

OWNER'S MANUAL

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

400 Series Telescoping Crane

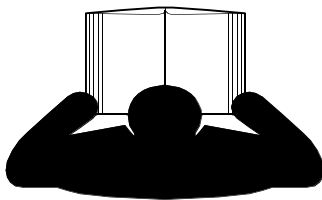
This Manual is divided into the following sections:

**INTRODUCTION AND TABLE OF CONTENTS
SAFETY INFORMATION
OPERATING CONTROLS AND PROCEDURES
MAINTENANCE INSPECTION
LUBRICATION
SERVICE
SPECIFICATIONS
INSTALLATION CONFIGURATIONS
INSTALLATION PROCEDURES**

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 Load Chart supplied with crane.
- Store Operator's Manual in holder provided on crane.

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Maintenance, Lubrication & Service

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DANGER

Payout loadline before extending boom. Failure to do so may cause the loadline to break or damage the crane.

Stabilizers – Up/Down – Operate the lever to **DOWN** to lower and **UP** to raise.

Stabilizers – Extend/Retract – Operate the lever to **EXTEND** to move beams out and to **RETRACT** to move beams in.

Outriggers – Operate the lever to **UP** to raise the outrigger legs. Operate the lever to **DOWN** to lower the outrigger legs.

Foot Throttle – Depress the foot throttle to accelerate the truck engine speed. Release to return to idle speed. Increasing truck speed increases operating speed.

Kill Switch – Operate the switch to kill the truck engine under emergency conditions. Switch must be reset to on to operate truck from cab.

Horn – Operate horn button to warn fellow workers on construction site of pending movement of crane.

Pressure Gauge – Observe pressure gauge while booming up or down at end of stroke to determine system pressure.

HCAS Load Range Gauge – Aid in determining the load condition of crane. The gauge has three colors on the dial face: (1) Green – OK; (2) Yellow – Caution;

and (3) Red – Overload. **Do not use the Load Range Gauge with a jib.** Refer to “Hydraulic Capacity Alert System” for more information

HCAS Overload Light – Indicator light illuminates when HCAS detects crane overload and boom down, extend out and winch up functions disabled.

ATB Light – Indicator light illuminates when a two block condition is detected.

Override Key Switch – Turn key switch to enable or disable HCAS and ATB override.

Override Button – With Override Key Switch in on position, depress button to override HCAS and ATB system. Do not use override to continue lifting operations in an overload or two blocked condition.

Capacity Chart – This chart shows capacities of crane at various operating areas and winch capacities with appropriate reeving.

Boom Angle Indicator – Located on either side of the base boom section and used to determine main boom angle with respect to horizontal. For reference only.

Boom Length Indicator – Located on either side of the second boom section. The letters on the intermediate boom lengths correspond to the letters on the capacity chart. The length indicators are used to define boom length and with the capacity chart and load radius are used to determine the maximum loads that may be safely lifted. Actual radius must be measured from the centerline of rotation.

Load Radius – Horizontal distance from the center of rotation of the turret to the center of the loadline hook or load with the load suspended. Use boom angle and boom length as a reference to determine loadline or load radius. When lifting maximum rated load, always know the weight of the load and measure the radius with the load suspended.

Oil too heavy may cause the following conditions in the system:

1. System pressure drop.
2. Increases system temperature.
3. Sluggish system operation.
4. Low mechanical efficiency.
5. Higher power consumption.

The following oil viscosity characteristics are recommended:

- 80 to 180 SUS optimum at system operating temperature.
- 60 SUS minimum at system operating temperature.
- 7500 SUS maximum at starting temperature.
- 90 Viscosity Index (VI) minimum.

Note: On units equipped with self-leveling platforms, low temperature service oils are necessary to provide proper boom functions at temperatures below +10°F (-12°C).

Regardless of temperature and oil viscosity, always use suitable start-up procedures to ensure adequate lubrication during system warm up.

Note: Operation of the crane with incorrect hydraulic oil in sub freezing temperature (below 32°F, 0°C) can cause damage to the extend cylinder.

Antiwear Additives. Excessive wear in the system may cause a loss in volumetric efficiency, and may cause shutdowns for maintenance. An efficient antiwear oil protects the components against rusting, resists oxidation and helps prevent wear.

Standard Hydraulic Oil. (32°F to 100°F) (0°C to 38°C) New cranes come from the factory with ISO Viscosity Grade 32 AW Hydraulic Oil. This fluid has a pour point of -15°F (-26°C).

Intermediate Hydraulic Oil. (-10°F to 80°F) (-23°C to 27°C) For colder operating environments, the standard fluid may be replaced with a Low Service Temperature Multi Viscosity Hydraulic Oil with High Viscosity Index 175+. Typical fluids are ESSO UNIVIS N-22 and CHEVRON RYKON PREMIUM Oil MV or equivalents.

Wide Range Intermediate Hydraulic Oil. (-30°F to 80°F) (-34°C to 27°C) For even colder operating conditions, the standard fluid may be replaced with a petroleum based fluid developed especially for colder environments. A typical fluid is Petro Canada Premium Plus All Season Hydraulic Oil or equivalent.

Arctic Hydraulic Oil. (-10°F and below) (-23°C and below). In general, petroleum based fluids developed especially for low temperature service may be used with satisfactory results. However, certain fluids, such as hydrogenated hydrocarbons, nitro hydrocarbons and phosphate ester hydraulic fluids might not be compatible with

hydraulic system seals and wear bands. A typical fluid is Texaco Aircraft Hydraulic Oil 15 or equivalent. This hydraulic oil is not recommended for service in ambient temperatures above 32°F (0°C).

If you are in doubt about the suitability of a specific fluid, check with your authorized National Crane distributor or National Crane Product Support.

LUBRICATION POINTS

A regular frequency of lubrication must be established for all lubrication points. Normally, this is based on component operating time. The most efficient method of keeping track of lube requirements is to maintain a job log indicating crane usage.

All oil levels are to be checked with the crane parked on a level surface in transport position, and while the oil is cold unless otherwise specified.

On plug type check points, the oil levels are to be at the bottom edge of the fill port.

Over lubrication of non-sealed fittings will not harm the fittings or components, but under lubrication will definitely lead to a shorter lifetime.

Grease fittings that are worn and will not hold the grease gun, or those that have a stuck check ball, must be replaced.

When wear pads or rotation bearings are lubricated, cycle the components and relubricate to ensure complete lubrication of the entire wear area.

WIRE ROPE LUBRICATION

Wire rope is lubricated during manufacturing so the strands, and individual wires in strands, may move and adjust as the rope moves and bends. A wire rope cannot be lubricated sufficiently during manufacture to last its entire life. Therefore, new lubricant must be added periodically throughout the life of a rope to replace factory lubricant which is used or lost.

The surface of some ropes may become covered with dirt, rock dust, or other material during their operation. This covering can prevent field applied lubricants from properly penetrating into the rope. Therefore, these ropes should be cleaned before being lubricated.

The lubricant applied should be light bodied enough to penetrate to the core of the rope. Lubricant may be applied effectively by various methods. It may be dripped on, sprayed on, or put on by brushing, but in any case it should be applied at a place where the rope is being bent, such as at a sheave. It should be applied at the top of the bend, because at that point the strands are spread by bending and are more easily penetrated. The service life of rope will be directly proportional to the effectiveness of the method used and amount of lubricant reaching the working parts of the rope.

A proper lubricant must reduce friction, protect against corrosion, adhere to every wire and be pliable and not crack or separate when cold and yet not drip when warm.

Alternative #2

This procedure is to be used for anti-two-block wire replacement in the event of a complete separation of the wire, or the inability to access one or both of the ends outside the boom assembly. This procedure routes a new anti-two-block wire through the boom without having an existing wire to pull it through (Alternative #1).

Special tools or equipment:

- Electrical tape
- Installation tool

To route the wire the entire length of the boom, a long tube, to be used as a installation tool, must be utilized to transport the end of the anti-two-block wire from one end of the boom assembly to the other. A telescopic grease applicator for the boom, hydraulic tubing or electrical conduit are all possibilities for an installation tool. The installation tool should be at a minimum 2' longer than the retracted boom assembly.

1. Retract boom completely.
2. Loosen and remove anti-two-block cable clamp arrangements from sheave case and 3rd section extend anchor. Remove spade bolt anchor from extend cable anchor plate in the winch mount end of boom.
3. Remove quick disconnect plug on anti-two-block wire by unscrewing base of plug and disconnecting individual wires from connections. Note pig-tail length at this time, and wire/terminal number location for proper reassembly.
4. Pull anti-two-block wire out of boom assembly. Visually inspect boom interior from both ends to verify all the cable has been removed from the boom. Visually inspect center sheave on extend cylinder for damage.
5. Start installation of replacement wire on the sheave case end of the boom assembly. Using electrical tape, attach one end of replacement wire to the end of the installation tool.
6. Insert installation tool and wire into sheave case in the center open area between the sheave case side plates. Visually guide the wire and installation tool over the center sheave on the extend cylinder sheave case.
7. Push installation tool and wire through boom until it appears at the winch mount end, detach wire from installation tool, route wire through open top of winch mount and temporarily tie off to a convenient anchor point. Pull installation tool out sheave case end of boom.
8. From sheave case end of boom, attach other end of replacement wire to installation tool with electrical tape. Insert installation tool and wire into the boom sheave case, in the open area between the sheave case side plates. Visually guide this end under the center sheave on the extend cylinder sheave case.

9. Push installation tool and wire through boom until it appears at the winch mount end. Do not detach wire from installation tool.
10. From winch mount end of boom, locate installation tool and attached wire, and pull the wire out of the boom section, removing the slack loop from the sheave case end of the boom. This will place the wire close to, if not on the center sheave of the extend cylinder.
11. Move to the sheave case end of the boom. Visually determine if the wire has properly located itself onto the sheave. If not, manipulate the wire placement through the end of the boom and place the wire on the sheave. A 5' (1.50 m) long access tool (hook end) will simplify this procedure greatly.
12. From the winch mount end of the boom, assemble the anti-two-block wire clamp on the extend cable anchor in the rear of the 3rd section. Loop anti-two-block wire around clamp and lightly tighten capscrew holding clamp together. Keeping a slight amount of tension on the wire at this point will keep the wire properly located on the sheave.
13. From the sheave case end, pull the installation tool and wire end out of the boom. The route of the anti-two-block wire in the boom is now complete.
14. Pull wire at either end of boom to adjust length of wire on sheave case end to properly attach and terminate wire.
15. Tighten anti-two-block wire clamp located in rear of 3rd section.
16. Route sheave case end of anti-two-block wire around clamp in sheave case and through holes in side plates. Pulling on this end will tension the static length of anti-two-block wire clamped in the 3rd. Approximately 15-25 lb (7-11 kg) will be sufficient to provide proper operation. Tighten sheave case anti-two-block wire clamp.
17. Reassemble quick disconnect plug to anti-two-block wire. Proper wire attachment is critical for proper anti-two-block system operation. Consult electrical schematic in this book for proper connector wiring.
18. From winch mount end of boom, slide strain relief/cord grip onto wire, into approximately position inside the boom.
19. Assemble spring and spade bolt to cord grip and reassemble anchor components to extend cable anchor plate on the winch mount. Slide cord grip up anti-two-block wire into boom to increase spring tension on moving length of anti-two-block wire. Approx. 2" (50 mm) of spring extension tension should be adequate for proper operation.
20. Visually inspect interior routing of anti-two-block wire for excess slack in wire, inaccurate routing of wire, etc. Correct any problems before boom operation.

(OPTIONAL) OIL COOLER SERVICE & MAINTENANCE

The heat exchanger must be kept clean to allow for efficient operation of the cooler system. Frequent washing of the heat exchanger core will eliminate oil film, road dirt and other foreign object buildup on the heat exchanger fins which reduces cooling efficiency.

Frequent inspection and tightening of hose clamp line connections will eliminate the possibility of end connection failure due to back pressure from cold startup.

If cooler system fails to provide adequate performance, reduced air or oil flow through the heat exchanger is the probable cause. The cooling fan should be inspected for proper operation (see Specifications). Any obstructions in air flow should be corrected (cooler too close to other truck components, foreign matter in heat exchanger fins, etc.) All hydraulic lines should be periodically checked for obstructions, hose kinks or other flow restrictions.

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JIB LOAD LIMITING DEVICE

This system is designed to provide load limiting capability for jibs. This is accomplished with the use of an angle sensor, a load cell force sensor, a microprocessor, and enough memory to store 30 table sets containing the maximum force for a given jib head angle and given crane configuration. The system will compare the measured force to the table and will provide lockout when the table value is exceeded. The system should be checked for proper operation during initial crane start up and quarterly thereafter.

SYSTEM INSTALLATION

Before mounting the electronics box in the jib, the following procedure needs to be followed to match the jib load limiting device to the jib.

Remove the electronics from the housing. Set the switches to 10101010. Power the system—a 12V power supply is required. The system is powered when the power supply is plugged into the 3-conductor cord of

the wire harness—12V to #2, ground to ground. Powering the system with the switches set as described clears the existing selection. Turn off power to the system. Choose the desired switch setting from the parts pages and set the switches. At the next power-up of the system, the desired selection will be stored. Replace the electronics into the housing, and mount the system in the jib as shown in the parts pages.

After assembling the jib, it is necessary to zero the angle sensor. Carefully level the jib from end to end. A level indicator should be placed near the tip end of the jib—directly over the electronics box. Power the system. Using a jumper wire short together pin #1 and the ground pin of the four-conductor cord from the electronics box. This is the cord that plugs into the ATB switch. Remove the jumper wire, plug the cord into the ATB switch, and remove the power supply. **Anytime the electronics box is removed from the jib, it must be re-zeroed upon re-installation.**

TROUBLESHOOTING

Symptom	Possible Cause	Corrective Action
System is in a state of constant cut-out	1. Loose or incorrect wiring. 2. Blown fuse. 3. ATB switch open. 4. No table selected. 5. Load cell not calibrated.	1. Carefully check the integrity of all circuits external to the electronics box, from the jib tip to the console. Compare to electrical schematic. 2. Check fuse at crane console. Replace if necessary. Remove electronics box from jib, remove electronics from housing, and check 2A fuse on board. Replace if necessary. 3. Ensure that ATB switch is closed. 4. Follow procedure in system installation section to select the correct table for the application. 5. To set the zero point, remove all force from the load cell. Remove the electronics from the housing. Set the switch position 8 to ON. Power the system. Do not turn off power until both the zero point and the gain have been set. To set the zero point, press the button on the board. To set the gain, set switch position 8 to OFF. Set the switch to the correct code that matches the load cell gain. This code can be found on the tag that accompanies the load cell. Press the button.

EXAMPLE:

Refer to the sample truck frame cross sections in Table E. Truck frame yield strength is 110,000 psi (758 MPa) with the following dimensions at the front axle location: 3/8 in. (9.65 mm) thick, 1.50 in. (38.1 mm) top flange, 3 in. (76.2 mm) bottom flange, 10.25 in. (260 mm) deep. To find the frame section modulus:

1. Use a channel with 1.50 (38.1 mm) flanges since 1.50 in. (38.1 mm) is the smaller flange width.
2. From Table E, 3/8 in. (9.65 mm) thickness, W (width) = 1.50 in. (38.1 mm), D (depth) = 10.0 in. (254 mm) Section Modulus = 10.2 in.^3 (167 cm^3).
3. From Table E, 3/8 in. (9.65 mm) thickness, W = 1.50 in. (38.1 mm), D = 11.0 in. (279 mm) Section Modulus = 11.9 in.^3 (195 cm^3).
4. Interpolate between the two values:

$$10 \text{ in. (254 mm) deep channel} \\ = 10.2 \text{ in.}^3 (167 \text{ cm}^3)$$

$$11 \text{ in. (279 mm) deep channel} \\ = 11.9 \text{ in.}^3 (195 \text{ cm}^3)$$

$$10.5 \text{ in. (267 mm) deep channel} \\ = \frac{10.2 \text{ in.}^3 + 11.9 \text{ in.}^3}{2} = 11.0 \text{ in.}^3 \\ = \frac{167 \text{ cm}^3 + 195 \text{ cm}^3}{2} = 181 \text{ cm}^3$$

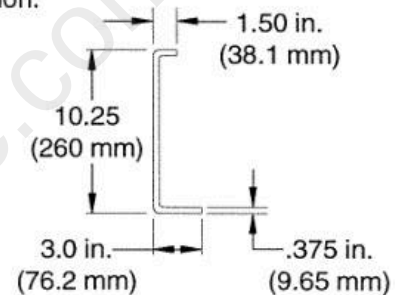
5. Now interpolate between a 10.0 in. (254 mm) deep channel and a 10.5 in. (267 mm) deep channel to get the section modulus of a 10.25 in. (260 mm) deep channel

$$10.0 \text{ in. (254 mm) deep channel} \\ = 10.2 \text{ in.}^3 (167 \text{ cm}^3)$$

$$10.5 \text{ in. (267 mm) deep channel} \\ = 11.0 \text{ in.}^3 (181 \text{ cm}^3)$$

$$10.25 \text{ in. (260 mm) deep channel} \\ = \frac{10.2 \text{ in.}^3 + 11.0 \text{ in.}^3}{2} = 10.6 \text{ in.}^3 \\ = \frac{167 \text{ cm}^3 + 181 \text{ cm}^3}{2} = 174 \text{ cm}^3$$

Frame Section Modulus at the front axle location is 10.6 in.^3 (174 cm^3). This is greater than the 6.2 in.^3 (102 cm^3) required so the truck frame is strong enough at this location.



Full Version Available

National Crane 400B Truck Crane Operator Manual

National Crane 400B truck crane operator manual, covering controls, safe operation, setup, and daily checks and care. Instant PDF download.

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