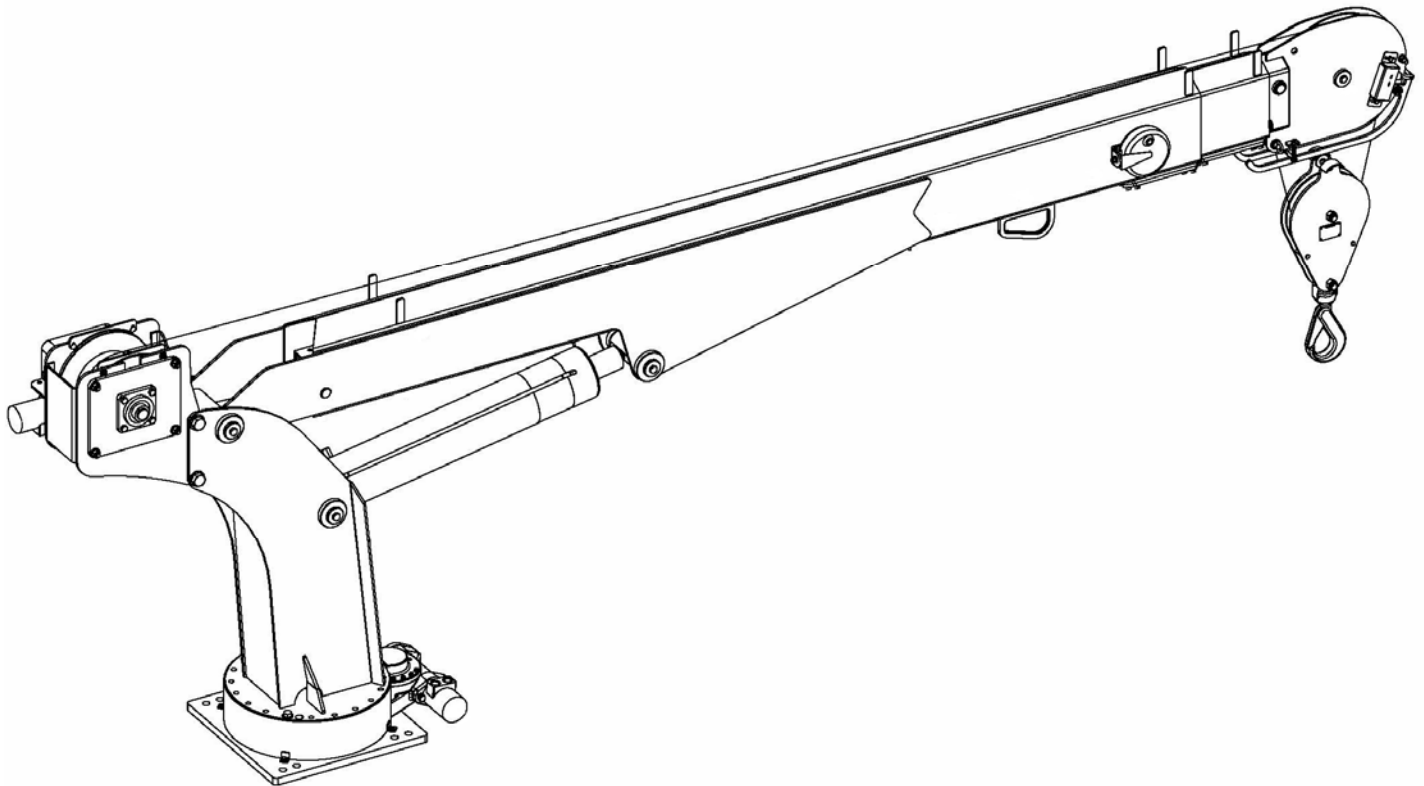


Maintainer



MAINTAINER CRANES: OPERATION, PARTS, & SERVICE

INTRODUCTION - PLEASE READ CAREFULLY

This manual contains information that is related to all cranes manufactured by Maintainer Corporation. This manual is provided to acquaint you with the operation and proper maintenance of your Maintainer crane. It is the user's responsibility to maintain and operate this unit in a manner that will result in the safest working conditions possible. It is also the user's responsibility to be aware of any existing Federal, State, or Local codes and regulations governing the use and maintenance of this crane.

OSHA requires the crane operator to fully understand ALL applicable regulations, including: OSHA 29 CFR Subpart CC, OSHA 1910.180, PCSA #2, ANSI B30.5 (2007). Maintainer also recommends ANSI B30.5 (2011)

ANSI/ASME B30.5 - 2007

MOBILE AND LOCOMOTIVE CRANES

The American Society of Mechanical Engineers

Three Park Avenue

New York, NY 10016-5990

Warranty of this unit will be void if any component of this unit is subjected to misuse due to overloading, abuse, lack of maintenance, unauthorized modifications, or operator error. No warranty verbal, written, or implied other than the enclosed written warranty will be valid with this unit.

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Base Plate.....Insert

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Outer & Inner Booms.....Insert

Hydraulic Schematic.....Insert

Remote Control Wiring Schematic.....Insert

WORK SAFELY: FOLLOW THESE RULES:

A careful operator is the best insurance against an accident

Important safety points to remember and follow while operating this unit:

- ◆ **NEVER** operate the crane too close to a power line. (see OSHA CFR 1926.1407-1411)
- ◆ **ALWAYS** have a clear view of the work area.
- ◆ **NEVER** lubricate, adjust or service truck while the engine is running, except when necessary.
After servicing, be sure all tools, parts or servicing equipment are removed.
- ◆ **NEVER** when servicing, allow anyone in the operator's position to accidentally start the engine.
- ◆ **ALWAYS** use the proper tools with safety glasses when working with and/or around the truck
- ◆ **ALWAYS** make sure no one is around or on the truck before starting it.
- ◆ **ALWAYS** depress the clutch pedal before engaging or disengaging the PTO.
- ◆ **NEVER** swing a load so it passes over people.
- ◆ **ALWAYS** stabilize the unit before attempting any lifting operation.
- ◆ **NEVER** rotate the crane too fast with a load.
- ◆ **NEVER** exceed the rated lifting capacity.
- ◆ **ALWAYS** repair any defects before placing the unit in service.
- ◆ **NEVER** leave the operator's station with a load suspended in the air.
- ◆ **ALWAYS** disengage the PTO before moving the vehicle.
- ◆ **NEVER** use the winch to drag a load into position before lifting.
- ◆ **NEVER** side load the boom by dragging a load from the side.
- ◆ **ALWAYS** make sure to extend the wire rope before extending the inner boom when using the winch.
- ◆ **NEVER** use the crane for lifting people.
- ◆ **NEVER** use quick, jerky movements when operating the crane.
- ◆ **ALWAYS** keep the load as close to the ground as possible.
- ◆ **NEVER** operate the crane during an electrical storm or when high wind conditions exist.
- ◆ **ALWAYS** deduct the weight of the load handling equipment from the rated capacity of the crane.

- ◆ **NEVER** perform any work on the crane unless authorized to do so.
- ◆ **ALWAYS** stand clear when positioning outriggers.
- ◆ **NEVER** attempt to service or repair the crane while the crane is operating.
- ◆ **ALWAYS** keep the crane operating area clear of unauthorized personnel.
- ◆ **NEVER** pick and carry with any crane.
- ◆ **ALWAYS** stow crane prior to moving the vehicle
- ◆ **ALWAYS** have a minimum cable wraps on the drum of 3
- ◆ **NEVER** lift load over the cab of truck

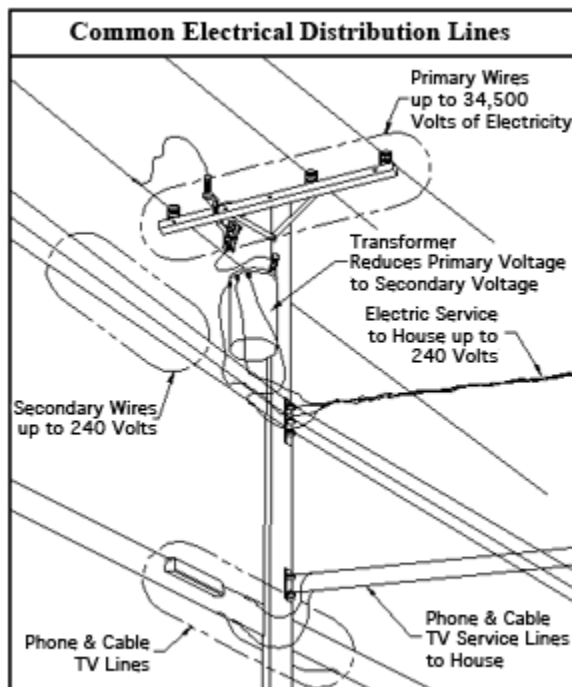
*** The most important factors in the safe operation of the crane are a competent operator, mechanical soundness of the crane, and absolute assurance that the crane is not loaded to exceed its maximum rated capacity***

Power Line Safety OSHA 29 CFR 1926.1407-1411

[More information on OSHA: Safety and Health Regulations for Cranes & Derricks in Construction, Standard Number 1926.1407, Power line safety \(up to 350 kV\)--assembly and disassembly.](#)

Before assembly or disassembly of a crane, the employer must determine if it could come within 20 feet of a power line (up to 350 kV). If so, the employer must take one of the following actions:

- (a) Confirm with the power company that the line is de-energized and visibly grounded at the worksite.
- (b) Make sure no part gets within 20 feet of the power line



- (c) Follow **Table A**, which has minimum clearance distances based on voltage.

If the line is not de-energized, the employer must take the following actions:

Conduct a meeting with the assembly/disassembly crew to review measures to prevent encroachment.

Use only nonconductive tag lines

Use a dedicated spotter, a proximity alarm, a range control warning device, an automatic limit device or an elevated warning line/barrier placed in view of the crane operator.

Cranes cannot be assembled/disassembled below an energized power line or within the **Table A** clearances from a power line. If **Table A** is used, the owner/utility must provide the power line voltage to the employer within two days of a request.

Power lines must be assumed to be energized until they are confirmed to be de-energized and visibly grounded. Warnings about electrocution hazards must be posted conspicuously in the crane cab and outside the cab in view of the operator (except for overhead gantry and tower cranes).

The work zones must be demarcated 360 degrees around the

equipment to prevent encroachments within 20 feet of a power line. If the line is not de-energized, a meeting must also be held with the crew before operations begin to review the location of the lines and procedures to prevent encroachment. Measures similar to those required during assembly/disassembly must be taken to prevent encroachment, but in this case an insulating link between the load line and the load is also an option.

Operators and crew members must be trained:

- On the procedures to follow in the event of power line contact
- To presume that power lines are energized until confirmed and visibly grounded
- To presume that power lines are not insulated until otherwise confirmed by the owner or a qualified person
- On the limits of insulating links and other devices (e.g. proximity alarms)
- On proper grounding procedures and their limitations.

Spotters must also get applicable training.

Table A: Minimum clearance distances:	
Voltage (kV)	Minimum clearance distance (ft)
Up to 50	10
>50 to 200	15
> 200 to 350	20
>350 to 500	25*
>500 to 750	35*
>750 to 1,000	45*
> 1,000	Determined by the utility/owner

*According to 1926.1409, for power lines over 350 to 1,000 kV, the minimum distance is presumed to be 50 feet. Over 1,000 kV, the utility/owner or a registered engineer must establish it.

If work must operate closer than the **Table A** values, then the following precautions must be taken at a minimum:

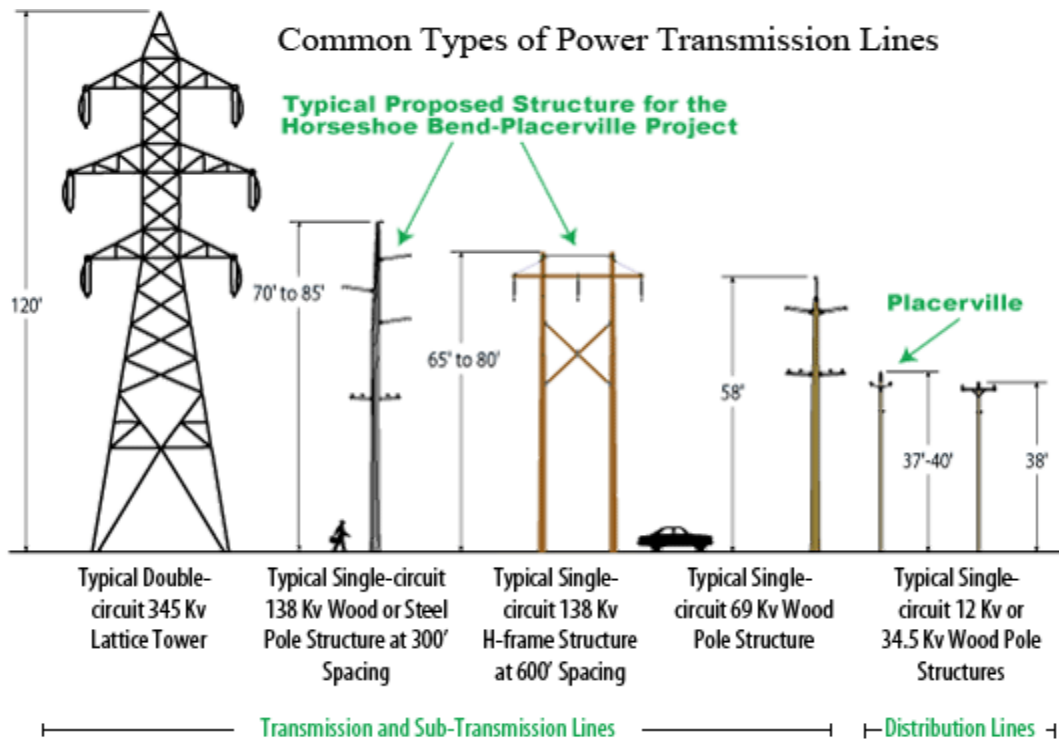
- The employer must show that **Table A** is infeasible and that it is infeasible to de-energize and ground or relocate the line.
- Safe distances must be determined by the owner/operator of the line or a registered professional engineer who is a qualified person.
- A planning meeting must be held and procedures developed must be implemented (if procedures are inadequate, work must be stopped and new procedures established or the line must be de-energized).
- Automatic re-energizing devices must be inoperative.
- A dedicated spotter must be assigned.
- An elevated warning line/barricade or an insulating link must be installed between the line and the load, except for work on electrical transmission/distribution lines covered by Subpart V (additional provisions take effect one to three years after the effective date).
- Non-conductive rigging must be used.
- A range-of-motion limiting device must be used.
- Non-conductive tag lines must be used.
- Barricades at least 10 feet from the equipment (where feasible) must be established.
- Equipment must be properly grounded.
- Workers must be kept from touching the line above the insulating link.
- Only essential personnel are allowed in the area.
- Insulating line hose or cover up must be installed by the owner/operator unless unavailable.
- The owner and user must meet with the equipment operator and other workers to review procedures.
- One person must be identified who will implement the plan and can stop work if necessary.
- Documentation of these procedures must be immediately available on site.
- Safety devices and aids must comply with manufacturers' specifications.
- All employees must be trained in power line safety per 1926.1408 (g).

Equipment traveling under or near a power line must:

- (a) Have a lowered boom/mast and support system
- (b) Obey minimum clearance distances set in **Table T**
- (c) Reduce speeds to minimize breaching
- (d) Use a dedicated spotter if closer than 20 feet
- (e) Illuminate or identify the power lines at night
- (f) Identify and use a safe path of travel.

Table T – Minimum clearance distances while traveling with no load	
Voltage	Clearance
Up to 0.75 kV	4 ft
>0.75 to 50 kV	6 ft
>50 to 345 kV	10 ft
>345 to 750 kV	16 ft
>750 to 1,000 kV	20 ft
> 1,000 kV	*

*Established by owner or registered professional engineer/qualified person



OPERATING INSTRUCTIONS

The crane is relatively simple to operate, however, prior to any work at job sites, the operator should be thoroughly familiar with the controls, load limits, safety factors and proper operating procedures and practices for the unit. In addition, practice job operation should be performed by the operator before putting the unit to a task. The operator's understanding of emergency measure execution is essential, the operator should be prepared to take emergency action at any time.

POWER TAKE-OFF:

Transmission driven PTO's are either switch or mechanically activated.

Mechanically activated:

The pull-type shifter control knob is located in the vehicle's cab, normally through the floor. To engage the PTO, place the emergency brake on and depress the clutch with the transmission in neutral, then pull out the control knob and release the clutch. To disengage, depress the clutch and push the control knob in, then release the clutch.

Switch activated (either electrically or air switched):

The switch is located in the vehicle's cab, normally on the dash.

If the transmission is a manual:

-To engage the PTO, place the emergency brake on and depress the clutch with the transmission in neutral, then activate the PTO switch, and release the clutch. To disengage, depress the clutch and de-activate the PTO switch, then release the clutch.

If the transmission is an automatic:

-To engage the PTO, place the emergency brake on, place the transmission in park or neutral, then activate the PTO switch. To disengage, de-activate the PTO switch.

(NOTE: for ship-out cranes be sure to follow the instructions for that particular PTO)

ENGINE SPEED CONTROL:

Recommended engine speed for PTO operations is 1200-1300 RPM'S. (Special circumstances may require some variance on this.) The electric speed control can be operated by the crane remote control and is adjusted at the factory for the proper RPM.

HYDRAULIC PRESSURE GAUGE:

A hydraulic pressure gauge is located in the valve compartment at the rear of the truck. This gauge is used to measure standby pressure and the maximum operating pressure. The typical standby pressure is set between 300-450 PSI, the maximum operating pressure is set at 3000 PSI..

HYDRAULIC CONTROLS:

An electric remote control for crane functions is standard on Maintainer Cranes. Manual operation is achieved by operating the manual levers on the valve body, or by pressing the red manual override buttons on the Parker open-center valve body. Decals provided on the backside of the valve compartment cover and on the cover of the open-center valve indicate the function and the direction of the movement.

HYDRAULIC VALVE:

The hydraulic functions of the closed center load sensing valve are preset to give the best performance. However, adjustments can be made to increase or decrease the hydraulic oil flow through a selected valve section, thus increasing or decreasing the function speed. Refer to the section of the valve found in the manual for the location of adjusters and adjustment information.

TRUCK INSPECTION: (ANSI B30.5-2.1)

Before putting the truck into operation always give the equipment a proper inspection and follow any safety and inspection rules that are required by your company. The check list below can be used as a general guide for the inspection.

1. **Structural Soundness:** Examine the truck for soundness and/or damaged or weak members
2. **Hydraulic Oil Supply:** Make sure that there is an adequate oil supply for proper hydraulic function
3. **Hydraulic Oil Leakage:** With the hydraulic system engaged, give the hose and the hydraulic equipment an examination for leaks, blisters, cracks in the hoses that might lead to future leaks
4. **Equipment Controls:** Give all the controls a quick test to confirm proper operation

This equipment should be checked before each operation to ensure your safety and that of those around you. If the inspection proves to be unsatisfactory the necessary repairs must be made before the equipment is used.

OUTRIGGER OPERATION:

When setting up a crane for operation the best location is a sturdy hard foundation that will not fail under working conditions. You should also avoid operating the crane with low overhead obstructions and be extra cautious where you have to be around overhead power lines. When lowering the outriggers make sure that everyone is standing clear and that nothing will get pinched between outrigger pad and the ground. For maximum stability, fully extend the crane side outrigger(s) and lower all outriggers on a firm foundation. OSHA requires the truck be level within 1% of grade before performing any lift. (see "Crane level indicator" insert)

ALWAYS HAVE OUTRIGGERS IN PLACE FOR ANY LIFTING OPERATION!

TRUCK/CRANE STABILITY: (ANSI B30.5-3.4.2)

Included in the operator's manual is Maintainer's BALLAST / COUNTERWEIGHT sheet. The specified ballast needs to be added to the truck to achieve stability in all lifting points and crane positions, as designated on the load chart. The ballast that is added must be applied to the truck so the cumulative center of gravity of the ballast is centered between the rear axle, and the back of the chassis cab. If the full required ballast can not be added to the truck, due to being limited by chassis GVW, the truck may not be stable in all lifting areas. After the ballast is loaded onto the truck, the stability of the unit must be verified in all lifting areas prior to jobsite use.

CRANE OPERATION:

Before removing the crane from the saddle and rotating the boom it is important that all the outriggers are extended and on a firm foundation. Before performing any lifting operation, be sure to study and understand the capacity chart. The capacity chart is located on the crane tower, and an additional chart can be found in the operator's manual. The distances measured on the capacity chart are from the cable to the centerline of the rotation.

Maintainer Cranes are equipped with an anti-2 Block safety device. When activated, the device will shut down the winch-up, extend-out, and lift-down functions. These functions will return to normal operation when the winch is lowered, or the boom is retracted. Maintainer cranes are also equipped with an internal hydraulic overstress system, which will protect the crane from overload conditions. These safety features are not intended to relieve the operator of any responsibility with the use of the crane. The main deterrent against accidents is an informed and competent operator. (OSHA & ANSI require qualified and competent individuals to operate cranes)

<p>WARNING: ATTEMPTING TO LIFT MORE THAN THE INDICATED CAPACITY COULD RESULT IN CRANE COMPONENT DAMAGE, IN-STABILITY, OR STRUCTURAL FAILURE LEADING TO SERIOUS INJURY OR DEATH!</p>
--

CRANE SHUTDOWN:

After the operation and the crane is ready to be shutdown, inspect the crane and its components to be sure it has not been damaged during use.

1. Retract the boom and cable before swinging the crane over the saddle.
2. Raise and retract all outriggers and make sure they are properly secured.
3. Disengage the throttle and the PTO controls and make sure all toggle switches are in the OFF position.
4. Before moving the vehicle make sure all compartments are closed and that any items on the truck bed have been secured.

SERVICE AND MAINTENANCE:

Proper maintenance on a regular schedule is essential to keeping the crane operating at peak efficiency. This section outlines required servicing and maintenance information. Personnel responsible for the care of the crane should familiarize themselves with the service intervals and types of maintenance to be performed.

HYDRAULIC OIL:

Maintainer recommends the using high quality oil: such as Mobil DTE, or Exxon Univis.

Change the hydraulic filter after the first 50 HOURS of operation. Change hydraulic oil filter & hydraulic oil annually there after. The oil level in the reservoir tank should reach the screen in the filler neck.

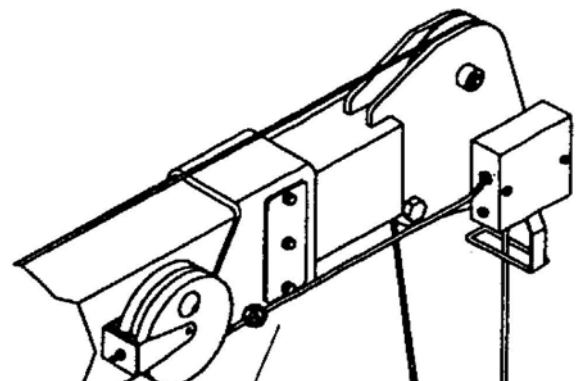
HYDRAULIC CYLINDER: (Disassembly and assembly of cylinders with turn-in wire)

Pull the piston rod to the fully extended position. Insert the spanner wrench into the holes in the cylinder gland and turn the gland so that the square wire comes out of the slot that is on the side of the cylinder tube. Remove the square wire from the tube. Pull on the piston rod and remove the piston from the cylinder tube. Make the necessary repairs and reassemble using a light film of oil on the piston gland and on the inside of the tube end. To get the square retainer into place, first line up the hole in the gland, with the slot in the tube. Then insert the square wire into the hole and turn the gland with the spanner wrench until the wire is completely around the inside of the tube. In repairing of any cylinder be careful not to contaminate the inside of the cylinder tube and also do not scratch or mark the rod.

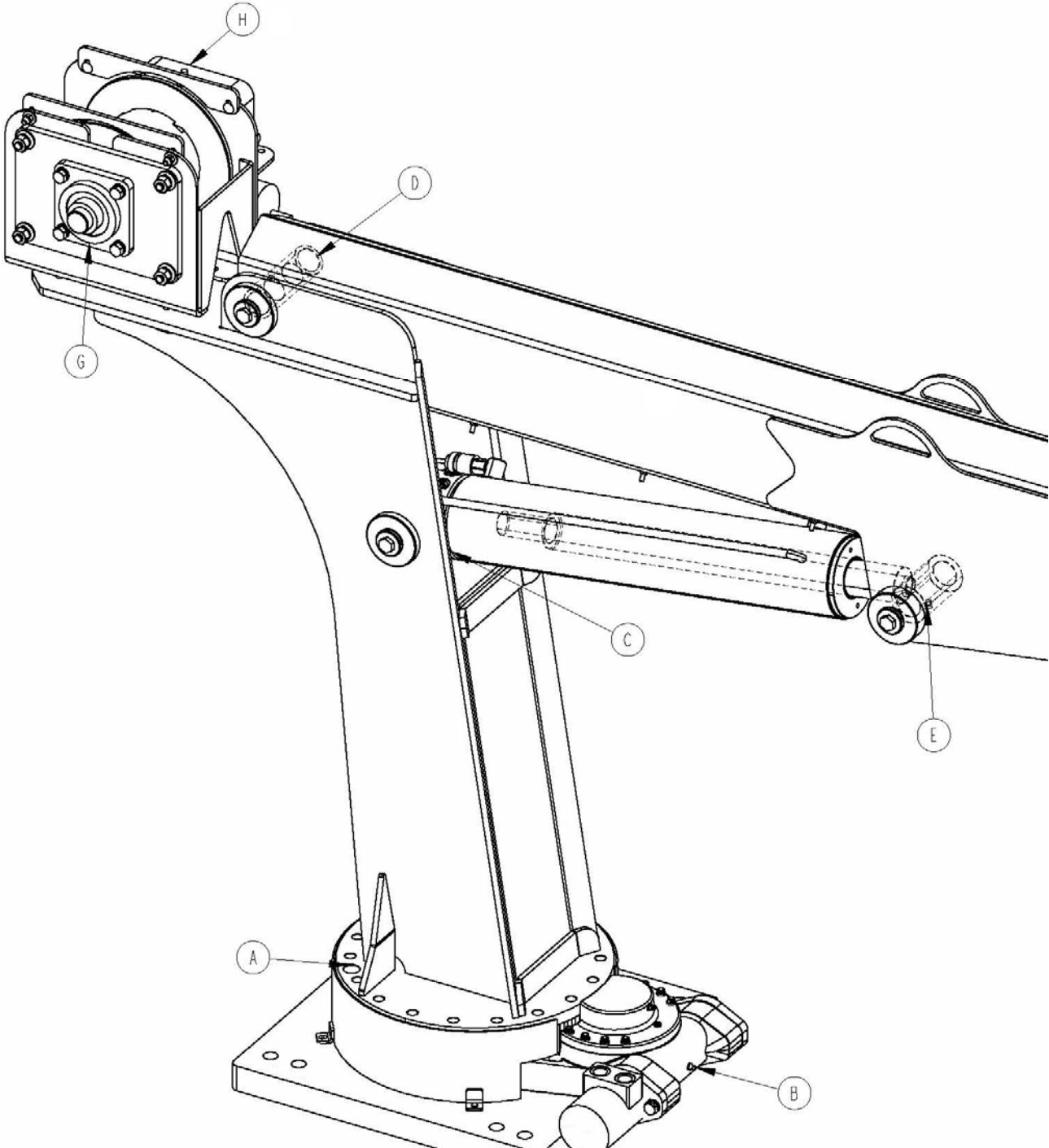
GREASE AND LUBE: [reference points are shown on the next page]

1. **Ref. A:** Grease weekly or accordingly with usage, the main rotate bearing of the crane
2. **Ref. B:** Grease weekly or accordingly with usage, the worm drive of the crane using an open bearing grease.
3. **Ref. C:** Grease weekly or accordingly with usage, the zerk at the base of the lift cylinder.
4. **Ref. D:** Grease weekly or accordingly with usage, the tower and the main boom pivot.
(Note: The lift cylinder may need to be fully extended to grease the main boom pivot.)
5. **Ref. E:** Grease weekly or accordingly with usage, the zerk at the rod-end of the lift cylinder.
6. **Ref. F:** Grease weekly or accordingly with usage, the zerks for the manual boom (if available).
7. **Ref. G:** Grease weekly or accordingly with usage, the winch pillow block bearing.
8. **Ref. H:** Check weekly the gear lube in the winch. Use an 80-90 wt. gear lube.

CRANE GREASE & OIL



SERVICE POINTS



SHIP-OUT CRANES

HYDRAULIC SYSTEM:

The Maintainer Ship-Out crane normally operates on an open center full pressure system through either a Parker BV-4-UL valve, or a Sauer-Danfoss valve.

Parker:

This valve is a 4-spool stack type, operated with either: an electric remote control and 33 ft. of cable, a wireless remote (optional), or manually by the manual override buttons on the side of the valve. A proportional control system allows the user to adjust the speed of the crane function by adjusting the “trigger” on the remote.

Sauer-Danfoss:

This valve is a 4-spool stack type, operated with either: an electric remote control and 33 ft. of cable, a wireless remote (optional), or manually by using the handles on the side of the valve. A proportional control system allows the user to adjust the speed of the crane function by adjusting the “trigger” on the remote.

SYSTEM REQUIREMENTS:

For proper operation this crane requires a hydraulic pump system capable of supplying 8-10 GPM at maximum pressure of 3000 PSI, and an in line pressure relief valve set to open at 3000 PSI is also necessary to prevent damage to the hydraulic components. Contact Maintainer with any specific questions regarding hydraulic system pump requirements.

CRANE MOUNTING BOLT SPECIFICATIONS

Crane Model	Bolt size	Number Req'd	Torque Spec (lubed)	Torque Spec (dry)
1115	3/4-10 UNC x 3 GR. 8	4	280 ft*lbs	380 ft*lbs
3216/20	7/8-9 UNC x 4 GR. 8	4	450 ft*lbs	600 ft*lbs
6000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
8000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
10000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
11000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
12000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs
14000	7/8-9 UNC x 4 GR. 8	8	450 ft*lbs	600 ft*lbs

WARNING: The crane must be mounted on a properly reinforced substructure that is capable of handling the forces/moment generated by any lifting operation or severe damage to the equipment, personal injury, or death may result.

PARTS LISTING

SERIAL NUMBER:

When ordering service parts or optional equipment, be sure to specify the work order number (quick reference number), located on the front side of the street side compartment along with the crane serial number, located at the rear of the crane winch.

Record your service body work order here
for future reference

Record you crane serial number here for
future reference

MAINTAINER: Oil Data Sheet (wide-temperature, shear-stable hydraulic oil)

Exxon Univis N 46

This oil is the highest quality oil with controlled low temperature flow properties and higher anti-wear protection for high pressure vane and piston pumps. This provides keep-clean performance for electro-hydraulic control systems, and is super stabilized to provide improved filterability, demulsibility, and multi-metal compatibility in the presence of water. It was selected for its optimum flow characteristics at cold temperatures. This oil is the primary recommendation for hydraulic applications where low circulating or rapid changes from low to high temperatures are encountered. It meets the requirements for all types of gear, vane, and piston pumps where shear stable anti-wear hydraulic oil is recommended.

Advantages:

- ◆ Suitable for wide temperature range conditions
- ◆ Superior low temperature flow properties
- ◆ Outstanding keep-clean performance
- ◆ Stay-in-grade viscosity under high-shear conditions
- ◆ Super stabilized anti-wear and water tolerance
- ◆ Good demulsibility, filterability, and foam resistance
- ◆ Excellent multi-metal compatibility and corrosion resistance

It is recommended that the hydraulic oil & filter be changed at least once (1) a year or every 1,000 hours.