

# Service Manual

## XR Series

**Serial Numbers 100 - Current**

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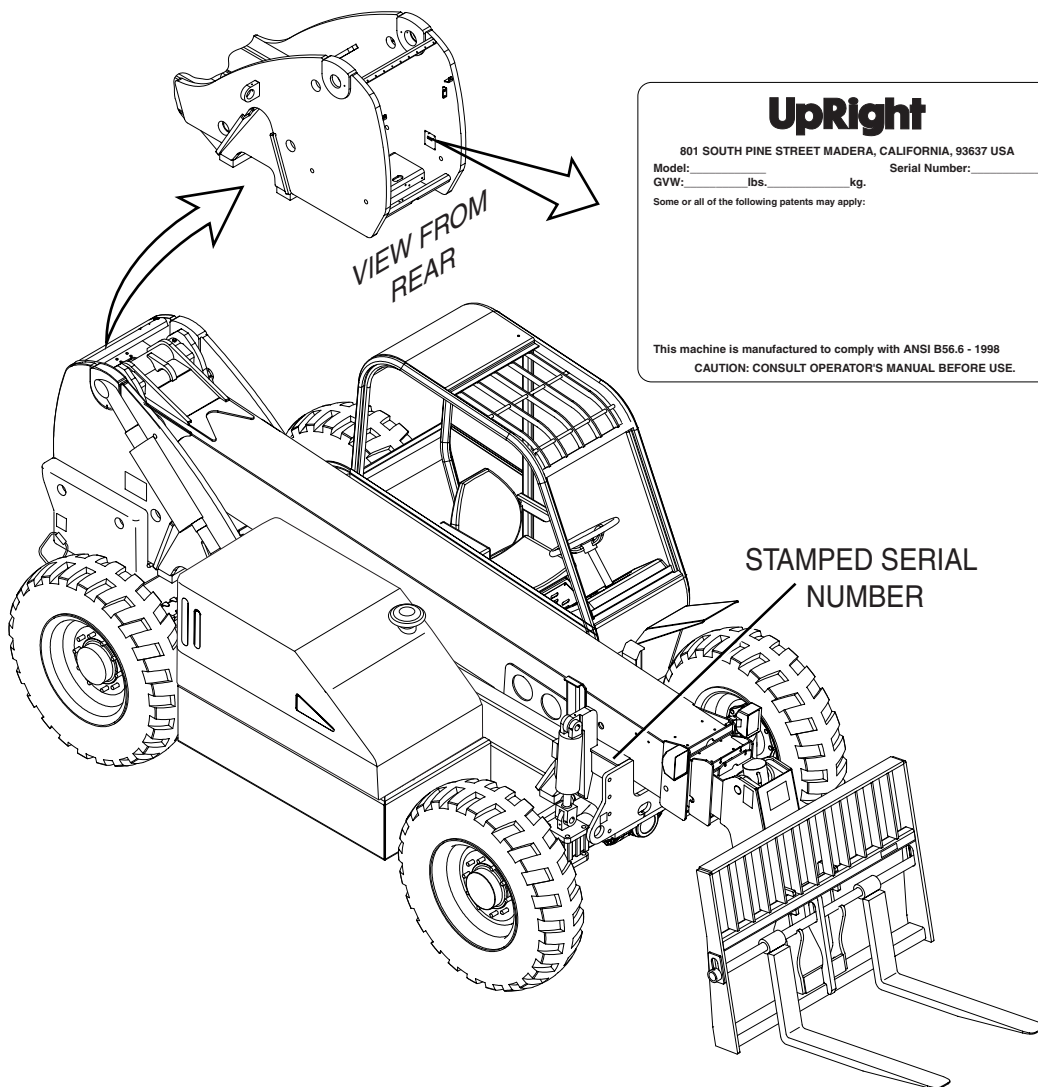
Publication Number: 103950-000

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**UpRight**

# XR Series Telehandler

## Serial Numbers 100 - Current



When contacting UpRight for service or parts information, be sure to include the MODEL and SERIAL NUMBERS from the equipment nameplate. Should the nameplate be missing, the SERIAL NUMBER is also stamped on top of the chassis rail above the front axle pivot.

**UpRight**

801 SOUTH PINE STREET MADERA, CALIFORNIA, 93637 USA

Model: \_\_\_\_\_ lbs. \_\_\_\_\_ kg. Serial Number: \_\_\_\_\_

Some or all of the following patents may apply:

This machine is manufactured to comply with ANSI B56.6 - 1998  
CAUTION: CONSULT OPERATOR'S MANUAL BEFORE USE.

STAMPED SERIAL  
NUMBER

### UpRight, Inc.

801 South Pine Street  
Madera, California 93637

TEL: 559-662-3900

FAX: 559-673-6184

PARTS: 1-888-UR-PARTS

PARTS FAX: 1-800-669-9884

# UpRight

Call Toll Free in U.S.A.

1-800-926-LIFT

### UpRight

Unit S1, Park West Industrial Park  
Friel Avenue  
Nangor Road  
Dublin 12, Ireland

TEL: +353 1 620 9300

FAX: +353 1 620 9301

# FOREWORD

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This manual contains instructions for the maintenance of your UpRight machine. Referring to the Safety, Operation, and Preventative Maintenance Manual will aid in understanding the operation and function of the various components and systems of the work platform, and help in diagnosing and repairing the machine.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at any time without notice. No part of this publication may be reproduced, stored in retrieval system, or transmitted, in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. This includes text, figures, and tables.

This manual consists of five (5) parts.

## **SAFETY, OPERATION, AND PREVENTATIVE MAINTENANCE MANUAL**

A copy of the manual that is stored on every UpRight machine.

### **SECTION 1 - GENERAL INFORMATION**

Contains generic information relevant to all UpRight machines.

### **SECTION 2 - SERVICE AND REPAIR**

Detailed information specific to this UpRight product.

### **SECTION 3 - TROUBLESHOOTING**

Causes and solutions to typical problems.

### **SECTION 4 - SCHEMATICS**

Electric and Hydraulic schematics.

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**NOTES:**

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# SAFETY, OPERATION, AND PREVENTATIVE MAINTENANCE MANUAL

## WARNING

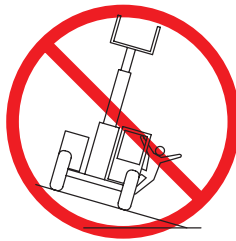
All personnel shall carefully read, understand and follow all safety rules, operating instructions, and ANSI Standard B56.6-1998 before operating or performing maintenance on any UpRight Telescopic Handler.

OSHA regulation 1910.178 requires all operators of rough terrain forklifts to be trained in their use and operation. DO NOT operate this machine if you have not been properly trained.

## Safety Rules



**NEVER** operate the machine within 25 feet of power lines. THIS MACHINE IS NOT INSULATED



**NEVER** drive with load or attachments elevated unless on a firm, level surface.



**NEVER** elevate personnel using this machine.



**NEVER** start or operate machine without seat belt properly fastened.

**NEVER** allow riders.

**NEVER** exceed the rated machine capacity or load center.

**ALWAYS** read and understand the load charts.

**NEVER** level the machine with boom elevated above horizontal position. Always level the machine before elevating boom. If the machine cannot be leveled using frame tilt, reposition the machine before elevating load.

**ALWAYS** be sure the load is stable on the forks before elevating the boom.

**NEVER** leave the cab while the boom is raised. Lower the load to the ground, shut off the engine, and engage the parking brake before leaving the cab.

**NEVER** operate the machine in an enclosed area. Exhaust gases can kill.

**AVOID** pinch point areas on the machine.

**USE** steps and hand holds when entering or exiting the cab.

**NEVER** operate the machine without first surveying the work area for surface hazards such as holes, drop-offs, bumps, and debris.

**NEVER** start or operate the machine until all personnel are clear of work area.

**OPERATE** the machine only on surfaces capable of supporting wheel loads.

**INSPECT** the machine thoroughly for cracked welds, loose or missing hardware, hydraulic leaks, loose wire connections, and damaged cables or hoses before using.

**VERIFY** that all labels are in place and legible before using.

**NEVER** use a damaged or malfunctioning machine.

**NEVER** use hands to check for hydraulic leaks. Use a board or a piece of cardboard to check for hydraulic leaks.

**NEVER** alter operating or safety systems without the manufacturer's written consent.

**NEVER** recharge battery near sparks or open flame; batteries that are being charged emit highly explosive hydrogen gas.

**TRANSPORT** by truck or trailer only. Do not tow the machine for transportation purposes.

**AFTER USE** secure the machine against unauthorized use by turning the key switch off and removing the key.

**NEVER** replace any component or part with anything other than original UpRight replacement parts without the manufacturer's written consent.

**DO NOT** jump start the machine at the starter motor. Ensure that the transmission is in neutral and the parking brake is applied before jump starting.

### California Proposition 65 Warning

Gasoline and diesel engine exhaust and some of their constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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## INTRODUCTION

This manual covers XR636, XR637, XR640, XR641, XR840, & XR841 models of the XR Series telescopic material handlers. A copy of this manual must be stored on the machine at all times.

## SAFETY INFORMATION

OSHA regulation 1910.178 requires all operators of rough terrain forklifts to be trained in their use and operation. DO NOT operate this machine if you have not been properly trained.

Many accidents involving the operation, maintenance, and repair of telehandlers are caused by failure to follow safety rules and precautions. A trained operator must be alert, watching for hazardous situations where accidents may occur and avoiding them. The operator must have in his or her possession the proper tools to operate and maintain this machinesafely.

The operator must be thoroughly trained on this machine, and must demonstrate competence in all aspects of machine use and function. Operators must read, fully understand, and follow this Operator Manual, OSHA regulations 1910.178 and 1926.602, and ANSI Standard B56.6-1998. Local regulations may require operators to have an operator's permit in their possession.

**Improper operation, maintenance, lubrication, or repair of this machine could result in serious injury or death. DO NOT operate this machine or perform any maintenance, lubrication, or repair on it until you have read and thoroughly understand this Operator's Manual.**

Safety precautions and warnings are found in this manual and on labels on the machine. Failure to follow these warnings could result in serious injury or death to you or to those in your work area.

You are responsible for the safe operation of this machine. Pay close attention when you see the following warnings:

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### **! DANGER !**

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*Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.*

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### **! WARNING !**

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*Indicates an potentially hazardous situation which, if not avoided, could result in serious injury or death.*

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### **! CAUTION !**

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*Indicates an potentially hazardous situation which, if not avoided, may result in minor or moderate injury.*

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### **CAUTION**

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*Indicates a potentially hazardous situation which, if not avoided, may result in property damage.*

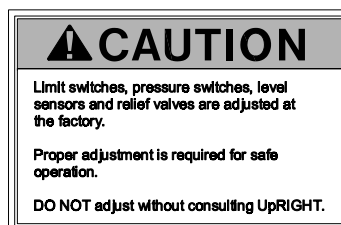
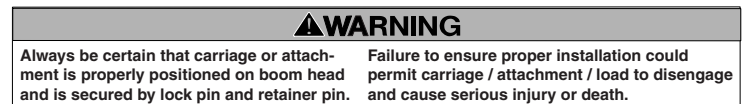
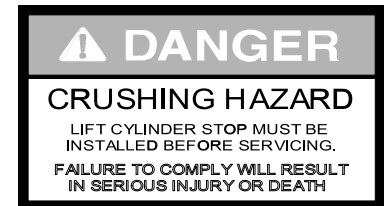
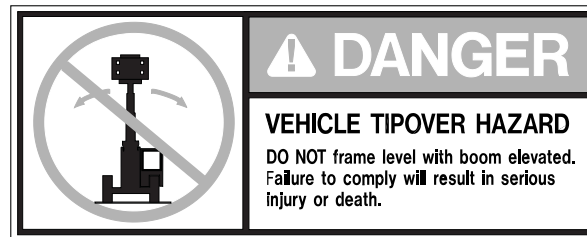
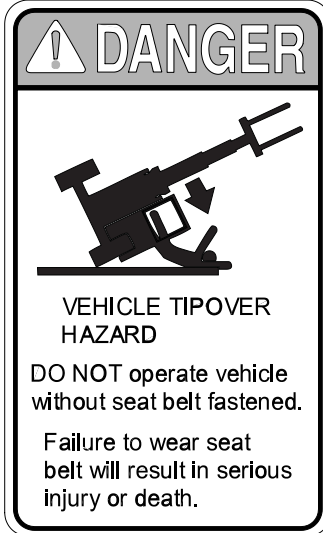
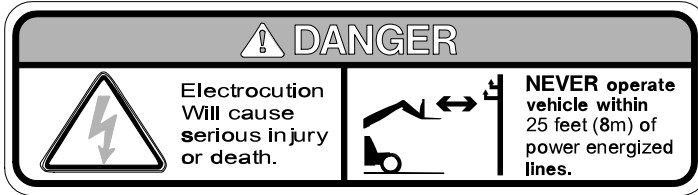
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**NOTE:** Gives helpful information.

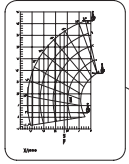
It is impossible for UpRight, Inc. to foresee every circumstance that may involve potential hazards. Therefore, the warnings on the machine and in this manual are not all-inclusive. Any tool, procedure, work method, or operational technique not specifically recommended by UpRight, Inc. must personally satisfy you, the operator, as safe for you and those who work around you. Such tools, procedures, work methods, and operational techniques must in no way damage the machine or make it unsafe for normal operation. When in doubt, call your local distributor or UpRight, Inc.

## LABELS

Proper XR Series label installation is required. All of these labels must be present and in good condition before operating the machine. Be sure to read, understand, and follow the instructions and warnings on these labels.

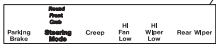


- 103791-000 3 Required XR637  
 103791-002 2 Required XR636H  
 103791-004 3 Required XR641  
 103791-006 2 Required XR640H  
 103791-008 3 Required XR841  
 103791-010 2 Required XR840H



**WARNING**  
 DO NOT apply parking brake until machine comes to a complete stop.

103778-002  
 1 Required



103778-001  
 1 Required

**CAUTION**  
 BEFORE operating this equipment, read, understand and then follow all safety information in instruction manual.

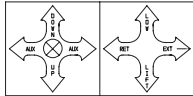
066554-000  
 1 Required



103794-000  
 2 Required



103786-000  
 2 Required



103798-000  
 2 Required

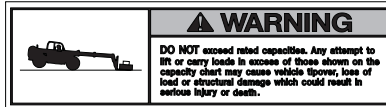
Lights

103778-000  
 1 Required

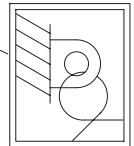
Frame Level



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103787-000  
 1 Required



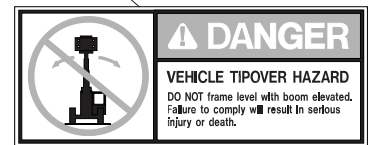
068632-001  
 4 Required

**DIESEL**

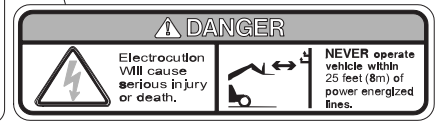
027898-001  
 1 Required



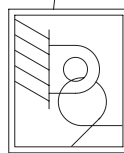
103784-000  
 1 Required



103789-000  
 1 Required

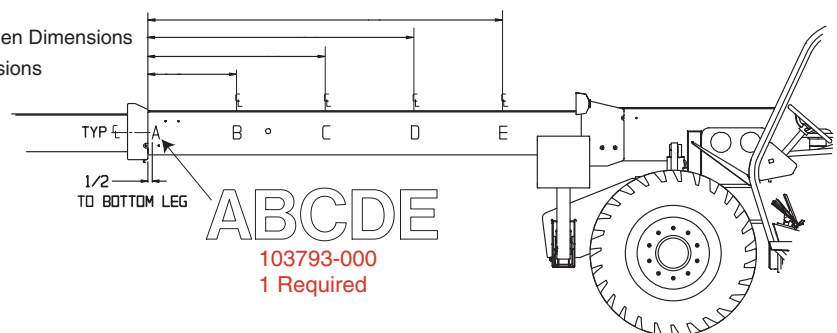


103790-000  
 1 Required

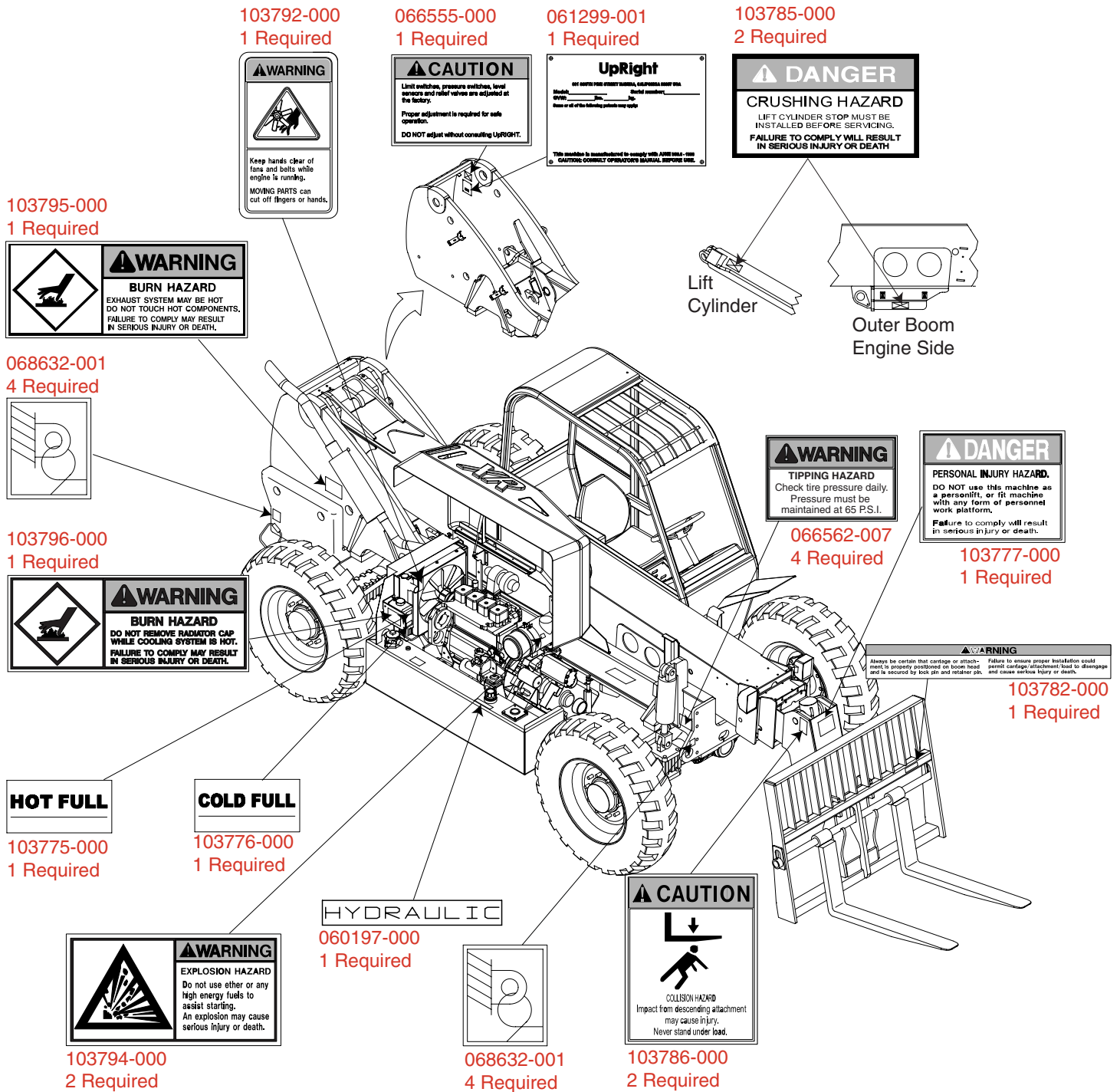


068632-001  
 4 Required

(640, 641, 840, 841 Boom) 32 3/4" Between Dimensions  
 (637, 636 Boom) 29 1/8" Between Dimensions



103793-000  
 1 Required





## GENERAL SAFETY INFORMATION

### **! WARNING !**

*Failure to follow all of these safety precautions will result in serious injury or death.*

OSHA regulation 1910.178 requires all operators of rough terrain forklifts to be trained in their use and operation. DO NOT operate this machine if you have not been properly trained.

Only trained and authorized persons may operate this machine. Do not allow any untrained or unauthorized person to operate this machine.

Wear protective equipment as required by the job conditions. This includes such items as hardhats and safety glasses. Do not wear loose clothing or jewelry that may catch any part of the machine.

Keep the machine clean and free of materials that are not part of the machine or part of the load.

Know the appropriate hand signals for operation on the job site. Accept these signals only from persons authorized to give them.

Check that all protective covers and guards are on the machine.

Use only the proper hand tools when maintaining and repairing the machine. These must be in good condition and of the proper size to prevent damage.

Never place machine fluids (diesel, engine oil, hydraulic fluid, etc.) in glass containers. Drain all fluids into containers suitable in size and composition. Dispose of fluids according to local regulations.

Report all needed repairs to the appropriate person. Remove the keys from the machine and tag the machine with a "Do Not Use" tag.

Keep your hands clear of linkage areas. Clearance in the linkage area changes with movement of the linkage. Avoid moving or rotating parts and fan blades.

When struck, retaining pins may fly out and injure anyone standing nearby. Check that the area is clear before driving out the pin. Always wear safety glasses when striking any object, and be sure that there is no one nearby without eye protection.

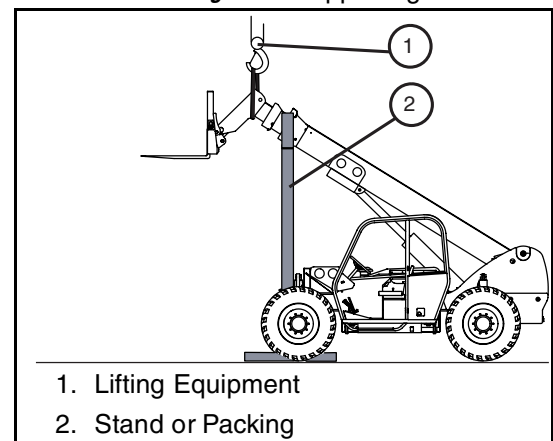
## MAINTENANCE SAFETY

Unless otherwise specified, the machine must be in the following condition when maintenance is performed:

- Parking brake engaged
- Transmission in neutral
- Boom fully retracted and fully lowered with the attachment blocked to prevent movement
- Engine off and key removed from Key Switch.
- Battery switch turned off.

Occasionally it is necessary to perform maintenance while the boom is elevated. In these instances, be sure to support the boom and attachments securely with a suitable stand or overhead sling capable of supporting the weight. DO NOT depend on hydraulic cylinders to support either the boom or the attachment.

**Figure 1:** Supporting the Boom





## COMPRESSED AIR AND HIGH PRESSURE FLUID

Compressed air may cause serious injuries. Wear a protective face shield, protective shoes, and protective clothing when using compressed air for cleaning purposes. Do not use compressed air exceeding 30 PSI for cleaning purposes.



*NEVER use your hands or any other body part to check for hydraulic leaks.*

Always use a board or a piece of cardboard to check for hydraulic leaks. Even a tiny leak can penetrate the skin, causing serious injury or death. **SEEK MEDICAL ASSISTANCE IMMEDIATELY if hydraulic fluid is injected into your skin.**

## OPERATOR PROTECTION

### AGAINST CRUSHING

A Rollover Protective Structure (ROPS) (or Falling Object Protective Structure (FOPS)) is designed to provide crush protection to the operator by controlled bending of its structural members. The cab of this machine is certified to both standards.

Any modification (i.e. welding, drilling holes) to a ROPS for any reason will change its ability to protect the operator, and will void the ROPS certification if it is done without the express written consent of UpRight, Inc. This certification cannot be renewed by repair, as certification requires the destruction of the ROPS. **DO NOT** mount any item such as a fire extinguisher or first aid kit to the ROPS by welding or drilling the structure.

Structural damage such as that which may be caused by a rollover or by falling objects will impair the ability of this ROPS to protect the operator.

### AGAINST BURNS

All engine systems must be cold before any maintenance or filling is done to them. Check that all pressure is relieved from a system before any component is loosened or removed.

**COOLANT** The cooling system must be cold before checking or draining. After only a short time in use, the engine coolant will be hot and under pressure. All parts associated with the cooling system (radiator, overflow tank, lines to the engine and heater) contain hot and possibly pressurized coolant that can cause severe burns. See pa ge31 for cooling system instructions and information.

**OILS** At operating temperature, the hydraulic oil is hot and under pressure. Take necessary precautions to avoid burns when working near the hydraulic system after the machine has been operating.

**EXHAUST SYSTEM** Do not touch the exhaust pipe, muffler, or muffler guard while they are hot.

**BATTERY** Batteries emit highly explosive hydrogen gas. Keep sparks, flame, and smoking material away from batteries. Always wear safety glasses when working near batteries. Avoid contact with the electrolyte. Rinse away with clean water if any contact occurs.



## FIRE AND EXPLOSION PREVENTION

### **W A R N I N G**

*DO NOT use ether or any starting aid. This machine is equipped with an inlet manifold heater to help with cold weather starting. Adding ether or any type of starting aid could cause an explosion resulting in serious injury or death.*

DO NOT use ether or any starting aid on this machine!

All fuels, many lubricants, and some cooling mixtures are flammable. For this reason, DO NOT smoke while refueling or while in a refueling area. Keep fuels and lubricants stored in properly marked containers and away from unauthorized persons. Store all oily rags and other flammable material in a protective container.

Do not smoke in areas where batteries are being charged or where flammable materials are stored.

Batteries emit highly explosive hydrogen gas. Keep sparks, flame, and smoking material away from batteries.

When starting the motor from an external power source, always connect the positive (+) boost cable to the positive (+) battery terminal on the engine to be started. Attach the negative(-) boost cable last, away from the battery. See “Jump Starting” on Page 26 for more information.

Remove all flammable materials such as fuel, oil, and other debris that may accumulate on the machine.

Clean and tighten all electrical connections and immediately repair any loose or frayed wires before operating the machine.

Do not expose the machine to flames, burning debris or brush, etc.

Have a fire extinguisher at hand and know how to use it. Follow its instruction plate for service and inspection intervals. The extinguisher must be mounted securely behind the operator's seat on a mounting which is attached to the machine using neither welds nor drilled holes (see “Operator Protection” on Page 9).

## LINES, TUBES, HOSES, AND FITTINGS

Do not bend or strike high pressure lines. Do not install bent or damaged lines, tubes, or hoses. Repair any bent or damaged lines, tubes, or hoses.

Leaks may cause fires. Check all lines and hoses carefully, using a board or piece of cardboard. DO NOT use your bare hands (see “Compressed Air and High Pressure Fluid” on Page 9). Tighten all connections to the torque specified in the General Information section of the Service Manual.

Replace the hose or tube if any of the following are found:

- Damaged or leaking fittings
- Damaged, bent, or crushed hydraulic tubing
- Chafed or cut outer covering, or exposed wire reinforcement
- Ballooned outer covering
- Kinked or crushed flexible hose
- Displaced end fittings

Check that all clamps, guards, and heat shields are installed correctly to prevent vibration, rubbing, and excessive heat during operation.

## TIRES

### **W A R N I N G**

*Tires must be inflated to proper pressure (65 PSI) to reduce the risk of rollover.*

*NEVER weld on a rim or wheel.*

*Tire service and replacement is dangerous and should be performed only by trained persons using the proper equipment and procedures.*

Inspect the tires for damage daily. Check the air pressure of each tire daily. Proper equipment and training are necessary to prevent over-inflation. Tire or rim failure may result from improperly used or incorrect equipment. Always stand to the front or rear of the tire tread when inflating, and always use a self-attaching chuck.

**NOTE:** Optional foam-filled tires do not require inflation or air pressure check.

Tire service and replacement is dangerous and should be performed only by trained persons using the proper equipment and procedures. Failure to follow correct procedure could result in tire explosions that may cause serious injury or death. Carefully follow the specific information provided by the tire or rim dealer.

## ENTERING AND EXITING THE CAB

Keep the floor, the handholds, and the steps of the cab clean and as dry as possible. Repair damaged handholds and steps immediately. Replace any worn anti-skid tape.

Enter the cab only through the doorway, being sure to use the handholds and steps. Face the machine when entering or exiting the cab. Maintain three point contact (two feet and one hand, or two hands and one foot) with the handholds and steps at all times. Do not attempt to enter or exit the cab while carrying tools. Do not use the steering wheel or any other cab control as a handhold.

Never get on or off a moving machine. Check that the machine has come to a full and complete stop and that the parking brake is set before exiting.

## BEFORE OPERATION

OSHA regulation 1910.178 requires all operators of rough terrain forklifts to be trained in their use and operation. DO NOT operate this machine if you have not been properly trained.

The operator must be thoroughly trained on this machine, and demonstrate competence in all aspects of machine use and function. Operators must read, fully understand, and follow this Operator Manual and ANSI Standard B56.6-1998. Local regulations may require operators to have an operator's permit in their possession.

Check that all guards and covers are in place and are fastened securely to the machine. Properly fasten the seat belt immediately upon entering the cab.

Know the job site where you are operating. Pay careful attention to areas limited in both vertical and horizontal clearance, areas with overhead obstructions such as electrical lines, steam or compressed air lines, etc.

### **DANGER**

---

*Keep the machine and attachments at least 25 feet (7.6 m) from any overhead electrical conductor.*

---

Check the firmness of the ground that you will be driving over. Be especially aware of back-filled trenches which haven't been compacted, basement roofs, underground tunnels, sewers, culverts and service ducts, etc.

The job site should offer even ground compaction. This minimizes the risk of a rollover caused by tire or outrigger penetration when a load is lifted or the boom extended.

Be sure that the load chart and instructional labels are in place (see "Reach Load Charts" on Page 52). DO NOT operate the machine until you understand how to use the load charts.

Make sure that the machine is equipped with a lighting system appropriate to the work conditions.

Check the service horn and the reverse alarm for proper operation.

Clear obstacles from the path of the machine.

Check for proper operation of the steering and braking system while moving slowly in an open area with the boom fully retracted and the attachment just clear of the ground. Check for proper operation of all other controls with the machine stationary. DO NOT raise or extend the boom unless the machine frame is level. See "Leveling the Frame" on Page 20 for more information.

### **DANGER**

---

*DO NOT use a machine that is damaged or malfunctioning. Tag and remove the machine from service until it is repaired.*

---

## OPERATION

OSHA regulation 1910.178 requires all operators of rough terrain forklifts to be trained in their use and operation. DO NOT operate this machine if you have not been properly trained.

The Daily or 10 Service Hour Maintenance Inspection (see page 38) must be completed at the beginning of each work shift. Any deficiencies must be corrected prior to operation. **Never operate a damaged or malfunctioning machine.**

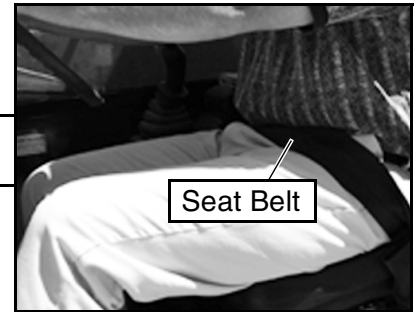
The operator must be thoroughly trained on this machine, and demonstrate competence in all aspects of machine use and function. Operators must read, fully understand, and follow this Operator Manual and ANSI Standard B56.6-1998. Local regulations may require operators to have an operator's permit in their possession.

At any time during operation, press the service horn button to sound an audible warning if necessary.

**Figure 2:** Seat Belt

### ! WARNING !

*Remain seated at all times in the operator's cab with the safety belt on. Keep arms and legs inside the cab.*



## TRAVEL

### ! WARNING !

*DO NOT set the parking brake while the machine is in motion. Setting the parking brake while the machine is in motion may cause premature failure of the parking brake and its ability to hold the machine.*

*The machine must be fully stopped before the parking brake is engaged.*

*Travel with the boom fully retracted and as low as possible. Never travel with the boom raised or extended. Raise or extend the boom only to place the load.*

Use the two wheel steering mode when driving any time that you are not maneuvering in tight places. Watch for and avoid personnel and other machines, especially at start-up, direction changes, and when picking up or placing a load.

Slow down and sound the service horn at any intersections. Use a spotter to check for oncoming vehicle and pedestrian traffic if your view is obstructed.

Travel with the boom fully retracted and as low as possible while maintaining adequate ground clearance. Never travel with the boom raised or extended. Raise and extend the boom only to place the load.

Check that the area around and above the work area is clear of obstacle (obstructions, holes, drop-offs, persons in the route of travel), and that the surface is capable of supporting wheel loads. Clear any obstructions before traveling through an area.

Know the job site traffic rules, and be aware of all signs, flags, and markings that may indicate hazards or rules that you may need to know about.

## STARTING THE ENGINE

### ! WARNING !

**DO NOT** use ether or any starting aid. This machine is equipped with an inlet manifold heater to help with cold weather starting. Adding ether or any type of starting aid could cause an explosion resulting in serious injury or death.

**NOTE:** The engine will not start unless the operator is seated in the cab.

1. Enter the cab, adjust the seat, and fasten the seat belt. Check for proper adjustment of the mirrors.
2. Turn the Key Switch right to the RUN position and wait for the Grid Heater Indicator Light to go out.
3. Turn the Key Switch fully right to crank the engine. Release it when the engine starts.



Grid Heater Indicator Light

## DRIVING

1. Check that the area around and above the work area is clear of obstacle (obstructions, holes, drop-offs, persons in the route of travel), and that the surface is capable of supporting wheel loads. Clear any obstructions before traveling through an area.

2. Disengage the Parking Brake Switch, found at the left side of the dash.

**NOTE:** The machine will not drive when parking brake is engaged.

3. Rotate the Gear Selection Lever to desired range position (1-4).
4. Move the Gear Selection Lever to set the direction of travel (Forward or Reverse)

**NOTE:** Higher gears may be selected while in motion.

5. Press the accelerator pedal to accelerate to desired speed.
6. To change direction from forward to reverse, stop the machine using the brake pedal, then shift the selector lever into reverse.

Figure 3: Cab Controls and Indicators

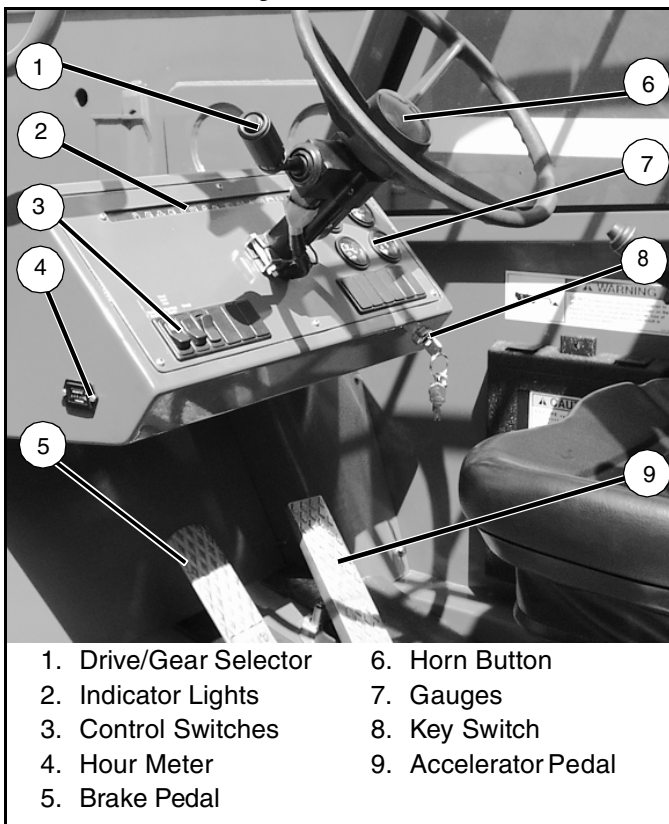
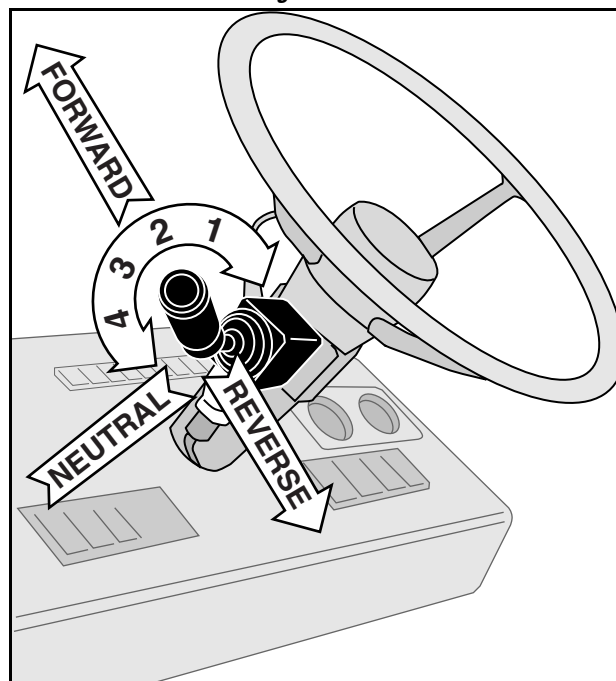


Figure 4: Gear Selection Lever



---

**! WARNING !**

---

**Use only the brake pedal to stop the machine.** DO NOT use the Drive/Gear Selector to slow or stop the machine. Using the Drive/Gear Selector to slow or stop the machine may result in bodily injury and cause damage to the machine.

DO NOT set the parking brake while the machine is in motion. Setting the parking brake while the machine is in motion may cause premature failure of the parking brake and its ability to hold the machine.

The machine must be fully stopped before the parking brake is engaged.

---

---

**CAUTION**

---

USE A LOWER GEAR when moving a heavy load. Shift to a lower gear if the engine does not respond to increased throttle. By avoiding engine "lugging" you will prolong the life of the engine and transmission.

---

**SHIFTING GEARS**

1. You may shift gears while the machine is in motion by rotating the Drive/Gear Selector.

---

**CAUTION**

---

Avoid over-revving the engine by downshifting too fast. Avoid lugging the engine by using a gear too high for your current speed.

---

2. When machine is stopped, place the Gear Selection Lever in NEUTRAL and set the Parking Brake Switch to ON.



## CONTROL SWITCHES

Control switches are located on the dashboard with the exception of the Frame Level Switch, which is located on the right arm rest near the Control Lever.

### PARKING BRAKE SET



Two position switch; Sets the parking brake.

## ! WARNING !

*DO NOT set the parking brake while the machine is in motion. Setting the parking brake while the machine is in motion may cause premature failure of the parking brake and its ability to hold the machine.*

*The machine must be fully stopped before the parking brake is engaged.*



### STEERING MODE

Three position switch; Top is Four Wheel/Round Mode, middle is Two Wheel Mode, bottom is Crab Mode. Refer to "Steerin " on page 18 for explanation of the steering modes.

### FRONT WIPER



Two position switch; Turns on main wiper on the front window of enclosed cabs.

### TOP WIPER



Two position switch; Turns on wiper on the top window of enclosed cabs.

### TOP WASHER



Two position momentary switch; Sprays window wash solution onto the top window of enclosed cabs.

### CREEP MODE



Two position momentary switch; Shifts transmission into highest gear.

Use this drive mode when moving close to your landing area where slow, controlled movement is necessary.

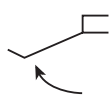


**WORK LIGHTS**

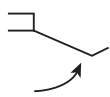
Two position switch; Turns on work lights on machines so equipped.

**HAZARD LIGHTS**

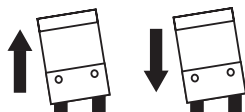
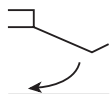
Two position switch; Turns on flashing hazard lights on machines so equipped.

**LEFT STABILIZER**

Three position momentary switch; Raises and lowers the left stabilizer on machines so equipped.

**RIGHT STABILIZER**

Three position momentary switch; Raises and lowers the right stabilizer on machines so equipped.

**FRAME LEVEL**

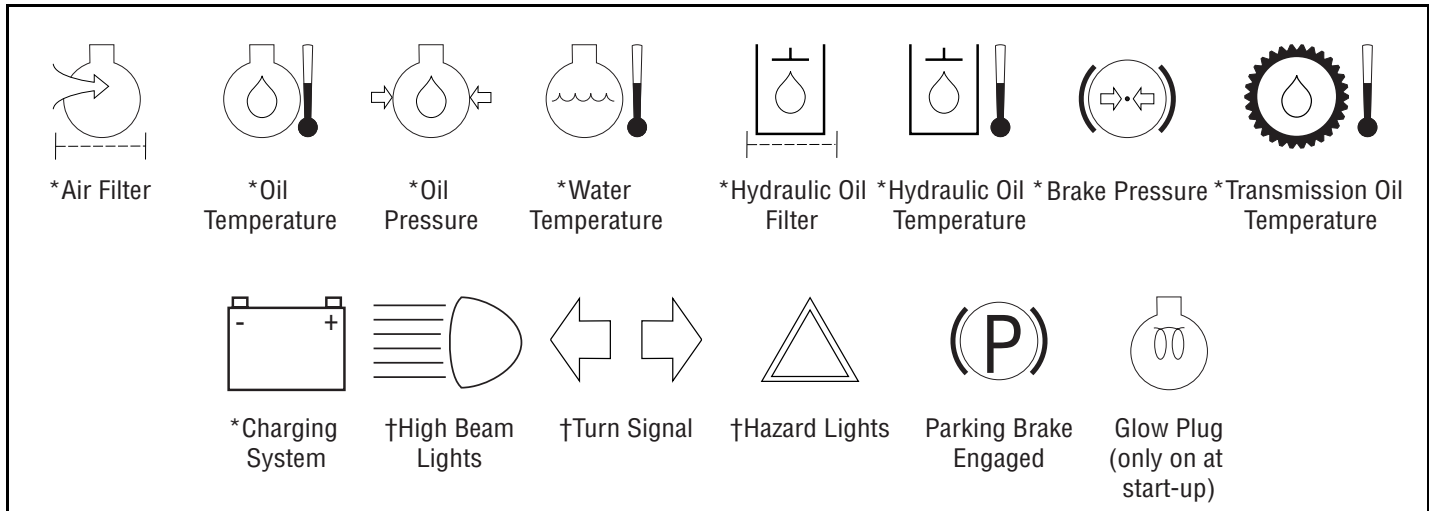
Three position momentary switch; Allows the operator to level the frame before elevating the boom.

**HEATER FAN**

Two position switch; Turns on heater fan on machines so equipped.

## INDICATOR LIGHTS

Figure 5: Warning Lights



Closely monitor the Indicator Lights at the top of the dash board. Indicator lights marked with a “\*” are warning lights. If one of these comes on while the machine is in use, or if the machines malfunctions at any time, stop the machine and correct the problem immediately.

Indicator lights marked with a “†” show the status of optional lighting components.

## STEERING

The XR Series machine has three steering modes: Two wheel steer, Four Wheel/Round steer and Crab steering.

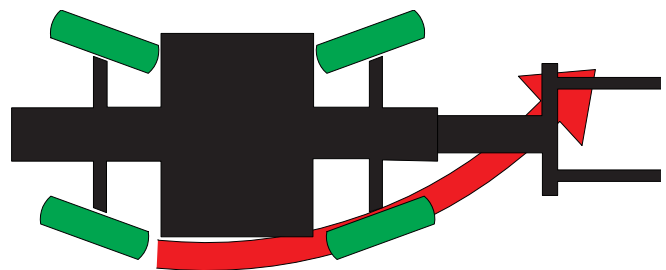
The steering mode is selected using the Steering Mode Control Switch.

**IMPORTANT: DO NOT** change steering modes unless all four wheels are pointing straight forward. If a steering mode does not function properly, position the rear wheels straight forward, set steering mode to two wheel steer, then turn the front wheels to straight forward. Steering will now work properly when shifted to other modes.

## ! WARNING !

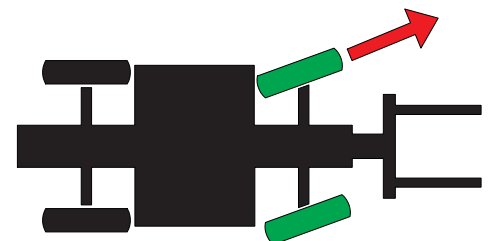
*FORKS EXTEND BEYOND TURNING RADIUS. Allow for adequate clearance of forks when turning.*

### FORKS EXTEND BEYOND TURNING RADIUS



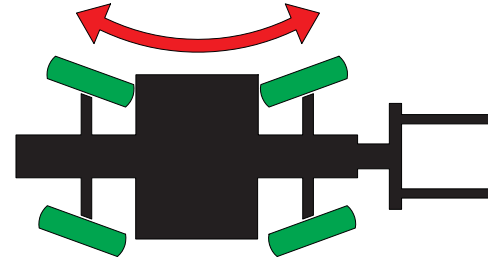
### TWO WHEEL STEERING

The front wheels will steer in the direction that the steering wheel is turned. The rear wheels will remain in the fixed forward position. This mode is used for on-highway travel, travel at higher speeds, and general travel around the job site when movement in tight places is not required.



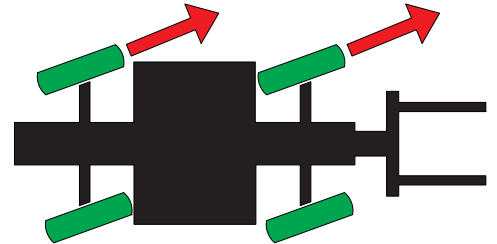
## ROUND STEERING

The front wheels will steer in the direction that the steering wheel is turned. The rear wheels will steer in the opposite direction. This mode allows an extremely short turning radius. It also enables the rear wheels to follow the tracking of front wheels, which is an advantage in mud or sand conditions.



## CRAB STEERING

All wheels will steer in same direction. This mode permits the operator to move the vehicle sideways toward the landing point of the load. This is especially helpful in tight quarters on a job, in order to line up at the exact spot in front of the landing location.



## BOOM FUNCTIONS

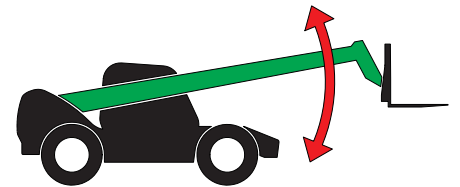
**Figure 6:** Boom Controls

1. Selector Control Button
2. Control Handle
3. Frame Level Switch



### ELEVATING THE BOOM

To elevate the boom, pull the Control Handle BACK. To lower the boom, push FORWARD.



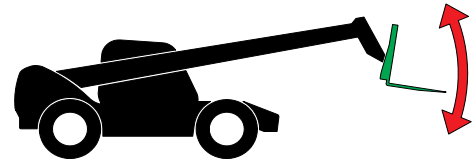
### EXTENDING THE BOOM

To extend the boom, move the Control Handle RIGHT. To retract the boom, move the Control Handle LEFT.



## LEVELING THE FORKS

While depressing the Selector Control Button, move the Control Handle BACK to tilt the attachment carriage up. Move the Control Handle FORWARD to tilt the attachment carriage down.



## ATTACHMENTS

There are many types of attachments available for installation on UpRight XR Series Telehandlers. Before installing or using an attachment, be sure that it is approved by UpRight, Inc. and that an UpRight load chart has been installed in the cab. Follow the manufacturer's instructions for use.

See the supplemental instructions that accompany each attachment for on proper use.

## ⚠ WARNING ⚠

*Use of unapproved attachments may result in serious injury or death. Before installing any attachment on this machine, check that it is approved by UpRight, Inc. and that an UpRight load chart covering its use has been installed in the cab.*

*DO NOT exceed the maximum load capacity.*

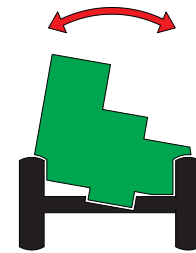
*Hydraulically operated attachments must be rated to operate at the pressures provided by the machine. Using attachments rated lower than the maximum system pressure of 2800 PSI (193 bar) may cause damage to the attachment. Attachments rated for pressures greater than machine maximum pressures may not work properly.*

## LEVELING THE FRAME

## ⚠ DANGER ⚠

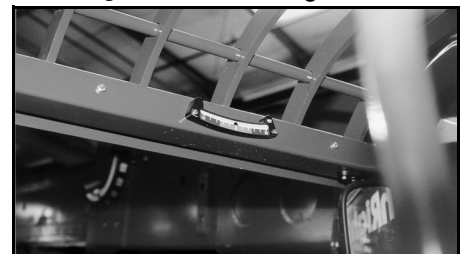
*Leveling the frame with the boom elevated above horizontal may cause tipover. DO NOT elevate the boom above horizontal unless the frame is level. If leveling is impossible because of ground slope, move the machine and attempt to level it again before placing the load.*

The boom must be at or below horizontal before the frame leveling is attempted. The Frame Angle Indicator (Figure 7) will show the angle of the frame relative to level. Press the Frame Leveling Switch RIGHT to tilt the frame right. Press the Frame Leveling Switch LEFT to tilt the frame left.



**Figure 7:** Frame Angle Indicator

Use the Frame Leveling Switch to adjust the frame angle until the Frame Angle Indicator shows 0°. DO NOT elevate the boom if 0° cannot be achieved. Reposition the machine and attempt to level it again before elevating the boom.



## CARRYING AND POSITIONING THE LOAD

DO NOT operate outside the capacity limits of this machine. Be sure that you are referencing the correct load chart. All loads must be within the weight and load center limits for the machine. Capacity is reduced at longer load centers and when an attachment is used.

Secure loose loads (pipe, lumber, etc.) to the forks or attachment before travel or placement.

1. Park the machine in front of the load.
2. Adjust the forks to match the openings on the pallet.
3. Extend the boom slowly until the forks have fully engaged the load. The pallet should be carried at the rear of the forks to maximize load capacity.
4. Survey the work area for obstacles (surface hazards, holes, drop-offs, bumps, curbs, or debris), and avoid them. Carry the load as low as possible. Do not extend the boom until it is necessary to place the load at the work area.
5. Survey the work site to find a suitable place to park the machine while elevating the load. This must be a firm level area as close as possible to the work area.

### **W A R N I N G**

*Before operating any function, check the area around and overhead for any obstructions or electrical conductors.*

6. Check the load chart to determine the maximum safe boom angle and extension (see “Reach Load Charts” on Page 52).

### **W A R N I N G**

*Make sure that the landing area is capable of supporting the load.*

*Listen for any crackling sounds that may indicate structural weakness in the landing area.*

7. Set the outriggers (if the machine is so equipped).
8. Use the frame level switch to level the frame of the machine.

### **D A N G E R**

*DO NOT adjust the outriggers while the load is elevated.*

*DO NOT raise the boom if the frame is not level.*

9. Elevate and extend the boom until the load is at the proper height and just in front of the work area. If visibility is limited, use a spotter to assist you in placing the load. Follow only one spotter's hand signals. Be sure that the spotter knows the proper hand signals and is qualified to assist you in placing the load.
10. Extend the boom until the load is above the work area, then lower the boom to place the load.
11. Slowly retract the forks by raising and retracting the boom in small increments until the forks clear the load. After the forks are clear, retract and lower the boom before driving.

## PARKING

### **W A R N I N G**

*DO NOT set the parking brake while the machine is in motion. Setting the parking brake while the machine is in motion will cause premature failure of the parking brake and its ability to hold the machine.*

*The machine must be fully stopped before the parking brake is engaged.*

*To prevent injury or damage to the machine, ALWAYS retract the boom and lower the forks flat on the ground before exiting the cab.*

*To prevent unauthorized use, ALWAYS remove the keys when the machine is not being used.*

Park on a firm level surface. Shift the Gear Selection Lever to NEUTRAL and engage the parking brake.

Retract the boom and lower the forks flat on the ground. Turn the Key Switch to OFF and remove the keys.

## AFTER USE EACH DAY

1. Ensure that the boom is fully lowered with forks flat on the ground.
2. Park the machine on level ground, preferably under cover, secure against vandals, children or unauthorized operation.
3. Turn the key switch to OFF and remove the key to prevent unauthorized operation.

# TRANSPORTATION AND EMERGENCY PROCEDURES

## CAUTION

*DO NOT tow the machine faster than 5 mph. Faster speeds will damage drive components and void the warranty.*

## WARNING

*CHOCK THE WHEELS when preparing to tow or winch the machine. The machine may roll out of control when the park brake is released.*

## MANUAL PARKING BRAKE RELEASE

It is necessary to release the parking brake to allow towing.

1. Chock the wheels to prevent accidental rolling.
2. Attempt to release the parking brake with the Parking Brake Control Switch.
3. If Step 1 fails to release the parking brake, start the engine. This will create hydraulic pressure to release the parking brake.
4. If the engine cannot be started or hydraulic pressure cannot be generated, the brake must be release manually. One of two types of parking brakes is used on each XR Series Telehandlers. Each is located on the front axle assembly. Determine which type your machine has, then follow the appropriate directions.

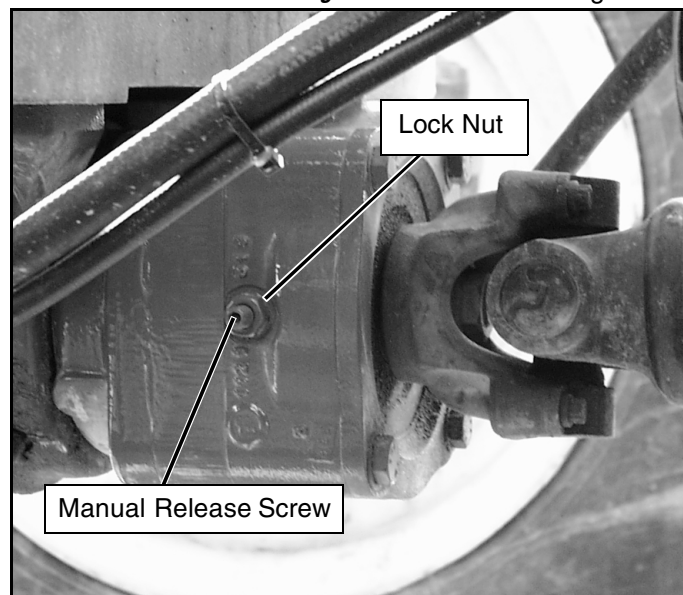
## DRIVELINE PARKING BRAKE MANUAL RELEASE

1. Shut off the engine, and chock the wheels to prevent accidental rolling.
2. There are two manual release screws, (one on each side of the parking brake). Loosen the lock nuts on the manual release screws.

**NOTE:** Record the exact number of turns that each screw makes to release the parking brake.

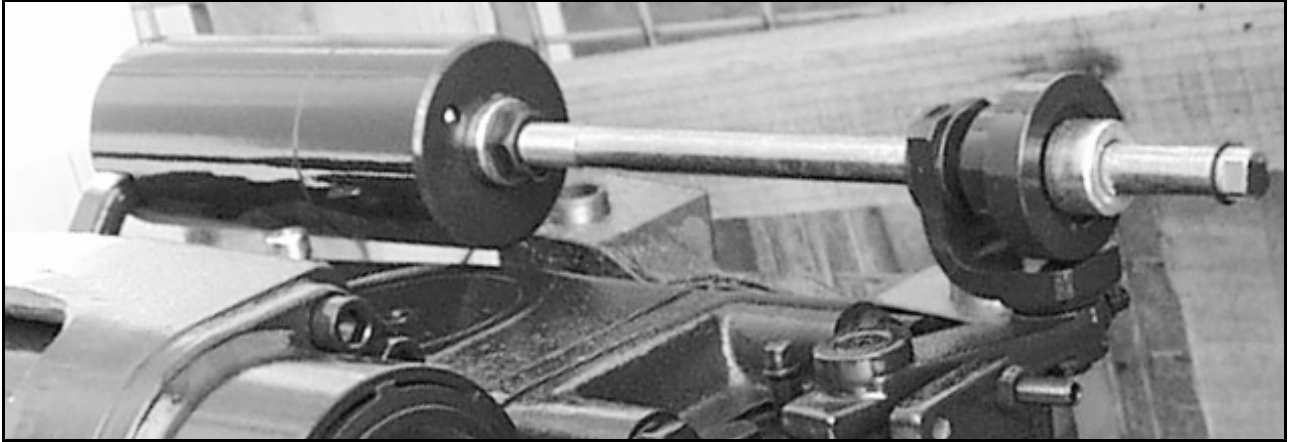
3. Turn each manual release screw clockwis until resistance is felt. Then, alternating between the two sides, turn each screw 1/4 turn at a time until the parking brake is released.
4. Once the machine has been secured to the trailer or has been moved to its destination, return the manual release screws to their original positions and tighten the lock nuts.

*Figure 8:* Driveline Parking Brake



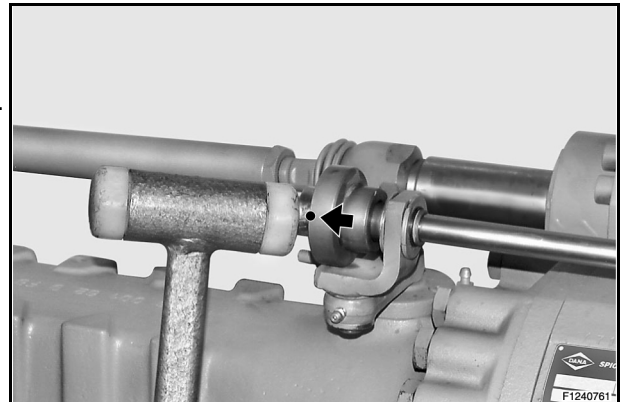
## HYDRAULIC CYLINDER PARKING BRAKE MANUAL RELEASE

**Figure 9:** Hydraulic Cylinder Parking Brake



**Figure 10:** Releasing the Parking Brake

1. Chock the wheels to prevent accidental rolling.
2. Release the brake by giving a hammer blow to the external ring of the check unit shown in Figure 10.
3. Once the machine has been secured to the trailer or has been moved to its destination, reset the parking brake by starting the machine to introduce pressure into the braking system. Check that, at the end of the piston stroke, the check unit is actually engaged onto the rod.



## EMERGENCY TOWING

Perform the following procedure only when the machine will not operate under its own power and it is necessary to move the machine, or when winching the machine onto a trailer for transportation.

1. Chock the wheels to prevent accidental rolling.
2. Lower the boom to a convenient towing height.
3. Use a chain of sufficient strength to attach the front or rear tie down lugs to the towing vehicle or winch.
4. Place the transmission in neutral and release the parking brake by following the procedure in the previous section.
5. When ready to move the machine, remove the chocks. Tow or winch into position and replace the chocks. Reset the parking brake.



## TRANSPORTATION

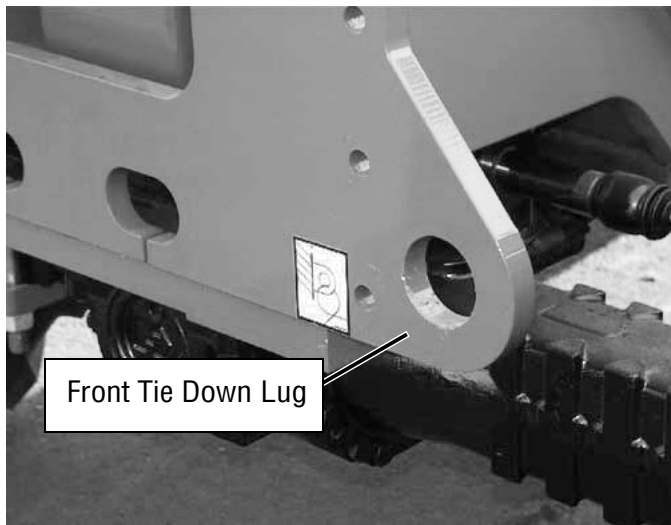


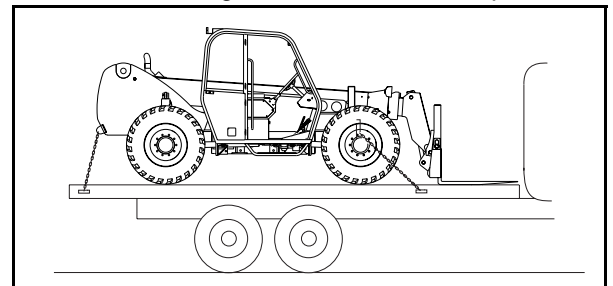
Figure 11: Tie Down Lugs



Figure 12: Securing the machine for transportation

### BY TRUCK OR TRAILER

1. Raise the boom enough to clear the ramp.
2. Maneuver the machine onto the bed of a truck or trailer.
3. Lower the boom completely with the forks flat on the bed of the transport vehicle. Attach chains or straps of sufficient strength to tie down lug only. Ensure that chains are adjusted properly to keep the machine secure.



### WINCHING THE MACHINE

#### CAUTION

*CHOCK THE WHEELS when preparing to tow or winch the machine. The machine may roll out of control when the park brake is released.*

1. When winching, follow the instructions for emergency towing on page 24. Attach the winch cable to front tie down lugs.

#### CAUTION

*DO NOT tow machine faster than 5 mph. Faster speeds will damage drive components and void warranty.*

2. Secure the machine to the transport vehicle using chains or straps of adequate load capacity attached to chassis tie down lugs.

## JUMP STARTING

The following procedure is to be performed only if the battery on your XR Series Telehandler is discharged and is incapable of starting the engine. Once the engine has started, it is advised that you perform an electrical system test to pinpoint the cause of the battery failure. Correct this fault immediately to avoid repeated jump starting.

1. The battery is located just in front of the right rear tire, below the radiator. Remove the two screws, then swing open the hinged battery tray.
2. Connect one of the positive clamps to the positive post of the discharged battery.
3. Connect the other positive clamp to the positive post of the charged battery or 12 volt power source.
4. Connect the first negative clamp to the negative post of the charged battery or 12 volt power source.
5. Connect the remaining negative clamp to the engine block of the machine with the discharged battery.
6. Start the engine of the machine with the charged battery, or turn on the 12 volt power source, and allow to run for five minutes. This aids in starting by allowing the battery to charge.
7. Start the machine with the discharged battery.
8. Remove the jumper cables in reverse order of that above.

### **! WARNING !**

*DO NOT attempt to jump start at the starter motor.*

**Figure 13:** Battery Tray



## RETRACTING AND LOWERING THE BOOM WITHOUT HYDRAULIC POWER

This procedure is for emergency use only. Effort should be made to restore hydraulic power before performing this procedure.

### ⚠ DANGER ⚠

*Read all instructions and warnings BEFORE attempting to lower or retract the boom without hydraulic power.*

The boom lift cylinder and the boom extend cylinder are equipped with counterbalance valves (also known as holding or overcenter valves) which keep the hydraulic fluid in the cylinder and the boom up and extended. In normal operation, the counterbalance valves are opened by pilot pressure generated by the down or retract functions, which allows the oil to flow back to the tank. If hydraulic power is lost, the boom may be lowered and retracted manually by releasing the counterbalance valves.

### ⚠ DANGER ⚠

*There is no working clearance between the boom and the frame when the boom is lowered. Working in this area will result in serious injury or death. Do not occupy this area until the boom has been supported.*

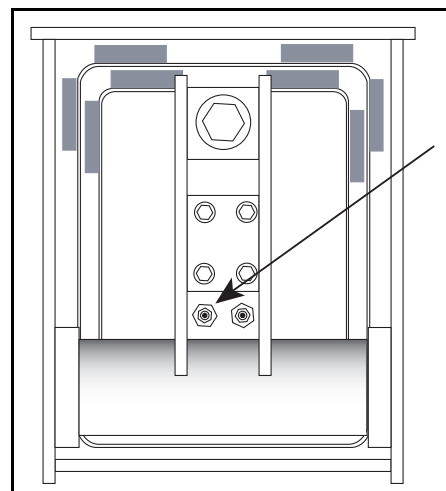
*The boom must be retracted before it can be lowered. Lowering the boom while it is still extended may cause forward instability resulting in machine tip-over. This will cause serious injury or death to any person in the area.*

Before releasing the counterbalance valves, the boom must be supported by a suitable stand or packing capable of supporting the full weight of the boom, the attachment, and the load (see Figure 15).

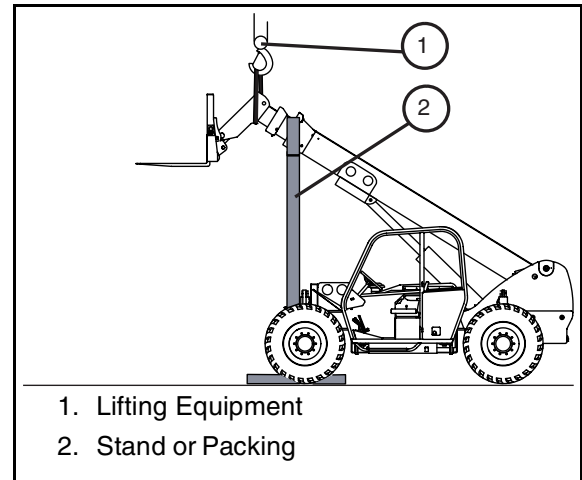
1. Ensure that the machine is stable and will not become unstable as the boom is retracted and/or lowered. Chock the tires. Clear all personnel away from the machine.
2. Remove the cover from the rear of the boom.
3. Loosen the lock nut on the extend cylinder counterbalance valve. Turn the socket head screw clockwise until the boom starts to retract.

**NOTE:** If the boom is horizontal, it will be necessary to use a winch or another machine to push the boom into the fully retracted position.

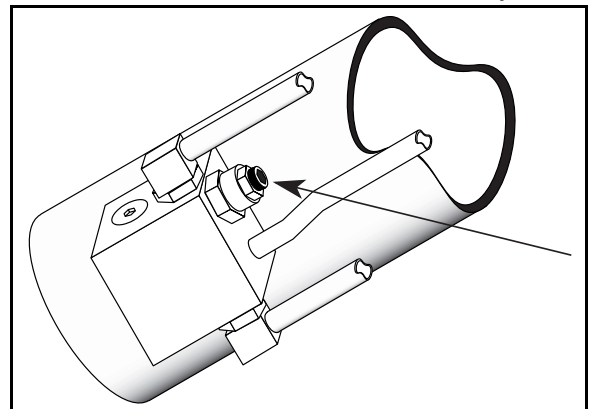
**Figure 14:** Boom Extend Counterbalance Valve, view from rear of boom with cover removed



3. Using suitable lifting equipment, support the boom at the head, lifting it from the stand or packing. Be sure that the lifting equipment is able to move to accommodate the boom's change of position as it is lowered. Remove the stand or packing.

**Figure 15:** Supporting The Boom**Figure 16:** Boom Lift Counterbalance Valve, shown at base of lift cylinder

4. The Boom Lift Counterbalance Valve is easily accessed from the right side of the machine behind the engine cover. Remove the cap that fits over the valve by pulling it straight off with a pair of pliers.
5. Loosen the locknut on the counterbalance valve, then turn the socket head screw fully clockwise.
6. Slowly lower and adjust the lifting equipment until the boom is fully lowered.



Due to the importance of proper adjustment, **you must replace any counterbalance valve whose setting has been altered to lower or retract the boom.**

Once the machine has been repaired, the lift/lower function and the extend/retract function must be cycled many times to purge air from the systems.

# MAINTENANCE

## FACTORY SETTINGS AND SPECIFICATIONS

### Hydraulic Pressures

Main Relief Valve	3500 PSI
Steering Relief Valve	2500 PSI
Fork Tilt Pressure	3500 PSI back/ 2500 PSI forward
Boom Pressure	3500 PSI up/ 2500 PSI down
Extend/Retract Pressure	2500 PSI
Frame Level Pressure	2500 PSI
Brake Pressure	800 PSI

Engine RPM (governed)	2500 RPM
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### Performance Specifications

Lift Speed Up	15 seconds $\pm$ 2
Lower Speed Down	17 seconds $\pm$ 2
Extend Speed Out	15 seconds $\pm$ 2
Retract Speed In	15 seconds $\pm$ 2
Lift/Extend Speed	23 seconds $\pm$ 2
Lower/Retract Speed	16 seconds $\pm$ 2
Frame Level Speed Left	5 seconds $\pm$ 1
Frame Level Speed Right	5 seconds $\pm$ 1
Fork Tilt Speed (Full Range)	4 seconds $\pm$ 1

Axle Lockout Activation Angle (Fore/Aft)	40 degrees $\pm$ 5
---	--------------------

Frame Level	10 degrees $\pm$ 1
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### Fluid Specifications

Engine	11.5 quarts (10.9 liters) 15W-40 CE/SG*
Hydraulic	48 gallons (180 liters) Mobilfluid 424 C-4*
Transmission	5.4 gallons (20.3 liters) Mobilfluid 424 C-4*
Differentials--each	2.4 gallons (9 liters) Mobilube HD 80W-90 LS
Hubs--each	.5 gallons (2 liters) Mobilube HD 80W-90 GL5
Transfer Case	.4 gallons (1.5 liters) Mobilube HD 80W-90 GL5
Grease	Mobilgrease Moly 51, 52 or Molykote VN2461C
Coolant	5.5 gallons (20.8 liters) Heavy Duty 50% antifreeze/50% water

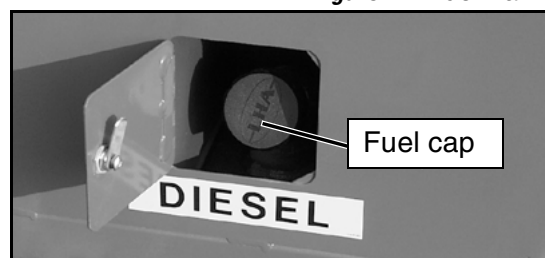
\*See page 31, figure 19 for recommended viscosity ratings for various work environment temperature ranges.

## AS NECESSARY MAINTENANCE

### FUELING

1. Use ASTM No.2D fuel with a minimum Cetane number of 40. Fuels with a Cetane number higher than 40 may be needed in high altitudes or extremely low work environment temperatures to prevent misfires and excessive smoke.
2. At operating temperatures below 32°F (0°C), use a blend of No.1D and No.2D fuels, also known as “winterized” No.2D.
3. Fuel tank capacity is 35 gallons (132.5 liters).

Figure 17: Fuel Tank



### ENGINE OIL

1. Check the oil with the engine turned off and the machine parked on a level surface.
2. Add oil if necessary. Always use **API CE/SG** rated oil. While 15W-40 is recommended for most climates, refer to Figure 19 for oil viscosity recommendations for extreme climates. Select the highest oil viscosity compatible with prevailing work environment temperatures.

### TRANSMISSION FLUID

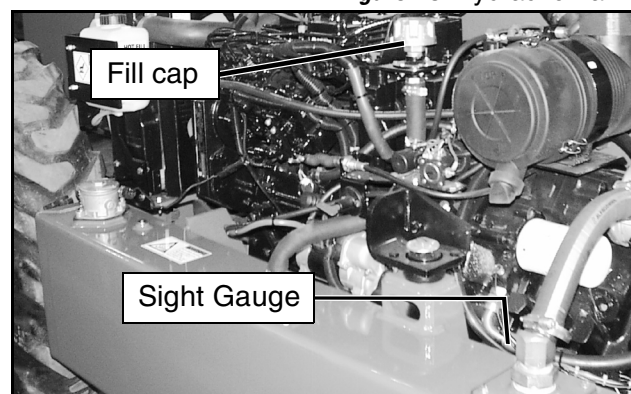
1. Park the machine on a level surface, making sure that the parking brake is set. Chock the wheels securely and check that the transmission is in NEUTRAL.
2. Start the engine. Using the dipstick, check the transmission oil level with the engine running at idle speed and the oil temperature at approximately 190°F (88°C).
3. If necessary, add transmission fluid to bring the level to FULL on the dipstick. Refer to Figure 19 for the correct type and select the highest oil viscosity compatible with prevailing work environment temperatures.

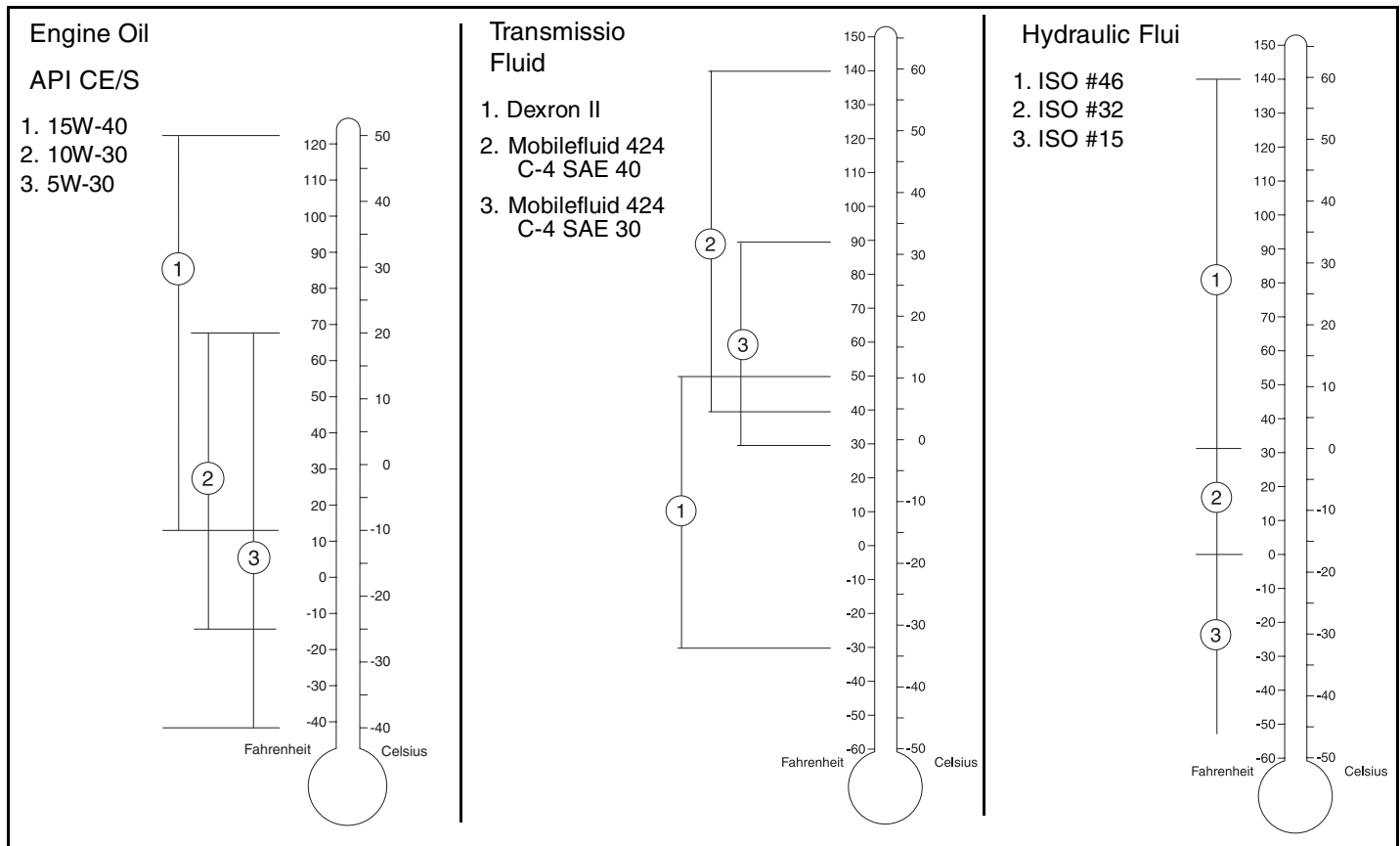
### HYDRAULIC FLUID

The boom must be fully retracted and lowered, and the outriggers (if equipped) completely raised before checking the hydraulic fluid level.

1. Check the hydraulic fluid level sight gauge. The hydraulic fluid should be between the lines in the sight gauge.
2. If necessary, fill to capacity with clean hydraulic fluid. Refer to Figure 19 for the correct grade of hydraulic fluid for your work environment. Clean the area around the cap before opening. **DO NOT** fill to the top. Stop filling the tank as soon as fluid becomes visible in the sight gauge and passes the first line.
3. The hydraulic tank has a capacity of 48 gallons (180 L).

Figure 18: Hydraulic Tank



**Figure 19: Fluid Selection For Various Work Environment Temperature Ranges**

## COOLING SYSTEM

### ⚠ WARNING ⚠

*Engine coolant operates at high temperature and pressure. Opening the system at operating temperature may cause serious injury by scalding.*

*DO NOT attempt to remove the radiator cap until the engine is stopped and has cooled. If the engine is hot, add fluid to the radiator overflow tank only. If the engine needs additional coolant, it may be necessary to allow the engine to cool, then find the source of the leak and repair.*

*Always wear eye protection.*

Diesel engines require a balanced mixture of water and antifreeze. Drain and replace the mixture every 2000 hours or two years to eliminate the buildup of harmful chemicals and minerals that reduce cooling system efficiency.

Antifreeze is essential in any climate. It broadens the operating temperature range by lowering the freezing point and raising the boiling point of the coolant mixture. Do not use more than 50% antifreeze unless additional freeze protection is required. Never use more than 68% antifreeze under any circumstance.

**Use only low silicate antifreeze that meets ASTM4985 (GM6038M spec.) test requirements. Mix with distilled water only. Tap water contains minerals that may build up in the engine and reduce the cooling system efficiency.**

Check the coolant level daily by first checking the radiator overflow tank. Check that there is fluid in the radiator overflow tank. If none is visible, be sure that the radiator is cold, then remove the cap from the radiator and check the level of the coolant. DO NOT open a hot radiator. Fill the radiator with coolant mixture to the top of the fill neck in the radiator, and the radiator overflow tank to the cold fill line. Mix 50% water with 50% coolant in a bucket and stir before adding the mixture to the engine. DO NOT add cold coolant to a hot radiator. Allow the engine to cool before adding the coolant.

## BATTERY MAINTENANCE

### ⚠ WARNING ⚠

*Hazard of explosive gas mixture. Keep sparks, flame and smoking materials away from batteries.*

*Always wear safety glasses when working with batteries.*

*Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after handling.***

*Battery fluid is highly corrosive. Rinse away any spilled fluid thoroughly with clean water.*

The battery is located just in front of the right rear tire, below the radiator. Remove the two screws which hold the tray closed, then swing open the hinged battery tray.

Check the battery fluid level by removing the caps. If the electrolyte level is lower than 3/8 in. (10 mm) above plates, add distilled water only. DO NOT use tap water, as it will shorten battery life.

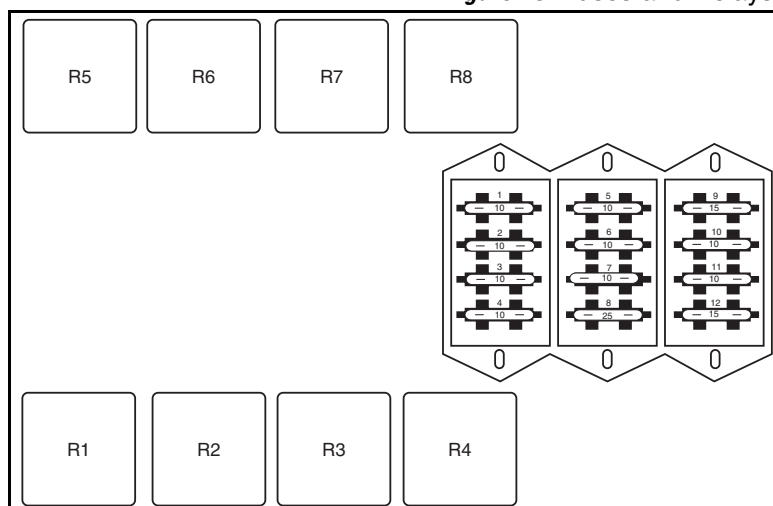
Keep the terminals and the top of the battery clean and dry.

## FUSES AND RELAYS

Replace fuses and relays as necessary. See the Troubleshooting section of the UpRight Service Manual for information on troubleshooting. Additional relays may be present when optional features are added to the machine.

1. Indicator lights--10 amp
2. Gauges--10 amps
3. Seat interlock--10 amps
4. Steering--10 amps
5. Creep mode--10 amps
6. Rear axle lock--10 amps
7. Control Handle Select--10 amps
8. Key Switch--25 amps
9. Horn-- 15 amps
10. Options-- wipers, washer, circulation fan, dome light--10 amps
11. Options--work lights, heater fan--10 amps
12. Options--road lights--15 amps
- R1. Main relay
- R2. Seat interlock relay
- R3. Parking brake interlock relay
- R4. Proximity relay
- R5. Selector valve relay
- R6. Transmission shift relay
- R7. Transmission shift relay
- R8. Transmission shift relay

**Figure 20: Fuses and Relays**





## TIRES



*Underinflated tires will result in tipover when a load is raised. Check tires for proper inflation daily.*

Tire selection can affect the stability of the machine. Use only tires supplied by UpRight for this machine unless authorized by the manufacturer in writing to do otherwise.

Check the tire air pressure daily to maintain 65 PSI. Proper tire pressure is vital to stability. Underinflated tires may lead to tipover.

Foam-filled tires are available as options and do not require inflation.

## FUEL FILTERS AND FUEL/WATER SEPARATOR

Fuel filters must be replaced every 500 hours or six months. They must also be changed whenever there is excessive water in the fuel system or when the engine shows a noticeable and sudden loss in power.

### DRAINING WATER FROM THE FUEL WATER SEPARATOR

The presence of water in fuel will cause the engine to run rough and to smoke excessively. If the water is not drained, it may cause engine damage. The main fuel filter incorporates a fuel/water separator. Drain this *daily* if water contamination is suspected. If water contamination is not suspected, it is good practice to drain the fuel/water separator weekly, as condensation inside the tank will cause some water to be present.

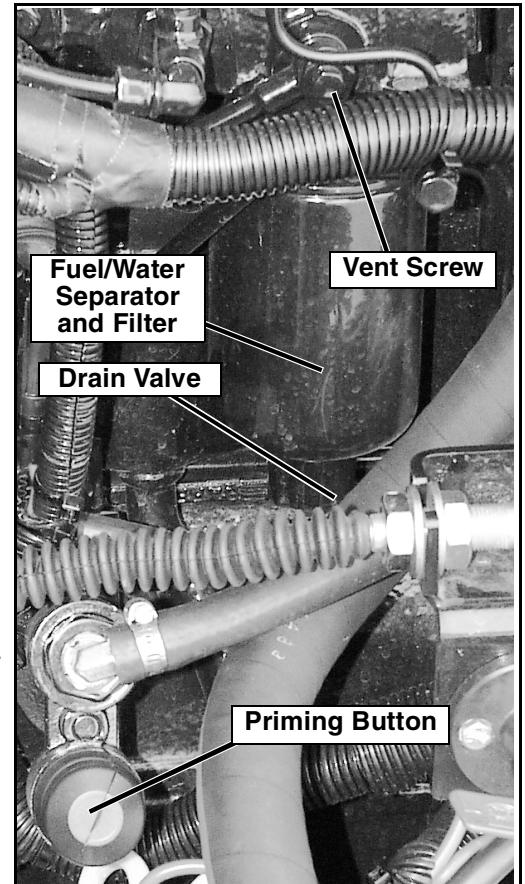
1. Drain the Fuel/Water Separator. Open the drain valve at the bottom by turning it counterclockwise four complete turns. The valve will drop down one inch. Drain the fuel sump of water until clear fuel is visible.
2. Push the valve up and turn clockwise to close. DO NOT overtighten, as thread damage will occur.
3. If more than 2 ounces of fuel is drained, the filter must be refilled to prevent hard starting. Follow the procedure under the next heading.

### PRIMING THE FUEL SYSTEM

This procedure is necessary any time filters have been replaced, the unit has run out of fuel, the fuel system has been disassembled, or when air has entered the fuel system.

1. Check that the fuel tank has enough fuel (at least five gallons) to perform this procedure.
2. Place a drain pan under the engine area to catch the purged fuel.
3. Open the 10mm vent screw located on the top of the fuel filter.
4. Operate the priming button on the fuel lifting pump until the fuel flowing from the vent screw is free of air.
5. Close the vent and wipe off any remaining fuel.
6. Start the engine while pushing the accelerator to the floor. Once the engine begins to run, release the accelerator pedal enough to keep the engine running at low speeds until it smooths out and the smoke clears.

**Figure 21:** Fuel/Water Separator



**NOTE:** Do not engage the starter for more than 30 seconds at a time. Allow it to cool for two minutes before restarting. If the engine fails to start after two attempts, repeat the above procedure.

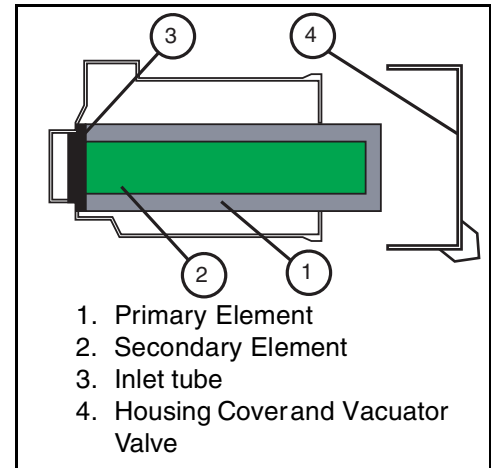
## ENGINE AIR INTAKE FILTER

**NOTE:** Never service the air filter while the engine is running.

If the air filter light comes on, service the primary element immediately. Do not service the secondary element. When the secondary element becomes restricted, it must be replaced.

1. Remove the air intake housing cover. Clean the inside of the cover and the vacuator.
2. The elements are retained in the housing by interference fit on the inlet tube. Carefully pull the outer element from the housing. Inspect for damage. Never clean the element by bumping or tapping it.
3. Use compressed air (30 PSI (205kPa) maximum pressure) directed along the length of the pleats, inside and outside the element. Inspect the element again for damage or small tears in the media. Replace it if it is damaged.
4. Mark the cleaned element to indicate the number of times it has been cleaned. **Re-use of an element that has been serviced too many times will result in engine damage.**
5. Clean inside the filter housing, then install the clean primary element and the cover.

**Figure 22:** Engine Air Intake Assembly

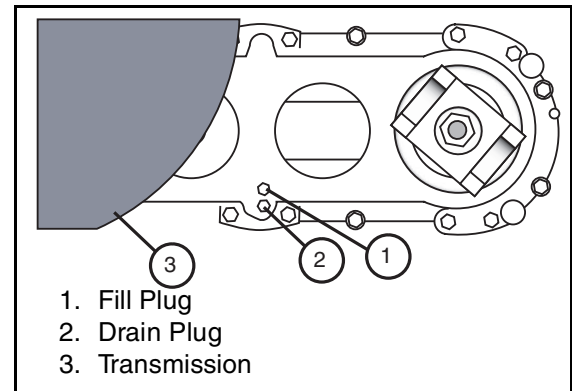


## TRANSFER CASE

**NOTE:** The transfer case is a separate, sealed unit and does not share oil with the transmission.

1. Park the machine on a level surface, making sure that the parking brake is set before exiting the cab. Chock the wheels securely.
2. Clean the area around the fill plug on the transfer case, then remove the plug. The oil should be level with the bottom of the threads.
3. Fill, if necessary, with SAE 80W90 (API GL4-Mil.L-2105 or API GL5-Mil. 2105 B/C) to the bottom of the threads.
4. Clean and install the fill plug.

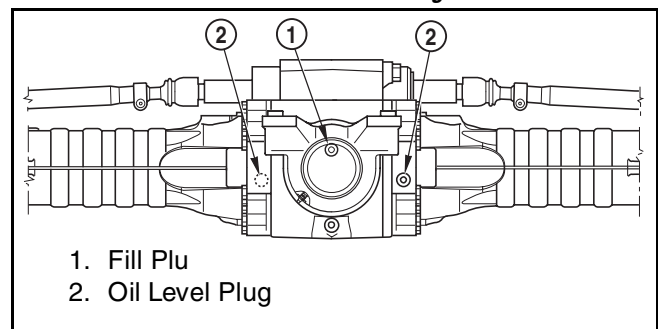
**Figure 23:** Transfer Case, Front View



## DRIVE AXLES

1. Park the machine on a level surface, making sure that the parking brake is set before exiting the cab. Chock the wheels securely.
2. Clean the area around the oil level plug on the transfer case, then remove the plug. The oil should be level with the bottom of the threads.
3. Fill, if necessary, with SAE 80W90 API LS Mil. 2105 B/C (Mobilube HD 80W-90 LS, Shell LS90, Chevron LS Gear SAE80W90, Esso Gear oil LSA 90) to the bottom of the threads.

**Figure 24:** Drive Axle



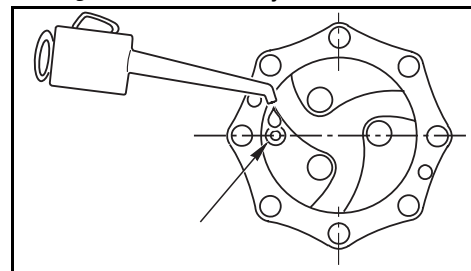
**NOTE:** Use of oil with the wrong API specification will cause brake noise and may prematurely wear the brake components.

4. Clean the area around the fill plug before removing it to add oil.
5. Clean and install the plugs.

## PLANETARY REDUCTION HUBS

1. Park the machine on a level surface, making sure that the parking brake is set before exiting the cab. Chock the wheels securely.
2. To properly check the oil level, the plug must be on the horizontal centerline of the hub. Clean the area around the plug on the hub, then remove the plug.
3. Fill, if necessary, with SAE 80W90 (API GL4-Mil.L-2105 or API GL5-Mil. 2105 B/C) to the bottom of the threads.
4. Clean and install the plug.
5. Repeat the procedure for the other three planetary reduction hubs.

**Figure 25:** Planetary Reduction Hub



## BOOM AND CHASSIS INSPECTION

The structural members of the machine must be inspected thoroughly at 1000 hour intervals, or sooner (as short as 250 hour intervals), if the machine is older or is in heavy use (i.e. multiple shift work days). Do not exceed 1000 hours or one year without a thorough structural inspection. The machine must be clean for the inspection. Dirt and oil buildup may hide damage or wear.

Remove from service and thoroughly inspect any machine that has been involved in an accident. Report any accident to UpRight, Inc. **immediatel** .

If performed regularly and thoroughly, periodic inspection will bring to light any structural deficiency in the machine. These must be repaired by persons knowledgeable in the proper repair of machine frames and structural members. Repairs must be made according to the manufacturer's recommendation. Contact UpRight, Inc. for advice any time structural service is being performed.

Pay particular attention to the following areas, especially the welded structures:

<b>MAIN CHASSIS</b>	Retract the boom, raise it, and support it with a suitable stand or overhead sling. Check the entire frame. Check all mounting points carefully (cab, engine, boom, axles, etc.), along with any towing attachments or mounting points.
<b>CAB</b>	Check carefully. Do not repair by welding. Consult UpRight, Inc. regarding any necessary repair.
<b>OUTRIGGERS (IF EQUIPPED)</b>	Lower the outriggers until they touch the ground. Inspect each carefully. Check the pads, pins, cylinders, and weldments.
<b>BOOM</b>	Extend the boom fully, then set the attachment carriage on the ground. Check each boom section thoroughly.
<b>ATTACHMENT CARRIAGE</b>	Check the carriage and attachment.
<b>CYLINDER ANCHOR POINTS</b>	Check all cylinder anchor points and pins for signs of wear or stress.

## SCHEDULED MAINTENANCE

### PREVENTATIVE MAINTENANCE TABLES

The Complete Inspection consists of periodic visual and operational checks, along with periodic minor adjustments that assure proper performance. Daily inspection will prevent abnormal wear and prolong the life of all systems. The inspection and maintenance schedule should be performed at the specified intervals. Inspection and maintenance shall be performed by personnel who are trained and familiar with mechanical and electrical procedures.

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#### **! WARNING !**

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*Before performing preventative maintenance, familiarize yourself with the operation of the machine.*

*Always block the elevating assembly whenever it is necessary to perform maintenance while the platform is elevated.*

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The preventative maintenance checklist has been designed for machine service and maintenance. Please photocopy the following page and use the checklist when inspecting the machine.

## PREVENTATIVE MAINTENANCE KEY

**Service Interval** (whichever comes first)

Daily=each shift or every day

50h/7d=every 50 hours or 7 days

250h/3m=every 250 hours or 3 months

500h/6m=every 500 hours or 6 months

1000h/1y=every 1000 hours or 1 year

2000h/2y=every 2000 hours or 2 years

**Y**=Yes/Acceptable

**N**=No/Not Acceptable

**R**=Repaired/Acceptable

## PREVENTATIVE MAINTENANCE REPORT

Date: \_\_\_\_\_

Owner: \_\_\_\_\_

Model No: \_\_\_\_\_

Serial No: \_\_\_\_\_

Serviced By: \_\_\_\_\_

Service Interval: \_\_\_\_\_

COMPONENT	INSPECTION OR SERVICES	INTERV L	Y	N	R
Entire Machine	Loose, damaged, or missing components	Daily			
	Check for cracked welds and collision damage	Daily			
	Inspect cab for damage	Daily			
	Fluid leakage	Daily			
Labels	Check that all are present and in good condition	Daily			
Radiator	Check coolant level	Daily			
	Check radiator grill for debris buildup	Daily			
Engine	Check oil level	Daily			
Hydraulic System	Check hydraulic fluid level	Daily			
	Check pump fittings for leaks	Daily			
	Check all hoses, cylinders, and fittings for leaks, pinch or rubbing points, and other damage	Daily			
Air Cleaner	Service if Air Cleaner indicator light is on	Daily			
Electrical System	Check wiring for damage or loose connections	Daily			
Steering System	Check for loose or missing articulation pins	Daily			
Tires	Check for tread and sidewall damage	Daily			
	Check for proper pressure	Daily			
	Check for loose lug nuts	Daily			
Controls	Check indicator lights, gauges, horn, back-up alarm, and lights for proper operation	Daily			
Seat Belt	Check for damage and for proper operation				
Transmission	Check fluid level	Daily			
Boom	Inspect for damage, deformation, and buckled paint	Daily			
	Check for loose, missing, or damaged hardware	Daily			
	Ensure that the boom letter labels are in good condition	Daily			
Lubrication	Lubricate all weekly lube points	50h			
Lubrication	Lubricate all weekly and 3 month lube points	250h			
Engine	Change oil and filter	250h			
	Check fan belt and tensioner	250h			

COMPONENT	INSPECTION OR SERVICES	INTERV L	Y	N	R
Gear Oil Level	Check Transfer Case oil level	250h			
	Check Drive Axle oil level	250h			
	Check Planetary Reduction Hub oil level	250h			
Breather Vents	Clean or replace	250h			
Service Brakes	Check for wear	250h			
Parking Brake	Test holding ability	250h			
Wheel Nuts	Check for proper torque	250h			
Boom Chains	Check for proper tension	250h			
Boom Wear Pads	Check for wear	250h			
Filters	Replace hydraulic filter	250h			
	Replace transmission filter	250h			
	Replace fuel filter	250h			
Transmission	Change oil and filter	1000h			
Transfer Case	Change oil	1000h			
Drive Axle	Change oil	1000h			
Planetary Reduction Hubs	Change oil	1000h			
Valve Adjustment	Initial valve lash adjustment to be performed after the first 1000 hours of service	1000h			
Valve Adjustment	Normally scheduled valve lash adjustment	2000h			
Hydraulic Tank	Change oil	2000h			
Engine Coolant	Change coolant and flush cooling system	2000h			
Boom Chains	Inspect and lubricate	2000h			

## DAILY OR 10 SERVICE HOUR MAINTENANCE

Read and understand the Safety Information section before performing any maintenance on this machine.

### **W A R N I N G**

*The engine must be cool at the beginning of this inspection, with the boom fully lowered and retracted.*

*Report any needed repairs to your supervisor immediately. Any deficiencies that this inspection identifies must be repaired before the machine is used.*

*DO NOT operate a damaged or malfunctioning machine. Tag and remove the machine from service until it is repaired.*

1. The machine must be cool and parked on a level surface, with the boom retracted and lowered completely, at the beginning of this inspection.
2. Open the engine cover.
3. Check the entire machine for loose, damaged, or missing components, and for any fluid leakage.

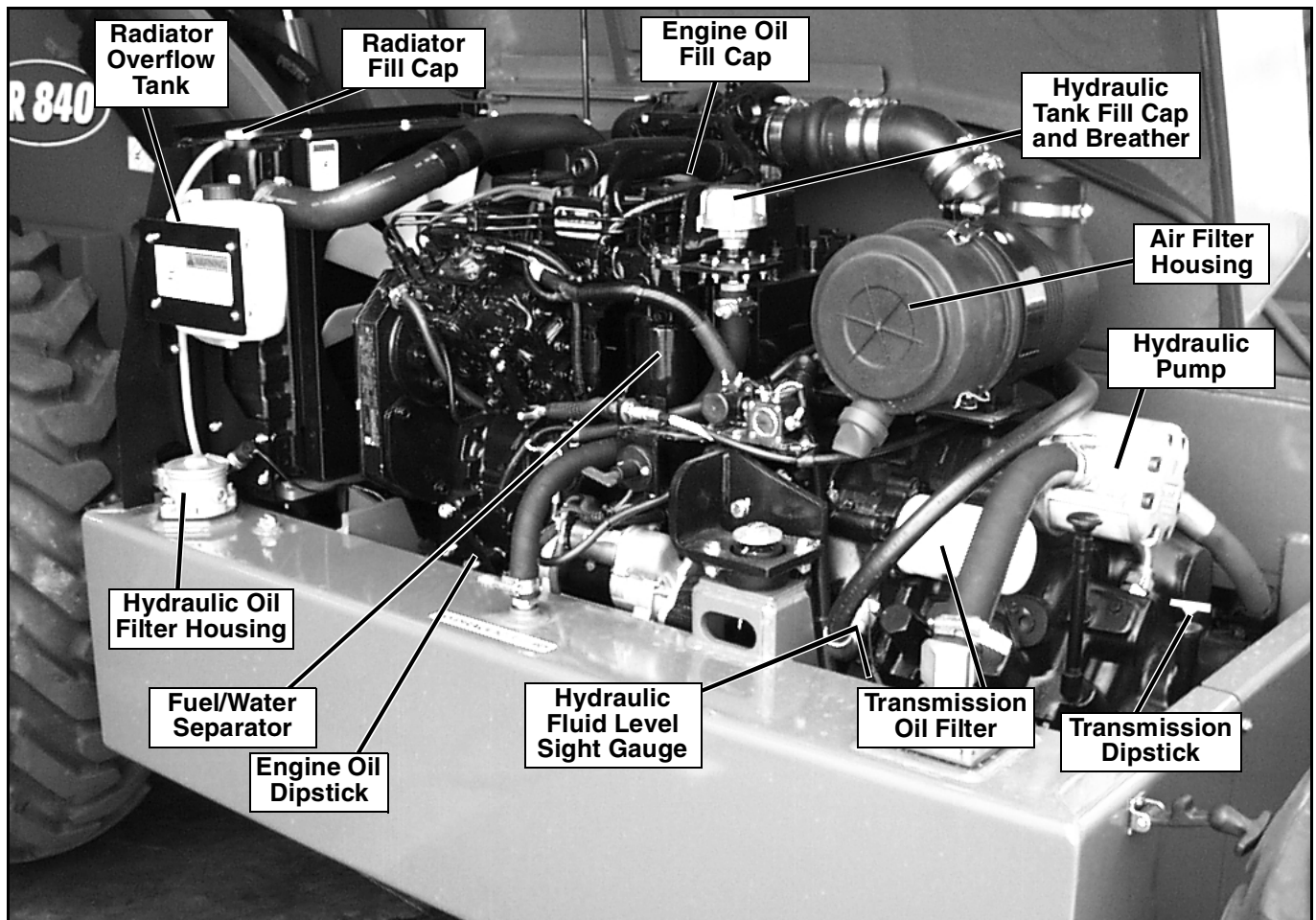
### **W A R N I N G**

*Engine coolant operates at high temperature and pressure. Opening the system at operating temperature may cause serious injury by scalding. DO NOT attempt to remove the radiator cap until the engine is stopped and has cooled. If the engine is hot, add fluid to the radiator overflow tank only. If the engine needs additional coolant, it may be necessary to allow the engine to cool, then find any possible leaks for repair. Always wear eye protection.*

4. Check the coolant level by first checking the radiator overflow tank. Check that there is fluid in the radiator overflow tank. If none is visible, be sure that the radiator is cold, then remove the cap from the radiator and check the level of the coolant. DO NOT open a hot radiator. Fill the radiator with coolant mixture to the top of the fill neck in the radiator and replace the cap, then fill the radiator overflow tank to the cold fill line. Mix 50% water with 50% coolant in a bucket and stir before adding the mixture to the engine. DO NOT add cold coolant to a hot radiator. Allow the engine to cool before adding the coolant. See "Cooling System" on Page 31 for more information.
5. Check the engine oil with the engine turned off and the machine parked on a level surface. The oil level should be between the ADD and FULL marks. Add oil if necessary. See Figure 19 to determine which type of oil is best suited for the temperature range in which the machine is operating.
6. Check the hydraulic fluid level sight gauge. The hydraulic tank is full when the fluid level is between the lines in the sight gauge. If necessary, add clean hydraulic fluid. Refer to Figure 19 for the correct grade of hydraulic fluid for your work environment. Clean the area around the cap before opening. DO NOT fill to the top. Stop filling the tank as soon as fluid becomes visible in the sight gauge and passes the first line.
7. Look for debris buildup on the radiator grill, and remove and clean if necessary. Check the belts and coolant hoses for cracks, bulges, or any other signs of wear.



Figure 26: Engine



### ⚠ WARNING ⚠

*NEVER remove the cap from a hot radiator. Hot coolant can cause severe burns.*

8. The hydraulic pump is located at the front of the transmission. Check for leaks at the hose fittings.
9. Service the air cleaner if necessary. See "Engine Air Intake Filter" on Page 34 for instruction.
10. Inspect the entire hydraulic system for leaks or damage. Check all fittings and cylinders. Check all hoses for pinch or rubbing points.
11. Inspect all electrical wiring and conductors for loose connections and damage.
12. Check the chassis for cracked welds. Check the entire machine for collision damage. Check also for peeling, missing, or unreadable labels. Inspect the cab for damage. Call UpRight, Inc. or your local distributor for advice if repairs are necessary.

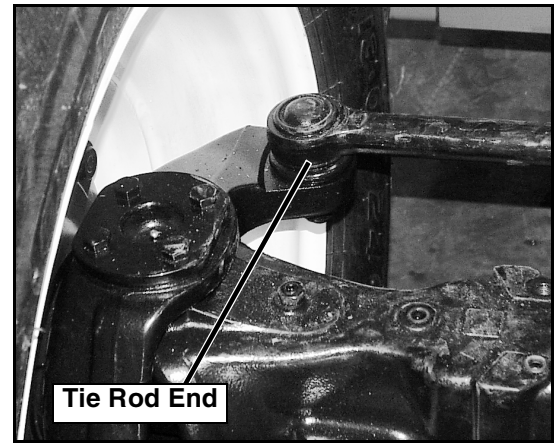
### ⚠ DANGER ⚠

*DO NOT use forks that are cracked or that have been repaired by welding. The forks are made of tempered steel. Welding weakens the metal and may result in fork failure.*

13. Check the forks carefully for cracks and deformities.

Figure 27: Articulation Pin

14. Check the steering system for loose or damaged tie rod ends.
15. Check the tires for damage (cuts, gouges, etc.) and proper pressure ( see page33). Optional foam-filled tires do not require inflation or pressure check. Check lug nut torque.
16. Chock the wheels and climb into the cab. Inspect the seat and seat belt for damage. Properly fasten the seat belt. Check for broken gauges or indicator lights. Ensure that the mirrors are clean and positioned correctly.
17. Turn the Key Switch to ON and check the fuel level. Add if necessary.
18. Check all the gauges, horn, back-up alarm and lights (if equipped), for proper operation.
19. Be certain that the Parking Brake Switch is ON and that the Drive/Gear Selector is in neutral. Start the engine by turning the Key Switch to START (fully right). Release the key after the engine has started.
20. Allow the engine to warm up for ten minutes before checking the transmission fluid. The transmission fluid dipstick is located on the front of the transmission. Check the transmission fluid level and add if necessary.
21. With no load on the forks, lift the forks off the ground and extend the boom completely. Lower the boom until the forks rest on the ground. Turn the Key Switch to OFF.
22. Thoroughly inspect the boom for damage, deformation, buckled paint, loose or missing hardware, an cracked welds. Check the attachment carriage for damage and wear. Look for any signs of fluid leakage from the elevating assembly.
23. Climb into the cab and properly fasten the seat belt. Start the engine, then lift the forks from the ground and fully retract the boom. Lower the forks to the ground. Turn the Key Switch fully left to OFF.
24. Close and secure the engine cover.

**! WARNING !**

*DO NOT operate a damaged or malfunctioning machine. Tag and remove the machine from service until it is repaired.*



## WEEKLY OR 50 SERVICE HOUR MAINTENANCE

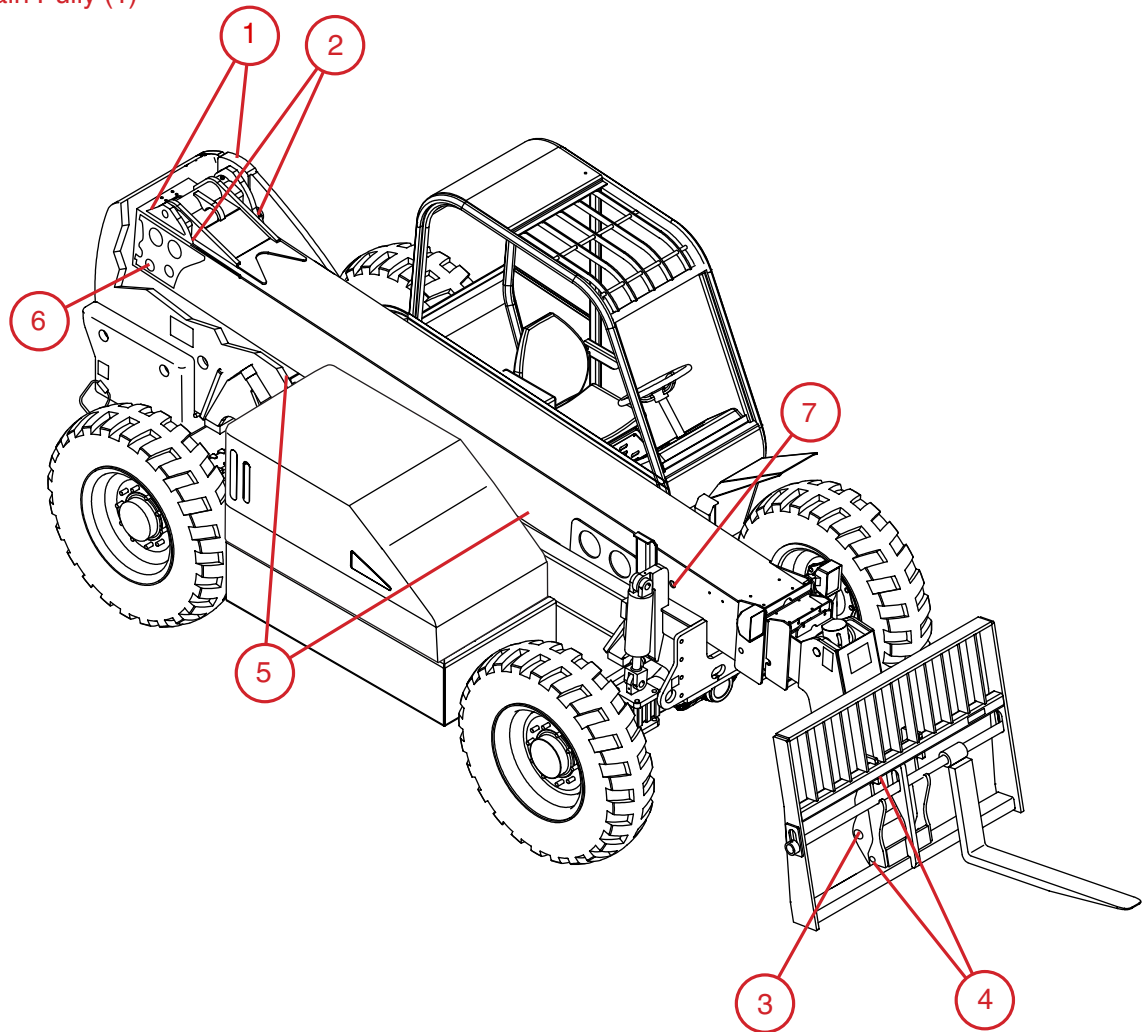
Perform the Daily or 10 Service Hour Inspection and any As Necessary maintenance needed. Then perform the following.

1. Proper and timely lubrication is important to the safe operation of the machine. Lubricate all points of the machine listed below.
  - Item 5--The boom must be raised and supported with a suitable stand or overhead sling to allow access.
  - Item 6--For low boom models: Remove the rear boom cover. Lubricate through the access hole in right rear side of the boom. For high boom models: The access hole is above the frame and easily accessible.
  - Item 7--With the boom fully retracted, lift the boom just enough to clear the access hole from the frame.

**Figure 28:** Weekly Lubrication

### Weekly or 50 Hour Lubrication

1. Boom Pivot Pins (2)
2. Slave Cylinders--Upper and Lower (4)
3. Carriage Level Cylinder (1)
4. Carriage Pivot Pins (2)
5. Lift Cylinder (2)
6. Rear Pully Chain (inside frame on lower boom) (1)
7. Front Chain Pully (1)



2. Use a spray lubricant to lubricate the throttle pedal linkage and brake pedal linkage. Clean any accumulated dirt and debris away from the pedals.
3. Drain the Fuel/Water Separator and inspect for the presence of water.

### 3 MONTH OR 250 SERVICE HOUR MAINTENANCE

Perform any As Necessary Maintenance needed, the Daily or 10 Service Hour Maintenance list, and the Weekly or 50 Service Hour Maintenance list. Then perform the following.

#### ENGINE OIL AND FILTER CHANGE

Perform the following operation with the machine on a level surface, the parking brake set, the wheels chocked, and the engine oil warm.

1. Place a container of suitable size (capacity is 11.5 quarts or 10.9 litres) and composition under the oil pan. Remove the drain plug from the oil pan and allow all of the oil to drain.

#### **W A R N I N G**

*The oil may be hot enough to burn. Avoid contact.*

2. Clean and reinstall the drain plug.
3. Remove the oil filter. The filter will contain oil. Use caution when handling.
4. Clean the oil filter housing base.
5. Apply a thin layer of clean oil to the gasket of the new filter. Thread the filter onto the base by hand. Tighten 3/4 of a turn after the gasket makes contact with the base.
6. Remove the oil filler cap. Fill the crankcase with 10 quarts (7.8L) of new oil. See Figure 19, page 31 to determine which type of oil is best suited for the temperature range in which the machine is operating.
7. Start and run the engine for five minutes. Check for leaks and make any necessary repairs.
8. Stop the engine and wait one minute for the oil to drain back to the oil pan. Check the dipstick and add oil, if necessary, until the oil level is between the ADD and FULL marks.

#### FAN BELT AND BELT TENSIONER

Turn the engine off before inspecting the fan belt.

Inspect the fan belt for wear, cracking, fraying, or other damage. Replace if necessary.

Inspect the belt tensioner for proper spring force and alignment. If the belt is running partially off the pulleys, the tensioner and belt may need replacement.

#### LUBRICANT LEVEL CHECK

Perform the following operation with the machine on a level surface, the parking brake set, and the wheels chocked.

Perform the following procedures from the "As Necessary Maintenance" section.

- Check the Transfer Case oil level.
- Check the front and rear Drive Axle oil level.
- Check the Planetary Reduction Hubs oil level (all four hubs).

#### BREATHING VENTS

Clean or replace as necessary.

- Transmission Breather Vent -- located at the front of the transmission next to the transmission oil dipstick.
- Drive Axle Breathers -- one per axle, located at the top center of each axle.
- Transfer case breather -- located on the rear of the transfer case.

#### SERVICE BRAKES

See the Service Manual for brake testing procedure.

#### PARKING BRAKE

Test the parking brake by checking the brakes' ability to hold on a 15% grade with the rated load on the attachment. If the brakes fail to hold, consult the Dana Maintenance and Repair Instruction Manual (UpRight part # 103506-005, Dana part # MO212S10).

**LUBRICATION**

Proper and timely lubrication is important to the safe operation of the machine. Lubricate all points of the machine listed below.

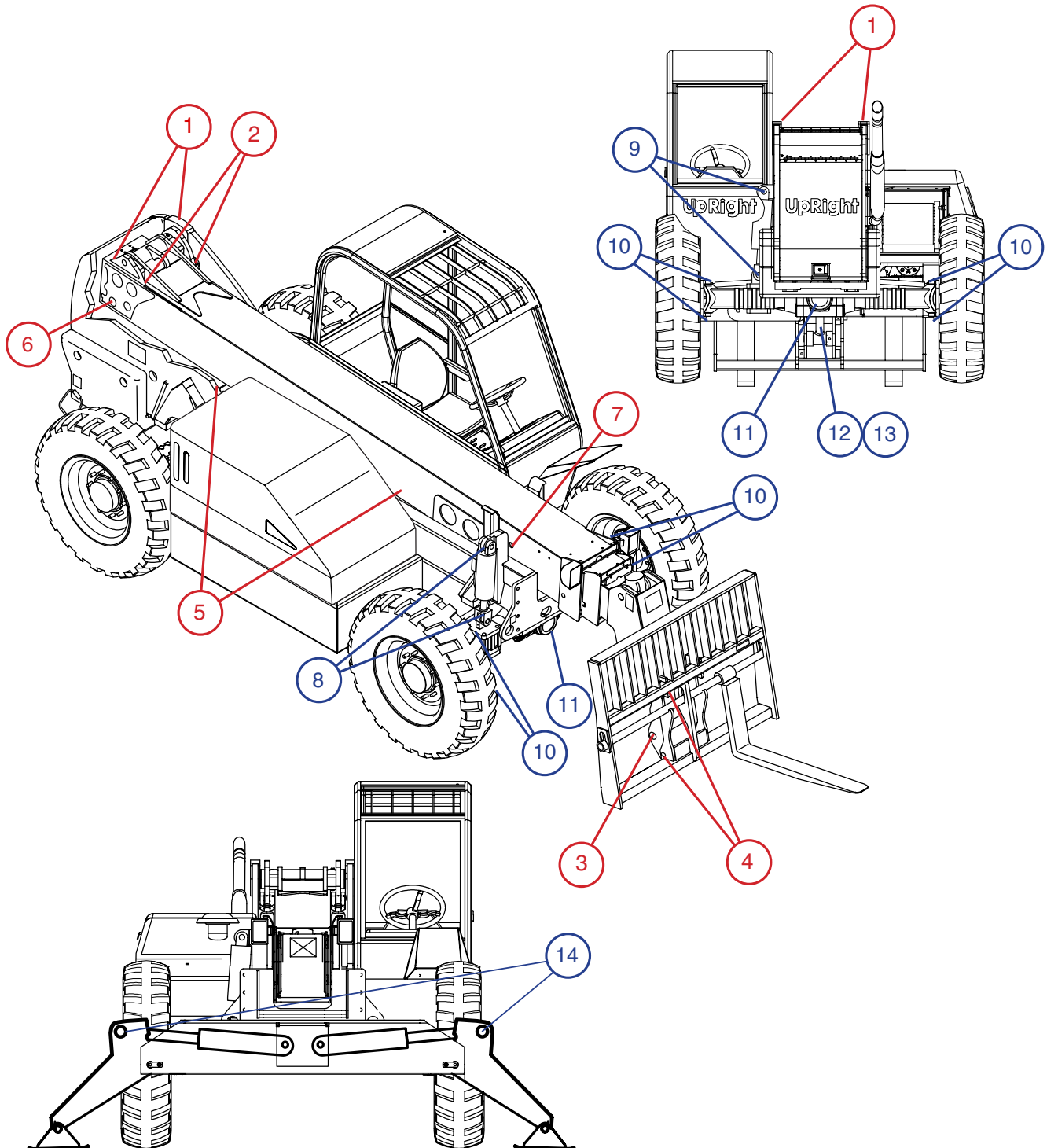
**Figure 29: Weekly and Monthly Lubrication****Weekly or 50 Hour Lubrication**

1. Boom Pivot Pins (2)
2. Slave Cylinders--Upper and Lower (4)
3. Carriage Level Cylinder (1)
4. Carriage Pivot Pins (2)
5. Lift Cylinder (2)
6. Rear Pully Chain (inside fram on lower boom) (1)
7. Front Chain Pully (1)

**Monthly or 250 Hour Lubrications**

Perform the weekly lubrication plus the following:

8. Front Frame Tilt (2)
9. Rear Frame Tilt (2)
10. Steer Pivot--Upper and Lower (8)
11. Axle Pivot (2)
12. U-Joints (4)
13. Drive Line Slip Yokes (2)
14. Outriggers (if equipped) (4)



## WHEEL NUTS

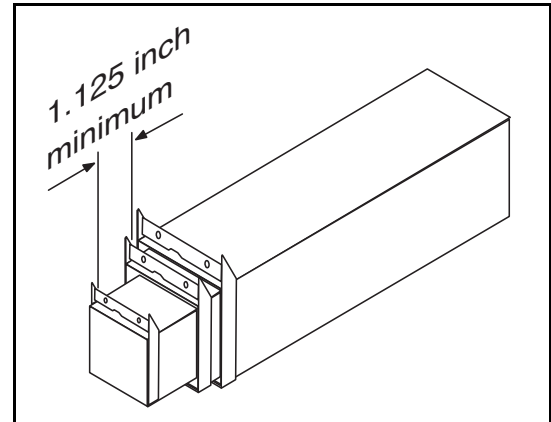
Wheel nut torque must be checked any time the wheel has been loosened, or at 3 month/250 hour intervals. Torque all wheel nuts to 450-500 ft./lbs (400-480 Nm)

## BOOM CHAINS

Boom chains are contained completely within the boom sections and are not visible from the exterior. Measuring the distance between the tops of boom sections 2 and 3 tests the chain tension.

1. Retract the boom fully.
2. Raise the boom to full height to allow all sections to fully retract.
3. Lower the boom until the attachment is 2 inches from the ground (or as low as possible without the attachment touching).
4. Measure the distance between the brackets on top of boom section 2 and 3. If the clearance is less than 1.125 inches (28 mm), the chains require adjustment. See the UpRight Service Manual for adjustment procedures.

**Figure 30:** Boom Chain Measurement



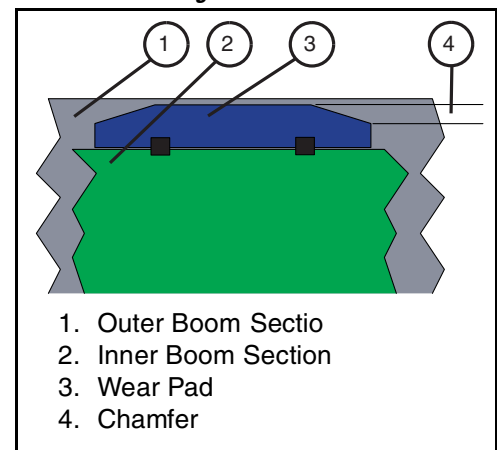
## BOOM WEAR PADS

Boom Wear Pads will wear more excessively in severe conditions. It may be necessary to inspect and measure boom wear pads more often in sandy or heavy dust conditions.

Each boom slide pad is “chamfered” at each end. This is designed as a wear indicator. If the wear pad is worn down to the point that the chamfer is no longer visible, the pad must be replaced. **The boom will be damaged** if the boom wear pad is allowed to wear past the chamfer. The wear pads may be shimmed as they wear down, so long as they do not wear down beyond the chamfer.

The clearance between the wear pads and the boom sections must not exceed .125 inches (3 mm). Shim as necessary, or replace the pads. Consult the UpRight Service Manual for instructions and shim part numbers.

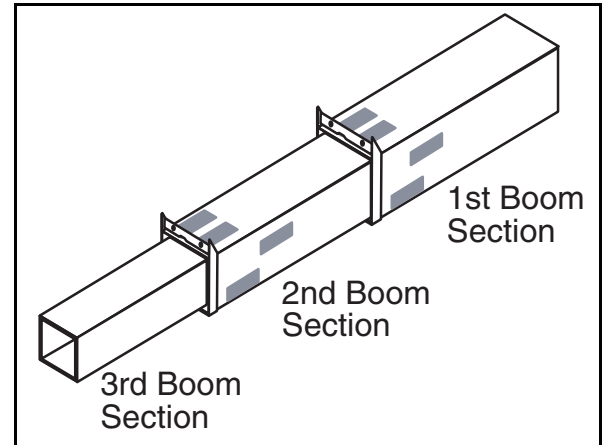
**Figure 31:** Boom Wear Pad



Perform the following operation with the machine on a level surface, the parking brake set, and the wheels chocked.

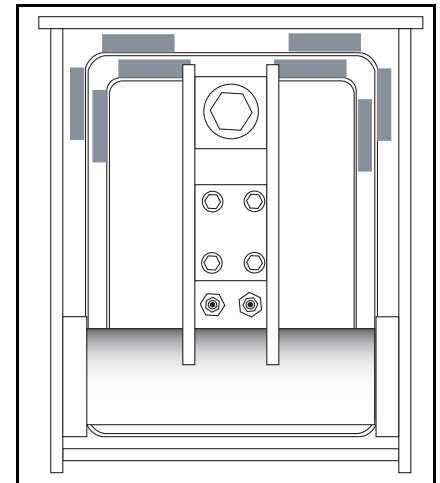
1. Fully extend the boom. Raise the boom and install a suitable stand under the first section so that the attachment remains off the ground.
2. Measure and record the clearance between the upper wear pad and the inner boom. This measurement must not exceed .125 inches (3mm).
3. Measure and record the clearance between the side boom wear pads and the side of the boom sections at each side. Add the measurements from corresponding side pads together (Lower left and lower right, and upper left and upper right). This number must not exceed .125 inches (3mm).
4. Raise the boom and remove the stand. Fully retract and lower the boom.

**Figure 32: Front Pads**



**Figure 33: View of Rear Pads With Cover Removed**

5. Remove the rear cover. Measure and record the clearance between the top wear pads and the outer boom. This measurement must not exceed .125 inches (3mm).
6. Measure and record the clearance between the side wear pads on each side and the outer boom. Add the measurements from corresponding side pads together (Lower left and lower right, and upper left and upper right). This number must not exceed .125 inches (3mm).
7. If the maximum clearance is exceeded, adjustments must be made. Consult the UpRight Service Manual for instructions and shim part numbers.



## 6 MONTH OR 500 SERVICE HOUR MAINTENANCE

Perform any As Necessary Maintenance needed, the Daily or 10 Service Hour Maintenance list, the Weekly or 50 Service Hour Maintenance list, and the 3 Month or 250 Service Hour Maintenance list. Then perform the following.

### HYDRAULIC FILTER REPLACEMENT

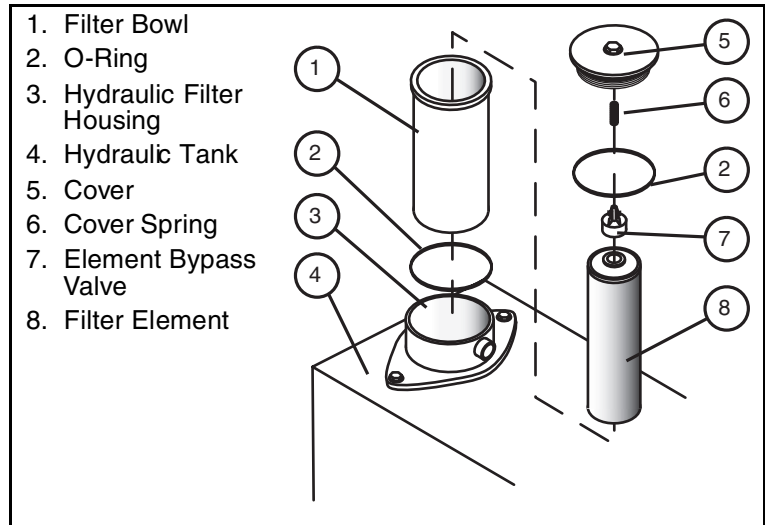
#### ⚠ WARNING ⚠

*Hydraulic Fluid may be hot enough to cause burns. Allow the hydraulic fluid to cool before servicing any components.*

1. Open the engine cover.

2. Unscrew the hydraulic filter cover (on top of the hydraulic filter housing) to access the filter element.
3. By pulling on the element bypass valve, remove the filter and filter bowl together.
4. Remove the bypass valve from the filter, and the filter from the bowl. Clean the bowl.
5. Inspect the O-rings, and replace if any irregularities are found.
6. Install the element bypass valve onto the new filter element, then insert the filter element into the bowl. Insert the lower O-ring into the hydraulic filter housing. Place the bowl into the hydraulic filter housing. Check that the element and bowl are properly seated.
7. Clean and lube the upper O-ring, then set in place. Center the cover spring over the bypass valve, then place the cover onto the housing and turn clockwise until hand tight.

**Figure 34:** Hydraulic Filter Assembly



### TRANSMISSION FILTER REPLACEMENT

#### ⚠ WARNING ⚠

*Transmission Fluid may be hot enough to cause burns. Allow the transmission fluid to cool before servicing any components.*

See Figure 26 on page 39 for the location of the transmission filter.

1. Open the engine cover. Place a pan under the transmission to catch any lost fluid.
2. Unscrew and discard the old filter.
3. Clean the filter gasket mounting surface.
4. Lubricate the gasket of the new filter with clean transmission fluid and install. **Hand tighten only!**

---

**C A U T I O N**

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*Use only UpRight (part number 103508-006) or Spicer/Clark-Hurth (part numbers 4202525 or 247050) replacement filters. Other filters may not be suitable for this application and may burst or damage the transmission.*

*Use of filters other than the two listed above will void the warranty.*

---

5. Operate the machine for ten minutes to warm the transmission fluid.
6. Set the parking brake and, with the engine still running, check the transmission fluid level with the dipstick.
7. Add fluid, if necessary, until the level is between the ADD and FULL marks on the dipstick.

**FUEL FILTER REPLACEMENT**

See "Fuel Filters and Fuel/Water Separator" on Page 33 for more information.

1. Place a drain pan underneath the engine area.
2. Remove the fuel filter/water separator.
3. Lubricate the gasket of the replacement filter and install.
4. Replace the primary (in-line) filter located in the same area.
5. Prime the fuel system. See page 33 for instruction.



# 1 YEAR OR 1000 SERVICE HOUR MAINTENANCE

See Figure 19 on page 31 for specific oil types for various temperature ranges.

Perform any As Necessary Maintenance needed, the Daily or 10 Service Hour Maintenance list, the Weekly or 50 Service Hour Maintenance list, the 3 Month or 250 Service Hour Maintenance list, and the 6 Month or 500 Service Hour Maintenance list. Then perform the following.

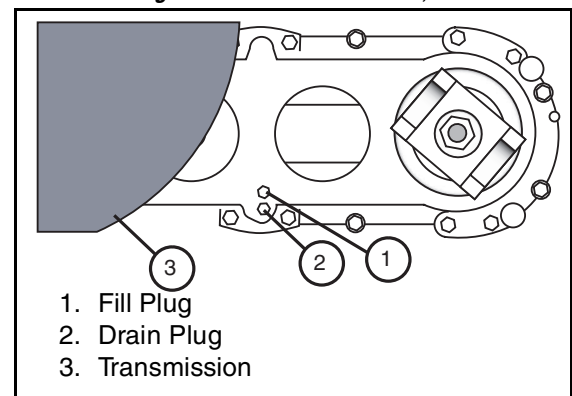
## TRANSMISSION OIL AND FILTER CHANGE

1. Place a drain pan of suitable size (capacity is 5.4 gallons or 20.3 litres) and composition under the transmission. Remove the transmission drain plug and allow the oil to drain.
2. Clean and reinstall drain plug.
3. Refill the transmission through the dipstick tube to the ADD mark on the transmission dipstick (check this with the engine OFF). See page 31 to determine which type of fluid best suits the local climate.
4. Unscrew and discard the old filter.
5. Clean the filter gasket mounting surface.
6. Lubricate the gasket of the new filter with clean transmission fluid and install. **Hand tighten only!**
7. Start the engine and allow it to idle for three minutes. Add oil as necessary to bring the level up to the ADD mark on the dipstick.
8. Operate the unit for ten minutes, then add oil as necessary until the level is between the ADD and FUL marks on the dipstick.
9. Check for and repair any leaks.

## TRANSFER CASE OIL CHANGE

1. Place a drain pan of suitable size (capacity is .4 gallons or 1.5 litres) and composition under the transfer case. Remove the drain plug and allow the oil to drain.
2. Clean and reinstall the drain plug.
3. Remove the oil fill plug and add oil until it reaches the bottom of the fill hole.
4. Clean and reinstall the fill plug.

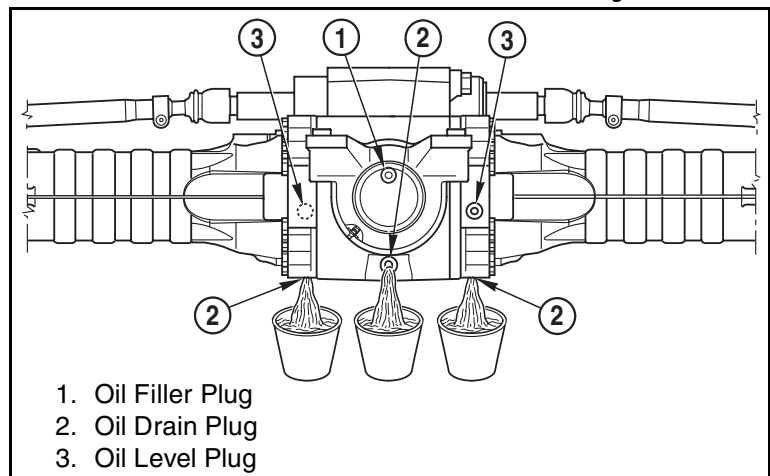
Figure 35: Transfer Case, Front View



## AXLE OIL CHANGE

1. Place a drain pan of suitable size (capacity is 2.4 gallons or 9 litres) and composition under the center of the front axle. Remove the drain plugs and allow the oil to drain.
2. Clean and reinstall all the drain plugs.
3. Remove the oil level plug.
4. Remove the oil filler plug and add oil until the level reaches the bottom of the oil level hole. Fill with SAE 80W90 API LS Mil. 2105 B/C (Mobilube HD 80W-90 LS, Shell LS90, Chevron LS Gear SAE80W90, Esso gear oil LSA 90) to the bottom of the threads.

Figure 36: Axle





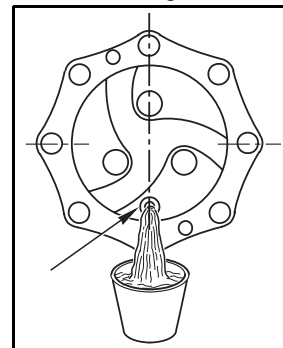
**NOTE:** Use of oil with the wrong API specification will cause brake noise and may prematurely wear the brake components.

5. Clean and reinstall both the oil filler plug and the oil level plug.
6. Repeat for the rear axle.

## PLANETARY REDUCTION HUB OIL CHANGE

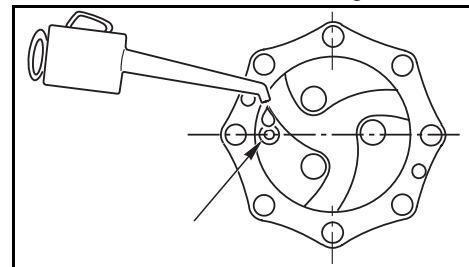
1. Drive the machine for five minutes to warm the oil.
2. Rotate one of the wheels until the drain plug is at the bottom of the hub
3. Place a drain pan of suitable size (capacity is .5 gallons or 2 litres) and composition under the hub. Remove the drain plug and allow the oil to drain
4. Move the machine forward just enough to move the drain/fill hole to the side (90° from the drain position).

**Figure 37:** Draining the Hub



5. Slowly fill the hub until the oil level is at the bottom of the fill hole.
6. Clean and install the plug
7. Repeat on the other three hubs.

**Figure 38:** Filling the Hub



## ENGINE VALVE LASH ADJUSTMENT

Initial Valve lash adjustment should be performed after the first 1000 hours of service. The valves should be adjusted every 2000 hours thereafter.

For valve adjustment procedures, refer to the Cummins Operation and Maintenance Manual (UpRight part number 103500-024 or Cummins part number 3810205-13) that is supplied with the machine.

## 2 YEAR OR 2000 SERVICE HOUR MAINTENANCE

Perform any As Necessary Maintenance needed, the Daily or 10 Service Hour Maintenance list, the Weekly or 50 Service Hour Maintenance list, the 3 Month or 250 Service Hour Maintenance list, the 6 Month or 500 Service Hour Maintenance list, and the 1 Year or 1000 Service Hour Maintenance list. Then perform the following.

### HYDRAULIC OIL REPLACEMENT

1. Place a drain pan of suitable size (capacity is 48 gallons or 180 litres) and composition under the center of the front axle. Remove the drain plug from the hydraulic tank and allow the oil to drain.
2. Clean and reinstall the drain plug.
3. Fill the tank with new oil to the bottom of the hydraulic tank sight gauge (see page 31 to determine which type of fluid best suits the local climate).
4. Check the area around the machine to insure adequate clearance. Start the engine, then fully raise, lower, extend, and retract the boom several times.
5. With the boom fully lowered and retracted, check the oil level again. Add, if necessary, until the oil appears in the sight gauge.

### ENGINE COOLANT REPLACEMENT

#### **! WARNING !**

*Engine coolant operates at high temperature and pressure. Opening the system at operating temperature may cause serious injury by scalding. DO NOT attempt to remove the radiator cap until the engine is stopped and has cooled. If the engine is hot, add fluid to the radiator overflow tank only. If the engine needs additional coolant, it may be necessary to allow the engine to cool, then find any possible leaks for repair.*

*Always wear eye protection.*

*DO NOT perform the following procedure when the engine is hot.*

*Read the "Cooling System Maintenance and Inspection" section of the Cummins Engine Manual before proceeding.*

1. Slowly remove the radiator cap.
2. Remove the two screws that hold the battery tray closed. Open the battery tray.
3. Place a drain pan of suitable size (capacity is 5.5 gallons or 20.8 litres) and composition under the radiator. Open the petcock and allow the coolant to drain.
4. Empty and clean the coolant recovery bottle.
5. Flush the system with a quality cooling system cleaner (available through auto parts stores). Mix according to the label with clean water. Fill the cooling system. Run the engine for 90 minutes.
6. Stop the engine and allow it to cool. Drain the cleaning solution.
7. With the petcock open and the engine off, flush the radiator with clean water until the draining water comes out clean. Allow all the water to drain, then close the petcock.
8. In a separate container, mix 2.75 gallons of antifreeze with an equal amount of water. **Use low silicate antifreeze that meets ASTM4985 (GM6038M spec.) test requirements. Mix with clean, distilled water only.** (Tap water contains minerals that may build up in the engine and reduce the cooling system efficiency.) Stir the mixture before putting it into the engine.
9. Pour the mixture slowly into the radiator to allow air to escape from the engine. Fill the radiator to the top, then install the cap.
10. Fill the coolant recovery bottle to the "Cold Fill" line.

**BOOM CHAIN INSPECTION AND LUBRICATION**

The boom extension and retraction chains must be removed for inspection and wear measurement. Serviceable chains must be lubricated before reinstallation. Refer to the UpRight Service Manual for the necessary procedures.

**ENGINE VALVE LASH ADJUSTMENT**

Initial Valve lash adjustment should be performed after the first 1000 hours of service. The valves should be adjusted every 2000 hours thereafter.

For valve adjustment procedures, refer to the Cummins Operation and Maintenance Manual (UpRight part number 103500-024 or Cummins part number 3810205-13) that is supplied with the machine.

# REACH LOAD CHARTS



*DO NOT exceed rated capacity. If rated capacity is exceeded, the machine may be damaged or tip over. Death or serious injury may result.*

*Make sure that the structure receiving the load is capable of supporting the load.*

The Reach Load Chart is located in the cab.

1. Determine the weight of the load, the height to which the load will be lifted, and the distance from the front of the machine chassis to the structure receiving the load.
2. Use the Reach Load Chart to determine maximum weight which can be lifted.

**Figure 39:** Boom Angle Indicator



3. Use the Boom Angle Indicator to determine the boom angle.

**Figure 40:** Boom Extend Reference Letters

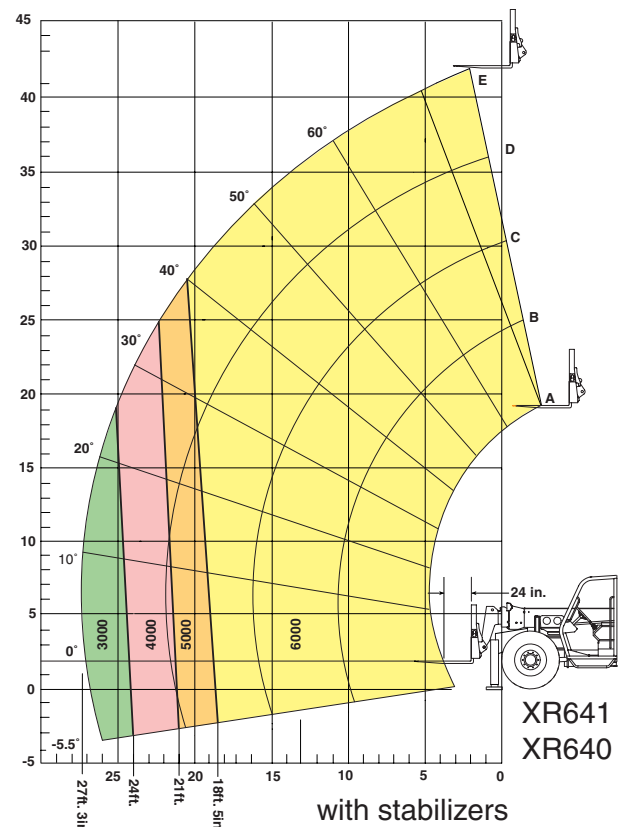
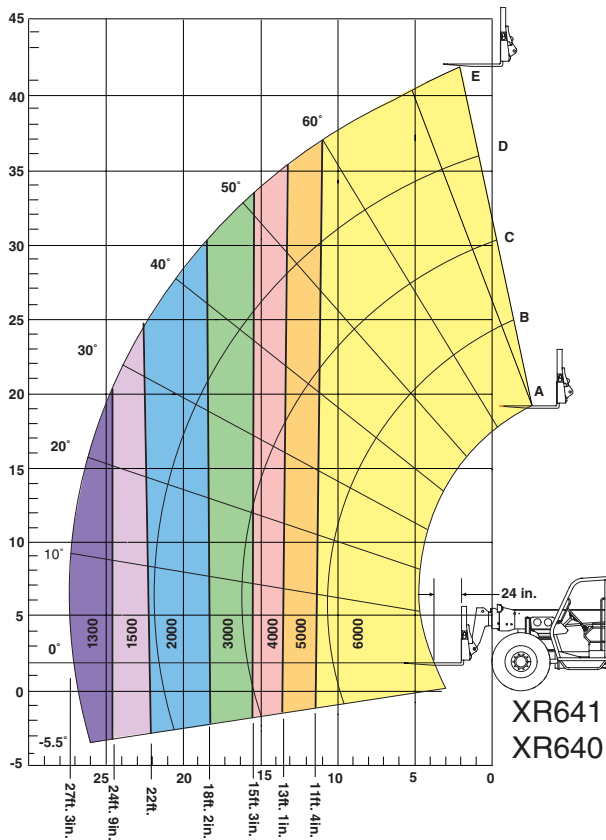
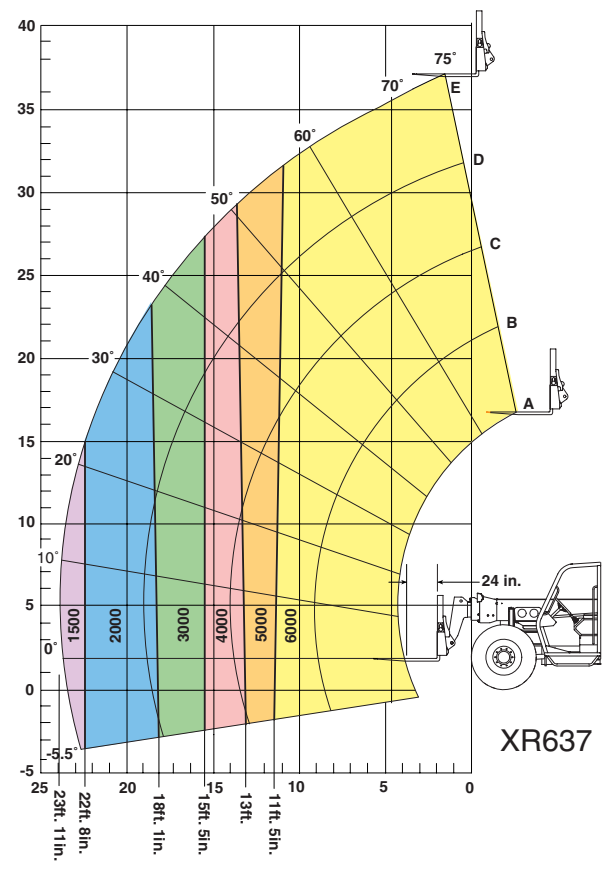
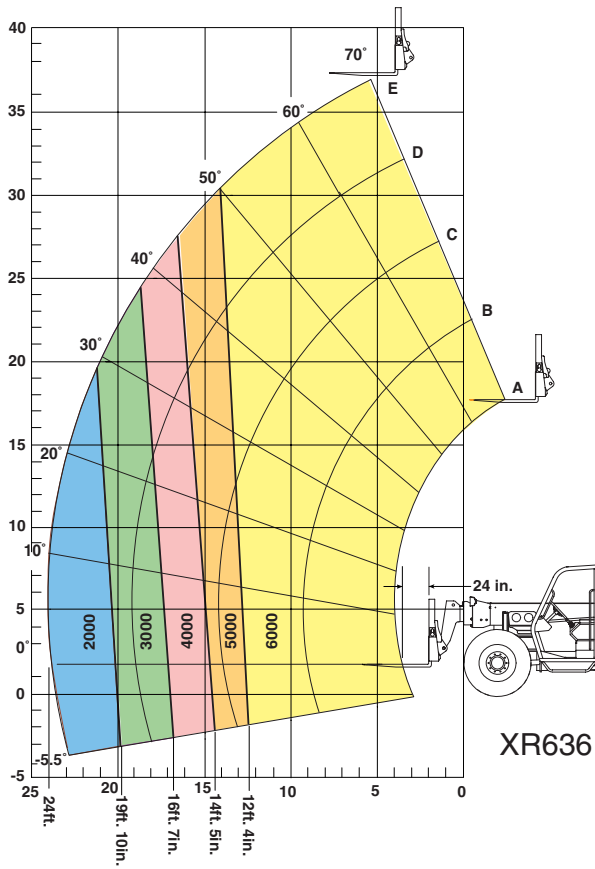
4. Use the Boom Extend Reference Letters to determine how far the boom is extended. These letters correspond to the curved lines drawn on the Load Charts.

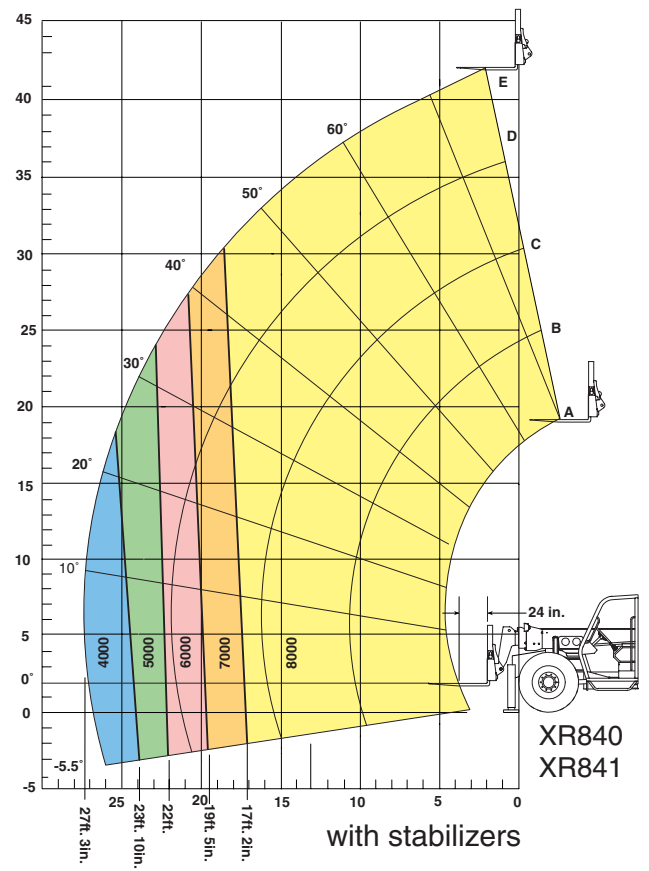
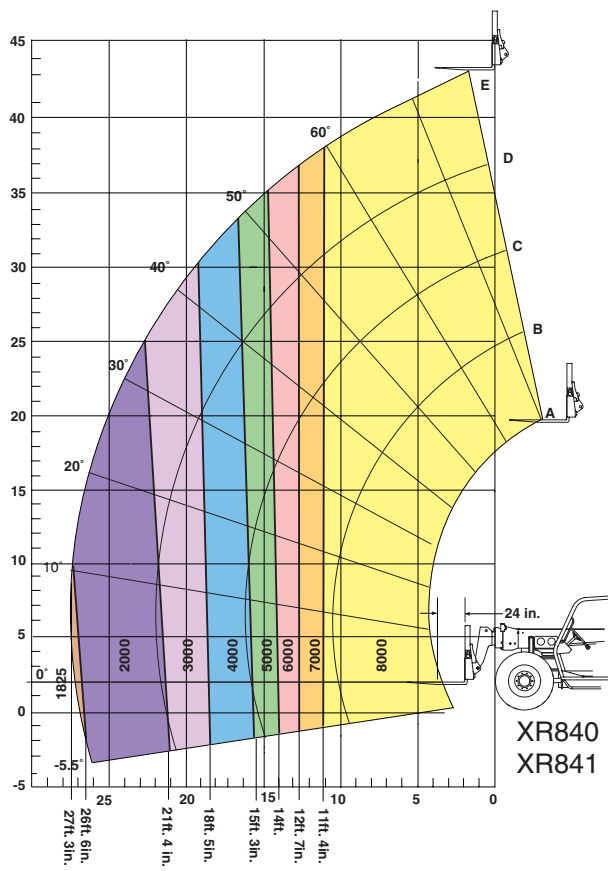


## EXAMPLE: XR637

1. Load Weight is 5000 lbs.
2. The safe lifting zone for 5000 lbs. is made up of the orange and yellow areas of the chart. Use the Boom Angle Indicator and the Boom Extend Reference Letters to keep the load within that zone.
3. If the structure is 13 feet from the front of the chassis and 15 feet tall, the boom may be safely extended until the letter "C" is just showing, so long as the angle of the boom does not go below 30°.

**NOTE:** When using optional attachments, refer to the load chart and supplemental operating instructions included with the attachment.





**NOTES:**

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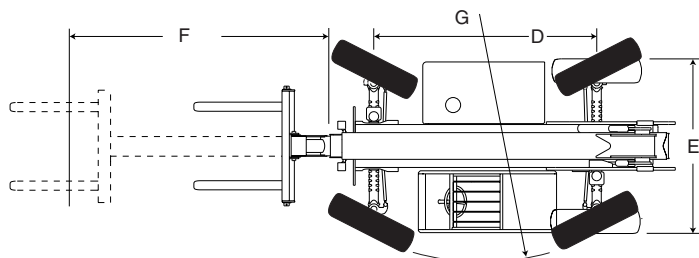
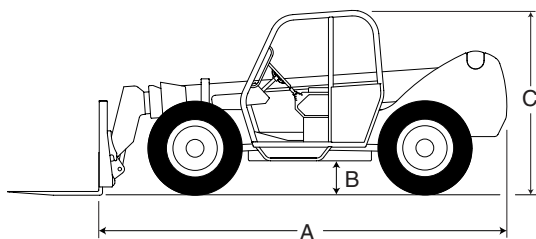
# SPECIFICATIONS

Specifications are subject to change without notice. Hot weather or heavy use may affect performance.

Refer to the Parts and Service Manuals for complete parts and service information.

The XR Series meets or exceeds applicable requirements of OSHA and ANSI B56.6-1998.

	XR636	XR637	XR640	XR641	XR840	XR841
Boom Profile	High	Low	High	Low	High	Low
Maximum Lift Height	36 ft. (10,9 m)	37 ft. (11,3 m)	40.5 ft. (12,3 m)	41.5 ft. (12,6 m)	40.5 ft. (12,3 m)	41.5 ft. (12,6 m)
Capacity at Maximum Lift Height	6000 lb(2720 kg)	6000 lb(2720 kg)	6000 lb(2720 kg)	6000 lb(2720 kg)	8000 lb(3630 kg)	8000 lb(3630 kg)
<b>F</b> Maximum Forward Reach	23.9 ft. (7,3 m)	23.9 ft. (7,3 m)	27.2 ft. (8,3 m)	27.2 ft. (8,3 m)	27.2 ft. (8,3 m)	27.2 ft. (8,3 m)
Capacity at Maximum Forward Reach	2000 lb (680 kg)	1500 lb (680 kg)	1300 lb (590 kg)	1300 lb (590 kg)	1825 lb (830 kg)	1825 lb (830 kg)
with outriggers down	n/a	n/a	3000 lb(1360 kg)	3000 lb(1360 kg)	4000 lb(1815 kg)	4000 lb(1815 kg)
Maximum Below Grade	3.3 ft. (1,0 m)	3.3 ft. (1,0 m)	3.8 ft. (1,2 m)	3.8 ft. (1,2 m)	3.8 ft. (1,2 m)	3.8 ft. (1,2 m)
Frame tilt	10°					
Maximum Drive Speed	22 mph (35 kph)					
<b>G</b> Outside Turning Radius	12.9 ft. (4.0 m)					
Dimensions						
<b>A</b> Length (less forks)	217 in (5.5 m)	217 in (5.5 m)	228 in (5.8 m)	228 in (5.8 m)	228 in (5.8 m)	228 in (5.8 m)
<b>B</b> Ground Clearance	16 in (0.4 m)	16 in (0.4 m)	16 in (0.4 m)	16 in (0.4 m)	16 in (0.4 m)	16 in (0.4 m)
<b>C</b> Height	96 in (2.44 m)	96 in (2.44 m)	96 in (2.44 m)	96 in (2.44 m)	96 in (2.44 m)	96 in (2.44 m)
<b>D</b> Wheelbase	121 in (3.07)	121 in (3.07)	121 in (3.07)	121 in (3.07)	121 in (3.07)	121 in (3.07)
<b>E</b> Width	98 in (2.49 m)	98 in (2.49 m)	98 in (2.49 m)	98 in (2.49 m)	98 in (2.49 m)	98 in (2.49 m)
Weight	18500 lb(8390 kg)	18500 lb(8390 kg)	18680 lb (8470kg)	18680 lb (8470kg)	21180 lb(9605 kg)	21180 lb(9605 kg)
Engine (Cummins Diesel)	4B3.9-80	4B3.9-80	4B3.9-80	4B3.9-80	4BT3.9-110	4BT3.9-110
Horsepower	80 hp (60 kw)	80 hp (60 kw)	80 hp (60 kw)	80 hp (60 kw)	110 hp (82 kw)	110 hp (82 kw)
with optional Turbo Charger	110 hp (82 kw)	110 hp (82 kw)	110 hp (82 kw)	110 hp (82 kw)	n/a	n/a
Alternator	105 Amps					
Battery	12 Volt Negative Ground- 1000 CCA Maintenance Free					
Transmission	Powershift					
Speeds (fwd/rev)	4/3					
Steering	Hydrostatic Power Steering with Circle/Crab/Front Steering Modes					
Axles	All Wheel Drive - Planetary Gear Reduction					
Service Brakes	Enclosed - Oil Disc Brakes					
Parking Brakes	Internal Spring Applied - Hydraulically Released					
Tire Size	13.0 x 24 - 16 Ply					
Optional Tire Size	15.5 x 25 - 12 Ply					
Fuel Tank Capacity	35 US gal (135 L)					
Hydraulic Reservoir Capacity	48 US gal (180 L)					
ROPS/FOPS Certified Cab	yes					





## GENERAL INFORMATION

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This section contains generic instructions for the repair and maintenance of UpRight machines. Referring to the Safety, Operation, and Preventative Maintenance Manual will aid in understanding the operation and function of the various components and systems of the machine, and help in diagnosing and repairing the machine.

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## 1.1 HAZARD INDICATORS

### **! D A N G E R !**

*Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*

### **! W A R N I N G !**

*Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.*

### **! C A U T I O N !**

*Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.*

### **C A U T I O N**

*Indicates a potentially hazardous situation which, if not avoided, may result in property damage.*

## 1.2 WORKSHOP PROCEDURES

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Please note that this manual does contain warnings and cautions against some specific service methods which could cause personal injury, or could damage a machine or make it unsafe. Please understand that these warnings cannot cover all conceivable ways in which service, whether or not recommended by UpRight, Inc., might be done, or of the possible hazardous consequences of each conceivable way, nor could UpRight Inc. investigate all such ways. Anyone using service procedures or tools, whether or not recommended by UpRight Inc., must satisfy themselves thoroughly that neither personal safety nor machine safety will be jeopardized.

### **! W A R N I N G !**

*Be sure to read, understand and follow all information in the Operation Manual before attempting to operate or perform service on any Work Platform.*

### **! W A R N I N G !**

*Never perform service on the work platform in the elevating assembly area while platform is elevated without first blocking the elevating assembly.*

*DO NOT stand in elevating assembly area while deploying or storing brace.*

*Refer to the Operator Manual for elevating assembly blocking instructions.*

## 1.3 TORQUE SPECIFICATIONS

### HYDRAULIC COMPONENTS

**NOTE:** Always lubricate threads with clean hydraulic oil prior to installation

Use the following values to torque hydraulic components used on UpRight Work Platforms.

**Table 1-1:** Torque Specifications for Hydraulic Components

Type: SAE Part Series	Cartridge Poppet		Fittings		Hoses	
	Ft/Lbs	Nm	Ft/Lbs	Nm	In/Lbs	Nm
#4	N/A	N/A	N/A	N/A	135-145	15-16
#6	N/A	N/A	10-20	14-27	215-245	24-28
#8	25-30	34-41	25-30	34-41	430-470	49-53
#10	35-40	47-54	35-40	47-54	680-750	77-85
#12	85-90	115-122	85-90	115-122	950-1050	107-119
#16	130-140	176-190	130-140	176-190	1300-1368	147-155

### FASTENERS

This standard applies to the preloading of fasteners measured by installation torque.

**NOTE:** For other preloading methods or fasteners consult UpRight Engineering Department.





This general standard applies to all SAE and Metric fasteners unless otherwise specified.

#### THREAD CONDITION

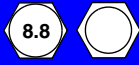
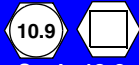

- For lubed or zinc plated fasteners use  $K = .15$
- For dry unplated fasteners use  $K = .20$

#### TORQUE TABLES

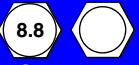
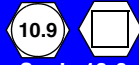

**Table 1-2:** Torque Specifications for SAE Fasteners

		 SAE J429 Grade 5			 SAE J429 Grade 8		
Nominal Thread Size		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque	
			K=.15	K=.20		K=.15	K=.20
		lbs.	in-lbs.	in-lbs.	lbs.	in-lbs.	in-lbs.
Unified Coarse Thread Series	1/4 -20	2,000	75	100	2850	107	143
	5/16 - 18	3,350	157	210	4700	220	305
		lbs.	ft-lbs.	ft-lbs.	lbs.	ft-lbs.	ft-lbs.
	3/8-16	4,950	23	31	6950	32.5	44
	7/16-14	6,800	37	50	9600	53	70
	1/2-13	9,050	57	75	12800	80	107
	9/16-12	11,600	82	109	16400	115	154
	5/8-11	14,500	113	151	20300	159	211
	3/4-10	21,300	200	266	30100	282	376
	7/8-9	29,435	321	430	41550	454	606
	1-8	38,600	483	640	54540	680	900
		 SAE J429 Grade 5			 SAE J429 Grade 8		
Nominal Thread Size		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque	
			K=.15	K=.20		K=.15	K=.20
		lbs.	in-lbs.	in-lbs.	lbs.	in-lbs.	in-lbs.
Unified Fine Thread Series	1/4 -28	2,300	85	115	3250	120	163
	5/16-24	3,700	173	230	5200	245	325
		lbs.	ft-lbs.	ft-lbs.	lbs.	ft-lbs.	ft-lbs.
	3/8-24	5,600	26	35	7900	37	50
	7/16-20	7,550	42	55	10700	59	78
	1/2-20	10,200	64	85	14400	90	120
	9/16-18	13,000	92	122	18300	129	172
	5/8-18	16,300	128	170	23000	180	240
	3/4-16	23,800	223	298	33600	315	420
	7/8-14	32,480	355	473	45855	500	668
	1-12	42,270	528	704	59670	745	995

**Table 1-3:** Torque Specifications for Metric Fasteners, U.S. Customary Units

Nominal Thread Size	 <b>Grade 8.8</b>			 <b>Grade 10.9</b>			 <b>Grade 12.9</b>		
	Clamp Load	Tightening Torque		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque	
		K = .15	K = .20		K = .15	K = .20		K = .15	K = .20
mm	lbs.	in-lbs.	in-lbs.	lbs.	in-lbs.	in-lbs.	lbs.	in-lbs.	in-lbs.
3	-	-	-	-	-	-	823	14.6	19.5
3.5	-	-	-	-	-	-	1,109	22.9	30.5
4	-	-	-	-	-	-	1,436	33.9	45.2
5	1,389	41.0	54.7	1,987	58.7	19.5	2,322	68.6	91.2
6	1,966	69.7	92.9	2,813	100.0	28.3	3,287	116.8	155.8
7	2,826	116.8	115.8	4,044	167.3	37.2	4,727	195.6	260.2
		ft-lbs.	ft-lbs.		ft-lbs.	ft-lbs.		ft-lbs.	ft-lbs.
8	3,579	14.1	18.8	5,122	20.1	26.9	5,986	23.6	31.4
10	11,742	27.9	37.2	8,117	39.9	53.3	9,486	46.7	62.3
12	8,244	48.7	64.9	11,797	69.7	92.2	13,787	81.1	108.4
14	11,246	77.4	103.3	16,093	110.6	147.5	18,808	129.1	172.6
16	15,883	125.4	166.7	21,971	173.3	230.9	25,677	202.1	269.2
18	19,424	171.9	229.4	26,869	238.2	317.2	31,401	278.1	371.0
20	2,304	243.4	325.3	34,286	337.8	449.9	40,070	394.6	525.9
22	30,653	331.9	442.5	42,403	458.8	612.2	49,556	536.2	715.4
24	35,711	420.4	562.0	49,400	583.4	778.1	57,733	682.2	909.4
27	46,435	617.3	84.8	64,235	853.4	1138.1	75,069	997.2	1329.8
30	56,753	837.9	1117.4	78,509	1159.4	1545.2	91,751	1354.9	1807.0
33	70,208	1140.3	1520.1	97,121	1576.9	2102.8	113,503	1843.9	2457.5
36	82,651	1464.1	1952.3	114,334	2025.3	2700.9	133,620	2367.6	3156.0

**Table 1-4:** Torque Specifications for Metric Fasteners, SI Units

Nominal Thread Size	 <b>Grade 8.8</b>			 <b>Grade 10.9</b>			 <b>Grade 12.9</b>		
	Clamp Load	Tightening Torque		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque	
		K = .15	K = .20		K = .15	K = .20		K = .15	K = .20
mm	N	N-m	N-m	N	N-m	N-m	N	N-m	N-m
3	-	-	-	-	-	-	3,660	1.65	2.2
3.5	-	-	-	-	-	-	4,932	2.59	3.45
4	-	-	-	-	-	-	6,387	3.83	5.11
5	6,177	4.63	6.18	8,840	6.63	8.84	10,330	7.75	10.3
6	8,743	7.87	10.5	12,512	11.3	15	14,623	13.2	17.6
7	12,570	13.2	17.6	17,990	18.9	25.2	21,025	22.1	29.4
8	15,921	19.1	25.5	22,784	27.3	36.5	26,626	32	42.6
10	52,230	37.8	50.5	36,105	54.1	72.2	42,195	63.3	84.4
12	36,670	66	88	52,475	94.5	125	61,328	110	147
14	50,025	105	140	71,587	150	200	83,663	175	234
16	70,650	170	226	97,732	235	313	114,218	274	365
18	86,400	233	311	119,520	323	430	139,680	377	503
20	10,250	330	441	152,513	458	610	178,238	535	713
22	136,350	450	600	188,618	622	830	220,433	727	970
24	158,850	570	762	219,743	791	1055	256,808	925	1233
27	206,550	837	115	285,728	1157	1543	333,923	1352	1803
30	252,450	1136	1515	349,223	1572	2095	408,128	1837	2450
33	312,300	1546	2061	432,015	2138	2851	504,885	2500	3332
36	367,650	1985	2647	508,582	2746	3662	594,368	3210	4279

## **1.4 DATE CODE IDENTIFICATION ON HOSES**

**GATES** uses a five digit code: Year, Month, Day.

i.e.: 6 11 29 - means 1996, month 11 (November), day 29.

**PARKER** uses a ten digit code: Plant, Year, Month, Day.

i.e.: XXXX 6 11 29 - means Plant XXXX, 1996, month 11 (November), day 29.

**DAYCO** stamps month, day and year on each hose.

## **1.5 SPECIAL TOOLS**

The following is a list of special tools which may be required to perform certain maintenance procedures on the machine.

- Quadriguage Hydraulic Pressure Gauge with Adapter Fitting (UpRight P/N 063971-000)
- 0-207 bar (**0-3000 psi**) Hydraulic Pressure Gauge with Adapter Fitting (UpRight P/N 014124-030)
- Small UpRight Electrical Connector Field Kit (UpRight P/N 030899-000)
- Large UpRight Electrical Connector Field Kit (UpRight P/N 030898-000)
- Inclinator (UpRight P/N 010199-000-00)
- Adapter Fitting 4FTP-4MJ (UpRight P/N 014048-010)
- Test Fitting--flat face run tee (UpRight P/N 100448-001)
- Test Fitting adapter 4FFOR-4MJ (UpRight P/N 100398-001)
- Test Fitting adapter 4MB-4MJ (UpRight P/N 011941-001)
- Test Fitting Adapter 4MB-4MJ 90° long (UpRight P/N 015736-001)

## 1.6 UPRIGHT CONNECTORS

UpRight connectors are designed so that connector parts, contacts or electrical cables may be replaced without replacing the entire connector.

**Figure 1-1:** UpRight Connector Field Kits



**Small Kit 030899-000**

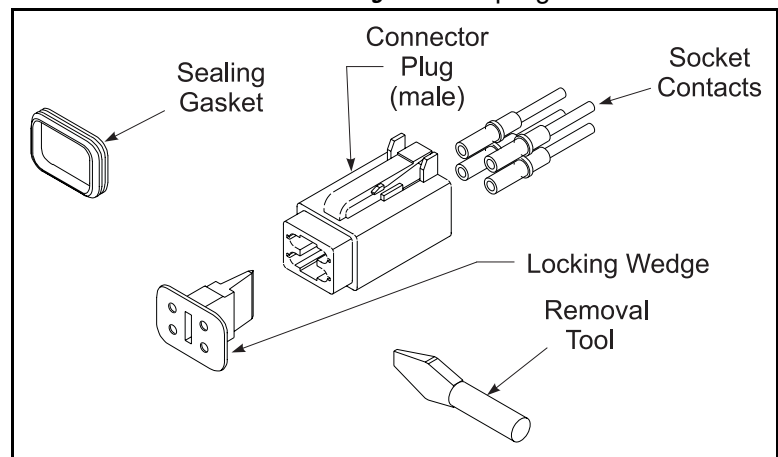


**Large Kit 030898-000**

### MALE CONNECTOR (PLUG)

1. Disconnect the male connector (plug) from the female connector (receptacle).
2. Using the flat end of the Removal Tool (or flat blade screwdriver), pry the Locking Wedge from the Male Connector. Care should be taken that the Silicon Gasket is not damaged during this procedure.
3. Check all parts for damage. Replace all parts which are damaged or worn.
4. Replace or re-crimp the wires and contacts. Refer to "Crimping" procedure.

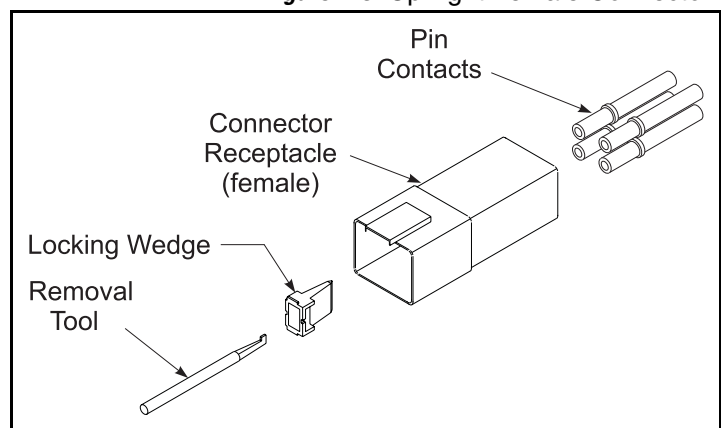
**Figure 1-2:** UpRight Male Connector



### FEMALE CONNECTOR (RECEPTACLE)

1. Disconnect the male connector (plug) from the female connector (receptacle).
2. Using the notched end of the Removal Tool (or a wire hook), pull the Locking Wedge from the Female Connector.
3. Check all parts for damage. Replace all parts which are damaged or worn.
4. Replace or re-crimp the wires and contacts. Refer to "Crimping" procedure.

**Figure 1-3:** UpRight Female Connector



## RELEASING LOCKING FINGERS

1. The Locking Fingers can be released following the removal of the Locking Wedge of either the male or female connector.
2. Use the removal tool (or flat bladed screwdriver) to push the Locking Fingers aside. This will release the grip on the contact.
3. Pull the wire and contact out of the connector.

## CRIMPING

1. Strip 6 mm ( $\frac{1}{4}$  in.) from the wire.

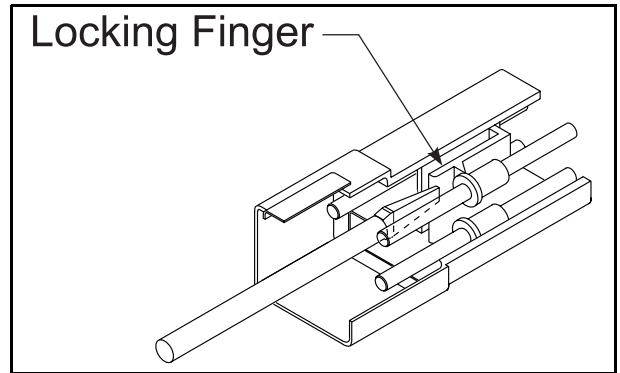
**NOTE:** Complete crimping instructions are included in each Field Kit.

2. Insert the contact into the crimping tool.
3. Insert the stripped wire into the contact. Copper strands should be visible in the bleed hole of the contact and no copper strands should be loose (outside) of the contact barrel.
4. Completely close the handles of the crimping tool. Release the handles of the crimping tool and remove the crimped contact.
5. Inspect the crimped contact to ensure that all strands are secure in the crimp barrel.

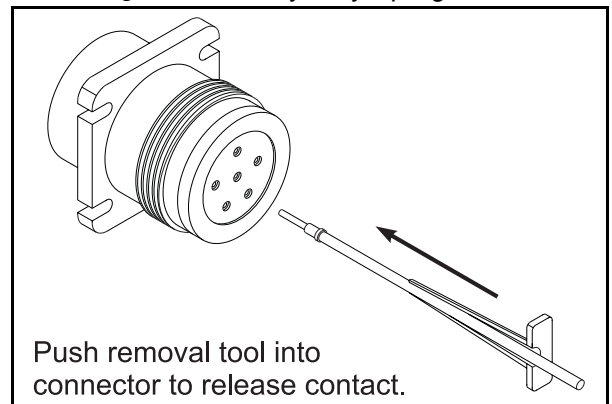
## REMOVING CONTACT FROM HEAVY DUTY PLUG

1. Slip the removal tool along the wire to be replaced.
2. Push the removal tool into the connector until the contact is released.
3. Pull the wire and contact out of the plug.

*Figure 1-4:* Locking Finger, UpRight Connector



*Figure 1-5:* Heavy Duty UpRight Connector



## 1.7 HYDRAULIC MANIFOLD REPAIR

### REMOVAL

Refer to the *Service and Repair* section for model specific information.

1. Disconnect the battery.
2. Tag and disconnect the solenoid valve leads.
3. Tag, disconnect, and plug hydraulic hoses.
4. Remove the bolts that hold the manifold to the mounting bracket.
5. Remove the manifold block.

### DISASSEMBLY

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**NOTE:** Mark all components as they are removed so as not to confuse their location during assembly.

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1. Remove coils from solenoid valves.
2. Remove valves.
3. Remove fittings, plugs, springs, balls, and orifices.
4. Remove the three tie rod bolts to separate the sections.

### CLEANING AND INSPECTION

1. Wash the manifold in cleaning solvent to remove built-up contaminants, then blow out all passages with clean compressed air.
2. Inspect the manifold for cracks, thread damage and scoring where O-rings seal against internal and external surfaces.
3. Wash and dry each component and check for thread damage, torn or cracked O-rings, and proper operation.
4. Replace parts and O-rings found unserviceable.

### ASSEMBLY

Refer to the *Service and Repair* section for assembly drawings, and the *Parts Manual* for illustrated parts breakdowns.

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**NOTE:** Lubricate all O-rings before installation to prevent damage to O-rings. Seat all balls in manifold block by lightly tapping on the ball with a brass drift punch.

---

1. Install fittings, plugs, springs, balls, and orifices. Use one drop of Locktite #242 on each screw-in orifice.
2. Install valves.

### INSTALLATION

Refer to the *Service and Repair* section for model specific information.

1. Attach manifold assembly to mounting plate with bolts.
2. Connect solenoid leads (as previously tagged).
3. Connect hydraulic hoses. Be certain to tighten hoses to manifold.
4. Reconnect the battery.
5. Operate each hydraulic function and check for proper operation and leaks.

Adjust valve pressures according to the *Service and Repair* section.



## 1.8 BATTERY MAINTENANCE

### **W A R N I N G**

*Hazard of explosive gas mixture. Do not charge batteries in an area containing sparks, flames, or smoking materials. Charge batteries only in a well ventilated area. Do not leave the charger unattended for more than two days. Never disconnect battery cables while the charger is operating. DO NOT operate the machine while the charger is operating.*

*Permanent damage will occur if the batteries are not recharged immediately after discharging.*

*Always wear safety glasses when working near batteries.*

*Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after use.***

*Battery fluid is highly corrosive. Thoroughly rinse away any spilled fluid with clean water.*

*Always replace batteries with UpRight batteries or manufacturer approved replacements.*

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Keep the terminals and tops of the batteries clean. Use a baking soda solution to clean the batteries, taking care not to get the solution inside the cells. Rinse thoroughly with clean water. Clean battery and cable contact surfaces to a bright metal finish whenever a cable is removed.

### **BATTERY CHARGING**

1. Check battery fluid level daily, especially if the work platform is being used in a warm, dry climate. If the electrolyte level is lower than 10 mm (**3/8 in.**) above plates, add distilled water only. DO NOT use tap water with high mineral content. It will shorten battery life.
2. Connect a 12 volt charger to the battery (positive clamp to positive post, negative clamp to negative post). Turn the charger on and charge the battery until the specific gravity reaches 1.260, or until the amp guage on the charger reads below 5 amps for one hour.

### **BATTERY CELL EQUALIZATION**

The specific gravity of battery cell electrolyte should be equalized monthly.

1. Charge the batteries as outlined in the section above.
2. Check the electrolyte level in each battery cell, and add if necessary. Charge the batteries for an additional eight hours.
3. After equalization, check the specific gravity of each cell with a hydrometer. The temperature-corrected specific gravity should be 1.260. If any corrected readings are below 1.230, the battery containing that cell should be replaced.

Do not check the specific gravity in a cell which has just had water added. If there is not enough electrolyte in a fully charged cell to obtain a hydrometer sample, add water and charge the battery for one to two hours to adequately mix the water and electrolyte.

## 1.9 LONG TERM STORAGE

**NOTE:** Do not drain the hydraulic system prior to long term storage.

If the work platform is to be placed in long term storage, follow these recommended preservation procedures.

### **PRESERVATION**

1. Clean painted surfaces. If paint is damaged, repaint.
2. Fill the hydraulic tank to operating level.

**IMPORTANT:** Do not fill the hydraulic tank while the platform is elevated.

3. Coat exposed portions of cylinder rods with a preservative such as multipurpose grease and wrap with a barrier material.
4. Coat all exposed unpainted metal surfaces with preservative.
5. **Internal Combustion Models:** Service the engine according to the manufacturers recommendations.
6. Add fuel stabilizers to the fuel tank per manufacturer's recommendations. Drive the machine over a rough course for five minutes to mix the fuel stabilizer with the fuel.
7. Remove the batteries and place them in alternative service.

## OTHER MAINTENANCE

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### 2.1 INTRODUCTION

This section contains instructions for the maintenance of your UpRight machine. Referring to the Safety, Operation, and Preventative Maintenance section will aid in understanding the operation and function of the various components and systems of the machine, and help in diagnosing and repairing the machine.

#### **! WARNING !**

*Never perform service on the machine while the boom is elevated without first blocking the elevating assembly.*

*DO NOT stand in elevating assembly area while deploying or storing brace.*

*Refer to Section 2 - Operation and Specifications for elevating assembly blocking instructions.*

*Be sure to read, understand and follow all information in the Safety, Operation, and Preventative Maintenance section of this manual before attempting to operate or perform service on any XR Series Telehandler.*

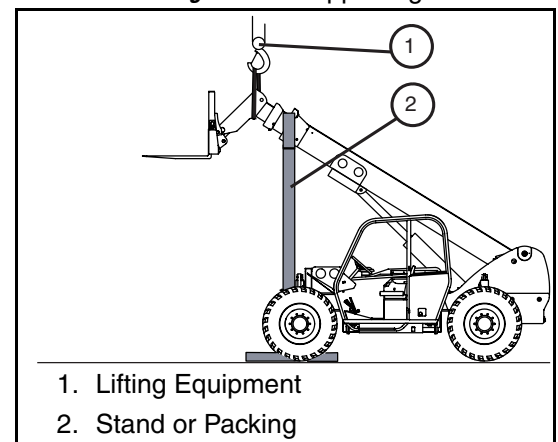
### MAINTENANCE SAFETY

Unless otherwise instructed, the machine must be in the following condition when maintenance is performed:

- Parking brake engaged
- Transmission in neutral
- Boom fully retracted and fully lowered with the attachment blocked to prevent movement
- Engine off and key removed from Key Switch.
- Battery switch turned off.

Occasionally it is necessary to perform maintenance while the boom is elevated. In these instances, be sure to support the boom and attachments securely with a suitable stand or overhead sling capable of supporting the weight. DO NOT depend on hydraulic cylinders to support either the boom or the attachment.

**Figure 2-1: Supporting the Boom**



## 2.2 HYDRAULIC PRESSURE SETTINGS

Refer to Figure 2-2 for the location of the pressure adjusting valves.

### MAIN RELIEF VALVE ADJUSTMENT PROCEDURE

When facing the main valve assembly from the rear of the machine, the main relief valve is located on the rear left side of the main valve assembly. On low boom machines, the boom must be raised to give easy access to this valve.

1. Operate the machine for ten minutes to warm the hydraulic oil. Park the machine on a level surface where there will be no overhead obstacles to interfere with full boom elevation. Apply the park brake, turn the engine off, and chock the wheels.
2. Remove the plug from the main pressure port (Item 2, Figure 2-2). Insert a fitting (UpRight Part # 015736-001) into the main pressure test port on the main control valve assembly, then connect a 5000 psi gauge (UpRight Part #063971-000) to the fitting using an adapter (UpRight Part #014048-010).
3. Run the engine at 2000 rpm. Raise the boom to full elevation, then continue to activate the boom lift function. Record the gauge reading after the boom has reached full elevation. Main relief valve pressure should be 3500 psi.
4. If adjustment is necessary, remove the cap from the main relief valve. Turn the inner adjusting screw counter clockwise to decrease pressure or clockwise to increase pressure until the specified pressure is reached. DO NOT increase pressure beyond the specifications.
5. After the pressure is set, replace the cap on the main relief valve. Remove all fittings from the main pressure port and replace the plug. Refer to the General Information section of this manual for torque specifications.

### STEERING RELIEF VALVE ADJUSTMENT PROCEDURE

When facing the main valve assembly from the rear of the machine, the steering relief valve is located on the front right side of the main valve assembly.

1. Operate the machine for ten minutes to warm the hydraulic oil. Park the machine on a level surface with the parking brake applied. Turn the engine off and chock the wheels.
2. Insert a fitting (UpRight Part # 063965-001) into the steering pressure test port on the main control valve assembly (Item 7, Figure 2-2), then connect a 5000 psi gauge (UpRight Part #063971-000) to the fitting using an adapter (UpRight Part #014048-010).
3. Run the engine at 2000 rpm. Turn and hold the steering fully in one direction and record the gauge reading. Steering relief valve pressure should be 2500 psi.
4. If the recorded reading is not within specification, loosen the lock nut on the steering relief valve and adjust the setting to specification. Turn counter clockwise to reduce pressure or clockwise to increase pressure. DO NOT increase pressure beyond specifications.
5. After the pressure is set, tighten the lock nut on the steering relief valve. Remove all fittings from the steering pressure port and replace the plug. Refer to the General Information section of this manual for torque specifications.

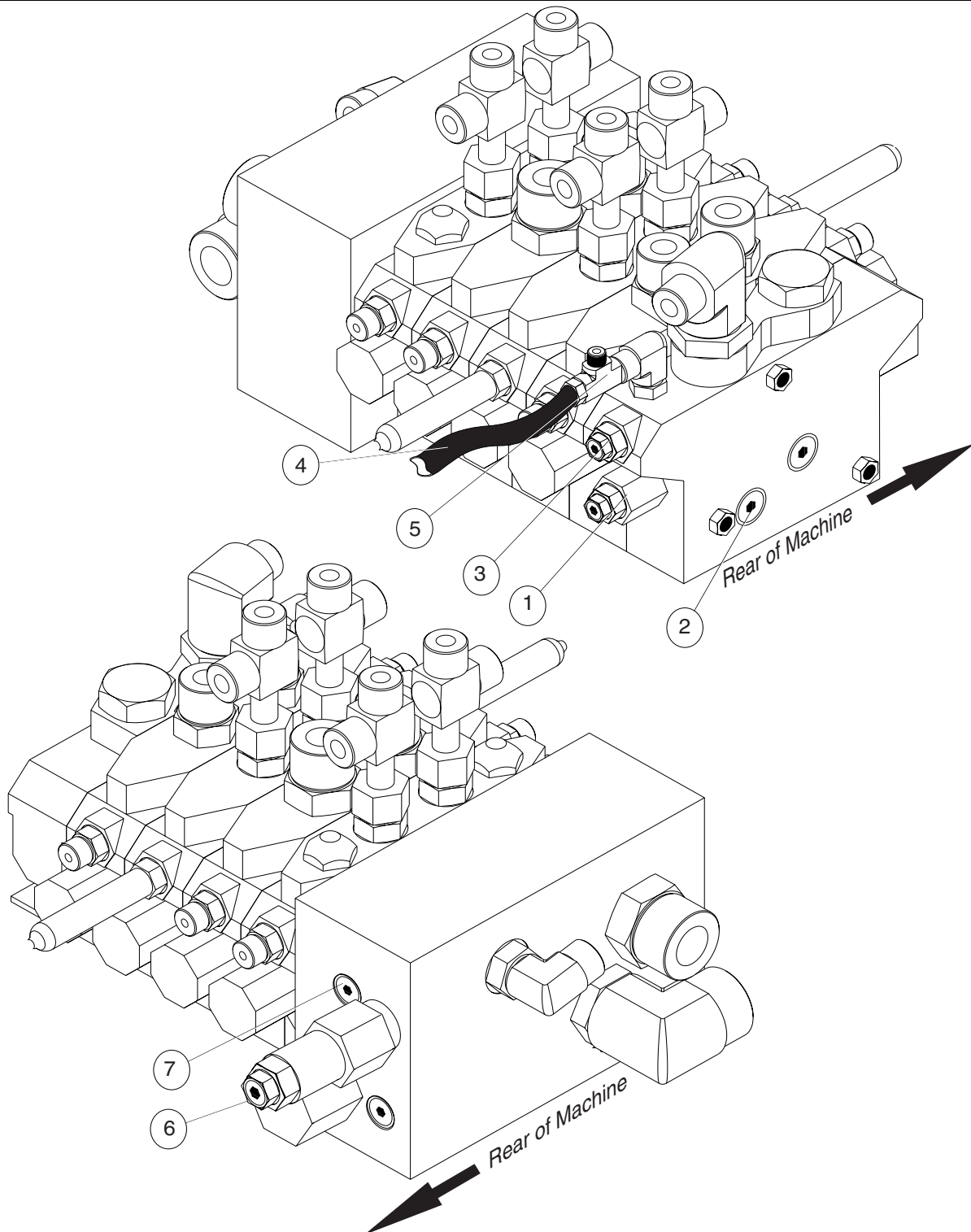
### PILOT PRESSURE ADJUSTMENT PROCEDURE

When facing the main valve assembly from the rear of the machine, the pilot pressure valve is located on the rear left side of the main valve assembly. On low boom machines, the boom must be raised to give easy access to this valve.

1. Operate the machine for ten minutes to warm the hydraulic oil. Park the machine on a level surface with the parking brake applied. Turn engine off and chock the wheels.
2. Remove the pilot hose from the main control valve assembly (Item 4, Figure 2-2) and install a tee fitting (UpRight Part # 100448-001), then reconnect the pilot hose to the tee fitting. Connect a 600 psi gauge (UpRight part # 014124-006) to the tee fitting using adapters (part # 014048-010 on the gauge and part # 100398-001 on the tee).
3. Run the engine at idle and record the gauge reading. Pilot pressure should be 350 psi.
4. If the reading is not within specification, loosen the lock nut on the pilot pressure valve and adjust the setting to specification. Turn counter clockwise to reduce pressure or clockwise to increase pressure. DO NOT increase pressure beyond specifications.

5. After the pressure is set, tighten the lock nut on the pilot pressure valve. Remove the tee fitting and pressure gauge, then reconnect the pilot hose to the main valve assembly. Refer to the General Information section of this manual for torque specifications.

**Figure 2-2:** Main Valve Assembly



- 1. Main Relief Valve
- 2. Main Pressure Port
- 3. Pilot Pressure Valve
- 4. Pilot Hose
- 5. T Fitting (UpRight part # 100448-001) (placed in line for pilot pressure test only)
- 6. Steering Relief Valve
- 7. Steering Pressure Port

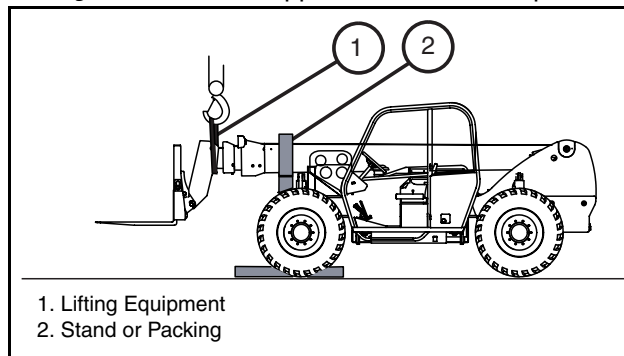
## 2.3 BOOM EXTEND CYLINDER AND CHAINS

Boom section 1 refers to the base section of the boom. Boom section 2 refers to the middle section, and boom section 3 refers to the furthest extending section of the boom where the fork or attachment is located.

### REMOVAL

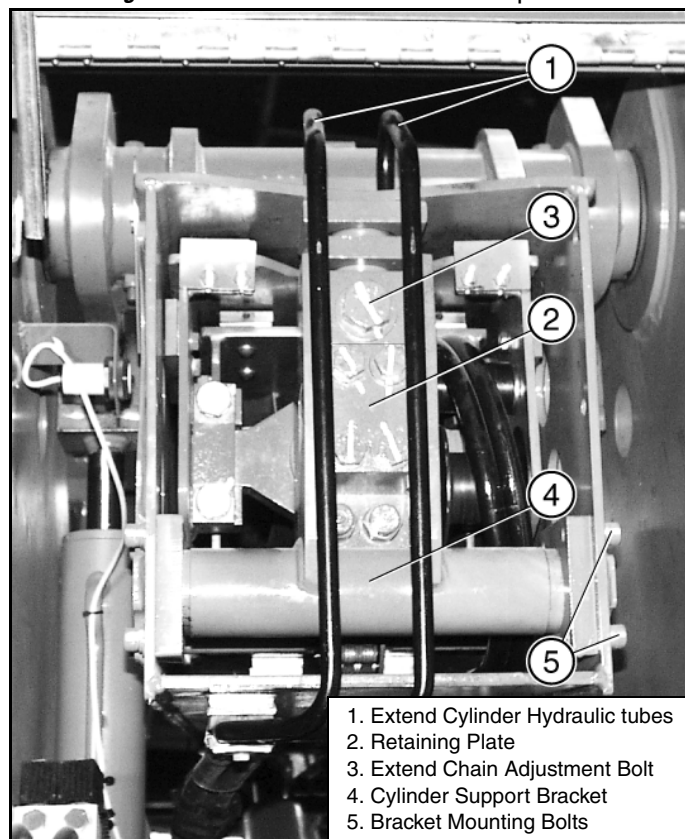
1. Park the machine on a firm, level surface with the parking brake set and the wheel chocked.

**Figure 2-3:** Boom supported in horizontal position



2. Using a stand or overhead sling, support the boom in the horizontal position with the boom fully retracted.

**Figure 2-4:** Rear of boom with coverplate removed

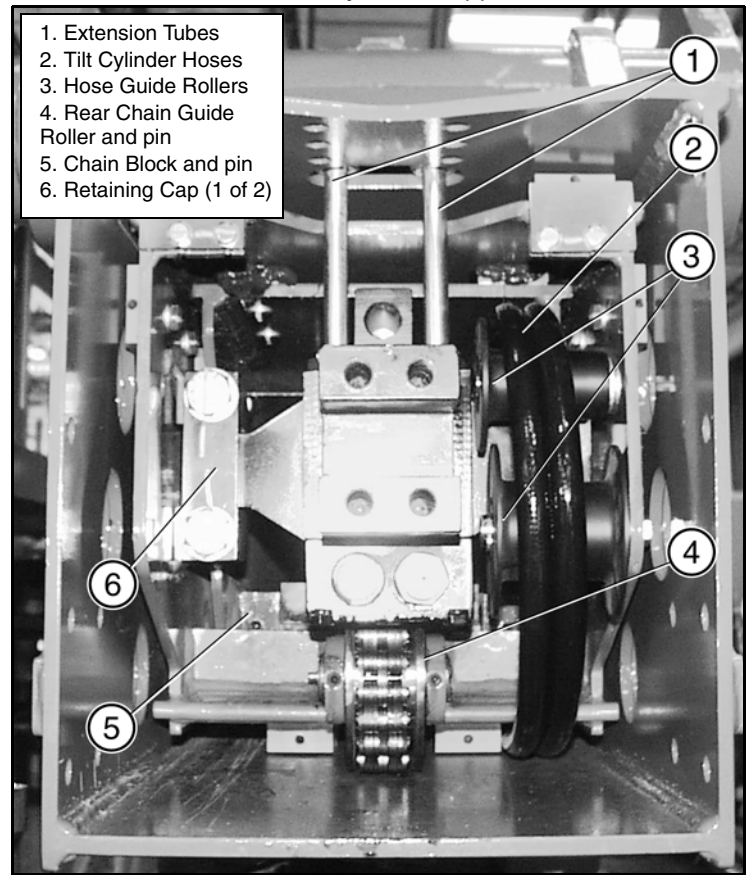


3. On the high boom models, remove the cover plate from the rear of the boom. On low boom models, remove the hinge bolts and door stays to remove the rear door assembly. On models with a bolt-on cover, remove the bolts and the rear cover
4. Disconnect the extend cylinder hydraulic tubes from extension tubes that rise from the cylinder. Cap the ends to prevent oil spillage. Remove the securing hardware at the bottom of the boom assembly, then move the tubes out of the way.
5. Remove the retaining plate from the rear of the cylinder.
6. Remove the extend chain adjustment bolt.
7. Remove the cylinder support bracket (there are four bolts on both the right and left side mounting plates, and six bolts on the top mounting plate).

**Figure 2-5:** Rear of boom with Cylinder Support Bracket removed

8. Remove the extension tubes that rise from the cylinder.
9. At the front of the machine, remove the tilt cylinder hoses from the tilt cylinder and cap them to prevent oil spillage. Pull them out from the rear of the boom and lay them out of the way. Repeat this procedure for the auxiliary hoses if the machine is so equipped.
10. Remove the hose guide rollers from the rear of the second boom (four if equipped with auxiliary hydraulics or two if not so equipped).
11. Remove the lock nut and loosen the retraction chain adjusting nut located at the bottom front end of boom section 1 (see Figure 2-10).
12. Loosen the set-screws that retain the rear chain guide roller pin. Remove the pin and the chain guide roller.
13. Loosen the set-screws that retain the chain block pin and remove the pin.

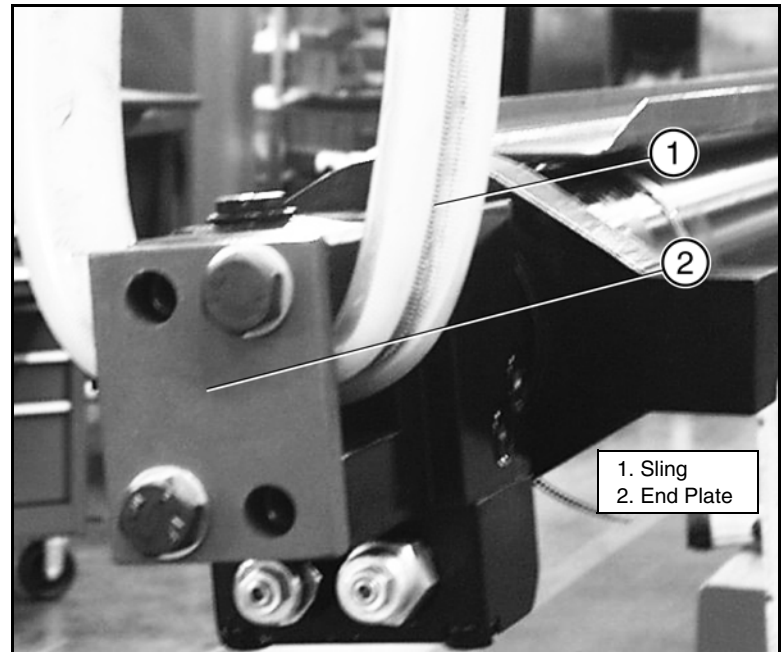
**NOTE:** On some low boom models it may not be possible to remove the chain block pin while the boom is in the machine. In this case only, carefully remove the cylinder without removing the chain block.



14. Remove the two retaining caps that hold the cylinder in the second boom.

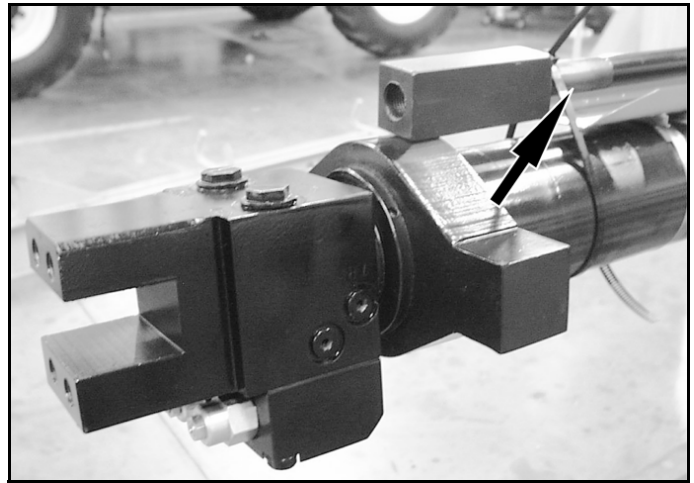
**Figure 2-6:** Extend Cylinder with sling attached

15. Attach a sling to the forked end of the cylinder. Install the retaining plate and bolts to the cylinder to retain the sling.



16. Secure the chain tensioner rod to the cylinder using a cable tie or rope.
17. Slightly raise the cylinder and partially extract it from the boom (approximately 2 ft. (60cm)). Lift the chain block with attached chains out of the rear of the boom as far as possible. Continue to withdraw the cylinder and chains out of the boom. Do not completely remove the cylinder.
18. Lower the cylinder onto a suitable stand or forklift truck and attach two slings to obtain a horizontal lift. Using the two slings, withdraw the cylinder completely from the boom. Weight of cylinder is approximately 400 lbs (181Kg).

**Figure 2-7:** Chain Tensioner Rod, secured with cable tie



**NOTE:** If removing the cylinder with the chain block in place, extract the cylinder as far as possible (the front chain guide roller will stop at the chain block), then lower the extracted end of the cylinder as needed to allow the front chain guide roller to clear the chain block. Attach a second sling to the chain guide roller bracket to obtain a horizontal lift. Using the two slings, withdraw the cylinder completely from the boom.

19. Lower the cylinder onto suitable stands or supports, one at each end, and remove all slings.
20. Separate the chain from the tension rod. Remove the cable tie and tension rod from the cylinder.
21. Remove the retraction chain adjusting nut, then pull the retraction chain from the boom.

## INSTALLATION

Inspect all components for wear and damage before re-installing.

1. Place the chain tension rod on the cylinder. Attach the chain to the chain tension rod using the clevis pin and new cotter pins.
2. Using a forklift truck or a hoist, place the cylinder at the rear of boom. Do not insert at this time.
3. Using a fish tape or similar tool, install the retract chain into boom section 1, ensuring the chain adjuster fits into the hole in the bottom front tip of boom section 1. Install the nut. Do not tighten at this time.
4. Insert the cylinder into the boom while feeding the chain and the chain block into the boom.
5. Fit the cylinder into mounting cradle on boom section 2. Install the retaining caps and bolts. Torque the bolts to 250-ft lb. (339Nm). Fit the chain block into position and install the pin. Tighten the setscrews.

**NOTE:** If the chain block was not removed from the boom, the cylinder must be supported by a sling at each end for installation. Lower the rear end of the cylinder as needed to allow the front chain guide roller to clear the chain block. Remove the sling from the front chain guide roller. Lift the rear end of the cylinder and insert the cylinder into the boom.

6. Install the rear chain guide roller and pin. Tighten the set screws.
7. Install the hose guide rollers (four if equipped with auxiliary hydraulics or two if not so equipped).
8. Feed the hydraulic hoses into the channels in the top of boom section 3 until they reach the front of the boom.
9. Connect the tilt cylinder hoses and the auxiliary hoses (if so equipped) to their proper locations in the front of the boom.
10. Install the two hydraulic extension tubes to the top of the cylinder end.
11. Install the cylinder support bracket. Torque all 14 bolts to 70-ft lb. (95 Nm).
12. Install the cylinder retaining plate to the rear of the cylinder. Torque 4 bolts to 235-ft lb. (173 Nm)
13. Install the extend cylinder hydraulic tubes to the extension tubes. Install the securing hardware on the underside of boom.
14. Install the extend chain adjustment bolt. Do not tighten at this time.
15. Adjust boom chains. Refer to "2.5 Boom Chain Adjustment" for chain adjustment procedure.
16. Install the rear cover.

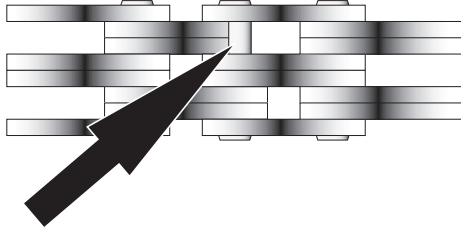


## 2.4 BOOM CHAINS AND CHAIN GUIDE ROLLERS WEAR INSPECTION

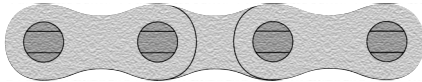
### BOOM CHAINS

1. Remove extend cylinder from the boom. Refer to the section entitled "2.3 Boom Extend Cylinder and Chains" on page 2-4 for instruction.
2. Carefully inspect individual links for the following conditions. If any of the following conditions exist, the chain must be replaced. When replacing chains always replace the chain anchor pins as well.

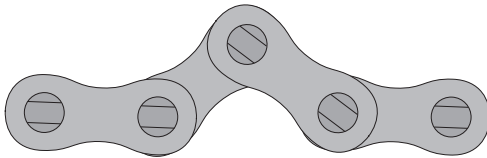
- a. Broken, missing or cracked plates



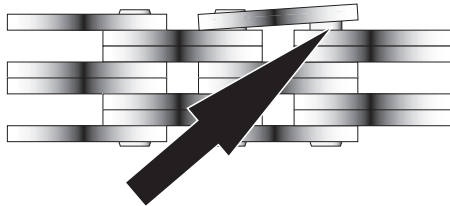
- b. Excessive surface rust and pitting



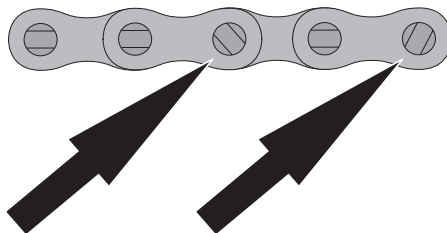
- c. Binding links, links that no longer rotate freely



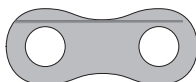
- d. Loose or broken pins



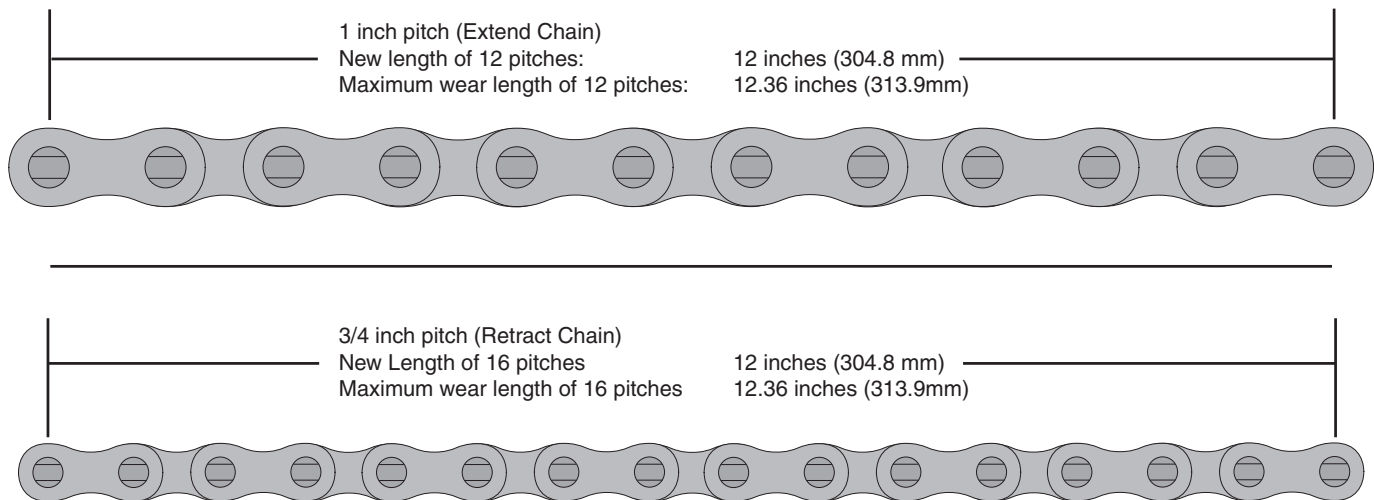
- e. Rotated pins



- f. Excessive exterior wear; Pay special attention to the areas that make contact with the guide rollers most often



- g. Measure chain wear or elongation. Apply 150 lbs (68 Kg) of pull to chain. Measure the distance between pin centers and refer to the following illustration for maximum allowable wear length. Measure at five different locations on each chain. If any measurement exceeds the wear limit, the chain must be replaced.



## CHAIN GUIDE ROLLERS

1. Remove the extend cylinder from the boom. Refer to the section entitled "2.3 Boom Extend Cylinder and Chains" on page 2-4 for instruction.
2. Remove the extend chain guide roller from the extend cylinder.
3. Inspect the guide rollers, pins, and bushings for wear. Any noticeable wear on any of these parts will require its replacement.
4. Inspect the lubrication passages and grease fittings to ensure proper flow of grease through the pins.

## CHAIN LUBRICATION

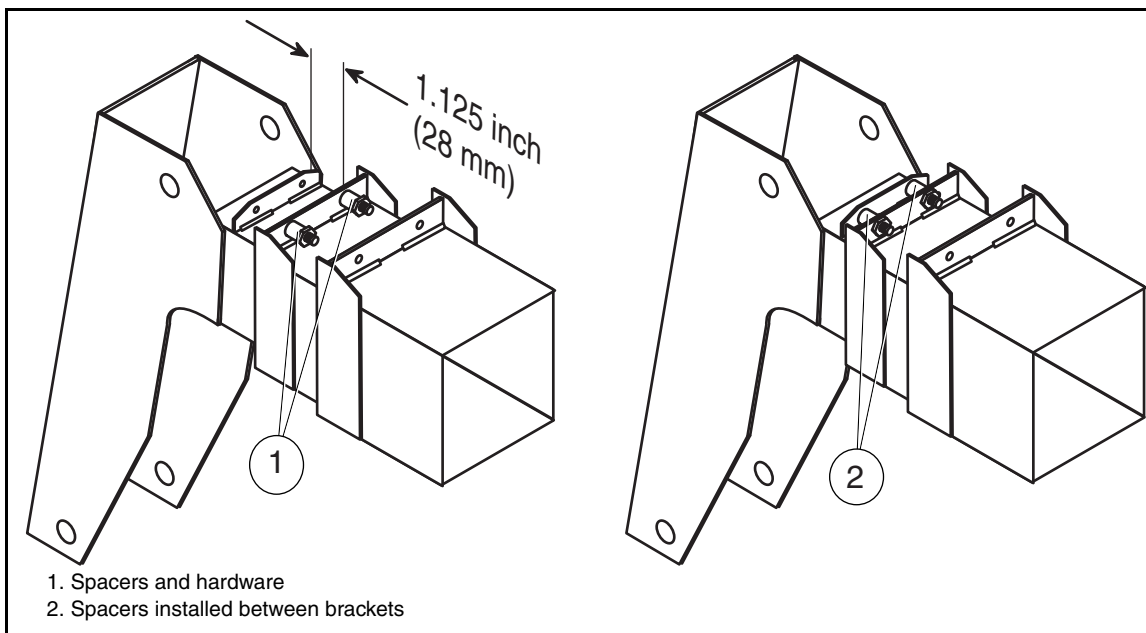
1. Once the boom chains have been inspected, it is very important to lubricate before installation. It is impossible to lubricate the boom chains once they are in place.
2. With a towel and/or wire brush, remove any grease or dirt that may prevent the penetration of new oil into the joints.
3. Apply small amounts of motor oil to each joint. Rotate the joint to ensure full penetration of oil. Wipe any excess oil from the chain.

**NOTE:** Do not apply grease to the chain. Grease will coat only the outside of the chain and will seal out the necessary lubricating oil.

## 2.5 BOOM CHAIN ADJUSTMENT

See the heading in the Safety, Operation, and Preventative Maintenance Manual entitled "Boom Chains" to determine whether the chains need adjustment.

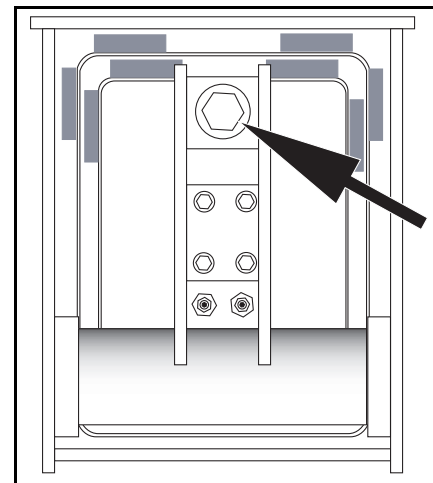
**Figure 2-8: Spacers**



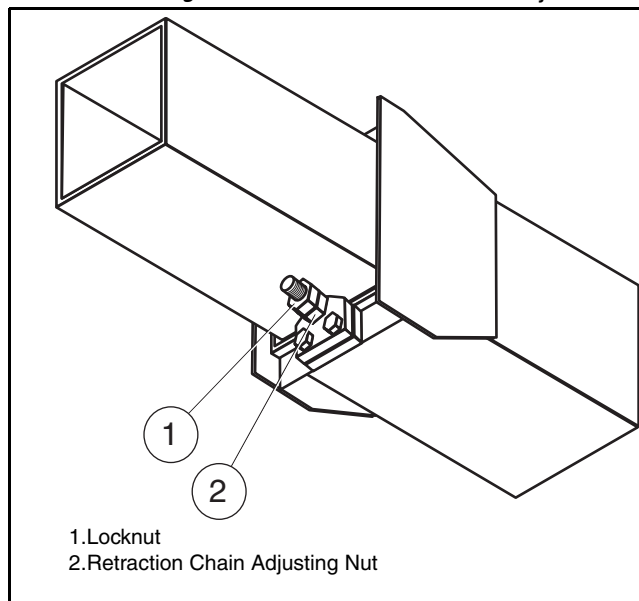
1. Remove the spacers and mounting hardware from the top bracket of boom section 2.
2. Extend the boom approximately 2 feet (600mm) then retract it until the space between the brackets (on top of boom sections 2 and 3) measures 1.25 in (30mm).
3. Install the spacers (removed in step 1) between the brackets and install the hardware through the brackets and spacers. Tighten the hardware until the spacers are snug between the brackets.

**Figure 2-9: Extension Chain Adjusting Bolt**

4. The extension chain adjusting bolt is located at the rear of the boom. Turn the extension chain adjusting bolt three full turns counter clockwise.



5. The retraction chain adjustment nut is located beneath the first boom section. Remove the lock nut and tighten the retraction chain-adjusting nut to 25 lbs ft (35Nm). Install and tighten the lock nut.
6. Tighten the extension chain adjusting bolt to 50 lbs-ft (70 Nm).
7. Remove the spacers from between the brackets and install them in their stowed position.

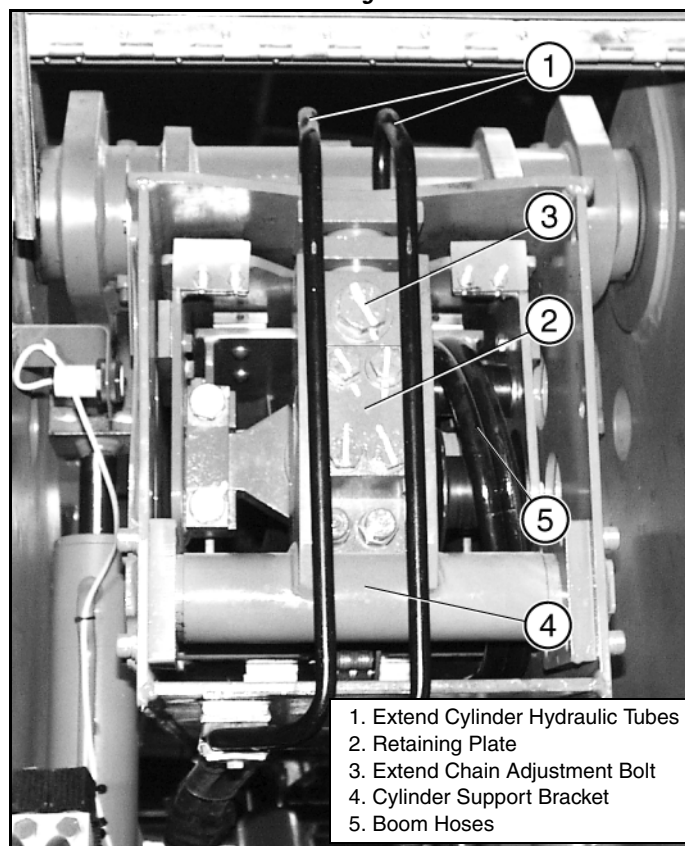
**Figure 2-10:** Retraction Chain Adjustment

## 2.6 BOOM HYDRAULIC HOSES

### HOSE REMOVAL

1. Park machine on firm level surface with the boom fully lowered and retracted. Turn off the engine, set the parking brake and chock the wheels.
2. Remove rear boom cover assembly.

3. Remove the extend cylinder hydraulic tubes from the extension tubes. Remove the securing hardware beneath the boom, then lay the tubes out of the way.
4. Remove the extend chain adjustment bolt.
5. Remove the retaining plate from the rear of the extend cylinder.
6. Remove the extend cylinder support bracket from the rear of the boom.
7. Remove hoses from the tilt cylinder and the auxiliary fittings (if so equipped). Cap the ends to prevent oil spillage.
8. Pull the hoses through the channel to the rear of the boom and lay them behind the machine
9. Securely attach a rope to the free end of each hose at the rear of the machine. Be sure that the rope is long enough to pass completely through the boom and still have 3 feet coming out of each end.
10. Disassemble the horseshoe tubes from the supply tubes at the bottom of the boom, then pull the horseshoe tubes out far enough to access the hose fittings.

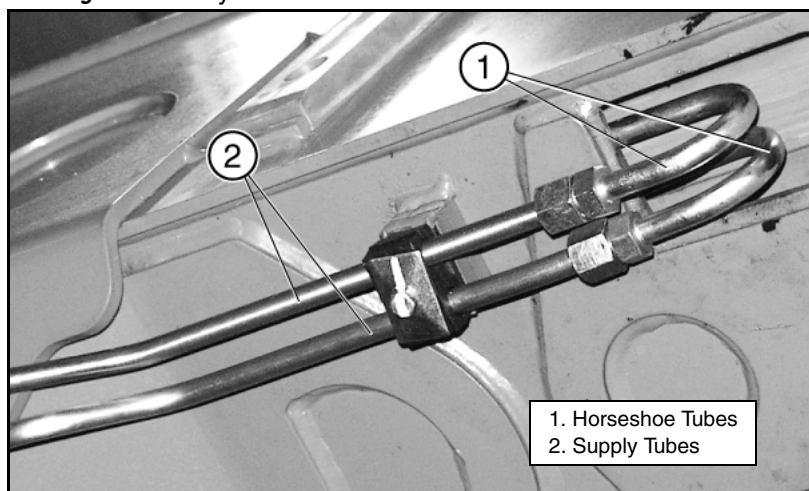
**Figure 2-11:** Rear of the boom

11. Detach the hoses from the horse-shoe tubes beneath the front of the boom (see Figure 2-12).
12. Withdraw each hose from the front of the boom until the length of rope protrudes from the front and rear of the boom. Untie the rope from the hose. **DO NOT** remove the rope from the boom, as it is required for re-assembly.

## HOSE INSTALLATION

1. At the front end of the boom, securely attach the rope to one pair of hydraulic hoses. Draw the hoses into the boom and connect them to the appropriate horseshoe tubes on the bottom of the boom (see Figure 2-12). Repeat this procedure on all remaining hoses. Lay the hoses behind the machine.
2. Attach the horseshoe tubes to the supply tubes. Pull all slack in the tubes to the rear of the boom.
3. Feed each of the hydraulic hoses through the channels at the rear of the boom until they come out the front of boom section 3.
4. Connect each hose to its appropriate connection at the front of the boom.
5. Install the extend cylinder support bracket and torque the 14 bolts to 75 ft lb. (95 Nm).
6. Install the retaining plate to the rear of the extend cylinder and torque 4 bolts to 235 ft lb. (173 Nm).
7. Install chain tension bolt and torque to 50 ft lb. (70 Nm).
8. Install extend cylinder hydraulic tubes and hose clamp.
9. Install rear cover.

**Figure 2-12:** Hydraulic hose connections at the front of the boom



## 2.7 TELESCOPIC BOOM SECTIONS

### DISASSEMBLE BOOM SECTIONS

1. Remove fork carriage, or other attachment, from the boom. Place the attachment on the ground. Pull out the pin retainer, then pull the carriage pin completely out. Lower the boom, then retract it to disconnect the attachment.
2. Remove boom extend cylinder and chains (see “Boom Extend Cylinder and Chains” on Page 2-4) .
3. Remove boom hydraulic hoses (see “Boom Hydraulic Hoses” on Page 2-10) .
4. Remove the side and lower wear pads from the front tip of boom sections 1 and 2 (see “Boom Wear Pads Adjustment or Replacement” on Page 2-12) .
5. Attach a sling to boom section 3 and extract it from boom section 2. **DO NOT remove completely.**
6. Attach an additional sling to support the rear of boom section 3. Fully extract boom section 3. Place it on stands in an area that will not obstruct the removal of boom section 2. Remove the slings.
7. Attach a sling to boom section 2 and extract it from boom section 1. **DO NOT remove completely.**
8. Attach an additional sling to support the rear of boom section 2. Fully extract boom section 2 and place it on stands. Remove the slings.

**Figure 2-13:** Removing the attachment carriage



## ASSEMBLE BOOM SECTIONS

1. Thoroughly clean the inside of boom sections 1 and 2. Thoroughly clean the outside of boom sections 2 and 3
2. Attach slings to the front and rear of boom section 2. Insert boom section 2 into boom section 1 approximately 2 ft. (60 cm).
3. Remove the sling from the rear of the boom and fully insert boom 2 into boom 1. Remove the remaining sling from boom 2.
4. Attach slings to the front and rear of boom section 3. Insert boom section 3 into boom section 2 approximately 2 ft. (60 cm).
5. Remove the sling from the rear of the boom and fully insert boom section 3 into boom section 2. Remove the sling from boom section 3.
6. Install the side and lower wear pads to booms 1 and 2 (see "Boom Wear Pads Adjustment or Replacement" on Page 2-12) .
7. Install the hydraulic hoses (see "Boom Hydraulic Hoses" on Page 2-10) .
8. Install boom extend cylinder and chains (see "Boom Extend Cylinder and Chains" on Page 2-4) .
9. Install the fork carriage or other attachment, to the quick coupler link.

## 2.8 BOOM WEAR PADS ADJUSTMENT OR REPLACEMENT

See Section 2--"Boom Wear Pads" to determine whether the pads need to be shimmed or replaced.

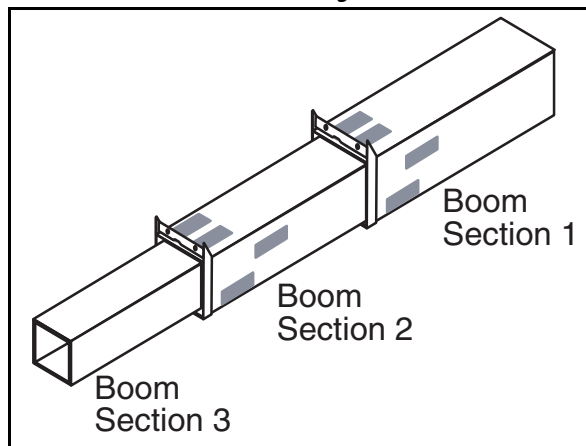
**NOTE:** Wear pad securing bolt length is important. Be sure that the bolts are returned to the same location from which they were removed.

Shim part number	Shim thickness
103371-100	.060 in (1.52 mm)
103372-100	.120 in (3.0 mm)
103373-100	.375 in (9.52 mm)

### BOOM FRONT WEAR PADS--ALL

1. Extend the boom approximately 10ft. (300cm) and lower onto a suitable stand or packing, placed under the third section.
2. Loosen the wear pad securing bolts for the **bottom** pads. Install enough shims to reduce the clearance to 0125in (3mm). When adjusting the side wear pads, install the shims as required to produce an equal gap between the boom sections at either side. One side may require more shims than the other.
3. Tighten the bolts to a torque of 39 ft-lb (54Nm).

Figure 2-14: Front Pads

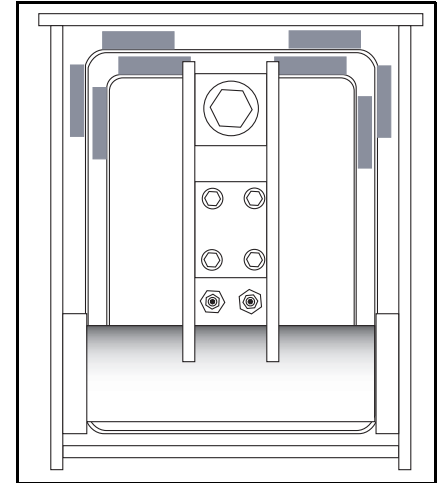


## BOOM SECTION 2 UPPER REAR WEAR PADS

*Figure 2-15: View of Rear Pads With Cover Removed*

The upper wear pads of boom section 2 cannot be shimmed. If they are worn beyond the specified clearance, they must be replaced.

1. Lower and retract the boom to the fully stowed position and remove the rear cover.
2. Remove the upper wear pad retaining brackets and hardware from the boom.
3. Insert a 5/16"-18 X 4" screw into the wear pads. Using the screw as a handle, remove the wear pads.
4. Install the new pads in the same manor then remove the 5/16"-18x4" screws once the pads are in place. Install the retaining brackets using the original hardware.



## BOOM SECTION 3 UPPER REAR WEAR PADS

1. Loosen the wear pad retaining bolt and install enough shims to reduce the clearance to **.125 in (3 mm)**
2. Tighten the bolts to a torque of 39 ft-lb (54 nm).

## SIDE REAR WEAR PADS--ALL

1. Loosen the side wear pad securing bolts and install enough shims to reduce the clearance to **.125 in (3 mm)** combined clearance for both sides (add the measurements from corresponding side pads together (lower left and lower right, and upper left and upper right)). Install the shims as required to produce an equal gap between the boom sections at either side. One side may require more shims than the other.
2. Tighten the bolts to a torque of 39 ft-lb. (54nm).

## 2.9 SERVICE BRAKES

### BLEEDING

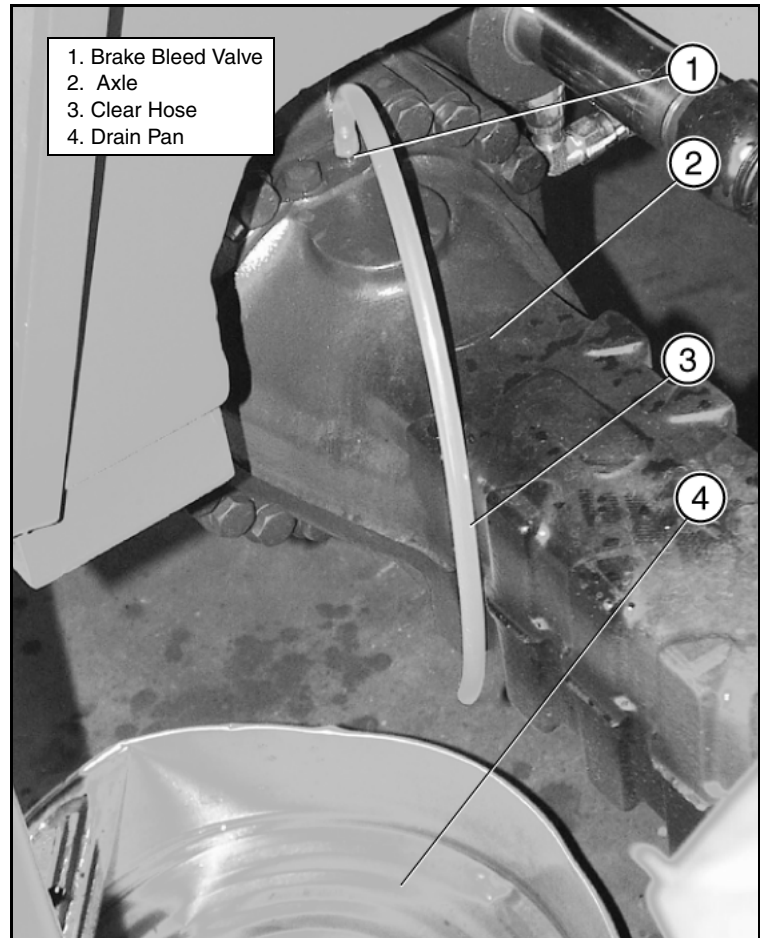
**NOTE:** The service brakes operate on hydraulic system pressure and fluid. There is no fluid reservoir to fill or maintain.

The following procedure will be necessary whenever air is suspected in the brake system or if the brake system has been disassembled for any reason.

Perform this procedure in the following order: Right rear brake, left rear brake, right front brake, left front brake. If your machine is not equipped with rear brakes, start with the right front brake.

1. Park the machine on level surface with the parking brake applied. Chock the wheels.
2. Ensure that the hydraulic oil is at the proper level in the main hydraulic tank.
3. Start the engine and leave it running throughout the procedure.
4. Fit a clear hose over the brake bleed valve so the oil can be directed into a drain pan.
5. Have an assistant depress the brake pedal while the bleed valve is opened. Watch for air in the oil as it flows through the clear hose.
6. Once the oil flows free of air, close the bleed valve. Wipe up any spills.
7. Test brakes for proper function. Repeat the bleeding procedure if necessary.

**Figure 2-16:** Bleeding the brakes





## SERVICE BRAKE INSPECTION

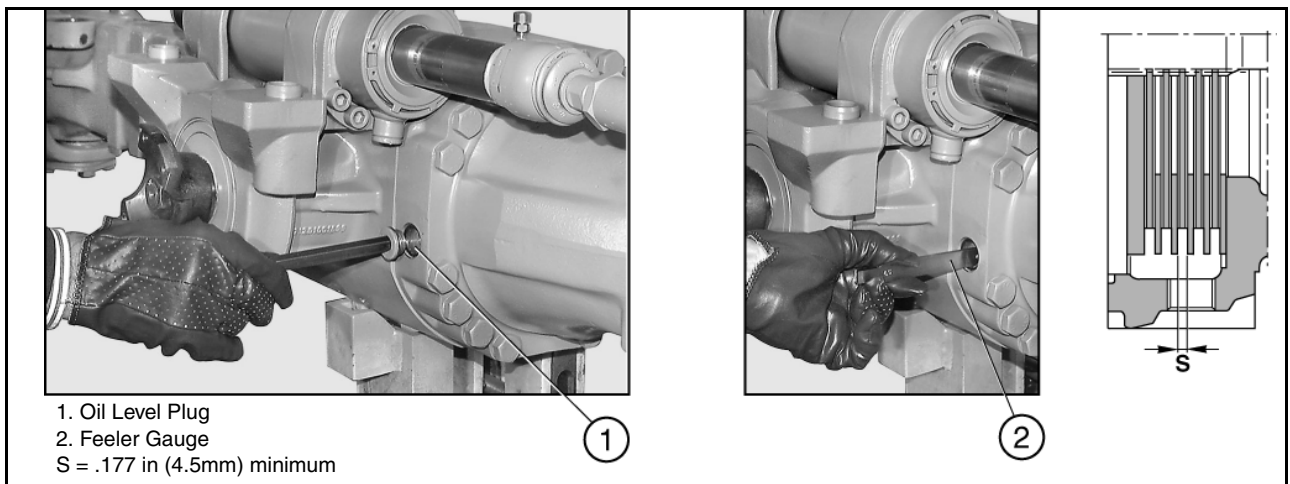
The service brakes are a hydraulically actuated, multi-plate, oil bath type, housed inside the axle housing on either side of the differential. They are designed to provide long trouble free service life by utilizing the oil in the axle to cool the brake assembly, and by using the gear reduction at the hub to reduce the braking effort.

Regular brake inspection and maintenance is not necessary. However, if a noticeable loss of brake efficiency is suspected, it is necessary to inspect, diagnose, and repair the brake system.

The following procedure explains how to measure the wear of the brake discs. If the discs are worn beyond the service limit or internal fluid leakage is suspected, axle disassembly is necessary. For all axle maintenance and repair procedures, consult the Dana Maintenance and Repair Instruction Manual (UpRight part # 103506-005, Dana part # MO212S10).

1. Park the machine on level surface with the parking brake applied and chock the wheels.
2. Remove the oil level plugs. One is on the front side and one is on the rear side of the axles.
3. Apply the brakes and, while the brakes are applied, measure the distance between the discs using a feeler gauge. The minimum distance between the discs is .177 in (4.5mm). If the brake discs are worn beyond the wear limit, the brake discs must be replaced.
4. Repeat steps 1-3 on the other axle.

**Figure 2-17:** Brake check



## 2.10 PARK BRAKE

Test the park brake by checking the brakes' ability to hold on a 15% grade with the rated load on the attachment. If the brakes fail to hold, consult the Dana Maintenance and Repair Instruction Manual (UpRight part # 103506-005, Dana part # MO212S10).

## 2.11 CYLINDER REPAIR

### REMOVAL

Mark and disconnect the hoses and IMMEDIATELY cap the openings to prevent contamination. Remove the cylinder from the machine. Refer to the XR Series Parts Manual (UpRight part number 103949-000) for information on the location of the cylinder and the parts that secure it.

### **W A R N I N G**

*Cylinders may be very heavy. Support heavy cylinders before removing the pins that secure the cylinder to the machine.*

*When removing the boom lift cylinder, be sure that all parts of the machine are supported with adequate stands, packing, or overhead support before beginning the removal process.*

### DISASSEMBLY

1. Remove the head from the cylinder body.
2. Carefully slide the rod assembly out of the cylinder.
3. Remove all seal kit components (wipers, rod seals, O-rings, and back-up rings) from the head and piston.
4. Inspect all the parts for scratches, pitting, or polishing. Scratches or pitting deep enough to catch the fingernail are unacceptable; replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the part must be checked for roundness. Cylinders more than .007 inches out of round should be replaced.

### ASSEMBLY

**NOTE:** Torque all hardware to the specifications listed in the General Information section of this manual unless otherwise specified.

1. Lubricate all components with clean hydraulic fluid.

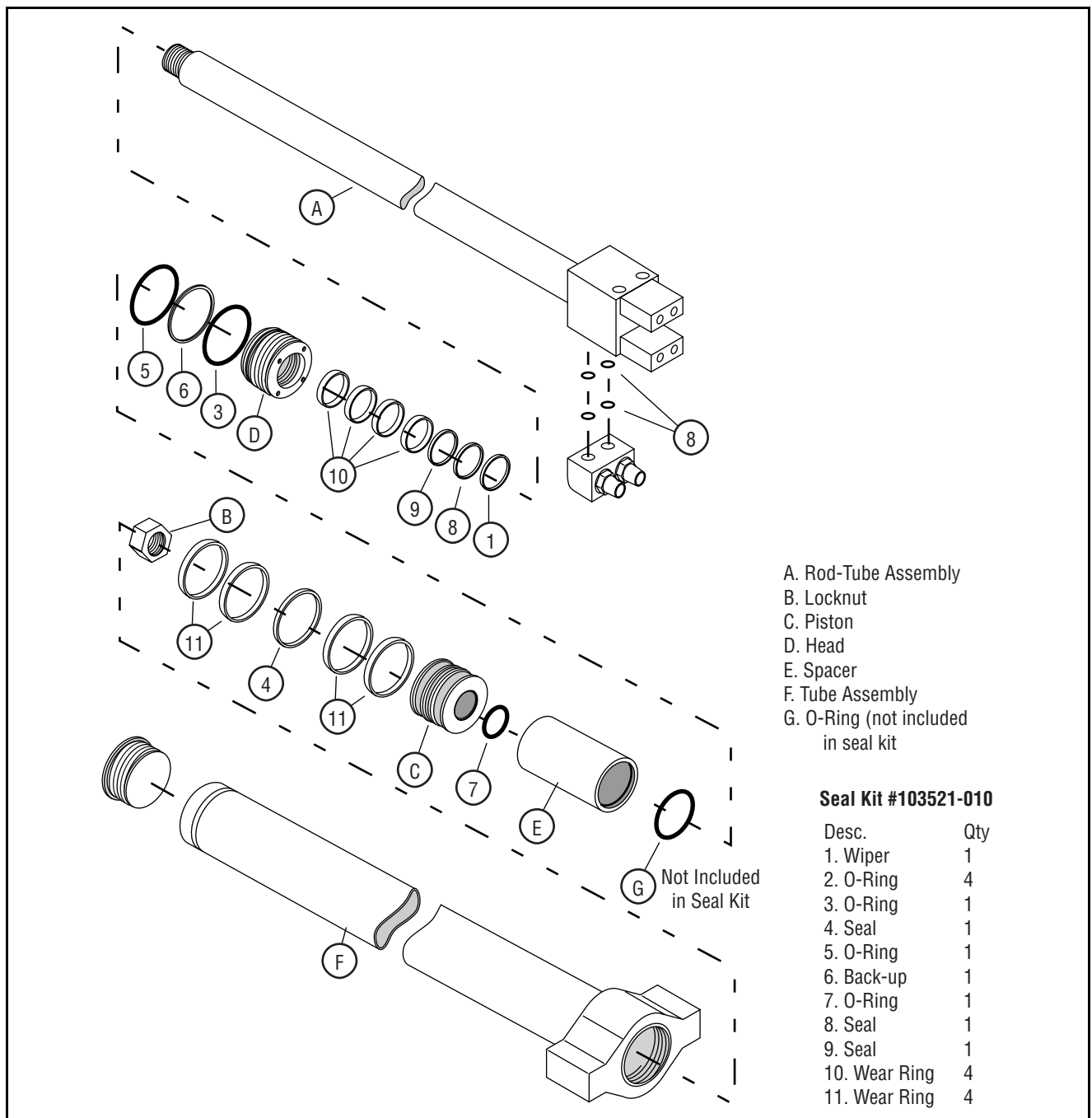
**NOTE:** To avoid cutting the seals, do not use sharp-edged tool during seal replacement. After installing the seals, wait at least one hour before assembling the cylinder to allow the seals to elastically restore their original shape.

2. Install the new components from the seal kits.
3. Lubricate the seals in the head and carefully slide it onto the rod, dust seal end first. Slide the spacer onto the rod (if equipped). Install the O-ring and piston on the end of the rod. Torque the nut to 250 ft/lbs (339 Nm).
4. Lubricate the seals on the piston and the head.
5. Carefully slide the rod assembly into the cylinder.
6. Secure the cylinder head to the cylinder.

### INSTALLATION

1. Installation is the reverse of removal.
2. After the cylinder is properly installed, carefully remove any stands, packing, or overhead supports.
3. Slowly cycle the cylinder several times to remove air from the hydraulic system.
4. Check for proper cylinder operation. Check all hydraulic connections for leaks.

Figure 2-18: Extend Cylinder



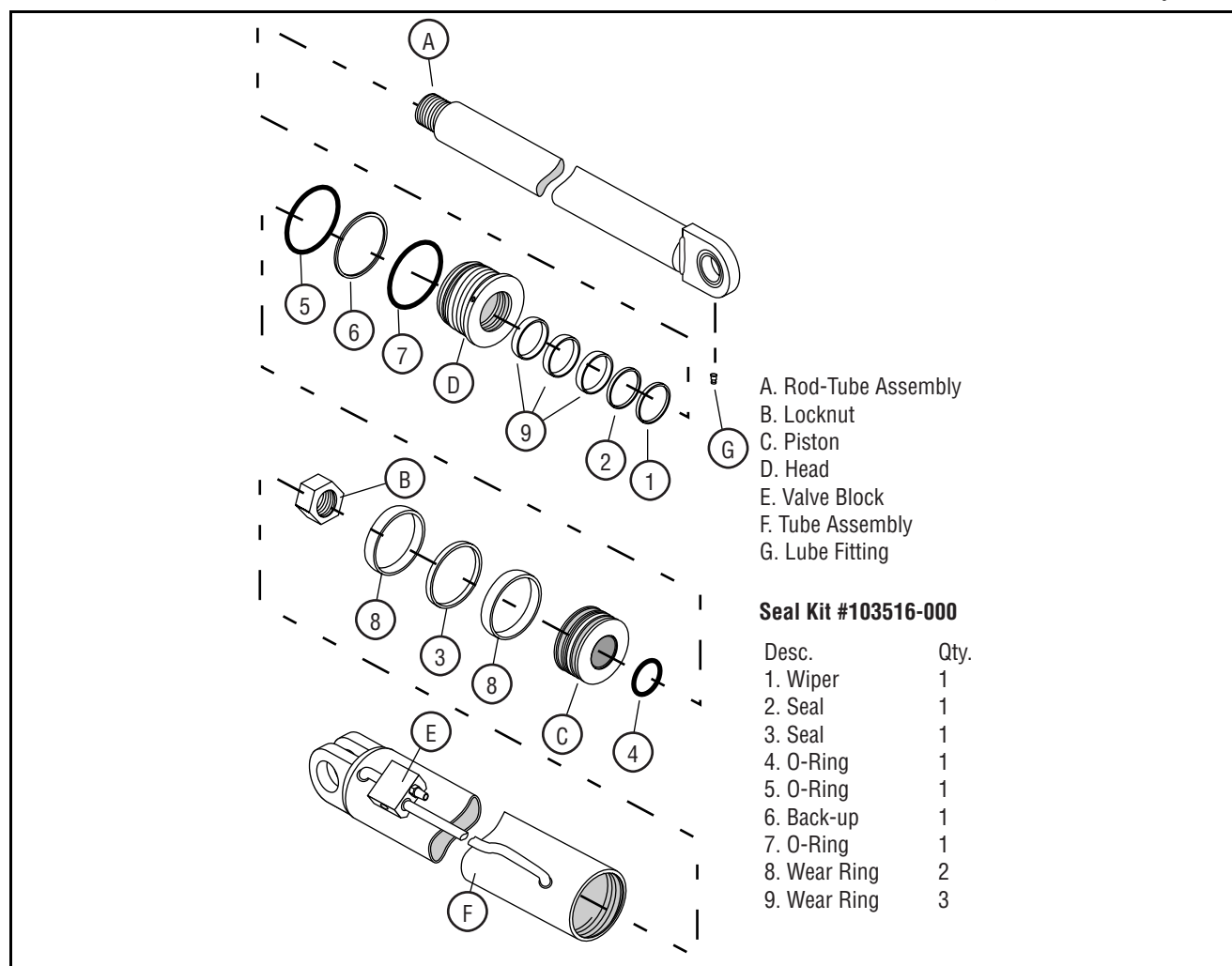
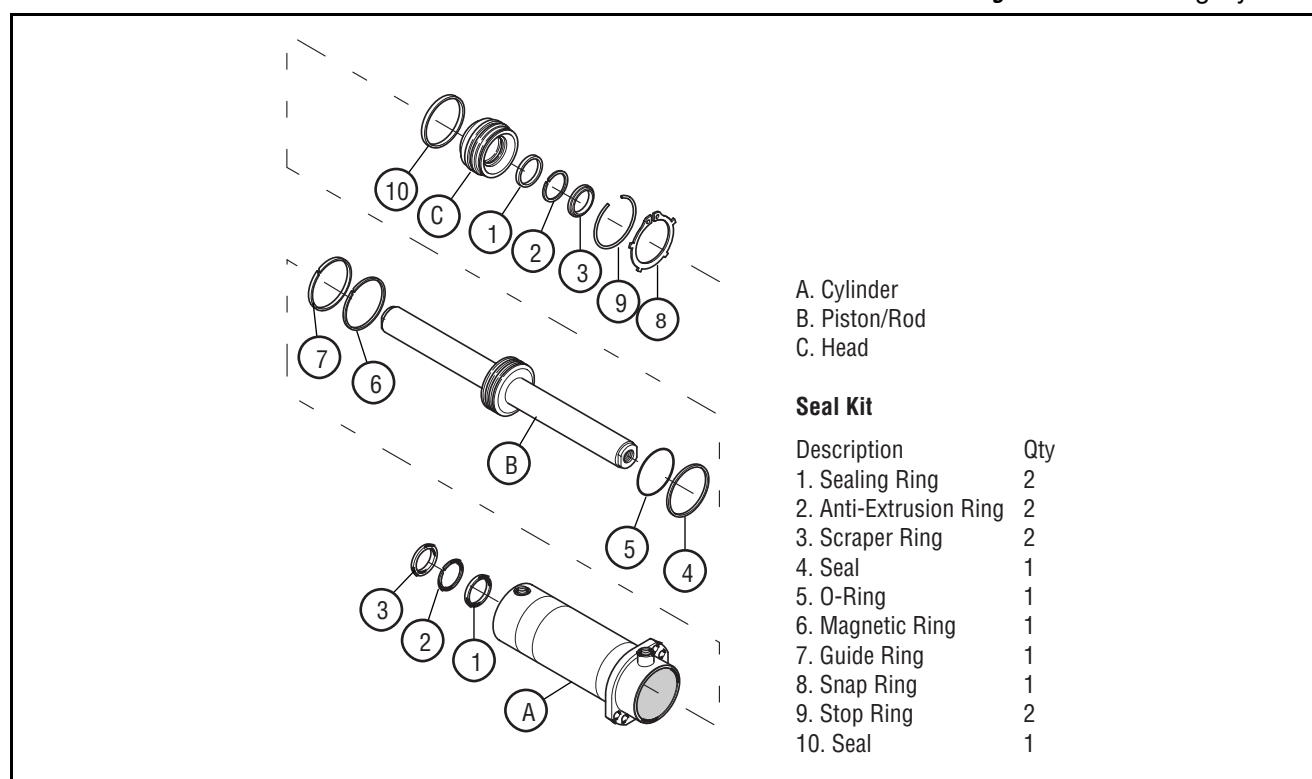
**Figure 2-19:** Lift Cylinder**Figure 2-20:** Steering Cylinder

Figure 2-21: Fork Tilt Cylinder

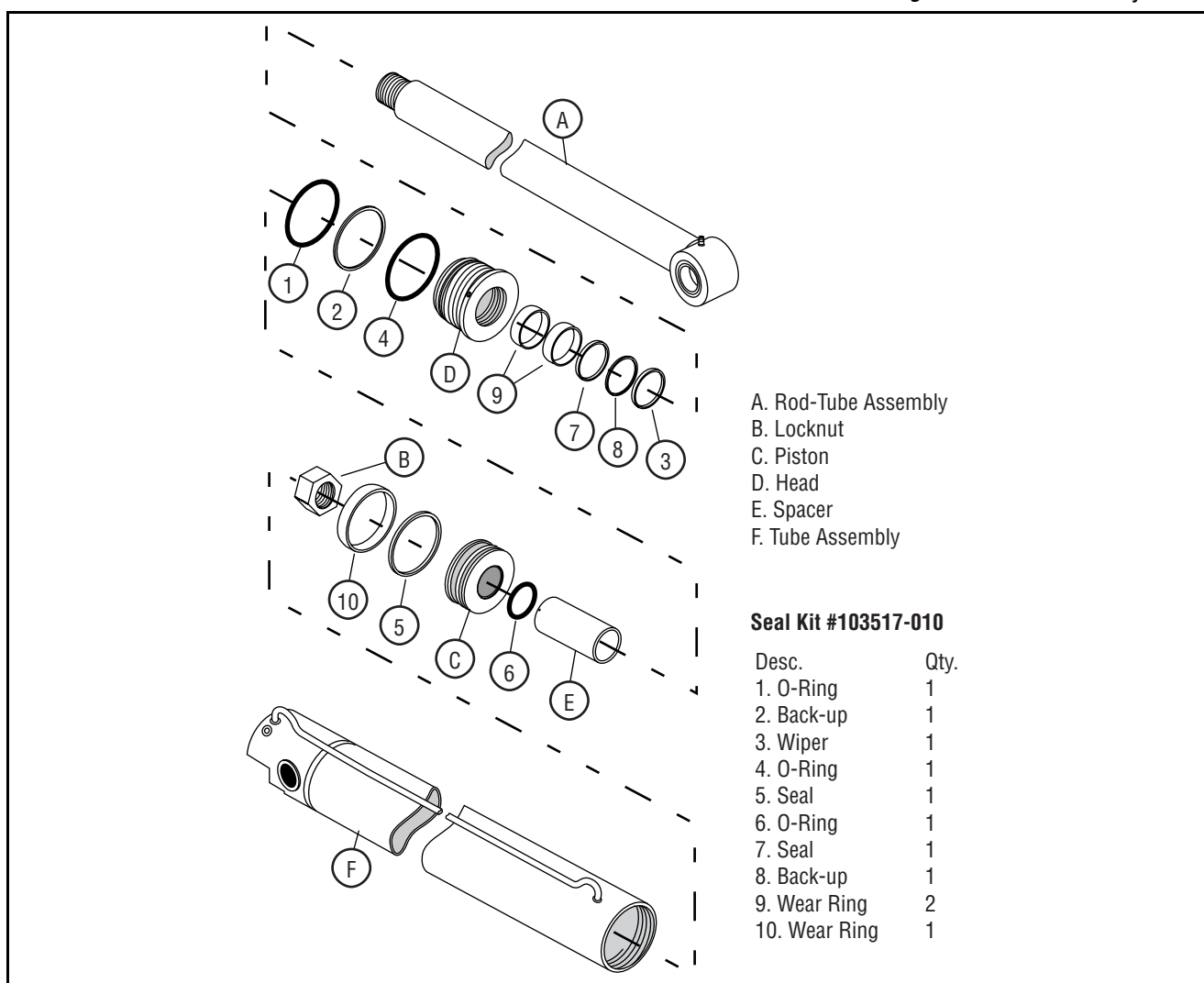


Figure 2-22: Slave Cylinder

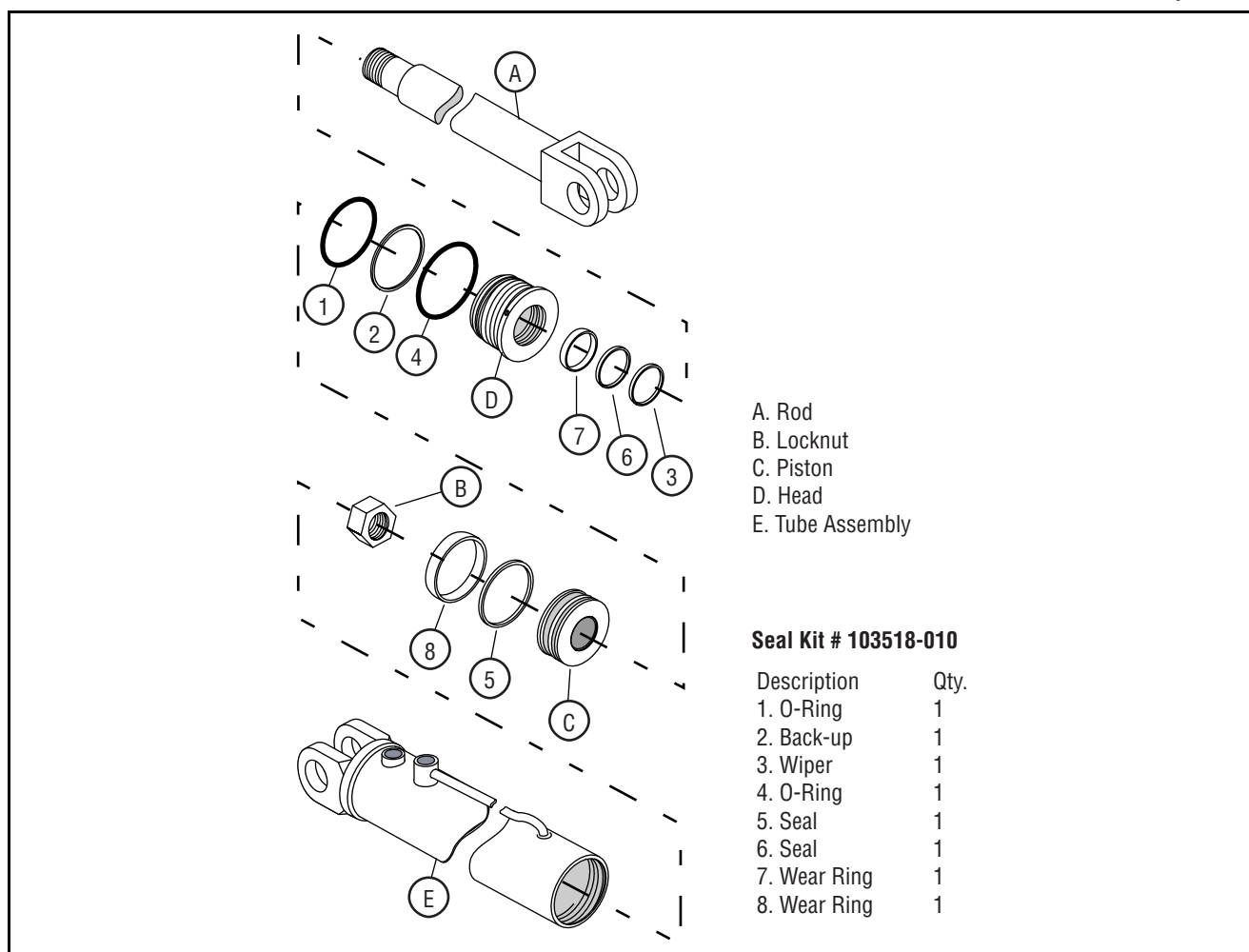
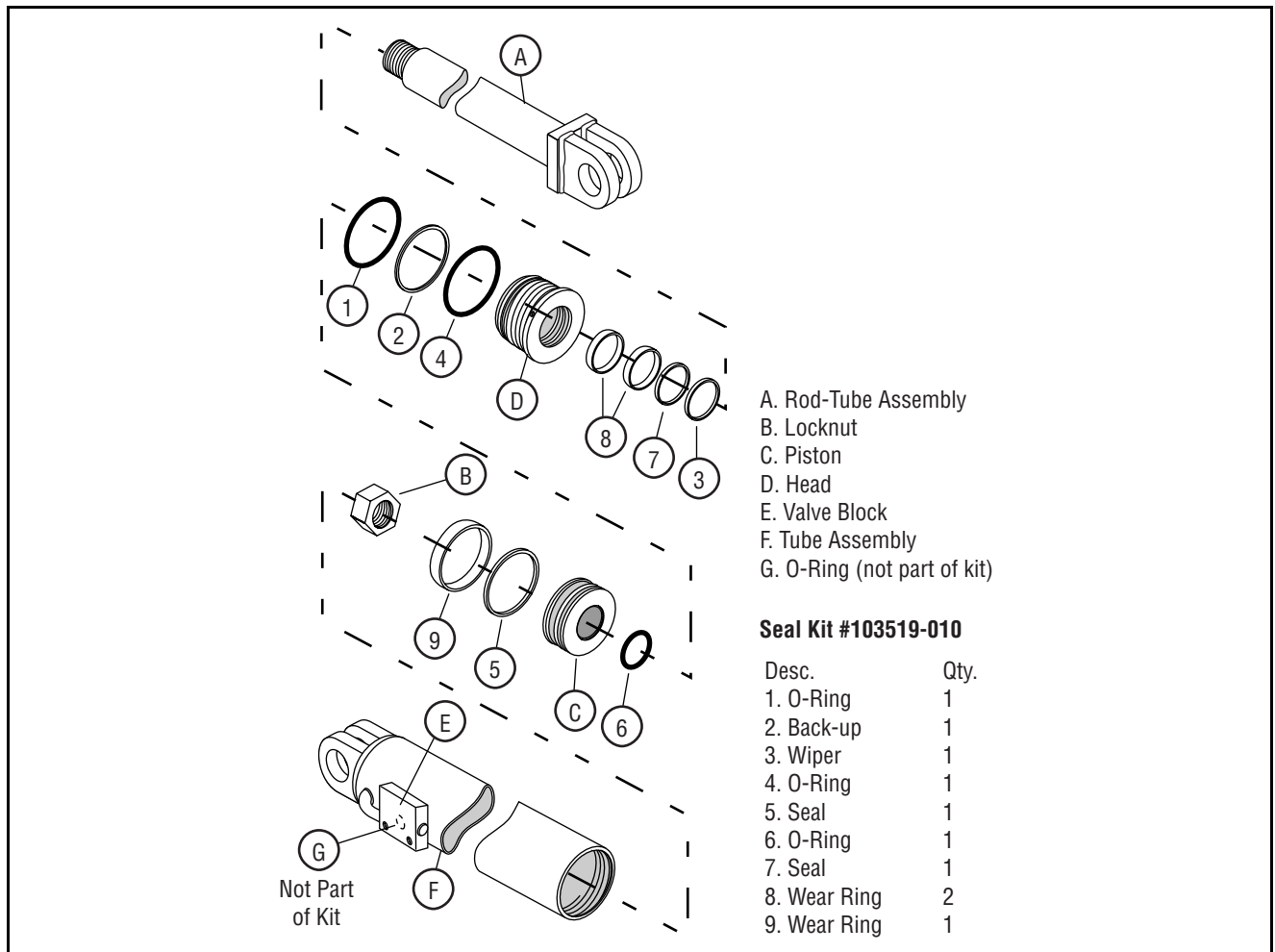
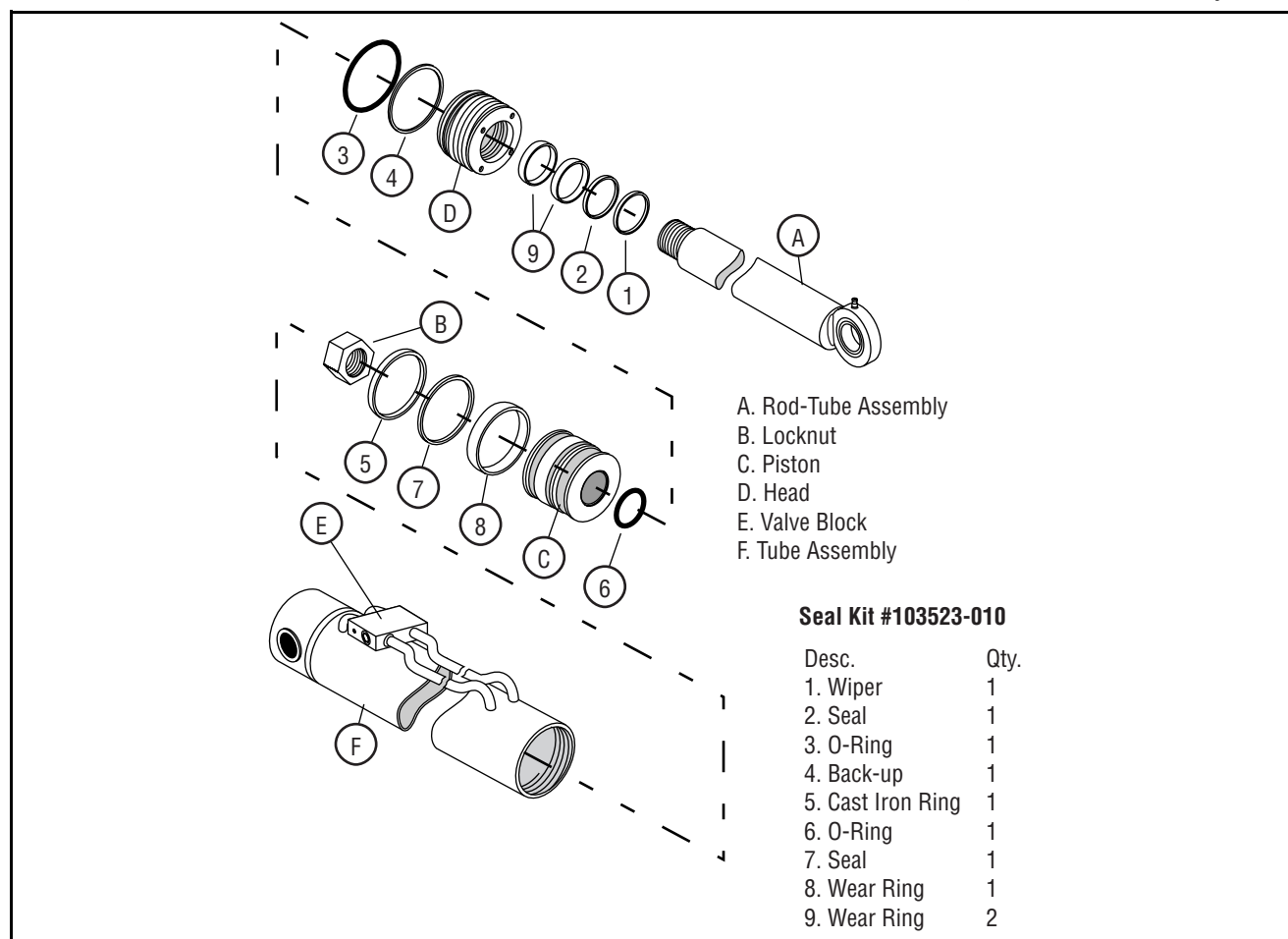
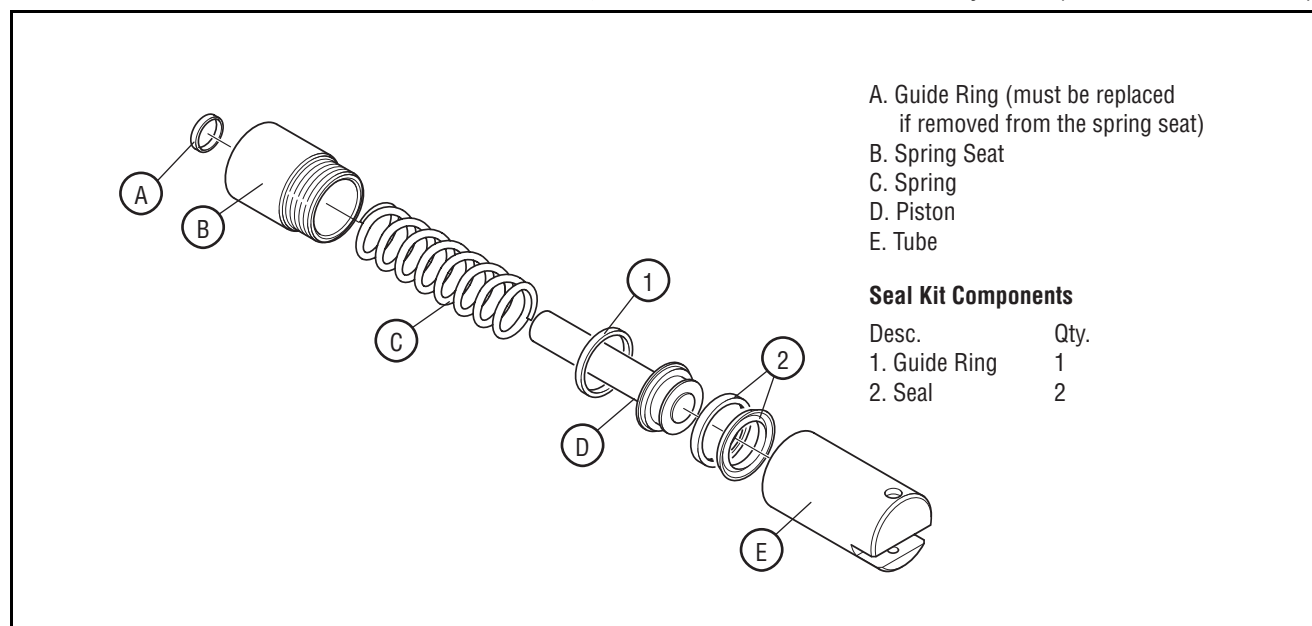


Figure 2-23: Frame Tilt Cylinder



**Figure 2-24:** Stabilizer Cylinder**Figure 2-25:** External Park Brake Cylinder (serial #159 and later)



## TROUBLESHOOTING

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### 3.1 INTRODUCTION

The following section on troubleshooting provides guidelines on the types of problems users may encounter in the field, helps determine the cause of problems, and suggests proper corrective action.

Careful inspection and accurate analysis of the symptoms listed in the Troubleshooting Guide will localize the trouble more quickly than any other method. This manual cannot cover all possible problems that may occur. If a specific problem is not covered in this manual, call our toll free number for service assistance.

Referring to the Safety, Operation, and Preventative Maintenance Manual and Section 4--Schematics will aid in understanding the operation and function of the various components and systems of the Work Platform and help in diagnosing and repair of the machine.

### GENERAL PROCEDURE

Thoroughly study hydraulic and electrical schematics in **Section 4**. Check for loose connections and short circuits. Check/repair/replace each component in the Truth Table which is listed under each machine function which does not operate properly.

Use the charts on the following pages to help determine the cause of a fault in your UpRight machine.

**NOTE:** Spike protection diodes at components have been left out of the charts to eliminate confusion.

### **W A R N I N G**

*When troubleshooting, ensure that the work platform is resting on a firm, level surface.*

*Unplug the machine or disconnect the battery when replacing or testing the continuity of any electrical component.*

#### **UPRIGHT USA**

Tel: 1-800-926-5438  
1-559-891-5200  
FAX: 1-559-896-9244

#### **UPRIGHT EUROPE**

Tel: +31-10-238-0000  
FAX: +31-10-238-0001

## 3.2 TROUBLESHOOTING

1. Verify your problem.
  - Do a full function test and note all functions that are not operating correctly.
2. Narrow the possible causes of the malfunction.
  - Use the troubleshooting guide to determine which components are common to all circuits that are not functioning correctly.
3. Identify the problem component.
  - Test components that are common to all circuits that are not functioning correctly. Remember to check wires and terminals between suspect components. Be sure to check connections to battery negative.
4. Repair or replace component found to be faulty.
5. Verify that repair is complete.
  - Do a full function test from both platform and chassis controls to verify that all functions are operating correctly and machine is performing to specified values

### ADJUSTMENT PROCEDURES

Hydraulic settings must be checked whenever a hydraulic component is repaired or replaced.

Connect a pressure meter of appropriate range to the test port located on the hydraulic manifold. See Section 2.2.

Correct pressure settings are listed in the hydraulic schematic.

3.3 ELECTRICAL SYSTEM TRUTH TABLE

SCHEMATIC DESIGNATION	COMPONENT	FUNCTION	ENGINE START	ENGINE RUN	GRID HEATER OPERATION	BATTERY CHARGE	HOUR METER FUNCTION	PARK BRAKE	FRAME LEVEL	OSCILLATING AXLE LOCKOUT	AUXILIARY HYDRAULIC FUNCTION	FORK TILT FUNCTION	1ST GEAR FORWARD	2ND GEAR FORWARD	3RD GEAR FORWARD	4TH GEAR FORWARD	1ST GEAR REVERSE	2ND GEAR REVERSE	3RD GEAR REVERSE	MOMENTARY CREEP SPEED	REVERSE ALARM	HORN	STEERING MODE SELECT	ALTERNATOR INDICATOR	GRID HEATER INDICATOR	HIGH TRANSMISSION TEMPERATURE INDICATOR	HIGH COOLANT TEMPERATURE INDICATOR	AIR FILTER RESTRICTION INDICATOR	LOW ENGINE OIL PRESSURE INDICATOR	HIGH HYDRAULIC OIL TEMPERATURE INDICATOR	HYDRAULIC FILTER RESTRICTION INDICATOR	LOW BRAKE ACCUMULATOR PRESSURE INDICATOR	PARK BRAKE INDICATOR	FUEL GAUGE	OIL PRESSURE GAUGE	VOLTMETER GAUGE	COOLANT TEMPERATURE GAUGE
ALM1	Horn																				X																
ALM2	Reverse Alarm																			X																	
ALT	Alternator	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BAT	Battery	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CM	Control Module	X		X																				X													
D1	Diode	X	X		X	X																															
D2	Diode											X	X				X	X																			
F1	Indicator Light Fuse 10A			X																				X	X	X	X	X	X	X	X						
F2	Gauge Fuse 10A																																	X	X	X	X
F3	Seat/Starter Interlock Fuse 10A	X																																			
F4	Steering Mode Fuse 10A																						X														
F5	Creep Mode Fuse 10A																			X																	
F6	Rear Axle Lock Fuse 10A									X																											
F7	Control Handle Select Fuse 10A								X		X	X																									
F8	Key Switch Fuse 25A	X	X	X				X	X	X	X	X							X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
F9	Horn Fuse 15A																					X															
F13	Grid Heater Fuse 110A	X		X																																	
F14	Grid Heater Fuse 110A	X		X																																	
G1	Fuel Gauge																																	X			
G2	Oil Pressure Gauge																																		X		
G3	Coolant Temperature Gauge																																				X
G4	Alternator Gauge																																			X	
GH1	Grid Heater	X		X																																	
GH2	Grid Heater	X		X																																	
HM	Hour Meter					X																															
L1	Alternator Light																							X													
L2	Air Filter Restriction Light																										X										
L3	High Transmission Temp Light																								X												
L4	Low Oil Pressure Light																											X									
L5	Hydraulic Filter Restriction Light																													X							
L6	High Hydraulic Oil Temp Light																												X								
L7	High Coolant Temp Light																									X											
L8	Low Brake Accumulator Pressure Light																														X						
L9	Grid Heater Light			X																					X												
L10	Park Brake On Light	X																															X				
R1	Main Relay	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
R2	Seat/Start Interlock Relay	X																																			
R3	Park Brake/Start Interlock Relay	X																																			
R4	Proximity Relay									X																											
R5	Selector Valve Control Relay										X	X																									
R6	Transmission Shift Relay															X																					
R7	Transmission Shift Relay												X			X																					
R8	Transmission Shift Relay											X	X		X	X	X																				
R9	Starter Relay	X																																			

SCHEMATIC DESIGNATION	COMPONENT	FUNCTION	ENGINE START	ENGINE RUN	GRID HEATER OPERATION	BATTERY CHARGE	HOUR METER FUNCTION	PARK BRAKE	FRAME LEVEL	OSCILLATING AXLE LOCKOUT	AUXILIARY HYDRAULIC FUNCTION	FORK TILT FUNCTION	1ST GEAR FORWARD	2ND GEAR FORWARD	3RD GEAR FORWARD	4TH GEAR FORWARD	1ST GEAR REVERSE	2ND GEAR REVERSE	3RD GEAR REVERSE	MOMENTARY CREEP SPEED	REVERSE ALARM	HORN	STEERING MODE SELECT	ALTERNATOR INDICATOR	GRID HEATER INDICATOR	HIGH TRANSMISSION TEMPERATURE INDICATOR	HIGH COOLANT TEMPERATURE INDICATOR	AIR FILTER RESTRICTION INDICATOR	LOW ENGINE OIL PRESSURE INDICATOR	HIGH HYDRAULIC OIL TEMPERATURE INDICATOR	HYDRAULIC FILTER RESTRICTION INDICATOR	LOW BRAKE ACCUMULATOR PRESSURE INDICATOR	PARK BRAKE INDICATOR	FUEL GAUGE	OIL PRESSURE GAUGE	VOLTMETER GAUGE	COOLANT TEMPERATURE GAUGE
R10	Grid Heater Relay				X																																
R11	Grid Heater Relay				X																																
R12	Fuel Shut-off Relay		X																																		
S1	Key Switch		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
S2	Air Filter Restriction Switch																										X										
S3	High Transmission Temperature Switch																								X												
S4	Low Oil Pressure Switch																												X								
S5A	Low Hydraulic Oil Temperature Switch																														X						
S5B	Hydraulic Filter Restriction Switch																														X						
S6	High Hydraulic Fluid Temperature Switch																												X								
S7	High Coolant Temperature Switch																									X											
S8	Low Brake Accumulator Pressure Switch																															X					
S9	Directional Switch		X									X	X	X	X	X	X	X	X	X	X																
S10	Park Brake Switch		X				X														X												X				
S11	Steering Mode Switch																					X															
S12	Selector Control Switch									X	X																										
S13	Frame Level Switch							X																													
S14	Horn Switch																					X															
S15	Creep Speed Switch																		X																		
S16	Master Shut-off Switch		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SN1	Fuel Sender																																	X			
SN2	Oil Pressure Sender																																		X		
SN3	Coolant Temperature Sender																																				X
SN4	Proximity Sensor									X																											
SN5	Engine Temperature Sensor				X																				X												
SOL1	Starter Solenoid		X																																		
SOL2	Fuel Shutoff Solenoid		X	X																																	
SOL4A	Oscillating Axle Lockout Solenoid									X																											
SOL4B	Oscillating Axle Lockout Solenoid									X																											
SOL9A	Transmission Solenoid											X	X	X	X																						
SOL9B	Transmission Solenoid															X	X	X																			
SOL9C	Transmission Solenoid																		X																		
SOL9D	Transmission Solenoid											X				X																					
SOL9E	Transmission Solenoid											X	X			X	X																				
SOL10	Park Brake Release Solenoid					X																															
SOL11A	Four Wheel Steer Solenoid																						X														
SOL11B	Crab Steer Mode Solenoid																					X															
SOL12A	Selector Valve Solenoid										X	X																									
SOL12B	Selector Valve Solenoid										X	X																									
SOL12C	Selector Valve Solenoid										X	X																									
SOL12D	Selector Valve Solenoid										X	X																									
SOL13A	Frame Level Solenoid							X																													
SOL13B	Frame Level Solenoid							X																													

## 3.4 HYDRAULIC SYSTEM

**Table 3-2:** Hydraulic Truth Table

SCHEMATIC DESIGNATION	COMPONENT	FUNCTION	BOOM LIFT/LOWER	BOOM EXTEND/RETRACT	FORK TILT	AUXILIARY HYDRAULIC POWER (OPTIONAL)	FRAME LEVEL	STEERING	STEERING MODE SELECT	SERVICE BRAKE	PARK BRAKE RELEASE	STABILIZER	PILOT SYSTEM	OSCILLATING AXLE
AC	Accumulator									X				
AUX	Auxiliary Hydraulic Couplers (option)					X								
BR	Service Brakes									X				
CB1A	Extend Counterbalance Valve			X										
CB1B	Retract Counterbalance Valve			X										
CB2	Lift Counterbalance		X											
CB3A	Stabilizer Counterbalance Valve (option)											X		
CB3B	Stabilizer Counterbalance Valve (option)											X		
CB3C	Stabilizer Counterbalance Valve (option)											X		
CB3D	Stabilizer Counterbalance Valve (option)											X		
CB4A	Fork Tilt Counterbalance Valve				X									
CB4B	Fork Tilt Counterbalance Valve				X									
CB13A	Frame Level Counterbalance Valve						X							
CB13B	Frame Level Counterbalance Valve						X							
CV6	Accumulator Check Valve (unservicable)									X				
CV11A	Check Valve							X						
CV11B	Check Valve							X						
CYL1	Extend Cylinder			X										
CYL2	Lift Cylinder		X											
CYL3A	Stabilizer Cylinder (option)											X		
CYL3B	Stabilizer Cylinder (option)											X		
CYL4A	Fork Tilt Cylinder				X									
CYL4B	Slave Cylinder				X									
CYL4C	Slave Cylinder				X									
CYL10	Park Brake Cylinder										X			
CYL11A	Front Steering Cylinder							X						
CYL11B	Rear Steering Cylinder							X						
CYL13A	Frame Level Rear Cylinder						X							
CYL13B	Frame Level Front Cylinder						X							
DVD	Priority Flow Divider		X	X	X	X	X	X	X	X	X	X	X	X
F1	Suction Strainer													
F2	Hydraulic Return Filter													
LC1	Extend Load Compensator Valve			X										
LC2	Lift Load Compensator Valve		X											
LC4	Fork Tilt Load Compensator Valve				X									
LC5	Auxiliary Load Compensator Valve					X								
LC13	Frame Level Load Compensator Valve						X							
OC	Oil Cooler													
PMP	Hydraulic Pump		X	X	X	X	X	X	X	X	X	X	X	X
RV1	Extend Relief Valve (not adjustable)			X										
RV2	Lift Relief Valve (not adjustable)		X											
RV4A	Fork Tilt Relief Valve (not adjustable)				X									
RV4B	Tilt Down Relief Valve (not adjustable)				X									
RV4C	Tilt Up Relief Valve (not adjustable)				X									

**Table 3-2:** Hydraulic Truth Table

SCHEMATIC DESIGNATION	COMPONENT	FUNCTION	BOOM LIFT/LOWER	BOOM EXTEND/RETRACT	FORK TILT	AUXILIARY HYDRAULIC POWER (OPTIONAL)	FRAME LEVEL	STEERING	STEERING MODE SELECT	SERVICE BRAKE	PARK BRAKE RELEASE	STABILIZER	PILOT SYSTEM	OSCILLATING AXLE
RV5	Auxiliary Relief Valve (not adjustable)					X								
RV7	Main Relief Valve		X	X	X	X	X						X	X
RV8	Brake and Steering Priority Relief Valve		X	X	X	X	X	X	X	X	X	X	X	X
RV13	Frame Level Relief Valve (not adjustable)						X							
SV1	Extend Shuttle Valve			X										
SV2	Lift Shuttle Valve		X											
SV13	Frame Level Shuttle Valve						X							
V1	Extend Valve			X										
V2	Lift Valve		X											
V3A	Stabilizer Valve (option)											X		
V3B	Stabilizer Valve (option)											X		
V3C	Power Beyond Valve (option)											X		
V4	Fork Tilt Valve				X									
V5	Auxiliary Hydraulic Valve					X								
V6A	Brake Priority Pilot Valve (unservicable)							X		X				
V6B	Brake Priority Pilot Valve (unservicable)									X				
V6C	Brake Pedal Valve									X				
V7	Unloader Valve		X	X	X	X	X							
V8	Pilot Pressure Valve		X	X	X	X					X		X	
V10	Park Brake Valve										X			
V11A	Steering Valve							X						
V11B	Steering Mode Selector Valve							X	X					
V12A	Function Selector Valve			X		X								
V12B	Function Selector Valve			X		X								
V12C	Function Selector Valve		X		X									
V12D	Function Selector Valve		X		X									
V12E	Control Handle Valve		X	X	X	X							X	
V13A	Frame Level Valve						X							
V13B	Oscillating Axle Lockout Valve													X
V13C	Oscillating Axle Lockout Valve													X

SCHMATICS

4.1 INTRODUCTION

This section contains electrical and hydraulic schematics and associated information for maintenance purposes.

The diagrams are to be used in conjunction with the *Troubleshooting Truth Tables* in *Section 3*. They allow understanding of the makeup and functions of the systems for checking, tracing, and faultfinding during troubleshooting analysis.

The components that comprise the electrical and hydraulic systems are given a reference designation and are explained as to function and location in the following tables.

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4.2 103030-000 ELECTRICAL SCHEMATIC

Reference Designation	Name	Function	Location
ALM1	Horn	Driver operated alert signal	Chassis, below boom rest
ALM2	Reverse Alarm	Signals that machine is in reverse	Rear of machine
ALT	Alternator	Provides electrical power to the machine electrical system	Engine
BAT	Battery	Provides electrical energy to start the machine	Battery tray under the radiator
CM	Control Module	Controls intake air Grid Heaters	Engine Compartment
D1	Diode	Prevents feedback from the Alternator	Wire loom near Alternator plug
D2	Diode	Allows proper transmission shift sequence	Wire loom near Directional Switch plug
F1	Indicator Light Fuse 10A	Protects the Indicator Light wiring	Fuse Block Under Dash
F2	Gauge Fuse 10A	Protects the Gauge wiring	Fuse Block Under Dash
F3	Seat/Starter Interlock Fuse 10A	Protects the Seat/Starter Interlockwiring	Fuse Block Under Dash
F4	Steering Mode Fuse 10A	Protects the Steering Mode wiring	Fuse Block Under Dash
F5	Creep Mode Fuse 10A	Protects the Creep Mode wiring	Fuse Block Under Dash
F6	Rear Axle Lock Fuse 10A	Protects the Frame Level Lockout wiring	Fuse Block Under Dash
F7	Control Handle Select Fuse 10A	Protects the Control Handle Select wiring	Fuse Block Under Dash
F8	Key Switch Fuse 25A	Protects the Key Switch wiring	Fuse Block Under Dash
F9	Horn Fuse 15A	Protects the Horn wiring	Fuse Block Under Dash
F13	Grid Heater Fuse 110A	Protects the Grid Heater wiring	Engine Compartment near the Grid Heater Relay
F14	Grid Heater Fuse 110A	Protects the Grid Heater wiring	Engine Compartment near the Grid Heater Relay
G1	Fuel Gauge	Indicates fuel level	Dash
G2	Oil Pressure Gauge	Indicates oil pressure level	Dash
G3	Coolant Temperature Gauge	Indicates coolant temperature	Dash
G4	Alternator Gauge	Indicates Alternator voltage	Dash
GH1	Grid Heater	Preheats air for the engine when the ambient operating temperature is low	Engine
GH2	Grid Heater	Preheats air for the engine when the ambient operating temperature is low	Engine
HM	Hour Meter	Indicates the number of hours that the machine has operated	Left Side of Dash
L1	Alternator Light	Indicates that alternator is not charging the electrical system	Dash
L2	Air Filter Restriction Light	Indicates that air filters need service or replacement	Dash
L3	High Transmission Temp Light	Indicates high transmission fluid temperature	Dash
L4	Low Oil Pressure Light	Indicates low engine oil pressure	Dash

Reference Designation	Name	Function	Location
L5	Hydraulic Filter Restriction Light	Indicates that hydraulic filter needs replacement	Dash
L6	High Hydraulic Oil Temp Light	Indicates high hydraulic fluid temperature	Dash
L7	High Coolant Temp Light	Indicates high engine coolant temperature and engine overheating	Dash
L8	Low Brake Accumulator Pressure Light	Indicates low hydraulic pressure in the brake system	Dash
L9	Grid Heater Light	Indicates that the Grid Heaters are Activated	Dash
L10	Park Brake On Light	Indicates that the Park Brake is applied	Dash
R1	Main Relay	Provides power to Fuses	Fuse/Relay Block under the dash
R2	Seat/Start Interlock Relay	Ensures that the driver is seated before start-up is allowed	Fuse/Relay Block under the dash
R3	Park Brake/ Start Interlock Relay	Ensures that the park brake is engaged before start-up is allowed	Fuse/Relay Block under the dash
R4	Proximity Relay	Locks out the Frame Level function when the boom is raised above 40°	Fuse/Relay Block under the dash
R5	Selector Valve Control Relay	Operstes Function Select Valve solenoids	Fuse/Relay Block under the dash
R6	Transmission Shift Relay	Activates 1st gear solenoid	Fuse/Relay Block under the dash
R7	Transmission Shift Relay	Activates 2nd gear solenoid	Fuse/Relay Block under the dash
R8	Transmission Shift Relay	Activates high speed solenoid	Fuse/Relay Block under the dash
R9	Starter Relay	Engages the starter motor	Engine Compartment
R10	Grid Heater Relay	Activates the Grid Heater	Engine Compartment behind the Engine
R11	Grid Heater Relay	Activates the Grid Heater	Engine Compartment behind the Engine
R12	Fuel Shut-off Relay	Operates the Fuel Shut-Off Solenoid	Engine Compartment
S1	Key Switch	Allows power to the electrical system for machine operation	Dash
S2	Air Filter Restriction Switch	Signals that air filters need service or replacement	Air Filter Assembly On Engine
S3	High Transmission Temperature Switch	Signals high transmission fluid temperature	Transmission
S4	Low Oil Pressure Switch	Signals low engine oil pressure	Engine
S5A	Low Hydraulic Oil Temperature Switch	Cuts out the Hydraulic Filter Restriction circuit when fluid temperature is below 100° F	Top of the hydraulic tank
S5B	Hydraulic Filter Restriction Switch	Signals that hydraulic filter needs replacement	Hydraulic Return Filter
S6	High Hydraulic Fluid Temperature Switch	Signals high hydraulic fluid temperature	Top of the hydraulic tank
S7	High Coolant Temperature Switch	Signals high engine coolant temperature and engine overheating	Engine

Reference Designation	Name	Function	Location
S8	Low Brake Pressure Switch	Signals low oil pressure in the brake system	Under Dash
S9	Directional Switch	Changes the transmission direction and speed	Steering Column
S10	Park Brake Switch	Sets and releases the park brake	Dash
S11	Steering Mode Switch	Selects between the three steering modes	Dash
S12	Selector Control Switch	Selects tilt/auxillary functions	Control Handle
S13	Frame Level Switch	Tilts the frame left and right	Armrest near Control Handle
S14	Horn Switch	Sounds the horn	Steering Wheel
S15	Creep Speed Switch	Drops transmission into creep speed	Dash
S16	Master Shut-off Switch	Allows power to the engine electrical system for machine operation	Engine
SN1	Fuel Sender	Senses fuel level	Fuel Tank
SN2	Oil Pressure Sender	Provides information to the Oil Pressure Gauge	Engine
SN3	Coolant Temperature Sender	Provides information to the Coolant Temperature Gauge	Engine
SN4	Proximity Sensor	Locks out the Oscillating Axle function when the boom is raised above 40°	Rear of Boom
SN5	Engine Temperature Sensor	Provides information to the Control Module	Engine
SOL1	Starter Solenoid	Activates Starter Motor	Engine, on the Starter
SOL2	Fuel Shutoff Solenoid	When activated, allows fuel for engine operation	Engine
SOL4A	Oscillating Axle Lockout Solenoid	Locks axle oscillation when the boom is raised above 40°	Front Frame Level Cylinder
SOL4B	Oscillating Axle Lockout Solenoid	Locks axle oscillation when the boom is raised above 40°	Rear Frame Level Cylinder
SOL9A	Transmission Solenoid	Forward machine motion	Transmission
SOL9B	Transmission Solenoid	Reverse machine motion	Transmission
SOL9C	Transmission Solenoid	High speed	Transmission
SOL9D	Transmission Solenoid	1st speed	Transmission
SOL9E	Transmission Solenoid	2nd speed	Transmission
SOL10	Park Brake Release Solenoid	Sets and releases the park brake	Under the floor plate in the cab
SOL11A	Four Wheel Steer Solenoid	Selects between the three steering modes	Right side of the cab
SOL11B	Crab Steer Mode Solenoid	Selects between the three steering modes	Right side of the cab
SOL12A	Selector Valve Solenoid	Selects between the extend/lift and tilt/auxillary functions	Function Select Valve Block at the rear end of the machine
SOL12B	Selector Valve Solenoid	Selects between the extend/lift and tilt/auxillary functions	Function Select Valve Block at the rear end of the machine
SOL12C	Selector Valve Solenoid	Selects between the extend/lift and tilt/auxillary functions	Function Select Valve Block at the rear end of the machine

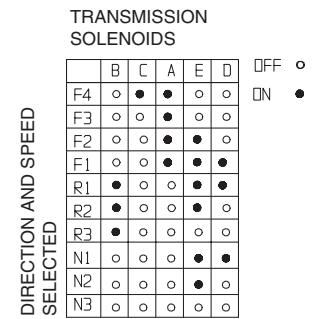
Reference Designation	Name	Function	Location
SOL12D	Selector Valve Solenoid	Selects between the extend/lift and tilt/auxillary functions	Function Select Valve Block at the rear end of the machine
SOL13A	Frame Level Solenoid	Frame level right	Main Control Valve Block
SOL13B	Frame Level Solenoid	Frame level left	Main Control Valve Block

The following denotes a plug and terminal connection located on the lower right side of the cab. The first letter will be either a T or a B, denoting either the top or bottom plug. The second letter is the terminal designation for that plug.





**Figure 4-1: 103030-000 Electrical Schematic**



4.3 103032-000 HYDRAULIC SCHEMATIC

Reference Designation	Name	Function	Location
AC	Accumulator	Stores hydraulic oil pressure	
AUX	Auxillary Hydraulic Couplers (option)	Connests optional machine attachments to the hydraulic system	End of the boom
BR	Service Brakes	Stops the machine from moving	Drive Axles
CB1A	Extend Counterbalance Valve	Retains oil in the cylinder to guard against hose breakage	Extend Cylinder
CB1B	Retract Counterbalance Valve	Retains oil in the cylinder to guard against hose breakage	Extend Cylinder
CB2	Lift Counterbalance	Retains oil in the cylinder to guard against hose breakage	Lift Cylinder
CB3A	Stabilizer Counterbalance Valve (option)	Retains oil in the cylinder to guard against hose breakage	Stabilizer Cylinder
CB3B	Stabilizer Counterbalance Valve (option)	Retains oil in the cylinder to guard against hose breakage	Stabilizer Cylinder
CB3C	Stabilizer Counterbalance Valve (option)	Retains oil in the cylinder to guard against hose breakage	Stabilizer Cylinder
CB3D	Stabilizer Counterbalance Valve (option)	Retains oil in the cylinder to guard against hose breakage	Stabilizer Cylinder
CB4A	Fork Tilt Counterbalance Valve	Retains oil in the cylinder to guard against hose breakage	Fork Tilt Cylinder
CB4B	Fork Tilt Counterbalance Valve	Retains oil in the cylinder to guard against hose breakage	Fork Tilt Cylinder
CB13A	Frame Level Counterbalance Valve	Retains oil in the cylinder to guard against hose breakage	Front Frame Tilt Cylinder
CB13B	Frame Level Counterbalance Valve	Retains oil in the cylinder to guard against hose breakage	Front Frame Tilt Cylinder
CV6	Accumulator Check Valve (unservicable)	Prevents the loss of accumulator pressure	Brake Control Valve
CV11A	Check Valve	Prevents Steering System cavitation	internal to Steering Valve
CV11B	Check Valve	Prevents backflow to Steering Valve	Auxillary port of Steering Valve
CYL1	Extend Cylinder	Extends the boom	Inside the boom
CYL2	Lift Cylinder	Raises the boom	Beneath the boom
CYL3A	Stabilizer Cylinder (option)	Extends and retracts the stabilizer arm	Stabilizer weldment
CYL3B	Stabilizer Cylinder (option)	Extends and retracts the stabilizer arm	Stabilizer weldment
CYL4A	Fork Tilt Cylinder	Adjusts the angle of the forks or attachment	Attachment carriage at the front of the boom
CYL4B	Slave Cylinder	Maintains the angle of the forks or attachment as the boom angle changes	Rear end of machine frame
CYL4C	Slave Cylinder	Maintains the angle of the forks or attachment as the boom angle changes	Rear end of the machine frame
CYL10	Park Brake Cylinder	Secures the machine against motion	Front drive axle
CYL11A	Steering Cylinder	Steers the front axle	Front drive axle
CYL11B	Steering Cylinder	Steers the rear axle	Rear drive axle

Reference Designation	Name	Function	Location
CYL13A	Frame Level Rear Cylinder	Allows the axle to oscillate; Levels the frame of the machine on uneven ground; Locks Frame Level system when the boom is raised above 40°	Chassis rear on the left side of the machine
CYL13B	Frame Level Front Cylinder	Levels the frame of the machine on uneven ground	Chassis front on the left side of the machine
DVD	Priority Flow Dividor	Provides priority flow to the Brake and Steering Systems	Main Control Valve at rear end of the machine frame
F1	Suction Strainer	Filters oil	Hydraulic tank
F2	Hydrualic Return Filter	Filters oil	Hydraulic Tank
LC1	Extend Load Compensator Valve	Maintains function speed while using multiple functions	Main Control Valve at rear end of the machine frame
LC2	Lift Load Compensator Valve	Maintains function speed while using multiple functions	Main Control Valve at rear end of the machine frame
LC4	Fork Tilt Load Compensator Valve	Maintains function speed while using multiple functions	Main Control Valve at rear end of the machine frame
LC5	Auxillary Load Compensator Valve	Maintains function speed while using multiple functions	Main Control Valve at rear end of the machine frame
LC13	Frame Level Load Compensator Valve	Maintains function speed while using multiple functions	Main Control Valve at rear end of the machine frame
OC	Oil Cooler	Cools oil	Radiator
PMP	Hydraulic Pump	Provides oil flow for machine hydraulic functions	Upper part of the Transmission
RV1	Extend Relief Valve (not adjustable)	Overpressure protecion	Main Control Valve at rear end of the machine frame
RV2	Lift Relief Valve (not adjustable)	Overpressure protecion	Main Control Valve at rear end of the machine frame
RV4A	Fork Tilt Relief Valve (not adjustable)	Overpressure protecion	Main Control Valve at rear end of the machine frame
RV4B	Tilt Down Relief Valve (not adjustable)	Overpressure protecion	Main Control Valve at rear end of the machine frame
RV4C	Tilt Up Relief Valve (not adjustable)	Overpressure protecion	Main Control Valve at rear end of the machine frame
RV5	Auxillary Relief Valve (not adjustable)	Overpressure protecion	Main Control Valve at rear end of the machine frame
RV7	Main Relief Valve	System overpressure protecion	Main Control Valve at rear end of the machine frame
RV8	Brake and Steering Priority Relief Valve	Overpressure protection for the Brake and Steering System	Main Control Valve at rear end of the machine frame
RV13	Frame Level Relief Valve (not adjustable)	Overpressure protecion	Main Control Valve at rear end of the machine frame
SV1	Extend Shuttle Valve	Works with Load Compensator valves to smooth machine function	Main Control Valve at rear end of the machine frame
SV2	Lift Shuttle Valve	Works with Load Compensator valves to smooth machine function	Main Control Valve at rear end of the machine frame
SV13	Frame Level Shuttle Valve	Works with Load Compensator valves to smooth machine function	Main Control Valve at rear end of the machine frame

Reference Designation	Name	Function	Location
V1	Extend Valve	Provides flow to the Extend cylinder	Main Control Valve at rear end of the machine frame
V2	Lift Valve	Provides flow to the Lift Cylinder	Main Control Valve at rear end of the machine frame
V3A	Stabilizer Valve (option)	Provides flow to Stabilizer Cylinder	Inside Stabilizer Frame at the front of the machine
V3B	Stabilizer Valve (option)	Provides flow to Stabilizer Cylinder	Inside Stabilizer Frame at the front of the machine
V3C	Power Beyond Valve (option)	Allows priority flow back to main valve block	Inside Stabilizer Frame at the front of the machine
V4	Fork Tilt Valve	Provides flow to fork tilt system	Main Control Valve at rear end of the machine frame
V5	Auxillary Hydraulic Valve	Provides flow to optional machine attachments (option)	Main Control Valve at rear end of the machine frame
V6A	Brake Priority Pilot Valve (unservicable)	Provides priority flow to brake system	Brake Control Valve in the compartment under the seat
V6B	Brake Priority Pilot Valve (unservicable)	Maintains Accumulator pressure	Brake Control Valve in the compartment under the seat
V6C	Brake Pedal Valve	Actuates the service brakes	Cab floor
V7	Unloader Valve	Returns oil to the tank when no function is selected	Main Control Valve at rear end of the machine frame
V8	Pilot Pressure Valve	Controls pilot system pressure	Main Control Valve at rear end of the machine frame
V10	Park Brake Valve	Disengages the Park Brake	Cab, under the floor plate
V11A	Steering Valve	Provides directional flow to the Steering System	Attached to the steering wheel
V11B	Steering Mode Selector Valve	Selects the steering mode	Right side of the cab
V12A	Function Selector Valve	Works in conjunction with the switch on the Control Handle to redirect pilot pressure to auxillary and tilt functions	Function Select Valve Block at the rear end of the machine frame
V12B	Function Selector Valve	Works in conjunction with the switch on the Control Handle to redirect pilot pressure to auxillary and tilt functions	Function Select Valve Block at the rear end of the machine frame
V12C	Function Selector Valve	Works in conjunction with the switch on the Control Handle to redirect pilot pressure to auxillary and tilt functions	Function Select Valve Block at the rear end of the machine frame
V12D	Function Selector Valve	Works in conjunction with the switch on the Control Handle to redirect pilot pressure to auxillary and tilt functions	Function Select Valve Block at the rear end of the machine frame
V12E	Control Handle Valve	Directs pilot pressure to function control valves	Cab arm rest
V13A	Frame Level Valve	Provides flow to the Frame Level system	Main Control Valve at rear end of the machine frame
V13B	Oscillating Axle Lockout Valve	Allow the rear axle to oscillate when the boom is below 40°	Rear Frame Level Cylinder
V13C	Oscillating Axle Lockout Valve	Allow the rear axle to oscillate when the boom is below 40°	Rear Frame Level Cylinder

## MAIN CONTROL VALVE

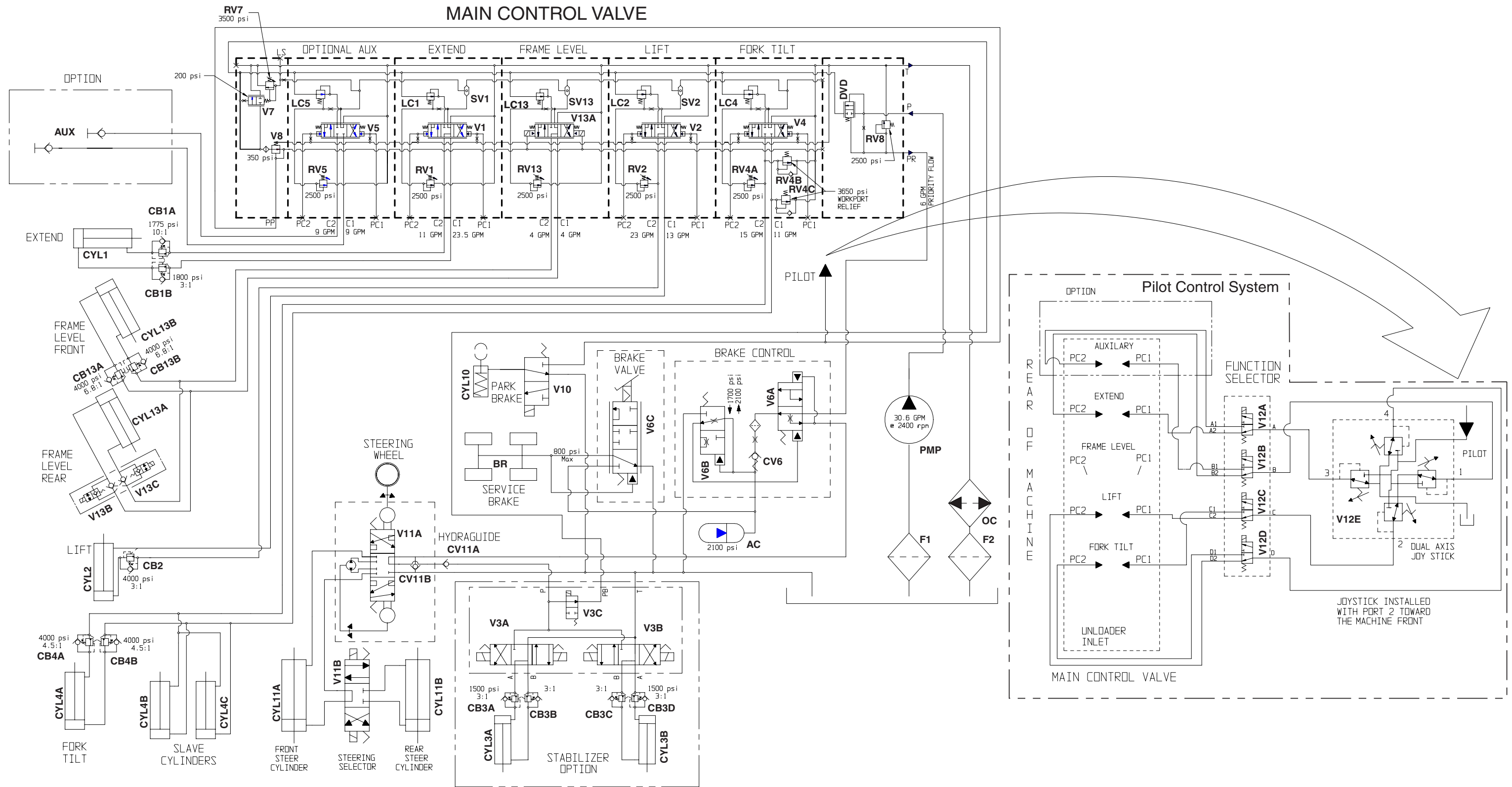


Figure 4-3: Main Control Valve

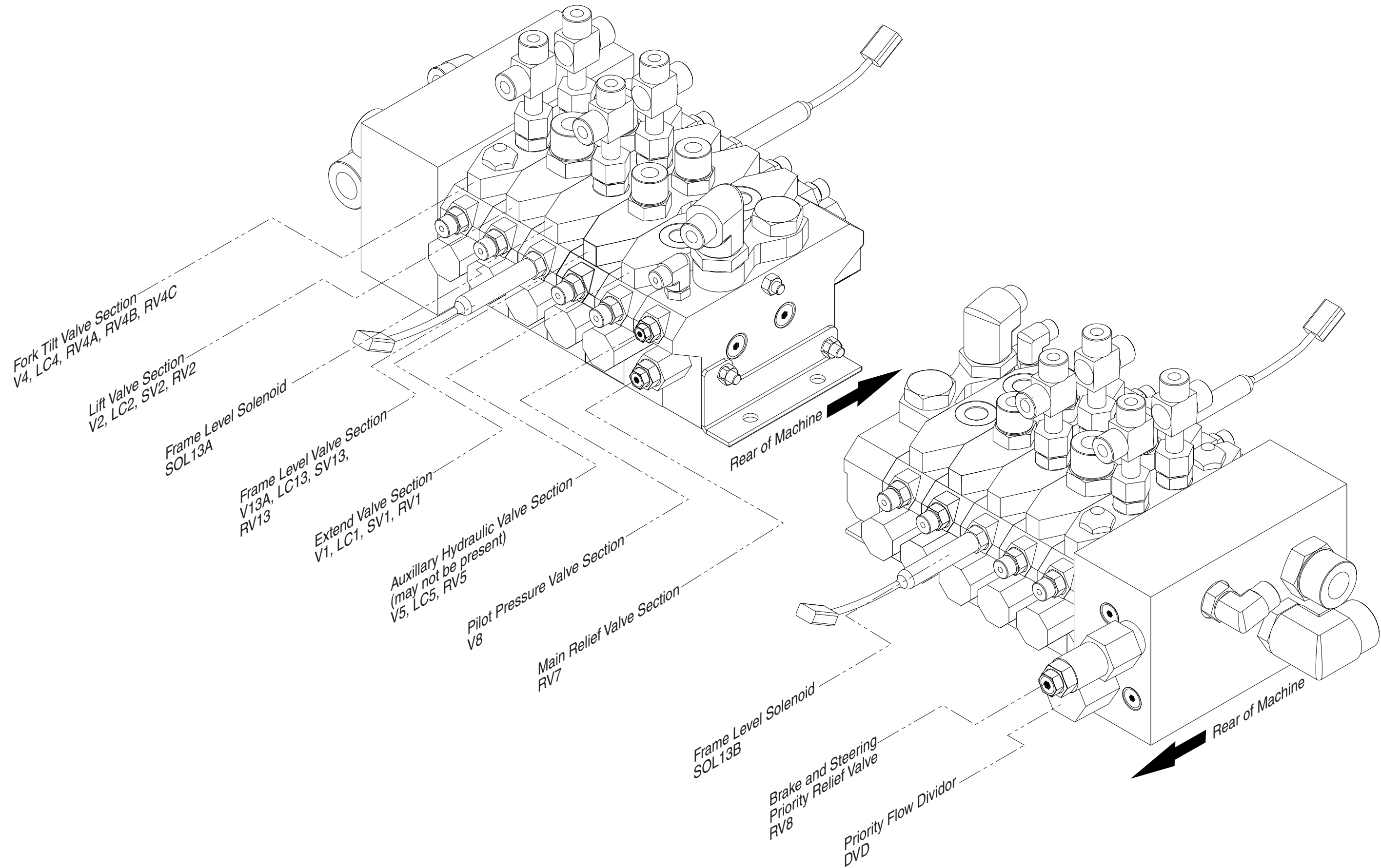
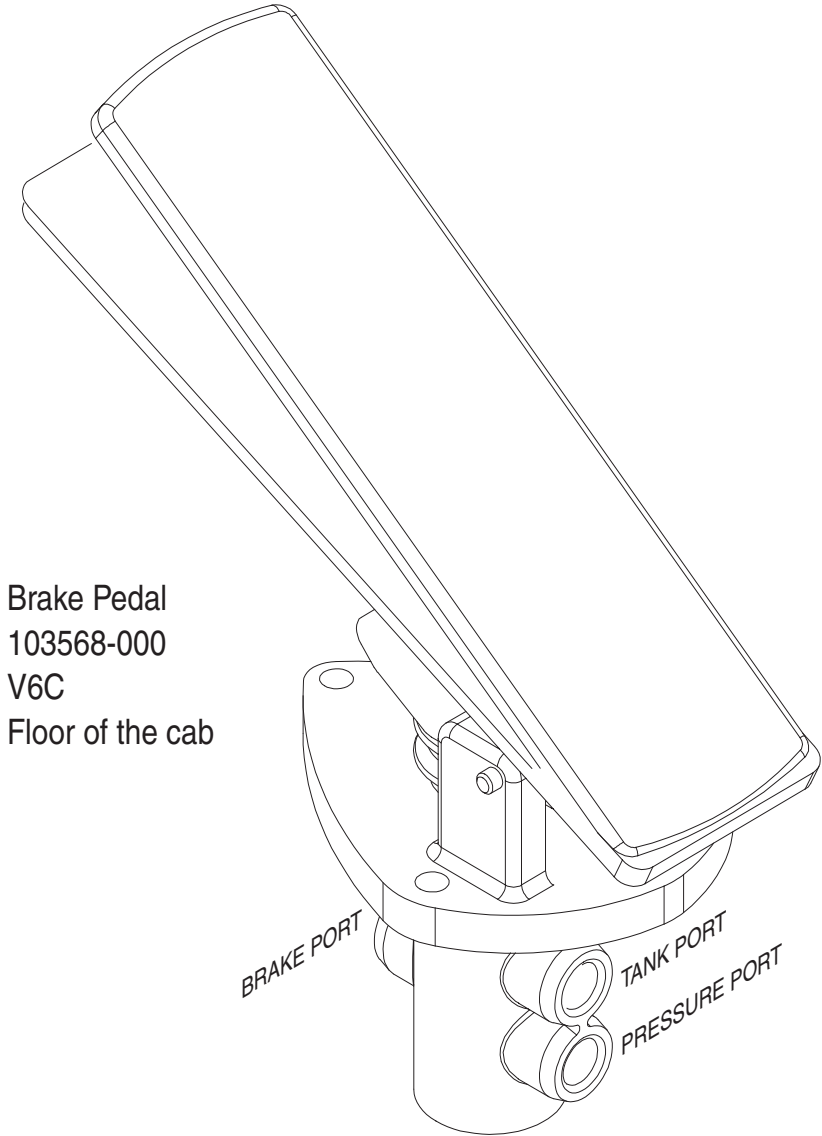
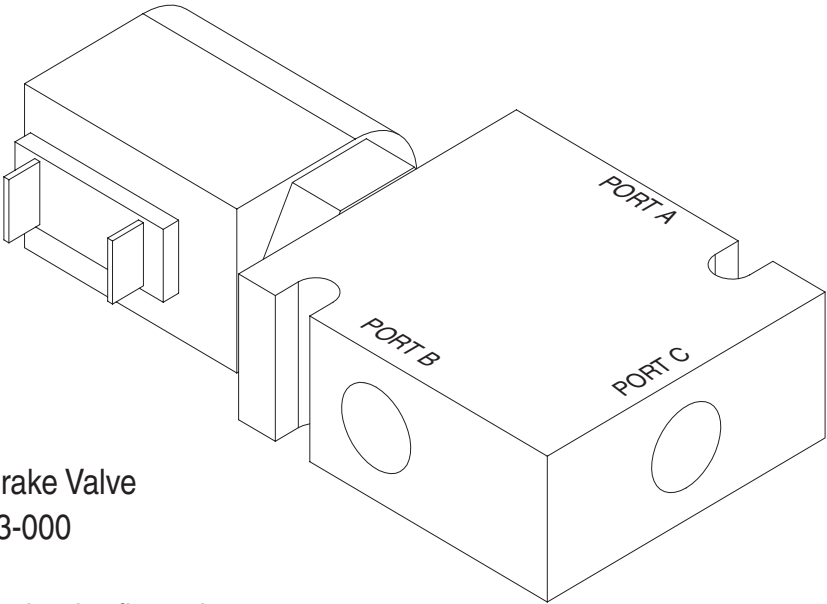


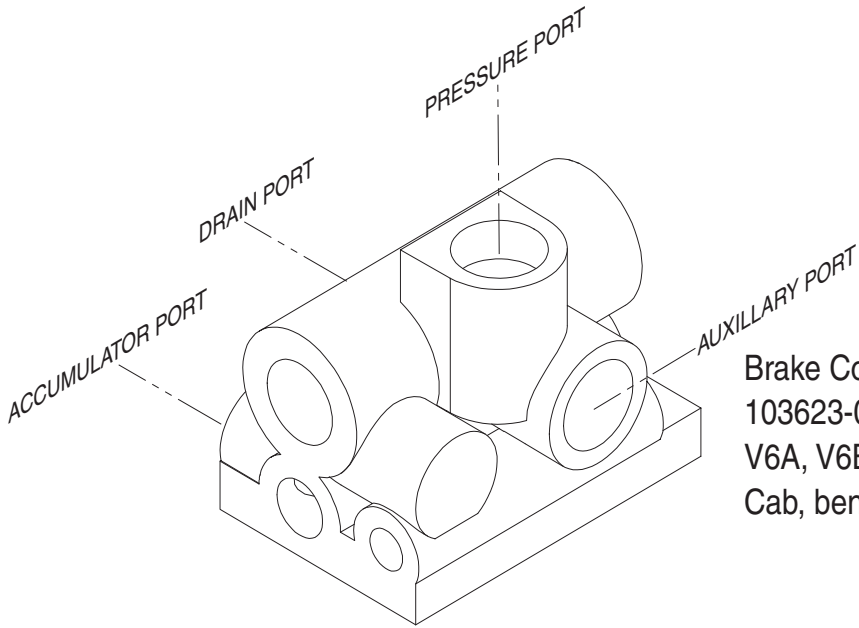
Figure 4-4: Brake System Components



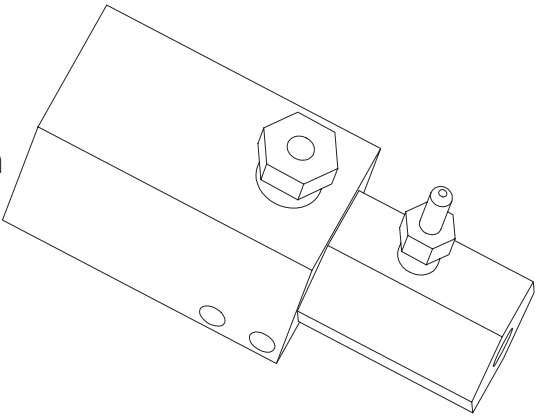
Brake Pedal  
103568-000  
V6C  
Floor of the cab



Park Brake Valve  
103613-000  
V10  
Cab, under the floor plate

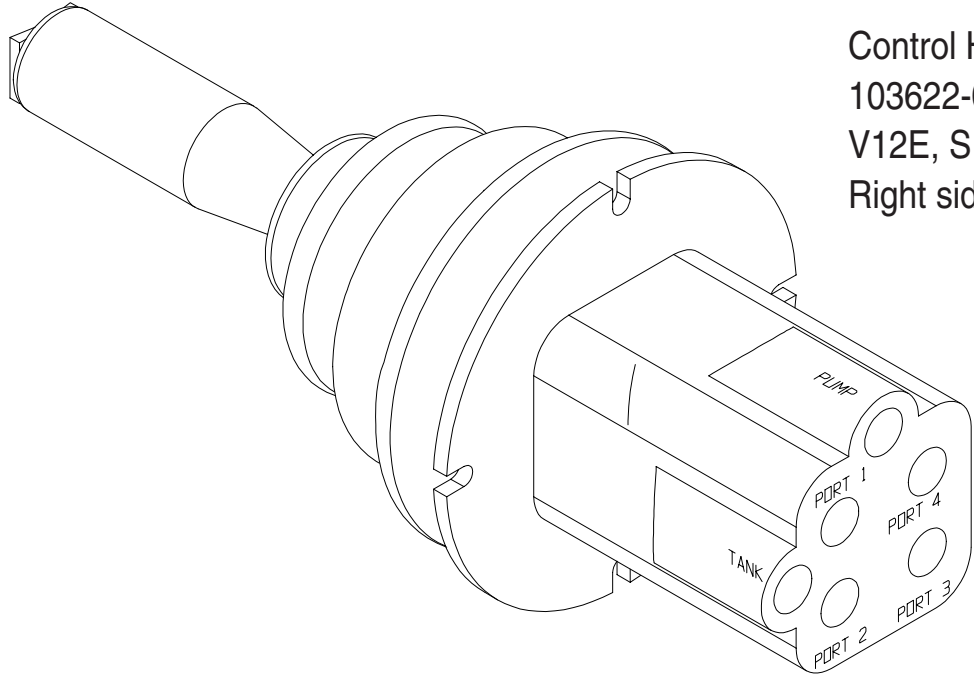


Brake Control Valve  
103623-000  
V6A, V6B, CV6  
Cab, beneath the seat

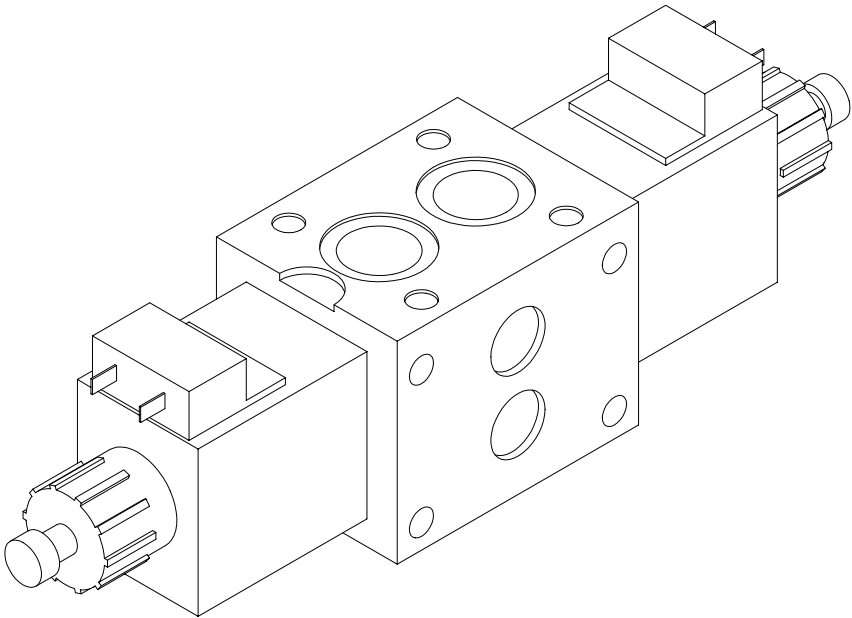


Brake Pressure Switch  
103624-000  
S8  
Cab, behind the dash

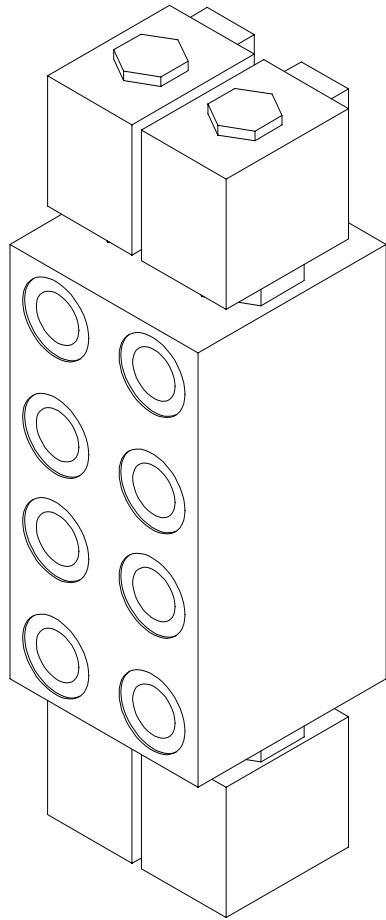
Figure 4-5: Other Machine Components



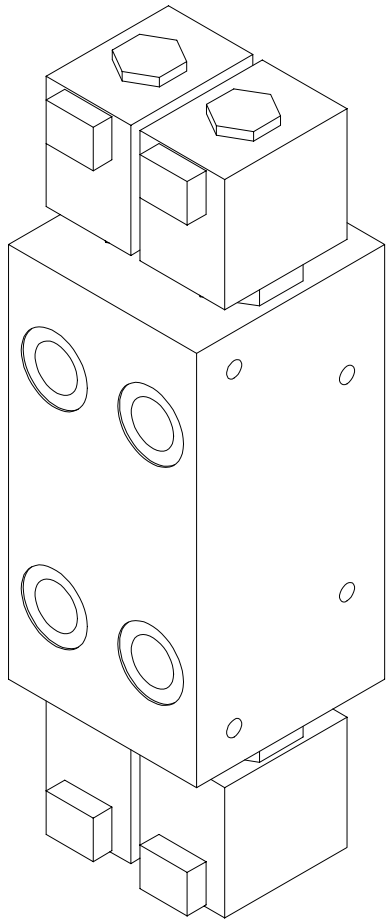
Control Handle  
103622-000  
V12E, S12  
Right side of the cab



Steering Mode Selector Valve  
103619-000  
V11B, SOL11A, SOL11B  
Outside of the cab, on the right

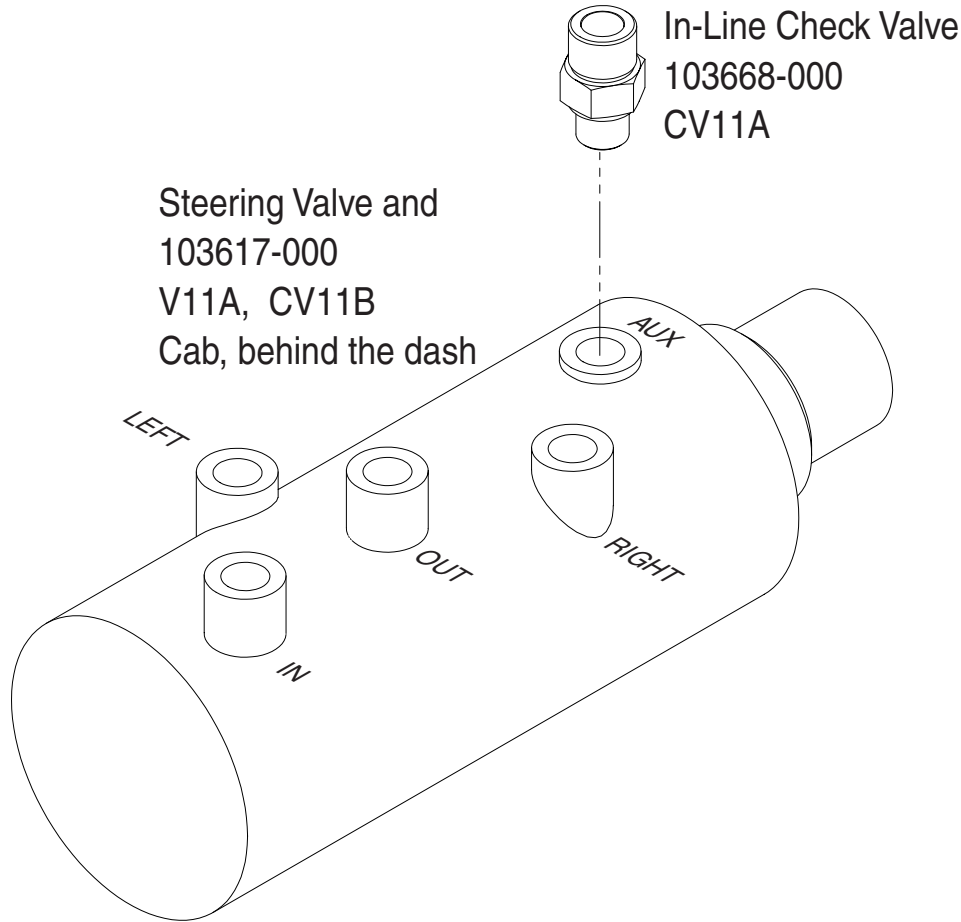


FRONT VIEW



REAR VIEW

Function Select Valve  
103611-000  
V12A-D, SOL12A-D  
Rear of the machine, to  
the left of the Main Control  
Valve



Steering Valve and  
103617-000  
V11A, CV11B  
Cab, behind the dash

In-Line Check Valve  
103668-000  
CV11A

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**UpRight**

Unit S1, Park West Industrial Park  
Friel Avenue  
Nangor Road  
Dublin 12, Ireland

TEL: +353 1 620 9300

FAX: +353 1 620 9301