

SERVICE MANUAL

This Manual has been prepared for and is considered part of -

900H Telescoping Crane

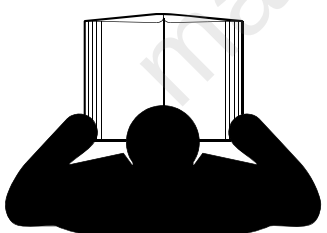
This Manual is Divided into the following Sections:

SECTION 1	INTRODUCTION
SECTION 2	HYDRAULIC SYSTEM
SECTION 3	ELECTRIC SYSTEM
SECTION 4	BOOM MAINTENANCE
SECTION 5	WINCH
SECTION 6	SWING
SECTION 7	OUTRIGGERS
SECTION 8	LUBRICATION
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NOTICE

The crane serial number is the only method your distributor or the factory has of providing you with correct parts and service information.

The crane serial number is identified on the builder's decal attached to the crane frame. **Always furnish crane serial number** when ordering parts or communicating service problems with your distributor or the factory.





WARNING

To prevent death or serious injury:

- Avoid unsafe operation and maintenance.
- This crane must be operated and maintained by trained and experienced personnel. National Crane is not responsible for qualifying these personnel.
- Do not operate or work on this crane without first reading and understanding Operator's Manual and Rating Plate supplied with crane.
- If Operator's Manual or Capacity Charts are missing from crane, contact your distributor for new ones.

Bearings

Antifriction Bearings

When an antifriction bearing is removed, cover it to keep out dirt and abrasives. Wash bearings in non-flammable cleaning solution and allow them to drain dry. The bearing may be dried with compressed air BUT do not spin the bearing. Discard the bearings if the races and balls or rollers are pitted, scored, or burned. If the bearing is serviceable, coat it with oil and wrap it in clean waxed paper. Do not unwrap new bearings until time of installation. The life of an antifriction bearing is shortened if not properly lubricated. Dirt can cause an antifriction bearing to lock and result in the shaft turning in the inner race or the outer race turning within the cage.

Double Row, Tapered Roller

Double row, tapered roller bearings are precision fit during manufacture and components are not interchangeable. The cups, cones, and spacers are etched with the same serial number and letter designator. If no letter designators are found, wire the components together to assure correct installation. Reusable bearing components should be installed in their original positions.

Heating Bearings

Bearings which require expansion for installation should be heated in oil not to exceed 121 °C (250 °F). When more than one part is heated to aid in assembly, they must be allowed to cool and then pressed together again. Parts often separate as they cool and contract.

Installation

Lubricate new or used bearings before installation. Bearings that are to be preloaded must have a film of oil over the entire assembly to obtain accurate preloading. When installing a bearing, spacer, or washer against a shoulder on a shaft, be sure the chamfered side is toward the shoulder.

When bearings are pressed into a retainer or bore, apply pressure to the outer race uniformly. If the bearing is pressed on the shaft, apply pressure on the inner race uniformly.

Preload

Preload is an initial load placed on the bearing at the time of assembly. Consult the disassembly and assembly instructions to determine if the bearing can be preloaded.

Be careful in applying preload to bearings requiring end clearance. Otherwise, bearing failure may result.

Sleeve Bearings

Do not install sleeve bearings with a hammer. Use a press and be sure to apply the pressure directly in line with the bore. If it is necessary to drive on a bearing, use a bearing

driver or a bar with a smooth flat end. If a sleeve bearing has an oil hole, align it with the oil hole in the mating part.

Gaskets

Be sure the holes in the gaskets correspond with the lubricant passages in the mating parts. If it is necessary to make gaskets, select material of the proper type and thickness. Be sure to cut holes in the right places. Blank gaskets can cause serious damage.

Hydraulic Systems



Pressurized hydraulic fluid can cause serious injury. Depressurize the hydraulic system before loosening fittings.

Visual Inspection

Do a visual inspection daily on all hydraulic components for missing hose clamps, shields, guards, excessive dirt build up, and leaks. Do a monthly or 250 hour inspection for the items listed in the inspection procedure below.

Valves and Manifolds

Inspect valves and manifolds for leaking ports or sections.

Hoses and Fittings

Inspect all hoses and fittings for the following:

- Cut, kinked, crushed, flattened, or twisted hoses.
- Leaking hoses or fittings.
- Cracked, blistered, or hoses charred by heat.
- Damaged or corroded fittings.
- Fitting slippage on hoses.

If any the above conditions exist, evaluate and replace as necessary.

The climate in which the crane operates affects the service life of the hydraulic components. The climate zones are defined in the table on page 1-5. Recommended replacement of hoses is as follows:

- Climate zone C after 8,000 hours of service.
- Climate zones A and C with high ambient temperatures and duty cycles after 4000 to 5000 hours of service.
- Climate zones D and E after 4000 to 5000 hours of service.

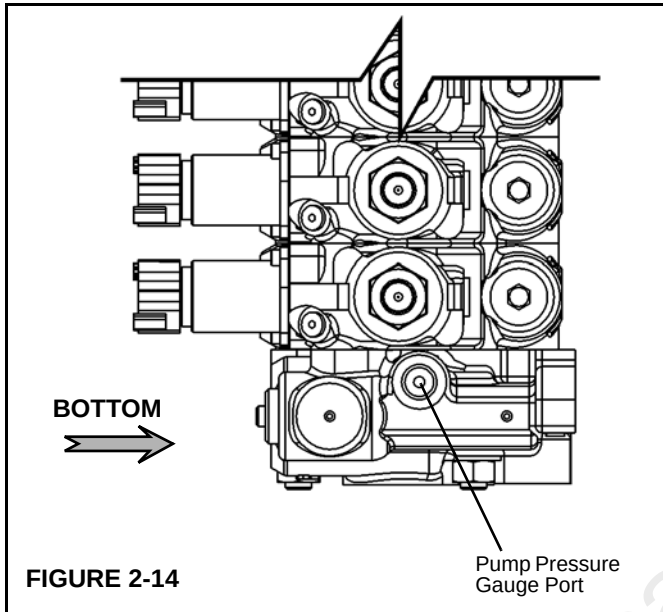
Cleanliness

Contaminants in a hydraulic system affects operation and results in serious damage to the system components.

CAUTION

The supply line shut-off valve must be open to allow flow to the pump to prevent pump damage.

3. Inspect the case drain line for leaks and restrictions.
4. Start the truck engine and engage the PTO. Turn off the truck engine.

**FIGURE 2-14**

5. Install a gauge at the pump pressure gauge port on the DCV (Directional Control Valve) (Figure 2-14).
6. Start the truck engine from the crane while monitoring the gauge and idle the engine about 2 to 3 minutes until the gauge registers pressure. Do not operate any hydraulic levers. Pressure at idle should be in the 200 to 400 psi range.

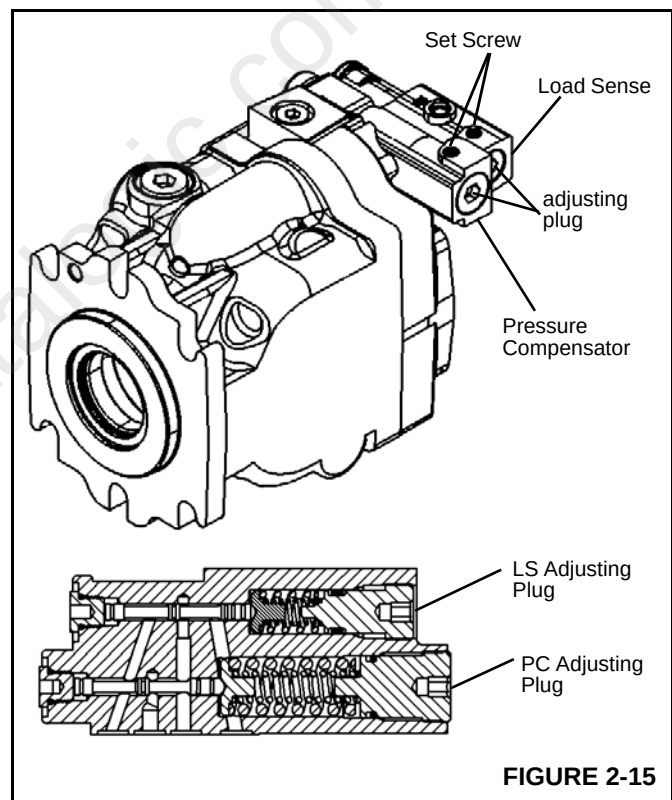
NOTE: If the pump does not build up pressure, shut down the engine and take corrective action.

7. Operate the system under a light load for 5 to 10 minutes.

NOTE: The stand by pressure is the system pressure with no hydraulic component operating.

8. Check stand by pressure and adjust as necessary.
 - a. Install a gauge at the pump pressure gauge port on the DCV (Figure 2-14)
 - b. Adjust the LS adjusting plug (Figure 2-15) on the pump until the stand by pressure is at 350 psi (2413 kPa).

9. Check the maximum pump pressure and adjust as necessary.
 - a. Install a gauge at the pump pressure gauge port on the DCV (Figure 2-14)
 - b. Start the engine at idle. Bottom out the lift cylinder so that the boom is a -10° angle.
 - c. Hold the boom control lever in the down position and check the maximum pump pressure. The pressure should be 4000 psi.
 - d. If necessary, adjust the maximum pump pressure with the PC adjusting plug (Figure 2-15). While holding the boom lever in the down position, loosen the set screw then make adjustment, retighten the set screw.

**FIGURE 2-15****Trouble Diagnosis**

The following chart lists malfunctions which may occur during operation, the possible cause, and the possible solution. These are not all inclusive but are designed to help isolate the problem and should be checked before calling Manitowoc Crane CARE.

Torque Values

Torque all swing bearing bolts to a final torque of 600 lb-ft $\pm$ 60 lb-ft (813 Nm $\pm$ 81 Nm).

Tools Required

A complete set of special tools required to torque the swing bearing bolts is listed and shown in (Figure 6-6).

Inner Race Torquing

The inner race bearing bolts are located on top of the inner race (Figure 6-8).

1. Extend and set the outriggers. Fully elevate the boom.
2. Torque eight bolts (Figure 6-7) to 470 lb-ft $\pm$ 20 lb-ft (637 Nm $\pm$ 27 Nm) using the following sequence pattern; 1, 19, 10, 28, 6, 23, and 15. Tools used are the socket, multiplier, backlash adapter, necessary extensions, and torque wrench.
3. Return to bolt 1 and torque all bolts sequentially in a clockwise direction to the final torque of 600 lb-ft $\pm$ 60 lb-ft (813 Nm $\pm$ 81 Nm). The same tools are used as in step 1.

Outer Race Torquing

The outer race bearing bolts are located on top of the outer race (Figure 6-8).

1. Extend and set the outriggers. Fully elevate the boom.
Torque eight bolts (Figure 6-7) to 470 lb-ft $\pm$ 20 lb-ft (637 Nm $\pm$ 27 Nm) using the following sequence pattern; 1, 17, 9, 25, 4, 20, 12, and 28. Tools used are the socket, multiplier, backlash adapter, necessary extensions, and torque wrench.
2. Return to bolt 1 and torque all bolts sequentially in a clockwise direction to 600 lb-ft $\pm$ 60 lb-ft (813 Nm $\pm$ 81 Nm). The same tools are used as in step 1.

BEARING CLEARANCE

If a swing bearing exhibits the following symptoms, it may have reached the end of its useful life.

- metal particles in the grease
- increased drive power required
- noise
- rough operation
- acceleration in the increase in bearing clearance

Measure the internal clearance of the swing bearing to determine if it needs to be replaced. (Reference National Crane Technical Support Information TSI #10)

1. Place the boom in the boom rest and set the outriggers.

2. Put a magnetic base dial indicator opposite the boom on the top of the frame (Figure 6-9).
3. Place the dial on the top of the swing bearing (Figure 6-9).
4. Power the boom down onto the boom rest.
5. Set the dial indicator at zero.
6. Raise the boom about 3 inches above the boom rest.
7. Record the deflection indicated on the dial.
8. Repeat steps 4 through 7 three times and average the readings.
9. If the average is greater than 0.090 inches, replace the bearing.
10. If the average is less than 0.090 inches, repeat the measurement at every 45° around the total working area of the crane (Figure 6-10).
 - a. Measure the deflection at positions 2,3,7, and 8 for 180° rotation and positions 2 and 8 for 360° rotation.
 - b. Use another crane to support the end of the boom when the boom is powered down.
 - c. Locate the dial indicator opposite the boom.
 - d. Set the dial indicator to zero.
 - e. Raise the boom about 3 inches.
 - f. Record the reading on the dial indicator.
 - g. Repeat steps d through f three times.
 - h. Average the readings.
 - i. If the averages is greater than 0.090 inches at any position, replace the bearing.

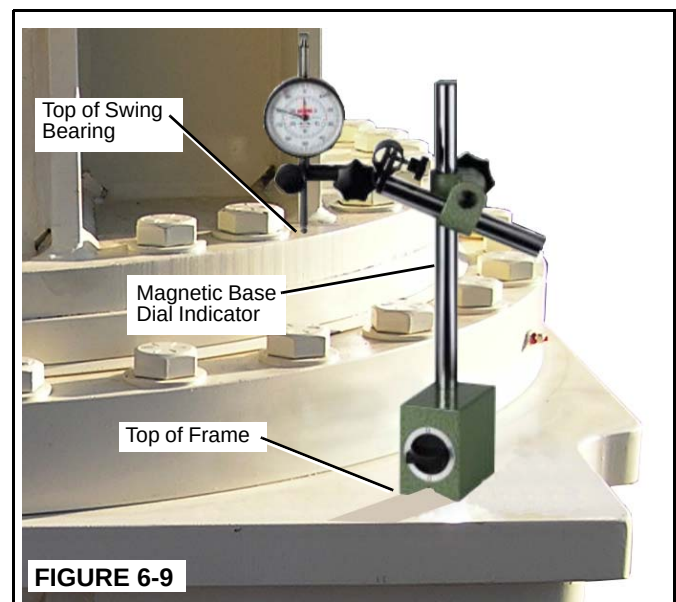


FIGURE 6-9

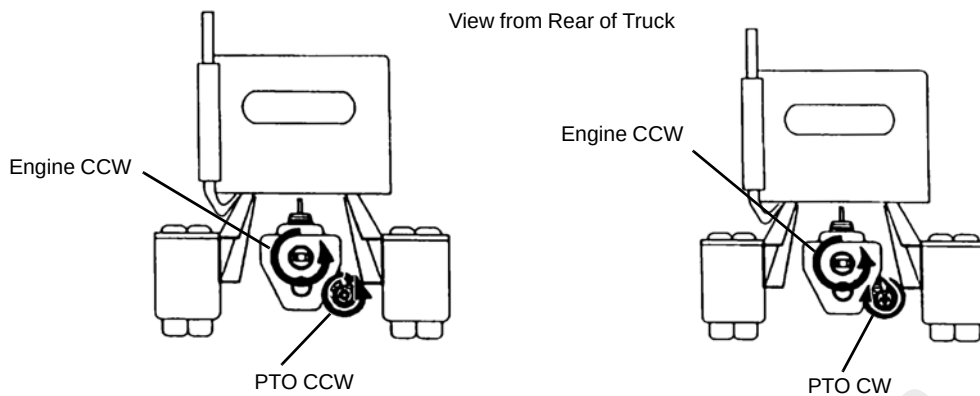


FIGURE 9-6

TRUCK FRAME STRENGTH

For a truck frame to be suitable for a Series 900H crane, the truck frame must:

- be rigid enough to prevent excessive boom movement due to truck frame deflection when lifting over the front of the unit.
- be strong enough to resist the loading induced by the crane.
- not permanently bend or deform.

The Section Modulus (S.M.), which determines the rigidity of the frame, is a measurement of the area of the truck frame. Resistance to bending moment (RBM) is a measurement of strength and is determined by multiplying the section modulus of each frame rail by the yield strength of the rail material.

For a standard, behind-the-cab mount, the Series 900H crane requires a minimum of 2,200,000 in-lb (248,566 N.m) RBM and 20.0 in³ (327 S.M. under the crane frame between the front and rear springs with 1,650,000 in-lb (186,424 N.m) RBM and 15 in³ (295 cm³) SM. through suspension to stabilizers on each truck frame rail.

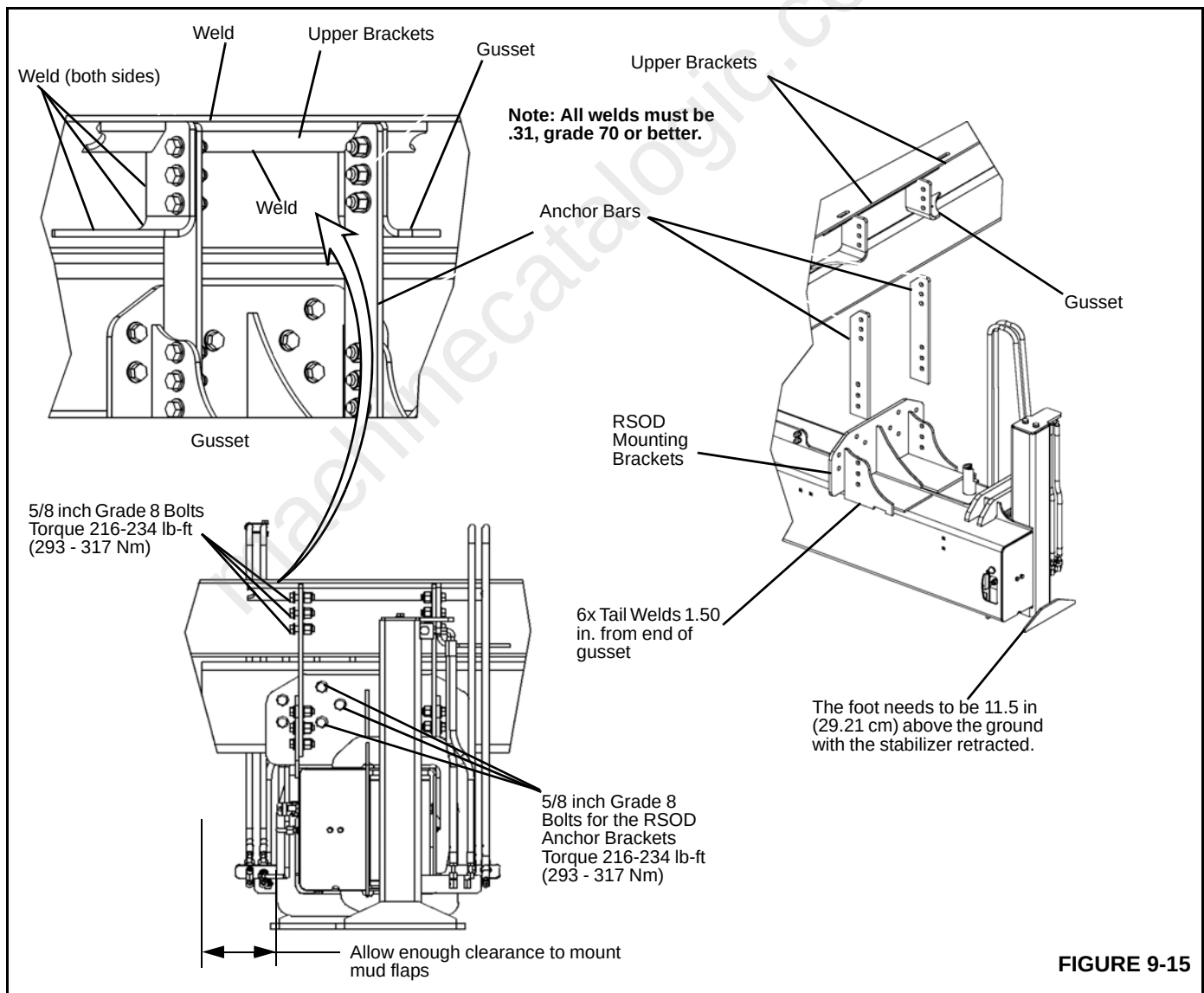
For 360° stability the truck frame must have a 20.0 in³ (327 cm³) section modulus [2,200,000 in-lb (197,610 N.m) RBM] minimum under the crane frame, 15 in³ (245 cm³)

section modulus [1,650,000 in-lb [186,424 N.m] RBM) at the front spring rear hanger, 10 in³ (163 cm³) section modulus [1,100,000 in-lb (124,283 N.m) RBM] through the front spring and 3 in³ (49 cm³) section modulus [330,000 lb (37,284 N.m) RBM] at the stabilizer attachment point on each truck frame rail. Listed below is a table showing the commonly used truck frame and reinforcing materials and the section modulus required for each material to ensure adequate strength and rigidity. In all cases, the minimum requirements for section modulus and RBM must be met.

Distance From Stabilizer Attachment Inches (centimeters)	Section Modulus Per Rail in. ³ (cm ³)
0 - 12 (0 - 30)	2.7 (44)
12 - 24 (30 - 61)	5.5 (90)
24 - 36 (61 - 91)	8.2 (134)
36 - 48 (91 - 121)	11.0 (180)
48 - 60 (121 - 152)	13.7 (224)
60 - 72 (152 - 182)	16.5 (270)
72 - 84 (182 - 213)	19.2 (315)
84 - 96 (213 - 243)	21.9 (359)
96 - 108 (243 - 274)	24.7 (405)
108 - 120 (274 - 304)	27.4 (449)
120+ (304 +)	30.0 (492)

Attach the RSOD

1. Position the RSOD on the truck frame so that there is about 12 in (30.4 cm) between the rear tire to the front of the RSOD Figure 9-15. This should be enough clearance for mounting the mud flaps.
2. Check for interference with truck frame rivets or bolt holes.
3. Make sure that the RSOD stabilizer is vertical and the foot is 11 in (27.9 cm) above the ground.
4. Use the RSOD brackets as a template and drill six 3/4 in holes in the truck frame for each bracket.
5. Bolt the RSOD brackets to the truck frame with the 3/4 x 2-1/2 inch grade 8 bolts. Torque 355-385 lb-ft (481 - 522 Nm).
6. Clamp the anchor bars to the RSOD mounting bracket.
7. Use the holes in the brackets as a template and drill three 5/8 inch holes in each anchor bar.
8. Loosely bolt the anchor bars to the RSOD mounting bracket.
9. Clamp the upper brackets to the anchor bars.
10. Position the upper brackets on the T-box and tack weld in place.
11. Drill three holes in the anchor bar using the upper bracket holes as a template.
12. Remove the anchor bars and weld the upper brackets and gussets in place.
13. Bolt the anchor bars to the RSOD brackets and upper brackets with the 5/8 in grade 8 mounting bolts. Torque 216-234 lb-ft (293 - 317 Nm). See page 9-24 for RSOD hydraulic line hookup.



Full Version Available

National Crane 900H Boom Truck Service Manual

National Crane 900H boom truck service manual with repair procedures, adjustments and troubleshooting for the main systems. Instant PDF download.

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