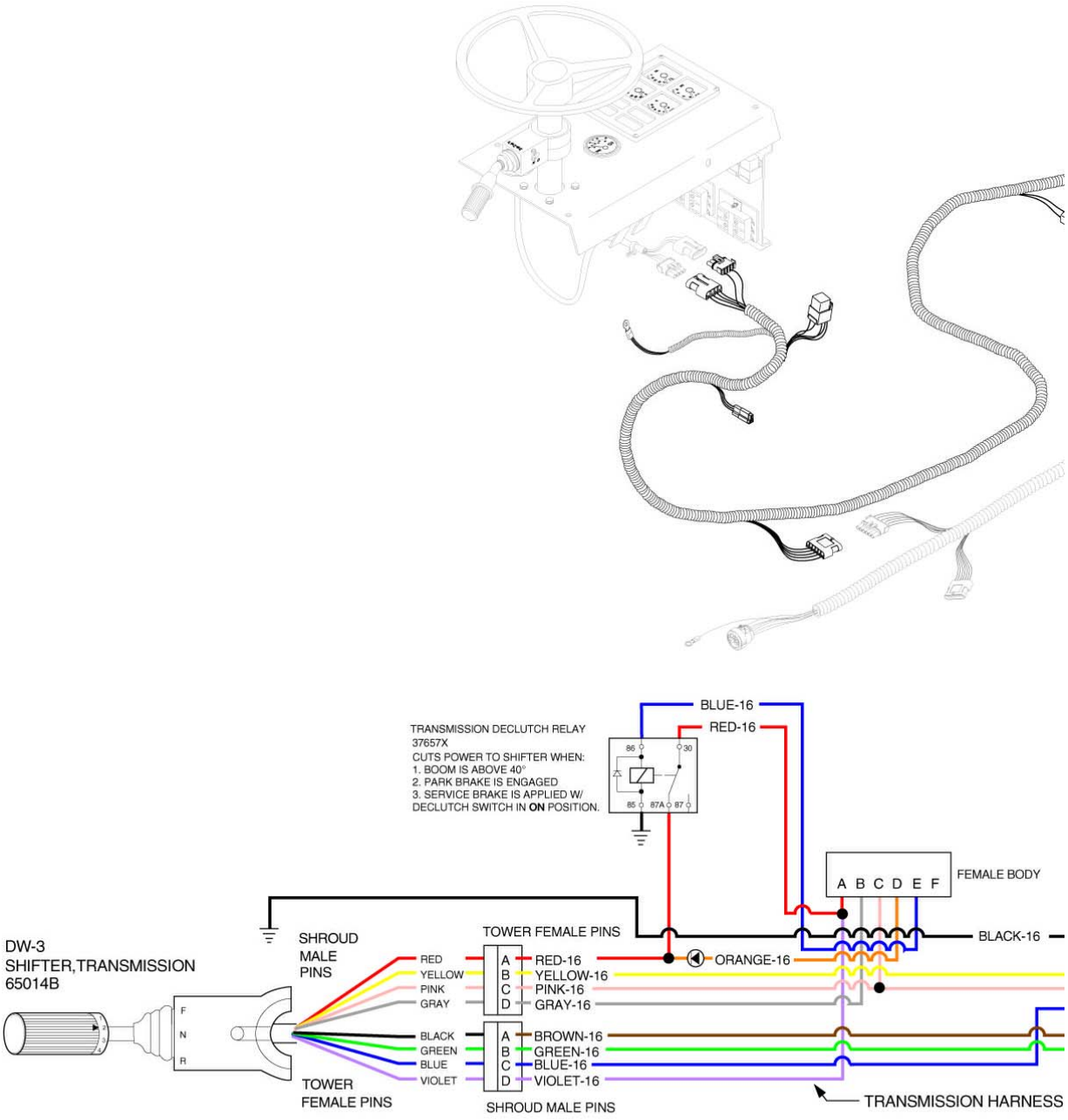
This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 101-880
644B-42 ..... S/N: 101-241
844C-42 ..... S/N: 101-783
1044C-42 ..... S/N: 101-121
1044C-54 ..... S/N: 101-215
6K-37 ..... S/N: 101-397
6K-42 ..... S/N: 101-131
8K-42 ..... S/N: 101-261
10K-42 ..... S/N: 101-107
10K-54 ..... S/N: 101-107, 109

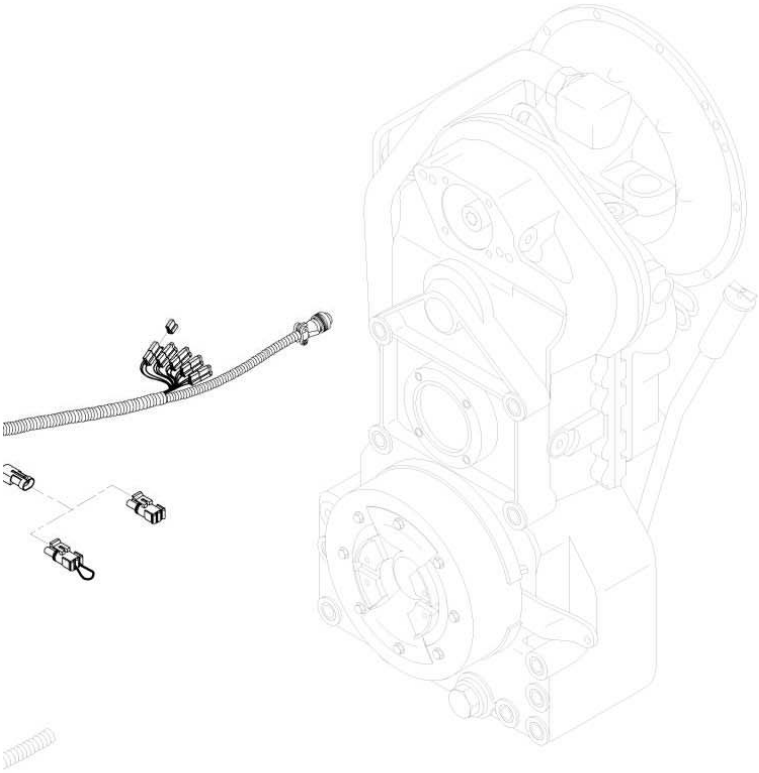
Electrical Diagram, ZF DW-2/EST-19 System Harness - Diagram 12

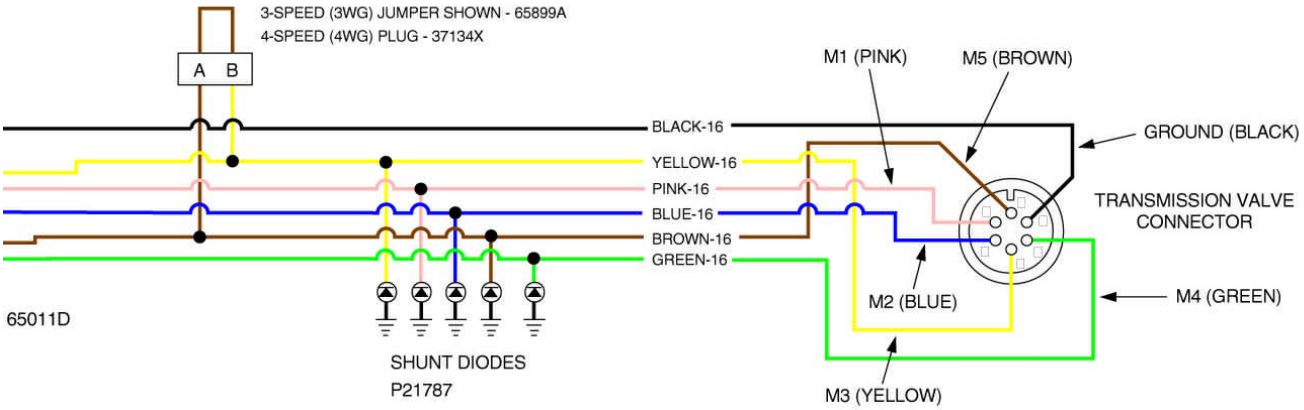
NOTES

Electrical Diagram, ZF DW-3 System Harness - Diagram 13



Electrical Diagram, ZF DW-3 System Harness - Diagram 13





Electrical Diagram, ZF DW-3 System Harness - Diagram 13

NOTES

This diagram applies to the following Model(s) and serial numbers:

644B-37 ..... S/N: 101-880
644B-42 ..... S/N: 101-241
844C-42 ..... S/N: 101-783
1044C-42 ..... S/N: 101-121
1044C-54 ..... S/N: 101-215
6K-37 ..... S/N: 101-397
6K-42 ..... S/N: 101-131
8K-42 ..... S/N: 101-261
10K-42 ..... S/N: 101-107
10K-54 ..... S/N: 101-107, 109

Electrical Diagram, ZF DW-3 System Harness - Diagram 13

NOTES

Section 5 — Supply, Pressure, and Return Hydraulics

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Section 5 — Supply, Pressure, and Return Hydraulics

General

Major System Components

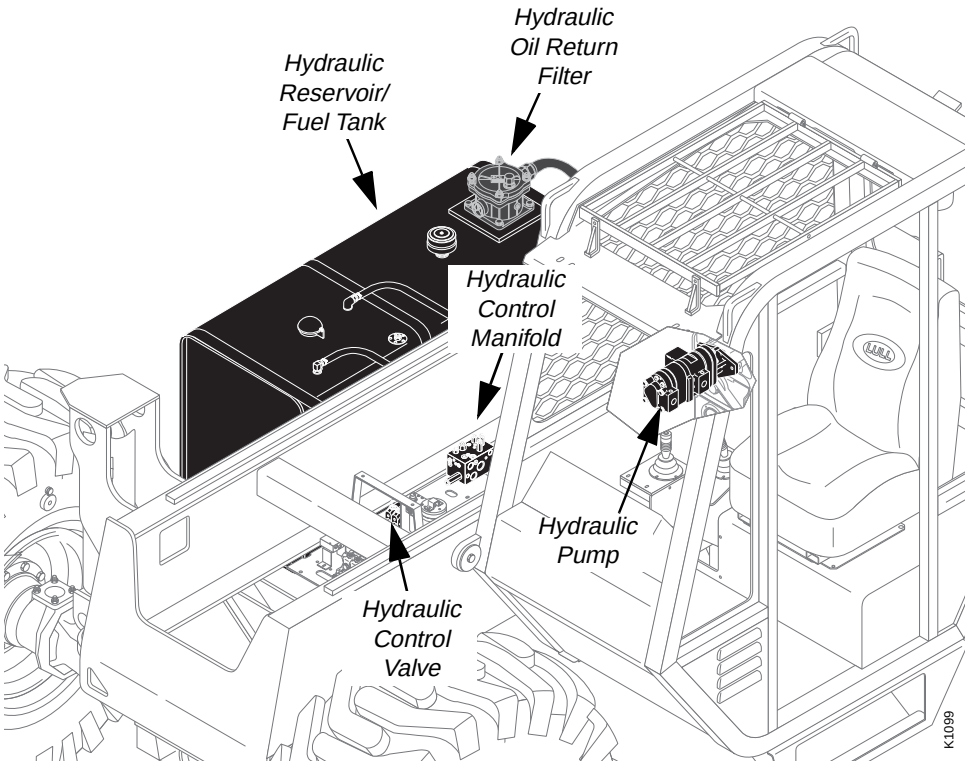


Fig. 5-1: Major Hydraulic Components

General Description

(Ref. Fig. 5-1) The hydraulic system consists of the following circuits:

- Boom Extension (See Section 6)
- Boom Hoist (See Section 6)
- Carriage Tilt (See Section 6)
- Transfer Carriage (See Section 6)
- Frame Tilt (See Section 7)
- Auxiliary — 1st - Standard, 2nd - Optional (See Section 6)
- Steering
- Service Brakes (See Section 9)
- Rear Axle Oscillation Lock (See Section 6)
- Outriggers (Optional on all models except 1044C-54 and 10K-54)

These circuits are supplied by a two-section, gear-type hydraulic pump, driven directly from the transmission power takeoff. The first pump supplies flow to all circuits except steering and the steer selector valve. The second pump supplies flow to all circuits via the steering priority valve.

The boom extension and hoist circuits are controlled by a two-spool valve with pressure relief. The frame tilt, carriage tilt, transfer carriage, and auxiliary circuits are controlled by a four-spool valve (five-spool optional) with pressure relief. The carriage tilt circuits are also equipped with two work port relief valves. The outrigger circuits are controlled by two additional valve sections with no-relief plugs. The steering circuit is controlled by a steering control unit and steering mode selector valve. The service brake circuit is controlled by a hydraulic power brake valve and includes an accumulator.

The boom extension, boom hoist, carriage tilt, outrigger, and frame tilt cylinders are equipped with externally mounted counterbalance valves. The counterbalance valves prevent movement of the cylinders in event of downstream hydraulic line failure, leakage through the main control valve or fittings. The counterbalance valves prevent movement of the cylinders when the engine is off, even if the control valve levers are operated. The counterbalance valves also provide over-load relief protection.

The hydraulic reservoir is mounted on the right-hand side of the machine. The hydraulic system return filter/magnetic separator is located at the top of the reservoir. The strainer and suction line is located at the bottom of the back side of the reservoir.

Hydraulic Systems

Control Manifold Hydraulic System

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

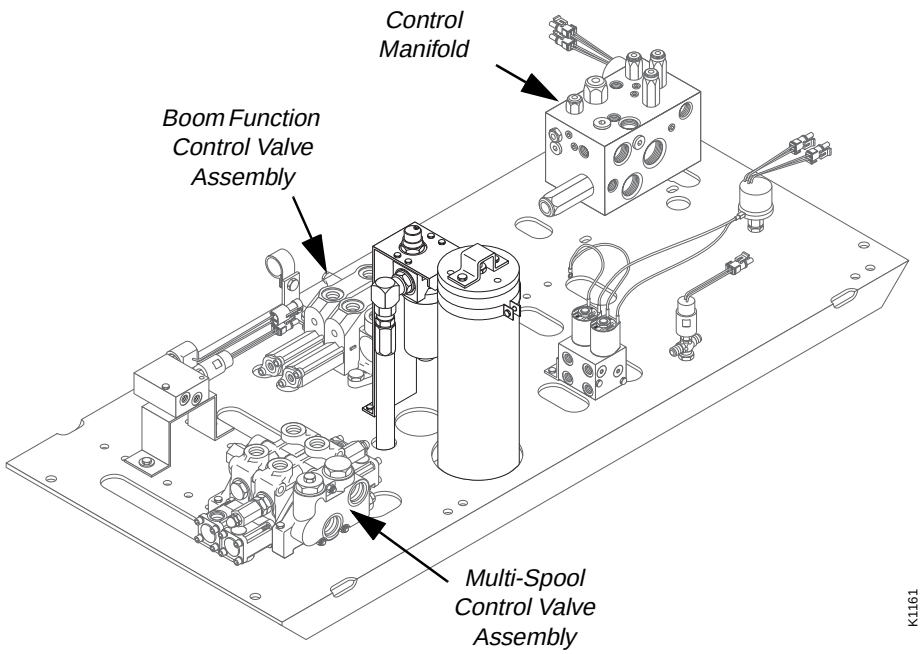


Fig. 5-2: Control Manifold Hydraulic Components

(Ref. Fig. 5-2) The term “control manifold hydraulic system” is used to reference the hydraulic system initially used on models 644B, 6K, 844C, 8K, 1044C, and 10K. This system uses a control manifold along with two other major control valve assemblies: one to control boom functions and one to control all other hydraulic functions.

Mid-Inlet Hydraulic System

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)

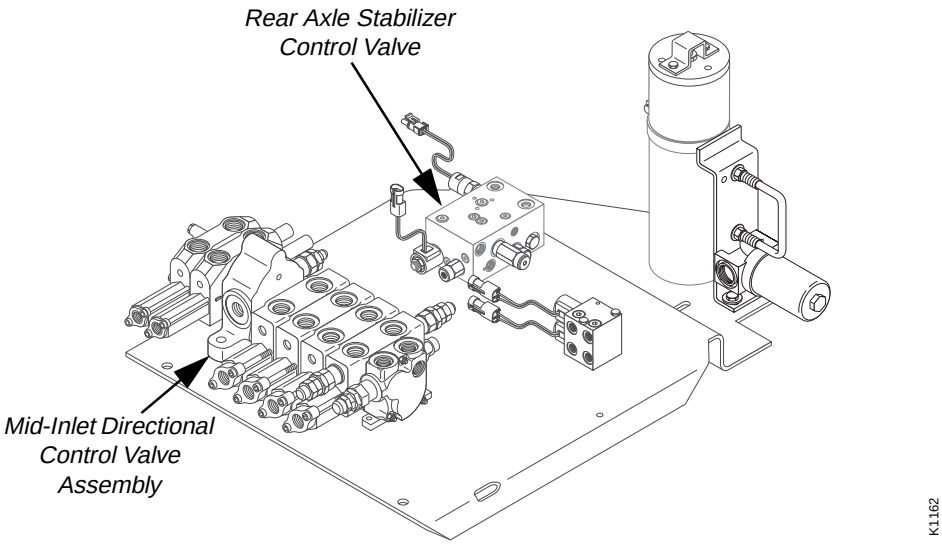
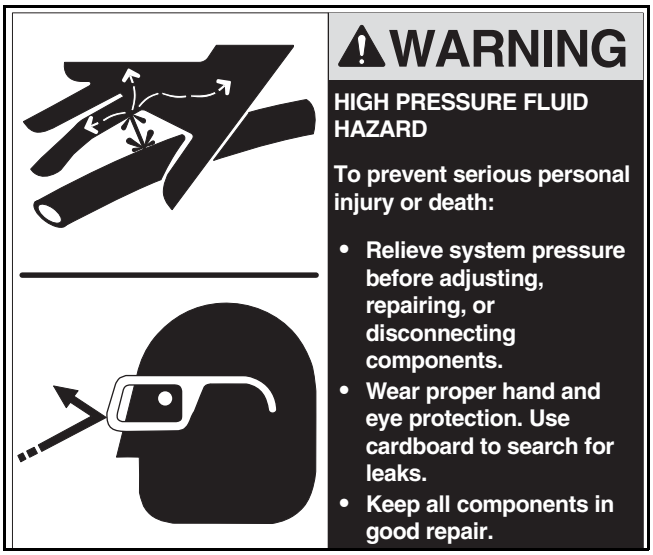


Fig. 5-3: Mid-Inlet Hydraulic Components

The term “mid-inlet hydraulic system” is used to reference and differentiate the types of components used in the hydraulic system. This system was designed to simplify the hydraulic system and improve overall reliability. It uses a rear axle stabilizer control valve along with a mid-inlet directional control valve assembly to control all hydraulic functions.

General Hydraulic Maintenance Practices

Safe Maintenance Practices



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- The hydraulic system is under pressure whenever the engine is running and can hold pressure after the engine is shut down. After forks or attachments are resting on the ground or support, make sure pressure is relieved from all hydraulic lines and components before removing them from the circuit.

Remember the following during inspection and maintenance of the hydraulic system:

- Wait for fluid to cool down before disconnecting lines.
- **DO NOT** use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks.
- Wear appropriate eye protection.
- If anyone is injured by or if any hydraulic fluid is injected into the skin, get medical attention immediately.
- When venting or filling the hydraulic system, loosen the filler cap slowly and remove it gradually.
- **NEVER** reset any relief valve in the hydraulic system to a pressure higher than that shown in the Specifications Section of this manual.

Cleanliness

Cleanliness is critical when servicing hydraulic systems.

KEEP DIRT AND OTHER CONTAMINANTS OUT OF THE SYSTEM!

Small particles can score valves, seize pumps and clog orifices, causing expensive repair jobs.

Steam clean or use solvents to clean the area of the machine around a hydraulic component before it is removed.

When steam cleaning or using water to clean a machine, be sure the reservoir breather filter is protected to keep water out of the system.

Use caps or plugs to cover ends of disconnected lines, or to plug openings when working on a hydraulic system.

When removing parts for service, clean them with a suitable solvent and store them in plastic bags or other clean containers until they are installed again.

Thoroughly rinse the cleaned parts, and dry them using compressed air. Protect the parts immediately with a coating of rust preventive oil.

A clean work bench is an absolute must when servicing hydraulic components. An industrial-type vacuum cleaner is a valuable aid in removing dust, dirt, and tiny metal particles from the work area.

Check the condition of the tools you use and make sure they are clean. Use hammers made of plastic or leather so there is no danger of metal chips getting into components.

Despite all the precautions you take when working with a hydraulic system, some contaminants will get into the system anyway. High quality hydraulic oils keep these contaminants in suspension and the filters will collect them as the oil passes through. A high quality hydraulic oil contains many additives which work to keep contaminants from damaging the system. However, these additives lose their effectiveness after a period of time. Therefore, change the oil at recommended intervals to make sure the additives do their job.

The system filter can absorb only a limited amount of dirt particles and other contaminants from the oil. Therefore, replace the filter element at the recommended intervals so the cleaning process can be maintained.

Checking Hydraulic Lines

Inspect hydraulic lines and fittings for gouges, nicks, kinks, leaks, and collapsed or deteriorating hoses.

Note: *Even small leaks can be detected by oil stains or build-up of dirt or other foreign material in a suspect area.*

Replace any tube lines that are pinched or dented.

Replace a hose if any of the following conditions exist:

- Any evidence of hydraulic oil leakage at the surface of the hose or its junction with the metal end couplings.
- Any blistering or abnormal deformation to the outer covering of the hose.

- Hydraulic oil leakage at any threaded or clamped joint that cannot be eliminated by normal tightening.
- Evidence of excessive abrasion or scrubbing on the outer surface of hose or hoses.

Important: *When tightening loose lines or connections, use two wrenches to avoid twisting hose or tubes. Tighten loose connections only until the leak stops. An over-tightened fitting may result in overstressing and/or cracking. Replace any connectors that continue to leak. See "Hydraulic Fitting Torques" in Section 3 for torque specifications for hydraulic fittings and hydraulic line connections.*

Hydraulic Reservoir

Description

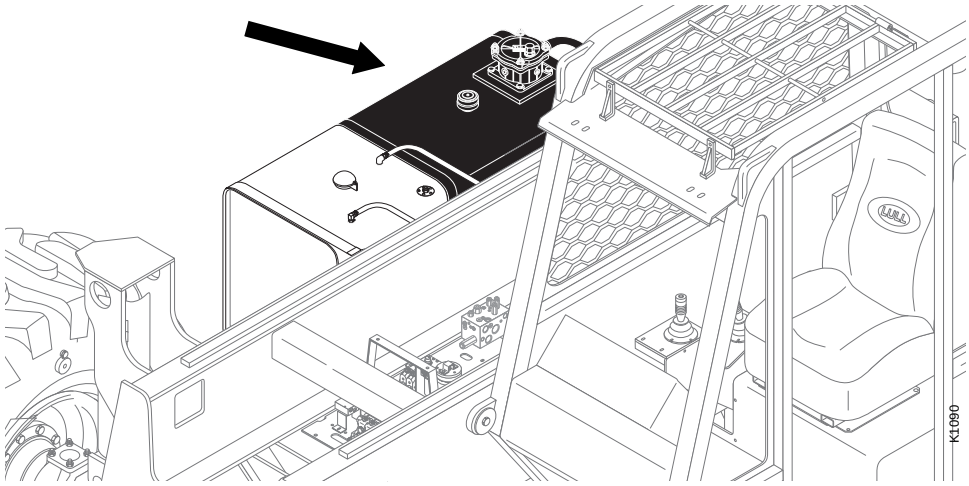
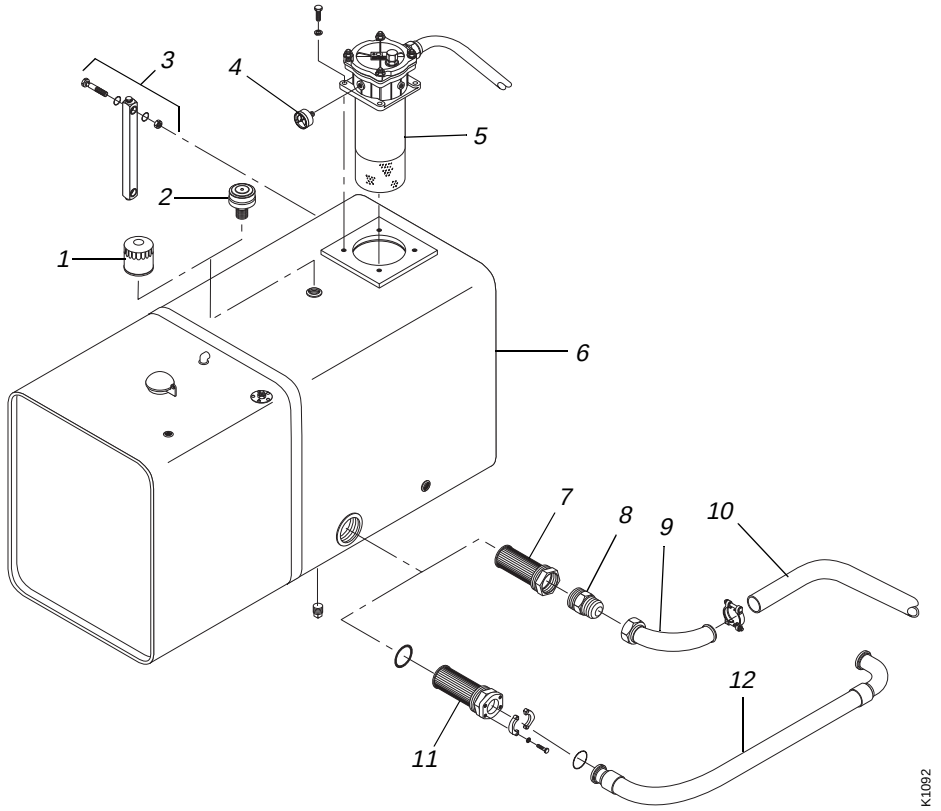


Fig. 5-4: Hydraulic Reservoir Location

(Ref. Fig. 5-4) The hydraulic reservoir is mounted on the right-hand side of the machine and is located next to the fuel tank. It has a capacity of 53 gallons. The major components associated with the hydraulic reservoir are:

- Hydraulic Tank Breather
- Hydraulic Tank Sight Gauge
- Pressure Gauge
- Hydraulic Oil Return Filter
- Hydraulic Oil Strainer.

A breakdown of hydraulic reservoir parts is shown in Fig. 5-5.



#	Description
1	Hydraulic Tank Breather (Models with Mid-Inlet Hydraulics)
2	Hydraulic Tank Breather (Models with Control Manifold Hydraulics)
3	Hydraulic Tank Sight Gauge
4	Pressure Gauge
5	Return Filter Assembly
6	Hydraulic Oil Tank

#	Description
7	Hydraulic Oil Strainer (Models with Control Manifold Hydraulics)
8	Connector
9	Suction Tube
10	Suction Hose
11	Hydraulic Oil Strainer (Models with Mid-Inlet Hydraulics)
12	Suction Line

Fig. 5-5: Hydraulic Reservoir

(Ref. Fig. 5-5) The hydraulic system return filter assembly (Item 5), along with the pressure gauge (Item 4), is located within the return filter housing, located at the top of the reservoir (Item 6).

The strainer (Item 7 or Item 11) and suction line (Item 8, 9, and 10; or Item 12) are located at the bottom of the back side of the reservoir.

A pressure differential gauge (Item 4) is fitted to the return filter housing to monitor filter condition.

A breather filter assembly (Item 1 or Item 2) is threaded into the top of the reservoir. It allows for expansion of fluid and prevents vacuum in the tank.

Check the hydraulic reservoir daily for the proper oil level. Maintain oil level at the full mark on the sight gauge (Item 3) with all cylinders retracted.

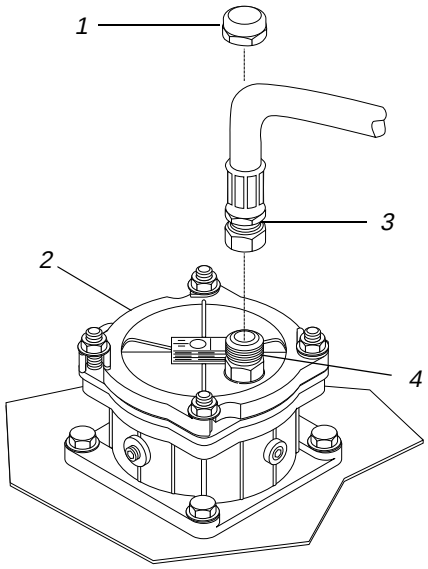
Important: *Do not operate the machine if the oil level falls below the low mark on the sight gauge. Low oil level could damage the pump and other components.*

Filling Hydraulic Reservoir

Preferred Method

CAUTION: Do not fill reservoir through the breather opening. The hydraulic system can become contaminated.

Oil must be filtered through the return filter to ensure purity. Contamination, even small amounts, can permanently damage hydraulic system components and void the warranty.



#	Description
1	Hex Cap
2	Cover

#	Description
3	Hydraulic Hose
4	Male JIC (37°) Filler Fitting

Fig. 5-6: Recommended Reservoir Filling Method

(Ref. Fig. 5-6) The following is the recommended filling procedure for the hydraulic reservoir:

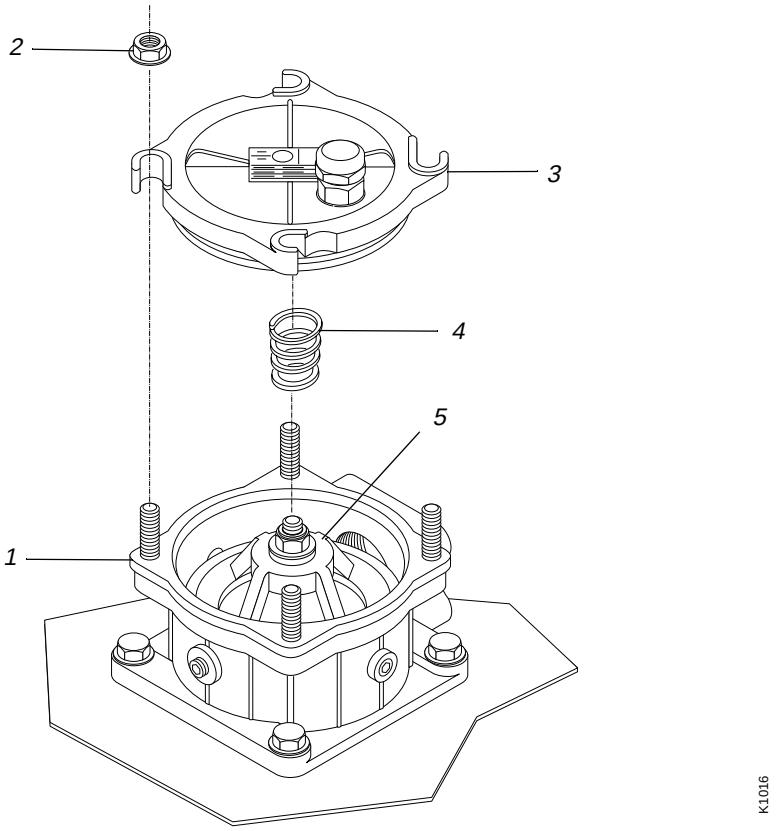
1. The machine must be parked on a level surface and the frame must be level.
2. Retract all cylinders except frame tilt cylinder. Apply the park brake and stop the engine.
3. Clean area around hex cap (Item 1) on the cover (Item 2). Loosen and remove the hex cap.
4. Provide a hydraulic hose of suitable length to run between hydraulic oil fill pump and male JIC (37°) filler fitting (Item 4), in return filter housing cover. The reservoir end of the hose must be fitted with a 1-1/16-12 JIC (37°) female hose fitting.
5. Assemble hose (Item 3) to reservoir filler fitting (Item 4) and tighten.
6. Fill reservoir until oil level in sight gauge is at HIGH mark. Use hydraulic oil as specified in “Fluid and Lubricant Specifications” in Section 3.

7. Start engine and allow hydraulic system to warm up. Operate controls gradually until you fully extend and retract each cylinder, including steering cylinders. This procedure removes air from the system.
8. Level the frame, retract all cylinders except frame tilt cylinder, and stop the engine. Recheck oil level and add oil as required.
9. Loosen and remove hose (Item 3) from reservoir filler fitting (Item 4). Install hex cap (Item 1) and torque to 70 ft-lbs.

Filling Hydraulic Reservoir Alternate Method

CAUTION: Do not fill reservoir through breather opening. The hydraulic system can become contaminated.

Oil must be filtered through the return filter to ensure purity. Contamination, even small amounts, can permanently damage hydraulic system components and void the warranty.



#	Description
1	Return Filter Housing
2	Flange Nut
3	Cover

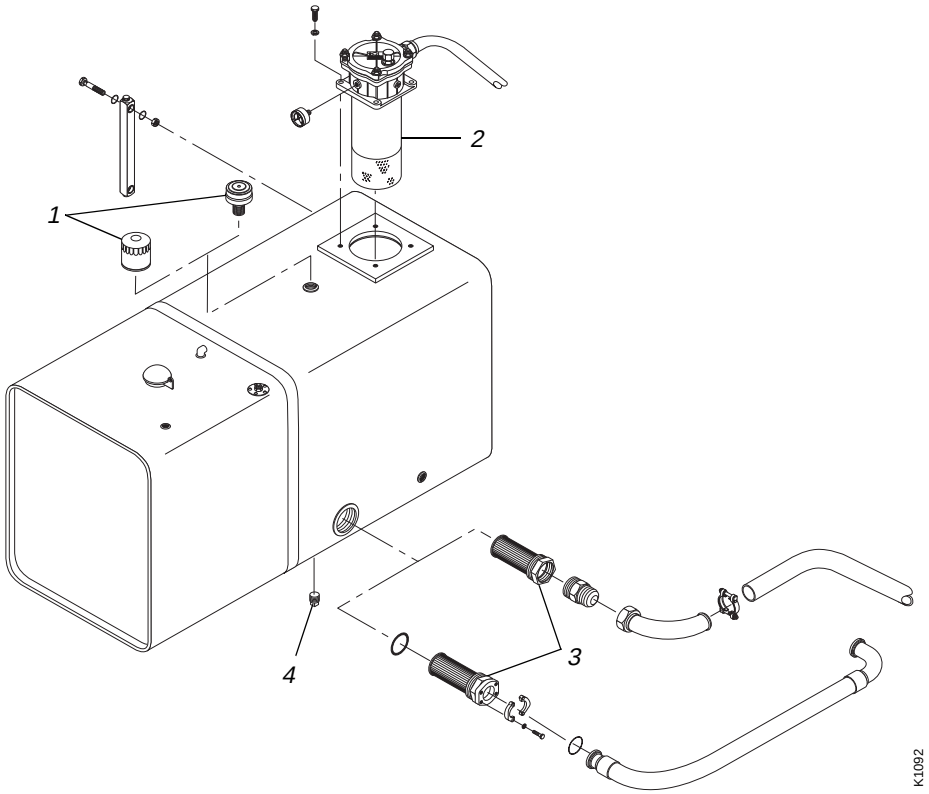
#	Description
4	Spring
5	Hydraulic Filter Element

Fig. 5-7: Alternate Reservoir Filling Method

(Ref. Fig. 5-7) The following is an alternate filling procedure for the hydraulic reservoir.

1. The machine must be parked on a level surface and the frame must be level.
2. Retract all cylinders except frame tilt cylinder, apply the park brake, and stop the engine.
3. Clean return filter housing (Item 1) and surrounding area.
4. Remove four (4) flange nuts (Item 2) that secure the filter housing cover (Item 3). Set hardware aside on a clean surface.
5. Lift the cover (Item 3) and spring (Item 4) from housing (Item 1) and set aside on a clean surface.
6. ***SLOWLY*** pour hydraulic oil into filter element (Item 5). It takes several moments for oil to drain through the element. Continue to add oil until HIGH mark is reached on hydraulic reservoir sight gauge.
7. Make sure the cover (Item 3) and spring (Item 4) are clean.
8. Place spring (Item 4) in position on filter element assembly (Item 5).
9. Place the cover (Item 3) in position and secure it to the filter housing (Item 1) with four (4) flange nuts (Item 2). Torque nuts to 35 ft-lbs.
10. Start the engine and allow hydraulic system to warm up. Operate controls gradually until you can fully extend and retract each cylinder, including steering cylinders. This procedure removes air from the system.
11. Retract all cylinders and stop the engine.
12. Recheck oil level and add oil as necessary.

Reservoir Drain and Refill



#	Description
1	Breather Filter
2	Return Filter Assembly

#	Description
3	Hydraulic Oil Suction Strainer
4	Drain Plug

Fig. 5-8: Hydraulic Reservoir Drain and Refill

(Ref. Fig. 5-8) The following procedure describes draining and refilling the hydraulic reservoir.

1. Lower the boom to the ground, apply the parking brake, and stop the engine.

CAUTION: Do not place hands in hot hydraulic oil. Hot hydraulic oil can cause severe burns and skin irritation.

2. Remove hydraulic reservoir drain plug (Item 4) and drain hydraulic oil into an appropriate container. Dispose of drained oil properly.
3. To remove the return filter assembly (Item 2), see “Removal” on page 5-26.
4. To remove the suction strainer (Item 3), see “Removal and Cleaning” on page 5-20.
5. Clean inside of reservoir of rust, sludge, scale, metallic particles, deposits, and other residue with solvent. Drain into suitable container and wipe clean with dry, lint-free wipes. Dry with compressed air and use a shop vacuum to remove any remaining particles.

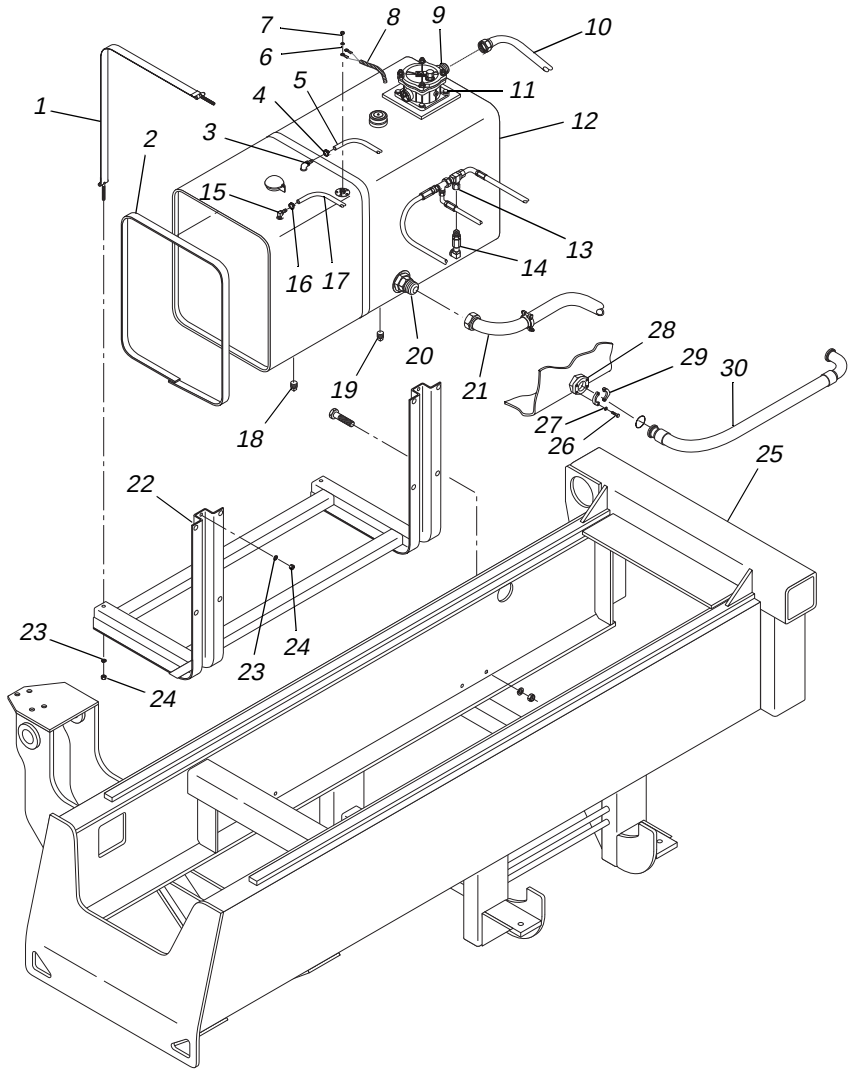
6. Clean the strainer (Item 2) by back flushing with solvent. Dry the strainer element thoroughly with compressed air. Install it as described under “Installation” on page 5-21.
7. Install the reservoir drain plug (Item 4). Tighten two or three turns past finger tight. If it is necessary to use thread sealant to stop fluid leakage, apply sealant only to last few threads close to the drain plug head.

CAUTION: To avoid contamination of hydraulic system, do not apply thread sealant to end threads of drain plug.

8. To install return filter assembly (Item 2), see “Installation” on page 5-27.
9. Install a new breather filter assembly (Item 1).
10. Fill hydraulic reservoir. see “Filling Hydraulic Reservoir” on page 5-8.

Removal

Hydraulic Reservoir and Fuel Tank



#	Description
1	Tank Hold-Down Strap
2	Chemprene Belting
3	Pipe Adapter
4	Hose Clamp
5	Fuel Supply Hose
6	Flatwasher
7	Nut
8	Wiring Harness
9	JIC Pipe Connector
10	Return Manifold Tube
11	Hydraulic Oil Return Filter
12	Hydraulic Reservoir/Fuel Tank
13	Swivel Branch Tee
14	Check Valve
15	90° Elbow

#	Description
16	Hose Clamp
17	Fuel Return Hose
18	Fuel Tank Drain Plug
19	Hydraulic Reservoir Drain Plug
20	JIC Pipe Connector
21	Suction Tube Elbow
22	Tank Support Mount
23	Lockwasher
24	Nut
25	Main Frame (Front End)
26	Capscrew
27	Lockwasher
28	Hydraulic Oil Strainer
29	Flange Halve
30	Hydraulic Suction Hose

Fig. 5-9: Hydraulic Reservoir/Fuel Tank Installation

(Ref. Fig. 5-9) The following procedure describes removal of the hydraulic reservoir/fuel tank.

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 5-4.
2. Remove the hydraulic reservoir drain plug (Item 19) and drain hydraulic fluid into a suitable container. Dispose of drained fluid properly. Temporarily reinstall drain plug.
3. Remove fuel tank drain plug (Item 18) and drain the fuel into an suitable container. Dispose of drained fuel properly. Temporarily reinstall drain plug.

WARNING: Fuel is highly combustible. Avoid all possibilities of sparks that could ignite the fuel. Drain the fuel tank in a well ventilated area, away from smoking materials, open flames, or exposed heater parts.

4. Remove two (2) nuts (Item 7) and flatwashers (Item 6) securing wiring harness (Item 8) to fuel sender.
5. Loosen and disconnect swivel nut of swivel branch tee (Item 13) from check valve (Item 14).
6. Tag fuel lines (Items 17 and 5). Remove hose clamps (Items 4 and 16) on fuel lines. Cap elbow (Item 15) and pipe adapter (Item 3).
7. For models with control manifold hydraulics, disconnect the suction tube elbow (Item 21) from the JIC pipe connector (Item 20).
8. For models with mid-inlet hydraulics, remove the four (4) capscrews (Item 26) and lockwashers (Item 27) securing the two (2) flange halves (Item 29) and the hydraulic suction hose (Item 30) to the hydraulic strainer (Item 28). Remove the flange halves.
9. Loosen and remove the return manifold tube (Item 10) connected to the JIC pipe connector (Item 9) on the hydraulic oil return filter (Item 11).

CAUTION: To avoid personal injury and/or damage to the equipment, support the hydraulic tank to ensure that it does not twist or fall when removing or installing it.

10. After ensuring that the tank is properly supported, remove the four (4) each nuts (Item 24) and lockwashers (Item 23) that secure the two (2) tank hold-down straps (Item 1) to the tank support mount (Item 22).
11. Remove the hydraulic reservoir/fuel tank (Item 12) to an appropriate area for cleaning/inspection.
12. Inspect reservoir/fuel tank for damage and replace if necessary.
13. Remove hydraulic reservoir drain plug and perform steps 3 thru 5 under “Reservoir Drain and Refill” on page 5-11.

14. Remove the fuel tank drain plug. Clean the inside of the fuel tank with high-pressure jet spray of diesel fuel to ensure it is free of rust, sludge, scale, metallic particles, deposits, and other residue. Drain into suitable container and hand wipe clean with dry rags.
15. Perform steps 6 through 9 under “Reservoir Drain and Refill” on page 5-11.
16. Install the fuel tank drain plug (Item 18). Tighten two or three turns past finger tight. If it is necessary to use thread sealant to stop fluid leakage, make sure that the sealant is applied only to the last few threads close to the drain plug head.

CAUTION: To avoid contamination of the fuel system, do not apply thread sealant to the end threads of the drain plug.

Installation

Hydraulic Reservoir and Fuel Tank

(Ref. Fig. 5-9) The following procedure describes installation of the hydraulic reservoir/fuel tank.

1. Inspect the two (2) pieces of chemprene belting (Item 2) and replace if necessary.

CAUTION: To avoid personal injury and/or damage to the equipment, support the hydraulic tank to ensure that it does not twist or fall when removing or installing it.

2. While ensuring that the hydraulic reservoir/fuel tank is properly supported and in the proper position, attach the two (2) tank hold-down straps (Item 1) over the two pieces of chemprene belting and to the tank support mount (Item 22) using four (4) each nuts (Item 24) and lockwashers (Item 23). For final tightening, torque nuts to 35 ft-lbs.
3. Reconnect the suction tube elbow (Item 21) to the JIC pipe connector (Item 20).
4. Reconnect swivel nut of swivel branch tee (Item 13) to check valve (Item 14). For final tightening, torque to 44–48 ft-lbs.
5. Reconnect return manifold tube (Item 10) to JIC pipe connector (Item 9) on hydraulic oil return filter (Item 11). For final tightening, torque connector on return manifold tube to 188–213 ft-lbs.
6. Reconnect fuel lines (Items 17 and 5) to elbow (Item 15) and pipe adapter (Item 3). Secure the fuel lines to the fittings with hose clamps (Items 4 and 16) and tighten as necessary.
7. Install wiring harness (Item 8) on fuel sender with two (2) flatwashers (Item 6) and nuts (Item 7). Tighten nuts until snug.
8. Fill hydraulic reservoir according to the preferred method on page 5-8.
9. Fill fuel tank as outlined in Section 3.

Sight Gauge

Description

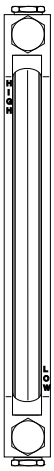


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Fig. 5-10: Hydraulic Reservoir Sight Gauge

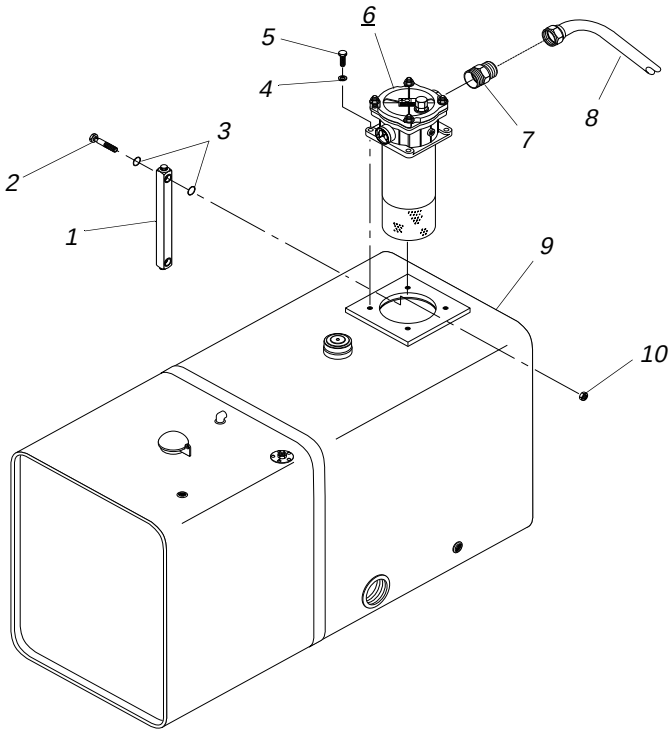
Note: *When checking oil quantity, the machine must be on a level surface and the frame must be level.*

The hydraulic reservoir sight gauge is located on the side of the reservoir (see Fig. 5-11, Item 1).

The hydraulic fluid level in the reservoir changes considerably during operation and a reading should not be taken until the boom is lowered to the ground, the parking brake is applied, the engine is stopped, and all hydraulic pressure is released in the system. The hydraulic reservoir sight gauge should then show the fluid level being near the high level. If necessary, add hydraulic fluid, being careful not to overfill.

Removal

Sight Gauge



#	Description
1	Hydraulic Sight Gauge
2	Hollow Hex Head Bolt
3	O-Ring
4	Lockwasher
5	Capscrew

#	Description
6	Hydraulic Oil Return Filter Assy
7	JIC Pipe Connector
8	Return Manifold Tube
9	Hydraulic Reservoir
10	Nut

Fig. 5-11: Reservoir Sight Gauge Installation

(Ref. Fig. 5-11) The following procedures describes removal of the reservoir sight gauge.

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 5-4.
2. Remove the hydraulic reservoir drain plug (Item 19) and drain hydraulic fluid into a suitable container. Dispose of drained fluid properly.
3. Disconnect return manifold tube (Item 8) connected to the JIC pipe connector (Item 7) on the hydraulic oil return filter assembly (Item 6).
4. Remove four (4) each capscrews (Item 5) and lockwashers (Item 4) that secure the hydraulic oil return filter assembly (Item 6) to the hydraulic reservoir (Item 9). Remove the hydraulic oil return filter assembly.
5. Reaching inside the opening for the hydraulic oil return filter assembly in the hydraulic fluid reservoir, remove the two (2) nuts (Item 10) that secure the sight gauge to the hydraulic reservoir.

6. Remove the sight gauge (Item 1) along with the two (2) hollow hex head bolts (Item 2).
7. Clean the two openings in the side of the hydraulic reservoir with appropriate solvent. Plug openings.

Installation

Sight Gauge

(Ref. Fig. 5-11) The following procedures describes installation of the reservoir sight gauge.

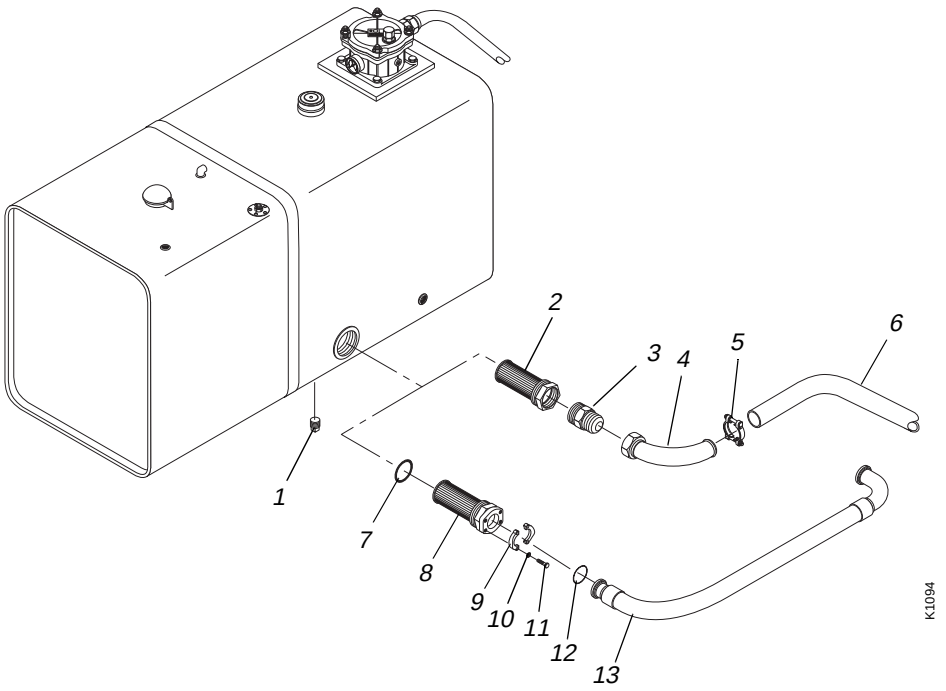
1. Remove the four (4) O-rings (Item 3) from the sight gauge and clean O-rings with appropriate solvent. Dry with compressed air. Check for and replace any damaged O-rings.
2. Inspect sight gauge for damage and replace if necessary. Clean sight gauge with appropriate solvent and dry with compressed air.
3. Install four (4) O-rings (Item 3) in sight gauge. Lubricate each O-ring before installing it.
4. Clean the two (2) hollow hex head bolts (Item 2) with appropriate solvent; inspect and replace if damaged.
5. Install sight gauge (Item 1) on hydraulic reservoir (Item 9) with hollow hex head bolts (Item 2) and nuts (Item 10). Tighten as necessary.
6. Install hydraulic oil return filter assembly (Item 6) as per instructions on page 5-27.
7. Reconnect return manifold tube (Item 8) to the JIC pipe connector (Item 7) on the hydraulic oil return filter assembly (Item 6). For final tightening, torque hex head connector on return manifold tube to 188–213 ft-lbs.
8. lean the inside of the reservoir of rust, sludge, scale, metallic particles, deposits, and other residue with high pressure jet spray of diesel fuel. Drain into suitable container and hand wipe clean with dry rags. Dispose of contaminated diesel fuel properly.
9. Install the reservoir drain plug (Item 4). Tighten two or three turns past finger tight. If it is necessary to use thread sealant to stop fluid leakage, apply sealant only to the last few threads close to the drain plug head.

CAUTION: To avoid contamination of the hydraulic system, do not apply thread sealant to the end threads of the drain plug.

10. Fill hydraulic reservoir. (See page 5-8.)

Suction Strainer

Description



#	Description
1	Drain Plug
2	Hydraulic Oil Strainer - Control Manifold Hydraulics
3	JIC Pipe Connector
4	Suction Tube Elbow
5	Hose Clamp
6	Suction Hose
7	O-Ring

#	Description
8	Hydraulic Oil Strainer - Mid-Inlet Hydraulics
9	Flange Half
10	Lockwasher
11	Capscrew
12	O-Ring
13	Hydraulic Suction Hose

Fig. 5-12: Suction Strainer Installation

(Ref. Fig. 5-12) The suction strainer is located behind the hydraulic reservoir. It removes contaminants as oil is pumped out of the hydraulic reservoir.

Removal and Cleaning

Suction Strainer

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

(Ref. Fig. 5-12) The following procedures describes removal of the suction strainer on models with control manifold hydraulics.

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 5-4.
2. Remove the hydraulic reservoir drain plug (Item 1) and drain hydraulic fluid into a suitable container. Dispose of drained fluid properly.
3. Loosen and disassemble the suction tube elbow (Item 4) from the pipe connector (Item 3). Cap end of suction tube elbow.
4. Loosen and remove the strainer (Item 2) from the reservoir. Take the strainer to an appropriate area for further cleaning.
5. Clean the strainer (Item 2) by back flushing with solvent. Dry the strainer element thoroughly with compressed air.

Models with Mid-Inlet Hydraulics

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)

(Ref. Fig. 5-12) The following procedures describes removal of the suction strainer on models with mid-inlet hydraulics.

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 5-4.
2. Remove the hydraulic reservoir drain plug (Item 1) and drain hydraulic fluid into a suitable container. Dispose of drained fluid properly.
3. Remove the four (4) capscrews (Item 11) and lockwashers (Item 10) securing the two (2) flange halves (Item 9) and the hydraulic suction hose (Item 13) to the hydraulic strainer (Item 8). Remove the flange halves.
4. Remove and discard the O-ring (Item 12) from the hydraulic suction hose.
5. Loosen and remove the strainer (Item 8) from the reservoir. Take the strainer to an appropriate area for further cleaning.
6. Clean the strainer (Item 8) by back flushing with solvent. Dry the strainer element thoroughly with compressed air.

Installation

Suction Strainer

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

(Ref. Fig. 5-12) The following procedures describes installation of the suction strainer on models with control manifold hydraulics.

1. Insert hydraulic oil strainer (Item 2) into cavity in hydraulic reservoir and tighten until snug.
2. Reconnect the pipe connector to the suction strainer. For final tightening, turn connector 2–3 turns past finger tight.
3. Clean end of the suction tube elbow with an appropriate solvent. Reconnect the suction tube elbow to the pipe connector. For final tightening, torque to 250–283 ft-lbs.
4. Apply thread sealant to few threads near the head of drain plug (Item 1). Install the drain plug. Tighten 2–3 turns past finger tight.
5. Fill hydraulic reservoir according to the preferred method on page 5-8.

Models with Mid-Inlet Hydraulics

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)

(Ref. Fig. 5-12) The following procedures describes installation of the suction strainer on models with mid-inlet hydraulics.

1. Insert hydraulic oil strainer (Item 8) into cavity in hydraulic reservoir and tighten until snug.
2. Install a new O-ring (Item 12) on the hydraulic suction hose (Item 13).
3. Install the hydraulic suction hose on the hydraulic oil strainer using the two flange halves (Item 9) and the four (4) lockwashers (Item 10) and capscrews (Item 11). For final tightening, torque the capscrews to 55 ft-lbs.
4. Apply thread sealant to few threads near the head of drain plug (Item 1). Install the drain plug. Tighten 2–3 turns past finger tight.
5. Fill hydraulic reservoir according to the preferred method on page 5-8.

Hydraulic Return Filter

Description

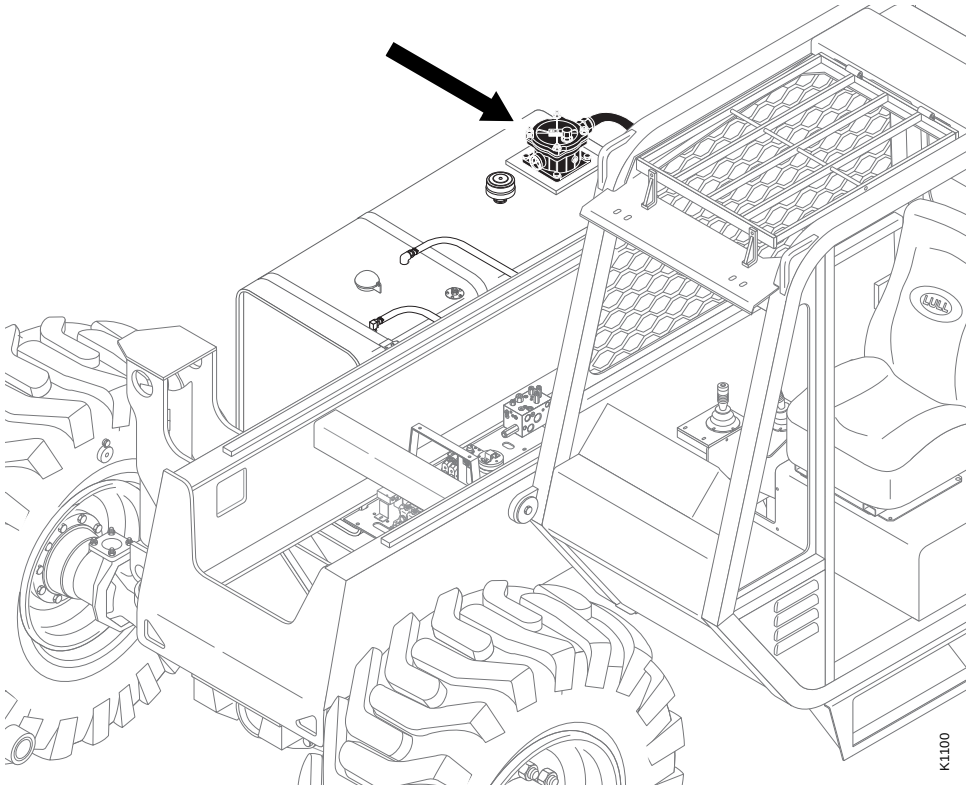


Fig. 5-13: Hydraulic Return Filter

(Ref. Fig. 5-13) The hydraulic return filter assembly is located on the hydraulic reservoir. Its function are to filter return hydraulic oil entering the reservoir and provide a means to fill the reservoir.

Checking Filter Condition

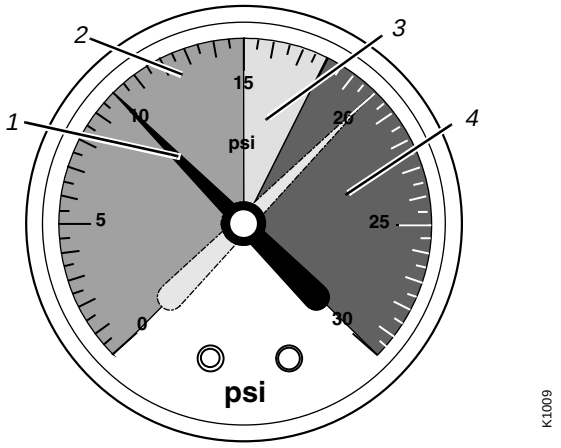


Fig. 5-14: Return Filter Pressure Gauge

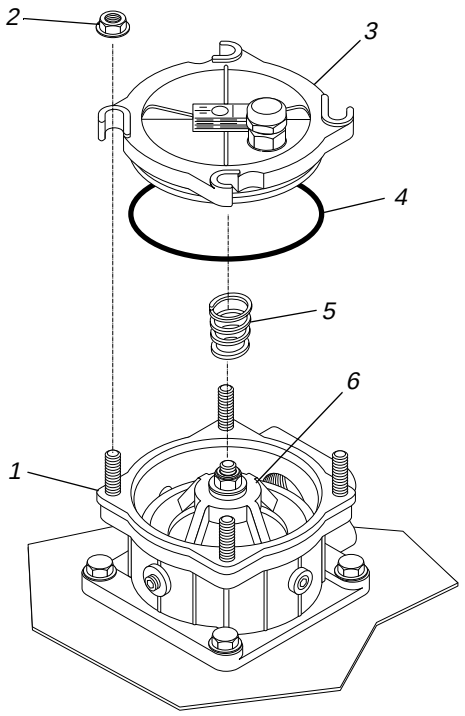
Note: *Check indicator with engine at idle, after thirty minutes of operation.*

The return filter pressure gauge is located on the side of the return filter housing.

The gauge indicates hydraulic fluid pressure entering the return filter element. As contamination accumulates in the filter element, pressure rises.

The acceptable operating pressure range is 0–15 psi and is indicated by needle ***(1)*** positioned in green arc ***(2)***. Pressures above 15 psi, orange arc ***(3)*** and red arc ***(4)***, indicate that the return filter element must be serviced.

Replacing Return Filter Element



#	Description
1	Return Filter Housing
2	Flange Nut
3	Filter Housing Cover

#	Description
4	O-Ring
5	Spring
6	Hydraulic Filter Element

Fig. 5-15: Filter Housing Cover

Disassembly, Return Filter Element

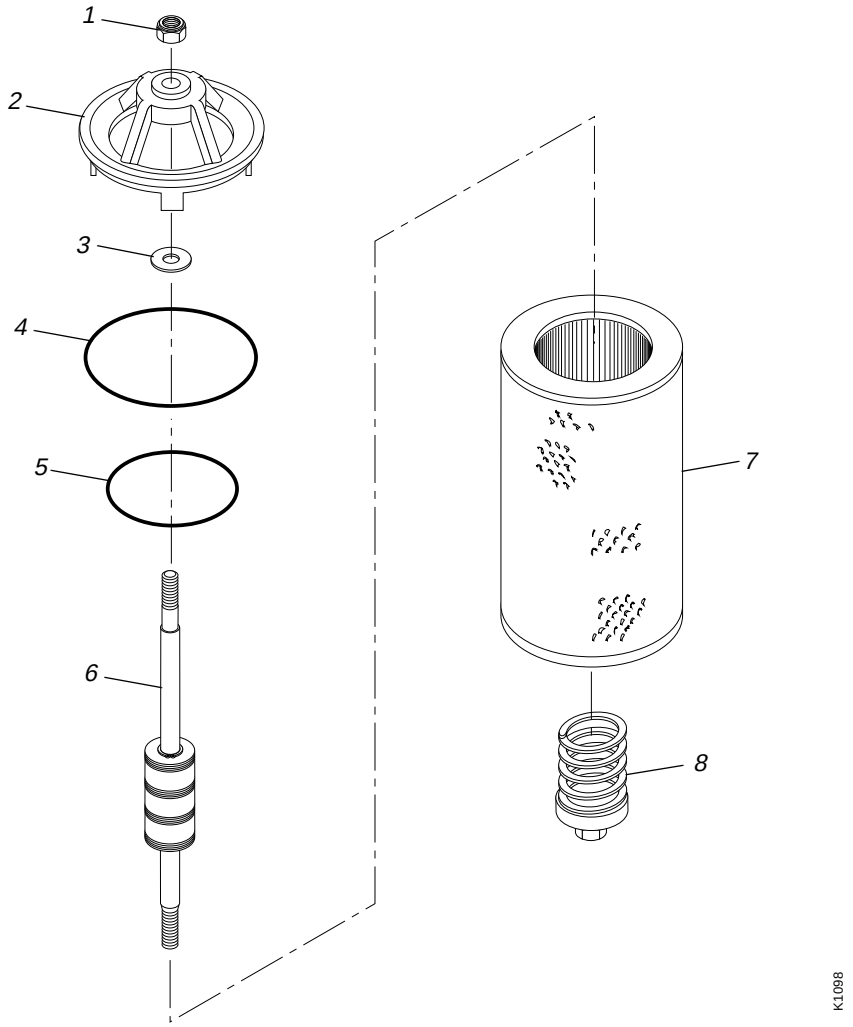
(Ref. Fig. 5-15) The following procedure describes removal of the return filter element.

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 5-4.

2. Loosen four (4) flange nuts (Item 2) that secure cover (Item 3) to return filter housing (Item 1). Loosen them only enough to be able to rotate cover. While applying pressure to cover, rotate cover clockwise so that recessed areas of cover line up to flange nuts. ***Slowly*** release pressure and remove cover.

CAUTION: Care must be taken to avoid injury when removing cover. Do not remove flange nuts. There is pressure under cover from spring (Item 5).

3. Remove spring (Item 5) and return filter element assembly (Item 6) and take to a suitable location for further inspection and cleaning.
4. To protect system from contamination while working on filter element assembly, place cover (Item 3) back on return filter housing (Item 1) and tighten flange nuts (Item 2).



#	Description
1	Lock Nut
2	Trestle
3	Flatwasher
4	O-Ring

#	Description
5	Filter Element O-Ring
6	Tie Rod
7	Filter Element
8	Bypass Spring Assembly

Fig. 5-16: Filter Element Assembly

Replacement, Return Filter Element

(Ref. Fig. 5-16) The following procedure describes replacing the return filter element.

1. To avoid contamination, place all parts on clean paper or cloth.
2. Loosen and remove lock nut (Item 1) that secures trestle (Item 2) to filter element (Item 7).
3. Remove trestle and flatwasher (Item 3).
4. Loosen bypass spring assembly (Item 8) by turning it counter-clockwise. Remove bypass spring assembly and tie rod (Item 6) from filter element (Item 7). Discard contaminated filter element.
5. Remove and inspect two (2) trestle O-rings (Items 4 and 5). Clean trestle and O-rings with solvent. Dry with compressed air. Lubricate O-rings with hydraulic oil and install.
6. Clean washer, lock nut, bypass spring assembly, and tie rod with solvent. Dry with compressed air.
7. Insert short end of tie rod (Item 6) through new filter element (Item 7). Connect bypass spring assembly (Item 8) to end of tie rod. Tighten by turning bypass spring assembly clockwise until snug and completely engaged on tie rod.
8. Reassemble flatwasher (Item 3), trestle (Item 2), and lock nut (Item 1) on other end of tie rod.

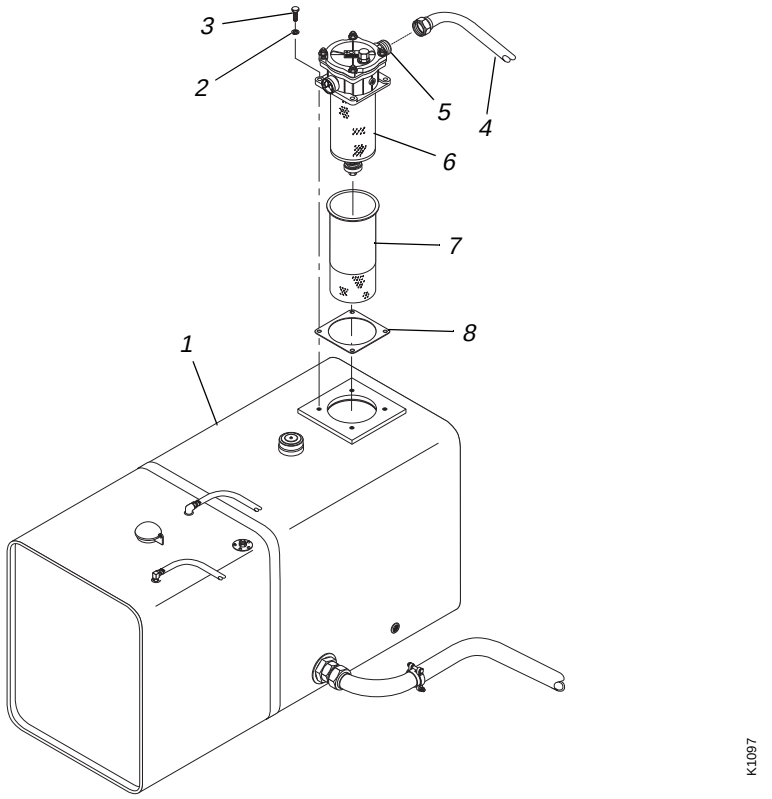
Reassembly, Return Filter Element

(Ref. Fig. 5-15) The following procedure describes installation of the return filter element.

1. Loosen four (4) flange nuts (Item 2) enough so cover (Item 3) can be removed from filter assembly head (Item 1). Twist cover clockwise so that recessed areas of cover line up to flange nuts before removing it.
2. Inspect and clean cover O-ring (Item 4) and replace if necessary. Lubricate O-ring with hydraulic oil and install on cover.
3. Insert filter element assembly (Item 6) into return filter housing (Item 1).
4. Place spring (Item 5) so it rests vertically on top of trestle.
5. Place cover (Item 3) on filter assembly head making sure recessed areas of cover line up with flange nuts.
6. Press down on cover until it can be rotated counter clockwise and slide under flange nuts (Item 2). Torque flange nuts to 35 ft-lbs.

Removal

Return Filter Assembly



#	Description
1	Hydraulic Oil Reservoir
2	Lockwasher
3	Capscrew
4	Return Manifold Tube

#	Description
5	Connector
6	Return Hydraulic Oil Filter
7	Diffuser
8	Rubber Gasket

Fig. 5-17: Return Filter Assembly

(Ref. Fig. 5-17) The following procedure describes disassembly of the return filter assembly.

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 5-4.
2. Clean the area around the return filter housing (Item 6).
3. Loosen and remove the return manifold tube (Item 4) connected to the connector (Item 5) on the hydraulic oil return filter assembly (Item 6).
4. Loosen and remove four (4) capscrews (Item 3) and lockwashers (Item 2) that secure the hydraulic oil return filter assembly (Item 6) to the hydraulic oil reservoir (Item 1). Remove the hydraulic oil return filter assembly. To avoid contamination, place all parts on a clean surface.
5. Remove the rubber gasket (Item 8) and clean it with an appropriate solvent. Inspect condition of the gasket and replace it if necessary.

6. Remove the diffuser (Item 7) and clean with solvent. Dry with compressed air.

Installation

Return Filter Assembly

(Ref. Fig. 5-17) The following procedures describes installation of the return filter assembly.

1. Reassemble the diffuser (Item 7) and the rubber gasket (Item 8) with the hydraulic return assembly (Item 6).
2. Install the return filter assembly on the hydraulic reservoir with the four (4) lockwashers (Item 2) and capscrews (Item 3). Torque the capscrews evenly to 276 in-lbs.
3. Connect the return manifold tube (Item 4) to the connector (Item 5) on the hydraulic oil return filter assembly (Item 6). Torque the nut on the return manifold tube to 188–213 ft-lbs.

Reservoir Breather

Description

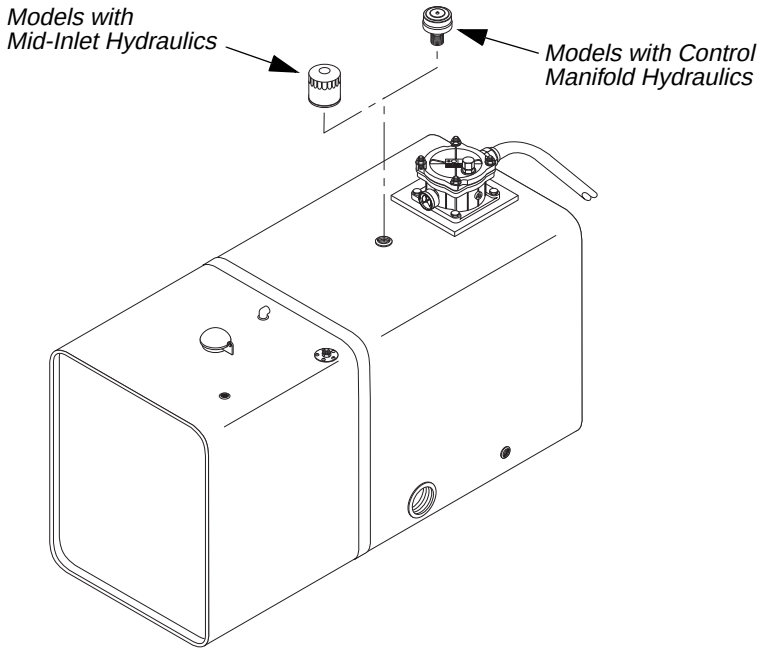


Fig. 5-18: Reservoir Breather

(Ref. Fig. 5-18) The reservoir breather is located on the top of the hydraulic reservoir near the return filter. It allows for expansion of fluid and prevents vacuum in the tank.

Removal and Installation

Reservoir Breather

1. Loosen and remove breather, using tool on hex portion of breather.
2. Replace breather per the maintenance schedule found on the machine or if damaged.
3. Install breather on tank and tighten as necessary.

CAUTION: To avoid contamination of the hydraulic system, do not use thread sealant or Teflon tape.

CAUTION: To avoid the possibility of the hydraulic system being contaminated, do not fill the reservoir through the breather opening.

Hydraulic Pressure Filter

Description

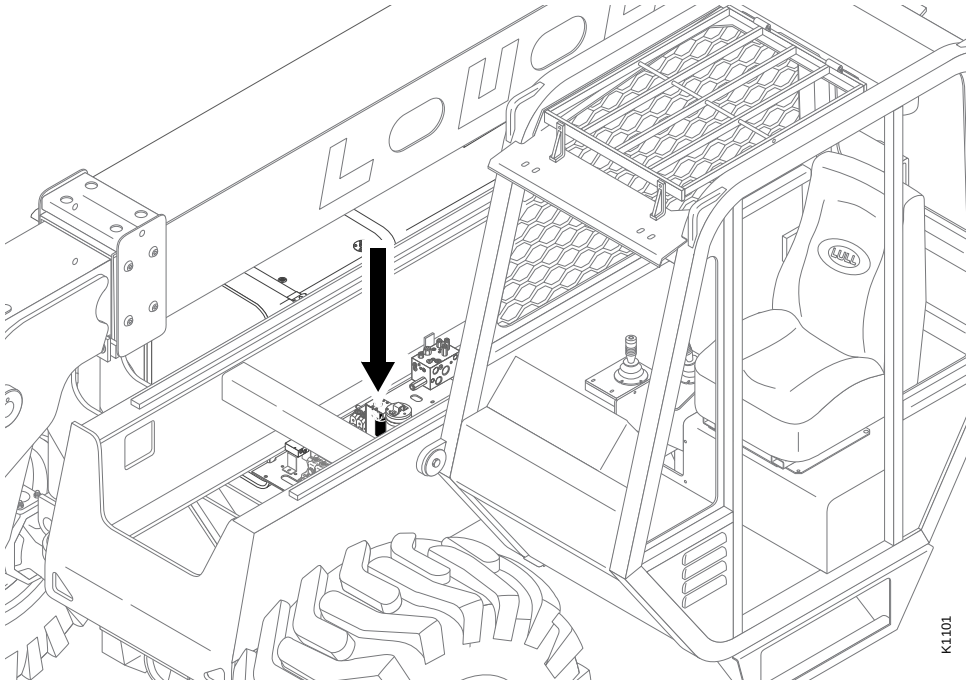


Fig. 5-19: Hydraulic Pressure Filter – Control Manifold Hydraulics

The hydraulic pressure filter is located on the mounting bracket for the pressure filter and accumulator which is attached to the valve plate. While Fig. 5-19 illustrates the hydraulic pressure filter for models that use control manifold hydraulics, the filter is located in the same general area for models that use mid-inlet hydraulics (see Fig. 5-21). The function of the pressure filter is to remove contaminants from the oil traveling to the joystick controls.

Checking Filter Element Condition

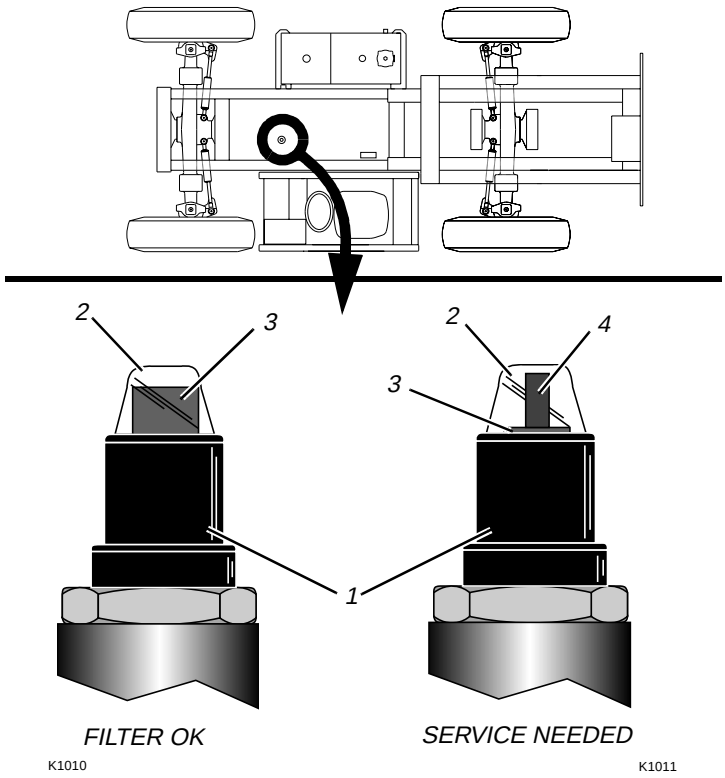


Fig. 5-20: Pressure Filter Service Indicator

Note: *Not all pressure filter assemblies have a pressure filter service indicator.*

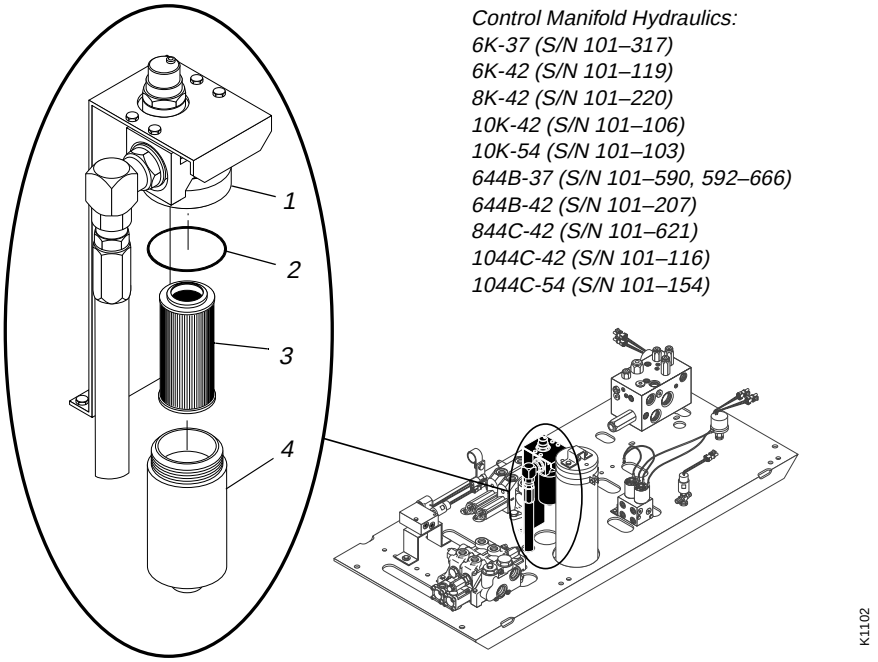
Note: *Check indicator with the engine on.*

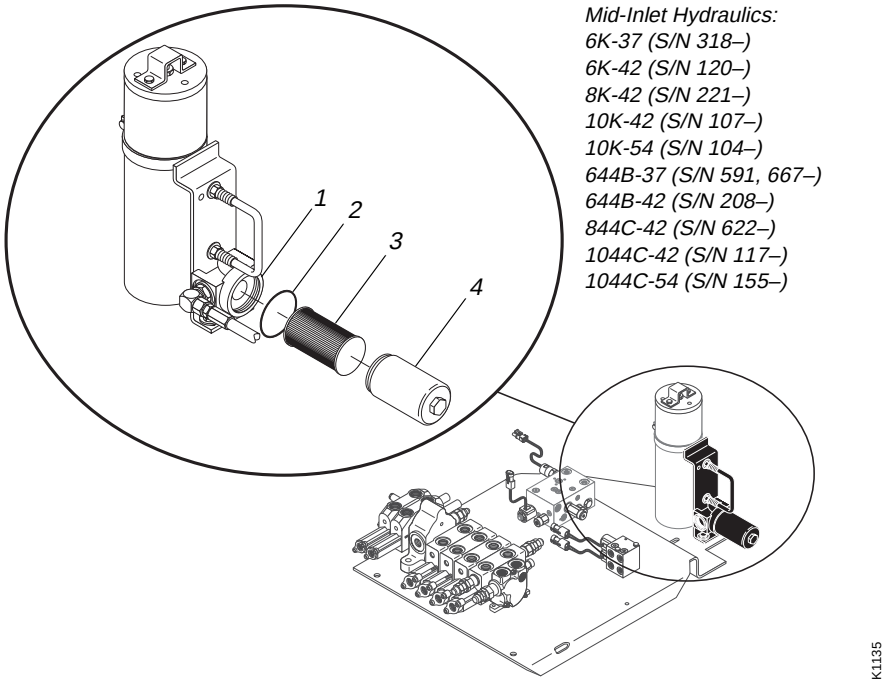
The pressure filter service indicator ***(1)*** is located on the top of the pressure filter assembly.

The indicator shows the relative amount of restriction in the pressure filter element.

When restriction is within acceptable limits, the green indicator ***(3)*** is fully visible in the window ***(2)***. As contamination accumulates in the element, the green indicator ***(3)*** will drop, exposing the red indicator ***(4)***. If the red indicator ***(4)*** is exposed, the filter must be replaced.

Replacing Pressure Filter Element





#	Description
1	Filter Head
2	Bowl O-Ring

#	Description
3	Filter Element
4	Bowl

Fig. 5-21: Hydraulic Pressure Filter Element

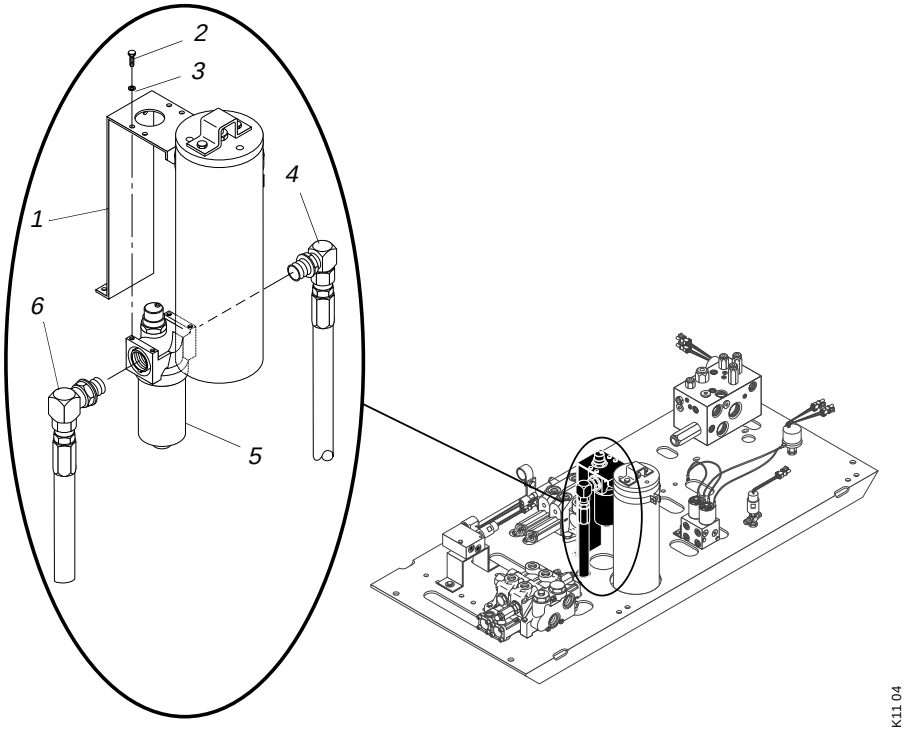
(Ref. Fig. 5-21) The following procedure describes replacement of the hydraulic pressure filter element.

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 5-4.

2. Clean hydraulic pressure filter assembly to avoid contamination of system while removing hydraulic pressure filter assembly.
3. Unscrew and remove filter element bowl (Item 4) from filter head (Item 1).
4. Remove filter element (Item 3) and discard it.
5. Remove bowl O-ring (Item 2), clean with an solvent, and dry with compressed air. Replace it if damaged.
6. Clean filter element bowl and filter head with solvent and dry with compressed air.
7. Insert a new filter element into bowl. Lubricate bowl O-ring with hydraulic oil and install it on bowl.
8. Screw bowl into filter head and tighten until snug.

Removal

Pressure Filter Assembly



#	Description
1	Filter Mounting Bracket
2	Capscrew
3	Lockwasher

#	Description
4	90° O-Ring Hose Elbow
5	Pressure Filter Assembly
6	90° O-Ring Hose Elbow

Fig. 5-22: Hydraulic Pressure Filter Assembly

(Ref. Fig. 5-22) The following procedure describes removal of the hydraulic pressure filter assembly.

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 5-4.
2. For models 644B, 844C, and 1044C, refer to roll-back hose tray removal procedures on page 5-92.
3. Clean the hydraulic pressure assembly to avoid contamination of the system while removing the hydraulic pressure filter assembly.
4. Tag and ***slowly*** loosen the two (2) 90° O-ring hose elbows (Items 4 and 6) from the pressure filter assembly and bleed any remaining oil. Cap fittings.
5. While securing the hydraulic pressure filter assembly (Item 5), loosen and remove the four (4) each capscrews (Item 2) and lockwashers (Item 3) that connect the pressure filter assembly to the filter mounting bracket (Item 1).
6. Remove the pressure filter assembly from the hole in the filter mounting bracket.

Installation

Pressure Filter Assembly

(Ref. Fig. 5-22) The following procedure describes installation of the hydraulic pressure filter assembly.

1. Insert the pressure filter assembly through the hole in the filter mounting bracket, making sure that the bypass indicator is closest to back of the mounting bracket.
2. Secure the pressure filter assembly to the mounting bracket with the four (4) each capscrews and lockwashers. For final tightening, torque the capscrews to 75 in-lbs.
3. Connect the two (2) elbows (Items 4 and 6) to the pressure filter assembly. For final tightening, torque to 75–85 ft-lbs.
4. For models 644B, 844C, and 1044C, refer to roll-back hose tray installation procedures on page 5-96.

Hydraulic Pump

Description

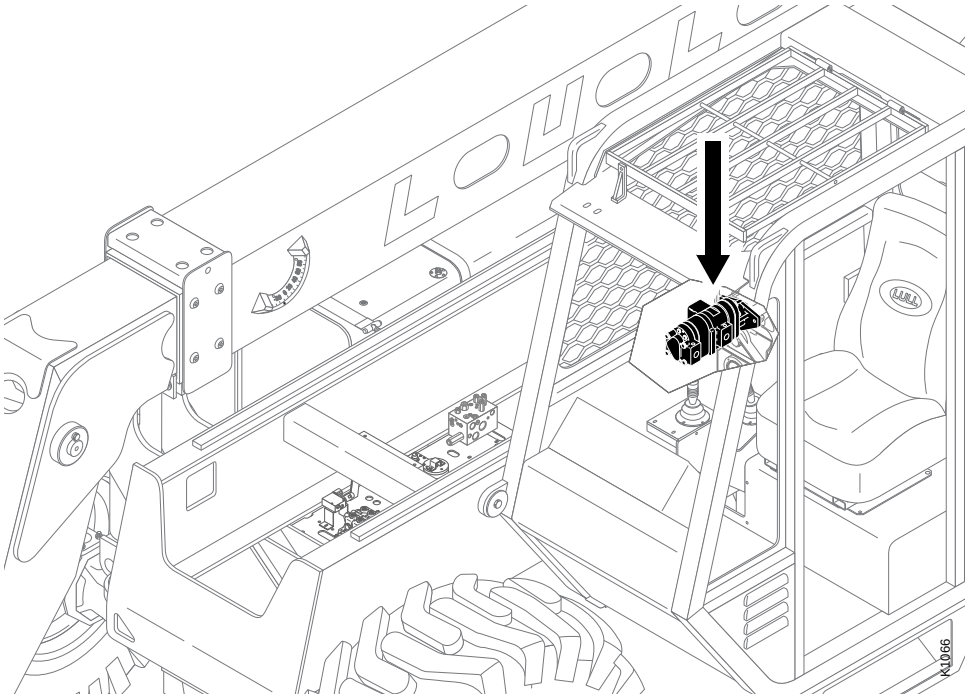


Fig. 5-23: Hydraulic Pump Location

(Ref. Fig. 5-23) The hydraulic pump is located on the transmission towards the back of the machine.The hydraulic pump used is a two-section gear type, driven directly from the transmission power takeoff.

PUMP SPECIFICATIONS:

- Type - Gear
- Sections - Two
- Manufacturer - Vickers
- Model - G2020
- GPM - 18 at 2500 RPM (Cover End - Pump 1)
- GPM - 26 at 2500 RPM (Shaft End - Pump 2)

Troubleshooting Pump Problems

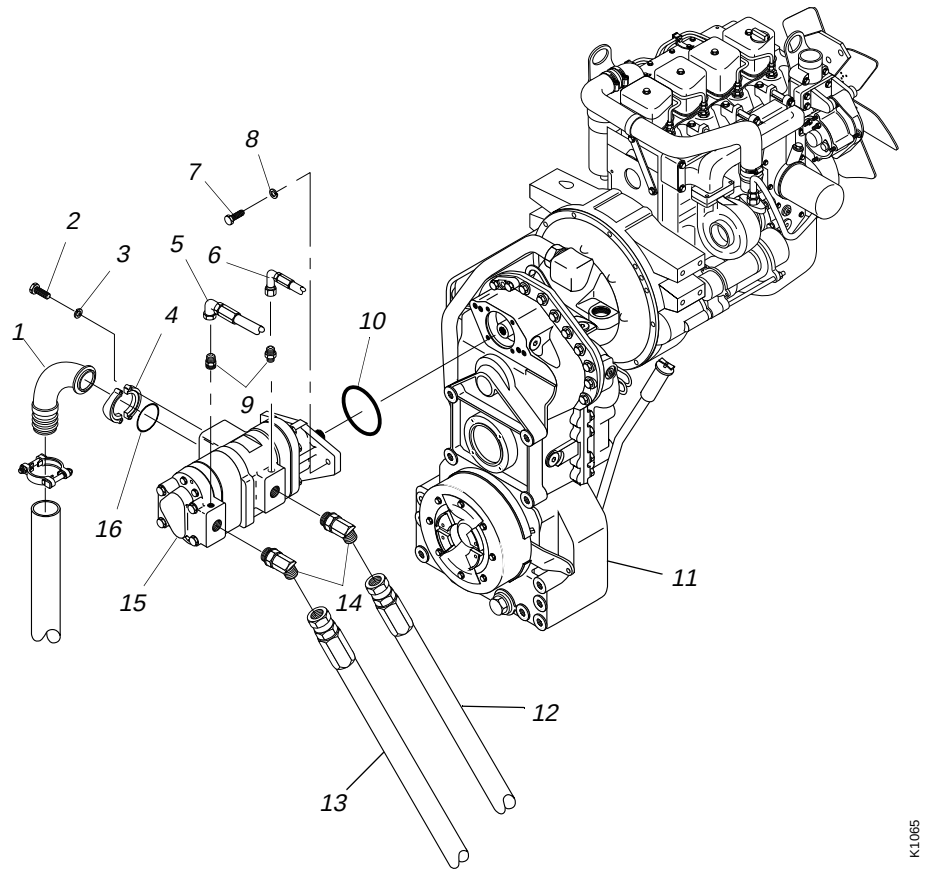
Problem	Probable Cause	Solution
1. Excessive pump noise	A. Low oil level in the hydraulic reservoir	Fill reservoir to proper level with the recommended hydraulic fluid. DO NOT overfill.
	B. Air in the system	1. Operate hydraulic system until purged. 2. Check inlet (suction) lines and fittings for air leaks.
	C. Vacuum condition	1. Check inlet (suction) lines and fittings for restrictions. 2. Check reservoir breather filter conditions.
	D. Oil too thick	Be certain correct type of oil is used for refilling or adding to the system. Viscosity must be correct for ambient temperatures.
	E. Cold weather	Run hydraulic system until unit is warm to the touch and noise disappears. Check oil viscosity.
2. Pump Overheating	A. Internal leakage	Return vehicle to maintenance shop for evaluation and repair.
	B. Low fluid level	Add oil to operating level.
3. System not developing pressure	A. Relief valve open	Replace or repair the relief valve.
	B. Loss of fluid internally (slippage)	Return the vehicle to the maintenance shop for repair of hydraulic system.
	C. Disconnected or broken pump drive	Inspect and repair or replace.
4. Loss of fluid	A. Ruptured hydraulic lines B. Loose fittings C. Leaking gaskets or seals in pump or circuit	1. Check all external connections, tubing, and hoses. Tighten connections and replace any ruptured tubes or hoses. 2. Observe mating sections of pump for leaks. 3. Replace seals or gaskets if possible.

Removal

Hydraulic Pump

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)



#	Description
1	Elbow Flange Head Connector
2	Capscrew
3	Lockwasher
4	Flange Half
5	Hydraulic Hose
6	Hydraulic Hose
7	Capscrew
8	Lockwasher

#	Description
9	Connector
10	O-Ring
11	Transmission
12	Hydraulic Hose
13	Hydraulic Hose
14	45° Elbow
15	Hydraulic Pump
16	O-Ring

Fig. 5-24: Hydraulic Pump Installation – Control Manifold Hydraulics

(Ref. Fig. 5-24) The following steps are required to remove the hydraulic pump for models with control manifold hydraulics.

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 5-4.
2. Install brake pressure diagnostic port test gauge into brake diagnostic port (see page 5-90).

3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.
4. For models 644B, 844C, and 1044C, refer to roll-back hose tray removal procedures on page 5-92.
5. Thoroughly clean the hydraulic pump (Item 15) to ensure that dirt will not get into the system/transmission.
6. Tag and ***slowly*** loosen four (4) hydraulic hoses (Items 5, 6, 12, and 13) and bleed any remaining oil. Disconnect hoses. Cap fittings and hoses.
7. Take note of how fittings are attached to the pump. To make sure they are reassembled in the same position, make sketches of the two (2) adjustable 45° O-ring elbows (Item 14).
8. Remove four (4) each capscrews (Item 2) and lockwashers (Item 3) holding the two (2) flange halves (Item 4) that secure the flange head connector (Item 1) to the hydraulic pump (Item 15). Remove the flange halves.
9. Plug the port on the elbow (Item 1) and tie up the elbow to ensure that fluid from the hydraulic tank does not spill.

CAUTION: Before loosening capscrews that secure the hydraulic pump to the transmission (Item 11), support the pump to ensure that it does not twist or fall.

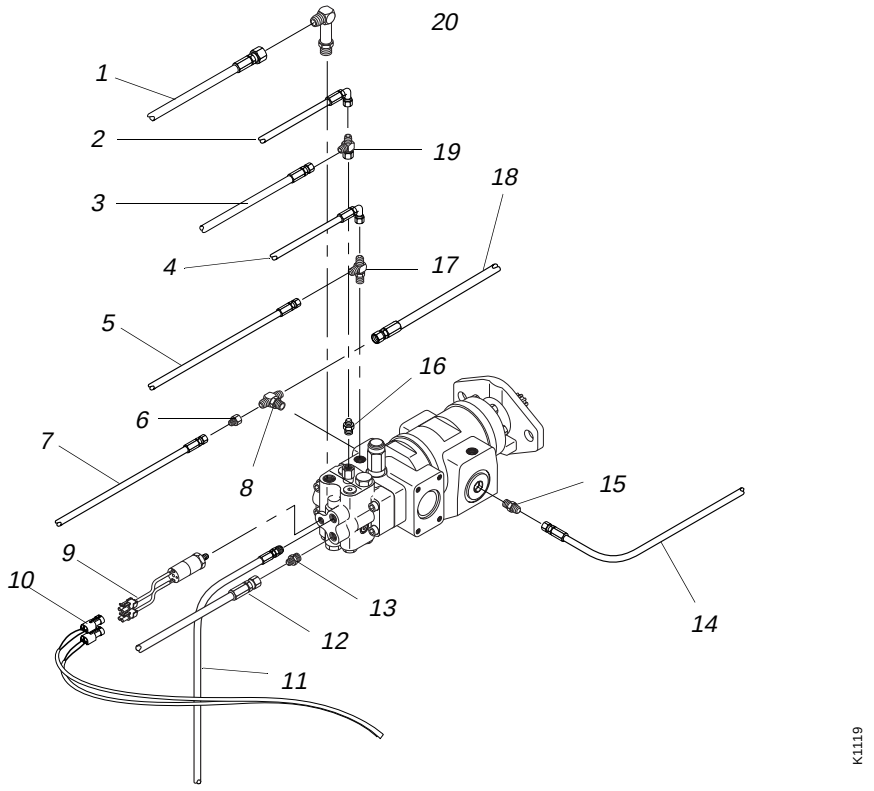
10. Remove two (2) each capscrews (Item 7) and lockwashers (Item 8).
11. Pull the pump straight out from the transmission and take it to an appropriate area for further inspection.

CAUTION: To avoid contamination of system, cap hoses and cover opening on transmission after pump is removed.

Models with Mid-Inlet Hydraulics

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)

Fig. 5-25 and Fig. 5-26 describe procedures for removal of the hydraulic pump for models with a mid-inlet hydraulic system.



#	Description
1	Hydraulic Hose to Valve Plate
2	Hyd. Hose to Steering Test Port
3	Hydraulic Hose to Valve Plate
4	Hydraulic Hose to Pilot Test Port
5	Hydraulic Hose to Accumulator
6	Reducer Adapter
7	Hyd. Hose to Pump 1 Test Port
8	Branch Tee
9	Pressure Switch
10	Intermediate Wiring Harness
11	Hydraulic Hose to Control Valve

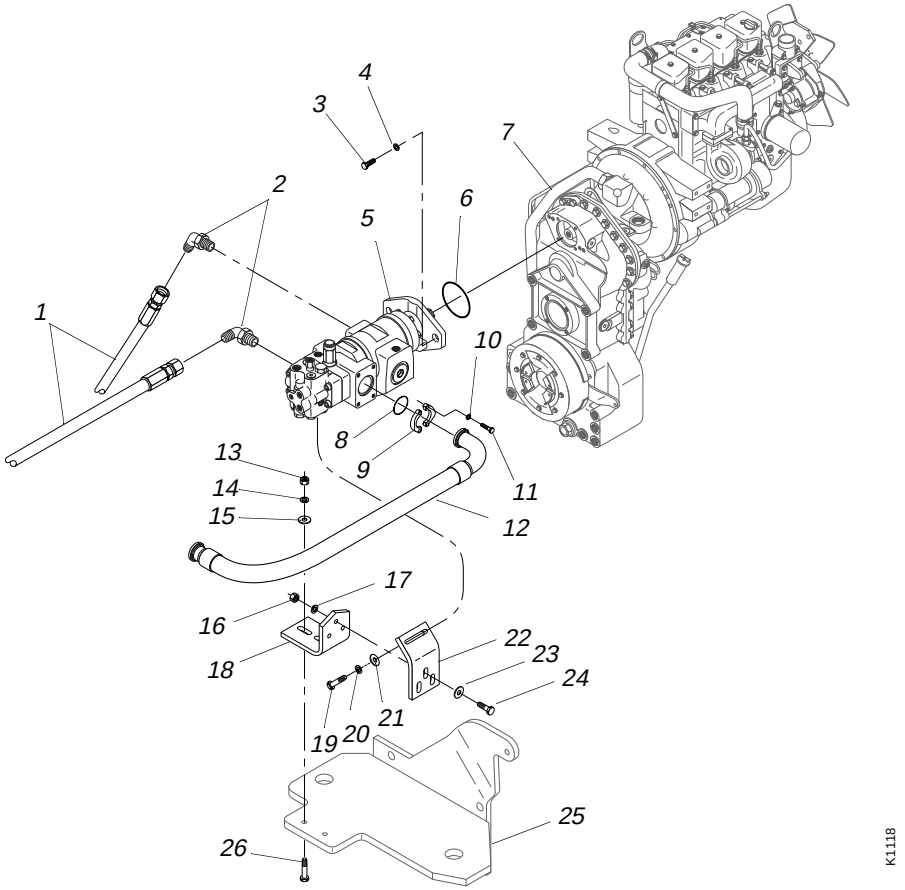
#	Description
12	Hydraulic Hose to Accumulator
13	Connector
14	Hydraulic Hose to Elbow on Rear Oscillation Lock Control Block
15	Check Valve
16	Connector
17	Run Tee
18	Hydraulic Hose to Check Valve on Rear Oscillation Lock Control Blk
19	Swivel Run Tee
20	Long Elbow

Fig. 5-25: Hydraulic Pump Hoses – Mid-Inlet Hydraulics

(Ref. Fig. 5-25) 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 5-4.
2. Install brake pressure diagnostic port test gauge into brake diagnostic port (see page 5-90).
3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.

4. For models 644B, 844C, and 1044C, refer to roll-back hose tray removal procedures on page 5-92.
5. Disconnect wiring harness (Item 10) from pressure switch (Item 9).
6. Thoroughly clean the hydraulic pump to ensure that dirt will not get into the system/transmission.
7. Tag and ***slowly*** loosen the ten (10) hydraulic hoses shown in Fig. 5-25 (Items 1 thru 5, 7, 11, 12, 14, and 18). Bleed any remaining oil into appropriate container. Disconnect hoses. Cap fittings and hoses.



#	Description	#	Description
1	Hydraulic Hose	14	Lockwasher
2	Elbow	15	Flatwasher
3	Capscrew	16	Nut
4	Lockwasher	17	Lockwasher
5	Hydraulic Pump	18	Lower Pump Support Bracket
6	O-Ring	19	Capscrew
7	Transmission	20	Lockwasher
8	O-ring	21	Flatwasher
9	Flange Half	22	Upper Pump Support Bracket
10	Lockwasher	23	Flatwasher
11	Capscrew	24	Capscrew
12	Hydraulic Suction Hose	25	Park Brake Cylinder Mount
13	Nut	26	Capscrew

Fig. 5-26: Hydraulic Pump Installation – Mid-Inlet Hydraulics

(Ref. Fig. 5-26) The following procedures completes the steps necessary for removal of the hydraulic pump.

1. Tag and ***slowly*** loosen two (2) hydraulic hoses (Item 1) and bleed any remaining oil. Disconnect hoses from elbows (Item 2). Cap fittings and hoses.
2. Remove four (4) capscrews (Item 11) and lockwashers (Item 10) securing the two (2) flange halves (Item 9) to the hydraulic suction hose (Item 12). Remove the flange halves.

CAUTION: Before removing support bracket or loosening capscrews that secure the hydraulic pump to the transmission (Item 7), support the pump to ensure that it does not twist or fall.

3. Remove two (2) capscrews (Item 19), lockwashers (Item 20), and flatwashers (Item 21) securing upper pump support bracket (Item 22) to the pump.
4. Remove two (2) capscrews (Item 3) and lockwashers (Item 4) securing the hydraulic pump to the transmission.
5. Pull the pump straight out from the transmission and take it to an appropriate area for further inspection.

CAUTION: To avoid contamination of system, cap hoses and cover opening in transmission after pump is removed.

Inspection and Maintenance, Hydraulic Pump

The following steps describe cleaning and replacement of fittings and O-rings for the hydraulic pump after it has been removed.

Models with Control Manifold Hydraulics (Ref. Fig. 5-24):

1. Remove and discard O-rings (Items 10 and 16).
2. Remove four (4) fittings (Items 9 and 14). Clean with appropriate solvent and dry with compressed air. Inspect and replace if damaged.
3. Clean exposed areas of hydraulic pump with appropriate solvent and dry with compressed air.
4. Lubricate and install new O-rings on pump.
5. Lubricate threaded portion of each fitting, including the O-ring. Install two (2) connectors (Item 9) and torque to 205–235 in-lbs. Install two (2) elbows (Item 14) and torque to 75–85 ft-lbs.

Models with Mid-Inlet Hydraulics:

1. (Ref. Fig. 5-26) Remove and discard O-rings (Items 6 and 8).
2. (Ref. Fig. 5-25) Remove pressure switch (Item 9).
3. Make notes of positions of hydraulic fittings shown in Fig. 5-25 and Fig. 5-26. Tag and remove all fittings. Clean with appropriate solvent and dry with compressed air. Inspect and replace if damaged.

4. Clean exposed areas of hydraulic pump with appropriate solvent and dry with compressed air.
5. (Ref. Fig. 5-26) Lubricate and install new O-rings on pump.
6. Lubricate threaded portion of each fitting, including the O-ring.

Steps 7 thru 14 apply to Fig. 5-25. Refer to notes made earlier for correct positioning of all fittings.

7. Install connector (Item 13) in lower port on front of pump. Torque the connector to 25–29 ft-lbs.
8. Install check valve (Item 15) in side port of pump. Torque the valve to 46–50 ft-lbs.
9. Install branch tee (Item 8) on side port of pump. Torque the tee to 40–44 ft-lbs.
10. Install reducer adapter (Item 6) on the branch tee (Item 8). Torque the adapter to 44–48 ft-lbs.
11. Install connector (Item 16) on top of pump. Torque connector to 205–235 in-lbs.
12. Install swivel run tee (Item 19) on connector (Item 16). Torque nut on tee to 130–150 in-lbs.
13. Install long elbow (Item 20) on top of pump. Torque elbow to 40–44 ft-lbs.
14. Install pressure switch (Item 9).
15. (Ref. Fig. 5-26) Install two (2) elbows (Item 2) on side of pump. Torque elbows to 75–85 ft-lbs.

Installation

Hydraulic Pump

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

(Ref. Fig. 5-24) The following procedure is for the installation of the hydraulic pump for models with control manifold hydraulics.

1. Insert assembled hydraulic pump straight into the transmission making sure the pump is supported so it cannot twist and cause damage. Install the pump on the transmission with the two (2) capscrews (Item 7) and lockwashers (Item 8). For final tightening, torque the capscrews to 55 ft-lbs.
2. Untie flange head connector (Item 1). Clean open end of flange head connector and opening on transmission (Item 11) with appropriate solvent. Dry with compressed air.
3. Connect the flange head connector to the hydraulic pump with the two (2) flange halves (Item 4), four (4) capscrews (Item 2), and four (4) lockwashers (Item 3). For final tightening, torque the capscrews to 55 ft-lbs.

4. Remove caps and clean hydraulic hose ends (Items 5, 6, 12, and 13) with appropriate solvent. Dry with compressed air.
5. Reconnect hydraulic hoses to fittings as instructed in Chapter 3 of this manual. Refer to the sketches and notes made earlier and adjust fittings as necessary so that they are in the same position as prior to being disconnected. For final tightening, torque the hose ends (Items 5 and 6) connected to the two (2) O-ring connectors (Item 9) to 130–150 in-lbs. For final tightening, torque the hose ends (Items 12 and 13) connected to the two (2) 45° O-ring elbows (Item 14) to 79-88 ft-lbs.
6. Start the engine and check for hydraulic leaks. Correct as necessary.
7. For models 644B, 844C, and 1044C, refer to roll-back hose tray installation procedures on page 5-96.

Models with Mid-inlet Hydraulics

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)

(Ref. Fig. 5-25 and Fig. 5-26) The following procedure is for the installation of the hydraulic pump for models with a mid-inlet hydraulic system.

Step 1 thru Step 5 refer to Fig. 5-26.

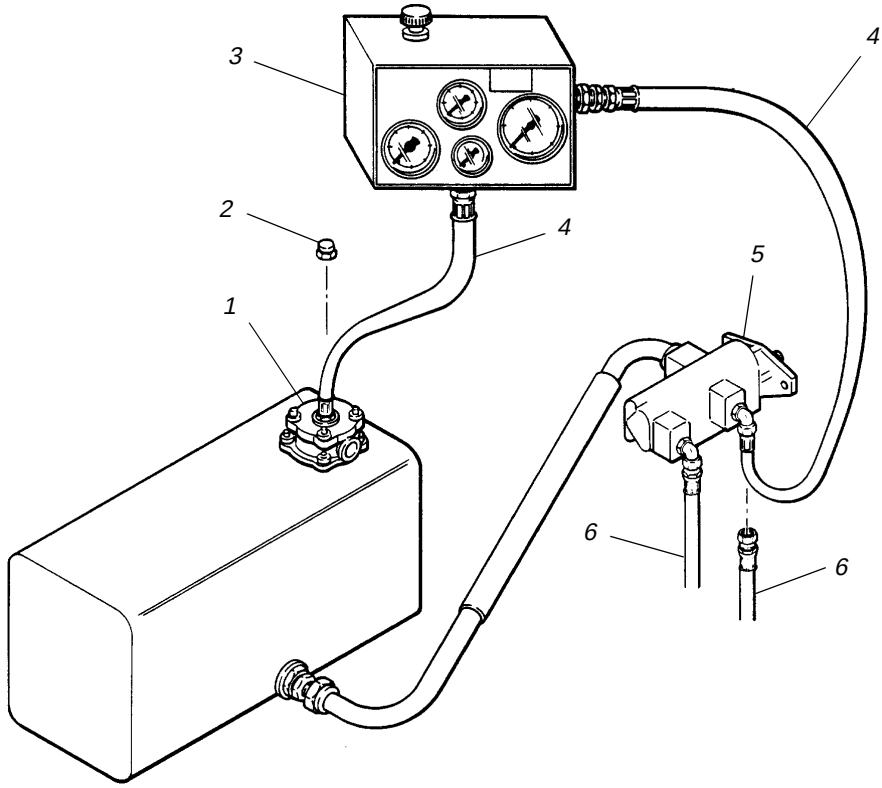
1. If the pump support brackets were removed,
   a. Install lower pump support bracket on park brake cylinder mount with two (2) capscrews (Item 26), flatwashers (Item 15), lockwashers (Item 14), and nuts (Item 13). Torque nuts to 180 in-lbs.
   b. Install upper pump support bracket on lower pump support bracket with three (3) capscrews (Item 24), flatwashers (Item 23), lockwashers (Item 17), and nuts (Item 16). Torque nuts to 180 in-lbs.
2. Insert assembled hydraulic pump straight into the transmission making sure the pump is supported so it cannot twist and cause damage. Install the pump on the transmission with the two (2) capscrews (Item 3) and lockwashers (Item 4). For final tightening, torque capscrews to 55 ft-lbs.
3. Secure upper pump support bracket to pump with two (2) each flatwashers (Item 21), lockwashers (Item 20), and capscrews (Item 19). Torque capscrews to 276 in-lbs.
4. Connect hydraulic suction hose (Item 12) to pump by installing two (2) flange halves (Item 9) and four (4) lockwashers (Item 10) and capscrews (Item 11). Torque capscrews to 55 ft-lbs.
5. Connect two (2) hydraulic hoses (Item 1) on elbows (Item 2) on side of pump. For final tightening, torque swivel nuts on hoses to 79–88 ft-lbs.

Step 6 thru Step 16 refer to Fig. 5-26.

6. install hydraulic hose (Item 7) from Pump 1 test port to reducer adapter (Item 6). For final tightening, torque swivel nut on hose to 130–150 in-lbs.

7. Install hydraulic hose (Item 18) from check valve on rear oscillation lock control block to branch tee (Item 8). For final tightening, torque swivel nut on hose to 44–48 ft-lbs.
8. Install hydraulic hose (Item 5) from accumulator to run tee (Item 17). For final tightening, torque swivel nut on hose to 130–150 in-lbs.
9. Install hydraulic hose (Item 4) from Pilot test port to run tee (Item 17). For final tightening, torque swivel nut on hose to 130–150 in-lbs.
10. Install hydraulic hose (Item 3) from valve plate to swivel run tee (Item 19). For final tightening, torque swivel nut on hose to 130–150 in-lbs.
11. Install hydraulic hose (Item 2) from Steering test port to swivel run tee (Item 19). For final tightening, torque swivel nut on hose to 130–150 in-lbs.
12. Install hydraulic hose (Item 1) from valve plate to long elbow (Item 20). For final tightening, torque swivel nut on hose to 44–48 ft-lbs.
13. Install hydraulic hose (Item 12) from accumulator to connector (Item 13) on front of pump. For final tightening, torque swivel nut on hose to 235–265 in-lbs.
14. Install hydraulic hose (Item 11) from control valve to front of pump. For final tightening, torque swivel nut on hose to 130–150 in-lbs.
15. Install hydraulic hose (Item 14) from elbow on rear oscillation lock control block to check valve (Item 15) on side of pump. For final tightening, torque swivel nut on hose to 44–48 ft-lbs.
16. Reconnect intermediate wiring harness (Item 10) to pressure switch (Item 9).
17. Start the engine and check for hydraulic leaks. Correct as necessary.
18. For models 644B, 844C, and 1044C, refer to roll-back hose tray installation procedures on page 5-96.

Checking Pump Flow Rate



#	Description
1	Return Filter Housing
2	Hex Cap
3	Hydraulic Tester

#	Description
4	Test Loop Hose (2)
5	Hydraulic Pump
6	Pressure Hose (2)

Fig. 5-27: Checking Hydraulic Pump Flow Rate

(Ref. Fig. 5-27) If the pump(s) is suspected of delivering below rated capacity, use the following procedure to check pump flow rate:

1. Lower boom to the ground, apply parking brake and stop engine. Release all hydraulic pressure in the system (See warning and procedure under “General Hydraulic Maintenance Practices” on page 5-4 of this section).
2. Loosen and remove pressure line hose (Item 6) from pressure port of pump (Item 5) to be tested.
3. Loosen and remove hex cap (Item 2) from top of return filter housing (Item 1).
4. Assemble a hydraulic tester (Item 3) in a test loop between the pump and return filter. Use hydraulic hose (Item 4) with a minimum burst pressure rating of 12,000 psi. Hose end fittings for the pump and return filter must be 1 1/16-12 JIC (37°) female.
5. Determine the system's maximum rated pressure (which is the specified-relief setting for boom hoist and extend control valve). See Fluid Pressures under “Specifications” for your model forklift in section 2.

6. Adjust pressure relief valve setting to 100 psi over that of system's maximum rated pressure.

Important: *Be sure the load valve is open before starting the engine.*

7. Start the engine and, when it is at normal operating temperature, open the throttle control all the way. Slowly close the load valve to load the system. (Do not exceed system's maximum rated pressure). Continue loading until normal operating temperature of the system is reached (see “Hydraulic Oil Working Temperature @ under Specifications @ for your model forklift in Section 2).
8. Open load valve. Record maximum pump flow at zero pressure.
9. Slowly close the load valve until the system is at the maximum rated pressure. Record the pump flow.
10. Open load valve until pump pressure is again at zero.
11. Shut off the engine.
12. Disconnect test loop from pump and return filter housing. Reconnect pump pressure hose (Item 6) and install hex cap (Item 2) atop return filter housing.

Pump flow at maximum pressure should be at least 75 percent of the rated pump flow. For rated pump flow, see “Hydraulic Pump”, under “Specifications”, in Section 2.

Repair or replace pump if pump flow rate is less than 75 percent of rated capacity. see “Hydraulic Pump” on page 5-33 for replacement pump procedures.

Multi-Spool Control Valve

Description

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

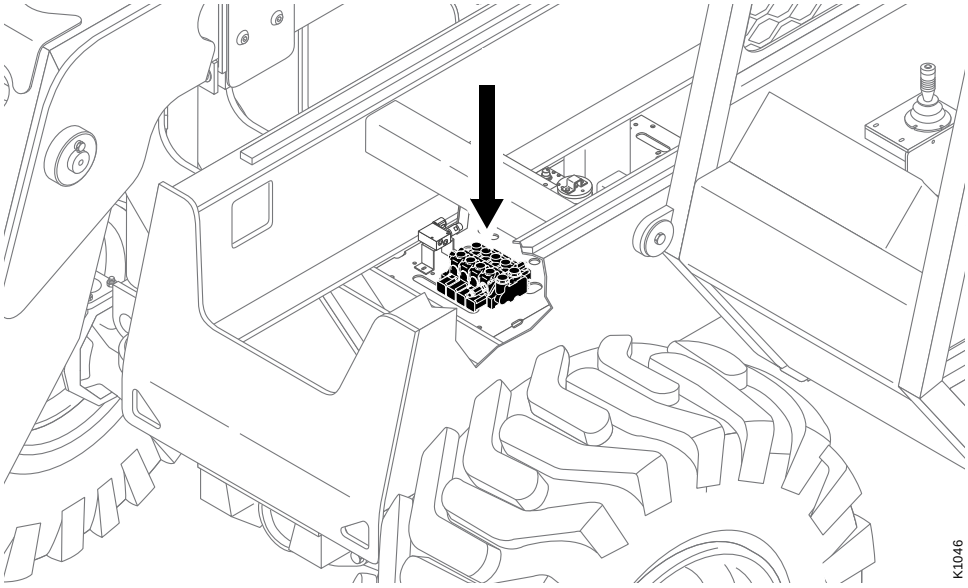


Fig. 5-28: Multi-Spool Control Valve Location

(Ref. Fig. 5-28) The multi-spool control valve is used on models with control manifold hydraulics. It is located on the valve plate, near the middle of the machine. This valve controls hydraulic functions for the following circuits:

- Carriage (Attachment) Tilt
- 1st Auxiliary Hydraulics
- 2nd Auxiliary Hydraulics
- Frame Tilt
- Transfer Carriage
- L.H. Outrigger
- R.H. Outrigger

The presence of these circuits, and the controlling valve sections, depends upon the machine model and installed options (See Figs. 5-29 and 5-30).

Multi-Spool Control Valve Configurations, Models 644B, 844C, and 1044C

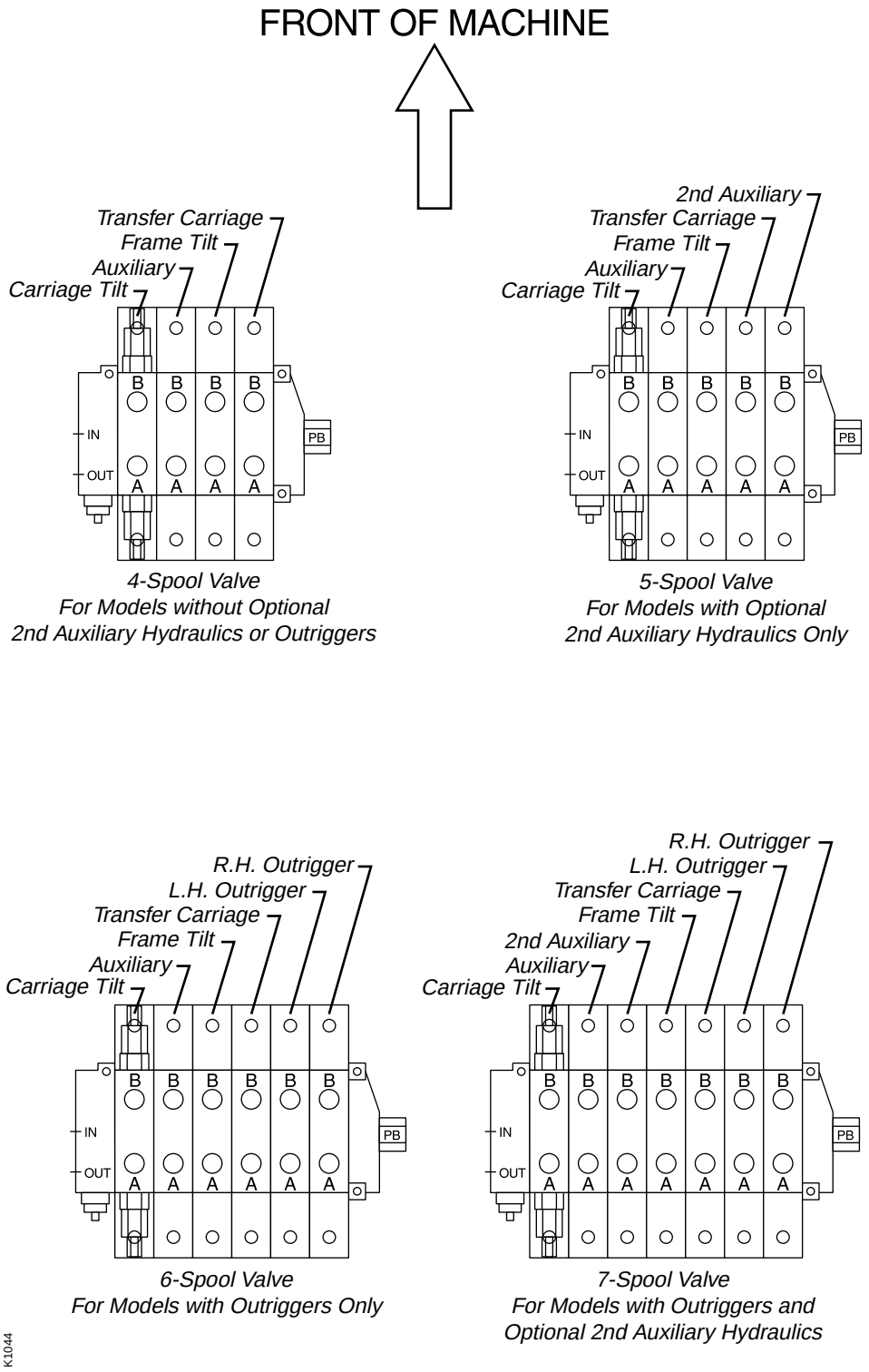


Fig. 5-29: Control Valve Configurations, Models 644B, 844C, and 1044C

Multi-Spool Control Valve Configurations, Models 6K, 8K, and 10K

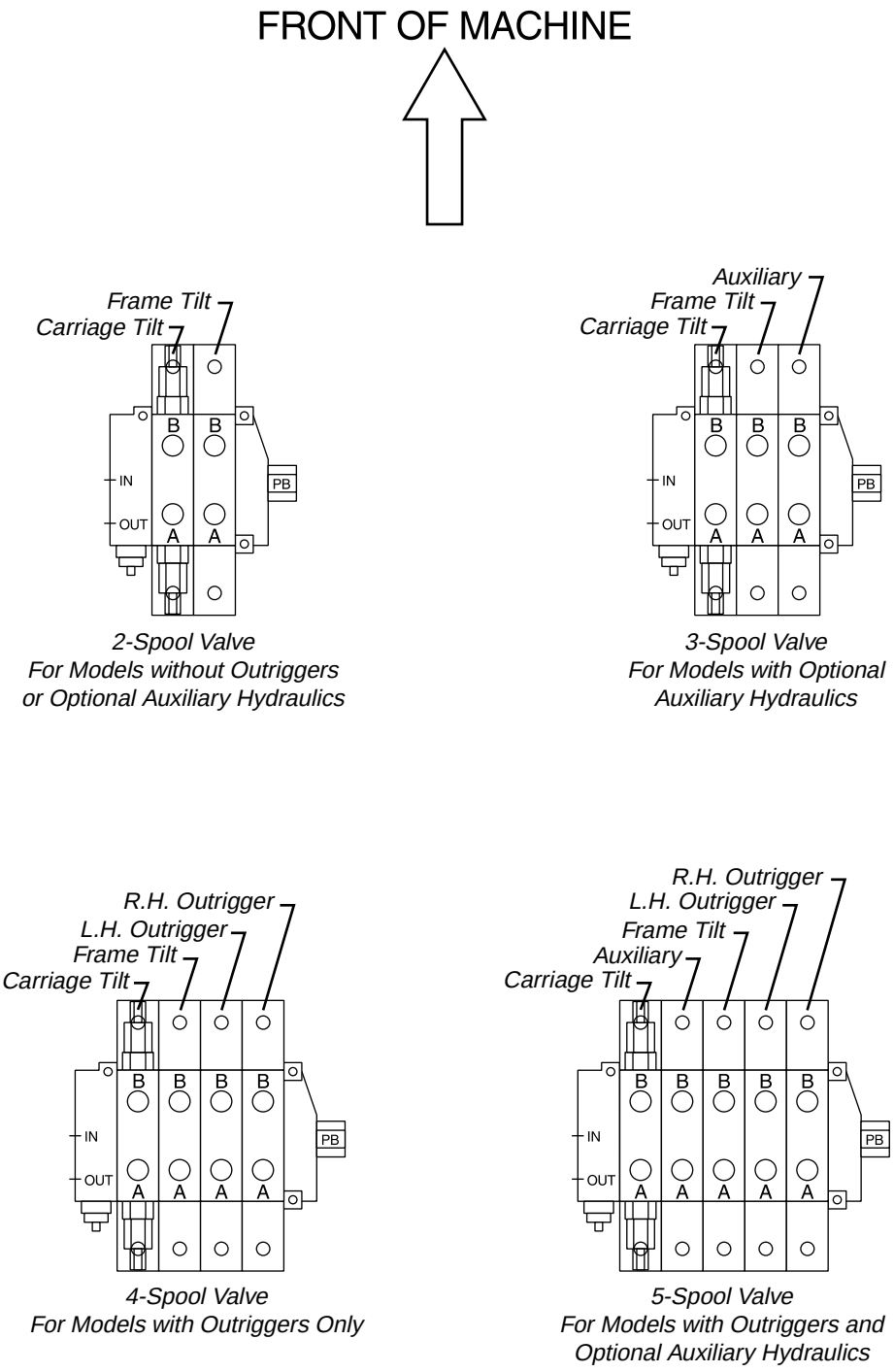


Fig. 5-30: Control Valve Configurations, Models 6K, 8K, and 10K

Control Valve Operation

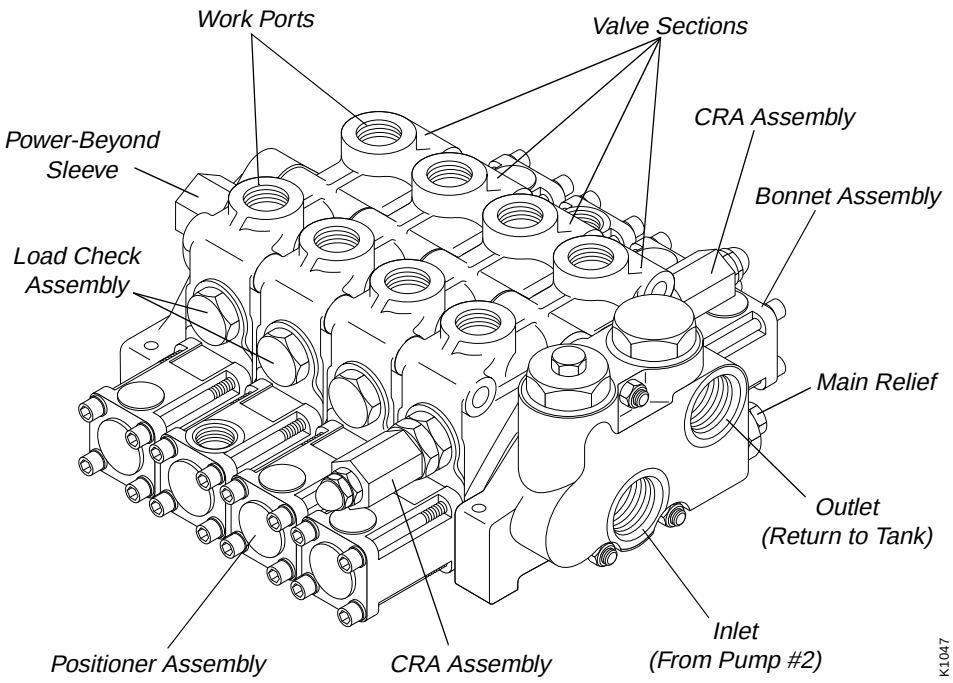


Fig. 5-31: Multi-Spool Control Valve Components

Each hydraulic circuit is controlled by a separate valve section (Fig. 5-31). The valve sections are 4-way, 3-position with an open center. The 4-way, 3-position spool design allows for control of double-acting cylinders and reversible motors, and is normally centered (closed or neutral position). An open center permits flow through the section when the spool is centered. The power-beyond sleeve (high pressure carryover) in the right cover housing allows the flow from the open centers to be used by other components downstream.

Each valve section is equipped with two load check assemblies, with the exception of the carriage tilt section, which is equipped with two combination relief and anti-cavitation check assemblies (CRA).

Removal

Multi-Spool Control Valve

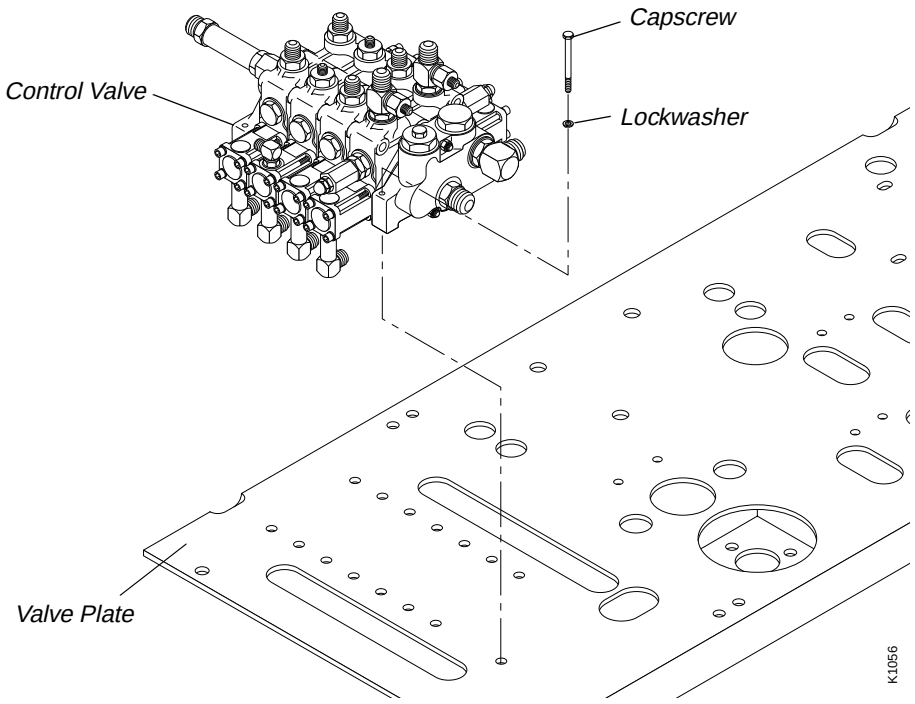


Fig. 5-32: Multi-Spool Control Valve Installation

(Ref. Fig. 5-32) The following procedure describes removal of the multi-spool control valve.

1. Follow preparation procedures as outlined in Section 3.
2. Install brake pressure diagnostic port test gauge onto “Brakes” diagnostic port (see Fig. 5-58).
3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge and cap diagnostic port.
4. Tag and disconnect all hydraulic lines and tubes from control valve fittings. Cap all hoses, tubes, and fittings.
5. (Ref. Fig. 5-32) Remove three (3) capscrews and lockwashers retaining control valve to valve plate.
6. Lift control valve from valve plate.

Installation

Multi-Spool Control Valve

1. (Ref. Fig. 5-32) Position control valve on valve plate. Secure with three (3) capscrews and lockwashers.
2. Connect all hydraulic hoses and tubes to fittings on control valve. Torque per instructions in Section 3.
3. Start engine and repeatedly cycle all hydraulic circuits controlled by valve to remove air from system.

4. Stop engine and check for hydraulic leaks. Tighten connections as necessary.

Overhaul

Multi-Spool Control Valve

Disassembly, Multi-Spool Control Valve

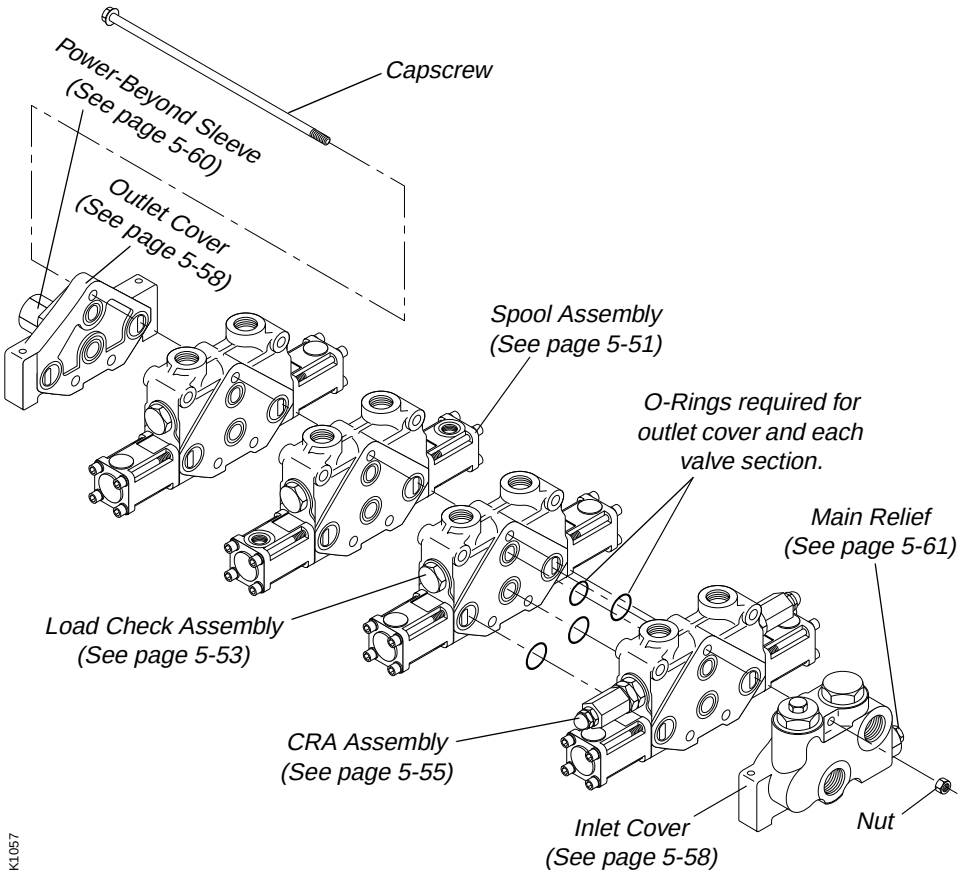


Fig. 5-33: Hydraulic Control Valve Sections

(Ref. Fig. 5-33) To separate the control valve sections,

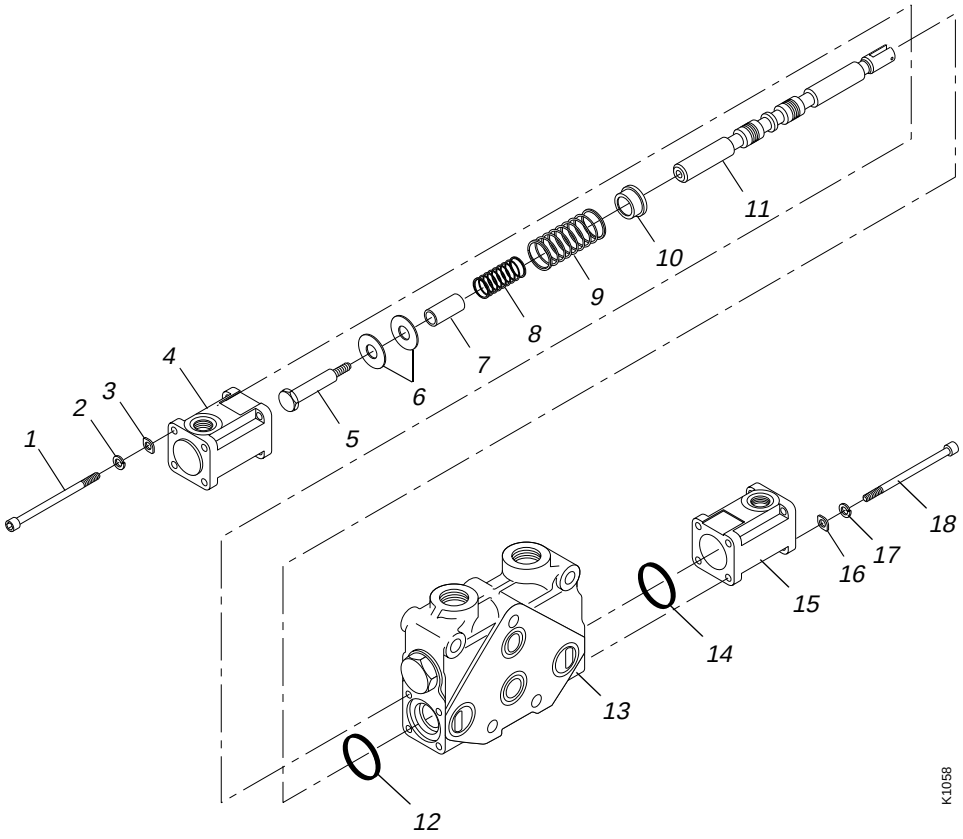
1. Place valve on clean work surface.
2. Tag or mark valve sections for order of assembly.
3. Remove three (3) nuts and capscrews.
4. Separate valve sections, inlet cover, and outlet cover.
5. Clean nuts and capscrews with solvent and dry with compressed air.

Assembly, Multi-Spool Control Valve

(Ref. Fig. 5-33) To assembly the control valve,

1. Place valve sections, inlet cover, and outlet cover together in the same order as they were disassembled.
2. Install three (3) capscrews and nuts. Torque nuts to 180 in-lbs.

Disassembly, Spool Assembly



#	Description	#	Description
1	Socket Head Capscrew	10	Stop Collar
2	Lockwasher	11	Spool
3	Bearing Washer	12	Square-Cut Seal
4	Positioner Housing	13	Valve Housing
5	Positioner Screw	14	Square-Cut Seal
6	Flatwasher	15	Bonnet Housing
7	Sleeve Stop	16	Bearing Washer
8	Internal Spring	17	Lockwasher
9	Spring	18	Socket Head Capscrew

Fig. 5-34: Spool Assembly

(Ref. Fig. 5-34) The following steps are required to disassemble the spool assembly.

1. Loosen and remove four (4) each socket head capscrews (Item 18), lockwashers (Item 17), and bearing washers (Item 16) that secure bonnet housing (Item 15) to valve housing (Item 13).
2. Remove bonnet housing. Tag or mark housing; note location of fitting port(s).
3. Loosen and remove four (4) each socket head capscrews (Item 1), lockwashers (Item 2) and bearing washers (Item 3) that secure positioner housing (Item 4) to valve housing.
4. Remove positioner housing. Tag or mark housing; note location of fitting port(s).
5. Remove spool assembly (Items 5 thru 11).
6. Loosen and remove positioner screw (Item 5) from spool assembly.

CAUTION: A permanent thread locking compound has been applied to threaded portion of positioner screw. Care must be exercised to prevent damage to spool during disassembly and cleaning. Protect the spool while securing it prior to turning positioner screw and breaking the thread locking compound seal.

7. Remove two (2) flatwashers (Item 6), sleeve stop (Item 7), internal spring (Item 8), spring (Item 9), and stop collar (Item 10) from spool (Item 11).
8. Remove two (2) square-cut seals (Items 12 and 14) — one from each end of valve housing. Discard seals.
9. Clean all parts with solvent and dry with compressed air. Inspect and replace any damaged parts.

Note: *Only the seals, capscrews, lockwashers, and bearing washers can be purchased individually. If additional items need replacement, it will be necessary to purchase an assembly that item is a part of. The positioner assembly includes items 1 thru 10 and 12. The bonnet assembly includes items 14 thru 18. If the spool (Item 11) becomes damaged, it will be necessary to purchase a complete new valve section. See parts book for details.*

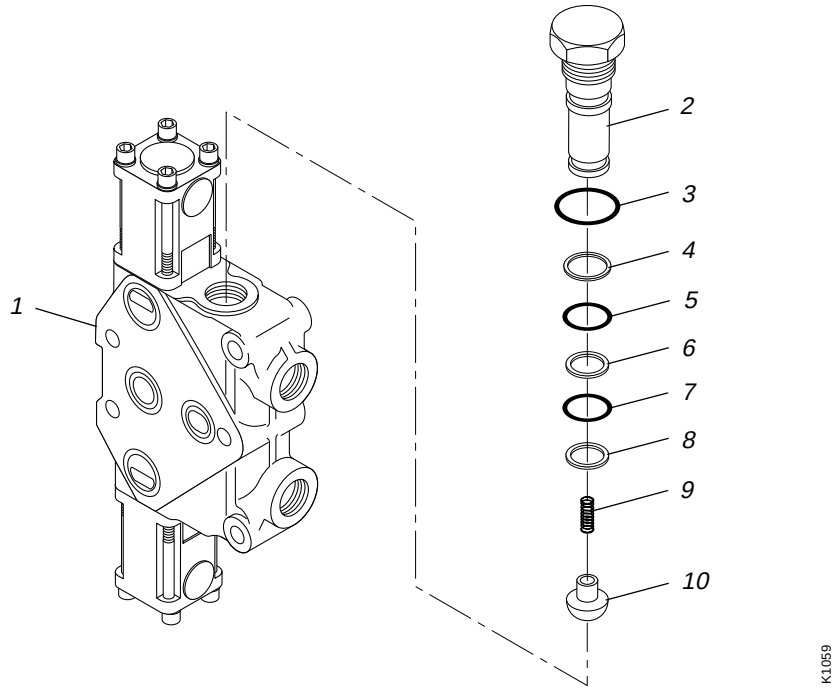
Assembly, Spool Assembly

The following steps are required to reassemble the spool assembly:

1. Lubricate new square-cut seals with hydraulic oil and install on valve housing.
2. Install bonnet housing (Item 15) on valve housing with four (4) each capscrews (Item 18), lockwashers (Item 17), and bearing washers (Item 16). Refer to note made earlier to ensure housing is installed in same position as when removed. Torque capscrews to 4–6 ft-lbs.
3. Install stop collar (Item 10), spring (Item 9), internal spring (Item 8), sleeve stop (Item 7), and two (2) flatwashers (Item 6) on spool (Item 11).

4. Apply type II, grade O, thread locking compound on threaded portion of positioner screw (Item 5). Install positioner screw on spool. Torque screw 10–12 ft-lbs.
5. Install spool assembly (Items 5 thru 11) in valve housing.
6. Install positioner housing (Item 4) on valve housing with four (4) each socket head capscrews (Item 1), lockwashers (Item 2) and bearing washers (Item 3). Refer to note made earlier to ensure housing is installed in same position as when removed. Torque capscrews to 4–6 ft-lbs.

Disassembly, Load Check Assembly



#	Description
1	Housing
2	Load Check Plug
3	O-Ring
4	Backup Washer
5	O-Ring

#	Description
6	Backup Washer
7	O-Ring
8	Backup Washer
9	Spring
10	Poppet

Fig. 5-35: Load Check Assembly

(Ref. Fig. 5-35) The following steps are required to disassemble the load check assembly.

1. Loosen and remove load check plug assembly from housing (Item 1).
2. Remove poppet (Item 10) and spring (Item 9) from load check plug (Item 2).
3. Remove two (2) backup washers (Items 6 and 8) and O-ring (Item 7) from end of load check plug.

4. Remove O-ring (Item 5) and backup washer (Item 4) from middle of load check plug.
5. Remove remaining O-ring (Item 3) near head of load check plug.
6. Discard all O-rings and backup washers.
7. Clean remaining parts with solvent and dry with compressed air. Inspect and replace any damaged parts.

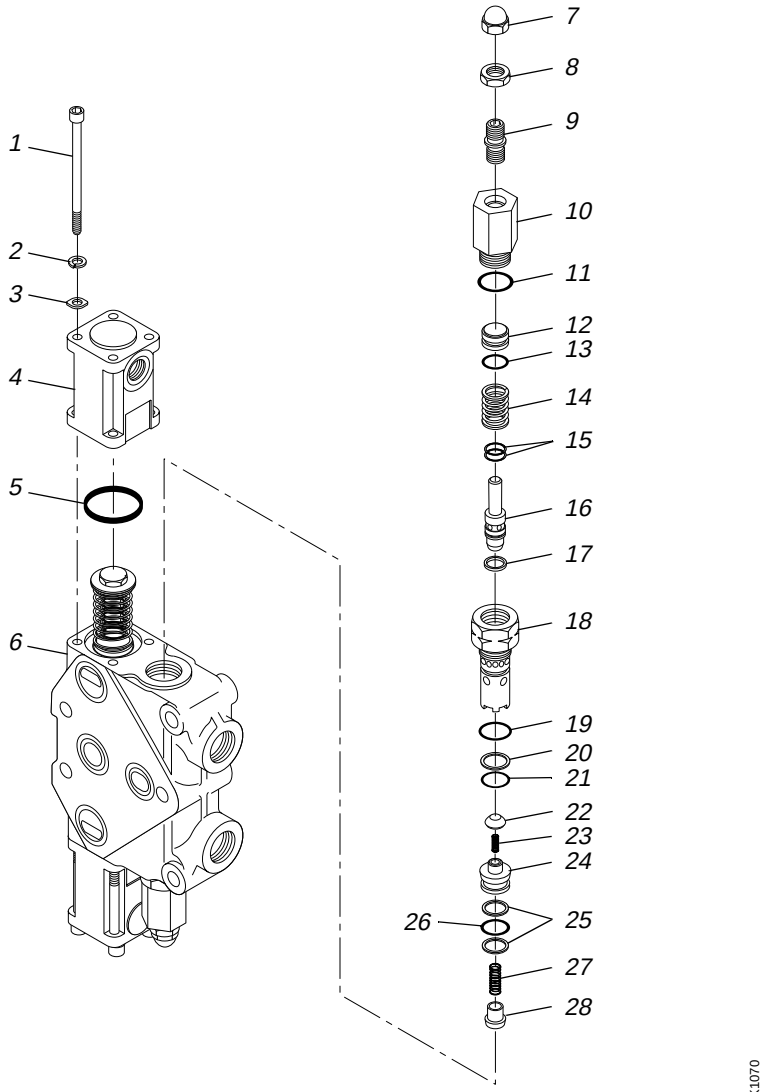
Note: *Only the O-rings and backup washers of the load check valve are replaceable. If other parts become damaged, it will be necessary to purchase a new load check valve.*

Assembly, Load Check Assembly

(Ref. Fig. 5-35) The following steps are required to reassemble the load check assembly:

1. Obtain a load check seal kit. Lubricate O-rings and backup washer with hydraulic oil.
2. Install large O-ring (Item 3) first. Install backup washer (Item 4) and O-ring (Item 5) near middle of load check plug. Then install backup washers (Items 6 and 8) and O-ring (Item 7) making sure that the O-ring is between the two backup washers.
3. Install spring and poppet in end of load check valve.
4. Lubricate load check valve with hydraulic oil and install it on housing. Torque to 20 ft-lbs.

Disassembly, CRA Assembly



#	Description
1	Socket Head Capscrew
2	Lockwasher
3	Bearing Washer
4	Positioner Housing
5	Square Cut Seal
6	Housing
7	Acorn Nut
8	Jam Nut
9	Adjustable Stem
10	Adjustable Relief Cap
11	O-Ring
12	Piston
13	O-Ring
14	Spring

#	Description
15	Shim
16	Relief Poppet
17	Piston Ring
18	Relief Body
19	O-Ring
20	Backup Washer
21	O-Ring
22	Anti-Cavitation Poppet
23	Anti-Cavitation Spring
24	Poppet Retainer
25	Backup Washer
26	O-Ring
27	Check Spring
28	Poppet

Fig. 5-36: CRA Assembly

(Ref. Fig. 5-36) The following procedure describes disassembly of the Combination Relief and Anti-Cavitation Check Assembly (CRA).

1. Loosen and remove four (4) each socket head capscrews, 33 lockwashers (Item 2), and bearing washers (Item 3).
2. Remove positioner housing (Item 4). Tag or mark housing; note location of fitting port(s).
3. Remove square cut seal (Item 5) from housing (Item 6). Discard square cut seal.
4. Loosen and remove relief assembly (Items 7 thru 21) from housing.
5. Loosen and remove acorn nut (Item 7), jam nut (Item 8), and adjustable stem (Item 9) from adjustable relief cap (Item 10).
6. Loosen and remove adjustable relief cap from relief body (Item 18).
7. Remove relief poppet (Item 16), shims (Item 15), spring (Item 14), and piston (Item 12) from adjustable relief cap.
8. Remove piston ring (Item 17) from relief poppet, O-ring (Item 13) from piston, and O-ring (Item 11) from adjustable relief cap. Discard O-rings.
9. Remove anti-cavitation poppet (Item 22) and spring (Item 23) from housing.
10. Remove poppet retainer (Item 24) from housing. Then remove poppet (Item 28) and check spring (Item 27).
11. Remove two (2) backup washers (Item 25) and O-ring (Item 26) from poppet retainer.
12. Remove O-ring (Item 21) and backup washer (Item 20) from middle of relief body.
13. Remove O-ring (Item 19) near head of relief body.
14. Discard all O-rings and backup washers.
15. Clean all remaining parts with solvent and dry with compressed air. Inspect and replace any damaged parts.

Note: *In the CRA assembly, only the O-rings, backup washers, and square cut seal are replaceable. If other parts become damaged, it will be necessary to replace the complete CRA assembly.*

Note: *In the positioner assembly, only the O-ring, hollow hex capscrews, lockwashers, and bearing washers can be purchased separately. If other parts become damaged, it will be necessary to replace the complete positioner assembly.*

Assembly, CRA Assembly

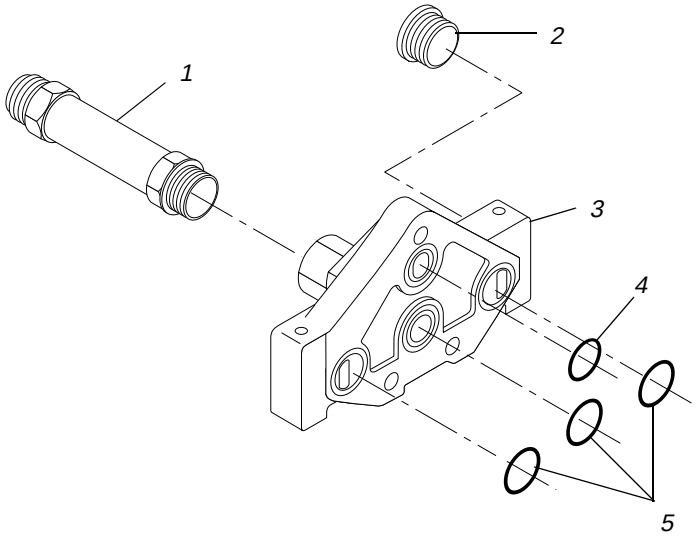
(Ref. Fig. 5-36) The following procedure describes reassembly of the CRA assembly.

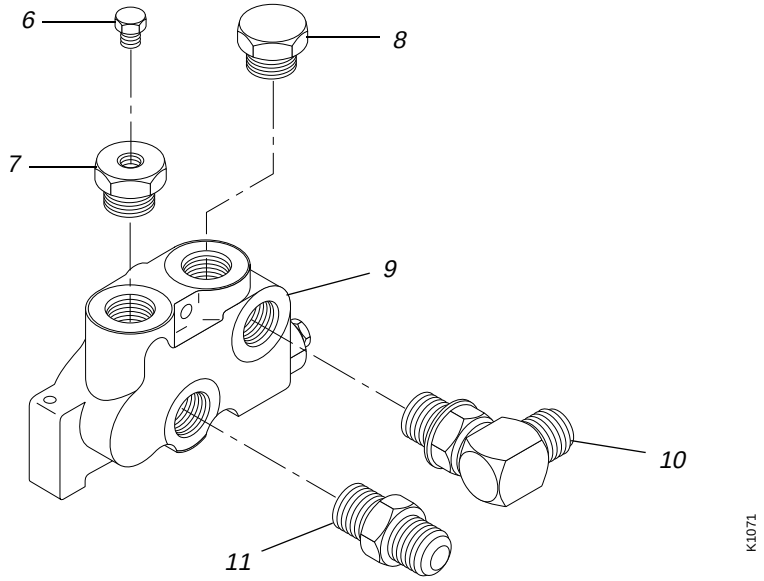
1. Obtain seal kit and new square cut seal. Lubricate each seal, backup washer, and other internal parts, with hydraulic oil before installing them.
2. Install new O-ring (Item 19) near head of relief body (Item 18).
3. Install new backup washer (Item 20) and O-ring (Item 21) near middle of relief body.
4. Install two (2) new backup washers (Item 25) and O-ring (Item 26) on poppet retainer (Item 24). Make sure O-ring is installed between backup washers.
5. Install poppet (Item 28) and check spring (Item 27) on poppet retainer (Item 24). Then install poppet retainer in housing (Item 6).

CAUTION: Care must be taken to avoid damaging O-ring and backup washers when installing poppet retainer. The poppet retainer must go into the orifice exactly square and very slowly. It will fit snug.

6. Install anti-cavitation spring (Item 23) and poppet (Item 22) in poppet retainer.
7. Install new piston ring (Item 17) on relief poppet (Item 16), O-ring (Item 13) on piston (Item 12), and O-ring (Item 11) on adjustable relief cap (Item 10).
8. Install relief poppet, shims (Item 15), spring (Item 14), and piston in relief body.
9. Install O-ring (Item 11) on adjustable relief cap (Item 10).
10. Install adjustable relief cap on relief body. Torque relief cap to 20 ft-lbs.
11. Install adjustable stem in relief cap.
12. Install jam nut (Item 8) on adjustable stem. Torque jam nut to 15 ft-lbs.
13. Install acorn nut (Item 7) on adjustable stem. Torque nut to 15 ft-lbs.
14. Install relief assembly (Items 7 thru 21) on housing. Torque relief assembly to 20 ft-lbs.
15. Install new square cut seal (Item 5) in housing.
16. Install positioner housing (Item 4) on housing with four (4) each bearing washers (Item 3), lockwashers (Item 2), and socket head capscrews (Item 1). Refer to note made earlier to ensure housing is installed in same position as when removed. Torque capscrews to 4–6 ft-lbs.

Inlet and Outlet Covers





#	Description
1	Long O-Ring Connector
2	Hollow Hex O-Ring Plug
3	Outlet Cover
4	O-Ring
5	O-Ring
6	Diagnostic Plug

#	Description
7	Hollow Plug
8	Hex O-Ring Plug (105-115 ft-lbs)
9	Inlet Cover
10	Adjustable Elbow
11	Connector

Fig. 5-37: Outlet and Inlet Covers

Disassembly, Outlet Cover

(Ref. Fig. 5-37) The following procedure describes disassembly of the outlet cover.

1. Loosen and remove long connector (Item 1) from outlet cover (Item 3).
2. Loosen and remove hollow hex plug (Item 2) from outlet cover.
3. Remove four (4) O-rings (Items 4 and 5) from outlet cover. Discard O-rings.
4. Clean remaining parts with solvent and dry with compressed air. Inspect for damage and replace, if necessary.

Assembly, Outlet Cover

(Ref. Fig. 5-37) The following procedure describes reassembly of the outlet cover.

1. Obtain valve section seal kit. Lubricate each O-ring with hydraulic oil before installing it.
2. Install new O-ring (Item 4) in upper port. Please note that this O-ring is smaller than the other three.
3. Install three (3) new O-rings (Item 5) in lower ports.
4. Install hollow hex plug (Item 2) on outlet cover and torque plug to 80–90 ft-lbs.
5. Install long connector (Item 1) on outlet cover and torque connector to 105–115 ft-lbs.

Disassembly, Inlet Cover

(Ref. Fig. 5-37) The following procedure describes disassembly of the inlet cover.

1. Loosen and remove connector (Item 11) and elbow (Item 10) from inlet cover (Item 9).
2. Loosen and remove diagnostic plug (Item 6) from hollow plug (Item 7). Remove plug from inlet cover.
3. Loosen and remove hex plug (Item 8) from inlet cover.
4. Clean all parts with solvent and dry with compressed air. Inspect for damage including O-rings on fittings and plugs. Replace if necessary.

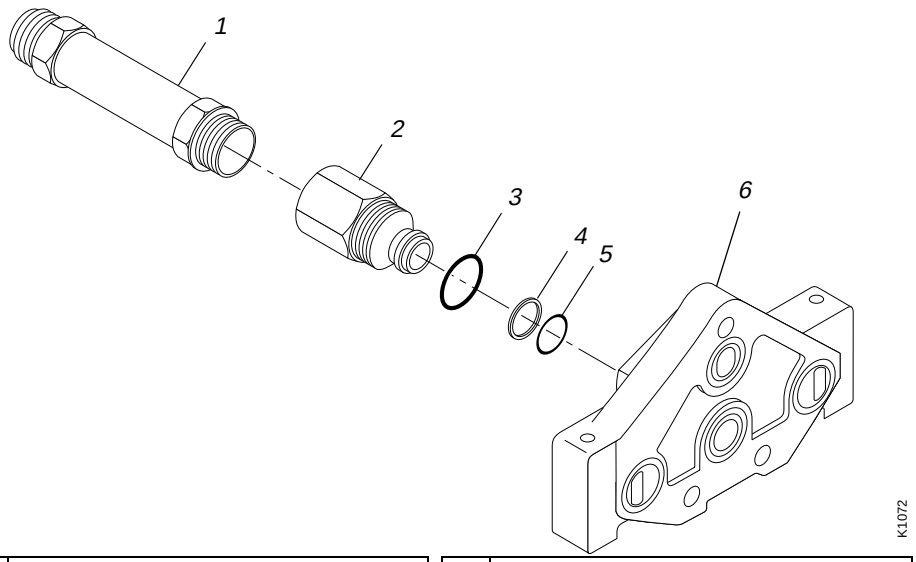
Note: *The diagnostic plug and hollow hex plug cannot be purchased separately. If either of these is damaged, it will be necessary to replace both of them.*

Assembly, Inlet Cover

(Ref. Fig. 5-37) The following procedure describes reassembly of the inlet cover.

1. Lubricate threaded portion, including the O-ring, on each fitting and plug with hydraulic oil before installing them.
2. Install hollow plug (Item 7) and hex plug (Item 8) on inlet cover. Torque each to 105–115 ft-lbs.
3. Install diagnostic plug (Item 6) on hollow plug and torque to 205–235 in-lbs.
4. Install connector (Item 11) on inlet cover. Torque connector to 105–115 ft-lbs.
5. Install elbow (Item 10) on inlet cover. Be sure elbow is installed in same position as shown in Fig. 5-37. Torque elbow to 75–85 ft-lbs.

Disassembly, Power-Beyond Sleeve



#	Description
1	Long O-Ring Connector
2	Power-Beyond Sleeve
3	O-Ring

#	Description
4	Backup Ring
5	O-Ring
6	Cover Housing

Fig. 5-38: Power-Beyond Sleeve Assembly

(Ref. Fig. 5-38) The following steps are required to disassemble the power-beyond sleeve.

1. Loosen and remove long connector (Item 1) from power-beyond sleeve (Item 2).
2. Loosen and remove power-beyond sleeve from cover housing (Item 6).

3. Remove O-ring (Item 5) and backup ring (Item 4) from cover housing.
4. Remove O-ring (Item 3) near head of power-beyond sleeve.
5. Discard O-rings and backup ring.
6. Clean remaining parts with solvent and dry with compressed air. Inspect remaining parts for damage, including O-ring on connector. Replace as necessary.

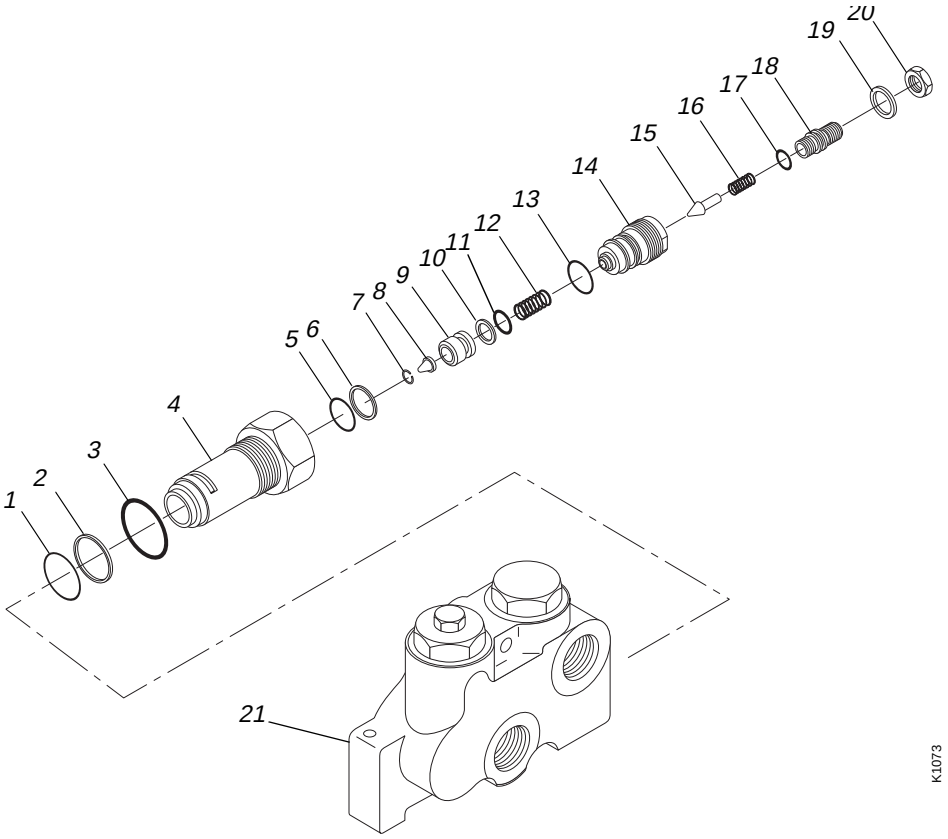
Note: *If the power-beyond sleeve is damaged, it will be necessary to purchase a new power-beyond assembly which includes the required O-rings and backup ring.*

Assembly, Power-Beyond Sleeve

(Ref. Fig. 5-38) The following steps are required to reassemble the power-beyond sleeve.

1. Lubricate new O-ring with hydraulic oil and install (Item 3) on power-beyond sleeve.
2. Lubricate O-ring (Item 5) and backup ring (Item 4) with hydraulic oil. Install O-ring first, then backup ring in housing orifice.
3. Install power-beyond sleeve on cover housing.
4. Lubricate threaded portion of long connector (Item 1) (including O-ring) with hydraulic oil and install it on power-beyond sleeve. Torque to 105–115 ft-lbs

Disassembly, Main Relief Assembly



#	Description
1	O-Ring
2	Backup Ring
3	O-Ring
4	Relief Valve Body
5	O-Ring
6	Backup Ring
7	Retaining Ring
8	Filter
9	Main Poppet
10	Backup Ring
11	O-Ring

#	Description
12	Spring
13	O-Ring
14	Pilot Assembly Body
15	Relief Poppet
16	Pilot Spring
17	O-Ring
18	Adjustment Screw
19	Washer
20	Jam Nut
21	Cover Assembly

Fig. 5-39: Main Relief Valve

(Ref. Fig. 5-39) The following steps are required to disassemble the main relief.

1. Loosen and remove main relief valve (Items 3 thru 20) from cover assembly (Item 21).
2. Remove backup ring (Item 2) and O-ring (Item 1) from cover assembly.
3. Loosen and remove jam nut (Item 20) and washer (Item 19) from pilot assembly body (Item 14).
4. Loosen and remove adjustment screw (Item 18) from pilot assembly body.

5. Remove relief poppet (Item 15) and pilot spring (Item 16) from adjustment screw.
6. Remove O-ring (Item 17) from adjustment screw.
7. Remove pilot assembly body (Item 14) from relief valve body (Item 4).
8. Remove O-ring (Item 13) from pilot assembly body.
9. Remove spring (Item 12), main poppet (Item 9), filter (Item 8), and retaining ring (Item 7) from relief valve body.
10. Remove O-ring (Item 11) and backup ring (Item 10) from main poppet.
11. Remove backup ring (Item 6) and O-ring (Item 5) from relief valve body.
12. Discard all O-rings and backup rings.
13. Clean remaining parts with solvent and dry with compressed air. Inspect and replace any damaged parts.

Note: *Only the O-rings and backup rings can be replaced. If any other parts are damaged, it will be necessary to replace the entire main relief valve.*

Assembly, Main Relief Assembly

(Ref. Fig. 5-39) The following steps are required to reassemble the main relief.

1. Obtain a main relief seal kit. Lubricate each O-ring, backup ring, as well as other internal parts with hydraulic oil before installing them.
2. Install new O-ring (Item 1) first and then backup ring (Item 2) in cover assembly.
3. Install new O-ring (Item 5) first and then backup ring (Item 6) in relief valve body (Item 4).
4. Install backup ring (Item 10) and O-ring (Item 11) on main poppet (Item 9) as shown in Fig. 5-39.
5. Install retaining ring (Item 7), filter (Item 8), main poppet (Item 9), and spring (Item 12) in relief valve body.
6. Install O-ring (Item 13) on pilot assembly body (Item 14). The O-ring must be installed past the second ridge to rest in the recessed area furthest in.
7. Install the pilot assembly body on the relief valve body. Torque pilot assembly body to 15–18 ft-lbs.
8. Install new O-ring (Item 17) on adjustment screw (Item 18).
9. Install relief poppet (Item 15) and pilot spring (Item 16) in adjustment screw and install this assembly in pilot assembly body.
10. Install jam nut (Item 20) on adjustment screw. Torque nut to 15–18 ft-lbs.
11. Install main relief valve on cover assembly. Torque relief valve to 20 ft-lbs.

Hydraulic Control Manifold

Description

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

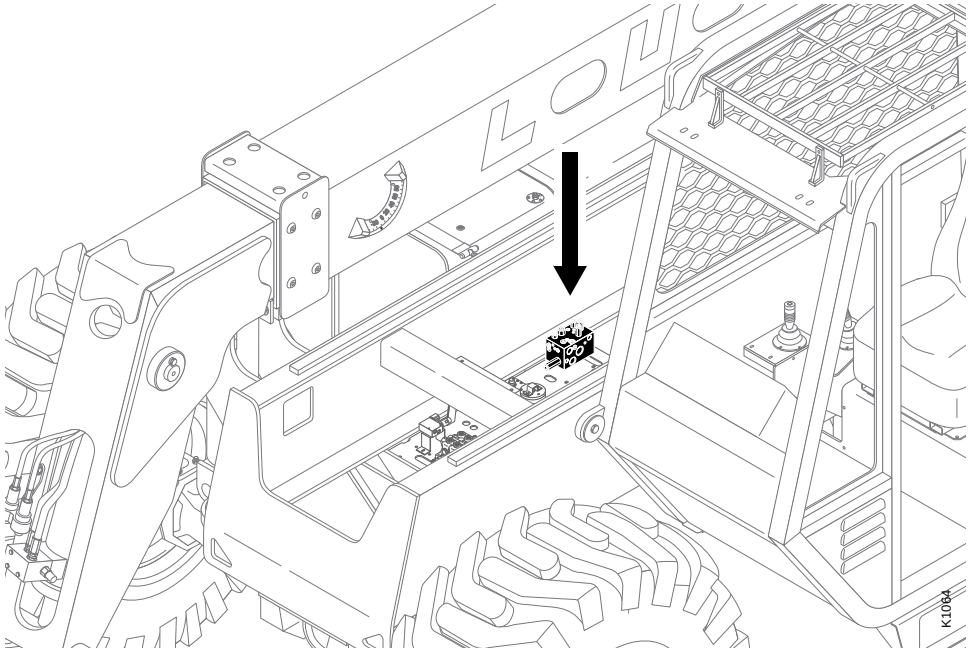


Fig. 5-40: Hydraulic Control Manifold Location

(Ref. Fig. 5-40) The hydraulic control manifold is located on the valve plate, near the middle of the machine. This manifold controls hydraulic functions using the following valves (see Fig. 5-41):

- Compensator Valve
- Check Valve
- Logic Valve
- Pilot Directional Valve
- Pilot Unloading Valve
- Pressure Reducing Valve
- Priority Flow Control

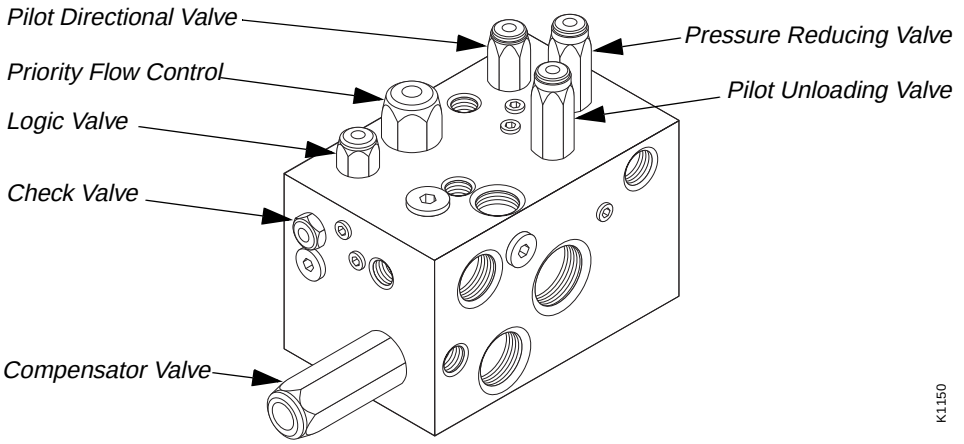


Fig. 5-41: Hydraulic Control Manifold Valves

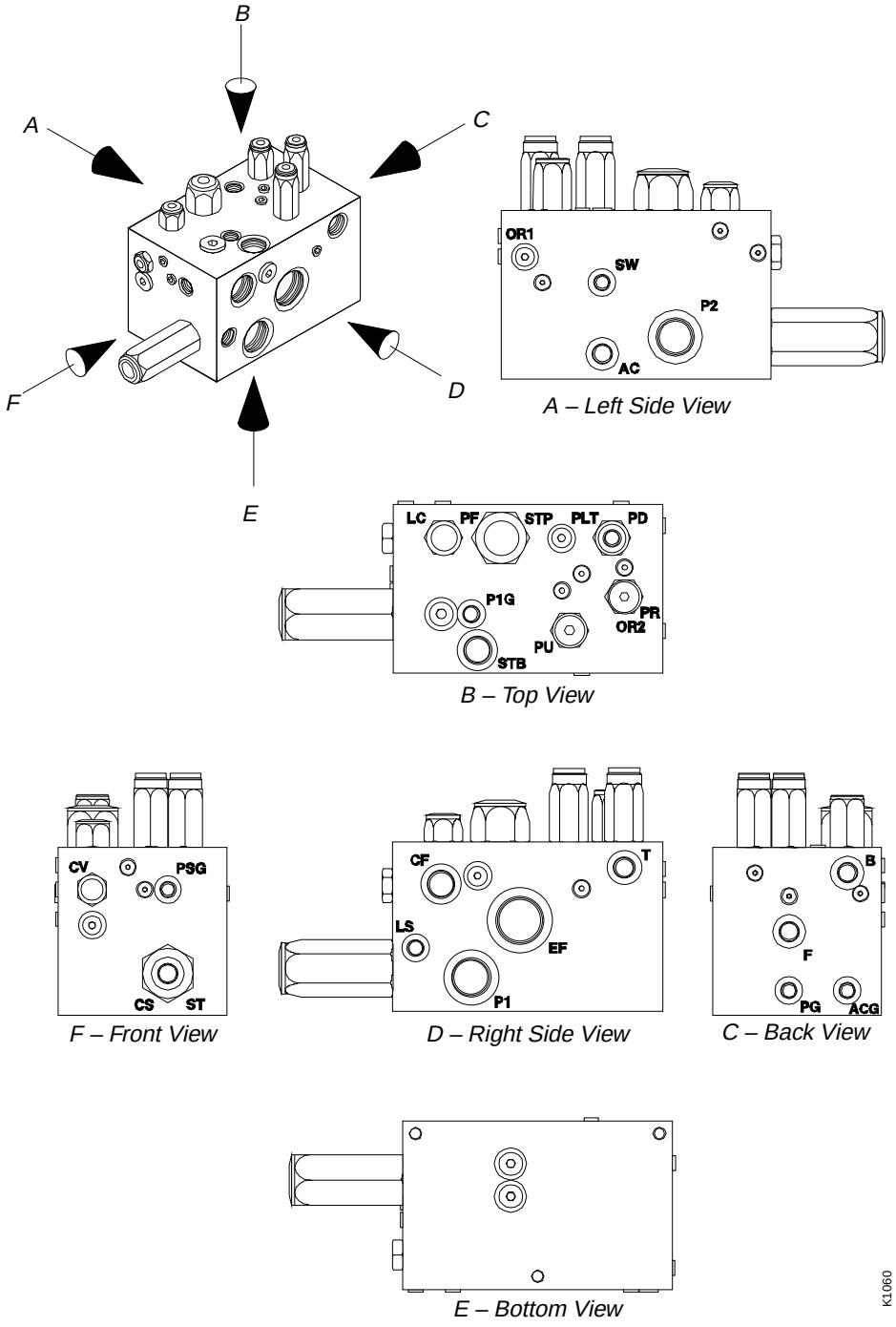


Fig. 5-42: Hydraulic Control Manifold Ports

Fig. 5-42 illustrates views of the manifold that show port locations and manifold markings. The manifold includes 7 valve and 20 port markings. Table 5-1 is a list of markings for each side of the manifold.

Table 5-1: Manifold Markings

View	Marking	Description
	OR1	Orifice #1
	SW	Switch, Low Brake Pressure
	AC	Accumulator
A - Left Side View	P2	Port #2
	LC	Logic Valve
	PF	Priority Flow Valve
	STP	Stabilizer Pilot
	PLT	Pilot (From Hydraulic Pump)
	PD	Pilot Directional Valve
	P1G	Pump 1 (Gauge)
	STB	Stabilizer (System Pressure from Pump 1)
	PU	Pilot Unloading Valve
	PR	Pressure Reducing Valve
B - Top View	OR2	Orifice #2
	B	Brake
	F	Filter (Filtered Oil for Joysticks)
	PG	Pilot Gauge
C - Back View	ACG	Accumulator Gauge
	CF	Controlled Flow (Steering Flow)
	T	Tank (Unfiltered)
	LS	Load Sense (From Steering Orbitrol)
	EF	Excess Flow
D - Right Side View	P1	Port #1
	CV	Check Valve
	PSG	Steering Pressure Gauge
	CS	Compensator Valve
F - Front View	ST	Steering Tank

Control Valve Functions

The following is a description of the seven control valves in the control manifold assembly and their function.

Compensator Valve

The Compensator (CS) valve is a load sensing bypass type with priority relief. It allows hydraulic fluid to flow to steering on demand. It limits pressure in the steering circuit to 2200 psi. Pressure can be checked at the Steering Pressure Gauge (PSG) port. A pressure reading can be taken from the steering diagnostic port (see Fig. 5-58 on page 5-90). When not steering, all flow goes out the Excess Flow (EF) port.

The CS valve will distribute priority flow to the steer orbitrol using a signal sent from the load sense port on the steer orbitrol. There is a built-in adjustment relief to keep steer pressure at approximately 2250 psi. Flow that is not used for steering is available downstream for boom functions.

Valve Specifications

Description	Load sensing bypass type with priority relief
Priority Relief Setting	2250 ± 50 psi @ 1 gpm
Maximum Operating Pressure	3000 psi
Nominal Flow Capacity	40 gpm (Inlet)
Maximum Control Flow	20 gpm
Bias Pressure	150 psi
Load Sense Signal	Static
Service Seal Kit	P33199

Check Valve

When charging of accumulator or pressurization of Excess Flow (EF) port, the Check Valve (CV) allows flow to charge accumulator. The CV flows in one direction only — towards Accumulator (AC) port.

Valve Specifications

Description	Poppet type check valve
Crack Pressure	5 ± 1 psi
Maximum Operating Pressure	3500 psi
Nominal Flow Capacity	6 gpm
Maximum Internal Leakage	20 gpm
Bias Pressure	5 Drops/Minute
Service Seal Kit	P33195

Logic Valve

The Logic (LC) valve opens and closes dependent upon a pilot signal from the Pilot Unloading (PU) valve.

Valve Specifications

Description	Poppet type logic valve, vent to open, side orifice
Maximum Operating Pressure	3500 psi
Maximum Leakage	5 Drops/minute
Pilot Flow @ 1000 psi	60 Cubic Inches/Minute
Bias Pressure	50 psi
Pilot Ratio	2:1
Service Seal Kit	P33197

Pilot Directional Valve

The Pilot Directional (PD) valve allows oil downstream to the pressure reducing valve once the engine has started and back pressure meets or exceeds 50 psi. When the engine is running, it allows flow to joysticks. When engine shuts down, back pressure is lost and the PD assumes a closed position.

Valve Specifications

Description	Three-way, two-position, directional valve; external pilot to shift
Minimum Shift Pressure	50 psi @ 1 Pilot Port
Maximum Operating Pressure	3500 psi
Nominal Flow Capacity	2 gpm
Maximum Internal Leakage	5 Cubic Inches/Minute
Service Seal Kit	P33196

Pilot Unloading Valve (PU)

The Pilot Unloading (PU) valve is one of three valves used to recharge the accumulator. When pressure is below 1200 psi, the valve energizes, closing off the logic valve, and fills the accumulator to 1600 psi. At 1600 psi, the PU valve opens the Logic (LC) valve allowing the 3 gpm to go to the Excess Flow (EF) port.

Valve Specifications

Description	Internally adjustable pilot unloading valve
Unload Pressure Setting	1600 ± 50 psi
Maximum Operating Pressure	75% of Unload Setting
Reload Ratio	40 gpm (Inlet)
Maximum Operating Pressure	3000 psi
Nominal Flow Capacity	2 gpm
Service Seal Kit	P33196

Pressure Reducing Valve

The Pressure Reducing (PR) valve limits pressure to the Filter (F) port to 450 psi for the joystick controllers and park brake cylinder. The Pilot Gauge (PG) port gives a reading in the joystick circuit. A reading can be taken from the pilot diagnostic port (see Fig. 5-58 on page 5-90).

Valve Specifications

Description	Pressure reducing/reviving valve, direct acting, internally adjustable
Reduced Pressure Setting	450 ± 25 psi
Maximum Inlet Pressure	3000 psi
Nominal Flow Capacity	6 gpm
Service Seal Kit	P33196

Priority Flow Control Valve

The Priority Flow (PF) control valve is a three-port flow regulator allowing 3 gpm for charging the accumulator circuit.

Valve Specifications

Description	Fixed priority flow control
Control Flow	3 gpm ± 15%
Maximum Inlet Flow	30 gpm
Maximum Operating Pressure	3000 psi
Service Seal Kit	P33198

Hydraulic Manifold Assembly Functions

Accumulator Charging

Hydraulic fluid is taken from hydraulic reservoir and flows through the hydraulic pump, through the control valve, through the pump unloader, and on to the hydraulic control manifold. Flow comes in P2 port and goes through the Priority Flow (PF) valve. Three gpm of flow is split off and flows through the Logic (LC) element and back to the PF valve. The circuit is then combined with input flow (P2). When accumulator pressure is below 1200 psi, the Pilot Unloading (PU) valve shifts – pressurizing backside of LC spool, allowing the 3 gpm to charge the accumulator through the Check Valve (CV). When pressure reaches 1600 psi, the PU valve shifts, dumping pilot signal on LC valve, allowing the three gpm to flow out Excess Flow (EF) port.

Steering

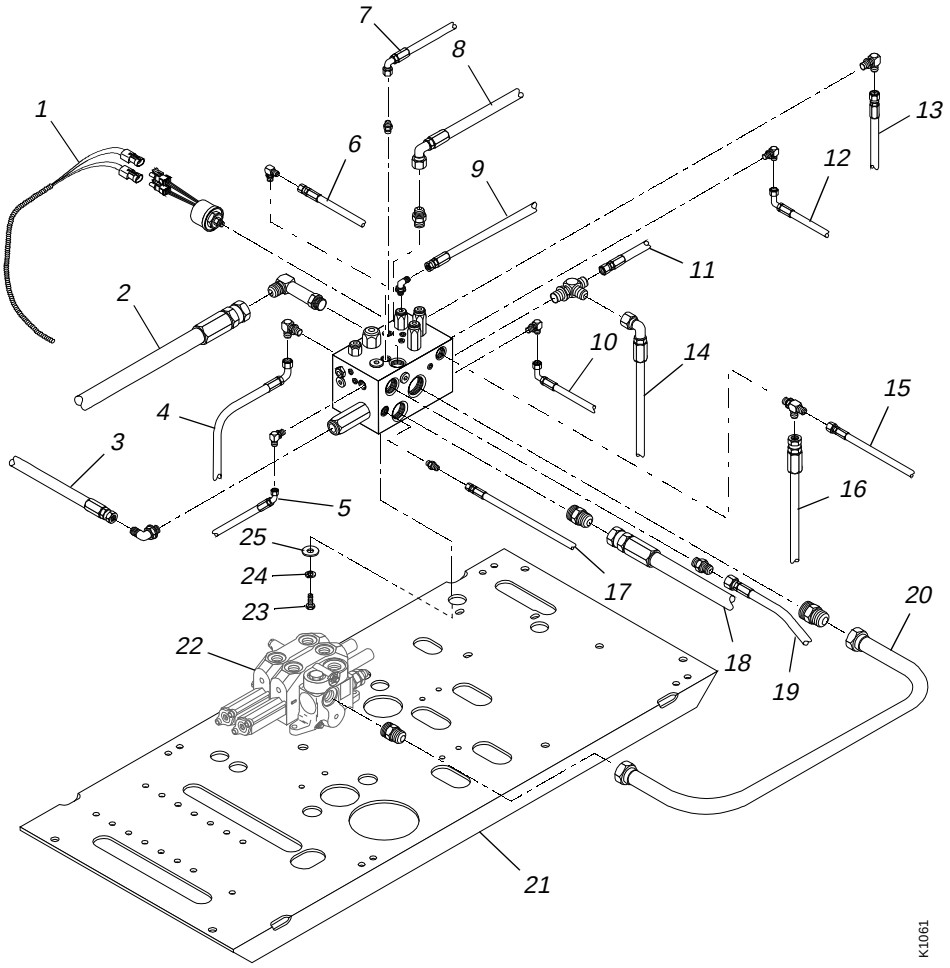
The steering circuit is designed to be a load-sense, on-demand circuit. No flow goes through steering until steering wheel is turned. When the steering wheel is turned, only the flow required for steering is taken off the hydraulic pump through the P1 port. Steering flow is proportional to steering rotation. The maximum pressure on Controlled Flow (CF) port is 2250 psi. The pressure can be checked at the steering diagnostic port (see Fig. 5-58 on page 5-90).

Pressure Reducing

When engine is started, Pilot Directional (PD) valve shifts, allowing flow through the Pressure Reducing (PR) valve (450 psi) to activate the joysticks. When engine shuts down, PD valve shifts to deactivate the joysticks.

Removal

Control Manifold



#	Description
1	Intermediate Wiring Harness
2	Hose for Elbow at P2 Port
3	Hose for Elbow at ST Port (CS Valve)
4	Hose for Elbow at AC Port
5	Hose for Elbow at PSG Port
6	Hose for Elbow at P1G Port
7	Hose for Connector at STP Port
8	Hose for Connector at STB Port
9	Hose for Elbow at PLT Port (PD Valve)
10	Hose for Elbow at PG Port
11	Hose for Tee at F Port

#	Description
12	Hose for Elbow at ACG Port
13	Hose for Elbow at B Port

#	Description
14	Hose for Tee at F Port
15	Hose for Tee at T Port
16	Hose for Tee at T Port
17	Hose for Connector at LS Port
18	Hose for Connector at P1 Port
19	Hose for Connector at CF Port
20	Tube for Connector at EF Port
21	Valve Plate
22	Control Valve
23	Capscrew

Fig. 5-43: Hydraulic Control Manifold Removal/Installation

(Ref. Fig. 5-43) The following procedure describes removal of the hydraulic control manifold.

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 5-4.
2. Install brake pressure diagnostic port test gauge into brake diagnostic port (see page 5-90).
3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.
4. Thoroughly clean hydraulic control manifold block.
5. Disconnect intermediate wiring harness (Item 1) from low brake pressure switch.
6. Tag and ***slowly*** loosen eighteen (18) hydraulic hoses (Items 2 through 19) and bleed any remaining oil into appropriate container. Disconnect hoses. Cap fittings and hoses.
7. Tag and ***slowly*** loosen both ends of the hydraulic tube (Item 20); bleed any remaining oil into appropriate container. Disconnect the tube from both O-ring connectors — the one on the hydraulic control manifold block and the one that is attached to the boom control valve (Item 22). Remove the hydraulic tube.
8. Take note of how fittings are attached to control manifold block. To make sure that they are reassembled in the same position, make sketches of those that are adjustable.
9. Remove three (3) each capscrews (Item 23), lockwashers (Item 24), and flatwashers (Item 25) holding manifold block to valve plate (Item 21).
10. Remove the control manifold block from the machine and take it, along with the hydraulic tube, to a clean area appropriate for further disassembly, cleaning, and overhauling.

Overhaul

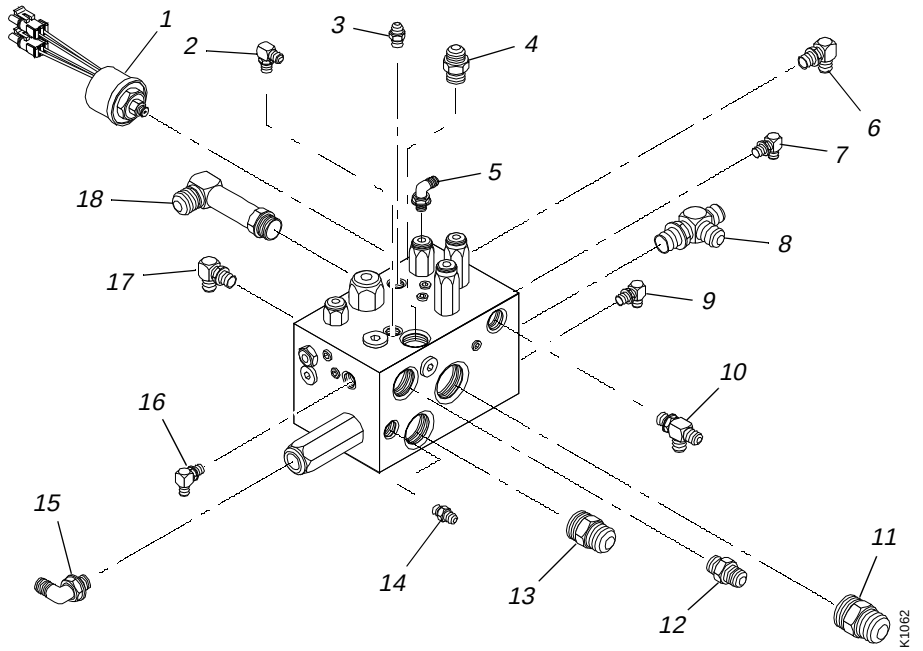
Hydraulic Control Manifold

Inspection and Cleaning, Hydraulic Control Manifold Block Fittings

(Ref. Fig. 5-44) The following procedure describes removal and cleaning of the fittings used on the hydraulic control manifold.

1. Inspect and clean hydraulic tube using solvent.
2. Remove low brake pressure switch (Item 1) by loosening hex closest to port. Do not attempt to loosen by applying tool to body of switch or large hex (if equipped).
3. Remove all fittings (Items 2 through 18).
4. Clean fittings and threaded end of low brake pressure switch using an solvent. Dry with compressed air.

5. Inspect and replace any damaged fittings or O-rings. Lubricate each O-ring with hydraulic oil before installing it on fitting or low brake pressure switch.



#	Description
1	Low Brake Pressure Switch - SW Port
2	O-Ring Elbow - P1G Port
3	O-Ring Connector - STP Port
4	O-Ring Connector - STB Port
5	O-Ring Elbow - PLT Port
6	O-Ring Elbow - B Port
7	O-Ring Elbow - ACG Port
8	O-Ring Tee - F Port

#	Description
9	O-Ring Elbow - PG Port

#	Description
10	O-Ring Tee - T Port
11	O-Ring Connector - EF Port
12	O-Ring Connector - CF Port
13	O-Ring Connector - P1 Port
14	O-Ring Connector - LS Port
15	O-Ring Elbow - ST Port
16	O-Ring Elbow - PSG Port

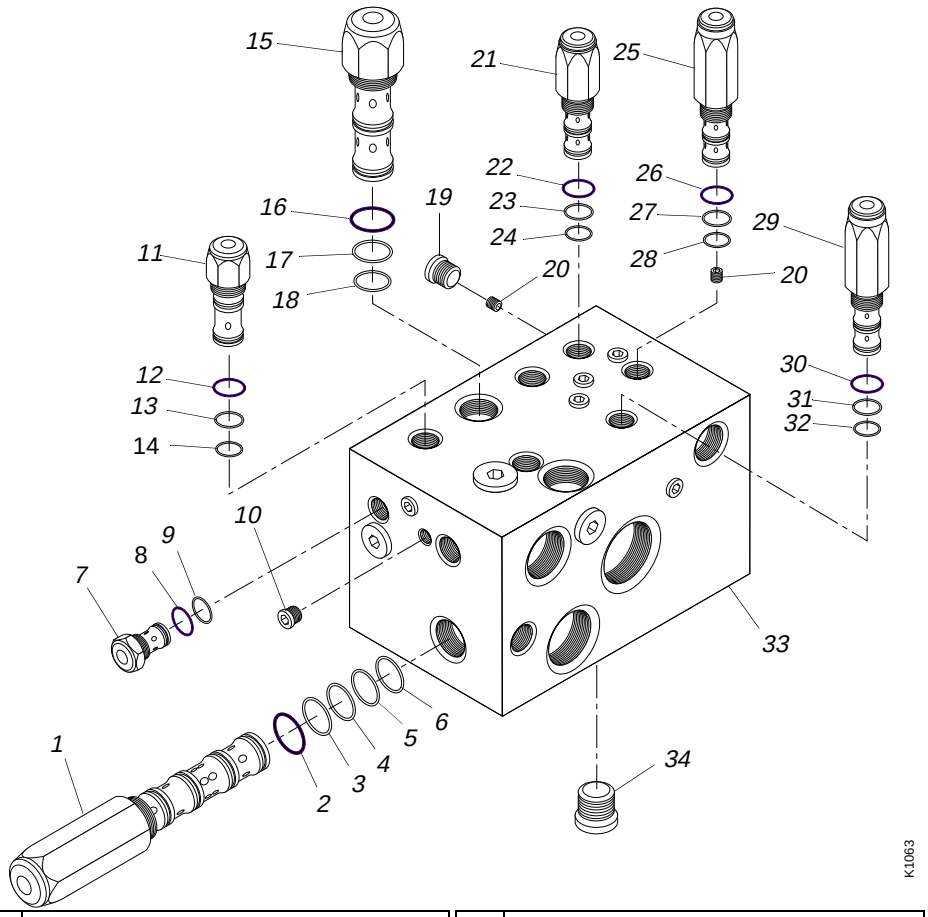
Fig. 5-44: Hydraulic Control Manifold Block Fittings Removal/Installation

Inspection and Cleaning, Hydraulic Control Manifold Plugs and Cartridge Valves

(Ref. Fig. 5-45) The following procedure describes disassembly and cleaning of the hydraulic control manifold plugs and cartridge valves.

1. Tag and remove seven (7) valve cartridges (Items 1, 7, 11, 15, 21, 25, and 29).
2. Remove eighteen (18) O-ring plugs (Items 10, 19, and 34) and two (2) orifice plugs (Item 20).
3. Thoroughly flush hydraulic control manifold block (Item 33) with solvent. Dry with compressed air.
4. Clean O-ring plugs and orifice plugs with solvent. Dry with compressed air.
5. Remove and discard all cartridge O-rings.

6. Clean valve cartridges using an solvent. Dry with compressed air.
7. Make sure that you have the correct O-ring kit for each cartridge valve ensuring they are not damaged. Lubricate each O-ring with hydraulic oil before installing it on cartridge valve. Install the largest (black) O-ring first. Install remaining O-rings in descending order, making sure largest is installed first and smallest last.



#	Description	#	Description
1	Compensator Valve Cartridge	18	O-Ring
2	O-Ring	19	Hollow Hex O-Ring Plug
3	O-Ring	20	Orifice Plug
4	O-Ring	21	Pilot Directional Valve Cartridge
5	O-Ring	22	O-Ring
6	O-Ring	23	O-Ring
7	Check Valve Cartridge	24	O-Ring
8	O-Ring	25	Press. Reducing Valve Cartridge
9	O-Ring	26	O-Ring
10	Hollow Hex O-Ring Plug	27	O-Ring
11	Poppet Type Logic Valve Cartridge	28	O-Ring
12	O-Ring	29	Pilot Unloading Valve Cartridge
13	O-Ring	30	O-Ring
14	O-Ring	31	O-Ring
15	Priority Flow Control Cartridge	32	O-Ring
16	O-Ring	33	Hydraulic Control Manifold Block
17	O-Ring	34	Hollow Hex O-Ring Plug

Fig. 5-45: Hydraulic Control Manifold Assembly

Installation, Hydraulic Control Manifold Plugs and Cartridge Valves

(Ref. Fig. 5-45) The following procedure describes installation of the hydraulic control manifold plugs and cartridge valves.

1. Visually inspect the hydraulic control manifold block to make sure all cavities are free of contamination including machine burrs and chips as well as pieces of O-rings.
2. Check two (2) 1/8” hex orifice plugs (Item 20) to make sure they are free of visible contamination.
3. Carefully screw orifice plugs into proper cavities (orifice OR1 and OR2). Torque to 30-40 in-lbs.
4. Check eighteen (18) hollow hex O-ring plugs (Items 10, 19, and 34) to be sure they are free of visible contamination.
5. Carefully screw hollow hex O-ring plugs into proper cavities. Use the following torque specifications:

Table 5-2: O-Ring Plug Torque Specifications for Hydraulic Control Manifold Assembly

Ref. #	Description	Quantity	Torque Spec.
10	1/8” Internal Hex	12 (2 on front, 3 on top, 1 on right, 3 on left, 3 on back)	30–40 in-lbs.
19	3/16” Internal Hex	3 (1 on front, 1 on left, 1 on right)	125–145 in-lbs.
34	1/4” Internal Hex	3 (1 on top, 2 on bottom)	210–230 in-lbs.

6. Check each cartridge valve to be sure it is free of visible contamination.
7. Dip cartridge valve in clean hydraulic oil up to the threads to lubricate seals.
8. Carefully screw each cartridge into its proper cavity. Use the following torque specifications:

Table 5-3: Cartridge Valve Torque Specifications for Hydraulic Control Manifold Assembly

Ref. #	Description	Torque Spec.
1	Compensator Valve Cartridge (CS Port)	65 ft-lbs.
7	Check Valve Cartridge (CV Port)	180 in-lbs.
11	Poppet Type Logic Valve Cartridge (LC Port)	35 ft-lbs.
15	Priority Flow Control Cartridge (PF Port)	65 ft-lbs.
21	Pilot Directional Valve Cartridge (PD Port)	35 ft-lbs.
25	Pressure Reducing Valve Cartridge (PR Port)	35 ft-lbs.
29	Pilot Unloading Valve Cartridge (PU Port)	35 ft-lbs.

Installation, Hydraulic Control Manifold Fittings and Low Brake Pressure Switch

(Ref. Fig. 5-44) The following procedure describes installation of fittings on the control manifold.

1. Install low brake pressure switch (Item 1) into SW port and torque to 205–235 in-lbs. Apply torque to hex closest to port. Do not apply torque to body of switch or large hex (if equipped).
2. Install each fitting in its proper location. Use the following torque specifications:

Table 5-4: Torque Specifications for Hydraulic Fittings on Control Manifold Assembly

Fig. 5-44 Fitting Ref. #	Fitting Description	Torque Spec.	Fig. 5-43 Hose Ref. #
2	90° O-Ring Elbow (P1G Port)	160–180 in-lbs.	6
3	O-Ring Connector (STP Port)	205–235 in-lbs.	7
4	O-Ring Connector (STB Port)	46–50 ft-lbs.	8
5	90° O-Ring Elbow (Cartridge on PLT Port)	160–180 in-lbs.	9
6	90° O-Ring Elbow (B Port)	25–29 ft-lbs.	13
7	90° O-Ring Elbow (ACG Port)	160–180 in-lbs.	12
8	O-Ring Tee (F Port)	25–29 ft-lbs.	11 & 14
9	90° O-Ring Elbow (PG Port)	160–180 in-lbs.	10
10	O-Ring Tee (T Port)	25–29 ft-lbs.	15 & 16
11	O-Ring Connector (EF Port)	154–166 ft-lbs.	20
12	O-Ring Connector (CF Port)	46–50 ft-lbs.	19
13	O-Ring Connector (P1 Port)	105–115 ft-lbs.	18
14	O-Ring Connector (LS Port)	205–235 in-lbs.	17
15	90° O-Ring Elbow (Cartridge on ST Port)	25–29 ft-lbs.	3
16	90° O-Ring Elbow (PSG Port)	160–180 in-lbs.	5
17	90° O-Ring Elbow (AC Port)	25–29 ft-lbs.	4
18	90° O-Ring Elbow (Long) (P2 Port)	75–85 in-lbs.	2

Installation

Hydraulic Control Manifold Assembly

For items referenced below, refer to Fig. 5-43.

1. Clean hydraulic hose endings with solvent. Dry with compressed air.
2. Install assembled control manifold to valve plate (Item 21) with three (3) each capscrews (Item 23), lockwashers (Item 24), and flatwashers (Item 25). Torque capscrews to 35 ft-lbs.
3. Reconnect hydraulic hoses to elbows, connectors, and tees as instructed in Chapter 3 of this manual. Refer to the sketches and notes made earlier and adjust fittings as necessary so that they are in the same position as prior to being disconnected.
4. Reconnect the hydraulic tube (Item 20) to the connector on the control manifold (EF orifice) and the connector on the control valve (Item 22). Torque nuts on hydraulic tube to 117–125 ft-lbs.
5. Reconnect intermediate wiring harness to low brake pressure switch.

Pump Unloader Valve

General

644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K -37 (S/N 101–317)
6K-42 (S/N 101–119)
With Naturally Aspirated Engines

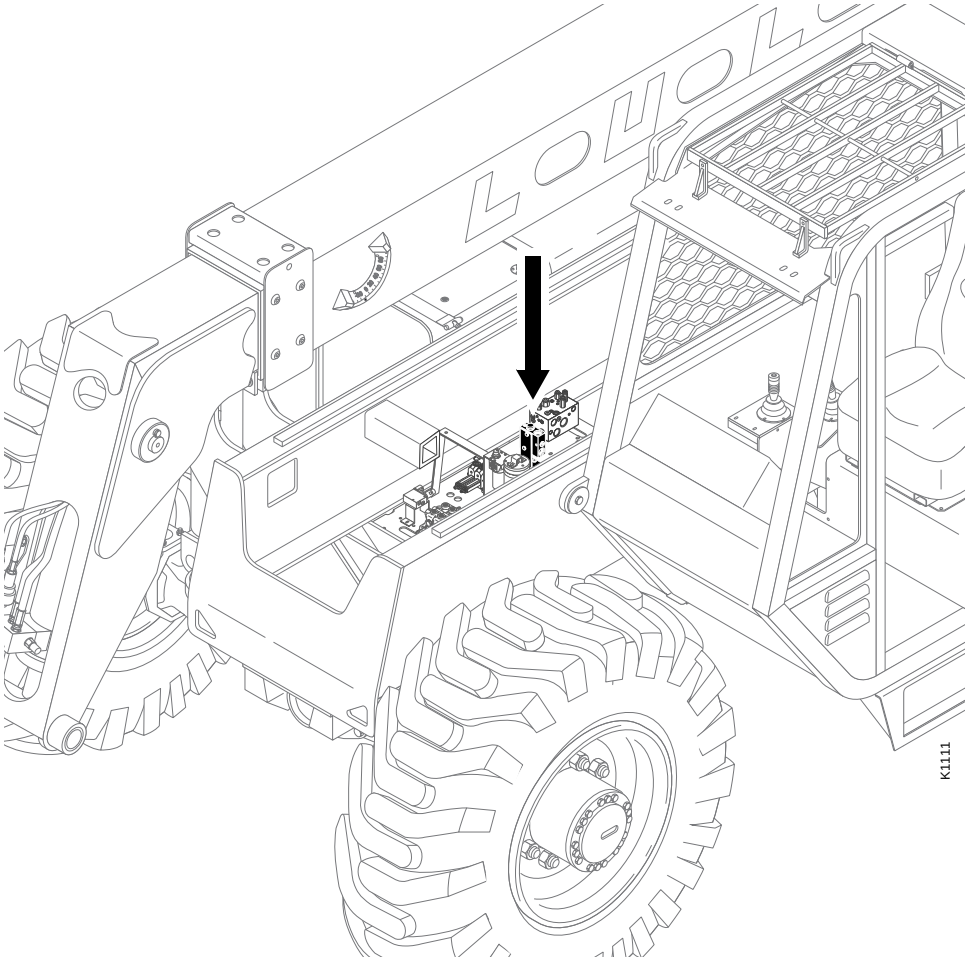
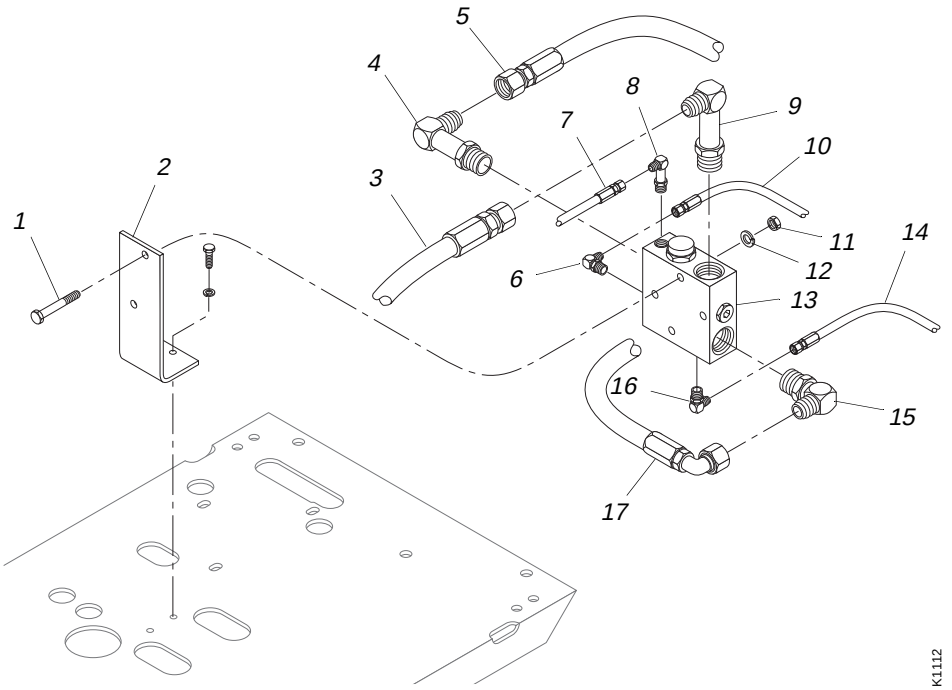


Fig. 5-46: Pump Unloader Valve Location

(Ref. Fig. 5-46) The pump unloader valve is located on the valve plate near the center of the machine. It is used on 644B and 6K models with naturally aspirated engines and control manifold hydraulics.

Removal

Pump Unloader Valve



#	Description
1	Capscrew
2	Mounting Bracket
3	Hydraulic Hose
4	Elbow
5	Hydraulic Hose
6	Elbow
7	Hydraulic Hose
8	Elbow
9	Elbow

#	Description
10	Hydraulic Hose
11	Nut
12	Lockwasher
13	Pump Unloader Valve
14	Hydraulic Hose
15	Elbow
16	Elbow
17	Hydraulic Hose

Fig. 5-47: Pump Unloader Valve Installation - Control Manifold Hydraulics

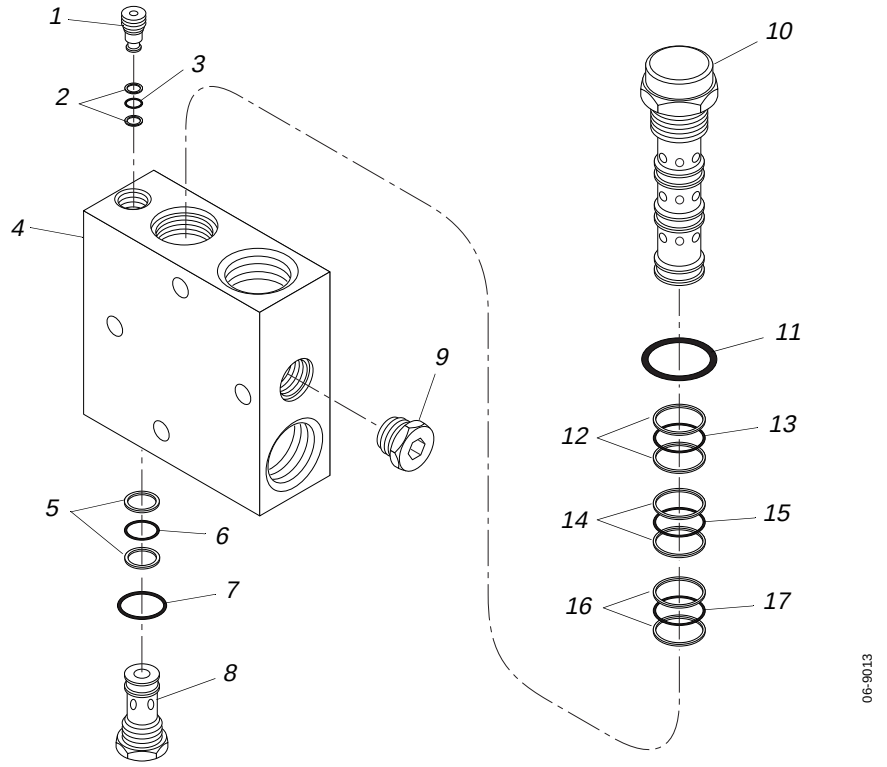
(Ref. Fig. 5-47) The following procedure describes removal of the pump unloader valve.

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 5-4.
2. Install brake pressure diagnostic port test gauge into brake diagnostic port (see page 5-90).
3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.
4. For 644B, 844C, and 1044C models, refer to roll-back hose tray removal procedures on page 5-94.
5. To avoid contamination of the system, clean pump unloader valve.

6. Tag and ***slowly*** loosen six (6) hydraulic hoses (Items 3, 5, 7, 10, 14, and 17) and bleed any remaining oil into appropriate container. Disconnect hoses. Cap fittings and hoses.
7. Loosen and remove the two (2) each nuts (Item 11) and lockwashers (Item 12) that secure the pump unloader valve (Item 13) to the mounting bracket (Item 2).
8. Remove the two (2) capscrews (Item 1) and the pump unloader valve assembly. Take nuts, lockwashers, capscrew, and pump unloader assembly to an appropriate area for further cleaning and disassembly.
9. Tag and remove all six (6) elbows (Items 4, 6, 8, 9, 15, and 16). Clean elbows, capscrew, nut, and lockwasher with an appropriate solvent and dry with compressed air. Replace any damaged elbows.

Overhaul

Pump Unloader Valve



#	Description
1	Shuttle Valve Cartridge
2	Backup Rings
3	O-Ring
4	Body
5	Backup Rings
6	O-Ring
7	O-Ring
8	Check Valve Cartridge
9	Hollow Hex O-Ring Plug

#	Description
10	Piloted Valve Cartridge
11	O-Ring
12	Backup Rings
13	O-Ring
14	Backup Rings
15	O-Ring
16	Backup Rings
17	O-Ring

Fig. 5-48: Pump Unloader Valve

(Ref. Fig. 5-48) The following procedures describes overhaul of the pump unloader valve.

1. Loosen and remove shuttle valve cartridge (Item 1).
2. Loosen and remove piloted valve cartridge (Item 10).
3. Loosen and remove check valve cartridge (Item 8).
4. Remove hollow hex plug (Item 9).
5. Remove and discard all O-rings and backup rings from the three valve cartridges.
6. Clean valve cartridges, hex plug, and body with appropriate solvent and dry with compressed air.
7. Install hollow head hex plug into the valve body (Item 4). For final tightening, torque to 44–48 ft-lbs.
8. Obtain seal kit for each valve cartridge. Lubricate O-rings and backup rings before installing them.
9. Install O-ring and backup rings on shuttle valve cartridge (Item 1) making sure that the O-ring (Item 3) is installed between the two back-up rings (Item 2).
10. For 644B, 844C, and 1044C models, refer to roll-back hose tray installation procedures on page 5-96.

Mid-Inlet Control Valve

Description

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)

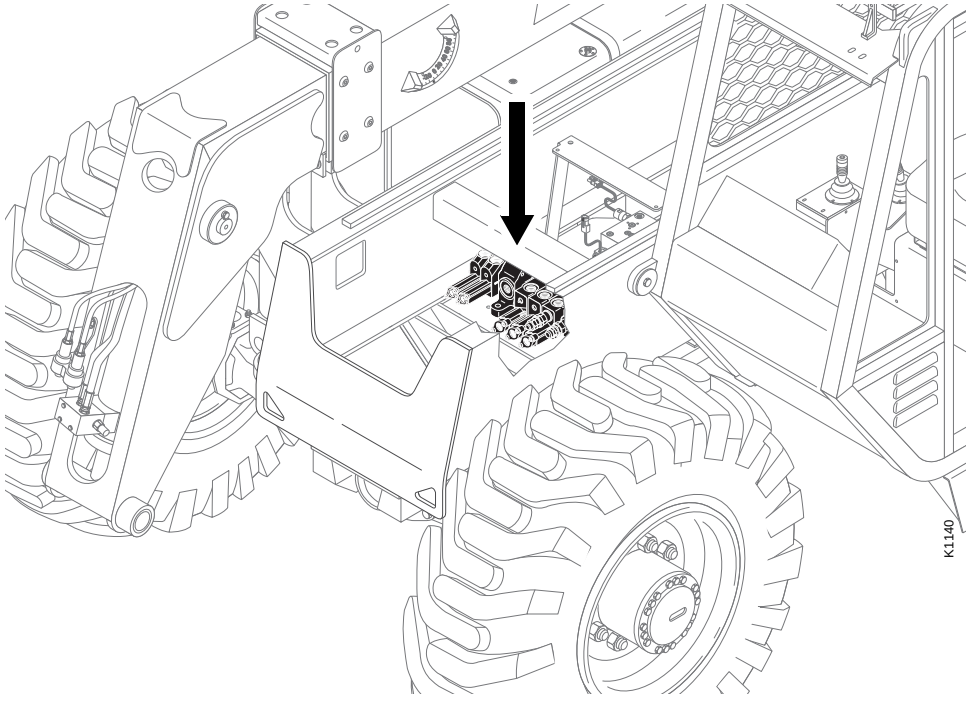


Fig. 5-49: Mid-Inlet Control Valve Location

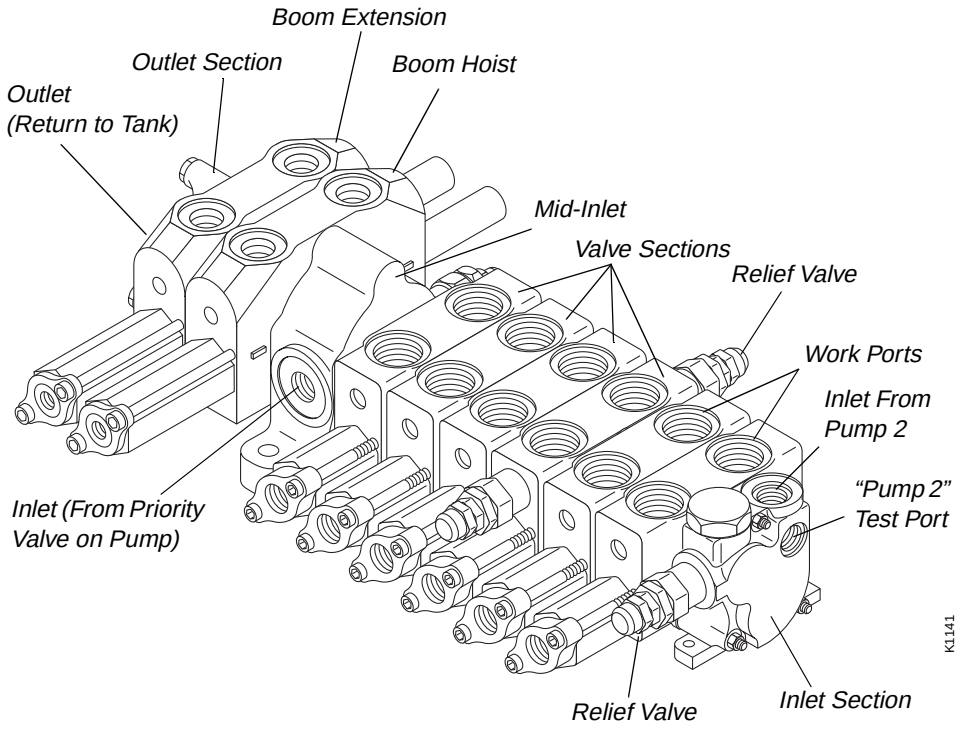


Fig. 5-50: Mid-Inlet Control Valve Components

(Ref. Fig. 5-49 and Fig. 5-50)The mid-inlet control valve is located on the valve plate, near the middle of the machine. This valve controls hydraulic functions for the following circuits:

- L.H. Outrigger
- R.H. Outrigger
- Carriage Fork Tilt
- Transfer Carriage
- 1st Auxiliary Hydraulics
- 2nd Auxiliary Hydraulics
- Frame Tilt
- Unloader (Used on 6K and 644B models with natural engines)

To the right of the mid-inlet section, there are two boom-controlling sections for the following circuits:

- Boom Hoist
- Boom Extension (Telescope)

The presence of these circuits, and the controlling valve sections, depends upon the machine model and installed options (see Fig. 5-51 and Fig. 5-52).

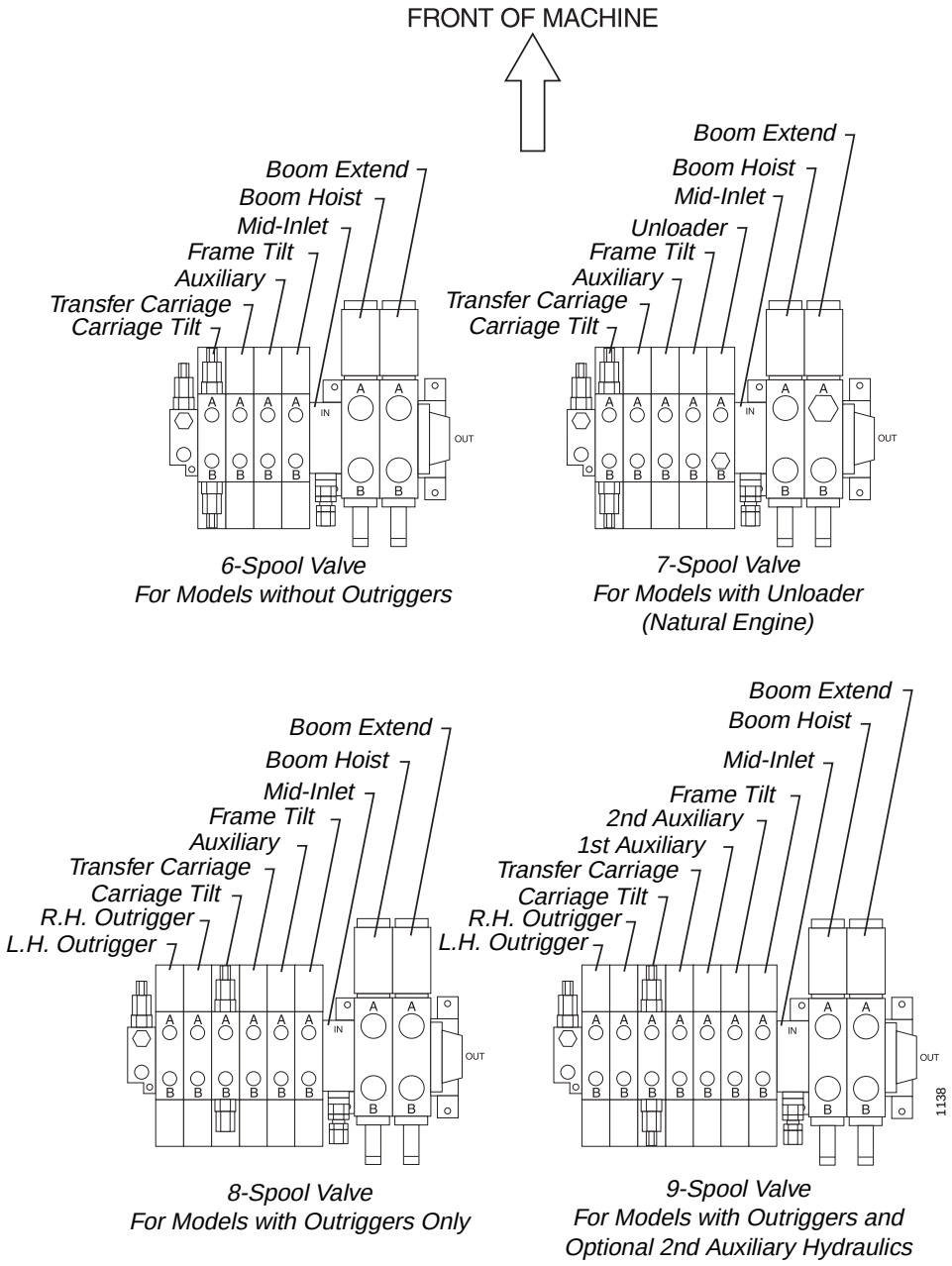


Fig. 5-51: Mid-Inlet Control Valve Configurations, Models 644B, 844C, 1044C

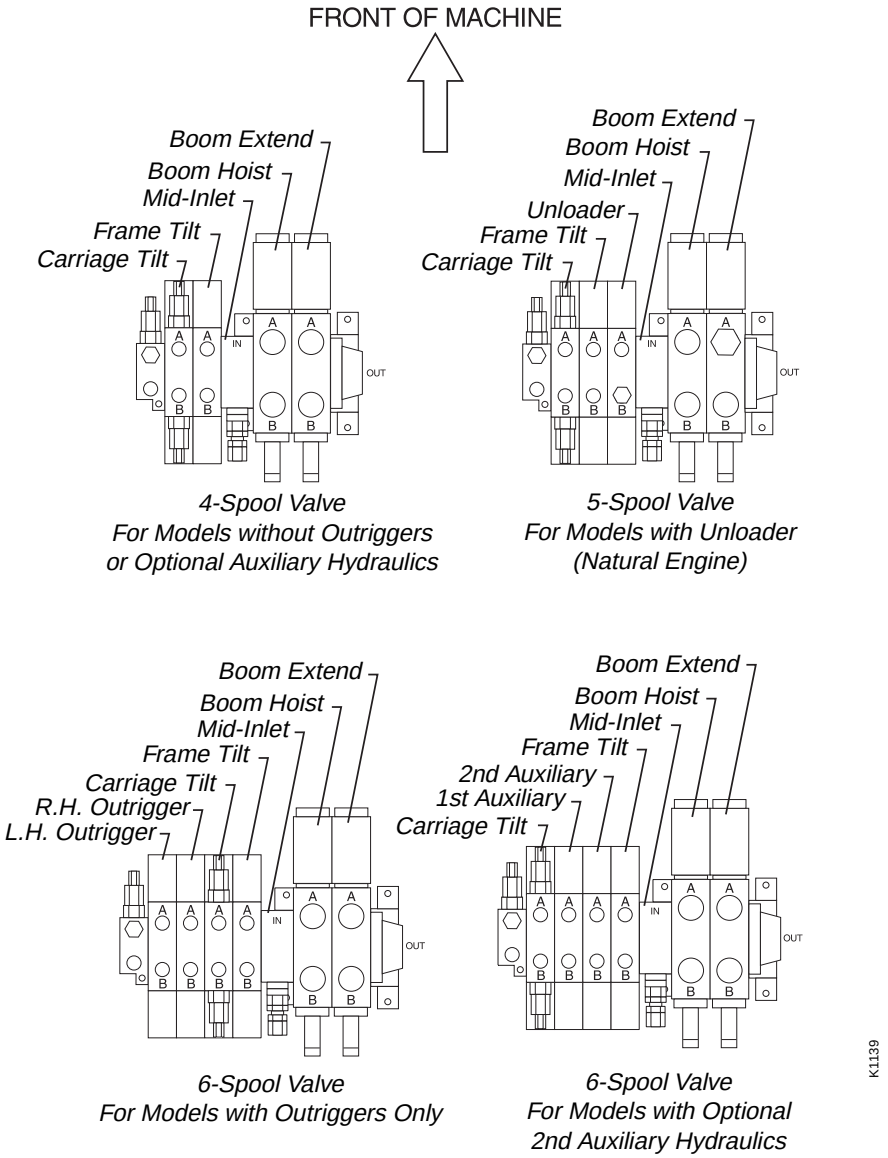


Fig. 5-52: Mid-Inlet Control Valve Configurations, Models 6K, 8K, 10K

Removal

Mid-Inlet Control Valve

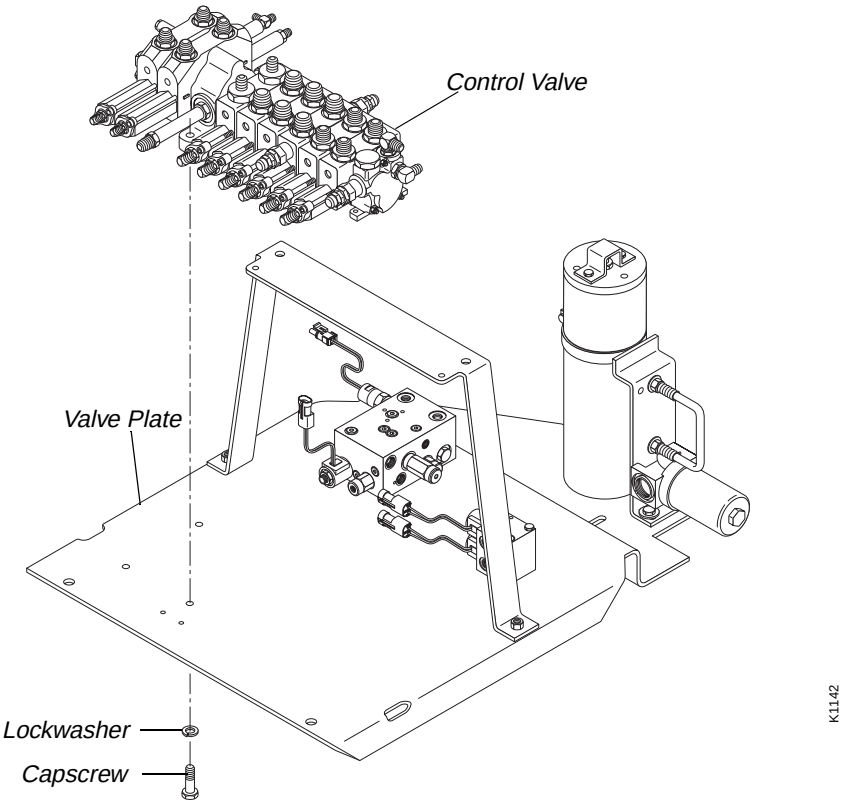


Fig. 5-53: Mid-Inlet Control Valve Installation

(Ref. Fig. 5-53) The following procedure describes removal of the mid-inlet control valve.

1. Follow preparation procedures as outlined in Section 3.
2. Install a brake pressure diagnostic test gauge onto the “Brakes” diagnostic port (see Fig. 5-58).
3. While watching the test gauge, press the brake pedal numerous times until the pressure gauge reads 0 psi. Remove the test gauge and cap the diagnostic port.
4. Tag and disconnect all hydraulic lines from control valve fittings. Cap all hoses, tubes, and fittings. Tag all fittings.
5. (Ref. Fig. 5-32) Remove three (3) capscrews and lockwashers securing the mid-inlet control valve to the valve plate.
6. Using appropriate lifting devices, lift the control valve from valve plate and take to an appropriate location for disassembly and cleaning.

Installation

Mid-Inlet Control Valve

1. (Ref. Fig. 5-53) Position the control valve on the valve plate. Secure with three (3) lockwashers and capscrews.
2. Connect all hydraulic hoses and tubes to fittings on the control valve. Torque per instructions in Section 3.
3. Start the engine and repeatedly cycle all hydraulic circuits controlled by the valve to remove air from the system.
4. Stop engine and check for hydraulic leaks. Tighten connections as necessary.

Rear Axle Stabilizer Control Valve

Description

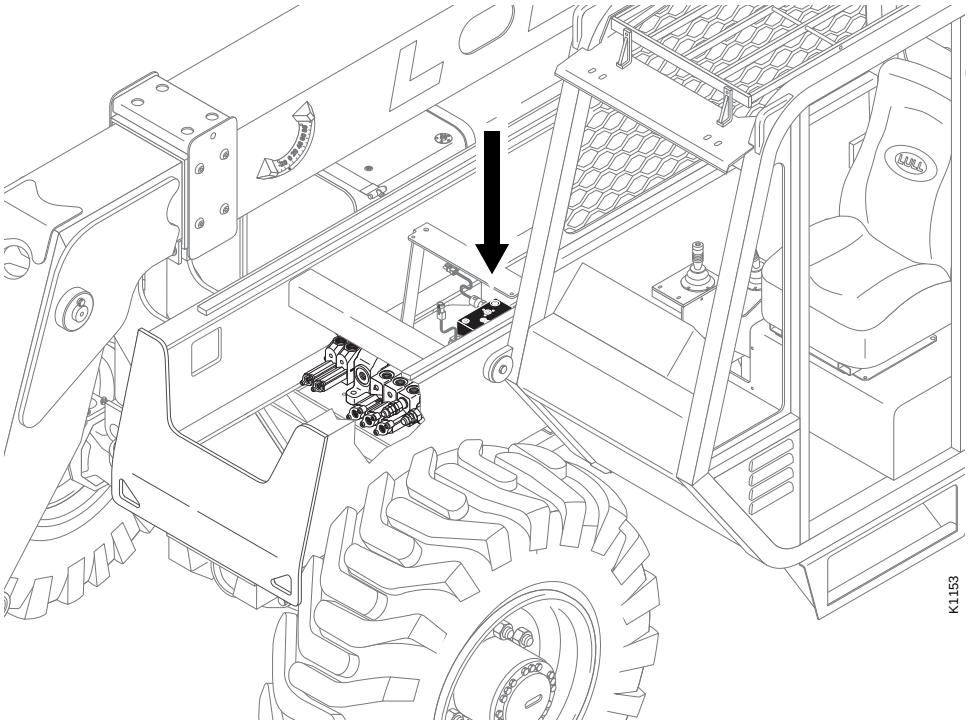


Fig. 5-54: Rear Axle Stabilizer Control Valve Location

(Ref. Fig. 5-54) The rear axle stabilizer control valve is located on the valve plate near the middle of the machine. This valve controls hydraulic functions using the following valves:

- Solenoid Valve
- Piloted 3-Way Cartridge Valve
- Sequence Cartridge Valve
- Piloted 2-Way Cartridge Valve
- Shuttle Cartridge Valve
- Boom Extend Lockout Valve - Used on models with outriggers (Standard equipment on 10K-54 and 1044C-54)

Fig. 5-55 illustrates views of the control valve, showing port locations and markings. Table 5-5 is a list of markings for each side of these valves.

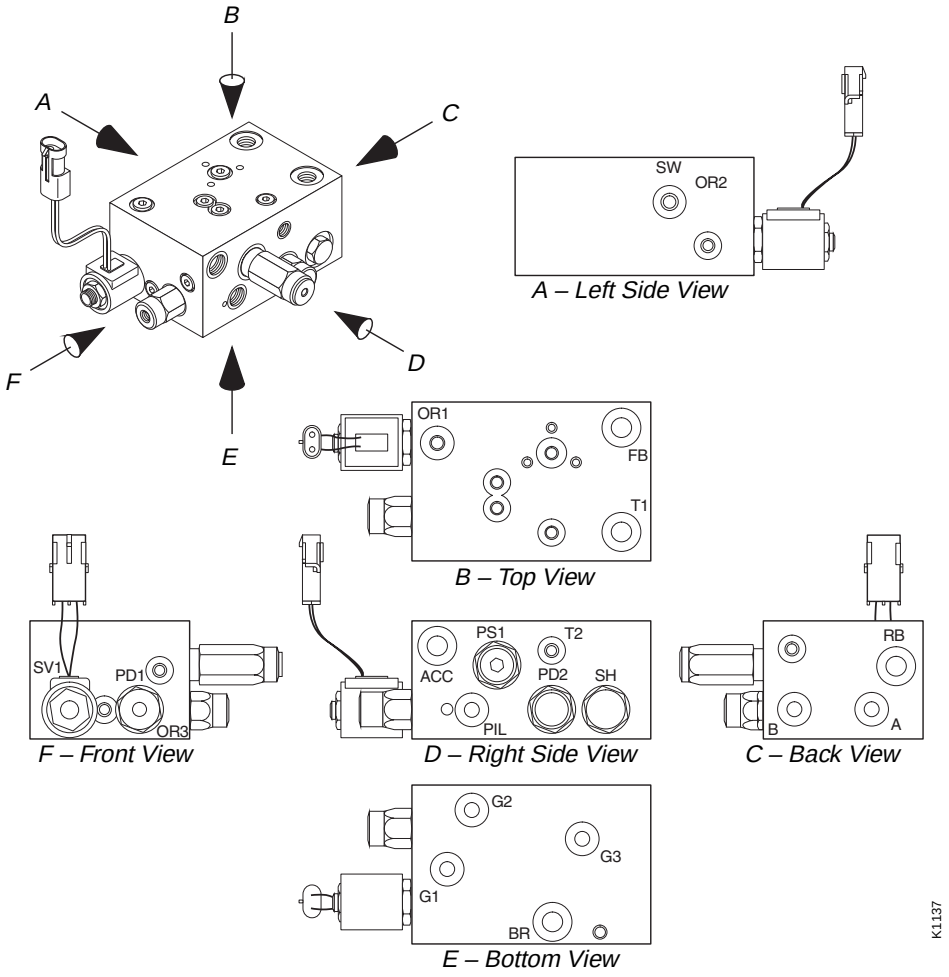
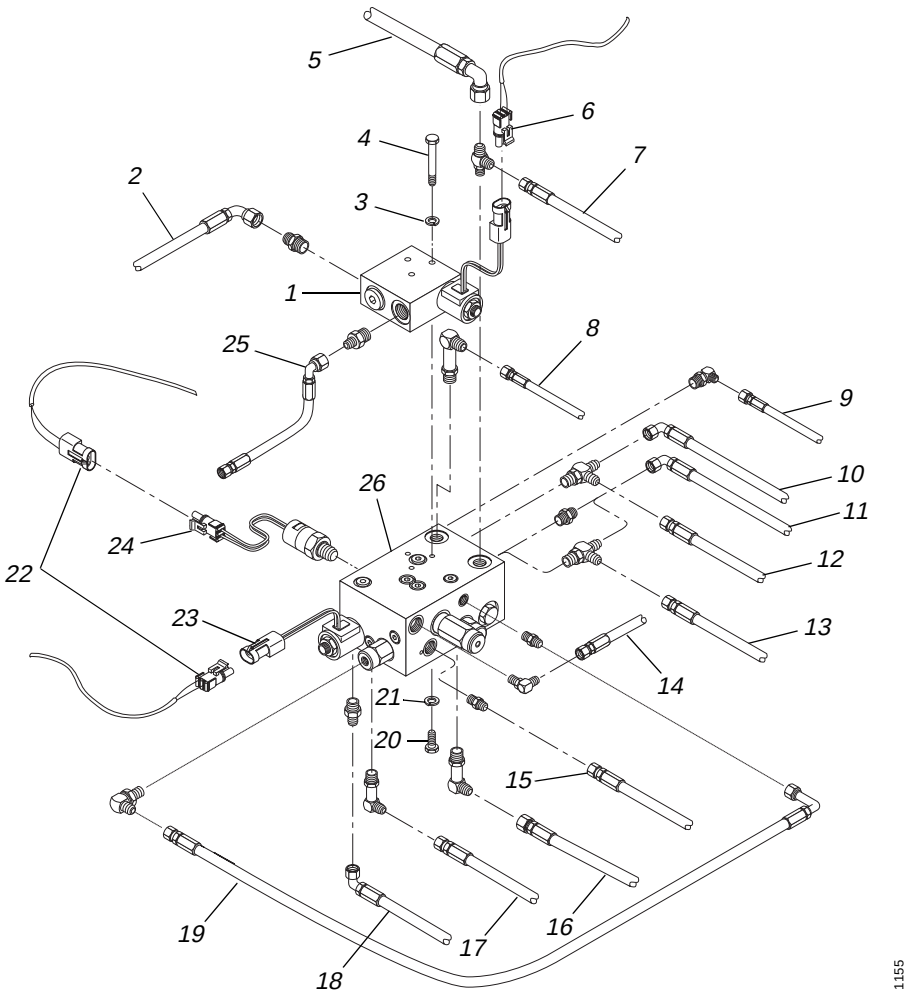


Fig. 5-55: Rear Axle Stabilizer Control Valve Ports

Table 5-5: Rear Axle Stabilizer Control Valve Markings

View	Marking	Description
A - Left Side View	OR2	Orifice #2
	SW	Service Brake Pressure Switch
B - Top View	T1	Tank
	FB	Front Brakes
	OR1	Orifice #1
C - Back View	RB	Rear Brakes
	A	Port A
	B	Port B
D - Right Side View	ACC	Accumulator
	PS1	Piloted Sequence Valve
	PIL	Pilot
	PD2	2-Way Pilot Operated Directional Valve
	SH	Shuttle Valve
E - Bottom View	G1	Gauge #1 - Test Port (Carr. Tilt, Base End)
	G2	Gauge #2 - Test Port (Carr. Tilt, Rod End)
	G3	Gauge #3 (Not Used)
	BR	Brake
F - Front View	SV1	Solenoid Valve
	PD1	3-Way Pilot Operated Directional Valve
	OR3	Orifice #3

Removal, Rear Axle Stabilizer Control Valve



#	Description
1	Boom Extend Lockout Valve
2	Hose for Connector on Boom Extend Lockout Valve
3	Lockwasher
4	Capscrew
5	Hose for Tee at T1 Port
6	Boom Extend Wire Harness
7	Hose for Tee at T1 Port
8	Hose for Elbow at FB Port
9	Hose for Elbow at RB Port
10	Hose for Tee at A Port
11	Hose for Fitting at B Port
12	Hose for Tee at A Port
13	Hose for Tee at B Port

#	Description
14	Hose for Elbow at ACC Port
15	Hose for Connector at PIL Port
16	Hose for Elbow at BR Port
17	Hose for Elbow at G1 Port
18	Hose for Connector at G2 Port
19	Hose for Elbow at PD1 Port to Connector at T2 Port
20	Capscrew
21	Lockwasher
22	Intermediate Wire Harness
23	Solenoid Valve
24	Low Brake Press. Switch at SW Port
25	Hose for Connector at D Port

Fig. 5-56: Rear Axle Stabilizer Control Valve Installation

(Ref. Fig. 5-56) The following procedure describes removal of the rear axle stabilizer control valve.

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 5-4.
2. Install brake pressure diagnostic port test gauge into brake diagnostic port (see page 5-90).
3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.
4. Thoroughly clean the rear axle stabilizer control valve.
5. Disconnect intermediate wiring harness (Item 22) from the low brake pressure switch (Item 24) and solenoid valve (Item 23).
6. If working on models with outriggers, disconnect the boom extend wire harness (Item 6) from the connector on solenoid valve located on the boom extend lockout valve (Item 1).
7. Except for item 19, tag and ***slowly*** loosen all hydraulic hoses (Items 2, 5, 7 through 18, and 25). Disconnect hoses and bleed any remaining oil into appropriate container. Cap fittings and hoses.

Note: *Models with outriggers have a total of sixteen (16) hoses; all other models have fifteen (15) hoses.*

8. Remove the three (3) each capscrews (Item 20) and lockwashers (Item 21) securing the rear axle stabilizer control valve (Item 26) to the valve plate.
9. Remove the rear axle stabilizer control valve from the machine and take it to a clean area appropriate for further disassembly, cleaning, and overhauling.

Boom Extend Lockout Valve

Description

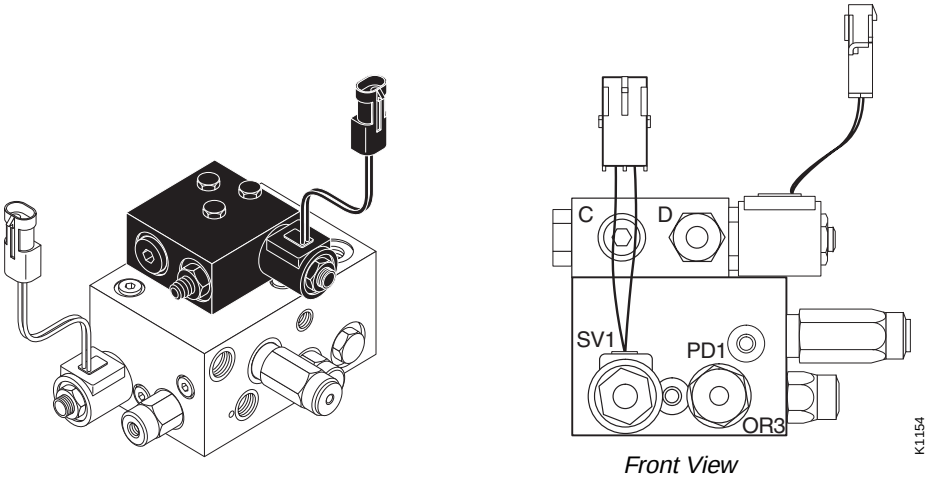


Fig. 5-57: Boom Extend Lockout Valve

(Ref. Fig. 5-57) The boom extend lockout valve is used on models with outriggers and is standard equipment on 10K-54 and 1044C-54 models. It is located on top of the rear axle stabilizer control valve.

Hydraulic Diagnostic Ports

General

The eight (8) hydraulic diagnostic ports are located beneath the operator's compartment and can be accessed through the opening in the operator's step.

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

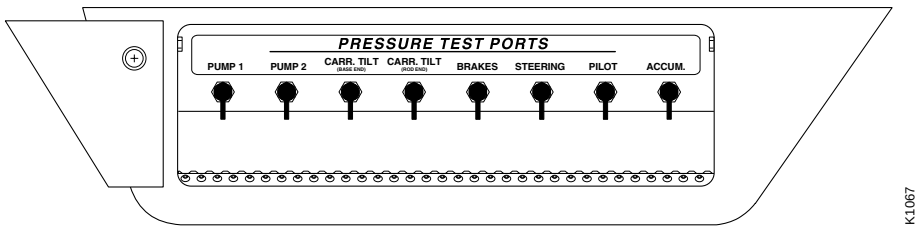


Fig. 5-58: Hydraulic Diagnostic Ports - Models with Control Manifold Hydraulics

(Ref. Fig. 5-58) The hydraulic ports on models with control manifold hydraulics are:

- **Pump 1** – Used for reading pressure of the hydraulic pump #1. Pressure limit is 2650 psi.
- **Pump 2** – Used for reading pressure of the hydraulic pump #2. Pressure limit is 2800 psi.
- **Carr. Tilt (Base End)** – Used for reading pressure for the base end of the carriage tilt cylinder. Pressure limit is 2800 psi.
- **Carr. Tilt (Rod End)** – Used for reading pressure for the rod end of the carriage tilt cylinder. Pressure limit is 2800 psi.
- **Brakes** – Used for reading pressure of the brake circuit and is used to indicate when pressure is eliminated from the system prior to disconnecting hydraulic hoses. Pressure limit is 330 psi.
- **Steering** – Used for reading pressure of the steering circuit. Pressure limit is 2200 psi.
- **Pilot** – Used for reading pressure of the joystick circuit. Pressure limit is 450 psi.
- **Accum.** – Used for reading of pressure in the accumulator charging circuit. Pre-charge pressure is 400 psi. The low pressure limit is 1200 psi and the high pressure limit is 1600 psi.

CAUTION: To ensure that system is kept free of dirt and contamination, always cap all ports when not in use.

Models with Mid-Inlet Hydraulics

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)

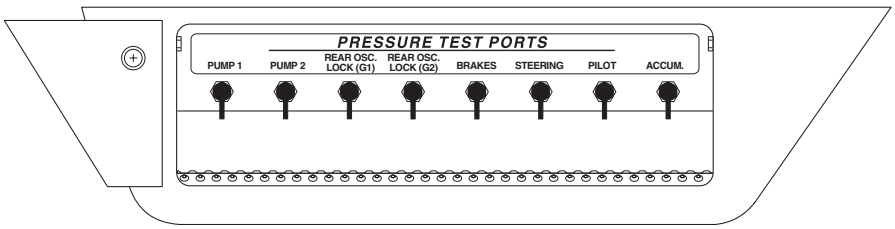


Fig. 5-59: Hydraulic Diagnostic Ports - Models with Mid-Inlet Hydraulics

(Ref. Fig. 5-59) The hydraulic ports on models with mid-inlet hydraulics are:

- **Pump 1** – Used for reading pressure of the hydraulic pump #1. Pressure limit is 2650 psi.
- **Pump 2** – Used for reading pressure of the hydraulic pump #2. Pressure limit is 2800 psi.
- **Rear Osc. Lock (G1)** – Used for reading output pressure of the solenoid valve SV1. It is useful when diagnosing service malfunctions in the rear axle stabilizer circuit.
- **Rear Osc. Lock (G2)** – Used for reading pressure in the rear oscillation lock circuit.

- **Brakes** – Used for reading pressure of the brake circuit and is used to indicate when pressure is eliminated from the system prior to disconnecting hydraulic hoses. Pressure limit is 330 psi.
- **Steering** – Used for reading pressure of the steering circuit. Pressure limit is 2200 psi.
- **Pilot** – Used for reading pressure of the joystick circuit. Pressure limit is 450 psi.
- **Accum.** – Used for reading of pressure in the accumulator charging circuit. Pre-charge pressure is 400 psi. The low pressure limit is 1200 psi and the high pressure limit is 1600 psi.

CAUTION: To ensure that system is kept free of dirt and contamination, always cap all ports when not in use.

Roll-Back Hose Tray

General

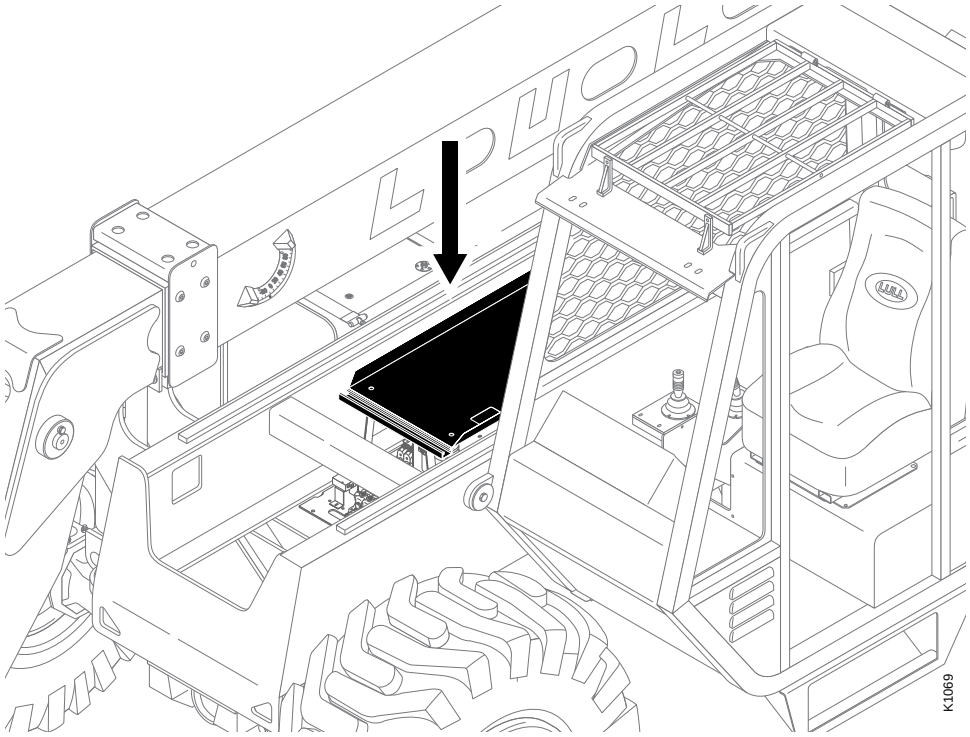


Fig. 5-60: Roll-Back Hose Frame Location - Control Manifold Hydraulics

(Ref. Fig. 5-60) The roll-back hose tray is located near the middle of the machine, above the valve plate. It is used with models 644B, 844C, and 1044C.

Removal

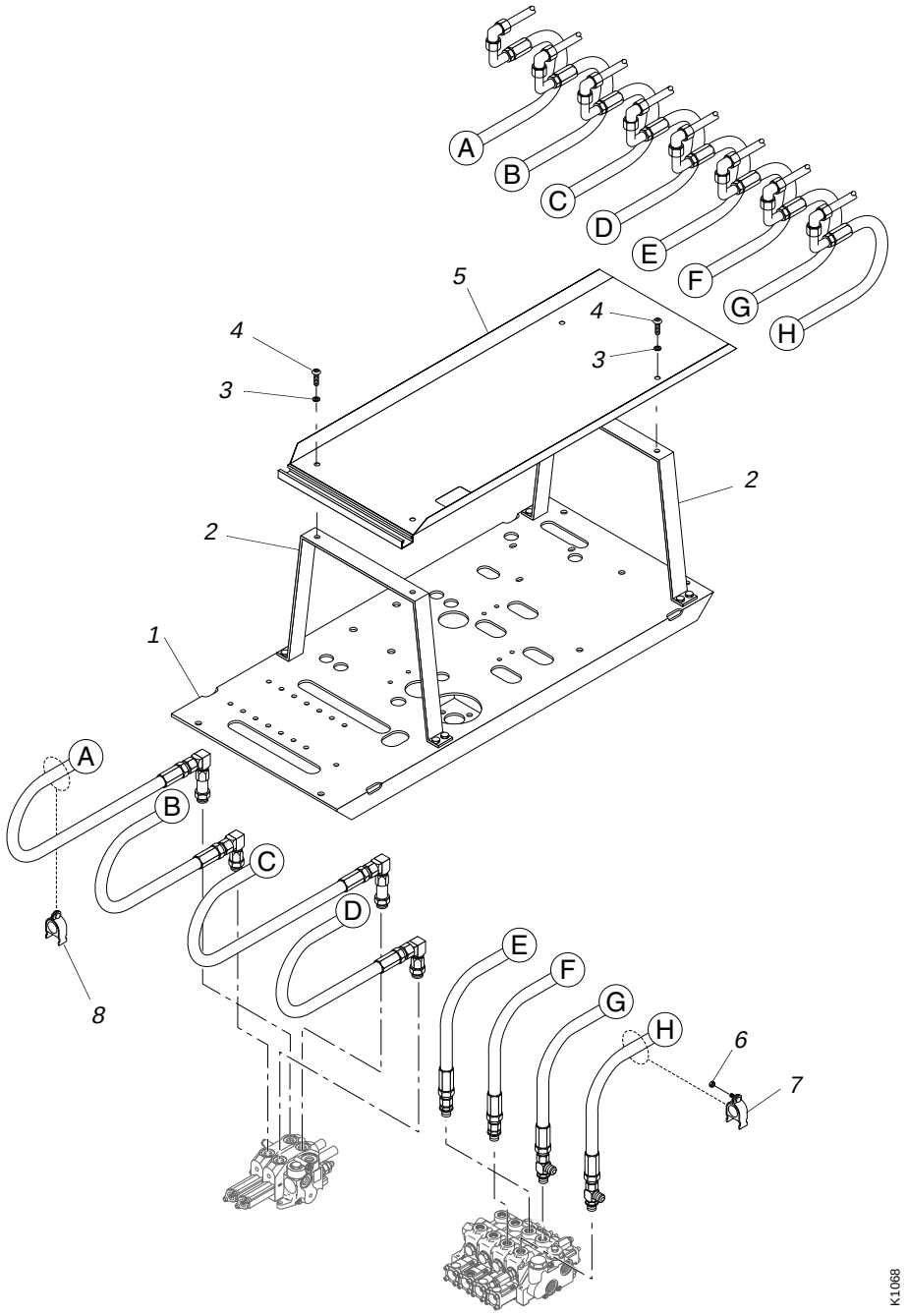
Roll-Back Hose Tray

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

(Ref. Fig. 5-61) The following procedure describes removal of the roll-back hose tray used in models with control manifold hydraulics.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Loosen self-locking nuts for the 1” and 1-1/8” cushion clamps (Items 7 and 8) that secure the hydraulic hoses to the roll-back hose tray (Item 5).
3. Slide the cushion clamps out of the roll-back hose tray channel.
4. Remove the four (4) each truss head screws (Item 4) and lockwashers (Item 3) that secure the roll-back hose tray to the two (2) hose tray support brackets (Item 2).
5. Remove the roll-back hose tray from the machine.

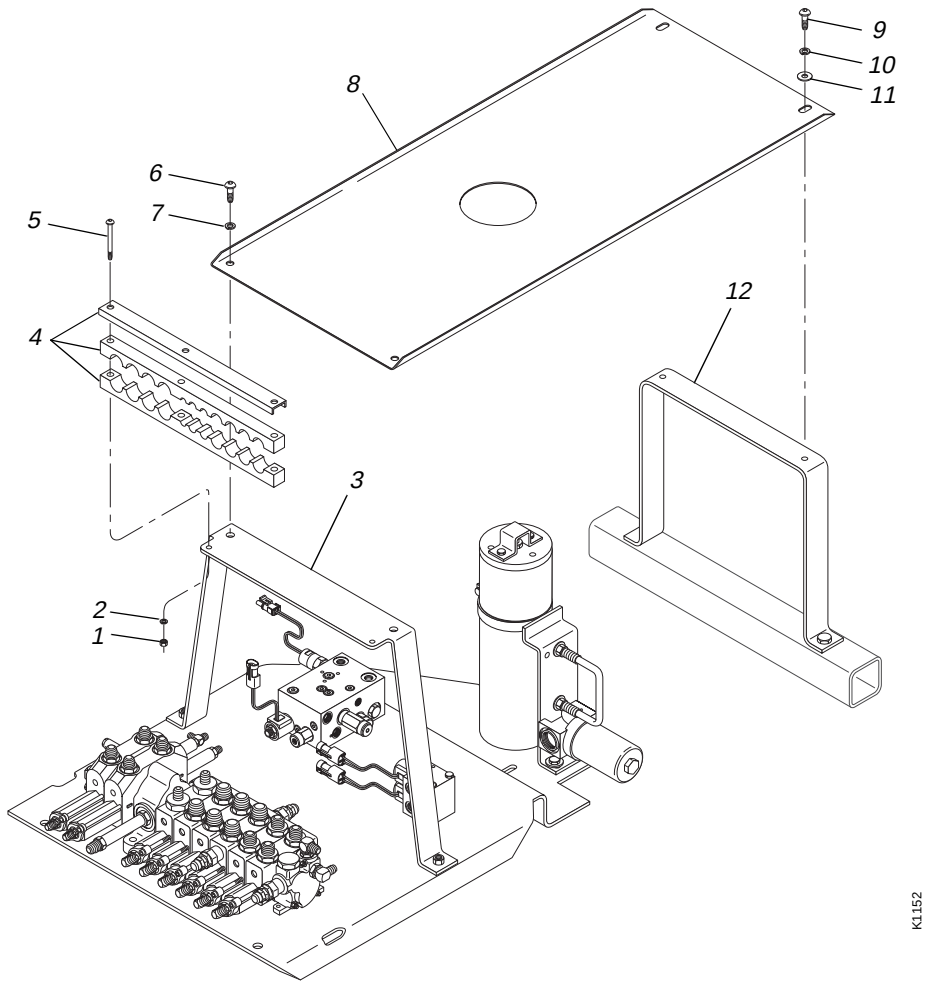


#	Description	#	Description
1	Valve Plate	5	Roll-Back Hose Tray
2	Hose Tray Support Bracket	6	Self-Locking Nut
3	Lockwasher	7	Cushion Clamp (1” Hose)
4	Truss Head Screw	8	Cushion Clamp (1-1/8” Hose)

Fig. 5-61: Roll-Back Tray Installation - Control Manifold Hydraulics

Models with a Mid-Inlet Hydraulic System

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)



#	Description
1	Nut
2	Lockwasher
3	Front Hose Tray Support Bracket
4	Hose Mount
5	Button Head Socket Capscrew
6	Button Head Socket Capscrew

#	Description
7	Lockwasher
8	Roll-Back Hose Tray
9	Button Head Socket Capscrew
10	Lockwasher
11	Flatwasher
12	Rear Hose Tray Support Bracket

Fig. 5-62: Roll-Back Tray Installation - Mid-Inlet Hydraulics

(Ref. Fig. 5-62) The following procedure describes removal of the roll-back hose tray used in models with a mid-inlet hydraulic system.

1. Remove the two (2) each button head socket capscrews (Item 6) and lockwashers (Item 7) securing the roll-back hose tray (Item 8) to the front hose tray support bracket (Item 3).
2. Remove the two (2) each button head socket capscrews (Item 9), lockwashers (Item 10), and flatwashers (Item 11) securing the roll-back hose tray to the rear hose tray support bracket (Item 12).
3. Remove the roll-back hose tray from the machine.

Installation

Roll-Back Hose Tray

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

(Ref. Fig. 5-61) The following procedure describes installation of the roll-back hose tray used in models with control manifold hydraulics.

1. Inspect and clean the roll-back hose tray.
2. Place the roll-back hose tray on the two support brackets making sure it is in the same position as when removed.
3. Install the roll-back hose tray (Item 5) with the four (4) each truss head screws (Item 4) and lockwashers (Item 3). Tighten as necessary.
4. Slide the cushion clamps (Items 7 and 8) into the channel of the roll-back hose tray and secure them to hydraulic hoses with self-locking nuts (Item 6). Tighten as necessary.

Models with Mid-Inlet Hydraulics

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)

(Ref. Fig. 5-62) The following procedure describes installation of the roll-back hose tray used in models with mid-inlet hydraulics.

1. Inspect and clean the roll-back hose tray.
2. Place the roll-back hose tray on the two support brackets making sure it is in the same position as when removed.
3. Secure the roll-back hose tray (Item 8) to the rear hose tray support bracket with two (2) each flatwashers (Item 11), lockwashers (Item 10), and button head socket capscrews (Item 9). Tighten as necessary.
4. Secure the roll-back hose tray to the front hose tray support bracket (Item 3) with two (2) lockwashers (Item 7) and button head socket capscrews (Item 6). Tighten as necessary.

Section 6 — Boom and Transfer

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Boom and Transfer Hydraulics

General Description

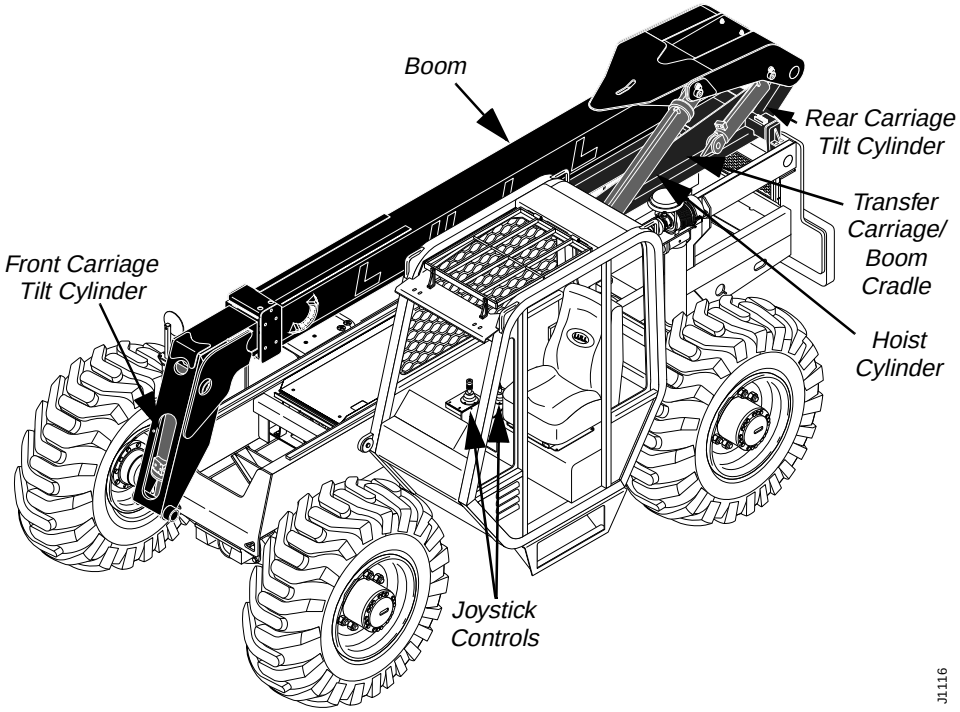


Fig. 6-1: Major Boom and Transfer Hydraulic Components

(Ref. Fig. 6-1) The following are major boom and transfer components:

- Boom - 2, 3, or 4 Sections
- Boom Extension Cylinder (not visible in illustration)
- Front Carriage Tilt Cylinder
- Boom Hoist Cylinder
- Rear Carriage Tilt Cylinder
- Joystick Controls
- Transfer Carriage (Models 644B, 844C, and 1044C)/Boom Cradle (Models 6K, 8K, and 10K)

Further information on the hydraulic system can be found in Section 4.

Joystick Controls

General Description

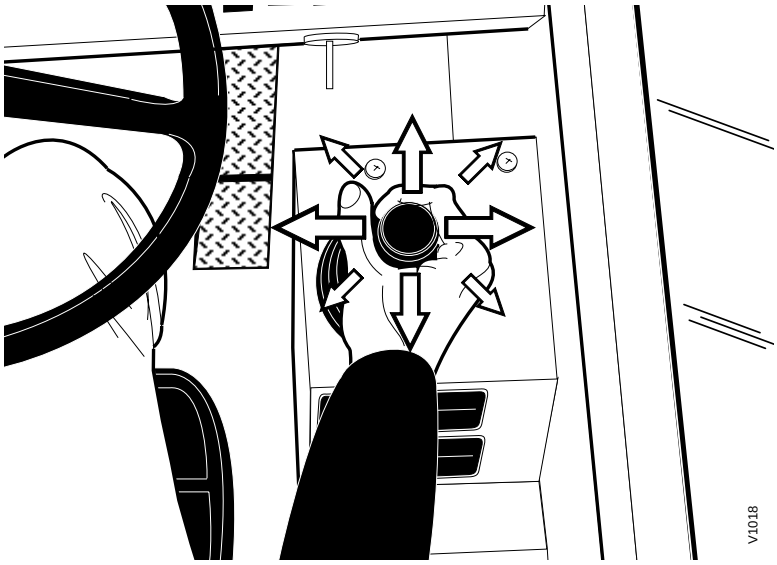


Fig. 6-2: Joystick

(Ref. Fig. 6-2) The joysticks control hydraulic flow to the associated cylinders.

Control is proportional: The more joystick movement, the greater the action. The speed of cylinder action is also affected by engine/hydraulic pump speed. Action is quicker at higher engine speeds.

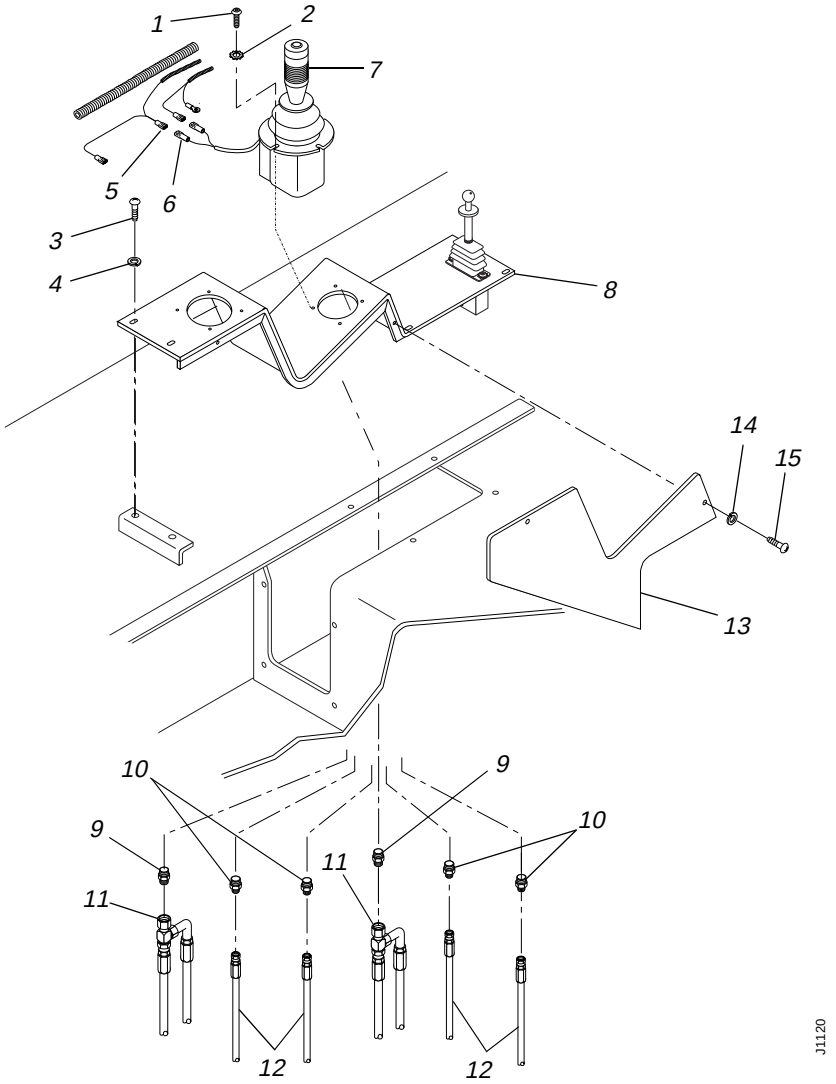
Joysticks can be moved in any direction and are not limited to front/back, left/right movement. Moving a joystick in a diagonal direction will cause a combination of actions.

A switch is located on the top of the front joystick, under a protective rubber cap. Pressing this switch down with your thumb activates the auxiliary function (models 644B, 844C, and 1044C only).

Note: *Releasing the switch while moving the joystick left or right changes the function of the joystick back to transfer carriage control.*

Removal

Joystick



#	Description
1	Button Head Socket Capscrew
2	Lockwasher with Internal Teeth
3	Phillips Truss Head Screw
4	Flatwasher
5	Wiring Harness
6	Lead Connector
7	Joystick
8	Control Panel

#	Description
9	Connector
10	Connector
11	Swivel Tee
12	Hydraulic Hose
13	Side Panel
14	Capscrew
15	Lockwasher

Fig. 6-3: Joystick Installation

(Ref. Fig. 6-3) The following steps are required to remove the joystick.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Remove two (2) capscrews (Item 14) and lockwashers (Item 15) securing side panel (Item 13) to control panel (Item 8). Remove side panel.

3. Tag, loosen, and remove two (2) swivel tees (Item 11) from connectors (Item 9) on bottom of joystick.

Note: *On models with two joysticks (644B, 844C, and 1044C), hydraulic hoses attach directly to the connectors on the front joystick and the swivel tees (Item 11) are not used. Swivel tees as shown in Fig. 6-3 are used with models 6K, 8K, and 10K and are also used with the rear joystick of models 644B, 844C, and 1044C.*

4. Tag, loosen, and remove remaining four (4) hydraulic hoses (Item 12) from connectors (Item 10).
5. Tag and disconnect two (2) lead connectors (Item 6) from wiring harness (Item 5).
6. Loosen and remove four (4) each capscrews (Item 1) and lockwashers (Item 2) securing joystick (Item 7) to control panel.
7. Remove joystick and take it to a suitable area for further disassembly and cleaning.
8. Remove six connectors (Items 9 and 10) from bottom of joystick and manifold. Clean with solvent. Dry with compressed air and inspect for damage. Replace if necessary.

Installation

Joystick

(Ref. Fig. 6-3) The following steps are required to install the joystick.

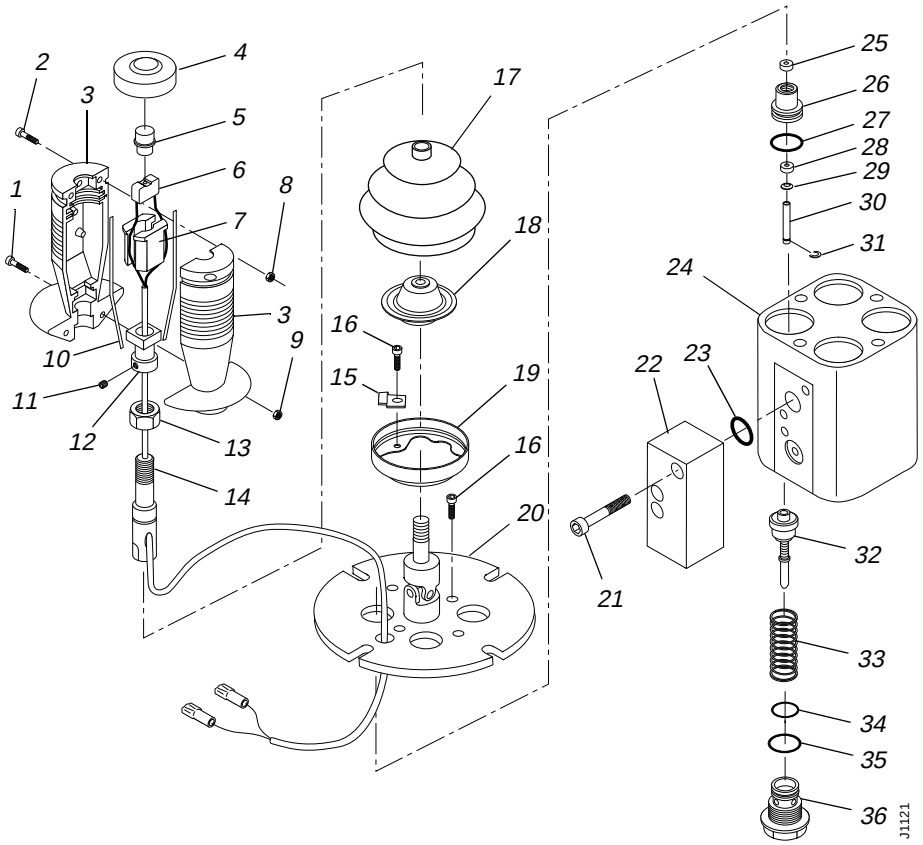
1. Install two (2) connectors (Item 9): one in center port in bottom of joystick (Item 7) and the other in the bottom of the manifold. Torque connectors to 25–29 ft-lbs.
2. Install remaining four (4) connectors (Item 10) in ported guides in bottom of joystick body. Torque connectors to 25–29 ft-lbs.
3. Install assembled joystick on control panel (Item 8) with four (4) each capscrews (Item 1) and lockwashers (Item 2). Torque capscrews to 50 in-lbs.
4. Reconnect two (2) lead connectors (Item 6) to wiring harness (Item 5).
5. Clean swivel nuts on hoses and tees with solvent.
6. Reconnect swivel tees/hydraulic hoses (Item 11) to connectors (Item 9). Torque swivel nuts to 130–150 in-lbs.

Note: *Hydraulic hoses in Step 6 are used only with the front joystick of models 644B, 844C, and 1044C. Swivel tees are used in all other instances.*

7. Reconnect remaining four (4) hydraulic hoses (Item 12) to connectors (Item 10). Torque swivel nuts on hoses to 235–265 in-lbs.
8. Reconnect two (2) lead connectors (Item 6) to wiring harness (Item 5).
9. Install side panel (Item 13) on control panel with two (2) lockwashers (Item 15) and capscrews (Item 14). Torque capscrews to 96 in-lbs.

Disassembly

Joystick



#	Description
1	Socket Head Capscrew
2	Socket Head Capscrew
3	Half Handle
4	Cap
5	Push Button
6	Switch
7	Guide
8	Hex Nut
9	Hex Nut
10	Seal
11	Setscrew
12	Lever Joint
13	Retaining Nut
14	Stem
15	Clip
16	Socket Head Capscrew
17	Boot
18	Cam

#	Description
19	Retainer
20	Flange
21	Socket Head Capscrew
22	Manifold
23	O-ring
24	Body
25	Wiper
26	Guide
27	O-ring
28	Seal
29	Spreader
30	Plunger
31	240
32	Spool
33	Spring
34	O-ring
35	O-ring
36	Ported Guide

Fig. 6-4: Joystick Components

(Ref. Fig. 6-4) The following steps are required to disassemble and repair the joystick.

1. Pull back boot (Item 17) so that access to retainer (Item 19) and flange (Item 20) can be made.
2. Loosen and remove four (4) socket head capscrews (Item 16) and one (1) clip (Item 15) that secure retainer and flange to joystick body (Item 24). Separate body from joystick handle assembly.
3. Disassemble joystick body assembly as follows:
   a. Loosen and remove three (3) socket head capscrews (Item 21) securing manifold (Item 22) to body.
   b. Remove O-ring (Item 23) from manifold. Discard O-ring.
   c. The following steps are required to remove parts (Items 25 thru 36) located in each port:

      Note: *Because the spools (Item 32) may differ from each other, it is strongly recommended that when they are removed, they should be removed one at a time and then reinstalled before another is removed.*

      1). Loosen and remove one (1) of the four (4) ported guides (Item 36) from body.
      2). Remove two (2) O-rings (Items 34 and 35) from ported guide. Discard O-rings.
      3). Remove spool (Item 32) and spring (Item 33) from body.
      4). Remove guide assembly (Items 25 thru 31) from body.
      5). Remove O-ring (Item 27) from guide (Item 26). Discard O-ring.
      6). Clean remaining parts with solvent. Dry with compressed air. Inspect and replace if damaged.

      Note: *Items 25 thru 31 cannot be purchased individually. The O-ring (Item 27) can only be purchased as a part of a seal kit. If any of the remaining parts become damaged, it will be necessary to purchase a complete new guide assembly.*

      7). Inspect open port in body and clean as necessary.
      8). Obtain O-ring (Item 27) from seal kit. Lubricate O-ring before installing it.
      9). Install new O-ring on guide (Item 26). Lubricate and install guide assembly (Items 21 thru 36) in body.
      10). Lubricate and install spring (Item 33) and spool (Item 32) in body.
      11). Obtain new O-rings from seal kit. Install large O-ring (Item 35) and then smaller O-ring (Item 34) on ported guide (Item 36).
      12). Install ported guide in body. Torque guide to 260 in-lbs.
   d. Repeat Step c for each of the remaining three (3) ports, one port at a time.

e. Clean all remaining parts of joystick body assembly, including the body's center port, with solvent. Dry with compressed air. Inspect and replace any damaged parts.

Note: *The body (Item 24) cannot be purchased individually. If it becomes damaged, it will be necessary to replace the entire joystick assembly.*

f. Lubricate and install new O-ring (Item 23) in manifold (Item 22).

g. Install manifold on body with three (3) capscrews (Item 21). Torque capscrews to 22 in-lbs.

4. Remove flange (Item 20) from stem (Item 14). Separate flange, retainer (Item 19), cam (Item 18), and boot (Item 17) from stem.

5. Clean items 15 thru 20 with solvent. Inspect and replace if damaged.

6. Disassemble handle assembly (Items 1 thru *14*) as follows:

a. Remove joystick cap (Item 4).

b. Loosen and remove two (2) each hex nuts (Item 1) and capscrews (Item 9) near bottom of joystick handle.

c. Loosen and remove two (2) each hex nuts (Item 8) and capscrews (Item 2) near top of joystick handle.

d. Separate the two (2) half handles (Item 3) and remove the push button (Item 5).

e. Remove switch (Item 6) from guide (Item 7) if damaged.

f. If the switch is damaged, remove connecting wires and discard switch. Solder wires to outside tabs on new switch. Install switch in guide.

g. Inspect remaining parts and replace if damaged.

Note: *Unless they are damaged, it will not be necessary to remove lever joint (Item 12) and retaining nut (Item 13) from stem (Item 14), to remove setscrew (Item 11) from lever joint, or to remove seal (Item 10) from handle half.*

Note: *Only the handle halves (Item 3), cap (Item 4), push button (Item 5), and switch (Item 6) can be purchased individually. If any of the remaining items become damaged, it will be necessary replace the entire handle assembly.*

h. Install push button in guide while installing guide and lever joint in one (1) half handle ensuring that each is placed in the correct slot of half handle.

i. Secure the two (2) half handles together with two (2) each hex nuts (Item 8) and capscrews (Item 2) near top of joystick handle.

j. Install remaining two (2) each hex nuts (Item 1) and capscrews (Item 9) near bottom of joystick handle. Tighten the four (4) screws until snug.

k. Reinstall cap on joystick.

7. Install boot (Item 17) on stem (Item 14) making sure that the top lip of the boot rests in the channel in the stem.
8. Roll back boot and install cam (Item 18), retainer (Item 19), and flange (Item 20) on stem.
9. Install flange on joystick body with two (2) capscrews (Item 16). Install retainer on flange with remaining two (2) capscrews, ensuring that one capscrew also secures the wire to the retainer with the clip (Item 15). Torque capscrews to 28 in-lbs.
10. Make final adjustment of cam and flange as follows:
    a. Make sure the cam is backed off enough to ensure that all four (4) plungers (Item 30) are in the spring-offset position.
    b. Apply thread locking compound to flange thread.
    c. Screw cam and stem on flange until cam just touches the plungers.
    d. Screw cam a maximum of 1/4 turn and then torque back cam against stem to 160 in-lbs.
11. Return boot to correct position, covering retainer.

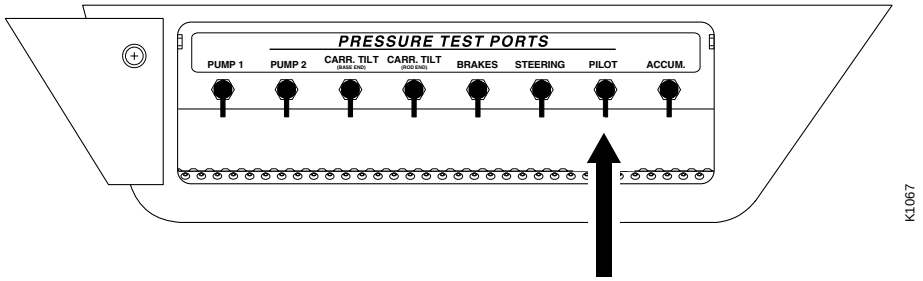


Fig. 6-5: Pilot Pressure Diagnostic Port

12. Test pilot pressure as follows:
    a. (Ref. Fig. 6-5) Connect a 600 psi gauge to the pilot pressure test port located behind the cab step.
    b. Start the machine and check pilot pressure. While the engine is idling, the pilot pressure should read 460 ±25 psi.

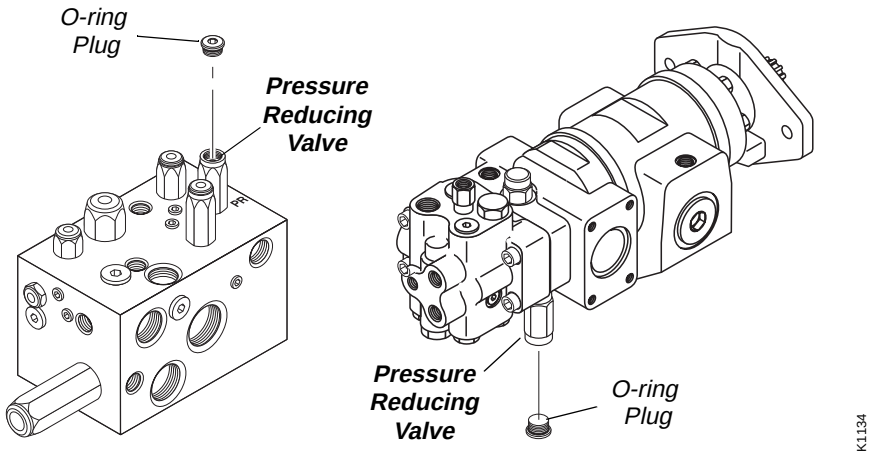


Fig. 6-6: Pilot Pressure Plug

c. (Ref. Fig. 6-6) If the pilot pressure is not within the recommended range, adjust pressure as follows:

   1). For models with control manifold hydraulics, remove the O-ring plug from the pressure reducing cartridge with a 1/4" Allen wrench. Use a 1/4" Allen wrench to adjust the reducing valve by turning clockwise to increase pressure and counterclockwise to decrease pressure.

   Note: *This pressure reducing cartridge is located in the port on the control manifold marked PR.*

   2). For models with mid-inlet hydraulics, remove the O-ring plug from the pressure reducing cartridge with a 5/16" Allen wrench. Use a 1/4" Allen wrench to adjust the reducing valve by turning clockwise to increase pressure and counterclockwise to decrease pressure.

   Note: *This pressure reducing cartridge is located on the hydraulic pump.*

   3). Install O-ring plug and torque to 44–48 ft-lbs.

   4). Retest pilot pressure, and make any additional valve adjustments as required.

Hydraulic Cylinders

Description

All hydraulic cylinders used on JLG forklifts are a double-acting, non-cushioned type with chromed rods.

The boom hoist, carriage tilt, boom extension, and frame tilt cylinders are equipped with externally mounted counterbalance valves. These counterbalance valves prevent movement of the cylinders in the event of

downstream hydraulic line failure or leakage through the control valves or fittings. Counterbalance valves prevent movement of the cylinders when the engine is off, even if the control valve levers are operated. Counterbalance valves also provide relief valve overpressure protection.

WARNING: Do not remove counterbalance valves from cylinders on the machine while the cylinder is under load (extended). If a counterbalance valve must be removed, first retract the cylinder and remove all hydraulic pressure in the cylinder. Wear eye protection when removing counterbalance valves.

WARNING: Hydraulic cylinders equipped with counterbalance valves may have hydraulic pressure stored within the cylinder even after the cylinder is removed from the machine. If a counterbalance valve must be removed, do so carefully while wearing eye protection.

Checking Cylinder Condition

Exposed piston rods can be damaged by impact with hard objects. If the smooth surface of the rod is marred, the rod seal may be damaged.

Cylinders need to be inspected periodically to check for excessive play at the cylinder pivot ends. Excessive play is an indication of worn bushings that will need to be replaced.

Note: *When the machine or cylinders are stored, retract the cylinder rods to protect them.*

Cylinder maintenance requires periodic inspection for wear and checks for leakage.

External Leakage

If a cylinder end cap is leaking or if the cylinder leaks around the rod, the seals must be replaced.

WARNING: **DO NOT** use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks.

Internal Leakage

Leakage past the piston seals inside the cylinder can cause sluggish movement or settling under load. Piston leakage can be caused by worn piston seals or scored cylinder walls. Scored cylinder walls may be caused by hydraulic oil contamination. Check hydraulic cylinders for internal leakage using the following procedure:

1. Lower the boom to the ground, apply the park brake, retract the cylinder, and stop the engine.

2. Install brake pressure diagnostic port test gauge into brake diagnostic port.
3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge and cap diagnostic port.
4. Remove the hose at the base end of the cylinder and plug the hose.
5. Start the engine and activate the control that will supply hydraulic oil to the rod end of the cylinder.
6. If there is leakage from the disconnected end of the cylinder, remove the cylinder and make repairs. If there is no leakage, reconnect the hose and tighten (see installation procedures for each cylinder for torque specifications).

Boom Hoist Cylinder

Description

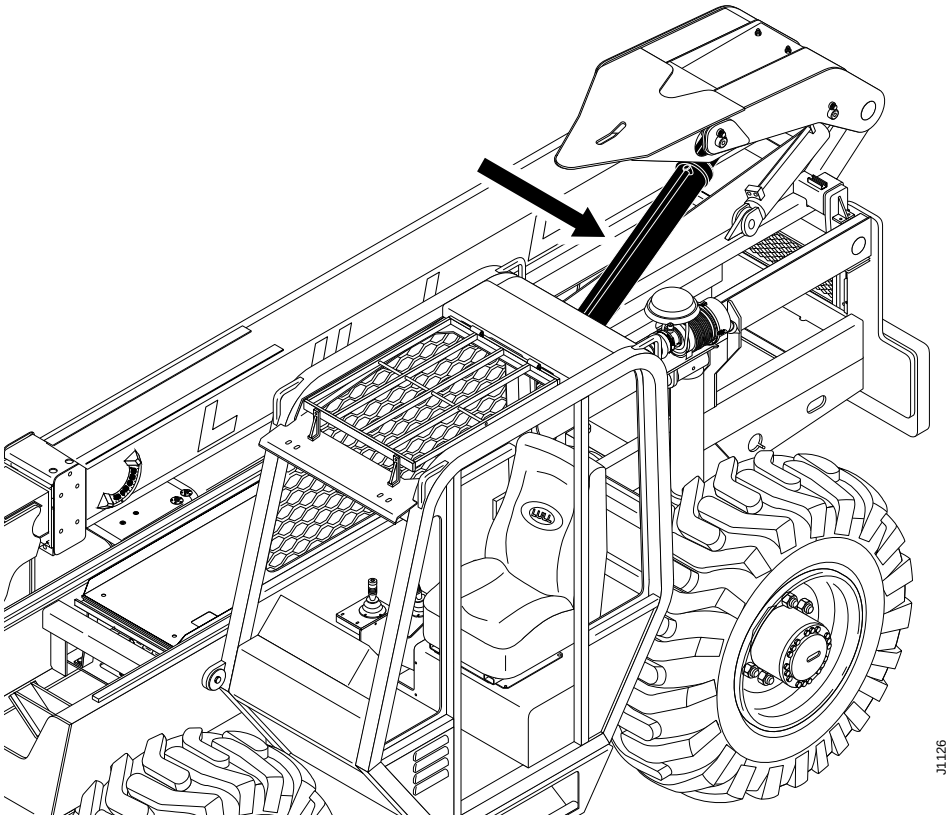
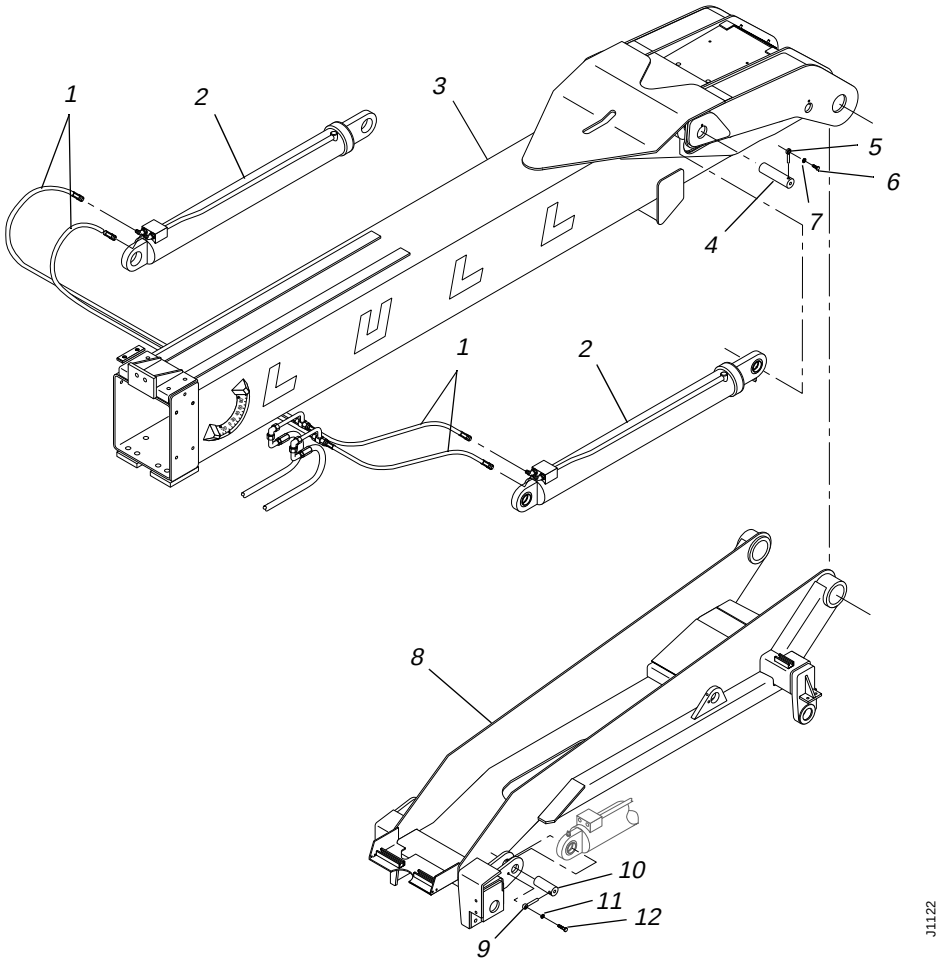


Fig. 6-7: Boom Hoist Cylinders

(Ref. Fig. 6-7) Two (2) boom hoist cylinders are used to raise and lower the boom. They are attached on one end to the outer boom and the other end is attached to the transfer carriage/boom cradle near the rear of the operator's compartment. Daily lubrication of the two grease fittings on each cylinder is required.

Removal

Boom Hoist Cylinder



#	Description	#	Description
1	Hydraulic Hose	7	Lockwasher
2	Hoist Cylinder	8	Transfer Carriage/Boom Cradle
3	Outer Boom	9	Lock Pin
4	Pivot Pin - Rod End	10	Pivot Pin - Base End
5	Lock Pin	11	Lockwasher
6	Hex Capscrew	12	Hex Capscrew

Fig. 6-8: Boom Hoist Cylinder Installation

(Ref. Fig. 6-8) The following steps are required to remove boom hoist cylinders.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Lower the boom to the ground, apply the park brake, retract the cylinder, and stop the engine.
3. Loosen and remove hydraulic hoses (Item 1) from fittings on hoist cylinder (Item 2). Bleed any remaining oil into a suitable container. Cap fittings and hoses.
4. Loosen and remove capscrew (Item 6) and lockwasher (Item 7) from rod end lock pin (Item 5).

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WARNING: To avoid personal and/or equipment damage, support the hydraulic cylinder before removing pins. Use suitable blocking and lifting devices when removing heavy machine components.

Note: *Cylinder pins are designed to be removed with a slide hammer.*

5. Remove lock pin from rod end pivot pin (Item 4).
6. Remove rod end hoist cylinder pin from outer boom (Item 3).
7. Slowly lower supported cylinder until it rests on main frame.
8. Loosen and remove capscrew (Item 12) and lockwasher (Item 11) from base end lock pin (Item 9).
9. Remove lock pin from base end pivot pin (Item 10).
10. Remove base end hoist cylinder pin from transfer carriage/boom cradle (Item 8).
11. Slowly remove the cylinder from the machine and take it to a location suitable for inspection and disassembly.

Installation

Boom Hoist Cylinder

(Ref. Fig. 6-8) The following steps are required to install boom hoist cylinders.

1. Using sling(s), crane, or other suitable means, position base end of cylinder (Item 2) in its proper location on the transfer carriage/boom cradle (Item 8).

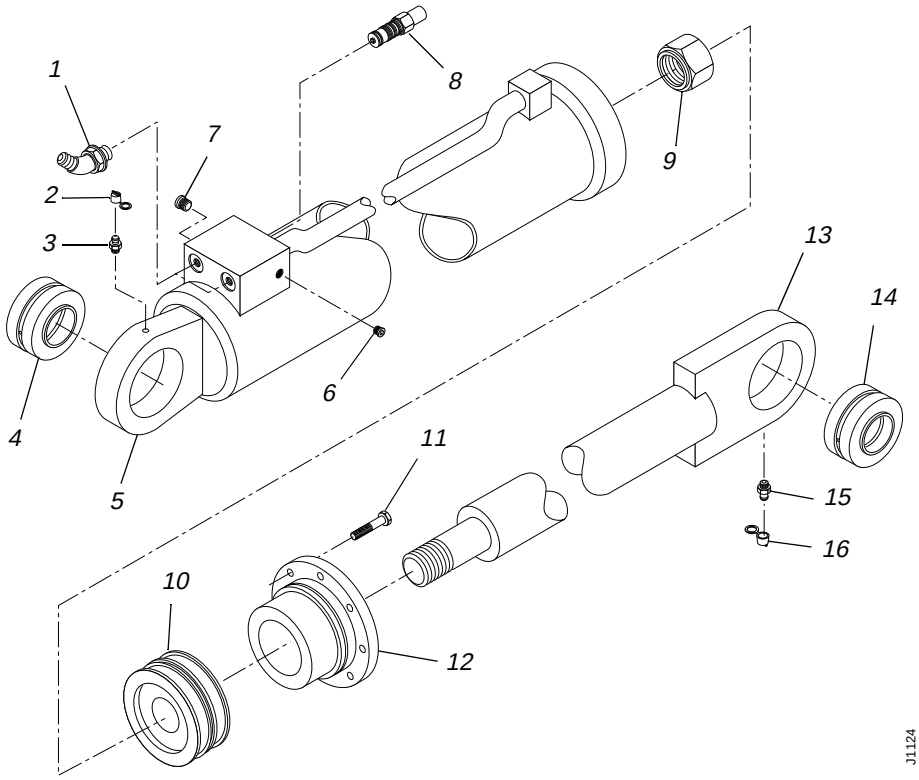
WARNING: To avoid personal and/or equipment damage, make sure the cylinder is properly supported until it is completely installed.

Note: *Be sure to apply thread locking compound to the threads of the capscrews before installing them.*

2. Align cylinder with pin bosses in transfer carriage/boom cradle and install pivot pin (Item 10). Secure pivot pin with lock pin (Item 5), lockwasher (Item 11), and capscrew (Item 12). Torque capscrew to 55 ft-lbs.
3. Place rod end of cylinder in its proper location and insert rod end pivot pin (Item 4) to secure the cylinder to outer boom (Item 3).
4. Secure pivot pin with lock pin (Item 9), lockwasher (Item 7) and capscrew (Item 6). Torque capscrew to 55 ft-lbs.
5. Clean hydraulic hose ends with solvent and reconnect them to fittings on each hoist cylinder. Torque hose swivel nuts to 50–58 ft-lbs.
6. Lubricate grease fittings with EP lithium based grease.

Overhaul

Boom Hoist Cylinder



#	Description	#	Description
1	45 Degree Elbow	9	Rod Nut
2	Grease Fitting Cover	10	Piston
3	Grease Fitting	11	Hex Head Capscrew
4	Self-Aligning Bushing - Base End	12	Rod Bearing Head
5	Cylinder Barrel	13	Cylinder Rod
6	Hollow Hex O-ring Plug	14	Self-Aligning Bushing - Rod End
7	Hollow Hex O-ring Plug	15	Grease Fitting
8	Counterbalance Valve Cartridge	16	Grease Fitting Cover

Fig. 6-9: Boom Hoist Cylinder Assembly

(Ref. Fig. 6-9) The following steps are required to overhaul boom hoist cylinders.

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. Release oil pressure in the cylinder as follows:

WARNING: The counterbalance valve cartridge traps hydraulic oil in the cylinder which may be under pressure. 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.

a. Place socket wrench over counterbalance valve cartridge (Item 8). Wrap a clean shop rag around the socket to cover the area of the counterbalance valve cartridge.

b. Carefully and slowly, turn cartridge out of manifold block to release pressure in cylinder.

3. Remove the counterbalance valve cartridge.
4. Slowly extend and retract cylinder by hand to remove most of the hydraulic oil.
5. Remove eight (8) capscrews (Item 11) securing rod bearing head (Item 12) to barrel.
6. Remove cylinder rod (Item 13) from cylinder barrel (Item 5).

CAUTION: To prevent possible damage to components, support rod and head; do not wiggle rod or head back and forth during removal.

7. Remove rod nut (Item 9), piston (Item 10), and rod bearing head from cylinder rod.
8. Remove two (2) O-ring plugs (Items 6 and 7).
9. Remove the two elbows (Item 1) from the cylinder manifold block.
10. Inspect bushings for damage. The following steps are necessary if bushing(s) need to be replaced:

    a. Remove bushing (Item 4) from cylinder barrel (Item 5) and/or remove bushing (Item 14) from cylinder rod (Item 13) using a bushing driver and hammer or press.

    b. Install new bushing so that it is centered in axle boss.

    c. To ensure proper lubrication, make sure an adequate amount of grease is applied to the grease fitting(s) after cylinder is reinstalled on machine.

11. If necessary, remove grease fitting covers (Items 2 and 16) and grease fittings (Items 3 and 15) on the cylinder. Inspect and replace if damaged. Install and tighten fittings 1.5 to 3 turns past finger tight.
12. Remove all O-rings, wear rings, and backup rings from cylinder components and discard.
13. Thoroughly clean components with solvent and dry with compressed air.
14. Inspect inner surface of barrel, outer surface of piston, and length of rod for scratches and scoring. If barrel, piston, or rod is damaged, it must be replaced.
15. Check condition of threads on rod, nut, and capscrews. Do not attempt to repair damaged threads.

16. Inspect counterbalance valve cartridge (Item 8), including O-rings, for condition and replace as necessary. Do not disassemble the cartridge. Service to counterbalance valve cartridges is limited to installing new O-rings or replacing the entire cartridge.
17. Lubricate counterbalance valve cartridge O-rings with clean hydraulic oil.
18. Install cartridge in manifold block and torque to 30–35 ft-lbs.
19. Install O-ring plug (Item 6) in manifold block and torque to 70–80 ft-lbs.
20. Install O-ring plug (Item 7) in manifold block and torque to 125–145 in-lbs.
21. Lubricate new O-ring with hydraulic oil and install inside piston (seals rod to piston).
22. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install on head. Using a seal driver, install new wiper seal in head. Lubricate wiper seal with hydraulic oil.
23. Slide head (Item 12) and piston (Item 10) onto rod (Item 13). Lubricate threads on rod with hydraulic oil and install rod nut (Item 9). Torque rod nut to 850 ft-lbs.
24. Lubricate new seal and wear rings with hydraulic oil and install on piston.
25. Lubricate threads on eight (8) capscrews (Item 11) with hydraulic oil. Coat inside of barrel (Item 5) with hydraulic oil. To avoid damaging seals during assembly, carefully insert rod and head into barrel. Install capscrews until snug. Do not torque capscrews (instructions follow).
26. Following sequence shown in Fig. 6-10, torque capscrews to an initial value of 30 ft-lbs. Follow sequence again and torque capscrews to a final value of 90 ft-lbs.

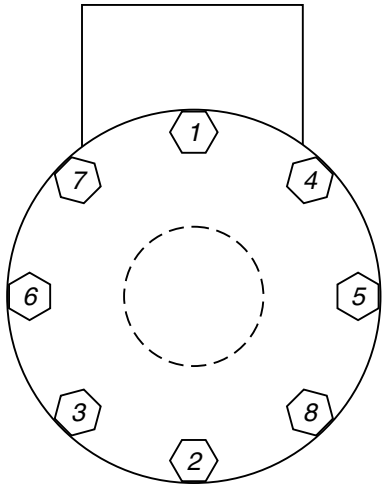


Fig. 6-10: Head Capscrew Torque Sequence

27. Install two (2) elbows (Item 1) on cylinder manifold. Torque elbow nuts to 58–63 ft-lbs.
28. Lubricate grease fittings with EP lithium based grease.

Front Carriage Tilt Cylinder

Description

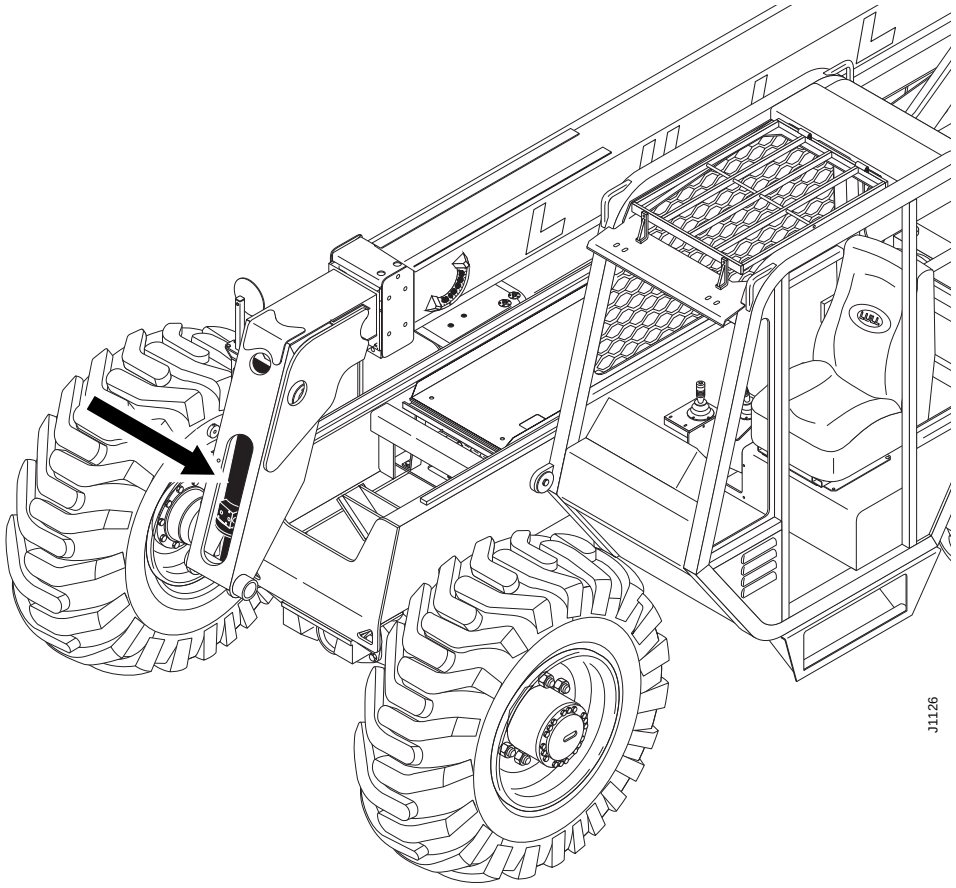
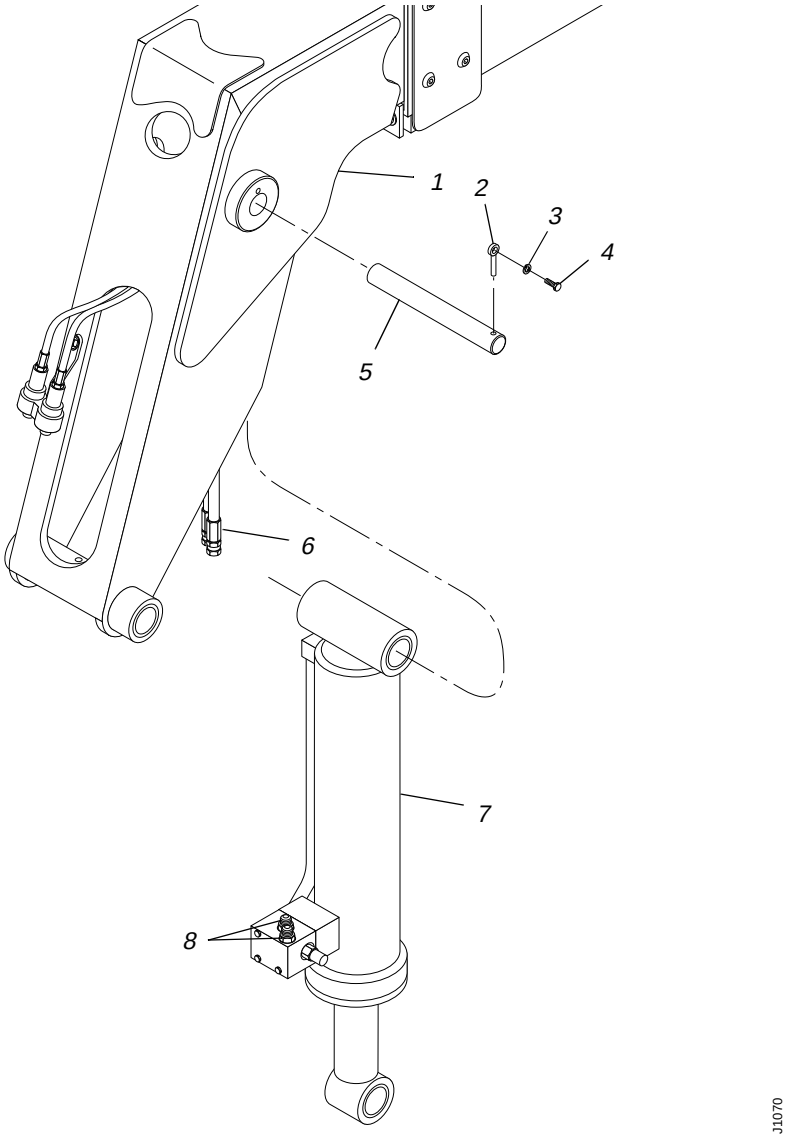


Fig. 6-11: Front Carriage Tilt Cylinder

The front carriage tilt cylinder is located inside the inner boom section at the front of the machine connecting to the inner boom and to the quick attach assembly. It controls attachment tilt when the appropriate joystick handle is activated. Maximum operating pressure is at approximately 3175 psi. Daily lubrication of the two grease fittings is required.

Removal

Front Carriage Tilt Cylinder



#	Description
1	Inner Boom Section Pin Boss
2	Lock Pin
3	Lockwasher
4	Capscrew

#	Description
5	Upper Pivot Pin
6	Hydraulic Hose
7	Front Carriage Tilt Cylinder
8	O-ring Connector

Fig. 6-12: Front Carriage Tilt Cylinder Installation

(Ref. Fig. 6-12) The following steps are required to remove the front carriage tilt cylinder.

1. Remove quick attach assembly. See page 6-58
2. Tag and disconnect two (2) hydraulic hoses (Item 6) from connectors (Item 8). Cap fittings and hoses.
3. Support cylinder (Item 7) with sling(s) and crane, or other suitable means. Make sure equipment has sufficient capacity to support weight of cylinder; the cylinder weighs approximately 200 pounds.

WARNING: To avoid personal and/or equipment damage, support the hydraulic cylinder before removing pins. Use suitable blocking and lifting devices when removing heavy machine components.

4. Remove capscrew (Item 4), lockwasher (Item 3), and lock pin (Item 2) from upper pivot pin (Item 5) of front carriage tilt cylinder. Remove pivot pin.
5. Carefully remove cylinder from boom nose (Item 1).
6. Clean with solvent and dry with compressed air. Inspect all components for condition and wear. Replace as necessary.

Installation

Front Carriage Tilt Cylinder

(Ref. Fig. 6-12) The following steps are required to install the front carriage tilt cylinder.

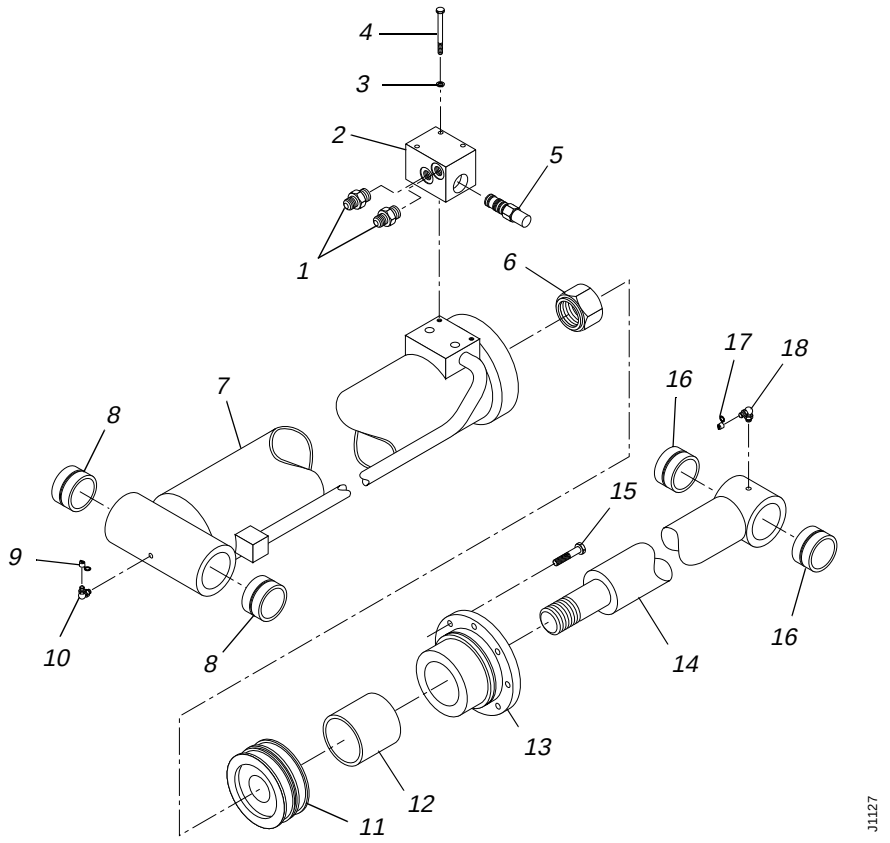
1. Using sling(s), crane, or other suitable means, position cylinder in boom nose. Align cylinder with pin bosses in boom and install pivot pin. Secure pin with lock pin, lockwasher, and capscrew. Torque capscrew to 55 ft-lbs.

Note: *Be sure to apply thread locking compound to the threads of the capscrew before installing it.*

2. Attach two (2) hoses to cylinder. Tighten swivel nuts on hoses (Item 6) to 50–58 ft-lbs.
3. Lubricate grease fitting at each end of the cylinder with EP lithium based grease.

Overhaul

Front Carriage Tilt Cylinder



#	Description	#	Description
1	O-ring Connector	10	Grease Fitting
2	Manifold Block	11	Piston
3	Lockwasher	12	Stroke Limiter
4	Capscrew	13	Rod Bearing Head
5	Counterbalance Valve Cartridge	14	Cylinder Rod
6	Rod Nut	15	Capscrew
7	Cylinder Barrel	16	Bushing
8	Bushing	17	Grease Fitting Cover
9	Grease Fitting Cover	18	Grease Fitting

Fig. 6-13: Front Carriage Tilt Cylinder Assembly

(Ref. Fig. 6-13) The following steps are required to overhaul the front carriage 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. Release oil pressure in the cylinder as follows:

WARNING: The counterbalance valve cartridge traps 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.

a. Place socket wrench over counterbalance valve cartridge (Item 5). Wrap a clean shop rag around the socket to cover the area of the counterbalance valve cartridge.

b. Carefully and slowly, turn cartridge out of manifold block (Item 2) to release pressure in cylinder.

3. Remove the counterbalance valve cartridge.

Note: *Some Models — 644B-37 (S/N 354–), 644B-42 (S/N 116–), 6K-37 (S/N 205–), 6K-42 (S/N 102–), 844C-42 (S/N 264–), 8K-42 (S/N 161–), 1044C-42 (S/N 105–), 1044C-54 (S/N 107–), 10K-42 (S/N 107–), and 10K-54 (S/N 101–) — do not have a separate manifold blocks (Item 2) attached to the cylinder barrel (Item 7). The counterbalance valve cartridge (Item 5) will need to be removed from the cylinder barrel manifold block.*

4. Slowly extend and retract cylinder by hand to remove most of the hydraulic oil.

5. Remove eight (8) capscrews (Item 15) securing rod bearing head (Item 13) to barrel.

6. Remove cylinder rod (Item 14) from cylinder barrel (Item 7).

CAUTION: To prevent possible damage to components, support rod and head; do not wiggle rod or head back and forth during removal.

7. Remove rod nut (Item 6), piston (Item 11), stroke limiter (Item 12), and rod bearing head from cylinder rod.

8. Remove the two (2) connectors (Item 1) from the cylinder manifold block (Item 2).

9. If so equipped, remove three (3) each capscrews (Item 4) and lockwashers (Item 3) securing cylinder manifold block to cylinder barrel (Item 7). Remove manifold block.

10. Inspect bushings for damage. The following steps are necessary if bushing(s) need to be replaced:

a. Remove bushing (Item 8) from cylinder barrel and/or remove bushing (Item 16) from cylinder rod using a bushing driver and hammer or press. Drive one bushing all the way through to remove other bushing.

b. Install new bushings so they are flush with outer edge boss to 0.02" below.

c. To ensure proper lubrication, make sure an adequate amount of grease is applied to the grease fitting(s) after cylinder is reinstalled on machine.

11. Remove all O-rings, wear rings, and backup rings from cylinder components and discard.

12. Thoroughly clean components with solvent and dry with compressed air.

13. Inspect inner surface of barrel, outer surface of piston, and length of rod for scratches and scoring. If barrel, piston, or rod is damaged, it must be replaced.
14. Check condition of threads on rod, nut, and capscrews. Do not attempt to repair damaged threads.
15. Inspect counterbalance valve cartridge (Item 5), including O-rings, for condition and replace as necessary. Do not disassemble the cartridge. Service to counterbalance valve cartridges is limited to installing new O-rings and replacing the entire cartridge.
16. Lubricate counterbalance valve cartridge O-rings with clean hydraulic oil.
17. Install cartridge in manifold block and torque to 30–35 ft-lbs.
18. Lubricate new O-ring with hydraulic oil and install inside piston (seals rod to piston).
19. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install on head. Using a seal driver, install new wiper seal in head. Lubricate wiper seal with hydraulic oil.
20. Slide head (Item 13), stroke limiter (Item 12), and piston (Item 11) onto rod (Item 14). Lubricate threads on rod with hydraulic oil and install rod nut (Item 6). Torque rod nut to 850 ft-lbs.
21. Lubricate new seal and wear rings with hydraulic oil and install on piston.
22. Lubricate threads on eight (8) capscrews (Item 15) with hydraulic oil. Coat inside of barrel (Item 7) with hydraulic oil. To avoid damaging seals during assembly, carefully insert rod and head into barrel. Install capscrews until snug. Do not torque capscrews (instructions follow).
23. Following sequence shown in Fig. 6-10, torque capscrews to an initial value of 30 ft-lbs. Follow sequence again and torque capscrews to a final value of 90 ft-lbs.
24. If so equipped, install cylinder manifold block (Item 2) on cylinder barrel with three (3) each lockwashers (Item 3) and capscrews (Item 4). Tighten capscrews to 156 in-lbs.
25. Install two (2) connectors (Item 1) on cylinder manifold. Torque connectors to 85–95 ft-lbs.
26. If necessary, remove grease fitting covers (Items 9 and 17) and grease fittings (Items 10 and 18) from cylinder. Inspect and replace if damaged. Install and tighten fittings 1.5 to 3 turns past finger tight.
27. Lubricate grease fittings with EP lithium based grease.

Rear Carriage Tilt Cylinder

Description

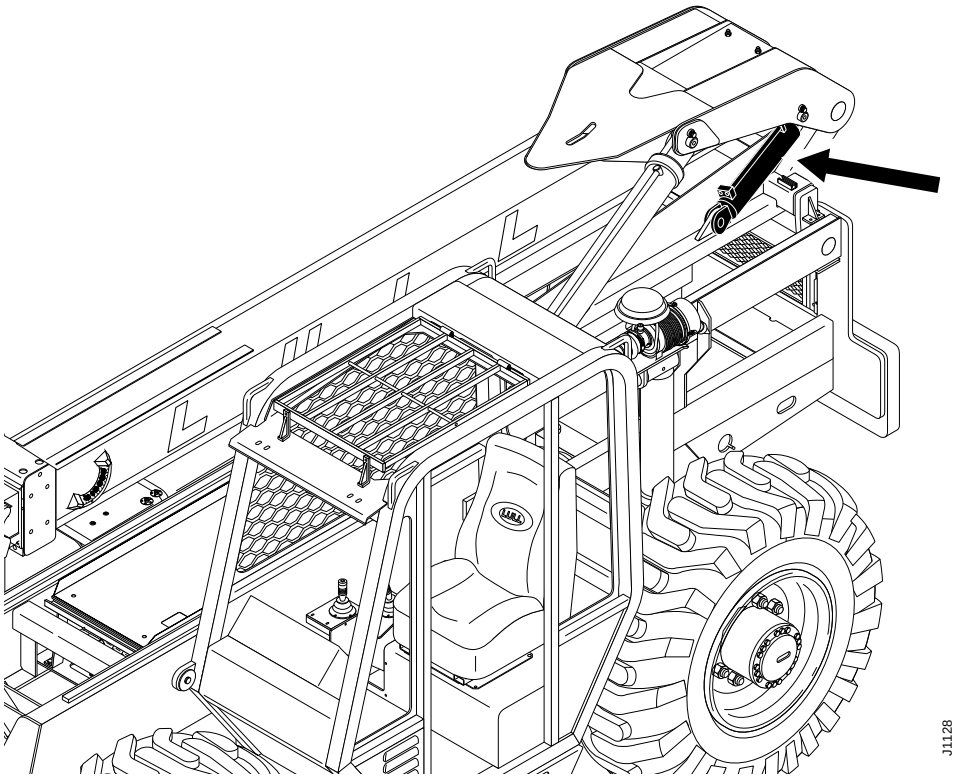
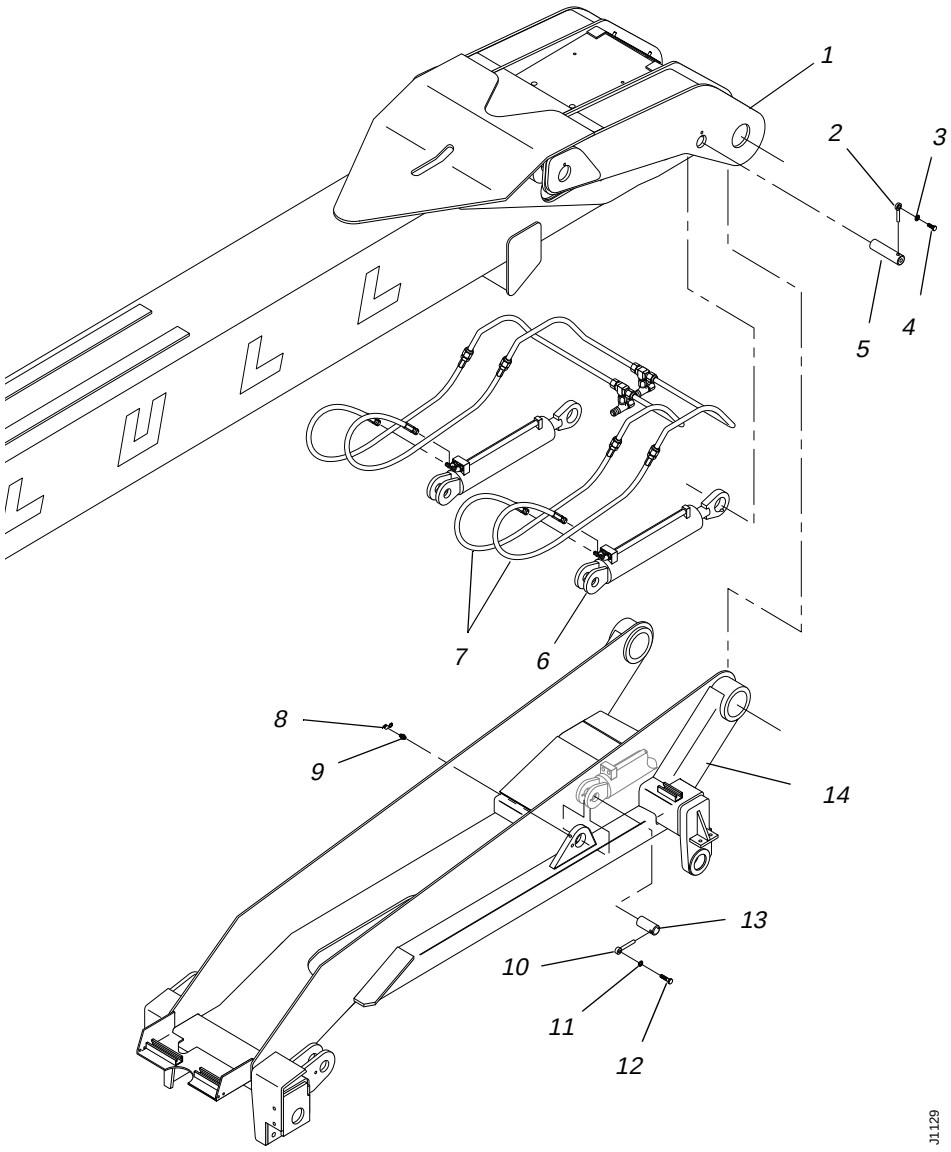


Fig. 6-14: Rear Carriage Tilt Cylinder

Two rear carriage tilt cylinders are located at the rear of the outer boom section, one on each side. These cylinders maintain the attachment tilt position as the boom is raised and lowered. As boom elevation changes, a specific amount of oil in the cylinders moves to the front carriage tilt cylinder, automatically adjusting the attachment tilt.

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. 6-15: Rear Carriage Tilt Cylinder Installation

(Ref. Fig. 6-15) 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.

3. Tag and disconnect two (2) hydraulic hoses (Item 7) from elbows on both cylinders (Item 6). Cap fittings and hoses.
4. Support each cylinder with sling(s) and crane, or other suitable means. Make sure equipment has sufficient capacity to support weight of cylinder.

WARNING: To avoid personal and/or equipment damage, support hydraulic cylinders before removing pins. Use suitable blocking and lifting devices when removing heavy machine components.

5. Loosen and remove capscrew (Item 4) and lockwasher (Item 3) from rod end lock pin (Item 2).
6. Remove lock pin from rod end cylinder pivot pin (Item 5).
7. Remove rod end cylinder pin from outer boom (Item 1).
8. Slowly lower supported cylinder until it rests on main frame.
9. Loosen and remove capscrew (Item 12) and lockwasher (Item 11) from base end lock pin (Item 10).
10. Remove lock pin from base end cylinder pivot pin (Item 13).
11. Remove base end cylinder pin from transfer carriage/boom cradle (Item 14).
12. Slowly remove the cylinder from the machine and take it to a location suitable for inspection and disassembly.

Installation

Rear Carriage Tilt Cylinder

(Ref. Fig. 6-15) The following steps are required to install rear carriage tilt cylinders.

1. Using sling(s), crane, or other suitable means, position base end of cylinder (Item 6) in its proper location on the transfer carriage/boom cradle (Item 14).

WARNING: To avoid personal and/or equipment damage, make sure each cylinder is properly supported until it is completely installed.

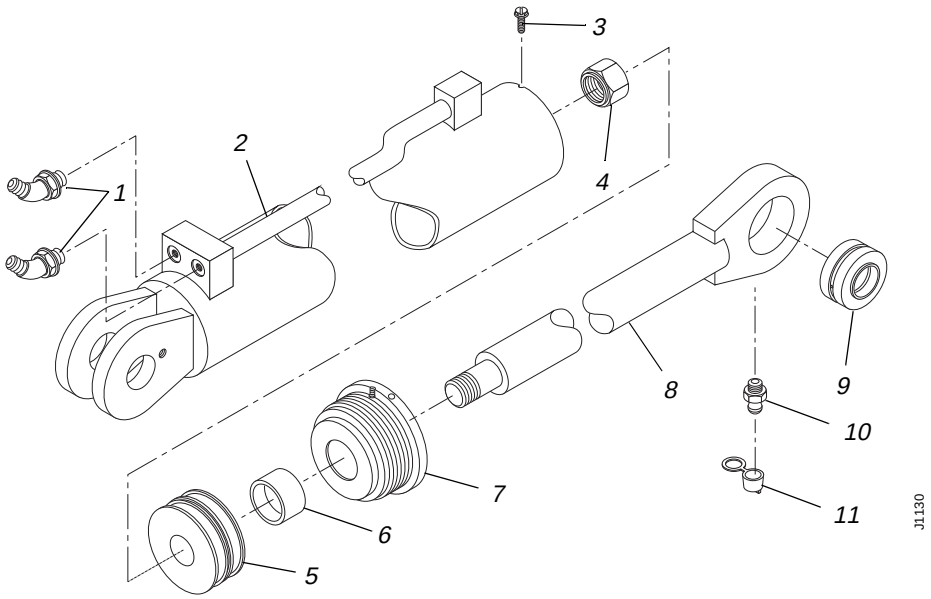
Note: *Be sure to apply thread locking compound to the threads of the capscrews before installing them.*

2. Align cylinder with pin bosses in transfer carriage/boom cradle and install pivot pin (Item 13). Secure pivot pin with lock pin (Item 10), lockwasher (Item 11), and capscrew (Item 12). Torque capscrew to 55 ft-lbs.
3. Place rod end of cylinder in its proper location and insert rod end pivot pin (Item 5) to secure the cylinder to the outer boom (Item 1).
4. Secure pivot pin with lock pin (Item 2), lockwasher (Item 3), and capscrew (Item 4). Torque capscrew to 55 ft-lbs.

5. Clean hydraulic hose ends with solvent. Attach two (2) hoses (Item 7) to elbows on each cylinder. Torque hose swivel nuts to 44–48 ft-lbs.
6. If necessary, remove grease fitting cover(s) (Item 8) and grease fitting(s) (Item 9). Clean and inspect for damage; replace if necessary. Install grease fitting(s) and covers; torque fitting(s) 1.5 to 3 turns past finger tight.
7. Lubricate grease fittings with EP lithium based grease.

Overhaul

Rear Carriage Tilt Cylinder



#	Description
1	45° O-ring Elbow
2	Cylinder Barrel
3	Setscrew
4	Rod Nut
5	Piston
6	Stroke Limiter

#	Description
7	Rod Bearing Head
8	Rod
9	Self-Aligned Bushing
10	Grease Fitting
11	Grease Fitting Cover

Fig. 6-16: Rear Carriage Tilt Cylinder Assembly

(Ref. Fig. 6-16) The following steps are required to overhaul the rear carriage tilt cylinder.

1. Lay cylinder horizontally in a vice or hold it down with a strap wrench. Hydraulic oil in cylinder will drain out during disassembly. Place a suitable pan or tray under the cylinder.
2. Remove the two (2) elbows (Item 1) from the manifold block on the cylinder barrel (Item 2).
3. For 10K and 1044C models, remove the setscrew (Item 3).
4. Install a spanner wrench in the two (2) holes in the end of the rod bearing head (Item 7). Unscrew the rod bearing head.

Note: *10K and 1044C models have three (3) holes in the side of the rod bearing head.*

5. Remove the cylinder rod assembly from cylinder barrel.

CAUTION: To prevent possible damage to components, support cylinder rod assembly; do not wiggle rod or head back and forth during removal.

6. Remove rod nut (Item 4), piston (Item 5), stroke limiter (Item 6), and rod bearing head from rod (Item 8).

   Note: *Some models do not have a stroke limiter (Item 6) This applies to the following models:*

   6K-37 (S/N 101–229) *6K-42 (S/N 101–109)*
   644B-37 (S/N 101–434) *644B-42 (S/N 101–130)*
   8K-42 (S/N 101–180) *844C-42 (S/N 101–319)*
   All 10K-42, 10K-54, 1044C-42, and 1044C-54 models

7. Inspect bushings for damage. The following steps are necessary if bushing(s) need to be replaced:
   a. Remove bushing (Item 9) from cylinder rod using a bushing driver and hammer or press.
   b. Install new bushing so that it is centered in rod end opening.
   c. To ensure proper lubrication, make sure an adequate amount of grease is applied to the grease fitting after cylinder is reinstalled on machine.
8. If necessary, remove grease fitting cover (Item 11) and grease fitting (Item 10) from cylinder. Inspect and replace if damaged. Install and tighten fitting 1.5 to 3 turns past finger tight.
9. Remove all O-rings, wear rings, and backup rings from cylinder components and discard.
10. Thoroughly clean components with solvent and dry with compressed air.
11. Inspect inner surface of barrel, outer surface of piston, and length of rod for scratches and scoring. If barrel, piston, or rod is damaged, it must be replaced.
12. Check condition of threads on rod and rod nut. Do not attempt to repair damaged threads.
13. Lubricate new O-ring with hydraulic oil and install inside piston (seals rod to piston).
14. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install on rod bearing head. Using a seal driver, install new wiper seal in head. Lubricate wiper seal with hydraulic oil.
15. Slide rod bearing head (Item 7), stroke limiter (Item 6) (see note after Step 6), and piston (Item 5) onto rod (Item 8). Lubricate threads on rod with hydraulic oil and install rod nut (Item 4). Torque rod nut as follows:

644B-37 (S/N 101–434), 644B-42 (S/N 101–130), 6K-37 (S/N 101–229), 6K-42 (S/N 101–109), 844C-42 (S/N 101–319), and 8K-42 (S/N 101–180) 745 ft-lbs.

644B-37 (S/N 435–), 644B-42 (S/N 131–), 6K-37 (S/N 230–), 6K-42 (S/N 110–), 844C-42 (S/N 320–), and 8K-42 (S/N 181–) 1508 ft-lbs.

1044C -42 (S/N 101–), 1044C-54 (S/N 101–), 10K-42 (S/N 101–), and 10K-54 (S/N 101–) 550 ft-lbs.

16. Lubricate new seal and wear rings with hydraulic oil and install on piston.
17. Coat inside of cylinder barrel (Item 2) with hydraulic oil. To avoid damaging seals during assembly, carefully insert cylinder rod assembly into cylinder barrel.
18. Install cylinder rod assembly in cylinder barrel. Install a spanner wrench in two (2) holes of rod bearing head and tighten until it is snug against the cylinder barrel.
19. Install two (2) elbows (Item 1) on cylinder manifold. Torque connectors to 40−44 ft-lbs.
20. Lubricate grease fittings with EP lithium based grease.

Boom Hydraulic Control Valve (Control Manifold System)

Description

644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
844C-42 (S/N 101–621)
8K-42 (S/N 101–220)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)

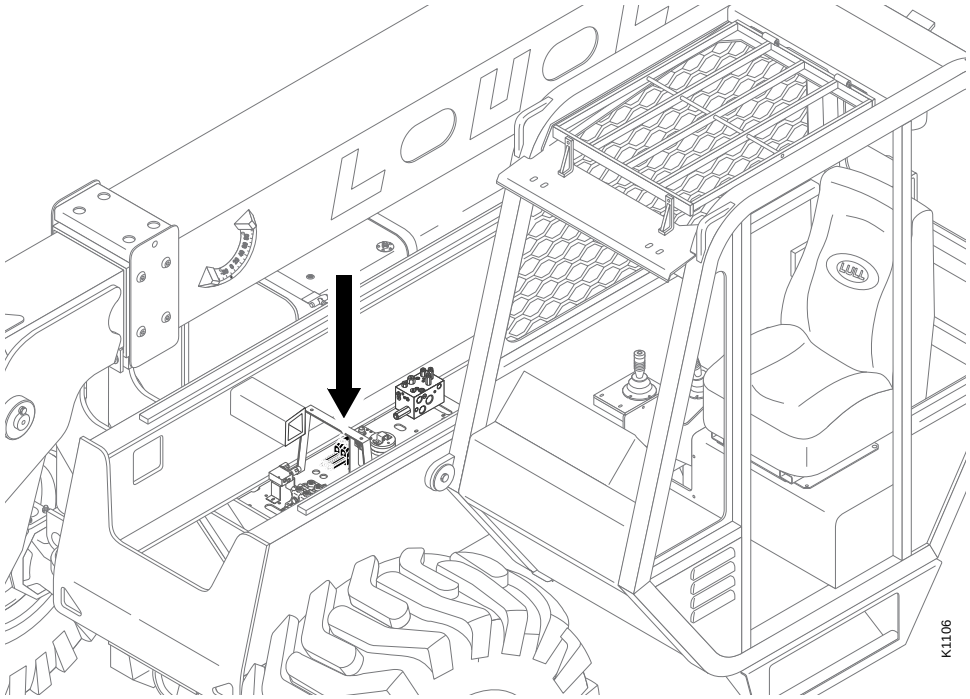


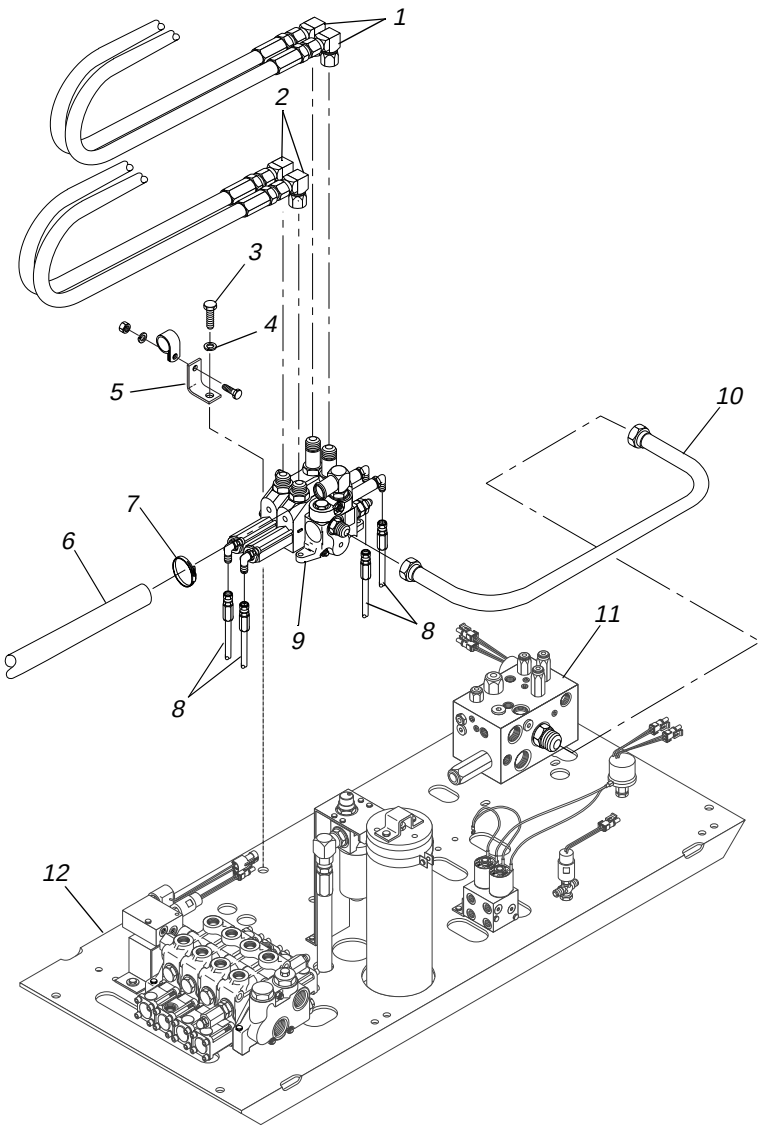
Fig. 6-17: Boom Hydraulic Control Valve

The boom hydraulic control valve is located near the middle of the machine on the valve plate. It controls fluid flow to the boom hoist and telescope cylinders when operating the hoist/telescope joystick control.

Removal

Boom Hydraulic Control Valve (Control Manifold System)

644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
844C-42 (S/N 101–621)
8K-42 (S/N 101–220)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)



#	Description
1	Hydraulic Hoses (Upper)
2	Hydraulic Hoses (Lower)
3	Hex Head Capscrew
4	Lockwasher
5	Mounting Bracket
6	Hydraulic Return Hose

#	Description
7	Hose Clamp
8	Hydraulic Hoses
9	Boom Hydraulic Control Valve
10	Hydraulic Tube
11	Hydraulic Control Manifold
12	Valve Plate

Fig. 6-18: Boom Hydraulic Control Valve Installation

(Ref. Fig. 6-18) The following procedures describes disassembly for the boom hydraulic control valve.

1. Follow preparation procedures as outlined in Section 3.
2. Install a 0–600 psi gauge into the brake diagnostic test port marked “BRAKES” located behind the cab step.
3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge and cap diagnostic port.
4. For models 644B, 844C, and 1044C, remove roll-back hose tray.
5. Thoroughly clean boom hydraulic control valve (Item 9).
6. Tag and ***slowly*** loosen the two upper hydraulic hose swivel elbows (Item 1) from the long connectors. Bleed any remaining oil into a suitable container.
7. Tag and ***slowly*** loosen the two lower hydraulic hose swivel elbows (Item 2) from the short connectors. Bleed any remaining oil into a suitable container.
8. Loosen the hose clamp (Item 7) securing the hydraulic return hose (Item 6) to the elbow on the boom control valve. Disconnect the hydraulic return hose.
9. Tag and ***slowly*** loosen both ends of the hydraulic tube (Item 10) Bleed any remaining oil into a suitable container. Disconnect the tube from both connectors — the one that is attached to the boom control valve and the one on the hydraulic control manifold block (Item 11). Remove the hydraulic tube.
10. Tag and ***slowly*** loosen the four (4) hydraulic hoses (Item 8) connected to the elbows on each end of the boom control valve. Disconnect hoses and bleed any remaining oil into a suitable container. Cap all hoses and fittings.

Note: *Models 644B and 6K with naturally aspirated engines have a pump unloader assembly that uses one (1) elbow and three (3) tees instead of four elbows. For these models, it will be necessary to disconnect seven (7) hydraulic hoses.*

11. Remove the four (4) each capscrews (Item 3) and lockwashers(Item 4) securing the boom control valve to the valve plate (Item 12).
12. Remove the boom hydraulic control valve to a suitable area for further disassembly and overhauling.

Installation

Boom Hydraulic Control Valve (Control Manifold System)

644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
844C-42 (S/N 101–621)
8K-42 (S/N 101–220)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)

(Ref. Fig. 6-18) The following procedures describes installation of the boom control valve.

1. Install boom control valve (Item 9) on valve plate (Item 12) with four (4) each hex head capscrews (Item 3) and lockwashers (Item 4). Make sure that the last capscrew installed secures the mounting bracket (Item 5) to the boom control valve. Tighten capscrews to 55 ft-lbs.
2. Clean hydraulic hose and tube ends with solvent and dry with compressed air.
3. Reconnect the hydraulic hoses (Item 8) to the elbows/tees on both ends of the boom control valve. Torque to 235–265 in-lbs.
4. Reconnect the hydraulic tube (Item 10) to the two (2) connectors on the boom control valve (Item 9) and control manifold block (Item 11). Torque to 117–125 ft-lbs.
5. Reconnect the hydraulic return hose (Item 6) to the elbow on the boom control valve with the hose clamp (Item 7). Tighten until snug.
6. Reconnect the two (2) lower hydraulic hose swivel elbows (Item 2) to the short connectors on the top of the boom control valve. Torque swivel nuts on elbows to 79–88 ft-lbs.
7. Reconnect the two (2) upper hydraulic hose swivel elbows (Item 1) to the long connectors on the top of the boom control valve. Torque swivel nuts on elbows to 79–88 ft-lbs.

Overhaul

Boom Hydraulic Control Valve (Control Manifold System)

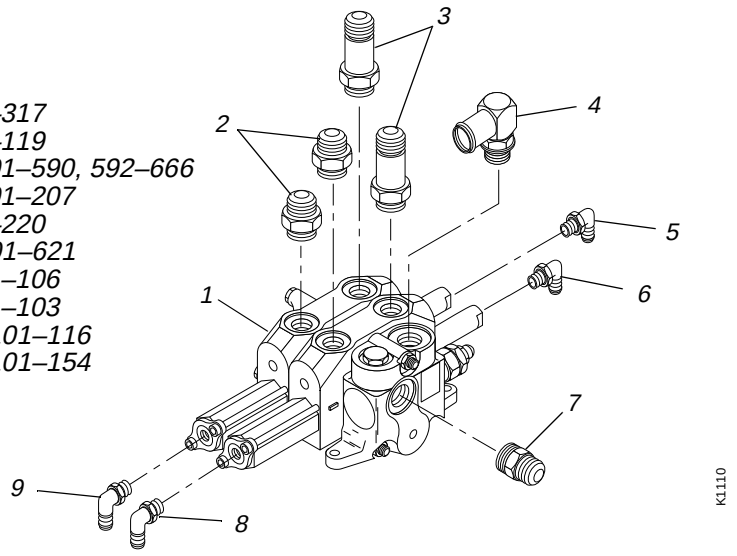
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
844C-42 (S/N 101–621)
8K-42 (S/N 101–220)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)

The following overhaul procedure for the boom hydraulic control valve assembly is broken down into the following areas:

- Fitting removal
- Boom control valve disassembly
- General overhaul
- Boom control valve reassembly
- Relief valve assembly
- Fitting installation

Fitting Removal

6K-37 – S/N 101–317
6K-42 – S/N 101–119
644B-37 – S/N 101–590, 592–666
644B-42 – S/N 101–207
8K-42 – S/N 101–220
844C-42 – S/N 101–621
10K-42 – S/N 101–106
10K-54 – S/N 101–103
1044C-42 – S/N 101–116
1044C-54 – S/N 101–154



#	Description
1	Boom Control Valve Assembly
2	Connector
3	Long Connector
4	Elbow (Hydraulic Return Hose)
5	Elbow*

#	Description
6	Elbow*
7	Connector (Hydraulic Tube)
8	Elbow*
9	Elbow

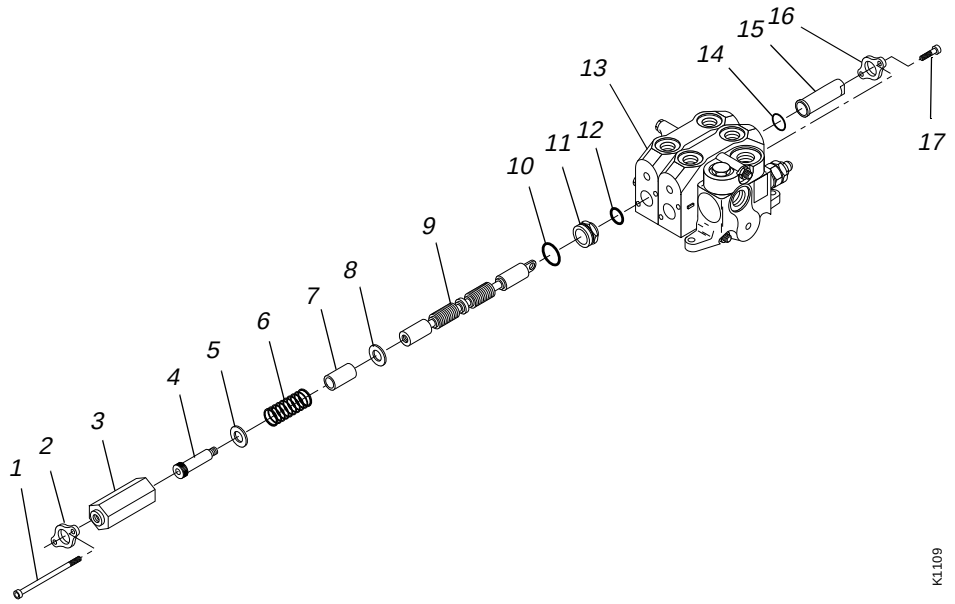
** This fitting is a tee on models with a pump unloader valve.*

Fig. 6-19: Boom Control Valve Fittings

(Ref. Fig. 6-19) The following procedure describes removal of fittings on the boom control valve.

1. Remove the four (4) elbows/tees (Items 5, 6, 8, and 9) from the boom control valve assembly (Item 1).
2. Remove the hydraulic return hose elbow (Item 4).
3. Remove the two (2) short connectors (Item 2) and two long connectors (Item 3) on the top of the boom control valve.
4. Remove the hydraulic tube connector (Item 7) on the side of the boom control valve.
5. Clean all fittings with solvent and dry with compressed air. Inspect fittings, including O-rings, for damage and replace if necessary.

Boom Control Valve Disassembly



#	Description
1	Socket Head Capscrew
2	Retainer
3	Spool Cap
4	Socket Head Shoulder Capscrew
5	Flatwasher
6	Spring
7	Spacer
8	Flatwasher
9	Spool

#	Description
10	O-ring
11	Spool Retainer
12	O-ring
13	Spool Housing
14	O-ring
15	Spool Cap
16	Retainer
17	Socket Head Capscrew

Fig. 6-20: Control Valve Components

(Ref. Fig. 6-20) The following procedure describes disassembly of the control valve. All steps will need to be completed for both valves.

1. Loosen the two (2) socket head capscrews (Item 1). Remove the capscrews and retainer (Item 2).
2. Remove the spool assembly (Items 3 thru 12) from the spool housing (Item 13).
3. Unscrew the spool cap (Item 3) from the spool retainer (Item 11). Remove cap and retainer from the spool subassembly (Items 4 thru 9).

Note: *Further disassembly of the spool subassembly (Items 4 thru 9) may not necessary for cleaning purposes. Disassemble this subassembly only if parts are damaged or there is excessive contamination.*

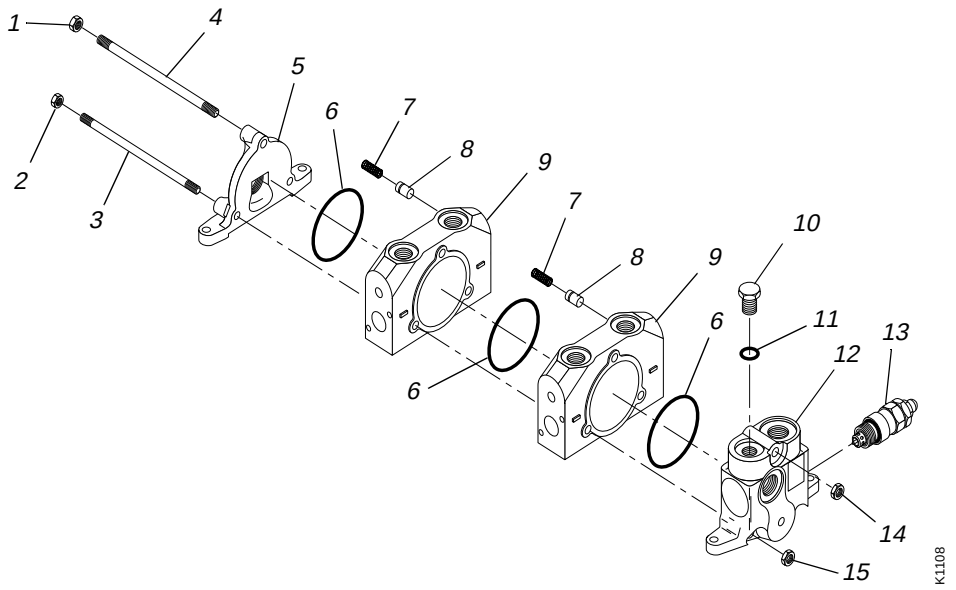
4. Loosen and remove the two (2) socket head capscrews (Item 17).
5. Remove retainer (Item 16) and spool cap (Item 15) including O-ring (Item 14).

6. Remove the two (2) O-rings (Items 10 and 12) from the spool retainer (Item 11) and the O-ring (Item 14) from the spool cap (Item 15). Discard all O-rings.
7. Clean all removed parts with solvent and dry with compressed air. Inspect for damage and replace if necessary.

Note: *The spool (Item 9) and the spool housing (Item 13) cannot be purchased separately. If they are damaged, purchase of an entire valve section is necessary.*

8. Lubricate and install new O-ring (Item 14) on spool cap (Item 15).
9. Install new O-rings (Items 10 and 12) on the spool retainer (Item 11). Lubricate each O-ring before installing it.
10. Install the spool retainer (Item 11) on the spool subassembly (Items 4 thru 9).
11. Screw the spool cap (Item 3) into the spool retainer. Torque spool cap to 154–166 ft-lbs.
12. Set aside this assembly and continue with “General Overhaul” .

General Overhaul



#	Description
1	Hex Nut
2	Hex Nut
3	Tie Rod
4	Tie Rod
5	Outlet Section Housing
6	O-ring
7	Spring
8	Poppet

#	Description
9	Spool Housing
10	Plug
11	O-ring
12	Inlet Section Housing
13	Relief Valve Assembly
14	Hex Nut
15	Hex Nut

Fig. 6-21: Boom Hydraulic Control Valve Assembly

(Ref. Fig. 6-21) The following procedure describes disassembly and overhaul of the boom hydraulic control valve assembly.

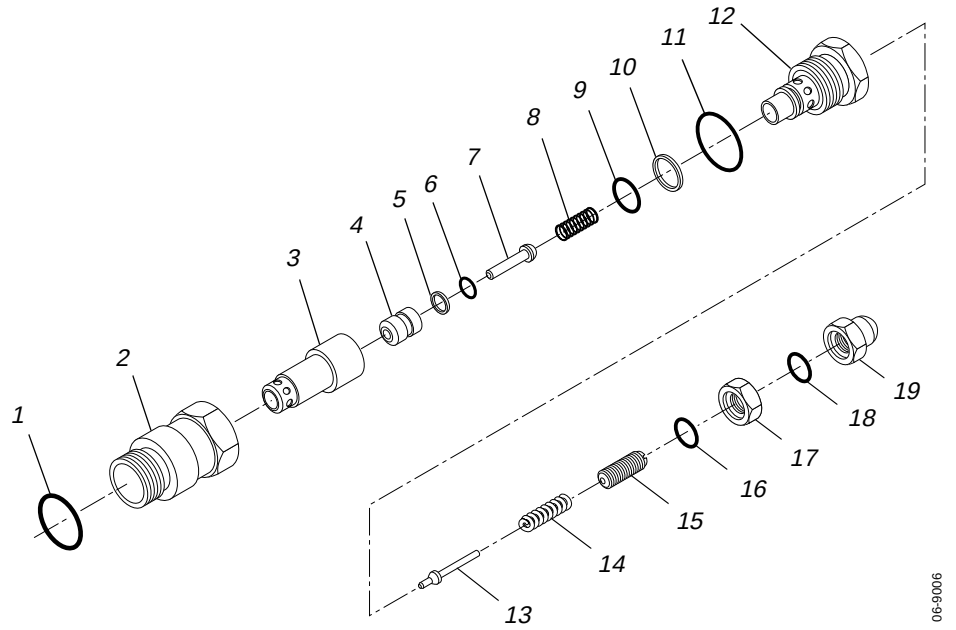
1. Loosen and remove three (3) hex nuts (Items 14 and 15).
2. Remove three (3) tie rods (Items 3 and 4) with remaining three (3) hex nuts (Items 1 and 2).
3. Separate the four (4) sections — outlet housing (Item 5), two (2) spool housings (Item 9) and inlet housing (Item 12).
4. Remove the two (2) each springs (Item 7) and poppets (Item 8).
5. Remove the three (3) O-rings (Item 6) between sections and discard.
6. Remove the plug (Item 10) and O-ring (Item 11) from the inlet section housing (Item 12). Discard the O-ring.
7. Remove the relief valve assembly (Item 13) and set aside for further disassembly.
8. Clean all remaining parts with solvent and dry with compressed air. Inspect and replace any damaged parts.
9. Lubricate new O-ring (Item 11) and install it on plug (Item 10) Install plug on inlet section housing (Item 12). Torque plug to 85–95 ft-lbs.
10. Lubricate three (3) new O-rings (Item 6) and install them on the two (2) spool housings (Item 9) and inlet section housing (Item 12).
11. Install three (3) tie rods (Items 3 and 4) with hex nuts (Items 1 and 2) in the outlet section housing.
12. Install spring (Item 7) and poppet (Item 8) in each spool housing before installing them on the tie rods.
13. Install inlet section housing (Item 12) on tie rods.
14. Install the remaining three (3) hex nuts (Items 14 and 15) onto the ends of the tie rods. Torque smaller two nuts (Item 15) to 48 ft-lbs and the larger nut (Item 14) to 74 ft-lbs.

Boom Control Valve Reassembly

(Ref. Fig. 6-20) The following procedure describes reassembly of the boom control valve. All steps will need to be completed for both valves.

1. Install the spool cap (Item 15), retainer (Item 16), and the two (2) socket head capscrews (Item 17) onto the spool housing (Item 13). For final tightening of the capscrews, torque to 50 in-lbs.
2. Install the spool assembly (Items 3 thru 12) into the spool housing (Item 13).
3. Install the retainer (Item 2) and two (2) socket head capscrews (Item 1) onto the spool housing. For final tightening of the capscrews, torque to 50 in-lbs.
4. Disassemble relief valve assembly as described below.

Relief Valve Assembly



#	Description
1	O-ring
2	Valve Body
3	Poppet
4	Poppet
5	Backup Ring
6	O-ring
7	Piston
8	Spring
9	O-ring
10	Backup Ring

#	Description
11	O-ring
12	Plug
13	Poppet
14	Spring
15	Adjusting Screw
16	O-ring
17	Hex Nut
18	O-ring
19	Rounded End Nut

Fig. 6-22: Relief Valve Assembly

(Ref. Fig. 6-22) The following steps are required to overhaul the relief valve assembly.

1. Loosen and remove the rounded end nut (Item 19) with O-ring (Item 18) from the adjusting screw (Item 15).
2. Loosen and remove the hex nut (Item 17) with O-ring (Item 16) from the adjusting screw (Item 15).
3. Loosen and remove the plug assembly (Items 8 thru 12) from the valve body assembly (Items 1 thru 7).
4. Remove spring (Item 8) from plug (Item 12).
5. Remove the adjusting screw (Item 15), spring (Item 14), and poppet (Item 13) from plug.

Note: *Record the number of turns that the adjusting screw was turned out.*

6. Remove the poppet assembly (Items 3 thru 7) from the valve body (Item 2).

7. Remove piston (Item 7) and poppet (Item 4) from poppet (Item 3).
8. Remove O-ring (Item 1) from valve body (Item 2), the backup ring (Item 5) and O-ring (Item 6) from the poppet (Item 4), and the two O-rings (Items 9 and 11) and backup ring (Item 10) from the plug (Item 12).
9. Discard all O-rings, backup rings, and springs.
10. Clean all remaining parts with solvent and dry with compressed air. Inspect and replace any damaged parts.

Note: *Only two poppets (Items 4 and 13) and the two nuts (Items 17 and 19) can be purchased individually. Damage to the other parts (Items 2, 3, 7, 12, and 15) will require replacement of the entire relief valve assembly.*

11. Obtain new O-rings, backup rings, and springs from seal and spring kit. Lubricate each O-ring before installing it.
12. Install large O-ring (Item 11) on plug (Item 12) near the hex head. Install the backup ring (Item 10) and O-ring (Item 9) on the end of the plug in order shown in Fig. 6-22.
13. Install spring (Item 8) into plug (Item 12).
14. Insert the poppet (Item 13), spring (Item 14), and adjusting screw (Item 15) into the end of the plug (Item 12).

Note: *Refer to notes made during disassemble and tighten the adjusting screw the same number of turns as when removed.*

15. Install backup ring (Item 5) and O-ring (Item 6) on poppet (Item 4) in order shown in Fig. 6-22.
16. Installed poppet (Item 4) and piston (Item 7) into poppet (Item 3) and install this assembly into the valve body (Item 2).
17. Reconnect the valve body (Item 2) to the plug (Item 12). Torque the plug to 43–53 ft-lbs.
18. Install O-ring (Item 1) on valve body (Item 2).
19. Insert O-ring (Item 16) into the hex nut (Item 17) and install it on the adjusting screw. Torque to 205–235 in-lbs while making sure that adjusting screw position does not change.
20. Insert the O-ring (Item 18) into the rounded end nut (Item 19) and install it on the adjusting screw. Torque to 205–235 in-lbs.
21. Install the assembled relief valve (Fig. 6-21, Item 13) on the inlet section housing (Fig. 6-21, Item 12). Torque valve body (Item 2) to 33 ft-lbs.
22. Perform a pressure test of the relief valve

Fitting Installation and Pressure Check

(Ref. Fig. 6-19) The following steps are required to install fittings on the boom control valve.

1. Install the four (4) elbows/tees (Items 5, 6, 8, and 9) on the ends of the valves sections in the control valve assembly (Item 1), making sure that they are positioned vertically so that the hydraulic hoses can be easily reconnected through the holes in the valve plate. Torque to 25–29 ft-lbs.
2. Install the hydraulic return elbow (Item 4) and torque to109–121 ft-lbs.
3. Install the short connector (Item 2) and long connector (Item 3) into the top of the control valves and torque the connectors to 105–115 ft-lbs.
4. Install the hydraulic tube connector (Item 7) into the side of the inlet section housing of the control valve assembly (Item 1) and torque to 154-166 ft-lbs.
5. Perform a pressure test of the relief valve.

Selector Valve (Control Manifold System)

Description

644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
844C-42 (S/N 101–621)
8K-42 (S/N 101–220)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)

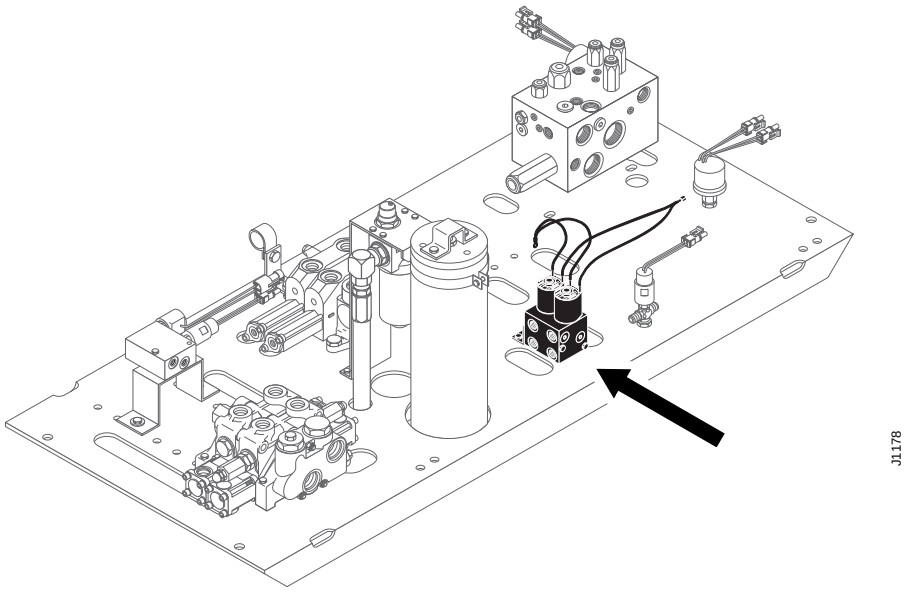


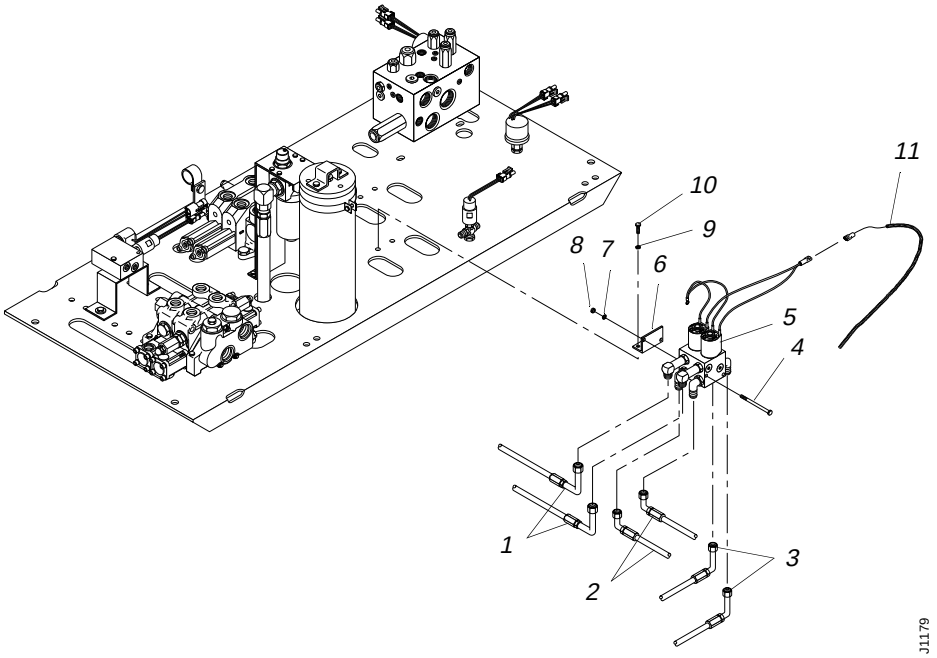
Fig. 6-23: Selector Valve – Models with Control Manifold Hydraulics

The 6-port circuit selector valve (directional control valve) is located on the valve plate near the center of the machine. It directs fluid to the control valve when the joystick is activated. The 6-port selector valve directs the flow of hydraulic oil from the joystick controller to the appropriate control valve section. The solenoids are used to change the flow of oil from one control valve section to the other.

Removal

Selector Valve (Control Manifold System)

644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
844C-42 (S/N 101–621)
8K-42 (S/N 101–220)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)



#	Description
1	Hydraulic Hose
2	Hydraulic Hose (Joystick)
3	Hydraulic Hose
4	Capscrew
5	Selector Valve
6	Mounting Bracket

#	Description
7	Lockwasher
8	Nut
9	Lockwasher
10	Capscrew
11	Joystick Wire Harness

Fig. 6-24: Selector Valve Installation – Models with Control Manifold Hydraulics

(Ref. Fig. 6-24) The following steps are required to remove the selector valve in models with a control manifold hydraulic system.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Install brake pressure diagnostic port test gauge into brake diagnostic port.
3. While watching test gauge, press and release the brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.
4. For 644B, 844C, and 1044C models, remove rollback hose tray.
5. To avoid contamination of the system, clean selector valve.
6. Disconnect joystick wiring harness (Item 11) from selector valve.
7. Tag and loosen six (6) hydraulic hoses (Items 1, 2 and 3) and bleed any remaining oil into a suitable container. Disconnect hoses. Cap fittings and hoses.

8. Remove two (2) each nuts (Item 8), lockwashers (Item 7), and capscrews (Item 4) securing selector valve (Item 5) to the mounting bracket (Item 6).
9. Take selector valve and mounting hardware to a suitable area for cleaning and further disassembly.
10. Clean mounting hardware with solvent. Dry with compressed air, inspect for damage, and replace as necessary.

Installation

Selector Valve (Control Manifold System)

644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
844C-42 (S/N 101–621)
8K-42 (S/N 101–220)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)

(Ref. Fig. 6-24) The following steps are required to install the selector valve in models with a control manifold hydraulic system.

Note: *If the mounting bracket was removed, mount it to the valve plate with two (2) each capscrews (Item 10) and lockwashers (Item 9). Torque the capscrews to 75 in-lbs.*

1. Secured the selector valve (Item 5) to the mounting bracket (Item 6) with two (2) each capscrews (Item 4), lockwashers (Item 7), and nuts (Item 8) making sure that the grounding wires are secured to the bracket with the mounting hardware. Torque the nuts to 50 in-lbs.

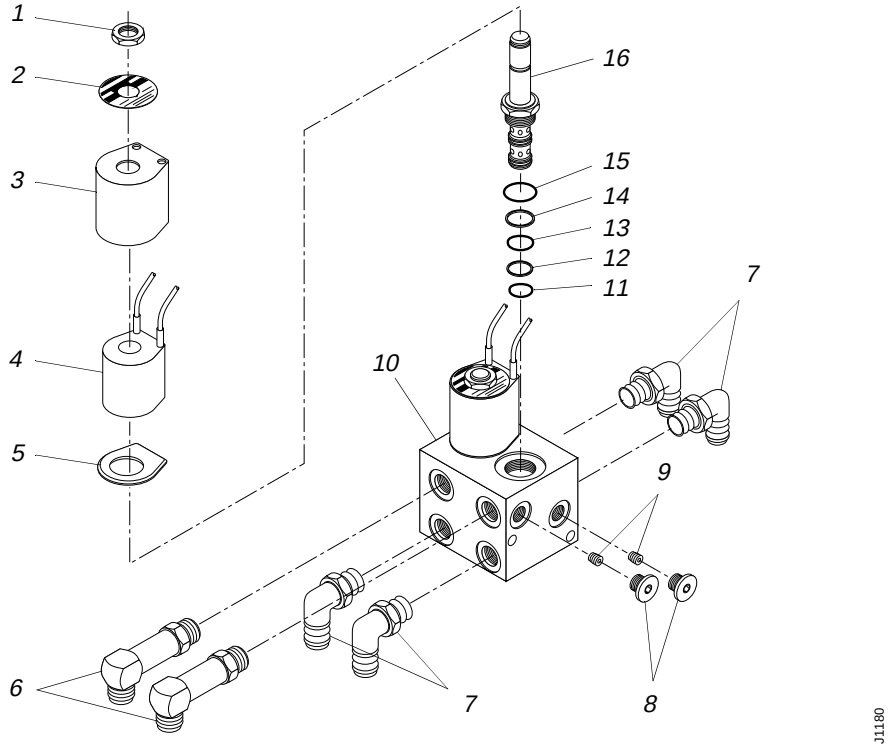
Note: *If the mounting bracket was removed, mount it to the valve plate with two (2) each capscrews and lockwashers. Torque the capscrews to 75 in-lbs.*

2. Reconnect six (6) hydraulic hoses (Items 1, 2 and 3) to respective elbows. Torque hydraulic hose swivel nuts to 130–150 in-lbs.
3. Reconnect joystick wiring harness (Item 11) to selector valve.

Overhaul

Selector Valve (Control Manifold System)

644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
844C-42 (S/N 101–621)
8K-42 (S/N 101–220)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)



#	Description	#	Description
1	Nut	9	Orifice
2	Name Plate	10	Valve Body
3	Coil Housing	11	O-ring
4	Solenoid Coil	12	Backup Ring
5	Cover Plate	13	Backup Ring
6	Long Elbow	14	O-ring
7	Elbow	15	O-ring
8	O-ring Plug	16	Solenoid Cartridge

Fig. 6-25: Selector Valve Assembly – Models with Control Manifold Hydraulics

(Ref. Fig. 6-25) The following steps describe disassembly and overhaul of the selector valve assembly in models with a control manifold hydraulic system.

1. Loosen and remove two (2) long elbows (Item 6).
2. Loosen and remove four (4) remaining elbows (Item 7).
3. Remove two (2) each O-ring plugs (Item 8) and orifices (Item 9) from valve body (Item 10).
4. Loosen and remove nut (Item 1) from solenoid cartridge (Item 16).
5. Remove name plate (Item 2), coil housing (Item 3), solenoid coil (Item 4), and cover plate (Item 5) from solenoid cartridge.

6. Remove O-rings and backup rings (Items 11, thru 15) from solenoid cartridge. Discard O-rings and backup rings.
7. Repeat Step 4 thru Step 6 for the other solenoid valve assembly.
8. Clean all remaining parts with solvent and dry with compressed air. Visually inspect the valve body to make sure all cavities are free of contamination including burrs and chips as well as pieces of O-rings. Inspect for all parts for damage and contamination; replace as necessary.

Note: *The name plate (Item 2) and valve body (Item 10) are not sold separately. Should these items need replacement, it will be necessary to purchase a complete solenoid valve assembly.*

9. Obtain seal kit. Lubricate each O-ring and backup ring before installing it.
10. Install O-rings and backup rings installed in descending order on each solenoid cartridge (Item 16). Install largest O-ring (Item 15) against the hex of the solenoid cartridge. Install O-ring (Item 14) and backup ring (Item 13) near the center of the solenoid cartridge. Install backup ring (Item 12) and O-ring (Item 11) near the end of the solenoid cartridge.
11. Check cartridges for any visible contamination. Dip each cartridge in clean oil up to the O-ring (Item 15) before installing it in the valve body.
12. Install cartridges on valve body (Item 10). Torque each cartridge to 35–40 ft-lbs.
13. Install cover plate (Item 5), solenoid coil (Item 4), coil housing (Item 3), name plate (Item 2), and nut (Item 1) on each solenoid cartridge. Torque nut to 4–6 ft-lbs.

CAUTION: Maintain a 4–6 ft-lbs. maximum torque on valve tube nut (Item 1). Overtightening may cause valve failure.

14. Install two (2) orifices (Item 9) in valve body. Torque orifices to 30–40 in-lbs.
15. Install two (2) O-ring plugs (Item 8) in valve body. Torque plugs to 210–230 in-lbs.
16. Install elbows (Item 7) in ports P1, P2, A1 and B1 of valve body. Torque elbows to 160–180 in-lbs.
17. Install long elbows (Item 6) in ports B3 and A3 of valve body. Torque elbows to 160–180 in-lbs.

Selector Valve (Mid-Inlet System)

Description

644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
6K-37 (S/N 318–)
6K-42 (S/N 120–)
844C-42 (S/N 622–)
8K-42 (S/N 221–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)

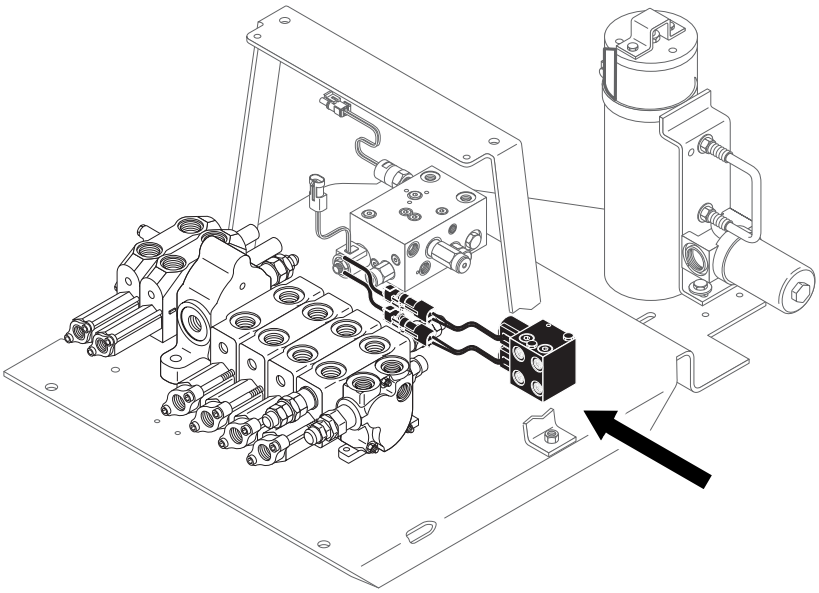


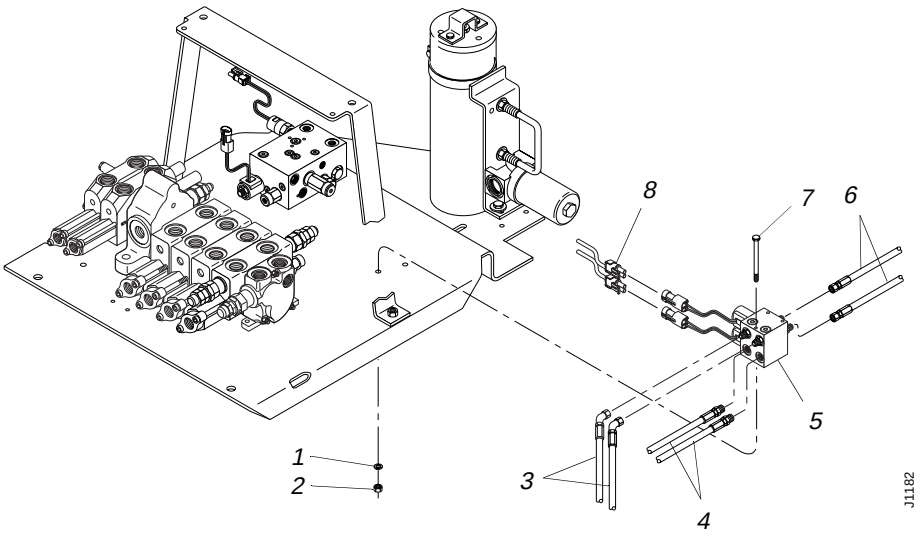
Fig. 6-26: Selector Valve – Models with Mid-Inlet Hydraulics

The 6-port circuit selector valve (directional control valve) is located on the valve plate near the center of the machine. It directs fluid to the control valve when the joystick is activated. The 6-port selector valve directs the flow of hydraulic oil from the joystick controller to the appropriate control valve section. The solenoids are used to change the flow of oil from one control valve section to the other.

Removal

Selector Valve (Mid-Inlet System)

644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
6K-37 (S/N 318–)
6K-42 (S/N 120–)
844C-42 (S/N 622–)
8K-42 (S/N 221–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)



#	Description
1	Lockwasher
2	Nut
3	Hydraulic Hoses
4	Hydraulic Hoses

#	Description
5	Selector Valve
6	Hydraulic Hoses (Joystick)
7	Capscrew
8	Joystick Wiring Harness

Fig. 6-27: Selector Valve Installation – Models with Mid-Inlet Hydraulics

(Ref. Fig. 6-27) The following steps are required to remove the selector valve in models with a mid-inlet hydraulic system.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Install brake pressure diagnostic port test gauge into brake diagnostic port.
3. While watching test gauge, press and release brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.
4. For 644B, 844C, and 1044C models, remove roll-back hose tray.
5. To avoid contamination of the system, clean selector valve.
6. Disconnect joystick wiring harness (Item 8) from selector valve.
7. Tag and loosen six (6) hydraulic hoses (Items 3, 4, and 6) and bleed any remaining oil into a suitable container. Disconnect hoses. Cap fittings and hoses.
8. Remove two (2) each nuts (Item 1), lockwashers (Item 2), and capscrews (Item 7) securing selector valve (Item 5) to the valve plate.
9. Take selector valve and mounting hardware to a suitable area for cleaning and further disassembly.
10. Clean mounting hardware with solvent. Dry with compressed air, inspect for damage, and replace as necessary.

Installation

Selector Valve (Mid-Inlet System)

644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
6K-37 (S/N 318–)
6K-42 (S/N 120–)
844C-42 (S/N 622–)
8K-42 (S/N 221–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)

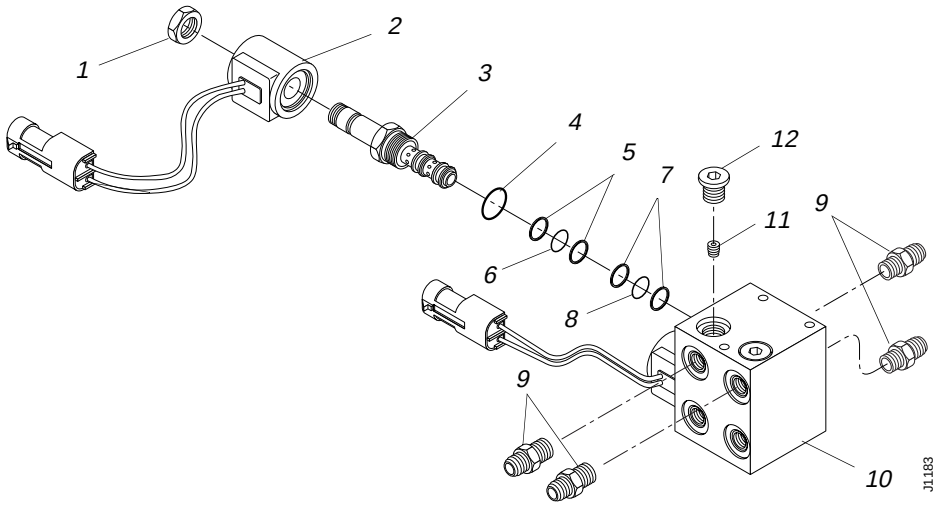
(Ref. Fig. 6-27) The following steps are required to install the selector valve in models with a mid-inlet hydraulic system.

1. Secured the selector valve (Item 5) to the valve plate with two (2) each capscrews (Item 7), lockwashers (Item 2), and nuts (Item 1). Torque nuts to 50 in-lbs.
2. Reconnect four (4) hydraulic hoses (Items 3 and 6) to respective elbows at ports A3, B3, P1, and P2 on selector valve. Torque hydraulic hose swivel nuts to 130–150 in-lbs.
3. Install two (2) hydraulic hoses (Item 4) to ports A1 and B1 on selector valve and torque hose swivel nuts to 130–150 in-lbs.
4. Reconnect joystick wiring harness (Item 8) to selector valve.

Overhaul

Selector Valve (Mid-Inlet System)

644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
6K-37 (S/N 318–)
6K-42 (S/N 120–)
844C-42 (S/N 622–)
8K-42 (S/N 221–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)



#	Description
1	Nut
2	Coil
3	Solenoid Valve
4	O-ring
5	Backup Rings
6	O-ring

#	Description
7	Backup Rings
8	O-ring
9	Connector
10	Valve Body
11	Orifice
12	O-ring Plug

Fig. 6-28: Selector Valve Assembly – Models with Mid-Inlet Hydraulics

(Ref. Fig. 6-28) The following steps describe disassembly and overhaul of the selector valve assembly in models with a mid-inlet hydraulic system.

1. Loosen and remove four (4) connectors (Item 9) from valve body (Item 10).
2. Loosen and remove two (2) each O-ring plugs (Item 12) and orifices (Item 11).
3. Loosen and remove nut (Item 1) from solenoid valve (Item 3).
4. Remove coil (Item 2) from solenoid valve.
5. Loosen and remove solenoid valve from valve body.
6. Remove O-rings and backup rings (Items 4 thru 8) from solenoid valve. Discard O-rings and backup rings.
7. Repeat Step 3 thru Step 6 for the other solenoid valve.
8. Clean all remaining parts with solvent and dry with compressed air. Visually inspect the valve body to make sure all cavities are free of contamination including burrs and chips as well as pieces of O-rings. Inspect for all parts for damage and replace as necessary.
9. Obtain seal kit. Lubricate each O-ring and backup ring before installing it. Install O-rings on each solenoid valve in descending order, making sure the largest is installed first and the smallest last. Make sure that O-rings (Items 6 and 8) are installed between their backup rings.
10. Check valves for any visible contamination. Dip each valve in clean oil up to the largest O-ring (Item 4) before installing it in the valve body.
11. Install valves on valve body (Item 10). Torque each valve to 20 ft-lbs.
12. Install coil (Item 2) on solenoid valve with nut (Item 1). Torque nut to 5 ft-lbs.
13. Install two (2) orifices in the valve body. Torque orifices to 30–40 in-lbs.
14. Install two (2) O-ring plugs in valve body. Torque plugs to 125–145 in-lbs.
15. Install four (4) connectors in ports A3, B3, P1, and P2. Torque connectors to 160–180 in-lbs.

Troubleshooting

Problem	Probable Cause	Solution	Reference
1. Boom fails to extend or retract	A. Broken hydraulic line(s) and/or connection leaks	A. Replace hydraulic tube(s)/hose(s) and/or tighten loose connections.	
	B. Faulty extension cylinder	B. Repair extension cylinder seals.	
	C. Broken chains or chain connections	C. Repair or replace chains.	
2. Boom fails to raise or lower	A. Broken hydraulic line(s) and/or connection leaks	A. Replace hydraulic hose(s)/tube(s) and/or tighten loose connections.	
	B. Faulty hoist cylinder(s)	B. Repair cylinder seals.	
	C. Faulty components in raise/lower hydraulic circuitry	C. Repair or replace damaged components.	
3. Excessive boom pivot pin or cylinder pivot pin wear	A. Failure to grease at regular intervals	A. Replace worn pins and lubricate at recommended intervals.	
	B. Worn bushings	B. Replace bushings and lubricate at recommended intervals.	
4. Excessive Slide Pad Wear	A. Improper shimming of slide pads	A. Make proper shim adjustments.	See page 6-52, and page 6-61 (2-section), page 6-91 (3-section), or page 6-147 (4-section).
	B. Contaminated or rusted slide pad sliding surfaces after long term storage	B. Clean and lubricate slide pad sliding surfaces.	See page 6-50.
5. Jerky boom extend or retract functions	A. Chains out of adjustment	A. Readjust chains.	
6. Excessive Chain Wear	A. Chains out of adjustment	A. Replace and readjust chains.	
	B. Improper chain lubrication	B. Replace chain(s) and lubricate at recommended intervals.	

Boom Slide Pads — General

Description

Within the slide boom assemblies, there art two classifications of slide pads:

- Load Bearing Slide Pads

  Load bearing slide pads are located at the front and on the bottom of any boom section that contains another section. Load bearing pads are also located on the top rear of a boom section that is placed inside another section.

- Non-Load Bearing Slide Pads

  Non-load bearing slide pads are located at the front and on the top of a boom section that contains another section. Pads that are located at the rear and on the bottom of a boom that fits inside of another or any pads that are located on a side of any boom section are also non-load bearing slide pads.

Slide Pad Inspection

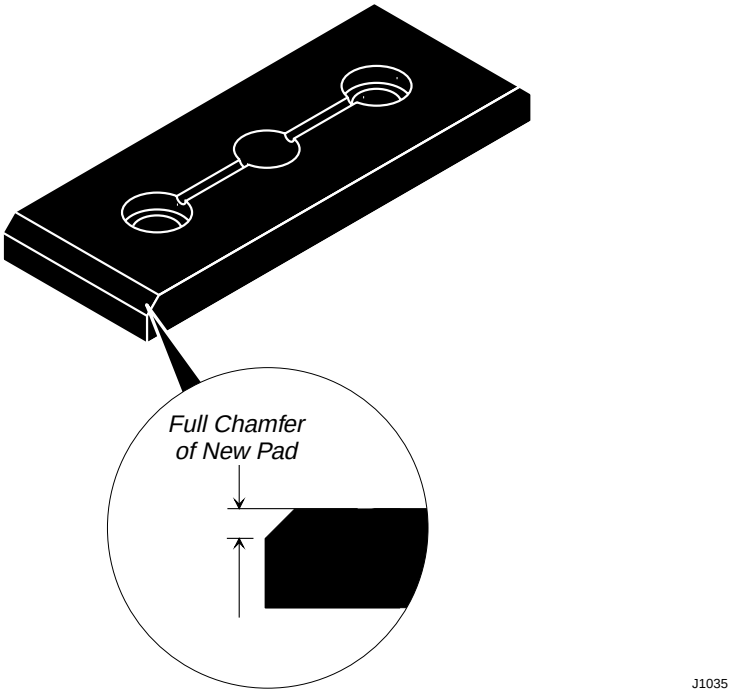


Fig. 6-29: Load Bearing Pad

(Ref. Fig. 6-29) Except for the lower slide pads located at the rear of the middle boom on 3-section booms, all other slide pads have a chamfer on each end of the top side (the side that wears). The depth of this chamfer varies, depending on the part number, and shows the amount of usable pad remaining.

Slide Pads with Chamfers

Fig. 6-30: Pad Worn, But Still OK

(Ref. Fig. 6-30) ***Inspect all pads weekly*** for condition and amount of chamfer wear. As a pad wears, the chamfer will get smaller. As long as a portion of the chamfer is visible, the pad is OK and does not need to be replaced.

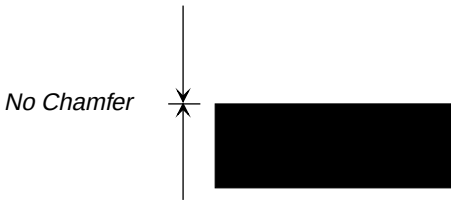


Fig. 6-31: Pad Must Be Replaced

(Ref. Fig. 6-31) When the chamfer is gone, the pad must be replaced.

Important: *Never use a boom slide pad that has worn past the chamfer. The boom will be damaged.*

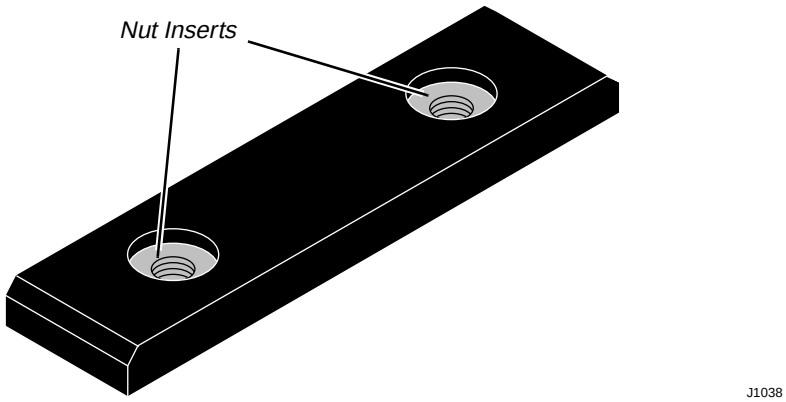


Fig. 6-32: Bolted Boom Slide Pad

(Ref. Fig. 6-32) Chamfered slide pads that have nut inserts are secured to the boom with capscrews, lockwashers (spring and/or star), and flatwashers (if needed).

Slide Pads without Chamfers

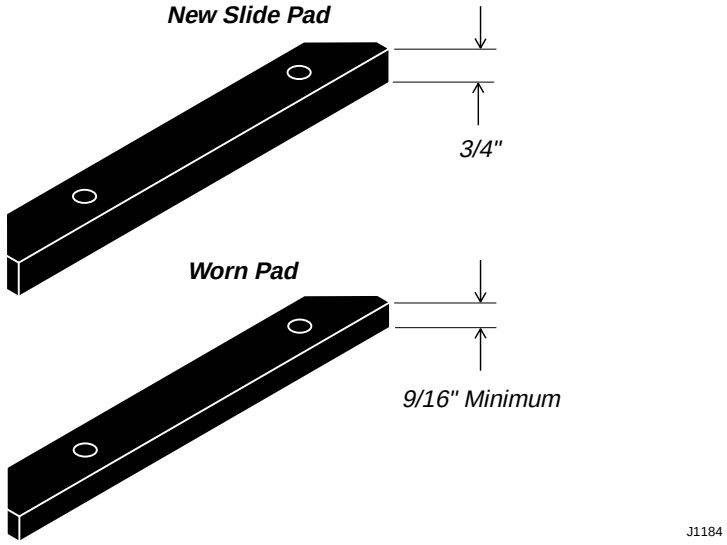


Fig. 6-33: Slide Pad Without Chamfers – 3 and 4-Section Boom

(Ref. Fig. 6-33) The lower slide pads, located at the rear of the middle boom on 3-section booms and at the rear of the middle (rear) boom on 4-section booms, do not have chamfers. It will be necessary to measure the thickness of these slide pads to ensure that they are a minimum of 9/16".

Lubrication

Load bearing pad slide areas must be greased at least monthly. Working conditions and heavy usage may warrant greasing more often.

Fully extend and lower the boom, then apply a thin coat of **EP Lithium based grease** on exposed pad slide areas. Retract the boom fully and use the grease fittings provided at the rear of the boom section(s) for lubricating those areas.

Slide Area Surface Finish

The areas on each boom section where the main load bearing pads slide must be smooth and free of nicks and scratches. Rough surfaces will greatly reduce the service life of slide pads. The general rule is: if you can catch your fingernail on a scratch, it must be repaired.

Damaged areas that are 0.030" deep or less may be repaired by blending the area smooth. Grind just enough material away to remove the damage, then blend the area using fine sand paper. See Fig. 6-34 and Fig. 6-35.

Damage greater than 0.030" deep must be filled with weld and ground smooth.

Another option is to install/replace boom wear strips. Contact the JLG Service Department or your dealer for information about available wear strips.

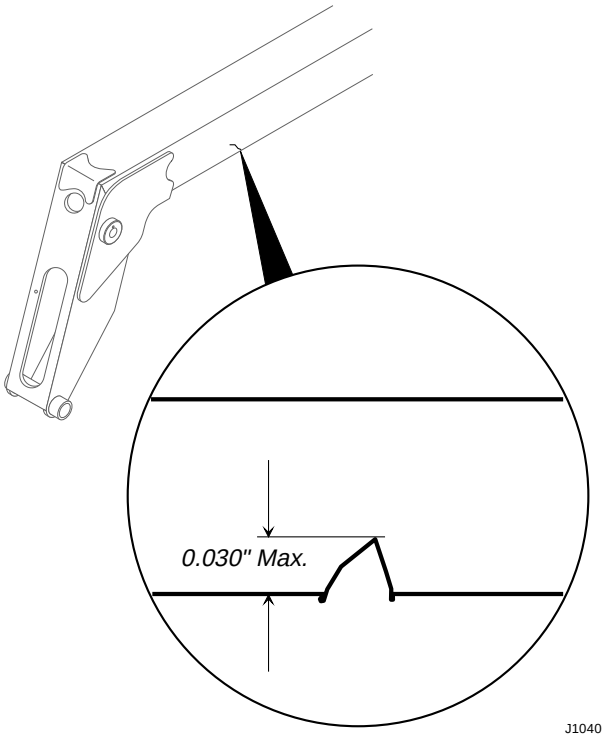


Fig. 6-34: Damaged Slide Surface

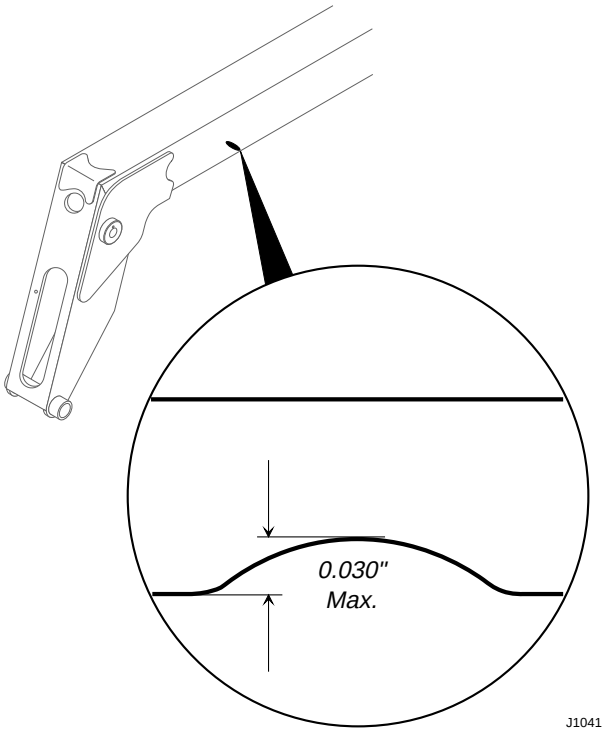


Fig. 6-35: Slide Surface Repair

Replacing and Shimming Boom Slide Pads — General

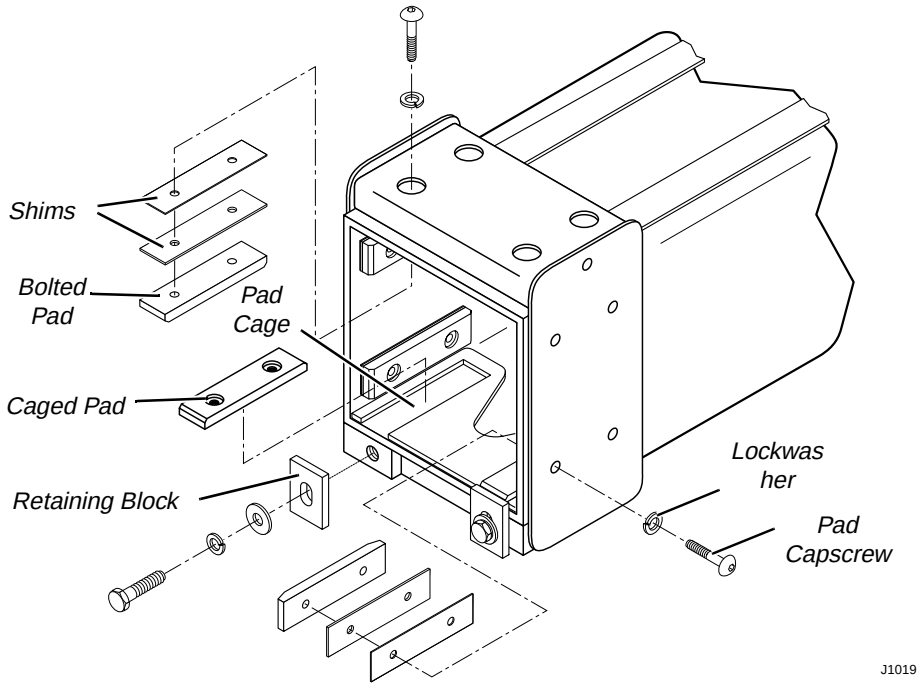


Fig. 6-36: Slide Pad Installation (2-Section Shown)

(Ref. Fig. 6-36) As boom pads wear, it becomes necessary to install or remove shims to maintain the correct clearances. Specific instructions and clearances for 2-section, 3-section, and 4-section booms are provided on following pages.

Usually, the main load bearing pads (caged pads) are the only pads that will need shimming. The other pads are not normally subjected to heavy wear.

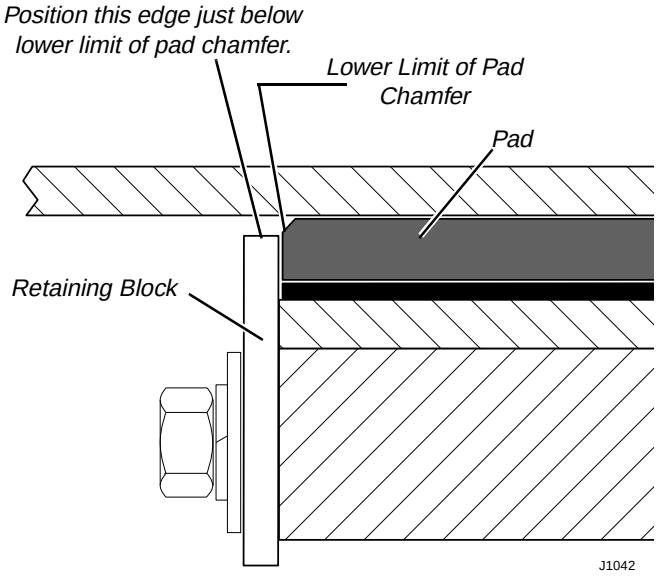
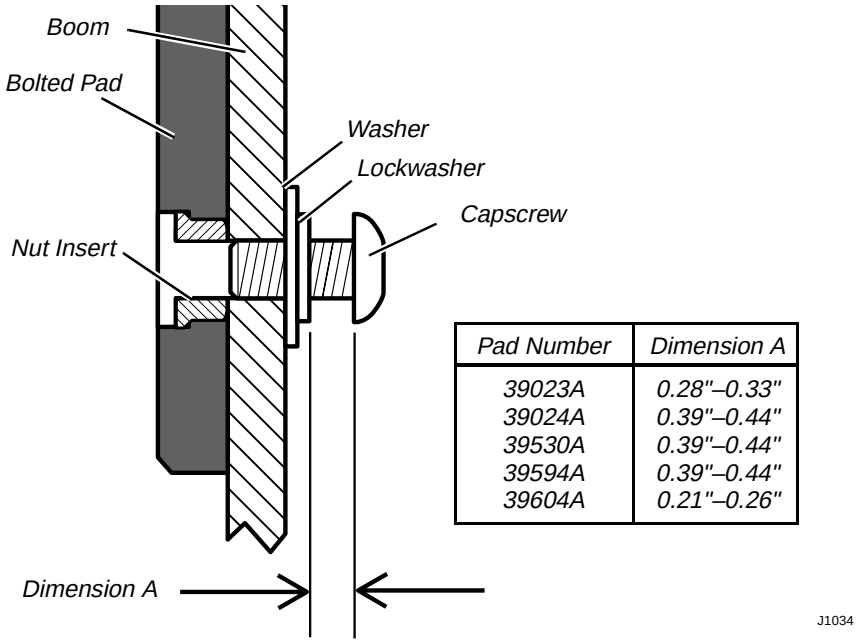


Fig. 6-37: Positioning Retaining Block

(Ref. Fig. 6-37) After shimming caged pads, the retaining block must be correctly positioned to prevent possible damage to the boom.

Adding or removing shims from bolted pads may require a different capscrew length or washer selection.



Pad Number	Dimension A
39023A	0.28"–0.33"
39024A	0.39"–0.44"
39530A	0.39"–0.44"
39594A	0.39"–0.44"
39604A	0.21"–0.26"

Fig. 6-38: Determining Capscrew Length

(Ref. Fig. 6-38) Select a combination of capscrew length, flatwasher (if needed), and lockwasher (spring and/or star) to obtain the required dimension (Dimension A). This dimension will ensure that the capscrew will not protrude past the nut insert and cause boom damage. See Fig. 6-39. Capscrews that can be purchased from JLG come in three (3) lengths (3/4", 1", and 1-1/4").

Clearance is measured from under the capscrew head to the *lockwasher.* A lockwasher must always be used under the capscrew head.

Apply nonpermanent thread locking compound to the first few threads of the capscrew before final installation.

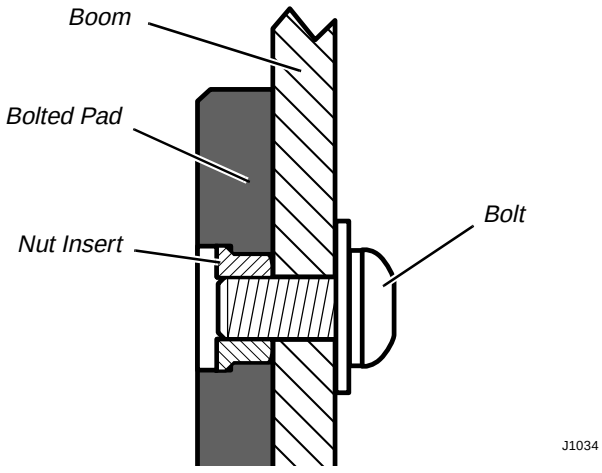


Fig. 6-39: Correctly Installed Capscrew

(Ref. Fig. 6-39) The end of the installed capscrew should be flush with, or just beneath, the inner edge of the nut insert.

Quick Attach

Description

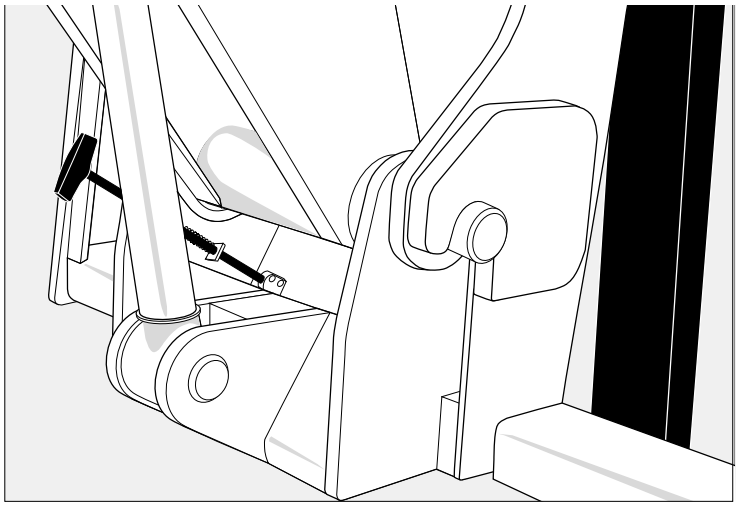


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Fig. 6-40: Quick Attach Rear View

(Ref. Fig. 6-40) The quick attach is designed for easy connection and disconnection of various attachments. By pulling the release handle, attachments can be easily interchanged.

Disconnecting an Attachment

1. Come to a complete stop on flat, level ground.
2. Set the park brake.
3. Raise the boom so attachment clears the ground.
4. Extend the boom a short distance.
5. Lower the boom to rest the attachment on level ground.
6. Shut off engine.
7. Disconnect attachment hydraulic lines (if equipped).

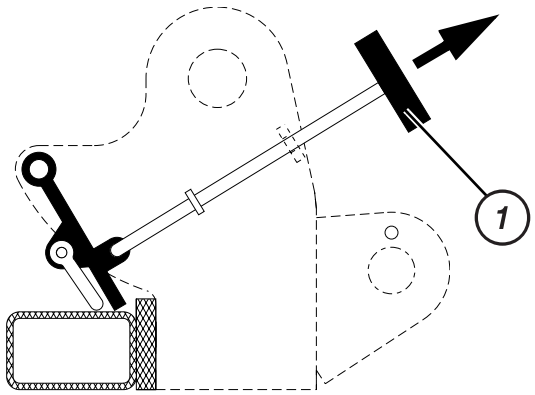

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Fig. 6-41: Release Handle

8. Pull release handle ***(1)*** back.

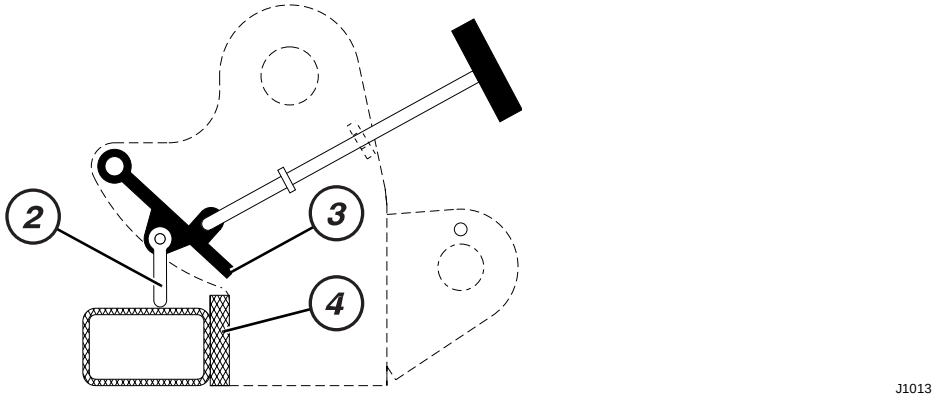

Fig. 6-42: Lock Plate

9. The lock pin ***(2)*** should engage the attachment, clearing the lock plate ***(3)*** from the attachment stop ***(4)***.

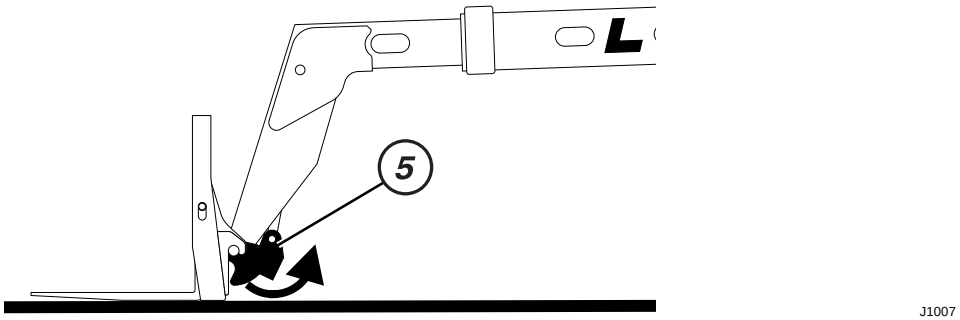

Fig. 6-43: Rotating Quick Attach Downwards

10. Start the engine. Fully rotate quick attach ***(5)*** downwards by using the attachment tilt control.

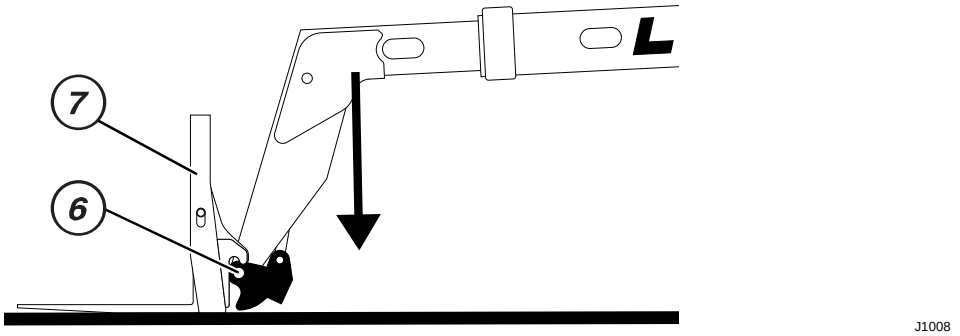

Fig. 6-44: Lowering Boom

11. Lower boom enough to clear quick attach pivot pin ***(6)*** from attachment ***(7)***.

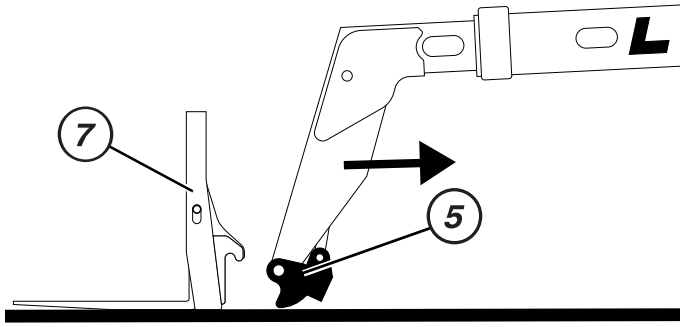

Fig. 6-45: Retracting Boom

12. Retract the boom until quick attach ***(5)*** is clear of attachment ***(7)***.

Connecting an Attachment

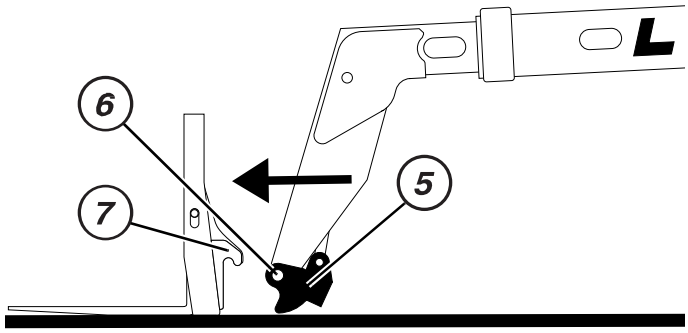

Fig. 6-46: Extending Boom

1. With quick attach ***(5)*** rotated fully downwards, extend the boom until quick attach pivot pin ***(6)*** is properly aligned underneath the attachment ***(7)***.

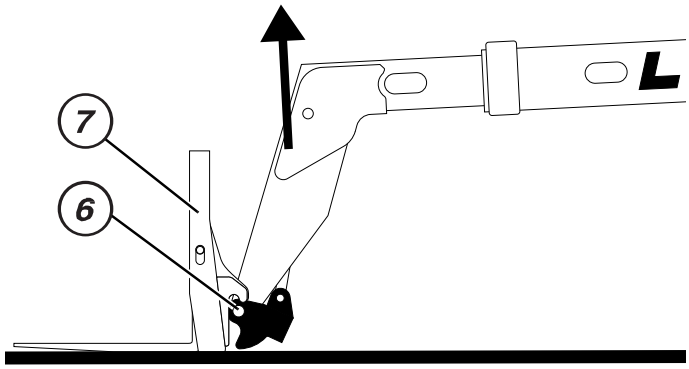

Fig. 6-47: Raising Boom

2. Raise the boom to engage the quick attach pivot pin ***(6)*** with the attachment ***(7)***.

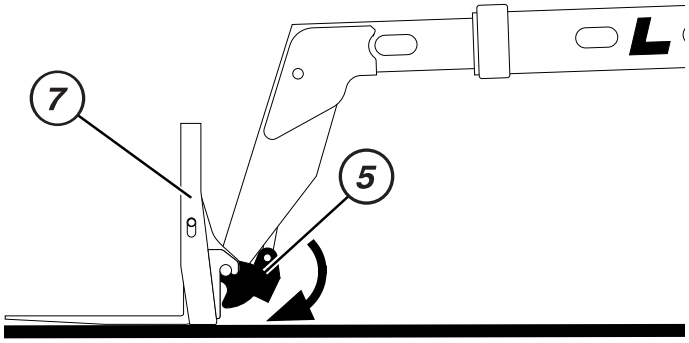

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Fig. 6-48: Rotating Quick Attach Forward

3. Rotate the quick attach ***(5)*** upwards to engage the attachment ***(7)***.
4. Shut off engine.

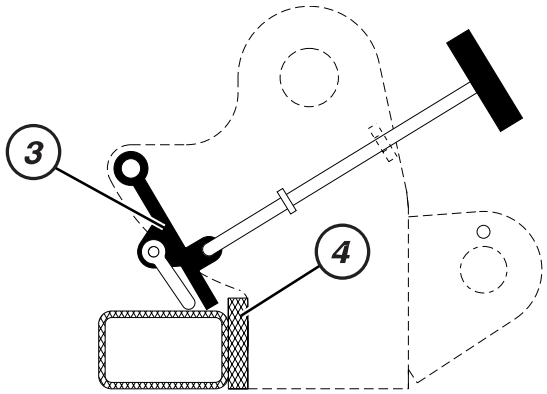

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Fig. 6-49: Lock Plate Engaged

5. Check to see that the lock plate ***(3)*** is engaged ahead of the attachment stop ***(4)***.

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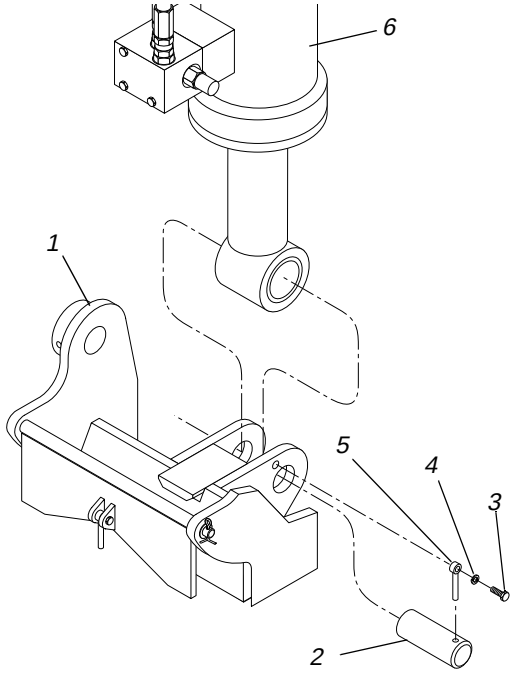
6. Connect attachment hydraulic hoses (if equipped).

Removal

Quick Attach

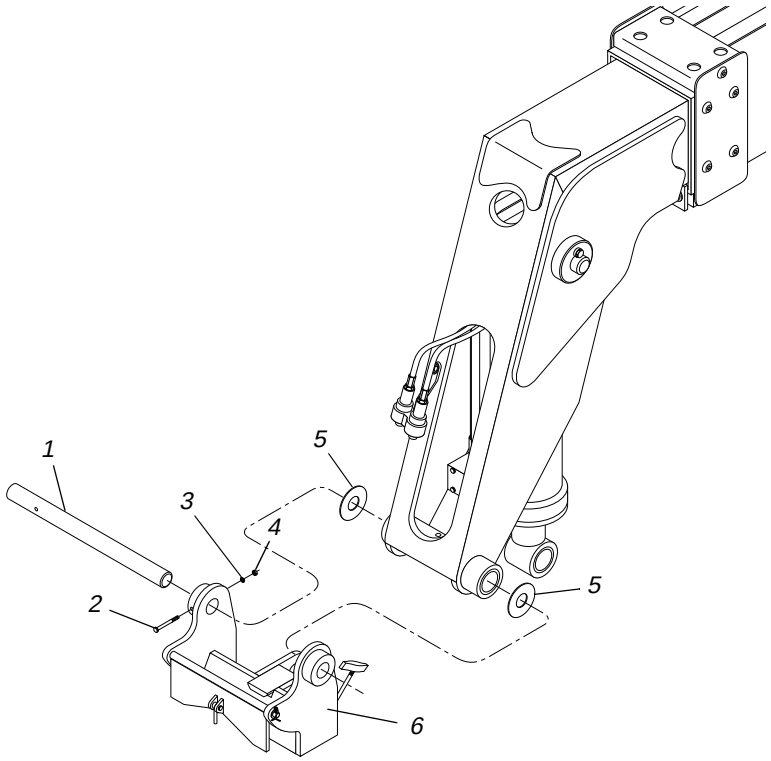
1. Disconnect attachment from quick attach.
2. Fully retract boom and transfer carriage (if equipped), level quick attach and lower boom to ground.
3. Set park brake, lock shift selector in NEUTRAL position, shut off engine and remove ignition key from switch. Block all wheels.



#	Description	#	Description
1	Quick Attach	4	Lockwasher
2	Pivot Pin	5	Lock Pin
3	capscrew	6	Front Carriage Tilt Cylinder

Fig. 6-50: Lower Pivot of Carriage Tilt Cylinder

4. (Ref. Fig. 6-50) Remove capscrew (Item 3), lockwasher (Item 4), and lock pin (Item 5) from lower pivot pin (Item 2) of front carriage tilt cylinder (Item 6). Remove pivot pin from quick attach (Item 1).



#	Description
1	Pivot Pin
2	Capscrew
3	Lockwasher

#	Description
4	Nut
5	Shim
6	Quick Attach

Fig. 6-51: Quick Attach Pivot

5. (Ref. Fig. 6-51) Remove nut (Item 4), lockwasher (Item 3), and capscrew (Item 2) from quick attach pivot pin (Item 1).
6. Remove quick attach pivot pin and shims (Item 5) (if installed).
7. Clean and inspect all parts for condition and wear. Replace as necessary.

Installation

Quick Attach

1. Align quick attach (Item 6) to boom. Check gaps between quick attach and boom. Select shims to center quick attach on boom.
2. (Ref. Fig. 6-51) Install quick attach pivot pin (Item 1) and shims (Item 5). Secure pivot pin with capscrew (Item 2), lockwasher (Item 3), and nut (Item 4).
3. (Ref. Fig. 6-50) Align rod-end of front carriage tilt cylinder with quick attach. Install pivot pin and secure with lock pin, lockwasher, and capscrew.
4. Lubricate grease fittings with EP lithium based grease.

Boom Angle Inclinometer

Description

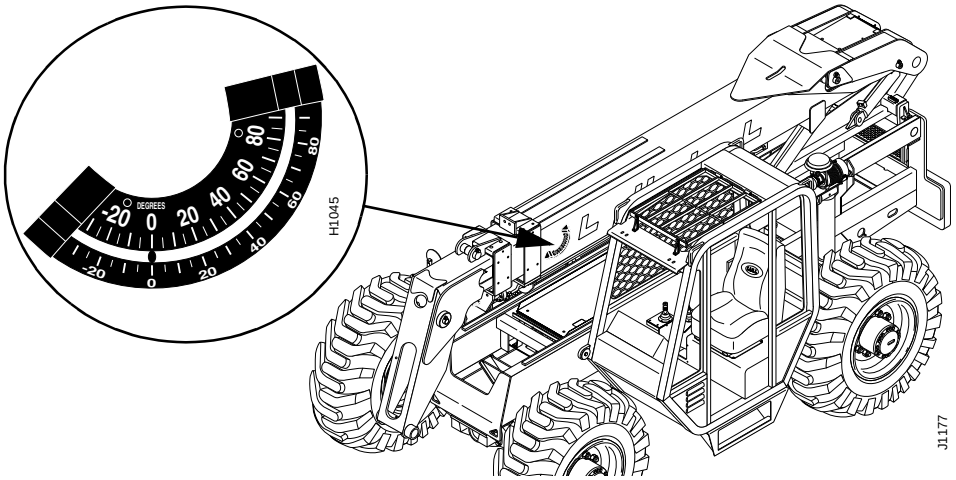
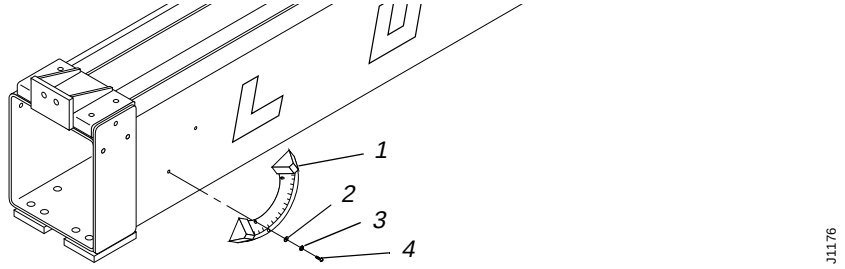


Fig. 6-52: Boom Angle Inclinometer

(Ref. Fig. 6-52) The boom angle inclinometer is located near the front of the outer boom section.

The boom angle inclinometer shows the angle of the boom relative to level ground. This indicator is used with the boom extension indicator, transfer carriage extension indicator (if equipped), and machine load chart to determine correct boom lifting capacities.

Replacement



#	Description	#	Description
1	Boom Angle Inclinometer	3	Starwasher
2	Flatwasher	4	Round Head Screw

Fig. 6-53: Boom Angle Inclinometer Installation

1. Remove two (2) each round head screws (Item 4), starwashers (Item 3), and flatwashers (Item 2) along with the boom angle indicator (Item 1) from the boom.
2. Discard old boom angle inclinometer.
3. Clean and inspect hardware for damage and replace as necessary.
4. Install new boom angle inclinometer with two (2) each flatwashers, starwashers, and round head screws. Tighten screws until snug.

2-Section Boom

Description

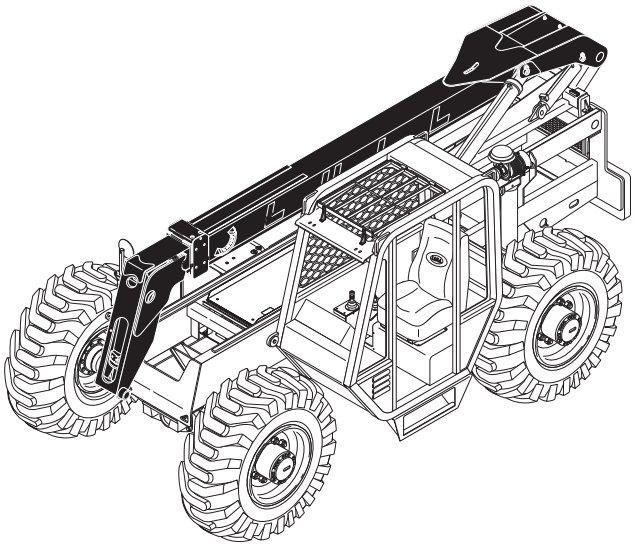
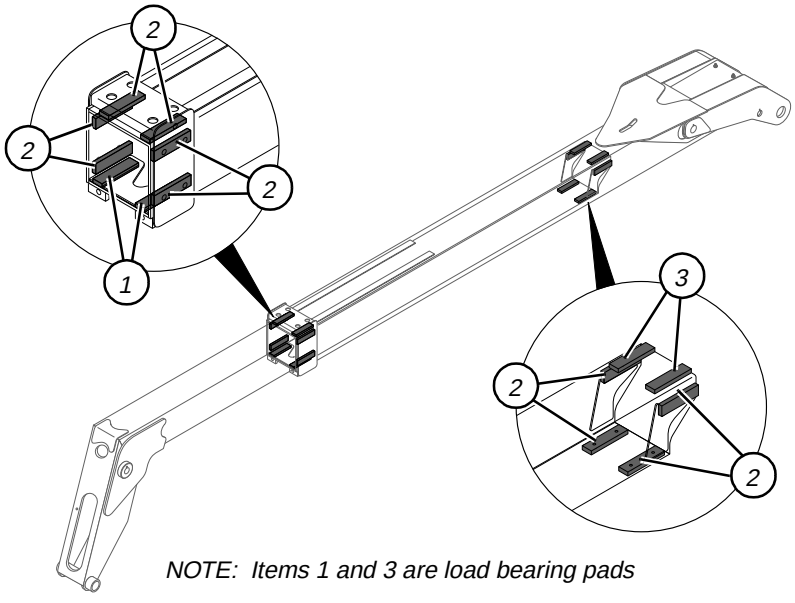


Fig. 6-54: 2-Section Boom

The 2-section boom is used on 644B-37 and 6K-37 models. It is a slide boom with a 37 foot maximum lift height. The maximum forward reach on the 644B-37 is 27 feet and the 6K-37 has a maximum reach of 20 feet.

Shimming Procedures

2-Section Boom



NOTE: Items 1 and 3 are load bearing pads

#	Description
1	Boom Pad, 9/16" Thick x 2" Wide
2	Boom Pad, 9/16" Thick x 2" Wide

#	Description
3	Boom Pad, 3/4" Thick x 2" Wide

Fig. 6-55: Boom Slide Pad Locations, 2-Section Boom

1. Park machine on firm, level surface and apply park brake. Level the frame. Level and fully retract the boom. Shut off engine.
2. Determine if all boom slide pads are serviceable. (See “Slide Pad Inspection” on page 6-48) Have replacement pads ready as required.

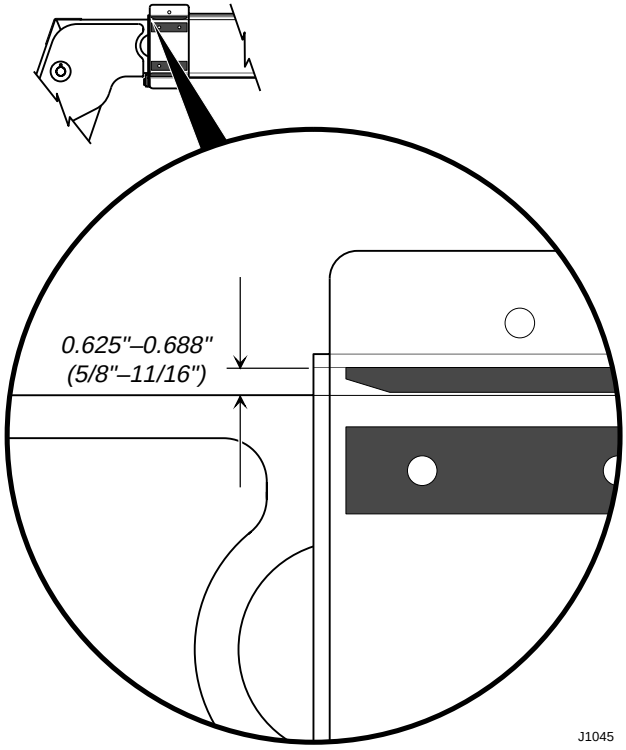


Fig. 6-56: Boom Section Gaps – Front of 2-Section Boom

3. (Ref. Fig. 6-56) Measure the gap between boom sections at both upper pads. If the dimensions are *not* within the specified range, proceed to Step 4. If the dimensions *are* within the specified range, proceed to Step 5.

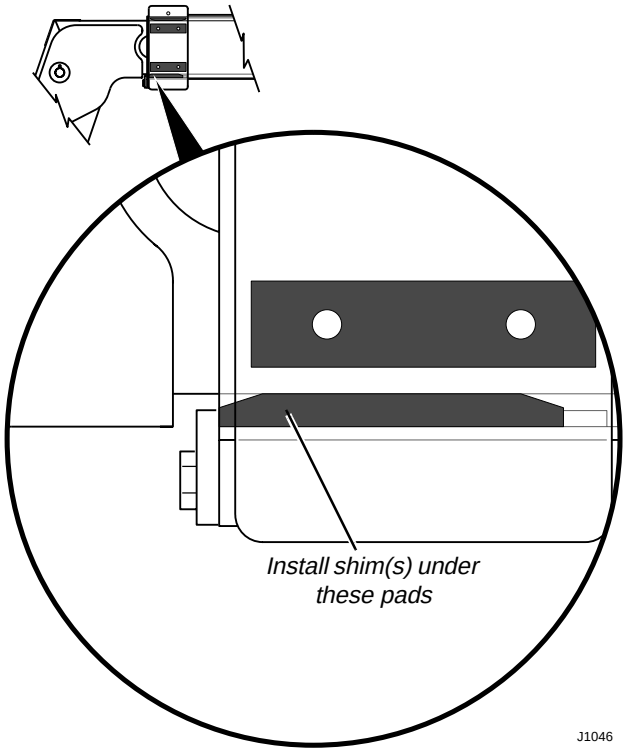


Fig. 6-57: Lower Shim Installation – Front of 2-Section Boom

4. (Ref. Fig. 6-57) Install/remove shim(s) under indicated pads to obtain clearance specified in Step 3.

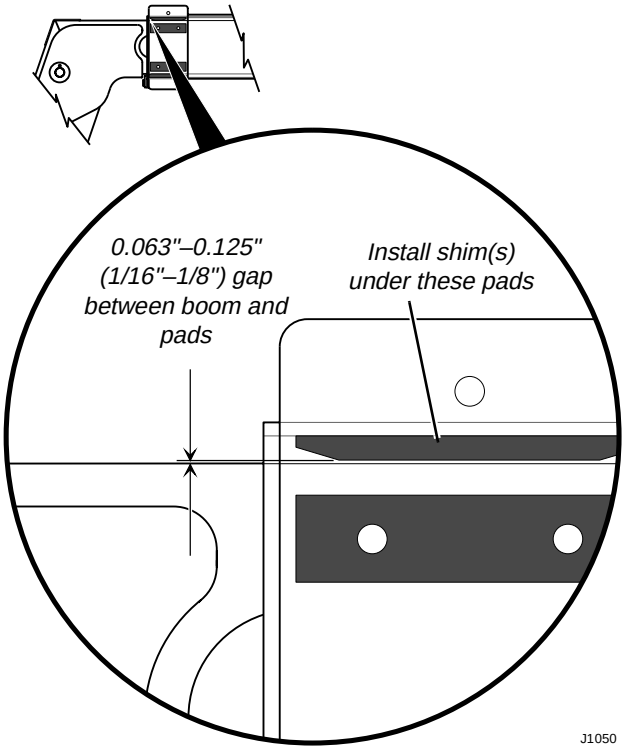


Fig. 6-58: Upper Shim Installation – Front of 2-Section Boom

5. (Ref. Fig. 6-58) Install/remove shim(s) under indicated pads to obtain specified clearance.

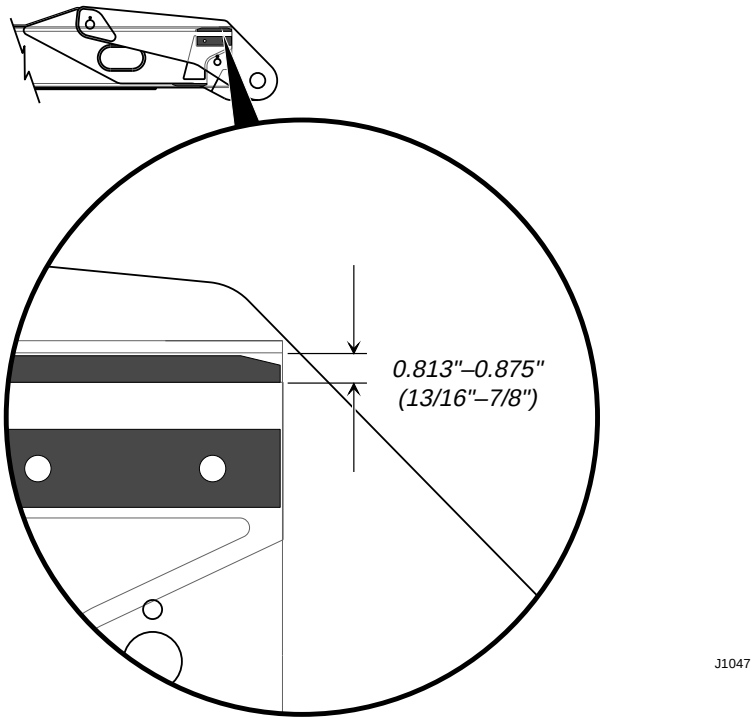


Fig. 6-59: Boom Section Gaps – Rear of 2-Section Boom

6. (Ref. Fig. 6-59) Measure the gap between boom sections at both upper pads. If the dimensions are *not* within the specified range, proceed to Step 7. If the dimensions *are* within the specified range, proceed to Step 8.

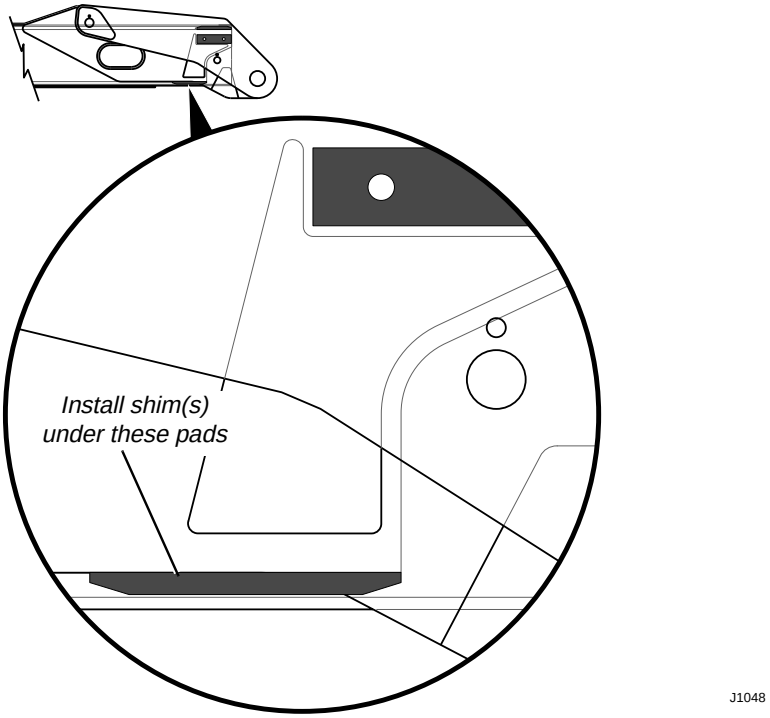


Fig. 6-60: Lower Shim Installation – Rear of 2-Section Boom

7. (Ref. Fig. 6-60) Install/remove shim(s) under indicated pads to obtain clearance specified in Step 5.

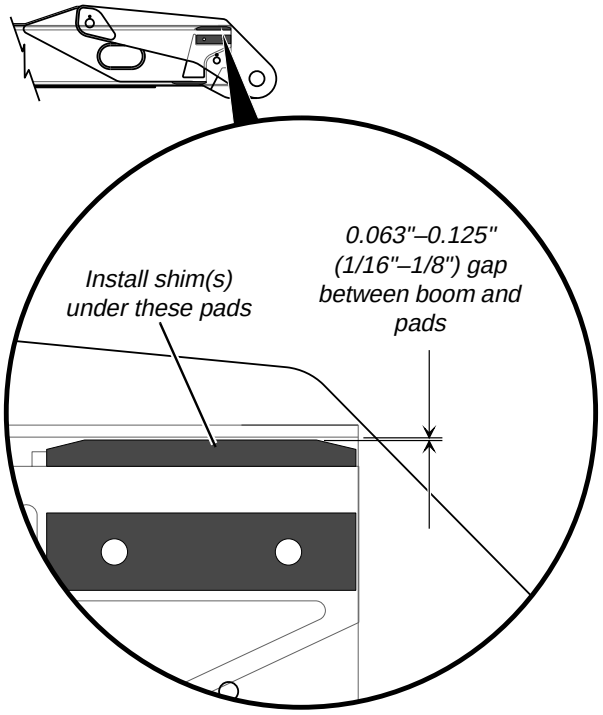


Fig. 6-61: Upper Shim Installation – Rear of 2-Section Boom

8. (Ref. Fig. 6-61) Install/remove shim(s) under indicated pads to obtain specified clearance.

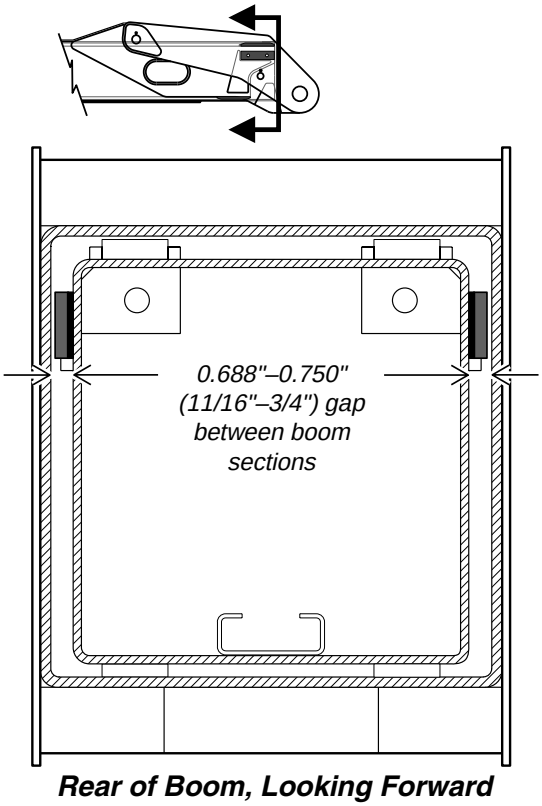


Fig. 6-62: Clearances Between Boom Sections Rear of 2-Section Boom

9. (Ref. Fig. 6-62) Position inner boom section to obtain the indicated dimensions.

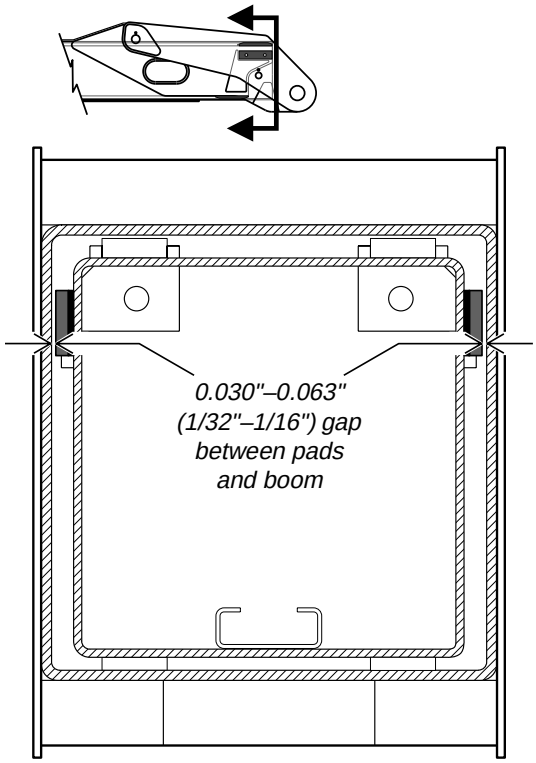


Fig. 6-63: Gaps Between Pads and Boom – Rear of 2-Section Boom

10. (Ref. Fig. 6-63) Install/remove shim(s) under indicated pads to obtain specified clearances.

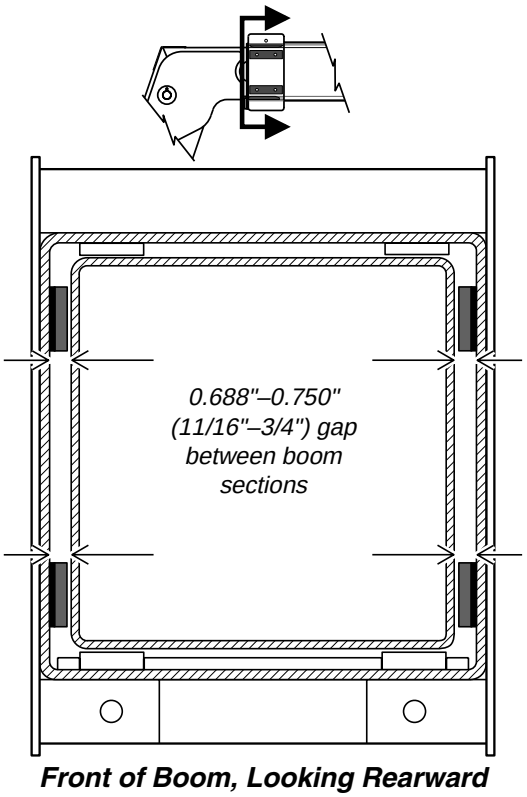


Fig. 6-64: Clearances Between Boom Sections – Front of 2-Section Boom

11. (Ref. Fig. 6-64) Position inner boom section to obtain the indicated dimensions.

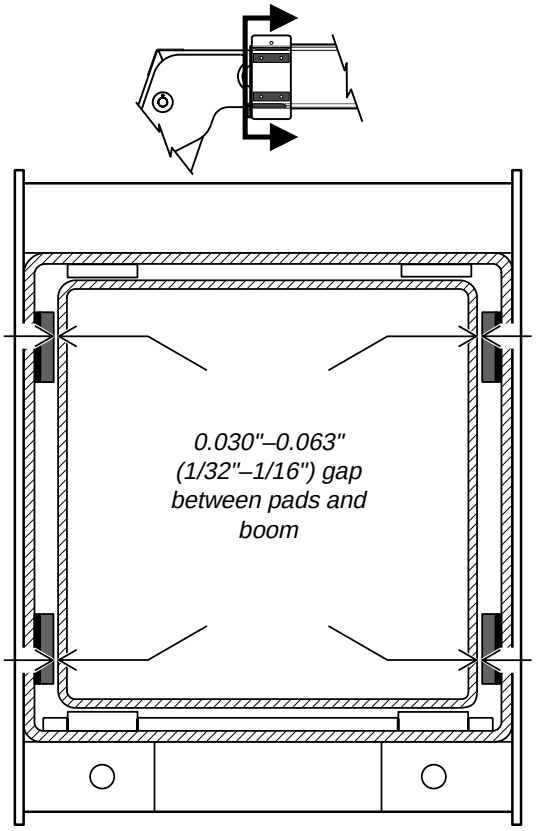


Fig. 6-65: Gaps Between Pads and Boom – Front of 2-Section Boom

12. (Ref. Fig. 6-65) Install/remove shim(s) under indicated pads to obtain specified clearances.
13. Extend boom and lubricate per previous instructions.
14. Check boom extension and retraction for binding against slide pads.

Inspection Procedures

2-Section Boom

These procedures are intended to determine if localized deformation has occurred on the inner boom section.

1. Extend the boom and lower the forks to the ground.

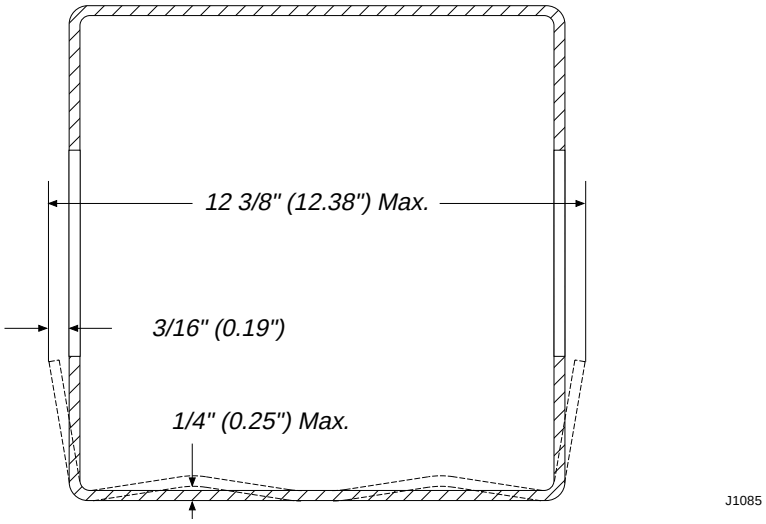


Fig. 6-66: Inner Boom Cross-Section at Window

2. (Ref. Fig. 6-66) Place a straight edge against the bottom surface of the inner boom section. Measure the distance from the straight edge to the bottom surface of the boom tube. This distance should not exceed 1/4" (0.25"). The maximum deflection will be found just in front of the outer boom section.
3. (Ref. Fig. 6-66) The side walls may also deflect outward at the window areas. Take this measurement across the boom tube, through the windows. Maximum allowable deflection is 3/16" (0.19) per side. The maximum allowable boom tube width is 12-3/8" (12.38"), measured through the windows.
4. Retract the boom.

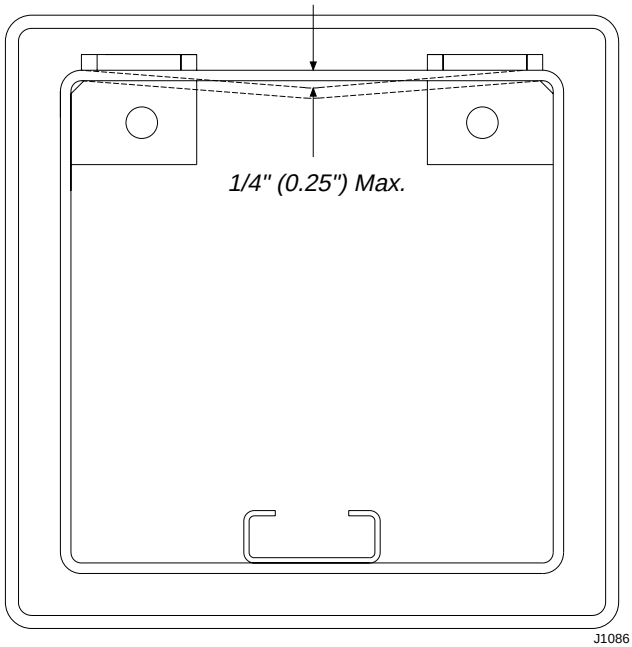


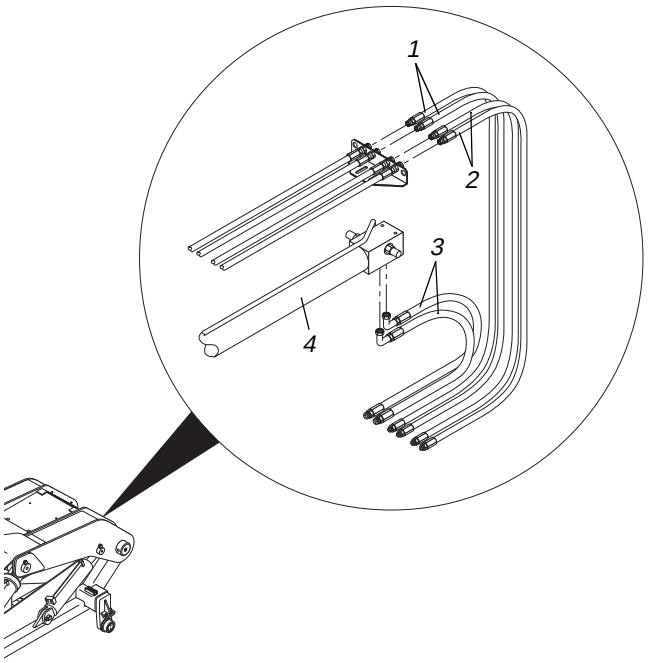
Fig. 6-67: View at Rear of 2-Section Boom

5. (Ref. Fig. 6-67) Look through the rear of the boom. Using a 12-inch straight edge, measure the top surface of the rear of the inner boom section. Maximum allowable deflection at the center, top of the inner boom section is 1/4" (0.25").

Removal

2-Section Boom

1. Remove Quick Attach. See page 6-58.
2. Fully retract boom and transfer carriage (if equipped), lower boom to ground.
3. Park machine on firm, level surface. Set park brake, lock shift selector in NEUTRAL position, shut off engine and remove ignition key from switch. Block all wheels.
4. Position crane next to machine.
5. Remove boom proximity switch. See “Boom Elevation Proximity Switch” in Section 7.



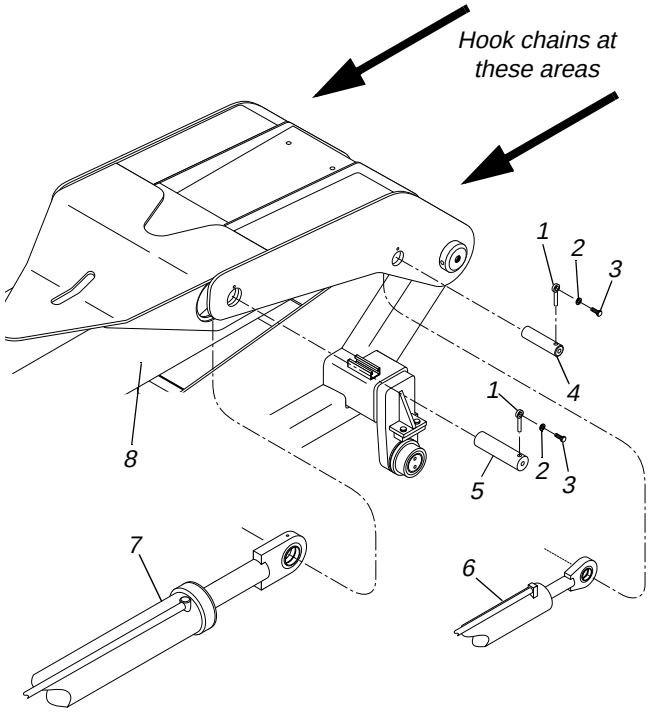
#	Description	#	Description
1	Auxiliary Hydraulic Hoses	3	Boom Extension Hoses
2	Carriage Tilt Hoses	4	Boom Extension Cylinder

Fig. 6-68: Hose Connections, 2-Section Boom

6. (Ref. Fig. 6-68) Tag and disconnect two (2) hoses (Item 3) at the boom extension cylinder (Item 4). Cap hoses and fittings.
7. (Ref. Fig. 6-68) Tag and disconnect two (2) carriage tilt hoses (Item 2), and two (2) auxiliary hydraulics hoses (Item 1) at the boom. Cap hoses and fittings.

8. Place sling around inner boom section, at the front. Chains with hooks may be attached to the rear of the outer boom section, near the pivot pin bosses (Ref. Fig. 6-69). Attach sling and chains to crane hook and lift crane to support weight of boom.

CAUTION: Make sure crane, slings, and chains have sufficient capacity to support the weight of the boom. A 2-section boom assembly weighs approximately 4,200 pounds.



J1072

#	Description
1	Lock Pin
2	Lockwasher
3	Capscrew
4	Pivot Pin, Rear Carriage Tilt Cyl.

#	Description
5	Pivot Pin, Boom Hoist Cylinder
6	Rear Carriage Tilt Cylinder
7	Boom Hoist Cylinder
8	Boom

Fig. 6-69: Cylinder Pivot Pins

9. (Ref. Fig. 6-69) Remove four (4) capscrews (Item 3) and lockwashers (Item 2) from lock pins (Item 1) securing rear carriage tilt cylinders (Item 6) and boom hoist cylinders (Item 7) to the boom (Item 8). Remove four (4) lock pins from pivot pins (Items 4 and 5).

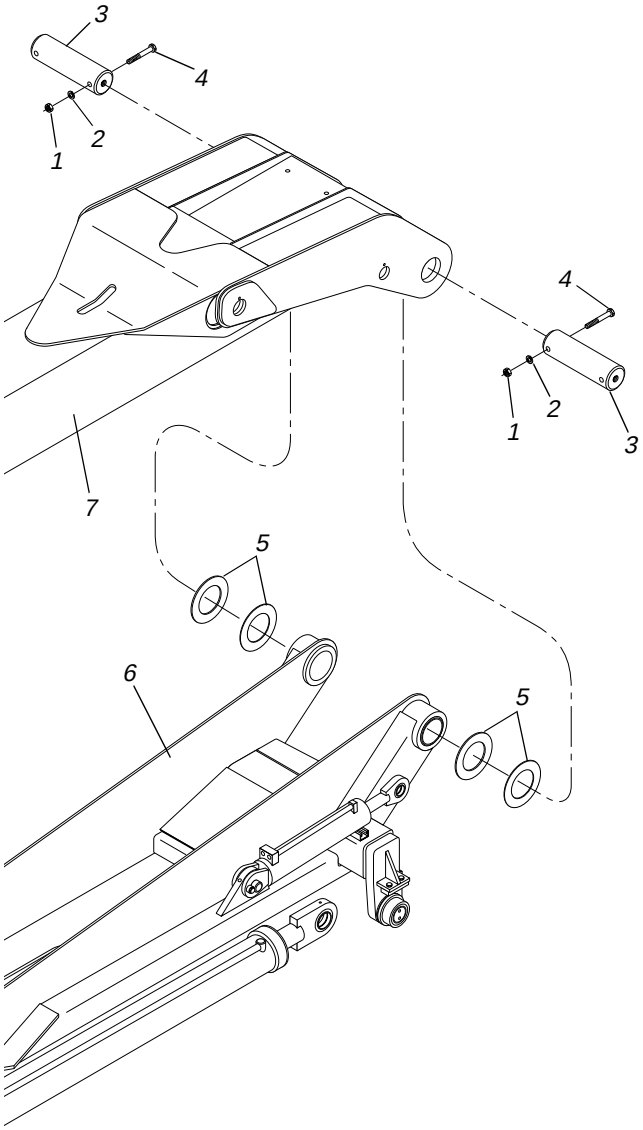
CAUTION: Make sure each cylinder is fully supported so it does not fall and cause personal or equipment damage when it is being removed.

10. (Ref. Fig. 6-69) Starting at a rear carriage tilt cylinder (Item 6), use a slide hammer puller threaded into the pivot pin (Item 4) to remove the pin from the boom. After the pivot pin has been removed, allow the cylinder to swing down and away from the boom.

CAUTION: Use suitable blocking to support the cylinder and prevent damage to the surrounding structure.

11. (Ref. Fig. 6-69) Repeat Step 10 for the remaining rear carriage tilt cylinder.

12. (Ref. Fig. 6-69) Continue with each of the two (2) the hoist cylinders (Item 7) by using a slide hammer puller threaded into pivot pin to remove it. After the pivot pin has been removed, allow the cylinder to swing down and away from the boom.



#	Description
1	Nut
2	Lockwasher
3	Boom Pivot Pin
4	Bolt

#	Description
5	Shims
6	Transfer Carriage/Boom Cradle
7	Boom Assembly

Fig. 6-70: Boom Pivot Pins, 2-Section

13. (Ref. Fig. 6-70) Remove two (2) nuts (Item 1), lockwashers (Item 2), and capscrews (Item 4) from the boom pivot pins (Item 3).

CAUTION: Make sure slings and chains are secure and crane is supporting the weight of the boom.

14. (Ref. Fig. 6-70) Using the slide hammer puller, remove the two (2) boom pivot pins and shims (Item 5).
15. (Ref. Fig. 6-70) Carefully lift the boom assembly (Item 7) clear of the transfer carriage/boom cradle (Item 6).
16. Swing the boom away from the machine and position it above a firm, level surface.

Installation

2-Section Boom

1. Using slings/chains and a crane, position the boom over the transfer carriage/boom cradle. Carefully lower the boom and align the boom pivot bosses with the matching bosses in the transfer carriage/boom cradle.
2. (Ref. Fig. 6-70) Partially insert the two (2) boom pivot pins (Item 3) to temporarily secure the boom pivot. Check gaps between the boom pivot boss and the matching bosses in the transfer carriage/boom cradle. Select appropriate shim sizes to center the boom in the transfer carriage/boom cradle.
3. Slide the boom pivot pins out one at a time and insert the required shims. Fully insert the boom pivot pins. Apply thread locking compound to the capscrew. Secure the pivot pins with two (2) capscrews, lockwashers, and nuts.
4. (Ref. Fig. 6-69) Align rod-end of a boom hoist cylinder with the matching boss on the boom. Apply thread locking compound to the capscrew. Insert pivot pin and secure with lock pin, lockwasher, and capscrew. Repeat this procedure for the other hoist cylinder and rear carriage tilt cylinders.
5. The slings/chains and crane may be removed at this point.
6. (Ref. Fig. 6-68) Connect the two (2) auxiliary hydraulic hoses and two (2) carriage tilt hoses to the rear of the boom.
7. Connect the two (2) hoses to the boom extension cylinder.
8. Lubricate all pivot grease fittings with EP lithium based grease.
9. Install boom elevation proximity switch in transfer carriage/boom cradle. See “Boom Elevation Proximity Switch” in Section 7.
10. Install quick attach assembly to boom. See page 6-59.
11. Start engine and cycle the frame tilt fully several times. Raise the boom, noting that **Rear Osc Lock** light illuminates when boom is at about 40° elevation. If light does not illuminate, stop and lower the boom. Follow procedures for adjustment under “Boom Elevation Proximity Switch” in Section 7. Complete proximity switch adjustment before proceeding to Step 12.

12. Cycle all boom hydraulics several times to remove air from system. Retract and lower boom to ground and shut off engine.
13. Inspect hydraulic connections for leaks and tighten as necessary.

Disassembly

2-Section Boom

1. Remove boom assembly from machine. See page 6-69.
2. Remove the front carriage tilt cylinder. See page 6-18.
3. Place the boom assembly on work stands in an upright position.

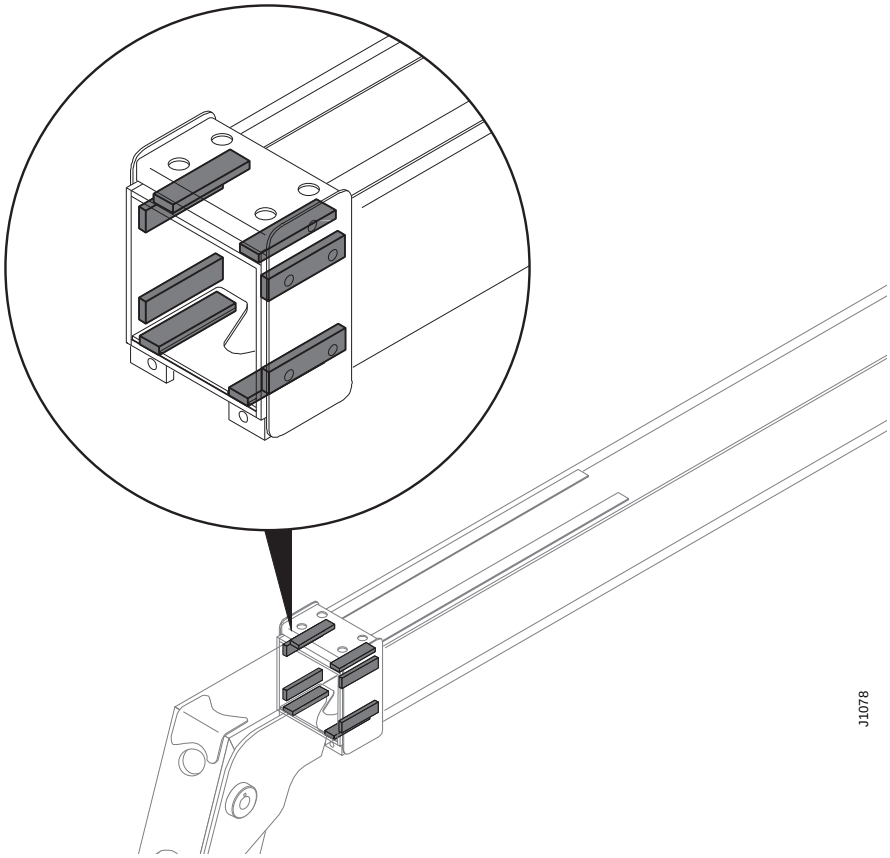


Fig. 6-71: Front Slide Pads, Outer Boom

4. (Ref. Fig. 6-71) Remove eight (8) slide pads and attaching hardware from the front of the outer boom section.

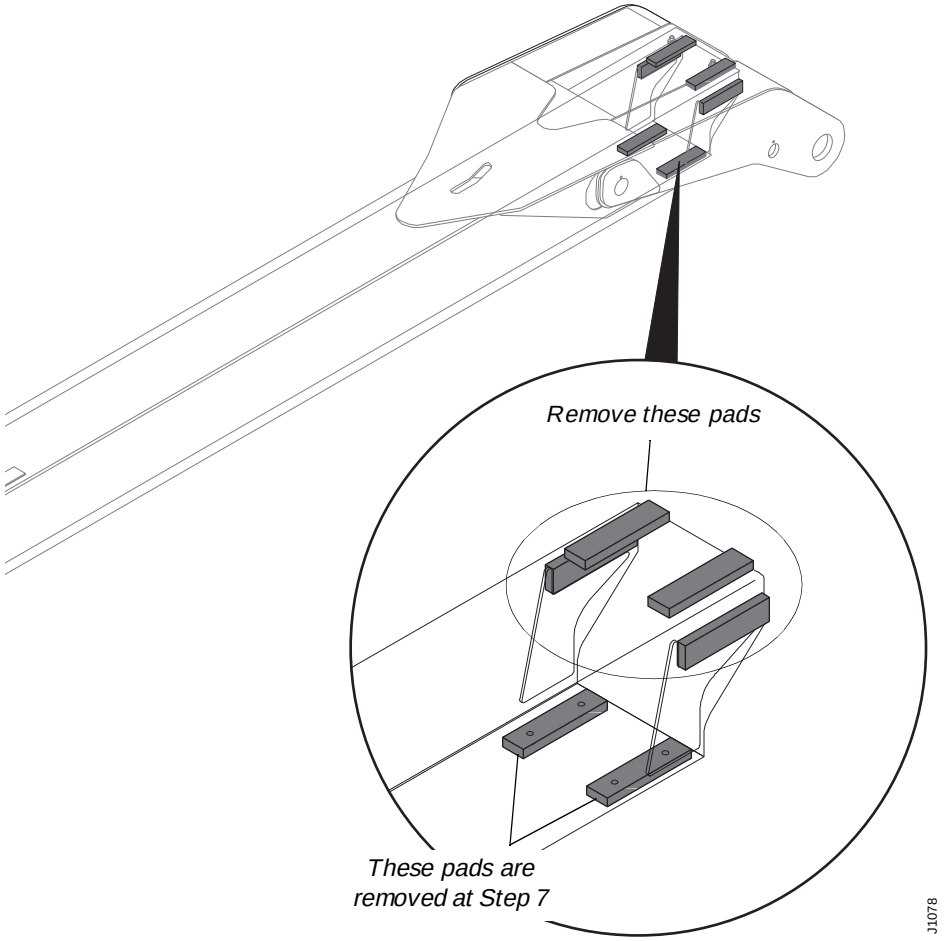
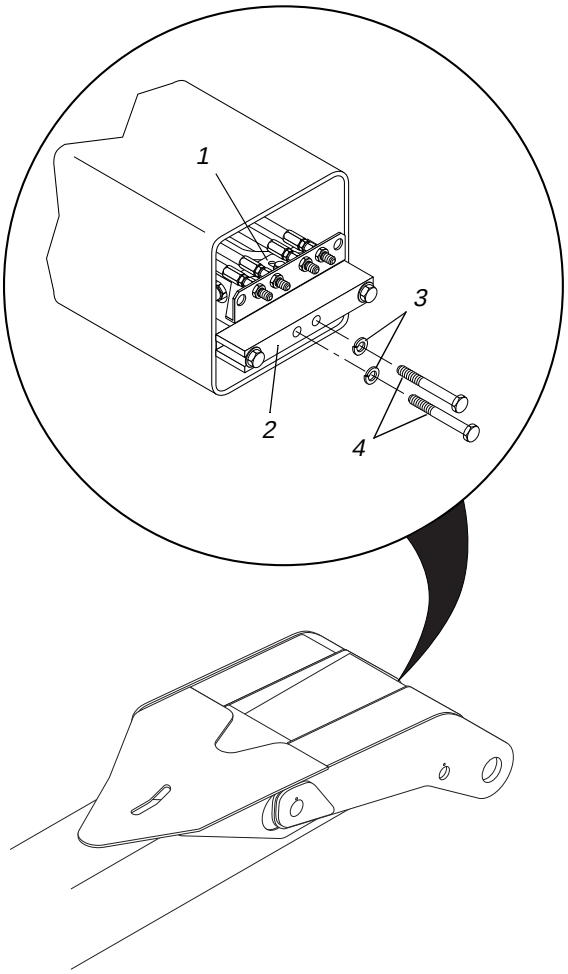


Fig. 6-72: Rear Slide Pads, Inner Boom

5. (Ref. Fig. 6-72) Remove four (4) upper slide pads from the rear of the inner boom section. Leave the lower rear pads installed to protect the outer boom section during separation.

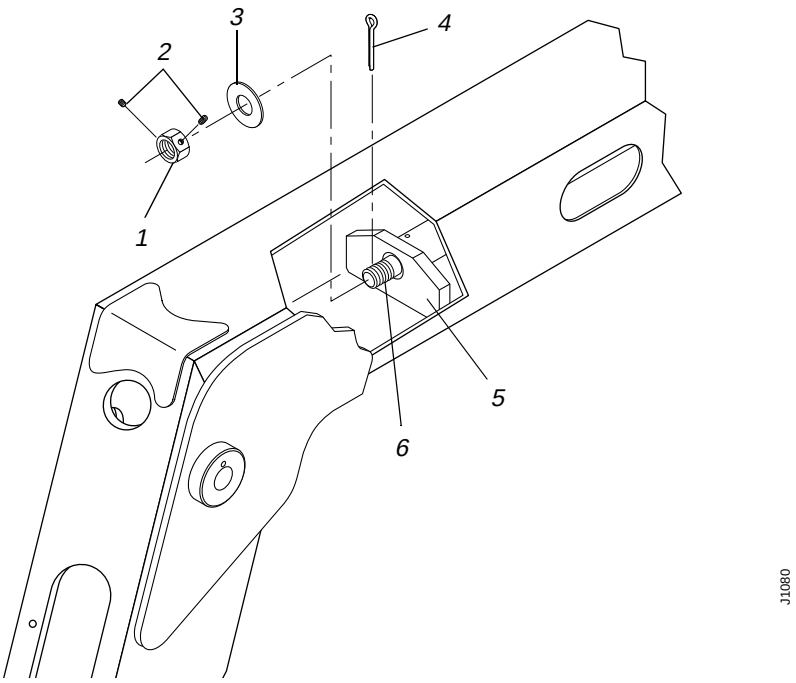


#	Description
1	Extension Cylinder
2	Rear Support

#	Description
3	Lockwasher
4	Capscrew

Fig. 6-73: Extension Cylinder Rear Support

6. (Ref. Fig. 6-73) Place a block between the extension cylinder (Item 1) and the inner boom. Remove two (2) capscrews (Item 4) and lockwashers (Item 3) securing the extension cylinder to the rear support (Item 2).
7. Carefully slide the inner boom section out until the lower rear slide pads are visible in the most forward window of the outer boom section.
8. (Ref. Fig. 6-72) Remove two (2) lower rear slide pads and attaching hardware from the inner boom section.
9. Support the inner boom section and slide it out from the outer boom section. Place the inner boom section on work stands in an upright position.



#	Description
1	Nut
2	Setscrew
3	Washer

#	Description
4	Cotter Pin
5	Mounting Block
6	Extension Cylinder

Fig. 6-74: Extension Cylinder Rod End

10. (Ref. Fig. 6-74) Loosen the two (2) setscrews (Item 2) in the extension cylinder nut (Item 1). Remove the nut and washer (Item 3).
11. (Ref. Fig. 6-74) For models with a 2" diameter rod in the boom extension cylinder (Item 6), remove the cotter pin (Item 4). Models with a 2.25" diameter rod do not have a cotter pin; proceed to Step 12.

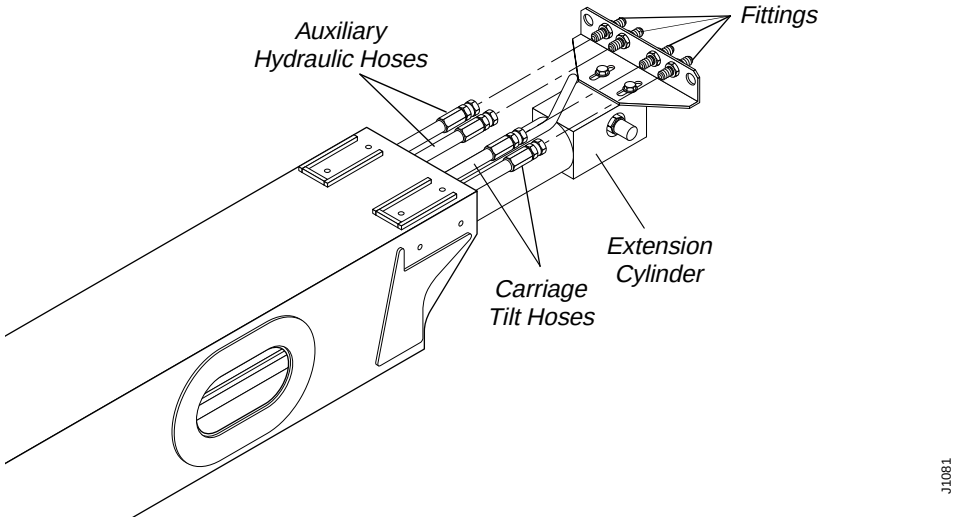


Fig. 6-75: Hose Connections at Extension Cylinder

Note: *"K" Model machines are not equipped with auxiliary hydraulics. For these models, disregard procedures that refer to auxiliary hydraulic components.*

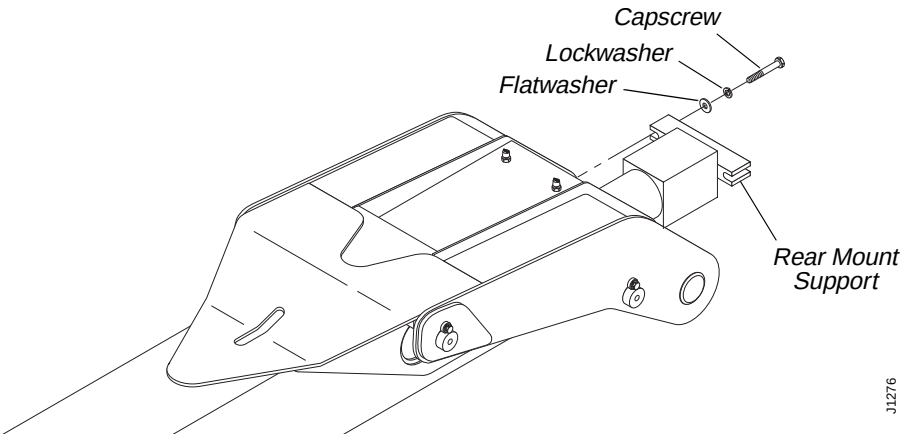


Fig. 6-76: Rear Boom Extension Cylinder Mount Support Installation

12. (Ref. Fig. 6-76) Support the boom extension cylinder and remove the two (2) capscrews, lockwashers, and flatwashers securing the rear mount support to the outer boom.
13. (Ref. Fig. 6-75) Slide the extension cylinder back about a foot. Tag and disconnect two (2) carriage tilt and two (2) auxiliary hydraulics hoses from the fittings at the extension cylinder. Cap hoses and fittings.

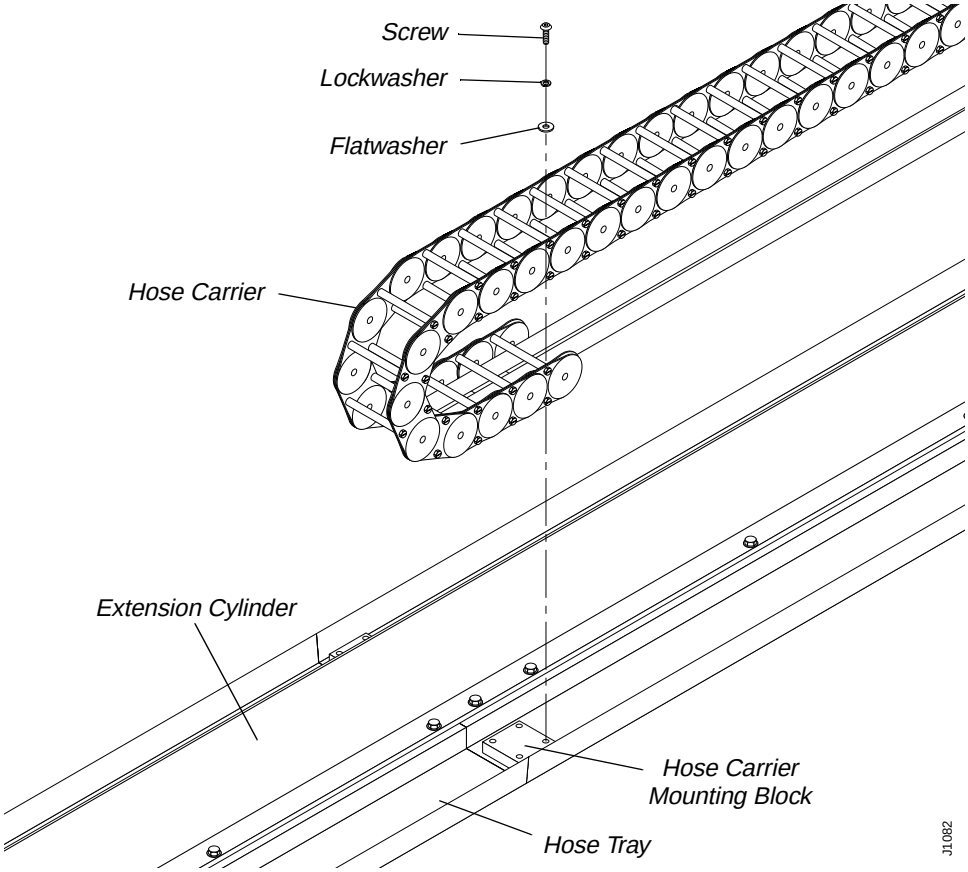


Fig. 6-77: Hose Carrier to Tray Attachments

14. (Ref. Fig. 6-77) Slide the extension cylinder out until the lower hose carrier attachments are accessible. Remove four (4) screws, lockwashers, and flatwashers securing each hose carrier to the hose tray.

15. Remove the extension cylinder from the inner boom section.
16. Rotate the inner boom section upside down.

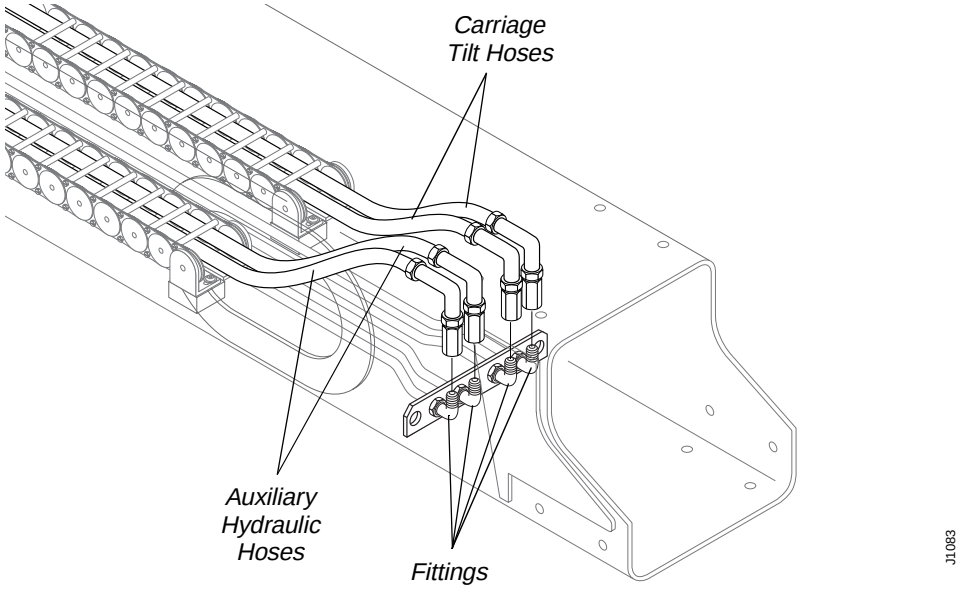


Fig. 6-78: Hose Connections in Inner Boom

17. (Ref. Fig. 6-78) Tag and disconnect two (2) carriage tilt and two (2) auxiliary hydraulics hoses from the fittings in the boom. Cap hoses and fittings.

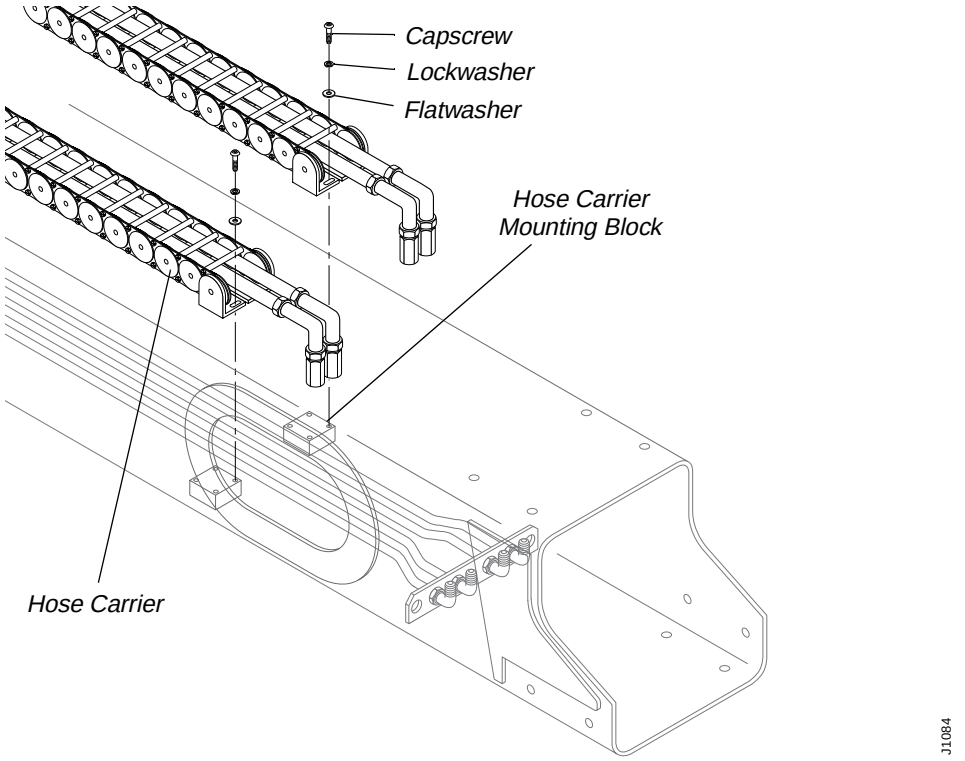


Fig. 6-79: Hose Carrier to Boom Attachments

18. (Ref. Fig. 6-79) Remove four (4) capscrews, lockwashers, and flatwashers securing each hose carrier to the boom section. Remove the hose carrier(s) and hoses from the boom.

Assembly

2-Section Boom

1. (Ref. Fig. 6-79) With the inner boom section lying upside down, position two (2) hose carriers (with hoses) in the boom, secure each carrier with four (4) screws, lockwashers, and washers. Apply thread locking compound to the screws before installing them.
2. (Ref. Fig. 6-78) Connect two (2) carriage tilt and two (2) auxiliary hydraulics hoses to the fittings in the boom.
3. Apply EP lithium based grease to the bottom surface of the inner boom section (slide pad slide areas).
4. Rotate the inner boom section to an upright position.
5. Apply EP lithium based grease to the inside, top surface of the outer boom section (slide pad slide areas).
6. (Ref. Fig. 6-77) Align the slide pad on the extension cylinder with the channel in the boom, then slide the cylinder partially into the boom so that the lower hose carrier brackets may be attached to the hose trays. Apply thread locking compound to the screws. Secure each hose carrier with four (4) screws, lockwashers, and washers.
7. (Ref. Fig. 6-75) Continue to slide the extension cylinder into the boom section until it is nearly fully inserted. Connect two (2) carriage tilt and two (2) auxiliary hydraulics hoses to the fittings at the extension cylinder.
8. (Ref. Fig. 6-74) Align the rod end of the extension cylinder with the hole in the boom mounting block. Fully insert the cylinder into the boom.
9. (Ref. Fig. 6-74) Install a washer and nut onto the cylinder rod end. Torque the nut to 1,640 ft-lbs and secure it with two (2) setscrews.
10. (Ref. Fig. 6-74) For models with a 2" diameter rod in the boom extension cylinder, install a cotter pin. Models with a 2.25" diameter rod do not have a cotter pin; proceed to Step 11.
11. Support the inner boom section and carefully slide it into the outer boom section until the rear of the inner section is visible in the forward window of the outer boom section.
12. Install two (2) lower rear slide pads and attaching hardware onto the inner boom.
13. (Ref. Fig. 6-73) Fully insert the inner boom section into the outer section. Secure the extension cylinder to the rear cylinder support with two (2) capscrews and lockwashers. Torque the capscrews to 280 ft-lbs.
14. Install the slide pads and shims according to drawing specifications.
15. Install the front carriage tilt cylinder. See page 6-19.

Extension Cylinder

2-Section Boom

Description

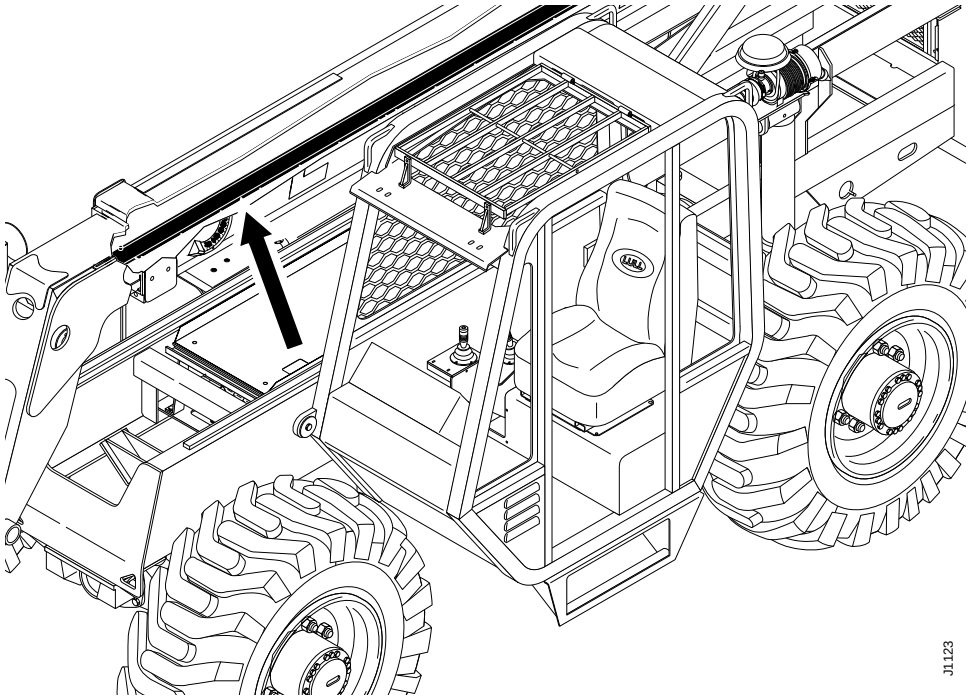


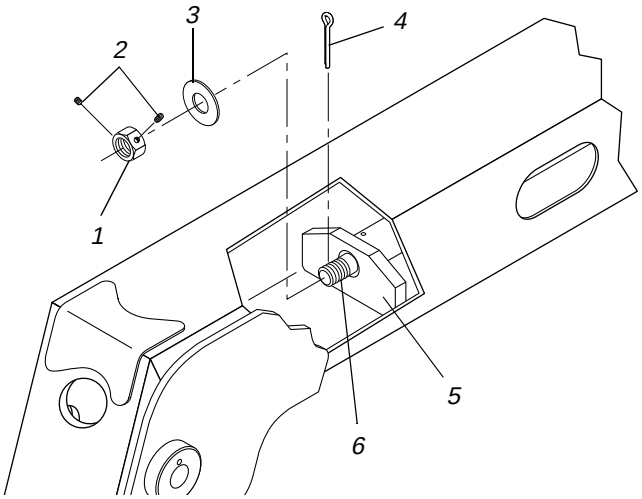
Fig. 6-80: 2-Section Boom Extension Cylinder

(Ref. Fig. 6-80) The boom extension cylinder controls extension and retraction of the boom. For models with a 2-section boom, it is located inside the boom. Operating pressure is at 3000 psi.

Removal, Boom Extension Cylinder

The following procedure describes removal of the boom extension cylinder.

1. Follow safety guidelines as outlined in Section 1 of this manual. Make sure to park the machine on a level surface and use appropriate tools when working with heavy equipment. Always make sure to follow safety precautions when dealing with hydraulic fluid under pressure.
2. Remove attachment. See page 6-54.
3. Remove the Quick Attach. See page 6-58.
4. Remove the front carriage tilt cylinder. See page 6-18.

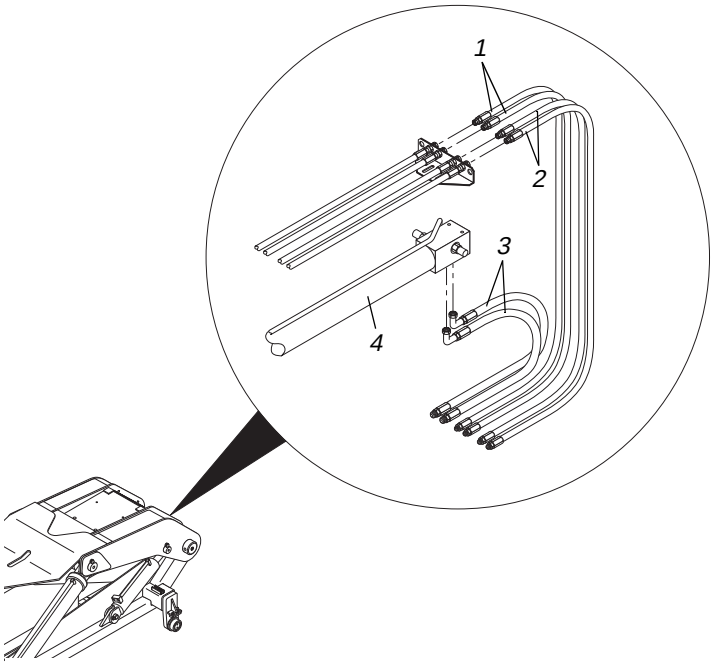


#	Description
1	Nut
2	Setscrew
3	Washer

#	Description
4	Cotter Pin
5	Mounting Block
6	Extension Cylinder

Fig. 6-81: Extension Cylinder Rod End

5. (Ref. Fig. 6-81) Level the boom. Then loosen the two (2) setscrews (Item 2) in the extension cylinder nut (Item 1). Remove the nut and washer (Item 3).
6. (Ref. Fig. 6-81) For models with a 2" diameter rod in the boom extension cylinder (Item 6), remove the cotter pin (Item 4). Models with a 2.25" diameter rod do not have a cotter pin; proceed to Step 7.



#	Description
1	Auxiliary Hydraulic Hoses
2	Carriage Tilt Hoses

#	Description
3	Boom Extension Hoses
4	Boom Extension Cylinder

Fig. 6-82: Hose Connections, 2-Section Boom

7. (Ref. Fig. 6-82) Tag and disconnect two (2) hoses (Item 3) at the boom extension cylinder (Item 4). Cap hoses and fittings.
8. (Ref. Fig. 6-82) Tag and disconnect two (2) carriage tilt hoses (Item 2), and two (2) auxiliary hydraulics hoses (Item 1) at the boom. Cap hoses and fittings.

Note: *"K" Model machines are not equipped with auxiliary hydraulics. For these models, disregard procedures that refer to auxiliary hydraulic components.*

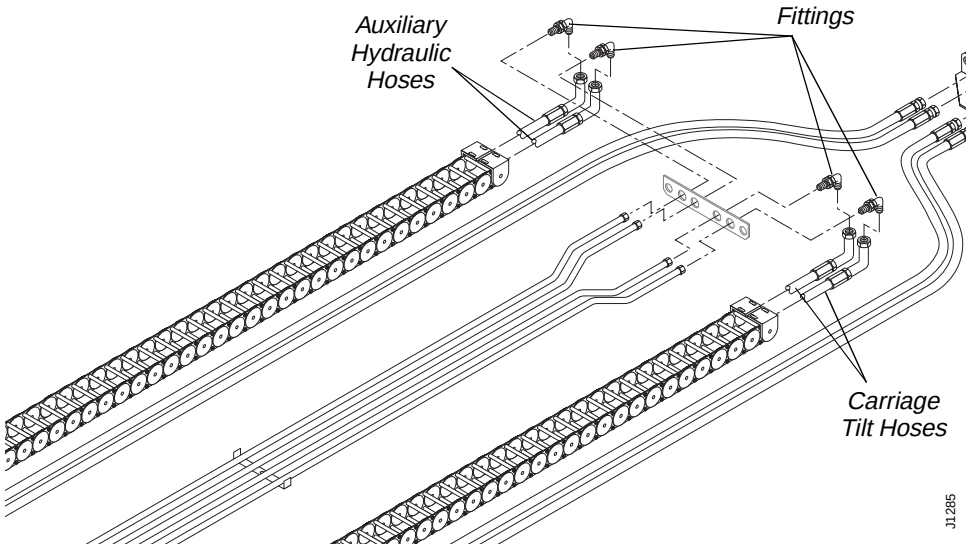


Fig. 6-83: Hose Connections in Inner Boom

9. (Ref. Fig. 6-83) Tag and disconnect two (2) carriage tilt and two (2) auxiliary hydraulics hoses from the fittings in the boom. Cap hoses and fittings.

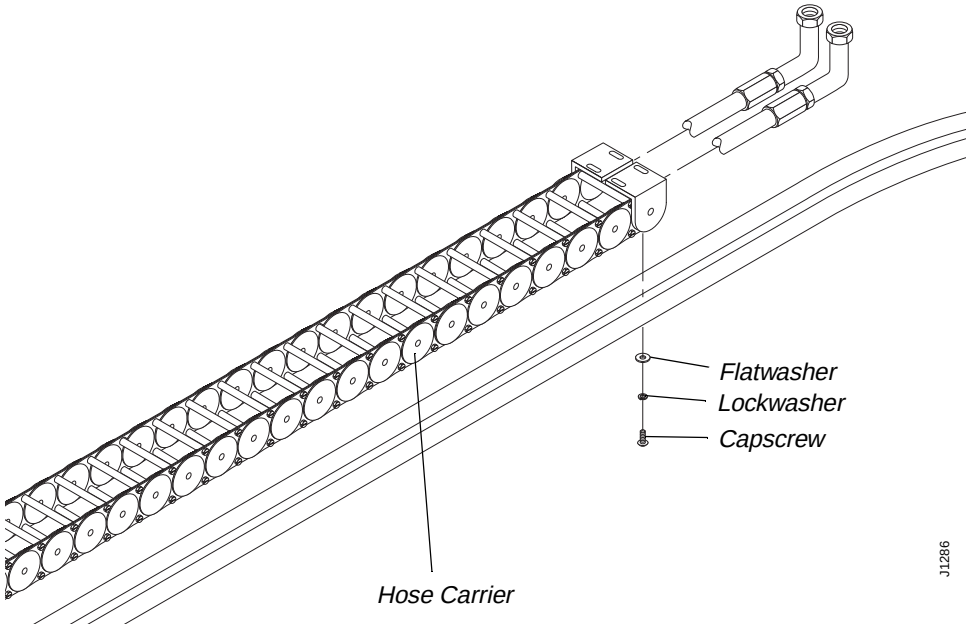


Fig. 6-84: Hose Carrier in Inner Boom

10. (Ref. Fig. 6-84) Remove four (4) capscrews, lockwashers, and flatwashers securing each hose carrier to the boom section. Remove the hose carrier(s) and hoses from the boom.

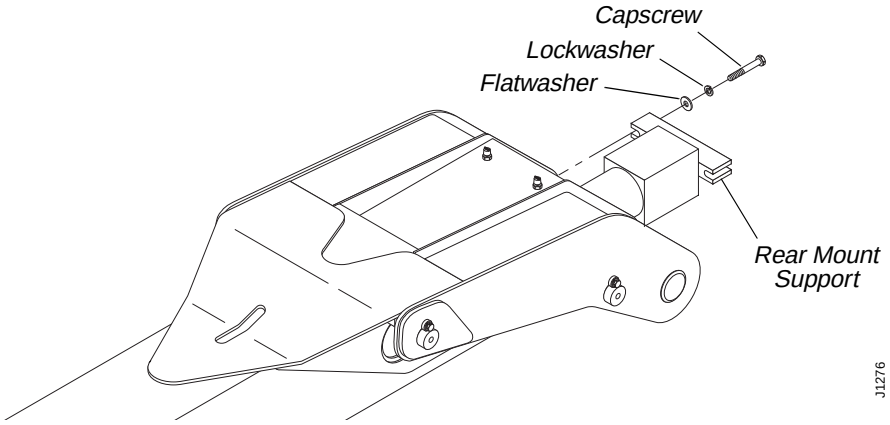
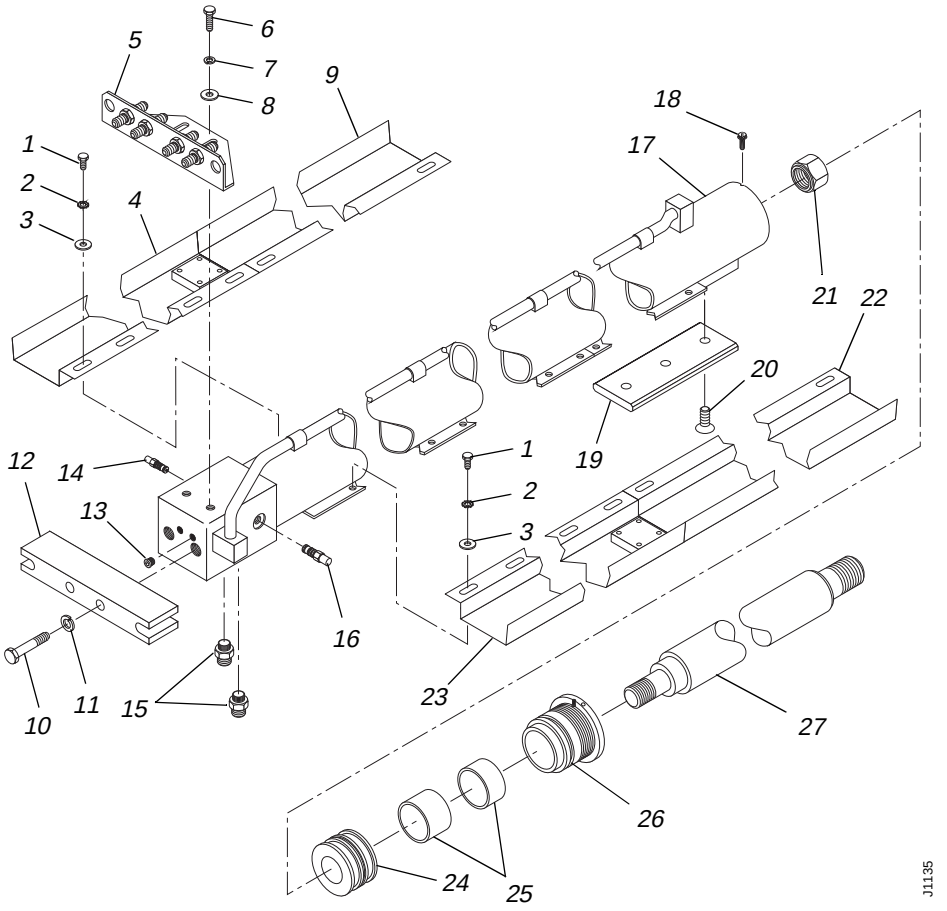


Fig. 6-85: Rear Boom Extension Cylinder Mount Support

11. (Ref. Fig. 6-85) Support the boom extension cylinder and remove the two (2) capscrews, lockwashers, and flatwashers securing the rear mount support to the outer boom. Remove the boom extension cylinder from the inner boom section.



#	Description
1	Capscrew
2	Lockwasher
3	Flatwasher
4	Rear Hose Tray - R.H.
5	Hose Mounting Bracket
6	Capscrew
7	Lockwasher
8	Flatwasher
9	Front Hose Tray
10	Capscrew
11	Lockwasher
12	Rear Mount Support
13	Hollow Hex O-ring Plug
14	Counterbalance Valve Cartridge

#	Description
15	O-ring Connector
16	Counterbalance Valve Cartridge
17	Cylinder Barrel
18	Setscrew
19	Slide Plate
20	Flat Head Socket Screw
21	Rod Nut
22	Front Hose Tray
23	Rear Hose Tray - L.H.
24	Piston
25	Stroke Limiter
26	Rod Bearing Head
27	Cylinder Rod

Fig. 6-86: 2-Section Boom Extension Cylinder Assembly

12. (Ref. Fig. 6-86) Remove the two capscrews (Item 6), lockwashers (Item 7), and flatwashers (Item 8) securing the hose mounting bracket (Item 5) to the cylinder manifold. Remove the hose mounting bracket.
13. (Ref. Fig. 6-86) Remove the two (2) capscrews (Item 10) and lockwashers (Item 11) securing the rear mount support (Item 12) to the cylinder manifold. Remove the rear mount support.

14. (Ref. Fig. 6-86) Remove the hardware securing the hose tray assembly(ies) (Items 4 and 9 and Items 22 and 23) to the boom extension cylinder. This includes capscrews (Item 1), lockwashers (Item 2), and flatwashers (Item 3). Remove the hose tray assemblies.

Note: *The 6K-37 has one hose tray assembly and seventeen (17) sets of hardware while the 644B-37 has two hose tray assemblies and thirty-four sets of hardware.*

15. (Ref. Fig. 6-86) Remove the three (3) flat head socket screws (Item 20) securing the slide plate (Item 19) to the boom extension cylinder. Remove the slide plate.

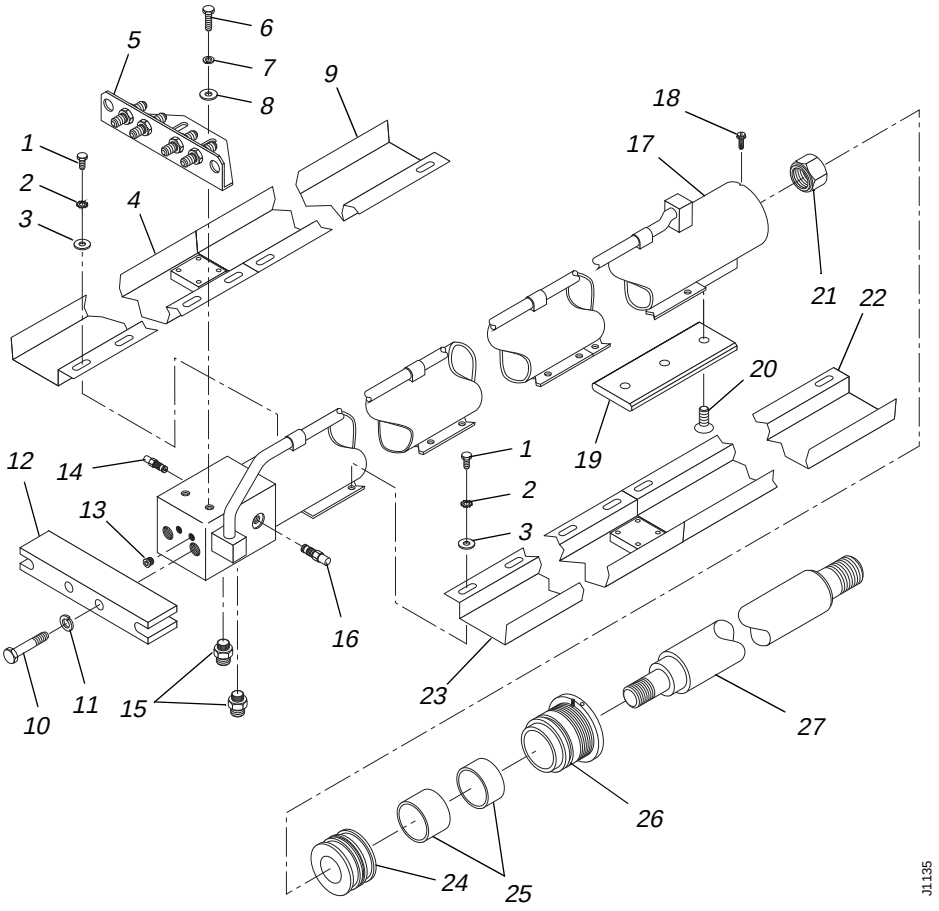
Installation, Boom Extension Cylinder

The following procedures describes installation of the boom extension cylinder.

1. (Ref. Fig. 6-86) Apply thread locking compound to the flat head socket screws (Item 20). Install the slide plate (Item 19) on the boom extension cylinder using three (3) flat head socket screws. Torque the flat head screws to 35 ft-lbs.
2. (Ref. Fig. 6-86) Apply thread locking compound to the capscrews (Item 1). Install the hose tray assembly(ies) (Items 4 and 9 and Items 22 and 23) on the boom extension cylinder with seventeen (17) flatwashers (Item 3), lockwashers (Item 2), and capscrews (Item 1) for each assembly. Torque the capscrews to 156 in-lbs.
3. (Ref. Fig. 6-86) Install rear mount support (Item 12) on the cylinder manifold with two (2) lockwashers (Item 11) and capscrews (Item 10). Torque the capscrews to 200 ft-lbs.
4. (Ref. Fig. 6-86) Install hose mounting bracket (Item 5) on the cylinder manifold with two (2) flatwashers (Item 8), lockwashers (Item 7), and capscrews (Item 6). Torque the capscrews to 276 in-lbs.
5. Use suitable lifting devices to install the boom extension cylinder along with the two hose carriers and hoses in the inner boom section.
6. (Ref. Fig. 6-83) Connect the two (2) carriage tilt and two (2) auxiliary hydraulic hoses to the fittings in the boom. Torque the hose swivel nuts to 50–58 ft-lbs.
7. (Ref. Fig. 6-81) Move the extension cylinder forward to make sure the threaded portion of the cylinder rod is properly lined up with the opening in the mounting block.
8. (Ref. Fig. 6-85) Secure the rear mount support to the outer boom section with two (2) flatwashers, lockwashers, and capscrews. Torque the capscrews to 200 ft-lbs.
9. (Ref. Fig. 6-82) Install two (2) carriage tilt hoses (Item 2), and two (2) auxiliary hydraulics hoses (Item 1) to the connectors located on the tube mount bracket. Torque the hose swivel nuts to 50–58 ft-lbs.
10. (Ref. Fig. 6-82) Install two (2) hoses (Item 3) to the boom extension cylinder (Item 4). Torque the hose swivel nuts to 79–88 ft-lbs.

11. (Ref. Fig. 6-81) Secure the extension cylinder to the mounting block with a washer (Item 3) and extension cylinder nut (Item 1). Torque the nut to 1640 ft-lbs. Tighten the two (2) setscrews (Item 2) in the extension cylinder nut.
12. (Ref. Fig. 6-81) For models with a 2" diameter rod in the boom extension cylinder (Item 6), install the cotter pin (Item 4). Models with a 2.25" diameter rod do not have a cotter pin; proceed to Step 13.
13. Install the front carriage tilt cylinder. See page 6-19.

Overhaul, Boom Extension Cylinder



#	Description
1	Capscrew
2	Lockwasher
3	Flatwasher
4	Rear Hose Tray - R.H.
5	Hose Mounting Bracket
6	Capscrew
7	Lockwasher
8	Flatwasher
9	Front Hose Tray
10	Capscrew
11	Lockwasher
12	Rear Mount Support
13	Hollow Hex O-ring Plug
14	Counterbalance Valve Cartridge

#	Description
15	O-ring Connector
16	Counterbalance Valve Cartridge
17	Cylinder Barrel
18	Setscrew
19	Slide Plate
20	Flat Head Socket Screw
21	Rod Nut
22	Front Hose Tray
23	Rear Hose Tray - L.H.
24	Piston
25	Stroke Limiter
26	Rod Bearing Head
27	Cylinder Rod

Fig. 6-87: 2-Section Boom Extension Cylinder Assembly

(Ref. Fig. 6-87) The following procedure describes overhauling the 2-Section boom extension cylinder.

1. Remove the two (2) connectors (Item 15) from the manifold block on the cylinder barrel.

2. Mount or support the cylinder vertically with the 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 the cylinder 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.

   a. Place socket wrench over each counterbalance valve cartridge (Items 14 and 16). Wrap a clean shop rag around the socket to cover the area of the counterbalance valve cartridge.
   b. Carefully and slowly, turn the cartridge out of the manifold block to release pressure in cylinder.

4. Remove the counterbalance valve cartridges.
5. Slowly extend and retract the cylinder by hand to remove most of the hydraulic oil.
6. Remove the setscrew (Item 18) between the cylinder barrel and the rod bearing head (Item 26).
7. Using the three (3) holes in the side of the rod bearing head, install a spanner wrench and remove the head.
8. Remove the cylinder rod assembly from the cylinder barrel.

CAUTION: To prevent possible damage to components, support the cylinder rod assembly; do not wiggle the rod or head back and forth during removal.

9. Remove the rod nut (Item 21), piston (Item 24), stroke limiter(s) (Item 25), and rod bearing head from the cylinder rod (Item 27).

Note: *Models 644B-37 (S/N 258–) and 6K-37 (S/N 170–) have only one stroke limiter.*

10. Remove two (2) O-ring plugs (Item 13) from the cylinder manifold block.
11. Remove all O-rings, wear rings, and backup rings from the cylinder components; discard the rings.
12. Thoroughly clean all components with solvent and dry with compressed air. Inspect and replace if damaged.
13. Inspect the inner surface of the barrel, the outer surface of the piston, and the length of rod for scratches and scoring. If the barrel, piston, or rod is damaged, it must be replaced.
14. Check condition of the threads on the rod, nut, and capscrews. Do not attempt to repair damaged threads.

15. Inspect counterbalance valve cartridges (Items 14 and 16), including O-rings, for condition and replace as necessary. Do not disassemble cartridges. Service to counterbalance valve cartridges is limited to installing new O-rings and replacing the entire cartridge.
16. Lubricate a new O-ring with hydraulic oil and install it inside the piston (seals the rod to the piston).
17. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install them on the head. Using a seal driver, install a new wiper seal in the head. Lubricate the wiper seal with hydraulic oil.
18. Slide the rod bearing head (Item 26), stroke limiter(s), (Item 25) and piston (Item 24) onto the rod (Item 27). Lubricate threads on the rod with hydraulic oil and install the rod nut (Item 21). Torque the rod nut to 300 ft-lbs for 2" diameter rods or 550 ft-lbs for 2.25" diameter rods.
19. Lubricate a new seal and wear rings with hydraulic oil and install them on the piston.
20. Install the cylinder rod assembly in the cylinder barrel.
21. Using the three (3) holes in side the rod bearing head install a spanner wrench and tighten the rod bearing head until it is snug against the cylinder barrel. Make sure the threaded half hole in the head lines up with the other half in the cylinder barrel.
22. Apply thread locking compound and install the setscrew (Item 18) between the cylinder barrel and rod bearing head. Tighten until snug.
23. Lubricate the counterbalance valve cartridge O-rings with clean hydraulic oil.
24. Install the valve cartridge (Item 14) in the manifold block and torque to 30–35 ft-lbs.
25. Install the valve cartridge (Item 16) in the manifold block and torque to 40–45 ft-lbs.
26. Install two (2) O-ring plugs (Item 13) in the manifold block and torque to 30–40 in-lbs.
27. Install two (2) connectors (Item 15) on the cylinder manifold block. Torque the connectors to 85–95 ft-lbs.

3-Section Boom

Description

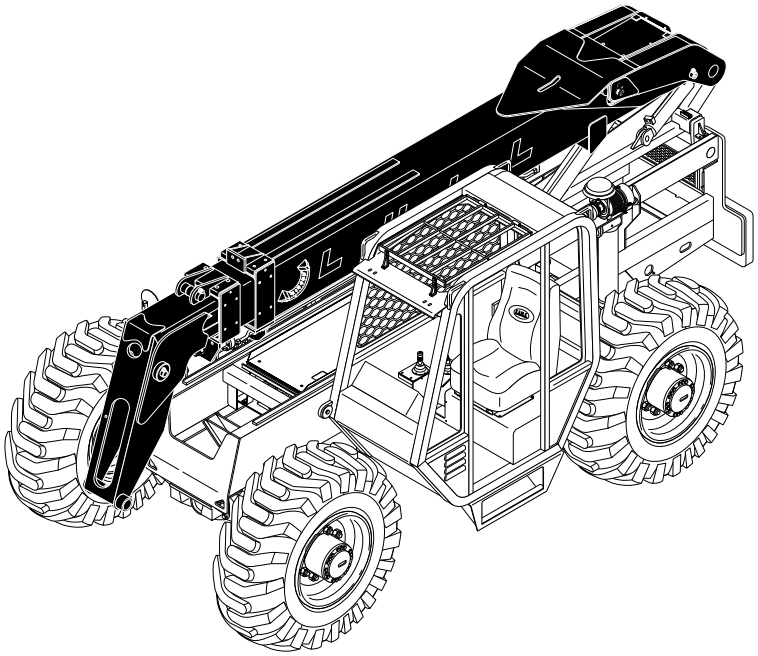
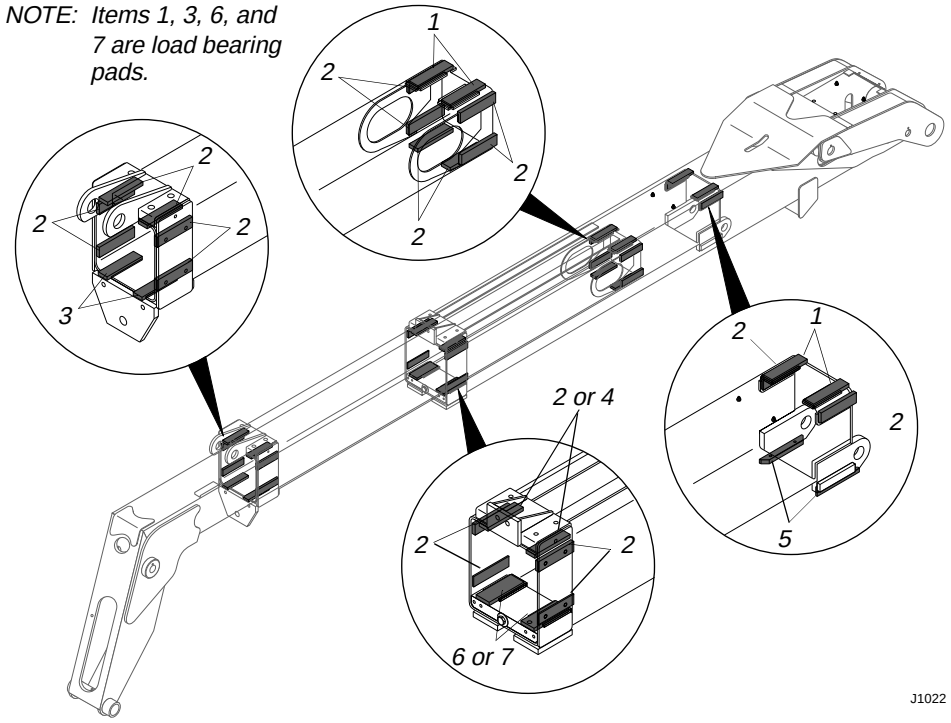


Fig. 6-88: 3-Section Boom

The 3-section boom is used on 644B-42, 6K-42, 844C-42, 8K-42, 1044C-42, and 10K-42 models. It is a fully synchronized slide boom with a 42 foot maximum lift height. The maximum forward reach on the 644B-42, 844C-42, and 1044C-42 is 32 feet. The 6K-42, 8K-42, and 10K-42 have a maximum reach of 25 feet, 6 inches.

Shimming Procedures

3-Section Boom



NOTE: Items 4 and 7 were used with early production units.
Items 2, 5, and 6 are used on models with the following serial numbers: 644B-42 (S/N 142–), 6K-42 (S/N 114–), 844C-42 (S/N 434–), 8K-42 (S/n 193–), 1044C-42 (S/N 111–), 10K-42 (S/N 101–)

#	Description
1	Boom Pad, 3/4" Thick x 2" Wide
2	Boom Pad, 9/16" Thick x 2" Wide
3	Boom Pad, 9/16" Thick x 2" Wide
4	Boom Pad, 7/16" Thick x 2" Wide

#	Description
5	Boom Pad, 3/4" Thick x 1-1/4" Wide
6	Boom Pad, 3/4" Thick x 3" Wide
7	Boom Pad, 5/8" Thick x 3" Wide

Fig. 6-89: Boom Slide Pad Locations, 3-Section Boom

1. Park the machine on a firm, level surface and apply the park brake. Level the frame. Level and fully retract the boom. Shut off the engine.
2. Determine if all boom slide pads are serviceable. (See “Slide Pad Inspection” on page 6-48). Have replacement pads ready as required.

Note: *Use thread locking compound on retaining hardware when installing slide pads.*

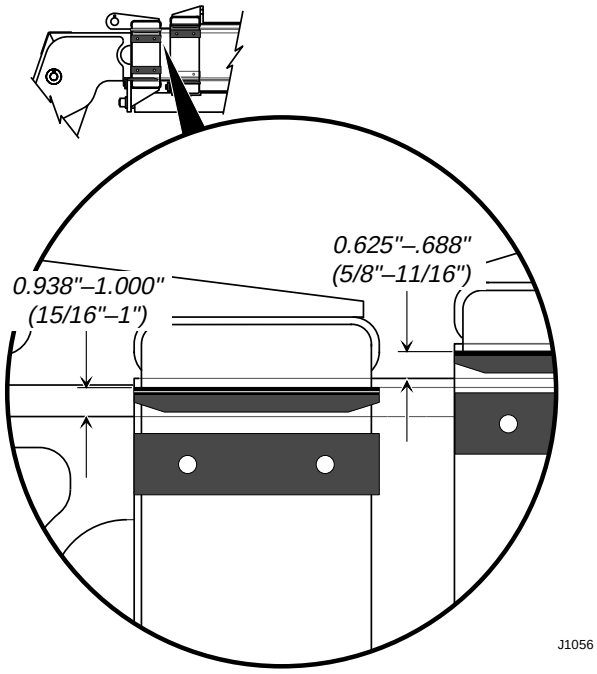


Fig. 6-90: Boom Section Gaps – Front of 3-Section Boom

3. (Ref. Fig. 6-90) Measure the gap between boom sections at all upper pads. If the dimensions are *not* within the specified range, proceed to Step 4. If the dimensions *are* within the specified range, proceed to Step 5.

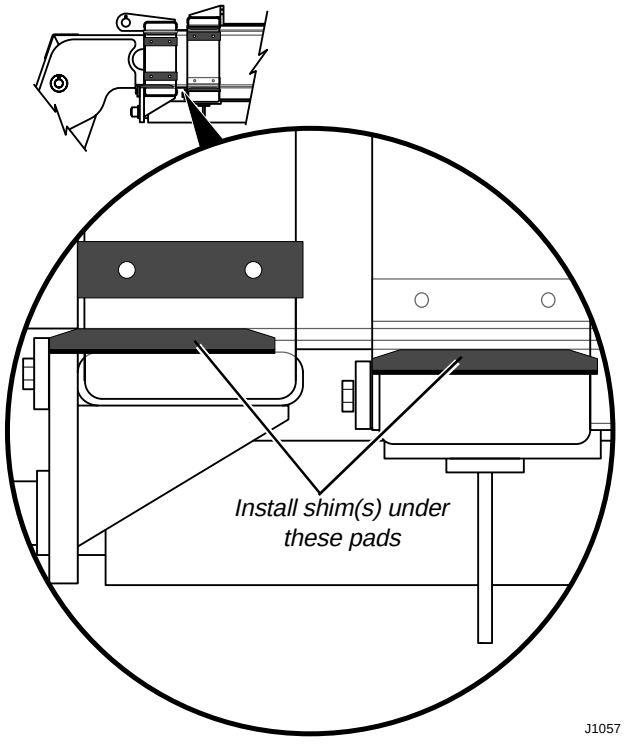


Fig. 6-91: Lower Shim Installation – Front of 3-Section Boom

4. (Ref. Fig. 6-91) Install/remove shim(s) under the indicated pads to obtain clearances specified in Step 3.

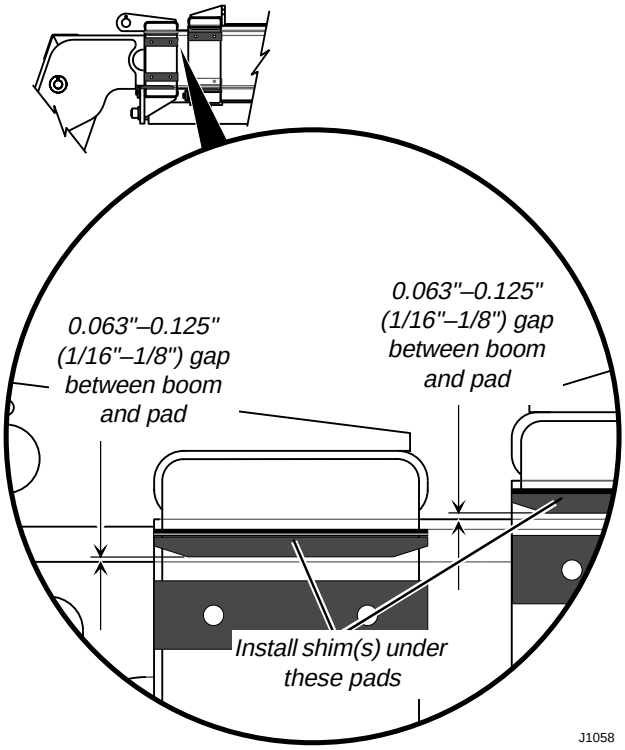


Fig. 6-92: Upper Shim Installation – Front of 3-Section Boom

5. (Ref. Fig. 6-92) Install/remove shim(s) under the indicated pads to obtain specified clearances.

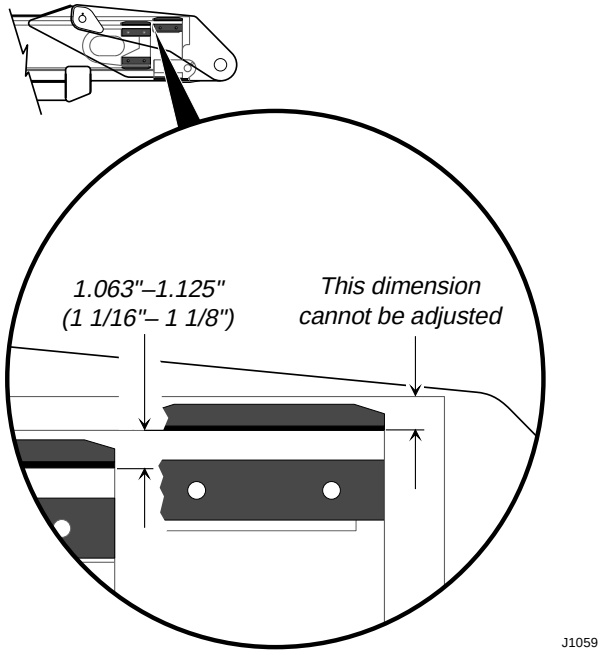


Fig. 6-93: Boom Section Gaps – Rear of 3-Section Boom

6. (Ref. Fig. 6-93) Measure the gaps between the inner and middle boom sections at the upper pads. Spacing between the middle and outer boom section cannot be adjusted. If the dimensions are *not* within the specified range, proceed to Step 7. If the dimensions *are* within the specified range, proceed to Step 8.

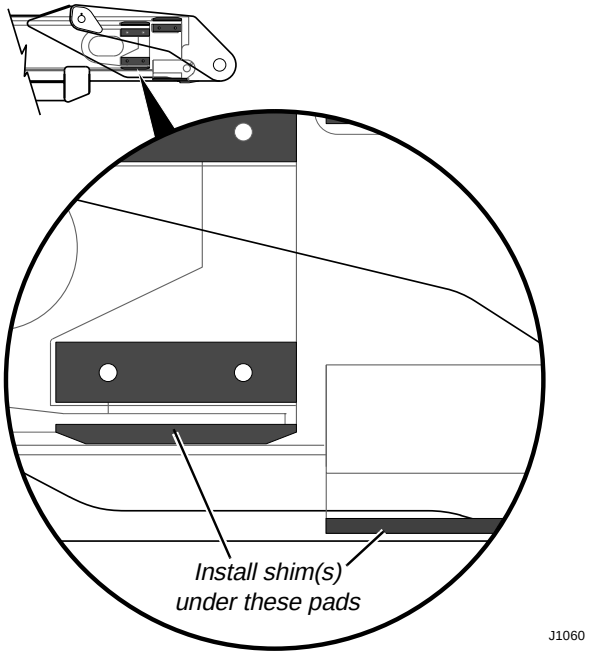


Fig. 6-94: Lower Shim Installation – Rear of 3-Section Boom

7. (Ref. Fig. 6-94) Install/remove shim(s) under the indicated pads to obtain clearance specified in Step 6.

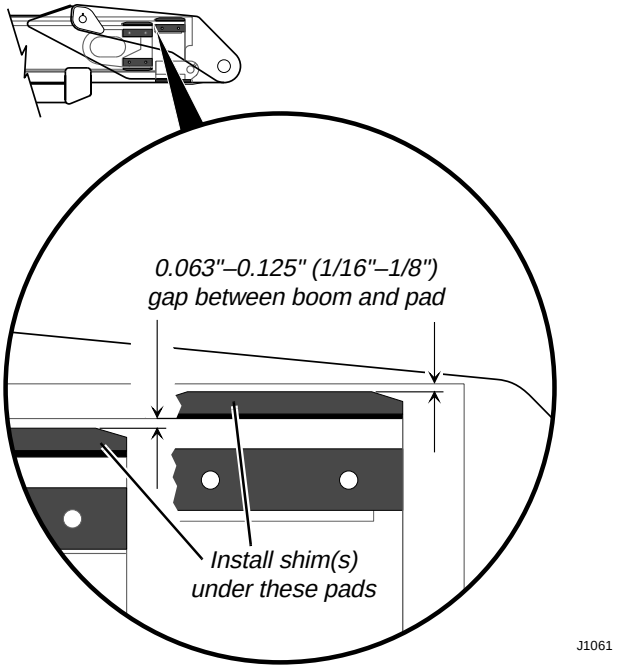


Fig. 6-95: Upper Shim Installation – Rear of 3-Section Boom

8. (Ref. Fig. 6-95) Install/remove shim(s) under the indicated pads to obtain specified clearance.

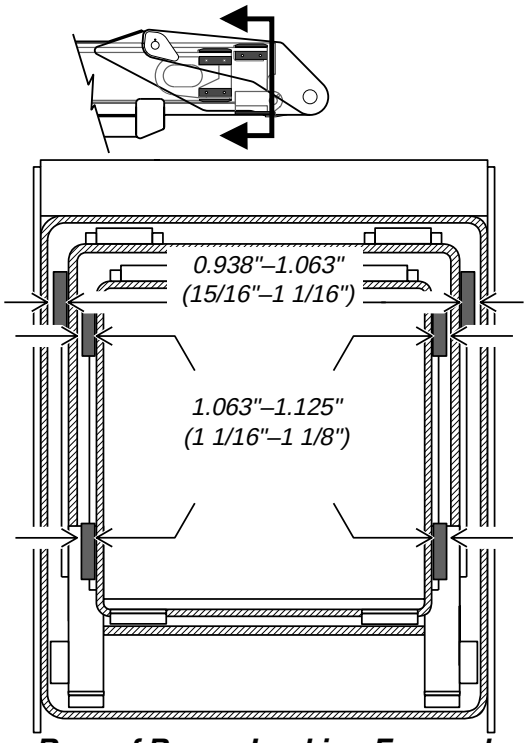


Fig. 6-96: Clearances Between Boom Sections – Rear of 3-Section Boom

9. Adjust boom positions to obtain clearances between boom sections as shown in Fig. 6-96. Measure these clearances at the slide pad locations.

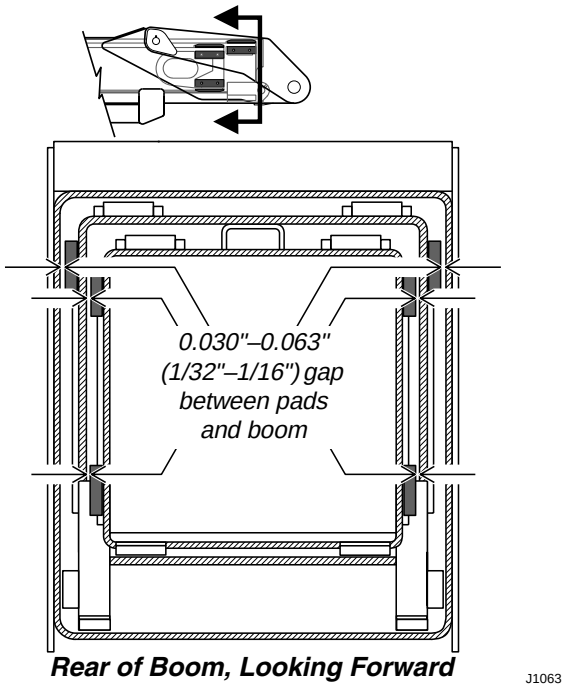


Fig. 6-97: Gaps Between Pads and Boom – Rear of 3-Section Boom

10. (Ref. Fig. 6-97) Install/remove shim(s) under the indicated pads to obtain specified clearances.

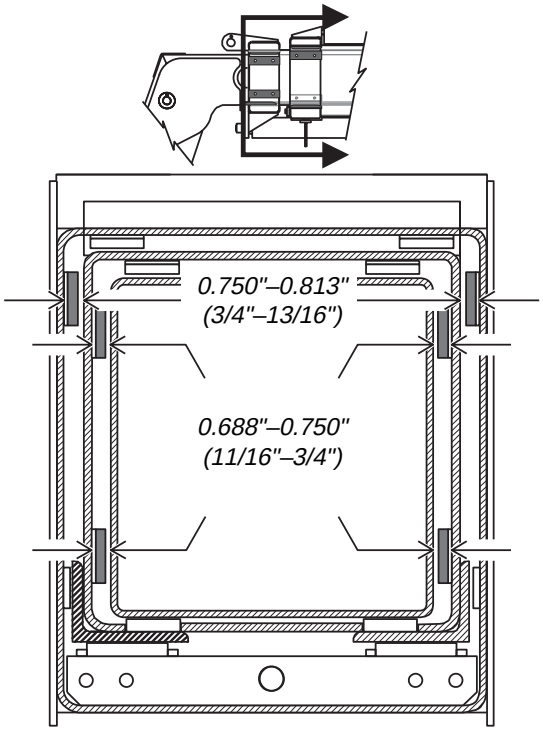


Fig. 6-98: Clearances Between Boom Sections – Front of 3-Section Boom

11. Adjust boom positions to obtain clearances between boom sections as shown in Fig. 6-98. Measure these clearances at the slide pad locations.

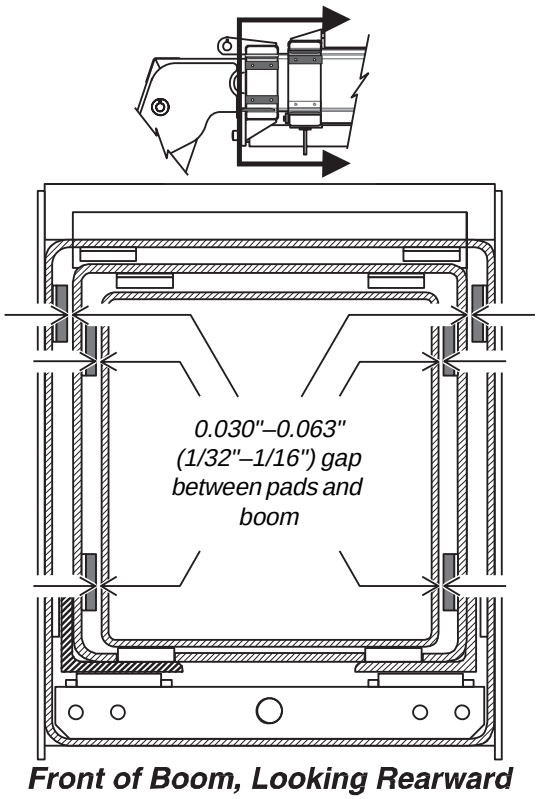


Fig. 6-99: Gaps Between Pads and Boom – Front of 3-Section Boom

12. (Ref. Fig. 6-99) Install/remove shim(s) under the indicated pads to obtain specified clearances.
13. Extend the boom and lubricate as per previous instructions.
14. Check the boom extension and retraction for binding against slide pads.

Inspection Procedures

3-Section Boom

These procedures are intended to determine if localized deformation has occurred on the inner and middle boom sections.

1. Extend the boom and lower the forks to the ground.

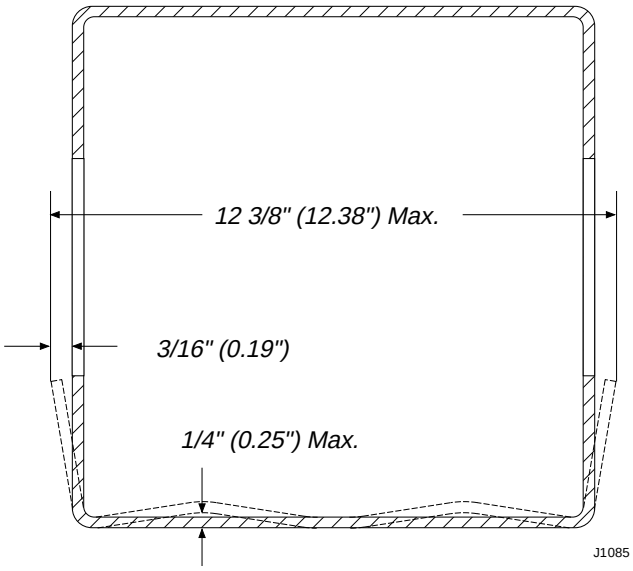


Fig. 6-100: Inner Boom Cross-Section at Window

2. (Ref. Fig. 6-100) Place a straight edge against the bottom surface of the inner boom section. Measure the distance from the straight edge to the bottom surface of the boom tube. This distance should not exceed 1/4" (0.25"). The maximum deflection will be found just in front of the middle boom section.
3. (Ref. Fig. 6-100) The side walls may also deflect outward at the window areas. Take this measurement across the inner boom tube, through the windows. Maximum allowable deflection is 3/16" (0.19) per side. The maximum allowable inner boom tube width is 12-3/8" (12.38"), measured through the windows.

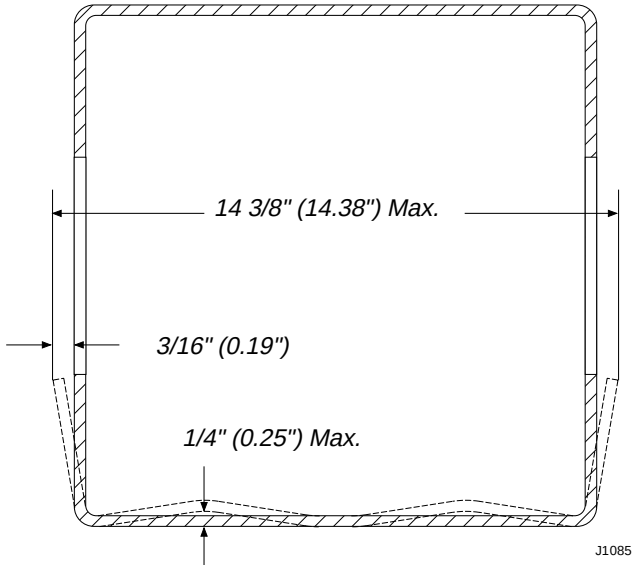


Fig. 6-101: Middle Boom Cross-Section at Window

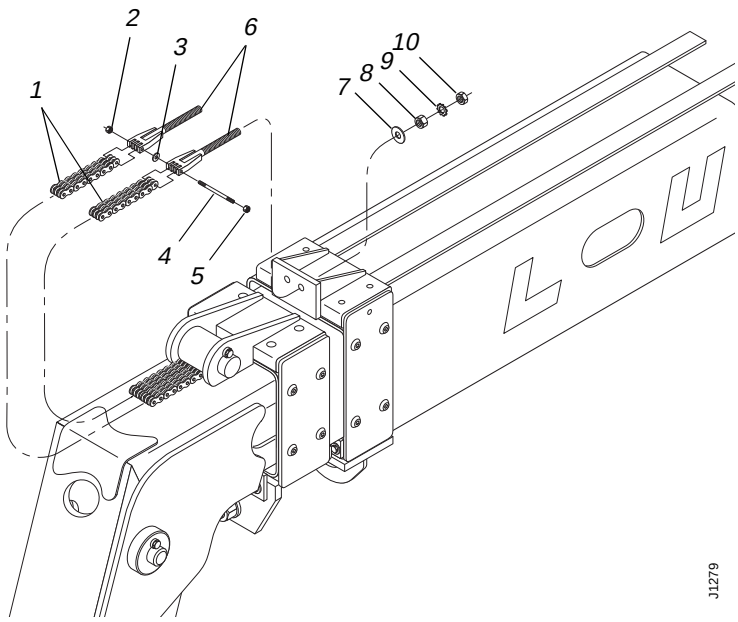
4. (Ref. Fig. 6-101) Place a straight edge against the bottom surface of the middle boom section. Measure the distance from the straight edge to the bottom surface of the boom tube. This distance should not exceed 1/4" (0.25"). The maximum deflection will be found just in front of the outer boom section.
5. (Ref. Fig. 6-101) The side walls may also deflect outward at the window areas. Take this measurement across the middle boom tube, through the windows. Maximum allowable deflection is 3/16" (0.19") per side. The maximum allowable middle boom tube width is 14-3/8" (14.38"), measured through the windows.

Removal and Disassembly

3-Section Boom

1. Follow safety guidelines as outlined in Section 1 of this manual. Make sure to park the machine on a level surface and use appropriate tools when working with heavy equipment. Always make sure to follow safety precautions when dealing with hydraulic fluid under pressure.
2. Remove attachment. See page 6-54.
3. Remove the Quick Attach. See page 6-58.
4. Retract the front carriage tilt cylinder all the way in.
5. Position the boom horizontally, pull the park brake, shut off the engine, and remove the key.
6. Loosen and remove the chain anchor adjustor from the top front of the outer boom. Machines were manufactured with three types of chain anchors. These are shown below. Follow the steps for the machine with the appropriate serial number.

644B-42 (S/N 101–141)
844C-42 (S/N 101–433)
1044C-42 (S/N 101–110)
6K-42 (S/N 101–113)
8K-42 (S/N 101–192)



#	Description
1	Upper Chain
2	Locknut
3	Flatwasher
4	Chain Anchor Rod
5	Locknut

#	Description
6	Chain Adjustment Anchor
7	Flatwasher
8	Nut
9	Lockwasher
10	Jam Nut

Fig. 6-102: Upper Chains - First Type

First Type (Ref. Fig. 6-102)

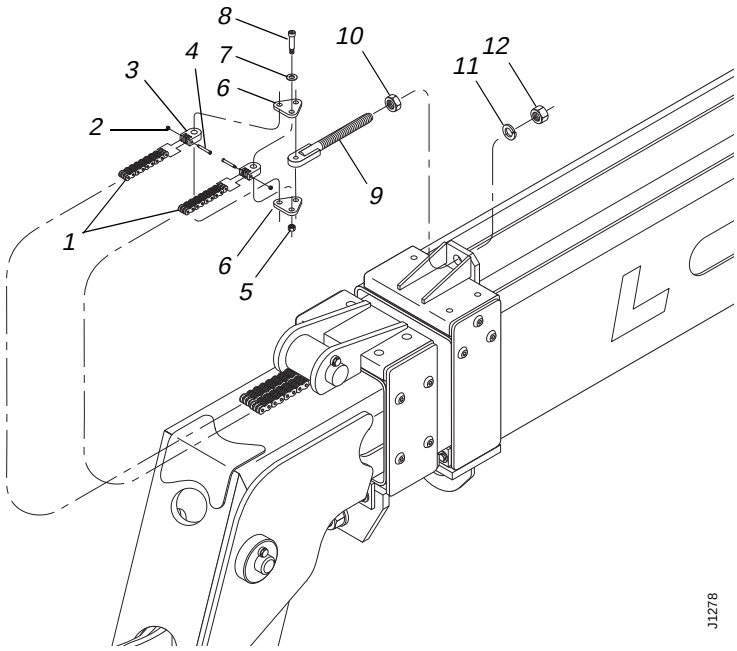
a. Remove two (2) jam nuts (Item 10), lockwashers (Item 9), nuts (Item 8), and flatwashers (Item 7) from the upper chain anchors (Item 6).

b. Remove the two locknuts (Items 2 and 5) from the chain anchor rod (Item 4).

c. Remove the chain anchor rod, chain adjustment anchors (Item 6), and the flatwasher (Item 3) from the upper chains (Item 1).

d. Lay the upper chains over the top of the inner boom section.

644B-42 (S/N 142–264)
844C-42 (S/N 434–856)
1044C-42 (S/N 111–120)
6K-42 (S/N 114–137)
8K-42 (S/N 193–)273
10K-42 (S/N 101–108)



#	Description
1	Upper Chain
2	Locknut
3	Chain Anchor
4	Shoulder Bolt
5	Locknut
6	Chain Equalizer

#	Description
7	Flatwasher
8	Shoulder Bolt
9	Chain Adjustment Anchor
10	Jam Nut
11	Lockwasher
12	Nut

Fig. 6-103: Upper Chains - Second Type

Second Type (Ref. Fig. 6-103)

a. Remove the nut (Item 12) and lockwasher (Item 11) securing the chain adjustment anchor (Item 9) to the outer boom section.

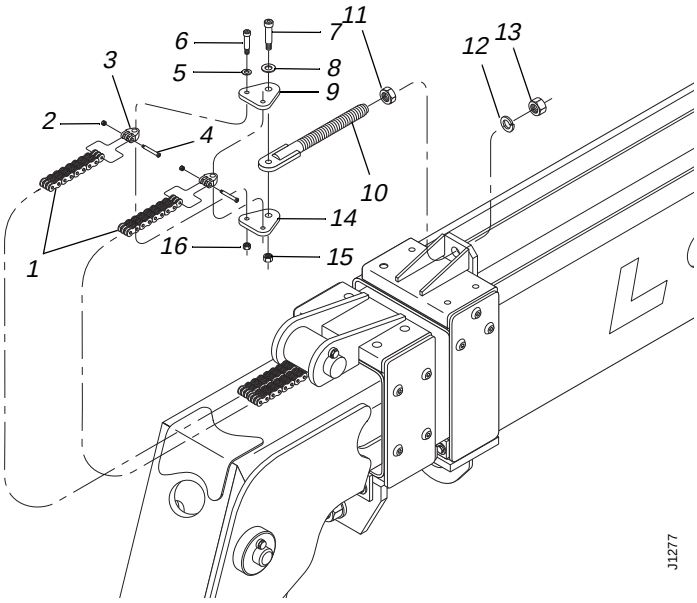
b. Pull the upper chain assembly out from the mount on the outer boom section.

c. Remove the three (3) locknuts (Item 5) and shoulder bolts (Item 8) and flatwashers (Item 7) securing the two (2) chain equalizers (Item 6) and the chain adjustment anchor to the chain anchors (Item 3).

d. Remove the locknut (Item 2) and shoulder bolt (Item 4) securing each chain anchor to the two upper chains (Item 1). Remove the two (2) upper chains.

e. Lay the chains over the top of the inner boom section.

644B-42 (S/N 265–)
844C-42 (S/N 857–)
1044C-42 (S/N 121–)
6K-42 (S/N 138–)
8K-42 (S/N 274–)
10K-42 (S/N 109–)



#	Description
1	Upper Chain
2	Locknut
3	Chain Anchor
4	Shoulder Bolt
5	Flatwasher
6	Shoulder Bolt
7	Shoulder Bolt
8	Flatwasher

#	Description
9	Chain Equalizer
10	Chain Adjustment Anchor
11	Jam Nut
12	Lockwasher
13	Nut
14	Chain Equalizer
15	Locknut
16	Locknut

Fig. 6-104: Upper Chains - Third Type

Third Type (Ref. Fig. 6-104)

a. Remove the nut (Item 13) and lockwasher (Item 12) securing the chain adjustment anchor (Item 10) to the outer boom section.

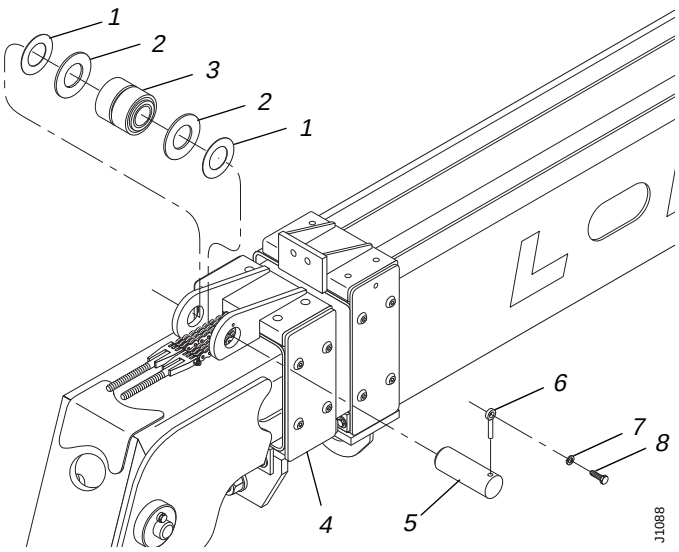
b. Pull the upper chain assembly out from the mount on the outer boom section.

c. Remove the locknut (Item 15) and shoulder bolts (Item 7) and flatwasher (Item 8) securing the two (2) chain equalizers (Items 9 and 14) to the chain adjustment anchor (Item 10).

d. Remove the two (2) locknuts (Item 16) and shoulder bolts (Item 6) and flatwashers (Item 5) securing the two (2) chain equalizers to the two (2) chain anchors (Item 3).

e. Remove the locknut (Item 2) and shoulder bolt (Item 4) securing each chain anchor to the two upper chains (Item 1). Remove the two (2) upper chains.

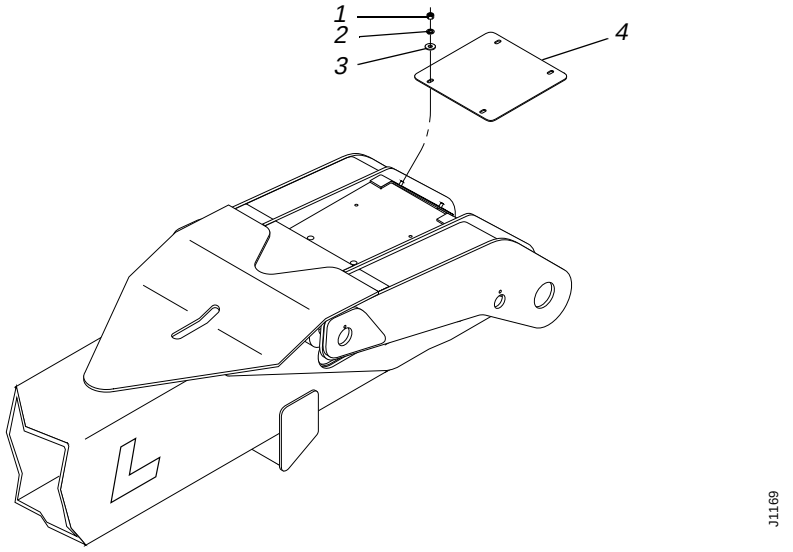
f. Lay the chains over the top of the inner boom section.



#	Description	#	Description
1	Shim	5	Middle Boom Section
2	Guide Washer	6	Lock Pin
3	Chain Roller Assembly	7	Lockwasher
4	Chain Roller Pin	8	Bolt

Fig. 6-105: Upper Chain Roller

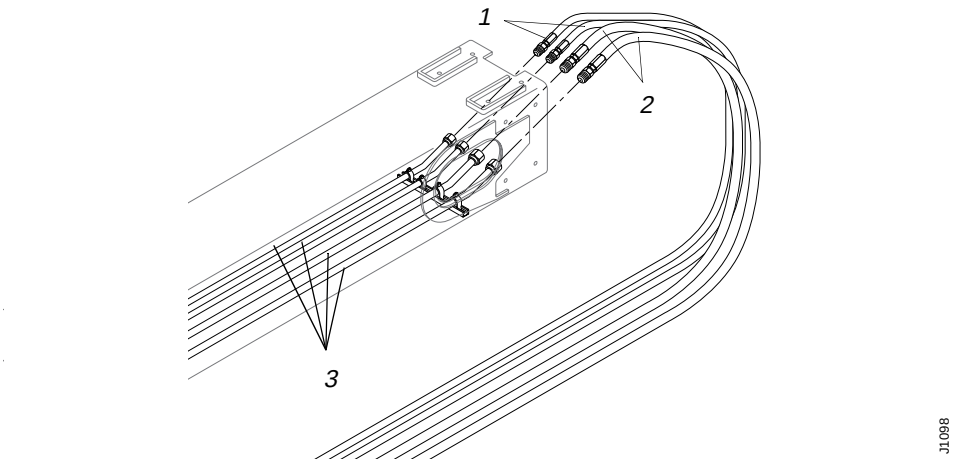
7. (Ref. Fig. 6-105) Remove the capscrew (Item 8), lockwasher (Item 7), and lock pin (Item 6) from the chain roller pin (Item 4). Remove the chain roller pin, shims (Item 1), guide washers (Item 2), and chain roller assembly (Item 3).



#	Description	#	Description
1	Nut	3	Flatwasher
2	Lockwasher	4	Boom Cover

Fig. 6-106: Boom Cover

8. (Ref. Fig. 6-106) Remove the four (4) nuts (Item 1), lockwashers (Item 2), and flatwashers (Item 3) securing the boom cover (Item 4) to the rear of the outer boom section. Remove the boom cover.



#	Description
1	Auxiliary Hydraulic Hoses
2	Carriage Tilt Hoses

#	Description
3	Hydraulic Tubes

Fig. 6-107: Rear Hose Connections, Inner Boom

9. (Ref. Fig. 6-107) Tag and disconnect carriage tilt (Item 2) and auxiliary hydraulic hoses (Item 1) from hydraulic tubes (Item 3) at rear of the inner boom section. Cap hoses and tubes. Lay the hoses down at the rear of the outer boom section.

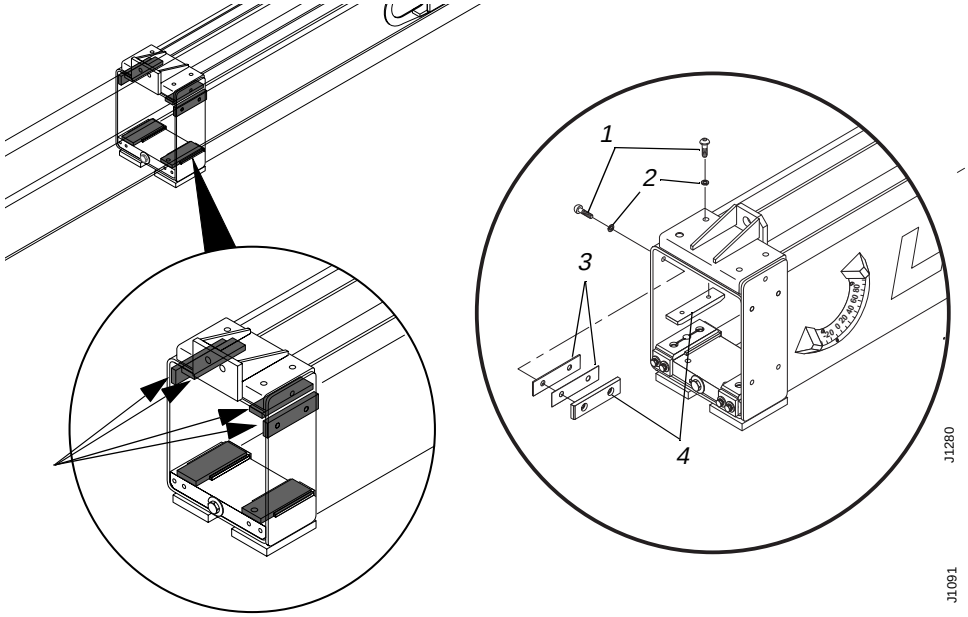
   Note: *These hoses can be accessed through the service windows at the rear of the inner, middle, and outer boom sections.*

   Note: *"K" Model machines are not equipped with auxiliary hydraulics. For these models, disregard procedures that refer to auxiliary components. Some models are equipped with an additional set of auxiliary hydraulics and will have two (2) additional sets of hoses, tubes, and mounting hardware.*

10. Start the engine and extend the middle boom out from the outer boom section.

11. Support the middle boom section.

CAUTION: Make sure the crane, slings, chains, or other means of support have sufficient capacity to support the weight of the boom. The weight of the entire 3-section boom assembly is approximately 5,400 pounds.

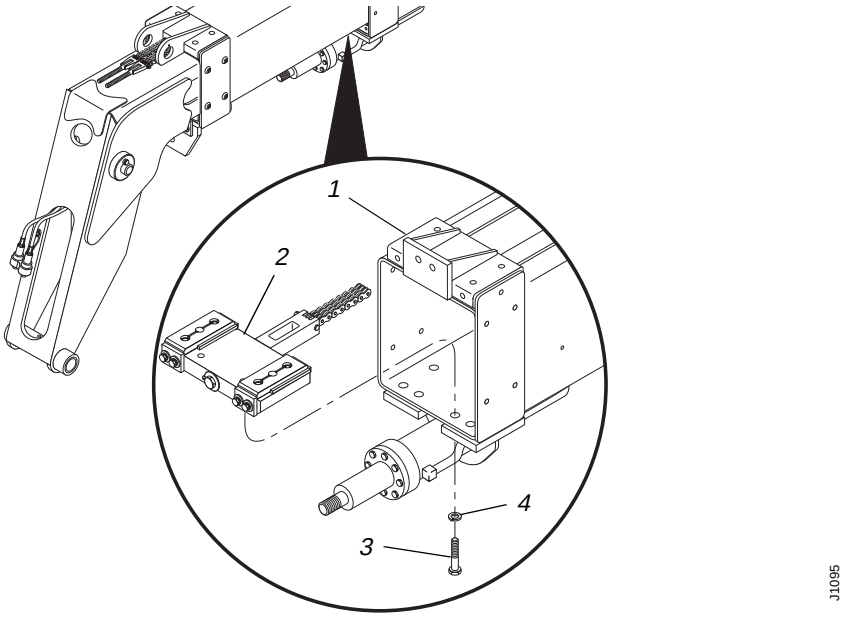


#	Description
1	Button Head Socket Capscrew
2	Lockwasher

#	Description
3	Shim
4	Slide Pad

Fig. 6-108: Front Slide Pads, Outer Boom

12. (Ref. Fig. 6-108) Remove the slide pads, shims, and attaching hardware (Items 1 thru 4) from the top and sides of the outer boom section.

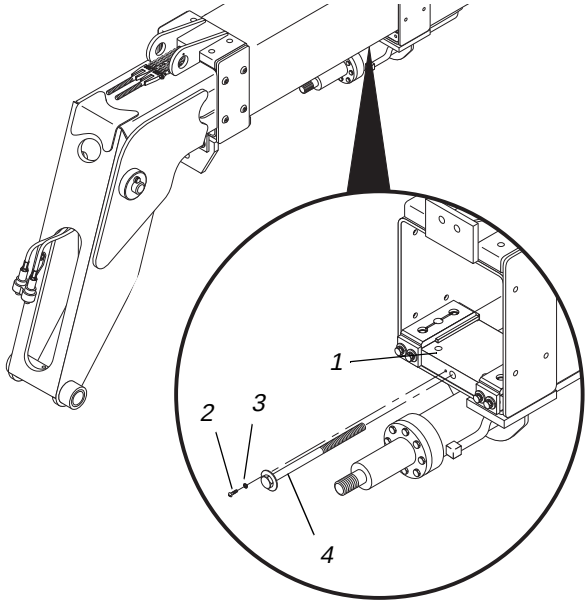


#	Description
1	Outer Boom Section
2	Anchor Base

#	Description
3	Capscrew
4	Lockwasher

Fig. 6-109: Anchor Base

13. (Ref. Fig. 6-109) Remove six (6) capscrews (Item 3) and lockwashers (Item 4) securing the anchor base (Item 2) to the outer boom section (Item 1).

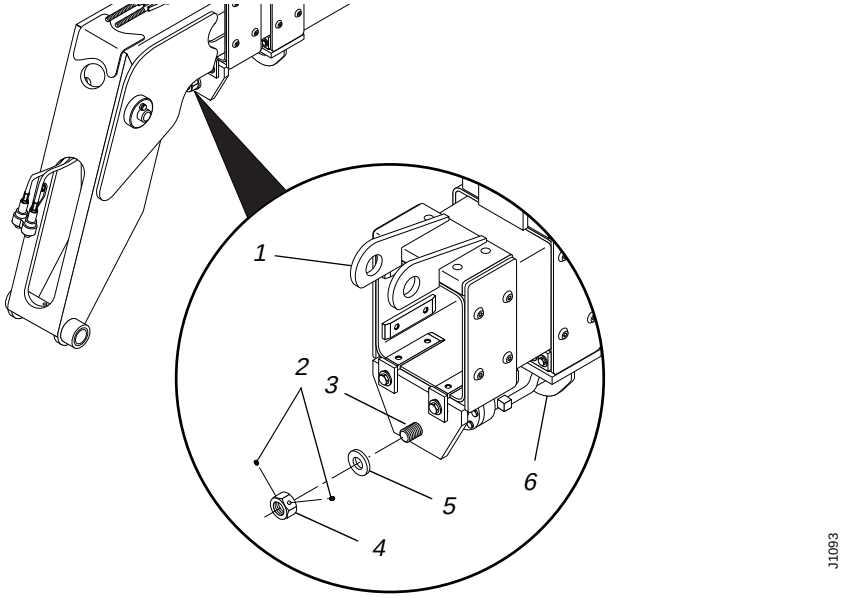


#	Description
1	Anchor Base
2	Capscrew

#	Description
3	Lockwasher
4	Chain Adjustment Rod

Fig. 6-110: Lower Chain Adjustment Rod

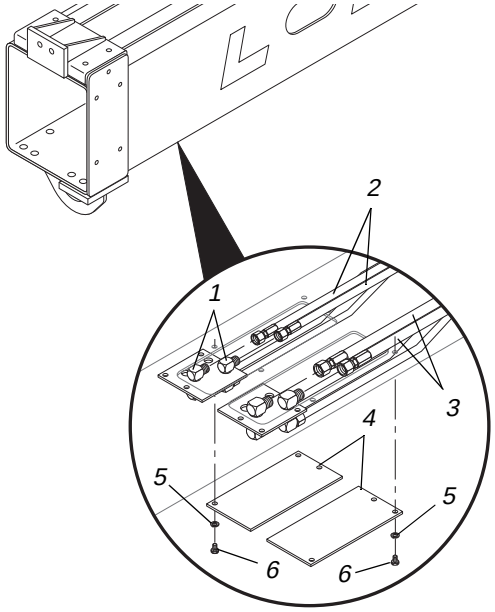
14. (Ref. Fig. 6-110) Remove capscrew (Item 2) and lockwasher (Item 3). Remove chain adjustment rod (Item 4) by turning counterclockwise until free. Remove the anchor base (Item 1).



#	Description	#	Description
1	Inner Boom Section	4	Nut
2	Setscrew	5	Washer
3	Extension Cylinder	6	Support Bracket

Fig. 6-111: Rod End of Extension Cylinder

15. (Ref. Fig. 6-111) Loosen two (2) setscrews (Item 2) and remove extension cylinder nut (Item 4) and washer (Item 5). Place blocks between extension cylinder (Item 3) and support bracket (Item 6) to prevent damage to cylinder during disassembly.
16. Back the machine away from the middle boom section until it is completely separated.

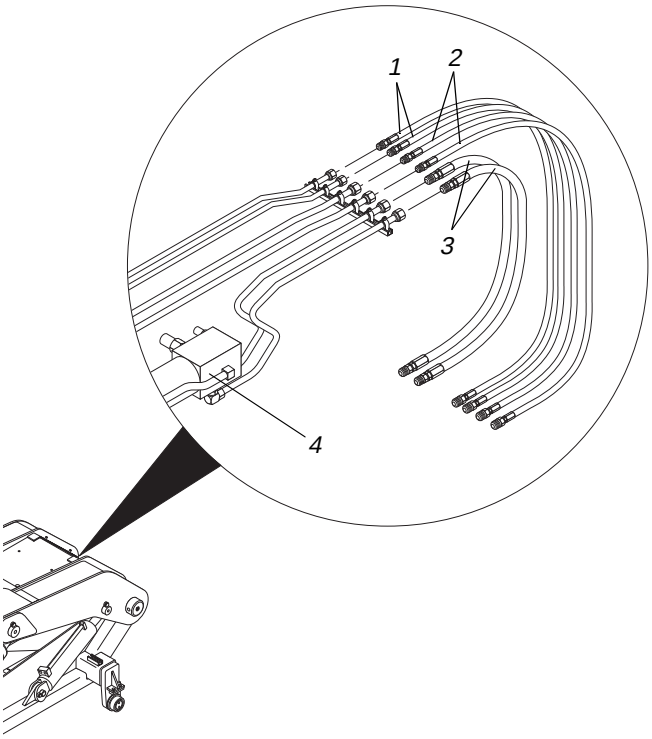


#	Description
1	Bulkhead Elbows
2	Auxiliary Hydraulic Hoses
3	Carriage Tilt Hoses

#	Description
4	Access Cover
5	Lockwasher
6	Capscrew

Fig. 6-112: Hose Connections, Outer Boom

17. (Ref. Fig. 6-112) Remove three (3) capscrews (Item 6) and lockwashers (Item 5) from each access cover (Item 4) to the outer boom section. Remove the access covers.
18. Park the machine on a firm, level surface. Set the park brake, lock the shift selector in the NEUTRAL position, shut off the engine and remove the ignition key. Block all wheels.
19. Position a crane next to the machine.
20. Remove the boom elevation proximity switch (see “Removal” in Section 7).



J1077

#	Description
1	Auxiliary Hydraulic Hoses
2	Carriage Tilt Hoses

#	Description
3	Boom Extension Hoses
4	Boom Extension Cylinder

Fig. 6-113: Hose Connections, 3-Section Boom

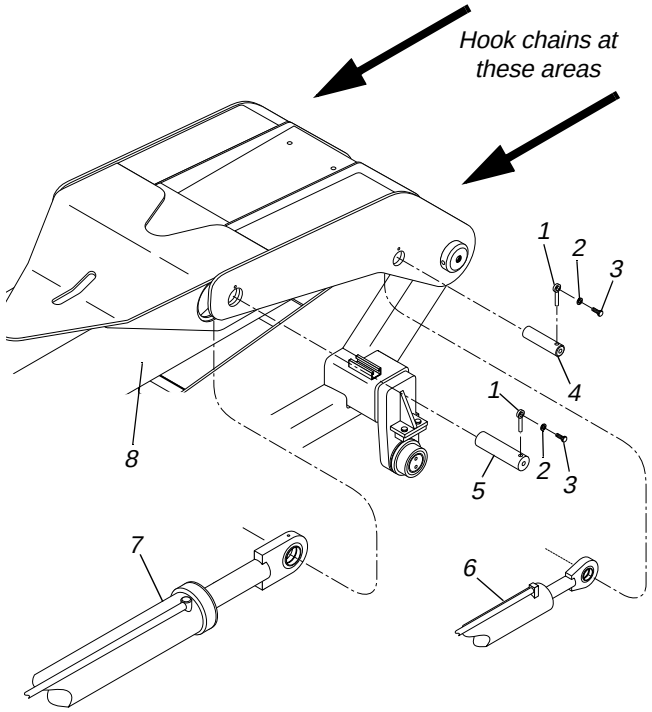
21. (Ref. Fig. 6-113) Disconnect hoses from the tubes at the rear of the outer boom section as follows.

    a. Tag and disconnect two (2) boom extension hoses (Item 3) at the rear of the inner boom. Cap the tubes and hoses.

    b. Tag and disconnect two (2) carriage tilt hoses (Item 2), and two (2) auxiliary hydraulics hoses (Item 1) at the boom. Cap tubes and hoses.

22. Place a sling around the front of the inner boom section. Chains with hooks may be attached to the rear of the outer boom section near the pivot pin bosses (Ref. Fig. 6-114). Attach a sling and chains to a crane hook. Lift the boom using a crane strong enough to support the weight of the boom.

CAUTION: Make sure the crane, slings, and chains have sufficient capacity to support the weight of the boom section. The weight of the entire 3-section boom assembly is approximately 5,400 pounds.



J1072

#	Description	#	Description
1	Lock Pin	5	Pivot Pin, Boom Hoist Cylinder
2	Lockwasher	6	Rear Carriage Tilt Cylinder
3	Capscrew	7	Boom Hoist Cylinder
4	Pivot Pin, Rear Carriage Tilt Cyl.	8	Boom

Fig. 6-114: Cylinder Pivot Pins

23. (Ref. Fig. 6-114) Remove four (4) capscrews (Item 3) and lockwashers (Item 2) from the lock pins (Item 1) securing the rear carriage tilt cylinders (Item 6) and boom hoist cylinders (Item 7) to the boom (Item 8). Remove four (4) lock pins from the pivot pins (Items 4 and 5).

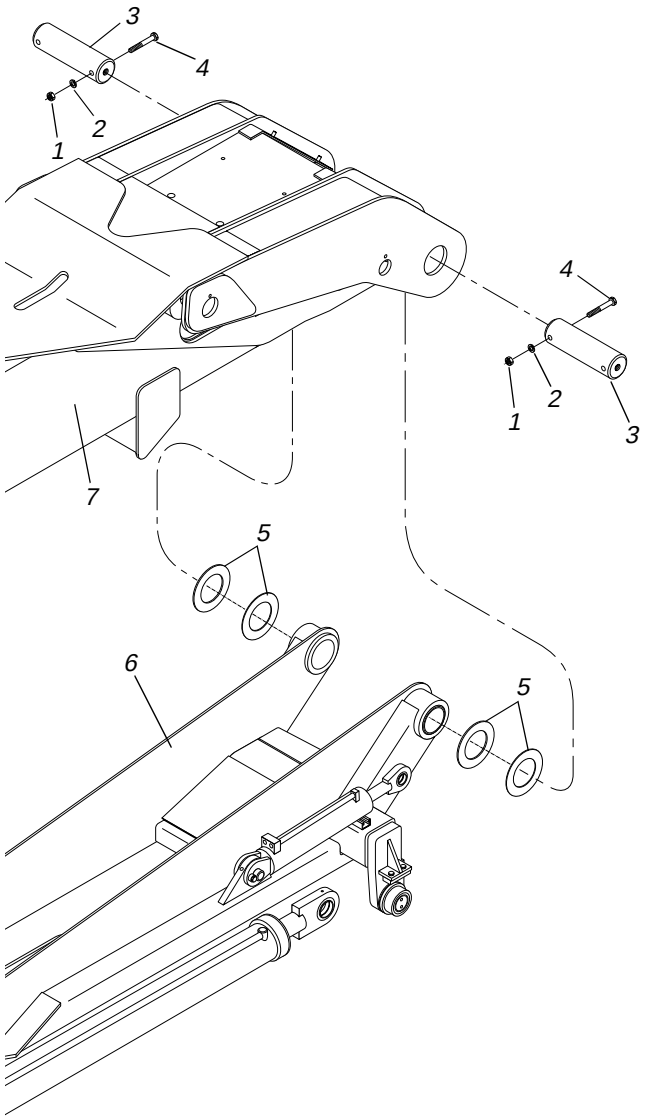
CAUTION: Make sure each cylinder is fully supported so it does not fall and cause personal or equipment damage when it is being removed.

24. (Ref. Fig. 6-114) Starting at a rear carriage tilt cylinder (Item 6), use a slide hammer puller threaded into the pivot pin (Item 4) to remove the pin from the boom. After the pivot pin has been removed, allow the cylinder to swing down and away from the boom.

CAUTION: Use suitable blocking to support the cylinders and prevent damage to the surrounding structure.

25. (Ref. Fig. 6-114) Repeat Step 24 for the remaining rear carriage tilt cylinder.

26. (Ref. Fig. 6-114) Continue with each of the two (2) hoist cylinders (Item 7) by using a slide hammer puller threaded into the pivot pin (Item 5) to remove it. After the pivot pin has been removed, allow the cylinder to swing down and away from the boom.



#	Description
1	Nut
2	Lockwasher
3	Boom Pivot Pin
4	Capscrew

#	Description
5	Shims
6	Transfer Carriage/Boom Cradle
7	Outer Boom Section

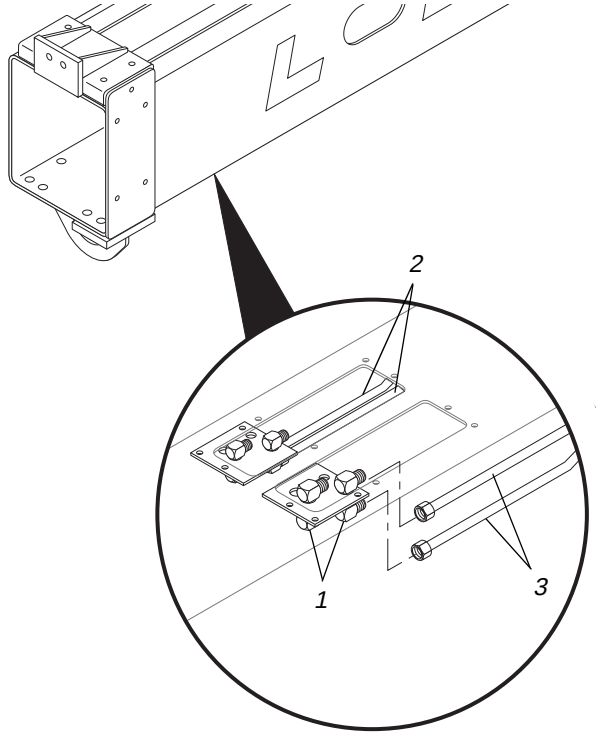
Fig. 6-115: 3-Section Boom Pivot Pins

27. (Ref. Fig. 6-115) Remove two (2) nuts (Item 1), lockwashers (Item 2), and capscrews (Item 4) from the boom pivot pins (Item 3).

CAUTION: Make sure slings and chains are secure and a crane is supporting the weight of the boom.

28. (Ref. Fig. 6-115) Using a slide hammer puller, remove the two (2) boom pivot pins and shims (Item 5).

29. (Ref. Fig. 6-115) Carefully lift the outer boom (Item 7) clear of the transfer carriage/boom cradle (Item 6).
30. Swing the boom away from the machine and position it above a firm, level surface.
31. (Ref. Fig. 6-112) Tag and disconnect the carriage tilt (Item 3) and auxiliary hydraulic hoses (Item 2) at the bulkhead elbows (Item 1). Cap hoses and fittings.

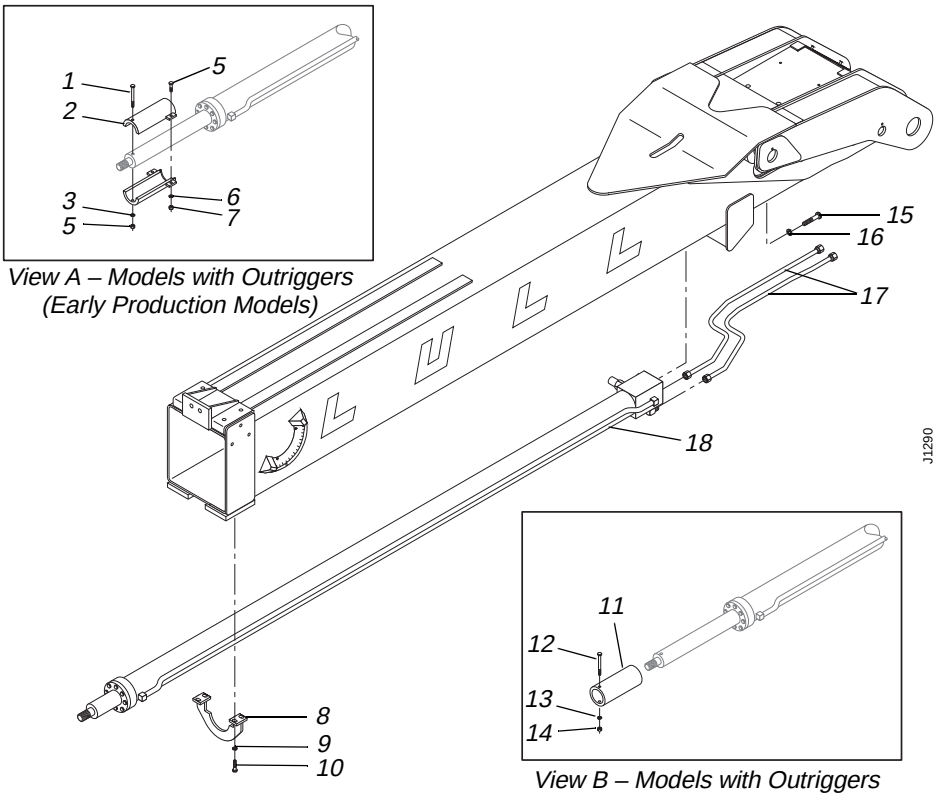


#	Description
1	Swivel Elbows
2	Auxiliary Hydraulic Tubes

#	Description
3	Carriage Tilt Tubes

Fig. 6-116: Hydraulic Tubes, Outer Boom

32. (Ref. Fig. 6-116) Disconnect the auxiliary and carriage tilt hydraulic tubes (Items 2 and 3) from the swivel elbows (Item 1) in the outer boom. Remove the cushion clamps and hydraulic tubes.



#	Description
1	Capscrew
2	Cylinder Stop
3	Lockwasher
4	Nut
5	Capscrew
6	Lockwasher
7	Nut
8	Cylinder Support Bracket
9	Lockwasher

#	Description
10	Capscrew
11	Cylinder Stop
12	Capscrew
13	Lockwasher
14	Nut
15	Capscrew
16	Lockwasher
17	Hydraulic Tube
18	Boom Extension Cylinder

Fig. 6-117: Boom Extension Cylinder Removal – 3-Section Boom

33. (Ref. Fig. 6-117) Remove the boom extension cylinder as follows:

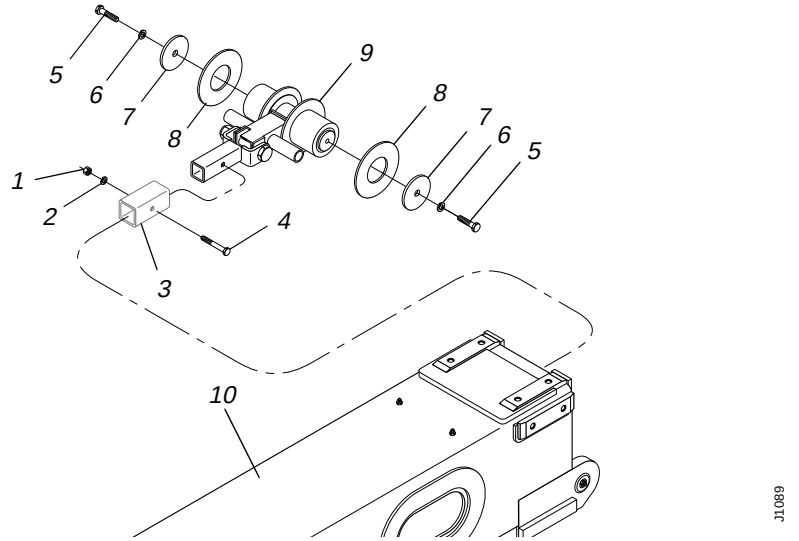
    a. Remove the two hydraulic tubes (Item 17) from the manifold block on the boom extension cylinder (Item 18).

    b. Secure the boom extension cylinder and remove the two (2) capscrews (Item 15) and lockwashers (Item 16) securing the boom extension cylinder to the outer boom section.

    c. Remove the two (2) capscrews (Item 10) and lockwashers (Item 9) along with the cylinder support bracket (Item 8).

    d. If the boom extension cylinder is to be replaced and the machine being worked on has outriggers, remove the cylinder stop assembly as shown in View A or View B (Items 1 thru 7 or Items 11 thru 14).

34. Remove the boom angle inclinometer. See page 6-60.



#	Description
1	Nut
2	Lockwasher
3	Tube in Boom
4	Bolt
5	Bolt

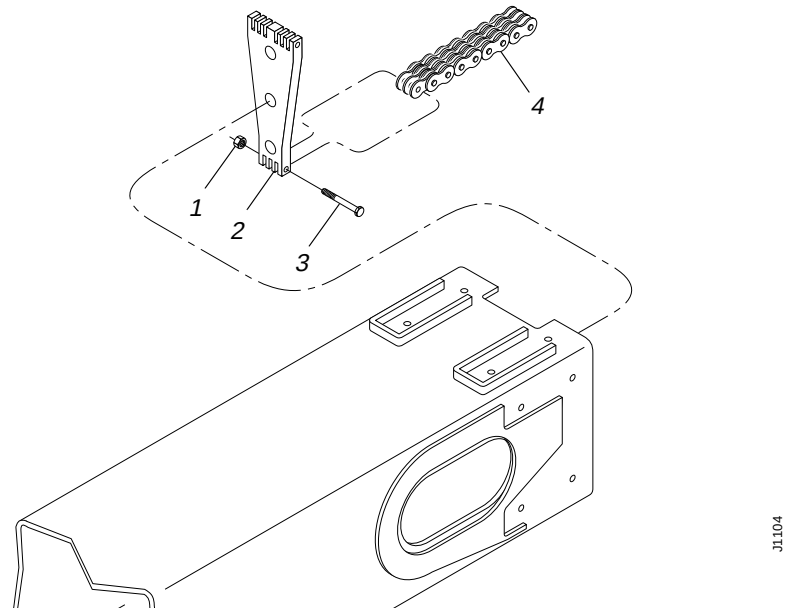
#	Description
6	Lockwasher
7	Special Washer
8	Guide Washer
9	Hose Tensioner
10	Middle Boom Section

Fig. 6-118: Hose Tensioner

35. (Ref. Fig. 6-118) Remove the hose tensioner from the middle boom section as follows:

    a. Take care during this step; the hose tensioner is spring-loaded. Remove the capscrew (Item 5), lockwasher (Item 6), special washer (Item 7), and outer guide washer (Item 8) from each end of the hose tensioner (Item 9). Slide the carriage tilt and auxiliary hydraulic hoses outward and off the hose tensioner.

    b. Remove capscrew (Item 4), lockwasher (Item 2), and nut (Item 1) securing hose tensioner to tube in boom (Item 3). Remove the hose tensioner.

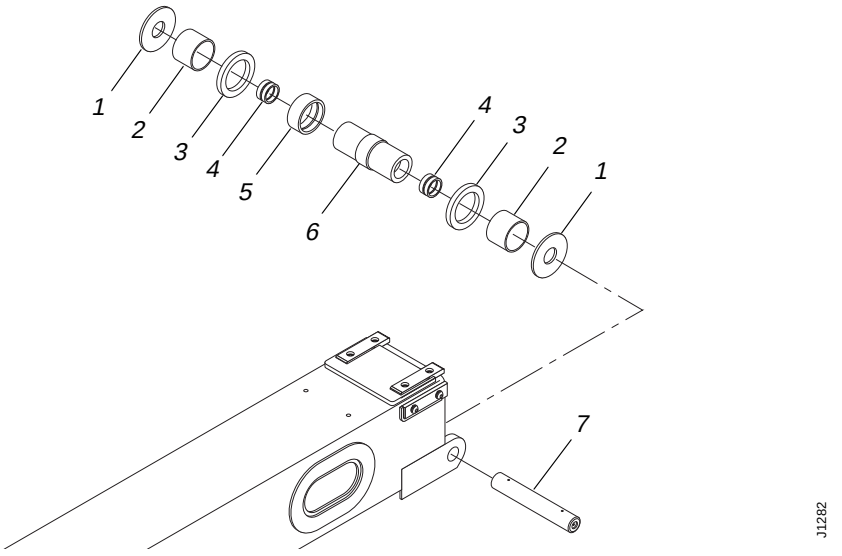


#	Description
1	Lock Nut
2	Rear Chain Anchor

#	Description
3	Shoulder Bolt
4	Lower Chain

Fig. 6-119: Attaching Chain to Rear Anchor

36. (Ref. Fig. 6-119) Remove the lower chain (Item 4) from the rear anchor (Item 2) at the rear of the inner boom section by removing the lock nut (Item 1) and shoulder bolt (Item 3).



#	Description
1	Outer Washer
2	Hose Spacer
3	Inner Washer
4	Chain and Rose Roller Bushing

#	Description
5	Hardened Bushing
6	Chain and Hose Roller
7	Chain and Hose Roller Shaft

Fig. 6-120: Rear Chain Roller - Middle Boom Section

37. (Ref. Fig. 6-120) Remove the rear chain roller assembly from the rear of the middle boom section.

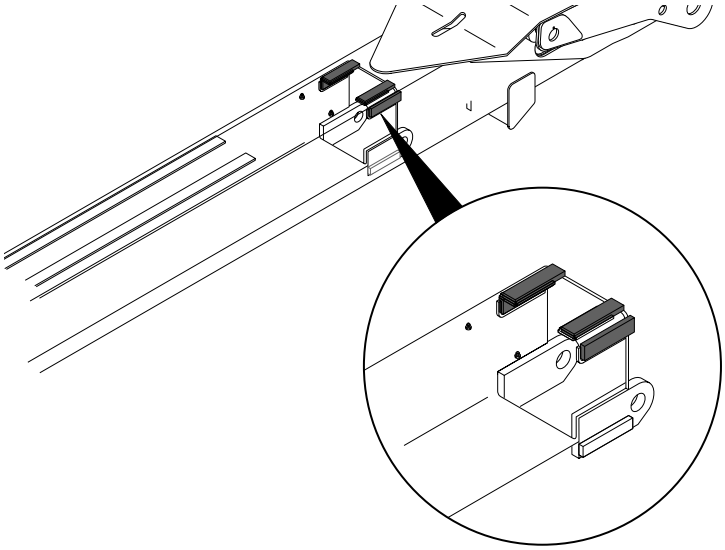


Fig. 6-121: Rear Slide Pads, Middle Boom Section

38. (Ref. Fig. 6-121) Remove slide pads, shims, and attaching hardware at the rear of the middle boom section.

39. Support the inner boom section.

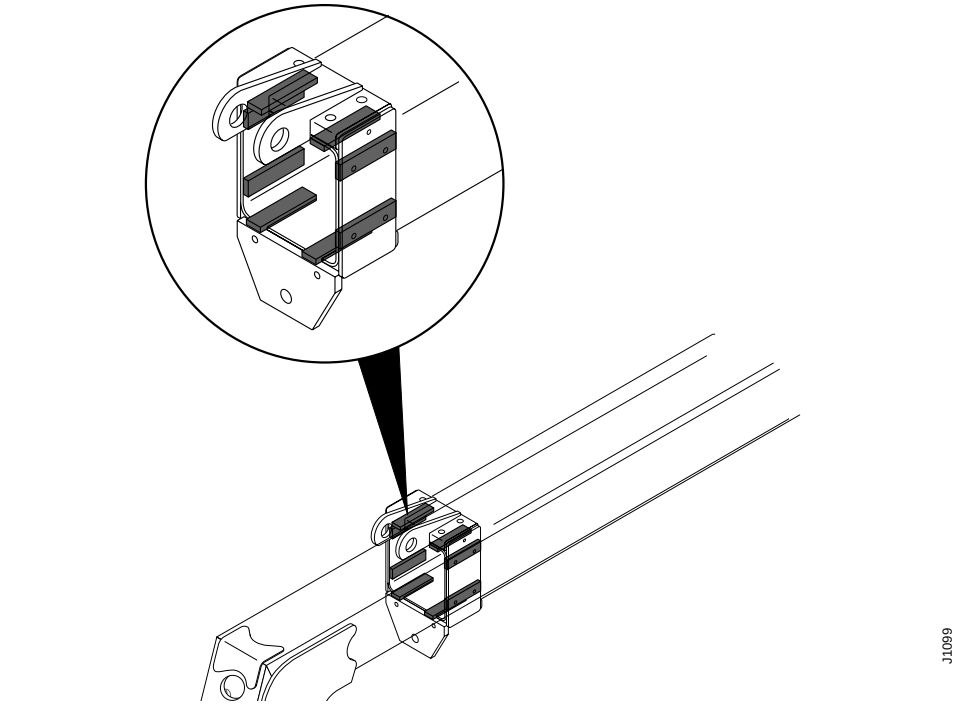
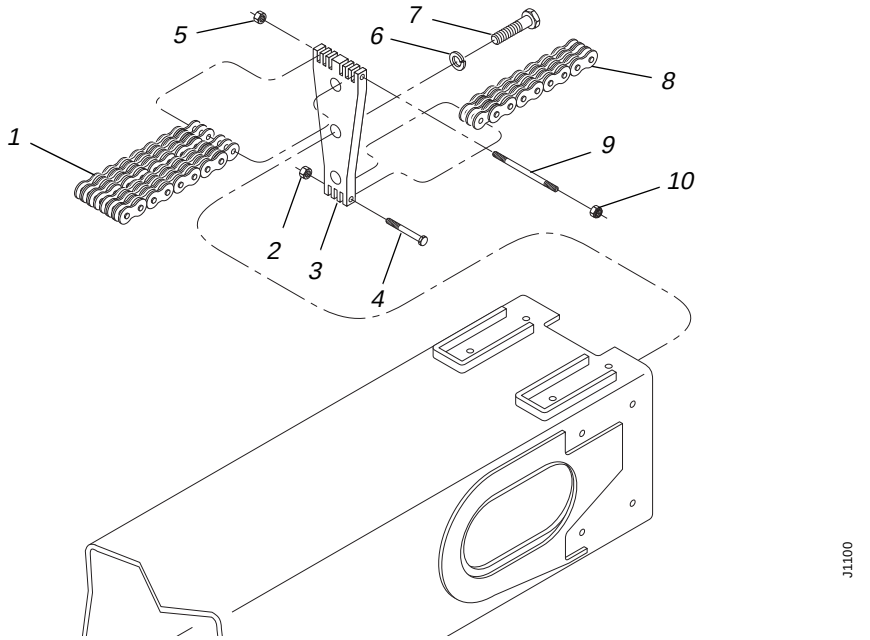


Fig. 6-122: Front Slide Pads, Middle Boom

40. (Ref. Fig. 6-122) Remove eight (8) slide pads and attaching hardware from the front of the middle boom section.

41. Remove the inner boom section out from middle boom section and place on work stands.



#	Description
1	Upper Chains
2	Lock Nut
3	Rear Chain Anchor
4	Shoulder Bolt
5	Lock Nut

#	Description
6	Lockwasher
7	Capscrew
8	Lower Chain
9	Chain Anchor Rod
10	Lock Nut

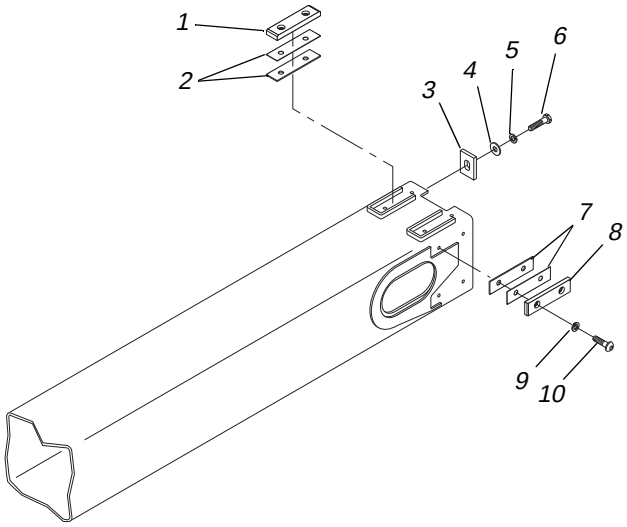
Fig. 6-123: Rear Chain Anchor

42. (Ref. Fig. 6-123) Remove the upper and lower chains from the inner boom section as follows:

    a. Remove a lock nut (Item 5) from the upper chain anchor rod (Item 9). Remove the anchor rod from rear chain anchor (Item 3). Pull upper chains (Item 1) out through the front of the boom.

    b. Remove the lock nut (Item 2) from the lower chain anchor shoulder bolt (Item 4). Remove the shoulder bolt. Pull the lower chain (Item 8) out through the rear of the inner boom section.

    c. Remove the three (3) capscrews (Item 7) and lockwashers (Item 6) securing the rear chain anchor to the rear of the inner boom section. Remove the rear chain anchor.



#	Description
1	Upper Slide Pad
2	Shim
3	Pad Retainer
4	Flatwasher
5	Lockwasher

#	Description
6	Capscrew
7	Shim
8	Slide Pad
9	Lockwasher
10	Button Head Socket Capscrew

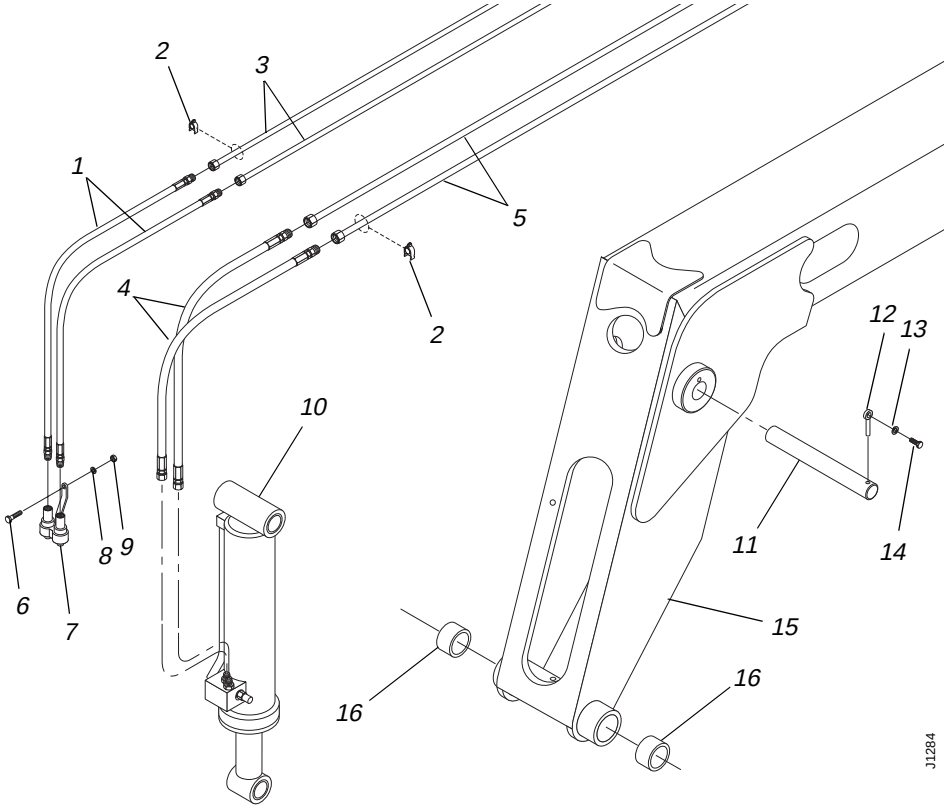
Fig. 6-124: Rear Slide Pads, Inner Boom

43. (Ref. Fig. 6-124) Remove slide pads from the rear of the inner boom section as follows:

    a. Remove two (2) capscrews (Item 6), lockwashers (Item 5), flatwashers (Item 4), and pad retainers (Item 3) securing the upper slide pads (Item 1) to the inner boom section.

    b. Remove the upper slide pads and shims (Item 2).

    c. Remove the four (4) side slide pads (Item 8) and two (2) bottom slide pads along with their attaching hardware (Items 9 and 10) and shims (Item 7).



#	Description
1	Auxiliary Hydraulic Hoses
2	Cushion Clamp
3	Auxiliary Hydraulic Tubes
4	Carriage Tilt Hydraulic Hoses
5	Carriage Tilt Hydraulic Tubes
6	Capscrew
7	Quick Disconnect Coupler
8	Lockwasher

#	Description
9	Nut
10	Front Carriage Tilt Cylinder
11	Base End Pin
12	Lock Pin
13	Lockwasher
14	Capscrew
15	Inner Boom Section
16	Quick Attach Pivot Boom Bushing

Fig. 6-125: Front Carriage Tilt Cylinder

44. (Ref. Fig. 6-125) Remove the nut (Item 9), lockwasher (Item 8), and capscrew (Item 6) securing the quick disconnect coupler(s) (Item 7) to the inner boom section.
45. (Ref. Fig. 6-125) Tag and remove the carriage tilt hydraulic hoses (Item 4) from the connectors on the front carriage tilt cylinder (Item 10).
46. (Ref. Fig. 6-125) Tag and remove the auxiliary hydraulic hoses (Item 1) from the quick disconnect coupler(s) (Item 7).
47. (Ref. Fig. 6-125) Cap hoses, tubes, and the connectors on the front carriage tilt cylinder.
48. (Ref. Fig. 6-125) Loosen and remove the cushion clamps (Item 2) securing the hydraulic tubes (Items 3 and 5) in the channels located inside the inner boom section.
49. (Ref. Fig. 6-125) Remove all tubes and hoses from the inner boom section.

50. Turn the inner boom upside down.
51. (Ref. Fig. 6-125) Remove the capscrew (Item 14), lockwasher (Item 13), and lock pin (Item 12) securing the base end pin (Item 11) to the inner boom section.
52. (Ref. Fig. 6-125) Remove the base end pin and the front carriage tilt cylinder.
53. (Ref. Fig. 6-125) Remove the two (2) quick attach pivot pin bushings (Item 16) from the inner boom section.

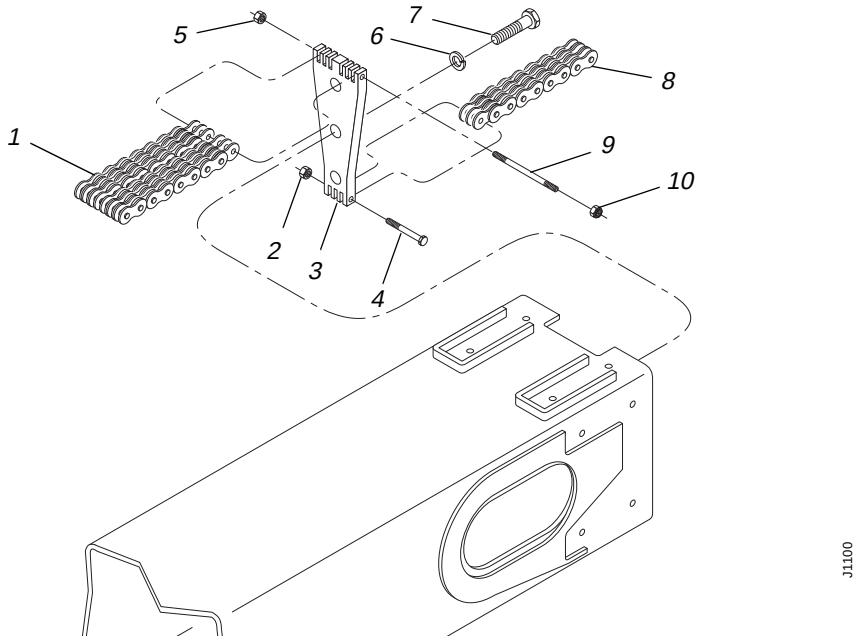
Assembly and Installation

3-Section Boom

1. With the inner boom section upside down, install new quick attach pivot pin bushings until they are flush with the outer edge of the tube of the inner boom section.
2. Clean and inspect the bushings in the front carriage tilt cylinder. If necessary, replace them as instructed in Step 10 on page 6-21.
3. Install the front carriage tilt cylinder as described under “Installation” on page 6-19.
4. Turn the inner boom section over to an upright position.
5. (Ref. Fig. 6-125) Secure the hydraulic tubes (Items 3 and 5) in the channels located inside the inner boom section using cushion clamps (Item 2).
6. (Ref. Fig. 6-125) Attach the auxiliary hydraulic hoses (Item 1) to the auxiliary hydraulic tubes and the carriage tilt hydraulic hoses (Item 4) to the carriage tilt hydraulic tubes. Torque the swivel nuts on the hoses to 50–58 ft-lbs.

   Note: *“K” Model machines are not equipped with auxiliary hydraulics. For these models, disregard procedures that refer to auxiliary components. Some models are equipped with an additional set of auxiliary hydraulics and will have two (2) additional sets of hoses, tubes, and mounting hardware.*

7. (Ref. Fig. 6-125) Connect the auxiliary hydraulic hoses (Item 1) to the quick disconnect coupler(s) (Item 7). Torque the hose swivel nuts to 44–48 ft-lbs.
8. (Ref. Fig. 6-125) Connect the carriage tilt hydraulic hoses (Item 4) to the connectors on the front carriage tilt cylinder (Item 10). Torque the hose swivel nuts to 50–58 ft-lbs.
9. (Ref. Fig. 6-125) Install the quick disconnect coupler(s) (Item 7) to the inner boom section with the capscrew (Item 6), lockwasher (Item 8), and nut (Item 9). Torque the nut to 55 ft-lbs.



#	Description
1	Upper Chains
2	Lock Nut
3	Rear Chain Anchor
4	Shoulder Bolt
5	Lock Nut

#	Description
6	Lockwasher
7	Capscrew
8	Lower Chain
9	Chain Anchor Rod
10	Lock Nut

Fig. 6-126: Rear Chain Anchor

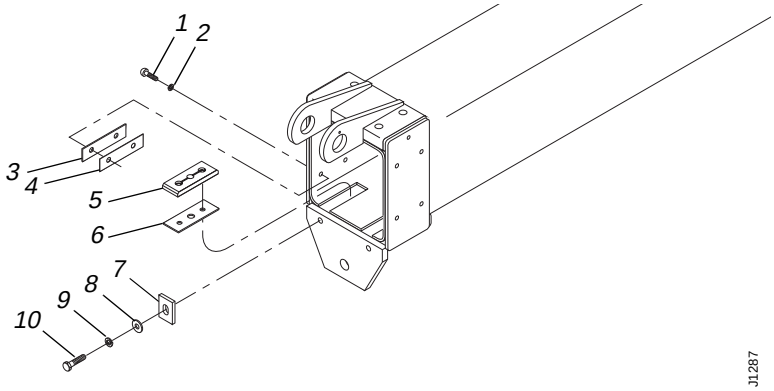
10. (Ref. Fig. 6-126) Install the upper chains to the inner boom section as follows:

    a. Install three (3) lockwashers (Item 6) and capscrews (Item 7) to secure the rear chain anchor (Item 3) to the rear of the inner boom section. Torque the capscrews to 200 ft-lbs.

    b. Lay the upper chains (Item 1) flat on top of the inner boom section. Install the upper chains on the rear chain anchor with anchor rod (Item 9) and the two lock nuts (Items 5 and 10). Torque the nuts to 156 in-lbs.

11. Slide the inner boom section into the middle boom section.

12. Support the inner boom section while installing the slide pads on the front of the middle boom section and the rear of the inner boom section as described in the next two steps.



#	Description
1	Button Head Socket Capscrew
2	Lockwasher
3	Side Slide Pad
4	Shim
5	Lower Slide Pad

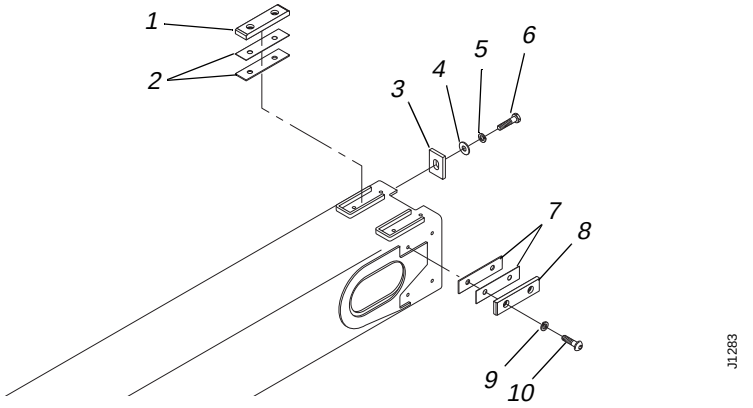
#	Description
6	Shim
7	Pad Retainer
8	Flatwasher
9	Lockwasher
10	Capscrew

Fig. 6-127: Front Slide Pads, Middle Boom

13. (Ref. Fig. 6-127) Install the front slide pads and shims in the middle boom section according to drawing specifications. See “Shimming Procedures” on page 6-91 for details.

    a. Install the lower shims (Item 6) and slide pads (Item 5). Install each pad retainer (Item 7) with a flatwasher (Item 8), lockwasher (Item 9), and capscrew (Item 10). Torque the capscrew to 200 ft-lbs.

    b. Install each side shim (Item 4) and slide pad (Item 3) with two (2) lockwashers (Item 2) and button head capscrews (Item 1). Torque the capscrews to 65 ft-lbs.



#	Description
1	Upper Slide Pad
2	Shim
3	Pad Retainer
4	Flatwasher
5	Lockwasher

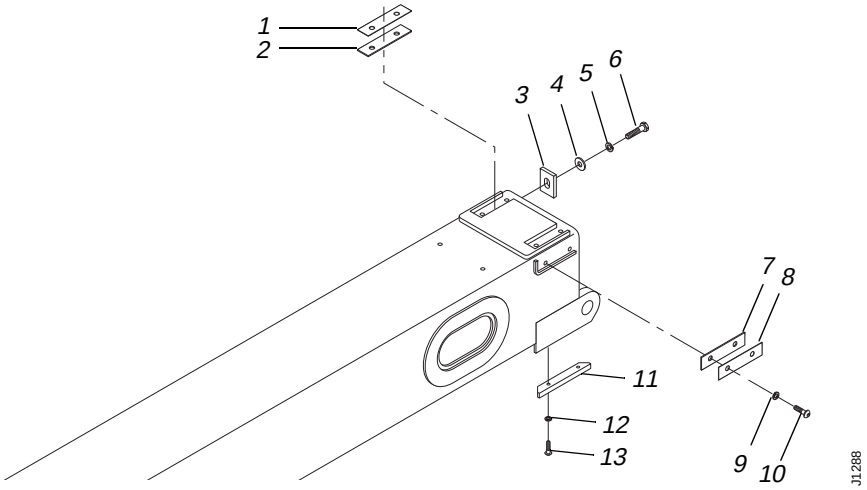
#	Description
6	Capscrew
7	Shim
8	Slide Pad
9	Lockwasher
10	Button Head Socket Capscrew

Fig. 6-128: Rear Slide Pads, Inner Boom

14. (Ref. Fig. 6-128) Install rear slide pads and shims on the inner boom section according to drawing specifications. See “Shimming Procedures” on page 6-91 for details.

    a. Install the upper shims (Item 2) and slide pads (Item 1). Install each pad retainer (Item 3) with a flatwasher (Item 4), lockwasher (Item 5), and capscrew (Item 6). Torque the capscrew to 200 ft-lbs.

    b. Install each side shim (Item 7) and slide pad (Item 8) with two (2) lockwashers (Item 9) and button head capscrews (Item 10). Torque the capscrews to 65 ft-lbs.



#	Description
1	Upper Slide Pad
2	Shim
3	Pad Retainer
4	Flatwasher
5	Lockwasher
6	Capscrew
7	Shim

#	Description
8	Side Slide Pad
9	Lockwasher
10	Button Head Socket Capscrew
11	Lower Slide Pad
12	Lockwasher
13	Button Head Socket Capscrew

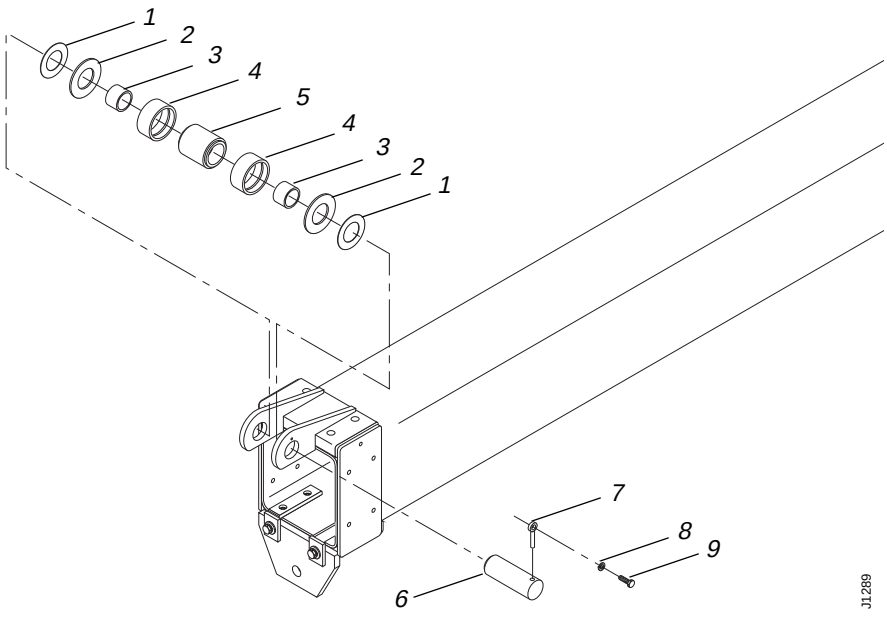
Fig. 6-129: Rear Slide Pads, Middle Boom

15. (Ref. Fig. 6-129) Install the rear slide pads and shims on the middle boom section according to drawing specifications. See “Shimming Procedures” on page 6-91 for details.

    a. Install the upper shims (Item 2) and slide pads (Item 1). Install each pad retainer (Item 3) with a flatwasher (Item 4), lockwasher (Item 5), and capscrew (Item 6). Torque the capscrew to 200 ft-lbs.

    b. Install each side shim(s) (Item 7) and slide pad (Item 8) with two (2) lockwashers (Item 9) and button head capscrews (Item 10). Torque the capscrews to 65 ft-lbs.

    c. Install the lower slide pads (Item 11) with two (2) lockwashers (Item 12) and button head capscrews (Item 13). Torque the capscrews to 276 in-lbs.



#	Description
1	Shim
2	Chain Guide Washer
3	Chain Roller Bushing
4	Hardened Bushing
5	Chain Roller

#	Description
6	Chain Roller Pin
7	Lock Pin
8	Lockwasher
9	Capscrew

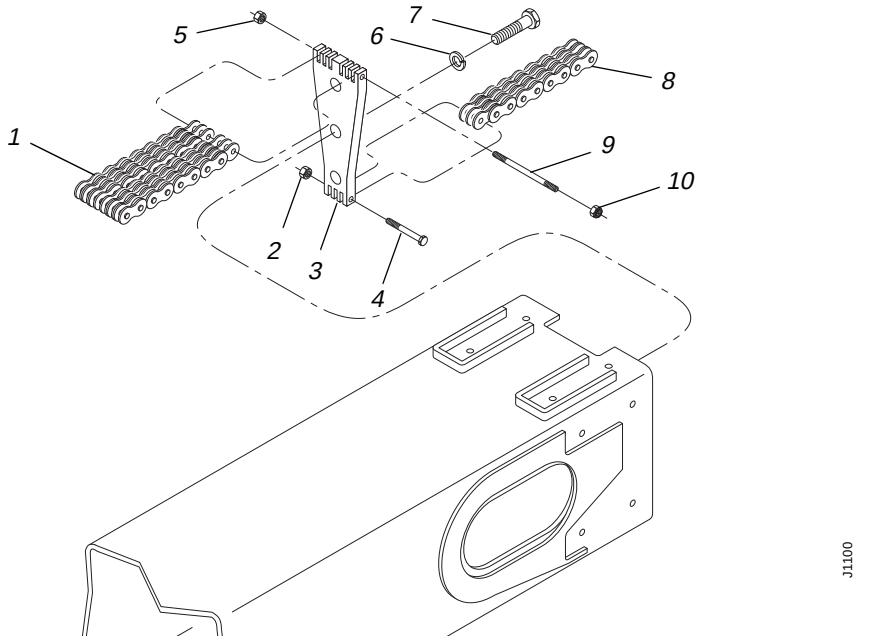
Fig. 6-130: Chain Roller Installation, Middle Boom

16. (Ref. Fig. 6-130) Install the chain roller assembly on the front of the middle boom section as follows:

    a. Install the two (2) shims (Item 1), chain guide washers (Item 2), new chain roller bushings (Item 3), new hardened bushings (Item 4), and the chain roller (Item 5) on the front of the middle boom section with a chain roller pin (Item 6).

    Note: *Apply EP lithium based grease to the bushings before installing them.*

    b. Apply thread locking compound to the capscrew (Item 9) and secure the chain roller pin to the boom section with a lock pin (Item 7), lockwasher (Item 8) and capscrew. Torque the capscrew to 55 ft-lbs.



#	Description
1	Upper Chains
2	Lock Nut
3	Rear Chain Anchor
4	Shoulder Bolt
5	Lock Nut

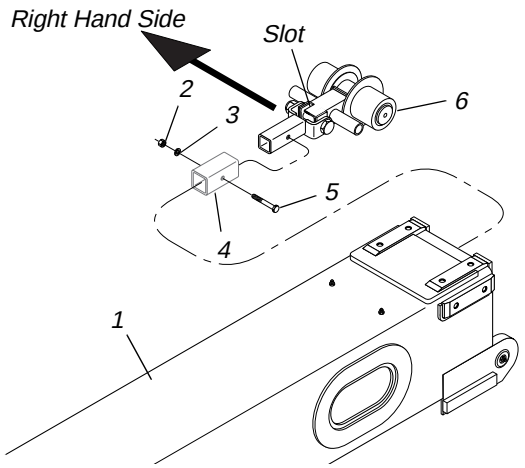
#	Description
6	Lockwasher
7	Capscrew
8	Lower Chain
9	Chain Anchor Rod
10	Lock Nut

Fig. 6-131: Lower Chain Installation

17. (Ref. Fig. 6-131) Install the lower chain to the inner boom section as follows:

    a. Unless a new chain is being installed, lubricate the lower chain with EP lithium based grease.

    b. Lay the lower chain (Item 8) flat inside the inner boom section. Install the lower chain on the rear chain anchor with the shoulder bolt (Item 4) and lock nut (Item 2). Torque the lock nut to 75 in-lbs.



#	Description
1	Middle Boom Section
2	Nut
3	Lockwasher

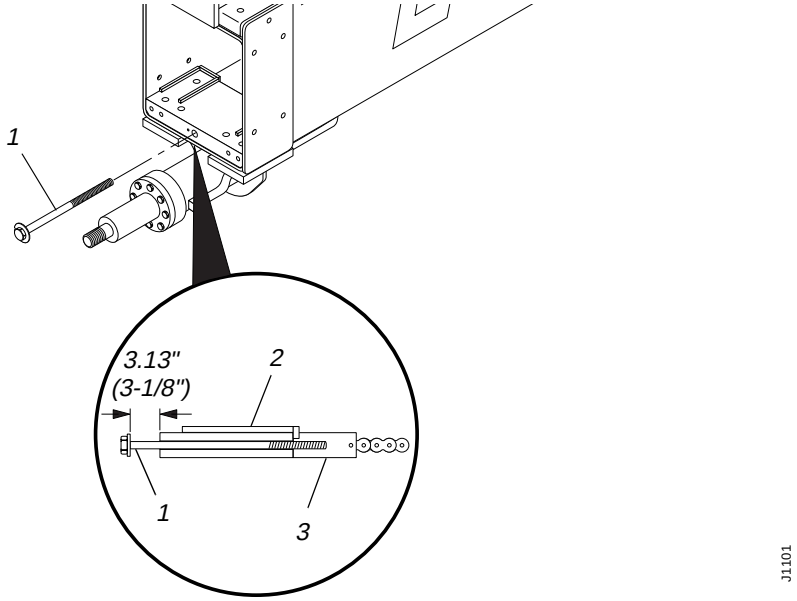
#	Description
4	Tube in Boom
5	Bolt
6	Hose Tensioner

Fig. 6-132: Hose Tensioner Mounting

18. (Ref. Fig. 6-132) Install the hose tensioner on the rear of the middle boom section as follows:

    a. Orient the hose tensioner (Item 6) with slot to the right and insert tensioner into tube (Item 4) in middle boom section (Item 1).

    b. Align holes in tensioner and tube; then secure with capscrew (Item 5), lockwasher (Item 3), and nut (Item 2). Torque the nut to 276 in-lbs.

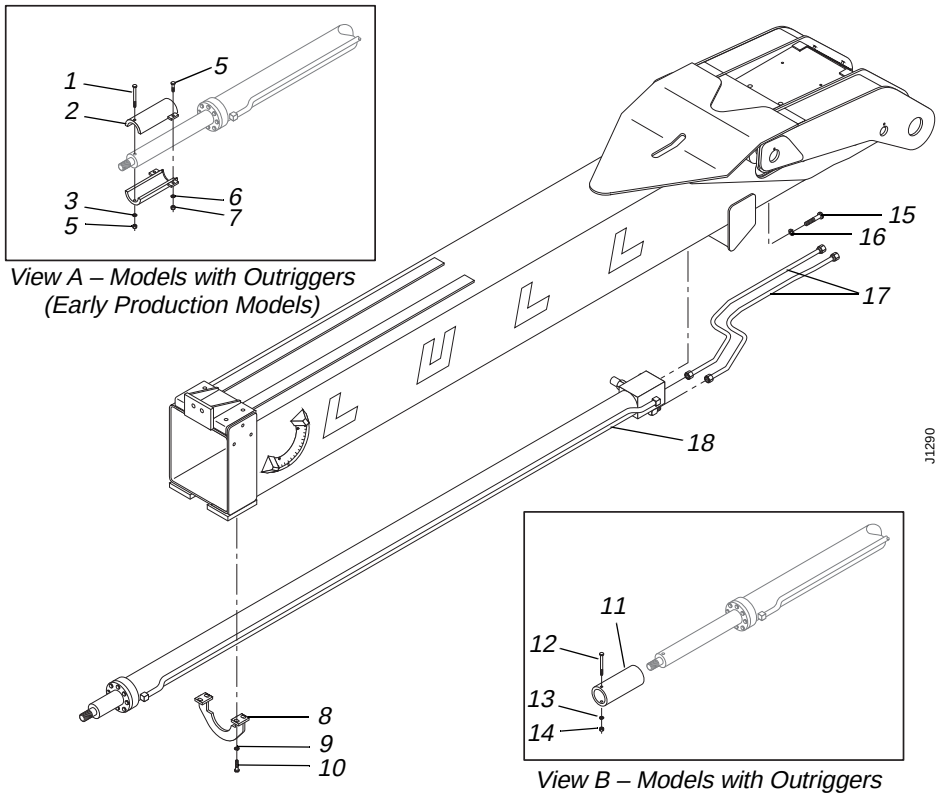


#	Description
1	Chain Adjustment Rod
2	Anchor Base

#	Description
3	Adjustment Block

Fig. 6-133: Initial Lower Chain Adjustment

19. (Ref. Fig. 6-133) Position chain adjustment block (Item 3) tight against back of anchor base (Item 2) as shown. Thread the chain adjustment rod (Item 1) into the block until the specified measurement is obtained. Push the adjustment rod fully into the anchor base.
20. With the outer boom still upside down, install the inclinometer. See page 6-60.



View A – Models with Outriggers (Early Production Models)

View B – Models with Outriggers

#	Description
1	Capscrew
2	Cylinder Stop
3	Lockwasher
4	Nut
5	Capscrew
6	Lockwasher
7	Nut
8	Cylinder Support Bracket
9	Lockwasher

#	Description
10	Capscrew
11	Cylinder Stop
12	Capscrew
13	Lockwasher
14	Nut
15	Capscrew
16	Lockwasher
17	Hydraulic Tube
18	Boom Extension Cylinder

Fig. 6-134: Boom Extension Cylinder Removal – 3-Section Boom

21. (Ref. Fig. 6-117) Install the boom extension cylinder as follows:
    a. If a new boom extension cylinder is being installed and the machine being worked on has outriggers, install the cylinder stop assembly as shown in View A or View B as follows:

For early production models (see View A),

1). Install cylinder stop halves (Item 2) on extension cylinder with two (2) each capscrews (Item 5), lockwashers (Item 6), and nuts (Item 7). Partially tighten the nuts.

2). Secure cylinder stop to extension cylinder with capscrew (Item 1), lockwasher (Item 3), and nut (Item 4) Torque nut to 276 in-lbs.

3). Torque the two (2) cylinder stop nuts (Item 7) to 276 in-lbs.

For all other models (see View B),

1). Install the cylinder stop (Item 11) on the boom extension cylinder with a capscrew (Item 12), lockwasher (Item 13), and nut (Item 14).

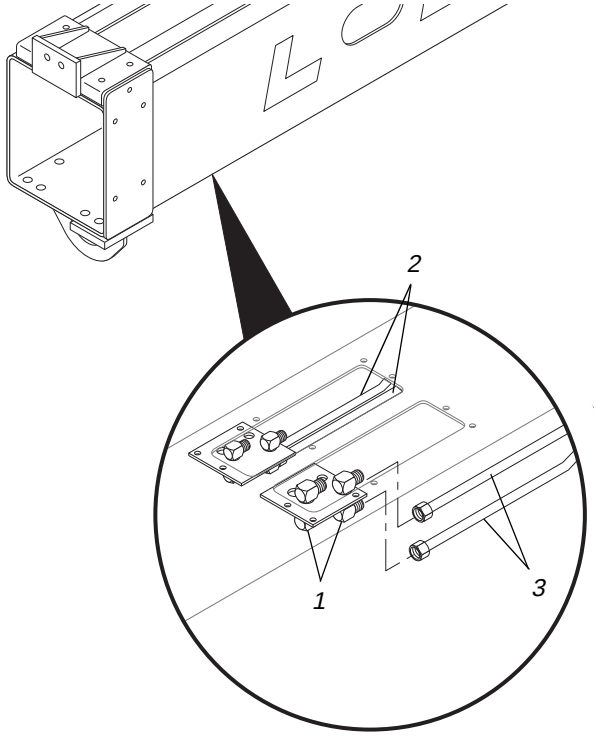
2). Torque the cylinder stop nut (Item 14) to 276 in-lbs.

b. Position the boom extension cylinder under the outer boom section. Secure the boom extension cylinder to the boom with two (2) lockwashers (Item 16) and capscrews (Item 15). Torque the capscrews to 200 ft-lbs.

c. Install the cylinder support bracket (Item 8) on the outer boom section using two (2) lockwashers (Item 9) and capscrews (Item 10). Torque the capscrews to 55 ft-lbs.

d. Install the two (2) hydraulic tubes (Item 17) on the manifold block of the boom extension cylinder (Item 18). Torque the hydraulic tube swivel nuts to 79–88 ft-lbs.

22. Cap hoses and fittings.

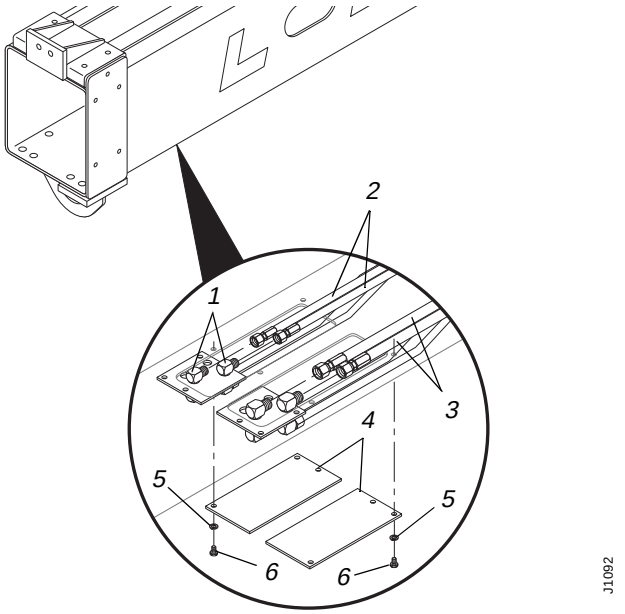


#	Description
1	Swivel Elbows
2	Auxiliary Hydraulic Tubes

#	Description
3	Carriage Tilt Tubes

Fig. 6-135: Hydraulic Tube Installation, Outer Boom

23. (Ref. Fig. 6-135) Install the auxiliary and carriage tilt hydraulic tubes (Items 2 and 3) on the swivel elbows (Item 1) in the outer boom. Torque the auxiliary tube swivel nuts to 50–58 ft-lbs and the carriage tilt tube swivel nuts to 79–88 ft-lbs. Secure the hydraulic tubes to the boom section with cushion clamps.



#	Description	#	Description
1	Bulkhead Elbows	4	Access Cover
2	Auxiliary Hydraulic Hoses	5	Lockwasher
3	Carriage Tilt Hydraulic Hoses	6	Capscrew

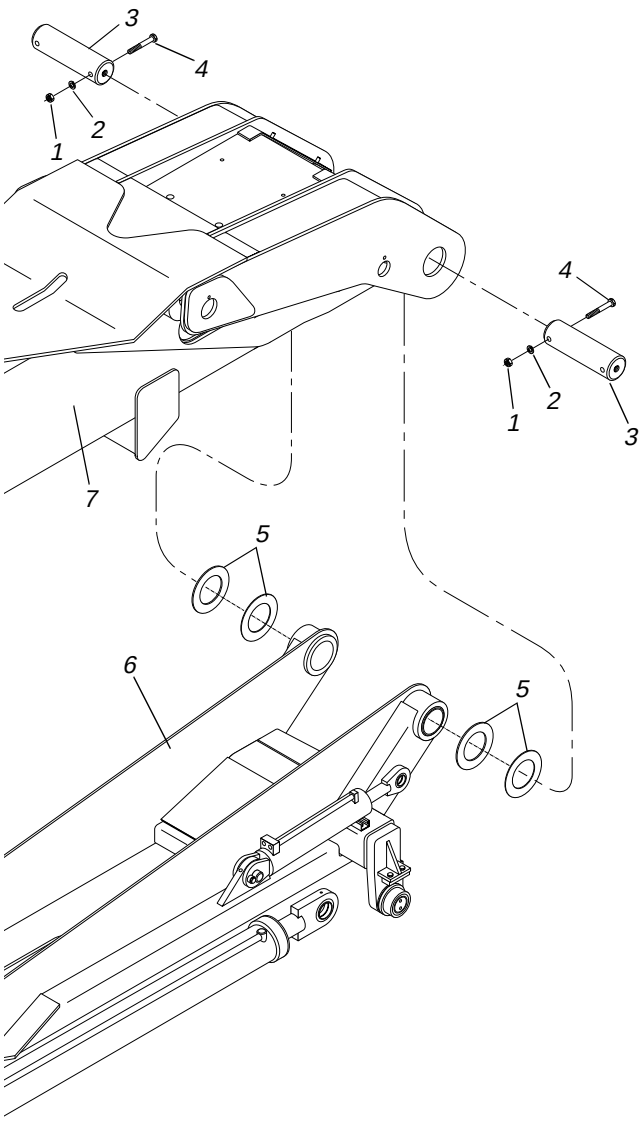
Fig. 6-136: Hose Installation, Outer Boom

24. (Ref. Fig. 6-136) Install the auxiliary and carriage tilt hydraulic hose (Items 2 and 3) to the bulkhead elbows (Item 1) in the outer boom section. Torque the auxiliary hose swivel nuts to 50–58 ft-lbs and the carriage tilt hose swivel nuts to 79–88 ft-lbs.

25. Attach slings/chains to the outer boom section and the crane.

CAUTION: Make sure slings and chains are secure and a crane is supporting the weight of the boom.

26. Position the outer boom section over the transfer carriage/boom cradle. Carefully lower the outer boom and align the boom pivot boss with the matching bosses in the transfer carriage/boom cradle.

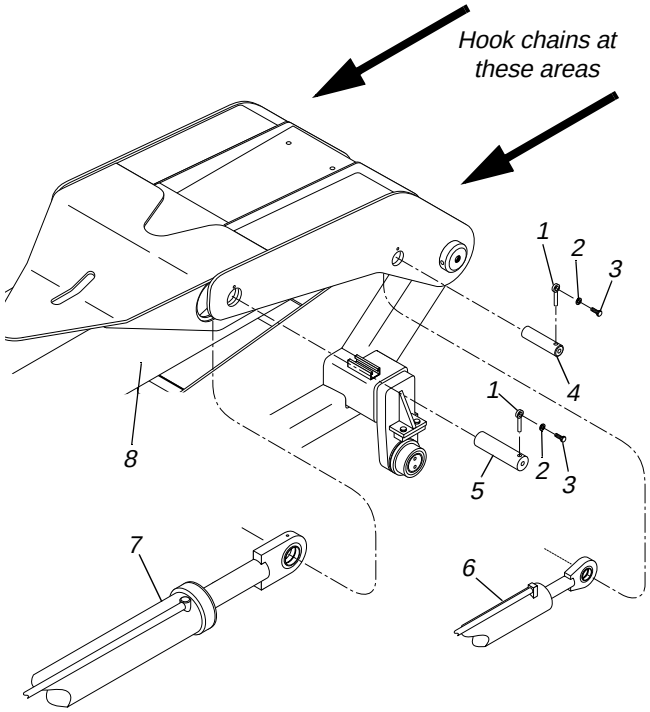


#	Description
1	Nut
2	Lockwasher
3	Boom Pivot Pin
4	Capscrew

#	Description
5	Shims
6	Transfer Carriage/Boom Cradle
7	Outer Boom Section

Fig. 6-137: 3-Section Outer Boom Installation

27. (Ref. Fig. 6-137) Partially insert two (2) boom pivot pins (Item 3) to temporarily secure the boom pivot. Check gaps between the boom pivot boss and the matching bosses in the transfer carriage/boom cradle. Select appropriate shim sizes to center the boom in the transfer carriage/boom cradle.
28. Slide the boom pivot pins out one at a time and insert the required shims (Item 5). Fully insert the boom pivot pins. Apply thread locking compound to the capscrews and secure the pivot pins with two (2) capscrews (Item 4), lockwashers (Item 2), and nuts (Item 1). Torque the nuts to 110 ft-lbs.

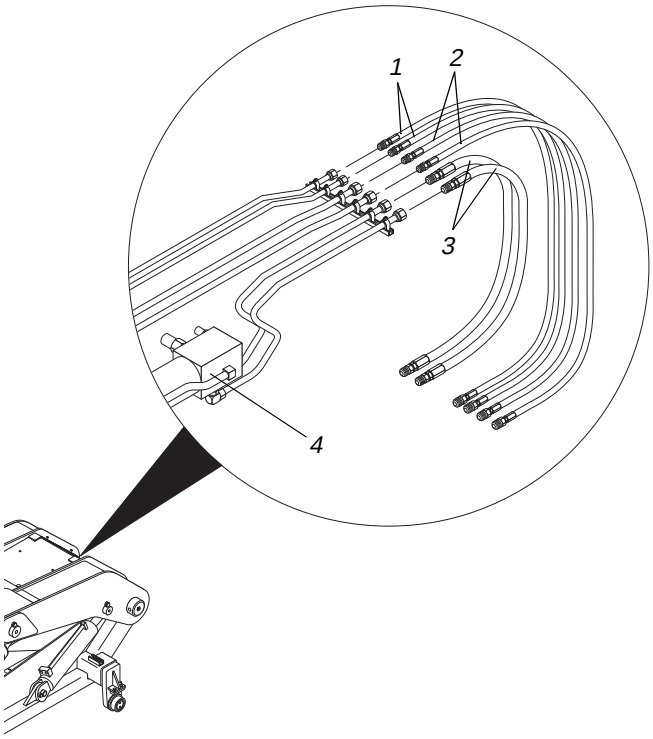


J1072

#	Description	#	Description
1	Lock Pin	5	Pivot Pin, Boom Hoist Cylinder
2	Lockwasher	6	Rear Carriage Tilt Cylinder
3	Capscrew	7	Boom Hoist Cylinder
4	Pivot Pin, Rear Carriage Tilt Cyl.	8	Boom

Fig. 6-138: Cylinder Pivot Pin Installation

29. (Ref. Fig. 6-138) Align the rod-end of a boom hoist cylinder (Item 7) with the matching boss on the boom. Insert a pivot pin (Item 5) and secure it with a lock pin (Item 1), lockwasher (Item 2), and a capscrew (Item 3) that has thread locking compound applied to its threads. Torque the capscrew to 55 ft-lbs. Repeat this procedure for the other hoist cylinder and the rear carriage tilt cylinders (Item 6).
30. The slings/chains and the crane may be removed at this point.



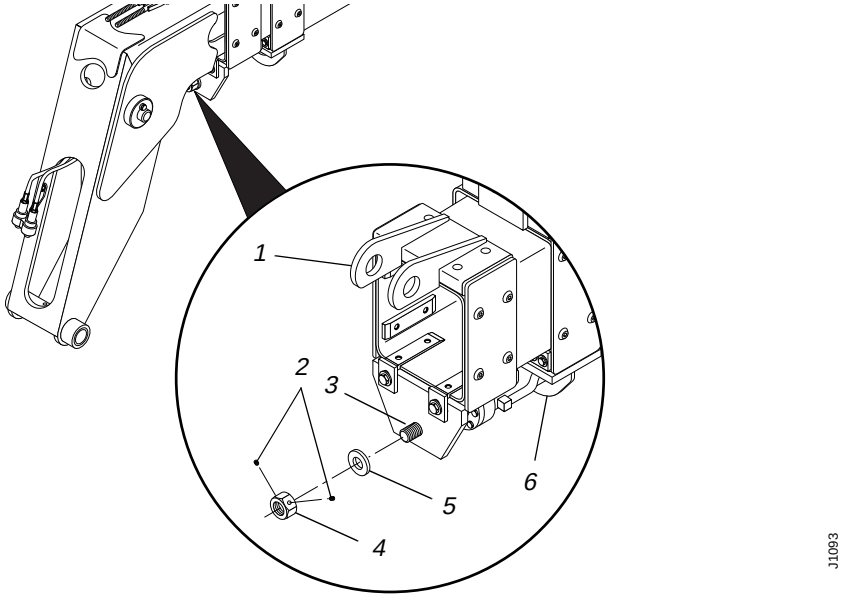
J1077

#	Description
1	Auxiliary Hydraulic Hoses
2	Carriage Tilt Hoses

#	Description
3	Boom Extension Hoses
4	Boom Extension Cylinder

Fig. 6-139: Hose Connections, 3-Section Boom

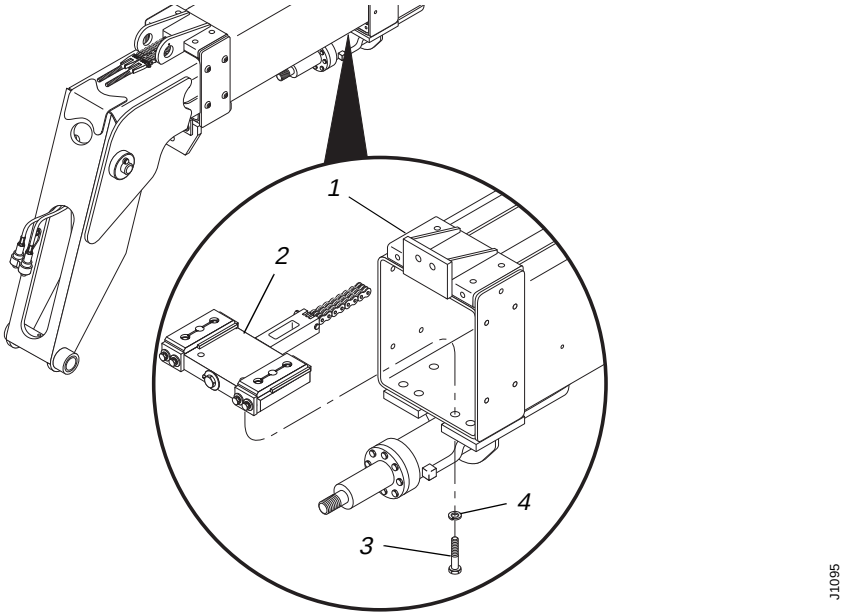
31. (Ref. Fig. 6-139) Connect the two (2) auxiliary hydraulic hoses (Item 1) and two (2) carriage tilt hoses (Item 2) to the rear of the boom. Torque the hose swivel nuts to 79–88 ft-lbs.
32. (Ref. Fig. 6-139) Connect the two (2) boom extension hoses (Item 3) to the boom extension cylinder lines. Torque the hose swivel nuts to 79–88 ft-lbs.
33. Lubricate all pivot grease fittings with EP lithium based grease.
34. Install the boom elevation proximity switch in the transfer carriage/boom cradle. (See “Installation” in Section 7).
35. Start the engine and extend the boom extension cylinder rod out three feet. Shut the engine off.
36. Attach slings/chains to the middle and inner boom sections. Use a crane to lift and install them in the outer boom section while attaching the boom extension cylinder to the middle boom section.



#	Description	#	Description
1	Inner Boom Section	4	Extension Cylinder Rod Nut
2	Setscrew	5	Washer
3	Extension Cylinder	6	Support Bracket

Fig. 6-140: Rod End of Extension Cylinder

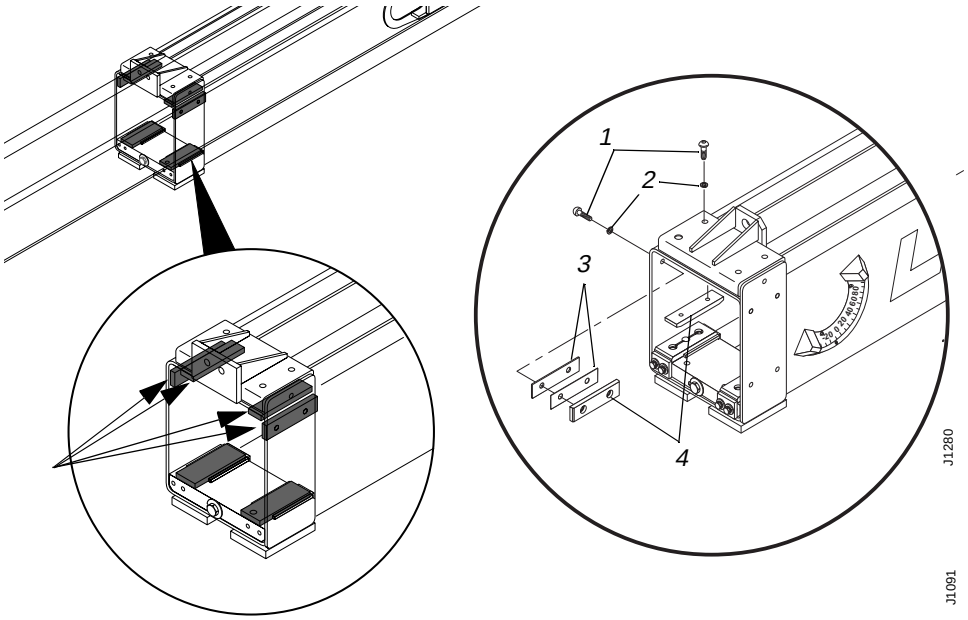
37. (Ref. Fig. 6-140) Install the washer (Item 5) and extension cylinder rod nut (Item 4) on the boom extension cylinder rod (Item 3). Torque the nut to 1,641 ft-lbs. Secure the nut with two setscrews (Item 2).



#	Description	#	Description
1	Outer Boom Section	3	Capscrew
2	Anchor Base	4	Lockwasher

Fig. 6-141: Anchor Base Installation

38. (Ref. Fig. 6-141) Install the anchor base assembly to the bottom of the middle boom section with six (6) lockwashers and capscrews. Install the shortest capscrew in the hole illustrated above. Torque this capscrew to 280 ft-lbs. Torque the other five (5) capscrews to 200 ft-lbs.



#	Description
1	Button Head Socket Capscrew
2	Lockwasher

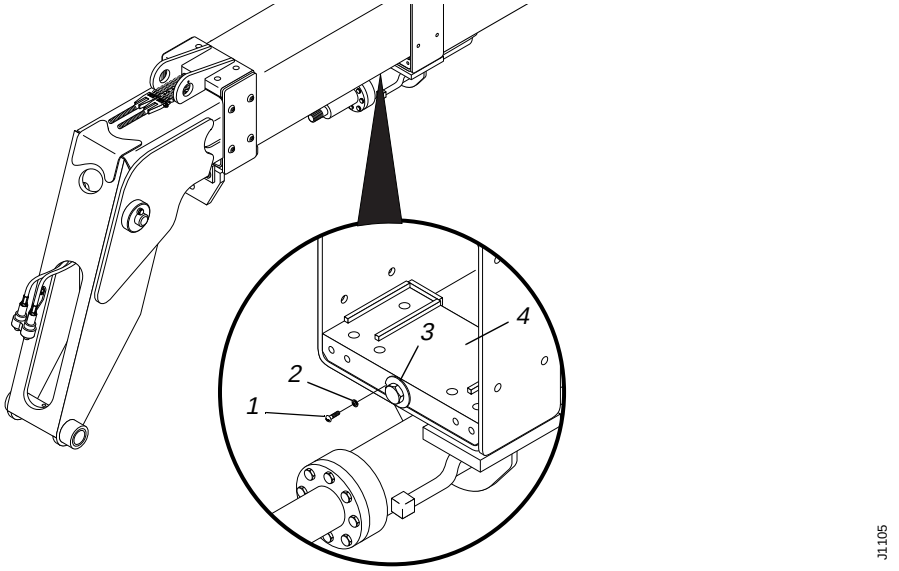
#	Description
3	Shim
4	Slide Pad

Fig. 6-142: Front Slide Pads Installation, Outer Boom

39. (Ref. Fig. 6-142) Install the top and side slide pads and shims on the outer boom section according to drawing specifications. See “Shimming Procedures” on page 6-91 for details.

    a. Install the shims and slide pads with two (2) each lockwashers and button head socket capscrews.

    b. Torque the capscrews to 65 ft-lbs.



#	Description
1	Capscrew
2	Lockwasher

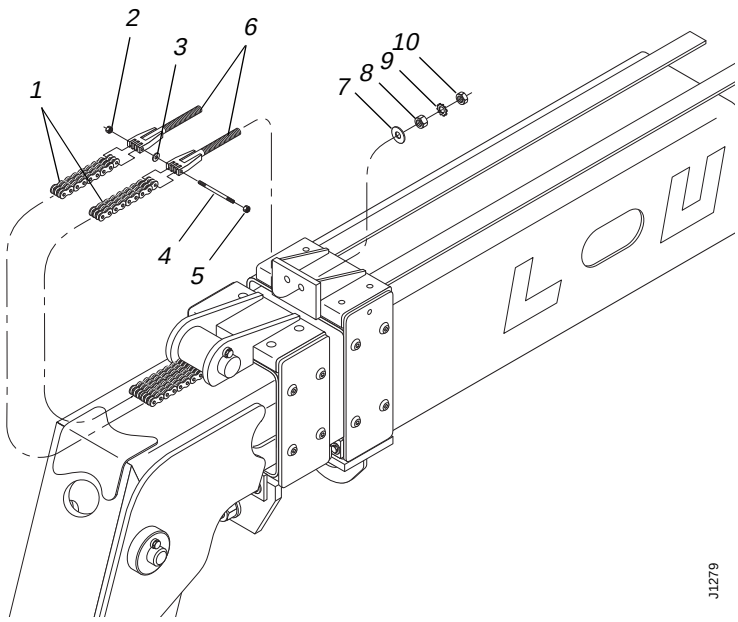
#	Description
3	Chain Adjustment Rod
4	Anchor Base

Fig. 6-143: Securing Lower Chain

40. (Ref. Fig. 6-143) Adjust the lower chain by tightening the chain adjustment rod (Item 3). Stop tightening just prior to the chain being taunt. Align the notch in the head of adjustment rod (Item 3) with the threaded hole in anchor base (Item 4). Secure the adjustment rod with a lockwasher (Item 2) and capscrew (Item 1). Torque the capscrew to 75 in-lbs.

41. Attach the upper chains to the chain anchors on the top of the outer boom. Machines were manufactured with three types of chain anchors. These are shown below. Follow the steps for the machine with the appropriate serial number.

644B-42 (S/N 101–141)
844C-42 (S/N 101–433)
1044C-42 (S/N 101–110)
6K-42 (S/N 101–113)
8K-42 (S/N 101–192)



#	Description
1	Upper Chain
2	Locknut
3	Flatwasher
4	Chain Anchor Rod
5	Locknut

#	Description
6	Chain Adjustment Anchor
7	Flatwasher
8	Nut
9	Lockwasher
10	Jam Nut

Fig. 6-144: Upper Chains - First Type

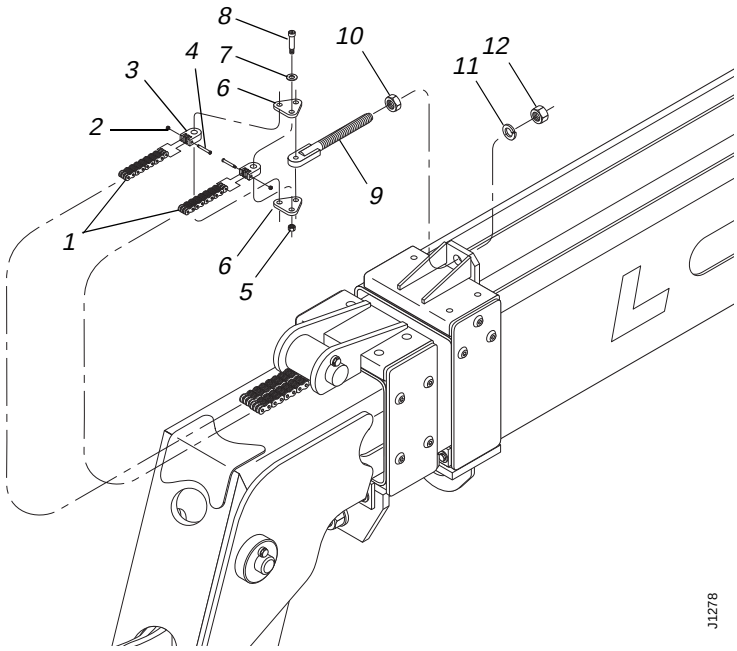
First Type (Ref. Fig. 6-144)

a. Install the two (2) chain adjustment anchors (Item 6) on the upper chains (Item 1) with a chain anchor rod (Item 4) and two (2) locknuts (Items 2 and 5). Make sure a flatwasher (Item 3) is installed between the two upper chains. Torque the locknuts to 156 in-lbs.

b. Install the two chain adjustment anchors in the upper boom section.

c. Install a flatwasher (Item 7), nut (Item 8), lockwasher (Item 9), and jam nut (Item 10) on each chain adjustment anchor. Torque the nut (Item 8) until just before the chains become taunt. Torque the jam nut (Item 10) to 200 ft-lbs.

644B-42 (S/N 142–264)
844C-42 (S/N 434–856)
1044C-42 (S/N 111–120)
6K-42 (S/N 114–137)
8K-42 (S/N 193–)273
10K-42 (S/N 101–108)



#	Description
1	Upper Chain
2	Locknut
3	Chain Anchor
4	Shoulder Bolt
5	Locknut
6	Chain Equalizer

#	Description
7	Flatwasher
8	Shoulder Bolt
9	Chain Adjustment Anchor
10	Jam Nut
11	Lockwasher
12	Nut

Fig. 6-145: Upper Chains - Second Type

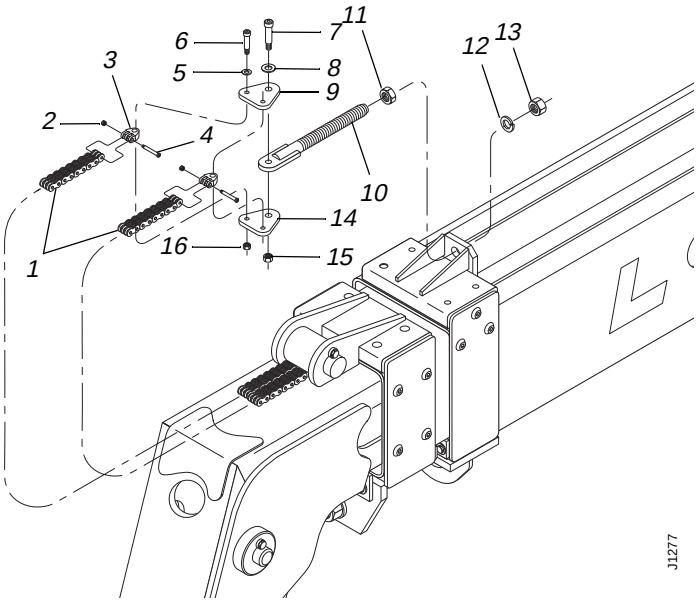
Second Type (Ref. Fig. 6-145)

a. Install a chain anchor (Item 3) on each upper chain (Item 1) with a shoulder bolt (Item 4) and locknut (Item 2). Torque the locknut to 75 in-lbs.

b. Install two (2) chain equalizers (Item 6) on the chain anchors and the chain adjustment anchor (Item 9) with three (3) flatwashers, (Item 7) shoulder bolts (Item 8), and locknuts (Item 5). Torque the locknuts to 110 ft-lbs.

c. Install the chain adjustment anchor, with the jam nut (Item 10) installed, on the outer boom section. Install the lockwasher (Item 11) and nut (Item 12) on the chain adjustment anchor. Torque the jam nut (Item 10) until just before the chains become taunt. Torque the nut (Item 12) to 840 ft-lbs.

644B-42 (S/N 265–)
844C-42 (S/N 857–)
1044C-42 (S/N 121–)
6K-42 (S/N 138–)
8K-42 (S/N 274–)
10K-42 (S/N 109–)



#	Description
1	Upper Chain
2	Locknut
3	Chain Anchor
4	Shoulder Bolt
5	Flatwasher
6	Shoulder Bolt
7	Shoulder Bolt
8	Flatwasher

#	Description
9	Chain Equalizer
10	Chain Adjustment Anchor
11	Jam Nut
12	Lockwasher
13	Nut
14	Chain Equalizer
15	Locknut
16	Locknut

Fig. 6-146: Upper Chains - Third Type

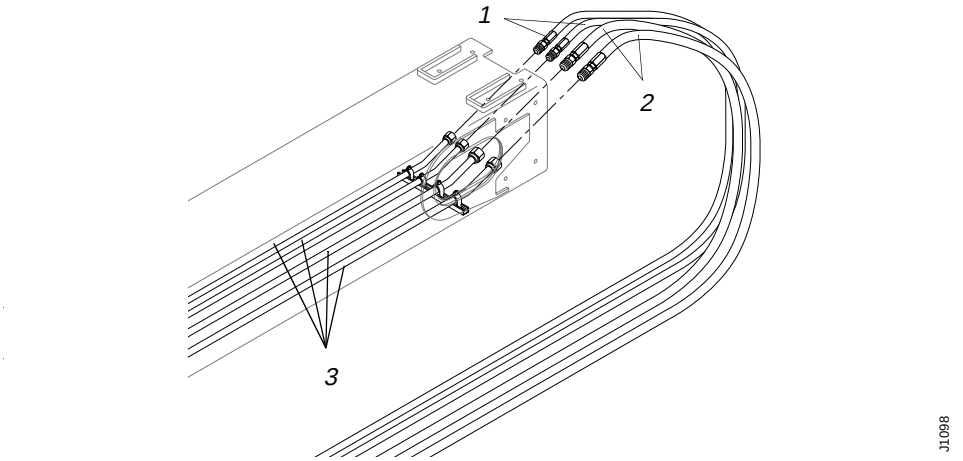
Third Type (Ref. Fig. 6-146)

a. Install a chain anchor (Item 3) on each upper chain (Item 1) with a shoulder bolt (Item 4) and locknut (Item 2). Torque the locknut to 75 in-lbs.

b. Install two (2) chain equalizers (Items 9 and 14) on the chain anchors with two (2) flatwashers, (Item 5) shoulder bolts (Item 6), and locknuts (Item 16). Torque the capscrews to 276 in-lbs.

c. Install the chain adjustment anchor (Item 10) between the two (2) chain equalizers with a flatwasher (Item 8), shoulder bolt (Item 7), and a locknut (Item 15). Torque the locknut to 110 ft-lbs.

d. Install the chain adjustment anchor, with the jam nut (Item 11) installed, on the outer boom section. Install the lockwasher (Item 12) and nut (Item 13) on the chain adjustment anchor. Torque the jam nut (Item 11) until just before the chains become taunt. Torque the nut (Item 13) to 840 ft-lbs.

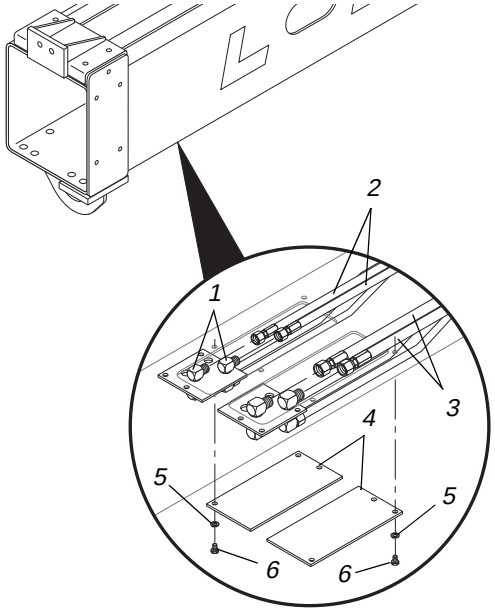


#	Description
1	Auxiliary Hydraulic Hoses
2	Carriage Tilt Hydraulic Hoses

#	Description
3	Hydraulic Tubes

Fig. 6-147: Rear Hose Connections, Inner Boom

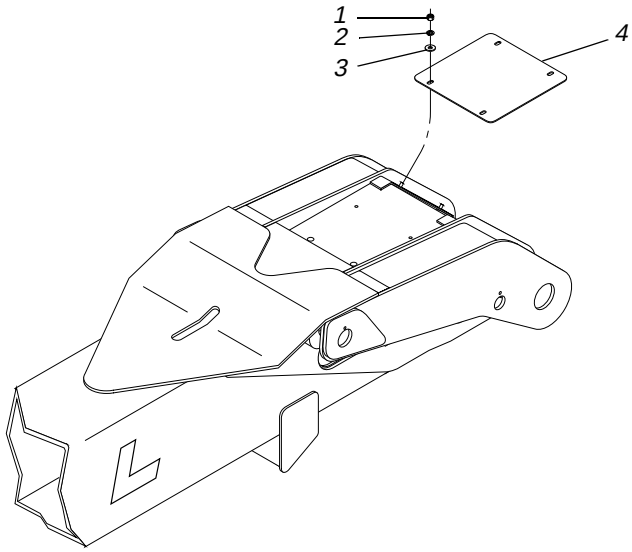
42. (Ref. Fig. 6-147) Install the auxiliary (Item 1) and carriage tilt (Item 2) hydraulic hoses to the hydraulic tubes (Item 3) at the rear of the inner boom section. Torque the auxiliary hose swivel nuts to 50–58 ft-lbs. Torque the carriage tilt hose swivel nuts to 79–88 ft-lbs.
43. Install the quick attach assembly to boom. See page 6-59.
44. Install attachment.
45. Retract the boom and grease the complete boom assembly.
46. Start engine and cycle the frame tilt fully several times. Raise the boom, noting that **Rear Osc Lock** light illuminates when boom is at about 40° elevation. If light does not illuminate, stop and lower the boom; then follow procedures for adjustments as outlined in Section 7.
47. Cycle all boom hydraulics several times to remove air from system. Retract and lower boom to ground and shut off engine.
48. Check chain adjustments and inspect hydraulic connections for leaks and tighten as necessary. Check boom clearances and adjust if necessary.



#	Description	#	Description
1	Bulkhead Elbows	4	Access Cover
2	Auxiliary Hydraulic Hoses	5	Lockwasher
3	Carriage Tilt Hydraulic Hoses	6	Capscrew

Fig. 6-148: Access Cover Installation, Outer Boom

49. (Ref. Fig. 6-148) Install each access cover (Item 4) on the outer boom section with three (3) lockwashers (Item 5) and capscrews (Item 6). Torque the capscrews to 276 in-lbs.



#	Description	#	Description
1	Nut	3	Flatwasher
2	Lockwasher	4	Boom Cover

Fig. 6-149: Boom Cover installation

50. Install the boom cover (Item 4) to the outer boom section with four (4) flatwashers (Item 3), lockwashers (Item 2), and nuts (Item 1). Torque the nuts to 276 in-lbs.

Extension Cylinder

3-Section Boom

Description

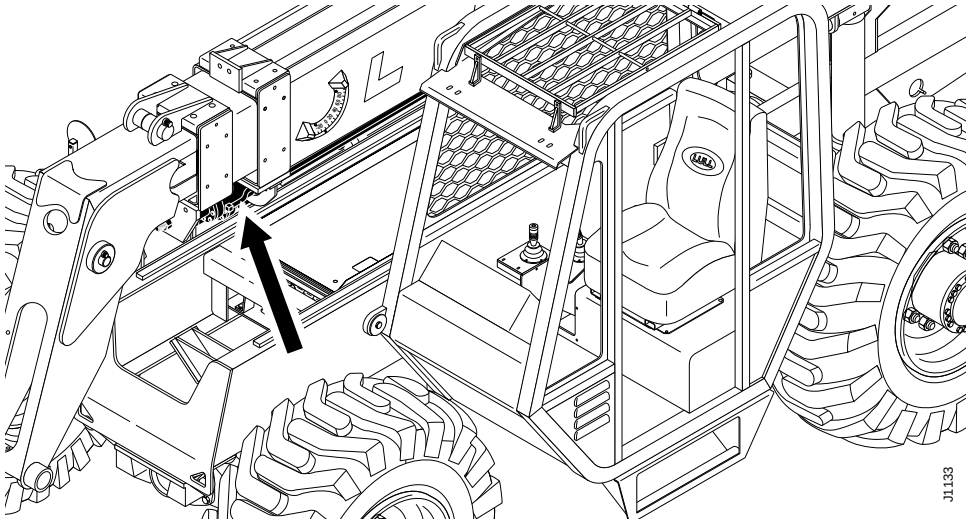
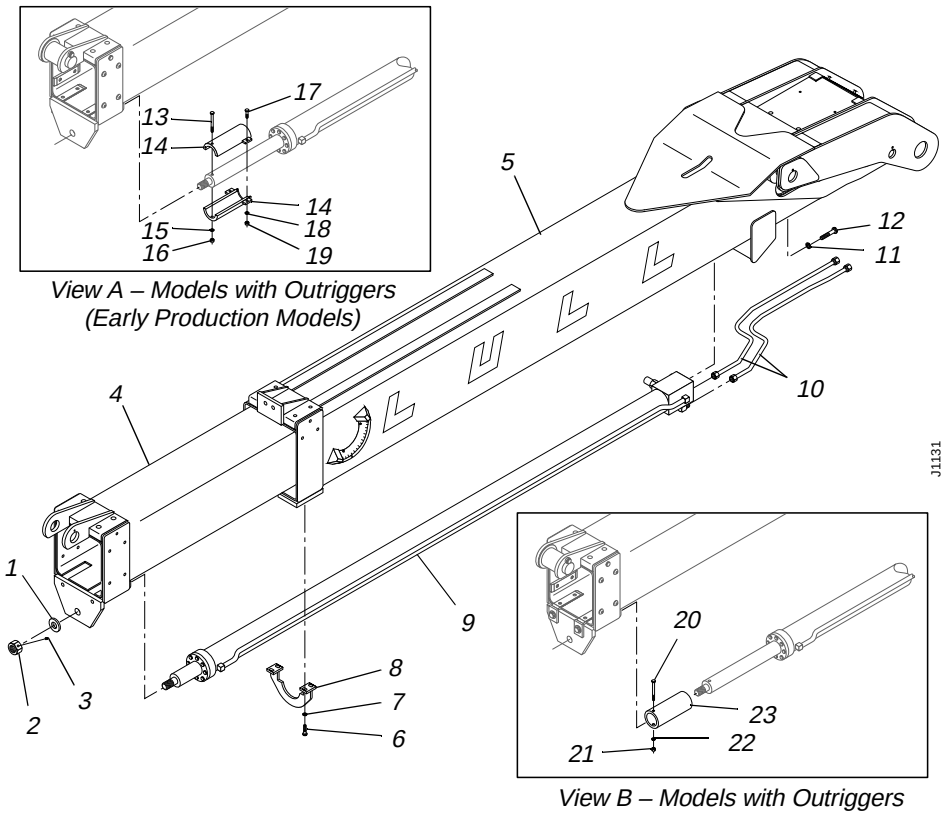


Fig. 6-150: 3-Section Boom Extension Cylinder

(Ref. Fig. 6-150) The boom extension cylinder controls extension and retraction of the boom. For models with a 3-section boom, it is located beneath the outer boom. Operating pressure is 3000 psi.

Removal, Boom Extension Cylinder



View A – Models with Outriggers (Early Production Models)

View B – Models with Outriggers

#	Description
1	Washer
2	Extension Cylinder Rod Nut
3	Socket Setscrew
4	Middle Boom Section
5	Outer Boom Section
6	Capscrew
7	Lockwasher
8	Cylinder Support Bracket
9	Boom Extension Cylinder
10	Hydraulic Tube
11	Lockwasher
12	Capscrew

#	Description
13	Capscrew
14	Cylinder Stop
15	Lockwasher
16	Nut
17	Capscrew
18	Lockwasher
19	Nut
20	Capscrew
21	Nut
22	Lockwasher
23	Cylinder Stop

Fig. 6-151: Boom Extension Cylinder Removal – 3-Section Boom

(Ref. Fig. 6-151) The following steps are required to remove the boom extension cylinder.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. For models with transfer carriages, extend the carriage out. Extend the middle boom section out one foot.
3. Level the boom, apply the park brake, and shut the engine off.
4. Loosen two (2) socket setscrews (Item 3) in rod nut (Item 2).
5. Loosen and remove the rod nut and washer (Item 1) securing boom extension cylinder to front of middle boom section (Item 4).

WARNING: To avoid personal and/or equipment damage, support the hydraulic cylinder before removing support bracket and other hardware that secure the cylinder to the boom. Use suitable blocking and lifting devices when removing heavy machine components.

6. Place blocks between the extension cylinder and the support bracket (Item 8) to prevent damage to the cylinder during removal.
7. Retract the extension cylinder.
8. Loosen and remove two (2) hydraulic tubes (Item 10) from the fittings on the boom extension cylinder (Item 9). Bleed any remaining oil into a suitable container. Cap fittings and tubes.
9. Using sling(s), crane, or other suitable means to secure the cylinder, loosen and remove two (2) each capscrews (Item 12) and lockwashers (Item 11) securing the extension cylinder to the rear of the outer boom section (Item 5).
10. Remove two (2) capscrews (Item 6), lockwashers (Item 7), and the cylinder support bracket (Item 8).
11. Slowly remove the cylinder from the machine and take it to a location suitable for inspection and disassembly.
12. For models with outriggers, remove the cylinder stop assembly as follows:
    a. For early production models (see View A),
        1). Remove the nut (Item 16), lockwasher (Item 15), and capscrew (Item 13) securing the cylinder stop (Item 14) to the extension cylinder.
        2). Remove the two (2) each nuts (Item 19), lockwashers (Item 18), and capscrews (Item 17) securing the two (2) cylinder stop halves; remove the cylinder stop halves.
    b. For all other models (see View B),
        1). Remove the nut (Item 21), lockwasher (Item 22), and capscrew (Item 20) securing the cylinder stop tube (Item 23) to the extension cylinder.
        2). Remove the cylinder stop tube.
13. Clean the remaining parts with solvent and dry with compressed air. Inspect for damage and replace as necessary.

Installation, Boom Extension Cylinder

(Ref. Fig. 6-151) The following steps are required to install the boom extension cylinder.

1. For models with outriggers, install a cylinder stop assembly as follows:
    a. For early production models (see View A),

1). Install cylinder stop halves (Item 14) on extension cylinder with two (2) each capscrews (Item 17), lockwashers (Item 18), and nuts (Item 19). Partially tighten the nuts.

2). Secure cylinder stop to extension cylinder with capscrew (Item 13), lockwasher (Item 15), and nut (Item 16) Torque nut to 276 in-lbs.

3). Torque the two (2) cylinder stop nuts (Item 19) to 276 in-lbs.

b. For all other models (see View B),

1). Install the cylinder stop (Item 23) on the boom extension cylinder with a capscrew (Item 20), lockwasher (Item 22), and nut (Item 21).

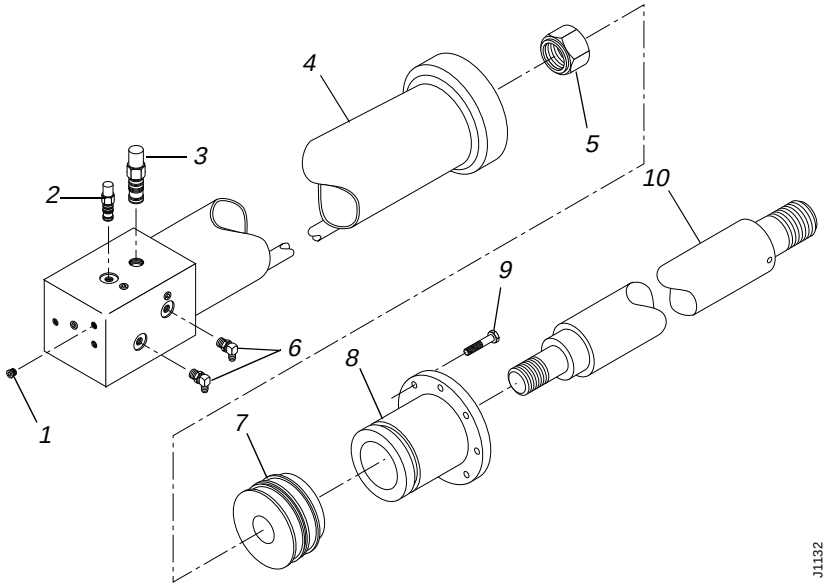
2). Torque the cylinder stop nut (Item 21) to 276 in-lbs.

2. Using sling(s), crane, or other suitable means, position the cylinder (Item 9) in its proper location.

WARNING: To avoid personal and/or equipment damage, make sure the cylinder is properly supported until it is completely installed.

3. Secure the cylinder to the outer boom section with two (2) each lockwashers (Item 11) and capscrews (Item 12). Torque the capscrews to 280 ft-lbs.
4. Reconnect two (2) hydraulic tubes (Item 10) to fittings on extension cylinder. Torque tube swivel nuts to 79–88 ft-lbs.
5. Extend the cylinder rod until it is in its proper location on the middle boom section (Item 4).
6. Secure the cylinder to the middle boom section with a washer (Item 1) and rod nut (Item 2). Torque the rod nut to 1,641 ft-lbs. Secure the nut with two (2) setscrews (Item 3).
7. Install the cylinder support bracket (Item 8) using two (2) lockwashers (Item 7) and capscrews (Item 6). Torque the capscrews to 55 ft-lbs.

Overhaul, Extension Cylinder



#	Description
1	Hollow Hex O-ring Plug
2	Counterbalance Valve Cartridge
3	Counterbalance Valve Cartridge
4	Cylinder Barrel
5	Rod Nut

#	Description
6	90° O-ring Elbow
7	Piston
8	Rod Bearing Head
9	Capscrew
10	Cylinder Rod

Fig. 6-152: 3-Section Boom Extension Cylinder Assembly

(Ref. Fig. 6-152) The following steps are required to overhaul the boom extension 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. Release pressure in counterbalance valve cartridges (Items 2 and 3) 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.

   a. Place socket wrench over counterbalance valve cartridge. Wrap a clean shop rag around the socket to cover the area of the counterbalance valve cartridge.
   b. Carefully and slowly, turn cartridge out of manifold block to release pressure in cylinder.
3. Remove the counterbalance valve cartridges.
4. Slowly extend and retract cylinder by hand to remove most of the hydraulic oil.

5. Remove eight (8) capscrews (Item 9) securing rod bearing head (Item 8) to cylinder barrel.
6. Remove cylinder rod (Item 10) from cylinder barrel (Item 4).

CAUTION: To prevent possible damage to components, support rod and head; do not wiggle rod or head back and forth during removal.

7. Remove rod nut (Item 5), piston (Item 7), and rod bearing head from cylinder rod.
8. Remove the two (2) elbows (Item 6) from the cylinder manifold block.
9. Remove four (4) O-ring plugs (Item 1) from cylinder manifold block.
10. Remove all O-rings, wear rings, and backup rings from cylinder components and discard.
11. Thoroughly clean components with solvent and dry with compressed air. Inspect and replace if damaged.
12. Inspect inner surface of barrel, outer surface of piston, and length of rod for scratches and scoring. If barrel, piston, or rod is damaged, it must be replaced.
13. Check condition of threads on rod, nut, and capscrews. Do not attempt to repair damaged threads.
14. Inspect counterbalance valve cartridge (Item 8), including O-rings, for condition and replace as necessary. Do not disassemble the cartridge. Service to counterbalance valve cartridges is limited to installing new O-rings and replacing the entire cartridge.
15. Lubricate counterbalance valve cartridge O-rings with clean hydraulic oil.
16. Install valve cartridge (Item 2) in manifold block and torque to 40–45 ft-lbs.
17. Install valve cartridge (Item 3) in manifold block and torque to 150–160 ft-lbs.
18. Install four O-ring plugs (Item 1) in manifold block and torque to 125–145 in-lbs.
19. Lubricate new O-ring with hydraulic oil and install inside piston (seals rod to piston).
20. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install on head. Using a seal driver, install new wiper seal in head. Lubricate wiper seal with hydraulic oil.
21. Slide rod bearing head (Item 8) and piston (Item 7) onto rod (Item 10). Lubricate threads on rod with hydraulic oil and install rod nut (Item 5). Torque rod nut to 550 ft-lbs.
22. Lubricate new seal and wear rings with hydraulic oil and install on piston.

23. Lubricate threads on eight (8) capscrews (Item 9) with hydraulic oil. Coat inside of barrel (Item 4) with hydraulic oil. To avoid damaging seals during assembly, carefully insert rod and head into barrel. Install capscrews until snug. Do not torque capscrews (instructions follow).
24. Following sequence shown in Fig. 6-10, torque capscrews to an initial value of 30 ft-lbs. Follow sequence again and torque capscrews to a final value of 90 ft-lbs.
25. Install two (2) elbows (Item 6) on cylinder manifold block. Torque elbow nuts to 75–85 ft-lbs.

4-Section Boom

Description

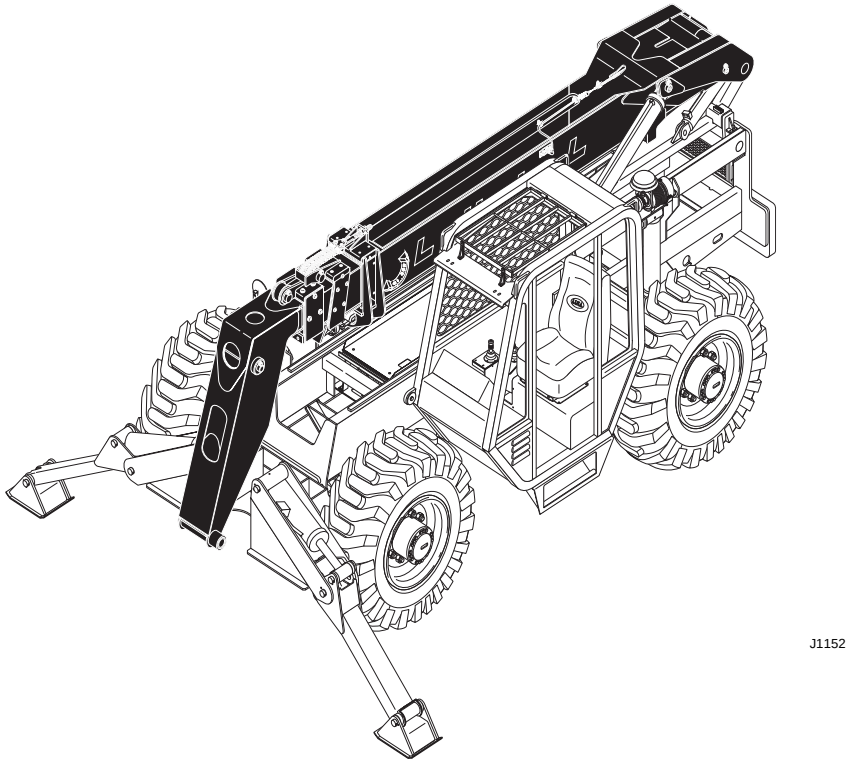
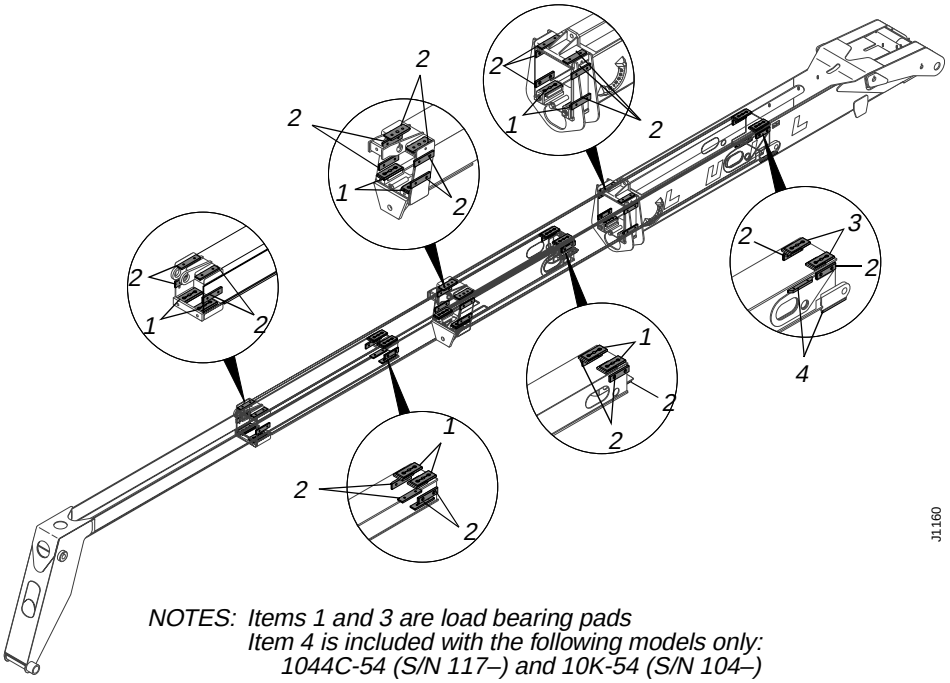


Fig. 6-153: 4-Section Boom

The 4-section boom is used on 1044C-54 and 10K-54 models. It is a fully synchronized slide boom with a 54 foot maximum lift height. The boom on the 1044C-54 has a maximum forward reach of 45 feet while the 10K-54 has a maximum forward reach of 38 feet, 4 inches.

Shimming Procedures

4-Section Boom



NOTES: Items 1 and 3 are load bearing pads
Item 4 is included with the following models only:
1044C-54 (S/N 117–) and 10K-54 (S/N 104–)

#	Description
1	Boom Pad, 1" Thick x 3" Wide
2	Boom Pad, 9/16" Thick x 2" Wide
3	Boom Pad, 3/4" Thick x 3" Wide

#	Description
4	Boom Pad, 3/4" Thick x 1-1/4" Wide

Fig. 6-154: Boom Slide Pad Locations – 4-Section Boom

1. Park machine on firm, level surface and apply park brake. Level the frame. Level and fully retract the boom. Shut off engine.
2. Determine if all boom slide pads are serviceable. (See “Slide Pad Inspection” on page 6-48). Have replacement pads ready as required.

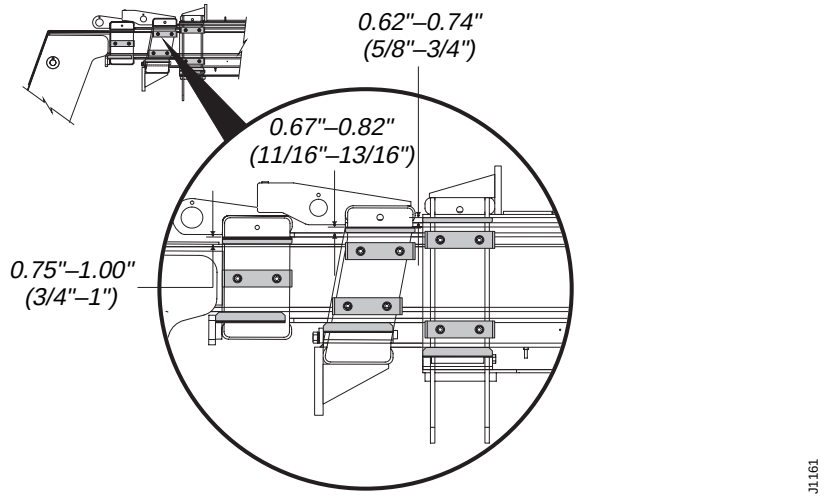


Fig. 6-155: Boom Section Gaps – Front of 4-Section Boom

3. (Ref. Fig. 6-155) Measure the gap between boom sections at all upper front pads. If the dimensions are *not* within the specified range, proceed to Step 4. If the dimensions *are* within the specified range, proceed to Step 5.

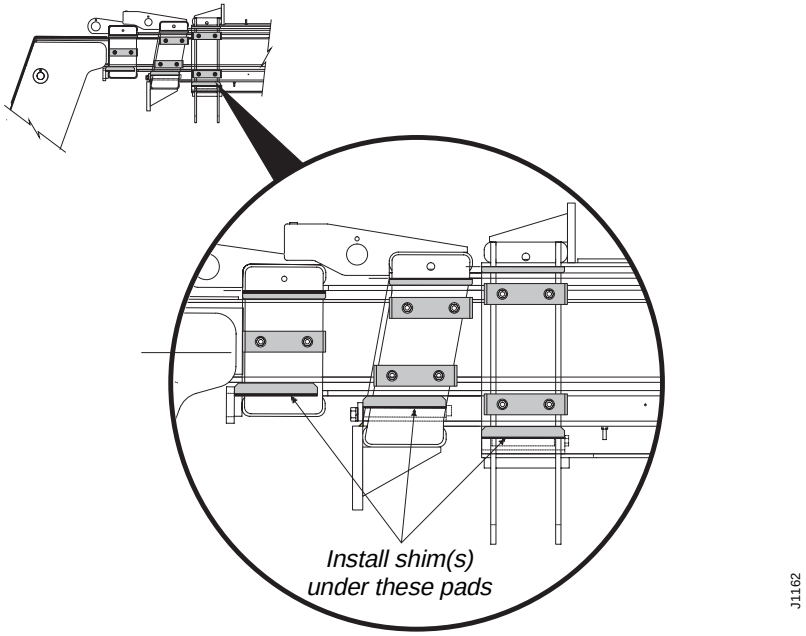


Fig. 6-156: Lower Shim Installation – Front of 4-Section Boom

4. (Ref. Fig. 6-156) Install/remove shim(s) under indicated pads to obtain clearances specified in Step 3.

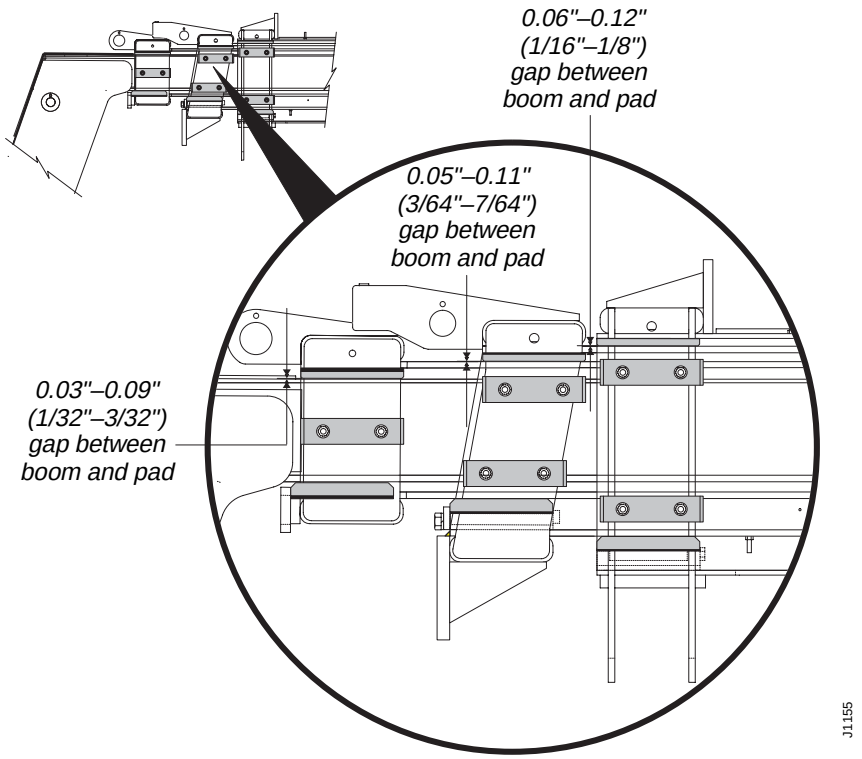


Fig. 6-157: Upper Shim Installation – Front of 4-Section Boom

5. (Ref. Fig. 6-157) Install/remove shim(s) under indicated pads to obtain specified clearances.

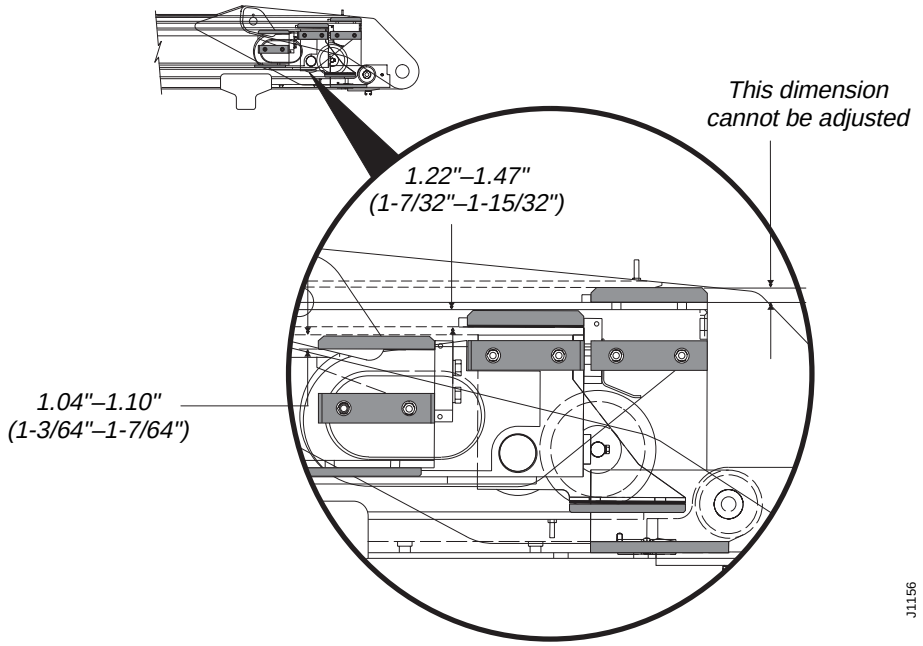


Fig. 6-158: Boom Section Gaps – Rear of 4-Section Boom

6. (Ref. Fig. 6-158) Measure the gaps between the inner, middle (forward), and middle (rear) sections at the upper pads. Spacing between the middle (rear) and outer boom section cannot be adjusted. If the dimensions are not within the specified range, proceed to Step 7. If the dimensions are within the specified range, proceed to Step 8.

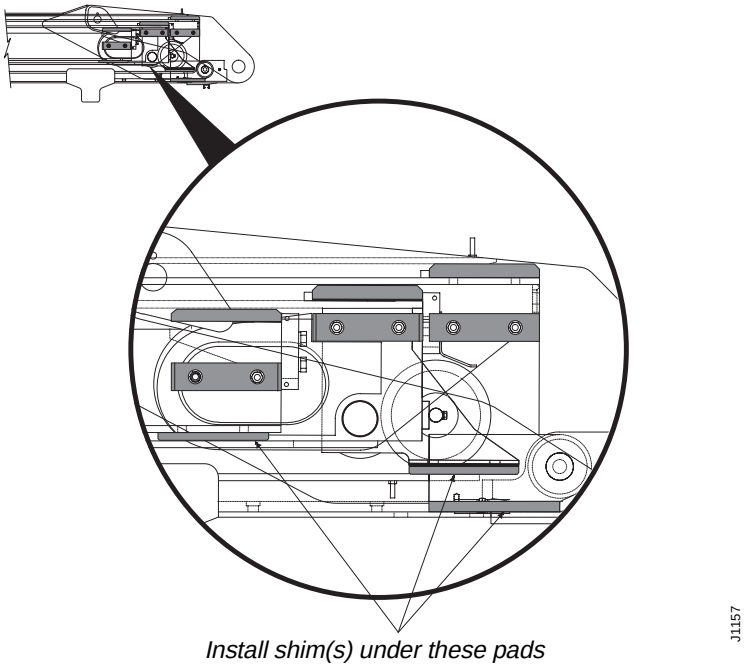


Fig. 6-159: Lower Shim Installation - Rear of 4-Section Boom

7. (Ref. Fig. 6-159)Install/remove shim(s) under indicated pads to obtain clearance specified in Step 6.

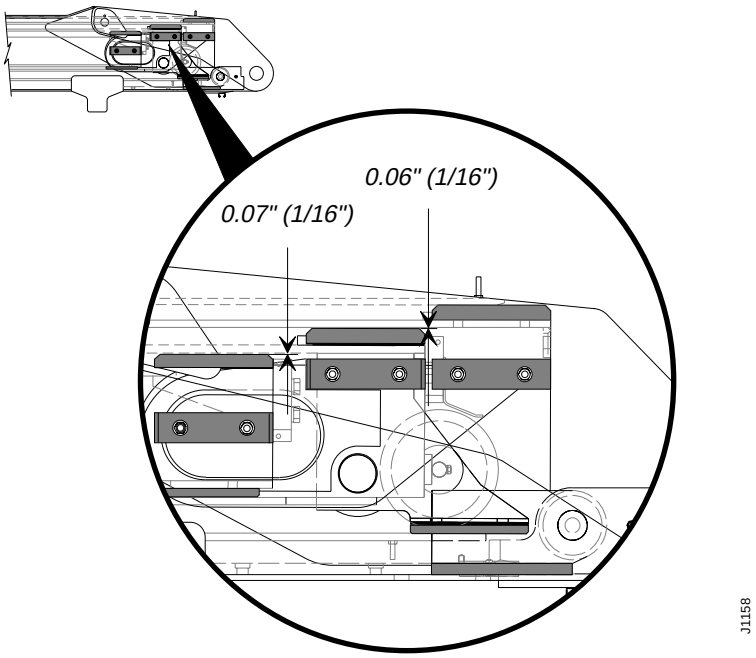


Fig. 6-160: Upper Shim Installation – Rear of 4-Section Boom

8. (Ref. Fig. 6-160) Install/remove shim(s) under indicated pads to obtain specified clearances.

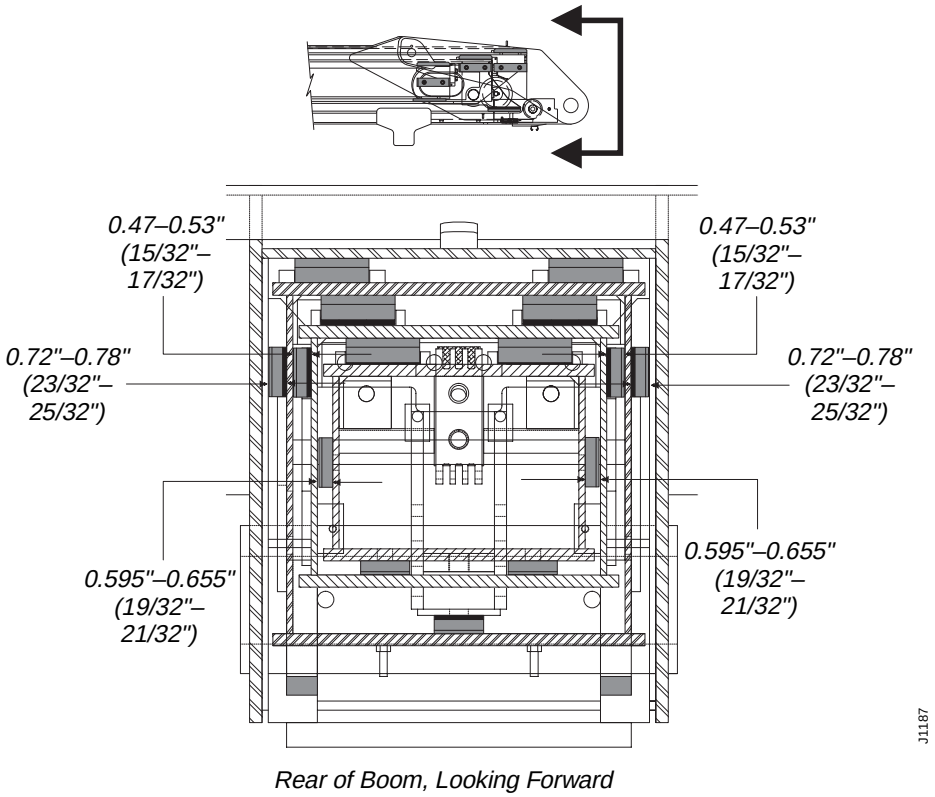
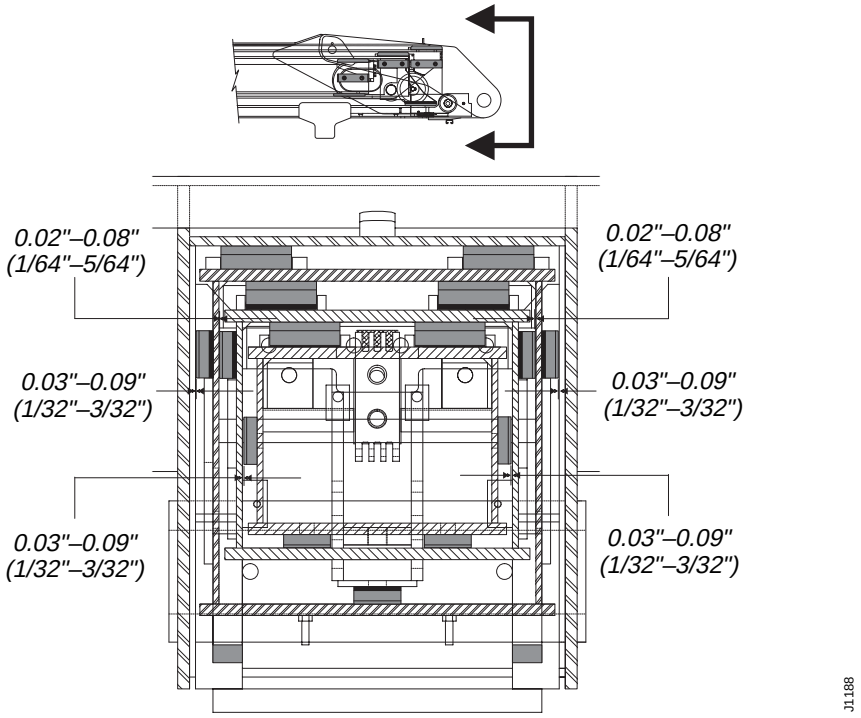


Fig. 6-161: Clearances Between Boom Sections – Rear of 4-Section Boom

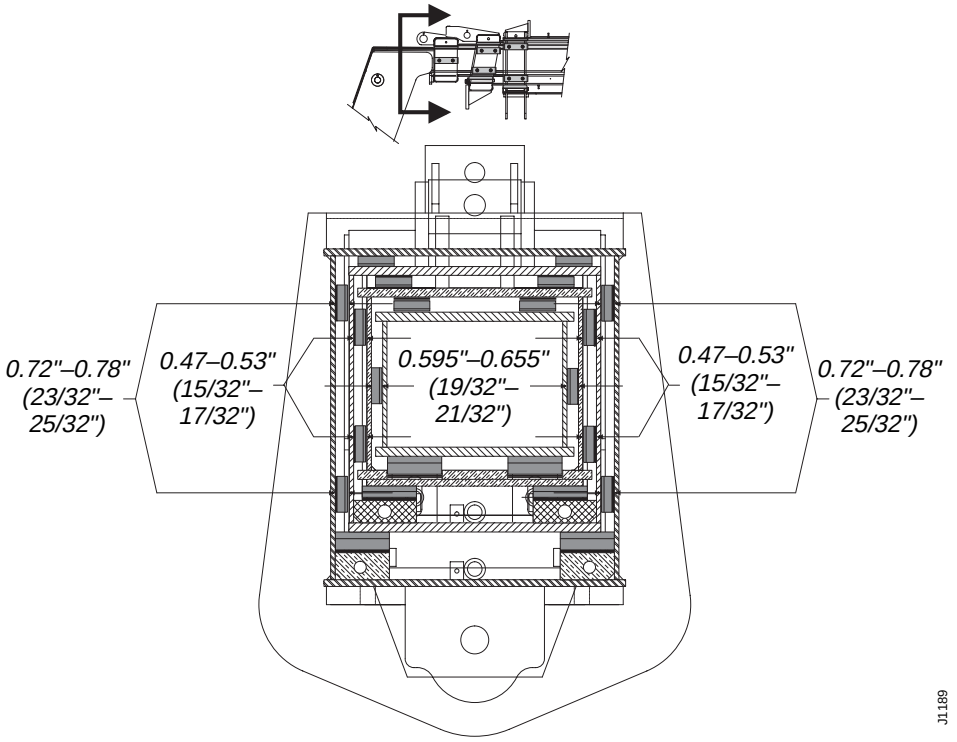
9. (Ref. Fig. 6-161) Adjust boom positions to obtain clearances between boom sections as shown. Measure these clearances at the slide pad locations.



Rear of Boom, Looking Forward

Fig. 6-162: Gaps Between Pads and Boom – Rear of 4-Section Boom

10. (Ref. Fig. 6-162) Install/remove shim(s) under indicated pads to obtain specified clearances making sure clearances on both sides of each boom section are the same.



Front of Boom, Looking Rearward

Fig. 6-163: Clearances Between Boom Sections – Front of 4-Section Boom

11. (Ref. Fig. 6-163) Adjust boom positions to obtain clearances between boom sections as shown. Measure these clearances at the slide pad locations.

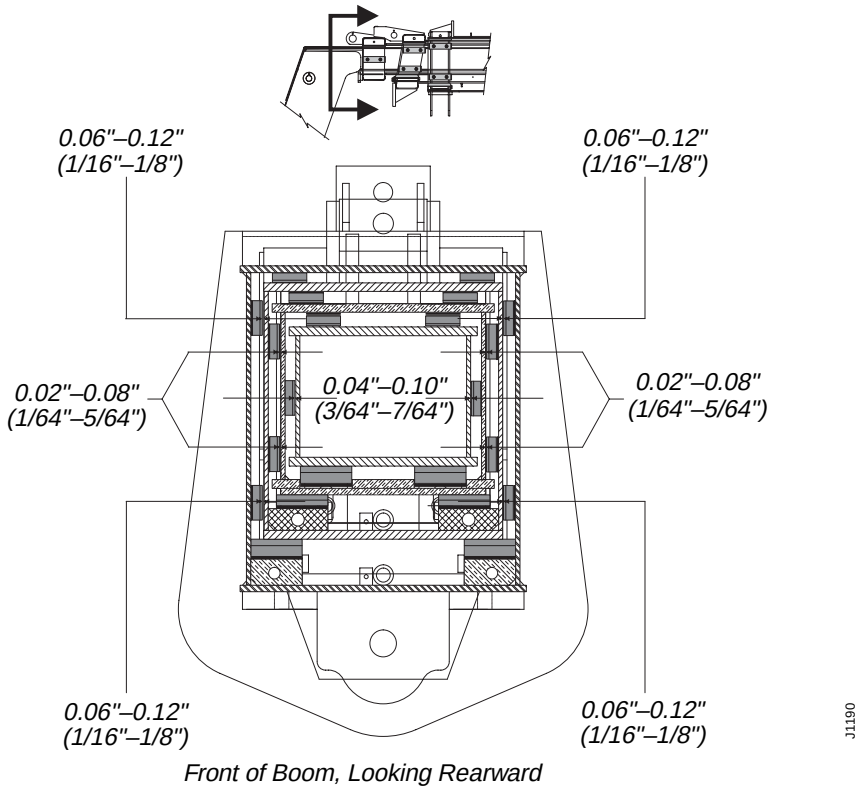


Fig. 6-164: Gaps Between Pads and Boom – Front of 4-Section Boom

12. (Ref. Fig. 6-164) Install/remove shim(s) under indicated pads to obtain specified clearances making sure clearances on both sides of each boom section are the same.
13. Extend boom and lubricate as described under “Lubrication” on page 6-50.
14. Check boom extension and retraction for binding against slide pads.

Inspection Procedures

4-Section Boom

These procedures are intended to determine if localized deformation has occurred on the inner, middle (forward), and middle (rear) boom sections.

1. Extend the boom and lower the forks to the ground.

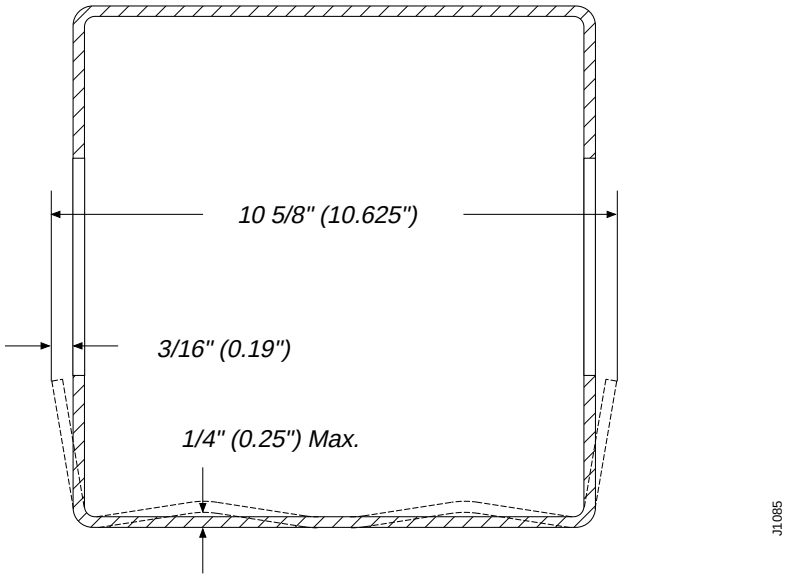


Fig. 6-165: Inner Boom Cross-Section at Window

2. (Ref. Fig. 6-165) Place a straight edge against the bottom surface of the inner boom section. Measure the distance from the straight edge to the bottom surface of the boom tube. This distance should not exceed 1/4" (0.25"). The maximum deflection will be found just in front of the middle (forward) boom section.
3. (Ref. Fig. 6-165) The side walls may also deflect outward at the window areas. Take this measurement across the inner boom tube, through the windows. Maximum allowable deflection is 3/16" (0.19) per side. The maximum allowable inner boom tube width is 10-5/8" (10.625"), measured through the windows.

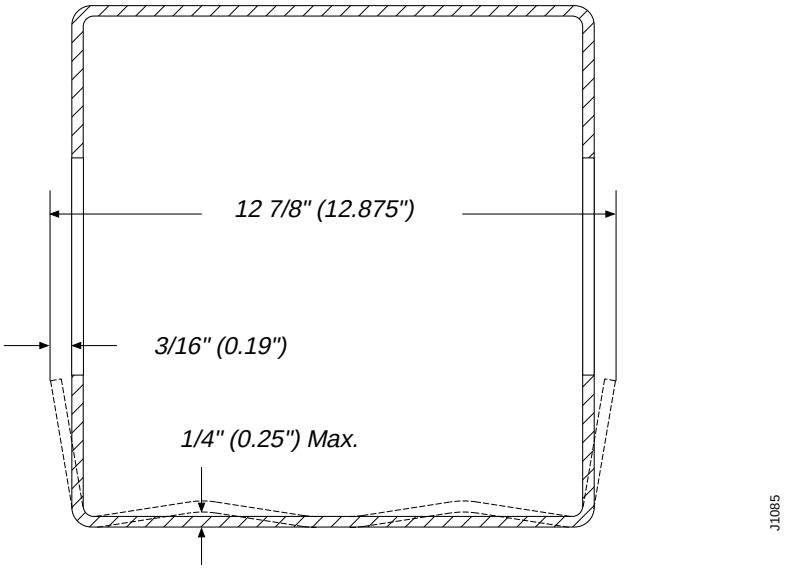


Fig. 6-166: Middle (Forward) Boom Cross-Section at Window

4. (Ref. Fig. 6-166) Place a straight edge against the bottom surface of the middle (forward) boom section. Measure the distance from the straight edge to the bottom surface of the boom tube. This distance should not exceed 1/4" (0.25"). The maximum deflection will be found just in front of the middle (rear) boom section.
5. (Ref. Fig. 6-166) The side walls may also deflect outward at the window areas. Take this measurement across the middle (forward) boom tube, through the windows. Maximum allowable deflection is 3/16" (0.19") per side. The maximum allowable middle (forward) boom tube width is 12-7/8" (12.875"), measured through the windows.

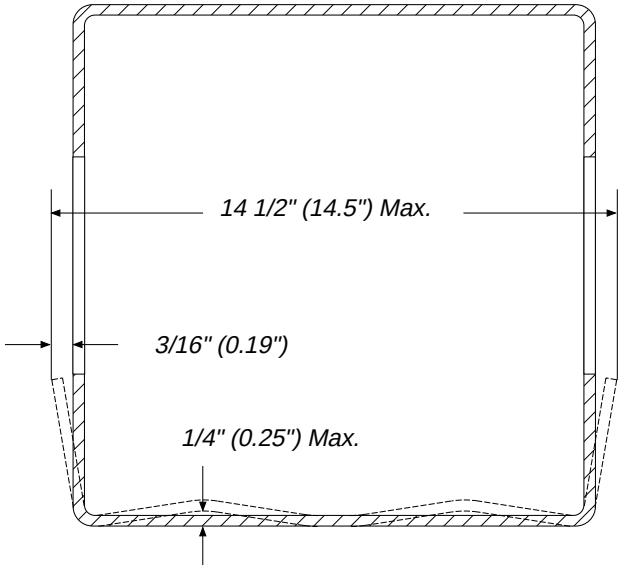


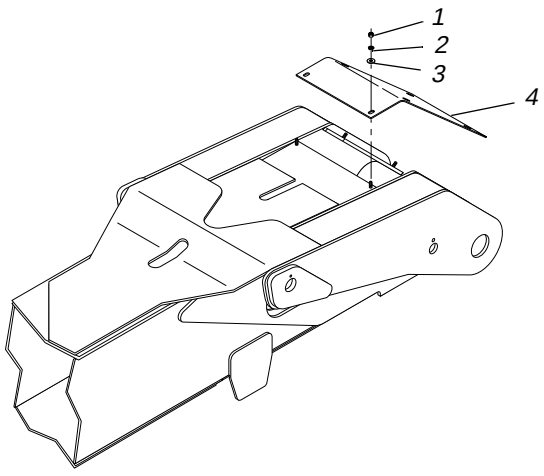
Fig. 6-167: Middle (Forward) Boom Cross-Section at Window

6. (Ref. Fig. 6-167) Place a straight edge against the bottom surface of the middle (rear) boom section. Measure the distance from the straight edge to the bottom surface of the boom tube. This distance should not exceed 1/4" (0.25"). The maximum deflection will be found just in front of the outer boom section.
7. (Ref. Fig. 6-167) The side walls may also deflect outward at the window areas. Take this measurement across the middle (rear) boom tube, through the windows. Maximum allowable deflection is 3/16" (0.19) per side. The maximum allowable middle (forward) boom tube width is 14-1/2" (14.5"), measured through the windows.

Boom Removal

4-Section Boom

1. Remove Quick Attach. See page 6-58.
2. Park machine on firm, level surface. If so equipped, fully retract transfer carriage. Fully retract boom before lowering it to the ground.
3. Set park brake, lock shift selector in NEUTRAL position, shut off engine and remove ignition key from switch. Block all wheels.
4. Position crane next to machine.

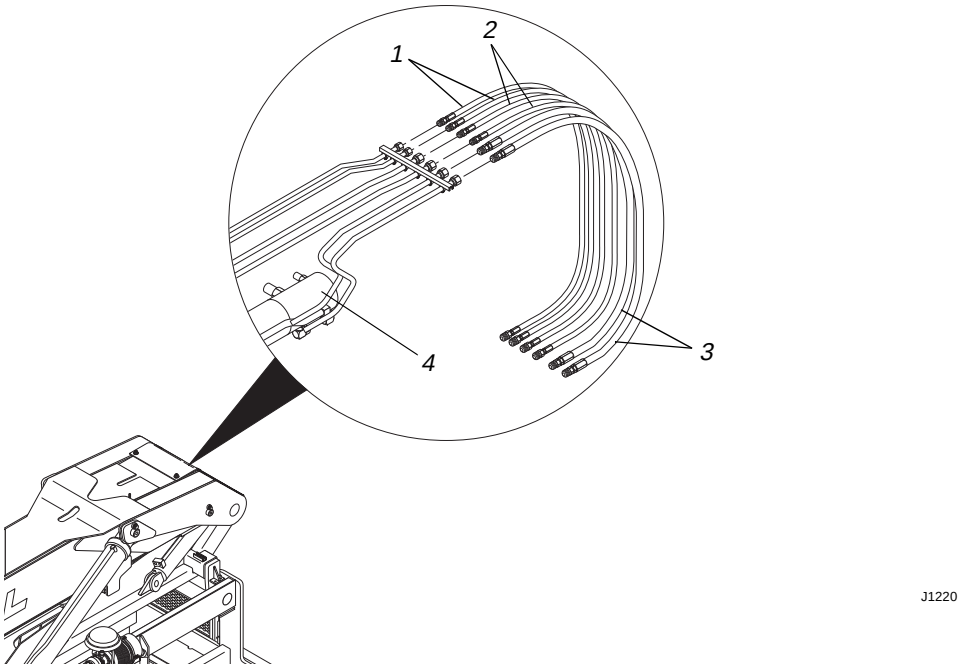


#	Description
1	Nut
2	Lockwasher

#	Description
3	Flatwasher
4	Boom Cover

Fig. 6-168: 4-Section Boom Cover Installation

5. (Ref. Fig. 6-168) Remove six (6) each nuts (Item 1), lockwashers (Item 2), and flatwashers (Item 3) securing boom cover (Item 4) to boom. Remove boom cover.
6. Remove boom elevation proximity switch. See “Boom Elevation Proximity Switch” in Section 7.
7. Remove boom extension proximity switch. See Step 8 on page 6-220.



#	Description
1	Auxiliary Hydraulic Hoses
2	Carriage Tilt Hoses

#	Description
3	Boom Extension Hoses
4	Boom Extension Cylinder

Fig. 6-169: Hose Connections, 4-Section Boom

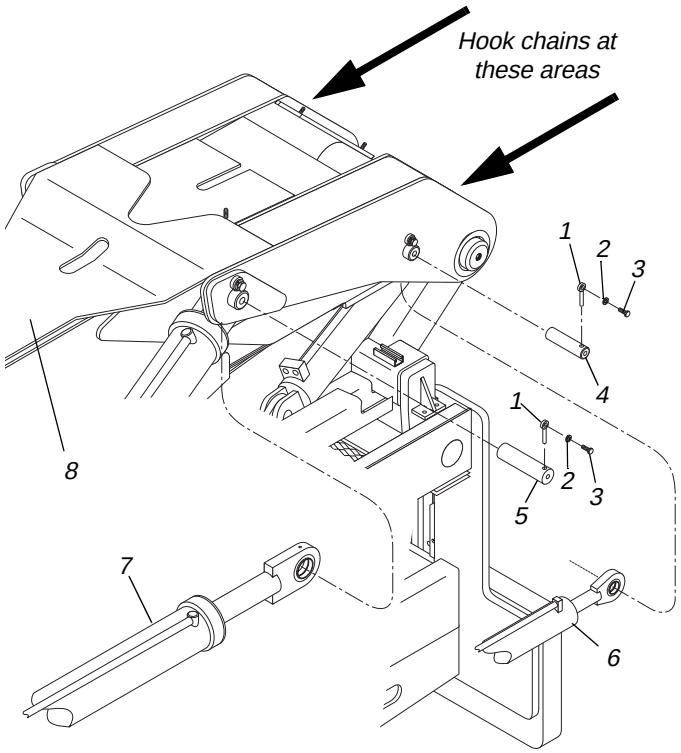
8. (Ref. Fig. 6-169) Tag and disconnect two (2) hoses at boom extension cylinder lines (Item 3). Cap lines and hoses.

Note: *"K" Model machines are not equipped with auxiliary hydraulics. For these models, disregard procedures that refer to auxiliary hydraulic components.*

9. Tag and disconnect two (2) carriage tilt hoses (Item 2), and two (2) auxiliary hydraulics hoses (Item 1) at the boom. Cap hoses and lines.

10. Place sling around inner boom section, at the front. Chains with hooks may be attached to the rear of the outer boom section, near the pivot pin bosses (Ref. Fig. 6-170). Attach sling and chains to crane hook and lift crane to support weight of boom.

CAUTION: Make sure crane, slings, and chains have sufficient capacity to support the weight of the boom. A 4-section boom assembly, including boom extension cylinder, weighs approximately 6,650 pounds.



#	Description
1	Lock Pin
2	Lockwasher
3	Bolt
4	Pivot Pin, Rear Carriage Tilt Cyl.

#	Description
5	Pivot Pin, Boom Hoist Cylinder
6	Rear Carriage Tilt Cylinder
7	Boom Hoist Cylinder
8	Boom

Fig. 6-170: Cylinder Pivot Pins

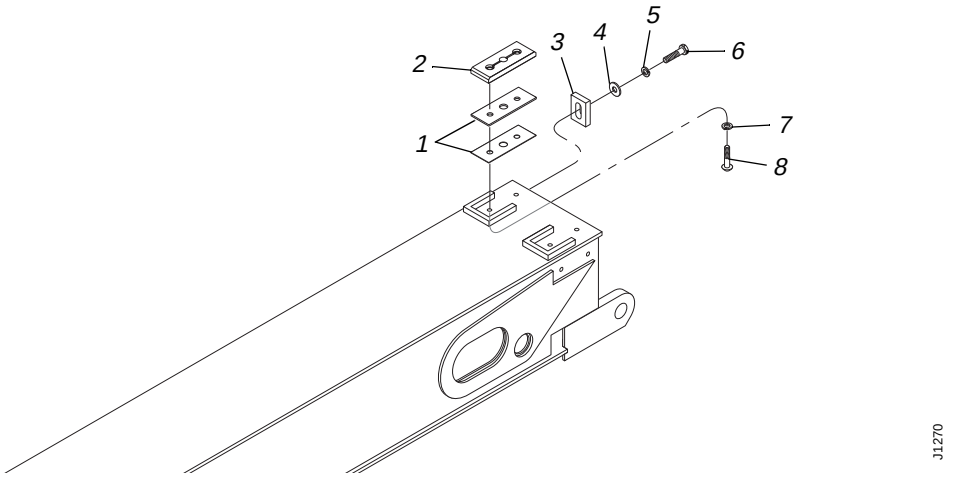
11. (Ref. Fig. 6-170) Remove four (4) capscrews (Item 3) and lockwashers (Item 2) from lock pins (Item 1) securing rear carriage tilt cylinders (Item 6) and boom hoist cylinders (Item 7) to the boom (Item 8). Remove four (4) lock pins from pivot pins (Items 4 and 5).

CAUTION: Make sure each cylinder is fully supported so it does not fall and cause personal or equipment damage when it is being removed.

12. (Ref. Fig. 6-170) Starting at a rear carriage tilt cylinder (Item 6), use a slide hammer puller threaded into the pivot pin (Item 4) to remove the pivot pin from boom. After the pivot pin has been removed, allow the cylinder to swing down and away from the boom.

CAUTION: Use suitable blocking to support cylinders and prevent damage to the surrounding structure.

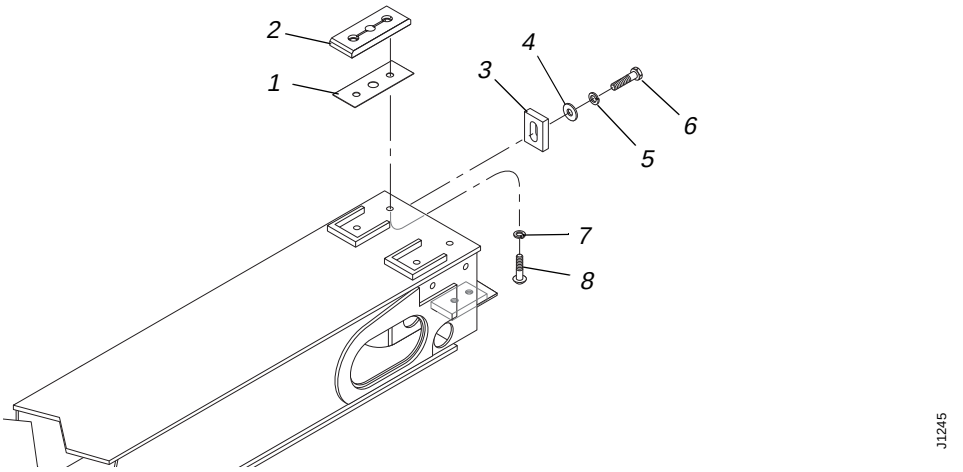
13. (Ref. Fig. 6-170) Repeat Step 24 for the remaining rear carriage tilt cylinder.
14. (Ref. Fig. 6-170) Continue with each of the two (2) hoist cylinders (Item 7) by using a slide hammer puller threaded into pivot pin (Item 5) to remove it. After the pivot pin has been removed, allow the cylinder to swing down and away from the boom.



#	Description	#	Description
1	Shim	5	Lockwasher
2	Upper Rear Slide Pad	6	Capscrew
3	Pad Retainer	7	Lockwasher
4	Flatwasher	8	Button-Head Socket Capscrew

Fig. 6-171: Upper Rear Slide Pad Removal – Middle (Rear) Boom Section

15. (Ref. Fig. 6-171) Remove upper rear slide pads from middle (rear) boom section as follows:
    a. Remove two (2) each capscrews (Item 6), lockwashers (Item 5), flatwashers (Item 4), and pad retainers (Item 3) from rear of middle (rear) boom section.
    b. Remove four (4) capscrews (Item 8) and lockwashers (Item 7) securing upper slide pads to rear of middle (rear) boom section. Remove two (2) slide pads (Item 2) and shims (Item 1).



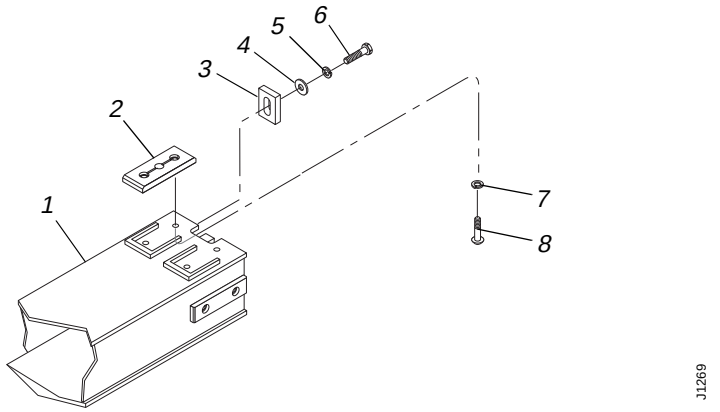
#	Description	#	Description
1	Shim	5	Flatwasher
2	Rear Upper Slide Pad	6	Capscrew
3	Pad Retainer	7	Lockwasher
4	Lockwasher	8	Button-Head Socket Capscrew

Fig. 6-172: Upper Rear Slide Pad Removal – Middle (Forward) Boom Section

16. (Ref. Fig. 6-172) Remove upper rear slide pads from middle (front) boom section as follows:

    a. Remove two (2) each capscrews (Item 6), lockwashers (Item 4), flatwashers (Item 5), and pad retainers (Item 3) securing upper slide pads to rear of middle (forward) boom section.

    b. Remove four (4) capscrews (Item 8) and lockwashers (Item 7) securing slide pads (Item 2) to top rear of middle (forward) boom section. Remove slide pads and shims (Item 1).



#	Description	#	Description
1	Inner Boom Section	5	Lockwasher
2	Upper Slide Pad	6	Capscrew
3	Pad Retainer	7	Lockwasher
4	Flatwasher	8	Button-Head Socket Capscrew

Fig. 6-173: Upper Rear Slide Pad Removal – Inner Boom Section

17. (Ref. Fig. 6-173) Remove upper rear slide pads from inner boom section as follows:

    a. Remove two (2) each capscrews (Item 6), lockwashers (Item 5), flatwashers (Item 4), and pad retainers (Item 3) from rear of inner boom section.

    b. Remove four (4) capscrews (Item 8) and lockwashers (Item 7) securing upper slide pads (Item 2) to rear of inner boom section. Remove the two (2) slide pads.

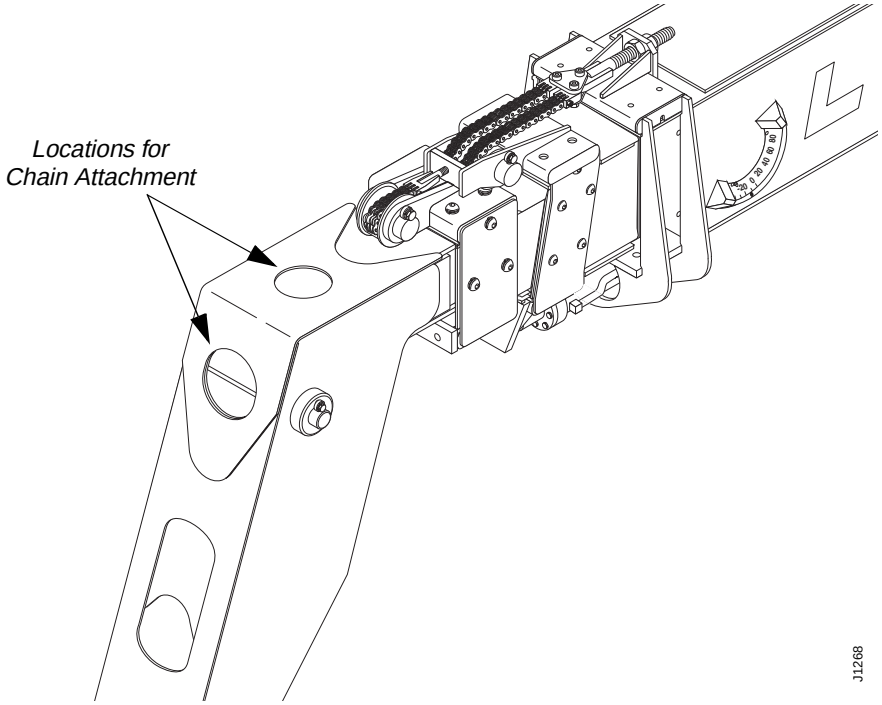
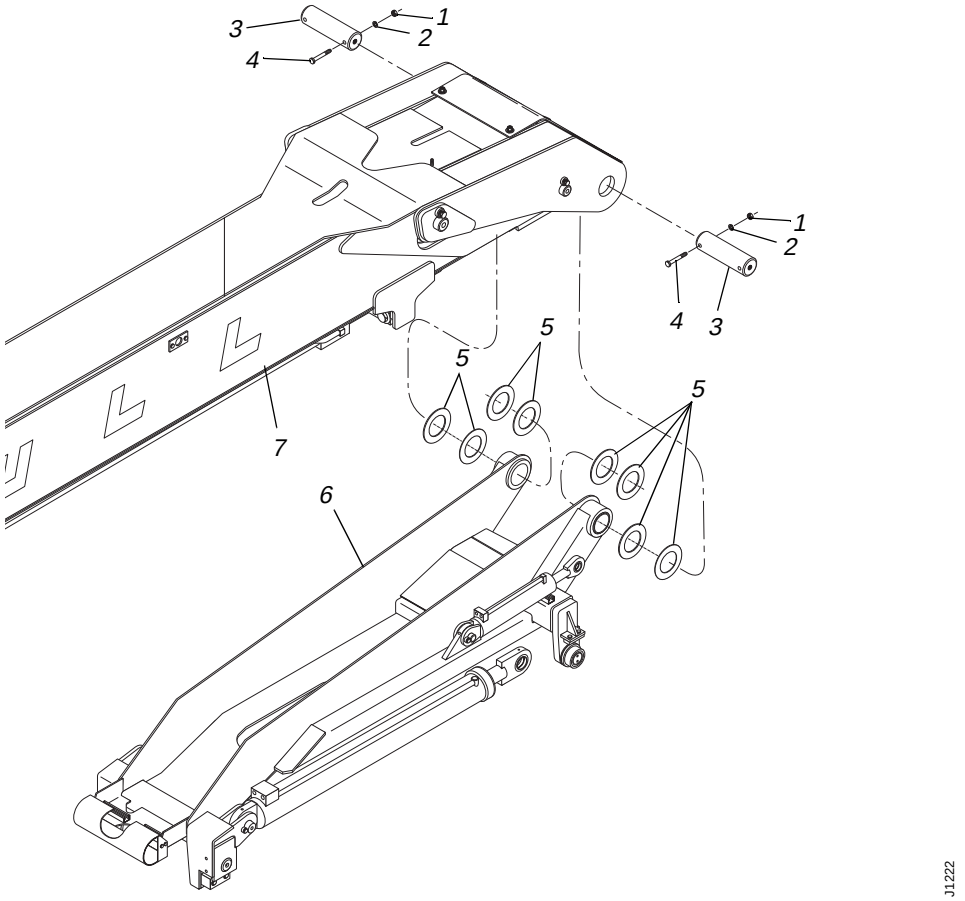


Fig. 6-174: Locations for Chain Attachment – Inner Boom Section

18. (Ref. Fig. 6-174) Because the chain and hose guide assembly interferes with removal of the boom pivot pins, it will be necessary to extend the boom approximately eight (8) inches. To do so, attach a chain to one of the openings either on the front or top of the inner boom section and pull the sections straight out.



#	Description
1	Nut
2	Lockwasher
3	Boom Pivot Pin
4	Bolt

#	Description
5	Shims
6	Transfer Carriage/Boom Cradle
7	Boom Assembly

Fig. 6-175: 4-Section Boom Pivot Pins

19. (Ref. Fig. 6-175) Remove two (2) each nuts (Item 1), lockwashers (Item 2), and capscrews (Item 4) from boom pivot pins (Item 3).

CAUTION: Make sure slings and chains are secure and crane is supporting the weight of the boom.

20. (Ref. Fig. 6-175) Using the slide hammer puller, remove the two (2) boom pivot pins and shims (Item 5).
21. (Ref. Fig. 6-175) Carefully lift the boom assembly (Item 7) clear of the transfer carriage/boom cradle (Item 6).
22. Swing the boom away from the machine and position it above a firm, level surface. Rotate the boom upside down and lower it onto support blocks.
23. Remove the front carriage tilt cylinder. See page 6-18.

installation

4-Section Boom

1. Prepare replacement boom for installation by removing strapping and blocks used for shipment. Note location of straps and blocks for use on the previously removed boom.
2. With the replacement boom still lying upside down, the front carriage tilt cylinder should be installed at this point. It is easier to install when the boom is in this position. See page 6-19
3. Attach slings/chains to the boom and crane. Lift the boom and rotate it to the upright position.
4. Position the boom over the transfer carriage/boom cradle. Carefully lower boom and align boom pivot boss with the matching bosses in the transfer carriage/boom cradle.
5. (Ref. Fig. 6-175) Partially insert two (2) boom pivot pins to temporarily secure the boom pivot. Check gaps between boom pivot boss and the matching bosses in the transfer carriage/boom cradle. Select appropriate shim sizes to center the boom in the transfer carriage/boom cradle.
6. (Ref. Fig. 6-175) Slide the boom pivot pins out one at a time and insert the required shims. Fully insert the boom pivot pins.
7. (Ref. Fig. 6-170) Align rod-end of a boom hoist cylinder with the matching boss on the boom. Insert pivot pin and secure with lock pin, lockwasher, and capscrew. Repeat this procedure for the other hoist cylinder and rear carriage tilt cylinders.
8. The slings/chains and crane may be removed at this point.
9. (Ref. Fig. 6-170) Connect the two (2) auxiliary hydraulic hoses and two (2) carriage tilt hoses to the rear of the boom.
10. Connect the two (2) hoses to the boom extension cylinder lines.
11. Lubricate all pivot grease fittings with EP lithium based grease.
12. Install boom extension proximity switch. See Step 9 on page 6-225.
13. Install boom elevation proximity switch in transfer carriage/boom cradle. See “Boom Elevation Proximity Switch” in Section 7.
14. Install quick attach assembly to boom. See page 6-59.
15. (Ref. Fig. 6-175) Start engine and extend the boom approximately eight inches. Shut engine off. Secure pivot pins with two (2) capscrews, lockwashers, and nuts. Torque nuts to 110 ft-lbs.
16. Start engine and cycle the frame tilt fully several times.
    a. Raise the boom, noting that **Rear Osc Lock** light illuminates when boom is at about 40° elevation. If light does not illuminate, stop and lower the boom. Follow procedures for under “Boom Elevation Proximity Switch” in Section 7.
    b. Complete proximity switch adjustment before proceeding to Step 17.
17. Cycle all boom hydraulics several times to remove air from system.

a. With the outriggers up, extend the boom, noting that **Boom Extension** proximity light illuminates when the boom is extended to specified distance (approximately 21 feet with tilting tower or 25 feet with standard carriage). If light does not illuminate, stop and retract the boom. See page 6-216 for adjustment procedures.

b. Retract and lower boom to ground and shut off engine.

c. Complete proximity switch adjustment before proceeding to Step 18.

18. Inspect hydraulic connections for leaks and tighten as necessary.

19. (Ref. Fig. 6-168) Install boom cover (Item 4) with six (6) each flatwashers (Item 3), lockwashers (Item 2), and nuts (Item 1). Tighten nuts to 180 in-lbs.

Boom Disassembly

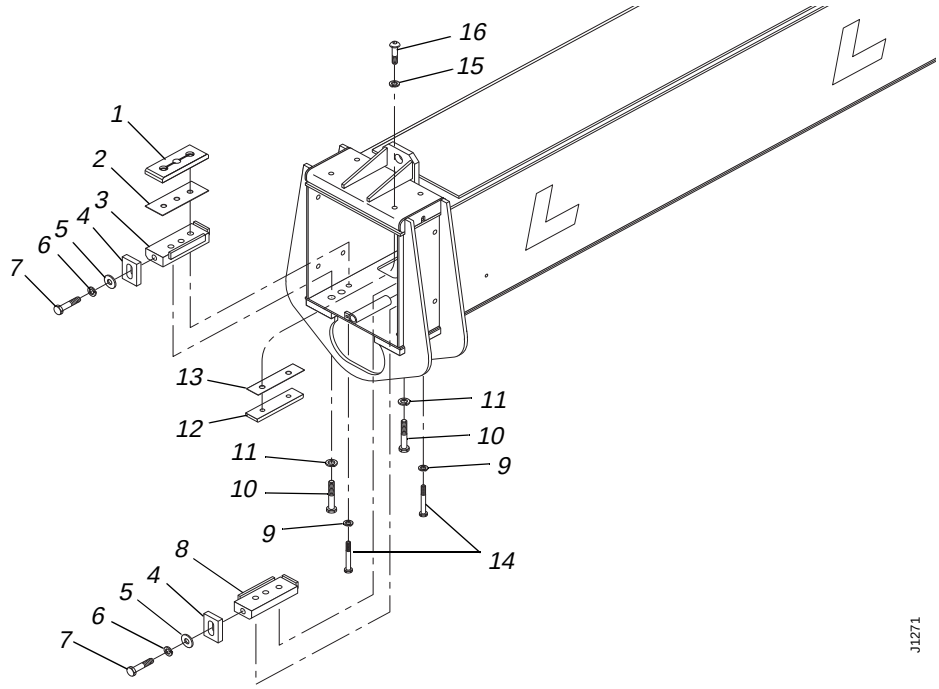
4-Section Boom

1. Remove boom assembly from machine. See page 6-154.

2. Place boom assembly on work stands in upside down position.

CAUTION: To avoid personal and equipment damage, make sure that the boom is properly supported through this entire procedure.

Note: *"K" Model machines are not equipped with auxiliary hydraulics. For these models, disregard procedures that refer to auxiliary hydraulic components. Some models are equipped with an additional set of auxiliary hydraulics. They will have two (2) additional sets of hoses, tubes, and mounting hardware than what is mentioned in the following procedures.*



#	Description
1	Lower Slide Pad
2	Shim
3	Right Hand Retainer Block
4	Pad Retainer
5	Flatwasher
6	Lockwasher
7	Capscrew
8	Left Hand Retainer Block

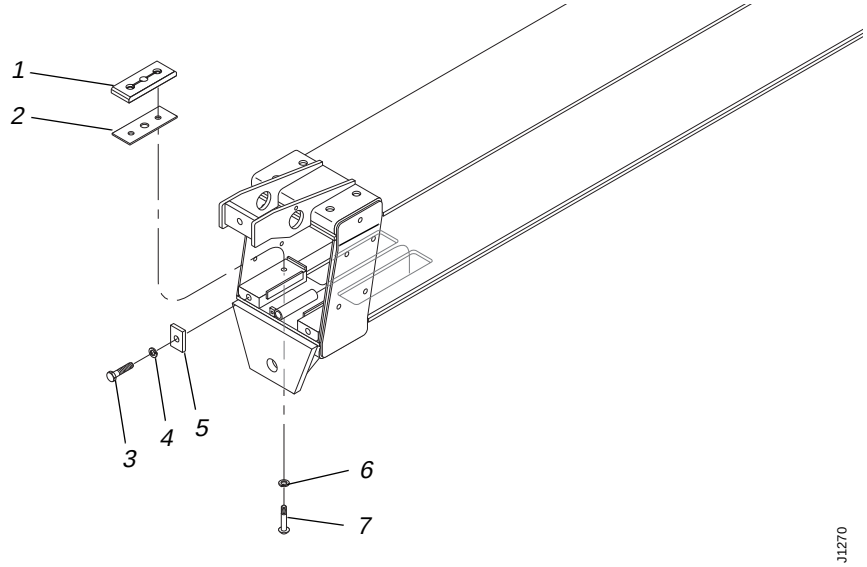
#	Description
9	Lockwasher
10	Capscrew
11	Lockwasher
12	Upper Slide Pad
13	Shim
14	Capscrew
15	Lockwasher
16	Button-Head Socket Capscrew

Fig. 6-176: Slide Pad Removal – Outer Boom Section

3. (Ref. Fig. 6-176) 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.



#	Description
1	Lower Front Slide Pad
2	Shim
3	Capscrew
4	Lockwasher

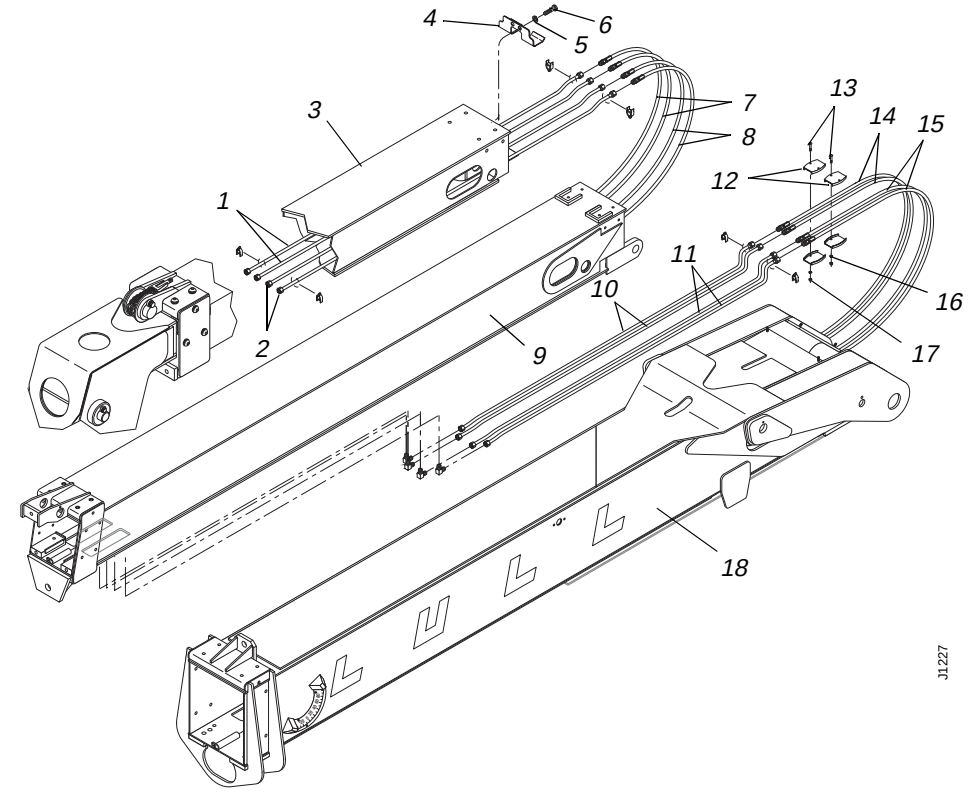
#	Description
5	Pad Retainer
6	Lockwasher
7	Button-Head Socket Capscrew

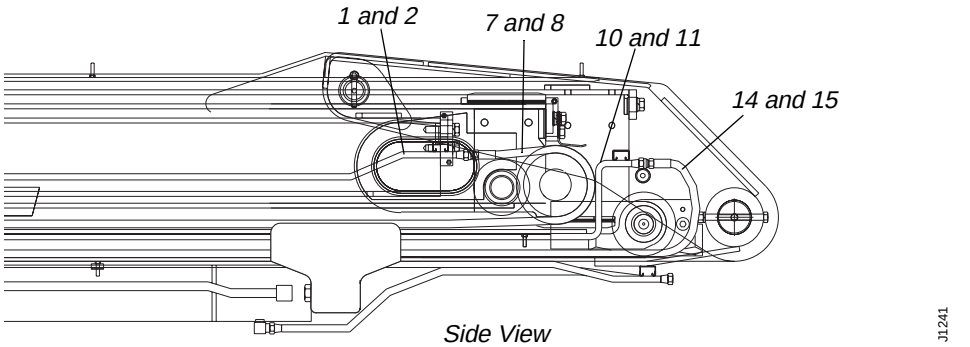
Fig. 6-177: Lower Front Slide Pad Removal – Middle (Rear) Boom Section

4. (Ref. Fig. 6-177) Remove lower front slide pads from middle (rear) boom section as follows:

   a. Remove two (2) each capscrews (Item 3), lockwashers (Item 4), and pad retainers (Item 5) from rear of middle (rear) boom section.

   b. Remove four (4) capscrews (Item 7) and lockwashers (Item 6) securing upper slide pads to rear of middle (rear) boom section. Remove two (2) slide pads (Item 1) and shims (Item 2).





Side View

#	Description
1	Auxiliary Hydraulic Tube
2	Carriage Tilt Hydraulic Tube
3	Middle (Front) Boom Section
4	Hose Guard
5	Lockwasher
6	Capscrew
7	Auxiliary Tilt Hydraulic Hose
8	Carriage Tilt Hydraulic Hose
9	Middle (Rear) Boom Section

#	Description
10	Auxiliary Hydraulic Tube
11	Carriage Tilt Hydraulic Tube
12	Half Clamp
13	Round Head Screw
14	Auxiliary Hydraulic Hose
15	Carriage Tilt Hydraulic Hose
16	Lockwasher
17	Nut
18	Outer Boom Section

Fig. 6-178: Disconnecting Hoses Between Sections

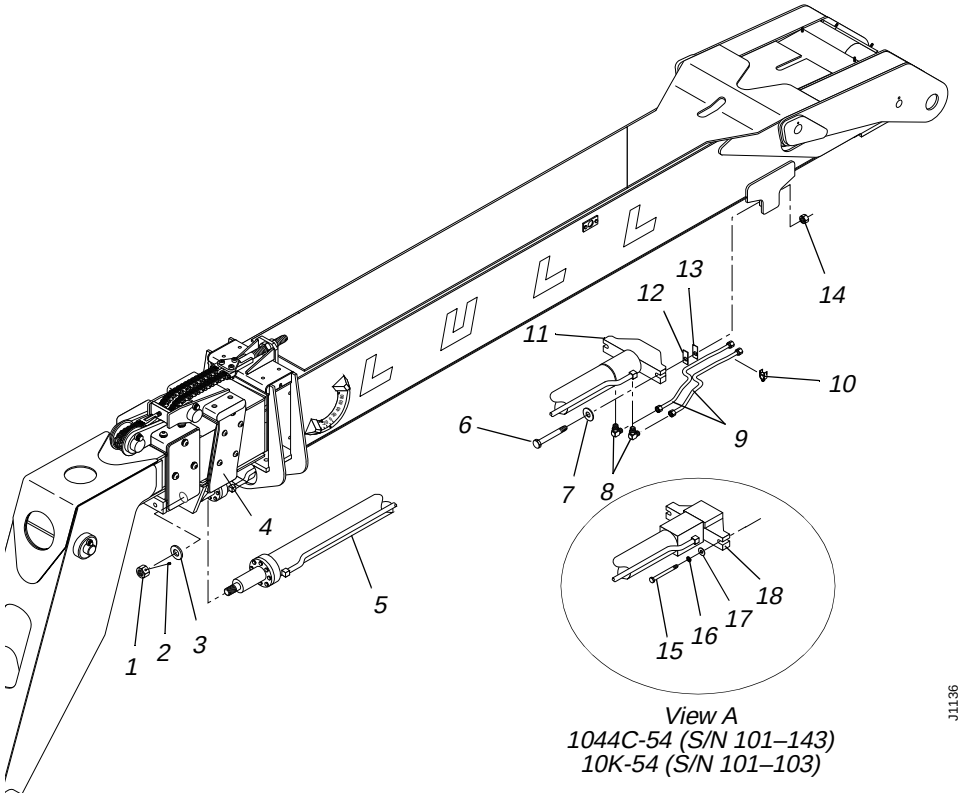
5. (Ref. Fig. 6-178) Disconnect hoses between sections as follows:
   a. Remove two (2) capscrews (Item 6), lockwashers (Item 5), and the hose guard (Item 4) from the rear of the middle (front) boom section (Item 3).

CAUTION: Be sure to note orientation of the hose guard during removal. Your hose guard may be different from that shown above. If the hose guard is reversed at assembly, equipment damage may occur during operation of machine.

b. Loosen and remove hydraulic hoses (two (2) each auxiliary and carriage tilt) (Items 7 and 8) from hydraulic tubes (Items 1 and 2) at rear of middle (front) boom section. Bleed any remaining oil into a suitable container. Tag and cap hoses and tubes.

c. Loosen and remove hydraulic hoses (two (2) each auxiliary and carriage tilt) (Items 14 and 15) from hydraulic tubes (Items 10 and 11) at rear of outer boom section (Item 18). Bleed any remaining oil into a suitable container. Tag and cap hoses and tubes.

d. For early production models, remove four (4) each nuts (Item 17), lockwashers (Item 16), round head screws (Item 13), and half clamps (Item 12).



View A
1044C-54 (S/N 101–143)
10K-54 (S/N 101–103)

#	Description
1	Rod Nut
2	Socket Setscrew
3	Extension Cylinder Rod Boss
4	Middle (Rear) Boom Section
5	Boom Extension Cylinder
6	Capscrew
7	Flatwasher
8	Elbow
9	Hydraulic Tube

#	Description
10	Cushion Clamp
11	Extension Cylinder Base Mount
12	Shim
13	Shim
14	Nut
15	Capscrew
16	Lockwasher
17	Flatwasher
18	Extension Cylinder Base Mount

Fig. 6-179: Extension Cylinder Removal – 4-Section Boom

6. (Ref. Fig. 6-179) Remove extension cylinder as follows:
   a. Support the extension cylinder with sling(s) or other suitable means. Make sure support items have sufficient capacity to support the weight of the cylinder. The extension cylinder weighs 650 pounds.
   b. Loosen and remove two (2) hydraulic tubes (Item 9) from elbows (Item 8) on boom extension cylinder (Item 5). Bleed any remaining oil into a suitable container. Tag and cap fittings and tubes.
   c. Loosen nut on two (2) cushion clamps (Item 10) and remove clamps and hydraulic tubes from mounting channel on outer boom section.
   d. Loosen two (2) socket setscrews (Item 2) in rod nut (Item 1).
   e. Loosen and remove rod nut and rod boss (Item 3) securing boom extension cylinder to front of middle (rear) boom section (Item 4).
   f. Loosen and remove hardware securing extension cylinder to outer boom section as follows:

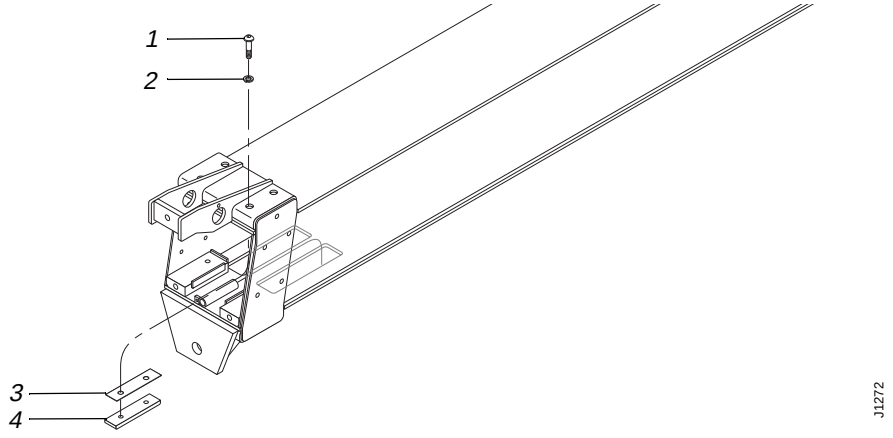
      For Models 10K-54 (S/N 101–103) and 1044C-54 (S/N 101–143) – See View A:

      Remove two (2) each capscrews (Item 15), lockwashers (Item 16), and flatwashers (Item 17) securing extension cylinder base mount (Item 18) to outer boom section.

      For Models 10K-54 (S/N 104–) and 1044C-54 (S/N 144–):

      Remove two (2) each nuts (Item 14), capscrews (Item 6), and flatwashers (Item 7) securing extension cylinder base mount (Item 11) to outer boom section. Remove the shim(s) (Items 12 and 13).
   g. Remove the extension cylinder.

      Note: *For additional information regarding disassembly and repair of the boom extension cylinder, see “Overhaul, Extension Cylinder” on page 6-211.*
7. Turn boom assembly over and place it on work stands in upright position.
8. (Ref. Fig. 6-176) Remove upper slide pads on outer boom as follows:
   a. Remove four (4) capscrews (Item 16) and lockwashers (Item 15) securing top slide pads (Item 12) to outer boom.
   b. Remove the two (2) slide pads and shims (Item 13).

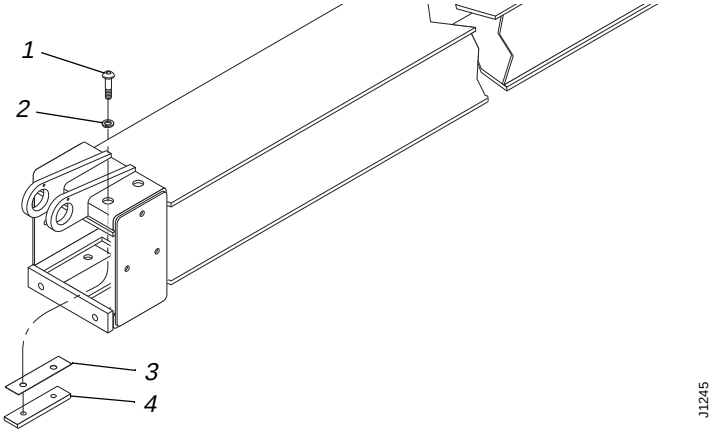


#	Description
1	Button-Head Socket Capscrew
2	Lockwasher

#	Description
3	Shim
4	Upper Front Slide Pad

Fig. 6-180: Upper Front Slide Pad Removal – Middle (Rear) Boom Section

9. (Ref. Fig. 6-180) Remove upper front slide pads from middle (rear) boom section as follows:
   a. Remove two (2) each capscrews (Item 1), lockwashers (Item 2), from front of middle (rear) boom section.
   b. Remove two (2) slide pads (Item 4) and shims (Item 3).

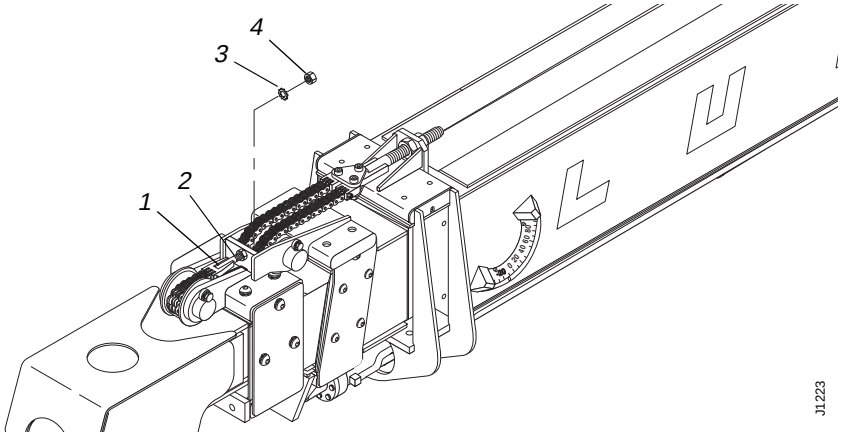


#	Description
1	Button-Head Socket Capscrew
2	Lockwasher

#	Description
3	Shim
4	Front Upper Slide Pad

Fig. 6-181: Upper Front Slide Pad Removal – Middle (Forward) Boom Section

10. (Ref. Fig. 6-181) Remove upper front slide pads from middle (front) boom section as follows:
    a. Remove two (2) capscrews (Item 1) and lockwashers (Item 2) securing each of the two (2) upper slide pads to the front of the middle (forward) boom section.
    b. Remove two (2) slide pads (Item 4) and shims (Item 3).

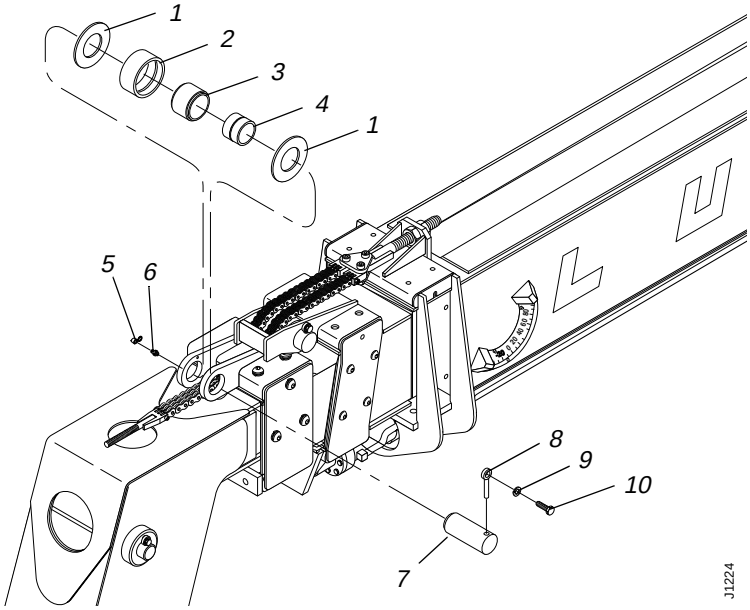


#	Description
1	Chain Adjustment Anchor
2	Jam Nut

#	Description
3	Lockwasher
4	Nut

Fig. 6-182: Upper Chain – Middle (Forward) to Middle (Rear) Boom Sections

11. (Ref. Fig. 6-182) Remove jam nut (Item 2) and lockwasher (Item 3) securing upper chain adjustment anchor (Item 1) to middle (rear) boom section.
12. Remove chain adjustment anchor from bracket at top of middle (rear) boom section and lay chain over top of inner boom section.



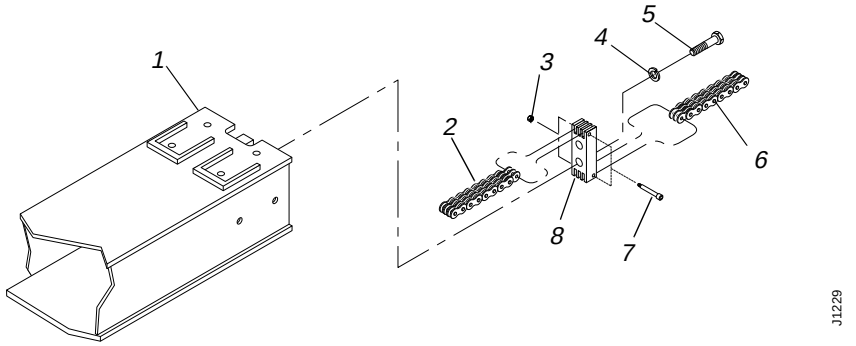
#	Description
1	Chain Guide Washer
2	Bushing
3	Chain Roller
4	Chain Roller Bushing
5	Grease Fitting Cover

#	Description
6	Grease Fitting
7	Chain Roller Pin
8	Lock Pin
9	Lockwasher
10	Capscrew

Fig. 6-183: Upper Chain Roller Assembly – Middle (Forward) Boom Section

13. (Ref. Fig. 6-183) Remove capscrew (Item 10), lockwasher (Item 9), and lock pin (Item 8) from chain roller pin (Item 7).

14. (Ref. Fig. 6-183) Remove chain roller pin, two (2) guide washers (Item 1), bushing (Item 2), chain roller (Item 3), and chain roller bushing (Item 4).



#	Description
1	Inner Boom
2	Upper Chain
3	Lock Nut
4	Lockwasher

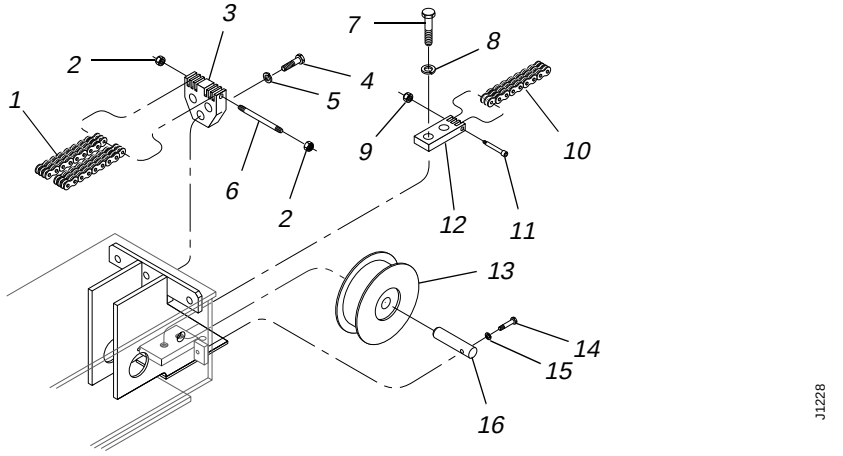
#	Description
5	Capscrew
6	Lower Chain
7	Shoulder Bolt
8	Rear Chain Anchor

Fig. 6-184: Disconnecting Chains at Rear of Inner Boom

15. (Ref. Fig. 6-184) Disconnect chains from rear of inner boom as follows:

    a. Remove two (2) lock nuts (Item 3) and shoulder bolts (Item 7) securing chains (Items 2 and 6) to rear chain anchor (Item 8).

    b. Remove two (2) capscrews (Item 5), lockwashers (Item 4), and rear chain anchor from rear of inner boom (Item 1).

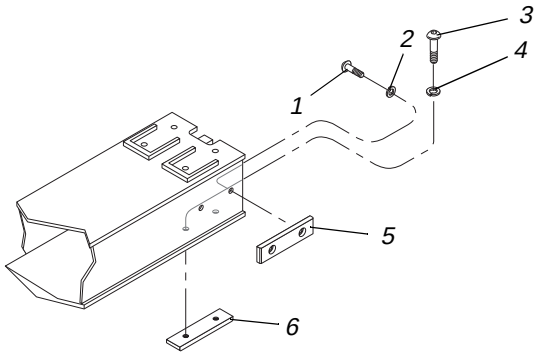


#	Description
1	Upper Chain
2	Lock Nut
3	Upper Chain Anchor
4	Capscrew
5	Lockwasher
6	Chain Anchor Rod
7	Lock Nut
8	Capscrew

#	Description
9	Lockwasher
10	Lower Chain
11	Shoulder Bolt
12	Lower Chain Anchor
13	Hose Reel
14	Capscrew
15	Lockwasher
16	Hose Reel Pin

Fig. 6-185: Disconnecting Chains at Rear of Middle (Forward) Boom

16. (Ref. Fig. 6-185) Disconnect chains from rear of middle (forward) boom as follows:
    a. Remove two (2) lock nuts (Item 2), chain anchor rod (Item 6), and upper chain (Item 1).
    b. Remove capscrew (Item 4), lockwasher (Item 5), and upper chain anchor (Item 3).
    c. Remove capscrew (Item 14), lockwasher (Item 15), and hose reel pin (Item 16) securing each of the two (2) hose reels (Item 13) to the rear of the middle (forward) boom section. Remove hose reels.
    d. Remove two (2) each capscrews (Item 7) and lockwashers (Item 8) securing lower chain anchor (Item 12) to middle (forward) boom section.
    e. Remove lock nut (Item 9), shoulder bolt (Item 11), and lower chain anchor from lower chain (Item 10).
17. (Ref. Fig. 6-184) Pull upper chain (Item 2) out through front of boom.
18. Slide inner and middle (forward) boom sections out of middle (rear) boom section. Place middle (forward) section (with inner) on work stands upside down.

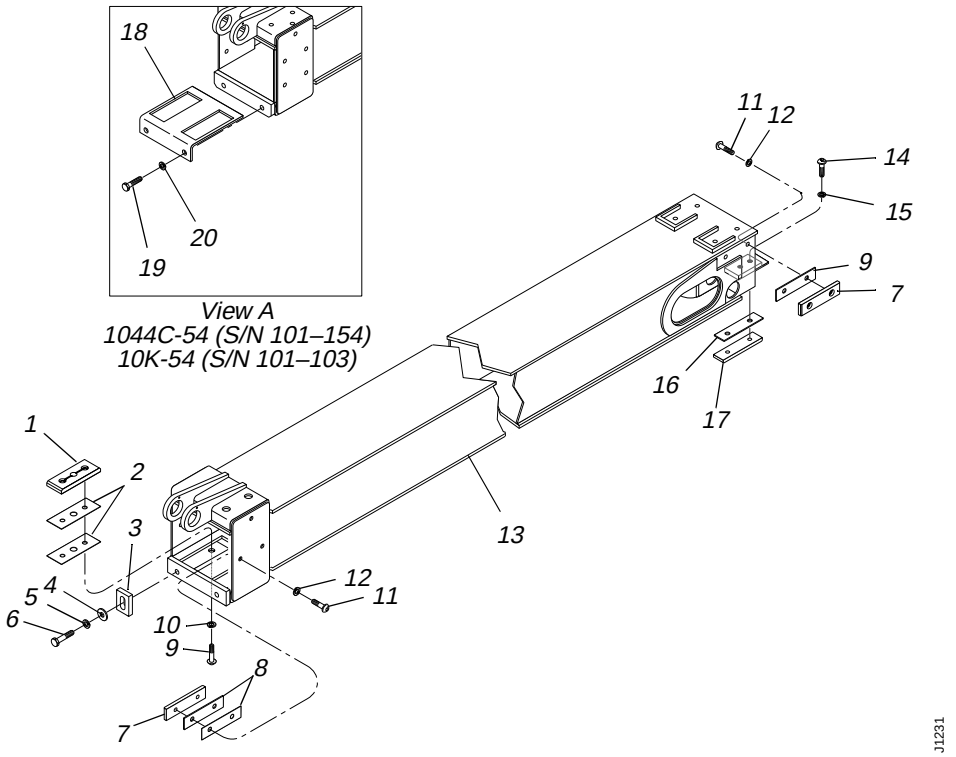


#	Description
1	Button-Head Socket Capscrew
2	Lockwasher
3	Button-Head Socket Capscrew

#	Description
4	Lockwasher
5	Side Slide Pad
6	Bottom Slide Pad

Fig. 6-186: Slide Pad Removal – Inner Boom Section

19. (Ref. Fig. 6-186) Remove eight (8) capscrews (Items 1 and 3) and lockwashers (Items 2 and 4) securing two (2) side and two (2) bottom slide pads (Items 5 and 6) to rear of inner boom section. Remove slide pads.



#	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
19	Capscrew
20	Lockwasher

Fig. 6-187: Slide Pad Removal – Middle (Forward) Boom Section

20. (Ref. Fig. 6-187) 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. 6-187) 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.

c. (Ref. Fig. 6-187) Remove lower slide pads from front of middle (forward) boom section as follows:

For Models 1044C-54 (S/N 101–154) and 10K-54 (S/N 101–103):

1). Remove two (2) each capscrews (Item 19) and lockwashers (Item 20) along with the pad retainer (Item 18) (see View A).

2). Remove two (2) socket capscrews (Item 9) and lockwashers (Item 10) securing lower slide pads (Item 1) to front of boom section.

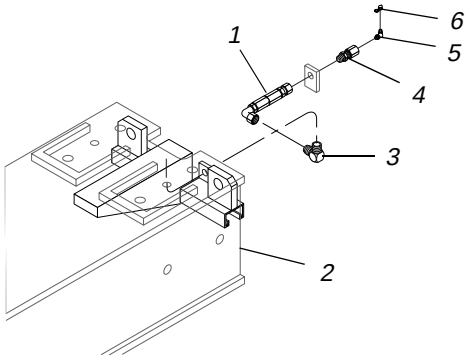
3). Remove slide pads and shims (Item 2).

For Models 1044C-54 (S/N 155–) and 10K-54 (S/N 104–):

1). Remove two (2) socket capscrews (Item 9) and lockwashers (Item 10) securing lower slide pads (Item 1) to front of boom section.

2). Remove slide pads and shims (Item 2).

21. (Ref. Fig. 6-187) Remove two (2) capscrews (Item 14) and lockwashers (Item 15) securing bottom slide pad (Item 17) to rear of middle (forward) boom section. Remove slide pad and shim(s) (Item 16).
22. Slide inner boom section out of middle (forward) boom section. Place inner boom on work stands in upright position.
23. Remove auxiliary hydraulic quick disconnects from inner boom.

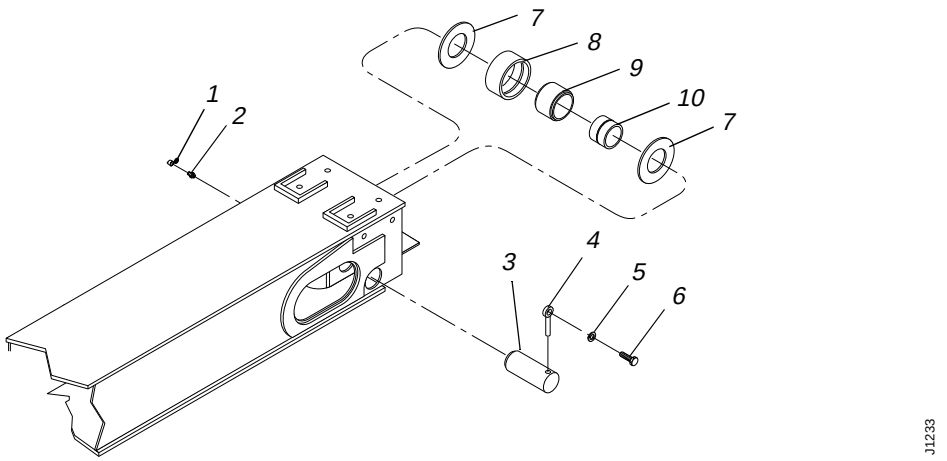


#	Description
1	Grease Hose
2	Inner Boom Section
3	Elbow

#	Description
4	Bulkhead Adapter
5	Grease Fitting
6	Grease Fitting Cover

Fig. 6-188: Grease Hose Assembly

24. (Ref. Fig. 6-188) Remove bulkhead adapter (Item 4) from rear of inner boom section (Item 2).
25. (Ref. Fig. 6-188) Loosen and remove grease hose (Item 1) and elbow (Item 3) from inside of inner boom section.
26. Flip middle (forward) boom section to upright position.

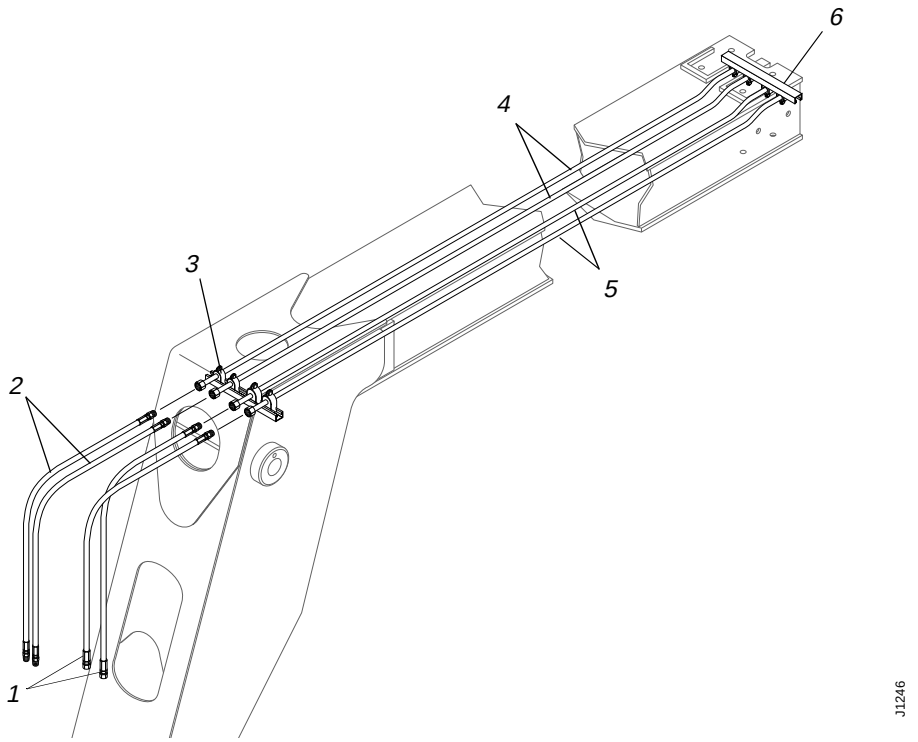


#	Description
1	Grease Fitting Cover
2	Grease Fitting
3	Chain Roller Pin
4	Lock Pin
5	Lockwasher

#	Description
6	Capscrew
7	Chain Guide Washer
8	Bushing
9	Chain Roller
10	Chain Roller Bushing

Fig. 6-189: Rear Chain Roller Removal - Middle (Forward) Boom Section

27. (Ref. Fig. 6-189) Remove rear chain roller assembly as follows:
    a. Remove capscrew (Item 6), lockwasher, (Item 5) and lock pin (Item 4) from chain roller pin (Item 3).
    b. Remove chain roller pin, two (2) chain guide washers (Item 7), bushing (Item 8), chain roller (Item 9), and chain roller bushing (Item 10).
28. Turn over inner boom section and place on work stands in upside down position.
29. Remove front carriage tilt cylinder from inner boom (See page 6-18, Steps 2–6).



#	Description
1	Auxiliary Hydraulic Hoses
2	Carriage Tilt Hydraulic Hoses
3	Cushion Clamp

#	Description
4	Auxiliary Hydraulic Tubes
5	Carriage Tilt Hydraulic Tubes
6	Mounting Channel

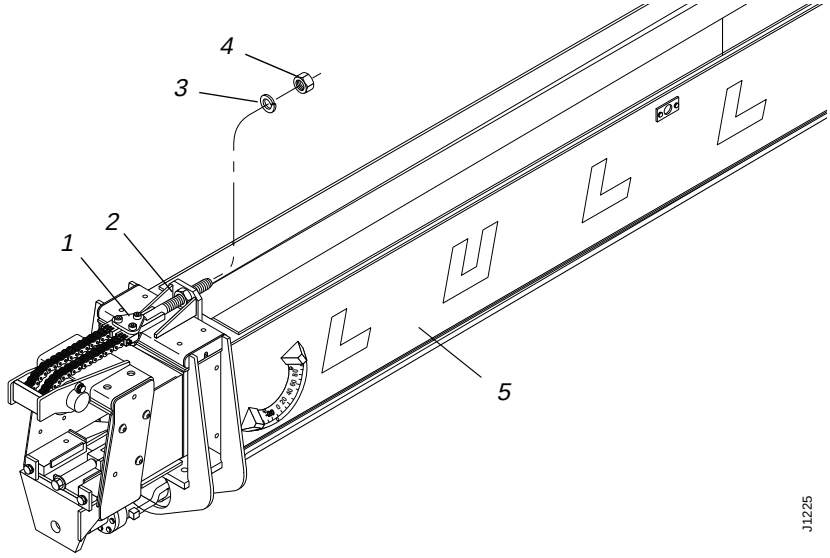
Fig. 6-190: Hose and Tube Removal – Inner Boom Section

30. (Ref. Fig. 6-190) Remove tubes and hoses from inner boom section as follows:

    a. Remove lock nuts from cushion clamps (Item 3) securing auxiliary and carriage tilt hydraulic tubes (Items 4 and 5) in mounting channels (Item 6).

    b. Slide cushion clamps from mounting channel and remove hydraulic tubes from inner boom section.

    c. Remove hydraulic hoses (Items 1 and 2) from tubes.

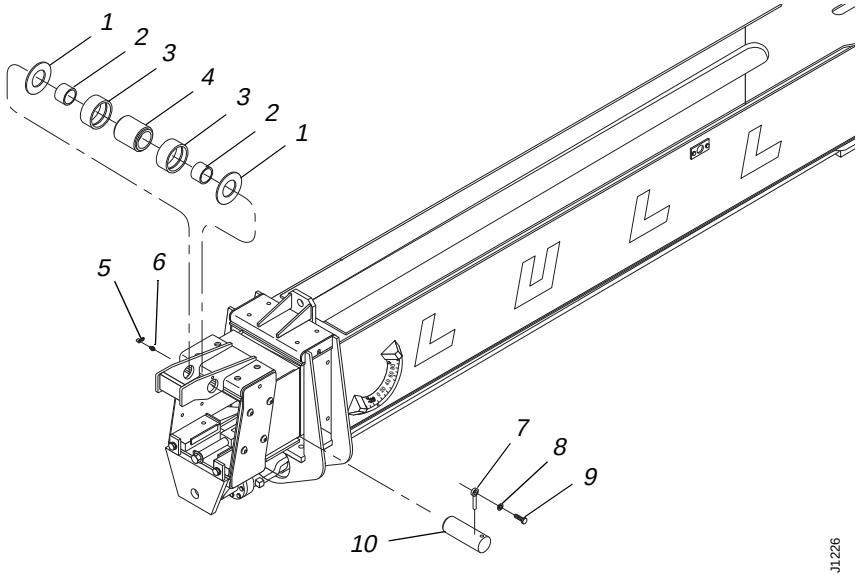


#	Description
1	Chain Anchor
2	Jam Nut
3	Lockwasher

#	Description
4	Nut
5	Outer Boom Section

Fig. 6-191: Upper Chain Assembly

31. (Ref. Fig. 6-191) Remove nut (Item 4) and lockwasher (Item 3) securing upper chain anchor (Item 1) to outer boom section (Item 5). Remove upper chain assembly from boom.

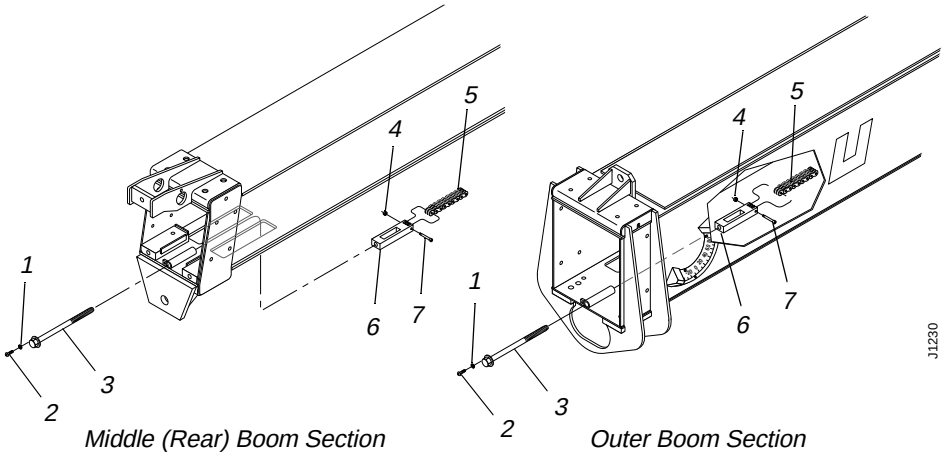


#	Description
1	Chain Guide Washer
2	Chain Roller Bushing
3	Hardened Bushing
4	Chain Roller
5	Grease Fitting Cover

#	Description
6	Grease Fitting
7	Lock Pin
8	Lockwasher
9	Capscrew
10	Chain Roller Pin

Fig. 6-192: Upper Chain Roller Assembly – Middle (Rear) Boom Section

32. (Ref. Fig. 6-192) Remove capscrew (Item 9), lockwasher (Item 8), and lock pin (Item 7) from chain roller pin (Item 10).
33. (Ref. Fig. 6-192) Remove chain roller pin along with two (2) each chain guide washers (Item 1), chain roller bushings (Item 2), hardened bushings (Item 3), and the chain roller (Item 4).



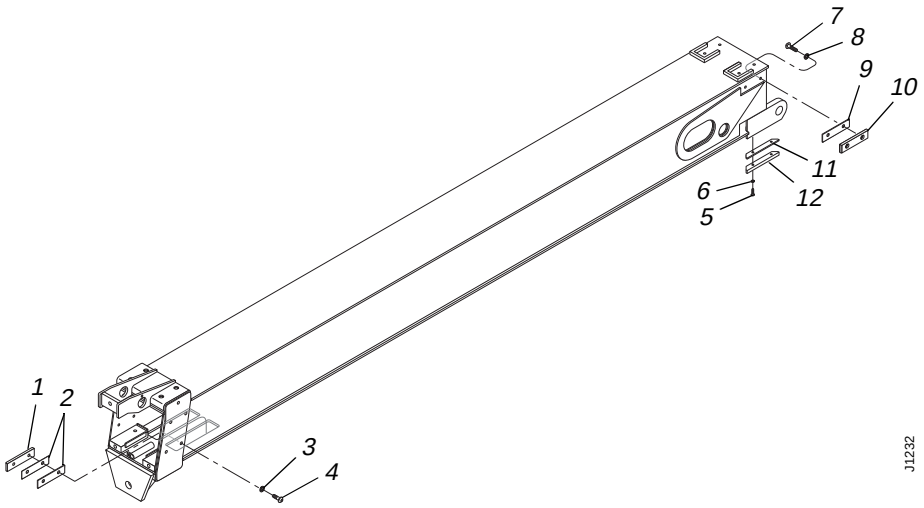
Middle (Rear) Boom Section *Outer Boom Section*

#	Description
1	Lockwasher
2	Button Head Capscrew
3	Chain Adjustment Rod
4	Lock Nut

#	Description
5	Chain
6	Chain Adjustment Block
7	Shoulder Bolt

Fig. 6-193: Removing Lower Chains

34. (Ref. Fig. 6-193) Remove lower chains from the middle (rear) and outer boom sections as follows:
    a. Remove capscrew (Item 2) and lockwasher (Item 1).
    b. Remove chain adjustment rod (Item 3).
    c. Pull the chain assembly (Items 4 thru 7) out through rear of boom.
35. Slide middle (rear) boom out of outer boom section and place it on work stands in upright position.



#	Description
1	Front Side Slide Pad
2	Shim
3	Lockwasher
4	Button-Head Socket Capscrew
5	Button-Head Socket Capscrew
6	Lockwasher

#	Description
7	Button-Head Socket Capscrew
8	Lockwasher
9	Shim
10	Rear Side Slide Pad
11	Shim
12	Rear Lower Slide Pad

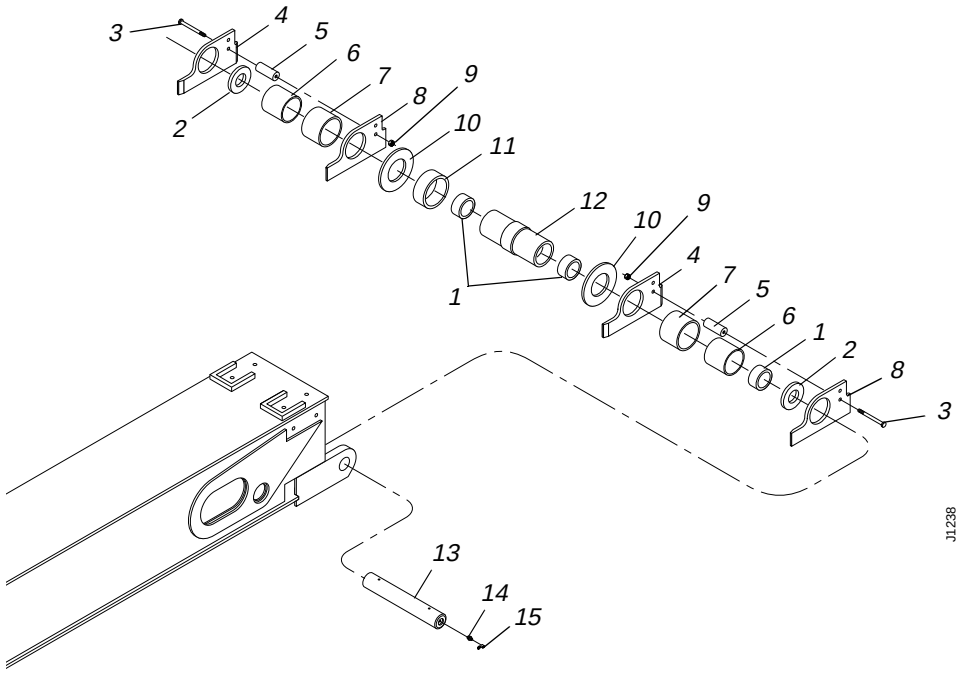
Fig. 6-194: Slide Pads – Middle (Rear) Boom Section

36. (Ref. Fig. 6-194) Remove remaining slide pads from middle (rear) boom section as follows:

    a. Remove eight (8) each capscrews (Item 4) and lockwashers (Item 3) securing side slide pads to front of middle (rear) boom section. Remove four (4) slide pads (Item 1) and shims (Item 2).

    b. Remove four (4) each capscrews (Item 7) and lockwashers (Item 8) securing side slide pads to rear of middle (rear) boom section. Remove two (2) slide pads (Item 10) and shims (Item 9).

    c. Remove four (4) each capscrews (Item 5) and lockwashers (Item 6) securing lower slide pads to rear of middle (rear) boom section. Remove two (2) slide pads (Item 12) and shims (Item 11).



#	Description
1	Roller Bushing
2	Washer
3	Capscrew
4	Right Hand Hose Guide
5	Hose Guide Spacer
6	Hose Spacer
7	Plastic Bushing
8	Left Hand Hose Guide

#	Description
9	Lock Nut
10	Chain Roller Washer
11	Hardened Bushing
12	Chain and Hose Roller
13	Chain and Hose Roller Shaft
14	Grease Fitting
15	Grease Fitting Cover

Fig. 6-195: Chain and Hose Guide Assembly

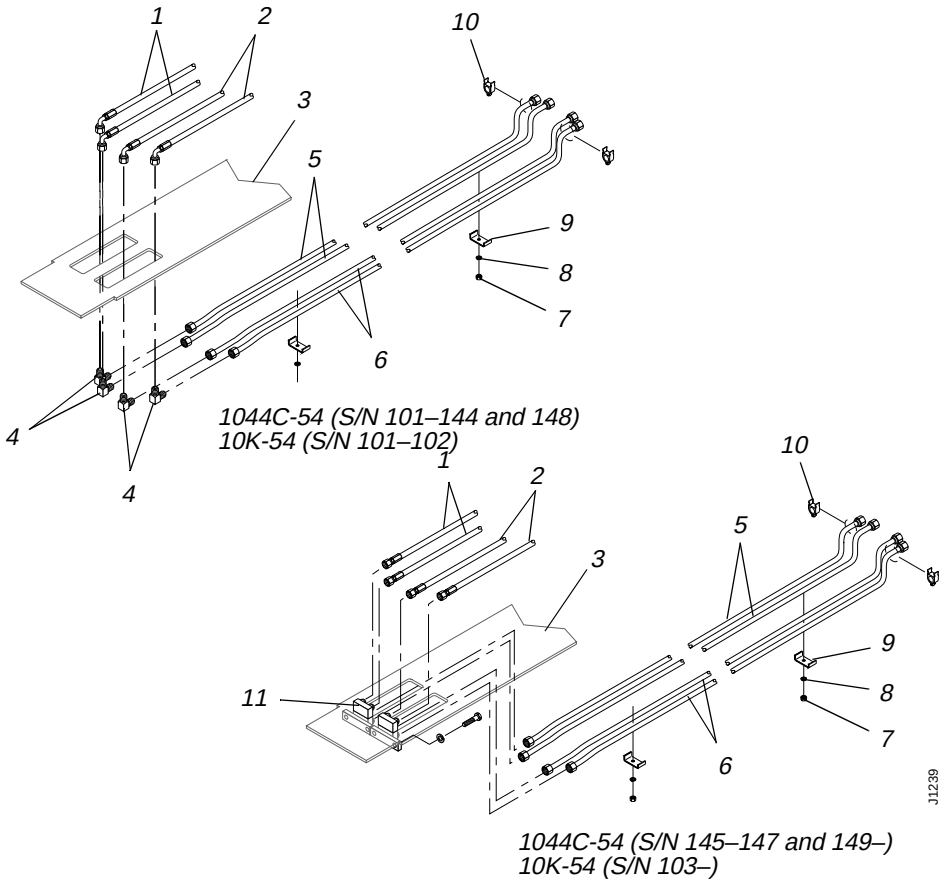
37. (Ref. Fig. 6-195) Remove chain and hose guide assembly from rear of middle (rear) boom section as follows:

    a. Remove chain and hose roller shaft (Item 13) from rear of middle (rear) boom section. Remove chain and hose roller assembly.

    b. Remove two (2) lock nuts (Item 9) and capscrews (Item 3).

    c. Separate two (2) each right hand hose guides (Item 4), washers (Item 2), roller bushings (Item 1), hose guide spacers (Item 5), hose spacers (Item 6), plastic bushings (Item 7), and left hand hose guides (Item 8) from chain and hose roller (Item 12).

    d. Remove two (2) chain roller washers (Item 10) and the hardened bushing (Item 11) from the chain and hose roller.



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

#	Description
7	Nut
8	Lockwasher
9	Clamp
10	Cushion Clamp
11	Hydraulic Manifold Block

Fig. 6-196: Tubes and Hoses – Middle (Rear) and Outer Boom Sections

38. (Ref. Fig. 6-196) Remove middle (rear) boom section hoses as follows:

For Models 1044C-54 (S/N 101–144 and 148) and 10K-54 (S/N 101–102):

a. Loosen and remove two (2) auxiliary and two (2) carriage tilt hydraulic hoses (Items 1 and 2) from elbows (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.

For Models 1044C-54 (S/N 145–147 and 149–) and 10K-54 (S/N 103–):

a. Loosen and remove two (2) auxiliary and two (2) carriage tilt hydraulic hoses (Items 1 and 2) from hydraulic manifold block (Item 11).

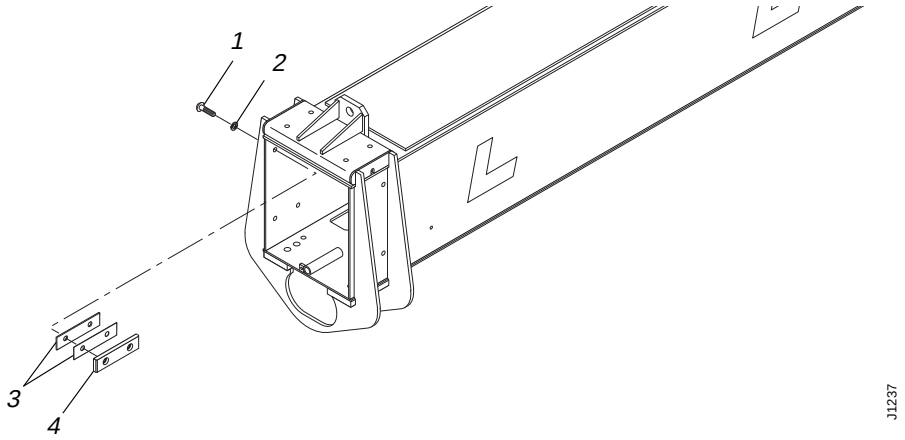
b. Bleed any remaining oil into a suitable container and remove hoses from inside middle (rear) boom section (Item 3). Tag and cap hoses and fittings.

39. Flip middle (rear) boom section upside down and place on work stands.

40. (Ref. Fig. 6-196) Remove hydraulic tubes from bottom of middle (rear) boom section as follows:

    a. Remove two (2) each nuts (Item 7), lockwashers (Item 8), and tube clamps (Item 9) securing each set of auxiliary and carriage tilt hydraulic tubes (Items 5 and 6) to bottom of middle (rear) boom section.

    b. Loosen screw on cushion clamps (Item 10). Slide cushion clamps out of channel and remove hydraulic tubes from boom section.



#	Description
1	Button-Head Socket Capscrew
2	Lockwasher

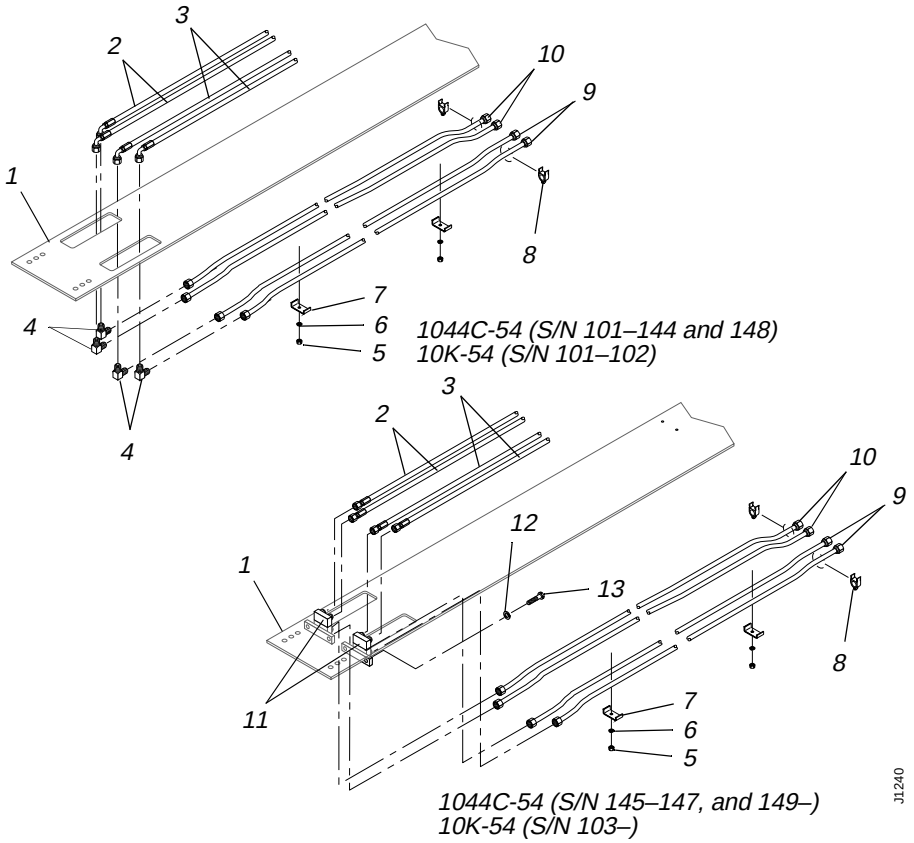
#	Description
3	Shim
4	Side Slide Pad

Fig. 6-197: Side Slide Pads – Outer Boom Section

41. (Ref. Fig. 6-197) Remove side slide pads from outer boom section as follows:

    a. Remove four (4) capscrews (Item 1) and lockwashers (Item 2) securing side slide pads to outer boom.

    b. Remove the two (2) slide pads (Item 4) and shims (Item 3).



#	Description
1	Outer Boom Section
2	Auxiliary Hydraulic Hose
3	Carriage Tilt Hydraulic Hose
4	Elbow
5	Nut
6	Lockwasher
7	Clamp

#	Description
8	Cushion Clamp
9	Auxiliary Hydraulic Tube
10	Carriage Tilt Hydraulic Tube
11	Hydraulic Manifold Block
12	Lockwasher
13	Capscrew

Fig. 6-198: Outer Boom Tubes and Hoses

42. (Ref. Fig. 6-198) Remove outer boom hydraulic hoses as follows:

For Models 1044C-54 (S/N 101–144 and 148) and 10K-54 (S/N 101–102):

a. Loosen and remove auxiliary and front carriage tilt hydraulic hoses (Items 2 and 3) from elbows (Item 4). Bleed any remaining oil into a suitable container.

b. Remove hoses from inside outer boom section (Item 1). Cap and tag hoses and fittings.

For Models 1044C-54 (S/N 145–147 and 149–) and 10K-54 (S/N 103–):

a. Loosen and remove auxiliary and front carriage tilt hydraulic hoses (Items 2 and 3) from hydraulic manifold blocks (Item 11). Bleed any remaining oil into a suitable container.

b. Remove hoses from inside outer boom section (Item 1). Cap and tag hoses and open ports on manifold blocks.

43. Turn outer boom section over and place it upside down on work stands.

44. (Ref. Fig. 6-198) Remove outer boom hydraulic tubes as follows:

For Models 1044C-54 (S/N 101–144 and 148) and 10K-54 S/N 101–102):

a. Remove four (4) elbows (Item 4) from auxiliary and front carriage tilt hydraulic tubes (Items 9 and 10). Bleed any remaining oil from tubes into a suitable container. Tag and cap tube ends and fittings.

b. Remove two (2) each nuts (Item 5), lockwashers (Item 6), and clamps (Item 7) securing each set of hydraulic tubes to bottom of outer boom section.

c. Loosen screws on cushion clamps (Item 8). Slide cushion clamps out of channel and remove hydraulic tubes.

For Models 1044C-54 (S/N 145–147 and 149–) and 10K-54 (S/N 103):

a. Loosen and remove four (4) auxiliary and front carriage tilt hydraulic tubes (Items 9 and 10) from hydraulic manifold blocks (Item 11). Bleed any remaining oil from tubes into a suitable container. Tag and cap hydraulic tubes and open ports on hydraulic manifold blocks.

b. Remove two (2) each nuts (Item 5), lockwashers (Item 6), and clamps (Item 7) securing each set of hydraulic tubes to bottom of outer boom section.

c. Loosen screws on cushion clamps (Item 8). Slide cushion clamps out of channel and remove hydraulic tubes.

d. Remove two (2) capscrews (Item 13) and lockwashers (Item 12) securing each manifold block to the outer boom. Remove the manifold blocks.

Note: *If damaged, further disassembly of chain assemblies may become necessary. If required, information on the removal and installation of additional items such as the boom angle indicator is covered elsewhere in this manual. Additional information of removal and installation of the boom elevation proximity switch and the boom extension proximity switch is also covered in this manual.*

Assembly

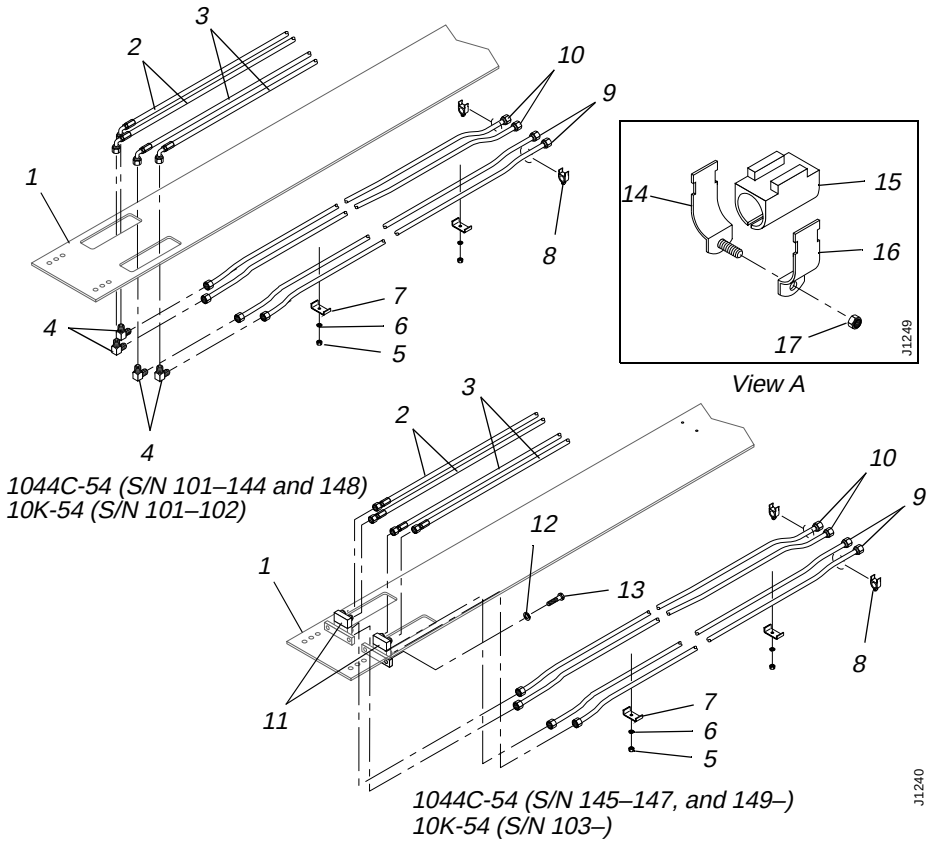
4-Section Boom

1. Use crane, chains, and slings to lift and place outer boom section on work stands in upside down position.

CAUTION: To avoid personal and equipment damage, make sure that major boom components are properly supported through this entire procedure.

Note: *This procedure assumes that the boom has been completely disassembled. In certain areas, references are made to other locations in this manual where specific subjects are covered in detail.*

Note: *"K" Model machines are not equipped with auxiliary hydraulics. For these models, disregard procedures that refer to auxiliary hydraulic components. Models that are equipped with an additional set of auxiliary hydraulics will have two (2) more sets of hoses, tubes, and mounting hardware than what is mentioned in the following procedures.*



#	Description
1	Outer Boom Section
2	Auxiliary Hydraulic Hose
3	Carriage Tilt Hydraulic Hose
4	Elbow
5	Nut
6	Lockwasher
7	Clamp
8	Cushion Clamp
9	Auxiliary Hydraulic Tube

#	Description
10	Carriage Tilt Hydraulic Tube
11	Hydraulic Manifold Block
12	Lockwasher
13	Capscrew
14	Left Clamp Half
15	Plastic Cushion
16	Right Clamp Half
17	Lock Nut

Fig. 6-199: Outer Boom Tube and Hose Assembly

2. (Ref. Fig. 6-199) Install auxiliary and front carriage tilt hydraulic tubes and hoses on outer boom section as follows:

   For Models 1044C-53 (S/N 101–144 and 148) and 10K-54 (S/N 101– 102):

a. Install two (2) each auxiliary and front carriage tilt hydraulic hoses (Items 2 and 3) on elbows (Item 4). Torque swivel nuts on hoses to 50–58 ft-lbs.

b. Install two (2) each auxiliary and front carriage tilt hydraulic tubes (Items 9 and 10) on elbows. Make sure the tube is positioned so that the longest portion of each tube will be close to the bottom of the boom section. Torque swivel nuts on tubes to 50–58 ft-lbs.

c. Place hoses through openings in bottom and outer boom section.

d. Install a cushion clamp (Item 8) on each hydraulic tube as follows (see View A):

   1). Install plastic cushion (Item 15) on hydraulic tube.

   2). Slide left cushion clamp half (Item 14) to correct position in channel on bottom of outer boom (Item 1).

   3). Position tube with cushion next to left cushion half and slide right cushion half (Item 16) into channel.

   4). Secure two halves of clamp together with lock nut (Item 17). Tighten lock nut until snug.

e. Secure two (2) each tubes to bottom of boom section with two (2) each clamps (Item 7), lockwashers (Item 6), and nuts (Item 5). Torque nuts to 96 in-lbs.

For Models 1044C-54 (S/N 145–147 and 149–) and 10K-54 (S/N 103–):

a. Install auxiliary and hydraulic hoses (Items 2 and 3) to two (2) hydraulic manifold blocks (Item 11). Torque swivel nuts on hoses to 50–58 ft-lbs.

b. Install auxiliary and front carriage tilt hydraulic tubes (Items 9 and 10) on manifold blocks. Make sure the tube is positioned so that the longest portion of each tube will be close to bottom of the boom section (Item 1). Torque swivel nut on tubes to 50–58 ft-lbs.

c. Place hoses through openings in bottom of outer boom section (Item 1) and install hydraulic manifold blocks on outer section with lockwashers (Item 12) and capscrews (Item 13). Torque capscrews to 55 ft-lbs.

d. Install a cushion clamp (Item 8) on each hydraulic tube as follows:

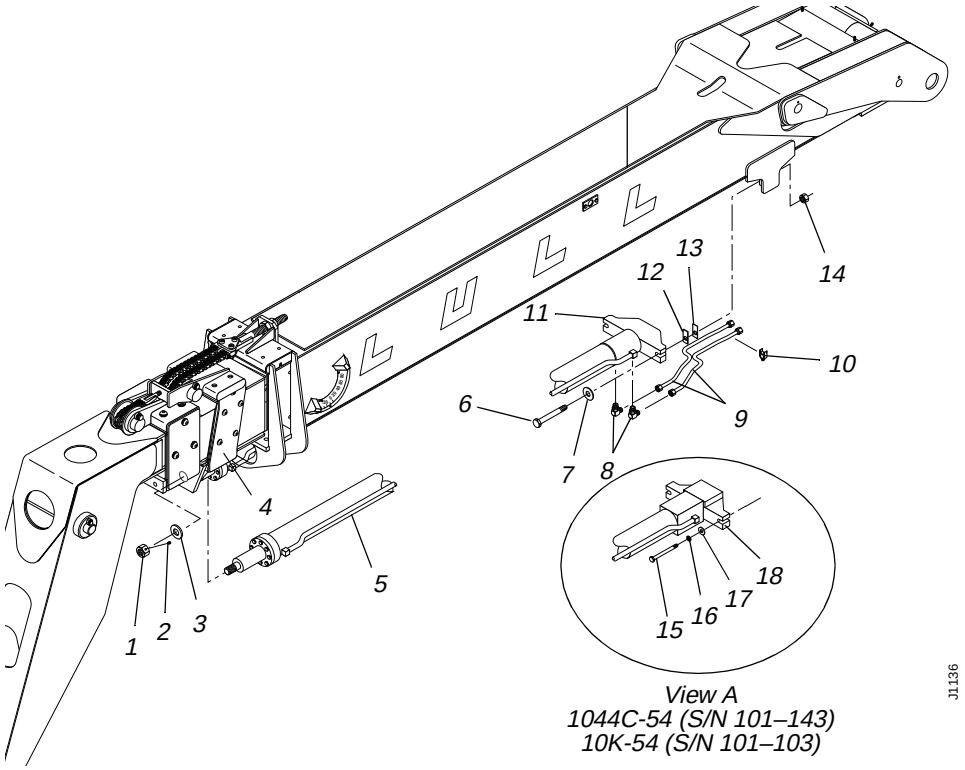
   1). Install plastic cushion (Item 15) on hydraulic tube.

   2). Slide left cushion clamp half (Item 14) to correct position in channel on bottom of outer boom (Item 1).

   3). Position tube with cushion next to left cushion half and slide right cushion half (Item 16) into channel.

   4). Secure two halves of clamp together with lock nut (Item 17). Tighten lock nut until snug.

e. Secure hydraulic tubes to bottom of boom section with two (2) each clamps (Item 7), lockwashers (Item 6), and nuts (Item 5). Torque nuts to 96 in-lbs.



View A
1044C-54 (S/N 101–143)
10K-54 (S/N 101–103)

#	Description
1	Rod Nut
2	Socket Setscrew
3	Extension Cylinder Rod Boss
4	Middle (Rear) Boom Section
5	Boom Extension Cylinder
6	Capscrew
7	Flatwasher
8	Elbow
9	Hydraulic Tube

#	Description
10	Cushion Clamp
11	Extension Cylinder Base Mount
12	Shim
13	Shim
14	Nut
15	Capscrew
16	Lockwasher
17	Flatwasher
18	Extension Cylinder Base Mount

Fig. 6-200: Extension Cylinder Installation

3. (Ref. Fig. 6-200) Install extension cylinder on outer boom section as follows:

   a. Using sling(s), crane, or other suitable means, position rod end of cylinder (Item 5) in its proper location on the middle (rear) boom section (Item 4).

WARNING: To avoid personal and/or equipment damage, make sure the cylinder is properly supported until it is completely installed.

   b. Secure cylinder to outer boom section with hardware as follows.

   For Models 1044C-54 (S/N 101–143) and 10K-54 (S/N 101– 103) (See View A):

   Use two (2) each flatwashers (Item 17), lockwashers (Item 16), and capscrews (Item 15) to secure extension cylinder base mount (Item 18) to rear of outer boom section. Torque capscrews to 200 ft-lbs.

For Models 1044C-54 (S/N 144–) and 10K-54 (S/N 104–):

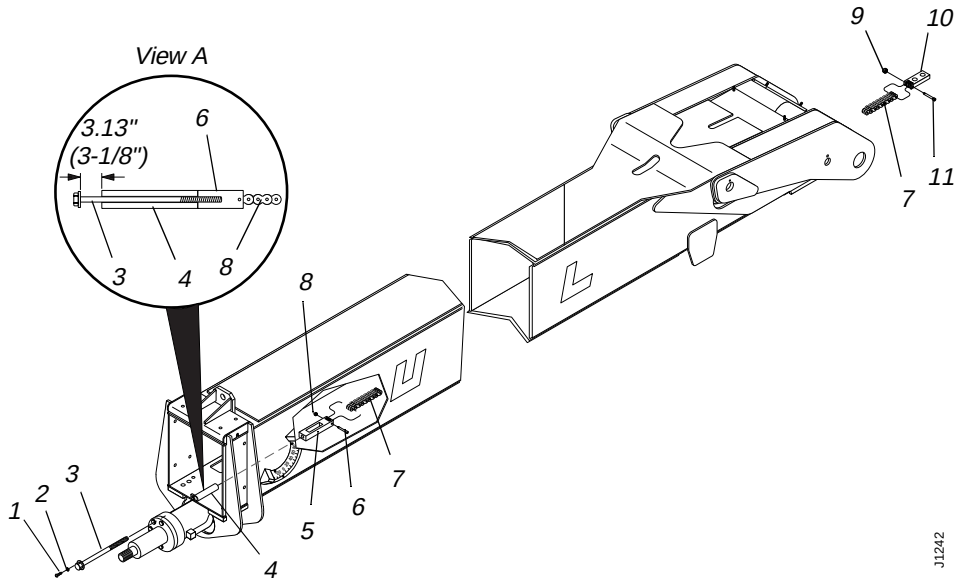
Use two (2) each nuts (Item 14), flatwashers (Item 7), and capscrews (Item 6) to secure extension cylinder base mount (Item 11) to rear of outer boom section. Install as many shims (Items 12 and 13) as necessary before installing the nuts. Torque nuts to 680 ft-lbs.

c. Install two (2) hydraulic tubes (Item 9) on extension cylinder elbows (Item 8). Torque swivel nuts on hydraulic tubes to 79–88 ft-lbs.

d. Install cushion clamp (Item 10) on each hydraulic tube as described in Substep d under Step 2 on page 6-185.

4. Apply EP lithium based grease to the inside top surfaces of outer boom section (slide pad slide areas).

5. Turn outer boom section over and place it in upright position on work stands.



#	Description
1	Capscrew
2	Lockwasher
3	Chain Adjustment Rod
4	Anchor Base
5	Chain Adjustment Block
6	Shoulder Bolt

#	Description
7	Lower Chain
8	Lock Nut
9	Lock Nut
10	Lower Chain Anchor
11	Shoulder Bolt

Fig. 6-201: Lower Chains on Outer Boom Section

6. (Ref. Fig. 6-201) Add lower chain to inside of outer boom section as follows:

a. Install lower chain anchor (Item 10) on lower chain (Item 7) with lock nut (Item 9) and shoulder bolt (Item 11). Torque lock nut to 108 in-lbs.

b. Install chain adjustment block (Item 5) on other end of lower chain with shoulder bolt (Item 6) and lock nut (Item 8). Torque lock nut to 108 in-lbs.

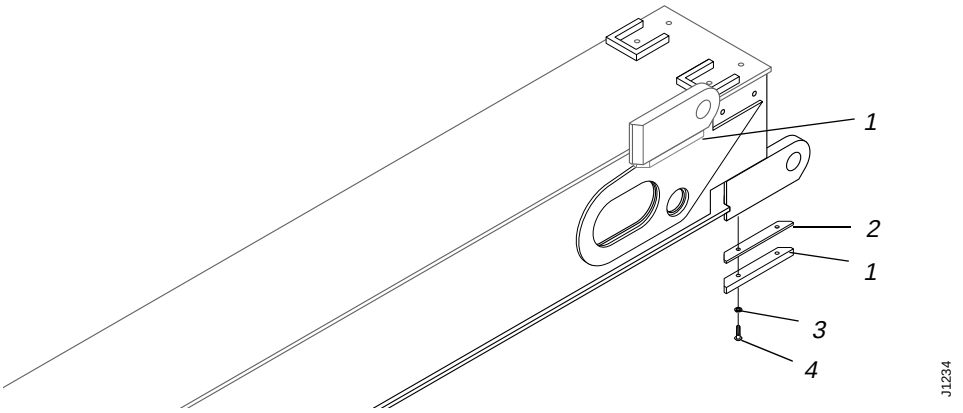
c. Position chain adjustment block tight against back of anchor base (Item 4) at bottom of outer boom section as shown in View A.

d. Thread chain adjustment rod (Item 3) into block until specified measurement is obtained.

e. Push adjustment rod fully into anchor base.

f. Lay chain flat inside of outer boom section. Attach a cord or wire to end of chain for ease in handling after all four sections are assembled.

7. Place middle (rear) boom section upside down on work stands.

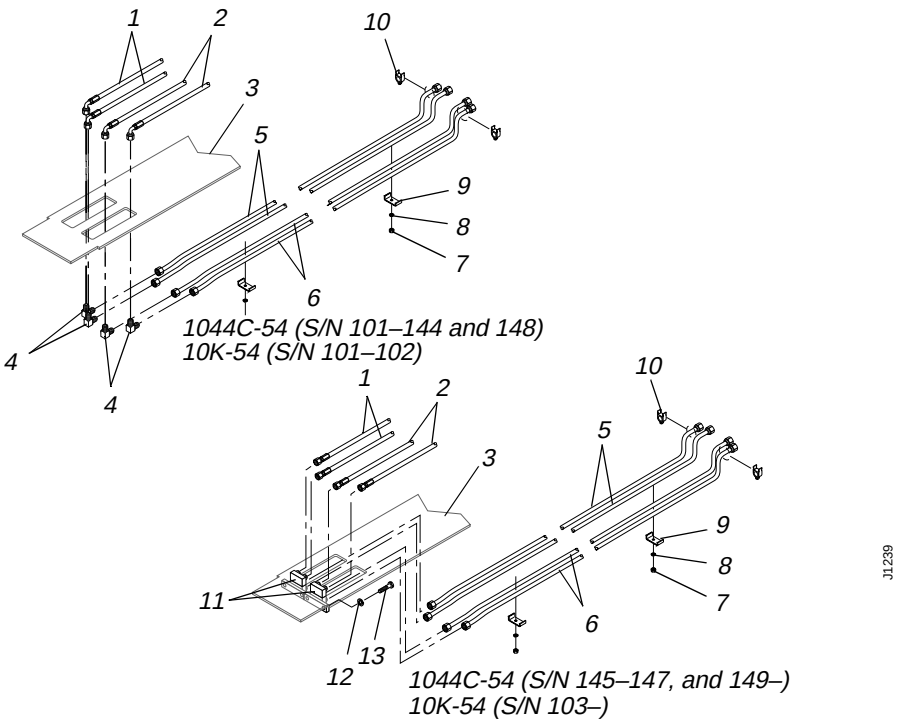


#	Description
1	Lower Rear Slide Pad
2	Shim

#	Description
3	Lockwasher
4	Button-Head Socket Capscrew

Fig. 6-202: Lower Rear Slide Pad Installation - Middle (Rear) Boom Section

8. (Ref. Fig. 6-202) After applying thread locking compound to the capscrews, install two (2) lower, rear slide pads (Item 1) and shim(s) (Item 2) to bottom of middle (rear) boom section with lockwashers (Item 3) and capscrews (Item 4) according to drawing specifications. Torque capscrews to 180 in-lbs.



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

#	Description
8	Lockwasher
9	Clamp
10	Cushion Clamp
11	Hydraulic Manifold Block
12	Lockwasher
13	Capscrew

Fig. 6-203: Tubes and Hoses – Middle (Rear) Boom Sections

9. (Ref. Fig. 6-203) Install hydraulic tubes and hoses on middle (rear) boom section as follows:

   For Models 1044C-53 (S/N 101–144 and 148) and 10K-54 (S/N 101–102):

   a. Install two (2) each auxiliary and front carriage tilt hydraulic hoses (Items 1 and 2) on elbows (Item 4). Torque swivel nuts on hoses to 50–58 ft-lbs.

   b. Install two (2) each auxiliary and front carriage tilt hydraulic tubes (Items 5 and 6) on elbows. Make sure the tube is positioned so that the longest portion of each tube will be close to bottom of the boom section (Item 3). Torque swivel nuts on tubes to 50–58 ft-lbs.

   c. Install cushion clamp (Item 10) on each hydraulic tube as described in Substep d under Step 2 on page 6-185.

   d. Secure hydraulic tubes to bottom of boom section with two (2) each clamps (Item 9), lockwashers (Item 8), and nuts (Item 7). Torque nuts to 96 in-lbs.

For Models 1044C-54 (S/N 145–147 and 149–) and 10K-54 (S/N 103–):

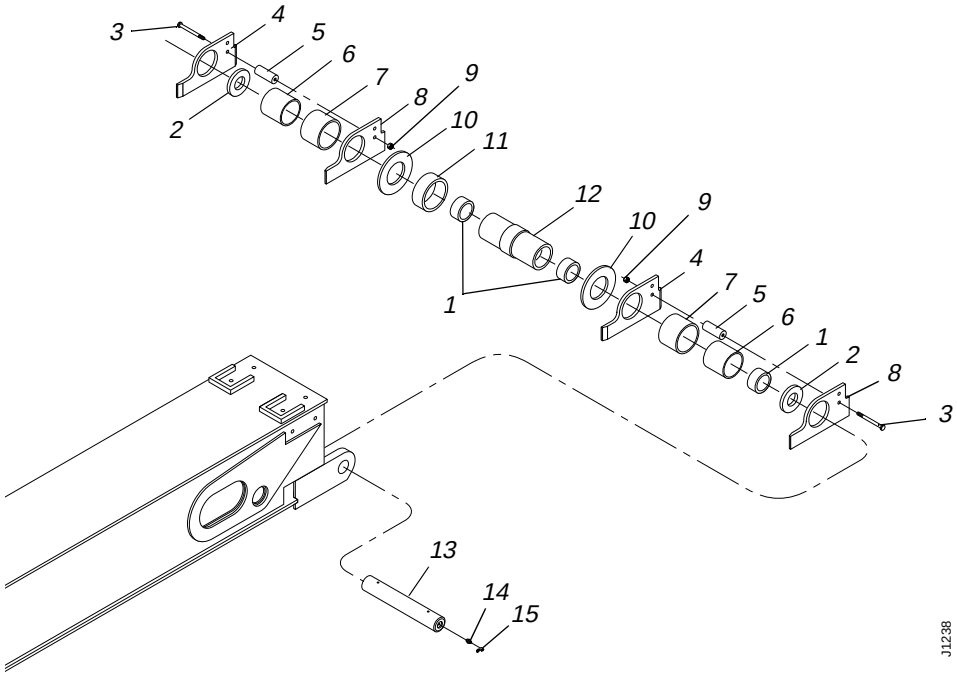
a. Install auxiliary and front carriage tilt hydraulic tubes (Items 5 and 6) on hydraulic manifold blocks (Item 11). Make sure the tube is positioned so that the longest portion of each tube will be close to bottom of the boom section (Item 3). Torque swivel nut on tubes to 50–58 ft-lbs.

b. Install two (2) manifold block on middle (rear) boom section with four (4) lockwashers (Item 12) and capscrews (Item 13). Torque capscrews to 55 ft-lbs.

c. Install cushion clamp (Item 10) on each hydraulic tube and secured in mounting channel as described in Substep d under Step 2 on page 6-184.

d. Securing hydraulic tubes to bottom of boom section with two (2) each clamps (Item 9), lockwashers (Item 8), and nuts (Item 7). Torque nuts to 96 in-lbs.

e. Install auxiliary and hydraulic hoses (Items 1 and 2) to hydraulic manifold blocks. Torque swivel nuts on hoses to 50–58 ft-lbs.

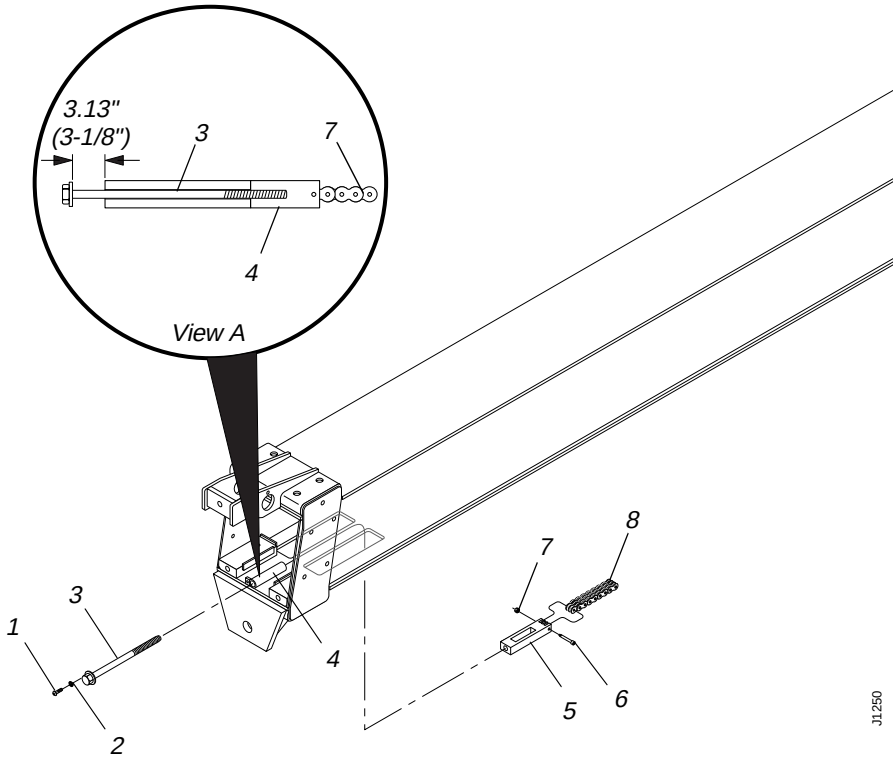


#	Description
1	Roller Bushing
2	Washer
3	Capscrew
4	Right Hand Hose Guide
5	Hose Guide Spacer
6	Hose Spacer
7	Plastic Bushing
8	Left Hand Hose Guide

#	Description
9	Lock Nut
10	Chain Roller Washer
11	Hardened Bushing
12	Chain and Hose Roller
13	Chain and Hose Roller Shaft
14	Grease Fitting
15	Grease Fitting Cover

Fig. 6-204: Chain and Hose Guide Assembly

10. (Ref. Fig. 6-204) Install chain and hose guide assembly on rear of middle (rear) boom section as follows:
    a. Install two (2) roller bushings (Item 1) inside chain and hose roller (Item 12) — one in each end.
    b. Install hardened bushing (Item 11) and two (2) chain roller washers (Item 10) on the chain and hose roller.
    c. Install two (2) each left hand hose guides (Item 8), plastic bushings (Item 7), hose spacers (Item 6), washers (Item 2), and right hand hose guides (Item 4) on chain and hose roller.
    d. Install two hose guide spacers (Item 5) between left and right hand hose guides with two (2) lock nuts (Item 9) and capscrews (Item 3). Torque the lock nuts to 180 in-lbs.
    e. Install chain and hose roller assembly on rear of boom section with chain and hose roller shaft (Item 13).
    f. Install two (2) grease fittings (Item 14) and grease fittings covers (Item 15) on chain and hose roller shaft.
11. Turn middle (rear) boom section over to upright position on work stands.



#	Description
1	Button-Head Socket Capscrew
2	Lockwasher
3	Chain Adjustment Rod
4	Anchor Base

#	Description
5	Chain Adjustment Block
6	Shoulder Bolt
7	Lock Nut
8	Chain

Fig. 6-205: Installation of Lower Chain – Middle (Rear) Boom Section

12. Install lower chain on bottom of middle (rear) boom section as follows:

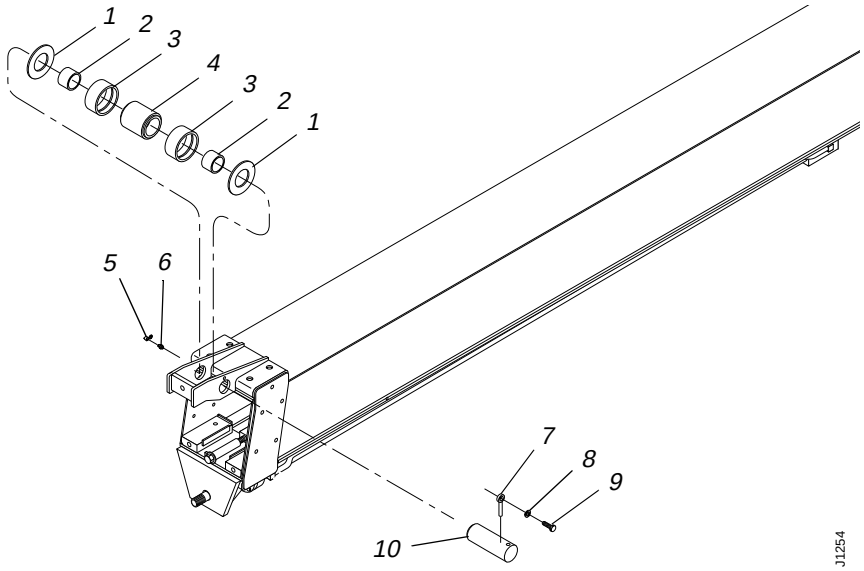
a. Install chain adjustment block (Item 5) on lower chain with shoulder bolt (Item 6) and lock nut (Item 7). Torque lock nut to 108 in-lbs.

b. Position chain adjustment block tight against back of anchor base (Item 4) at bottom of middle (rear) boom section as shown in View A.

c. Thread chain adjustment rod (Item 3) into block until specified measurement is obtained.

d. Push adjustment rod fully into anchor base.

e. Lay chain flat inside of middle (rear) section. Attach a cord or wire to end of chain for ease in handling after all four sections are assembled.



#	Description
1	Chain Guide Washer
2	Chain Roller Bushing
3	Hardened Bushing
4	Chain Roller
5	Grease Fitting Cover

#	Description
6	Grease Fitting
7	Lock Pin
8	Lockwasher
9	Capscrew
10	Chain Roller Pin

Fig. 6-206: Upper Chain Roller Assembly – Middle (Rear) Boom Section

13. (Ref. Fig. 6-206) Install upper chain roller assembly on middle (rear) boom section as follows:

a. Install two (2) chain roller bushings (Item 2) into chain roller (Item 4).

b. Install two (2) hardened bushings (Item 3) on chain roller.

c. Install bushings and chain roller and two (2) chain guide washers (Item 1) on front of middle (forward) boom section with chain roller pin (Item 10).

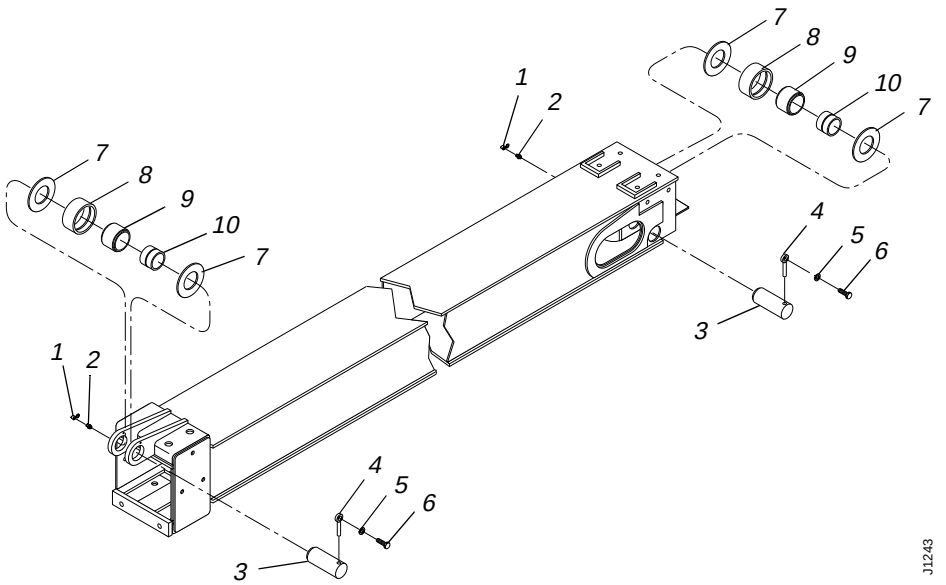
d. Secure chain roller pin with lock pin (Item 7), lockwasher (Item 8), and capscrew (Item 9). Torque capscrew to 110 ft-lbs.

e. Install grease fitting (Item 6) and grease fitting cover (Item 5) on chain roller pin. Tighten the grease fitting 2–3 turns past finger tight.

14. Lift and slide middle (rear) boom section into outer boom section. Release strap securing extension cylinder to outer boom section and install cylinder end through orifice of middle (rear) section.

15. Apply EP lithium based grease to the inside bottom surfaces of middle (rear) boom section (slide pad slide areas).

16. Place middle (forward) boom section on work stands upside down.



#	Description
1	Grease Fitting Cover
2	Grease Fitting
3	Chain Roller Pin
4	Lock Pin
5	Lockwasher

#	Description
6	Capscrew
7	Chain Guide Washer
8	Bushing
9	Chain Roller
10	Chain Roller Bushing

Fig. 6-207: Chain Roller Assemblies - Middle (Forward) Boom Section

17. (Ref. Fig. 6-207) Install chain roller assemblies on middle (forward) boom section as follows:

a. Install chain roller bushing (Item 10) in chain roller (Item 9).

b. Install chain roller in bushing (Item 8).

c. Install chain roller and two (2) chain guide washers (Item 7) on front of boom section with chain roller pin (Item 3).

d. Secure the chain roller pin to the boom section with lock pin (Item 4), lockwasher (Item 5), and capscrew (Item 6). For models 1044C-54 (S/N 101–192) and 10K-54 (S/N 101–109), torque the capscrew to 55 ft-lbs. For models 1044C-54 (S/N 193–) and 10K-54 (S/N 110–), torque the capscrew to 110 ft-lbs.

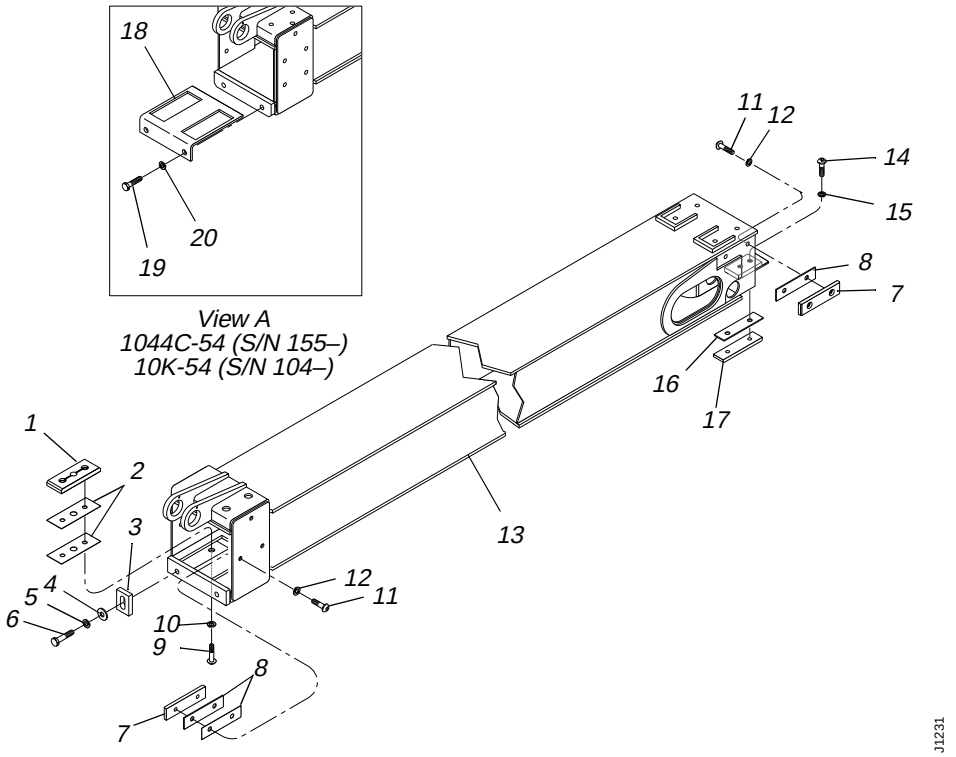
e. Install grease fitting (Item 2) and grease fitting cover (Item 1) on chain roller pin. Tighten grease fitting 2–3 turns past finger tight.

f. Repeat the preceding steps to install chain roller assembly to the rear of the boom section.

g. Install upper chain anchor (Item 3) on upper chains (Item 1) with chain anchor rod (Item 6) and two (2) lock nuts (Item 2). Torque lock nuts to 108 in-lbs.

h. Install upper chain anchor to rear of boom section with lockwasher (Item 5) and capscrew (Item 4). Make sure the hole in the anchor (where the anchor rod was installed) is positioned toward the front of the boom. Torque capscrew to 280 ft-lbs.

i. Lay upper chain on top of middle (forward) boom section.



#	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
19	Capscrew
20	Lockwasher

Fig. 6-208: Slide Pad Installation – Middle (Forward) Boom Section

Note: *Apply thread locking compound to all slide pad mounting capscrews before installing them.*

18. (Ref. Fig. 6-208) Install shim pads on middle (forward) boom section as follows:

a. Install bottom slide pad (Item 17) and shim(s) (Item 16) to rear of boom section with two (2) lockwashers (Item 15) and capscrews (Item 14) according to drawing specifications. Torque capscrews to 180 in-lbs.

b. Install two (2) side slide pads (Item 7) and shim(s) (Item 8) to rear of boom section with two (2) each lockwashers (Item 12) and capscrews (Item 11) according to drawing specifications. Torque capscrews to 180 in-lbs.

19. (Ref. Fig. 6-208) Install bottom slide pads and shims on front of boom section as follows:

For Models 1044C-54 (S/N 101–154) and 10K-54 (S/N 101–103):

a. Install two (2) bottom slide pads (Item 1) and shims (Item 2) to front of boom section with four (4) each lockwashers (Item 10) and capscrews (Item 9) according to drawing specifications. Torque capscrews to 180 in-lbs

b. Install pad retainer (Item 18) (see View A) on front of boom section with two (2) each lockwashers (Item 20) and capscrews (Item 19). Torque capscrews to 200 ft-lbs.

For Models 1044C-54 (S/N 155–) and 10K-54 (S/N 104–):

a. Install two (2) bottom slide pads (Item 1) and shims (Item 2) to front of boom section with four (4) each lockwashers (Item 10) and capscrews (Item 9) according to drawing specifications. Torque capscrews to 180 in-lbs.

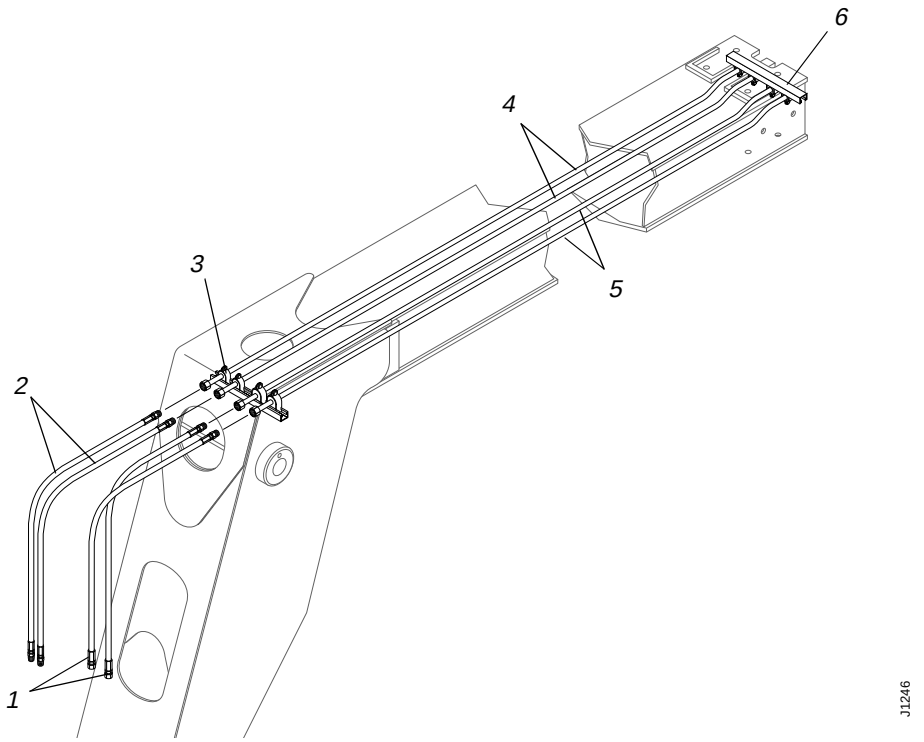
b. Install two (2) pad retainers (Item 3) on front of boom section with flatwashers (Item 4), lockwashers, (Item 5) and capscrews (Item 6). Torque capscrews to 200 ft-lbs.

c. Install two (2) side slide pads (Item 7) and shims (Item 8) on front of boom section with four (4) each lockwashers (Item 12) and capscrews (Item 11). Torque capscrews to 180 in-lbs.

20. Apply EP lithium based grease to the inside top surfaces of middle (forward) boom section (slide pad slide areas).

21. Turn middle (forward) boom section over to upright position on work stands.

22. Place inner boom section upside down on work stands.

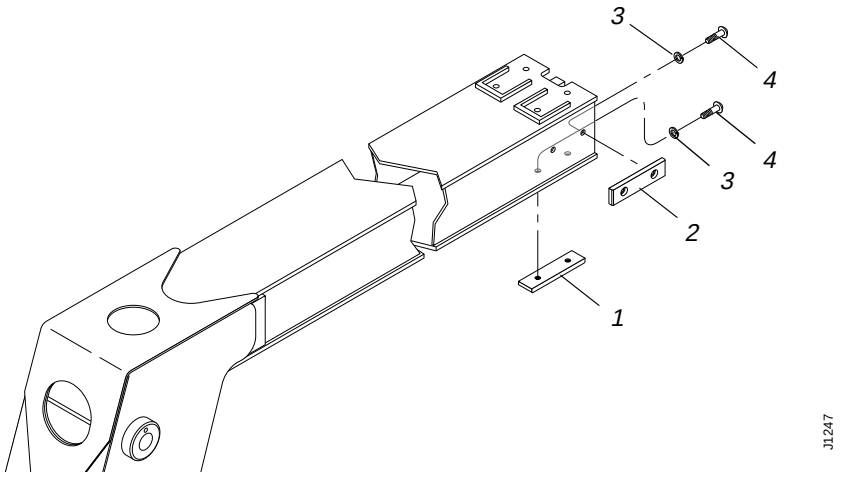


#	Description
1	Auxiliary Hydraulic Hoses
2	Carriage Tilt Hydraulic Hoses
3	Cushion Clamp

#	Description
4	Auxiliary Hydraulic Tubes
5	Carriage Tilt Hydraulic Tubes
6	Mounting Channel

Fig. 6-209: Hydraulic Hose and Tube Installation – Inner Boom Section

23. (Ref. Fig. 6-209) Install auxiliary and front carriage tilt cylinder hydraulic hoses and tubes as follows:
    a. Connect hydraulic hoses (Item 1) to carriage tilt hydraulic tubes (Item 4). Torque swivel nuts on hydraulic tubes to 50–58 ft-lbs.
    b. Connect hydraulic hoses (Item 2) to auxiliary hydraulic tubes (Item 5). Torque swivel nuts on hydraulic tubes to 50–58 ft-lbs.
    c. Install auxiliary and front carriage tilt hydraulic tubes on channels (Item 6) in inside of inner boom section with cushion clamps (Item 3) as described in Substep d under Step 2 on page 6-185.
24. Install front carriage tilt cylinder in inner boom (See page 6-19).
25. Install auxiliary hydraulic quick disconnects

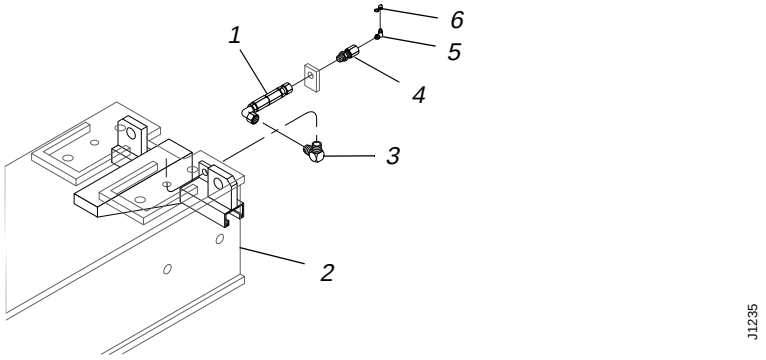


#	Description
1	Lower Slide Pad
2	Side Slide Pad

#	Description
3	Lockwasher
4	Button-Head Socket Capscrew

Fig. 6-210: Slide Pad Installation – Inner Boom Section

26. (Ref. Fig. 6-210) After applying thread locking compound to the capscrews, install two (2) lower and two (2) side slide pads (Items 1 and 2) on inner boom section according to drawing specifications with lockwashers (Item 3) and capscrews (Item 4). Torque capscrews to 180 in-lbs.



#	Description
1	Grease Hose
2	Inner Boom Section
3	Elbow

#	Description
4	Bulkhead Adapter
5	Grease Fitting
6	Grease Fitting Cover

Fig. 6-211: Grease Hose Installation

27. (Ref. Fig. 6-211) Install grease hose assembly on rear of inner boom section as follows:

    a. Install two (2) elbows (Item 3) on inside of inner boom section making sure elbows are in correct position for grease hose to be connected.

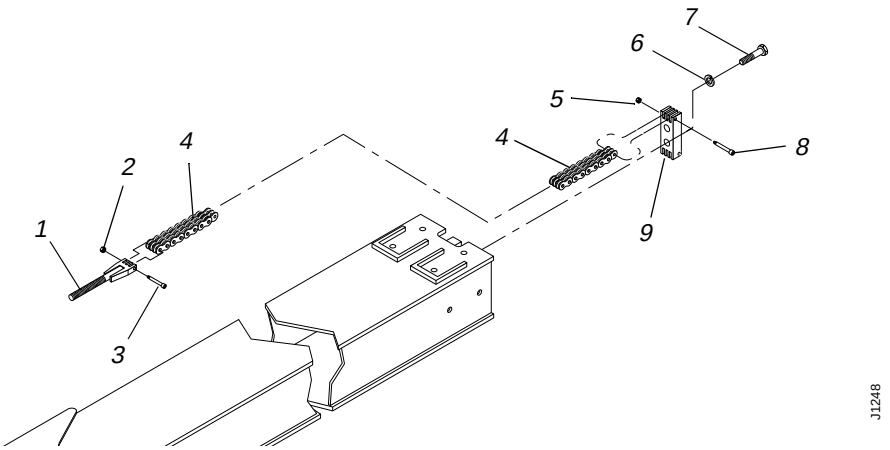
b. Install two (2) bulkhead adapters (Item 4) on rear of inner boom section (Item 2).

c. Connect two (2) grease hoses (Item 1) to bulkhead adapters. Torque swivel nuts on grease hoses to 130–150 in-lbs.

d. Connect grease hoses to elbows. Torque swivel nuts on grease hose to 130–150 in-lbs.

e. Install grease fittings (Item 5) and grease fitting covers (Item 6) on bulkhead adapters (Item 2). Torque grease fittings 2–3 turns past finger tight.

28. Turn inner boom section over and place it on work stands in upright position.



#	Description
1	Chain Adjustment Anchor
2	Lock Nut
3	Shoulder Bolt
4	Upper Chain
5	Lock Nut

#	Description
6	Lockwasher
7	Capscrew
8	Shoulder Bolt
9	Rear Chain Anchor

Fig. 6-212: Upper Chain Installation – Inner Boom Section

29. (Ref. Fig. 6-212) Install upper chain assembly on inner boom section as follows:

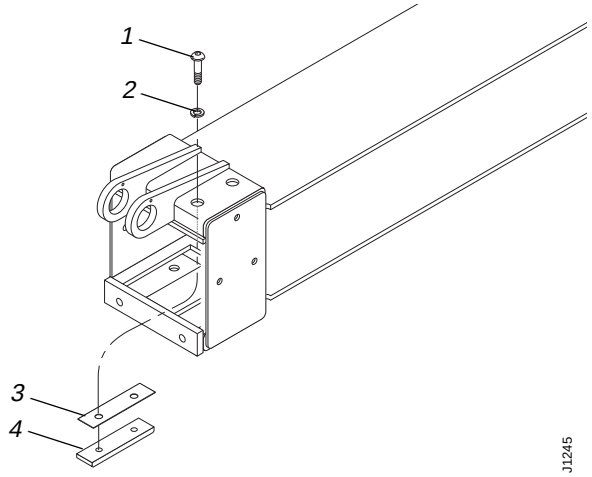
a. Install rear chain anchor (Item 9) on inner boom section with two (2) lockwashers (Item 6) and capscrews (Item 7). Torque capscrews to 280 ft-lbs.

b. Install upper chain (Item 4) on chain anchor with shoulder bolt (Item 8) and lock nut (Item 5). Torque lock nut to 108 in-lbs.

c. Install chain adjustment anchor (Item 1) on upper chain with shoulder bolt (Item 3) and lock nut (Item 2). Torque lock nut to 108 in-lbs.

d. Lay upper chain flat on top of inner boom section.

30. Lift inner boom section and slide it into middle (front) boom section.

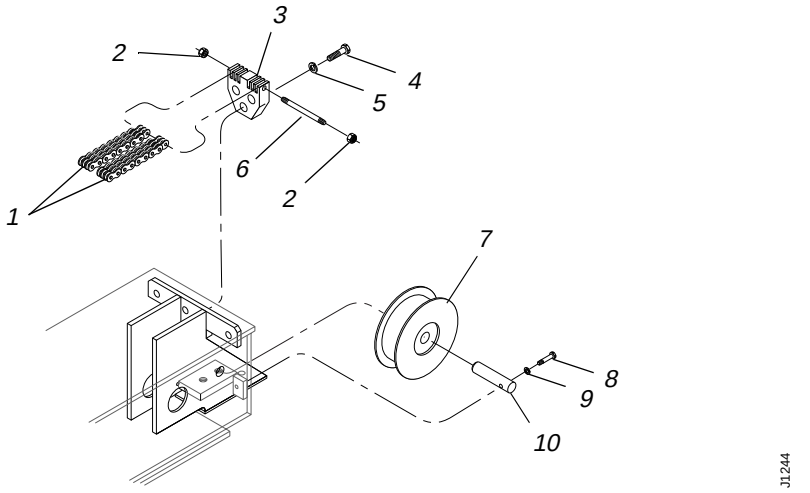


#	Description
1	Button-Head Socket Capscrew
2	Lockwasher

#	Description
3	Shim
4	Front Upper Slide Pad

Fig. 6-213: Upper Slide Pad Installation – Front of Middle (Forward) Boom Section

31. (Ref. Fig. 6-213) After applying thread locking compound to the capscrews, install two (2) upper slide pads (Item 4) and shims (Item 3) on front of middle (forward) boom section with lockwashers (Item 2) and capscrews (Item 1) according to drawing specifications. Torque capscrews to 180 in-lbs.
32. Lift middle (forward) and inner boom sections and slide them into middle (rear) boom section.



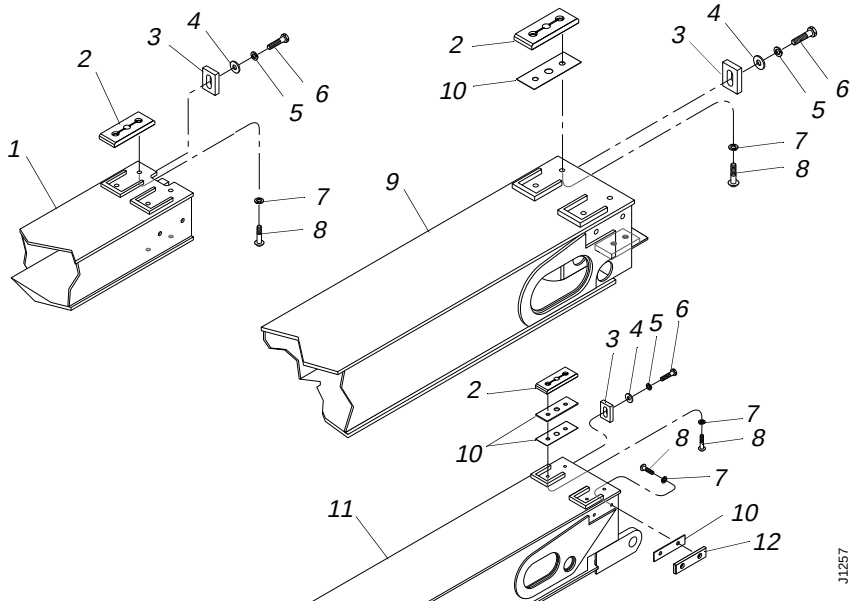
#	Description
1	Upper Chains
2	Lock Nut
3	Upper Chain Anchor
4	Capscrew
5	Lockwasher

#	Description
6	Chain Anchor Rod
7	Hose Reel
8	Capscrew
9	Lockwasher
10	Hose Reel Pin

Fig. 6-214: Upper Chain and Hose Reel Assembly – Middle (Forward) Boom

33. (Ref. Fig. 6-214) Install upper chains and hose reel assembly on middle (forward) boom section as follows:

    a. Install two (2) hose reels (Item 7) to rear of boom section with hose reel pins (Item 10). Secure each pin to boom section with lockwasher (Item 9) and capscrew (Item 8). Torque capscrews to 216 in-lbs.



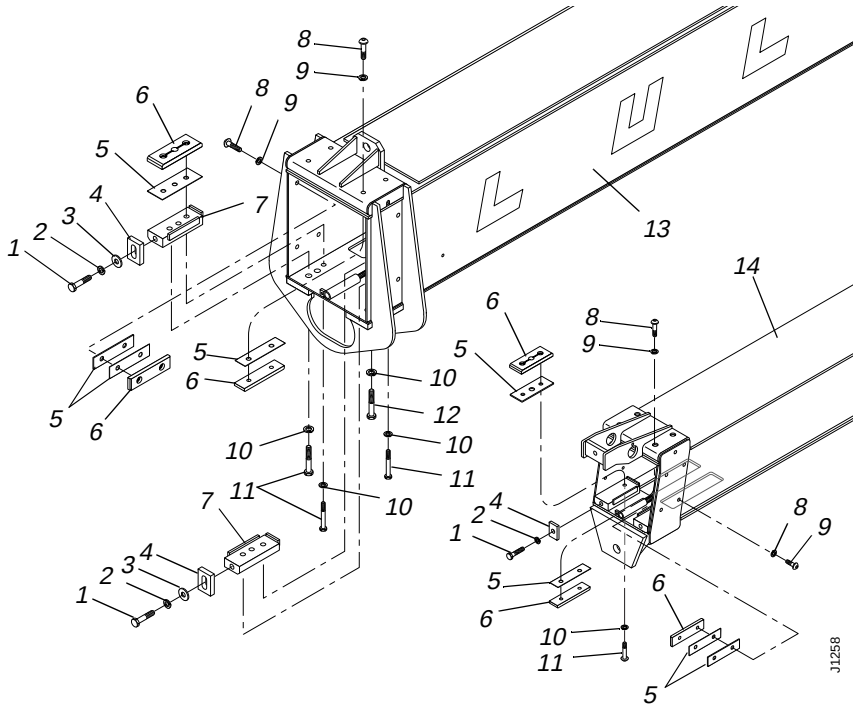
#	Description	#	Description
1	Inner Boom Section	7	Lockwasher
2	Upper Slide Pad	8	Button-Head Socket Capscrew
3	Slide Pad Retainer	9	Middle (Forward) Boom Section
4	Flatwasher	10	Shim
5	Lockwasher	11	Middle (Rear) Boom Section
6	Capscrew	12	Side Slide Pad

Fig. 6-215: Rear Slide Pad Installation

34. (Ref. Fig. 6-215) After applying thread locking compound to the capscrews, install remaining slide pads (Items 2 and 12) and shims (Item 10) on rear of boom sections with lockwashers (Item 7) and capscrews (Item 8). Torque slide pad capscrews to 180 in-lbs.

    Note: *See "Shimming Procedures" on page 6-147 for details in determining the number of shims that will be required when performing Steps 34 and 37.*

35. (Ref. Fig. 6-215) Install slide pad retainers (Item 3) with flatwashers (Item 4), lockwashers (Item 5), and capscrews (Item 6). Torque capscrews to 200 ft-lbs.

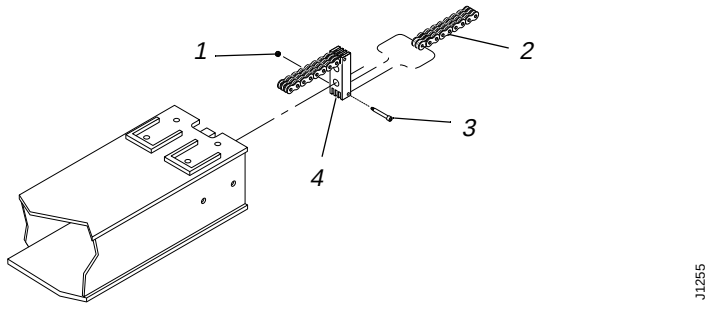


#	Description
1	Capscrew
2	Lockwasher
3	Flatwasher
4	Slide Pad Retainer
5	Shim
6	Slide Pad
7	Retainer Block

#	Description
8	Button-Head Socket Capscrew
9	Lockwasher
10	Lockwasher
11	Capscrew
12	Capscrew
13	Outer Boom Section
14	Middle (Rear) Boom Section

Fig. 6-216: Front Slide Pad Installation – Outer and Middle (Rear) Boom Sections

36. (Ref. Fig. 6-215) Install two (2) retainer blocks (Item 7) on front of outer boom section (Item 13) with lockwashers (Item 10) and capscrews (Items 11 and 12). Torque capscrews (Item 11) to 90 ft-lbs and capscrew (Item 12) to 200 ft-lbs.
37. (Ref. Fig. 6-215) After applying thread locking compound to the capscrews, install remaining slide pads (Item 6) and shims (Item 5) on front of outer and middle (rear) boom sections with lockwashers (Item 9) and capscrews (Item 8). Torque capscrews to 180 in-lbs.
38. (Ref. Fig. 6-215) Install remaining slide pad retainers (Item 4) with flatwashers (Item 3), lockwashers (Item 2), and capscrews (Item 1). Torque capscrews to 200 ft-lbs.

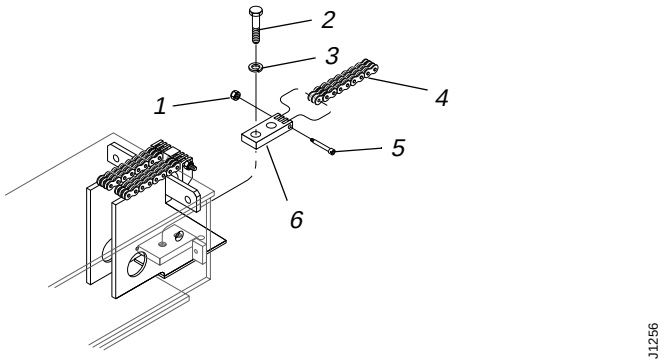


#	Description
1	Lock Nut
2	Lower Chain

#	Description
3	Shoulder Bolt
4	Rear Chain Anchor

Fig. 6-217: Lower Chain Installation – Inner Boom Section

39. Install lower chain (Item 2) from inside middle (rear) boom section to rear chain anchor (Item 4) at rear of inner boom section with shoulder bolt (Item 3) and lock nut (Item 1). Torque lock nut to 108 in-lbs.



#	Description
1	Lock Nut
2	Capscrew
3	Lockwasher

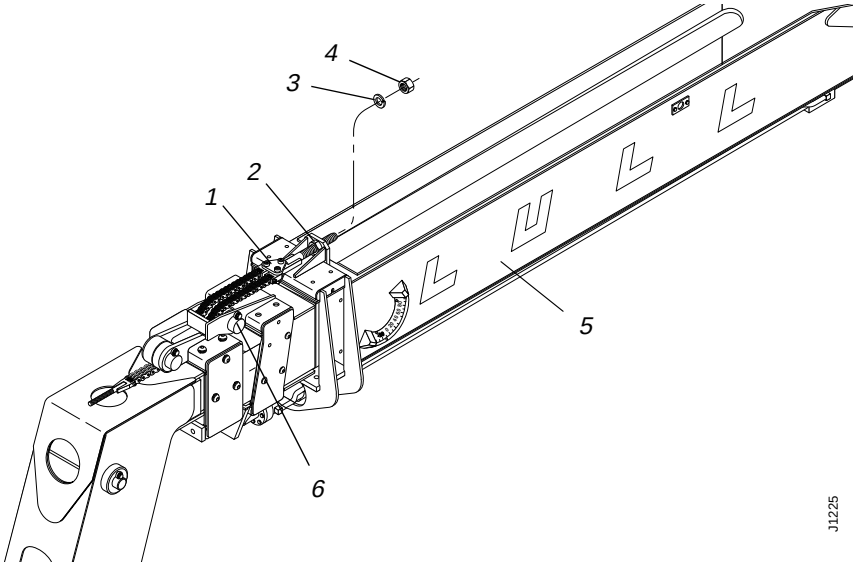
#	Description
4	Lower Chain
5	Shoulder Bolt
6	Lower Chain Anchor

Fig. 6-218: Lower Chain Installation – Middle (Forward) Boom Section

40. Install lower chain assembly from inside outer boom section to middle (front) boom section as follows:

    a. Install lower chain anchor (Item 6) on lower chain (Item 4) with shoulder bolt (Item 5) and lock nut (Item 1). Torque lock nut to 108 in-lbs.

    b. Install lower chain anchor on rear of boom section with two (2) lockwashers (Item 3) and capscrews (Item 2). Torque capscrews to 280 ft-lbs.



#	Description
1	Chain Anchor
2	Jam Nut
3	Lockwasher

#	Description
4	Nut
5	Outer Boom Section
6	Upper Chain Roller Assembly

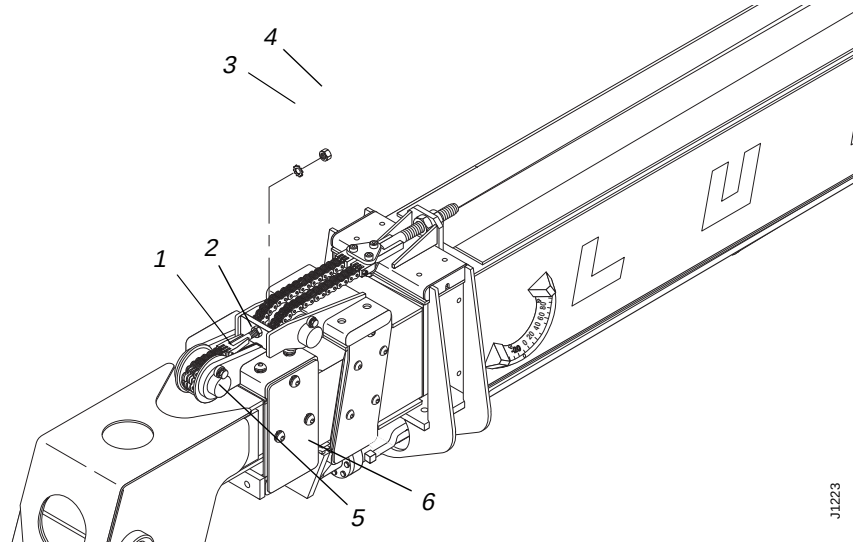
Fig. 6-219: Upper Chains – Middle (Rear) to Outer Boom Sections

41. (Ref. Fig. 6-219) Secure upper chain to outer boom section as follows:

    a. Bring upper chain lying on top of middle (front) boom section up and around the upper chain roller assembly (Item 6) on the middle (rear) boom section (Item 5).

    b. Install jam nut (Item 2) on chain anchor (Item 1) and insert threaded portion of chain anchor through opening in bracket at top of outer boom section.

    c. Secure chain anchor with lockwasher (Item 3) and nut (Item 4). Torque anchor nut to 120 ft-lbs.



#	Description
1	Chain Adjustment Anchor
2	Jam Nut
3	Lockwasher

#	Description
4	Nut
5	Upper Chain Roller Assembly
6	Middle (Forward) Boom Section

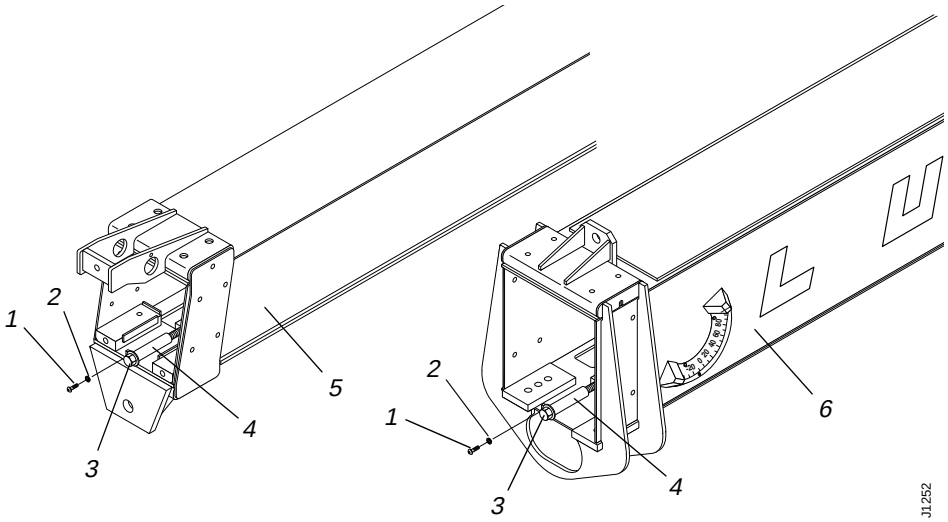
Fig. 6-220: Upper Chain – Middle (Forward) to Middle (Rear) Boom Sections

42. (Ref. Fig. 6-220) Secure upper chain to middle (rear) boom section as follows:

    a. Bring upper chain lying on top of inner boom section up and around the upper chain roller assembly (Item 5) on the middle (forward) boom section (Item 6).

    b. Install jam nut (Item 2) on chain adjustment anchor (Item 1). Insert threaded portion of chain adjustment anchor through opening in bracket at top of middle (rear) boom section.

    c. Secure chain anchor with lockwasher (Item 3) and nut (Item 4). Torque nut to 374 ft-lbs.

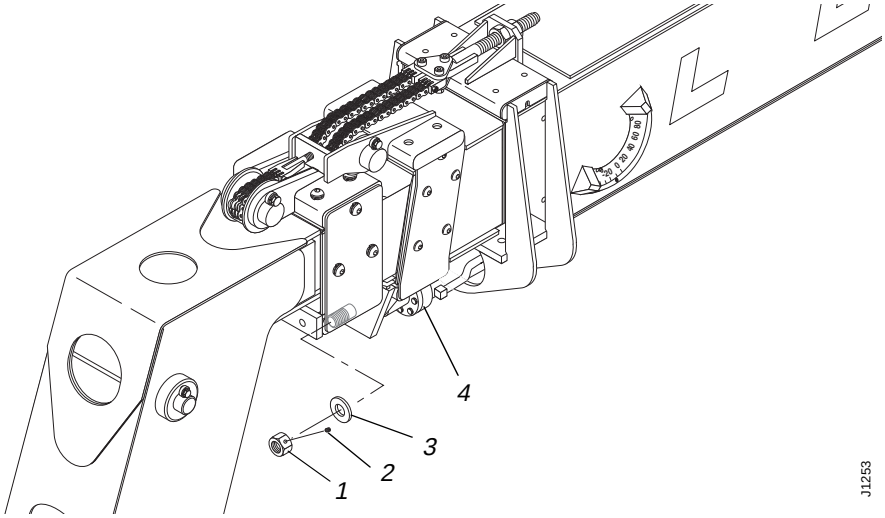


#	Description
1	Capscrew
2	Lockwasher
3	Adjustment Rod

#	Description
4	Anchor Base
5	Middle (Rear) Boom Section
6	Outer Boom Section

Fig. 6-221: Securing Lower Chains – Middle (Rear) and Outer Boom Sections

43. (Ref. Fig. 6-221) Align notch in head of adjustment rod (Item 3) with threaded hole in anchor base (Item 4) of middle (rear) (Item 5) and outer boom (Item 6) sections. Secure adjustment rod with lockwasher (Item 2) and capscrew (Item 1). Torque capscrews to 50 in-lbs.

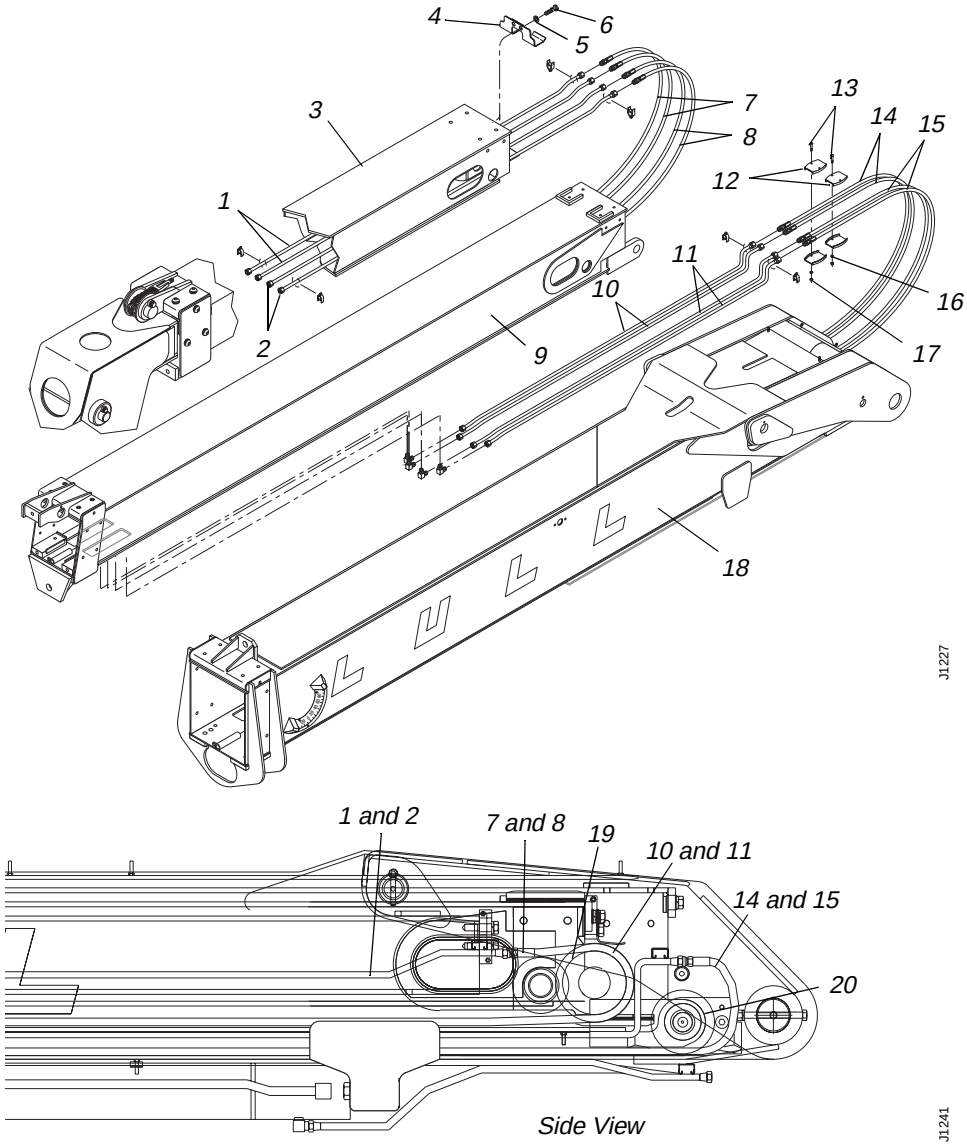


#	Description
1	
2	Setscrew

#	Description
3	Cylinder Rod Boss
4	Boom Extension Cylinder

Fig. 6-222: Securing Boom Extension Cylinder

44. (Ref. Fig. 6-222) Secure extension cylinder (Item 4) to front of middle (rear) boom section with extension cylinder rod boss (Item 3) and rod nut (Item 1). Torque rod nut to 733 ft-lbs. Secure rod nut with two (2) setscrews (Item 2).



#	Description
1	Auxiliary Hydraulic Tube
2	Carriage Tilt Hydraulic Tube
3	Middle (Front) Boom Section
4	Hose Guard
5	Lockwasher
6	Capscrew
7	Auxiliary Tilt Hydraulic Hose
8	Carriage Tilt Hydraulic Hose
9	Middle (Rear) Boom Section
10	Auxiliary Hydraulic Tube

#	Description
11	Carriage Tilt Hydraulic Tube
12	Half Clamp
13	Round Head Screw
14	Auxiliary Hydraulic Hose
15	Carriage Tilt Hydraulic Hose
16	Lockwasher
17	Nut
18	Outer Boom Section
19	Hose Reels
20	Hose Rollers

Fig. 6-223: Connecting Hoses Between Sections

45. (Ref. Fig. 6-223) Connect hydraulic hoses between boom sections as follows:

a. Bring auxiliary and front carriage tilt hoses (Items 7 and 8) from inside the middle (rear) boom section (Item 9) up and around the two (2) hose reels (Item 19) at the rear of the middle (forward) boom section (Item 3).

b. Connect the hydraulic hoses to the hydraulic tubes (Items 1 and 2) at the rear of the inner boom section. Torque swivel nut on hydraulic hoses to 50–58 ft-lbs.

c. Install hose guard (Item 4) on rear of inner boom section with two (2) each lockwashers (Item 5) and capscrews (Item 6). Torque capscrews to 280 ft-lbs.

CAUTION: Make sure hose guard is installed in the same orientation as it was before being removed. The hose guard may be different from that shown above. If hose guard is reversed, equipment damage may occur during operation of machine.

d. Bring auxiliary and front carriage tilt hoses (Items 14 and 15) from inside the outer boom section (Item 18) up and around the hose rollers (Item 20) at the rear of the middle (rear) boom section.

e. Connect the hydraulic hoses to the hydraulic tubes (Items 10 and 11) at the rear of the middle (rear) boom section. Torque swivel nut on hydraulic hoses to 50–58 ft-lbs.

f. For model 1044C-54 (S/N 101–106), attach four (4) half clamps (Item 12) to each set of hoses with round head screws (Item 13), lockwashers (Item 16) and nuts (Item 17). Torque nuts to 50 in-lbs.

46. Install assembled 4-section boom on machine as described on page 6-161.

Extension Cylinder

4-Section Boom

Description

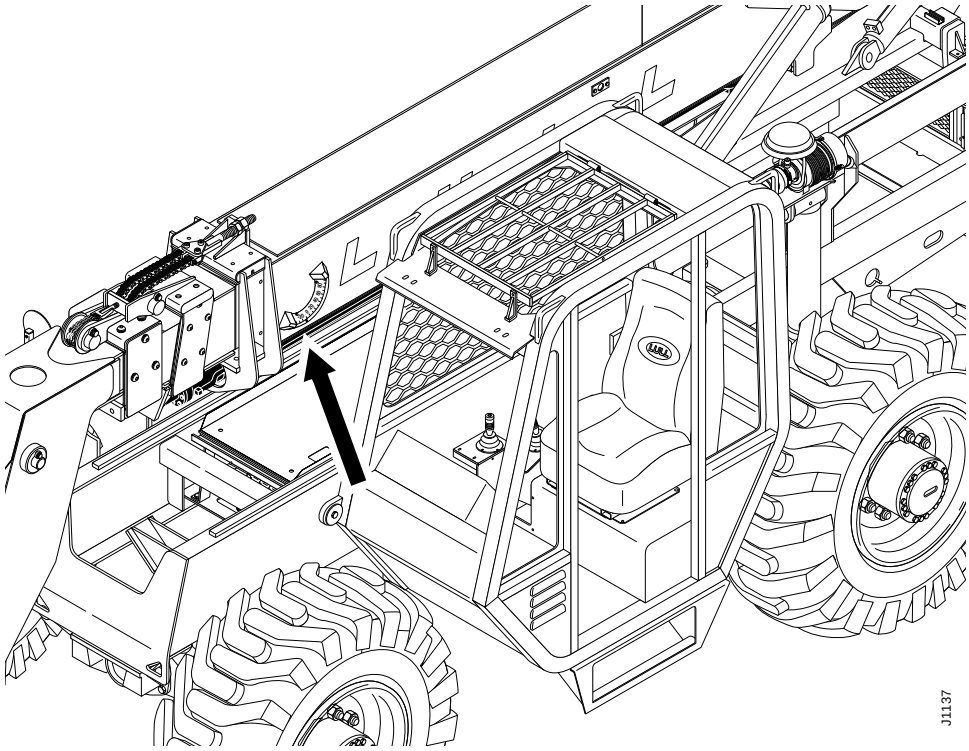
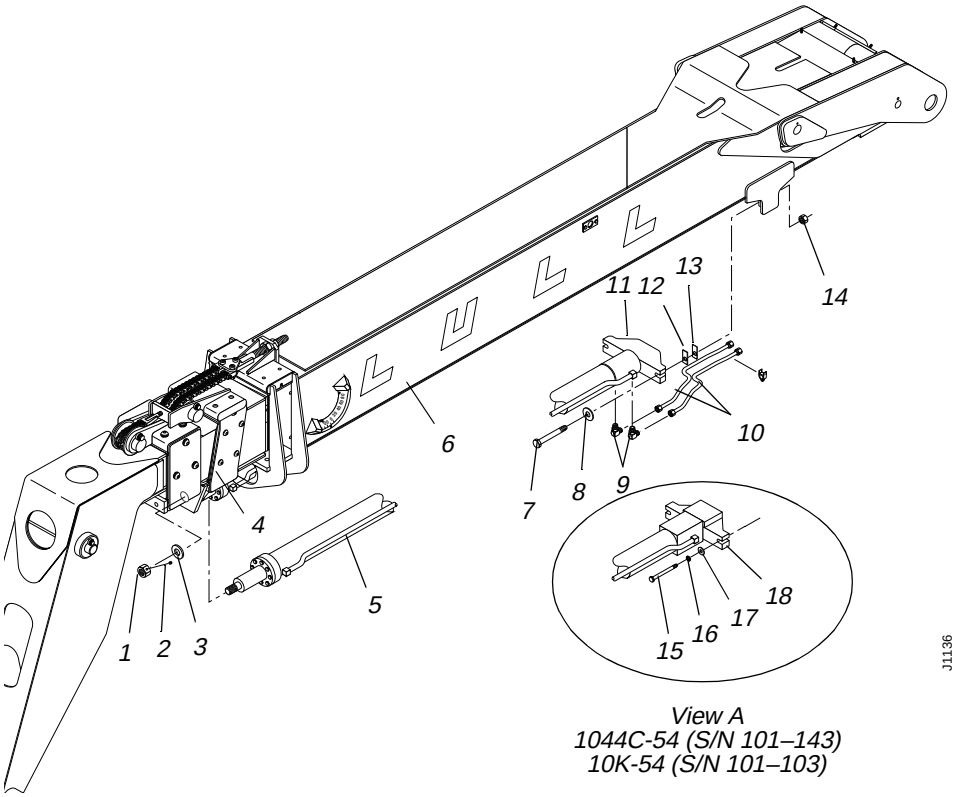


Fig. 6-224: 4-Section Boom Extension Cylinder

The 4-section boom extension cylinder is located beneath the boom assembly. It is attached from the middle (rear) to the outer boom section. Its operating pressure is 3000 psi and weighs 650 pounds. When completely retracted, it is 149-3/4" long. When fully extended, it is 280-3/4" long.

Removal, Extension Cylinder



View A
1044C-54 (S/N 101–143)
10K-54 (S/N 101–103)

#	Description
1	Rod Nut
2	Socket Setscrew
3	Extension Cylinder Rod Boss
4	Middle (Rear) Boom Section
5	Boom Extension Cylinder
6	Outer Boom Section
7	Capscrew
8	Flatwasher
9	Elbow

#	Description
10	Hydraulic Tube
11	Extension Cylinder Base Mount
12	Shim
13	Shim
14	Nut
15	Capscrew
16	Lockwasher
17	Flatwasher
18	Extension Cylinder Base Mount

Fig. 6-225: 4-Section Boom Extension Cylinder Installation

(Ref. Fig. 6-225) The following steps are required to remove the boom extension cylinder.

1. Follow preparation procedures as outlined in Section 3 and “General Hydraulic Maintenance Practices” on page 5-4 of this manual.
2. Disconnect any attachments and raise the boom enough so that access to the rear of the extension cylinder is possible. Apply the park brake, retract the cylinder, and shut the engine off.
3. Support the boom and extension cylinder with sling(s) and crane or other suitable means. Make sure support items have sufficient capacity to support the weight of the boom and cylinder; the combined weight of the boom and extension cylinder is approximately 6650 pounds.

DANGER: Support of the boom is essential to avoid the possibility of injury or death should the boom fall. To avoid personal and/or equipment damage, support the hydraulic cylinder before removing any additional hardware securing cylinder to the boom. Use suitable blocking and lifting devices when removing heavy machine components.

4. Loosen and remove two (2) hydraulic tubes (Item 10) from elbows (Item 9) on boom extension cylinder (Item 5). Bleed any remaining oil into a suitable container. Cap fittings and tubes.
5. Loosen two (2) socket setscrews (Item 2) in rod nut (Item 1).
6. Loosen and remove rod nut and rod boss (Item 3) securing boom extension cylinder to front of middle (rear) boom section (Item 4).
7. Loosen and remove hardware securing extension cylinder to outer boom section (Item 6) as follows.

   For Models 1044C-54 (S/N 101–143) and 10K-54 (S/N 101–103) (See View A):

   Remove two (2) each capscrews (Item 15), lockwashers (Item 16), and flatwashers (Item 17) securing extension cylinder base mount (Item 18) to outer boom section.

   For Models 1044C-54 (S/N 144–) and 10K-54 (S/N 104–):

   Remove two (2) each nuts (Item 14), capscrews (Item 7), and flatwashers (Item 8) securing extension cylinder base mount (Item 11) to outer boom section. Also, remove the shim(s) (Items 12 and 13).
8. Slowly remove the cylinder from the machine and take it to a location suitable for inspection and disassembly.
9. Clean remaining parts with solvent and dry with compressed air. Inspect for damage and replace as necessary.

Installation, Extension Cylinder

The following steps are required to install the boom extension cylinder (Ref. Fig. 6-225).

1. Using sling(s), crane, or other suitable means, position rod end of cylinder (Item 5) in its proper location on the middle (rear) boom section (Item 4).

WARNING: To avoid personal and/or equipment damage, make sure the cylinder is properly supported until it is completely installed.

2. Secure cylinder to middle (rear) boom section with rod boss (Item 3) and rod nut (Item 1).

3. Secure cylinder to outer boom section with hardware as follows.

   For Models 1044C-54 (S/N 101–143) and 10K-54 (S/N 101–103) (See View A):

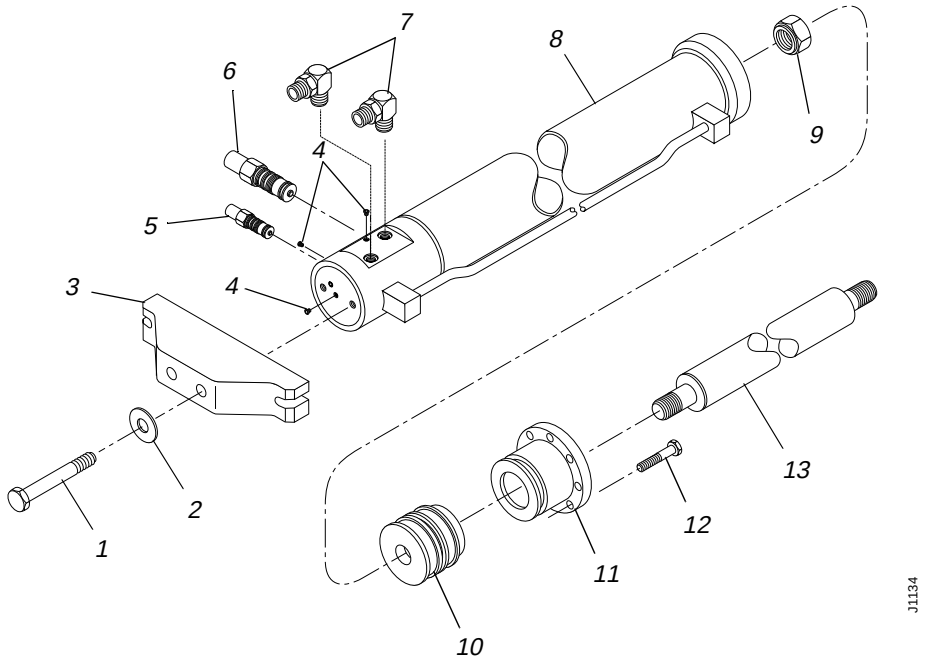
   Use two (2) each flatwashers (Item 17), lockwashers (Item 16), and capscrews (Item 15). Torque capscrews to 200 ft-lbs.

   For Models 1044C-54 (S/N 144–) and 10K-54 (S/N 104–):

   Use two (2) each nuts (Item 14), flatwashers (Item 8), and capscrews (Item 7). Install as many shims (Items 12 and 13) as necessary before installing the nuts. Torque nuts to 680 ft-lbs.

4. Torque rod nut to 733 ft-lbs.
5. If socket setscrews (Item 2) were removed, install them in rod nut.
6. Reconnect two (2) hydraulic tubes (Item 10) to elbows on extension cylinder. Torque tube swivel nuts to 79–88 ft-lbs.

Overhaul, Extension Cylinder



#	Description
1	Bolt
2	Flatwasher
3	Extension Cylinder Base Mount
4	Hollow Hex O-ring Plug
5	Counterbalance Valve Cartridge
6	Counterbalance Valve Cartridge
7	90° O-ring Elbow

#	Description
8	Cylinder Barrel
9	Rod Nut
10	Piston
11	Rod Bearing Head
12	Capscrew
13	Cylinder Rod

Fig. 6-226: 4-Section Boom Extension Cylinder Assembly

(Ref. Fig. 6-226) The following steps are required to overhaul the boom extension cylinder.

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

   For Models 1044C-54 (S/N 101–143) and 10K-54 (S/N 101–103)

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

   For Models 1044C-54 (S/N 144–) and 10K-54 (S/N 104–):

   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.

   a. Place socket wrench over counterbalance valve cartridge. Wrap a clean shop rag around the socket to cover the area of the counterbalance valve cartridge.
   b. Carefully and slowly, turn cartridge out of manifold block to release pressure in cylinder.

4. Remove the counterbalance valve cartridges.
5. Slowly extend and retract cylinder by hand to remove most of the hydraulic oil.
6. Remove eight (8) capscrews (Item 12) securing rod bearing head (Item 11) to cylinder barrel.
7. Remove cylinder rod (Item 13) from cylinder barrel.

CAUTION: To prevent possible damage to components, support rod and head; do not wiggle rod or head back and forth during removal.

8. Remove rod nut (Item 9), piston (Item 10), and rod bearing head from cylinder rod.
9. Remove the two (2) elbows (Item 7) from cylinder barrel.
10. Remove four (4) O-ring plugs (Item 4) from cylinder manifold block.
11. Remove all O-rings, wear rings, and backup rings from cylinder components and discard.
12. Thoroughly clean components with solvent and dry with compressed air. Inspect and replace if damaged.

13. Inspect inner surface of barrel, outer surface of piston, and length of rod for scratches and scoring. If barrel, piston, or rod is damaged, it must be replaced.
14. Check condition of threads on rod, nut, and capscrews. Do not attempt to repair damaged threads.
15. Inspect counterbalance valve cartridges (Items 5 and 6), including O-rings, for condition and replace as necessary. Do not disassemble cartridges. Service to counterbalance valve cartridges is limited to installing new O-rings and replacing the entire cartridge.
16. Lubricate counterbalance valve cartridge O-rings with clean hydraulic oil.
17. Install valve cartridge (Item 5) in manifold block and torque to 40–45 ft-lbs.
18. Install valve cartridge (Item 6) in manifold block and torque to 150–160 ft-lbs.
19. Install four O-ring plugs (Item 4) in manifold block and torque to 125–145 in-lbs.
20. Lubricate new O-ring with hydraulic oil and install inside piston (seals rod to piston).
21. Lubricate new seal and wear rings with hydraulic oil and install on piston.
22. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install on head. Using a seal driver, install new wiper seal in head. Lubricate wiper seal with hydraulic oil.
23. Slide rod bearing head (Item 11) and piston (Item 10) onto rod (Item 13). Lubricate threads on rod with hydraulic oil and install rod nut (Item 9). Torque rod nut to 750 ft-lbs.
24. Lubricate threads on eight (8) capscrews (Item 12) with hydraulic oil. Coat inside of barrel (Item 8) with hydraulic oil. To avoid damaging seals during assembly, carefully insert rod and head into barrel. Install capscrews until snug. Do not torque capscrews (instructions follow).
25. Following sequence shown in Fig. 6-10, torque capscrews to an initial value of 30 ft-lbs. Follow sequence again and torque capscrews to a final value of 65 ft-lbs.
26. Install two (2) elbows (Item 7) on cylinder barrel. Torque elbow to 75–85 ft-lbs.
27. Install the extension cylinder base mount (Item 3) to the cylinder barrel as follows.

    For Models 1044C-54 (S/N 101–143) and 10K-54 (S/N 101–103):

    Install with three (3) each flatwashers (Item 2) and capscrews (Item 1). Torque capscrews to 200 ft-lbs.

    For Models 1044C-54 (S/N 144–) and 10K-54 (S/N 104–):

    Install with two (2) each flatwashers (Item 2) and capscrews (Item 1). Torque capscrews to 680 ft-lbs.

Boom Extension Proximity Switch

(Models 1044C-54 and 10K-54 Only)

Description

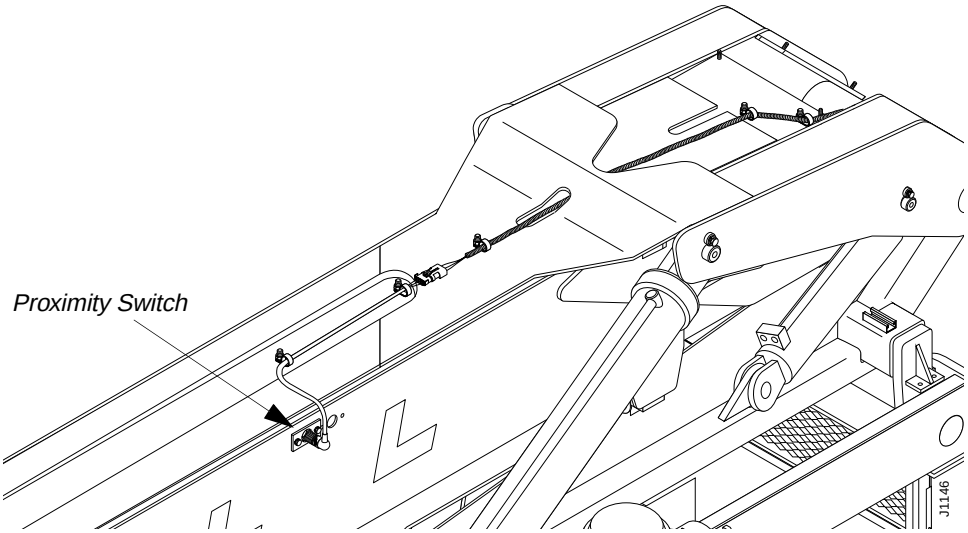


Fig. 6-227: Boom Extension Proximity Switch

(Ref. Fig. 6-227) The boom extension proximity switch is located on the left side of the outer boom section on machines with a 4-section boom. The boom extend/lockout circuit is designed to increase stability of the machine by limiting how far the boom can be extended with the outriggers up. The system will disable the boom extend and transfer extend functions and the warning lamp will come on when the boom is extended to specified distance (approximately 21 feet with tilting tower or 25 feet with standard carriage). The proximity switch then opens as it no longer senses metal. At this point, the left and right outriggers must both be lowered to the ground to allow the boom or transfer carriage to be extended any further.

Normally-open differential pressure switches in the outrigger cylinders close when the base end pressure exceeds the rod end pressure by approximately 90–95 psi. When both pressure switches close, this completes the circuit, allowing the boom and transfer carriage to be extended, and the lamp turns off. The system is fail-safe in that it requires an electrical signal to enable the boom to be extended beyond the specified distance.

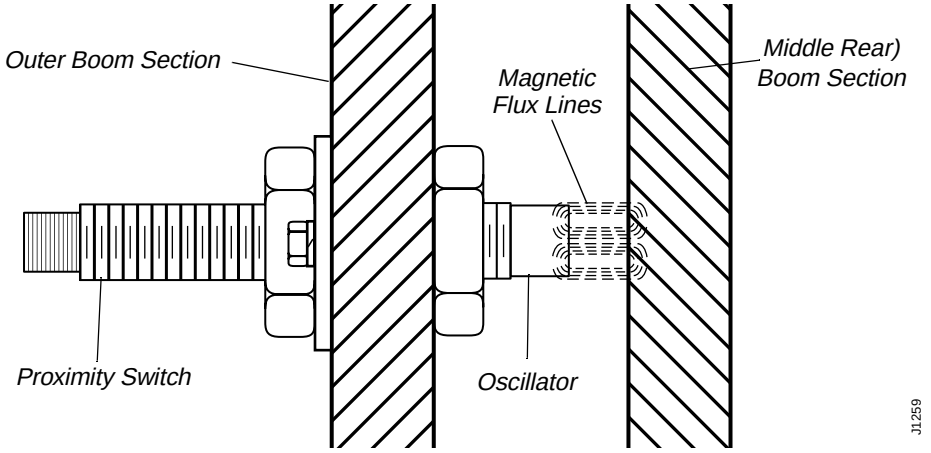
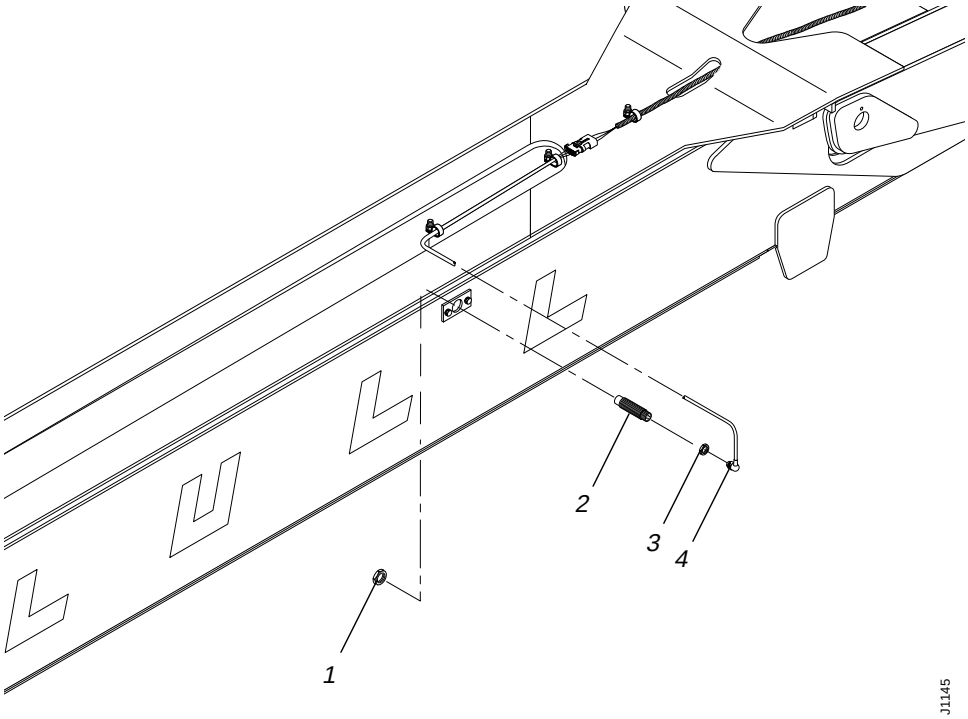


Fig. 6-228: Boom Extension Proximity Switch Operation

(Ref. Fig. 6-228) The switch operates by sending out a constant, high frequency magnetic field a short distance from the oscillator end of the switch. Eddy currents are produced in metal when the magnetic flux lines pass through it. These eddy currents oppose the oscillations of the magnetic flux lines and the oscillations stop. A sensor in the switch detects if the oscillator is on or off and this gives the switch its on/off function.

Removal

Boom Extension Proximity Switch



#	Description	#	Description
1	Inner Jam Nut	3	Outer Jam Nut
2	Proximity Switch	4	Wire Harness

Fig. 6-229: Boom Extension Proximity Switch Assembly

(Ref. Fig. 6-229) The following procedure describes removal of the boom extension proximity switch.

1. Disconnect wire harness (Item 4) at boom extension proximity switch (Item 2).
2. Place a piece of masking tape around proximity switch body at the outer jam nut (Item 3) (this will serve as a guide during reinstallation).
3. Remove inner jam nut (Item 1) and proximity switch. Reinstall inner jam nut on proximity switch for safekeeping.

Installation

Boom Extension Proximity Switch

(Ref. Fig. 6-229) The following procedure describes installation of the boom extension proximity switch.

1. Position outer jam nut (Item 3) on switch body (Item 2) at previously marked position.
2. Install boom extension proximity switch in outer boom. Install inner jam nut (Item 1). Check gap between end of proximity switch and boom. See Fig. 6-230.
3. Connect wire harness (Item 4) to proximity switch.
4. Check operation of proximity switch by extending the boom. The boom extension proximity light must come on at specified distance (approximately 21 feet with tilting tower or 25 feet with standard carriage). If the light does not illuminate, stop and retract boom. Proceed to “Adjustments” below.

Adjustments

Boom Extension Proximity Switch

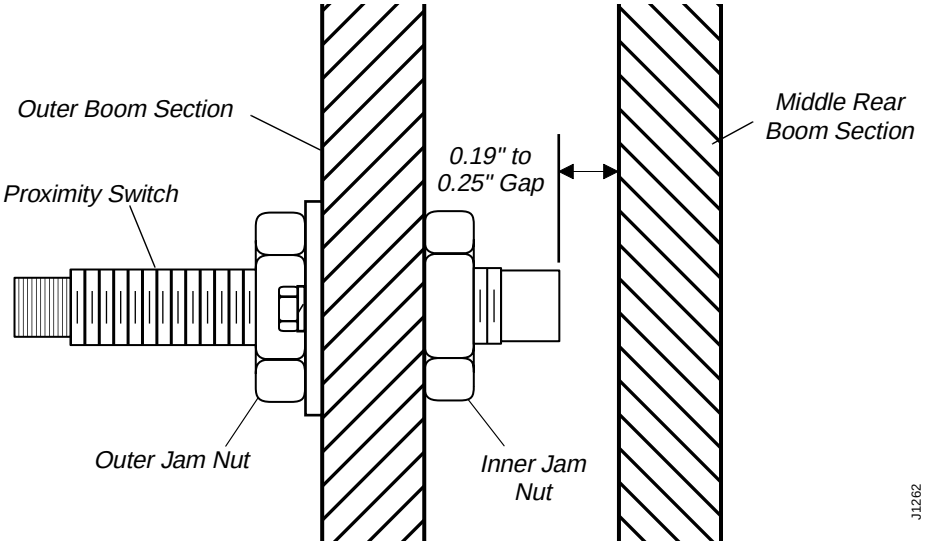


Fig. 6-230: Boom Extension Proximity Switch Adjustment

(Ref. Fig. 6-230) The following procedure describes adjustments to the boom extension proximity switch.

1. Loosen, but do not remove the two (2) jam nuts on the proximity switch body.
2. Check gap between switch and boom. Gap must be within the range specified in Fig. 6-230.
3. If boom extension proximity light does not illuminate when boom is extended to specified distance (approximately 21 feet with tilting tower or 25 feet with standard carriage), adjust proximity switch to slightly reduce the gap. Do not exceed gap tolerances specified in Fig. 6-230. Snug jam nuts to hold switch in position.
4. Extend boom and check operation of boom extension proximity light. The light must come on when boom is extended to specified distance (approximately 21 feet with tilting tower or 25 feet with standard carriage). If light does not illuminate, stop and retract boom. Repeat Step 3.
5. Tighten jam nuts.

Transfer Carriage

(Models 644B, 844C and 104 Only)

Description

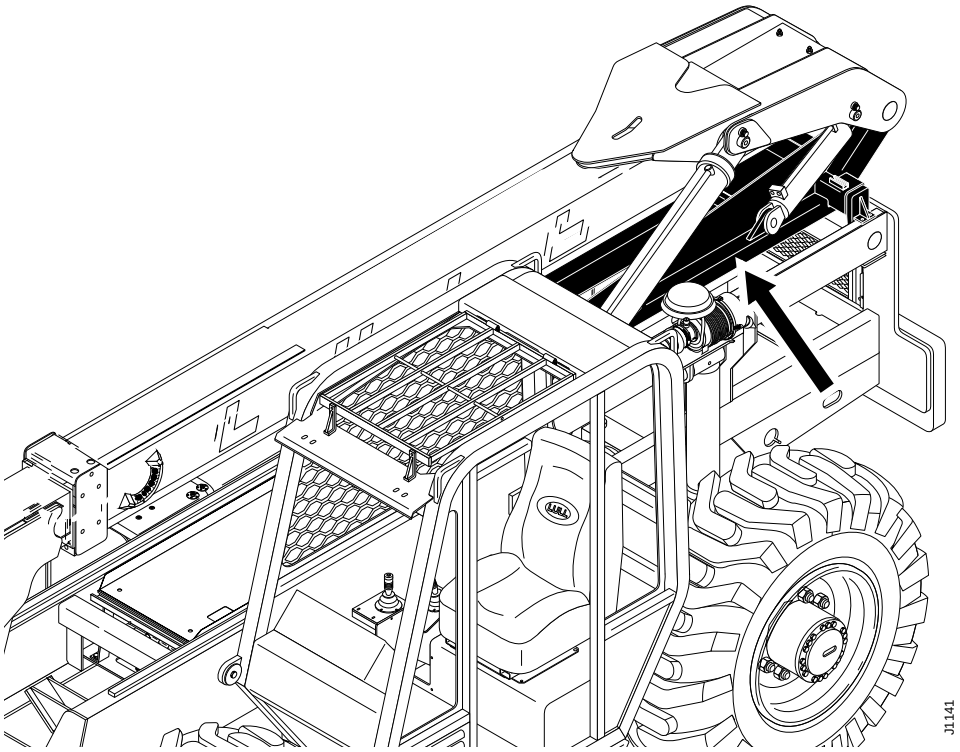


Fig. 6-231: Transfer Carriage

The transfer carriage, along with the transfer cylinder, make up the “Trans-Action” feature. This feature makes it possible to land materials from a parked, level machine by driving the boom load forward at any height. The operator can then retract the boom and forks by moving the entire upper assembly rearward without driving the machine on uneven terrain.

Removal

Transfer Carriage

The following steps are required to remove the transfer carriage.

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

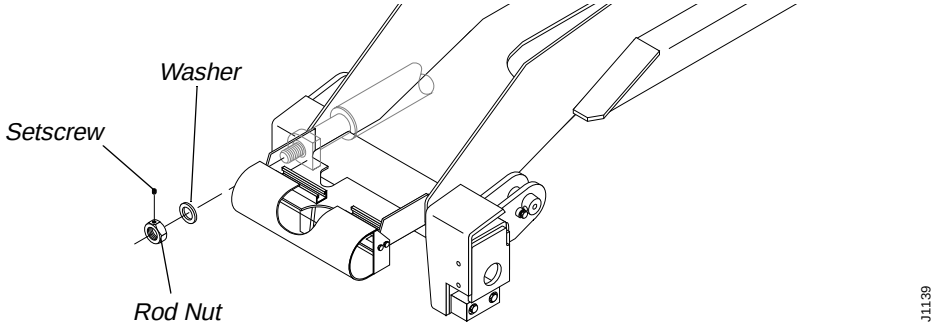


Fig. 6-232: Disconnecting Transfer Cylinder from Transfer Carriage

3. (Ref. Fig. 6-232) Loosen two (2) socket setscrews in rod nut securing transfer cylinder to the transfer carriage.
4. (Ref. Fig. 6-232) Remove transfer cylinder rod nut and washer.
5. Move transfer carriage forward enough so that the threaded port of transfer cylinder rod comes clear from its mounting hole. Block and secure the transfer cylinder to the main frame.

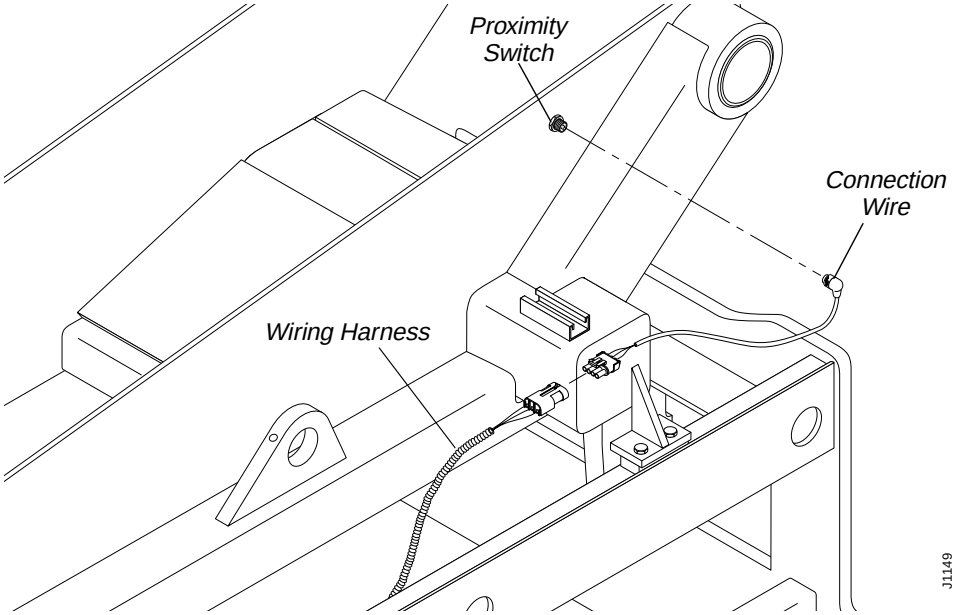
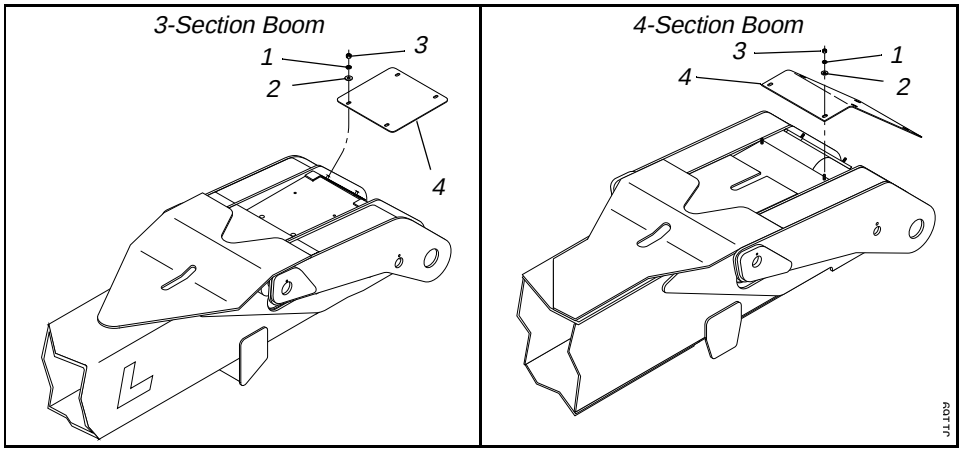


Fig. 6-233: Boom Elevation Proximity Switch Wiring

6. (Ref. Fig. 6-233) Remove boom elevation proximity switch as follows:
   a. Disconnect connection wire from boom proximity switch.
   b. Disconnect connection wire from wiring harness.
   c. Remove all wire ties that secure the wiring harness to hydraulic tubes and hoses so that it is completely separated from the transfer carriage.



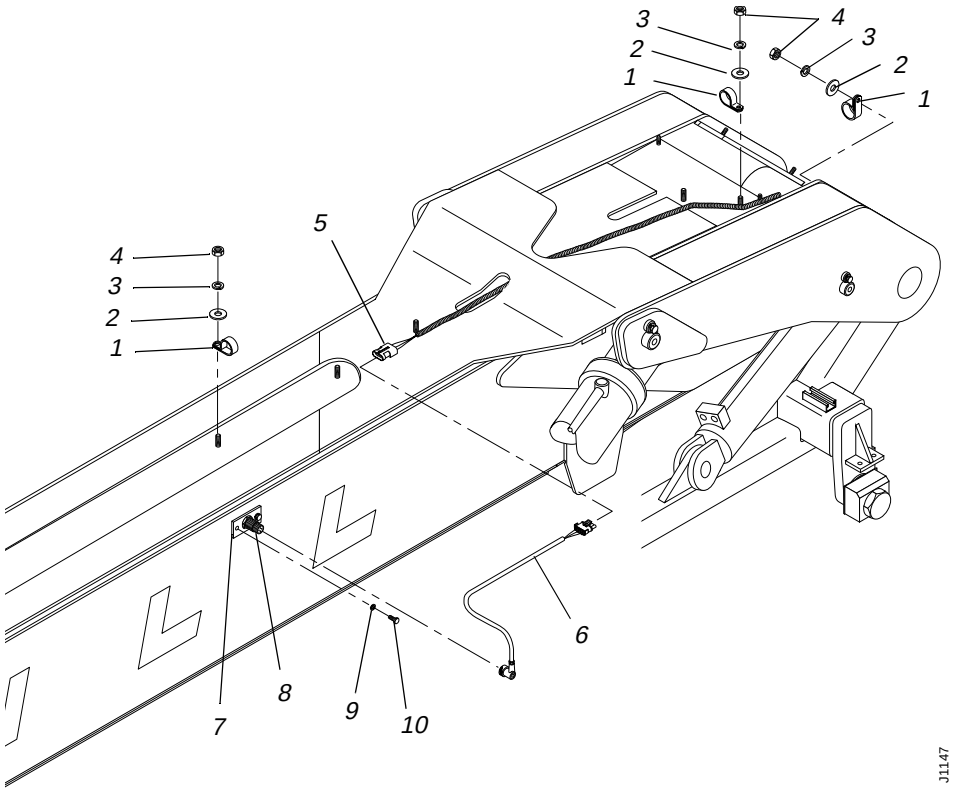
#	Description
1	Lockwasher
2	Flatwasher

#	Description
3	Nut
4	Boom Cover

Fig. 6-234: Boom Cover Installation

7. (Ref. Fig. 6-234) Remove the boom cover on models with 3-section booms (see Step a) or 4-section booms (see Step b).
   a. Remove four (4) each nuts (Item 3), lockwashers (Item 1), and flatwashers (Item 2) securing boom cover (Item 4) to boom. Remove boom cover.

b. Remove six (6) each nuts (Item 3), lockwashers (Item 1), and flatwashers (Item 2) securing boom cover (Item 4) to boom. Remove boom cover.



#	Description
1	JClamp
2	Flatwasher
3	Lockwasher
4	Nut
5	Proximity Switch Wiring Harness

#	Description
6	Proximity Switch Connection Wire
7	Proximity Mounting Plate
8	Boom Extension Proximity Switch
9	Lockwasher
10	Capscrew

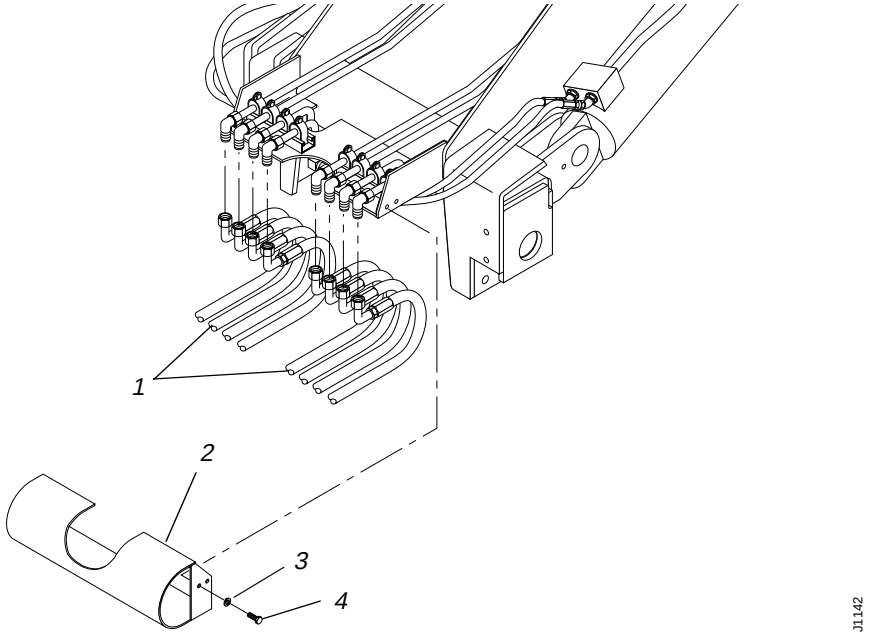
Fig. 6-235: Boom Extension Proximity Switch Wiring

8. (Ref. Fig. 6-235) For models with a 4-section boom, remove the boom extension proximity switch as follows:

   a. Remove the six (6) each (five on top of the boom and one inside of the back left side of the boom) nuts (Item 4), lockwashers, (Item 3) flatwashers (Item 2), and J-clamps (Item 1) that secure the boom extension proximity switch wiring to the boom.

   b. Disconnect the proximity switch connection wire (Item 6) from the proximity switch (Item 8) and the wiring harness (Item 5).

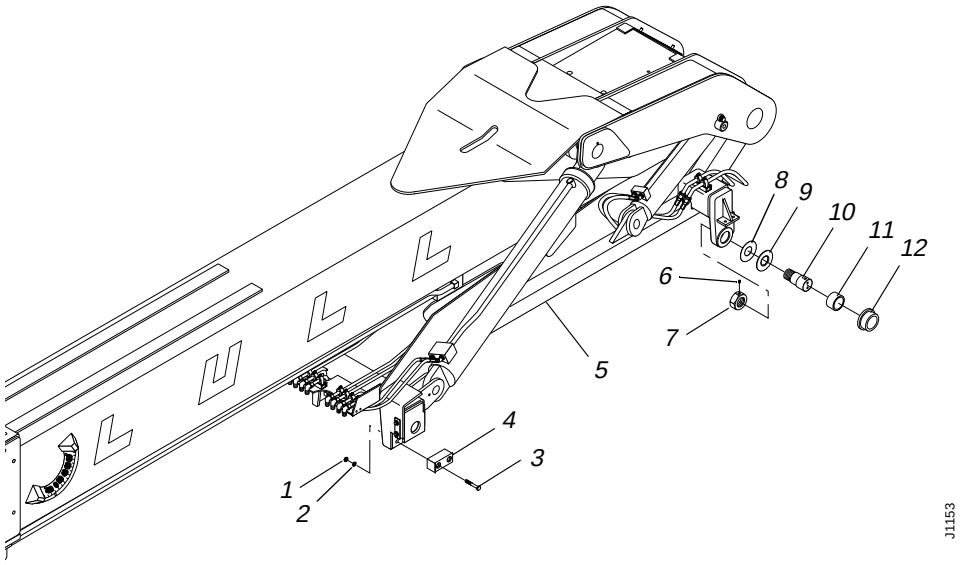
   c. Remove all wire ties that secure the wiring harness to hydraulic tubes and hoses so that it is completely separated from the transfer carriage.



#	Description	#	Description
1	Hydraulic Hoses	3	Lockwasher
2	Hose Cover	4	Capscrew

Fig. 6-236: Disconnecting Hydraulic Hoses from Transfer Carriage

9. (Ref. Fig. 6-236) Remove four (4) each capscrews (Item 4) and lockwashers (Item 3) along with the hose cover (Item 2).
10. (Ref. Fig. 6-236) Disconnect hydraulic hoses (Item 1) from the hydraulic tube elbows.
11. If the boom and transfer carriage are being removed as an assembly, go to Step 12. If the boom is being removed separately from the transfer carriage, go to Step 13.



#	Description
1	Nut
2	Lockwasher
3	Capscrew
4	Front Slide Block
5	Transfer Carriage
6	Setscrew

#	Description
7	Spindle Nut
8	Spacer Washer
9	Thrust Washer
10	Spindle
11	Roller Bushing
12	Transfer Roller

Fig. 6-237: Transfer Carriage with Boom Installation

12. (Ref. Fig. 6-237) The following steps are necessary if the boom and transfer carriage are to be removed as an assembly.

    a. Use sling(s), crane, or other suitable means to support the boom and transfer carriage assembly. It will be necessary to fully secure the transfer carriage securely to the boom before removal.

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

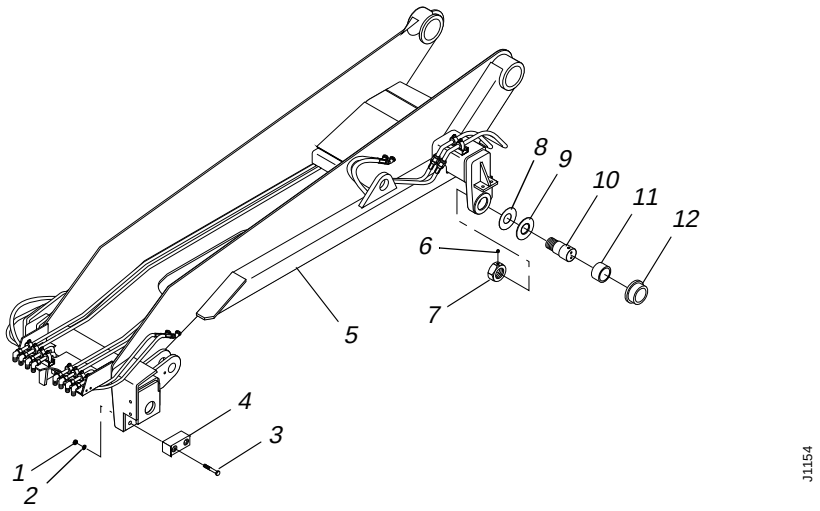
    b. Remove the four (4) each nuts (Item 1) and lockwashers (Item 2) securing the front slide blocks (Item 4) to the transfer carriage (Item 5). Remove the four (4) capscrews (Item 3) and the two (2) slide blocks.

    c. Loosen the two (2) setscrews (Item 6) in each spindle nut (Item 7).

    d. Remove the two (2) each spindle nuts, spacer washers (Item 8), thrust washers (Item 9), spindles (Item 10), roller bushings (Item 11), and transfer rollers (Item 12) from the rear transfer carriage mount.

    Note: *The quantity of spacer washers used with each machine may vary.*

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
1	Nut
2	Lockwasher
3	Capscrew
4	Front Slide Block
5	Transfer Carriage
6	Setscrew

#	Description
7	Spindle Nut
8	Spacer Washer
9	Thrust Washer
10	Spindle
11	Roller Bushing
12	Transfer Roller

Fig. 6-238: 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 6-12).

    b. Remove the rear carriage tilt cylinder (See page 6-24).

    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. 6-238) 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. 6-238) Loosen the two (2) setscrews (Item 6) in each spindle nut (Item 7).

g. (Ref. Fig. 6-238) Remove the two (2) spindle nuts. Remove spacer washer (Item 8), thrust washer (Item 9), spindle (Item 10), roller bushing (Item 11), and transfer roller (Item 12) from each side of the rear transfer carriage mount.

Note: *The quantity of spacer washers used with each machine may vary.*

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

Installation

Transfer Carriage

The following steps are required to install the transfer carriage.

1. If the boom and transfer carriage were removed as an assembly, go to Step 2. If the boom was removed separately from the transfer carriage, go to Step 3.
2. (Ref. Fig. 6-237) The following steps are necessary to reinstall the boom and transfer carriage assembly.
   a. Using sling(s), crane, or other suitable means of support, slowly lift the boom and transfer carriage assembly up and unto its proper position on the machine.

WARNING: To avoid personal and/or equipment damage, supporting the boom and transfer carriage assembly is essential when lifting and reinstalling it back on the machine. Make sure that the boom and transfer carriage assembly is supported until it is completely installed.

   b. Install the transfer carriage (Item 5) to rear of the main frame using the two (2) each transfer rollers (Item 12), roller bushings (Item 11), spindles (Item 10), thrust washers (Item 9), spacer washers (Item 8), and spindle nuts (Item 7). Torque spindle nuts to 3466 ft-lbs.

Note: *The quantity of spacer washers used with each machine may vary.*

   c. Secure each spindle nut with two (2) setscrews (Item 6).
   d. Install the two (2) slide blocks (Item 4) to the front of the transfer carriage with four (4) each capscrews, (Item 3) lockwashers (Item 2), and nuts (Item 1). Torque the nuts to 130 ft-lbs.
3. (Ref. Fig. 6-238) The following steps are necessary to reinstall the transfer carriage assembly.
   a. Using sling(s), crane, or other suitable means of support, slowly lift the transfer carriage assembly up and unto its proper position on the machine.

WARNING: To avoid personal and/or equipment damage, support the transfer carriage assembly when lifting and reinstalling it back on the machine. Make sure that the transfer carriage assembly is supported until it is completely installed.

b. Install the transfer carriage (Item 5) to rear of the main frame using the two (2) each transfer rollers (Item 12), roller bushings (Item 11), spindles (Item 10), thrust washers (Item 9), spacer washers (Item 8), and spindle nuts (Item 7). Torque spindle nuts to 3466 ft-lbs.

Note: *The quantity of spacer washers used with each machine may vary.*

c. Secure each spindle nut with two (2) setscrews (Item 6).

d. Install the two (2) slide blocks (Item 4) to the front of the transfer carriage with four (4) each capscrews, (Item 3) lockwashers (Item 2), and nuts (Item 1). Torque the nuts to 130 ft-lbs.

e. Install the boom as described elsewhere in this section.

f. Install the rear carriage tilt cylinder (See page 6-25).

g. Install the boom hoist cylinder (See page 6-13).

4. Move transfer carriage backward until the threaded port of transfer cylinder rod can be inserted in its mounting hole.

5. (Ref. Fig. 6-232) Install transfer cylinder rod nut and washer. Torque cylinder rod nut to 1641 ft-lbs. Secure rod nut with two (2) setscrews.

6. (Ref. Fig. 6-236) Reconnect hydraulic hoses (Item 1) to the hydraulic tube elbows. Torque the swivel nuts on the hoses 79–88 ft-lbs.

7. (Ref. Fig. 6-236) Install the hose cover (Item 2) on the transfer carriage with four (4) each capscrews (Item 4) and lockwashers (Item 3). Torque the capscrews to 75 in-lbs.

8. (Ref. Fig. 6-233) Install boom elevation proximity switch as follows:

   a. Work the wiring harness along the hydraulic tubes on the transfer carriage.

   b. Reconnect connection wire to boom proximity switch and wiring harness.

   c. Secure wiring harness to hydraulic tubes with wire ties.

9. (Ref. Fig. 6-235) For models with a 4-section boom, install the boom extension proximity switch as follows:

   a. If necessary, install the proximity mounting plate (Item 7) with two (2) each lockwashers (Item 9) and capscrews (Item 10). Torque the capscrews to 276 in-lbs.

   b. Work the wiring harness along the hydraulic tube s on the transfer carriage and up to the top of the boom.

   c. Connect the proximity switch connection wire (Item 6) to the proximity switch (Item 8) and the wiring harness (Item 5).

d. Secure the wiring harness and switch connection wire to the boom with six (6) each (five on top of the boom and one inside of the back left side of the boom) nuts (Item 4), lockwashers, (Item 3), flatwashers (Item 2), and J-clamps (Item 1). Tighten nuts until snug.

e. Secure the wire harness to the hydraulic tubes and hoses with wire tires.

10. (Ref. Fig. 6-234) Install the boom cover on models with 3-section (see Step a) or 4-section booms (see Step b).

    a. Install boom cover (Item 4) on boom and secure it with four (4) each flatwashers (Item 2), lockwashers (Item 1), and nuts (Item 3). Torque nuts to 180 in-lbs.

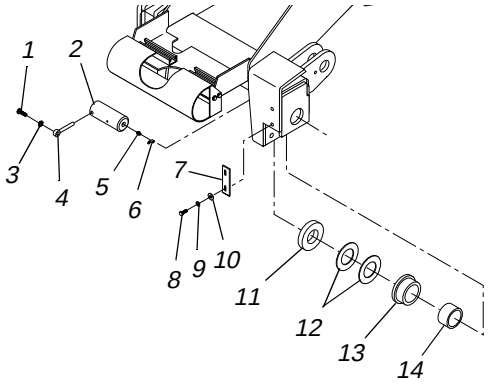
    b. Install boom cover (Item 4) on boom and secure it with six (6) each flatwashers (Item 2), lockwashers (Item 1), and nuts (Item 3). Torque nuts to 180 in-lbs.

Rollers, Bushings, and Shims

Transfer Carriage

The following procedures describe replacement of transfer rollers and bushings for the transfer carriage along with shimming procedures and replacement of scraper plates.

Front Mount Rollers, Bushings, and Shims



#	Description	#	Description
1	Capscrew	8	Capscrew
2	Front Roller Pin	9	Lockwasher
3	Lockwasher	10	Flatwasher
4	Lock Pin	11	Roller Spacer
5	Grease Fitting	12	Roller Shims
6	Grease Fitting Cover	13	Front Transfer Roller
7	Scraper Plate	14	Front Roller Bushing

Fig. 6-239: Transfer Carriage – Front Rollers, Bushings, and Shims

(Ref. Fig. 6-239) The following steps are required to replace the front transfer rollers and bushings.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Lower the boom to the ground, apply the park brake, retract the transfer cylinder, and stop the engine.
3. Remove capscrew (Item 1) and lockwasher (Item 3) securing the two (2) lock pins (Item 4) to transfer carriage.

CAUTION: To avoid personal and/or equipment damage, support the boom and transfer carriage before removing the transfer roller assembly. Use suitable blocking and lifting devices to prevent the transfer carriage from dropping.

4. Remove lock pins from front roller pins (Item 2).
5. Raise the boom and transfer carriage slightly to remove roller pins, roller spacers (Item 11), roller shims (Item 12), transfer rollers (Item 13), and roller bushings (Item 14).
6. Discard transfer rollers and bushings. Clean remaining parts with solvent and dry with compressed air. Replace any damaged parts.
7. Install new bushings so that each is centered in each transfer roller.
8. Install transfer roller, roller shims, roller spacer, and roller pin on each side of transfer carriage.
9. Secure roller pins with lock pins and secure lock pins to transfer carriage with lockwashers and capscrews.

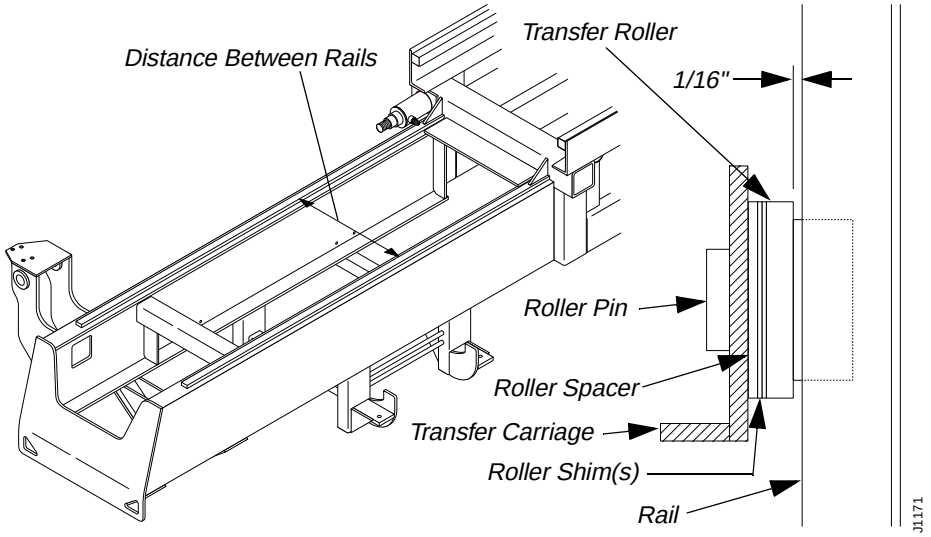


Fig. 6-240: Shims for Front Transfer Rollers

10. (Ref. Fig. 6-240) Check to see if correct number of shims are installed.
    a. Locate the point that is the shortest distance between the two rails (usually near the center of the rails).
    b. Start the engine and slowly move the transfer carriage forward until the front transfer rollers are at this point.

c. Measure the gap between the lip of the transfer roller and the inner edge of the rail. If this measurement is not 1/16", remove the transfer roller assembly and install or remove shims until the required measurement is reached.

11. Secure front transfer roller assembly to transfer carriage by tightening capscrew (Item 1) to 55 ft-lbs.
12. Remove two (2) grease fitting cover caps (Item 6) and lubricate grease fittings (Item 5) with EP lithium based grease.

Scraper Plate

(Ref. Fig. 6-239) The following steps are required to replace scraper plates.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Lower the boom to the ground, apply the park brake, retract the transfer cylinder, and stop the engine.
3. Remove two (2) each capscrews (Item 8), lockwashers (Item 9), and flatwashers (Item 10) securing each of the two (2) scraper plates (Item 7) to the front of the transfer carriage. Remove scraper plates. Clean, inspect for damage, and replace as necessary.

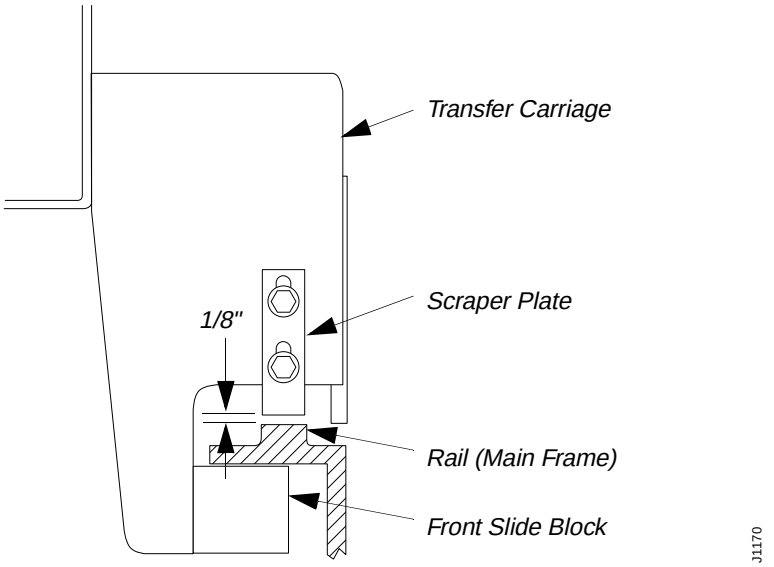
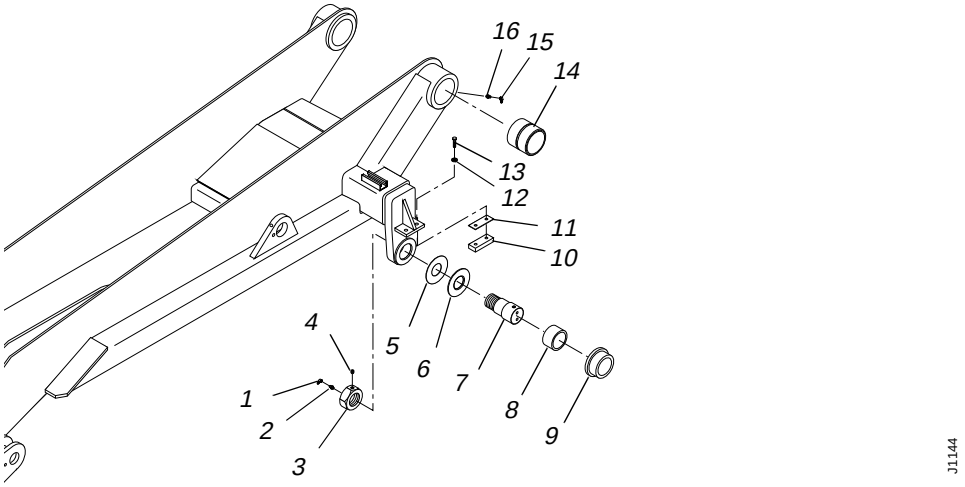


Fig. 6-241: Scraper Plate

4. Install each scraper plate with two (2) each flatwashers, lockwashers, and capscrews. Make sure that the distance from the scraper plate to the rail is as shown in Fig. 6-241. Torque capscrews to 156 in-lbs.

Rear Mount Rollers, Bushings, and Spacer Washers



#	Description
1	Grease Fitting Cover
2	Grease Fitting
3	Spindle Nut
4	Setscrew
5	Spacer Washer
6	Thrust Washer
7	Spindle
8	Rear Roller Bushing

#	Description
9	Rear Transfer Roller
10	Rear Slide Block
11	Slide Block Shim
12	Lockwasher
13	Capscrew
14	Boom Pivot Bushing
15	Grease Fitting Cover
16	Grease Fitting

Fig. 6-242: Transfer Carriage – Rear Rollers, Bushings, and Shims

(Ref. Fig. 6-242) The following steps are required to replace rear transfer rollers and bushings.

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

CAUTION: To avoid personal and/or equipment damage, support the boom and transfer carriage before removing the transfer roller assembly. Use suitable blocking and lifting devices to prevent the transfer carriage from shifting.

3. Loosen two (2) setscrews (Item 4) in each spindle nut (Item 3). Remove two (2) spindle nuts.
4. Remove spacer washer(s) (Item 5), thrust washer (Item 6), spindle (Item 7), roller bushing (Item 8), and transfer roller (Item 9) from each side of transfer carriage.
5. Discard transfer rollers and bushings. Clean remaining parts with solvent and dry with compressed air. Replace any damaged parts.
6. Install new bushings so that each is centered in transfer roller.
7. Install transfer roller, spindle, thrust washer, and spacer washer(s) on each side of transfer carriage.

8. Secure spindle to transfer carriage with spindle nut.

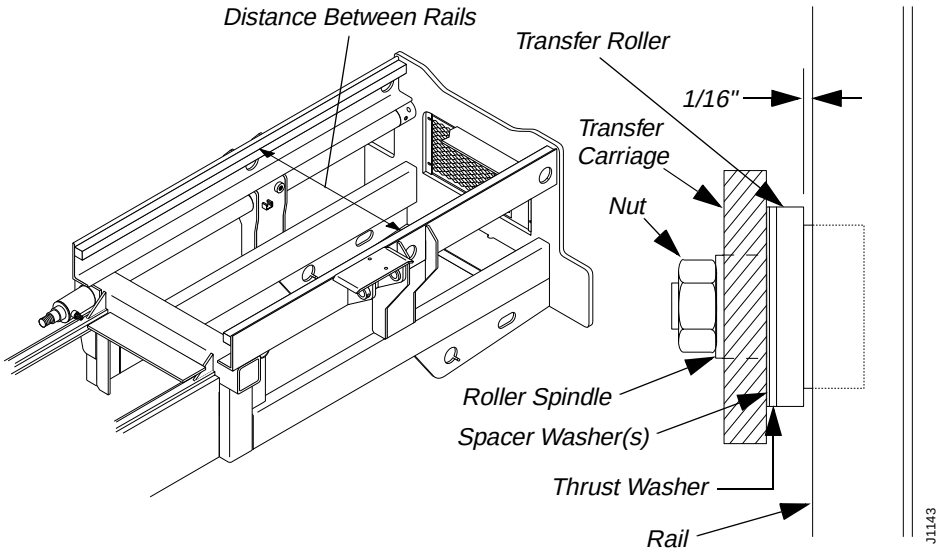


Fig. 6-243: Spacer Washers for Rear Transfer Rollers

9. (Ref. Fig. 6-243) Check to see if the number of spacer washers installed is correct.
   a. Locate the point that is the shortest distance between the two rails (usually near the center of the rails).
   b. Move the transfer carriage forward until the rear transfer rollers are at this point.
   c. Measure the gap between the lip of the transfer roller and the inner edge of the rail. If this measurement is not 1/16", remove the transfer roller assembly and install or remove spacer washers until the required measurement is reached.
10. Secure front transfer roller assembly to transfer carriage by tightening spindle nut (Item 3) to3466 ft-lbs.
11. Remove two (2) grease fitting cover caps (Item 1) and lubricate grease fittings (Item 2) with EP lithium based grease.

Transfer Carriage/Boom Pivot Bushings

(Ref. Fig. 6-242) The following steps are required to replace transfer carriage/boom pivot bushings.

1. Remove boom and shims as in this section.
2. Remove two (2) boom pivot bushings (Item 14) using a bushing driver and hammer. Discard bushings.

Note: *It may be necessary to cut out the old bushing.*

3. Install new bushings so that each is centered in transfer carriage boss.

Note: *It may be necessary to freeze the new bushing before installing it.*

4. Reinstall boom and shims as described earlier in this section.
5. Remove two (2) grease fitting cover caps (Item 15) and lubricate grease fittings (Item 16) with EP lithium based grease.

Rear Slide Block and Shims

(Ref. Fig. 6-242) The following steps are required to replace worn rear slide blocks.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Lower the boom to the ground, apply the park brake, retract the transfer cylinder, and stop the engine.
3. Remove two (2) each capscrews (Item 13) and lockwashers (Item 12) securing each of the two rear slide blocks (Item 10) and shims (Item 11) to the transfer carriage. Remove slide blocks and shims.
4. Discard worn slide block. Clean and inspect remaining parts; replace as necessary.

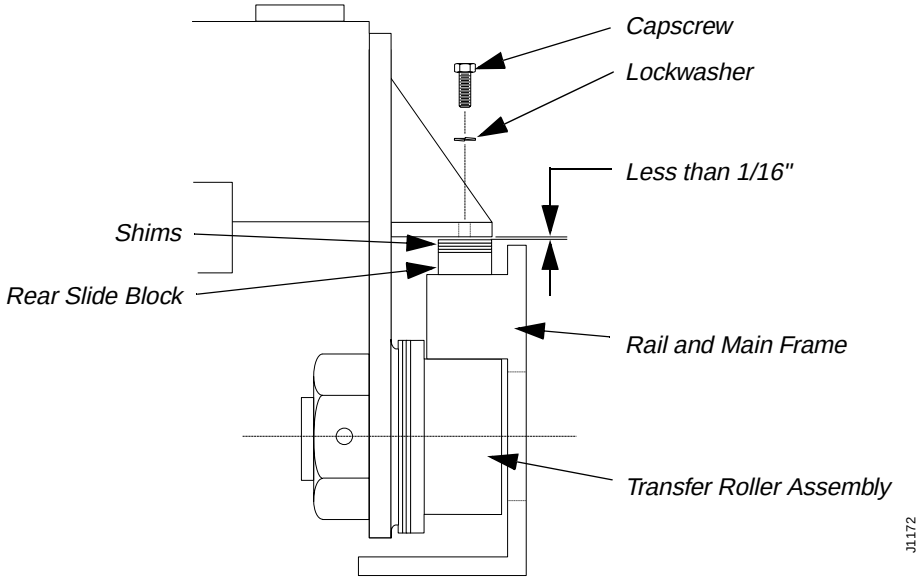


Fig. 6-244: Rear Slide Block Installation

5. (Ref. Fig. 6-244) Make sure that the correct number of shims will be installed.
   a. Check to see that the rear transfer roller is up against the bottom of the rail. It may be necessary to start the engine and relocate the weight of the boom until the transfer roller is snug against the rail.
   b. Place slide block and shims on the rail beneath the transfer carriage.
   c. Measure the space between the stack to the transfer carriage. Add or subtract shims until the remaining gap is less than 1/16".
6. Install new slide block and shims on each side of the transfer carriage with two (2) each lockwashers and capscrews. Torque capscrews to 55 ft-lbs.

Boom Cradle

(Models 6K, 8K and 10K On

Description

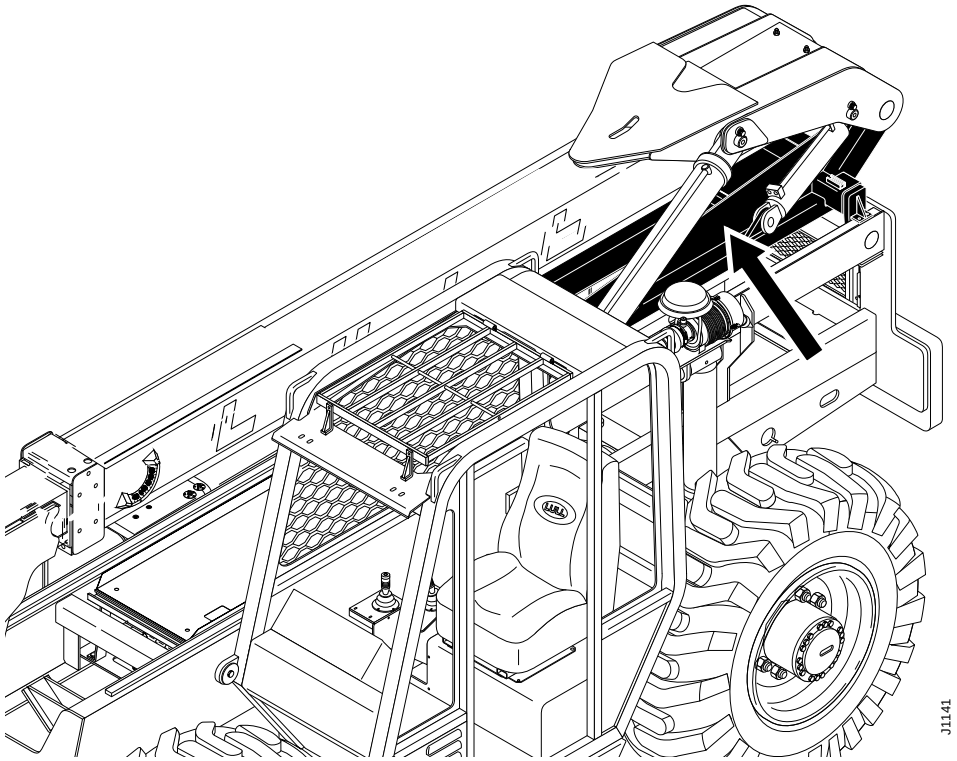


Fig. 6-245: Boom Cradle

The boom cradle is a stationary structure, similar to a transfer carriage. It is only found on “K” Models: 6K, 8K, 10K. Unlike the transfer carriage found on Models 644B, 844C, and 1044C, the boom cradle does not allow for boom “Tans-Action” (see page 6-217).

Removal

Boom Cradle

The following steps are required to remove the boom cradle.

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

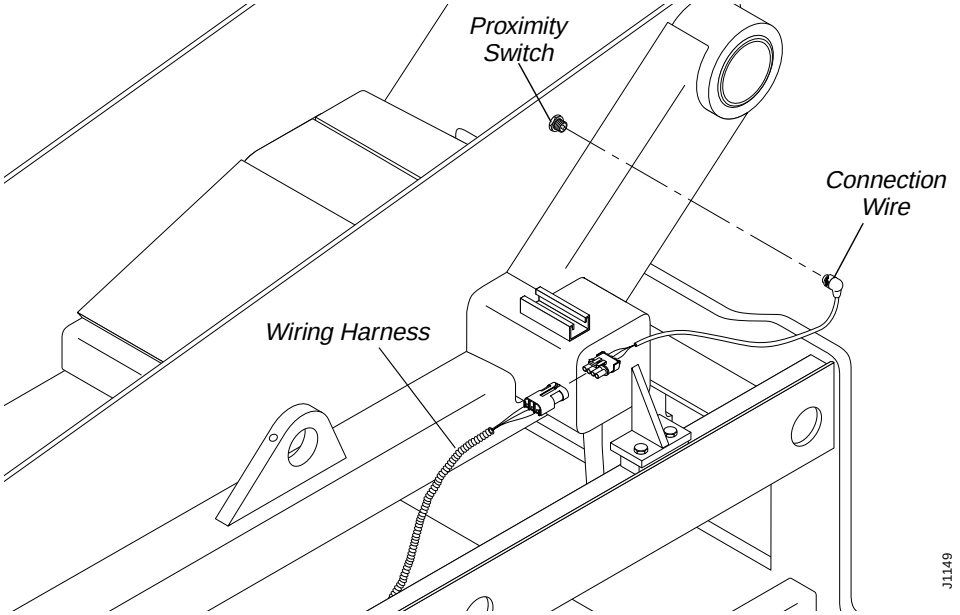
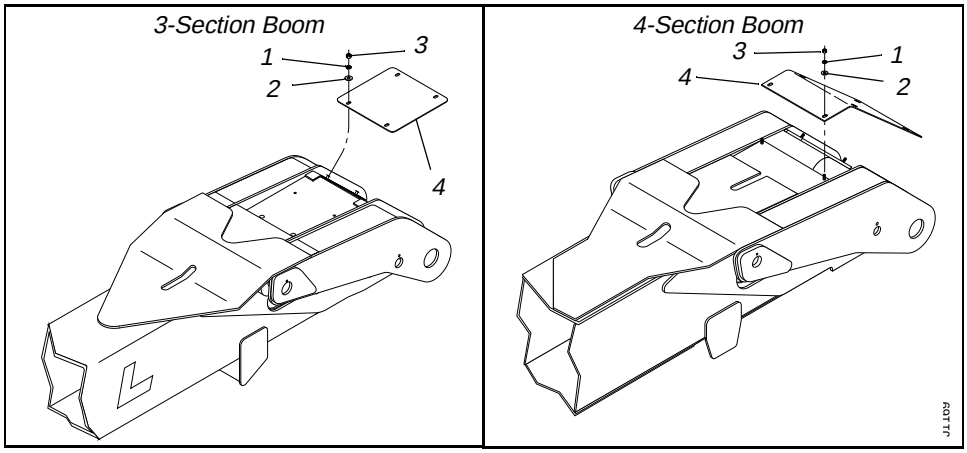


Fig. 6-246: Boom Elevation Proximity Switch Wiring

3. (Ref. Fig. 6-246) Remove boom elevation proximity switch as follows:
   a. Disconnect connection wire from boom proximity switch.
   b. Disconnect connection wire from wiring harness.
   c. Remove all wire ties that secure the wiring harness to hydraulic tubes and hoses so that it is completely separated from the transfer carriage.



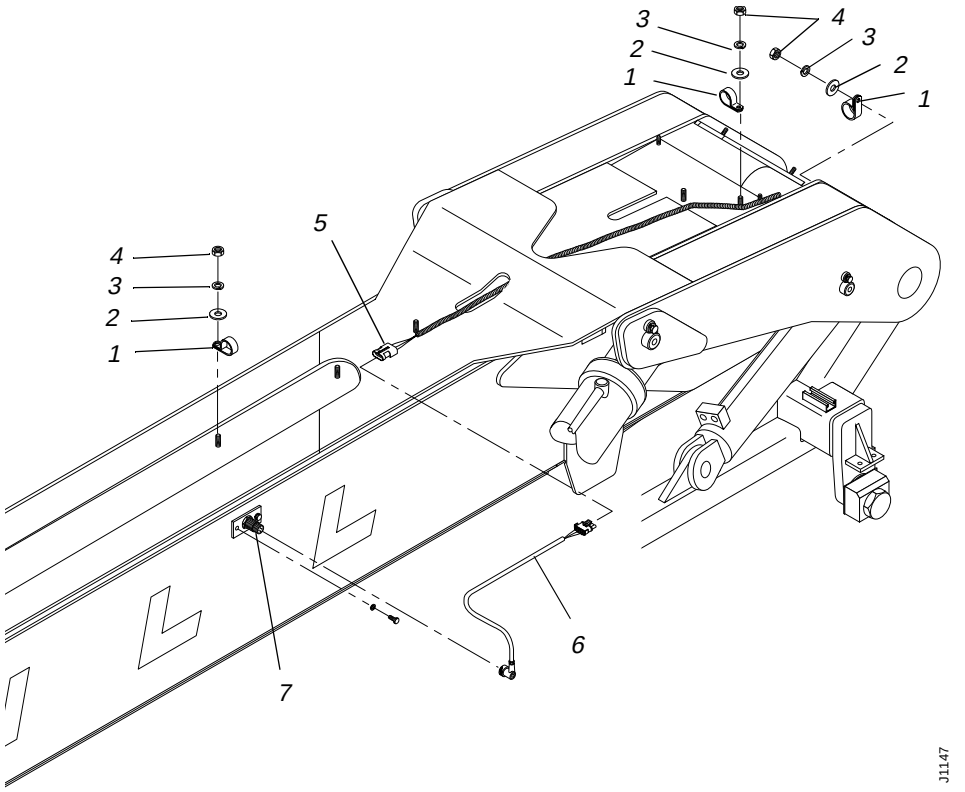
#	Description
1	Lockwasher
2	Flatwasher

#	Description
3	Nut
4	Boom Cover

Fig. 6-247: Boom Cover Installation

4. (Ref. Fig. 6-247) Remove the boom cover on models with 3-section (see Step a) or 4-section booms (see Step b).
   a. Remove four (4) each nuts (Item 3), lockwashers (Item 1), and flatwashers (Item 2) securing boom cover (Item 4) to boom. Remove boom cover.

b. Remove six (6) each nuts (Item 3), lockwashers (Item 1), and flatwashers (Item 2) securing boom cover (Item 4) to boom. Remove boom cover.



#	Description
1	J-Clamp
2	Flatwasher
3	Lockwasher
4	Nut

#	Description
5	Proximity Switch Wiring Harness
6	Proximity Switch Connection Wire
7	Boom Extension Proximity Switch

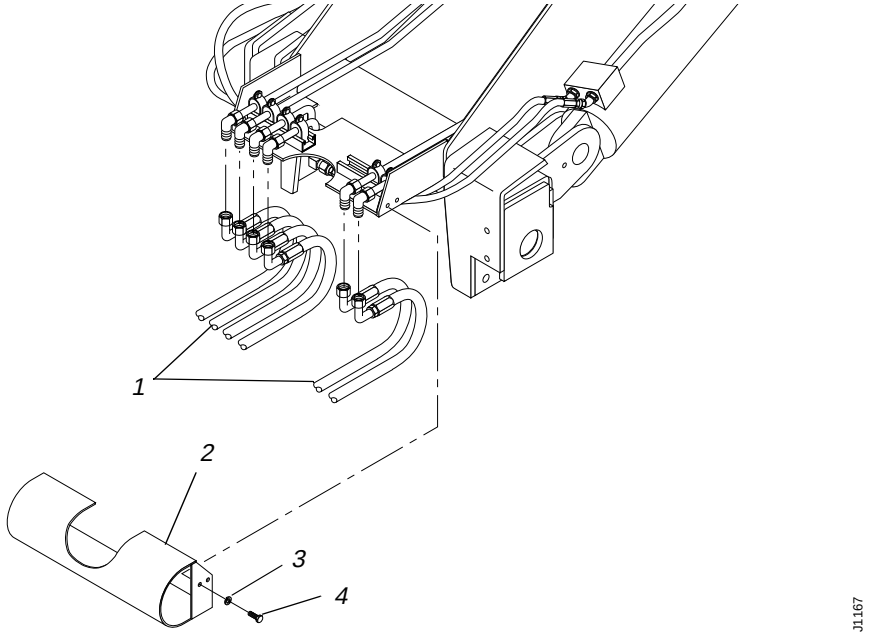
Fig. 6-248: Boom Extension Proximity Switch Wiring

5. (Ref. Fig. 6-248) For models with a 4-section boom, remove the boom extension proximity switch as follows:

   a. Remove the six (6) each (five on top of the boom and one inside of the back left side of the boom) nuts (Item 4), lockwashers, (Item 3) flatwashers (Item 2), and J-clamps (Item 1) that secure the boom extension proximity switch wiring to the boom.

   b. Disconnect the proximity switch connection wire (Item 6) from the proximity switch (Item 7) and the wiring harness (Item 5).

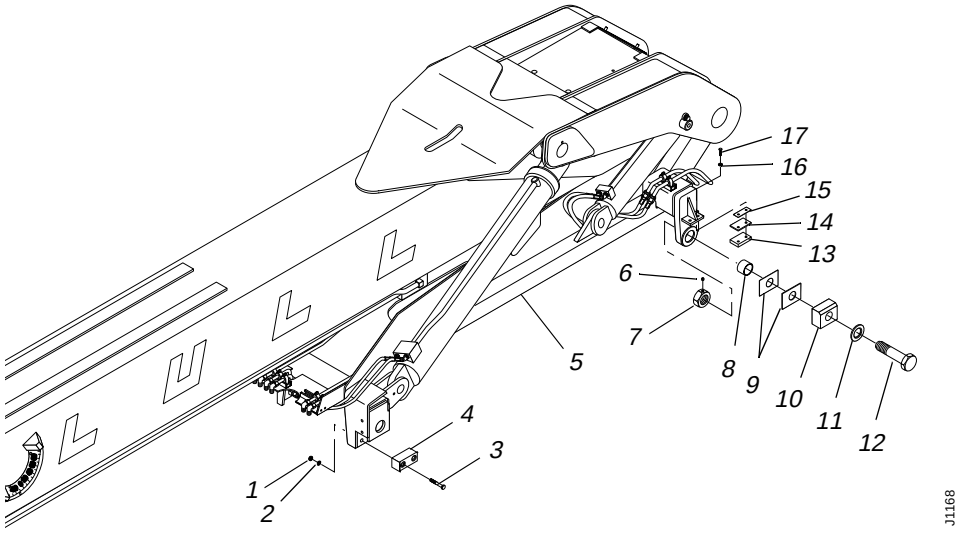
   c. Remove all wire ties that secure the wiring harness to hydraulic tubes and hoses so that it is completely separated from the transfer carriage.



#	Description	#	Description
1	Hydraulic Hoses	3	Lockwasher
2	Hose Cover	4	Capscrew

Fig. 6-249: Disconnecting Hydraulic Hoses from Boom Cradle

6. (Ref. Fig. 6-249) Remove the four (4) each capscrews (Item 4) and lockwashers (Item 3) along with the hose cover (Item 2).
7. (Ref. Fig. 6-249) Disconnect hydraulic hoses (Item 1) from the hydraulic tube elbows.
8. If the boom and boom cradle are being removed as an assembly, go to Step 9. If the boom is being removed separately from the boom cradle, go to Step 10.



#	Description
1	Nut
2	Lockwasher
3	Capscrew
4	Front Slide Block
5	Boom Cradle
6	Setscrew
7	Spindle Nut
8	Sleeve
9	Shim

#	Description
10	Spacer Block
11	Flatwasher
12	Capscrew
13	Rear Support Block
14	Spacer (1/4" Thick)
15	Shim (22 Gauge)
16	Lockwasher
17	Capscrew

Fig. 6-250: Boom Cradle with Boom Installation

9. (Ref. Fig. 6-250) The following steps are necessary if the boom and boom cradle are to be removed as an assembly.

    a. Use sling(s), crane, or other suitable means to support the boom and boom cradle assembly.

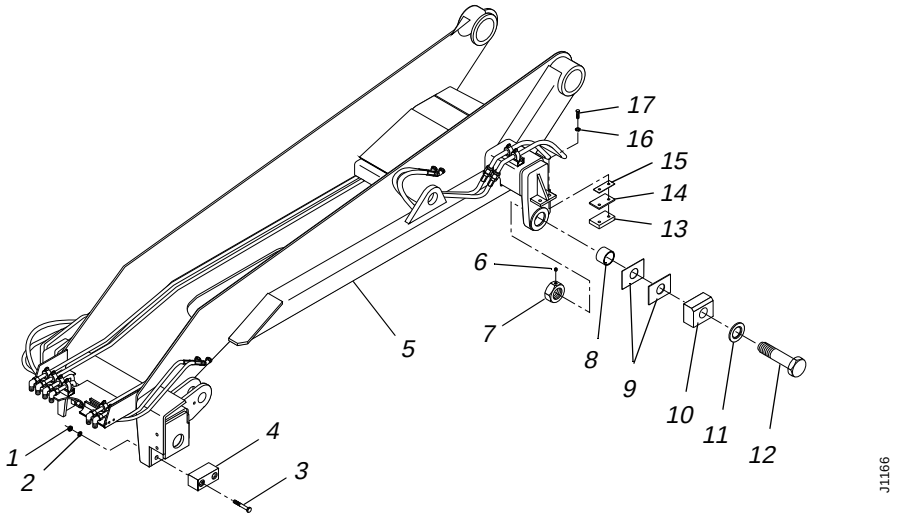
WARNING: To avoid personal and/or equipment damage, supporting the boom and boom cradle is essential before removing any additional mounting hardware. Use suitable blocking and lifting devices when removing heavy machine components.

    b. Remove the four (4) each nuts (Item 1) and lockwashers (Item 2) securing the two (2) front slide blocks (Item 4) to the boom cradle (Item 5). Remove the four (4) capscrews (Item 3) and the slide blocks.

    c. Remove two (2) rear support block assemblies (Items 13 thru 17) as described in Step 3 and Step 4 under “Rear Spacer Blocks, Support Blocks, and Shims” on page 6-242.

    d. Remove two (2) spacer block assemblies (Items 6 thru 12) as described in Step 5 thru Step 7 under “Rear Spacer Blocks, Support Blocks, and Shims” on page 6-242.

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



#	Description
1	Nut
2	Lockwasher
3	Capscrew
4	Front Slide Block
5	Boom Cradle
6	Setscrew
7	Spindle Nut
8	Sleeve
9	Shim

#	Description
10	Spacer Block
11	Flatwasher
12	Capscrew
13	Rear Support Block
14	Spacer (1/4" Thick)
15	Shim (22 Gauge)
16	Lockwasher
17	Capscrew

Fig. 6-251: Boom Cradle Installation

10. (Ref. Fig. 6-251) The following steps are necessary if the boom is being removed separately from the boom cradle.
    a. Remove the boom hoist cylinder (See page 6-12).
    b. Remove the rear carriage tilt cylinder (See page 6-24).
    c. Remove the boom as described in this section.
    d. Use sling(s), crane, or other suitable means to support the boom cradle assembly.

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

    e. Remove two (2) rear support block assemblies (Items 13 thru 17) as described in Step 3 and Step 4 under “Rear Spacer Blocks, Support Blocks, and Shims” on page 6-242.
    f. Remove two (2) spacer block assemblies (Items 6 thru 12) as described in Step 5 thru Step 7 under “Rear Spacer Blocks, Support Blocks, and Shims” on page 6-242.

g. Slowly lift the boom cradle assembly up and away from the machine. Place the assembly on support blocks on a firm level surface.

Installation

Boom Cradle

1. If the boom and boom cradle were removed as an assembly, go to Step 2. If the boom was removed separately from the boom cradle, go to Step 3.
2. (Ref. Fig. 6-250) The following steps are required to reinstall the boom and boom cradle assembly.
   a. Using sling(s), crane, or other suitable means of support, slowly lift the boom and transfer carriage assembly up and unto its proper position on the machine.

WARNING: To avoid personal and/or equipment damage, supporting the boom and boom cradle assembly is essential when lifting and reinstalling it back on the machine. Make sure that the boom and boom cradle assembly is supported until it is completely installed.

   b. Install two (2) spacer block assemblies (Items 6 thru 12) as described in Step 8 thru Step 12 under “Rear Spacer Blocks, Support Blocks, and Shims” on page 6-242.
   c. Install two (2) rear support block assemblies (Items 13 thru 17) as described in Step 13 and Step 14 under “Rear Spacer Blocks, Support Blocks, and Shims” on page 6-242.
   d. Install the two (2) slide blocks (Item 4) to the front of the transfer carriage with four (4) each capscrews, (Item 3) lockwashers (Item 2), and nuts (Item 1). Torque the nuts to 130 ft-lbs.
3. (Ref. Fig. 6-251) The following steps are required to reinstall the boom cradle assembly.
   a. Using sling(s), crane, or other suitable means of support, slowly lift the boom cradle assembly up and unto its proper position on the machine.

WARNING: To avoid personal and/or equipment damage, support the boom cradle assembly when lifting and reinstalling it back on the machine. Make sure that the boom cradle assembly is supported until it is completely installed.

   b. Install two (2) spacer block assemblies (Items 6 thru 12) as described in Step 8 thru Step 12 under “Rear Spacer Blocks, Support Blocks, and Shims” on page 6-242.
   c. Install two (2) rear support block assemblies (Items 13 thru 17) as described in Step 13 and Step 14 under “Rear Spacer Blocks, Support Blocks, and Shims” on page 6-242.

d. Install the two (2) slide blocks (Item 4) to the front of the transfer carriage with four (4) each capscrews, (Item 3) lockwashers (Item 2), and nuts (Item 1). Torque the nuts to 130 ft-lbs.

e. Install the boom as described elsewhere in this section.

f. Install the rear carriage tilt cylinder (See page 6-25).

g. Install the boom hoist cylinder (See page 6-13).

4. (Ref. Fig. 6-249) Reconnect hydraulic hoses (Item 1) to the hydraulic tube elbows. Torque the swivel nuts on the hoses 79–88 ft-lbs.

5. (Ref. Fig. 6-249) Install the hose cover (Item 2) on the transfer carriage with four (4) each capscrews (Item 4) and lockwashers (Item 3). Torque the capscrews to 75 in-lbs.

6. Install boom elevation proximity switch as follows (Ref. Fig. 6-246):

   a. Work the wiring harness along the hydraulic tubes on the boom cradle.

   b. Reconnect connection wire to boom proximity switch and wiring harness.

   c. Secure wiring harness to hydraulic tubes with wire ties.

7. (Ref. Fig. 6-248) For models with a 4-section boom, install the boom extension proximity switch as follows:

   a. Work the wiring harness along the hydraulic tubes on the boom cradle and up to the top of the boom.

   b. Connect the proximity switch connection wire (Item 6) to the proximity switch (Item 7) and the wiring harness (Item 5).

   c. Secure the wiring harness and switch connection wire to the boom with six (6) each (five on top of the boom and one inside of the back left side of the boom) nuts (Item 4), lockwashers, (Item 3), flatwashers (Item 2), and J-clamps (Item 1). Tighten nuts until snug.

   d. Secure the wire harness to the hydraulic tubes and hoses with wire tires.

8. (Ref. Fig. 6-247) Install the boom cover on models with 3-section (see Step a) or 4-section booms (see Step b).

   a. Install boom cover (Item 4) on boom and secure it with four (4) each flatwashers (Item 2), lockwashers (Item 1), and nuts (Item 3). Torque nuts to 180 in-lbs.

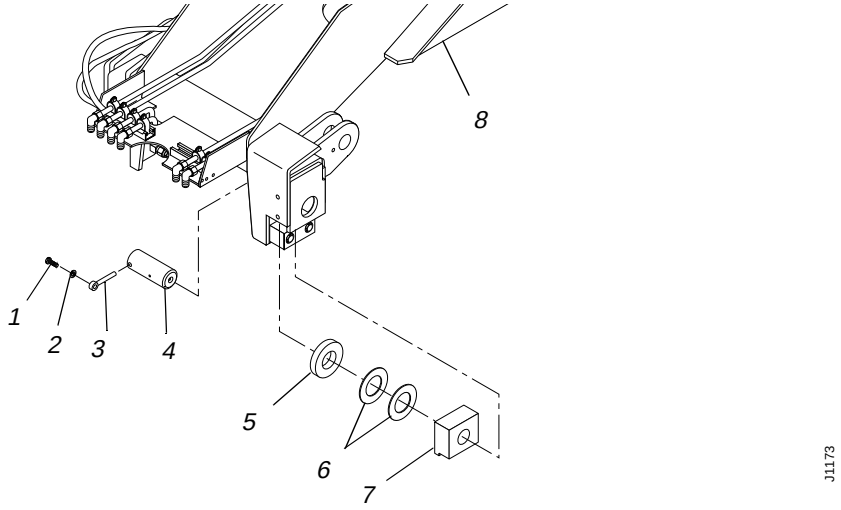
   b. Install boom cover (Item 4) on boom and secure it with six (6) each flatwashers (Item 2), lockwashers (Item 1), and nuts (Item 3). Torque nuts to 180 in-lbs.

Shims and Bushings

Boom Cradle

The following procedures describe shimming procedures and replacement of worn or damaged bushings.

Front Support Blocks and Shims



#	Description	#	Description
1	Capscrew	5	Spacer
2	Lockwasher	6	Shim
3	Lock Pin	7	Support Block
4	Front Roller Pin	8	Boom Cradle

Fig. 6-252: Boom Cradle – Front Support Blocks and Shims

(Ref. Fig. 6-252) The following steps are required to replace the front support blocks and shims.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Lower the boom to the ground, apply the park brake, and stop the engine.
3. Remove capscrew (Item 1) and lockwasher (Item 2) securing the two (2) lock pins (Item 3) to boom cradle.

CAUTION: To avoid personal and/or equipment damage, support the boom and boom cradle before removing the front slide block assembly. Use suitable blocking and lifting devices to prevent the boom cradle from dropping or shifting from side to side.

4. Remove lock pins from roller pins (Item 4).
5. Raise the boom and boom cradle slightly so that the support blocks no longer rest on the rails. Block the cradle to prevent it from dropping during disassembly and reassembly.
6. Remove roller pins, spacer (Item 5), shims (Item 6), and support block (Item 7) from each side of the boom cradle.
7. Clean parts with solvent and dry with compressed air. Replace any damaged parts.

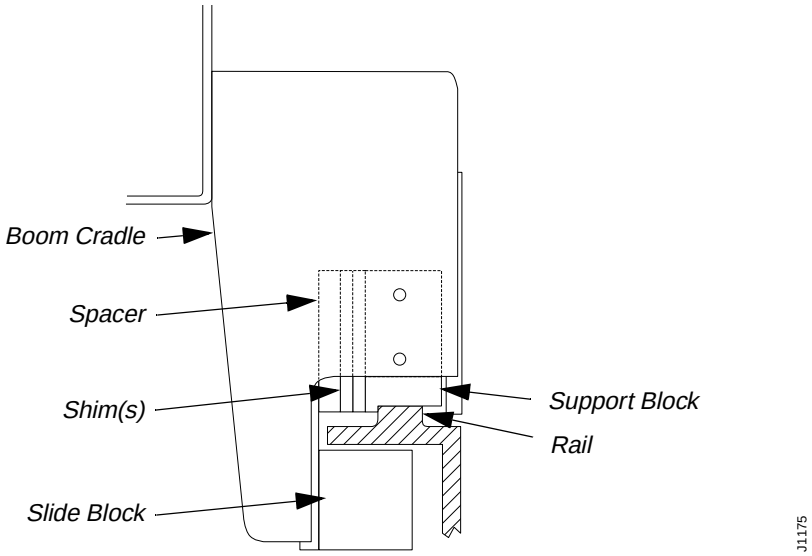
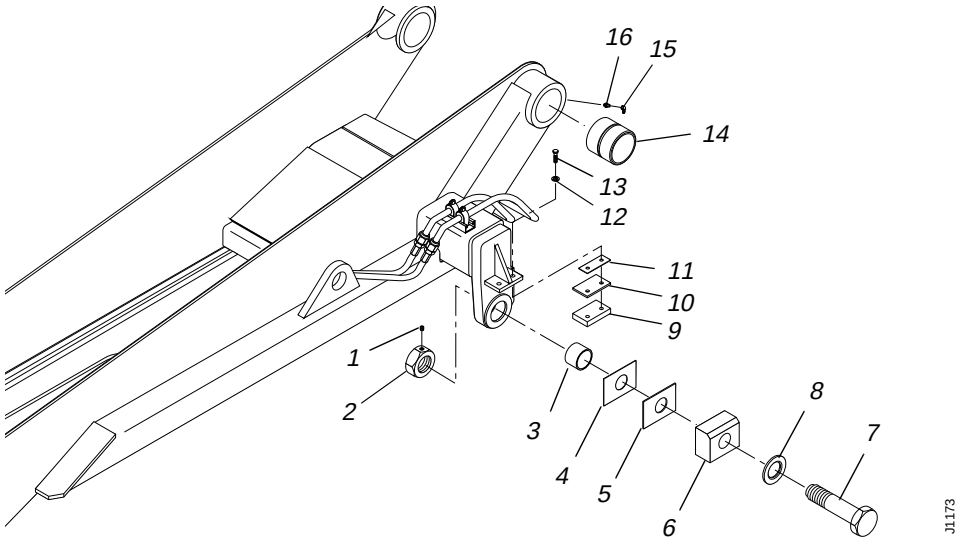


Fig. 6-253: Shims for Front Support Blocks

8. (Ref. Fig. 6-253) Check to see if the number of shims to be installed is correct.
   a. Place support block on rail so that the lower lip is resting snug against the inner side of the rail.
   b. Insert spacer and shims between support block and boom cradle.
   c. Add or remove as many 14 gauge shims as necessary to fill the gap. Make sure that the same number of shims will be added to each side of the boom cradle.
9. Install spacer, shims, support block, and roller pin on each side of boom cradle.
10. Secure roller pins with lock pins and secure lock pins to boom cradle with lockwashers and capscrews. Tighten capscrews to 55 ft-lbs.

Rear Spacer Blocks, Support Blocks, and Shims



#	Description
1	Setscrew
2	Spindle Nut
3	Sleeve
4	Shim (16 Gauge)
5	Shim (10 Gauge)
6	Spacer Block
7	Capscrew
8	Flatwasher

#	Description
9	Rear Support Block
10	Spacer (1/4" Thick)
11	Shim (22 Gauge)
12	Lockwasher
13	Capscrew
14	Boom Pivot Bushing
15	Grease Fitting Cover
16	Grease Fitting

Fig. 6-254: Boom Cradle – Rear Spacer Blocks, Bushings, and Shims

(Ref. Fig. 6-254) The following steps are required to replace rear shims and support blocks.

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

CAUTION: To avoid personal and/or equipment damage, support the boom and boom cradle before removing the support and spacer block assemblies. Use suitable blocking and lifting devices to prevent the boom and cradle from shifting from side to side.

3. Remove two (2) each capscrews (Item 13) and lockwashers (Item 12) securing each support block to the boom cradle.
4. Remove the shim(s) (Item 11), spacer(s) (Item 10) and rear support blocks (Item 9).
5. Lower the rear of the boom cradle slightly so that the spacer blocks are no longer against the lower edge of the rail.
6. Loosen two (2) setscrews (Item 1) in each spindle nut (Item 2). Remove two (2) spindle nuts.

7. Remove capscrew (Item 7), flatwasher (Item 8), spacer block (Item 6), sleeve (Item 3), and shims (Items 4 and 5) from each side of the boom cradle.
8. Clean parts with solvent and dry with compressed air. Replace any damaged parts.

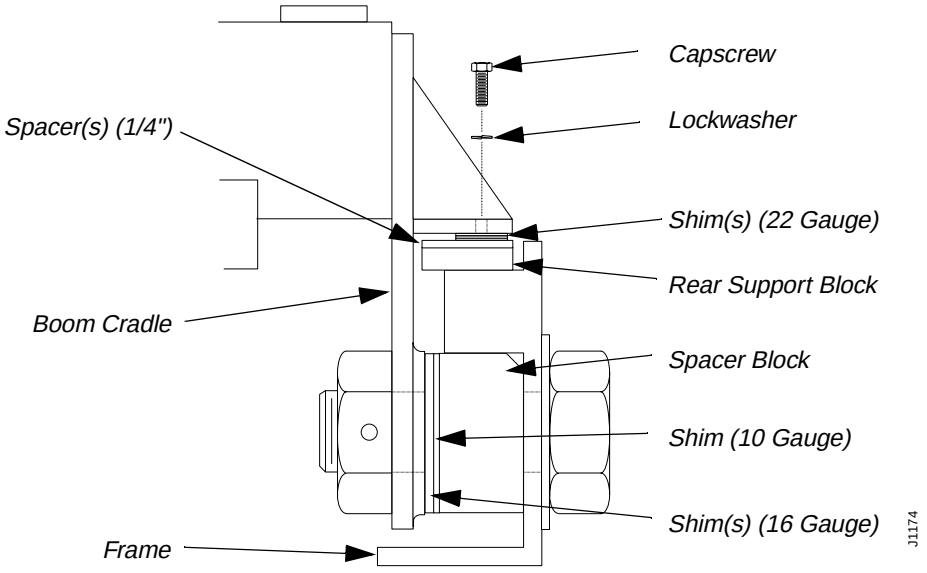


Fig. 6-255: Boom Cradle – Rear Shims

9. (Ref. Fig. 6-255) Check to see if the number of shims to be installed with the spacer block is correct.
   a. Place spacer block and 10 gauge shim between the boom cradle and frame.
   b. Add as many 16 gauge shims as necessary to fill the remaining gap. Try to make sure that an equal number of 16 gauge shims will be added to each side of the boom cradle.
10. Install spacer block, 10 gauge shim, and 16 gauge shim(s) on each side of the boom cradle with a flatwasher, capscrew, and nut.
11. Raise the boom cradle up until the spacer block is against the bottom edge of the rail (see Fig. 6-255). Torque the spindle nuts to 3466 ft-lbs.
12. Secure each spindle nut by tightening the two setscrews.
13. Check to see if the number of shims to be installed with the rear support block is correct (see Fig. 6-255).
   a. Place the rear support block on the rail beneath the boom cradle mount.
   b. Add as many spacers and 22 gauge shims as necessary to fill the remaining gap. Make sure that the same quantity of spacers and shims are added to each side of the boom cradle.
14. Install rear support blocks, spacers, and shims to boom cradle with two (2) each lockwashers and capscrews. Torque capscrews to 55 ft-lbs.

Boom Cradle/Boom Pivot Bushings

(Ref. Fig. 6-254) The following steps are required to replace boom cradle/boom pivot bushings.

1. Remove boom and shims as described in this section.
2. Remove two (2) boom pivot bushings (Item 14) using a bushing driver and hammer. Discard bushings.

Note: *It may be necessary to cut out the old bushing.*

3. Install new bushings so that each is centered in boom cradle boss.

Note: *It may be necessary to freeze the new bushing before installing it.*

4. Reinstall boom and shims as described earlier in this section.
5. Remove two (2) grease fitting cover caps (Item 15) and lubricate grease fittings (Item 16) with EP lithium based grease.

Transfer Cylinder

(Models 644B, 844C and 104
Only)

Description

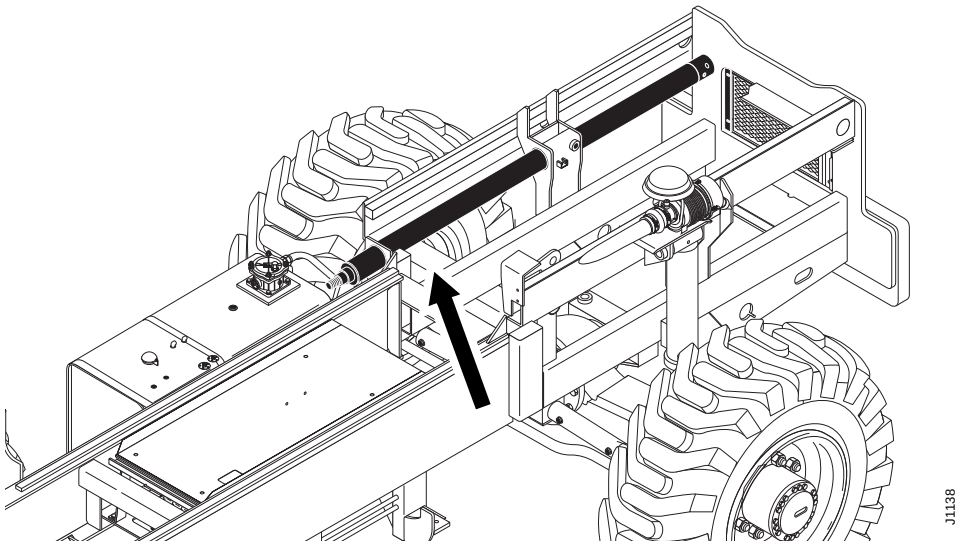
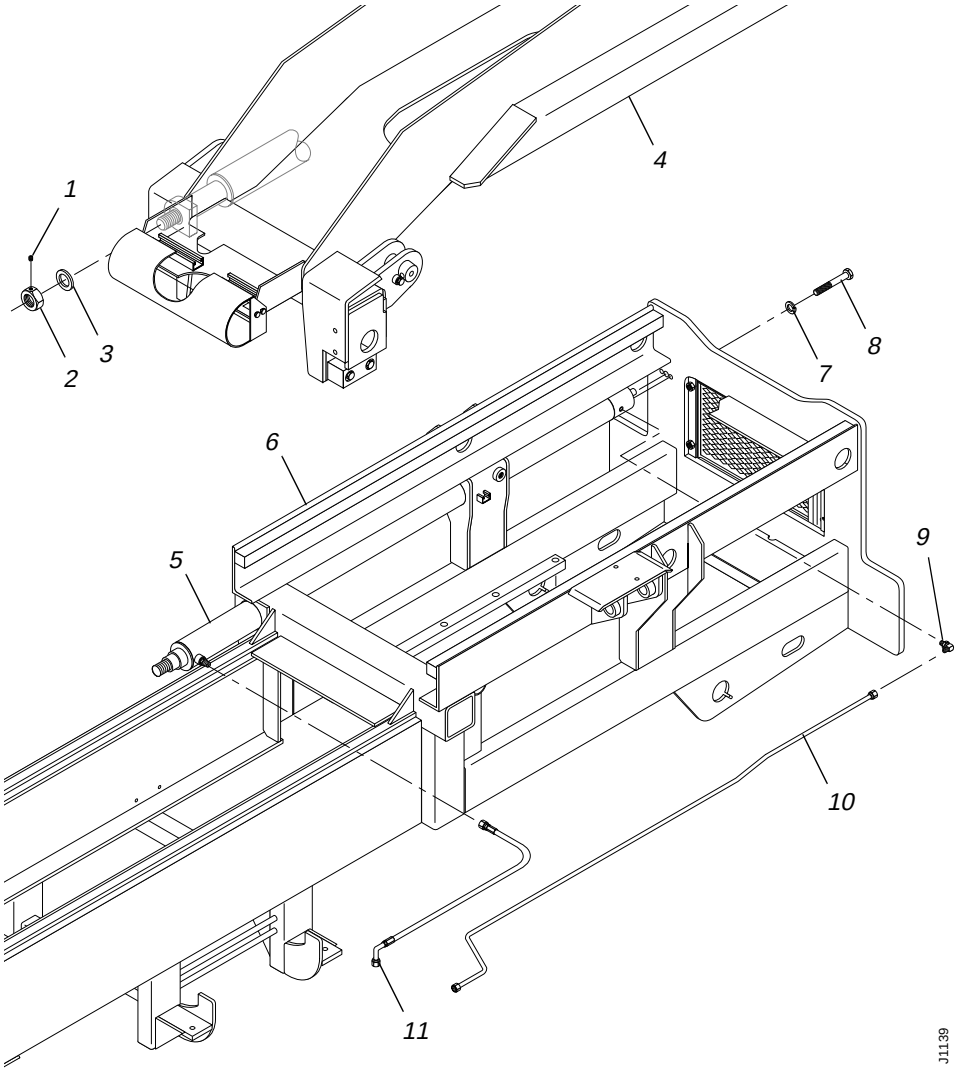


Fig. 6-256: Transfer Cylinder

The transfer cylinder is located on the right rear side of the main frame and is connected to the main frame and transfer carriage. Its function is control forward and backward movement of the transfer carriage. It has an operating pressure of 3000 psi and has a stroke limit of 80 inches.

Removal

Transfer Cylinder



#	Description
1	Setscrew
2	Rod Nut
3	Washer
4	Transfer Carriage
5	Transfer Cylinder
6	Main Frame

#	Description
7	Lockwasher
8	Capscrew
9	90° Elbow
10	Hydraulic Tube
11	Hydraulic Hose

Fig. 6-257: Transfer Cylinder Installation

(Ref. Fig. 6-257) The following steps are required to remove the transfer cylinder.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Lower the boom to the ground, apply the park brake, retract the cylinder, and stop the engine.
3. Loosen and remove hydraulic tube (Item 10) from elbow on transfer cylinder (Item 5). Bleed any remaining oil into a suitable container.

4. Remove elbow (Item 9) from transfer cylinder. Cap cylinder orifice.
5. Loosen and remove hydraulic hose (Item 11) from connector on transfer cylinder. Bleed any remaining oil into a suitable container. Cap connector and hose end.
6. Loosen two (2) socket setscrews (Item 1) in rod nut (Item 2).

WARNING: To avoid personal and/or equipment damage, support the hydraulic cylinder before removing any additional hardware securing cylinder to transfer carriage or main frame. Use suitable blocking and lifting devices when removing heavy machine components.

7. Remove rod nut and washer (Item 3) securing transfer cylinder to the transfer carriage (Item 4).
8. Remove two (2) each capscrews (Item 8) and lockwashers (Item 7) securing transfer cylinder to main frame (Item 6).
9. Slowly remove the cylinder from the machine and take it to a location suitable for inspection and disassembly.
10. Clean remaining parts with solvent and dry with compressed air. Inspect for damage and replace as necessary.

Installation

Transfer Cylinder

(Ref. Fig. 6-257) The following steps are required to install the transfer cylinder.

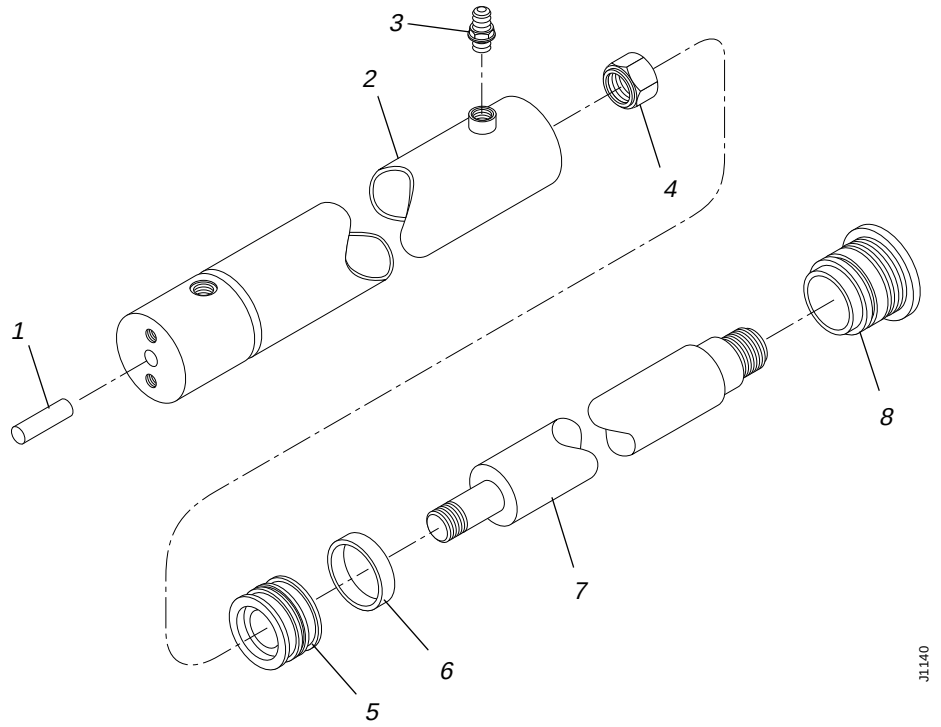
1. Using sling(s), crane, or other suitable means, install cylinder (Item 5) into openings in transfer carriage (Item 4) and main frame (Item 6).

WARNING: To avoid personal and/or equipment damage, make sure the cylinder is properly supported until it is completely installed.

2. Secure cylinder to main frame with two (2) each lockwashers (Item 7) and capscrews (Item 8). Torque capscrews to 200 ft-lbs.
3. Secure cylinder to transfer carriage with washer (Item 3) and rod nut (Item 2). Torque rod nut to 1641 ft-lbs.
4. If socket setscrews (Item 1) were removed, apply thread locking compound to the setscrews and install them in rod nut; tighten until snug.
5. Install elbow (Item 9) on transfer cylinder and torque to 40–44 ft-lbs.
6. Install hydraulic tube (Item 10) on transfer cylinder elbow. Torque swivel nut on tube to 44–48 in-lbs.
7. Install hydraulic hose (Item 11) on transfer cylinder connector. Torque swivel nut on hose to 44–48 in-lbs.

Overhaul

Transfer Cylinder



#	Description	#	Description
1	Dowel Pin	5	Piston
2	Cylinder Barrel	6	Stroke Limiter
3	Connector	7	Rod
4	Rod Bearing Nut	8	Rod Bearing Head

Fig. 6-258: Transfer Cylinder Assembly

(Ref. Fig. 6-258) The following steps are required to overhaul the transfer cylinder.

1. Remove the connector (Item 3) from the cylinder barrel (Item 2).
2. Remove dowel pin (Item 1) from cylinder barrel.
3. 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.
4. Using the three (3) holes in the side of the rod bearing head (Item 8) install a spanner wrench and remove the head.
5. Remove the cylinder rod assembly from cylinder barrel.

CAUTION: To prevent possible damage to components, support cylinder rod assembly; pull rod or head straight out during removal.

6. Remove rod nut (Item 4), piston (Item 5), stroke limiter (Item 6), from cylinder rod (Item 7).

Note: *Older production models do not have a stroke limiter. This includes S/N 101–433 for 644B-37, S/N 101–130 for 644B-42, S/N 101–323 and 326–328 for 844C-42, S/N 101–109 for 1044C-42, and S/N 101–108 for 1044C-54.*

7. Remove all O-rings, wear rings, and backup rings from cylinder components and discard.
8. Thoroughly clean components with solvent and dry with compressed air. Inspect and replace if damaged.
9. Inspect inner surface of barrel, outer surface of piston, and length of rod for scratches and scoring. If barrel, piston, or rod is damaged, it must be replaced.
10. Check condition of threads on rod, nut, and capscrews. Do not attempt to repair damaged threads.
11. Lubricate new O-ring with hydraulic oil and install inside piston (seals rod to piston).
12. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install on head. Using a seal driver, install new wiper seal in head. Lubricate wiper seal with hydraulic oil.
13. Slide rod bearing head (Item 8), stroke limiter (Item 6), and piston (Item 5) onto rod (Item 7). Lubricate threads on rod with hydraulic oil and install rod nut (Item 4). For older production models with a 1" rod nut, torque rod nut to 740 ft-lbs. For more recent production models with a 1-1/4" rod nut, torque rod nut to 930 ft-lbs.
14. Lubricate new seal and wear rings with hydraulic oil and install on piston.
15. Install spanner wrench on rod bearing head using the three (3) holes in side the head. Tighten rod bearing head until it is snug against the cylinder barrel.
16. Install connector to cylinder barrel and torque to 46–50 ft-lbs.
17. Install dowel pin (Item 1) in end of cylinder barrel.

Section 7 — Frame Tilt and Oscillation

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Section 7 — Frame Tilt and Oscillation

Frame Tilt System

General Description

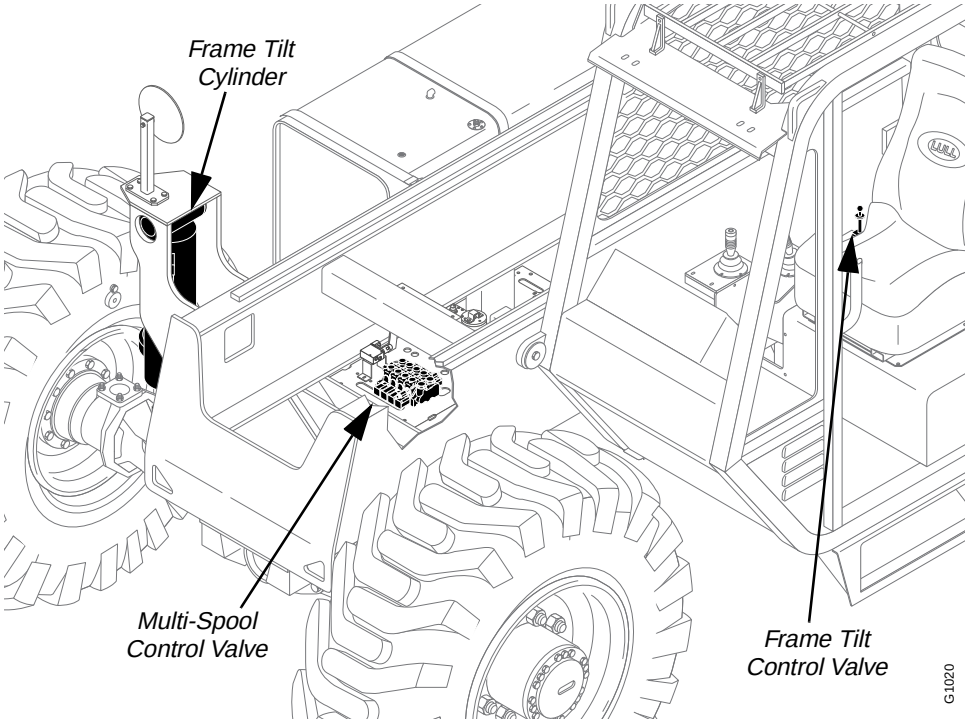


Fig. 7-1: Frame Tilt System Components

(Ref. Fig. 7-1) The frame tilt system allows the machine to be levelled laterally (side-to-side) up to 12.5°, left or right. The lateral angle of the machine, relative to level ground, is shown on the frame level indicator (See “Frame Level Indicator” on page 7-17).

When hydraulic pressure is applied to the frame tilt cylinder the frame pivots around each axle. Two counterbalance valves (one on the rod end and one on the base end) are used to inhibit hydraulic fluid from exiting the frame tilt cylinder.

Function is controlled by the frame tilt control valve (see page 7-3) located in the operator’s compartment. The system is functional only while the engine is running and the boom is below 40°.

Circuit Description

Reference Fig. 7-1 above and Section 4, “Reference Diagrams”.

The frame tilt system works in combination with the rear oscillation lock system. The frame tilt system is explained here. See “Rear Oscillation Lock System” on page 7-18 for detailed information concerning that system.

Control Centered

With the engine on and the boom below 40° elevation, the frame tilt system is enabled. The frame tilt control valve (see page 7-3) is normally centered and no pilot pressure is supplied to ports **A6** or **B6** of the frame tilt section of the multi-spool control valve. In this condition, the spool in the frame tilt section remains centered and no pressure is supplied to the frame tilt cylinder.

Two (2) counterbalance valves on the frame tilt cylinder prevent fluid escaping from the cylinder. This mechanically locks the cylinder in position and prevents the frame from rotating on the front axle.

Control to Right

Moving the frame tilt control handle to the right allows pilot pressure to flow from port **#2** of the control valve. This pilot pressure is routed to port **A6** of the frame tilt section of the multi-spool control valve. The spool is shifted away from port **A6**, allowing pump flow to be routed through port **A** to the rod end of the frame tilt cylinder. Pressure is sufficient to pilot the counterbalance valves open, allowing fluid to enter and leave the cylinder.

As the cylinder retracts, the frame tilts to the right and fluid from the base end of the cylinder is routed through port **B** of the frame tilt section and on to the filtered tank return.

Control to Left

Moving the frame tilt control handle to the left allows pilot pressure to flow from port **#1** of the control valve. This pilot flow is routed to port **B6** of the frame tilt section of the multi-spool control valve. The spool is shifted away from port **B6**, allowing pump flow to be routed through port **B** to the base end of the frame tilt cylinder. Pressure is sufficient to pilot the counterbalance valves open, allowing fluid to enter and leave the cylinder.

As the cylinder extends, the frame tilts to the left and fluid from the rod end of the cylinder is routed through port **A** of the frame tilt section and on to the filtered tank return.

Frame Tilt Disabled

Under certain conditions the frame tilt system is disabled by the frame tilt lockout valve. The lockout valve prevents or allows pilot flow to be routed to ports **A6** and **B6** on the frame tilt section of the multi-spool valve. The frame tilt lockout valve is a component of the rear oscillation lock system and its function is explained under “Rear Oscillation Lock System” on page 7-18.

Frame Tilt Control Valve

Description

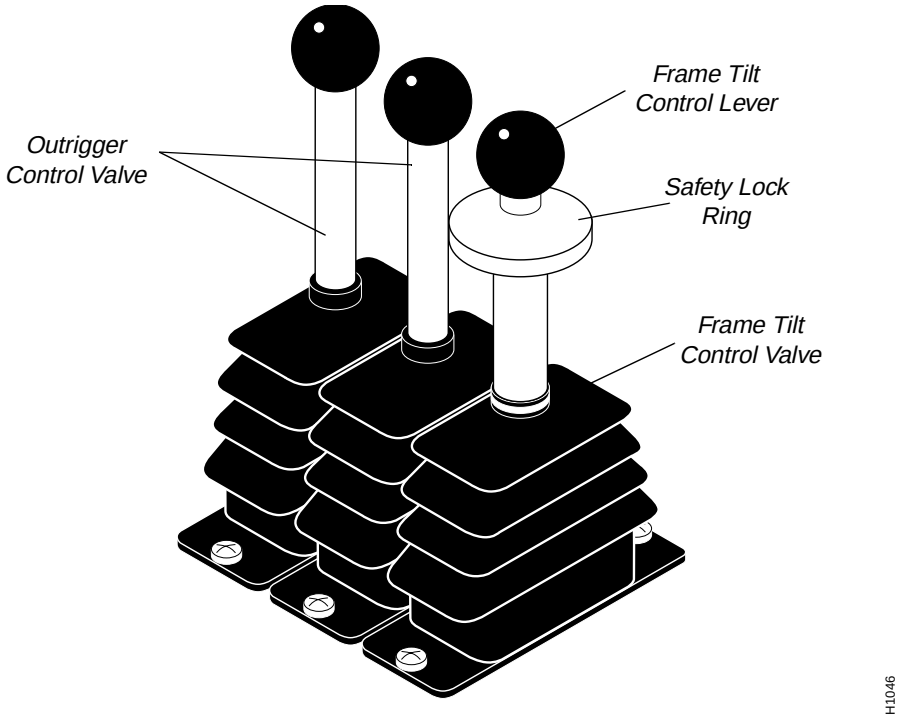


Fig. 7-2: Frame Tilt Control Valve

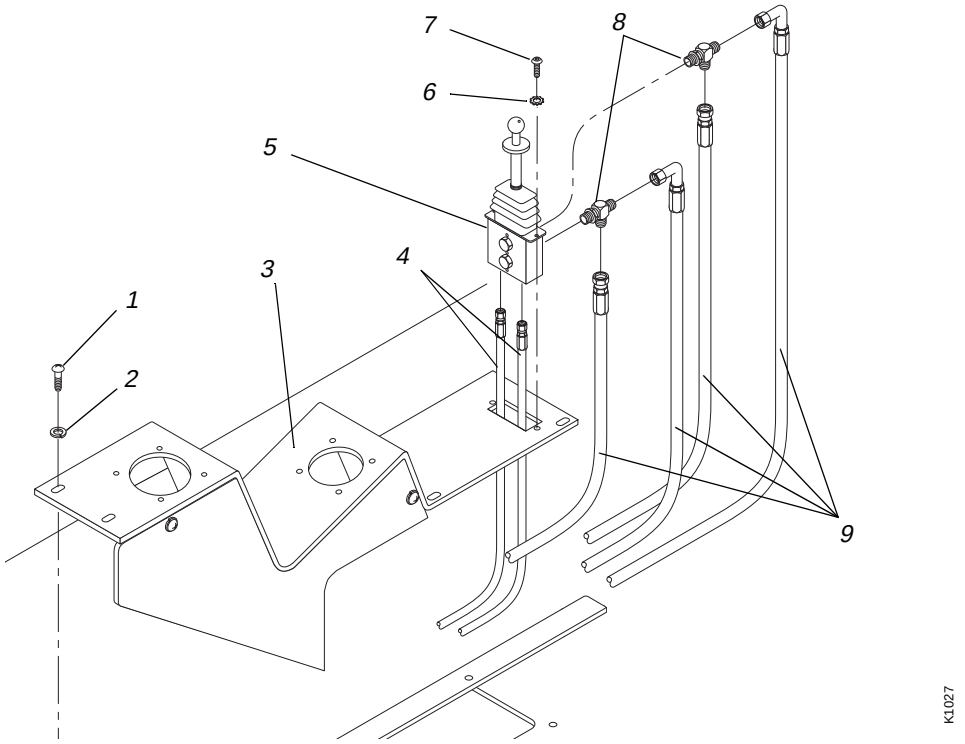
The frame tilt control lever is located immediately to the right of the driver’s seat on the control panel. It is used to level the machine laterally (side-to-side) up to 12.5°, left or right. The lateral angle of the machine, relative to level ground, is shown on the frame level indicator (See “Frame Level Indicator” on page 7-17). The control is functional only while the engine is running.

The control lever is equipped with a safety lock to prevent unintentional operation. Lifting the lock ring to unlock the lever allows it to be moved left or right tilting the frame accordingly. Returning the control lever to center position and releasing the lock ring secures the lever.

To level the frame, move the lever in the direction you want the ball in the frame level indicator to move. Control is proportional: a small amount of movement causes the frame to tilt slowly, while full movement of the control causes faster frame movement.

Removal

Frame Tilt Control Valve



#	Description
1	Flatwasher
2	Screw
3	Control Panel
4	1/4” Hoses
5	Frame Tilt Control Valve

#	Description
6	Starwasher
7	Capscrew
8	Fittings
9	3/8” Hoses

Fig. 7-3: Frame Tilt Control Valve Installation

(Ref. Fig. 7-3) The following procedure describes removal of the frame tilt control valve.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Remove six (6) screws (Item 2) and flatwashers (Item 1) securing control panel (Item 3) to operator’s compartment. Lift up rear of control panel to expose lower portion of frame tilt control valve (Item 5).
3. Tag and disconnect six (6) hydraulic hoses (Items 4 and 9) at frame tilt control valve. Cap hoses and fittings.

   Note: *“K” Models have four hoses connected to the control valve.*

4. Note Position of two (2) tee fittings (Item 8) on back side of valve body. Remove fittings.

Note: *"K" Models have 90° elbows instead of tee fittings.*

5. Remove two (2) capscrews (Item 7) and starwashers (Item 6) retaining control valve to control panel.
6. Lift valve up to remove.

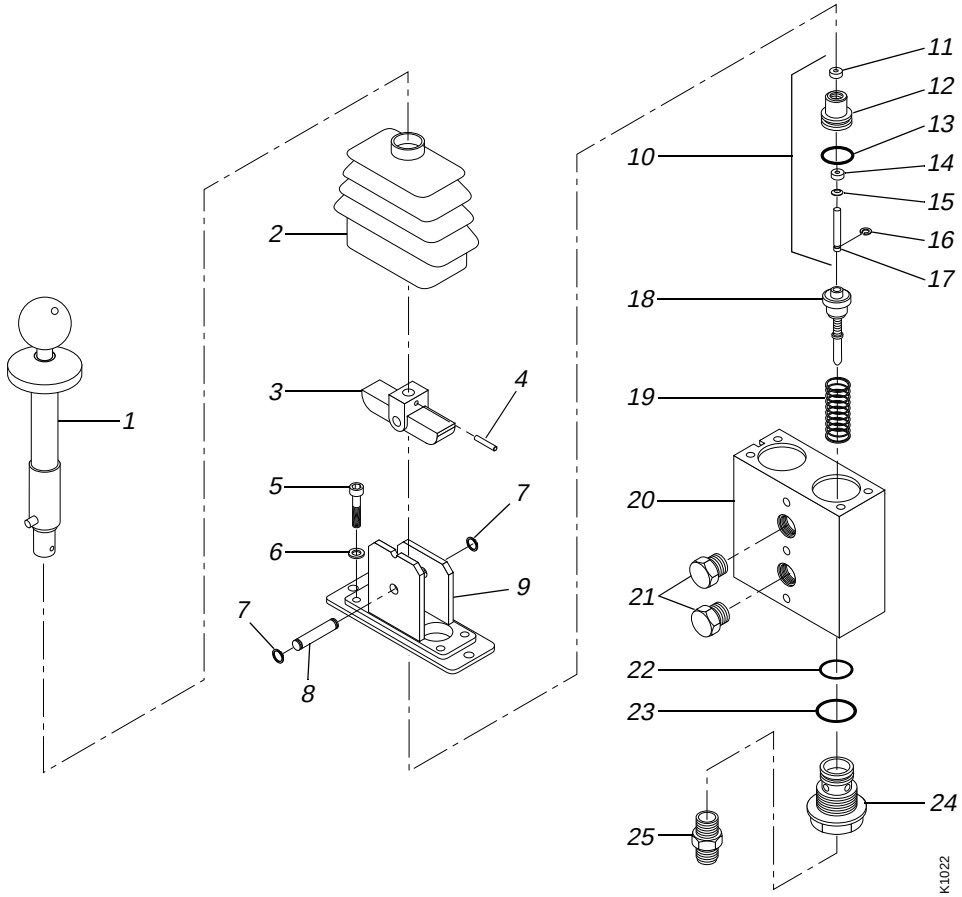
Installation

Frame Tilt Control Valve

1. (Ref. Fig. 7-3) Insert frame tilt control valve (Item 5) into control panel (Item 3) with plugged ports on front of valve body facing forward.
2. Install two (2) starwashers (Item 6) and capscrews (Item 7) to secure valve to control panel.
3. Install two (2) fittings (Item 8) into rear of valve body and position them as previously noted. Torque fittings to 300–340 in-lbs (25–29 ft-lbs).
4. Install hydraulic hoses (Items 4 and 9) onto fittings. Torque nuts on 3/8" hoses to 235–265 in-lbs (20–22 ft-lbs). Torque nuts on 1/4" hoses to 130–150 in-lbs.
5. Position control panel in operator's compartment and secure with six (6) flatwashers (Item 1) and screws (Item 2).
6. Start engine and raise boom slightly. Tilt frame fully left and right several times to purge trapped air from frame tilt hydraulic system.
7. Level frame, and cycle remaining controls to purge air from those control circuits. Lower boom to ground, and shut off engine. Inspect for hydraulic leaks and repair as necessary.

Overhaul

Frame Tilt Control Valve



#	Description
1	Lever Assembly
2	Rubber Boot
3	Cam
4	Roll Pin
5	Capscrew (4)
6	Washer (4)
7	Circlip (2)
8	Pivot Pin
9	Flange
10	Guide Assembly (2) (Incl. 11–17)
11	Wiper
12	Guide
13	O-Ring

#	Description
14	Seal
15	Spreader
16	Circlip
17	Plunger
18	Spool Assembly (2)
19	Spring (2)
20	Valve Body
21	Plug, O-Ring
22	O-Ring (2)
23	O-Ring (2)
24	Ported Guide (2)
25	Fitting, O-Ring

Fig. 7-4: Frame Tilt Control Valve (Exploded View)

(Ref. Fig. 7-4) The following procedures are for the disassembly, cleaning, and assembly of the frame tilt control valve. Follow the guidelines for cleanliness as stated in Section 3 of this manual.

Disassembly, Frame Tilt Control Valve

1. Note locations of fittings and plugs installed in valve body ports. Remove all fittings and plugs. Drain any residual oil into a suitable container.
2. Lift rubber boot (Item 2) from flange (Item 9) and slide it up lever assembly (Item 1).
3. Remove one of the circlips (Item 7) from pivot pin (Item 8). Push pin out of flange and remove lever assembly.
4. If rubber boot (Item 2) needs to be replaced, remove roll pin (Item 4) and pull lever assembly out of cam (Item 3). Remove plastic cable tie (if installed) from around top of boot. Slide boot off lever assembly.
5. The lever assembly (Item 1) is a sealed unit and service is limited to replacing the plastic knob.
6. Note position of flange (Item 9) on valve body (Item 20). Remove four (4) capscrews (Item 5) and washers (Item 6). Remove flange.
7. Remove guide assemblies (Item 10). Plunger (Item 17) may now be removed from guide (Item 12). Be careful not to scratch the plunger. The seals in the guide may be removed by first removing spreader (Item 15).
8. Remove two (2) spool assemblies (Item 18) and springs (Item 19). Take care not to scratch the spools.
9. Before removing ported guides (Item 24) be aware that the guides were factory-installed with thread sealant. Removing ported guides is very difficult and results in severe contamination of the valve body porting. If the guides must be removed, extra care must be given to cleaning and flushing the valve body. All traces of thread sealant must be removed from the guide and valve body threads.

Cleaning and Inspection, Frame Tilt Control Valve

1. Thoroughly clean all parts, except for the lever assembly, in clean solvent and dry with compressed air. Do not immerse the lever assembly (Item 1) in solvent. Solvent can become trapped in the assembly and will be difficult to remove.
2. Pay particular attention to the porting in the valve body. Flush valve body with clean solvent and use compressed air to dry.
3. Inspect each spool (Item 18) for scratches and damage. Scoring on the spool may also indicate damage to the ported guides (Item 24). If damage is evident, replace with new parts. Check fit of spools in ported guides. The spools must fit snugly with no sticking. A stuck spool can cause unintentional operation of a hydraulic circuit. Excessive play or sticking means that the spool and its ported guide must be replaced.

4. Check surface of each plunger (Item 17) and guide (Item 12) for wear and damage. Check fit of plunger in guide to make sure no sticking occurs. Like the spools, a stuck plunger can cause unintentional operation of a hydraulic circuit.
5. Inspect each spool cavity in the valve body for scratches.
6. Check condition of lever assembly (Item 1), cam (Item 3), pivot pin (Item 8), springs (Item 19), and flange (Item 9). Replace as necessary.
7. Replace O-rings and seals as necessary. Lubricate O-rings and seals with clean hydraulic oil before installing them.

Assembly, Frame Tilt Control Valve

1. If ported guides (Item 24) were removed, install new O-rings and apply non-permanent thread sealant sparingly to bottom threads (nearest the hex end of guide). Do not use too much sealant as the hydraulic system may become contaminated. Lubricate O-rings (Items 22 & 23) with clean hydraulic oil and install ported guides in valve body (Item 20). Torque guides to 240–260 in-lbs.
2. Install springs (Item 19). Lubricate spool assemblies (Item 18) with clean hydraulic oil and install.
3. Lubricate O-rings (Item 13) and plungers (Item 17) with clean hydraulic oil. Insert plungers into guides (Item 12) with circlip (Item 16) on spool-side of guide. Install guide assemblies (Item 10).
4. Position flange (Item 9) on valve body as previously noted. Secure flange with four (4) washers (Item 6) and capscrews (Item 5).
5. If rubber boot (Item 2) was previously removed, install boot on lever assembly, taking care not to damage boot on pin located near bottom of lever assembly (Item 1). Install new plastic cable tie around top of boot to help prevent water from entering between lever assembly shaft and boot. Place cam (Item 3) on lever assembly and install roll pin (Item 4).
6. Lubricate cam (Item 3) and pivot pin (Item 8) with grease. Position lever/boot/cam assembly (Items 1–4) in flange with pin on lever aligned with notch in flange. Install pivot pin and secure with circlips (Item 7).
7. Move lever fully left and right. Make sure plungers (Item 17) do not stick down. If sticking occurs, the valve must be disassembled and the problem corrected.
8. Slip rubber boot into position over flange.
9. Install fittings and plugs at previously noted positions. Torque plugs (Item 21) and fittings (Item 25) to 300–340 in-lbs. Cap all open ports and fittings.

Frame Tilt Cylinder

Description

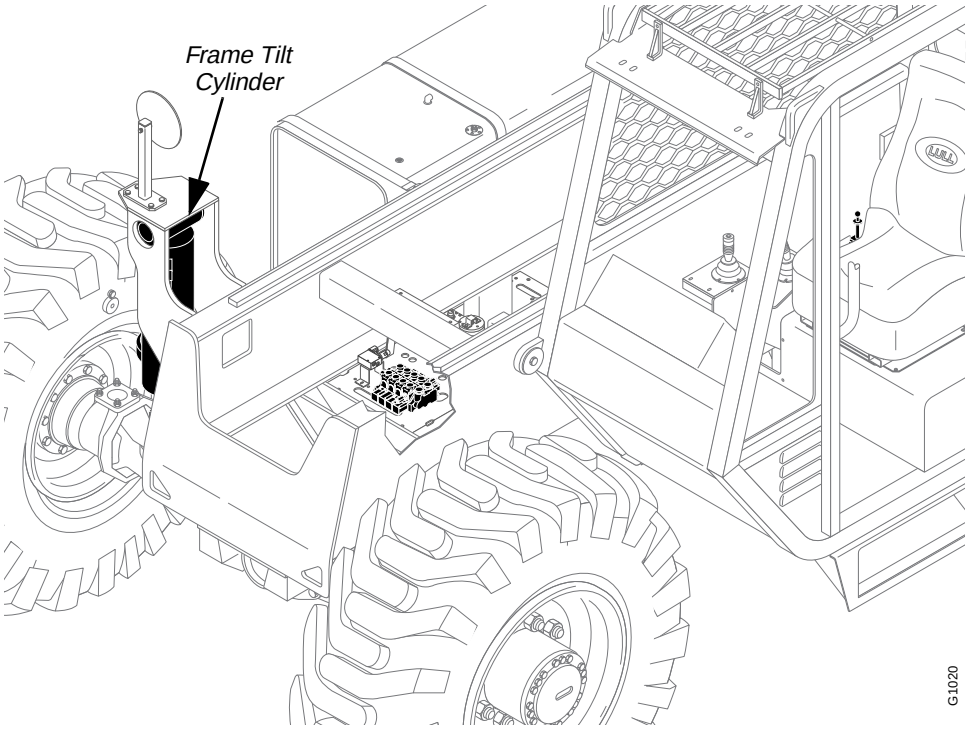


Fig. 7-5: Frame Tilt Cylinder

(Ref. Fig. 7-5) The frame tilt cylinder is located near the front of the machine, on the right side. The cylinder is mounted vertically with the base end secured to the frame and the rod end mounted to the front axle.

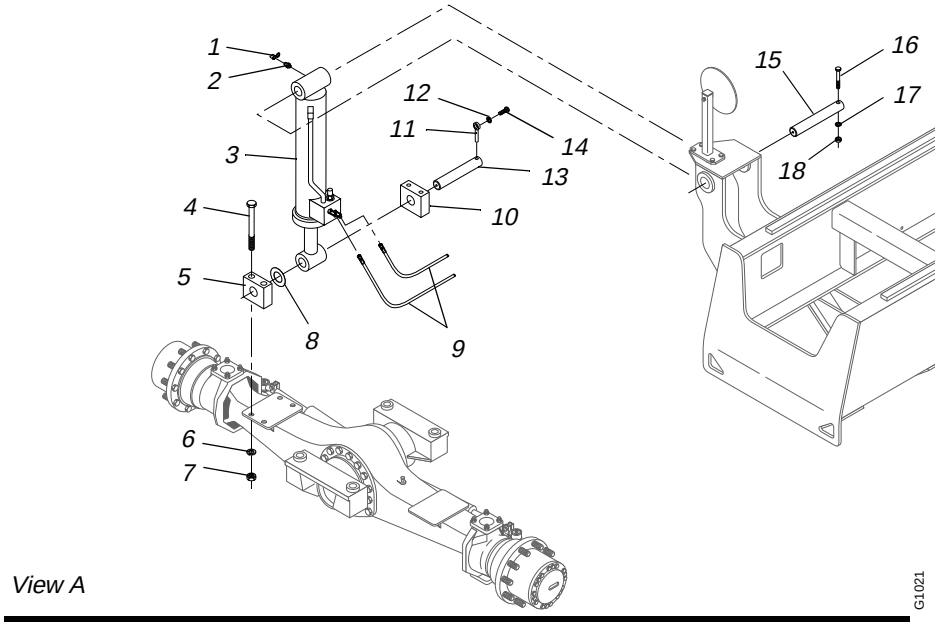
With the engine running, moving the frame tilt control valve handle (see page 7-3) to the right causes the cylinder to retract and the frame tilts to the right. Moving the tilt control handle to the left causes the cylinder to extend and the frame will tilt to the left.

There are conditions during normal machine operation when the frame tilt cylinder cannot be actuated. See “Rear Oscillation Lock System” on page 7-18 for further information.

Removal

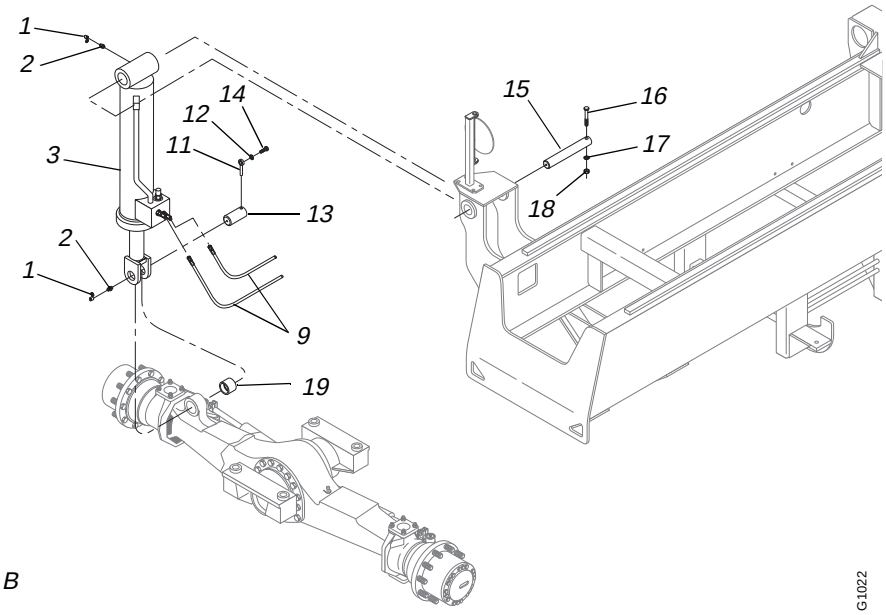
Frame Tilt Cylinder

644B-37 (S/N 101–170)
6K-37 (S/N 101–144)
844C-42 (S/N 101–164)
8K-42 (S/N 101–125)



View A

644B-37 (S/N 171–)
6K-37 (S/N 145–)
644B-42 (S/N 101–)
6K-42 (S/N 101–)
844C-42 (S/N 165–)
8K-42 (S/N 26–)
1044C-42 (S/N 101–)
10K-42 (S/N 101–)
1044C-54 (S/N 101–)
10K-54 (S/N101–)



View B

#	Description
1	Grease Fitting Cover
2	Grease Fitting
3	Frame Tilt Cylinder
4	Capscrew
5	Mounting Block
6	Lockwasher
7	Nut
8	Shim
9	Hydraulic Hose
10	Mounting Block w/Lock Pin Hole

#	Description
11	Lock Pin
12	Lockwasher
13	Lower Pivot Pin
14	Capscrew
15	Upper Pivot Pin
16	Capscrew
17	Lockwasher
18	Nut
19	Lower Cylinder Bushing

Fig. 7-6: Frame Tilt Cylinder Installation

(Ref. Fig. 7-6) The following procedures are required to remove the frame tilt cylinder.

1. Follow preparation procedures as outlined in Section 3.
2. Place blocks between frame and top of front axle. These will hold the frame in place when the cylinder is removed.
3. Tag and disconnect two (2) hydraulic hoses (Item 9) at frame tilt cylinder (Item 3). Cap hoses and fittings.
4. See warning and procedures on page 7-16 for releasing hydraulic pressure in cylinder.
5. Remove nut (Item 18), lockwasher (Item 17), and capscrew (Item 16) securing cylinder upper pivot pin (Item 15) to frame.
6. Remove capscrew (Item 14), lockwasher (Item 12), and lock pin (Item 11) securing cylinder lower pivot pin (Item 13).
7. Place a sling around the cylinder and attach the sling to suitable lifting equipment. Make sure sling and lifting equipment have sufficient capacity. The frame tilt cylinder weighs approximately 200 pounds. Using the lifting equipment, support the weight of the cylinder.
8. Remove upper pivot pin.
9. Remove lower pivot pin and shims (Item 8) (early production models only).
10. Move cylinder out and up from the machine.
11. For models with the cylinder illustrated in View B, remove lower bushing (Item 19) from front axle using bushing driver and hammer or press. Inspect and, if damaged, discard bushing.

Installation

Frame Tilt Cylinder

(Ref. Fig. 7-6) The following procedures are required to install the frame tilt cylinder.

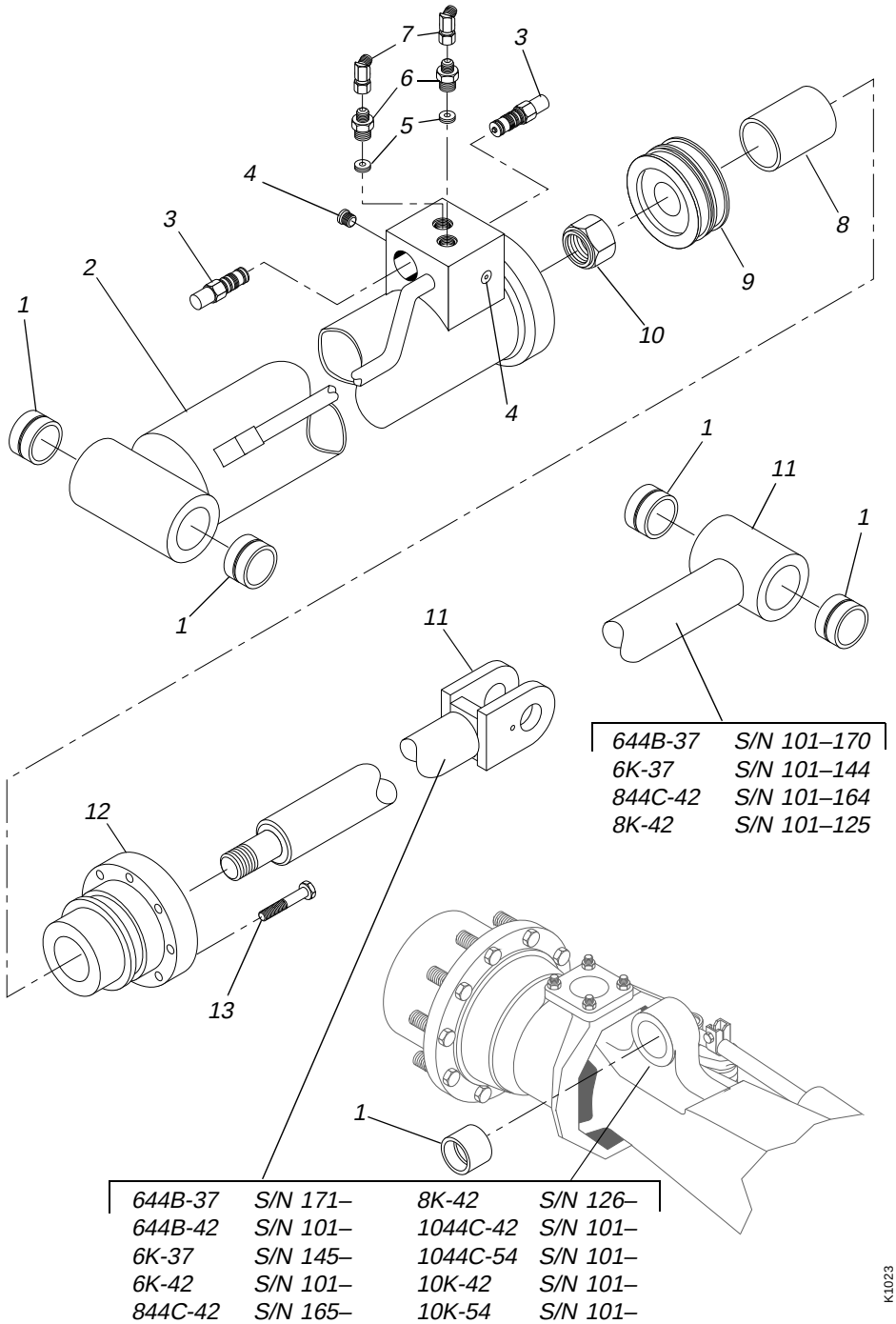
1. Prior to installation, lubricate upper and lower pivot pins with a light coating of grease.
2. For models with the cylinder illustrated in View B, install new lower bushing (Item 19) on front axle. Install bushing so that it is centered in axle boss.
3. Using suitable lifting equipment, position upper cylinder pivot at frame pivot. Install upper pivot pin so hole in pin is aligned with hole in frame boss. Secure upper pivot pin with capscrew (Item 16), lockwasher (Item 17), and nut (Item 18). Torque nut to 180 in-lbs.
4. If necessary (models with the cylinder illustrated in View A), install mounting blocks on front axle as follows:
   a. Install mounting block (Item 5) to front of axle with two (2) capscrews (Item 4), lockwashers (Item 6) and nuts (Item 7). Torque nuts to 150 ft-lbs.

b. Install mounting block (with lock pin hole) (Item 10) to rear of axle with two (2) capscrews (Item 4), lockwashers (Item 6), and nuts (Item 7). Make sure the lock pin hole is to the rear of the machine. Torque nut to 150 ft-lbs.

5. Position lower cylinder pivot on axle to install lower pivot pin. Install lower pivot pin (Item 13) and shims (Item 8) (early production models only).
6. Secure pin with lock pin (Item 11), lockwasher (Item 12), and capscrew (Item 14). Torque capscrew to 55 ft-lbs.
7. Attach hydraulic hoses (Item 9) to fittings on cylinder. Torque hose swivel nuts to 235–265 in-lbs.
8. If necessary, install grease fittings (Item 2) and grease fitting covers (Item 1) as shown in Fig. 7-6. Torque grease fitting 1.5–3 turns past finger tight.
9. Lubricate upper and lower pivots with grease.
10. Start engine and cycle frame tilt fully left and right several times to purge air from hydraulic system. Lower boom and shut off engine.
11. Inspect for hydraulic leaks and repair as necessary.
12. Check oil level in hydraulic reservoir. Add oil as necessary. See “Filling Hydraulic Reservoir” in Section 5 for procedures.

Overhaul

Frame Tilt Cylinder



#	Description
1	Bushing
2	Barrel
3	Counterbalance Valve Cartridge
4	O-Ring Plug
5	Orifice
6	Fitting, O-Ring
7	Swivel Fitting

#	Description
8	Stroke Limiter
9	Piston
10	Rod Nut
11	Rod
12	Head
13	Capscrew

Fig. 7-7: Frame Tilt Cylinder (Exploded View)

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. See warning and procedures on page 7-16 for counterbalance valve (Item 3) removal.
3. Slowly extend and retract cylinder by hand to remove most of the hydraulic oil.
4. Remove eight (8) capscrews (Item 13) 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), stroke limiter (Item 8), and head from rod.
7. Remove two (2) O-ring plugs (Item 4).
8. Remove fittings (Items 6 & 7).

   Note: *Swivel fittings are not used with the latest production models (e.g. 644B-37 (S/N 591, 667–) and 644B-42 (S/N 208–)).*
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.

Bushing Replacement

1. Fig. 7-7 shows both types of rod end configurations and bushing locations. Remove pivot bushings (Item 1) using a bushing driver and hammer or press. Drive one bushing all the way through to remove other bushing.

2. Install new bushings so they are flush with outer edge boss to 0.02" below. For machines with lower (rod end) pivot bushing installed in front axle: Install bushing so that it is centered in axle boss.

Assembly, Frame Tilt Cylinder

1. (Ref. Fig. 7-7) Install two (2) orifices (Item 5) using a large, flat bladed screw driver.
2. Install two (2) O-ring plugs (Item 4) and torque to 125–145 in-lbs.
3. Lubricate new O-ring with hydraulic oil and install inside piston (seals rod to piston).
4. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install on head (Item 12). Using a seal driver, install new wiper seal in head. Lubricate wiper seal with hydraulic oil.
5. Slide head (Item 12), stroke limiter (Item 8) and piston (Item 9) onto rod (Item 11). Lubricate threads on rod with hydraulic oil and install rod nut (Item 10). Torque rod nut to 850 ft-lbs.
6. Lubricate new seal and wear rings with hydraulic oil and install on piston.
7. (Ref. Fig. 7-7) Lubricate threads on capscrews (Item 13) with hydraulic oil. Coat inside of barrel (Item 2) with hydraulic oil. Carefully insert rod and head into barrel. Do not damage seals during assembly. Install and snug capscrews (Item 13). Do not torque capscrews (instructions follow).

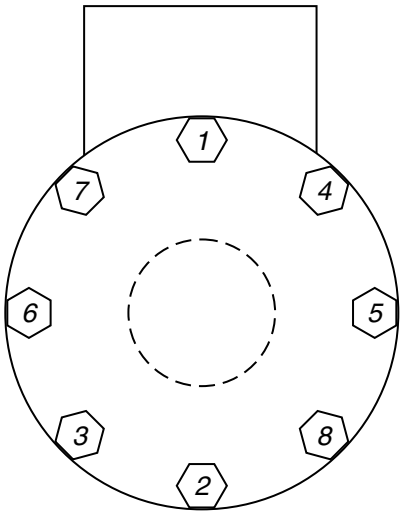


Fig. 7-8: Head Capscrew Torque Sequence

8. Following sequence shown in Fig. 7-8, torque capscrews to an initial value of 30 ft-lbs. Follow sequence again and torque capscrews to a final value of 65 ft-lbs.
9. Install two (2) O-ring fittings (Item 6) and torque to 46–50 ft-lbs.
10. Install two (2) swivel fittings (Item 7) and torque nuts to 235–265 in-lbs.

Note: *Swivel fittings are not used with the latest production models (e.g. 644B-37 (S/N 591, 667~) and 644B-42 (S/N 208~)).*

11. Install counterbalance valve cartridges. See below.

Counterbalance Valve Cartridge

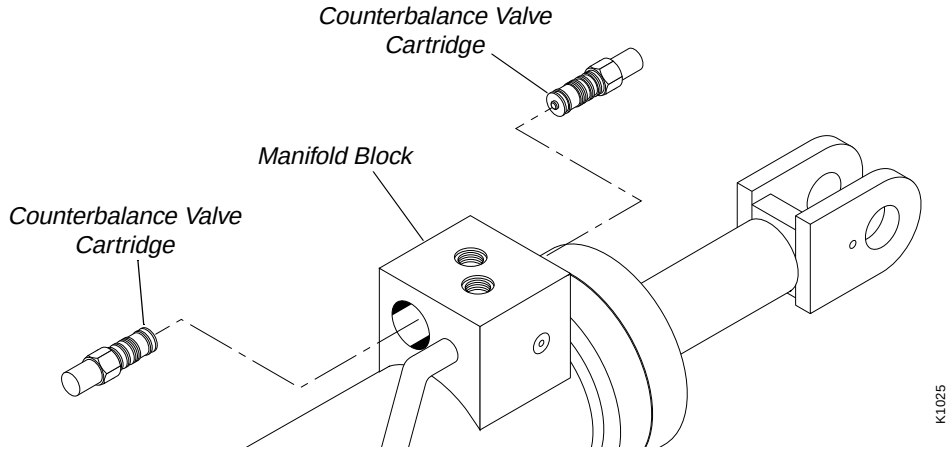


Fig. 7-9: Counterbalance Valve Cartridges, Frame Tilt Cylinder

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.

The following procedures refer to Fig. 7-9.

Releasing Pressure in Cylinder

1. Place socket wrench over a counterbalance valve cartridge. Wrap a clean shop rag around the socket to cover the area of the counterbalance valve cartridge.
2. Carefully and slowly, turn cartridge out of manifold block to release pressure in cylinder. Repeat for other cartridge to release pressure from other end of cylinder.
3. After pressure has been released, tighten cartridges. If cartridges will not be removed, then torque counterbalance valve cartridges to 30–35 ft-lbs.

Removal and Service, Counterbalance Valve

1. Remove both cartridges and cap ports in manifold block. Inspect cartridge O-rings for condition and replace as necessary.
2. Do not disassemble the cartridge. Service to a counterbalance valve cartridge is limited to installing a new O-ring and replacing the entire cartridge.

Installation, Counterbalance Valve

1. Lubricate O-rings with clean hydraulic oil.
2. Install each cartridge in manifold block and torque to 30–35 ft-lbs.

Frame Level Indicator

Description

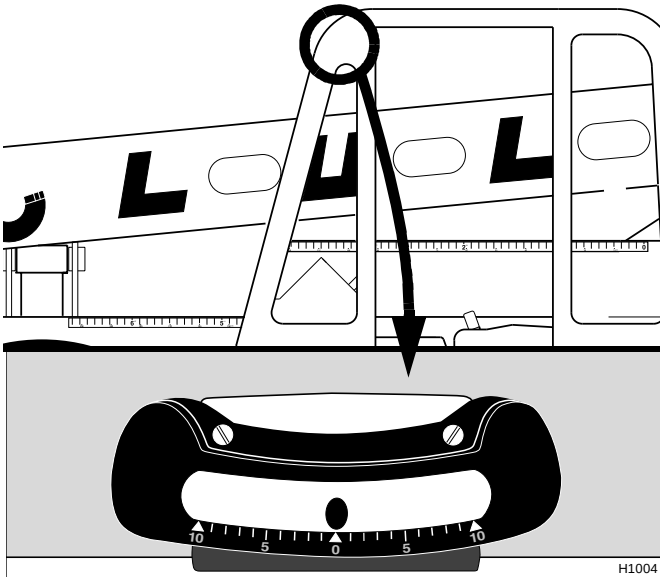


Fig. 7-10: Frame Level Indicator

(Ref. Fig. 7-10) The Frame Level Indicator shows the lateral (side-to-side) angle of the frame relative to level ground. Indicator range is from 0° to 10° left or right, in increments of one degree. When the ball is centered (0°), the machine is laterally level. The frame tilt feature may be used to correct machine angles up to 12.5° to the left or right. See “Frame Tilt Control Valve” on page 7-3.

Adjustment

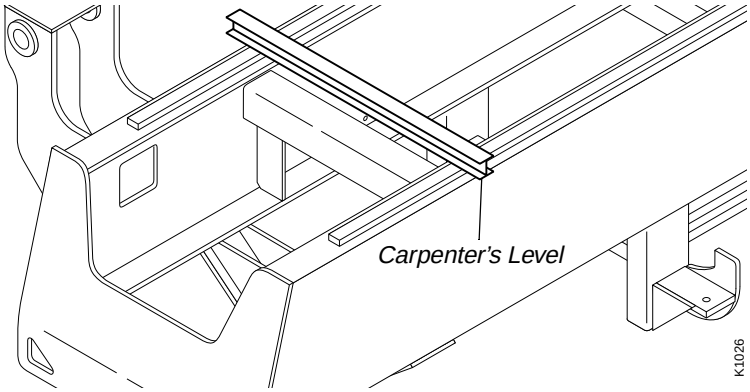


Fig. 7-11: Leveling the Frame

1. (Ref. Fig. 7-11) Park the machine on a firm, level surface. Place a carpenter's level across the frame rails.
2. Loosen screws securing frame level indicator to its mounting bracket. Start the engine and adjust frame tilt so the carpenter's level shows the frame is level.
3. Adjust frame level indicator so ball is centered over 0° mark. Tighten indicator screws.

Rear Oscillation Lock System

General Description, Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

The Rear Oscillation Lock System provides safety and stability by preventing the frame from rotating on the rear axle.

The rear oscillation lock will be operational when any or all of the following conditions apply:

- When the boom angle exceeds 40°.
- When the service brakes are applied.
- If a system component fails.

When the boom angle is above 40°, the following conditions apply:

- Rear axle cylinder locks, preventing the frame from rotating on the rear axle.
- Transmission is inoperative.
- Frame tilt function is disengaged.
- REAR OSC LOCK light in the instrument cluster illuminates.
- When the frame tilt function is disengaged, it CANNOT be overridden by the operator unless the boom angle is below 40°.

When the service brakes are applied, the following conditions apply:

- Rear axle cylinder locks, preventing the frame from rotating on the rear axle.
- The rear oscillation lock cylinder can be unlocked by the frame tilt function when the boom is below 40°.

Theory of Operation and Circuit Logic

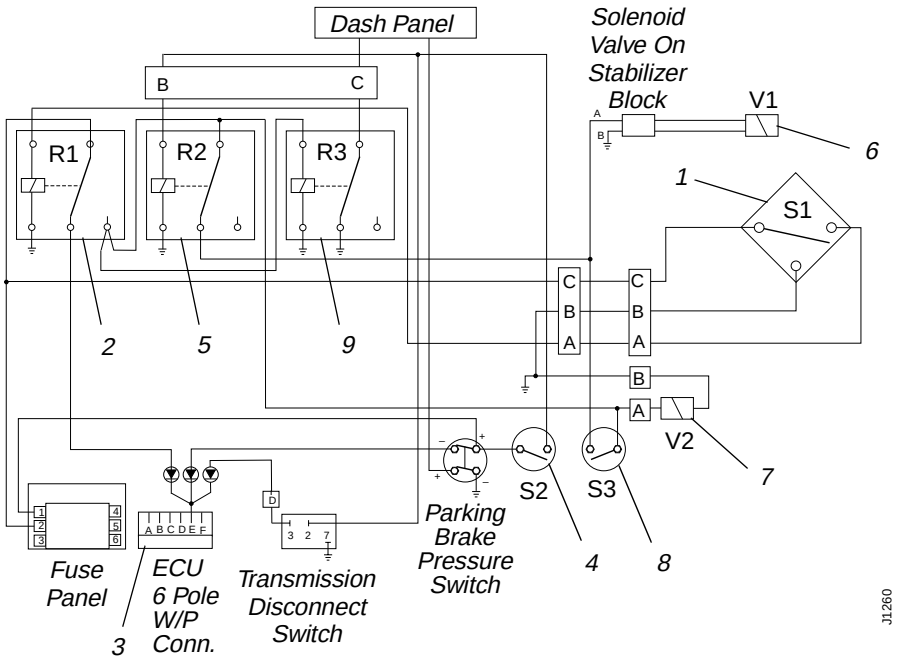


Fig. 7-12: Rear Oscillation Lock Component Locations

(Reference Fig. 7-12 and Section 4, “Reference Diagrams”) Major components of the rear oscillation lock system are:

1. Boom Elevation Proximity Switch (**S1**) **— s**enses boom position.
2. Proximity Switch Relay (**R1**) — receives signal from the proximity switch (**S1**).
3. Electronic Control Unit (**ECU**) (Transmission) — controls transmission directional and gearshift functions.
4. Service Brake Pressure Switch (**S2**) — senses pressure in service brake circuit (brakes applied).
5. Service Brake Relay (**R2**) **—** receives signal from the service brake pressure switch (**S2**).
6. Solenoid Valve (**V1**) — mounted on oscillation control block at the rear oscillation lock cylinder. This component locks/unlocks the cylinder. See “Oscillation Control Block” on page 7-31.
7. Frame Tilt Lockout Solenoid Valve (**V2**) **—** enables/disables frame tilt functions.
8. Frame Tilt Override Switch (**S3**) **—** senses pilot pressure directed to the frame tilt valve section. Directs power to solenoid valve (**V1**), which unlocks the rear oscillation lock cylinder.
9. REAR OSC LOCK Light Relay (**R3**) **—** receives signal from the proximity switch relay (**R1**).

Boom Positioned Above 40°

R1 = Proximity Switch Relay
R2 = Service Brake Relay
R3 = Oscillation Lock Warning Light Relay
S1 = Proximity Switch
S2 = Service Brake Pressure Switch
S3 = Frame Tilt Override Pressure Switch
V1 = Stabilizer Block Solenoid Valve
V2 = Frame Tilt Lockout Solenoid Valve

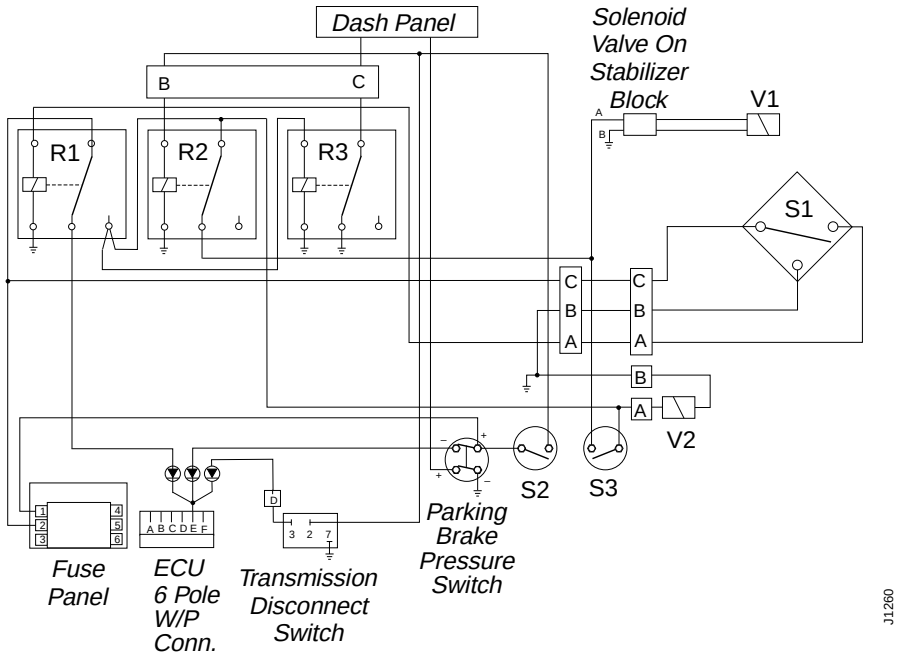


Fig. 7-13: Circuit Operation Above 40°

(Ref. Fig. 7-13) The following describes the rear axle stabilizer circuit logic when the boom is positioned above 40° elevation.

1. When the boom is above 40°, the proximity switch (**S1**) is not sensing the outer boom. Therefore, the proximity switch opens.
2. When the proximity switch is open, the proximity switch relay (**R1**) is not energized and power is directed to the transmission Electronic Control Unit (ECU). The ECU signals the transmission to drop pressure to the forward and reverse clutches, placing the transmission in a neutral position.
3. Since (**R1**) is not energized, no power is directed through the service brake relay (**R2**) and on to the solenoid valve (**V1**) on the stabilizer block. Therefore, the stabilizing cylinder assumes a locked position. See “Oscillation Control Block” on page 7-31 for more information.
4. Also, there is no power directed from relay (**R1**) to the frame tilt lockout solenoid valve (**V2**). Therefore, pilot pressure at the frame tilt control valve spool is directed to the tank and there is no spool movement or frame tilt function.
5. With relay (**R1**) not energized, no power is relayed to the rear oscillation lock warning light relay (**R3**). Therefore, the indicator light on the dash panel maintains a path to ground and the light in the instrument cluster illuminates, indicating oscillation lock engagement.

Boom Positioned Below 40°

R1 = Proximity Switch Relay
R2 = Service Brake Relay
R3 = Oscillation Lock Warning Light Relay
S1 = Proximity Switch
S2 = Service Brake Pressure Switch
S3 = Frame Tilt Override Pressure Switch
V1 = Stabilizer Block Solenoid Valve
V2 = Frame Tilt Lockout Solenoid Valve

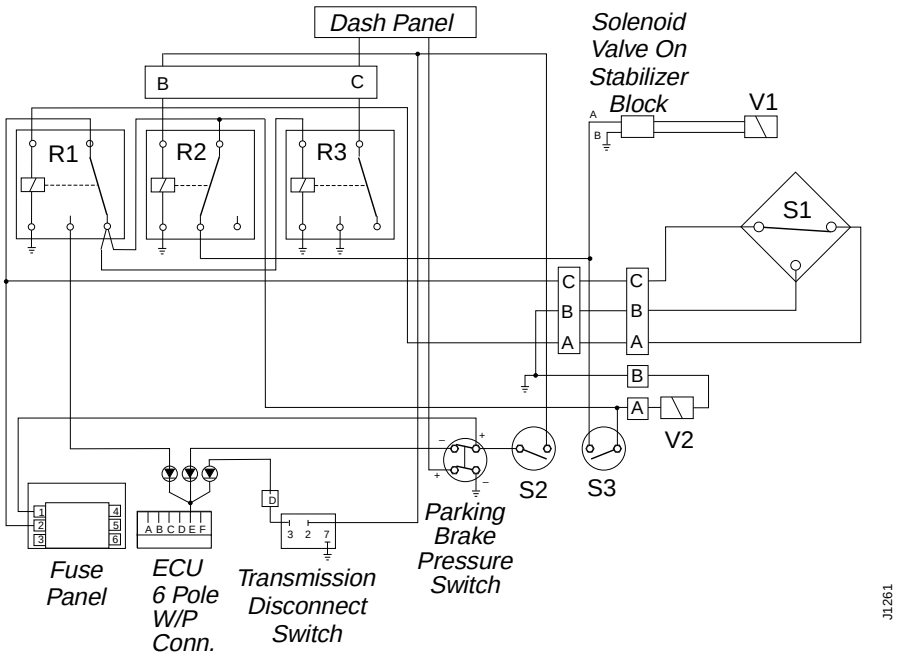


Fig. 7-14: Circuit Operation Below 40°

(Ref. Fig. 7-14) The following describes the rear axle stabilizer circuit logic when the boom is positioned below 40° elevation.

1. When the boom is below 40°, the proximity switch (**S1**) is sensing the outer boom. Therefore, the proximity switch closes. See “Boom Elevation Proximity Switch” on page 7-43 for more information.
2. A closed proximity switch energizes the proximity switch relay (**R1**). Power is routed through relay (**R2**) and onto the solenoid valve (**V1**) on the stabilizer block. Power is no longer routed to the transmission (**ECU**).
3. With solenoid valve (**V1**) energized, hydraulic fluid is allowed to flow freely to/from the rear oscillation lock cylinder. This allows the frame to pivot on the rear axle. See “Oscillation Control Block” on page 7-31 for more detailed information about the functions of control block components.
4. Power is routed from relay (**R1**) to frame tilt lockout solenoid valve (**V2**). The solenoid valve energizes and allows hydraulic pilot pressure to the routed to the frame tilt control valve spool. The frame may then be tilted.

5. When the proximity switch (**S1**) energizes the proximity switch relay (**R1**), power is also directed from relay (**R1**) to the rear oscillation lock warning light relay (**R3**). When the warning light relay is energized, the path to ground for the warning light is interrupted and the oscillation lock warning light goes out.

Boom Positioned Below 40° With the Service Brake Applied

R1 = Proximity Switch Relay
R2 = Service Brake Relay
R3 = Oscillation Lock Warning Light Relay
S1 = Proximity Switch
S2 = Service Brake Pressure Switch
S3 = Frame Tilt Override Pressure Switch
V1 = Stabilizer Block Solenoid Valve
V2 = Frame Tilt Lockout Solenoid Valve

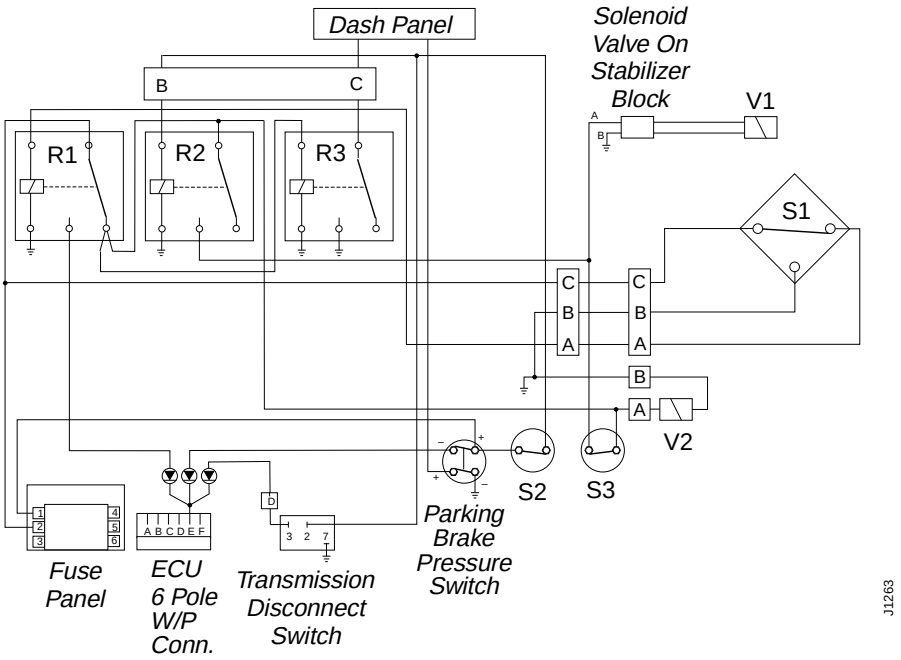


Fig. 7-15: Circuit Operation Below 40° with Service Brake Applied

(Ref. Fig. 7-15) The following describes the rear axle stabilizer circuit logic when the boom is positioned below 40° elevation with the service brake applied.

1. When the boom is below 40°, the proximity switch (**S1**) is sensing the outer boom. Therefore, the proximity switch is closed. See “Boom Elevation Proximity Switch” on page 7-43 for more information.
2. A closed proximity switch (**S1**) energizes the proximity switch relay (**R1**) and power is routed through relay (**R2**) and onto the solenoid valve (**V1**) on the stabilizer block. Power is no longer routed to the transmission (**ECU**):
3. Power is routed from relay (**R1**) to frame tilt lockout solenoid valve (**V2**). The solenoid valve energizes and allows hydraulic pilot pressure to the routed to the frame tilt valve section spool. The frame may then be tilted.

4. When the proximity switch (**S1**) energizes the proximity switch relay (**R1**), power is also directed from relay (**R1**) to the rear oscillation lock warning light relay (**R3**). When the warning light relay is energized, the path to ground for the warning light is interrupted and the oscillation lock warning light goes out.
5. As the service brake is applied, the normally open service brake pressure switch (**S2**) closes. Power is directed to the service brake pressure switch relay (**R2**), energizing it. This breaks the power directed to the solenoid valve (**V1**) and locks the rear axle cylinder.
6. Even though the boom is below 40°, when the service brake is applied so there is no power to the solenoid valve at the stabilizer block and the stabilizing cylinder is locked, it is still possible to frame tilt.
7. Power is still supplied to the frame tilt lockout solenoid valve (**V2**) and the frame tilt override pressure switch (**S3**). When the frame tilt controller is activated (in the operator's compartment), it directs pilot pressure to the frame tilt valve section. The frame tilt override pressure switch (**S3**) senses this pressure from the controller and closes. This directs power to the solenoid valve (**V1**) on the stabilizer block which unlocks the rear oscillation lock cylinder. This enables the main frame to be tilted with the boom below 40° and with the service brake applied.

Testing Rear Oscillation Lock Circuit

Use Table 7-1 for testing the rear oscillation lock circuit.

Table 7-1: Rear Oscillation Lock Circuit Test Matrix

OPERATING PARAMETERS	S1 PROXIMITY SWITCH	S2 SERVICE BRAKE SWITCH	S3 FRAME TILT OVERRIDE SWITCH	R1 RELAY #1 PIN #86	R2 RELAY #2 PIN #86	R3 RELAY #3 PIN #86	V1 STABILIZER SOLENOID	V2 FRAME TILT LOCKOUT SOLENOID	REAR OSC. LOCKED LIGHT (10)
Boom below 40° Service brake released	Closed	Open	Open	12 Volts	0 Volts	12 Volts	Energized (Unlocked)	Energized Frame tilt allowed	Off
Boom below 40° Service brake applied	Closed	Closed	Open	12 Volts	12 Volts	12 Volts	De-energized (Locked)	De-energized Frame tilt allowed	Off
Boom above 40° Service brake applied Operating frame tilt	Closed	Closed	Closed	12 Volts	12 Volts	12 Volts	Energized (Unlocked)	Energized while frame tilting	Off
Boom above 40° Service brake released	Open	Open	Open	0 Volts	0 Volts	0 Volts	De-energized (Locked)	De-energized Frame tilt disabled	On
Boom above 40° Service brake applied	Open	Closed	Open	0 Volts	12 Volts	0 Volts	De-energized (Locked)	De-energized Frame tilt disabled	On
Boom above 40° (Attempting to frame tilt)	Open	Depends on brake position	Open	0 Volts	Depends on brake position	0 Volts	De-energized (Locked)	De-energized Frame tile disabled	On

Rear Oscillation Lock Cylinder

Description

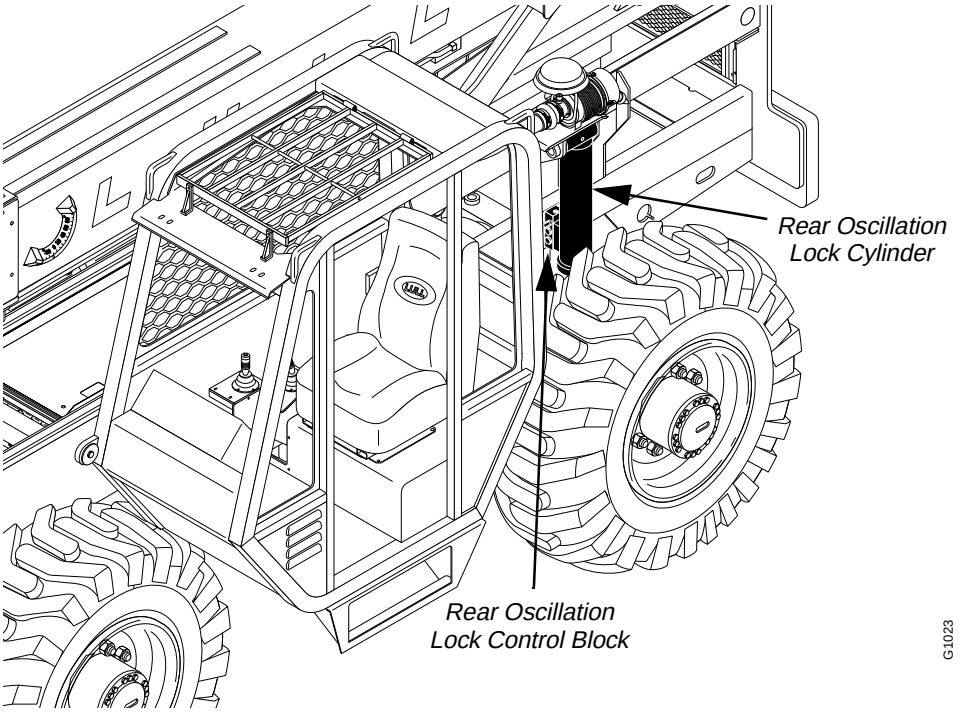


Fig. 7-16: Rear Oscillation Lock Cylinder

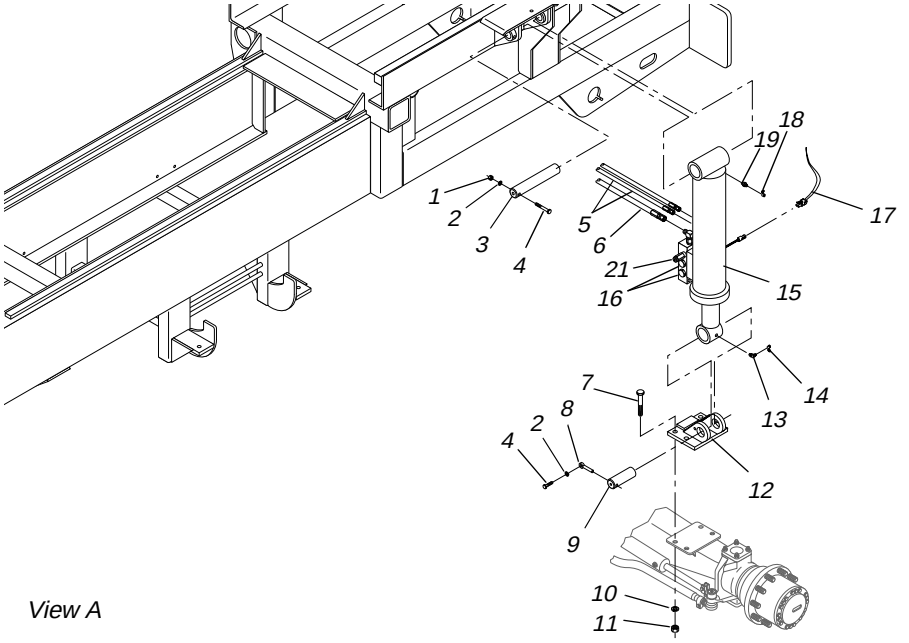
(Ref. Fig. 7-16) The rear oscillation lock cylinder is located near the rear of the machine, on the left side. The cylinder is mounted vertically with the base end secured to the frame and the rod end mounted to the rear axle.

The oscillation control block is mounted to the inboard side of the cylinder and controls hydraulic flow to and from the cylinder. When hydraulic fluid is trapped in the cylinder the frame is prevented from rotating around the rear axle.

The rear oscillation lock cylinder and the oscillation control block are components of the rear oscillation lock system. See “Rear Oscillation Lock System” on page 7-18 for more information.

Removal

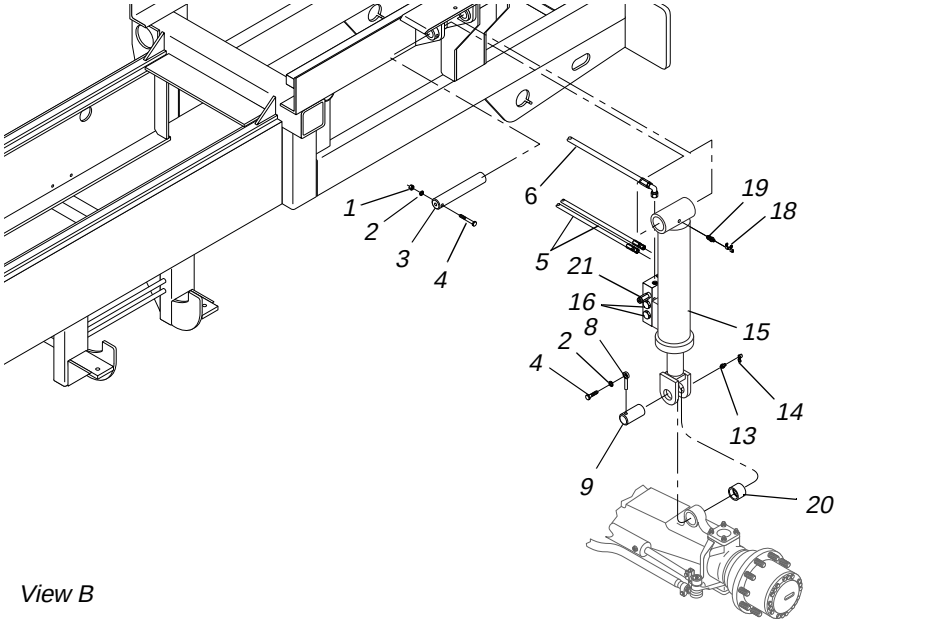
644B-37 (S/N 101–170)
6K-37 (S/N 101–144)
844C-42 (S/N 101–164)
8K-42 (S/N 101–125)



View A

G1024

644B-37 (S/N 171–)
6K-37 (S/N 145–)
644B-42 (S/N 101–)
6K-42 (S/N 101–)
844C-42 (S/N 165–)
8K-42 (S/N 126–)
1044C-42 (S/N 101–)
10K-42 (S/N 101–)
1044C-54 (S/N 101–)
10K-54 (S/N 101–)



View B

G1025

#	Description
1	Nut
2	Lockwasher
3	Upper Pivot Pin
4	Capscrew
5	#6 Hydraulic Hose
6	#8 Hydraulic Hose
7	Capscrew
8	Lock Pin
9	Lower Pivot Pin
10	Lockwasher
11	Nut

#	Description
12	Mounting Base
13	Grease Fitting
14	Grease Fitting Cover
15	Rear Carriage Tilt Cylinder
16	Check Valve
17	Wiring Harness
18	Grease Fitting Cover
19	Grease Fitting
20	Bushing
21	Pressure Reducing Valve

Fig. 7-17: Rear Oscillation Lock Cylinder Installation

(Ref. Fig. 7-17) The following steps are required to remove the rear oscillation lock cylinder:

1. Follow preparation procedures as outlined in Section 3.
2. Place blocks between frame and top of rear axle. These will hold the frame in place when the cylinder is removed.
3. Install brake pressure diagnostic port test gauge onto brake diagnostic port.
4. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.
5. Place a suitable drip pan under rear oscillation lock cylinder.

WARNING: Residual hydraulic pressure may be trapped in rear oscillation lock cylinder. Wear proper eye and hand protection when releasing pressure from cylinder. Hydraulic fluid under pressure can be injected under skin or into eyes, resulting in serious personal injury or death.

6. Slowly loosen each check valve (Item 16) on control block (labeled 3.1 and 3.2) to allow residual pressure to escape. After pressure has been released, torque check valves to 50 ft-lbs.
7. Tag and disconnect three (3) hydraulic hoses (Items 5 and 6) at oscillation control block. Cap hoses and fittings.
8. For models with control manifold hydraulics, disconnect wiring harness electrical connection (Item 17) at oscillation control block.
9. Remove nut (Item 1), lockwasher (Item 2), and capscrew (Item 4) securing cylinder upper pivot pin (Item 3) to frame.
10. Remove capscrew (Item 4), lockwasher (Item 2), and lock pin (Item 8) securing cylinder lower pivot pin (Item 9).
11. Place a sling around cylinder (Item 15) and attach sling to suitable lifting equipment. Make sure sling and lifting equipment have sufficient capacity. The rear oscillation lock cylinder weighs approximately 200 pounds. Using lifting equipment, support weight of cylinder.
12. Remove upper and lower pivot pins (Items 3 and 9). Move cylinder out and up from machine.

Installation

Rear Oscillation Lock Cylinder

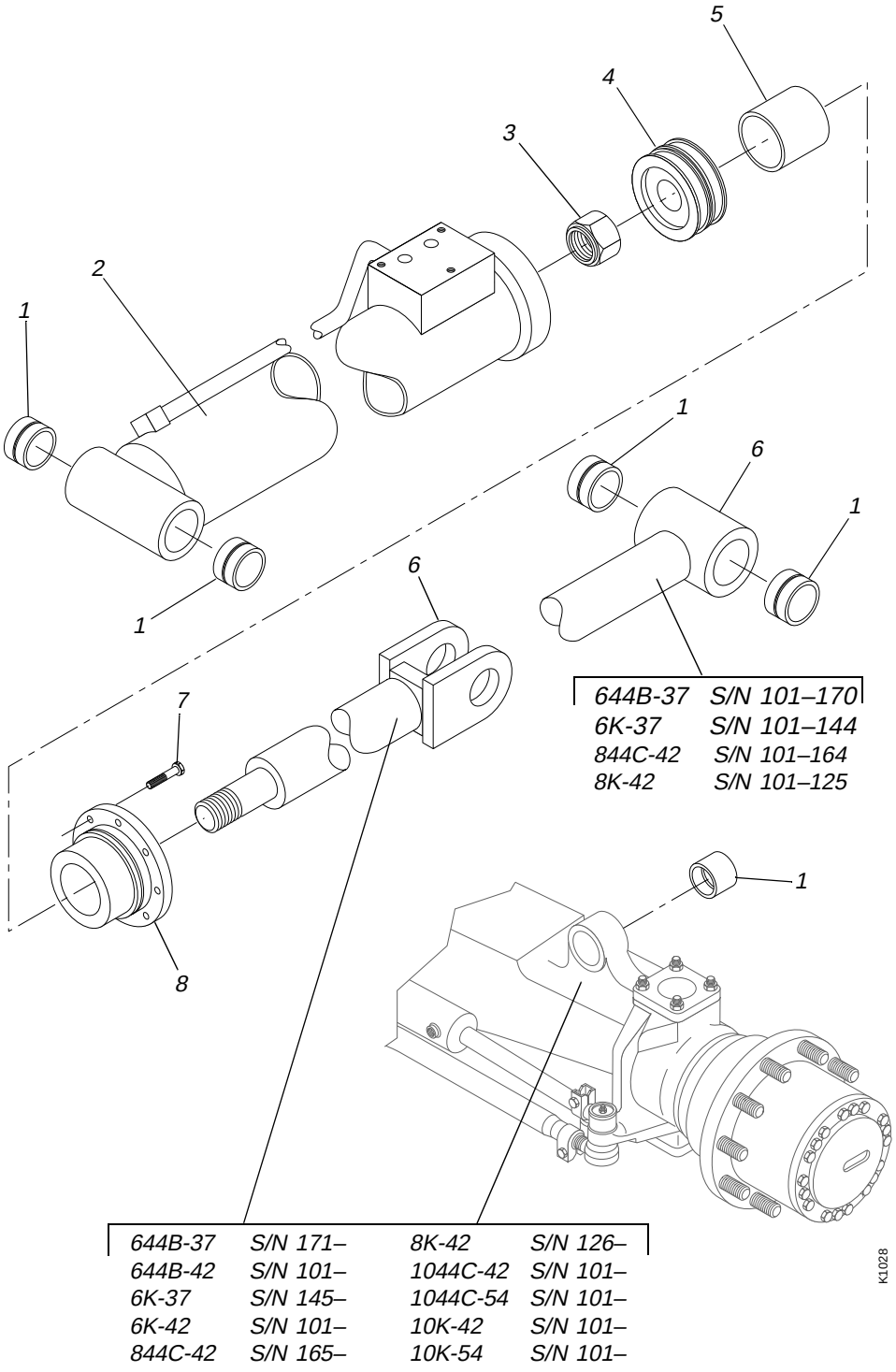
(Ref. Fig. 7-17) The following steps are required to install the rear oscillation lock cylinder:

1. Prior to installation, lubricate upper and lower pivot pins with a light coating of grease.
2. Using suitable lifting equipment, position upper cylinder pivot at frame pivot. Install upper pivot pin (Item 3) so hole in pin is aligned with hole in frame boss. Secure upper pivot pin with capscrew (Item 4), lockwasher (Item 2), and nut (Item 1). Torque nut to 180 in-lbs.

3. If necessary (models with a cylinder as illustrated in View A), install mounting base (Item 12) with four (4) each capscrews (Item 7), lockwashers (Item 10), and nuts (Item 11). Torque nuts to 280 ft-lbs.
4. If necessary (models with a cylinder as illustrated in View A), install bushing (Item 20) in rear axle boss. Install bushing so that it is centered in axle boss
5. Position lower cylinder pivot on axle and install lower pivot pin. Secure pin with lock pin (Item 8), lockwasher (Item 2), and capscrew (Item 4). Torque capscrew to 55 ft-lbs.
6. Attach hydraulic hoses to fittings on oscillation control block. Torque nut on #8 hose (Item 6) to 44–48 ft-lbs. Torque nuts on #6 hoses (Item 5) to 235–265 in-lbs (20–22 ft-lbs).
7. For models with a cylinder as illustrated in View A, connect electrical lead from wiring harness (Item 17) at oscillation control block.
8. If necessary, install grease fittings (Items 13 and 19) and grease fitting covers (Items 14 and 18). Torque grease fittings 1.5–3 turns past finger tight. Lubricate upper and lower pivots with grease.
9. Start engine and cycle frame tilt fully left and right several times to purge air from hydraulic system. Lower boom and shut off engine.
10. Inspect for hydraulic leaks and repair as necessary.
11. Check oil level in hydraulic reservoir and add as necessary. See “Filling Hydraulic Reservoir” in Section 5 for procedures.

Overhaul

Rear Oscillation Lock Cylinder



#	Description
1	Bushing
2	Barrel
3	Rod Nut
4	Piston

#	Description
5	Stroke Limiter
6	Rod
7	Capscrew
8	Head

Fig. 7-18: Rear Oscillation Lock Cylinder (Exploded View)

Disassembly, Rear Oscillation Lock Cylinder

(Ref. Fig. 7-18) Disassembly procedures for the rear oscillation lock cylinder are as follows:

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 cylinder.
2. See warning and procedures on page 7-34 for removal of oscillation control block.
3. Slowly extend and retract cylinder by hand to remove most of the hydraulic oil.
4. Remove eight (8) capscrews (Item 7) securing head (Item 8) to barrel (Item 2).
5. Pull rod (Item 6) out to help remove head. Support rod and head during removal to prevent damage. Do not wiggle the rod or head back and forth to remove; this may damage the components.
6. Remove rod nut (Item 3), piston (Item 4), stroke limiter (Item 5), and head from rod.
7. If the bushings need to be replaced, see “Bushing Replacement, Rear Oscillation Lock Cylinder” below.

Cleaning and Inspection, Rear Oscillation Lock Cylinder

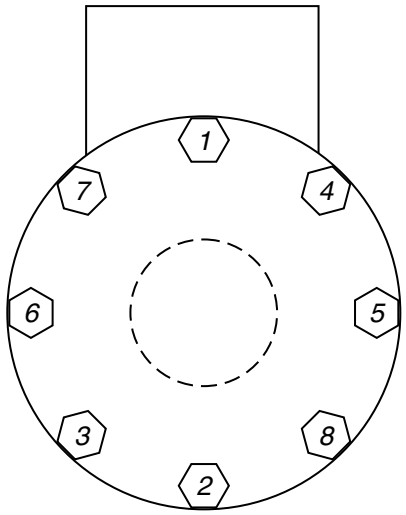
1. Remove all O-rings, wear rings, and backup rings from cylinder components and discard.
2. Thoroughly wash components in solvent and dry with compressed air.
3. Inspect inner surface of barrel, the outer surface of piston, and rod for scratches and scoring. If barrel, piston, or rod is damaged, the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

Bushing Replacement, Rear Oscillation Lock Cylinder

1. Fig. 7-18 shows both types of rod end configurations and bushing locations. Remove pivot bushings (Item 1) using a bushing driver and hammer or press. Drive one bushing all the way through to remove other bushing.
2. Install new bushings so they are flush with outer edge of boss to 0.02" below. For machines with lower (rod end) pivot bushing installed in rear axle: Install bushing so that it is centered in axle boss.

Assembly, Rear Oscillation Lock Cylinder

1. Lubricate new O-ring with hydraulic oil and install inside piston (seals the rod to the piston).
2. Lubricate new O-ring, backup ring, seals, and wear rings with hydraulic oil and install on head (Item 8). Using a seal driver, install new wiper seal in head. Lubricate wiper seal with hydraulic oil.
3. (Ref. Fig. 7-18) Slide head (Item 8), stroke limiter (Item 5) and piston (Item 4) onto rod (Item 6). Lubricate threads on rod with hydraulic oil and install rod nut (Item 3). Torque rod nut to 950 ft-lbs.
4. Lubricate new seal and wear rings with hydraulic oil and install on piston.
5. Lubricate threads on capscrews (Item 7) with hydraulic oil. Coat inside of barrel (Item 2) with hydraulic oil. Carefully insert rod and head into barrel. Do not damage seals during assembly. Install and snug capscrews (Item 7). Do not torque capscrews (instructions follow).



K1024

Fig. 7-19: Head Capscrew Torque Sequence

6. Following sequence shown in Fig. 7-19, torque head capscrews to an initial value of 30 ft-lbs. Follow sequence again and torque capscrews to a final value of 65 ft-lbs.
7. Install oscillation control block. See page 7-35.

Oscillation Control Block

Description

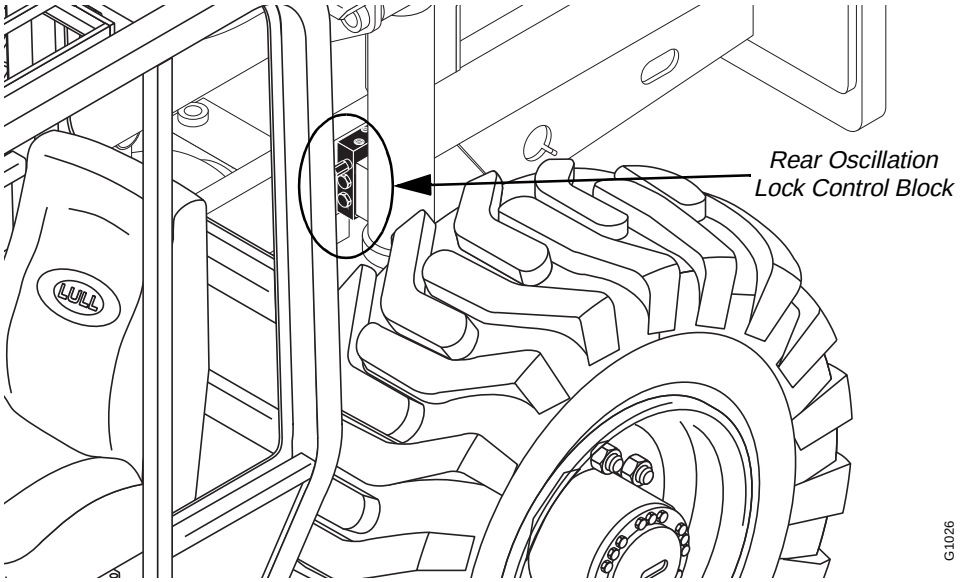


Fig. 7-20: Oscillation Control Block

(Ref. Fig. 7-20) The oscillation control block assembly controls the function of the rear oscillation lock cylinder.

When the oscillation lock system is in UNLOCK mode, the control block allows hydraulic fluid to freely pass into and out of the cylinder.

When the oscillation lock system is in LOCK mode, the control block traps hydraulic fluid in both the rod-end and base-end of the cylinder. This hydraulic lock in the cylinder prevents the frame from rotating on the rear axle.

(See Section 4, “Reference Diagrams” for more information.)

Hydraulic ports on the block:

SYS = System pressure from Pump 1 (front pump section). This fluid is routed to the cylinder.

T = Tank port. Fluid from this port is routed back to the hydraulic reservoir.

PIL = Pilot pressure port. This fluid actuates the pilot pistons, allowing free flow of fluid to/from the rear oscillation lock cylinder.

The major components of the oscillation control block assembly are:

1. Pressure reducing valve.
2. Solenoid valve (**V1**).
3. Two (2) check valves. These valves are labeled **3.1** and **3.2** on the block body.
4. Two (2) pilot pistons.

The functions of these components depend upon the mode of the oscillation lock system: LOCKED or UNLOCKED.

During LOCKED mode:

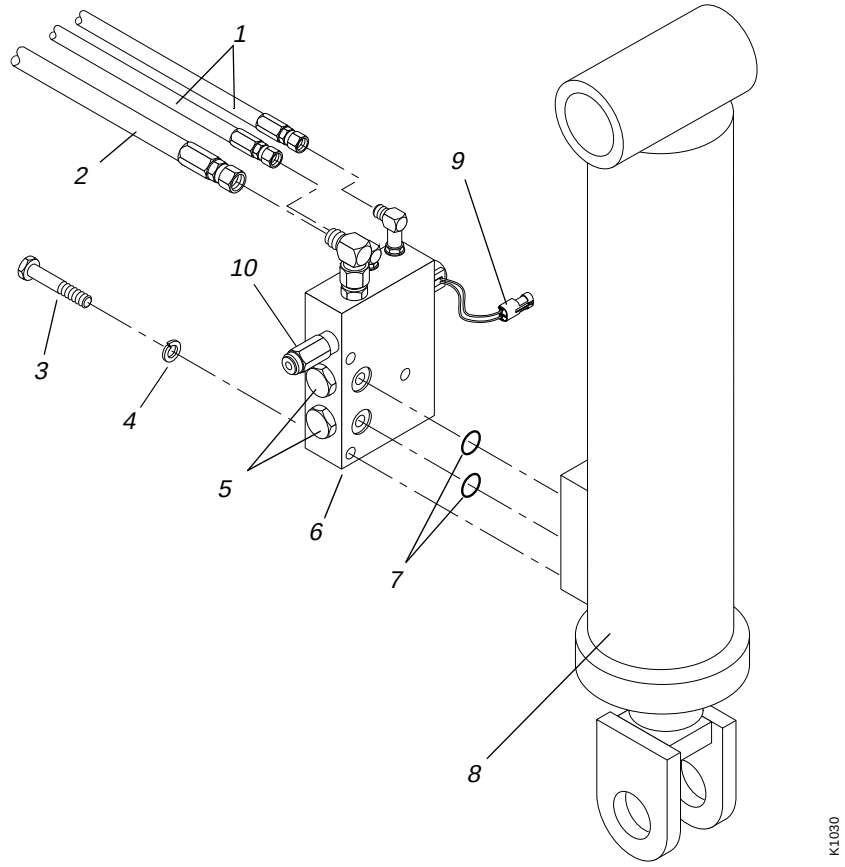
1. No electrical power is supplied to solenoid valve **V1**. Pilot pressure from port **PIL** does *not* reach the pilot pistons at check valves **3.1** and **3.2**.
2. Check valves **3.1** and **3.2** keep hydraulic fluid trapped in the cylinder, locking the cylinder and preventing the frame from rotating on the rear axle.
3. System pressure from port **SYS** is reduced to 150 psi at the pressure reducing valve. This fluid flows through an orifice and is then routed back to tank through port **T**.

During UNLOCKED mode:

1. Electrical power is supplied to solenoid valve **V1**. and pressure from port **PIL** is directed to each pilot piston. The pistons force open check valves **3.1** and **3.2**. Fluid may then enter and escape the rear oscillation lock cylinder, permitting the frame to rotate on the rear axle.
2. System pressure from port **SYS** is reduced to 150 psi at the pressure reducing valve. This fluid is available to the cylinder. Fluid from the cylinder, as well as excess from port **SYS**, is routed through an orifice and back to tank through port **T**.

Removal

Oscillation Control Block



#	Description
1	#6 Hydraulic Hose
2	#8 Hydraulic Hose
3	Capscrew
4	Lockwasher
5	Check Valve Cartridge

#	Description
6	Oscillation Control Block
7	O-Ring
8	Rear Oscillation Lock Cylinder
9	Electrical Lead
10	Pressure Reducing Valve

Fig. 7-21: Oscillation Control Block Installation

Rear Oscillation Lock Cylinder Installed on Machine

(Ref. Fig. 7-21) Use the following control block removal procedures when the rear oscillation lock cylinder is installed on the machine. For removal procedures when the cylinder has been removed, see page 7-34.

1. Follow preparation procedures as outlined in Section 3.
2. Place blocks between frame and top of rear axle. This will hold the frame in place when the control block is removed.
3. Install brake pressure diagnostic port test gauge onto brake diagnostic port.
4. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge from diagnostic port.

5. Place a suitable drip pan under rear oscillation lock cylinder.

WARNING: Residual hydraulic pressure may be trapped in rear oscillation lock cylinder. Wear proper eye and hand protection when releasing pressure from cylinder. Hydraulic fluid under pressure can be injected under skin or into eyes, resulting in serious personal injury or death.

6. Slowly loosen each check valve cartridge (Item 5) on control block (labeled 3.1 and 3.2) to allow residual pressure to escape. After pressure has been released, tighten check valves. If control block (Item 6) will not be overhauled, torque check valves to 45–50 ft-lbs.
7. For models with control manifold hydraulics, disconnect electrical connection (Item 9) at oscillation control block.
8. Tag and disconnect three (3) hydraulic hoses (Items 1 and 2) from the fittings at the oscillation control block. Cap hoses and fittings.
9. Remove three (3) capscrews (Item 3) and lockwashers (Item 4) securing control block to cylinder (Item 8). Remove control block.
10. Plug ports in cylinder.

Rear Oscillation Lock Cylinder Removed from Machine

(Ref. Fig. 7-21) Use the following control block removal procedures when the rear oscillation lock cylinder is removed from the machine. For removal procedures when the cylinder is installed on the machine, see page 7-33.

1. Support cylinder in a vice. Place a suitable pan or tray under cylinder.

WARNING: Residual hydraulic pressure may be trapped in rear oscillation lock cylinder. Wear proper eye and hand protection when releasing pressure from cylinder. Hydraulic fluid under pressure can be injected under skin or into eyes, resulting in serious personal injury or death.

2. Slowly loosen each check valve cartridge (Item 5) on control block (labeled 3.1 and 3.2) to allow residual pressure to escape. After pressure has been released, tighten check valves. If control block (Item 6) will not be overhauled, torque check valves to 45–50 ft-lbs.
3. Remove three (3) capscrews (Item 3) and lockwashers (Item 4) securing control block to cylinder. Remove control block.

Installation

Oscillation Control Block

Rear Oscillation Lock Cylinder Installed on Machine

(Ref. Fig. 7-21) Use the following control block installation procedures when the rear oscillation lock cylinder is installed on the machine. For installation procedures when the cylinder has been removed, see below.

1. Clean mating surfaces of rear oscillation lock cylinder and oscillation control block.
2. Lubricate two (2) O-rings (Item 7) with hydraulic oil and install in control block.
3. Position control block on cylinder and secure with three (3) capscrews (Item 3) and lockwashers (Item 4). Torque capscrews evenly to 80 ft-lbs.
4. Attach hydraulic hoses to fittings on oscillation control block (Item 6). Torque nut on #8 hose (Item 2) to 44–48 ft-lbs. Torque nuts on #6 hoses (Item 1) to 235–265 in-lbs (20–22 ft-lbs).
5. For models with control manifold hydraulics, connect electrical lead (Item 9) at control block.
6. Start engine and tilt frame fully left and right several times to purge air from the hydraulic system. Shut off engine and check for leaks.

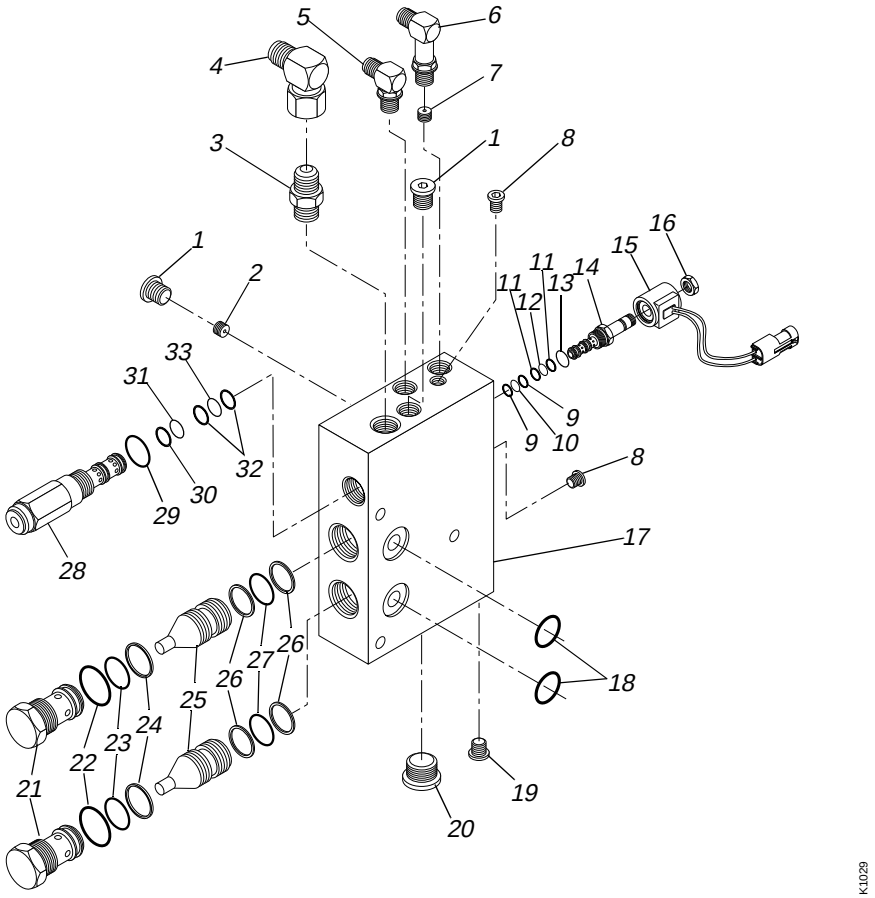
Rear Oscillation Lock Cylinder Removed from Machine

(Ref. Fig. 7-21) Use the following control block installation procedures when the rear oscillation lock cylinder is removed from the machine. For installation procedures when the cylinder is installed on the machine, see above.

1. Clean mating surfaces of rear oscillation lock cylinder and oscillation control block.
2. Lubricate two (2) O-rings (Item 7) with hydraulic oil and install in control block.
3. Position control block on cylinder and secure with three (3) capscrews (Item 3) and lockwashers (Item 4). Torque capscrews evenly to 80 ft-lbs.

Overhaul

Oscillation Control Block



#	Description
1	Plug, SAE #6
2	Orifice Plug
3	Check Valve
4	Swivel Fitting
5	Elbow, Adjustable O-Ring
6	Elbow w/ Orifice, O-Ring
7	Orifice Plug
8	Plug, SAE #2
9	Backup Ring
10	O-Ring
11	Backup Ring
12	O-Ring
13	O-Ring
14	Solenoid Valve
15	Solenoid Coil
16	Nut
17	Block Body

#	Description
18	O-Ring
19	Plug, SAE #4
20	Plug, SAE #10
21	Check Valve Cartridge
22	O-Ring
23	O-Ring
24	Backup Ring
25	Pilot Piston
26	Backup Ring
27	O-Ring
28	Pressure Reducing Valve Cartridge
29	O-Ring
30	Backup Ring
31	O-Ring
32	Backup Ring
33	O-Ring

Fig. 7-22: Oscillation Control Block (Exploded View)

(Ref. Fig. 7-22) Follow the guidelines for cleanliness as stated in Section 5 of this manual. The following procedures are for the disassembly, cleaning, and assembly of the oscillation control block.

Disassembly, Oscillation Control Block

Check Valve

1. Note position of hydraulic fittings (Items 4–6) installed in block body (Item 17) then remove fittings. Remove the check valve (Item 3) from the SYS port. The orifice plug (Item 7) is used on models with control manifold hydraulics and does not usually require removal.

   Note: *Elbow (Item 4) is used on models with control manifold hydraulics only. Models with mid-inlet hydraulics use a hydraulic hose which connects directly to the check valve (Item 3).*

Pressure Reducing Cartridge

2. Remove pressure reducing cartridge (Item 28) and two (2) check valve cartridges (Item 21).
3. Remove two (2) pilot pistons (Item 25).

Solenoid Valve

4. For models with control manifold hydraulics, remove the nut (Item 16) and coil (Item 15) from the solenoid valve (Item 14). Remove the solenoid valve.
5. Remove the two (2) SAE #6 plugs (Item 1), two (2) SAE #2 plugs (Items 8 and 34), SAE #4 plug (Item 19), and SAE #10 plug (Item 20).

   Note: *Models with mid-inlet hydraulics do not have the SAE #2 plug (Item 8).*

6. Orifice plug (Item 2) does not usually require removal. It will be cleaned when the block body is flushed.

Cleaning and Inspection, Oscillation Control Block

1. Remove O-rings and backup rings from pressure reducing valve cartridge (Item 28), two (2) check valve cartridges (Item 21), and solenoid valve (Item 14). Clean these components with solvent and dry with compressed air. Inspect components for condition and cleanliness.
2. Thoroughly flush block body (Item 17) with solvent and dry with compressed air.
3. Clean remaining components (except solenoid coil) with solvent and dry with compressed air.
4. Inspect orifice plugs (Items 2 and 7) for blockage and clean as necessary.

Assembly, Oscillation Control Block

1. If orifice plug (Item 2) was removed, install in block body (Item 17) so it is finger tight. Tighten orifice plug 2–3 turns past finger tight.
2. Install two (2) SAE #6 plugs (Item 1). Torque plugs to 210–230 in-lbs.

3. Install two (2) SAE #2 plugs (Items 8 and 34). Torque plugs to 30–40 in-lbs.

Note: *Models with mid-inlet hydraulics do not have the SAE #2 plug (Item 8).*

4. Install SAE #4 plug (Item 19). Torque plug to 125–145 in-lbs.
5. Install SAE #10 plug (Item 20). Torque plug to 71–79 ft-lbs (850–950 in-lbs).
6. Obtain new O-rings and backup rings for pressure reducing cartridge (Item 28), two (2) check valve cartridges (Item 21), two (2) pilot pistons (Item 25), and solenoid valve (Item 14). Lubricate all O-rings and backup rings with hydraulic oil before installing on components.

Pressure Reducing Cartridge

7. Install large O-ring (Item 29) on pressure reducing valve cartridge (Item 28).
8. Install backup ring (Item 30) and O-ring (Item 31) on cartridge so backup ring is behind O-ring as shown in Fig. 7-22. Note that backup ring and O-ring (Items 30 and 31) are slightly larger in diameter than Items 32 and 33.
9. Install two (2) backup rings (Item 32) and O-ring (Item 33) on cartridge so O-ring is between backup rings as shown in Fig. 7-22.
10. Lubricate all O-rings and backup rings on pressure reducing cartridge (Item 28). Install cartridge and torque to 270–300 in-lbs.

Solenoid Valve

11. For models with control manifold hydraulics,
    a. Install large O-ring (Item 13) on solenoid valve (Item 14).
    b. Install two (2) backup rings (Item 11) and O-ring (Item 12) on solenoid valve so O-ring is between backup rings as shown in Fig. 7-22.

    Note: *The backup rings and O-ring (Items 11 and 12) are slightly larger in diameter than Items 9 and 10.*

    c. Install two (2) backup rings (Item 9) and O-ring (Item 10) on solenoid valve so O-ring is between backup rings as shown in Fig. 7-22.
    d. Lubricate all O-rings and backup rings on solenoid valve (Item 14). Install solenoid valve and torque to 215–240 in-lbs.
    e. Install solenoid coil (Item 15) on solenoid valve so lettering is away from block body. Install nut (Item 16) and torque to 55–60 in-lbs.
12. Install two (2) backup rings (Item 26) and O-ring (Item 27) on each pilot piston (Item 25) so O-ring is between backup rings. (Ref. Fig. 7-22).
13. Lubricate backup rings and O-ring on each pilot piston (Item 25) and install pistons in block body. Tapered end of pistons must face out as shown in Fig. 7-22.
14. Install large O-ring (Item 22), O-ring (Item 23), and backup ring (Item 24) on each check valve cartridge (Item 21). Follow assembly sequence shown in Fig. 7-22.

15. Lubricate O-rings and backup ring on each check valve cartridge (Item 21). Install cartridges and torque to 45–50 ft-lbs (540–600 in-lbs).

Check Valve

16. Install check valve (Item 3) in SYS port and torque to 46–50 ft-lbs.
17. For models with control manifold hydraulics, install swivel fitting (Item 4) on check valve (Item 3). Position fitting as previously noted and torque to 44–48 ft-lbs.
18. Install adjustable fitting (Item 5) in T port. Position fitting as previously noted and torque to 300–340 in-lbs (25–29 ft-lbs).
19. If orifice plug (Item 7) was removed (models with control manifold hydraulics), install it in the elbow (Item 6) so it is finger tight. Then tighten it 2–3 turns past finger tight. Install the elbow in the PIL port and torque to 300–340 in-lbs (25–29 ft-lbs).
20. Two (2) O-rings (Item 18) are installed when control block is installed on rear oscillation lock cylinder. See “Installation” on page 7-35.

Frame Tilt Lockout Valve

Description

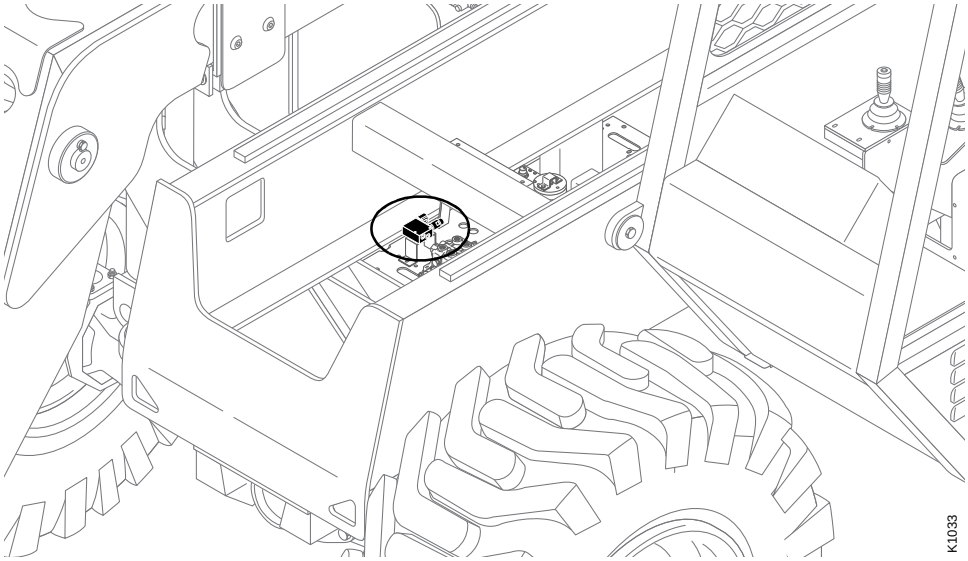
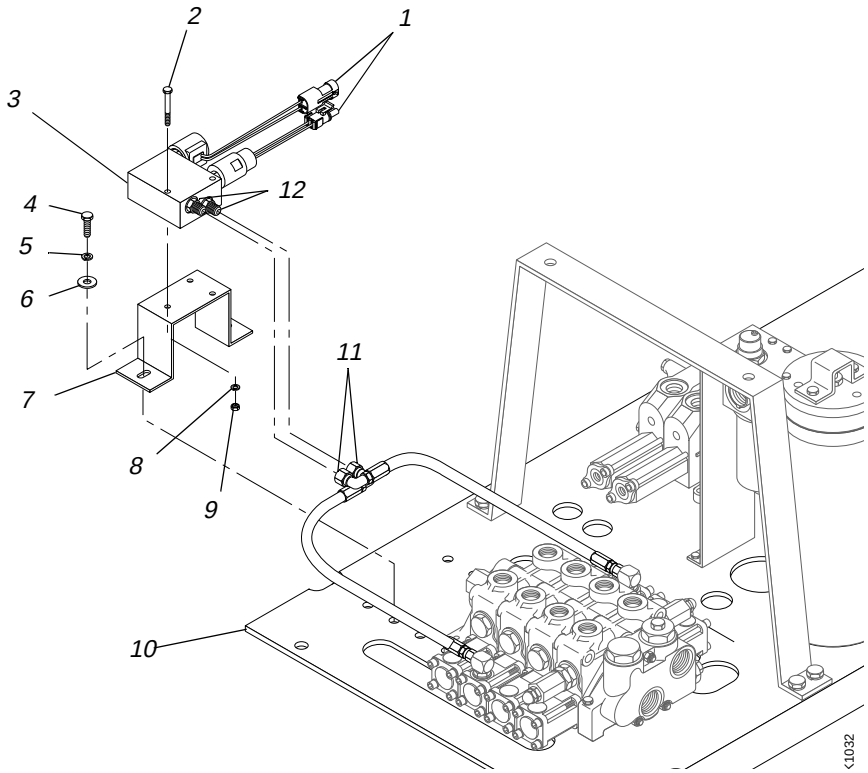


Fig. 7-23: Frame Tilt Lockout Valve

The frame tilt lockout valve is located on the valve plate, near the middle of the machine. The valve enables/disables frame tilt functions and is a component of the rear oscillation lock system on early production models only. See page 7-18 for further information concerning the operation of the valve.

Removal

Frame Tilt Lockout Valve



#	Description
1	Electrical Leads
2	Capscrew
3	Frame Tilt Lockout Valve
4	Capscrew
5	Lockwasher
6	Flatwasher

#	Description
7	Mounting Bracket
8	Lockwasher
9	Nut
10	Valve Plate
11	Hydraulic Hose
12	Connector

Fig. 7-24: Frame Tilt Lockout Valve Installation

(Ref. Fig. 7-24) The following procedure describes removal of the frame tilt lockout valve.

1. Follow preparation procedures as outlined in Section 3.
2. Tag and disconnect two (2) hydraulic hoses (Item 11) from connectors (Item 12) at frame tilt lockout valve (Item 3). Cap fittings and hoses.
3. Disconnect electrical leads (Item 1).
4. Remove two (2) capscrews (Item 4), lockwashers (Item 5), and flatwashers (Item 6) securing mounting bracket (Item 7) to valve plate (Item 10). Remove mounting bracket with lockout valve.
5. Remove two (2) capscrews (Item 2), lockwashers (Item 8), and nuts (Item 9) securing lockout valve to mounting bracket. Separate valve and bracket.

Installation

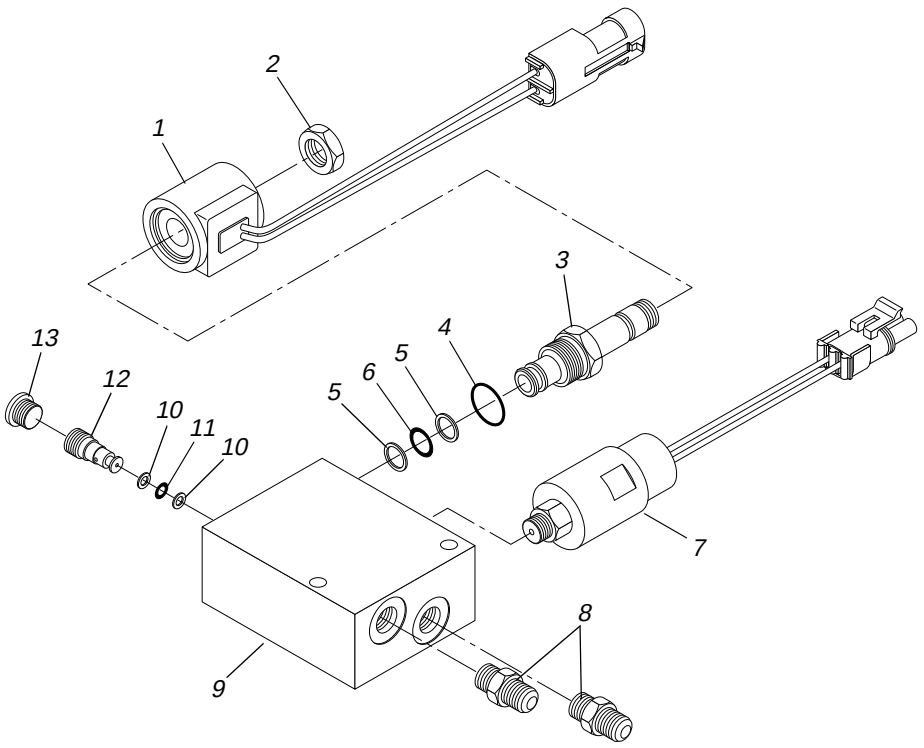
Frame Tilt Lockout Valve

(Ref. Fig. 7-24) The following procedure describes installation of the frame tilt lockout valve.

1. Position frame tilt lockout valve (Item 3) on mounting bracket (Item 7) and secure with two (2) capscrews (Item 2), lockwashers (Item 8), and nuts (Item 9). Torque nuts to 50 in-lbs.
2. Position mounting bracket on valve plate. Secure with two (2) flatwashers (Item 6), lockwashers (Item 5), and capscrews (Item 4). Torque capscrews to 156 in-lbs.
3. Connect electrical leads (Item 1).
4. Connect two (2) hydraulic hoses (Item 11) to connectors (Item 12). Torque nuts to 130–150 in-lbs.

Overhaul

Frame Tilt Lockout Valve



#	Description
1	Solenoid Coil
2	Nut
3	Solenoid Valve
4	O-Ring
5	Backup Ring
6	O-Ring
7	Frame Tilt Override Press. Switch

#	Description
8	O-Ring Fittings
9	Valve Body
10	Backup Ring
11	O-Ring
12	Shuttle Valve
13	Plug, O-Ring

Fig. 7-25: Frame Tilt Lockout Valve (Exploded View)

(Ref. Fig. 7-25) Follow the guidelines for cleanliness as stated in Section 5 of this manual. The following procedures are for the disassembly, cleaning, and assembly of the frame tilt lockout valve.

Disassembly, Frame Tilt Lockout Valve

1. Remove two (2) fittings (Item 8) from valve body (Item 9).

Frame Tilt Override Press. Switch

2. Remove frame tilt override pressure switch (Item 7). Place wrench on hex fitting at base of switch. Do not apply torque to body of switch.

Solenoid Valve

3. Remove nut (Item 2) and solenoid coil (Item 1) from solenoid valve (Item 3). Remove solenoid valve.
4. Remove plug (Item 13) and shuttle valve (Item 12).

Cleaning and Inspection, Frame Tilt Lockout Valve

1. Remove O-rings and backup rings from solenoid valve (Item 3) and shuttle valve (Item 12). Clean these components with solvent and dry with compressed air. Inspect components for condition and cleanliness. Ball in shuttle valve must move freely.
2. Thoroughly flush valve body (Item 9) with solvent and dry with compressed air.
3. Clean remaining components (except solenoid coil and pressure switch) with solvent and dry with compressed air.

Assembly, Frame Tilt Lockout Valve

1. Install new O-ring (Item 11) and backup rings (Item 10) on shuttle valve (Item 12). Follow assembly sequence as shown in Fig. 7-25. Lubricate O-ring with hydraulic oil.
2. Install shuttle valve (Item 12) in valve body (Item 9). Torque shuttle valve to 95–120 in-lbs.
3. Install plug (Item 13) and torque to 125–145 in-lbs.

Solenoid Valve

4. Install large O-ring (Item 4) on solenoid valve (Item 3). Install backup rings (Item 5) and O-ring (Item 6) on solenoid valve (Item 3). Follow assembly sequence as shown in Fig. 7-25. Lubricate O-rings with hydraulic oil.
5. Install solenoid valve (Item 3) and torque to 215–240 in-lbs.
6. Install solenoid coil (Item 1) on solenoid valve so lettering is away from valve body. Install nut (Item 2) and torque to 55–60 in-lbs.

Frame Tilt Override Press. Switch

7. Install frame tilt override pressure switch (Item 7). Place wrench on hex fitting at base of switch. Do not apply torque to body of switch. Torque switch to 130–150 in-lbs.
8. Install fittings (Item 8) and torque to 205–235 in-lbs.

Boom Elevation Proximity Switch

Description

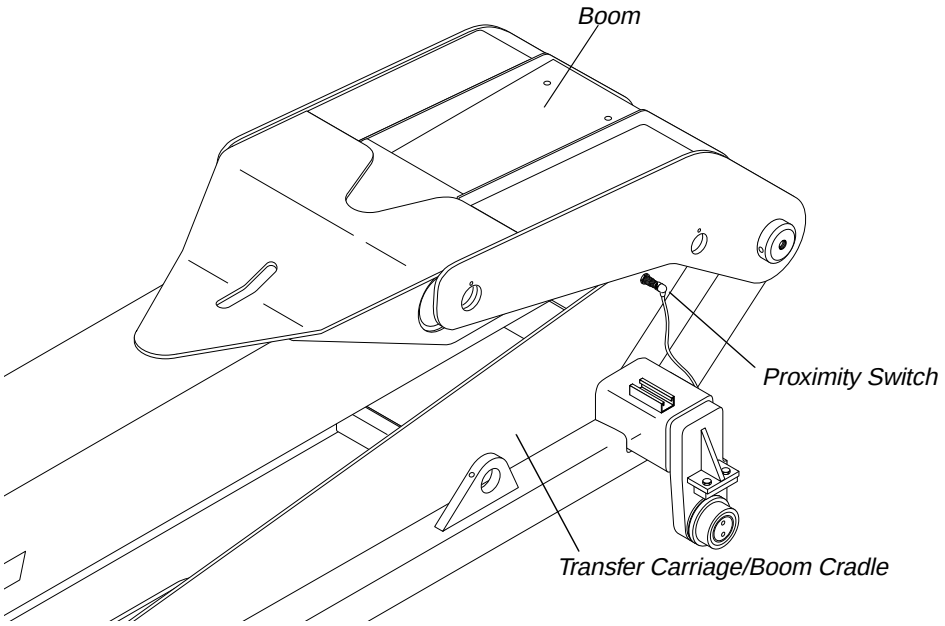


Fig. 7-26: Boom Elevation Proximity Switch

(Ref. Fig. 7-26) The boom elevation proximity switch is located on the left side of the transfer carriage/boom cradle. This normally open switch closes when the boom is below 40° elevation. The switch is a component of the rear oscillation lock system. See “Rear Oscillation Lock System” on page 7-18.

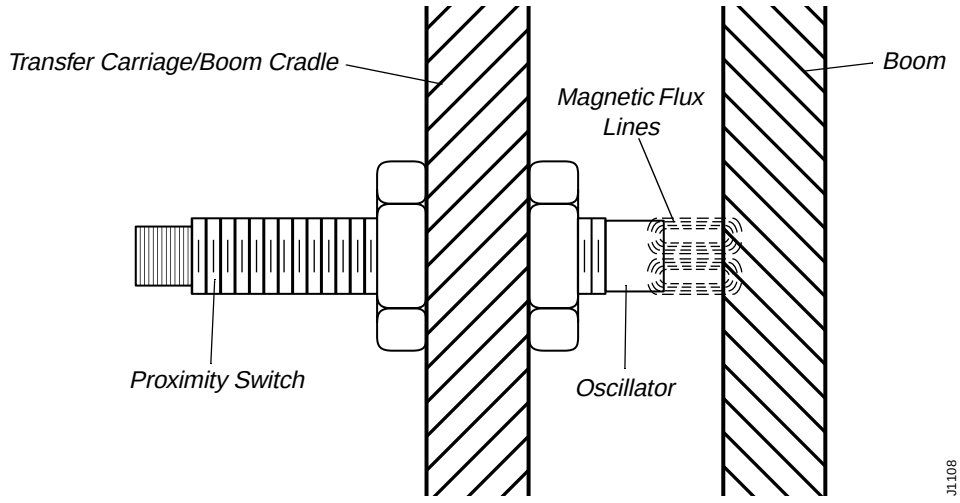
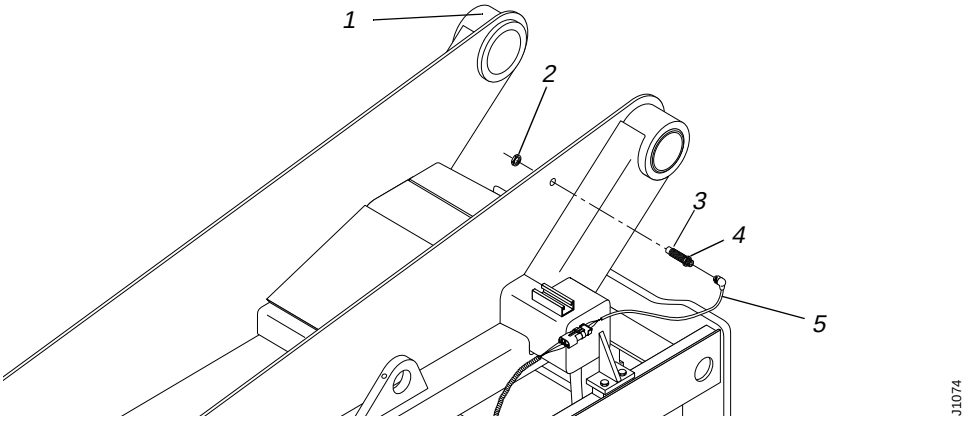


Fig. 7-27: Boom Elevation Proximity Switch Operation

(Ref. Fig. 7-27) The switch operates by sending out a constant, high frequency magnetic field a short distance from the oscillator end of the switch. Eddy currents are produced in metal when the magnetic flux lines pass through it. These eddy currents oppose the oscillations of the magnetic flux lines and the oscillations stop. A sensor in the switch detects if the oscillator is on or off and this gives the switch its on/off function.

Removal

Boom Elevation Proximity Switch



#	Description
1	Transfer Carriage/Boom Cradle
2	Inner Jam Nut
3	Proximity Switch

#	Description
4	Outer Jam Nut
5	Wire Harness

Fig. 7-28: Boom Elevation Proximity Switch Assembly

1. (Ref. Fig. 7-28) Disconnect wire harness (Item 5) at boom proximity switch (Item 3).
2. Place a piece of masking tape around proximity switch body at the outer jam nut (Item 4) (this will serve as a guide during re-installation).
3. Remove inner jam nut (Item 2) and proximity switch form transfer carriage/boom cradle (Item 1). Re-install inner jam nut on proximity switch for safekeeping.

Installation

Boom Elevation Proximity Switch

1. Position outer jam nut (Item 4) on switch body (Item 3) at previously marked position.
2. Install boom proximity switch in transfer carriage/boom cradle (Item 1). Install inner jam nut (Item 2). Check gap between end of proximity switch and boom. See Fig. 7-29.
3. Connect wire harness (Item 5) to proximity switch.
4. Check operation of proximity switch by raising the boom. The **Rear Osc Lock** light must come on at approximately 40° of boom elevation. If the light does not illuminate, stop and lower boom. Proceed to “Adjustment” below.

Adjustment

Boom Elevation Proximity Switch

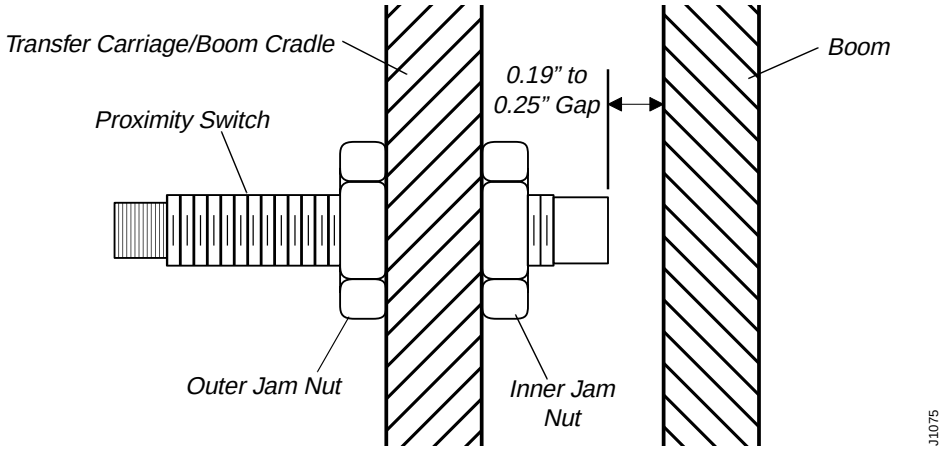


Fig. 7-29: Boom Elevation Proximity Switch Adjustment

1. Loosen, but do not remove the two (2) jam nuts on the proximity switch body.
2. Check gap between switch and boom. Gap must be within the range specified in Fig. 7-29.
3. If **Rear Osc Lock** light does not illuminate when boom is at approximately 40° elevation, adjust proximity switch to slightly reduce the gap. Do not exceed gap tolerances specified in Fig. 7-29. Snug jam nuts to hold switch in position.
4. Raise boom and check operation of **Rear Osc Lock** light. The light must come on at approximately 40° of boom elevation. If light does not illuminate, stop and lower boom. Repeat Step 3.
5. Tighten jam nuts.

Section 8 — Transmission

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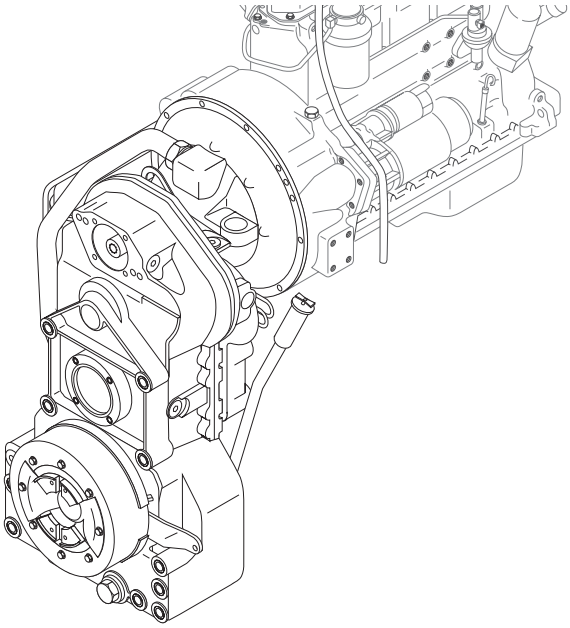

E1014

Fig. 8-1: ZF Transmission

Description

ZF Transmission with DW-2 Shifter

644B-37 (S/N 101–880)
6K-37 (S/N 101–397)
6K-42 (S/N 101–131)
644B-42 (S/N 101–241)
844C-42 (S/N 101–783)
8K-42 (S/N 101–261)
1044C-42 (S/N 101–121)
10K-42 (S/N 101–107)
1044C-54 (S/N 101–25)
10K-54 (S/N 101–107, 109)

The ZF transmission system that uses a DW-2 shifter employs an EST-19 microprocessor control unit and contains the following six components:

1. DW-2 Speed Range/Direction Selector (Part Number 35367A)

   The DW-2 speed range and direction selector is a column-mounted shifter consisting of a rotary switch for speed range selection and microswitches for neutral, forward, and reverse selection. It sends input signals to the EST-19 microprocessor control unit.

2. EST-19 12V Microprocessor Control Unit

   a. For 3-Speed Transmission:
      P31564 — Declutches 1st and 2nd Only (no longer available)
      37494X — Declutches All Speed Ranges

   b. For 4-Speed Transmission:
      P31565 — Declutches 1st and 2nd Only (no longer available)
      37495X — Declutches All Speed Ranges

   This control unit processes all driver instructions concerning speed range and direction (inputs from the shifter). It also interprets two frequency inputs from the inductive transmitter and processes digital inputs for clutch cut-off from the parking brake pressure switch, the service brake pressure switch, and rear oscillation lock circuitry.

3. 3- or 4-Speed Transmission

   a. 38369A — 3-Speed Transmission

   b. 38370A — 4-Speed Transmission

   The 3- and 4-speed transmission consists of a torque converter coupled to a multi-speed powershift transmission with an integrated transfer case. The 3-speed design has three forward and three reverse speeds. The 4-speed design has four forward and three reverse speeds. Speed ranges and direction can be engaged and disengaged under load with hydraulically-actuated multidisc clutches.

4. ZF Cable Harness

   a. P31566 — Used with 3- and 4-speed transmissions which employ an EST-19 Microprocessor Control Unit

   The ZF cable harness adapts the vehicle's power supply to the ZF transmission system and completes the electrical connections between the EST-19 microprocessor, shifter, transmission valve assembly, and the inductive transmitter.

5. Inductive Sensor

   a. P32077 — Sensor used with 3- or 4-speed transmissions which employ an EST-19 Microprocessor Control Unit

   The inductive sensor is a pulse transmitter. Its function is to protect the transmission and engine from over-speeding or over-revving caused by sudden downshifting or high-speed reversals by transmitting input frequency signals which equate ground speed to the microprocessor.

6. Vehicle Electrical System

   The ZF transmission will not operate without an uninterrupted 12 volt power supply. The recommended continuous operating voltage is 10.5–16.5 volts. Intermittent voltage, low voltage, or voltage exceeding 16.5 may cause the EST-19 to shut down until voltage is stabilized within recommended parameters.

ZF Transmission with DW-3 Shifter

6K-37 (S/N 398–)
6K-42 (S/N 132–)
644B-37 (S/N 881–)
644B-42 (S/N 242–)
8K-42 (S/N 262–)
844C-42 (S/N 784–)
10K-42 (S/N 108–)
10K-54 (S/N 108, 110–)
1044C-42 (S/N 122–)
1044C-54 (S/N 216–)

The ZF transmission system that uses a DW-3 shifter contains the following four components:

1. DW-3 Speed Range/Direction Selector (Part Number 65014B)

   The column-mounted shifter consists of a rotary switch for speed range selection and microswitches for neutral, forward, and reverse selection. The DW-3 shifter sends signals directly to the solenoids at the transmission valve assembly.

2. 3- or 4-Speed WG100 Transmission

   a. 38369A — 3-Speed Transmission

   b. 38370A — 4-Speed Transmission

The 3- or 4-speed WG100 transmission consists of a torque converter coupled to a multi-spool powershift transmission with an integrated transfer case. The 3-speed design has three forward and three reverse speeds. The 4-speed design has four forward and three reverse speeds. Speed ranges and direction can be engaged and disengaged under load with hydraulically-actuated multidisc clutches.

3. Transmission Harness Connection DW-3 Shifter to Transmission Solenoid Valve Assembly

   a. 65011D — Harness

   b. 65899A — Connector Assembly (not used with 4-speed transmission)

   c. 37657X — Declutch Relay

   d. P21787 — Diodes

   The transmission harness adapts the vehicle's power supply to the ZF transmission and completes the electrical connections between the DW-3 speed range/direction selector, the solenoids at the transmission valve assembly, the declutch relay, and the shunt diodes.

   The function of the declutch relay is to inhibit power into the shifter from the vehicle's electrical supply into the shifter when the boom is above 40°, when the park brake is applied, or when the service brake is applied and the transmission disconnect switch is in the "ON" position. This results in no directional signals exiting the shifter to the transmission's M1 or M3 directional solenoids. If the declutch relay is functioning correctly, the transmission should not engage when the boom is above 40°, when the park brake is applied, or when the service brake is applied with the transmission disconnect switch in the "ON" position.

   The five shunt diodes function to protect the contacts of the rotary and micro switches in the DW-3 shifter. When the rotary and micro switches inside the DW-3 shifter are closed and then opened, magnetic fields around the activated transmission valve solenoids collapse, creating reverse polarity or negative voltage. Reverse polarity spikes or negative voltage spikes can seek a path of lesser resistance to ground through the shunt diodes rather than arcing and damaging the switch contacts of the DW-3 shifter (see page 8-16 for more information).

4. Vehicle Electrical System

   The ZF transmission will not operate without an uninterrupted 12 volt power supply. The recommended operating voltage is 10.5–16.5 volts.

Troubleshooting and Test Procedures

Troubleshooting Options

ZF Transmission with DW-2 Shifter

644B-37 (S/N 101–880)
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8K-42 (S/N 101–261)
1044C-42 (S/N 101–121)
10K-42 (S/N 101–107)
1044C-54 (S/N 101–25)
10K-54 (S/N 101–107, 109)

1. Check for correct fluid and fluid level. Consult Service/Lubrication Schedule and see the Transmission Oil Selection Chart located in the Owner/Operator Manual.
2. Check vehicle electrical supply.
   a. See “Testing ZF Transmission Electrical System” on page 8-6.
   b. Monitor voltage supply for interruption. Check to make sure there is an uninterrupted 10.5–16.5 volts.
   c. Check 7.5 amp fuse.
   d. Check ground connections and plug connectors.
3. Isolate pressure/proximity switches. The park brake pressure switch, the service brake pressure switch in conjunction with the transmission declutch switch, and the rear oscillation lock proximity switch in conjunction with the proximity switch relay (R1 relay) can declutch the transmission.
   a. Unplug the park brake pressure switch.
   b. Unplug the service brake pressure switch or position the transmission declutch switch to the “OFF” setting.
   c. Remove the proximity switch relay (R1 relay).
4. Check shifter signals. See “DW-2 Shifter System Tests” on page 8-7.
5. Check computer signals. See “DW-2 Shifter System Tests” on page 8-7.
6. Check inductive transmitter. See “Inductive Sensor Test” on page 8-9. The correct readings should be 1.35–1.55 kW. Check for pinched or severed wires on units employing a computer and utilize the inductive transmitter.
7. Check transmission valve solenoids (M1, M2, M5, M3, M4; resistance should be 24–40 W).
8. Check long harness. It adapts the vehicle’s power supply to the ZF transmission system and completes the electrical connections between the EST-19 microprocessor, shifter, transmission valve assembly, and the inductive transmitter.
   a. Inspect connections.
   b. Inspect harness for damage.
   c. Perform continuity tests. See Section 4, “Reference Diagrams” for system schematics.

9. Check short harness. It connects the solenoids to the transmission valve connector. It is accessible by removing the transmission valve assembly cover.
    a. Inspect harness and connections from solenoids to the transmission valve connector.
    b. Test continuity between plug ends and valve connector pins.
10. Check transmission pressure. Control pressure should be 230–260 psi (16–18 bar). See “ZF Transmission Pressure Checks” on page 8-23.

ZF Transmission with DW-3 Shifter

6K-37 (S/N 398–)
6K-42 (S/N 132–)
644B-37 (S/N 881–)
644B-42 (S/N 242–)
8K-42 (S/N 262–)
844C-42 (S/N 784–)
10K-42 (S/N 108–)
10K-54 (S/N 108, 110–)
1044C-42 (S/N 122–)
1044C-54 (S/N 216–)

1. Check for correct fluid and fluid level. Consult Service/Lubrication Schedule and see the Transmission Oil Selection Chart located in the Owner/Operator Manual.
2. Check vehicle electrical supply.
    a. See “Testing ZF Transmission Electrical System” on page 8-6.
    b. Monitor voltage supply for interruption. Check to make sure there is an uninterrupted 10.5–16.5 volts.
    c. Check 7.5 amp fuse.
    d. Check ground connections and plug connectors.
3. Isolate pressure/proximity switches. The park brake pressure switch, the service brake pressure switch in conjunction with the transmission declutch switch, and the rear oscillation lock proximity switch in conjunction with the proximity switch relay (R1 relay) can declutch the transmission.
    a. Unplug the park brake pressure switch.
    b. Unplug the service brake pressure switch or position the transmission declutch switch to the “OFF” setting.
    c. Remove the proximity switch relay (R1 relay).
4. Check shifter signals. See “DW-3 Shifter System Tests” on page 8-10.
5. Check shifter signals at the transmission solenoid assembly. See“DW-3 Signals at Transmission Test” on page 8-14.
6. Check transmission valve solenoid integrity. Test resistance of all five solenoids. Resistance should be 24–40 W.
7. Check long harness (connects shifter to transmission valve connector.
    a. Inspect connections.
    b. Inspect harness for pinched or severed wires.
8. Check short harness (connects solenoids to transmission valve connector).
    a. Inspect harness and connections from the solenoids to the valve connector.
    b. Test continuity between plug ends and valve connector pins.

9. Check transmission pressure. Control pressure should be 230–260 psi (16–18 bar). See “ZF Transmission Pressure Checks” on page 8-23.

Testing ZF Transmission Electrical System

ZF Transmission with DW-2 Shifter

644B-37 (S/N 101–880)
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8K-42 (S/N 101–261)
1044C-42 (S/N 101–121)
10K-42 (S/N 101–107)
1044C-54 (S/N 101–25)
10K-54 (S/N 101–107, 109)

If an electrical supply problem is suspected, the operator may also experience circuit failures, alternator/charging problems, or starting problems. These problems should be addressed and corrected prior to proceeding with diagnosis of the ZF transmission electrical system. Once this is done, proceed with the following steps:

1. Check battery integrity to ensure that it has not discharged.
2. Check battery cable connections.
3. Check 30 amp circuit breaker to ensure that it is not defective or stuck in open position.
4. Check battery post connection at ignition switch.
5. Check the ignition switch as follows:
   a. With the ignition switch in the “OFF” position, only the Bat. Post should be active.
   b. With the ignition switch in the “ACC” position, only the Bat. Post and the Acc Post should be active.
   c. With the ignition switch in the “ON” position, only the Bat. Post, Acc Post, and the Ign Post should be active.
   d. With the ignition switch in the “ST.” position, only the Bat. Post, Ign Post, and St. Post should be active.
6. Check ignition switch relay (if equipped).
7. Check 7.5 amp fuse (8 amp fuse for early production models) and fuse holder.
8. Check shifter signals. See “DW-2 Speed Range/Direction Signal Test” on page 8-7.
9. Check shifter signals at the transmission solenoid assembly. See “DW-2 Signals from EST-19 to Transmission Solenoid Assembly Test” on page 8-8.
10. Check park brake switch, service brake pressure switch, and proximity switch. See pages 8-17, 8-18, and 8-20.

ZF Transmission with DW-3 Shifter

6K-37 (S/N 398–)
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10K-42 (S/N 108–)
10K-54 (S/N 108, 110–)
1044C-42 (S/N 122–)
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If an electrical supply problem is suspected, the operator may also experience circuit failures, alternator/charging problems, or starting problems. These problems should be addressed and corrected prior to proceeding with diagnosis of the ZF transmission electrical system. Once this is done, proceed with the following steps:

1. Check battery integrity to ensure that it has not discharged.
2. Check battery cable connections.
3. Check 30 amp circuit breaker to ensure that it is not defective or stuck in open position.
4. Check battery post connection at ignition switch.
5. Check the ignition switch as follows:
   a. With the ignition switch in the “OFF” position, only the Bat. Post should be active.
   b. With the ignition switch in the “ACC” position, only the Bat. Post and the Acc. Post should be active.
   c. With the ignition switch in the “ON” position, only the Bat. Post, Acc. Post, and the Ign. Post should be active.
   d. With the ignition switch in the “ST.” position, only the Bat. Post, Ign. Post, and St. Post should be active.
6. Check ignition switch relay (if equipped).
7. Check 7.5 amp fuse and fuse holder.
8. Check park brake pressure switch, service brake pressure switch, and proximity switch. See pages 8-17, 8-18, and 8-20.

DW-2 Shifter System Tests

644B-37 (S/N 101–880)
6K-37 (S/N 101–397)
6K-42 (S/N 101–131)
644B-42 (S/N 101–241)
844C-42 (S/N 101–783)
8K-42 (S/N 101–261)
1044C-42 (S/N 101–121)
10K-42 (S/N 101–107)
1044C-54 (S/N 101–25)
10K-54 (S/N 101–107, 109)

DW-2 Speed Range/Direction Signal Test

1. Park the machine on level ground, lower the boom, and block the wheels.

2. Make sure the parking brake is disengaged and the service brake is not applied.
3. Transmission declutch switch must be in “OFF” position.
4. With the engine off, turn ignition switch to the “ON” position. Do not start the engine.
5. Wait five seconds before selecting a direction and speed range. This allows the EST-19 to perform self diagnostic checks.
6. Probe colored wires from shifter at the front of the sealed connectors. Test all direction and speed range signal combinations shown in Fig. 8-2. If other discrepancies are found, contact the JLG Service Department.

   Note: Use a 12V test light or a multimeter.

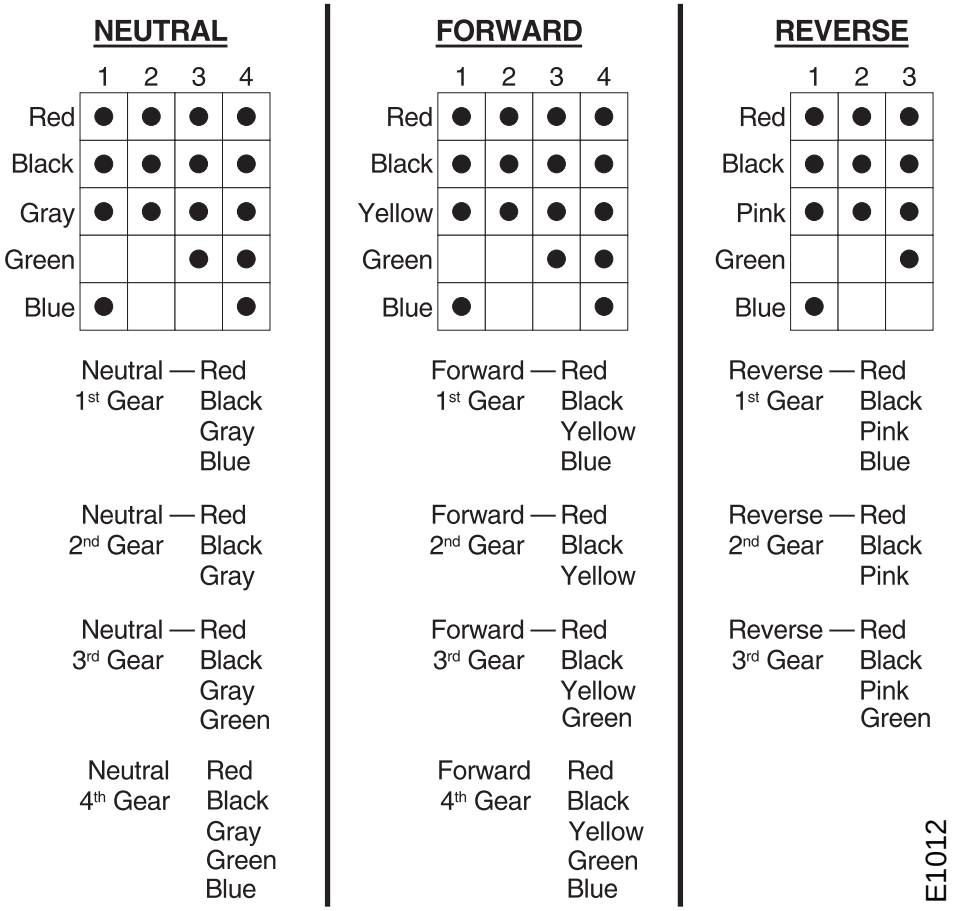
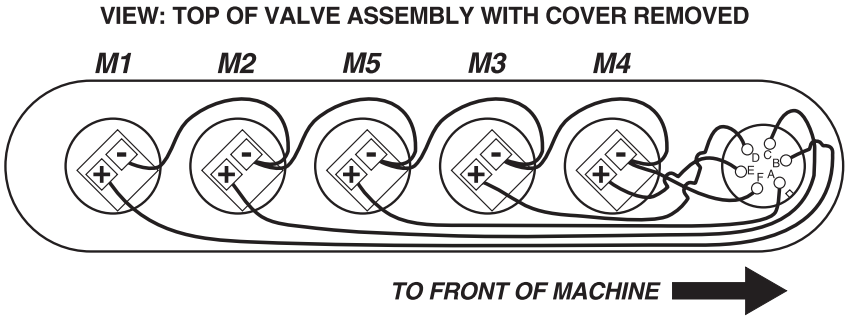


Fig. 8-2: DW-2 Signal/Wire Combinations

DW-2 Signals from EST-19 to Transmission Solenoid Assembly Test

1. Park the machine on level ground, lower the boom, and block the wheels.
2. Make sure the parking brake is disengaged and the service brake is not applied.

3. Because the proximity switch can also declutch the transmission, the boom elevation must be lower than 40°.
4. Remove cover at transmission valve to gain access to solenoids.
5. Turn ignition to “ON” position.
6. Wait five seconds before shifting. This allows the EST-19 to perform self-diagnostic testing.
7. Select direction and speed range.
8. Probe positive (+) contacts for voltage.
9. Test all direction and speed range combinations shown in Fig. 8-3.
10. If any discrepancies are found, contact the JLG Service Department.



WG-100, 3- OR 4-SPEED TRANSMISSION SOLENOID CONFIGURATION
DW-2 CONTROLLER SIGNALS MEASURED AT VALVE SOLENOIDS

Forward, Declutch OFF	Forward. Declutch ON	Neutral
1st Gear — M3 M2 M4	1st Gear — M2 M4	1st Gear — —
2nd Gear — M3 M4	2nd Gear — M4	2nd Gear — —
3rd Gear — M3	3rd Gear — —	3rd Gear — —
4th Gear — M5	4th Gear — —	4th Gear — —

Reverse, Declutch OFF	Reverse, Declutch ON
1st Gear — M1 M2 M4	1st Gear — M2 M4
2nd Gear — M1 M4	2nd Gear — M4
3rd Gear — M1	3rd Gear — —

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Fig. 8-3: DW-2 Controller Signal Combinations Measured at Valve Solenoids

Inductive Sensor Test

Inductive sensor failure can be detected in two ways.

1. Electronically by the microprocessor
2. Irregular transmission operation

Irregular transmission operation is an indication of an inductive sensor fault. The symptoms are:

1. When in forward gear, downshifts from 4th-to-3rd-to-2nd-to-1st are allowed but no up-shifts back to 2nd, 3rd, or 4th gear are possible.
2. When in reverse gear, downshifts from 3rd-to-2nd-to-1st are allowed but no upshifts back to 2nd or 3rd gear are possible.

Inductive sensor failure can be eliminated as soon as the sensor signal is sensed by the microprocessor. Inductive sensor failure can be corrected with the following steps:

1. Check for pinched or severed wire(s) between the EST-19 and the ZF transmission system harness. Repair or replace, if necessary.
2. Check for a loose or separated plug connection at the transmitter on the transmission.
3. Check for a failed inductive transmitter by checking resistance. The correct resistance should be 1.35–1.55 W.
4. Check required clearance between contact face of inductive transmitter and the spur gear. Clearances should be 0.6–0.8mm (.024–.031”).

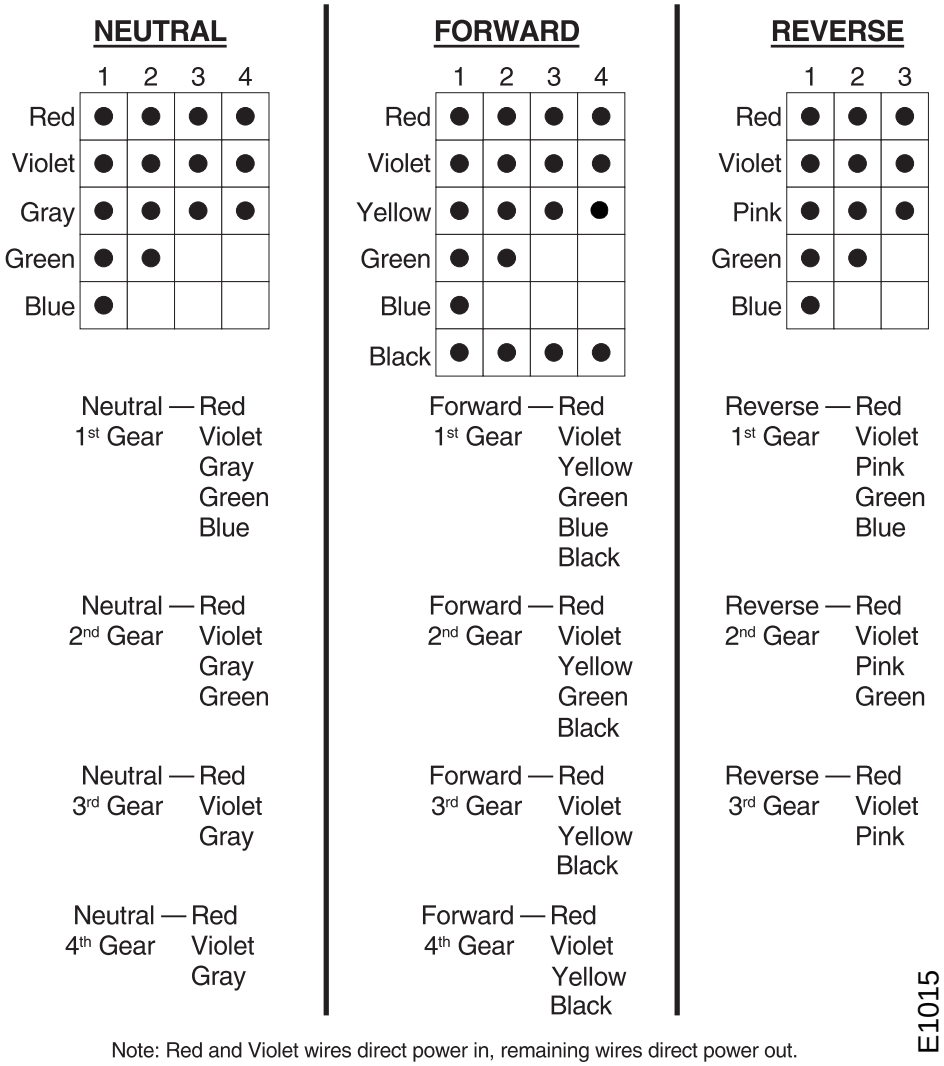
DW-3 Shifter System Tests

6K-37 (S/N 398–)
6K-42 (S/N 132–)
644B-37 (S/N 881–)
644B-42 (S/N 242–)
8K-42 (S/N 262–)
844C-42 (S/N 784–)
10K-42 (S/N 108–)
10K-54 (S/N 108, 110–)
1044C-42 (S/N 122–)
1044C-54 (S/N 216–)

DW-3 Speed Range/Direction Signal Test for a 3WG-100 Transmission

1. Park the machine on level ground, lower the boom, and block the wheels.
2. Make sure the parking brake is disengaged and the service brake is not applied.
3. Transmission declutch switch must be in “OFF” position.
4. With the engine off, turn ignition switch to the “ON” position. Do not start the engine.
5. Probe colored wires from shifter at the front of the sealed connectors. Test all direction and speed range signal combinations shown in Fig. 8-4. If no power is present at Red or Violet wires, proceed to Step 7. If other discrepancies are found, contact the JLG Service Department

   Note: Use a 12V test light or a multimeter.
6. If no discrepancies are found, shifter integrity is OK. See “DW-3 Signals at Transmission Test” on page 8-14 for further test procedures.



Note: Red and Violet wires direct power in, remaining wires direct power out.

Fig. 8-4: DW-3 Signal/Wire Combinations for a 3WG-100 Transmission

No power at Red or Violet Wires

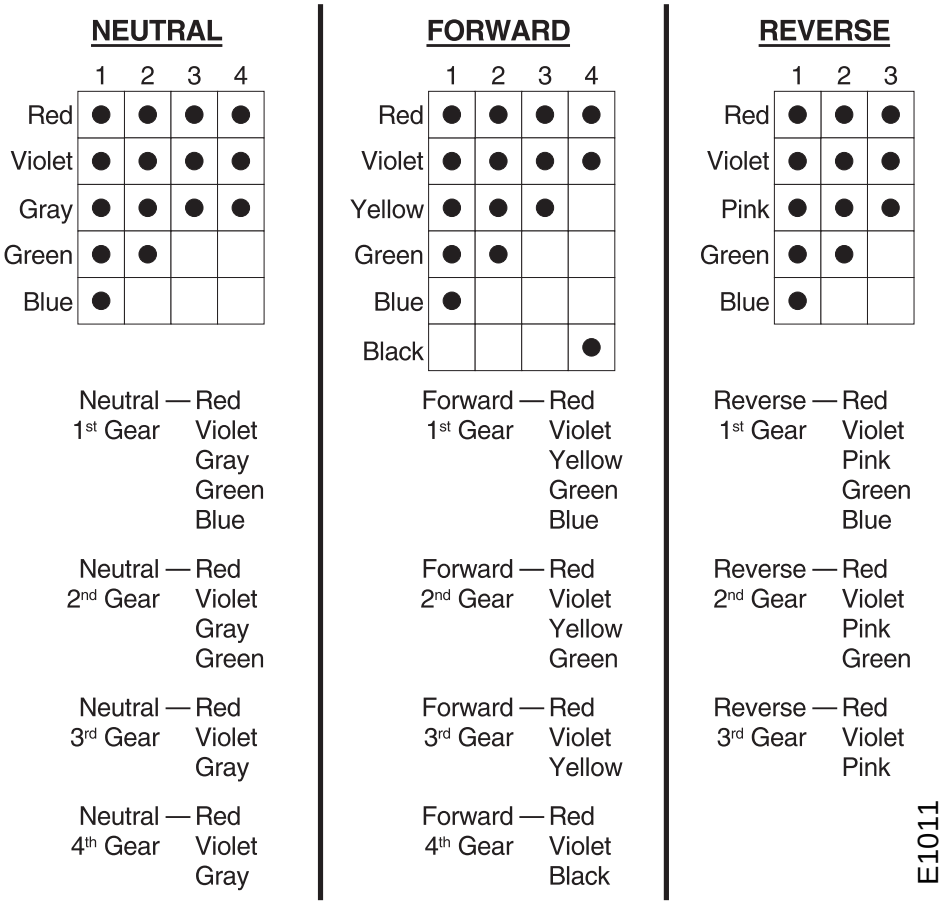
7. If no power is present at Red or Violet wires, check for the following:
   a. Park brake is on or the park brake pressure switch is closed when it should be open.
   b. Transmission declutch switch is in the “ON” position and the service brake pressure switch is stuck closed.
   c. Boom is above 40° or the proximity switch relay is not being energized by proximity switch.
   d. Proximity switch is not sensing metal or connector at switch is loose or disconnected.
   e. Transmission declutch relay (37657X):
      i. Check for continuity between pin 30 and pin 87A.
      ii. Check resistance between pin 86 and 85: approximately 82 W
      iii. Check ground connection to pin 85.
   f. 7.5 amp fuse and fuse holder.

g. Ignition Relay (37383X):
   i. Check resistance between pin 86 and pin 85: 76 W
   ii. Check ground connection to pin 85 through the horn button ground.
h. Ignition switch.
i. Circuit breaker.
j. Battery and cable connections.

DW-3 Speed Range/Direction Signal Test for a 4WG-100 Transmission

1. Park the machine on level ground, lower the boom, and block the wheels.
2. Make sure the parking brake is disengaged and the service brake is not applied.
3. Transmission declutch switch must be in “OFF” position.
4. With the engine off, turn ignition switch to the “ON” position. Do not start the engine.
5. Probe colored wires from shifter at the front of the sealed connectors. Test all direction and speed range signal combinations shown in Fig. 8-5. If no power is present at Red or Violet wires, proceed to Step 7. If other discrepancies are found, contact the JLG Service Department

   Note: Use a 12V test light or a multimeter.
6. If no discrepancies are found, shifter integrity is OK. See “DW-3 Signals at Transmission Test” on page 8-14 for further test procedures.



Note: Red and Violet wires direct power in, remaining wires direct power out.

Fig. 8-5: DW-3 Signal/Wire Combinations for a 4WG-100 Transmission

No power at Red or Violet Wires

7. If no power is present at Red or Violet wires, check for the following:
   a. Park brake is on or the park brake pressure switch is closed when it should be open.
   b. Transmission declutch switch is in the “ON” position and the service brake pressure switch is stuck closed.
   c. Boom is above 40° or the proximity switch relay is not being energized by proximity switch.
   d. Proximity switch is not sensing metal or connector at switch is loose or disconnected.
   e. Transmission declutch relay (37657X):
      iii. Check for continuity between pin 30 and pin 87A.
      iv. Check resistance between pin 86 and 85: approximately 82 W
      v. Check ground connection to pin 85.
   f. 7.5 amp fuse and fuse holder.
   g. Ignition Relay (37383X):
      i. Check resistance between pin 86 and pin 85: 76 W

ii. Check ground connection to pin 85 through the horn button ground.

h. Ignition switch.

i. Circuit breaker.

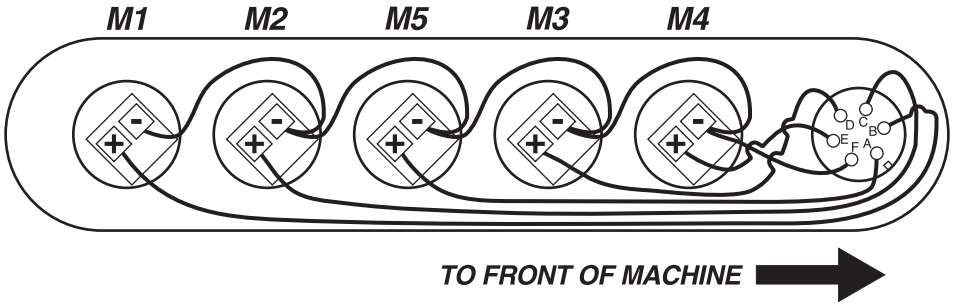
j. Battery and cable connections.

DW-3 Signals at Transmission Test

Note: Signals from DW-3 Controller, when measured at the solenoids, are dependent upon correct voltage “IN” and “OUT” signals from the DW-3. It is necessary to confirm signal integrity from the DW-3 before proceeding with the following test. See “DW-3 Speed Range/Direction Signal Test for a 3WG-100 Transmission” on page 8-10 or “DW-3 Speed Range/Direction Signal Test for a 4WG-100 Transmission” on page 8-12 for procedures.

1. Park the machine on level ground, lower the boom, and block the wheels.
2. Make sure the parking brake is disengaged and the service brake is not applied.
3. Remove the cover at transmission valve to gain access to solenoids.
4. With the engine off, turn ignition switch to the “ON” position. Do not start the engine.
5. Test all direction and speed range signal combinations shown in Fig. 8-6. If signal discrepancies are found, proceed to Step 6. If signals are correct, proceed to Step 7.

VIEW: TOP OF VALVE ASSEMBLY WITH COVER REMOVED



3WG-100, 3-SPEED TRANSMISSION
DW-3 CONTROLLER SIGNALS MEASURED AT VALVE SOLENOIDS

Forward, Declutch OFF	Forward, Declutch ON	Neutral
1st Gear — M3 M2 M4 M5	1st Gear — M2 M4	1st Gear — M2 M4
2nd Gear — M3 M4 M5	2nd Gear — M4	2nd Gear — M4
3rd Gear — M3 M5	3rd Gear — —	3rd Gear — —

Reverse, Declutch OFF	Reverse, Declutch ON
1st Gear — M1 M2 M4	1st Gear — M2 M4
2nd Gear — M1 M4	2nd Gear — M4
3rd Gear — M1	3rd Gear — —

4WG-100, 4-SPEED TRANSMISSION
DW-3 CONTROLLER SIGNALS MEASURED AT VALVE SOLENOIDS

Forward, Declutch OFF	Forward, Declutch ON	Neutral
1st Gear — M3 M2 M4	1st Gear — M2 M4	1st Gear — M2 M4
2nd Gear — M3 M4	2nd Gear — M4	2nd Gear — M4
3rd Gear — M3	3rd Gear — —	3rd Gear — —
4th Gear — M5	4th Gear — —	4th Gear — —

Reverse, Declutch OFF	Reverse, Declutch ON
1st Gear — M1 M2 M4	1st Gear — M2 M4
2nd Gear — M1 M4	2nd Gear — M4
3rd Gear — M1	3rd Gear — —

E1010

Fig. 8-6: DW-3 Controller Signal Combinations Measured At Valve Solenoids

6. If signal discrepancies are found, check the following:
   a. Check DW-3 signals at controller (see page 8-10).
   b. Check transmission wire harness (65011D) plug connectors and wires for security and condition.
   c. Check shunt diodes (see page 8-16).
7. If signal are correct, check the following:
   a. Check solenoid resistance values: 24–40 W
   b. Check transmission pressures. See “ZF Transmission Pressure Checks” on page 8-23

Shunt Diodes

Description

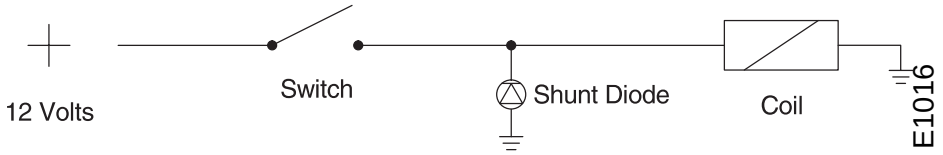


Fig. 8-7: Typical Shunt Diode Application

Fig. 8-7 represents a typical shunt diode application. When the switch is opened, the magnetic field surrounding the coil collapses and generates reverse polarity voltage. If enough voltage is present, it will jump (arc) the contacts in the switch and may cause damage.

The diode protects the switch contacts from this reverse voltage by providing a path of lesser resistance for the electricity.

The shunt diode can fail in two ways:

1. If the diode has failed and allows forward voltage or the voltage intended to energize the coil to pass through to ground, the result will be a blown fuse.
2. If the diode has failed but will not allow the reverse polarity voltage to pass to ground, the reverse spike will seek the next path of lesser resistance and arc the switch contacts of the DW-3 shifter. This may also occur if the ground connection for the shunt diodes is not securely fastened to the ground post.

Diode Test

The diode should be tested with both forward and reverse voltage applied. Use a DMM, with diode testing ability, already set for diode testing.

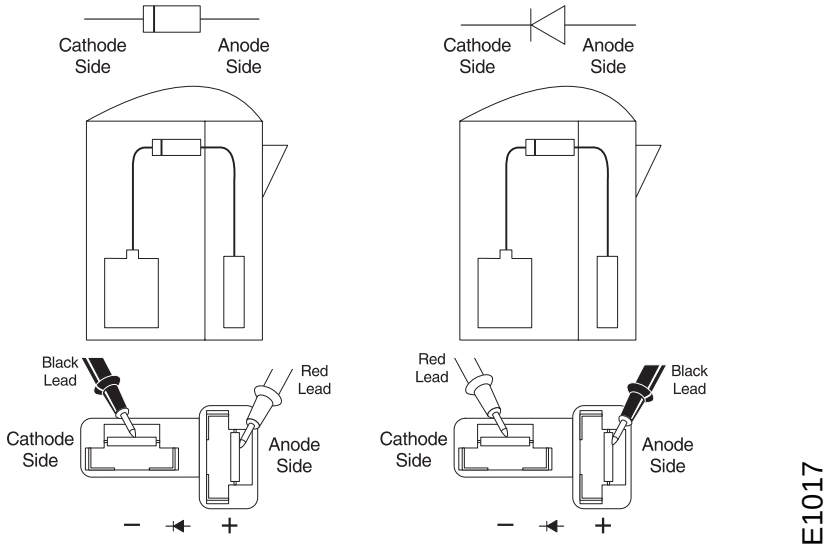


Fig. 8-8: Shunt Diode Test

1. Remove the diode from the circuit.

2. Measure forward voltage by connecting the black DMM lead to the cathode side of the diode and the red DMM to the anode side of the diode. Typically the value registered on the DMM display will be 0.5V for a P21787 diode.
3. Measure reverse voltage by connecting the black DMM lead to the anode side of the diode and the red DMM lead to the cathode side of the diode. The DMM display should register “OL” for overrange.
4. If both readings indicated “OL”, then the diode is open and should be replaced.
5. If both readings indicated continuity or 0.0 volts, then the diode is shorted and should be replaced.

Park Brake Pressure Switch

Description

The park brake pressure switch is a double pole, single throw, normally closed, 100 psi pressure switch. (Double pole means that there are two microswitches in the pressure switch.) The pressure switch is connected to the park brake hydraulic circuit between the park brake valve and the park brake cylinder. When hydraulic pressure releases the park brake, the pressure switch senses pressure greater than 100 psi and the switch opens.

When hydraulic pressure is released from the park brake cylinder a spring in the cylinder applies the brake. The pressure sensed by the park brake pressure switch drops below 100 psi and the pressure switch closes.

Machines w/ DW-2 Shifter

For machines equipped with a DW-2 shifter, the closed pressure switch (pressure less than 100 psi and park brake ON) causes one microswitch to complete a circuit that lights the park brake indicator lamp. The other microswitch completes a circuit that enables the EST-19 microprocessor to stop signals to the transmission solenoids that engage forward/reverse and this declutches the transmission.

Machines w/ DW-3 Shifter

For machines equipped with a DW-3 shifter, the closed pressure switch (pressure less than 100 psi and park brake ON) causes one microswitch to complete a circuit that lights the park brake indicator lamp. The other microswitch completes a circuit that sends an electric signal to the transmission declutch relay. The relay energizes and stops power to the DW-3 shifter. This prevents the shifter from sending signals to the transmission solenoids that engage forward/reverse and this declutches the transmission.

When hydraulic pressure at the switch exceeds 100 psi (park brake OFF), both microswitches in the pressure switch must open and remain open as long as the pressure stays above 100 psi. When the pressure drops below 100 psi, both microswitches must close.

Simply put, when the park brake is ON the pressure switch is closed, and when the park brake is OFF the pressure switch is open.

A symptom of a failed park brake (or service brake) pressure switch is a transmission that will not go into forward or reverse (loss of forward and reverse clutch packs). If this happens, check the pressure switch integrity (see below).

Park Brake Pressure Switch Integrity Test

1. Apply the park brake.
2. Locate the park brake pressure switch and unplug both leads connecting the pressure switch to the vehicle's harness.
3. With a Digital Multi Meter (DMM) set to test continuity, connect the DMM leads to the pins in one of the two pressure switch plugs. The switch should be open. The DMM should display NO continuity.
4. Connect the leads of the DMM to the pins in the remaining pressure switch plug. The switch should be open and the DMM should again display NO continuity.
5. Start the engine, release the park brake, and shut the engine off.
6. With the DMM set to test continuity, connect the DMM leads to the pins in one of the two pressure switch plugs. The switch should be closed. The DMM should display continuity.
7. Connect the leads of the DMM to the pins in the remaining pressure switch plug. The switch should be closed and the DMM should again display continuity.

If one or both of the microswitches in the park brake pressure switch consistently or intermittently fails to open when they both should be open, remove and replace the pressure switch. Or, if both microswitches open and one or both consistently or intermittently fails to close when both should be closed, remove and replace the pressure switch (See "Park Brake Pressure Switch" in Section 9).

Service Brake Pressure Switch

Description

The service brake pressure switch is a single pole, single throw, normally open, 250 psi pressure switch connected between the service brake valve and the wheel end brake assemblies. When the service brake is not applied, there is no pressure at the service brake pressure switch and the switch is open. The switch closes when the service brake is applied and the pressure switch senses brake output pressure greater than 250 psi.

Machines w/ DW-2 Shifter

For machines equipped with a DW-2 shifter, if this switch closes and the transmission declutch switch (mounted in the dash panel) is in the "ON" position, an electric signal is sent to the EST-19 microprocessor. This signal enables the microprocessor to stop signals to the transmission solenoids that engage forward/reverse and this declutches the transmission.

Machines w/ DW-3 Shifter

For machines equipped with a DW-3 shifter, a closed pressure switch completes a circuit that sends an electric signal to the transmission declutch relay. The relay energizes and stops power to the DW-3 shifter. This prevents the shifter from sending the signals to the transmission solenoids that engage forward/reverse and this declutches the transmission.

When this switch senses pressure greater than 250 psi, it must close and remain closed as long as the pressure stays above 250 psi. When the pressure drops below 250 psi, the switch must open.

A symptom of a failed service brake (or park brake) pressure switch is a transmission that will not go into forward or reverse (loss of forward and reverse clutch packs). If this happens, check the pressure switch integrity (see below).

Service Brake Pressure Switch Integrity Test

1. Install a 0–600 psi test gauge test gauge in the test port marked “BRAKES” located beneath the operator’s compartment. Pressure should read 0 psi.
2. Locate the service brake pressure switch and unplug the pressure switch from the vehicle’s harness.
3. Using a DMM set to test continuity, connect the DMM leads to the pins in the plug of the pressure switch. The switch should be open. The DMM should display NO continuity.
4. Slowly depress the brake pedal while watching the pressure gauge and the DMM display. As the pressure at the gauge rises and approaches approximately 250 psi, the display on the DMM should indicate continuity. The switch should close.
5. Slowly release the brake pedal while watching the pressure gauge and the DMM display. As the pressure at the gauge falls below approximately 250 psi, the display on the DMM should indicate NO continuity. The switch should be open.

If the service brake pressure switch fails to close or if the service brake pressure switch intermittently fails to close or closes and intermittently fails to open, remove and replace the pressure switch (See “Service Brake Pressure Switch Replacement” in Section 9).

Rear Oscillation Lock Proximity Switch and Relay

General

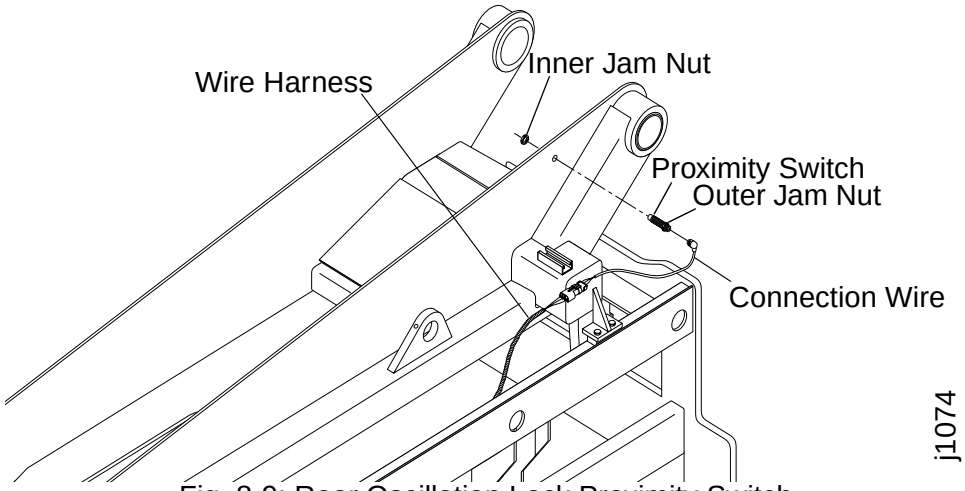


Fig. 8-9: Rear Oscillation Lock Proximity Switch

(Ref. Fig. 8-9) The rear oscillation lock proximity switch is located at the rear left side of the transfer carriage. This switch senses if the boom elevation is above or below 40°.

When the boom elevation is below 40°, the proximity switch is closed and energizes the proximity switch relay (R1). As long as the proximity switch relay (R1) remains energized (with the park brake off, the declutch switch in the “OFF” position, and the service brake not applied), the transmission will engage when the direction/speed range selector is shifted to forward or reverse.

When the boom elevation exceeds 40°, the proximity switch opens.

Machines w/ DW-2 Shifter

For machines equipped with a DW-2 shifter, the open proximity switch stops the signal energizing the proximity switch relay (R1). The proximity switch relay relaxes and routes a signal from the fuse panel to the EST-19 microprocessor. This signal enables the EST-19 microprocessor to stop signals to the transmission solenoids that engage forward/reverse and this declutches the transmission.

Machines w/ DW-3 Shifter

For machines equipped with a DW-3 shifter, the open proximity switch stops the signal energizing the proximity switch relay (R1). The proximity switch relay relaxes and routes a signal from the fuse panel to the transmission declutch relay, energizing it. This stops power to the DW-3 shifter, preventing the shifter from sending the signals to the transmission solenoids that engage forward/reverse and this declutches the transmission.

A symptom of a failed proximity switch is a transmission that will not go into forward or reverse (loss of forward and reverse clutch packs). If this happens, check the proximity switch integrity (see below).

Rear Oscillation Lock Proximity Switch Integrity Test

1. Disconnect the plug connecting the wire harness at the proximity switch.
2. Remove the proximity switch from the transfer carriage by loosening and removing the jam nut on the inside of the transfer carriage.
3. Reference the wire harness end of the proximity switch to note the connection guide and the position of the four pins as shown in Fig. 8-10.

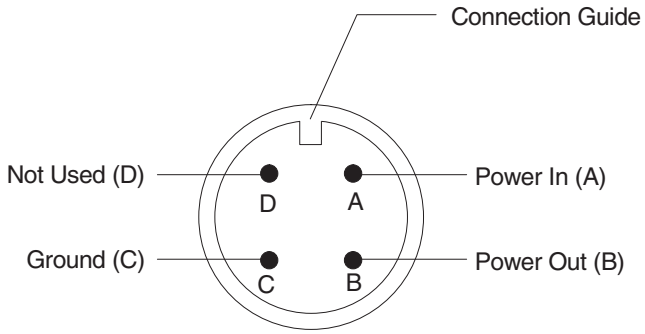


Fig. 8-10: Connection Guide and Pin Positions

4. Connect a 12 volt power lead to the (A) pin.
5. Connect a wire lead to (C) pin and ground this lead. With the proximity switch not sensing metal, there should not be a 12 volt signal at pin (B). If a 12 volt signal is detected at pin (B), remove and replace the proximity switch.
6. Put the sensing surface of the proximity switch within 0.190–0.250 inches from a metal source. At this time, a 12 volt signal should be detected at pin (B). If a 12 volt signal is not detected at pin (B), remove and replace the proximity switch. (See “Boom Elevation Proximity Switch” in Section 7.)

Proximity Switch Relay (R1) Integrity Test

1. Remove the electrical panel cover from the fuse panel assembly to access the R1 proximity switch relay.
2. Separate the R1 proximity switch relay from the relay receptacle and note the configuration of the five blade connections (see Fig. 8-11).

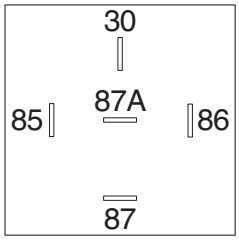


Fig. 8-11: R1 Proximity Switch Relay Blade Connections

3. Using a DMM set to meter resistance, test for resistance between blade 86 and blade 85. A Bosch brand relay should meter 85 ±5 W. A Potter & Brummfield brand relay should meter 90 ±10% W.
4. Connect a 12 volt lead to blade 86. Connect a ground lead to blade 85. Using a DMM set to test continuity, test for continuity between blade 30 and blade 87.

Note: With 12 volts at blade 86 and blade 85 grounded, continuity between blade 30 and blade 87 must be present; if not, replace the relay.

5. Disconnect the 12 volt lead to blade 86. Using a DMM set to test continuity, test for continuity between blade 30 and blade 87A.

Note: With no 12 volt signal at blade 86, continuity between blade 30 and blade 87A must be present; if not, replace the relay.

ZF Transmission Pressure Checks

Control Pressure
232–261 PSI (16–18 Bar)

Forward/Reverse
1, 2, 3, 4, Clutch Pressures
232–261 PSI (16–18 Bar)

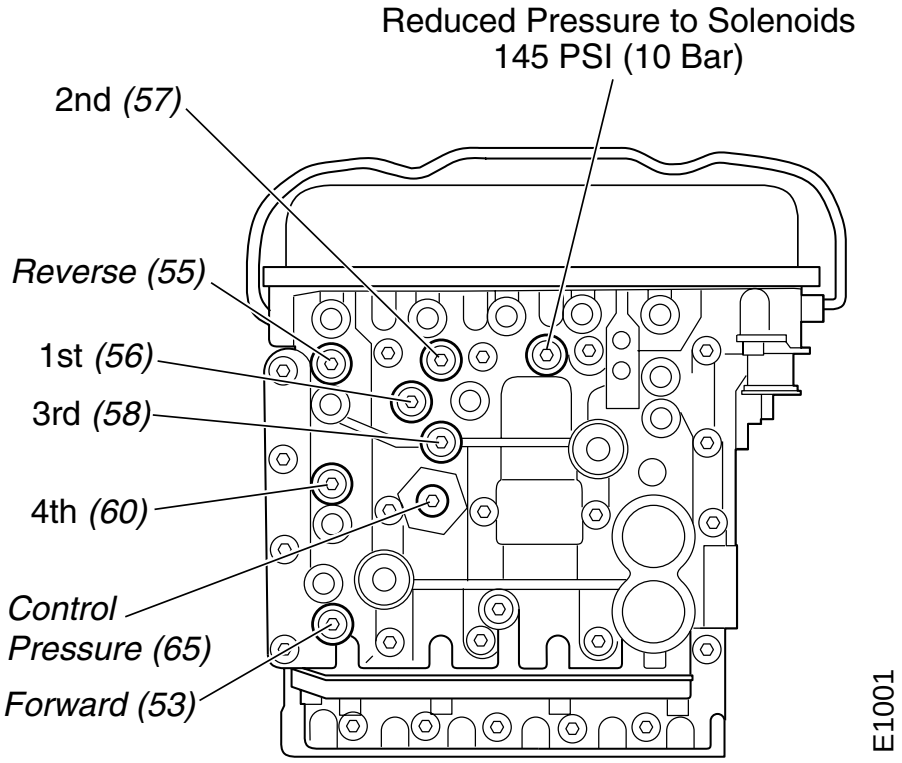


Fig. 8-12: Transmission Pressure Check Ports

(Ref. Fig. 8-12) Install 600 psi gauge at control pressure port (65). Check and record control pressure in neutral at idle rpm.

Note: Pressure port thread is metric (M10X1).

_____ psi

(Ref. Fig. 8-12) Using two 600 psi gauges, check and record pressure readings at the ports listed below.

(Forward) Port 53	_____ psi	And Port 56 (1st Gear)	_____ psi
(Forward) Port 53	_____ psi	And Port 57 (2nd Gear)	_____ psi
(Forward) Port 53	_____ psi	And Port 58 (3rd Gear)	_____ psi
		And Port 60 (4th Gear)	_____ psi
(Reverse) Port 55	_____ psi	And Port 56 (1st Gear)	_____ psi
(Reverse) Port 55	_____ psi	And Port 57 (2nd Gear)	_____ psi
(Reverse) Port 55	_____ psi	And Port 58 (3rd Gear)	_____ psi

Section 9 — Brakes

Table of Contents

List of Figures

Section 9 — Brakes

Service Brakes

Description, Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

The service brakes are operated and controlled by hydraulic oil from the hydraulic system. Fluid flows from the brake port of the control manifold to the brake valve and on to the front and rear brakes. The service brake system consists of:

1. Accumulator
2. Brake Pedal
3. Brake Valve
4. Disc Brakes.

The accumulator is located near the middle of the machine on the valve plate. The brake pedal and valve is located on the floor of the cab. The disc brakes are internally located in an oil bath within the wheel ends of the axles. See Fig. 9-1.

Note: *The axles must be disassembled to service the brake discs. Refer to the axle manufacturer's maintenance manual for overhaul procedures.*

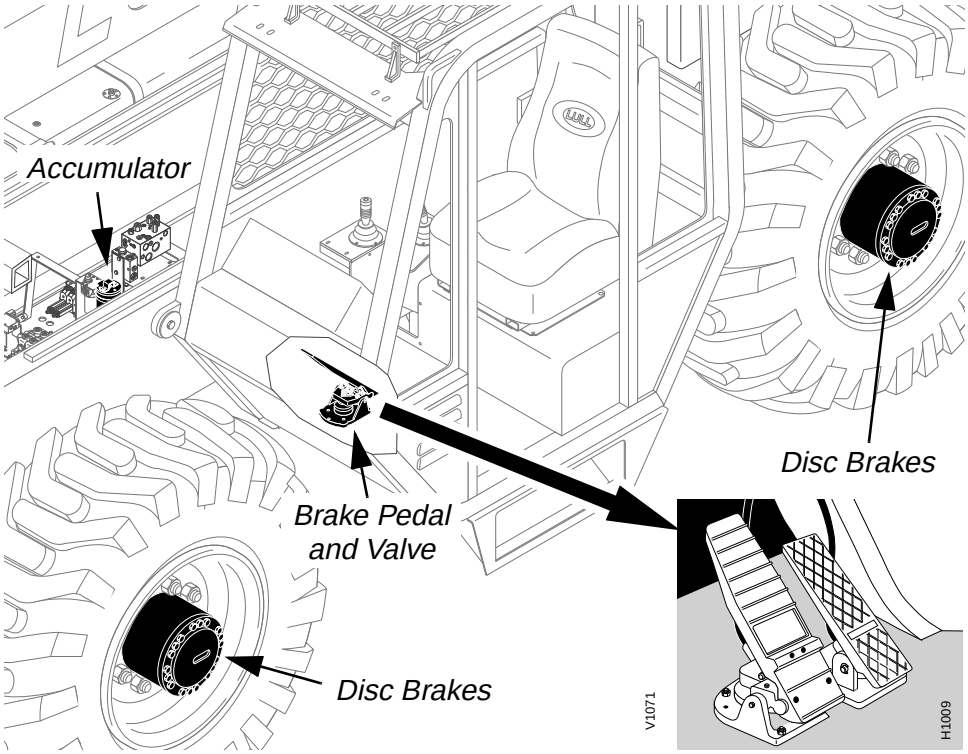
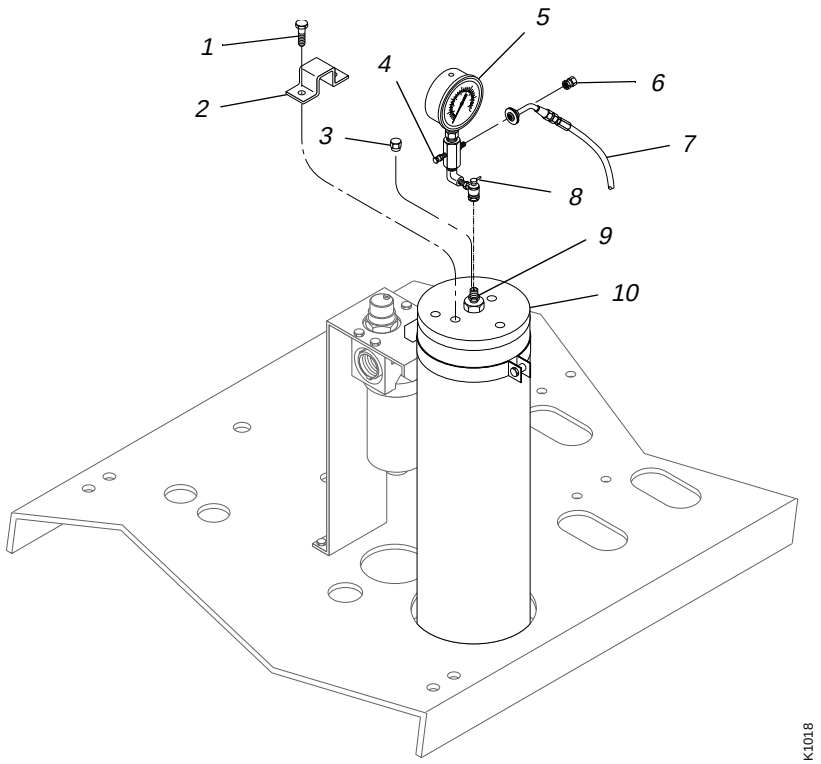


Fig. 9-1: Service Brakes

Brake Testing and Bleeding

The following procedure may be used to check brake components for failure or adjustment with the aid of test gauges. Test gauge kits sold by JLG are listed in Section 19. The bleeding procedure alone does not require use of test equipment.



#	Description	#	Description
1	Capscrew	6	Gauge Cap
2	Valve Guard	7	Nitrogen Hose
3	Gas Valve Cap	8	“T” Handle
4	Gauge Bleed Valve	9	Gas Valve
5	Accumulator Test Gauge	10	Accumulator

Fig. 9-2: Brake Testing

Testing and Bleeding

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Before proceeding, perform the following:
   a. Place transmission selector control in neutral.
   b. Apply park brake.
   c. Shut off engine.
   d. Make sure hydraulic oil level is adequate.
   e. Make sure hydraulic pump is in good operating order.

3. Remove the two (2) capscrews (Item 1), valve guard (Item 2), and gas valve cap (Item 3) from the accumulator (Item 10) (see Fig. 9-2).
4. Mount accumulator test gauge (Item 5) to the accumulator gas valve (Item 9). The pressure gauge must have a 2000 psi capacity (correctly calibrated) with 5/16-32 UNEF mounting nut threads. Before installing it, perform the following:
   a. The bleed valve (Item 4) must be tightly closed (turned in).
   b. The “T” handle (Item 8) must be backed out (counter clockwise).
   c. Be sure of an air-tight connection when mounting the gauge.
   d. The "T" handle must then be turned in after the pressure gauge is mounted.
5. Mount brake pressure testing gauge to the brake test port located behind the cab step (see Fig. 9-3). The gauge must have a 600 psi capacity (correctly calibrated).

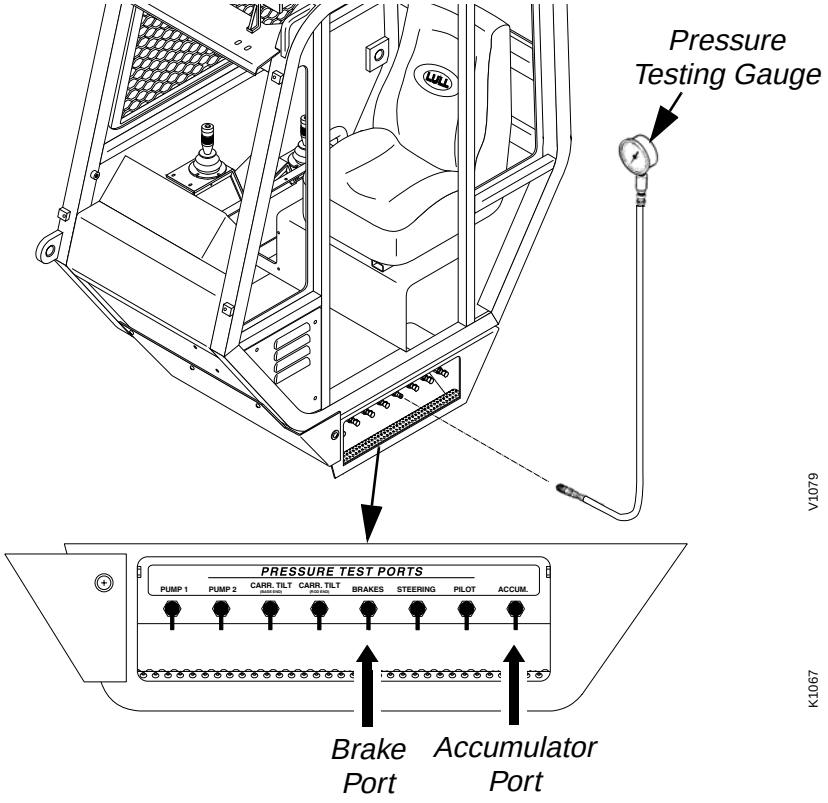


Fig. 9-3: Diagnostic Ports

6. Repeatedly pump (push, hold, release) the brake pedal until all brake line pressure is depleted. The brake test gauge must read 0 psi.
7. Check to see if the accumulator test gauge (Item 5) now reads 375–425 psi. If pressure is correct, proceed to Step 8. If pressure is incorrect, proceed to Step 15.
8. Start the engine and allow it to run (idle) throughout the remainder of the bleeding and testing procedure. This will allow the accumulator to maintain operating pressure.

9. Open bleeder screw at left rear wheel (see Fig. 9-4) and slowly apply brake pedal until air is bled out of the line. Then close the bleeder screw by torquing it to 20 ft-lbs. Repeat this step at each wheel in the following sequence: left rear, right rear, right front, left front.

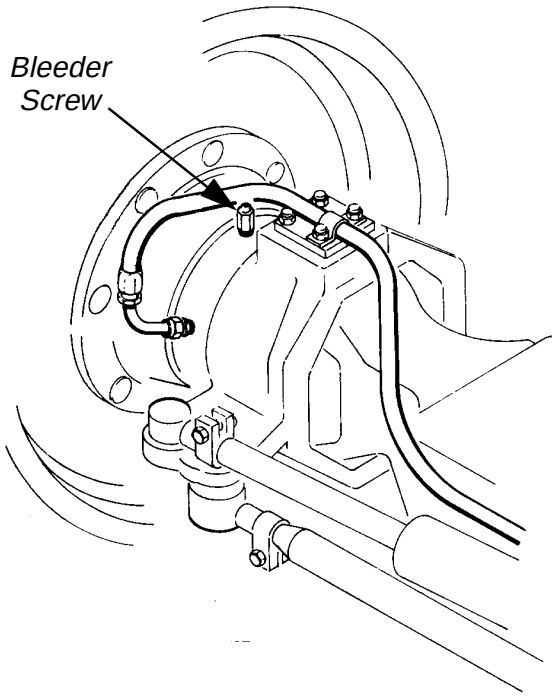


Fig. 9-4: Brake Bleeding

10. For testing brake line pressure, apply pressure on the brake pedal and hold. The gauge at the test port should read 310 to 350 psi. If pressure is correct, release the brake pedal, remove gauge from port, put the cap back on the port, and continue with Step 11. If pressure is incorrect, contact the JLG Service Department.
11. Allow accumulator to reach full charge (high limit) pressure. The accumulator test gauge must read between 1500 and 1600 psi. If pressure is correct, proceed to Step 12. If pressure is incorrect, make necessary adjustments (see “Service Brake Valve - Models with Control Manifold Hydraulics” on page 9-6).
12. Repeatedly pump (push, hold, release) the brake pedal to allow accumulator pressure to drop. While watching the accumulator test gauge (Item 5), note the lowest pressure indicated before the accumulator begins to recharge (pressure begins to rise).
13. Perform Step 12 two more times. Lowest pressure reading (low limit) must be between 1100 and 1200 psi. If pressure is correct, proceed to Step 14. If pressure is incorrect, shut off engine, replace the brake valve, and return to Step 8.
14. Turn out “T” handle (Item 8) on accumulator test gauge (Item 5). Release any remaining air in gauge through bleeding screw (Item 4) and tighten. Remove gauge from accumulator and replace gas valve cap (Item 3). Replace valve guard (Item 2) and two (2) capscrews (Item 1). Torque capscrews to 35 ft-lbs.

The brake testing and bleeding procedure is complete.

Accumulator Pre-charge

15. The following procedure is for adjusting accumulator pre-charge (from Step 7 above).

    a. If test gauge pressure reads too high, slowly turn out gauge bleeding valve (Item 4) to release pressure and tighten when 375–425 psi on accumulator gauge (Item 5) is indicated.

    b. If test gauge pressure reads too low, charge accumulator as described in “Pre-Charging Accumulator” on page 9-19 (through Step 12).

    c. If correct pressure cannot be achieved, replace accumulator, reinstall test gauge, and adjust accumulator to correct pressure.

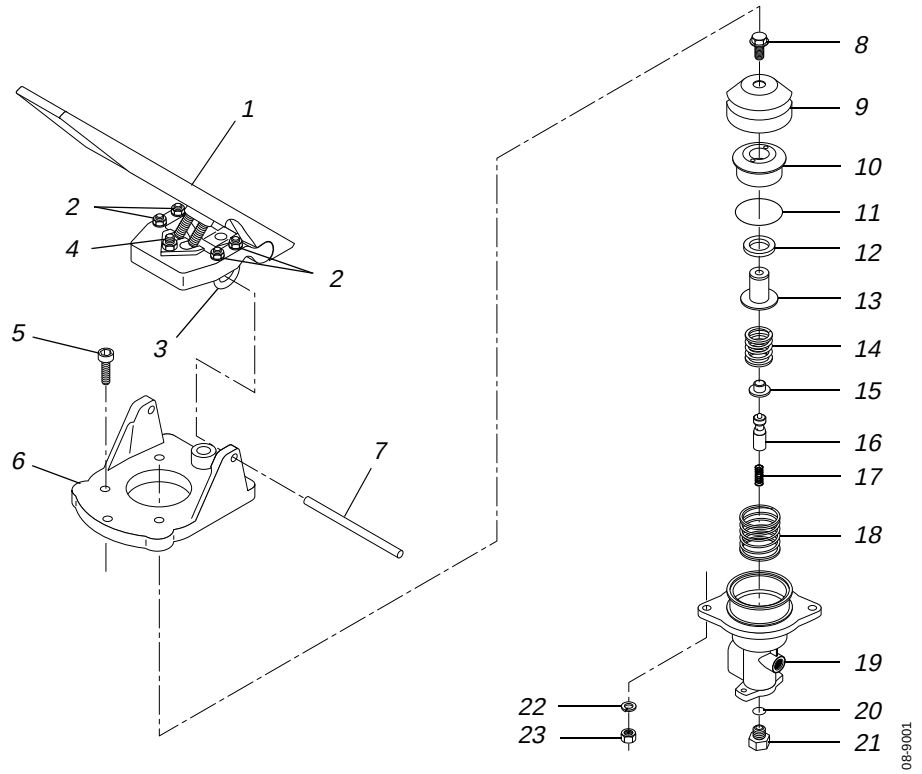
    d. Return to Step 8 under “Testing and Bleeding” and continue.

Service Brake Pedal and Valve

Adjustment

Service Brake Valve - Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)



#	Description
1	Brake Pedal
2	Hex Nut
3	U-Clamp
4	Deadband Setscrew
5	Socket Head Capscrew
6	Actuator Base
7	Pedal Mounting Pin
8	Flange Head Capscrew
9	Rubber Boot
10	Piston Guide
11	O-Ring
12	Seal

#	Description
13	Piston
14	Regulator Spring
15	Spring Seat
16	Spool
17	Spool Return Spring
18	Piston Return Spring
19	Body
20	O-Ring
21	Port Adapter
22	Lockwasher
23	Hex Jam Nut

Fig. 9-5: Service Brake Valve Adjustment - Models with Control Manifold Hydraulics

(Ref. Fig. 9-5) The following procedure is for checking and adjusting the brake valve pressure for models with control manifold hydraulics.

1. With the engine off, connect a 0–600 psi gauge to the test port marked “BRAKES” located behind the cab step. Pump the brakes until the gauge reads 0 psi.
2. Remove the brake pedal assembly (Item 1) by loosening the four (4) 1/4” nuts (Item 2) on the two (2) U-clamps (Item 3) and pushing the pedal mounting pin (Item 7) out.
3. Remove the rubber boot (Item 9), being careful not to damage it.
4. Use a spanner wrench to remove the piston guide (Item 10) from the body (Item 19).
5. Remove the flange head capscrew (Item 8) from the piston (Item 13). Record the number of turns the capscrew was backed out.

Note: *The flange head capscrew has thread sealant applied to the threads. Grasp the piston around the large diameter end so as to not damage the sealing area on the piston.*

6. Remove the thread sealant from the flange head capscrew and piston.
7. Reassemble the flange head capscrew into the piston, turning it in the same number of turns that was used to turn it out.

Note: *Do not apply thread sealant at this point.*

8. Install and use a spanner wrench to secure the piston guide to the piston.

Note: *Do not install the rubber boot at this time.*

9. Install the brake pedal assembly (Item 1) onto the actuator base (Item 6) by pushing the pedal mounting pin (Item 7) through the U-clamps (Item 3) until centered in the actuator base.
10. Tighten the 1/4” nuts (Item 2) on the U-clamps (Item 3). Adjust the deadband setscrew (Item 4) out so that it does not contact the flange head capscrew.
11. Connect a 0–600 psi gauge to the brake test port located behind the cab step. Start the engine and record the maximum brake output pressure with the brake pedal fully depressed. If the pressure is outside the range of 330–375 psi, adjust the flange head capscrew.

Note: *Turn the flange head capscrew into the piston to decrease pressure and out to increase pressure.*

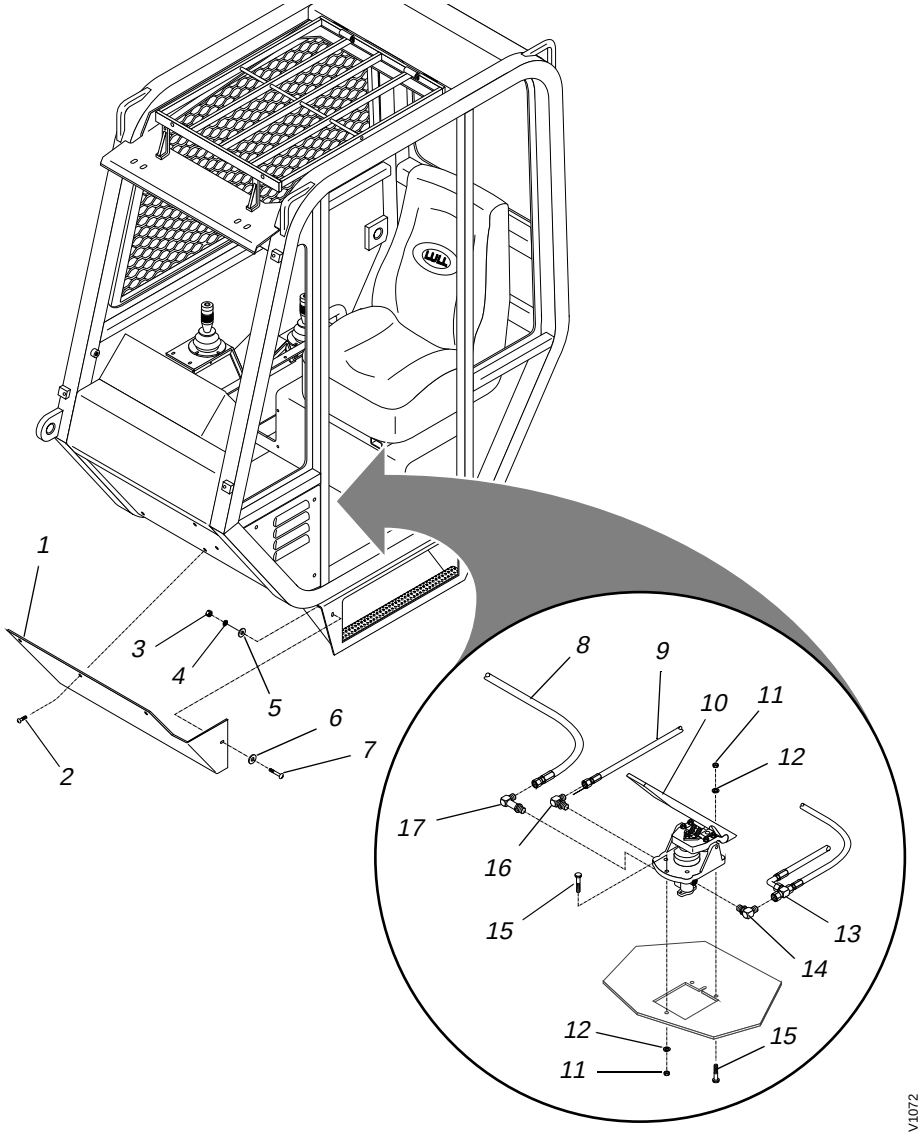
12. Repeat Steps 1–4.
13. Remove the flange head capscrew (Item 8) and record the number of turns the capscrew was backed out.
14. Apply blue thread sealant to the threads of the capscrew, being careful not to get thread sealant anywhere on the piston sealing area. Install the capscrew in the piston and turn it in the recorded amount.
15. Install and use a spanner wrench to secure the piston guide to the piston.

16. Install the rubber boot (Item 9) onto the body (Item 19). Apply a quality adhesive sealant to the boot and head of the flange head capscrew.
17. Repeat Step 9 and Step 10.
18. Adjust the deadband setscrew (Item 4) until it contacts the flange head capscrew.
19. Place a 0.010” shim between the actuator base (Item 6) and the pedal return stop.
20. Connect a 0–600 psi gauge to the brake test port behind the cab step and start the engine. Adjust the deadband set screw just until the regulated output pressure starts to rise, then back out the setscrew 1/8 turn and lock the setscrew with its jam nut.
21. Remove the 0.010” shim.

Removal

Service Brake Pedal and Valve – Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)



#	Description
1	Cab Front Cover
2	Phillips Truss Head Screw
3	Hex Nut
4	Lockwasher
5	Large Flatwasher
6	Flatwasher
7	Phillips Truss Head Screw
8	Hydraulic Hose to B Port
9	Hydraulic Hose to T Port

#	Description
10	Brake Pedal and Valve Assembly
11	Hex Nut
12	Lockwasher
13	Swivel Tee for Pressure Switch and Diagnostic Port Hoses
14	Elbow
15	Hex Head Capscrew
16	Elbow
17	Elbow

Fig. 9-6: Service Brake and Valve Installation — Models with Control Manifold Hydraulics

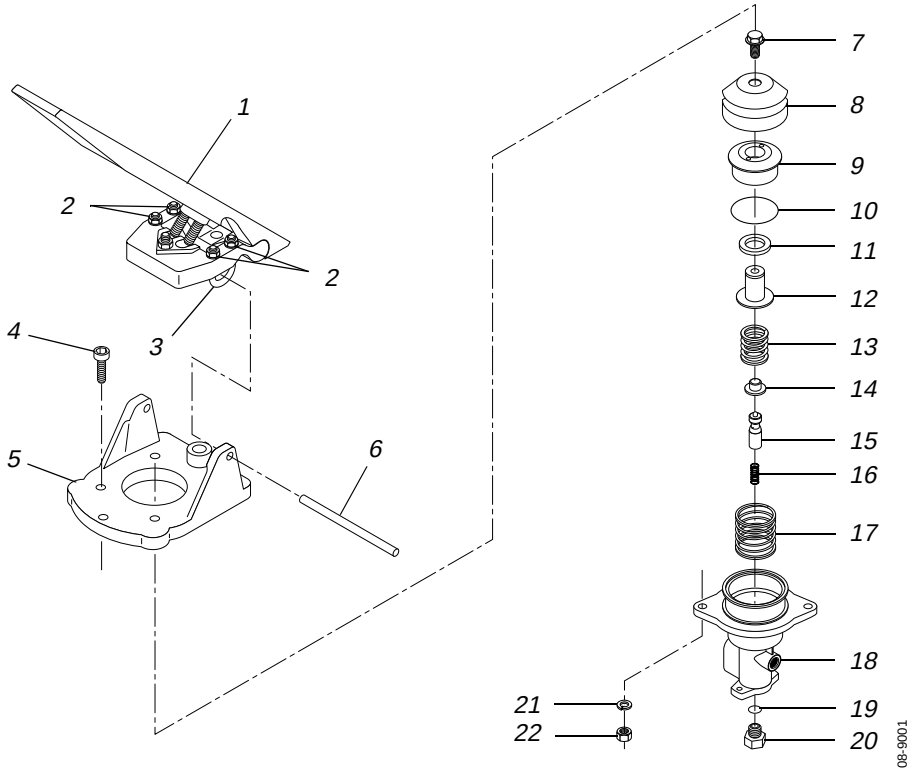
The following service brake removal procedure refers to Fig. 9-6.

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. With the engine off, connect a 0–600 psi gauge to the test port located behind the cab step.
3. Pump the brake repeatedly until the gauge reads 0 psi.
4. Loosen and remove Phillips truss head screw (Item 7), flatwashers (Items 5 and 6), lockwasher (Item 4), and hex nut (Item 3) that secure cab front cover (Item 1) to cab step.
5. Loosen and remove remaining three (3) Phillips truss head screws (Item 2) and cab front cover.
6. Slowly loosen hydraulic hoses (Items 8 and 9) from elbows (Items 16 and 17). Tag hoses and fittings. Disconnect hoses and drain remaining oil into appropriate container.
7. Slowly loosen swivel tee (Item 13) from elbow (Item 14) connected to the brake valve. Disconnect tee and drain remaining oil into appropriate container.
8. Loosen and remove three (3) each capscrews (Item 15), nuts (Item 11), and lockwashers (Item 12) that secure the service brake and valve assembly to floor of cab.
9. Remove service brake and valve assembly (Item 10) from the machine and take it to a suitable location for further disassembly.
10. Note position of, tag, and remove three (3) elbows (Items 14, 16, and 17) from service brake and valve assembly. Clean with solvent and dry with compressed air.

Disassembly

Service Brake Valve – Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)



#	Description
1	Brake Pedal
2	Hex Nut
3	U-Clamp
4	Socket Head Capscrew
5	Actuator Base
6	Pedal Mounting Pin
7	Flange Head Capscrew
8	Rubber Boot
9	Piston Guide
10	O-Ring
11	Seal

#	Description
12	Piston
13	Regulator Spring
14	Spring Seat
15	Spool
16	Spool Return Spring
17	Piston Return Spring
18	Body
19	O-Ring
20	Port Adapter
21	Lockwasher
22	Hex Jam Nut

Fig. 9-7: Service Brake and Valve Assembly – Models with Control Manifold Hydraulics

The following disassembly procedure refers to Fig. 9-7.

1. Loosen and remove flange head capscrew (Item 7) along with other brake valve assembly parts (Items 8–17).
2. Remove the thread sealant from the flange head capscrew and piston (Item 12).
3. Loosen and remove port adapter (Item 20) and O-ring (Item 19) from brake valve body.

4. Discard rubber boot (Item 8), O-ring (Item 10), and seal (Item 11).
5. Clean remaining parts with solvent and dry with compressed air. Inspect all parts for damage and replace, if necessary.

Note: *The spool (Item 15) and valve body (Item 18) cannot be purchased separately. If these parts are damaged, it will be necessary to replace the entire valve assembly (Items 7–20).*

Reassembly

Brake Valve – Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

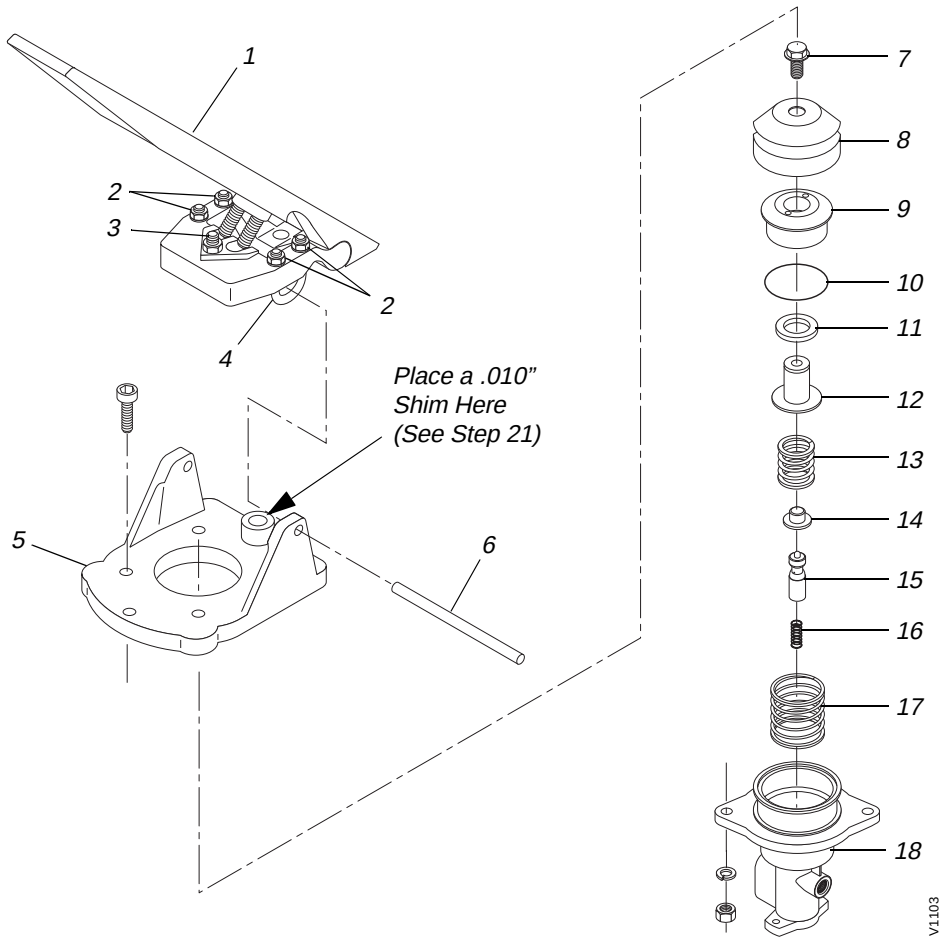
The following reassembly procedure refers to Fig. 9-7.

1. Install port adapter (Item 20) and O-ring (Item 19) on brake valve body (Item 18). Lubricate O-ring before installing it.
2. Obtain a seal kit which includes a rubber boot (Item 8), O-ring (Item 10), and seal (Item 11). Lubricate O-ring and seal before installing them.
3. Install remaining valve assembly parts (Items 8–17) on valve body (Item 18) with flange head capscrew (Item 7) in order shown in Fig. 9-7.

Service Brake Adjustment Procedures

Models with Control Manifold Hydraulics

6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)



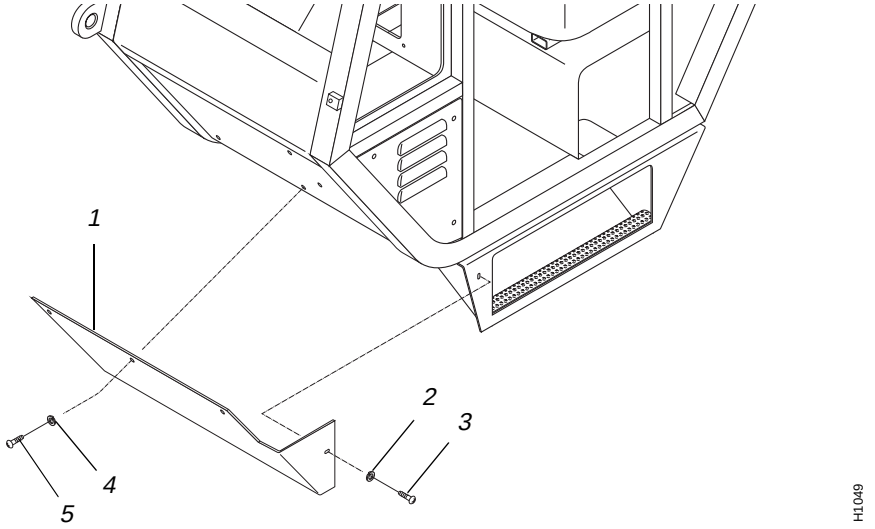
#	Description
1	Brake Pedal
2	Hex Nut
3	Deadband Setscrew
4	U-Clamp
5	Actuator Base
6	Pedal Mounting Pin
7	Flange Head Capscrew
8	Rubber Boot
9	Piston Guide

#	Description
10	O-Ring
11	Seal
12	Piston
13	Regulator Spring
14	Spring Seat
15	Spool
16	Spool Return Spring
17	Piston Return Spring
18	Body

Fig. 9-8: Service Brake Adjustment – Models with Control Manifold Hydraulics

The following brake adjustment procedure refers to Fig. 9-8.

1. With the engine off, connect a 0–600 psi gauge to the test port marked “Brakes” located behind the cab step.
2. Pump the brakes until the gauge reads 0 psi; remove the gauge.



#	Description
1	Cab Front Cover
2	Flatwasher
3	Phillips Truss Head Screw

#	Description
4	Flatwasher
5	Phillips Truss Head Screw

Fig. 9-9: Cab Front Cover Installation – Early Production

3. (Ref. Fig. 9-9) Remove the cab front panel as follows:
   a. Remove the Phillips truss head screw (Item 3) and flatwasher (Item 2) securing the cab front cover (Item 1) to the cab step.
   b. Remove the three (3) Phillips truss head screws (Item 5) and flatwashers (Item 4) and the cab front cover.
4. Remove the pedal assembly by loosening the four (4) ¼" nuts (Item 2) on the U-clamps (Item 4) and pushing the pedal mounting pin (Item 6) out.
5. Remove the rubber boot (Item 8), being careful not to damage it.
6. Use a spanner wrench to loosen and remove the piston guide (Item 9) from the body (Item 18).
7. Remove the flange head capscrew (Item 7) from the piston (Item 12). Record the number of turns it took to back out the capscrew.

   Note: *The flange head capscrew (Item 7) has thread sealant applied to its threads. Grasp the piston around the large diameter end, so as to not damage the sealing area on the piston.*

8. Remove all thread sealant from the flange head capscrew and the piston.
9. Install the flange head capscrew into the piston, turning it in the same number of turns that was used to back it out.
10. Install and secure the piston guide (Item 9) into the body.

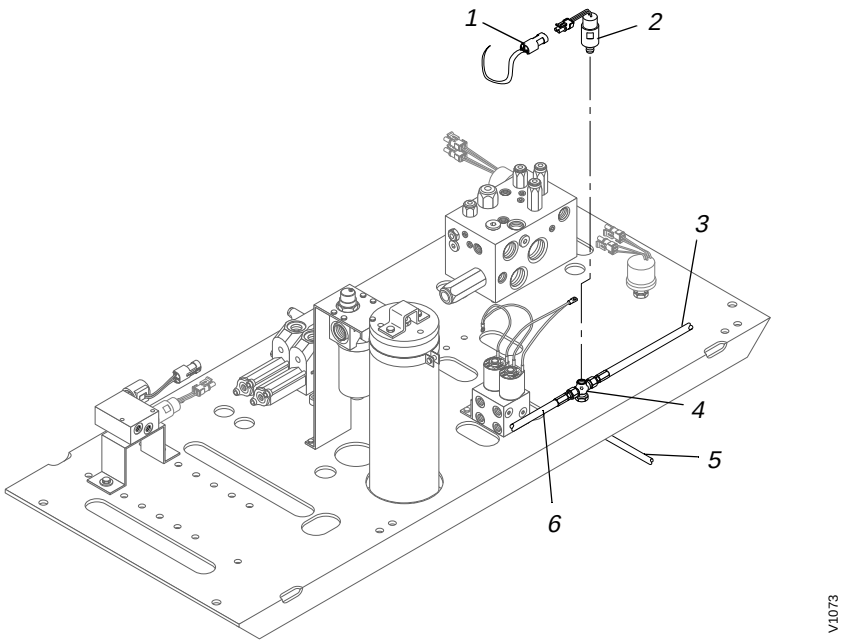
    Note: *Do not install rubber boot at this time.*

11. Install the brake pedal (Item 1) onto the actuator base (Item 5) by pushing the pedal mounting pin (Item 6) through the U-clamps (Item 4) until centered in the actuator base (Item 5).
12. Tighten the four (4) ¼" nuts (Item 2) on the U-clamps. Adjust the deadband setscrew (Item 3) out so that it doesn't contact the flange head capscrew (Item 7).
13. Connect a 0–600 psi gauge to the brake test port located behind the cab step.
14. Start the engine and record the maximum brake output pressure with the brake pedal fully depressed. If the pressure is outside the range of 330–375 psi, adjust the flange head capscrew (Item 7). This can be accomplished by turning the capscrew into the piston (Item 12) to decrease the pressure or out to increase the pressure.
15. Repeat Step 1 through Step 6.
16. Record the number of turns it takes to remove the flange head capscrew from the piston. Apply blue thread sealant the threads of the capscrew, being careful not to get the thread sealant anywhere on the piston sealing area. Turn the flange head capscrew in the recorded number of turns.
17. Install and secure the piston guide (Item 9) into the body (Item 18).
18. Install rubber boot (Item 8) onto body. Apply a quality adhesive sealant to the boot and the head of the flange bolt.
19. Repeat Step 11 and Step 12.
20. Adjust the deadband setscrew until it contacts the flange head capscrew (Item 7).
21. Place a 0.010" shim between the actuator base (Item 5) and the pedal return stop.
22. Connect a 0-600 psi gauge to the brake test port behind the cab step. Start the engine.
23. Adjust the deadband setscrew just until the regulated output pressure starts to rise, back out the setscrew 1/8 turn, and lock the setscrew with the jam nut.
24. Remove the 0.010" shim and the 0–600 psi gauge.
25. (Ref. Fig. 9-9) Install the cab front panel as follows:
    a. Secure the cab front cover (Item 1) to the front of the cab with three (3) flatwashers (Item 4) and Phillips truss head screws (Item 5)
    b. Secure the cab front cover to the cab step with a flatwasher (Item 2) and Phillips truss head screw (Item 3).
    c. Tighten screws until snug.

Service Brake Pressure Switch Replacement

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)



#	Description
1	Wiring Harness Connector
2	Service Brake Pressure Switch
3	Hydraulic Hose

#	Description
4	Adapter Fitting
5	Brake Pedal Hydraulic Hose
6	Hydraulic Hose

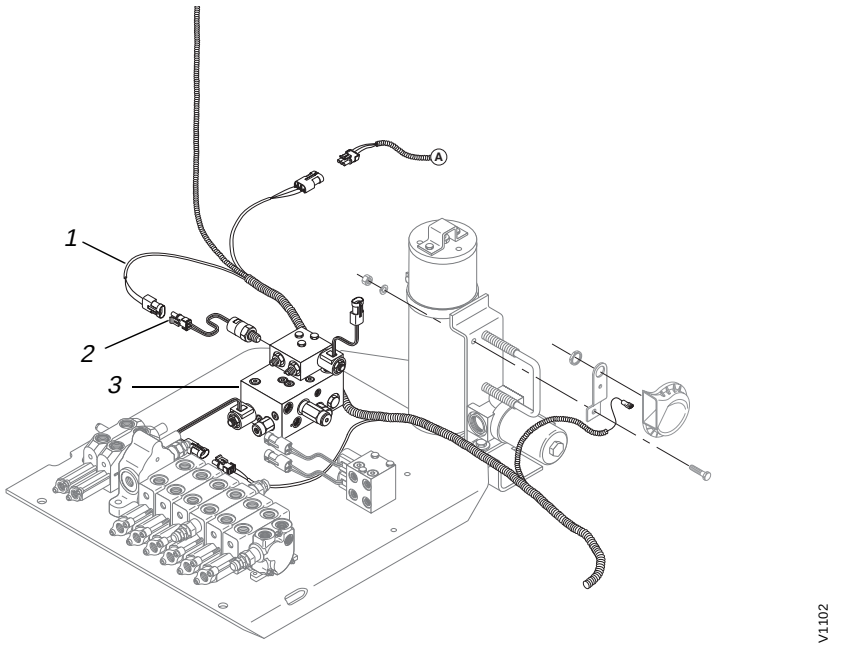
Fig. 9-10: Service Brake Pedal Pressure Switch – Control Manifold Hydraulics

The service brake pedal pressure switch is located on the left side and towards the rear of the valve plate (see Fig. 9-10). This switch is normally open and is set to close above 250 psi.

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Tag and disconnect the wiring harness connector (Item 1) from the connector on the brake pressure switch (Item 2).
3. Remove the brake pressure switch from the adapter fitting (Item 4). Discard the pressure switch.
4. Install a new brake pressure switch (Item 2) on the adapter fitting (Item 4). For final tightening, torque the pressure switch to 205–235 in-lbs.
5. Reconnect the wiring harness connectors (Item 1) to the connectors on the brake pressure switch.

Models with Mid-Inlet Hydraulics

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)



#	Description
1	Wiring Harness Connector
2	Service Brake Pressure Switch

#	Description
3	Control Valve

Fig. 9-11: Service Brake Pedal Pressure Switch – Models with Mid-Inlet Hydraulics

The service brake pedal pressure switch is located on the right side of the control valve in the port marked "**SW**" (see Fig. 9-11). This switch is normally open and is set to close above 250 psi.

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Tag and disconnect the wiring harness connector (Item 1) from the connector on the brake pressure switch (Item 2).
3. Remove the brake pressure switch from the control valve (Item 3). Discard the pressure switch.
4. Install a new brake pressure switch in the "SW" port of the control valve. For final tightening torque the pressure switch to 205–235 in-lbs.
5. Reconnect the wiring harness connector (Item 1) to the connector on the brake pressure switch.

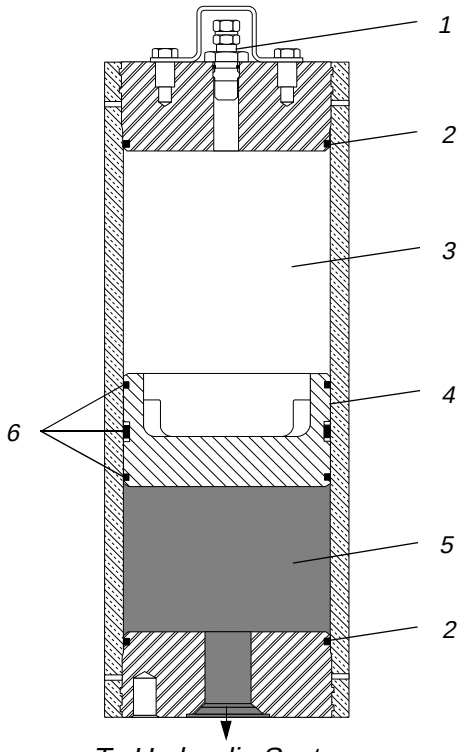
Accumulator

General

The accumulator is a 3000 psi piston-type accumulator. It has a oil volume of 116 cubic inches and gas volume of 126 cubic inches, with a bore size of four inches.

The pneumatic accumulator is operated by compressed gas. Gas and hydraulic oil occupy the same container. When oil pressure rises, incoming oil compresses the gas. When oil pressure drops, the gas expands, forcing oil out. The gas is separated from the oil by a “free floating” piston (see Fig. 9-12). This prevents mixing of gas and oil and keeps gas out of the hydraulic system. The piston (Item 4) fits into a smooth bore and uses seals (Item 6) to separate gas (Item 3) from oil (Item 5). O-rings (Item 2) in the end caps prevent leakage of gas/oil.

The accumulator must be “pre-charged” with gas before use in a system. This is done by filling the gas chamber with dry nitrogen to a pressure of 400 psi. The gas valve (Item 1) is used for pre-charging and testing the accumulator.



#	Description
1	Gas Valve
2	End Cap O-Rings
3	Gas Chamber

#	Description
4	“Free-Floating” Piston
5	Oil Chamber
6	Piston Seals

Fig. 9-12: Accumulator

Precautions

WARNING: Never fill an accumulator with oxygen! An explosion could result if oil and oxygen mix under pressure. **Always fill an accumulator with dry nitrogen.** Nitrogen gas is free of water vapor and oxygen which makes it harmless to parts and is safe to use.

CAUTION: Never fill an accumulator with air. When air is compressed, water vapor condenses and can cause corrosion. This may damage seals and ruin the accumulator.

CAUTION: Never charge an accumulator to a pressure more than that specified. Pressure should be 375–425 psi.

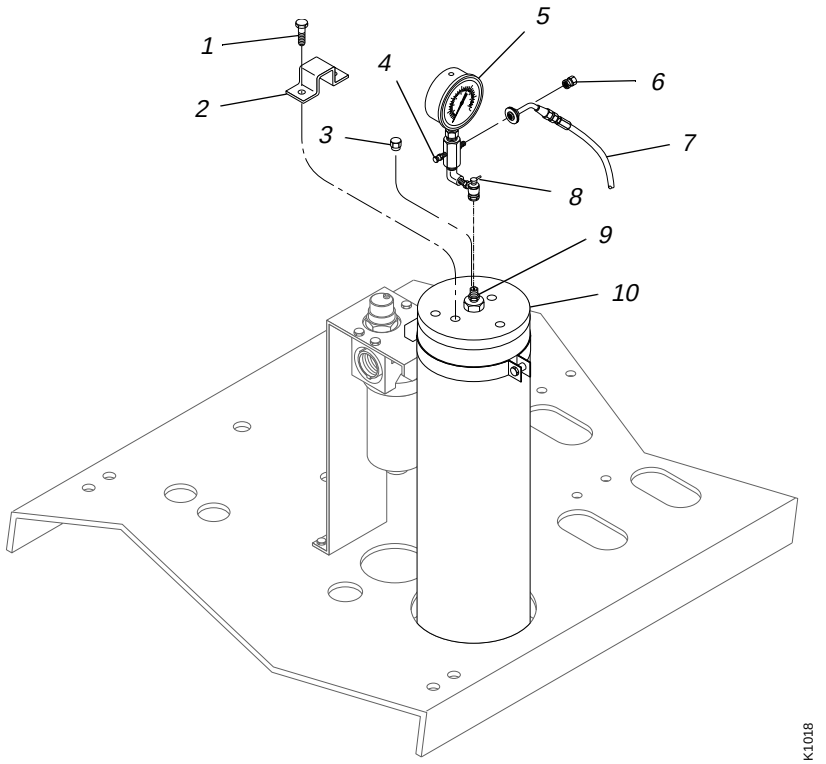
WARNING: Always release all hydraulic pressure before removing an accumulator from the system.

CAUTION: Before disassembling an accumulator, release both gas and hydraulic pressure. When disassembling an accumulator, make sure that dirt and abrasive materials do not enter any openings.

Pre-Charging Accumulator

Note: *Replacement accumulators shipped from the factory are not pre-charged.*

Make sure the nitrogen bottle, as well as the charging and gauging assembly used, is compatible with the gas valve assembly. The nitrogen source and all components must be rated for a pressure at least as high as the nitrogen source. It is strongly recommended that the nitrogen bottle has a high pressure regulator. Nitrogen gas bottles for water-pumped nitrogen have right-hand valve threads and are used with accumulators up to 3000 psi.



#	Description
1	Capscrew
2	Valve Guard
3	Gas Valve Cap
4	Gauge Bleed Valve
5	Accumulator Test Gauge

#	Description
6	Gauge Cap
7	Nitrogen Hose
8	“T” Handle
9	Gas Valve
10	Accumulator

Fig. 9-13: Accumulator Charging

Pre-charge the accumulator using the following steps (see Fig. 9-13):

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Make sure nitrogen supply is shut off.
3. Attach hose (Item 7) to nitrogen bottle.
4. Remove two (2) capscrews (Item 1), valve guard (Item 2), and gas valve cap (Item 3).
5. Back “T” handle (Item 8) on accumulator test gauge (Item 5) all the way out (counterclockwise). The pressure gauge must have 2500 psi capacity (correctly calibrated).
6. Mount test gauge on accumulator gas valve (Item 9) and tighten. Be sure of an air-tight connection when mounting gauge.
7. Close (turn in) bleed valve (Item 4).
8. Remove gauge cap (Item 6) from test valve.
9. While making sure not to loop or twist the hose, attach swivel nut on nitrogen hose (Item 7) to gas valve.

10. Turn “T” handle all the way down. This will depress (open) the core in the gas valve.
11. Crack open nitrogen bottle valve and **slowly** fill the accumulator. Close the nitrogen bottle valve when gauge indicates desired pre-charge pressure (400 psi).
12. Let the pre-charge set for 10–15 minutes. This will allow the gas temperature to stabilize. If the desired pre-charge range (375–425) is exceeded, close nitrogen bottle valve, then slowly open the bleed valve (Item 4) until desired pressure is reached.

CAUTION: Do not reduce pre-charge by depressing valve core with a foreign object. High pressure may rupture rubber valve seat.

13. When finished pre-charging accumulator, turn “T” handle all the way out, then open (turn out) bleed valve.
14. While holding the gas valve to keep it from turning, loosen and remove swivel nut on nitrogen hose (Item 7).
15. Install gauge cap on test valve. Remove test gauge and replace gas cap on valve (Item 3). Torque gas cap to 10–15 in-lbs. (Gas cap acts as a secondary seal.)
16. Install gas valve guard and two (2) capscrews on the accumulator gas end cap. Torque capscrews to 35 ft-lbs.

Checking Pre-charge

Gas Leaks

If an external gas leak is suspected, apply soapy water to the gas valve and seams of the gas end cap. If bubbles form, there is a leak.

If and internal gas leak is suspected, check for foaming oil in the hydraulic reservoir and/or no accumulator action. These signs usually mean faulty piston seals inside the accumulator.

Checking Accumulator Recharge Pressure and Nitrogen Pre-Charge

1. Park the vehicle on a level surface, lower boom to the ground, and engage park brake.
2. While the engine is off, pump brake pedal repeatedly until accumulator is discharged. This will allow the “free-floating” piston to bottom against the hydraulic end cap.
3. Connect a high pressure gauge to the test port marked “ACCUM.” located behind the cab step (see Fig. 9-3).
4. Start the engine and slowly pump the brake pedal while closely watching the test gauge.

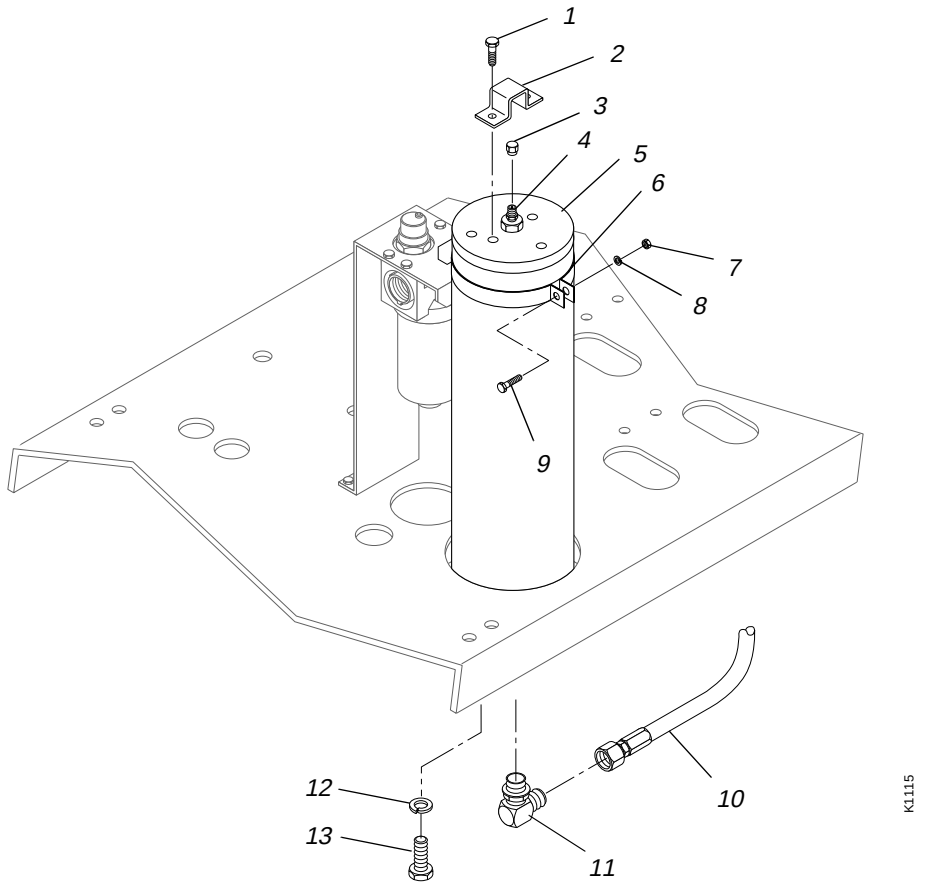
5. Record the lowest pressure observed before the accumulator recharges. The pressure should be 950–1200 psi. This reading is the accumulator recharge pressure.
6. Shut the engine off.
7. Slowly pump the brake pedal while closely watching the pressure gauge.
8. Record the lowest pressure observed before the pressure drops to nearly zero. This reading is the nitrogen pre-charge. This pressure should be 375–425 psi.
9. If either of the recorded readings are outside the recommended ranges, contact the JLG Service Department.

Removal

Accumulator

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)



#	Description
1	Capscrew
2	Gas Valve Guard
3	Gas Valve Cap
4	Gas Valve
5	Accumulator
6	Mounting Bracket
7	Hex Nut

#	Description
8	Lockwasher
9	Capscrew
10	Hydraulic Hose to AC Port on Control Manifold
11	Elbow
12	Lockwasher
13	Hex Capscrew

Fig. 9-14: Accumulator Installation – Models with Control Manifold Hydraulics

The following procedure refers to Fig. 9-14.

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. With the engine off, install a brake pressure diagnostic port test gauge to the hose into the brake diagnostic port. This test gauge kit sold by JLG includes a 3-foot long hose making it possible to read the gauge from the operator cab.

3. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. At this point, the “free-floating” piston will be bottomed at the hydraulic end cap. Remove test gauge and cap diagnostic port.
4. To release pre-charge pressure in accumulator, perform the following steps (see Fig. 9-2 on page 9-2):
   a. Remove two (2) capscrews (Item 1) and gas valve guard (Item 2).
   b. Remove gas valve cap (Item 3) from gas valve (Item 9).
   c. Back “T” handle (Item 8) on accumulator test gauge (Item 5) all the way out (counter clockwise). The bleed valve (Item 4) should be closed (turned in).
   d. Mount test gauge on accumulator gas valve (Item 9). Be sure of an air-tight connection when mounting the gauge.
   e. Turn “T” handle all the way down. This will depress (open) the core in gas valve.
   f. Slowly open bleed valve to release gas pressure.
   g. Wait until all gas pre-charge is released from accumulator (pressure gauge reads 0 psi). Remove pressure gauge and temporarily reinstall gas valve cap (Item 3).

CAUTION: Do not release pre-charge by depressing valve core with a foreign object. High pressure may rupture rubber valve seat.

5. To avoid possible contamination of hydraulic system, clean swivel nut on hydraulic hose (Item 10) and elbow (Item 11) on bottom of accumulator (Item 5) with solvent.
6. Slowly loosen and remove hydraulic hose connected to elbow. Drain remaining oil into appropriate container. Cap elbow and hydraulic hose end.
7. Loosen hex nut (Item 7), lockwasher (Item 8), and capscrew (Item 9) securing accumulator to mounting bracket (Item 6) enough so accumulator may be removed.

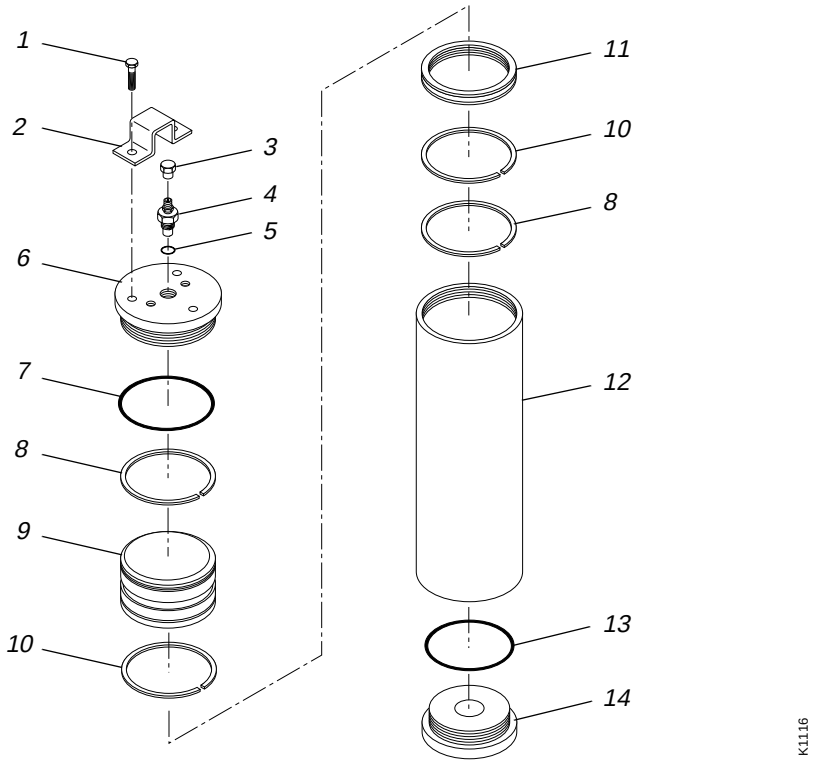
CAUTION: Do not completely remove hex nut, lockwasher, and capscrew. Care must be taken to avoid personal and/or equipment damage when accumulator is being removed.

8. Loosen and remove three (3) capscrews (Item 13) and lockwashers (Item 12) securing accumulator to valve plate.
9. Carefully remove the accumulator and take it to an appropriate place for further disassembly and cleaning.

Note: *Threaded holes in the accumulator end cap may be used as a means of attachment for lifting. A sling around the body may also be used.*

Overhaul

Accumulator



#	Description
1	Hex Capscrew
2	Valve Guard
3	Gas Valve Cap
4	Gas Valve
5	O-Ring
6	Gas End Cap
7	O-Ring

#	Description
8	Teflon Ring
9	Piston
10	Backup Washer
11	V-Ring
12	Accumulator Body
13	O-Ring
14	Hydraulic End Cap

Fig. 9-15: Accumulator Assembly

The following procedure refers to Fig. 9-15.

1. Lay accumulator horizontally in a vice or hold it down with a strap wrench.
2. Remove fitting (Item 11) from bottom of accumulator.
3. Remove gas valve cap (Item 3) and gas valve (Item 4).
4. Remove the gas end cap (Item 6) from accumulator body (Item 12) as follows:
   a. Install three (3) pins into holes in end cap.
   b. Using a long bar working against the pins, unscrew end cap from body.

CAUTION: Always remove the gas end cap before removing the hydraulic end cap.

5. Remove piston (Item 9) by pushing it out with a bar from hydraulic end of accumulator.

CAUTION: Never try to remove piston by applying compressed air to the opposite end.

6. Remove two (2) Teflon rings (Item 8) from piston.
7. Remove two (2) backup washers (Item 10) from piston.
8. To remove V-ring (Item 11) from piston, lift it with a small, smooth screw driver or similar tool. Move tool around the piston several times while using the other hand to work ring off piston.
9. Remove hydraulic end cap (Item 14) from the accumulator body as described in Step 4.
10. Remove O-rings (Items 5, 7, and 13) from gas valve and end caps (Items 4, 6, and 14).
11. Discard O-rings, Teflon rings, backup washers, and V-ring.
12. Clean all remaining parts with solvent and dry with compressed air. Clean bore of accumulator body with a clean, lint-free cloth soaked in clean solvent. The bore must be clean of any visible particles or particles detectable to touch.
13. Inspect piston for cracks, burrs around O-ring grooves, or any other visible damage. Using a light, examine the body bore for scratches or scoring. Inspect end caps for damaged threads or burrs on O-ring grooves. Replace any damaged parts.

Note: *Minor nicks, scratches, or light scoring of the body bore can be removed by using crocus cloth. Dress bore until all apparent imperfections have been removed.*

Note: *The two end caps (Items 6 and 14) and accumulator body (Item 12) cannot be purchased separately. If these items become damaged, the entire accumulator assembly must be replaced.*

14. Obtain an accumulator repair kit to replace O-rings, Teflon rings, back-up washers, and V-ring.

Note: *Coat all internal parts with clean hydraulic fluid before reassembly.*

15. Install new V-ring (Item 11) and two (2) backup washers (Item 10) (one on each side of V-ring) on piston (Item 9).
16. Install two (2) new Teflon rings (Item 8) on piston.
17. Install piston (hollow side toward gas end) into bore of hydraulic end of accumulator body (Item 12). Piston will fit snug. To avoid possible damage, do not let V-ring drag on threads. The piston must go into the bore exactly square and very slowly. The V-ring will compress as it rides up the chamfer if done slowly. However, it may be damaged if forced quickly.

18. Use a hammer and wood block to tap piston into the bore until it is about two inches below start of honed bore surface. To prevent piston from bouncing back and damaging the V-ring, keep force against piston while tapping piston through bore chamfer. Cover gas end opening of accumulator body to keep dirt out.
19. Install new O-rings (Items 7 and 13) on end caps (Items 6 and 14).

Note: *Care should be taken not to drag end cap O-rings over threads in body. Each end cap should be flush with or above the end of the accumulator body within 1/32" to 3/32". The end cap will stop against chamfer leading into honed bore. Since O-ring sealing is not dependent upon cap tightness, extreme tightness is not required.*

20. Install hydraulic end cap (Item 14) on hydraulic end of accumulator body.
21. Push piston fully down until it contacts hydraulic end cap.

Important: *If piston is not in contact with hydraulic end cap, it will slam into end cap when accumulator is pre-charged.*

22. Install gas end cap (Item 6) on gas end of accumulator body.
23. Install new O-ring (Item 5) on gas valve (Item 4) and install valve in end cap. Pre-charge the accumulator with nitrogen. See "Pre-Charging Accumulator" on page 9-19 for procedures.

Installation

Accumulator

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C42 (S/N 101–521)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)

The following installation procedure refers to Fig. 9-14 on page 9-23.

1. It is usually easier to pre-charge the accumulator before installation on the machine. See "Pre-Charging Accumulator" on page 9-19 for procedures.
2. Install elbow (Item 11) in accumulator bottom (Item 5). Torque to 40–44 ft-lbs and cap elbow.
3. Install accumulator into mounting bracket (Item 6). Position accumulator so that bottom holes line up with holes in valve plate.
4. Secure accumulator to valve plate with three (3) lockwashers (Item 12) and capscrews (Item 13). Torque capscrews to 65 ft-lbs.
5. Tighten hex nut (Item 7), lockwasher (Item 8), and capscrew (Item 9) to secure the accumulator to the mounting bracket. Torque hex nut to 50 in-lbs.
6. Connect hydraulic hose (Item 10) to elbow. Torque swivel nut to 44–48 ft-lbs.

Park Brake

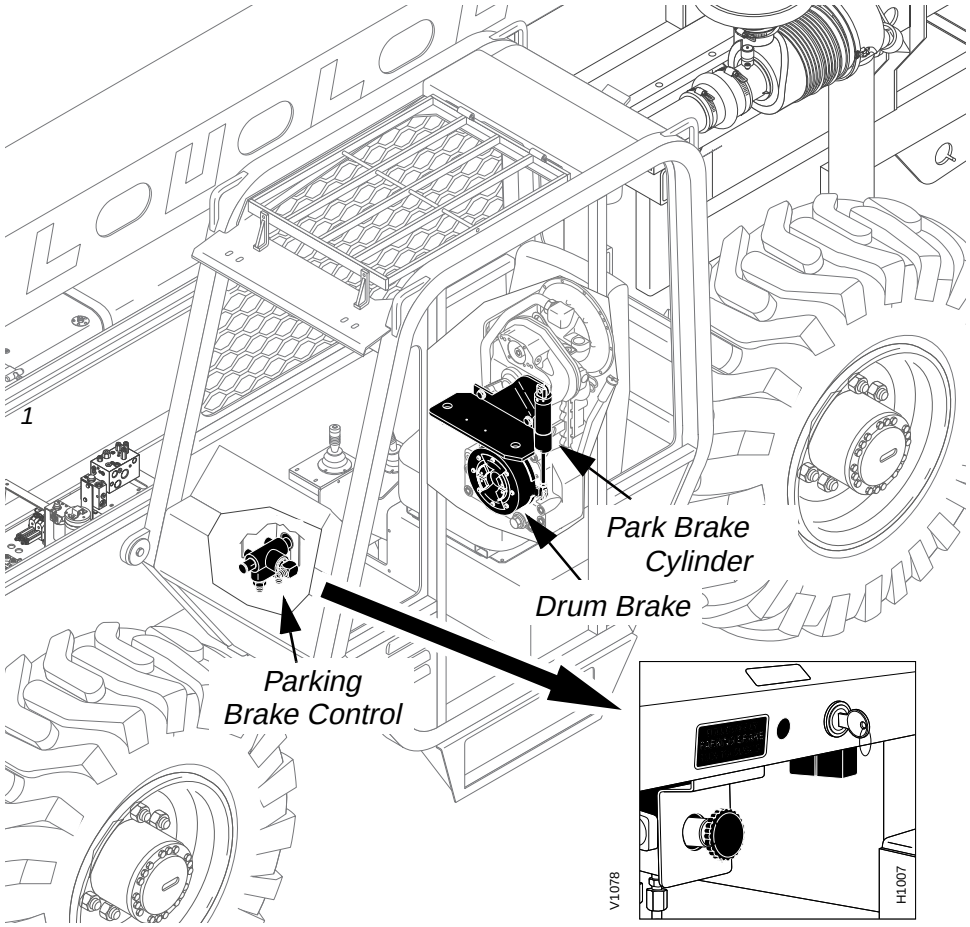


Fig. 9-16: Park Brake

The park brake is a drum type located on the output shaft of the transmission (see Fig. 9-16). The park brake cylinder, cylinder mount, and linkage assembly is located on the transmission behind the valve plate. The hydraulic cylinder has an internal compression spring that actuates the park brake.The park brake control is located beneath the instrument panel in the operator compartment.

When the valve handle is pulled out, hydraulic pressure is routed to the cylinder. The hydraulic pressure overcomes the spring force and the park brake is engaged. When the handle is pushed in, the hydraulic pressure in the cylinder is released to the return side of the hydraulic system. The spring force in the cylinder then releases the park brake. In the event that hydraulic pressure is lost, the park brake can still be set.

Two versions of park brake cylinder mounting and linkage assemblies are described in the following pages. The version used in early production (see Fig. 9-21 under “Cylinder Removal” below) has a brake cylinder mounted horizontally. This version includes a cylinder that has 200 pounds of spring force when the rod is fully extended, a maximum hydraulic retract of 500 psi, and a 2” bore by 2” stroke single-acting spring extend. It has one grease fitting that requires weekly lubrication (see Fig. 9-21, Item 22).

The version used in latter production is shown in Fig. 9-22. This version includes a cylinder that is mounted vertically and has 600 pounds of spring force when the rod is fully extended and 300 pounds of spring force when the rod is fully retracted. It has a maximum hydraulic extend of 500 psi and a 2” bore by 2.62” stroke single-acting spring retract.

Inspection

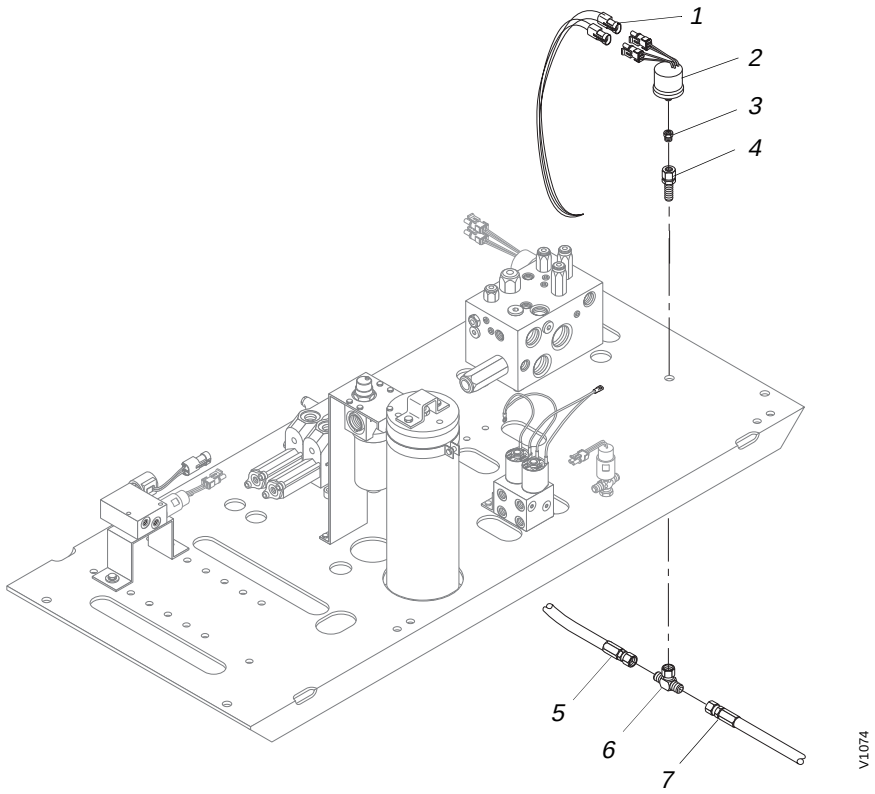
1. Inspection interval is every 100 hours of operation.
2. Check all hydraulic lines and fittings for leaks and damage.
3. Inspect hydraulic cylinder and mechanical linkages for condition and wear.
4. Check condition of breather port on hydraulic cylinder.
5. Repair or replace items as needed.

Park Brake Pressure Switch

Removal

Models with Control Manifold Hydraulics

6K-37 (S/N 101–317)
6K-42 (S/N 101–119)
8K-42 (S/N 101–220)
10K-42 (S/N 101–106)
10K-54 (S/N 101–103)
644B-37 (S/N 101–590, 592–666)
644B-42 (S/N 101–207)
844C-42 (S/N 101–621)
1044C-42 (S/N 101–116)
1044C-54 (S/N 101–154)



#	Description
1	Wiring Harness Connector
2	Park Brake Pressure Switch
3	Reducer Bushing
4	Adapter

#	Description
5	Hydraulic Hose to Brake Cylinder
6	Swivel Branch Tee
7	Hydraulic Hose to Brake Valve

Fig. 9-17: Park Brake Pressure Switch - Models with Control Manifold Hydraulics

(Ref. Fig. 9-17) For models with control manifold hydraulics, the park brake pressure switch is located on the center, rear portion of the valve plate. This switch is normally closed and is set to open at 100 psi.

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.

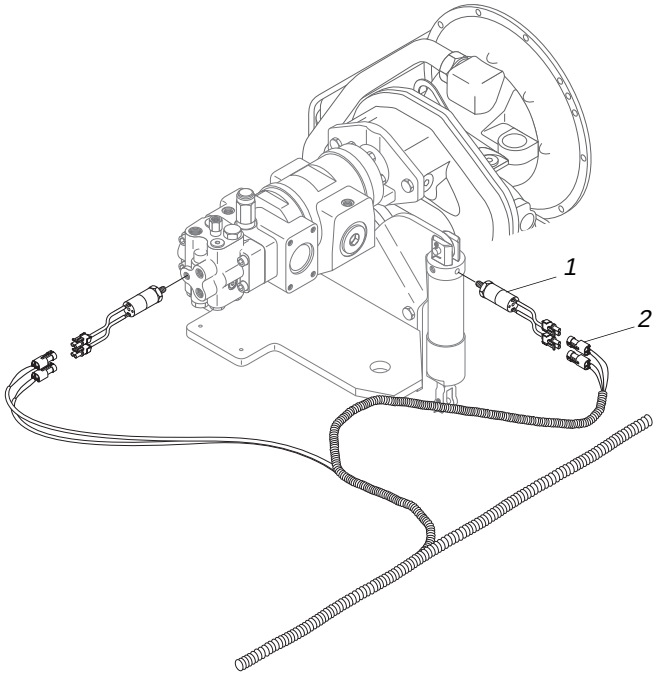
CAUTION: To avoid potential injury, be sure to park the vehicle on a level surface, lower the boom to the ground, shut off the engine, and *block the wheels* before servicing the park brake.

2. Release the park brake.
3. Tag and disconnect the wiring harness connectors (Item 1) from the connectors on the brake pressure switch (Item 2).

4. Remove the brake pressure switch from the reducer bushing (Item 3). Discard pressure switch.

Models with Mid-Inlet Hydraulics

6K-37 (S/N 318–)
6K-42 (S/N 120–)
8K-42 (S/N 221–)
10K-42 (S/N 107–)
10K-54 (S/N 104–)
644B-37 (S/N 591, 667–)
644B-42 (S/N 208–)
844C-42 (S/N 622–)
1044C-42 (S/N 117–)
1044C-54 (S/N 155–)



#	Description
1	Park Brake Pressure Switch

#	Description
2	Intermediate Wire Harness

Fig. 9-18: Park Brake Pressure Switch - Models with Mid-Inlet Hydraulics

(Ref. Fig. 9-18) For models with mid-inlet hydraulics, the park brake pressure switch is located on the park brake cylinder. This switch is normally closed and is set to open at 100 psi.

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.

CAUTION: To avoid potential injury, be sure to park the vehicle on a level surface, lower the boom to the ground, shut off the engine, and *block the wheels* before servicing the park brake.

2. Release the park brake.
3. Tag and disconnect the wiring harness connectors (Item 2) from the connectors on the brake pressure switch (Item 1).
4. Remove the brake pressure switch from the park brake. Discard pressure switch.

Installation, Park Brake Pressure Switch

Models with Control Manifold Hydraulics

(Ref. Fig. 9-17) The following procedure describes installation of the park brake pressure switch used on models with control manifold hydraulics.

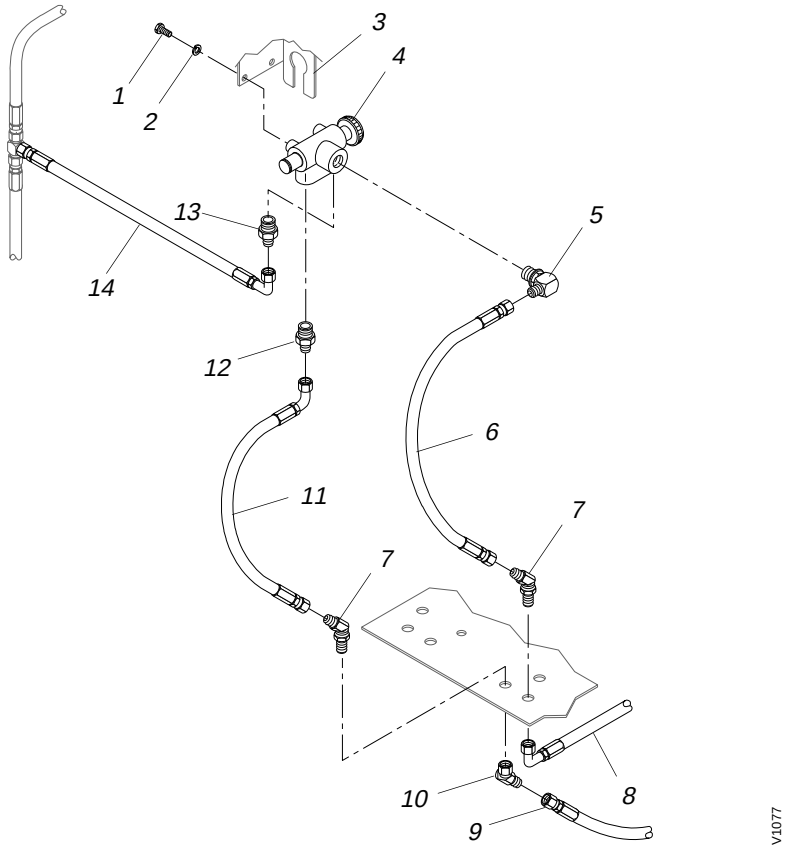
1. Install a new brake pressure switch (Item 2) on reducer bushing (Item 3). Tighten two or three turns past finger tight.
2. Reconnect wiring harness connectors (Item 1) to the connectors on the brake pressure switch.

Models with Mid-Inlet Hydraulics

(Ref. Fig. 9-18) The following procedure describes installation of the park brake pressure switch used on models with control manifold hydraulics.

1. Install a new brake pressure switch (Item 1) on the park brake. Tighten two or three turns past finger tight.
2. Reconnect wiring harness connectors (Item 2) to the connectors on the brake pressure switch. 3

Valve Removal, Park Brake



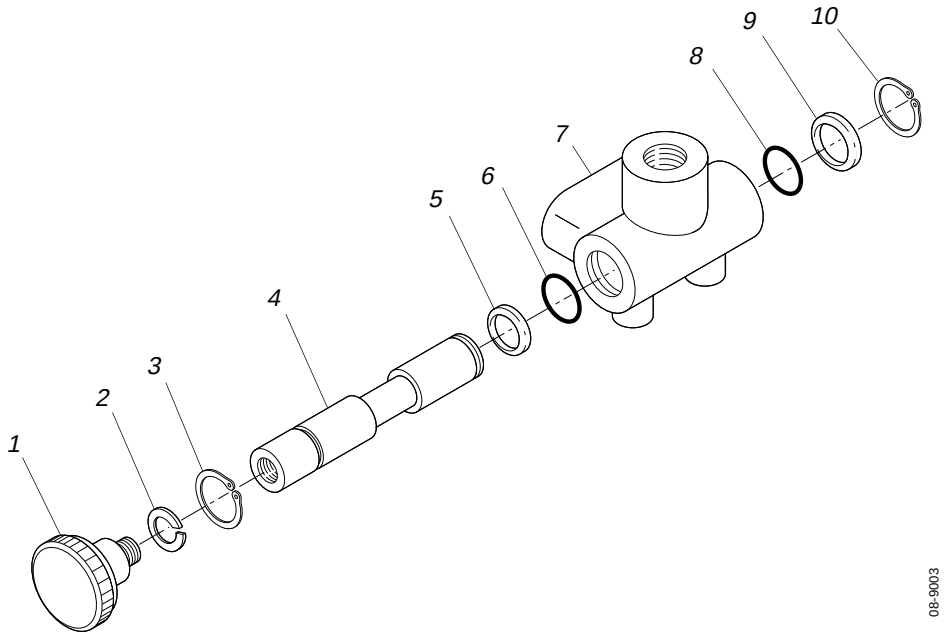
#	Description
1	Capscrew
2	Lockwasher
3	Instrument Panel
4	Park Brake Valve
5	Elbow
6	Hydraulic Hose
7	Elbow

#	Description
8	Hydraulic Hose to Pressure Switch
9	Hydraulic Hose to Control Manifold
10	Elbow
11	Hydraulic Hose
12	Check Valve
13	Connector
14	Hydraulic Hose

Fig. 9-19: Park Brake Assembly

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Block the wheels and release the park brake.
3. Install a brake pressure diagnostic port test gauge to the hose into the brake diagnostic port.
4. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge and cap diagnostic port.
5. To avoid possible contamination of hydraulic system, clean the park brake valve and connecting hoses.

6. Tag and slowly loosen hydraulic hoses (Items 6, 11 and 14) from elbow (Item 5), check valve (Item 12), and connector (Item 13). Bleed any remaining oil into appropriate container. Disconnect hoses. Cap hoses and fittings.
7. Loosen and remove the two (2) each capscrews (Item 1) and lockwashers (Item 2) that secure the park brake valve (Item 4) to the instrument panel (Item 3).
8. Remove the park brake valve and take it to a clean area appropriate for further cleaning and disassembly.
9. Remove elbow (Item 5), check valve (Item 12), and connector (Item 13) from park brake valve (Item 4). Clean with appropriate solvent and dry with compressed air. Replace any damaged parts.
10. Disassemble, inspect, and repair park brake valve as described below and shown in Fig. 9-20.



#	Description
1	Control Knob
2	Lockwasher
3	Snap Ring
4	Valve Spool
5	Teflon Backup Ring

#	Description
6	O-Ring
7	Valve Housing
8	O-Ring
9	Teflon Backup Ring
10	Snap Ring

Fig. 9-20: Park Brake Valve Assembly

a. Remove snap ring (Item 10) from valve spool (Item 4).

b. Remove valve spool assembly (Items 1–4) from the valve housing (Item 7).

c. Remove snap ring (Item 3) from valve spool.

d. Remove O-rings (Items 6 and 8) and backup rings (Items 5 and 9) from valve housing.

e. Discard O-rings, backup rings, and snap rings.

f. Clean all remaining parts with appropriate solvent and dry with compressed air. Inspect and replace any damaged parts.

Note: *It may not be necessary to separate control knob (Item 1) and lockwasher (Item 2) from valve spool (Item 4). Disassemble only if they are damaged or extremely contaminated.*

Note: *The valve spool (Item 4) and valve housing (Item 7) are not sold separately. If these parts are damaged, it will necessary to replace the entire park brake valve assembly.*

g. Install new O-rings (Items 6 and 8) and backup rings (Items 5 and 9) into valve housing in order shown in Fig. 9-20. Lubricate O-rings and backup rings before installing them.

h. Install new snap ring (Item 3) into slot on valve spool near control knob.

i. Install valve spool assembly (Items 1–4) into valve housing (Item 7).

j. Install remaining snap ring (Item 10) into slot near end of valve spool.

Valve Installation, Park Brake

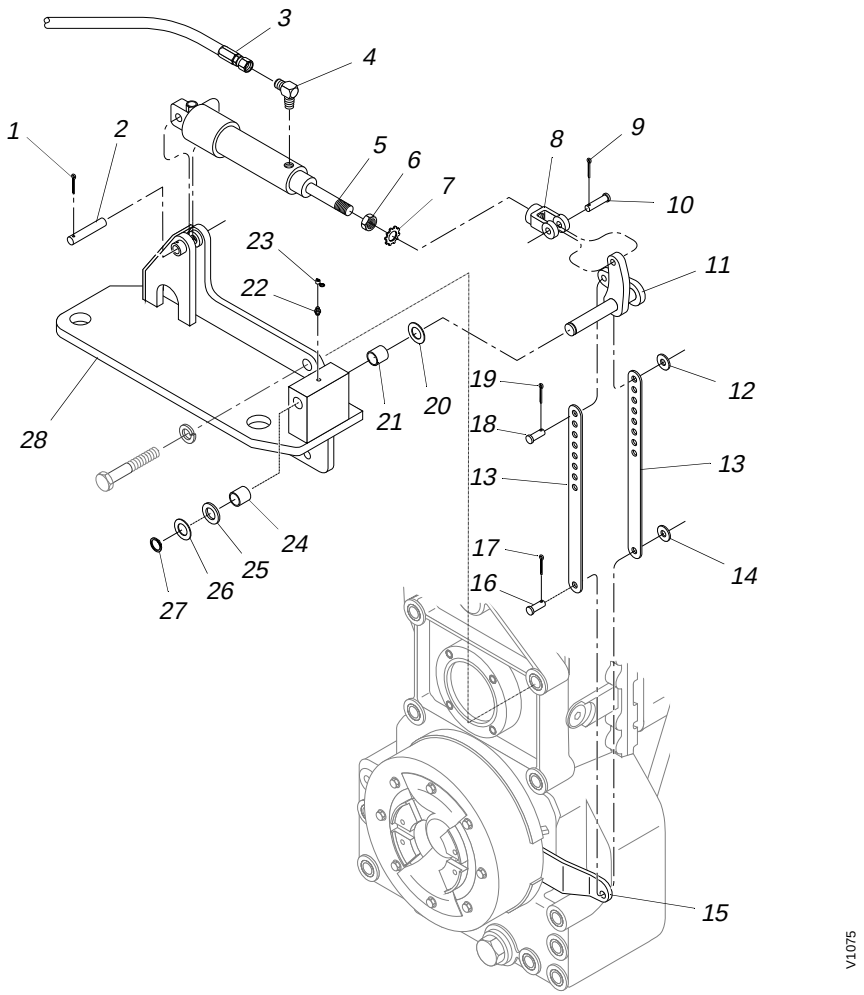
The following installation procedure refers to Fig. 9-19.

1. Reconnect elbow (Item 5), check valve (Item 12), and connector (Item 13) to assembled park brake valve (Item 4). For final tightening, torque the check valve and connector to 46–50 ft-lbs and the elbow to 40–44 ft-lbs.
2. Install the park brake valve assembly (Item 4) on the instrument panel (Item 3) using two (2) each capscrews (Item 1) and lockwashers (Item 2). For final tightening, torque the capscrews to 156 in-lbs.
3. Reconnect the hydraulic hoses (Items 6, 11, and 14) to elbow (Item 5), check valve (Item 12), and connector (Item 13). For final tightening, torque hydraulic hose swivel nuts to 235–265 in-lbs.

Cylinder Removal

Models with Horizontal Cylinder Mount

644B-37 (S/N 101–383)
644B-42 (S/N 101–119)
844C-42 (S/N 101–281)
1044C-42 (S/N 101–106)
1044C-54 (S/N 101–102)
6K-37 (S/N 101–211)
6K-42 (S/N 101–105)
8K-42 (S/N 101–162, 165)
10K-42 (S/N 101–106)



#	Description
1	Cotter Pin
2	Brake Cylinder Pin
3	Hydraulic Brake Hose
4	Elbow
5	Park Brake Cylinder
6	Hex Jam Nut
7	Lockwasher
8	Clevis
9	Cotter Pin
10	Clevis Pin
11	Bell Crank
12	Flatwasher
13	Adjustable Link
14	Flatwasher

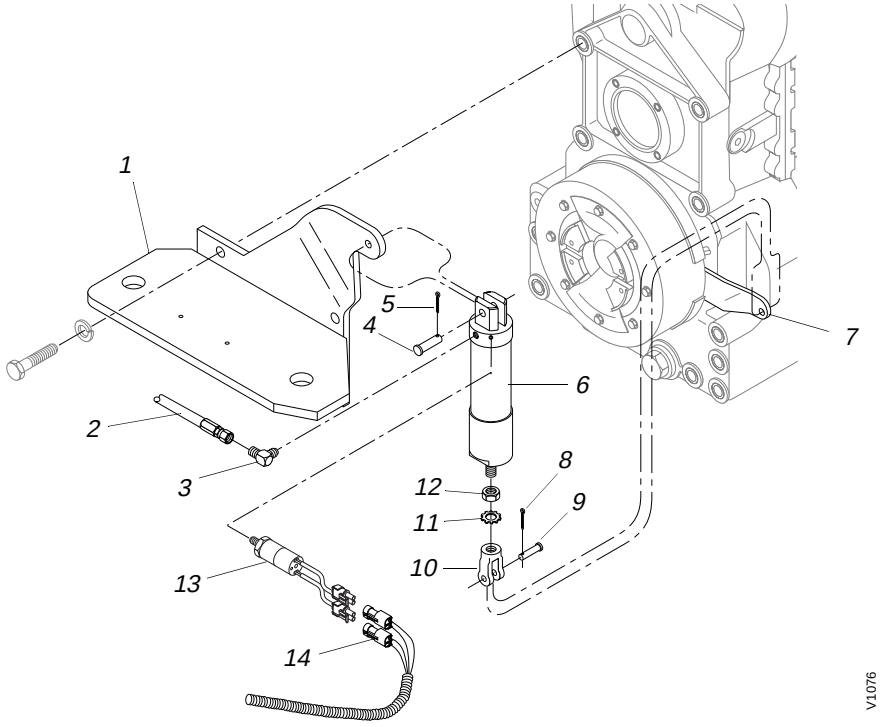
#	Description
15	Brake Cam
16	Clevis Pin
17	Cotter Pin
18	Clevis Pin
19	Cotter Pin
20	Shim
21	Bushing
22	Grease Fitting
23	Grease Fitting Cover
24	Bushing
25	Flatwasher
26	Shim
27	Retaining Ring
28	Park Brake Cylinder Mount

Fig. 9-21: Park Brake Cylinder – Models with Horizontal Cylinder Mount

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Block the wheels and make sure the park brake is released.
3. Install a brake pressure diagnostic port test gauge to the hose into the brake diagnostic port.
4. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge and cap diagnostic port.
5. Slowly loosen hydraulic brake hose (Item 3), bleed any remaining oil into appropriate container, and disconnect hose from elbow (Item 4).
6. Remove cotter pin (Item 9) from clevis pin (Item 10). While securing the brake cam in the up position and rotating the bell crank (Item 11) towards the park brake cylinder (Item 5), remove clevis pin from clevis (Item 8).
7. Remove the cotter pin (Item 1) and brake cylinder pin (Item 2) securing the park brake cylinder to the park brake cylinder mount (Item 28). Remove park brake assembly.
8. Remove adjustable link assembly (Items 12–19) as follows:
    a. Remove cotter pin (Item 19), flatwasher (Item 12), and clevis pin (Item 18) that secure two (2) adjustable links (Item 13) to bell crank (Item 11).
    b. Remove cotter pin (Item 17), flatwasher (Item 14), and clevis pin (Item 16) that secure two (2) adjustable links to brake cam (Item 15).
9. Remove bell crank assembly (Items 11, 20, 21, and 24–27) as follows:
    a. Remove retaining ring (Item 27), shim(s) (Item 26), and flatwasher (Item 25) from bell crank.
    b. Remove bell crank and remaining shim(s) (Item 20) from park brake cylinder mount (Item 28).
    c. Remove two (2) bushings (Items 21 and 24) from block portion of park brake cylinder mount.
10. Take the park brake assembly, along with other disassembled parts, to an appropriate place for further inspection and cleaning.
11. Remove the elbow (Item 4), clevis (Item 8), lockwasher (Item 7), and jam nut (Item 6) from park brake cylinder.
12. Discard the park brake cylinder, bushings, and cotter pins. Clean all remaining parts with appropriate solvent; inspect and replace as necessary.

Models with Vertical Cylinder Mount

644B-37 (S/N 384–)
644B-42 (S/N 120–)
844C-42 (S/N 282–)
1044C-42 (S/N 107–)
1044C-54 (S/N 103–)
6K-37 (S/N 212–)
6K-42 (S/N 106–)
8K-42 (S/N 163–164, 166–)
10K-42 (S/N 107–)
10K-54 (S/N 101–)



#	Description
1	Park Brake Cylinder Mount
2	Hydraulic Brake Hose
3	Elbow
4	Clevis Pin
5	Cotter Pin
6	Park Brake Cylinder
7	Brake Cam

#	Description
8	Cotter Pin
9	Clevis Pin
10	Clevis
11	Lockwasher
12	Jam Nut
13	Park Brake Pressure Switch
14	Wiring Harness

Fig. 9-22: Park Brake Cylinder – Vertical Cylinder Mount

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Block the wheels and make sure the park brake is released.
3. Install a brake pressure diagnostic port test gauge to the hose into the brake diagnostic port.
4. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge and cap diagnostic port.
5. Tag and disconnect wiring harness (Item 14) from park brake pressure switch (Item 13). Remove park brake pressure switch.
6. Slowly loosen hydraulic brake hose (Item 2), bleed any remaining oil into appropriate container, and disconnect hose from elbow (Item 3).
7. Remove cotter pin (Item 8) from clevis pin (Item 9). While holding the brake cam (Item 7) up, remove clevis pin from clevis (Item 10).

8. Remove cotter pin (Item 5) and clevis pin (Item 4) securing the park brake cylinder (Item 6) to cylinder mount (Item 1). Remove park brake assembly.
9. Take park brake assembly, along with other disassembled parts, to an appropriate place for further inspection and cleaning.
10. Remove elbow (Item 3), clevis (Item 10), lockwasher (Item 11), and jam nut (Item 12) from park brake cylinder.
11. Discard park brake cylinder and cotter pins. Clean all remaining parts with appropriate solvent; inspect and replace as necessary.

Cylinder Installation

Models with Horizontal Cylinder Mount

644B-37 (S/N 101–383)
644B-42 (S/N 101–119)
844C-42 (S/N 101–281)
1044C-42 (S/N 101–106)
1044C-54 (S/N 101–102)
6K-37 (S/N 101–211)
6K-42 (S/N 101–105)
8K-42 (S/N 101–162, 165)
10K-42 (S/N 101–106)

The following procedure refers to Fig. 9-21.

1. Install bell crank assembly (Items 11, 20, 21, and 24–27) as follows:
   a. Lubricate and install new bushings (Items 21 and 24) into block portion of park brake cylinder mount (Item 28). Install one into each end of block.
   b. Install shim(s) (Item 20) on bell crank (Item 11) and install bell crank through bushings.
   c. Install flatwasher (Item 25), shim(s) (Item 26), and retaining ring (Item 27) on bell crank.

Note: *Install as many shims as needed to eliminate horizontal movement of bell crank.*

2. Install adjustable link assembly (Items 12–19) as follows:
   a. Install clevis pin (Item 16) to secure two (2) adjustable links (Item 13) to brake cam. Install flatwasher (Item 14), and cotter pin (Item 17) on clevis pin.
   b. While securing brake cam (Item 15) in the up position and rotating bell crank (Item 11) towards park brake cylinder, secure adjustable links to bell crank (Item 11) with clevis pin (Item 18).
   c. Install flatwasher (Item 12), and new cotter pin (Item 19) on clevis pin.
3. Install elbow (Item 4) on new park brake cylinder (Item 5). Position elbow as shown in Fig. 9-21. For final tightening, turn elbow to 1.5–3 turns past finger tight.
4. Install park brake cylinder (Item 5) on brake cylinder mount (Item 28) using the brake cylinder pin (Item 2) and new cotter pin (Item 1).
5. Install clevis (Item 8), lockwasher (Item 7), and jam nut (Item 6) on new park brake cylinder.

Note: *With the park brake cylinder (Item 5) fully extended and the brake cam (Item 15) raised 1/16–1/8" from its lowest possible position, it should be possible to insert the clevis pin (Item 10) directly into the clevis (Item 8) and through the bell crank (Item 11).*

6. Make any necessary adjustments in the position of the clevis on the cylinder rod to meet the guidelines described in the above note.
7. Install new cotter pin (Item 9) on clevis pin.
8. Tighten jam nut (Item 6) to ensure that lockwasher (Item 7) is secured to clevis.
9. Reconnect hydraulic brake hose (Item 3) to elbow and torque hose swivel nut to 235–265 in-lbs.

Models with Vertical Cylinder Mount

644B-37 (S/N 384–)
644B-42 (S/N 120–)
844C-42 (S/N 282–)
1044C-42 (S/N 107–)
1044C-54 (S/N 103–)
6K-37 (S/N 212–)
6K-42 (S/N 106–)
8K-42 (S/N 163–164, 166–)
10K-42 (S/N 107–)
10K-54 (S/N 101–)

The following procedure refers to Fig. 9-22.

1. Install elbow (Item 3) on new park brake cylinder (Item 6). Position elbow as shown in Fig. 9-22. For final tightening, turn elbow 1.5–3 turns past finger tight.
2. Install park brake cylinder on brake cylinder mount (Item 1) using the clevis pin (Item 4) and new cotter pin (Item 5).
3. Install clevis (Item 10), lockwasher (Item 11), and jam nut (Item 12) on new park brake cylinder.

Note: *With the park brake cylinder (Item 6) fully extended and the brake cam (Item 7) raised 1/16–1/8" from its lowest possible position, it should be possible to insert the clevis pin (Item 9) directly into the clevis (Item 10).*

4. Make any necessary adjustments in the position of the clevis on the cylinder rod to meet the guidelines described in the above note.
5. Install new cotter pin (Item 8) on clevis pin.
6. Tighten jam nut (Item 12) to ensure that lockwasher (Item 11) is secured to clevis.
7. Reconnect hydraulic brake hose (Item 2) to elbow and torque swivel nut to 235–265 in-lbs.
8. Install park brake pressure switch (Item 13) on service brake.
9. Reconnect wiring harness (Item 14) to park brake pressure switch.

Adjustment, Park Brake

CAUTION: To avoid possible injury, be sure to park the vehicle on a level surface, lower the boom to the ground, shut off the engine, make sure the park brake is released, and ***block the wheels*** before servicing the park brake.

Models with Horizontal Cylinder Mount

644B-37 (S/N 101–383)
644B-42 (S/N 101–119)
844C-42 (S/N 101–281)
1044C-42 (S/N 101–106)
1044C-54 (S/N 101–102)
6K-37 (S/N 101–211)
6K-42 (S/N 101–105)
8K-42 (S/N 101–162, 165)
10K-42 (S/N 101–106)

The park brake cylinder used on models with a horizontal cylinder mount includes a clevis and jam nut whose position can be adjusted (see Fig. 9-21). As the brake shoes wear, the position of these two items will need to move closer to the end of the threaded portion of the cylinder rod.

If adjustment of the clevis location is inadequate, modifications may also be made to the adjustable link assembly. As the brake shoes wear, it will become necessary to select mounting holes further away from the top end of the adjustable links when connecting them to the bell crank.

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Block the wheels and make sure the park brake is released.
3. Install a brake pressure diagnostic port test gauge to the hose into the brake diagnostic port.
4. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge and cap diagnostic port.
5. Remove cotter pin (Item 9) from clevis pin (Item 10). While holding the brake cam (Item 15) up, remove clevis pin from clevis (Item 8).

Note: *With the park brake cylinder (Item 5) fully extended and the brake cam (Item 15) raised 1/16–1/8" from its lowest possible position, it should be possible to insert the clevis pin (Item 10) directly into the clevis (Item 8) and through the bell crank (Item 11).*

6. If it appears to be possible to meet these guidelines, go directly to Step 8. If it does not appear to be possible to meet these guidelines, continue with Step 7
7. To make a link adjustment, perform the following steps:
   a. Remove cotter pin (Item 19) and flatwasher (Item 12) from clevis pin (Item 18).
   b. While holding brake cam (Item 15) up, remove the clevis pin securing two (2) adjustable links (Item 13) to bell crank (Item 11).
   c. Choose suitable matching hole locations in adjustable links to remove excess play in system.
   d. While holding brake cam (Item 15) up, attach adjustable links to bell crank with clevis pin.
   e. Secure clevis pin with washer and new cotter pin.
8. To properly position the clevis, perform the following steps:
   a. Make any necessary adjustments in the position of the clevis on the cylinder rod to meet the guidelines described in the above note.
   b. Insert clevis pin in clevis and through mounting hole in bell crank. Install cotter pin in clevis pin.

Models with Vertical Cylinder Mount

644B-37 (S/N 384–)
644B-42 (S/N 120–)
844C-42 (S/N 282–)
1044C-42 (S/N 107–)
1044C-54 (S/N 103–)
6K-37 (S/N 212–)
6K-42 (S/N 106–)
8K-42 (S/N 163–164, 166–)
10K-42 (S/N 107–)
10K-54 (S/N 101–)

The park brake cylinder used on models with a vertical cylinder mount require only an adjustment to the position of the clevis and jam nut (see Fig. 9-22). As the brake shoes wear, the position of these two items will need to move closer to the end of the threaded portion of the cylinder rod.

1. Follow preparation procedures as outlined in Section 3 and in Section 5 of this manual.
2. Block the wheels and make sure the park brake is released.
3. Install a brake pressure diagnostic port test gauge to the hose into the brake diagnostic port.
4. While watching test gauge, press brake pedal numerous times until pressure gauge reads 0 psi. Remove test gauge and cap diagnostic port.
5. Remove cotter pin (Item 8) from clevis pin (Item 9). While holding the brake cam (Item 7) up, remove clevis pin from clevis (Item 10).

Note: *With the park brake cylinder (Item 6) fully extended and the brake cam (Item 7) raised 1/16–1/8" from its lowest possible position, it should be possible to insert the clevis pin (Item 9) directly into the clevis (Item 10).*

6. Make any necessary adjustments in the position of the clevis on the cylinder rod to meet the guidelines described in the above note.
7. Insert clevis pin in clevis and install cotter pin in clevis pin.

Drum Brake Repair/Replacement

Refer to ZF (Zahnradfabrik Passau) repair and maintenance manual for drum brake replacement procedures.

Section 10 — Outriggers

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Section 10 — Outriggers

Outriggers

General

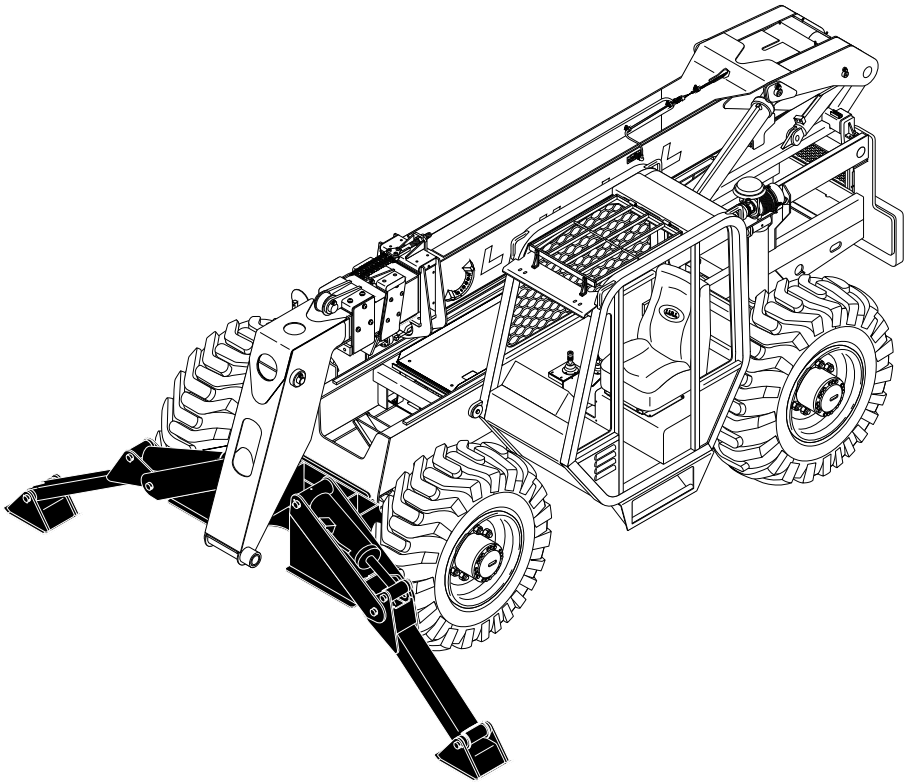
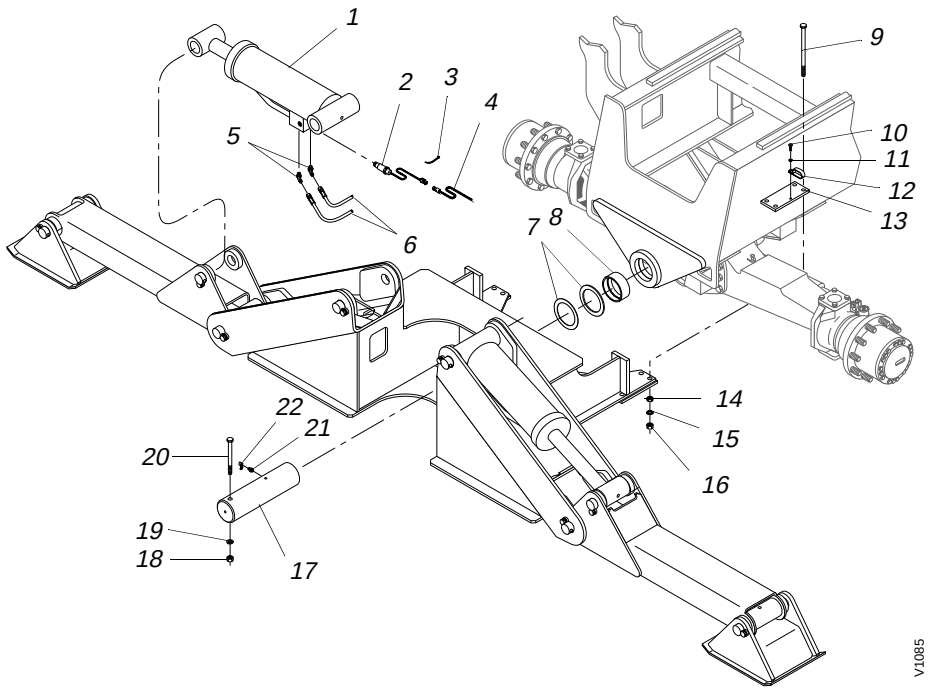


Fig. 10-1: Outriggers

Outriggers are standard on models with 4-section booms (1044C-54, 10K-54). and optional on other models. They increase the stability of the machine when lifting and placing loads.

Removal

Outriggers



#	Description
1	Outrigger Cylinder
2	Differential Pressure Switch
3	Tie
4	Wiring Harness
5	Elbow
6	Hydraulic Hose
7	Shim(s)
8	Outrigger Support Plate Bushing
9	Capscrew
10	Capscrew
11	Lockwasher

#	Description
12	Double Tube Clamp
13	Clamp Plate
14	Jam Nut
15	Starwasher
16	Nut
17	Shaft Assembly
18	Nut
19	Lockwasher
20	Capscrew
21	Grease Fitting
22	Grease Fitting Cover

Fig. 10-2: Outrigger Installation

(Ref. Fig. 10-2) The following procedure describes removal of the outrigger.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Disconnect any attachments and raise the boom enough so easy access can be made to the outrigger. Apply the parking brake and fully retract the boom extension cylinder. Raise the outrigger foot pads completely and shut the engine off.
3. Support the boom and extension cylinder with sling(s) and crane or other suitable means. Make sure support items have sufficient capacity to support the weight of the boom and cylinder; the combined weight of the boom and extension cylinder is approximately 6650 pounds.

DANGER: Support of the boom is essential to avoid the possibility of injury or death should the boom fall. Use suitable blocking and lifting devices when removing heavy machine components.

4. Place blocks or other means of support under the front and rear corners of the outrigger frame. Make sure supports are adequate to support the weight of the outrigger; the outrigger weighs approximately 2585 pounds.
5. Disconnect the wiring harness (Item 4) from the differential pressure switch (Item 2) from both cylinders. Remove the ties (Item 3) securing pressure switch wires to wiring harness or hydraulic hoses.
6. Loosen and remove two (2) hydraulic hoses (Item 6) from elbows (Item 5) on both outrigger cylinders (Item 1). Tag hoses and fittings. Bleed any remaining oil into a suitable container.
7. Remove the nut (Item 18), lockwasher (Item 19), and capscrew (Item 20) from the shaft assembly (Item 17).
8. Remove all ties around hydraulic hoses and wiring harness.
9. Remove the capscrew (Item 10), lockwasher (Item 11), and double tube clamp (Item 12) securing the hydraulic tubes to the clamp plate (Item 13) on each side of the machine.
10. Remove four (4) each nuts (Item 16), starwashers (Item 15), jam nuts (Item 14), and capscrews (Item 9) securing each of the clamp plates and the outrigger assembly to the axle. Remove the clamp plates.
11. Remove the wiring harness and hoses from outrigger and secure them to the main frame.
12. Start the engine and slowly back the machine away from the outrigger.

Installation

Outriggers

(Ref. Fig. 10-2) The following procedure describes installation of the outrigger.

1. If the bushing and shaft assembly were removed,
   a. Install a bushing (Item 8) in the outrigger support plate. Make sure the front edge of the bushing is flush with the edge of the support plate.
   b. Install the shaft assembly (Item 17) on the bushing, making sure the port for a grease fitting is on the rights side of the machine.
   c. Install a grease fitting (Item 21) on the shaft assembly. Torque the grease fitting to 1.5–3 turns past finger tight. Install a grease fitting cover (Item 22) on the grease fitting.
2. With the boom raised and fully supported, use sling(s), crane or other suitable means of support to position the outrigger until it can be slid onto the shaft assembly (Item 17).

3. Temporarily install a capscrew (Item 20) into the orifice in the shaft assembly (Item 17). Measure the gap between the outrigger assembly and the support plate boss on the main frame.
4. Remove the capscrew and outrigger assembly.
5. Install as many shims (Item 7) as needed on shaft assembly to fill the gap measured in Step 3.

Note: *Shims are available in three different sizes – 16, 20, and 24 gauge.*

6. Reinstall the outrigger on the shaft assembly and secure it with a capscrew (Item 20), lockwasher (Item 19), and nut (Item 18). Torque the nut to 130 ft-lbs.
7. Secure the outrigger to each side of the axle with a clamp plate (Item 13) and four (4) capscrews (Item 10), jam nuts (Item 14), starwashers (Item 15), and nuts (Item 16). Torque nuts to 320 ft-lbs.
8. Install two (2) hydraulic hoses (Item 6) on the two (2) elbows (Item 5) on each outrigger cylinder (Item 1). For final tightening, torque swivel nuts on hoses to 44–48 ft-lbs.
9. Connect the wiring harness (Item 4) on the differential pressure switch (Item 2). Install a tie (Item 3) to secure the pressure switch wires to the wiring harness or the hydraulic hoses.
10. Secure the wiring harness and hydraulic hoses to the clamp plate with a double tube clamp (Item 12), lockwasher (Item 11), and capscrew (Item 10). Torque the capscrew to 276 in-lbs.

Outrigger Cylinders

General

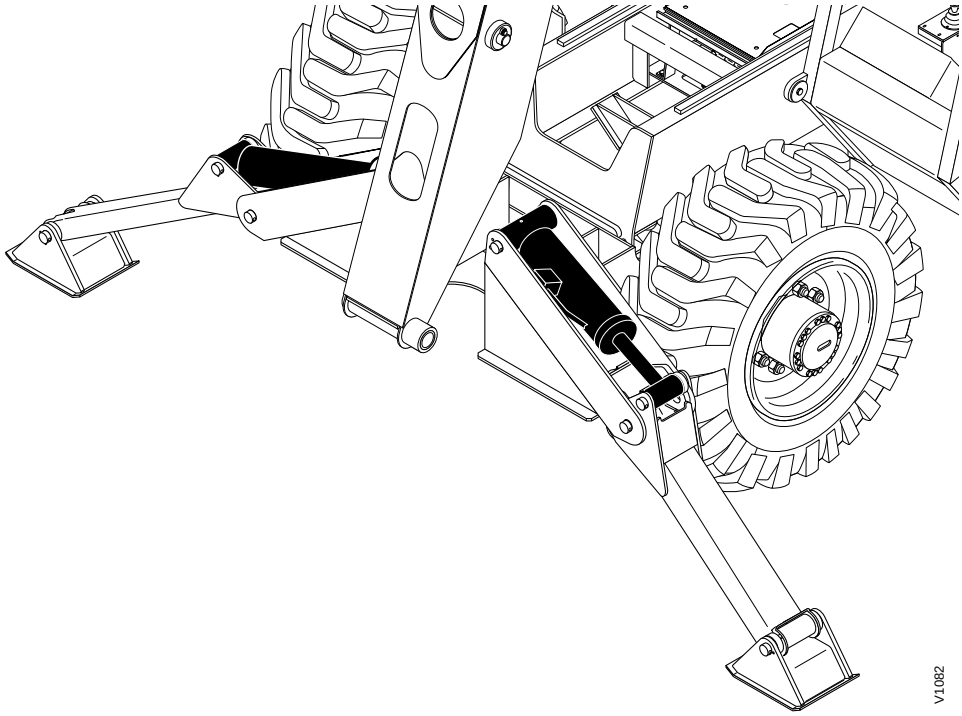
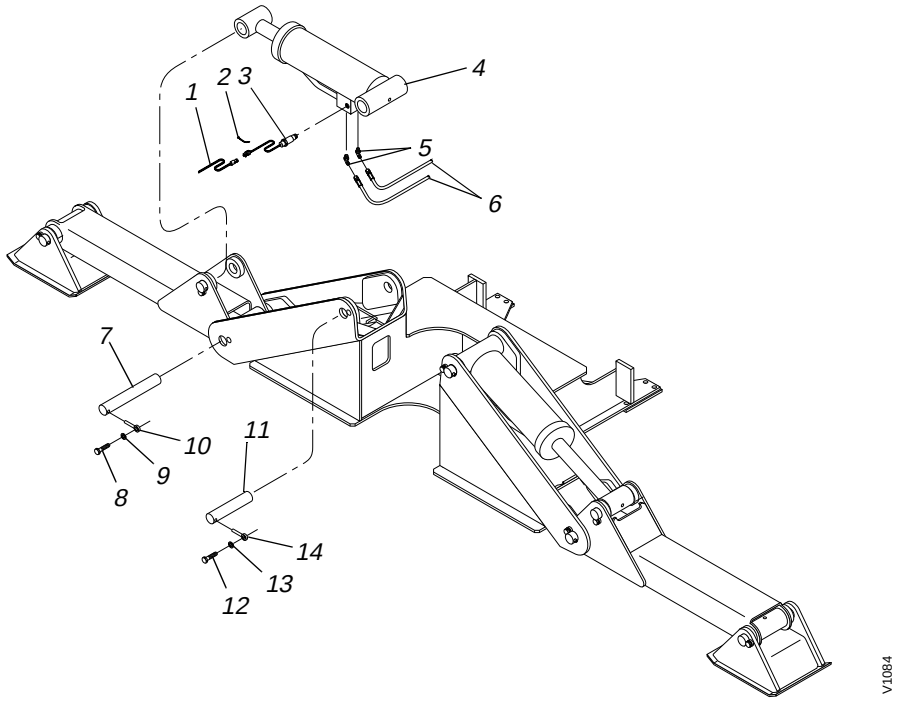


Fig. 10-3: Outrigger Cylinders

The outrigger cylinders have an operating pressure of 3000 psi and have a 15.63” stroke. Each cylinder includes four bushings.

Removal

Outrigger Cylinders



#	Description
1	Wiring Harness
2	Tie
3	Differential Pressure Switch
4	Outrigger Cylinder
5	Elbow
6	Hydraulic Hose
7	Pin

#	Description
8	Capscrew
9	Lockwasher
10	Lock Pin
11	Pin
12	Capscrew
13	Lockwasher
14	Lock Pin

Fig. 10-4: Outrigger Cylinder Installation

(Ref. Fig. 10-4) The following procedure describes removal of the outrigger cylinders.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Lower the boom, apply the parking brake, raise the outrigger foot pads completely, and shut the engine off.
3. Disconnect the wiring harness (Item 1) from the differential pressure switch (Item 3) on both cylinders. Remove the ties (Item 2) securing the pressure switch wires to the wiring harness or the hydraulic hoses.
4. Loosen two (2) hydraulic hoses (Item 6) from the elbows (Item 5) on both outrigger cylinders (Item 4).

CAUTION: Use suitable blocking and lifting devices when removing the cylinders. Care must be taken when removing and lifting the cylinders to prevent personal injury or equipment damage.

5. Place blocking device under the top of the outrigger cylinder. Remove the capscrew (Item 12) and lockwasher (Item 13) from the lock pin (Item 14). Remove the lock pin and upper pin (Item 11).
6. Remove a capscrew (Item 8) and lockwasher (Item 9) from the lock pin (Item 10). Remove the lock pin and lower pin (Item 7).
7. Remove the outrigger cylinder.
8. Repeat Steps 5–7 for the remaining outrigger cylinder.

Installation

Outrigger Cylinders

(Ref. Fig. 10-4) The following procedure describes installation of the outrigger cylinders.

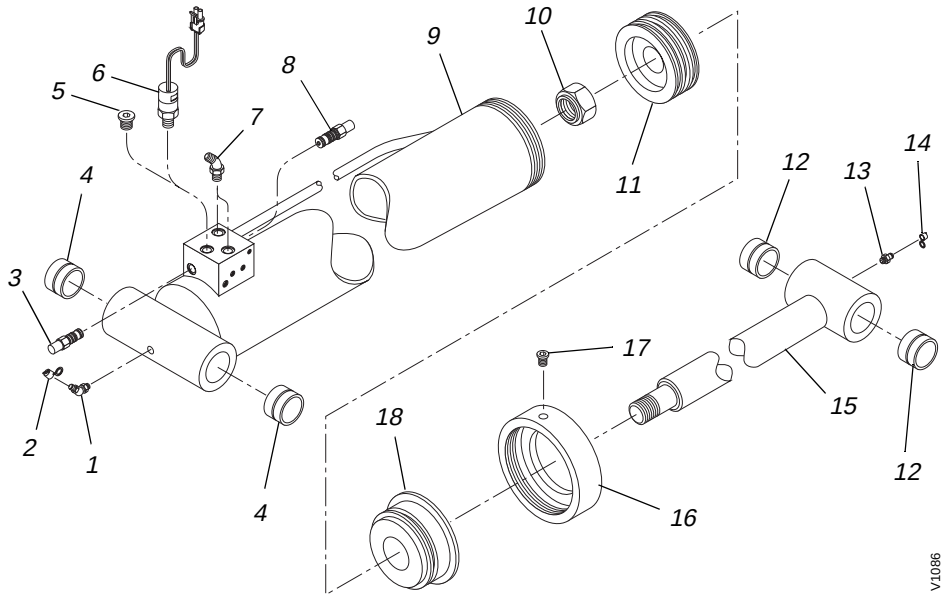
1. Use a suitable lifting device to place the outrigger cylinder in its proper location. Secure the cylinder to the outrigger by installing the lower pin (Item 7).
2. Secure the cylinder to outrigger with the upper pin (Item 11).

Note: B*e sure to apply blue thread sealant to the threads of the capscrews before installing them.*

3. Secure the upper pin by installing a lock pin (Item 14), lockwasher (Item 13), and capscrew (Item 12). Torque the capscrew to 55 ft-lbs.
4. Secure the lower pin by installing a lock pin (Item 10), lockwasher (Item 9), and capscrew (Item 8). Torque the capscrew to 55 ft-lbs.
5. Repeat Steps 1–4 for the remaining cylinder.
6. Install two (2) hydraulic hoses (Item 6) on elbows (Item 5) on both outrigger cylinders (Item 1). For final tightening, torque the swivel nuts on hoses to 44–48 ft-lbs.
7. Connect the wiring harness (Item 4) to the differential pressure switch (Item 2). Install a tie (Item 3) to secure the pressure switch wires to wiring harness or hydraulic hoses.

Overhaul

Outrigger Cylinders



#	Description
1	Grease Fitting
2	Grease Fitting Cover
3	Counterbalance Valve Cartridge
4	Bushing
5	O-ring Plug
6	Differential Pressure Switch
7	Elbow
8	Counterbalance Valve Cartridge
9	Cylinder Barrel

#	Description
10	Rod Bearing Nut
11	Piston
12	Bushing
13	Grease Fitting
14	Grease Fitting Cover
15	Rod
16	Cylinder Cap
17	Setscrew
18	Stroke Limiter

Fig. 10-5: Outrigger Cylinder Assembly

(Ref. Fig. 10-4) The following procedure describes removal of the outrigger cylinders.

1. Mount or support the cylinder vertically with the rod end down. Hydraulic oil in cylinder will drain out during disassembly. Place a suitable pan or tray under the cylinder.
2. Remove the differential pressure switch (Item 6) from the cylinder manifold block.

Note: *Early production models had the differential pressure switch installed on the side of the control manifold block instead of where it is shown in Fig. 10-5. These included S/N 101–154 for 1044C-54 models, S/N 101–103 for 10K-54 models and S/N 101–116 for 1044C-42 models with outriggers.*

Note: *Some early production models included also included an O-ring plug (Item 5) in the control manifold block. This included S/N 133–154 for the 1044C-54 and S/N 101–103 for the 10K-54.*

3. For models with an O-ring plug (Item 5), remove the plug.

4. Release pressure in each cylinder as follows:

WARNING: The counterbalance valve cartridge traps 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.

   a. Place a socket wrench over each counterbalance valve cartridge (Items 3 and 8). Wrap a clean shop rag around the socket to cover the area of the counterbalance valve cartridge.

   b. Carefully and slowly, turn the cartridge out of the manifold block to release pressure in cylinder.

5. Remove the counterbalance valve cartridges.
6. Slowly extend and retract the cylinder by hand to remove most of the hydraulic oil.
7. Remove two (2) elbows (Item 7) from the cylinder manifold block.
8. Loosen the setscrew (Item 17) and remove the cylinder cap (Item 16) from cylinder barrel (Item 9).
9. Remove the cylinder rod (Item 15) from the cylinder barrel.

CAUTION: To prevent possible damage to components, support the rod and head; do not wiggle the rod or head back and forth during removal.

10. Remove the rod nut (Item 10), piston (Item 11), and the stroke limiter (Item 18) from the cylinder rod.
11. Inspect bushings for damage. If necessary, replace the bushings as follows:

    a. Remove two (2) bushings (Item 4) from the cylinder barrel end and/or remove two (2) bushings (Item 12) from the cylinder rod end using a bushing driver and hammer or press. Drive one bushing all the way through to remove other bushing.

    b. Install new bushings so they are flush with outer edge boss to 0.02” below.

    c. To ensure proper lubrication, make sure an adequate amount of grease is applied to the grease fitting(s) after the cylinder is reinstalled on the machine.

12. If necessary, remove the grease fitting covers (Items 2 and 14) and grease fittings (Items 1 and 13) from the cylinder. Inspect and replace if damaged. Install and tighten fittings 1.5 to 3 turns past finger tight.
13. Remove all O-rings, wear rings, and backup rings from the cylinder components and discard.
14. Thoroughly clean components with solvent; dry with compressed air.

15. Inspect inner surface of barrel, outer surface of piston, and length of rod for scratches and scoring. If the barrel, piston, or rod are damaged, they must be replaced.
16. Check the condition of the threads on the rod, nut, and capscrews. Do not attempt to repair damaged threads.
17. Inspect the counterbalance valve cartridges (Items 3 and 8), including O-rings, for condition and replace as necessary. Do not disassemble cartridges. Service to counterbalance valve cartridges is limited to installing new O-rings and replacing the entire cartridge.
18. Lubricate counterbalance valve cartridges O-rings with clean hydraulic oil.
19. Install cartridges in the manifold block.
20. Lubricate a new O-ring with hydraulic oil and install it inside the piston (seals rod to piston).
21. Lubricate new seal and wear rings with hydraulic oil and install them on the piston.
22. Slide the cylinder cap (Item 16), stroke limiter (Item 18), and piston (Item 11) onto the rod (Item 15). Lubricate the threads on the rod with hydraulic oil and install the rod nut (Item 10).
23. Install the rod assembly in the cylinder barrel. Tighten the cylinder cap and secure with a setscrew (Item 17).
24. Install two (2) elbows (Item 7) on the cylinder manifold block. Torque the elbows to 40–44 ft-lbs.
25. For models with an O-ring plug (Item 5), install the plug in the control manifold block. Torque the plug to 85–95 ft-lbs.
26. Install the differential pressure switch (Item 6) on the cylinder manifold block.

Differential Pressure Switch

Description

The differential pressure switch is a cartridge-style switch with a maximum operating pressure of 6000 psi. It is a normally open circuit that is set to close at 92 psi (+0, -18 psi).

Boom Extension Proximity Switch

Description

1044C-54
10K-54

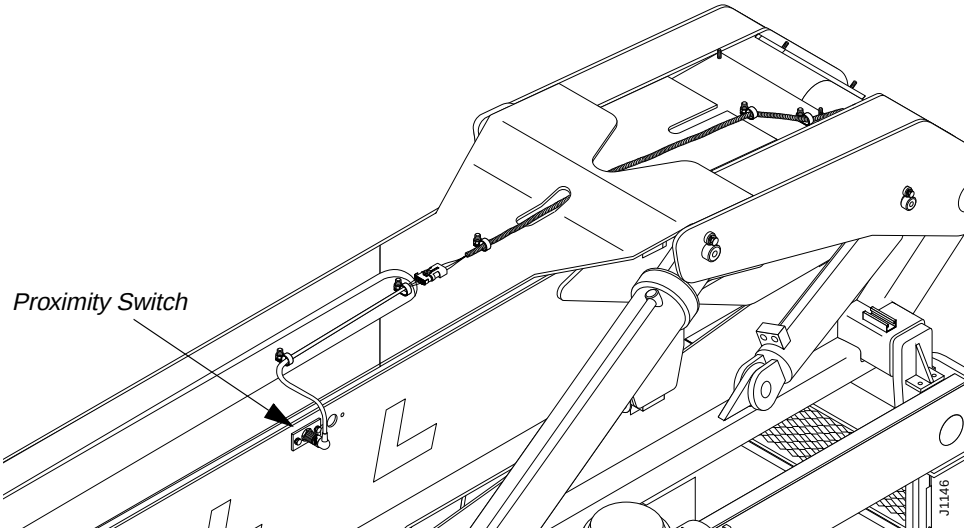


Fig. 10-6: Boom Extension Proximity Switch

(Ref. Fig. 10-6) The boom extension proximity switch is located on the left side of the outer boom section on machines with a 4-section boom. The boom extend/lockout circuit is designed to increase stability of the machine by limiting how far the boom can be extended without the outriggers down. The system will disable the boom extend and transfer extend functions and the warning lamp will come on when the boom is extended to specified distance (approximately 21 feet with tilting tower or 25 feet with standard carriage). The proximity switch then opens as it no longer senses metal. At this point, the left and right outriggers must both be lowered to the ground to allow the boom or transfer carriage to be extended any further.

Normally open differential pressure switches in the outrigger cylinders close when the base end pressure exceeds the rod end pressure by approximately 90–95 psi. When both pressure switches close, this completes the circuit, allowing the boom and transfer carriage to be extended, and the lamp turns off. The system is fail-safe in that it requires an electrical signal to enable the boom to be extended beyond the specified distance.

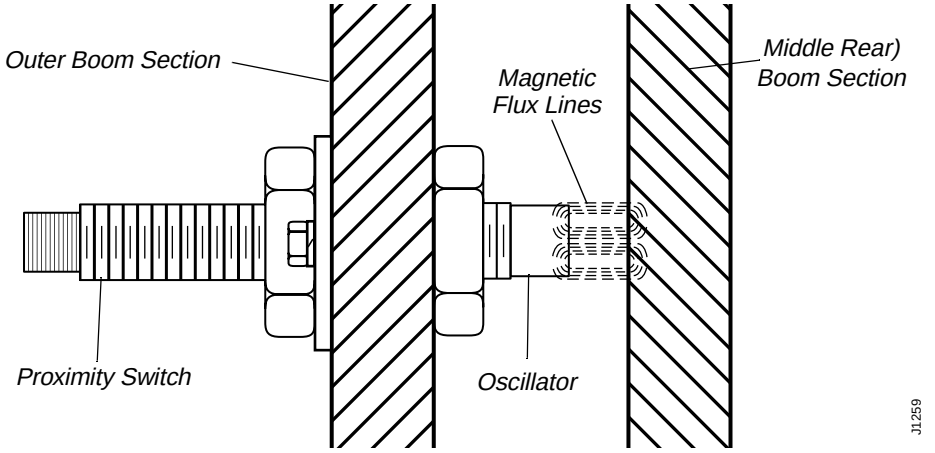
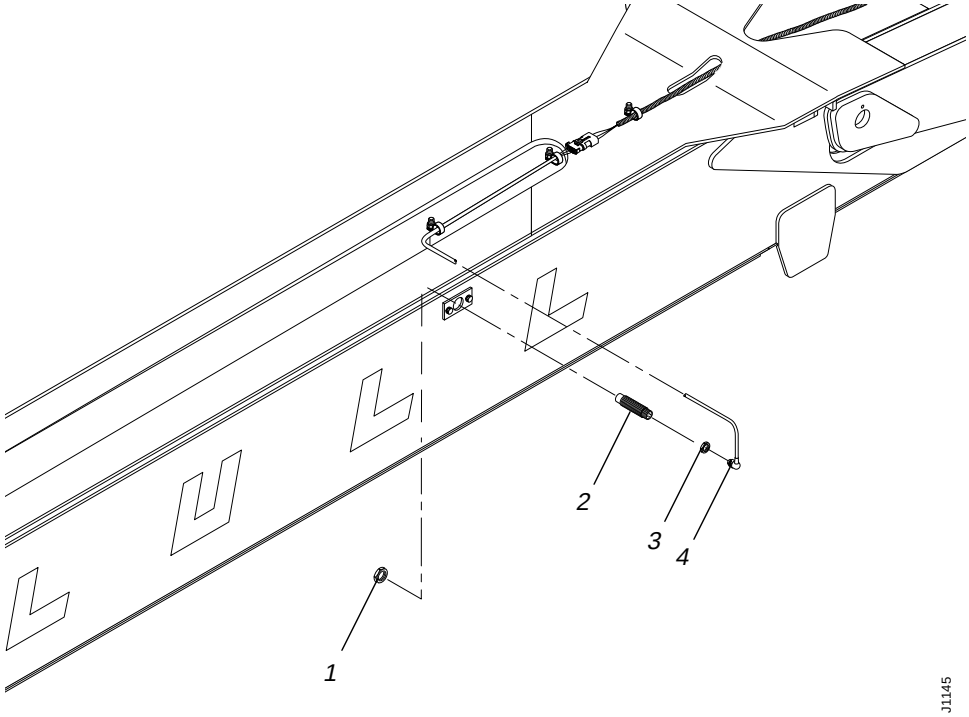


Fig. 10-7: Boom Extension Proximity Switch Operation

(Ref. Fig. 10-7) The switch operates by sending out a constant, high frequency magnetic field a short distance from the oscillator end of the switch. Eddy currents are produced in metal when the magnetic flux lines pass through it. These eddy currents oppose the oscillations of the magnetic flux lines and the oscillations stop. A sensor in the switch detects if the oscillator is on or off and this gives the switch its on/off function.

Removal

Boom Extension Proximity Switch



#	Description	#	Description
1	Inner Jam Nut	3	Outer Jam Nut
2	Proximity Switch	4	Wire Harness

Fig. 10-8: Boom Extension Proximity Switch Assembly

(Ref. Fig. 10-8) The following procedure describes removal of the boom extension proximity switch.

1. Disconnect the wire harness (Item 4) at the boom extension proximity switch (Item 2).
2. Place a piece of masking tape around the proximity switch body at the outer jam nut (Item 3). This will serve as a guide during reinstallation.
3. Remove the inner jam nut (Item 1) and proximity switch. Reinstall the inner jam nut on the proximity switch for safekeeping.

Installation

Boom Extension Proximity Switch

(Ref. Fig. 10-8) The following procedure describes installation of the boom extension proximity switch.

1. Position the outer jam nut (Item 3) on the switch body (Item 2) at the previously marked position.
2. Install the boom extension proximity switch in the outer boom. Install the inner jam nut (Item 1). Check the gap between the end of the proximity switch and boom. See Fig. 10-9.
3. Connect the wire harness (Item 4) to the proximity switch.
4. Check operation of the proximity switch by extending the boom. The boom extension proximity light must come on at specified distance (approximately 21 feet with a tilting tower or 25 feet with a standard carriage). If the light does not illuminate, stop and retract the boom. Proceed to “Adjustments” below.

Adjustments

Boom Extension Proximity Switch

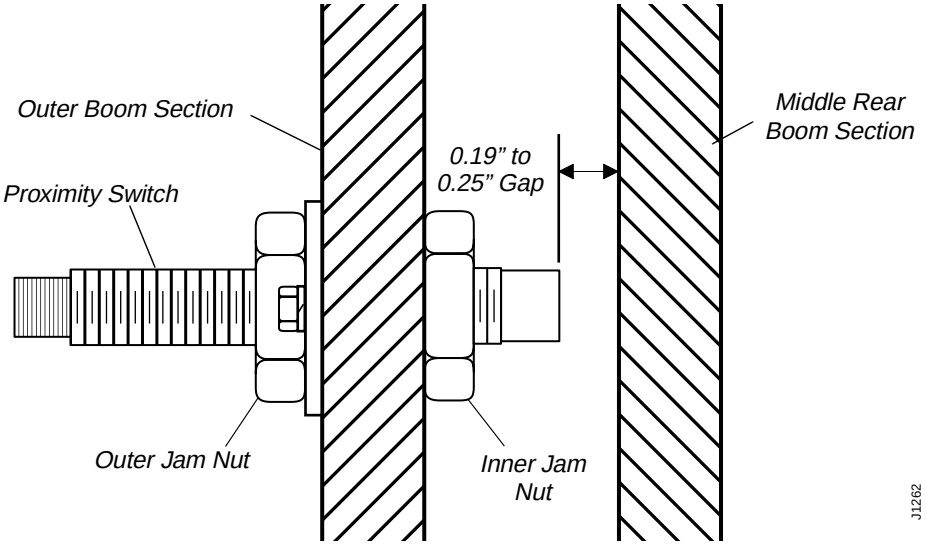


Fig. 10-9: Boom Extension Proximity Switch Adjustment

(Ref. Fig. 10-9) The following procedure describes adjustments to the boom extension proximity switch.

1. Loosen, but do not remove the two (2) jam nuts on the proximity switch body.
2. Check the gap between switch and boom. The gap must be within the range specified in Fig. 10-9.
3. If the boom extension proximity light does not illuminate when the boom is extended to the specified distance (approximately 21 feet with a tilting tower or 25 feet with a standard carriage), adjust the proximity switch to slightly reduce the gap. Do not exceed gap tolerances specified in Fig. 10-9. Snug jam nuts to hold switch in position.
4. Extend the boom and check operation of the boom extension proximity light. The light must come on when the boom is extended to specified distance (approximately 21 feet with tilting tower or 25 feet with standard carriage). If the light does not illuminate, stop and retract the boom. Repeat Step 3.
5. Tighten the jam nuts.

Outrigger Control Valves

Description

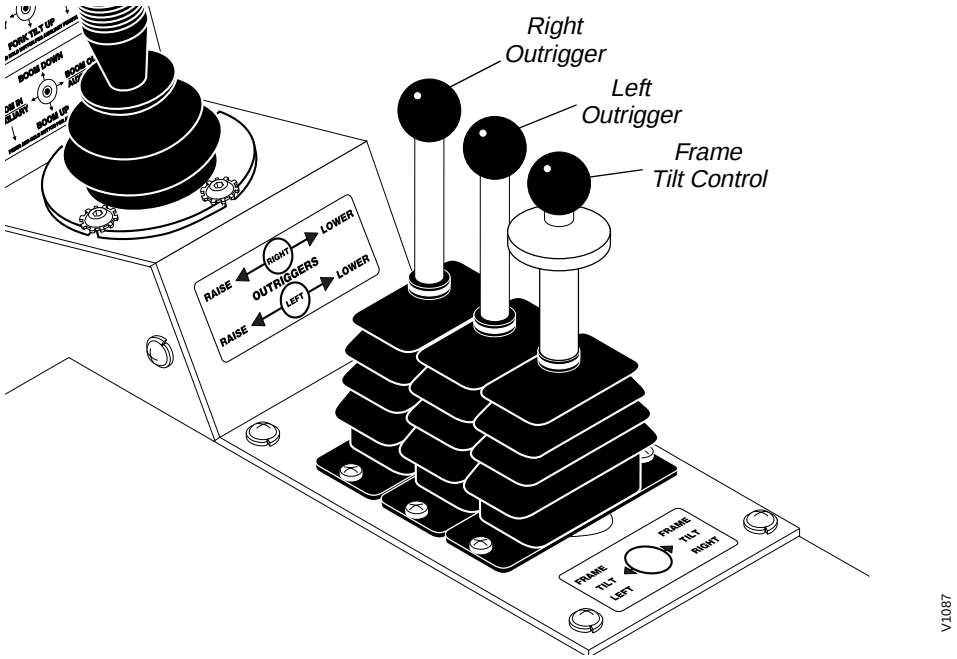
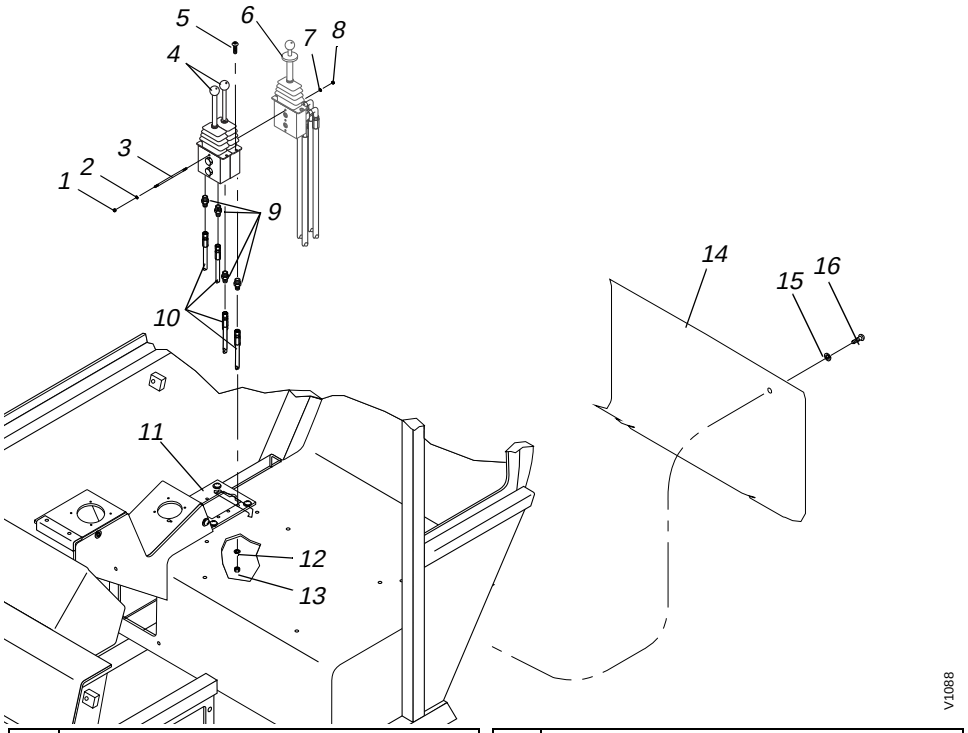


Fig. 10-10: Outrigger Controls

(Ref. Fig. 10-9) The remote controls are located to the right of the seat and consists of three sections. One section is used for frame tilt control (rear control) and two are outrigger controls. The pressure range for each section is 116–410 psi. The front control raises and lowers the right outrigger and the middle control raises and lowers the left outrigger.

Removal

Outrigger Control Valve



#	Description
1	Nut
2	Lockwasher
3	Tie Rod
4	Outrigger Control Valve
5	Button Head Capscrew
6	Frame Tilt Control Valve
7	Lockwasher
8	Nut

#	Description
9	Connector
10	Hydraulic Hose
11	Control Panel
12	Lockwasher
13	Nut
14	Rear Cover
15	Flatwasher
16	Phillips Truss Head Screw

Fig. 10-11: Outrigger Control Valve Installation

(Ref. Fig. 10-11) The following procedure describes removal of the outrigger control valves.

1. Follow preparation procedures as outlined in Section 3 of this manual.
2. Lower the boom, apply the parking brake, raise the outrigger foot pads completely, and shut the engine off.
3. Remove four (4) screws (Item 16) and flatwashers (Item 15) securing the rear cover (Item 14) to the operator's compartment. Remove the rear cover.
4. Loosen and remove four (4) hydraulic hoses (Item 10) from the connectors (Item 9) on the bottom of the outrigger control valves (Item 4). Bleed any remaining oil into a suitable container. Tag and cap the hoses and fittings.
5. Remove the nut (Item 1) and lockwasher (Item 2) from each of the three (3) tie rods (Item 3). Remove the tie rods, along with lockwashers (Item 7) and nuts (Item 8), securing the control valve sections together.

6. Remove the two (2) nuts (Item 13), lockwashers (Item 12), and capscrews (Item 5) securing each valve section to the control panel (Item 11). Remove the outrigger valve sections.

Installation

Outrigger Control Valve

(Ref. Fig. 10-11) The following procedure describes installation of the outrigger control valves.

1. Secure the two (2) outrigger control valves (Item 4) to the frame tilt control valve (Item 6) with three (3) tie rods (Item 3). Install lockwashers (Items 2 and 7) and nuts (Items 1 and 8) on each end of both tie rods.
2. Install each outrigger control valve on the control panel (Item 11) with two (2) capscrews (Item 5), lockwashers (Item 12), and nuts (Item 13). Torque the nuts to 50 in-lbs.
3. Install the hydraulic hoses (Item 10) on the connectors (Item 9) on the bottom of each control valve. For final tightening, torque the hose swivel nuts to 130–150 in-lbs.
4. Install the rear cover (Item 14) on the operators compartment with four (4) flatwashers (Item 15) and screws (Item 16). Torque the screws to 96 in-lbs.

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