OPERATOR'S MANUAL

RT-400-B CRANE

99030264

BMC BRODERSON® Manufacturing Corp.

Lenexa, Kansas, 66215 • 913-888-0606

SAFETY DECLARATION TO THE OPERATOR

Proper lighting, safety signs, warning bells, etc., can only **ASSIST** in preventing an accident. But **YOU**, the operator, can **PREVENT** an accident. **YOU**, the operator, must be responsible for the personal safety of yourself and all persons around the machine. **YOU**, the operator, have total responsibility for the safe operation of this machine. You are not to move it until **YOU** know it is safe to do so, or have been appropriately signaled by an appointed ground person.

Jan 2024

Employees should be aware of possible dangers in operating or working around lift equipment. This type of machine operates in and around rough terrain. This environment increases the potential hazard in operating these machines. This naturally requires alertness and caution by you to prevent accidents while achieving expected productivity from your machine.

⚠ WARNING

Working in the area of industrial equipment is dangerous. Certain inherent risks are associated with industrial machines due to the nature of their use. Personnel in the area of industrial machines are subject to certain hazards that cannot be met by mechanical means but only by the exercise of intelligence, care, and common sense. It is therefore essential to have personnel involved in the use and operation of equipment who are competent, careful, physically and mentally qualified, and trained in the safe operation of the equipment and the handling of loads. Failure to do so could result in personal injury or death. W-2034-WP-0

CALIFORNIA

PROPOSITION 65 WARNING

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

For more information on the type of chemicals covered under the Proposition 65 Warning, visit oehha.ca.gov/proposition-65. W-2035-WP-0

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SECTION 1

INTRODUCTION

BRODERSON MANUFACTURING CORP.

STATEMENT OF WARRANTY

Broderson Manufacturing Corp. (“BMC”) warrants its products to be free from defects in material or workmanship at the date of shipment from BMC. This warranty shall be effective only when validated by the return to BMC of its standard form of Warranty Validation Certificate (Attachment A), duly completed and signed by the original purchaser from BMC and any subsequent purchaser who buys a BMC product as a new product, and then only as to defects reported to BMC in writing within 1 year or 2000 hours, whichever occurs first, from the date a product is placed in service, as evidenced by such warranty validation certificate. **THIS WARRANTY APPLIES TO ALL PARTS OF BMC’S PRODUCTS EXCEPT ENGINES, DRIVE TRAINS, HYDRAULIC SYSTEM COMPONENTS, T I RE S, OR ACCESSORY EQUIPMENT, WITH RESPECT TO WHICH BMC MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND NO OTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED**; the sole warranties, if any, with respect thereto being those made by the respective manufacturers thereof.

THE SOLE REMEDY FOR BREACH BY BMC OF THIS WARRANTY SHALL BE THE REPLACEMENT OF ANY PARTS OF ITS PRODUCTS WHICH WERE DEFECTIVE AT THE DATE OF SHIPMENT OR, IF (AND ONLY IF) REPLACEMENT OF DEFECTIVE PARTS IS IMPOSSIBLE OR IS DEEMED BY BMC TO BE IMPRACTICAL, REPLACEMENT OF THE ENTIRE PRODUCT OR, AT BMC’S OPTION, REFUND OF THE PURCHASE PRICE. The replacement remedies include labor in connection with the removal of defective parts and the installation of their replacements, as well as the cost of delivery and transportation of defective products or parts and the replacements thereof. The sole purpose of these remedies is to provide the purchaser with free replacement of defective parts or, in the limited circumstances specified, replacement of the entire product or a refund of the purchase price. These exclusive remedies shall not be deemed to have failed of their essential purpose so long as BMC is willing and able to replace defective parts or the entire product or to refund the purchase price. The remedies herein provided shall be available only if BMC is given reasonable access to the product, including all allegedly defective parts, promptly after the defect is discovered. BMC shall have the right to return any allegedly defective parts to its plant or any other location selected by it, for inspection and testing to determine whether they were defective at the date of shipment, prior to replacement thereof.

The warranty herein made is extended only to the original purchaser from BMC and any subsequent purchaser who buys a BMC product as a new product. **WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, BMC EXPRESSLY DISCLAIMS THAT THE WARRANTY MADE HEREIN EXTENDS TO A PERSON WHO RENTS OR LEASES ANY BMC PRODUCT OR WHO PURCHASES ANY BMC PRODUCT AS A USED PRODUCT.** For purposes hereof, a BMC product shall conclusively be deemed “used” after the expiration of twelve (12) months from its placement in service, as evidenced by a duly completed and signed warranty validation certificate actually received by Broderson, or after such earlier time as it has been operated for more than one hundred (100) hours. This warranty shall not apply to ordinary wear and tear; negligence; acts of God; vandalism; abuse; misuse; neglect; accident or causes beyond the reasonable control of BMC, including without limitation fires, freezing, floods and other natural disasters; overloading; unauthorized altered, modified or changed products or parts; products or parts that have been improperly adjusted; or the Purchaser’s neglect, negligence or willful damage; any products or parts not provided by BMC; any products or parts which have been repaired outside of BMC or an authorized distributor facility ; unless authorized in writing by BMC; or damages caused by failure to follow the maintenance procedures outlined in the applicable service manual or in technical bulletins issued by BMC.

BMC does not warrant any of its products to meet any state, local or municipal law, ordinance, code, rule or regulation. The purchaser must assume the responsibility for maintaining and operating the products which are the subject of this warranty in compliance with such of the foregoing as may be applicable, and BMC shall not be liable for the purchaser’s failure to meet such responsibility.

THE WARRANTY HEREIN MADE IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED. BMC MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER EXPRESS OR IMPLIED WARRANTY OF ANY KIND, TO ANY PURCHASER, LESSEE OR RENTER OF NEW OR USED BMC PRODUCTS OR ANY OTHER PERSON

WHATSOEVER. NO PERSON IS AUTHORIZED TO ACT ON BEHALF OF BMC IN MODIFYING THE WARRANTY HEREIN MADE OR IN MAKING ANY ADDITIONAL OR OTHER WARRANTY.

IN NO EVENT SHALL BMC BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER. THIS EXCLUSION OF INCIDENTAL AND CONSEQUENTIAL DAMAGES IS INTENDED TO BE INDEPENDENT OF ALL OTHER PROVISIONS OF THIS STATEMENT OF WARRANTY AND SHALL BE GIVEN FULL EFFECT NOTWITHSTANDING THE UNENFORCEABILITY OR FAILURE OF THE ESSENTIAL PURPOSE OF ANY OTHER PROVISION OF THIS STATEMENT OF WARRANTY.

THE FOREGOING DISCLAIMERS OF WARRANTIES AND DISCLAIMER OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES SHALL BE EFFECTIVE REGARDLESS OF WHETHER THE EXPRESS WARRANTY CONTAINED HEREIN BECOMES EFFECTIVE AS PROVIDED IN THE FIRST PARAGRAPH HEREOF.

RT-400-B ROUGH TERRAIN CRANE

INTRODUCTION

The Broderson RT-400-B was designed and built to provide safe, dependable, and efficient crane service. We warrant this by our testing and quality control procedures. To properly utilize the full potential of the equipment, the following customer-controlled conditions must exist:

1. The operator must understand the equipment.
2. The operator must know the operating characteristics.
3. The operator must observe the safety rules.
4. The equipment must be given proper maintenance.

This manual was written to provide information required for these conditions. The recommendations for periodic inspection, test, and maintenance are minimum standards for safe and economical performance.

This unit must not be altered or modified without written factory approval.

When ordering parts, the unit serial number, unit model number, part number, part description and quantity must be provided.

To reorder this manual, ask for RT-400-B Operation Manual Part Number **99030264**. Contact your Broderson Service Representative at:

Broderson Manufacturing Corp.

14741 W. 106th Street

Lenexa, Kansas, 66215 U.S.A.

913-433-2700

service@bmccranes.com

MESSAGE TO THE OPERATOR

⚠ WARNING

This machine must be operated by trained personnel only. Operation by untrained personnel could result in personal injury or death. W-2030-WP-0

You are about to operate the finest MACHINE in the industry.

A great deal of confidence has been placed in you because you were selected to operate such a key piece of equipment. When operating this machine, keep in mind safety and maintenance. Your skill and attitude (or lack of) are the most important factors in controlling safety and maintenance costs. A careless or untrained operator can make useless any safety device installed on the machine. They also can cause damage to the machine itself.

As you become familiar with the day-to-day operation of this machine, you will become familiar with its distinctive sound and “feel”. Only you can notice any changes in its operation. If something doesn’t sound right or feel right, bring it to the attention of your maintenance department. If caught in time, it may result in savings to your company.

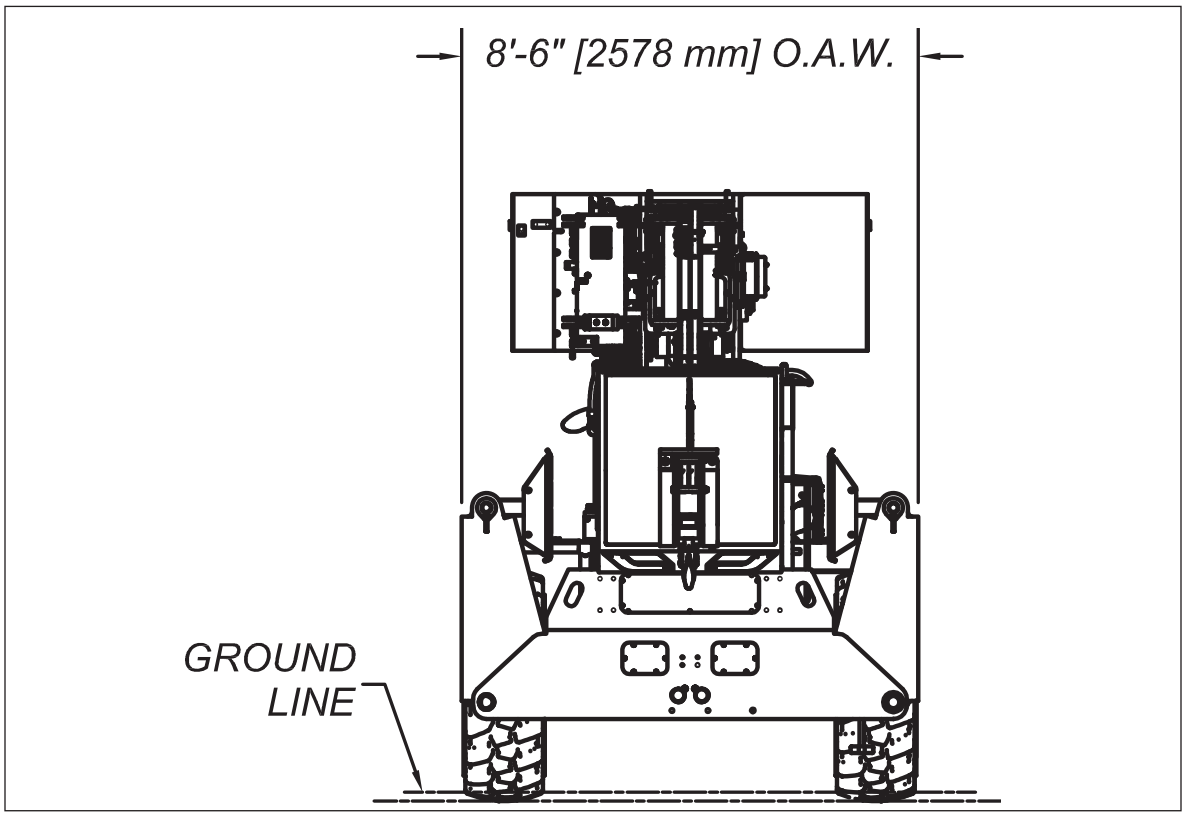
Most importantly, operate your machine in a safe and efficient manner. Be alert at all times and follow the safety rules and operating procedures as provided in this manual.

The mark of an experienced operator is safe, efficient, well-thought-out moves. The responsibility placed on you as an operator of this key piece of equipment marks you as a professional operator.

SECTION 2

DIMENSIONS AND ORIENTATION

FRONT VIEW



RT-400B-GS-020-00-DR-1

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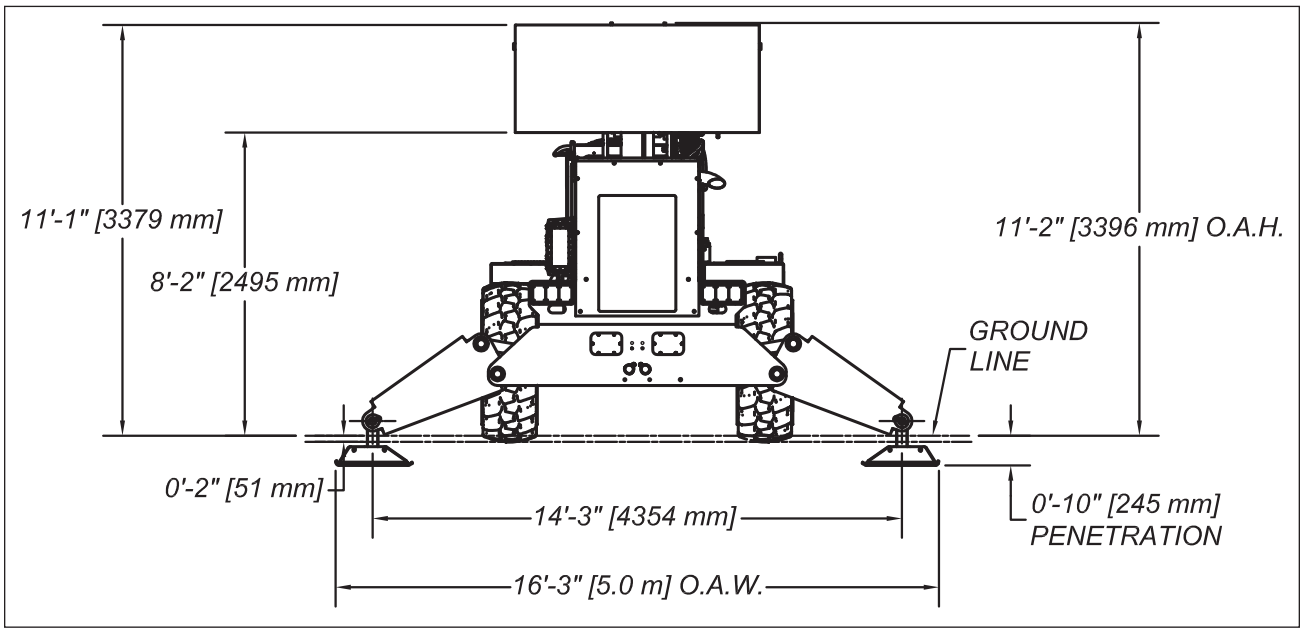
REAR VIEW



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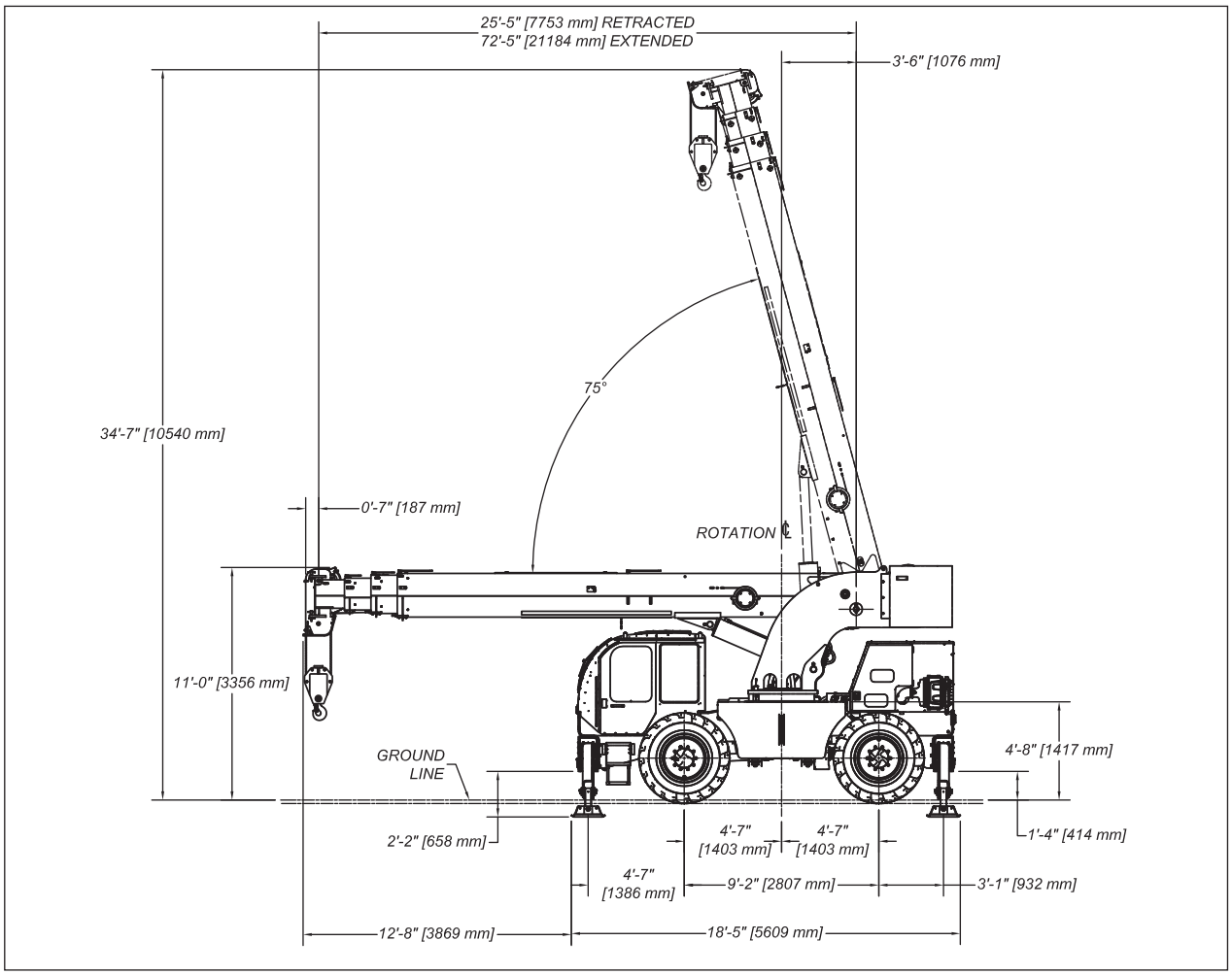

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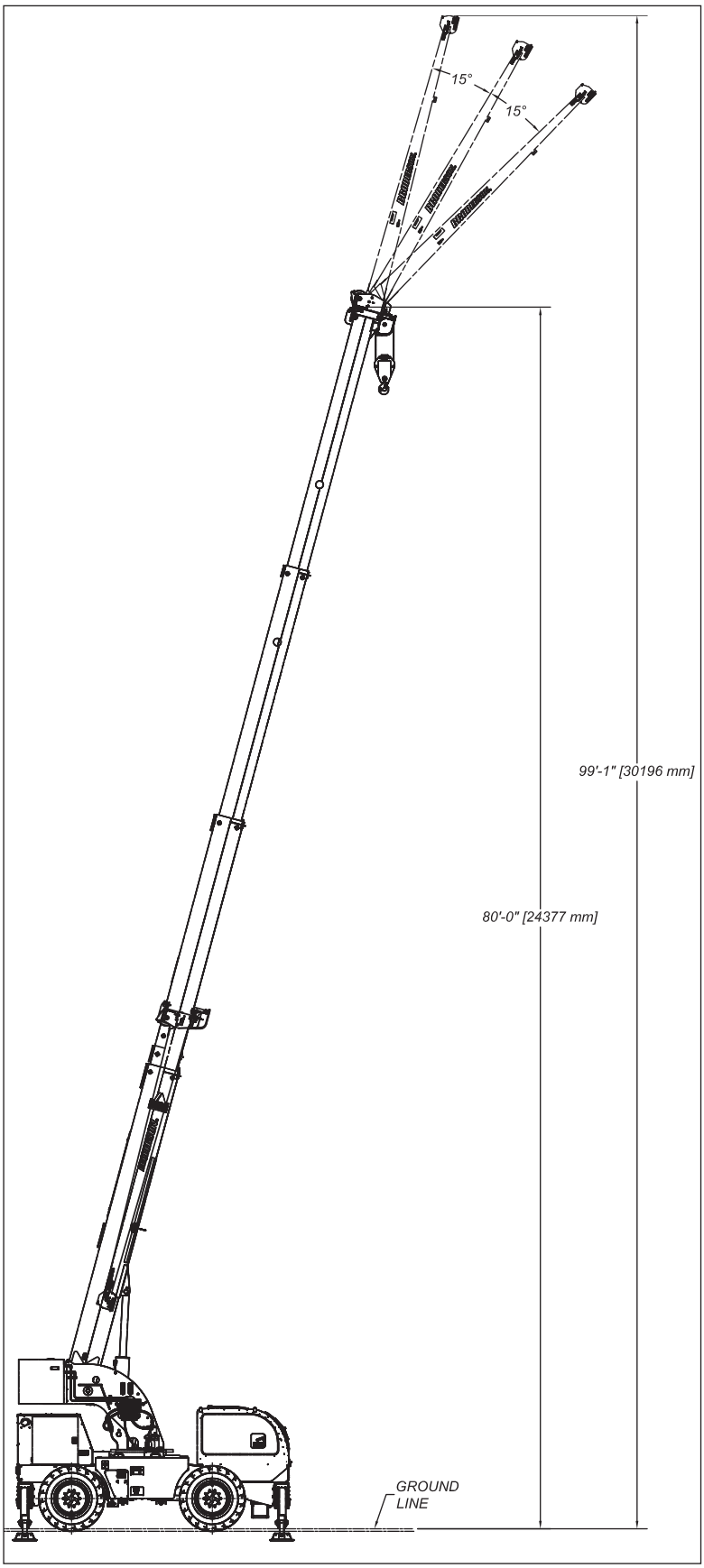
RT-400B-GS-020-00-PH-3

RIGHT VIEW



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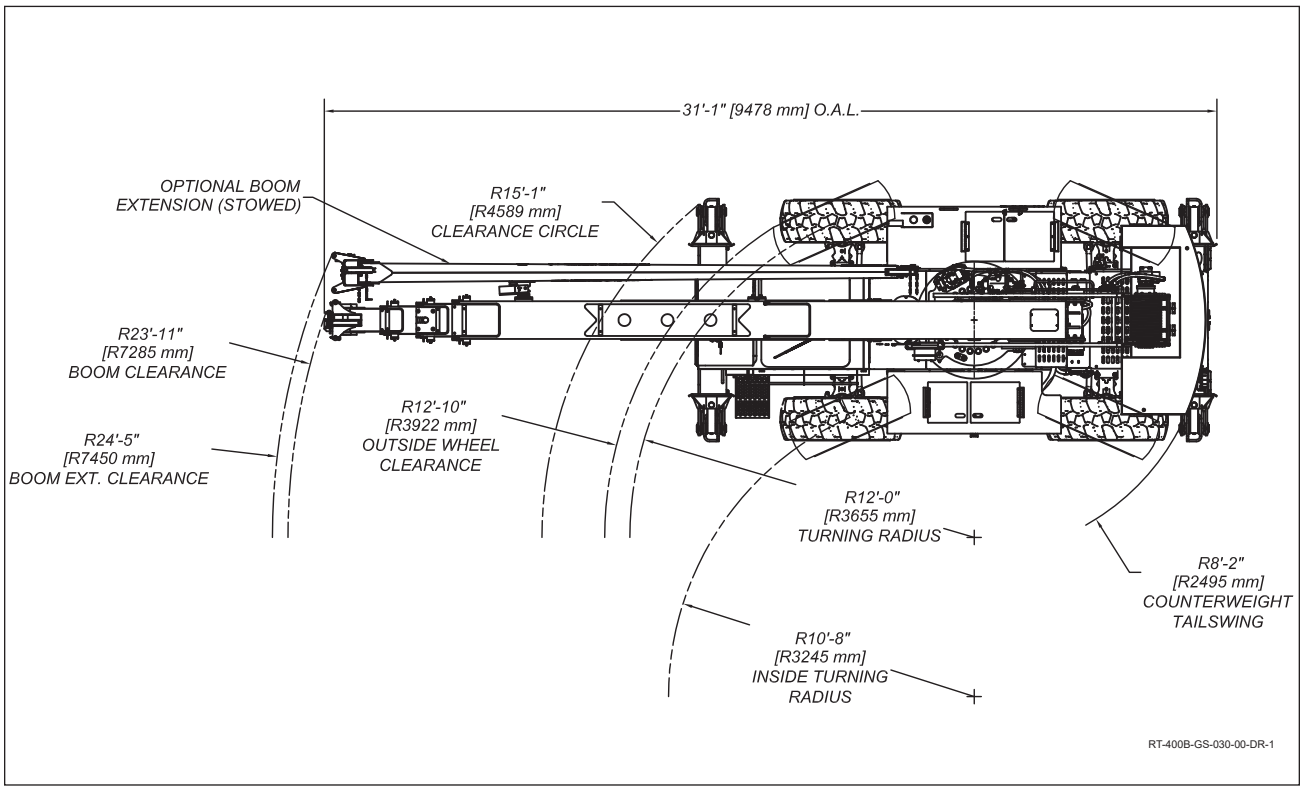
SECTION 3

TURNING DIMENSIONS

TURN RADIUS



Measurement	Dimension
R24’-5” [R7450 mm]	Boom Ext. Clearance
R23’-11” [R7285 mm]	Boom Clearance
R12’-10” [R3922 mm]	Outside Wheel Clearance
R15’-1” [R4589 mm]	Clearance Circle
R12’-0” [R3655 mm]	Turning Radius
R10’-8” [R3245 mm]	Inside Turning Radius
R8’-2” [R2495 mm]	Counterweight Tailswing

SECTION 4

DESCRIPTION AND SPECIFICATIONS

DESCRIPTION

The RT-400-B is a self-propelled cab-down rough-terrain crane designed for lifting and material handling and features 4-wheel steer and 4-wheel drive. It is designed to be used in applications where the easy “stair step” entry and exit of a cab-down rough-terrain crane is desired. The 20 US ton (18,143.7 kg) lifting capacity and the 72-ft 5-in (22.07 m) telescopic boom provides superior lifting capacity and reach envelope compared to competitive units.

The RT-400-B incorporates an electro-hydraulic control system to provide superior controllability during crane function movement. RT-400-B control levers are multi-axis electronic joysticks mounted on the operator’s station armrests to enable comfortable operation of the crane in a spacious operator cab environment. The RT-400-B engine is US EPA Tier 4 Final/Stage V emissions compliant. The RT-400-B CAN-bus-based control system provides troubleshooting and operation history data, and it easily integrates with advanced functions like telematics, load-indicating external light bars, and crane camera systems.

The basic unit consists of a chassis and rotating hydraulic boom turret assembly. The chassis includes:

- Steel frame
- 4 hydraulic independently controlled swing-down outriggers
- Engine
- 2-range, 3-speed (forward and reverse) transmission
- Front and rear steering/driving axles
- 4-mode power steering (front 2-wheel steer, 4-wheel steer, crab steer, 2-wheel rear steer)
- Fuel tank
- Hydraulic oil tank
- Operator cab and control station
- Power brakes and lighting package

The turret includes:

- 4-section boom and hydraulic telescoping cylinder
- Topping cylinder
- Counterweight
- Single-speed hydraulic powered hoist (2-speed optional)
- Planetary rotation gear with hydraulic motor and parking brake

A Broderson-designed Rated Capacity Limiter is standard.

RT-400-B SPECIFICATIONS

General

Length	
Overall	31 ft 0 in (9,449 mm)
Chassis	18 ft 5 in (5,613 mm)
Width	8 ft 6 in (2,591 mm)
Height, Overall	11 ft 2 in (3,404 mm)
Weight, Total	49,750 lbs (22,566 kg)
Wheelbase	9 ft 2 in (2,794 mm)
Ground Clearance, Chassis	16 in (406 mm)
Angle of Approach	18°
Angle of Departure	27°
Turning Radius: (4-Wheel Steering)	
Outside Tire Centerline Radius	12 ft 0 in (3,658 mm)
Vehicle Clearance Circle Radius	15 ft 1 in (4,597 mm)
Inside Turning Radius	10 ft 8 in (3,251 mm)
Counterweight Tail Swing	8 ft 2 in (2,489 mm)
Road Speed	22 mph (37 km/h)
Gradeability	70%* (34°)
Grade Limit	19%* (11°)
*Calculated, wheels spin below these values in 2-wheel drive.	
Front Axle	29,050 lbs (13,177 kg)
Rear Axle	20,700 lbs (9,389 kg)
Drawbar Pull	33,500 lbs (15,100 kg)
Boom Capacity	40,000 lbs (18,143 kg) at 10 ft (3,048 mm)
Boom - Extended Length	72 ft 5 in (22,073 mm)
Main Boom - Horizontal Reach	69 ft 6 in (21,183 mm)
Maximum Sheave Height	80 ft (24,384 mm)

	Rotation	**Elevation**	**Extension**
Boom	Continuous	0° to 75°	47 ft (14,300 mm)
Boom Speeds	2 rpm	28 sec	57 sec

Engine

Standard:

Cummins QSF3.8

- Cummins Model QSF 3.8 diesel engine, turbocharged, charge air-cooled, four-cylinder, 3.8 liter (229 CID).
- U.S. EPA Tier 4 Final / EU Stage V. Bore 4.02 in (10.2 cm), stroke 4.53 in (11.5 cm).
- Rated 154 hp (115 kw) at 2,500 rpm.
- 457 ft lbs (620 Nm) maximum torque at 1,500 rpm.
- 130 amp alternator.
- Oil capacity: 11.6 qts (11 L).
- Coolant capacity: 33.6 qts (31.8 L).
- Multiple throttle control modes: foot pedal, auto-idle, speed presets – 1100, 1500 or 2000 rpm, as well as incremental rpm steps at 100 rpm per step between set points.
- Charge air cooler, grid heater and 120 VAC engine block heater.
- Tier 4 Final / EU Stage V engines require ultra-low sulfur diesel (ULSD) 15 parts per million (ppm) and diesel exhaust fluid (DEF).
- A 10-gallon DEF container is located adjacent to the fuel tank.
- Engine protection system derates the engine if the multiple operator fault codes are ignored.

Optional:

For sale only to countries that do not require the standard engine emissions ratings.

- Cummins model F3.8 diesel engine, turbocharged, charge air cooled, four-cylinder, 3.8 liter (229 CID).
- QSF3.8L. EU Stage II, Bore 4.02 in (10.2 cm), stroke 4.53 inches (11.5 cm).
- Rated 154 hp (115 kw) at 2,500 rpm.
- 435 ft lbs (590 Nm) maximum torque at 1,500 rpm.
- 130 amp alternator.
- Oil capacity, 11.6 qts (11 L).
- Coolant capacity, 33.6 qts (31.8 L).
- Multiple throttle control modes: foot pedal, auto-idle, speed presets – 1100, 1500 or 2000 rpm, as well as incremental rpm steps, at 100 rpm per step between set points.
- Engine protection system derates the engine if the multiple operator fault codes are ignored.
- Charge air cooler, grid heater and 120 VAC engine block heater.

Fuel Tank:

- 70 gallon (265 L) capacity.

Transmission

Standard:

- Dana 13.5 HR Powershift transmission with 2 ranges and 3 speeds in FORWARD and REVERSE.
- Provides full powershifts between the 3 FORWARD and REVERSE gears at maximum engine speed.
- Provides a low range and a high range that can be selected when the machine is at a STOP.
- All shifting is done with an electric push button operator interface.
- The transmission includes a front axle disconnect for 2-wheel drive when commanded by the operator through the electric push button interface in the operator compartment.
- The machine must be placed in park before changing from 2-wheel drive or 4-wheel drive.
- A torque converter attaches directly to the engine flywheel to drive the transmission.
- Equipped with oil cooler and filter.

Forward Gear Ratios and Speeds			Reverse Gear Ratios and Speeds		
Gear	**Ratio**	**Speed**	**Gear**	**Ratio**	**Speed**
1st	9.05	1.7 mph (2.7 km/h)	1st	9.05	1.7 mph (2.7 km/h)
2nd	4.68	3.4 mph (5.5 km/h)	2nd	4.68	3.4 mph (5.5 km/h)
3rd	1.72	9.2 mph (14.8 km/h)	3rd	1.72	9.2 mph (14.8 km/h)
4th	3.73	4.2 mph (6.8 km/h)	4th	3.73	4.2 mph (6.8 km/h)
5th	1.93	8.2 mph (13.2 km/h)	5th	1.93	8.2 mph (13.2 km/h)
6th	0.71	22.3 mph (36 km/h)	6th	0.71	22.3 mph (36 km/h)

Front Axle

Standard:

- Dana 213 Series planetary drive-steer axle with 19.33 to 1 ratio. Front axle is rigid mounted and has 30% limited-slip differential.

Rear Axle

Standard:

- Dana 213 Series planetary drive-steer axle with 19.33 to 1 ratio. Rear axle is rigid mounted and has 30% limited-slip differential.

Brakes

Standard:

- Four-wheel hydraulic, internal wet-disc brakes. System includes two 0.4 gallon (1.4 L) accumulators, unloading valve, and brake malfunction light.
- Parking brake is internal wet-disc, spring applied, hydraulically released, integral to rear axle.

Steering

Standard:

- Hydraulic steering unit with a 4 in (10.1 cm) bore cylinder attached to each axle. Allows limited steering when engine is not running.
- Push button operator interface to select between four steer modes: front-wheel, 4-wheel, rear-wheel, or crab steer. See the Instruments and Controls section of the Operator's Manual for more information.
- Electronic sensors sense when wheels are centered upon selection of new mode.
- Steering wheel, control module, and electronically controlled selector valve control 4-mode steering.

Tires

Standard:

17.5 x 25, 20-ply rating, mud lug, bi-directional.

Tire Options:

Spare Wheel and Tire:

- Standard Size: Extra wheel with 17.5 x 25, 20-ply rating tire mounted, ready for service.
- Net Weight: 530 lbs (240 kg)

Chassis

Standard:

Steps:

- Grip-strut steps forward of driver's side front tire and ergonomically located grab bars enable easy cab entry and exit.

Outriggers:

- Four independently controlled outriggers of swing-down design. Hydraulic cylinders are equipped with holding valves.
- Outrigger pad dimensions: 19 in (483 mm) by 25 in (635 mm).

Sheave Block Storage:

- Recessed storage location integral to fuel tank for stowing sheave block with hook on top for easy lifting and lowering into storage box.

Tie Downs:

- Four tie-down points (two front, two rear) for transport.

Rear View Mirrors:

- Right and left side mirrors mounted to cab provide visibility to rear and sides of crane.

Optional Chassis Accessories

Auxiliary Front Winch:

- Planetary gear winch with manual free spool drum disconnect, mounted beneath front chassis frame with push button controls located in operator's compartment.
- Hydraulically powered to provide bare drum line pull of 15,000 lbs (6800 kg) and 25 ft/min (7.6 m/min) line speed.
- Includes 125 ft (38.1 m) of 9/16 in (14 mm) diameter 6x36-EIP-IWRC wire rope, minimum breaking strength of 33,600 lbs (150kN).
- A pintle hook is recommended for 2-parting line with a sheave block (not included).
- Option includes cab front window folding guard.
- Net Weight: 580 lbs (265 kg)

Rated Line Pull		(lbs) 15,000 (kg) 6,800					
Gear Reduction		7.7:1					
Weight (without cable)		290 lbs (131 kg)					
Layer of Cable		**1**	**2**	**3**	**4**	**5**	**6****
*Rated line pull per layer	lbs	15,000	12,600	10,800	9,500	8,500	7,600
	kg	6,800	5,710	4,890	4,300	3,850	3,440
***Cable Capcity per Layer**							
"Y" Drum	ft	20	45	75	110	150	195
	m	6	13	22	33	45	60
*Line Speed (at 15 GPM)	FPM	25	29	34	39	44	48
	MPM	7.6	8.8	10.3	11.8	13.4	14.6
* These specifications are based on recommended wire rope of 1/2" (13mm) EIPS cable and 24.0 cu.in./Rev. motor. ** Last layer does not comply with SAE J-706							

Pintle Hook Front:

- T-60-AOL Holland pintle hook mounted on front outrigger frame member, rated for 30,000 lbs (13,600 kg) trailer weight.
- Net Weight: 15 lbs (6.8 kg).

Pintle Hook Rear:

- T-60-AOL Holland pintle hook mounted on rear frame member, rated for 30,000 lbs (13,600 kg) trailer weight.
- Net Weight: 15 lbs (6.8 kg).

Operator's Compartment

Standard:

- Operator control station with one-position access to all chassis and crane control functions. Includes adjustable suspension seat, seat belt, and tilting steering column.
- Includes connection point to J1939 CAN Bus System, DC charging plug, and cup holder.
- Operator compartment is equipped with safety glass and sliding door for entry and egress.
- Door is equipped with a keyed lock to protect the operator's station.

- Includes dome light, heater/AC with 2-speed fan, 12V-electric windshield wiper on front and top glass, and retractable shade for top glass.
- There is a sliding window in the right side of the operator compartment and kick-out emergency window in the rear of the cab.

Drum Rotation Indicator:

- Feedback device attached to hoist control handle provides tactile feedback to operator when hoist drum is rotating.
- Feedback is proportional to hoist speed.

Air Conditioning and Heating:

- Integrally-designed HVAC system. Heating system uses water from engine and a two-speed fan to deliver warmth to the operator station.
- Compact AC unit mounted in operator area, fan-cooled condenser integral to the machine cooling system, and belt-driven compressor with magnetic clutch, driven by engine, uses R134a coolant.
- All HVAC controls are located in the operator's station.

Hydraulic Controls:

- Two (2) electronic, multi-axis joysticks provide control of boom functions and hoist.
- "Arm" command, in conjunction with the seat switch, enables or disables the function of the joysticks. Keypads on armrest console control outrigger, transmission and steering functions. The unit must be armed to drive.

Electrical System - Standard 12 Volt DC - Standard

Batteries:

- Two (2) 12V, Group 31, 950 CCA batteries connected in parallel.

Lighting Group:

- Consists of two (2), 12V LED headlamps; LED front turn signals; LED taillights with brake; backup and turn signal lights; and one (1) emergency flasher.

Horn:

- 12V horn actuated by button located on steering wheel and joystick.

Operator Display:

- 10.1-in LED shows engine data including RPMs, warnings, faults, battery voltage, fuel level, hydraulic oil level and temperature. Display also includes RCL, outrigger, and control system information.

Back-Up Alarm:

- Provides pulsating sound from a 97-dB alarm when ignition is on and transmission is in REVERSE. Conforms to SAE J994B.

Outrigger Alarm System:

- Provides pulsating sound from a 97-dB alarm when the OUTRIGGER DOWN controls are operated.

Emergency Stop Switch:

- A two-position push button switch located on the top of the left armrest console. Designed to stop the engine and shut down the hydraulic system.

Optional Electrical Accessories

Cameras:

- Two cameras, one located on the hoist winch, and one located in the rear for backup use.
- Display in cabin.
- Net weight: 5.8 lbs (2.6 kg)

Strobe Lights:

- Two amber LED strobe lights, one mounted on each side of counterweight for high 360° visibility around crane. Flashes 60-120 times per minute.
- Lights are on whenever the outriggers or boom functions are moving. If the machine is in the "On Outriggers" state, they are also on. They can also be manually turned on from the HMI screen.
- Net weight: 15 lbs (7 kg)

Boom Work Lights:

- Two LED work lights, one on left side of boom to illuminate boom tip and one on the right side of the turret to illuminate ground under boom tip.
- Includes switch on the display in the operator compartment.
- Net Weight: 10 lbs (4.5 kg)

Hydraulic System

Standard:

- Two axial piston pumps, mounted on and driven by the main transmission, delivers a combined flow of up to 95 GPM (360 L/min) at up to 4000 PSI (280 bar) and 2500 RPM engine speed. System protected by relief valves, pressure filters (20 micron), and return filters (10 micron). Hydraulic oil cooler is standard.
- Hydraulic Reservoir: 110 gal (416 L) capacity, equipped with 10-micron breather filter on top and oil level gauge on side.

Boom

Standard:

- Four-section, high-strength steel construction. Single, telescoping hydraulic cylinder with wire rope and sheave system that extends and retracts the second, third, and fourth stages proportionally.
- The telescoping cylinder and the boom elevation cylinder are equipped with cylinder-mounted holding valves.
- Boom angle indicator is provided on the left side of the boom.
- Main boom horizontal reach: 65 ft (19.8 m). Hydraulically extended boom length: 72 ft 5 in (22.1 m).
- Extended boom length: 72 ft 5 in (22.1 m)
- Retracted boom length: 25 ft 6 in (7.77 m)

Boom Rotation

Standard:

- Heavy-duty bearing rotation gear with external teeth supports the turntable. Rotation is powered by hydraulic motor and planetary drive with integral spring set, hydraulically released brake. Rotation gearbox may be adjusted as wear occurs, to minimize backlash. Manual turret lock pin for transport.

Main Hoist

Standard:

- Hydraulically powered single speed planetary gear hoist with spring applied, hydraulically released brake and load holding valve. Grooved drum, spring applied cable follower and 3rd wrap indicator. Maximum bare drum line pull of 13,792 lbs (6,255.9 kg) and maximum line speed of 209 ft/min (63.7 m/min) (5th layer).

Optional:

- Hydraulically powered 2-speed (12 VDC solenoid at motor for speed selection) planetary gear hoist with spring applied, hydraulically released brake, and load holding valve. Grooved drum, spring-applied cable follower and 3rd wrap indicator. Maximum bare drum line pull of 13,792 lbs (6,255.9 kg) and maximum line speed of 297 ft/min (90.5 m/min) (5th layer).

Main Hoist Rope

Standard:

- Main hoist rope is 5/8” dia (16 mm), 425 ft (130 m) long, compact 35 rotation resistant, grade 2160 wire rope with a minimum breaking strength of 56,400 lbs (251 kN).
- Weight per foot is 0.88 lbs (1.31 kg per/m). Note that rope weight is not included in load calculations.

Hoist Performance - Normal Speed		
Wire Rope: 5/8-in diameter, Compact 35 rotation resistant rope, RRL lay, 2160 Grade. Line pulls are not based on wire rope strength.		
Rope Layer	Max Line Pull	Line Speed
1	13,792 lbs (6,255.9 kg)	151.8 ft/min (46.3 m/min)
2	12,598 lbs (5,714.4 kg)	166.2 ft/min (50.7 m/min)
3	11,594 lbs (5,258.9 kg)	180.6 ft/min (55.0 m/min)
4	10,738 lbs (4,870.7 kg)	195.0 ft/min (59.4 m/min)
5	10,000 lbs (4,535.9 kg)	209.0 ft/min (63.7 m/min)

Hoist Performance - High Speed (Optional)					
Wire Rope: 5/8-in diameter, Compact 35 rotation resistant rope, RRL lay, 2160 Grade. Line pulls are not based on wire rope strength.					
Rope Layer	Max Line Pull	Line Speed	Pitch Dia	Layer	Total
1	6,896 lbs (3128 kg)	215.3 ft/min (65.6 m/min)	13.2 in (33.5 cm)	84.5 ft (25.8 m)	84.5 ft (25.8 m)
2	6,299 lbs (2857.2 kg)	235.7 ft/min (71.8 m/min)	14.4 in (36.6 cm)	92.5 ft (28.2 m)	177.0 ft (53.9 m)
3	5,797 lbs (2629.5 kg)	256.1 ft/min (78.1 m/min)	15.7 in (39.9 cm)	100.5 ft (30.6 m)	277.5 ft (84.6 m)
4	5,369 lbs (2435.3 kg)	276.6 ft/min (84.3 m/min)	16.9 in (42.9 cm)	108.5 ft (33.1 m)	386.0 ft (117.7 m)
5	5,000 lbs (2268 kg)	297.0 ft/min (90.5 m/min)	18.2 in (46.2 cm)	116.5 ft (35.5 m)	502.5 ft (153.2 m)

Boom Attachments - Standard

Downhaul Weight & Hook:

- Downhaul weight and 14,000-lbs (6350 kg) rated swivel hook to use with wedge socket on 5/8-in (16 mm) load line. Specially designed to work with the anti-two-block system and to clamp the dead end of the rope.
- Weight: 180 lbs (82 kg).

Anti-Two-Block Device:

- Potential two-block damage to hoist rope and/or machine components is prevented by an electric switch triggered by a trip arm on the boom, stopping hoist raise, telescope extend, boom lower, and swing functions.
- Consists of trip arm at boom tip which is moved upward by sheave block or downhaul weight as hook approaches boom tip. Trip arm actuates electric switch that is connected by cable reel mounted on boom to the crane control system.
- This system will stop HOIST RAISE, TELESCOPE EXTEND, BOOM LOWER, and SWING. No other circuits are affected. These circuits are returned to normal operation by operating the HOIST LOWER or TELESCOPE RETRACT control.

Rated Capacity Limiter:

- Operational aid that warns the operator of impending overload with audible and visual signals. LED Screen has read-outs for maximum permissible and actual load, boom angle, boom length, boom tip height, and load radius. System senses if the machine is on outriggers or on rubber tires.
- In the event of an overload, it will block the following boom functions: HOIST RAISE, BOOM TELESCOPE EXTEND, BOOM LOWER, and SWING.
- Operator configurable working range limits for: Swing angle, maximum radius, maximum boom tip height.
- Real time display of outrigger ground bearing pressure.

Four-Part-Line Sheave Block:

- Capacity of 20 tons
- Two sheave block for 4-part-line requirements.
- 12-in (305 mm) OD sheaves for 5/8-in (16 mm) diameter wire rope.
- Swivel hook with safety latch.
- 480-lb (218 kg) weight provides positive overhaul.
- Includes bar on top to actuate trip arm of Anti-Two-Block Device.

Optional Boom Attachments

Boom Extension - 20 ft (6.1 m), Offset:

- Provides 20 ft (6.1 m) of additional length for lifting loads with load line.
- Boom extension may be stowed alongside base boom section when not in use. Tip sheave, attaching brackets, and pins are included.
- Deduct 500 lbs (220 kg) from Capacity Chart when boom extension is in the stowed position.
- Includes trip arm for Anti-Two-Block device.
- Boom extension will offset through 3 positions: in-line, 15° offset and 30° offset.
- Net Weight: 775 lbs (350 kg).

Two-Part-Line Sheave Block:

- Max capacity of 10 tons
- Single sheave block for 2-part-line requirements.
- 12-in (305 mm) OD sheaves for 5/8-in (16 mm) diameter wire rope.
- Swivel hook with safety latch.
- 200-lb (90 kg) weight provides positive overhaul.
- Includes bar on top to actuate trip arm of Anti-Two-Block Device.

Specifications subject to change without notice.

SECTION 5

OPERATOR INSPECTION

An operator, in the course of normal operation, should make certain observations, inspections, and tests to assure that the unit is ready to perform safely.

DAILY

1. Check levels of engine oil, coolant, and transmission fluid.
2. Check air cleaner intake system for cracks or looseness.
3. Check general condition of tires.
4. Visually inspect for loose pins, bolts, physical damage, and leaks.
5. Check hydraulic hoses, particularly those that flex during crane operation.
6. Check hydraulic oil level.
7. Check fuel level.
8. Check foot brake operation. Check for warning message operation as described in the HMI section on page RT-400B-OM-020-00-020.
9. Check parking brake operation.
10. Check power steering operation.
11. Observe chassis for normal driving operation.
12. Observe boom operation for normal power, speed, and sequencing.
13. Check boom extension (if equipped) is properly pinned with retainers in place.
14. Check load line and hooks for damage.
15. Check condition of sheaves and load line retainers.
16. Check anti-two-block system for proper operation.
17. Check back-up alarm for proper operation.
18. Check operation of all transmission gears, FORWARD and REVERSE.
19. Clean all glass and check for cracks.
20. Check operation of all warning and safety devices.
21. Check operation of Rated Capacity Limiter according to the steps in this chapter. See page RT-400B-GS-050-00-003.
22. Check seat switch and emergency stop operation.
23. Check operation of horn.
24. Check Drum Rotation Indicator.
25. Cummins QSF 3.8L Diesel Engine, per engine manual:
    - Check crankcase breather tube.
    - Drain water from diesel fuel filter.
    - Inspect cooling fan for refuse and damage.
    - Inspect drive belts.
    - Check air cleaner restriction indicator.
    - Check diesel exhaust fluid (DEF) level (if equipped).
    - Check lubricating oil level.
    - Check coolant level.
    - Check aftertreatment exhaust piping (if equipped).
    - Check air intake piping.
    - Check dust ejection valve.

WEEKLY

1. Check tire pressure: 100 PSI (6.9 bar).
2. Check for loose wheel nuts. 475 foot-pounds (645 N-m) torque required.
3. Check lights and turn signals.
4. Check power steering lines for damage.
5. Check brake lines for damage.
6. Check operation of hoist brake for smoothness.
7. Check outrigger holding valves for operation.
8. Check boom topping holding valves for operation.
9. Check rotation gears for looseness or backlash.
10. Check boom extension cylinder for proper sequencing and holding valve performance.
11. Check operation of windshield wipers.
12. Check for loose cylinder trunnion bolts and rope end nuts. See Maintenance Manual for proper torques.

MONTHLY

1. Check accumulator pre-charge, as shown in brake maintenance manual section.
2. Perform a load test as described in this chapter on page RT-400B-GS-050-00-004.

RATED CAPACITY LIMITER (RCL) CHECKS

Checking the Cable Reel Wire

1. Carefully examine the cable reel wire for damage.
2. Fully extend and retract the boom. Ensure the cable reel wire extends and retracts without sagging or erratic movements. Ensure that the cable reel wire is smoothly fed on and off the extension reel without drooping along the boom or jumping, especially as the boom is telescoped in.

⚠ WARNING

The extension reel setting is factory set. Do not attempt to repair a break in the reel-off cable without consulting with a service representative. W-2036-WP-0

Checking the Reel-to-Control-System Cable

The reel-to-control-system cable exits from the cable reel and runs down the boom and around its pivot to the control system node. Ensure that the cable is free from damage. If this cable has been damaged in any way, it should be carefully tested and may need to be replaced to ensure accurate transmission of signals.

Checking the Hydraulic Pressure Sensor Connections

The two hydraulic pressure transducers, separate from the computer, measure the pressure within each side of the boom lift cylinder. The pressure transducers are connected to the boom lift cylinder valve block directly.

Ensure there are no leaks in the pressure transducers' connection. Check for oil drips with the boom in the down position. Do not turn counterclockwise if checking tightness with a wrench.

⚠ WARNING

Do not check for hydraulic leaks with hands. If a mist of hydraulic oil is noticed around a line or component, use cardboard or other material to check for the location of the leak. High pressure fluid leaking from small holes can be almost invisible, yet have enough force to penetrate skin. If injured by escaping fluid, see a doctor at once. Serious reaction or infection can occur. W-2037-WP-0

Checking the Two-Block Warning Signals and Cutout of Machine Motions

The following test activates the Anti-Two-Block warning signals and the valve controlling cutout of crane motions to ensure proper operation. Use this test procedure to ensure the Anti-Two-Block warning signals and the function kick-out are working properly. Ensure no pre-existing alarm conditions are active when performing this test.

- Ensure the Anti-Two-Block parts are undamaged and correctly connected.
- Ensure the Anti-Two-Block switch is secure on its mounting.
- Ensure all the electrical cable and connectors are free from damage and correctly connected.

⚠ WARNING

Before performing this test, power the crane off and then back on again to ensure that there is not an existing two block warning or function kick-out.

Do not press the cancel alarm button to disable the audible alarm during this test. Do not winch the hook block into the boom tip in case the system does not cause a function kick-out.

During this test, operate the crane motions with extreme caution.

W-2038-WP-0

IMPORTANT

Ensure the configuration menu identifies the correct configuration for the current operation. If in doubt, set up the configuration again. I-4000-WP-0

Two-Block Signals and Function Kick-Out Test Procedure

1. Ensure that the engine is off. Place the Anti-Two-Block switch in the tripped position. Wedge, clamp, tie, or otherwise immobilize the switch in the tripped position.
2. Power up the crane.
3. Check that the hoist up, boom down, boom extend, and boom slewing motions are disabled. Audible and visual alarms on the operator's display should become active.
4. Turn the engine off.
5. De-activate the Anti-Two-Block switch by returning it to the normal position.

   This action should disable the audible and visual alarms on the operator's display and activate the boom motions.

LOAD TEST

It is recommended that a load test be performed monthly. Performing a load test is the best method to identify a possible problem in the system. The accuracy of this load test is dependent upon accurate operation of all sensors, correct crane configuration selection, and an accurate known weight of the test load.

IMPORTANT

Ensure the crane configuration on the HMI matches the actual configuration of the crane. I-4001-WP-0

1. Select a known weight of at least 20% of Maximum Rated Capacity for the current configuration.
2. Calculate the weight of the total load, including the slings and hook block. This weight must be an accurate number.
3. Lift the weight and record the load weight displayed on the operator's display console. The load should be stable and not swinging before taking this reading.
4. The load weight on the display must read 0-10% higher than the actual total load that was lifted. For example, when lifting 5000 lbs, the load reading on the display should read between 5000-5500 lbs. It is never acceptable for the display to indicate less than the total load.
5. If the display indicates less than the total load, consult the factory.

⚠ WARNING

A load reading on the operator's display console that falls outside of this range may indicate a sensor problem. W-2041-WP-0

SECTION 6

OPERATOR SAFETY RULES

TERMINOLOGY

The following terms define the various precautions and notices used in this manual.

NOTE

“NOTE” is the term used whenever information requires additional emphasis beyond the standard text.

IMPORTANT

“IMPORTANT” is the term used whenever information requires special attention to procedures to ensure proper operation or to prevent possible equipment failure.

CAUTION

“CAUTION” is the term used whenever there is potential for equipment damage that requires correct procedures/practices for prevention.

WARNING

“WARNING” is the term used whenever there is a potential for personal injury or death that requires correct procedures/practices for prevention.

DANGER

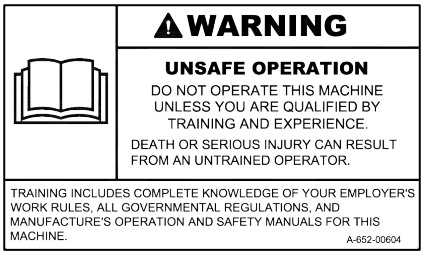
“DANGER” is the term used whenever there is an immediate hazard that cannot be eliminated by design safeguards, which could result in personal injury or death.

This safety alert symbol indicates important safety messages in this manual. When you see this symbol, carefully read the message that follows and be alert to the possibility of personal injury or death.

GENERAL OPERATING GUIDELINES

This list of rules is only a supplement to all federal, state, and local safety rules that may apply.

- Since the manufacturer has no direct control over machine application and operation, conformance with good safety practice is the responsibility of the owner and operator. Only sufficiently trained operators should be allowed to operate the machine.



W-2000-PS-0

- Do not install personnel platforms to the boom tip or load line as this can result in serious injury or death by falling.

W-2001-PS-0

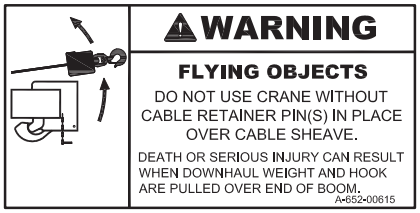
- The operator shall be responsible for those operations under their direct control. Whenever there is any doubt as to safety, the operator shall have the authority to stop and refuse to handle loads until safety has been assured.
- The operator shall not engage in any practice which will divert their attention while actually operating the crane.
- Do not run the engine in an enclosed area or indoors without adequate ventilation.
- Do not use ether for starting. Ether is highly flammable and can be ignited by the intake manifold heater grid, causing engine damage and/or operator injury.

Crane Condition

- Before beginning operation each day, thoroughly inspect the entire crane to be sure it is in good operating condition.

- Inspect load hoist rope and wedge socket daily. We recommend rope inspection, replacement and maintenance in accordance with ASME B30.5.
- Keep operator's compartment free of mud and grease.
- Keep all window glass clean. Keep displays clean.
- Tools, lubricants, or rags on the crane should be kept in a secured toolbox.
- To avoid weakening the rope, do not use a rope clip on the live side of the load hoist rope.

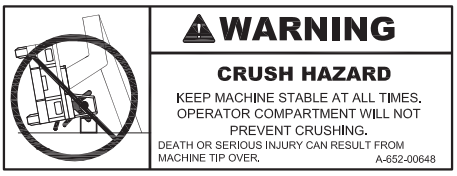
- To avoid pulling the downhaul weight and hook over the end of the boom, do not use the crane without cable retainer pins in place over the cable sheave.



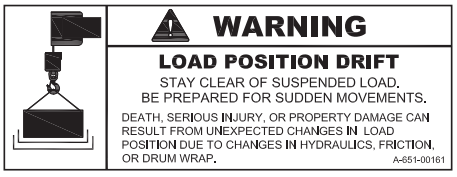
- The Rated Capacity Limiter must be checked after each setup for the proper operating configuration on the display.

Lifting

- Always refer to Crane Capacity Chart in the operator's compartment before handling a load. Do not exceed load ratings. Under some conditions the standard capacity ratings cannot be recommended and must be adjusted downward to compensate for special hazards, such as weak supporting ground, wind, hazardous surroundings, operator inexperience, etc. The weight of the load should always be known.
- Keep the crane stable at all times to avoid machine tip over, which could cause serious injury or death by crushing.



- Rated Capacity Limiter components must be inspected for damage and proper function at the beginning of each shift. The Rated Capacity Limiter must be tested with a known load at least once a month as described in the load test on page RT-400B-GS-050-00-004.
- Be careful to prevent load swinging. A swinging load can cause instability or loss of control of the load. Be aware that the Anti-Two-Block System and the Rated Capacity Limiter can cause sudden stopping of boom movement, which can cause the load to swing. Swing the boom slowly whenever these systems might stop the boom.
- Do not allow anyone to put any part of their body under a load, and be prepared for sudden movements of the crane. The load may lower or fall if there are damaged parts in the crane. Also, the load may drop a short distance due to thermal contraction of the hydraulic oil in the cylinders.



- Do not use the crane to drag loads sideways. Do not use crane to raise grounded or fixed loads using the boom raise function.
- Always stand clear of outriggers; they can cause serious crushing injuries to personnel.

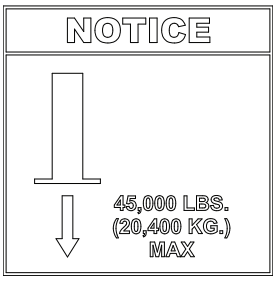
- Never ride on the crane loadline or any device attached to the loadline as this can result in death or serious injury from falling.

W-2006-PS-0

- Level the crane before lifting. A small incline will significantly reduce the capacity. If necessary, use appropriate cribbing under the outriggers for leveling. All tires must clear the ground to use the ON OUTRIGGERS ratings.
- **The RCL system requires the crane to be within 1 degree of level when on outriggers and 3 degrees when on rubber. Otherwise, crane hydraulic functions will be stopped until the crane is properly leveled.**
- Always use outriggers if possible. If you must lift on rubber, keep the load as close to the ground as possible to prevent tipping. Move the load very slowly and use tag lines to prevent load swinging.
- The crane may tip at less than rated loads if the surface is uncompacted or wet soil, soft soil with frozen crust, thin or cracked pavement, or a surface near a hole or ledge. Crane tipping can cause injury or death. Always use adequate outrigger floats and/or cribbing. See page RT-400B-OM-070-00-008 for additional warnings.

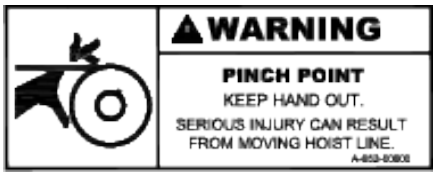
⚠ WARNING

Crane tipping can result in injury or death. Always follow safe operating guidelines. W-2046-WP-0



N-5000-PS-0

- The operator should not leave the controls while the load is suspended.
- Always use adequate parts of load hoist line for lifting heavy loads.
- Always be sure the rope is properly seated and wound evenly on the hoist drum.
- Keep hands away from the load hoist rope when the hoist is in operation to avoid serious injury.



W-2007-PS-0

- Be sure at least four wraps of rope are left on the hoist drum to ensure against rope pulling out of its anchor.
- Never wrap the hoist rope around a load. Always use approved rigging.
- Avoid pinch points such as between a rotating turret and the cab, in access holes of a telescoping boom or between the anti-two-block mechanisms.

⚠ WARNING

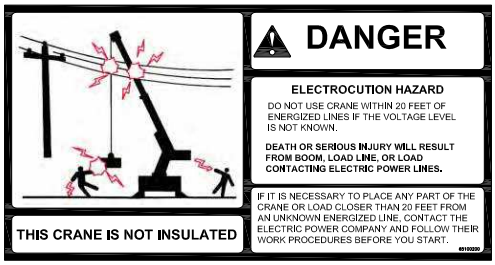
Keep hands out of anti-two-block mechanism. Serious injury can result from moving parts. W-2032-WP-0

- Avoid two-blocking.
  - Stop raising hoist line before downhaul or hook block strikes boom tip plates.
  - Pay out hoist line while extending boom.
  - Maintain clearance between downhaul weight or hook block and boom tip while booming down.

⚠ DANGER

Two-block will abruptly stop boom lowering, hoist up, boom extend, and slewing. If the boom is moving fast, this will cause the load to bounce or swing, which could cause loss of control of load or tipping. D-1000-WP-0

- The amount of counterweight supplied with this crane should never be changed. Unauthorized addition of counterweight in the field to increase lifting ability constitutes a safety hazard.
- Always keep crane boom at least 20 ft (6 m) away from any electric power lines of unknown voltage. If voltage is known, use chart on side of turntable to determine required clearance distance. When in doubt, contact your local power authority.



D-1001-PS-0

REQUIRED CLEARANCE FOR NORMAL VOLTAGE TABLE

NORMAL VOLTAGE, kV (PHASE TO PHASE)	MINIMUM REQUIRED CLEARANCE, FEET (METERS)
OPERATION NEAR HIGH VOLTAGE POWER LINES	
TO 50	10 (3)
OVER 50 TO 200	15 (4 1/2)
OVER 200 TO 350	20 (6)
OVER 350 TO 500	25 (7 1/2)
OVER 500 TO 750	35 (10)
OVER 750 TO 1000	45 (14)
OPERATION IN TRANSIT WITH NO LOAD AND BOOM LOWERED	
TO 1	4 (1 1/2)
OVER 1 TO 50	6 (2)
OVER 50 TO 345	10 (3)
OVER 345 TO 750	16 (5)
OVER 750 TO 1000	20 (6)

REF. ASME B30.5 - 2011 65100163

I-4002-PS-0

- If the boom should accidentally contact a power line, keep ground personnel away from crane. Stay in the crane until the power source is de-energized. Move the crane away from electrical hazard if this does not cause new hazards. If it is absolutely necessary to leave the crane, jump clear of the crane with both feet together. Beware: the ground surface may be energized.
- Do not operate outside during thunderstorms. Avoid all lightning strike opportunities. Consult local weather reports during inclement weather conditions.
- When transporting the crane, be sure it is properly secured to the vehicle. Utilize the tiedown anchors, as indicated on the crane, to stabilize the load and prevent shifting during transport. Use caution to not over-tighten the chains and binders when securing the crane to the transport vehicle. The turret lock pin should be installed. Proper securement and prudent shipping practices are the responsibility of the carrier.

Travel

- For Pick and Carry operation: Traveling with suspended loads involves many variables, such as ground conditions, boom length and vehicle acceleration. For such operations, the user must evaluate prevailing conditions and determine safe practices using precautions, such as the following:
  - The boom shall be centered over front axle of crane.
  - Use the shortest boom practical.
  - Carry the load as close to ground as practical.
  - Reduce travel speed to suit conditions [2 mph (3 km/h) maximum].
  - Maintain specified tire pressures and lug nut torques.
  - Avoid sudden starts and stops.
  - Provide tag or restraint lines to restrict the swinging of the load.
  - Handheld tag lines should be nonconductive.
  - Do not pick and carry with the boom extension installed.
  - Do not exceed the 360° PICK & CARRY, ON RUBBER capacity.
- When raising the boom or moving the unit with boom elevated, be sure there is adequate overhead clearance for boom.
- Cranes with rear steering require close watch because of “tail swing” when the chassis is turned in tight quarters.
- Keep all parts of the body inside the operator compartment, as pinch points on the machinery can cause serious injury or death.

W-2008-PS-0

- Every effort has been made to make the BMC Rough Terrain Crane a stable vehicle. However, with the rigid front and rear axles, the operator must take care to control the vehicle speed to be compatible with conditions of rough roads or uneven terrain.
- When this crane is to be parked on a grade, set the parking brake and block wheels or extend outriggers fully.
- Do not drive the unit in four-wheel-drive on hard surfaces such as concrete or asphalt to avoid damage to the differential.

⚠ CAUTION

Driving the unit in four-wheel drive on hard surfaces such as concrete or asphalt may damage the differential. C-3001-WP-0

- Know your visibility limitations. Loads being carried hanging on the hook can add further limitations to visibility during travel. Always use a signal person when in doubt.

Refueling

- Shut off the engine before refueling, and remove the fuel cap slowly. Vapor pressure in the tank can cause a burst of fuel and vapor when the cap is removed. Always refuel with proper fuel and into the proper tank.

⚠ WARNING

Vapors can be formed inside fuel tank and cause buildup of pressure that can result in sudden expulsion of fuel and fuel vapors from the filler neck when the fuel cap is removed from a hot tank. Remove cap slowly. Fuel spray may cause injury. W-2010-WP-0

⚠ CAUTION

Do not allow fuel tank to become empty. The engine will be difficult to restart and may require “bleeding” of diesel injectors. Keep fuel tank full when idle to prevent condensation in tank. C-3002-WP-0

SECTION 7

INSTRUMENTS AND CONTROLS

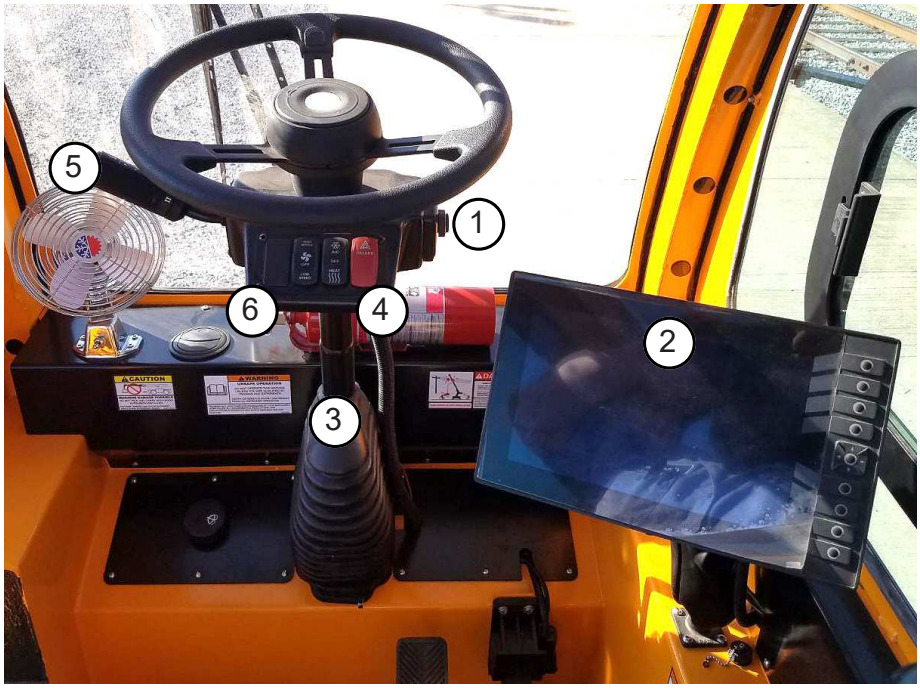
OVERVIEW

The RT-400-B is equipped with an RCL human-machine interface (HMI), located to the right of the steering wheel. It allows the operator to access a variety of information and crane controls, divided into the following interface screens:

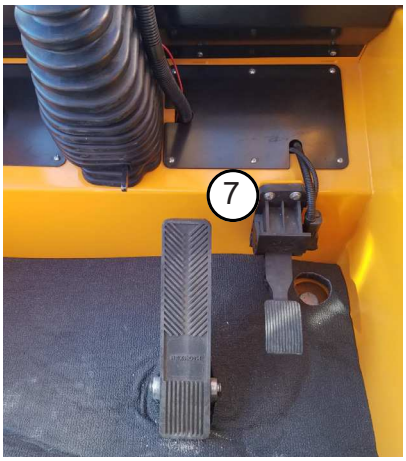
- Main/Startup
- Machine Info
- Engine
- RCL
- Outriggers
- Information

See the RCL HMI section on page RT-400B-OM-020-01-005 for more details on its operation.

The following images and table explain cab controls.



RT-400B-OM-020-01-PH-1



RT-400B-OM-020-01-PH-2

Callout	Item	Function
1	Ignition Switch	Key-operated and has OFF, RUN and START positions. The ignition switch should always be turned off and the key removed when the vehicle is left unattended.
2	HMI Display	Allows operator to access crane interface and controls. Work light controls are also located on the HMI. Parking brake manual control is located on the HMI. The parking brake is also automatically applied when the crane is in neutral.
3	Steering Column	The steering column provides tilting features. It features a hold lever on the side of the column to hold the column in the preferred position for the operator. The tilt is done by a lever at the base of the column and adjusted by foot. The controls for the headlights are located on the steering column.
4	Hazard Button	The hazard lights are controlled by the red hazard button below the steering wheel.
5	Signal Lever	This lever operates the turn signals. The emergency flasher lights are activated by pulling the turn signal lever toward the operator. Repeating this will disengage the emergency flasher lights.
6	Fan/A/C/ Heat Buttons	The cabin fan, A/C, and heat are controlled by the correspondingly labeled buttons below the steering wheel.
7	Foot Pedals	Stop lights are controlled by operating the foot brakes. The foot brake and accelerator pedals are located and operated as they are in other vehicles already familiar to the operator.

The powershift transmission is controlled through the series of buttons on the 12-button panel to the right of the operator. There are two ranges for this transmission and 3 gears in each range for FORWARD and REVERSE. There is also a 2wd/4wd button. The shifting is electronically controlled.

To shift the range of the transmission, the machine must be at a complete STOP. An electronic interlock built into the control system will only allow the range to shift if the machine is in Neutral/Park. The control system will default the transmission to the N/P state when the engine is started. The parking brake switch prevents driving with the brake on and engages the transmission to neutral.

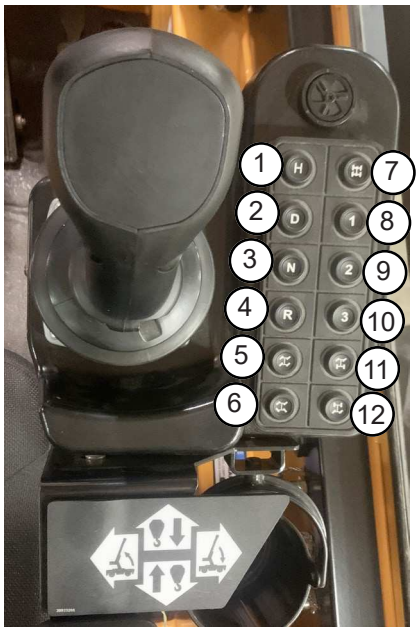
⚠ CAUTION

The transmission and drive train components can be damaged by shifting from forward to reverse or vice versa while the unit is in motion, or while the engine speed is above 1100 RPM. The transmission and drive train components can also be damaged by changing range from Low to High or vice versa while the machine is in motion. C-3016-WP-0

Normal engine speed control uses the foot accelerator pedal. Controls on the HMI Engine Screen provide preset engine speeds. In addition, there are buttons on the screen to increment and decrement the engine speed once the preset engine speed has been engaged. The parking brake must be set in order to change the driving state of the crane.

Auto-idle is used to automatically return the engine to idle speed after 5 seconds of no movement from the outriggers or boom. When this feature is enabled, the engine will automatically return to a preset rpm previously selected by the operator when movement is commanded again by the joysticks or outrigger buttons.

To set auto-idle, first set the engine rpm to the desired speed by using the rpm raise/lower buttons. Then, push the auto-idle button to set the function return rpm to the set rpm value. The button will illuminate green to confirm the feature is on. Press the auto-idle button again to turn off the auto-idle function.



RT-400B-OM-020-01-PH-3

Callout	Button	Function
1	High Drive	Shifts between low and high range
2	Drive	Shifts to drive
3	Neutral	Shifts to neutral
4	Reverse	Shifts to reverse
5	Crab Steer	Changes steering mode to crab
6	Round (4-wheel) Steer	Changes steering mode to 4-wheel
7	2-Wheel/4-Wheel	Shifts steering mode between 2-wheel and 4-wheel
8	First Gear	Shifts to first gear
9	Second Gear	Shifts to second gear
10	Third Gear	Shifts to third gear
11	Front Wheel Steer	Changes steering mode to front wheel
12	Rear Wheel Steer	Changes steering mode to rear wheel

Four-wheel or 2-wheel drive is selected from the 12-button powertrain panel located to the right of the operator. The transmission and drivetrain components can be damaged if attempting to shift from 2-wheel drive to 4-wheel drive, or vice versa, while the machine is in motion. To shift from 2-wheel drive to 4-wheel drive, or vice versa, the machine must be at a complete STOP. An electronic interlock is built into the control system that will only allow the operator to change from 2-wheel drive and 4-wheel drive if the machine is in Neutral/Park. Avoid 4-wheel drive operation on pavement except for short distances.

FOUR-MODE STEERING FUNCTIONS

The RT-400-B is equipped with four-mode power steering:

- Four-wheel
- Front two-wheel
- Rear two-wheel
- Crab steer

Four-wheel round steering can be used for making tight turns; two-wheel front steering should be used for traveling long distances; two-wheel rear steering can be used to better maneuver the rear of the machine in tight spaces; crab steering can be used for maneuvering in tight places. Switches on the 12-button panel to the right of the operator provide the mode selection. Electronic sensors and controls automatically sense when the wheels are centered, as they steer past the centered position, once a new mode is selected. The steering wheel is directly mounted to the steering control unit of the all-hydraulic power steering system. The steering system will provide limited steering even if the engine should stop running.

Turtle mode, which limits the speed of boom movement, can be activated via the HMI RCL screen. The crane slows down as it approaches the set limits. See page RT-400B-OM-020-01-013 for details.

RCL HUMAN-MACHINE INTERFACE (HMI)

The RT-400-B is equipped with an RCL HMI system to aid in crane operation. Each operator must be properly trained in its usage and operation.

The following are common screens operators will encounter while using the HMI. For reference on what individual icons represent on each screen, see the Switch and Indicator Symbols section on page RT-400B-OM-130-00-002.

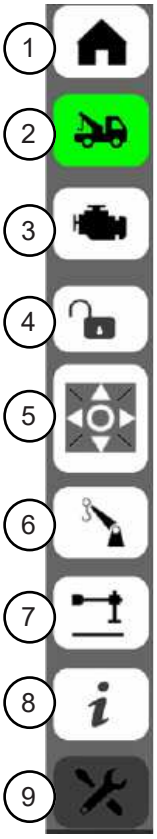
Navigation Bar

This navigation bar is visible on the right side of most screens in the HMI display. Selecting a button icon will navigate the HMI to the corresponding screen.

The icons represent:

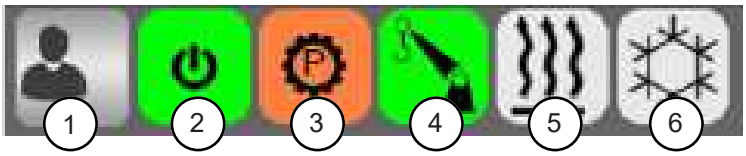
1. Main Screen
2. Machine Info Screen
3. Engine Screen
4. Screen lock
5. Navigation arrows (**not used**)
6. RCL Screen
7. Outriggers Screen
8. Info Screen
9. Maintenance Screen (locked out for standard users)

The icon matching the currently displayed screen will be highlighted green.



RT-400B-OM-020-01-PH-4

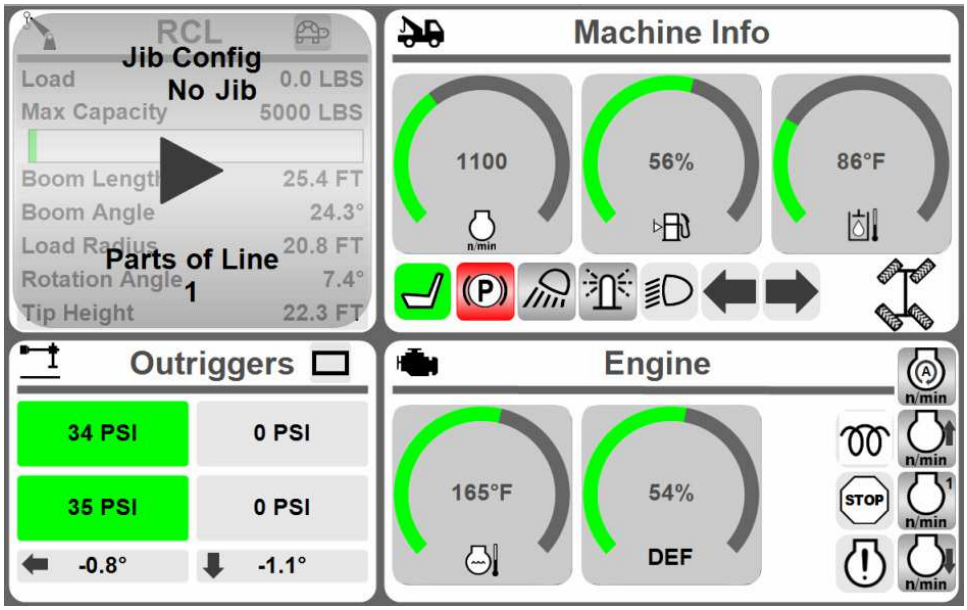
Status Bar



RT-400B-OM-020-01-PH-5

1. HMI User Profile
2. Machine Power Status
3. Parking Brake Engagement Status
4. Crane Usage Status
5. Heater On/Off Status
6. Air Conditioner On/Off Status

Startup Screen



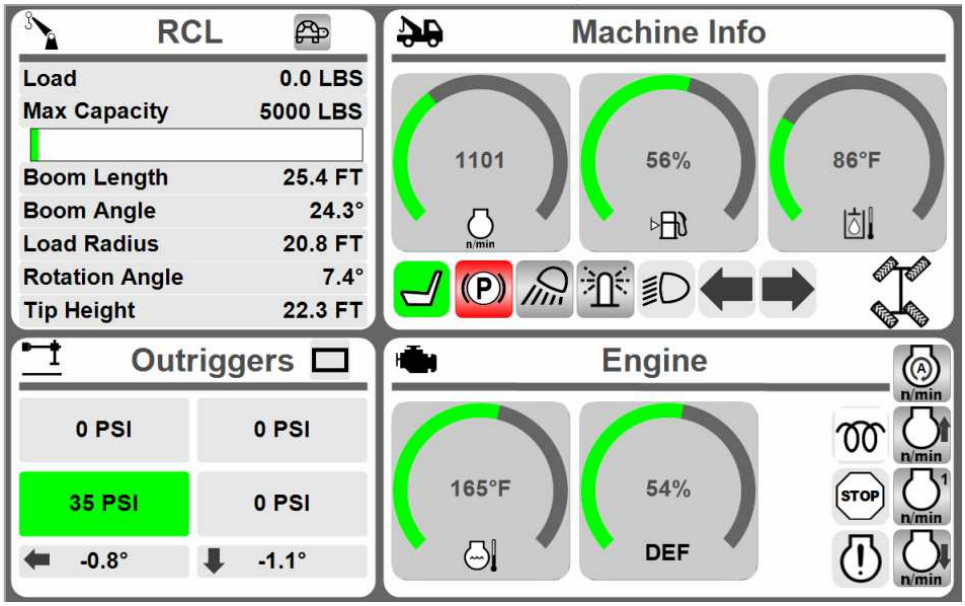
Before operating the HMI, arm the crane using the ARM keypad button (see page RT-400B-OM-030-00-003 for description and location of the ARM button).

When starting the crane, a gray box overlay will appear over the RCL box at the top left corner. It contains information on current jib configuration and parts of line number setting. Confirm these settings are correct by pressing the triangle in the middle of the box. To change an incorrect jib or parts of line setting, tap on the incorrect item, which will provide the option to edit the setting.

If the jib or parts of line settings are incorrect, use the RCL button on the right side of the screen to navigate to the RCL screen to access and change the settings. Then, confirm the settings are correct by pressing the triangle in the gray box.

Main Screen

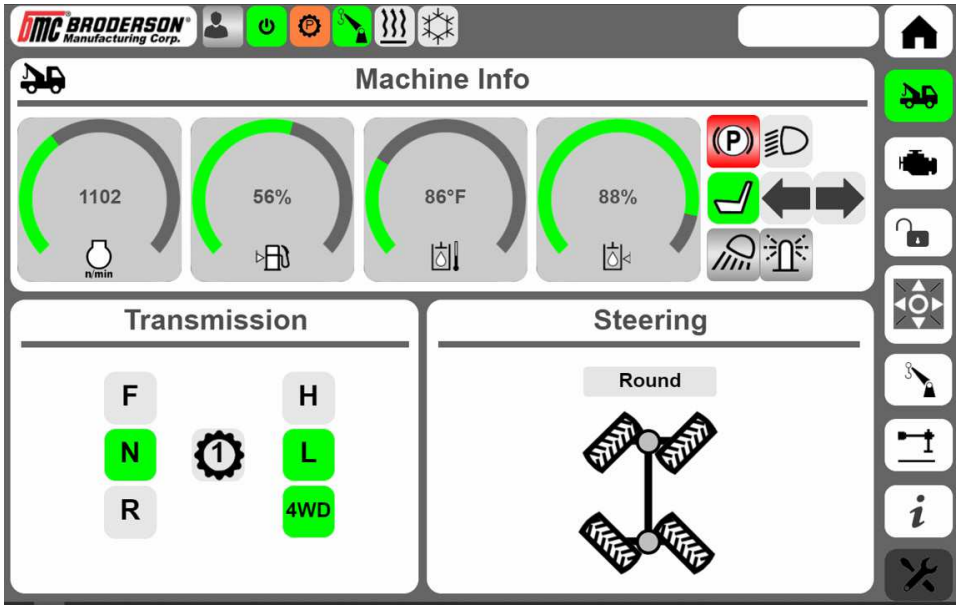
Navigate here using the main screen icon as shown in the navigation bar (page RT-400B-OM-020-01-005).



Screen Area	Function
RCL	This box shows the current load weight, the max capacity weight, a capacity bar showing the percentage of the current load weight out of the max capacity weight, the boom length, the boom angle, the load radius, the rotation angle in degrees, and the tip height. The turtle icon at the top right indicates whether turtle mode is active. In the example shown it is inactive; if it were active, the icon would be highlighted green. The crane slows down as it approaches the set limits. Turtle mode can be controlled on the RCL screen.
Machine Info	This box shows engine RPM, fuel level, and hydraulic temperature. The icons at the bottom of the screen indicate the current status of the seat switch (presence of operator in the seat), parking brake, headlights, beacon, turn signals, and steering mode.
Outriggers	This box shows the ground bearing pressure measurement of each crane outrigger and how level the crane is.
Engine	This box shows engine coolant temperature and DEF percentage remaining in the tank (if equipped). The buttons on the right indicate: automatic idle control , increase rpm , rpm setpoint 1 , and decrease rpm . These buttons are interactable from this screen; press the buttons to change the settings as desired.

Machine Info Screen

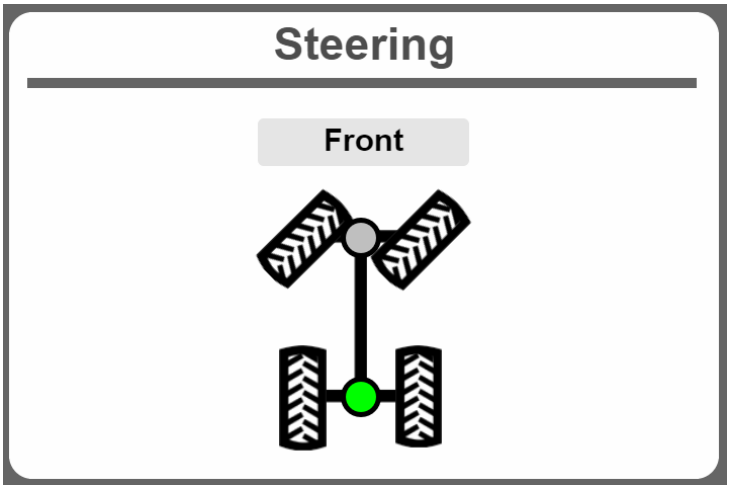
Navigate here using the machine info screen icon as shown in the navigation bar (page RT-400B-OM-020-01-005).



RT-400B-OM-020-01-PH-8

Screen Area	Function
Machine Info	This box shows the engine RPM, fuel level, engine coolant temperature, and hydraulic temperature. The status of the parking brake, headlights, beacon, steering mode, and more are shown in the symbols on the right side of the box.  See Symbol/Icon Guide on page RT-400B-OM-130-00-002 for reference on what each symbol indicates.
Transmission	This box shows the transmission setting in use.
Steering	This box shows the steering mode in use. The steering mode options are: • Four-wheel round steering: used for making tight turns • Two-wheel front steering: used for traveling long distances • Two-wheel rear steering: used to better maneuver the rear of the machine in tight spaces • Crab steering: used for maneuvering in tight spaces For requirements to change steering modes, see the Interlock Chart on page RT-400B-OM-020-01-020.

Steering Screen



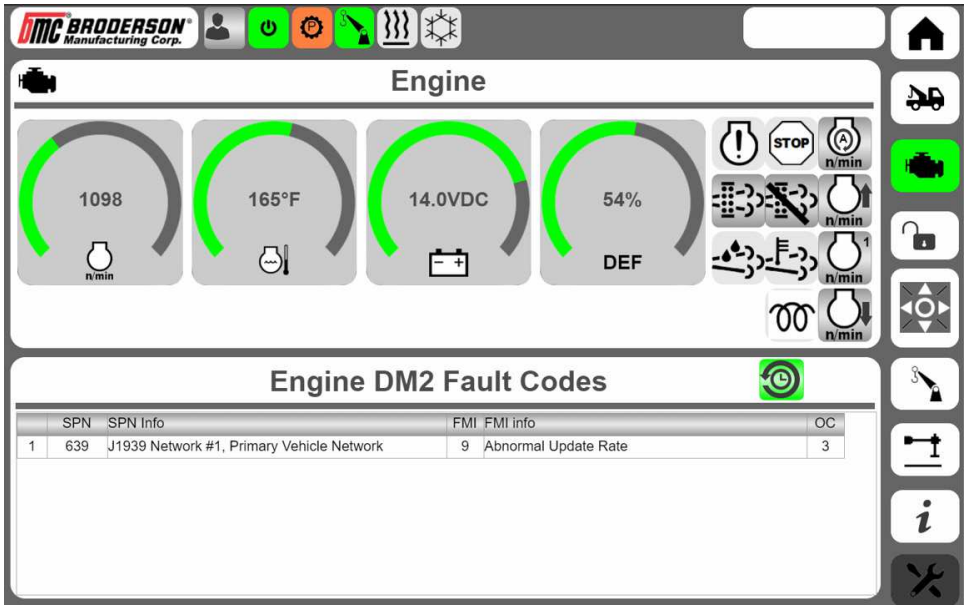
RT-400B-OM-020-01-PH-9

This screen shows the current steering setting. The green dot indicates which axles are currently engaged/active. In this example, 2-wheel drive is engaged.

Use the arm rest keypad to change steer and transmission modes.

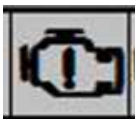
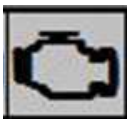
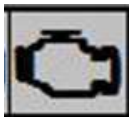
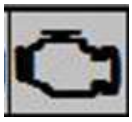
Engine Screen

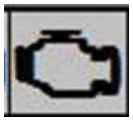
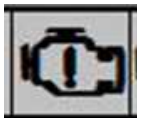
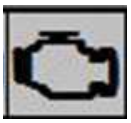
Navigate here using the engine screen icon as shown in the navigation bar (page RT-400B-OM-020-01-005).



RT-400B-OM-020-01-PH-10

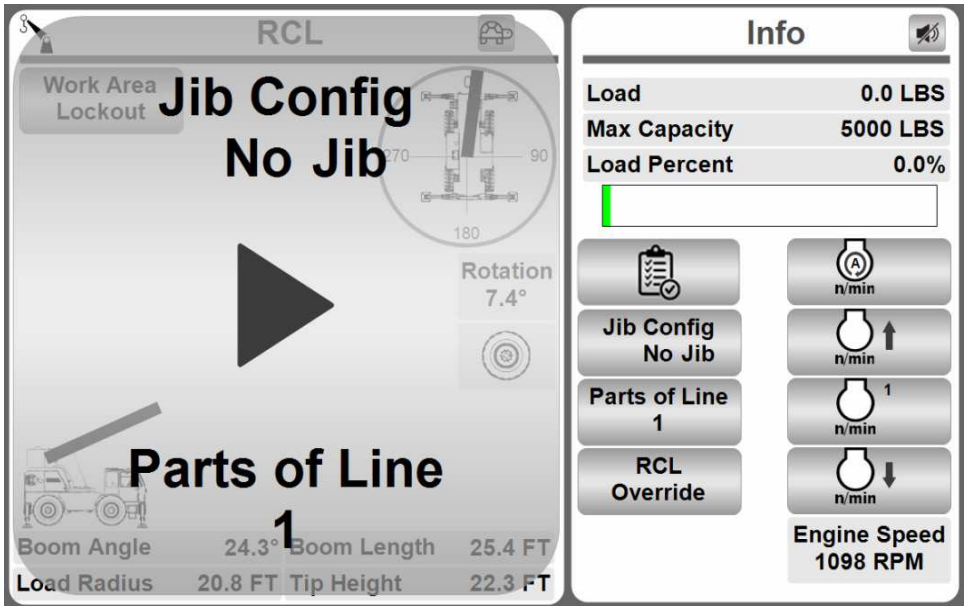
Screen Area	Function
Engine	This box shows the engine RPM, the engine coolant temperature, the battery voltage, and the DEF level percentage remaining in the tank. For a description of each indicator icon to the right, see the following table on page RT-400B-OM-020-01-010 and the Symbol/Icon Guide on page RT-400B-OM-130-00-002.
Engine DM2 Fault Codes	This box lists current engine fault code warnings. Press the green clock button on the right side of the box to change the display from active faults (gray) to stored faults (green). If the faults are active, they will be bolded and highlighted.

Engine Indicators and Operation	
	**STOP ENGINE LAMP** When the STOP ENGINE light illuminates, in conjunction with the flashing DEF Lamps, this indicates that the DEF Tank is empty. Stop operation immediately and fill the DEF Tank. Engine power will be reduced or limited to idle until the tank is refilled. Normal engine power will be restored once the tank is refilled. **IMPORTANT:** When the STOP ENGINE light illuminates, stop operation immediately and notify maintenance to fill the DEF Tank. The engine will go into "limp home" mode if the DEF Tank is not filled.
	**CHECK ENGINE LAMP** When this lamp illuminates in conjunction with the flashing DEF Lamps, this indicates that the DEF Fluid is critically low. Stop operation and fill the DEF Tank, or engine power loss will occur. When this lamp illuminates along with the Exhaust System Cleaning Lamp and the audible alarm sounds, this indicates that a Stationary Exhaust System Cleaning is required.
 ON + AUDIBLE ALARM FLASHING + AUDIBLE ALARM	**DEF LAMP** The DEF lamp illuminates and the audible alarm sounds when the DEF level is low. The DEF lamp flashes and the audible alarm sounds when the DEF level is very low. The operator should fill up the DEF tank.
  ON ON (yellow) + AUDIBLE ALARM	**DEF LAMP ON with CHECK ENGINE LAMP** When the DEF Lamp and Check Engine Lamp are illuminated yellow, with the audible alarm sounding, the Diesel Exhaust Fluid is critically low. If the tank is not refilled immediately, power will be reduced. The operator should fill the DEF tank. Normal engine power will be restored after the DEF tank is filled.
  FLASHING ON (yellow) + AUDIBLE ALARM	**DEF LAMP FLASHING with CHECK ENGINE LIGHT = Critically Low DEF Level** When the DEF LAMP flashes and the Check Engine lamp illuminates and the audible alarm sounds, the DEF tank level is near zero. Stop operation and notify maintenance to fill the DEF tank or engine power loss will occur. Normal engine power will be restored once the tank is refilled.

Engine Indicators and Operation	
  FLASHING ON (yellow)  ON (red) + AUDIBLE ALARM	**DEF LAMP FLASHING with CHECK ENGINE AND STOP ENGINE LIGHTS = DEF Tank Empty** When the DEF Lamp flashes and both the Check Engine and Stop Engine lamps illuminate yellow and red respectively, with the audible alarm sounding, the DEF tank has been empty for 30 minutes. Power will be limited to idle. Stop operation when it is safe to do so and refill the tank. Normal engine power will be restored after filling the DEF tank.
 ON	**HIGH EXHAUST SYSTEM TEMPERATURE (HEST) LAMP** This symbol displays on the Electronic Engine Display when high exhaust temperatures are present, which can happen during normal engine operation or during exhaust system cleaning. The operator should ensure that the exhaust pipe is not directed at any flammable or combustible surfaces.
 FLASHING	**EXHAUST SYSTEM CLEANING LAMP** This light flashes when a stationary Exhaust System Cleaning event is initiated using the EXHAUST CLEANING / ENG. DIAG. REQUEST SWITCH on the Engine Power Unit Panel. The lamp will continue to flash until the stationary cleaning event is complete. Once the lamp turns off, the operator can resume normal operation.
 ON	**EXHAUST SYSTEM CLEANING LAMP** This light illuminates when the exhaust system is unable to complete an automatic Exhaust System Cleaning event. The operator should ensure the Exhaust System Cleaning switch is not in the Stop position and continue working until there is an opportunity, such as the end of a work day or shift, to complete a stationary Exhaust System Cleaning.
  FLASHING ON (yellow)	**EXHAUST SYSTEM CLEANING LAMP** If an Exhaust System Cleaning is not performed in a timely manner after the Exhaust System Cleaning lamp is illuminated, the Check Engine Lamp will illuminate and engine power will be significantly reduced. Park the equipment when safe to do so, and press the EXHAUST CLEANING / ENG. DIAG. REQUEST SWITCH on the Engine Power Unit Panel. Once the cleaning is complete, full engine power will be restored.
 ON	**EXHAUST SYSTEM CLEANING STOP LAMP** This light illuminates when the Stop Exhaust System Cleaning switch on the Power Unit Panel has been pressed to prevent an automatic Exhaust System Cleaning event. This switch should normally be in the OFF position. It should only be used in situations where high exhaust temperatures must be prevented. Excessive use of the Stop Exhaust System Cleaning switch will result in the need for more frequent Exhaust System Cleaning events.

RCL Screen - Startup

Navigate here using the RCL screen icon as shown in the navigation bar (page RT-400B-OM-020-01-005).



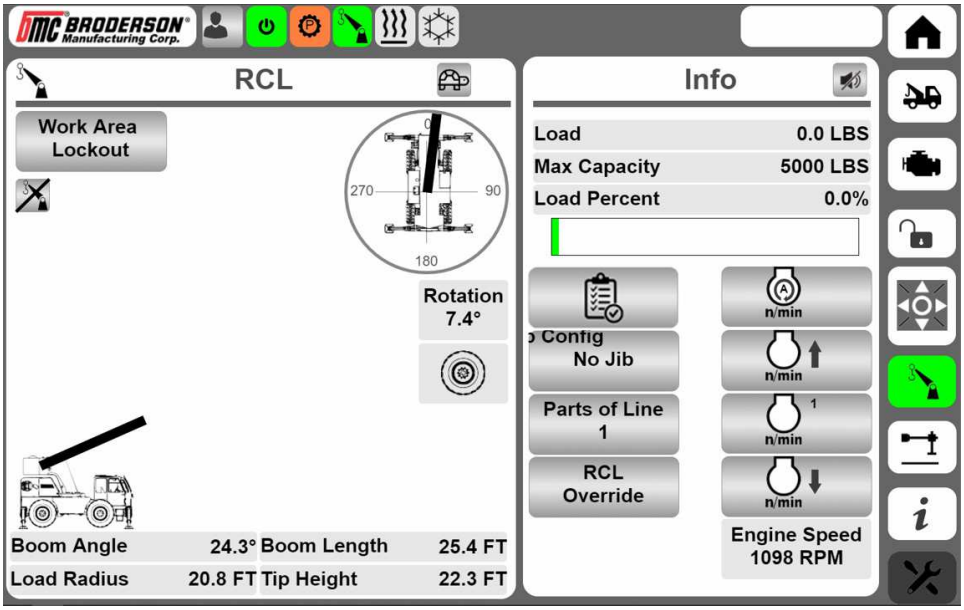
RT-400B-OM-020-01-PH-11

On startup, a gray box overlay will appear over the RCL box at the top left corner. It contains information on current jib configuration and parts of line number setting. Confirm these settings are correct by pressing the triangle button in the middle of the box.

If they are incorrect, press the triangle button to clear the overlay, then change the jib and parts of line settings in the Info box.

RCL Screen

Navigate here using the RCL screen icon as shown in the navigation bar (page RT-400B-OM-020-01-005).

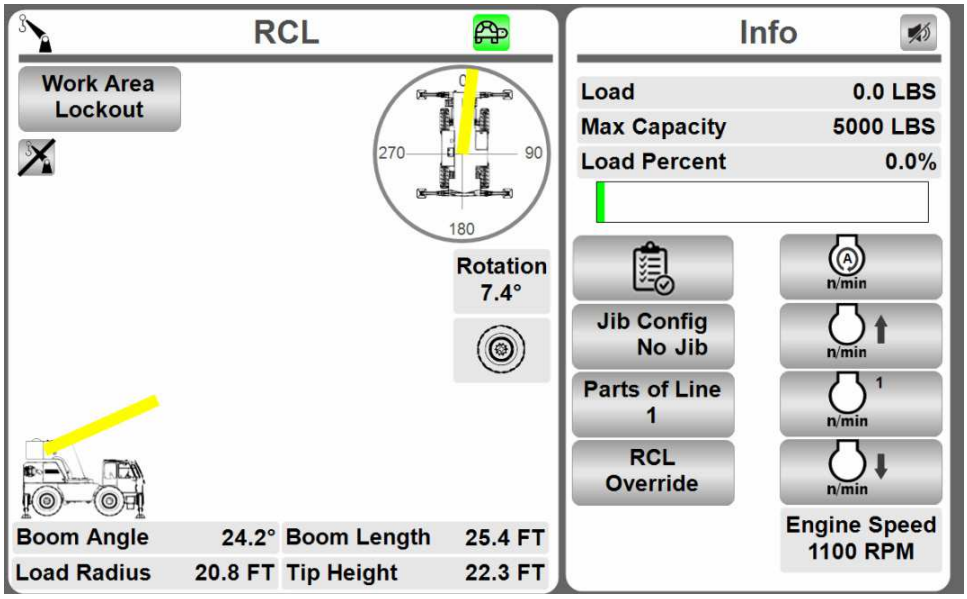


RT-400B-OM-020-01-PH-12

Screen Area	Function
RCL	This box shows the boom rotation, boom angle, boom length, load radius, and tip height. The work area lockout button is used to designate an area that the boom will be prevented from moving outside of. The crane slows down as it approaches the set limits. This is helpful for operation in tight areas such as under power lines or next to buildings. The turtle icon in the top right will change to green when turtle mode is active. To activate turtle mode, tap on the turtle icon.
Info	This box shows the current load weight, the max load capacity, and the percent of the max capacity used (also represented in the bar graph below the reading). Below that, the checklist, current configuration setting, parts of line number, and the RCL override button are shown. To the right, current engine settings and RPM are shown. Pressing the speaker icon next to the Info title will mute and unmute the RCL alarm.

RCL Screen (Continued)

Navigate here using the RCL screen icon as shown in the navigation bar (page RT-400B-OM-020-01-005).



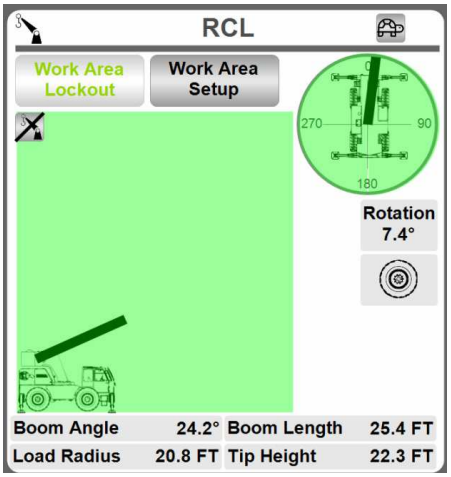
RT-400B-OM-020-01-PH-13

Screen Area	Function
RCL	The green turtle icon at the top right of the box and the yellow highlighting on the boom in both crane images indicates the crane is in turtle mode, which means the boom movement slows down when it is moved close to an edge of a work area.

RCL Screen (Continued)

The green box on the left side of the screen represents the work area zone. The circle at the top right indicates the boom's current rotation area; in this example it is set to entire rotation movability.

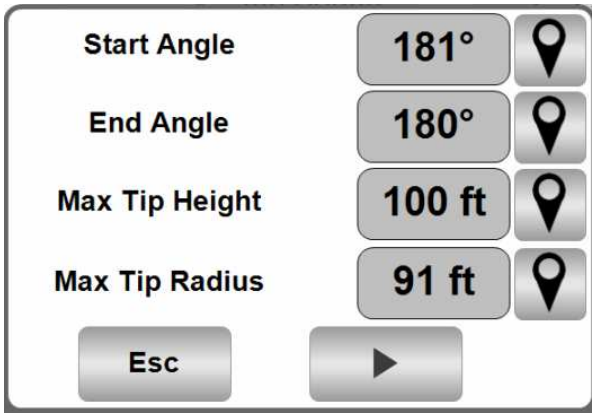
Press the work area setup button Work Area Setup to access and change work area settings.



RT-400B-OM-020-01-PH-14

Work Area Setup Screen

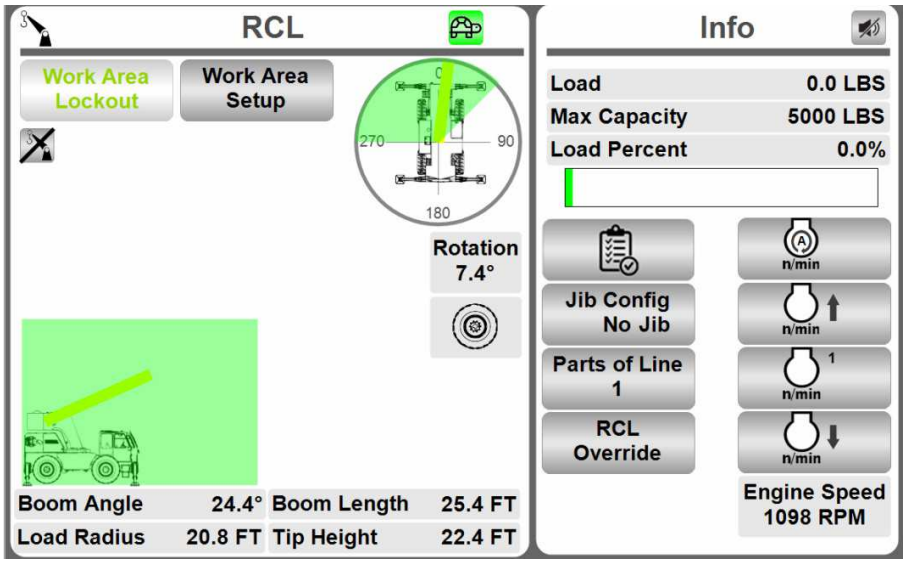
Access this screen by pressing the Work Area Setup button on the RCL screen.



RT-400B-OM-020-01-PH-15

Screen Area	Function
Angle/Height/ Radius	These values show the start and end angle of the boom along with the maximum tip height and radius. Press the number buttons to bring up a number pad to manually input the max/min values. Press the buttons to the right of each number  to set the value based on the current position of the boom.
Esc/Triangle Buttons	Select the Esc button to leave this screen without making changes, or press the triangle icon button to leave this screen with changes saved.

RCL Screen (Continued)

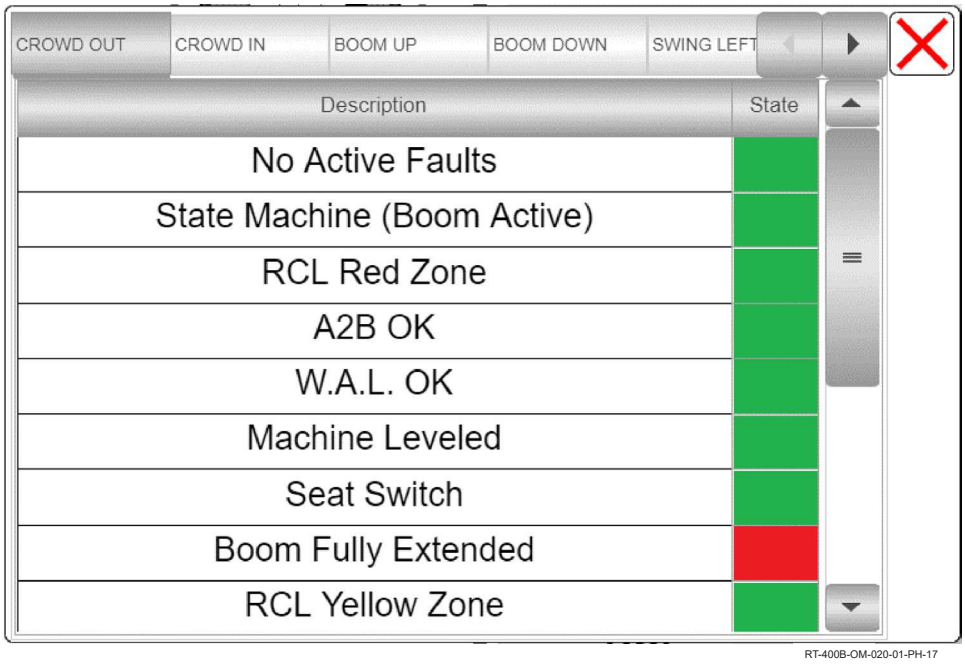


RT-400B-OM-020-01-PH-16

Screen Area	Function
RCL	As shown in the previous RCL Screen 3, the green box on the left side of the screen represents the work area zone. The circle at the top right indicates the boom‘s current rotation area; in this example it is set to a limited rotation movement area. Additionally, the green turtle icon at the top right of the box and the yellow highlighting on the boom indicates the crane is in turtle mode.

RCL Checklist Screen

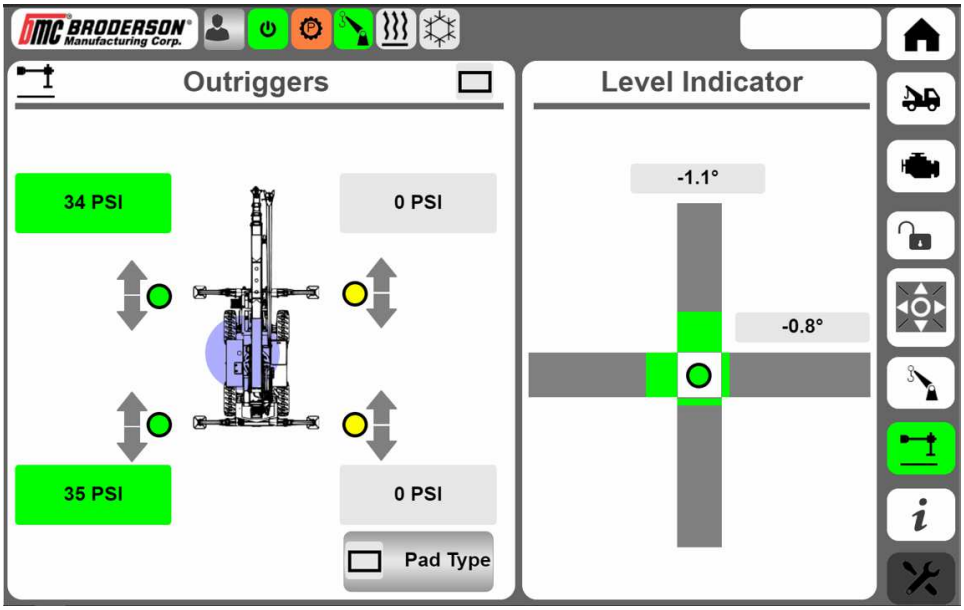
Access this screen by pressing the checklist button on the RCL screen.



Screen Area	Function
Tabs	Along the top are the different boom functions. When selecting an individual function, such as crowd out as shown, a list of interlocks will display.
Interlock List	These are a list of all of the conditions that could prevent boom movement. If the boom is not working/moving slow, this screen will display the reason. For example, in the screen example, the “Boom Fully Extended” state is red. Boom Fully Extended This means that the crowd out movement is not allowed because the boom is fully extended. If the box is green, that condition is met. If the box is yellow, that condition is currently slowing the boom down from going full speed (such as when the boom is nearing end of maximum travel).

Outriggers Screen

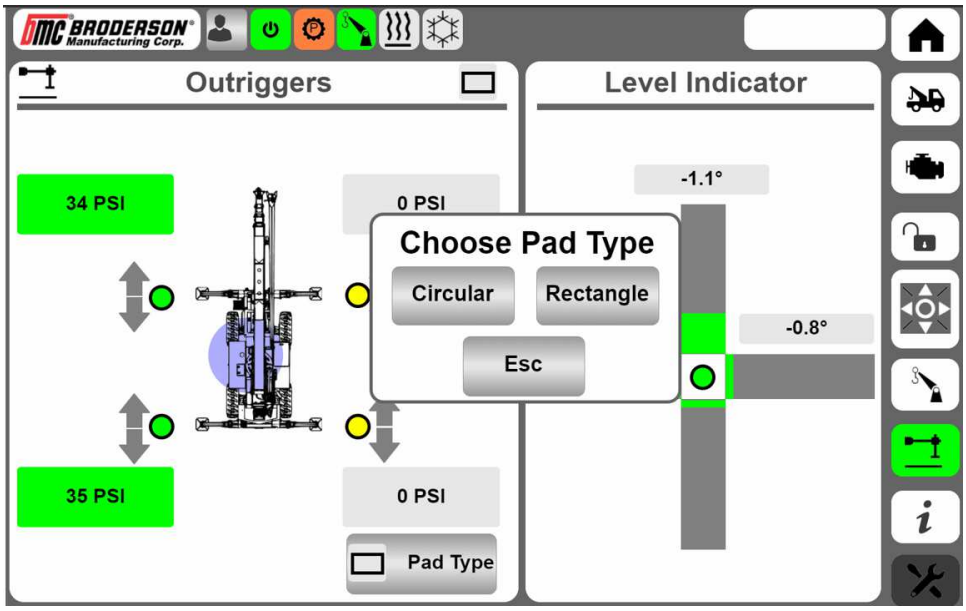
Navigate here using the outriggers screen icon as shown in the navigation bar (page RT-400B-OM-020-01-005).



RT-400B-OM-020-01-PH-18

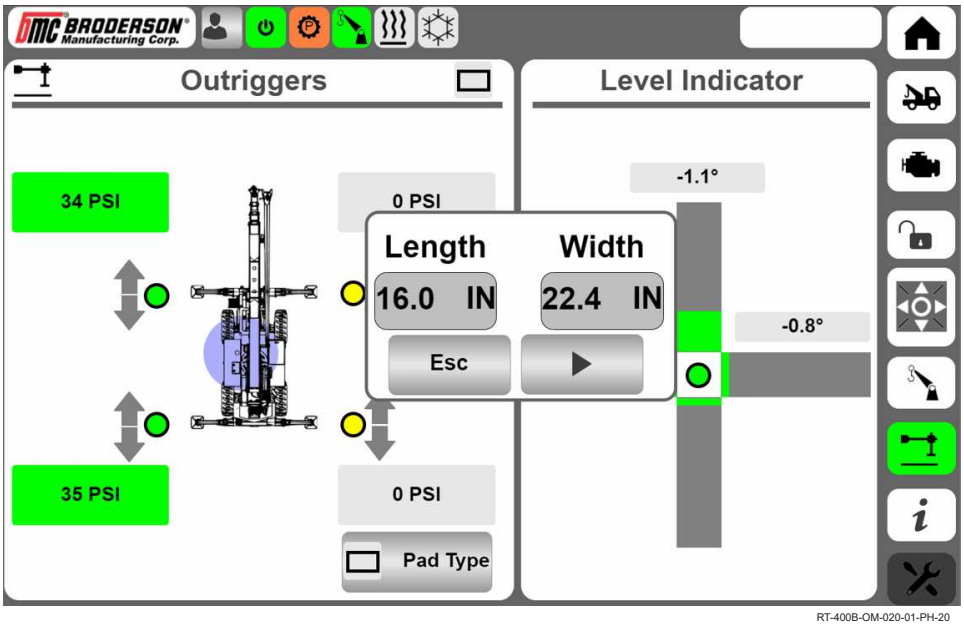
Screen Area	Function
Outriggers	This box shows the ground bearing pressure measurement of each crane outrigger. The lights turn green when the outrigger is down and yellow when the outrigger is up. The Pad Type button  is be used to choose the pad type, i.e. rectangular or circular, as shown later in this section.
Level Indicator	This box shows how level the crane is. The level limit when the crane is on the outriggers is +/-1 degree; the limit when the crane is on rubber is +/- 3 degrees. If the level measurement is within the limit, the bars will turn green (as shown in the image above). If level limit is surpassed, the bars on the level indicator will turn to yellow and certain boom functions will be disabled. See the Interlock Chart on page RT-400B-OM-020-01-020 for which boom functions are affected.

Outriggers Screen - Choosing Pad Type



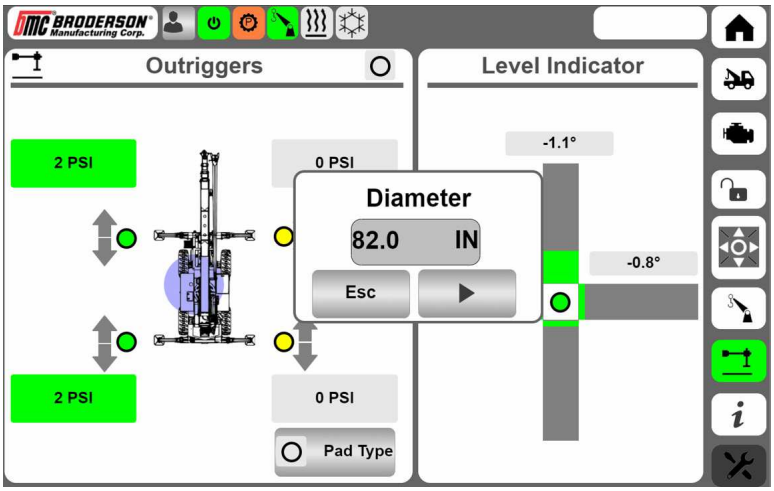
Screen Area	Function
Choose Pad Type	Selecting the Pad Type button Pad Type in the Outriggers box will trigger a pop-up window allowing you to change the pad type. Select the Esc button to close this window.

Outriggers Screen - Rectangular Pad Length/Width Selection



Screen Area	Function
Length/Width	The pop-up window shown applies to the rectangular pad type. Set the desired length/width here and this will affect the PSI calculations shown for each outrigger. Select the triangle button to confirm your choice, or select the Esc button to leave the window without making a change.

Outriggers Screen - Circular Pad Diameter Selection

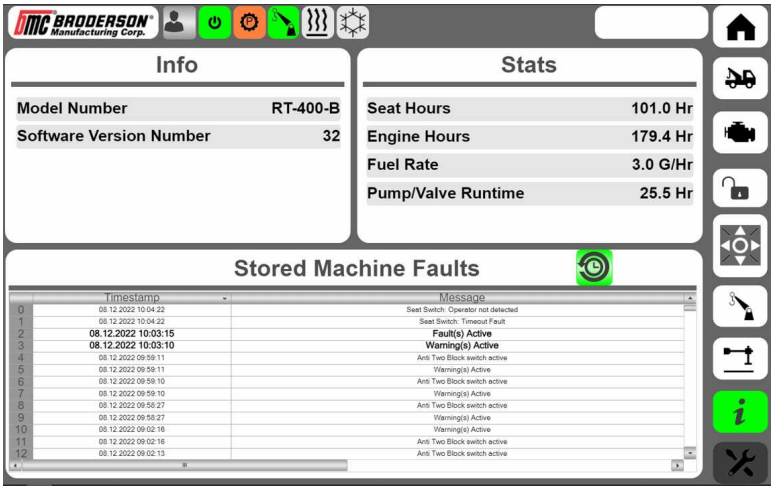


RT-400B-OM-020-01-PH-21

Screen Area	Function
Diameter	The pop-up window shown applies to the circular pad type. Set the desired diameter here and this will affect the PSI calculations shown for each outrigger. Select the triangle button to confirm your choice, or select the Esc button to leave the window without making a change.

Information Screen

Navigate here using the information screen icon as shown in the navigation bar (page RT-400B-OM-020-01-005).

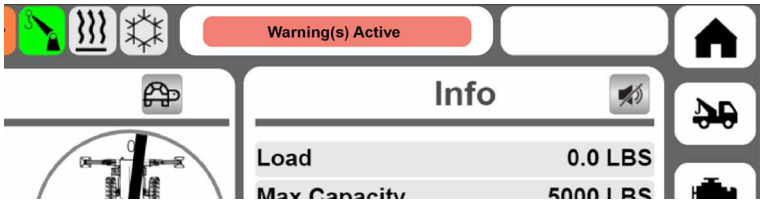


RT-400B-OM-020-01-PH-22

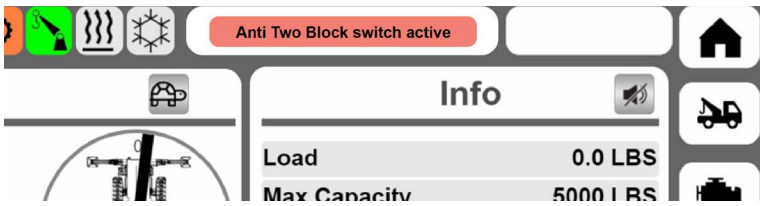
Screen Area	Function
Info	This box shows the crane model and the HMI software version number.
Stats	This box shows the seat hours, engine hours, fuel consumption rate, and pump/valve runtime.
Stored Machine Faults	This box shows the stored machine faults list, which communicates the timestamp of each fault and the associated message. Press the green clock button on the right side of the box to change the display from active faults (gray) to stored faults (green). If the faults are active, they will be bolded and highlighted.

Malfunction Messages

Malfunction messages are located at the top of the HMI screen, highlighted in red. In the example below, the anti-two-block switch warning is active. This warning box will switch between “Warning(s) Active” and the specific error message, such as “Anti Two Block switch active” in this example.



RT-400B-OM-020-01-PH-23



RT-400B-OM-020-01-PH-24

INTERLOCK CHART

Function/Action	Interlocks Needed for Operation
Start Engine	• E-Stop Circuit OK • Engine NOT Running • Keyswitch to Ignition
Arm Machine	• Engine Running • Seat Switch Active • Press Arm Button
Disarm Machine	• Press and HOLD Arm Button for 2s • OR Seat Switch is OFF for 5s
Release Parking Brake	• Parking Brake Active • No Brake Pressure Fault • Machine Not in Neutral
Apply Parking Brake	• Parking Brake Inactive • Machine in Neutral • Brake Pedal Pressed • Engine RPM ≤ RPM 1 Parameter
Shift from Neutral	• Machine Armed • Parking Brake Applied • Brake Pedal Pressed • No Faults Active • FWD / REV Button Pressed • If Boom is loaded and on Rubber, it must be over front

Function/Action	Interlocks Needed for Operation
Shift Gears	• Machine Armed • No Faults Active • If Shifting from 1st Gear, No Load on Boom • Gear Button Pressed
Shift Range (Hi-Lo)	• Machine Armed • Machine in Neutral • Parking Brake Applied • No Faults Active • No Load on Boom • High Gear Button Pressed
Change Steering Mode	• Machine Armed • Machine in Neutral • Parking Brake Applied • Rear Axle Centered • Front Axle Centered • No Faults Active • Steer Button Pressed
Motion Alarm	• Outriggers Currently Active (Up OR Down) • Machine In Reverse
RCL Buzzer	• RCL in Yellow Zone or Red Zone • A2B Limit Switch Activated • Inside WAL Stop Zone
Driving with Load	• Machine Armed • Machine is in 1st Gear Low • Not in RCL Red Zone
Crowding: Boom Out	• Machine Armed • Boom Parameters Set • No Faults • Seat Switch Closed • Not in RCL Red Zone • A2B Limit Switch Not Faulted • Machine Level within +/-3 degrees (rubber) • Machine Level within +/- 1 degrees (O/R) • Not in WAL Stop Zone • Boom Extension Limit

Function/Action	Interlocks Needed for Operation
Crowding: Boom In	• Machine Armed • Boom Parameters Set • No Faults • Seat Switch Closed • Machine Level within +/-3 degrees (rubber) • Machine Level within +/- 1 degrees (O/R) • Boom Retraction Limit
Crowding: Boom Out Full Speed	• Not in RCL Yellow Zone • Hydraulic Tank Temperature not Low • Not in WAL Slow Zone • Boom Close to Fully Extended
Crowding: Boom in Full Speed	• Not in RCL Red / Yellow Zone • Hydraulic Tank Temperature not Low • Not in WAL Slow Zone • Boom Close to Fully Retracted
Topping: Boom Up	• Machine Armed • Boom Parameters Set • No Faults • Seat Switch Closed • Boom Topping Up Limit • Not in WAL Stop Zone • Machine Level within +/-3 degrees (rubber) • Machine Level within +/- 1 degrees (O/R)
Topping: Boom Down	• Machine Armed • Boom Parameters Set • No Faults • Seat Switch Closed • Not in RCL Red Zone • A2B Limit Switch Not Faulted • Machine Level within +/-3 degrees (rubber) • Machine Level within +/- 1 degrees (O/R) • Not in WAL Stop zone • Boom Topping Down Limit
Topping: Boom Up Full Speed	• Not in RCL Red / Yellow Zone • Hydraulic Tank Temperature not Low • Not in WAL Slow Zone • Turtle Mode • Boom Close to Upper Limit

Function/Action	Interlocks Needed for Operation
Topping: Boom Down Full Speed	• Not in RCL Yellow Zone • Not in RCL Red Zone • Hydraulic Tank Temperature not Low • Not in WAL Slow Zone • Turtle Mode • Boom Close to Lower Limit
Winch: Load Up	• Machine Armed • Boom Parameters Set • No Faults • Seat Switch Closed • A2B Switch • Not in RCL Red / Yellow Zone • Machine Level within +/-3 degrees (rubber) • Machine Level within +/- 1 degrees (O/R)
Winch: Load Down	• Machine Armed • Boom Parameters Set • No Faults • Seat Switch Closed
Winch: Load Up Full Speed	• Not in RCL Red / Yellow Zone • Hydraulic Tank Temperature not Low • Turtle Mode
Winch: Load Down Full Speed	• Not in RCL Red / Yellow Zone • Hydraulic Tank Temperature not Low • Turtle Mode
Swing: Turn Left/Right	• Machine Armed • Boom Parameters Set • No Faults • Seat Switch Closed • Not in RCL Red Zone • Not in WAL Stop Zone • Machine Level within +/-3 degrees (rubber) • Machine Level within +/- 1 degrees (O/R) • A2B Limit Switch
Swing: Full Speed	• Not in RCL Yellow Zone • Machine Level within +/-3 degrees (rubber) • Machine Level within +/- 1 degrees (O/R) • Hydraulic Tank Temperature not Low • Not in WAL Slow Zone

Function/Action	Interlocks Needed for Operation
Outriggers: Up/Down	• Machine Armed • No Faults Active • Machine Parked • Seat Switch Closed
Aux Winch: In/Out	• Any Aux Winch Button Pressed

SECTION 8

CONTROL FUNCTIONS

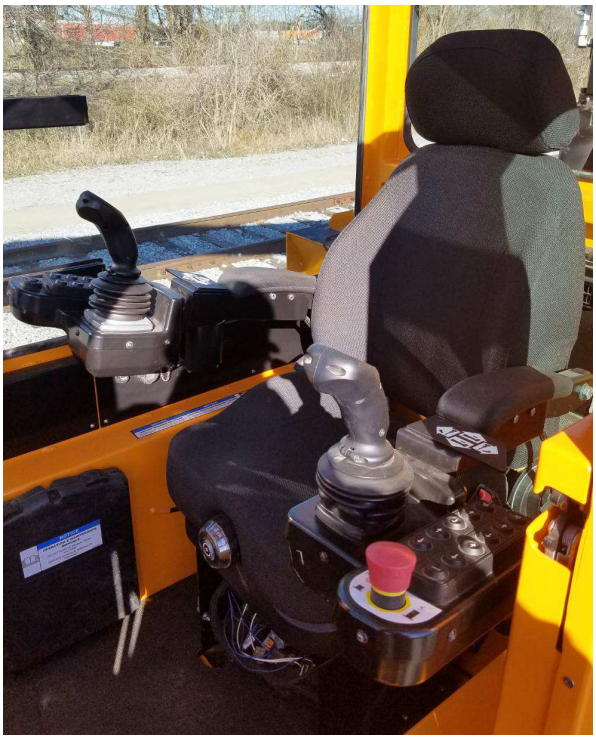
BOOM FUNCTION

Two (2) electronic, multi-axis joysticks (mounted on the operator's arm rests) provide control of boom functions and hoist. The joystick handles are electronically connected to the remote-mounted hydraulic control valves.

An arming button (ARM) is located on the left joystick control pad, labeled with the letter "A," to serve as the handle interlock for the control system. The ARM button must be used any time the operator wants to either use boom functions or drive the crane.

Push the button to engage. The seat switch and the arming button must be active to enable functionality of the joysticks. Boom functions will not operate unless the arm button is engaged before moving the joysticks out of center. The ARM button also needs to be pressed to put the machine into forward or reverse.

Push and hold the ARM button to disengage. Disengaging the ARM button or releasing the seat switch while the handle is not centered will result in an abrupt stop. Avoid an abrupt stop; use it only in emergency situations. The placards located at the base of the joystick handles identify the function and direction resulting from each handle movement.



RT-400B-OM-030-00-PH-1

RT-400B-OM-030-00--PH-2

Callout	Button	Function
1	Fault Reset	Resets machine faults.
2	Emergency Stop	Stops the engine and shuts down the hydraulic system. Push switch in to disconnect power to the engine run circuit and control system circuit. Twist and pull to restore power.
3	ARM (Arming Button)	Serves as the interlock for the control system. When pressed, it allows function movement. To disarm and disable function movement, press and hold the button.
4	Outrigger Control	Eight buttons are paired together giving two directions for each outrigger. Pressing and holding the lower side of the button will deploy the associated outrigger while pressing and holding the upper side of the button will stow the associated outrigger. All four outrigger button pairs may be operated simultaneously or individually.
5	Front Auxiliary Winch (Option)	Controls winch out and winch in. Press and hold the button for a couple of seconds to engage.

BOOM ENABLE CONTROLS

Engage the arm button before operating the joysticks.

1. Left Joystick
   - Moving the joystick to the left will slew the boom to the operator's left.
   - Moving the joystick to the right will slew the boom to the operator's right.
   - Moving the joystick forward will extend the boom.
   - Moving the joystick backward will retract the boom.
2. Right Joystick
   - Moving the joystick to the left will move the topping up.
   - Moving the joystick to the right will move the topping down.
   - Moving the joystick forward will pay out the hoist cable.
   - Moving the joystick backward will haul in the hoist cable.

Joysticks may be used together for simultaneous operation to achieve combinations of movements. Some controls must be used together. For instance, the boom telescope and the hoist controls must be used together to maintain clearance between boom and load line hook. Full speed operation of all boom functions is allowed when:

- The crane is set up on outriggers leveled to +/-1° or on rubber leveled to +/-3°
- The RCL is running in the normal mode

⚠ CAUTION

Avoid holding a joystick lever or outrigger button in the activated position after the function has reached the end of its travel. This will impose unnecessary stresses on the hydraulic components and overheat, damaging the hydraulic system. C-3010-WP-0

OUTRIGGERS

A 12-button pad is mounted to the left-hand operator arm rest for controlling the direction of outriggers on each corner of the machine (see image on page RT-400B-OM-030-00-002).

Eight buttons are paired together giving two directions for each outrigger. Engaging the lower side of the button will deploy the associated outrigger while engaging the upper side of the button will stow the associated outrigger. All four outrigger button pairs may be operated simultaneously or individually. Outrigger alarms will sound when deploying any of the outriggers.

As with all operation, pay careful attention to avoid hitting personnel or obstacles.

⚠ CAUTION

Special attention must be given to avoid hitting personnel or obstacles. C-3003-WP-0

SECTION 9

SEQUENCE OF OPERATION

DRIVING THE VEHICLE

The following procedure is recommended for driving the vehicle:

1. Perform the daily inspection and test. (See page RT-400B-GS-050-00-002)
2. Start the engine and allow a warming period; allow it to run at idle for 30 seconds to a minute. If the temperature is cold, crane functions may be limited to a slower speed until the hydraulic oil warms up. Ensure you run the engine in an adequately ventilated area to avoid inhalation of exhaust fumes.

> **⚠ WARNING**
>
> Engine exhaust contains carbon monoxide, a poisonous gas that is invisible and odorless. Breathing engine exhaust fumes can cause death or serious illness. Do not run the engine in enclosed areas without adequate ventilation. W-2009-WP-0

3. Engage the ARM button. It must be engaged before any movement can occur.
4. While warming the engine, set up the Rated Capacity Limiter (RCL) configuration.
5. Stow the boom over front.
6. Pull the hoist line snug.
7. Stow the outriggers.
8. Step on the brake pedal.
9. Release park brake switch by selecting the desired range, direction (forward or reverse), and the desired gear to operate the machine in.
10. Release brake pedal and press on accelerator pedal.
11. Slow down when making turns.
12. When parking the vehicle, check park brake is active and lower outriggers or chock tires.

OPERATING THE CRANE

The following procedure is recommended for placing the crane in operation:

1. Perform the daily inspection and test. (See page RT-400B-GS-050-00-002).
2. Start engine and allow a warming period at low RPM (if not already running). Allow it to run at idle for 30 seconds to a minute. If the temperature is cold, crane functions may be limited to a slower speed until the hydraulic oil warms up.
3. Drive the crane to lifting location. Take the time to survey the location for obstacles, solid footing, and check if crane is spotted within the lifting radius for the load being lifted.
4. Place the transmission in neutral and verify the park brake is on.
5. Set all outriggers to lift wheels off of the ground and level the crane. Use appropriate cribbing under outrigger shoes as needed on soft ground. Outriggers should remain deployed during all crane operations except for pick and carry.
6. Set up the Rated Capacity Limiter (RCL) configuration for the boom and outrigger conditions.

> **NOTE**
>
> Any change in outrigger position when in the working mode will automatically revert the machine to the "On Rubber" state and update the RCL screens accordingly to indicate this. The system senses a configuration has changed even if temporarily. N-5002-WP-0

7. Enable the ARM button on the operator's left joystick button panel to activate the joysticks. Meter the controls when beginning or ending any movement. This prevents suddenly starting or stopping, which causes unsafe load swinging and shock loads on the equipment. The control should be slightly actuated to begin movement and then slowly increased to desired speed. Metering can be improved by coordinating with the accelerator pedal.
8. You may use the throttle control switch to set the engine speed to one of the preset RPM options when the park brake is on. Return to idle by cycling through set points to return to low idle, or by using the decrement speed buttons. The setpoints are indicated on the HMI with the setpoint icons ().
   - There are three setpoints: setpoint 1 = 1100 rpm, setpoint 2 = 1500 rpm, setpoint 3 = 2000 rpm.
9. Release the accelerator when crane is not in use and shut off engine, if practical.

AUTO-IDLE

See page RT-400B-OM-020-00-007 for an HMI screen example of auto-idle button use.

Auto-idle  is used to automatically return the engine to idle speed after 5 seconds of no movement from the outriggers or boom.

When this feature is enabled, the engine will automatically return to a preset rpm previously selected by the operator when movement is commanded again by the joysticks or outrigger buttons.

To set auto-idle, first set the engine rpm to the desired speed by using the rpm raise/lower buttons. Then, push the auto-idle button to set the function return rpm to the set rpm value. The button will illuminate green to confirm the feature is on. Press the auto-idle button again to turn off the auto-idle function.

NORMAL GAUGE READINGS

The RT-400-B is equipped with one full-color touch screen human-machine interface. The main display is on the right side of the cab. This display is programmed to be the primary controller for the machine. It will monitor engine information provided by the engine manufacturer on the J1939 CAN bus network. The display is also connected to other inputs, such as the fuel tank sender and hydraulic tank temperature sensor, to provide a wide variety of valuable information to the operator. Much of the run-time information is combined together in the main screen where the operator will find many common vehicle parameters. Buttons are provided on the right side of the display to serve as redundant buttons to the touch screen icons for navigation to these various screens as needed.

See the HMI section on page RT-400B-OM-020-00-005 for images of the common operation screens and explanations of available functions.

HMI Screens

- Main
- Machine Info
- Engine
- RCL
- Outriggers
- Info
- Maintenance

The HMI displays real-time data for each parameter. Engine and system fault codes will display on the main screen as a pop-up window when those events occur, as well as on the engine and information screens. It also has warning and shutdown icons that will turn on when a critical threshold has been exceeded. These icons include the following:

- Battery charging system error
- Engine warning light
- Engine shutdown light
- Engine grid heater / wait to start light
- Engine coolant level indicator light
- DEF level indicator
- DEF level warning light
- After-treatment regeneration active
- After-treatment regeneration disable
- After-treatment system temperature/ regeneration underway indicator light

See the RCL HMI section on page RT-400B-OM-020-00-005 for examples and descriptions of screens and icons shown.

Level Guide Screen

Within the outrigger display screen there is a level indicator diagram that provides feedback to the operator on the current status of the crane's level. This screen will assist in leveling the crane during setup. The number of degrees the crane is off of "true level" appears on the side of each axis on the level indicator. The level limit is +/- 1° when on outriggers and +/- 3° when on rubber.

⚠ CAUTION

The crane will not operate if it is not within the level limit. C-3011-WP-0

SECTION 10

RATED CAPACITY LIMITER (RCL)

OVERVIEW

A rated capacity limiter (RCL) is installed on the crane to assist the operator in estimating loads and measuring load radii. Following are some operating tips, but be advised that the RCL is not a substitute for reading and understanding the load chart provided on the crane.

⚠ CAUTION

The RCL is an operator's aid only. It is not intended to be a safety device. C-3017-WP-0

Always be aware that the RCL can stop boom movement at capacity load conditions and in two-blocking conditions. Use good judgment in controlling the speed of boom movements to prevent shock loads and swinging loads. If the RCL system stops the crane movement, there are various remedies that may be used to restart operation. If the hook is two-blocked, it should be lowered using HOIST DOWN, if safe to do so. BOOM RAISE OR TELESCOPE RETRACT may be used if this is safer.

If the load is the maximum for the load line or attachment, the load should be set down in a safe place using the HOIST DOWN control and the load or attachment changed. TELESCOPE RETRACT may also be used, if safe. DO NOT USE THE BOOM RAISE CONTROL as this may increase the overload.

If the load is at the maximum allowable load radius, the boom can be raised or retracted to a safe radius, or the load may be lowered to a safe place using HOIST LOWER. If the boom extension is at its lower angle limit, the boom must be raised or the load hoisted down.

If there is a malfunction of the RCL or Anti-Two-Block system that causes loss of boom movement and cannot be remedied by the procedures above, the override button on the RCL display may be required to move the boom. The override button will provide an amount of time (and a countdown for that time), to the operator, to get the load into a SAFE POSITION.

The RCL override keyswitch is located on the exterior of the right side of the cab. It is a momentary keyswitch that allows a site foreman, supervisor, or other qualified personnel the ability to temporarily override the RCL system on the crane. To override the RCL system, turn and hold the keyswitch in the "on" position. When the keyswitch is released the RCL system will function as normal.

We recommend the emergency override button or keyswitch be used with discretion. Improper or careless use of this button/keyswitch can cause damage to the crane and endanger people and property. The operator or qualified personnel who uses this override in an emergency should use good judgment.

⚠ WARNING

Emergency override should be used only in the event of system failure where normal operation of the boom is not possible. Ensure the area is clear of personnel and other obstacles prior to use of the override button or keyswitch. Failure to follow the above criteria may result in equipment damage, personal injury, or death. W-2012-WP-0

For RCL checks and load test procedure, see the operator inspection chapter on page RT-400B-GS-050-00-003.

SECTION 11

CRANE CAPACITY

GUIDELINES

Before lifting loads, the operator must read the Crane Capacity Chart and adhere to the load capacities and radii of handling stated in the chart. The information provided on this chart is based on stability, structural strength and/or hydraulic capacity.

To operate the crane safely, the operator must know the weight of the load and handling devices, and the radius of the lifting operation. The crane must not be loaded beyond the specifications of the capacity chart except for test purposes as provided in ASME B30.5. The person responsible for the lift must be sure that the load does not exceed the crane ratings at any radius or position at which the load may travel during the entire lifting operation. The weights of the hooks, blocks, downhaul weights, slings, and other handling devices must be added with the load.

Be aware that one outrigger may lift off the ground while operating on outriggers at less than Rated Capacity. This is considered normal if the load is mainly over the opposite corner at the time. The loading on the outrigger closest to the hook load will increase substantially. Loading on the outrigger in the opposite corner will decrease. Flexing in the chassis can cause the opposite corner to lift slightly.

The Rated Capacity Limiter on the crane is intended to assist the operator in estimating loads, measuring load radii and to alert the operator to impending overload conditions. The use of the Rated Capacity Limiter does not replace the requirements of the preceding section. Verified weights and measured radii must take precedence over the Rated Capacity Limiter readings.

The Rated Capacity Limiter displays a load, load radius, and boom angle that are obtained from electronic calculations using readings from pressure, length and angle sensors. These readings cannot be exact and should be treated as estimates.

Be aware that the electronic and mechanical components cannot be 100% fail-safe. Do not consider the system as a substitute for good judgment, training, experience or accepted safe operating practices. The operator is solely responsible for operation of the crane.

Setting the Rated Capacity Limiter for the proper configuration of the crane is necessary before starting a lift. If incorrectly set, the system will not alert the operator to an impending overload, possibly resulting in the loss of life or destruction of property. If the Rated Capacity Limiter is inoperative or malfunctioning, repair or recalibration of the unit must be done as soon as reasonably possible. The person responsible for lifts must establish procedures for determining load weights and radii and conduct the lifts according to safe operating practices.

The Rated Capacity Limiter is designed to stop some crane functions at the limitations of the capacity chart. These are: BOOM LOWER, TELESCOPE EXTEND, HOIST RAISE, and SWING. Great care must be exercised when handling a load near capacity or near a two-blocking condition. If the boom is being lowered or swung, the load will tend to swing if the Rated Capacity Limiter stops the boom movement. If the load is moving too fast, the sudden stopping by the system can cause dangerous load swinging which can cause death or injury to personnel or property damage by impact with the load or by the crane tipping.

⚠ WARNING

The Rated Capacity Limiter can suddenly stop the BOOM LOWER, TELESCOPE EXTEND, HOIST RAISE, and SWING functions, causing the load to bounce or swing. Use great care when handing a load near capacity limits or near a two-blocking condition. W-2013-WP-0

The RT-400-B is equipped with transducers that detect when all the outriggers are deployed. These transducer inputs are fed to the RCL, which allows it to decide which chart to work with outriggers or rubber.

Once the RCL is in run mode, the RT-400-B continues to detect when outrigger positions change. An allowance is made for one outrigger to lift due to chassis flex. When two are detected to be lifted, the audio alarm will sound, an HMI pop-up will appear, and the machine will go to the “On Rubber” state when it detects an outrigger state change.

NOTE

The outriggers should always be deployed before configuring the Rated Capacity Limiter. The system will check for outrigger position before the configuration can be confirmed. The machine will automatically detect the outrigger state and update the RCL and Rubber/Outrigger state to reflect this. N-5003-WP-0

Crane Capacity Chart, Definitions, and Rules

The load radius is the horizontal distance from the centerline of boom rotation (the center of the turntable when it is level), to the vertical load line with the load suspended. Because of deflections of the boom and carrier, the load radius increases when a load is hoisted from its resting place. The load radius may be measured with a measuring tape. If the desired load radius falls between two load radii on the chart, use the load radius with the lower capacity. Interpolating between the numbers is not recommended.

Load capacity ratings on this equipment are given on the basis that operations are to be conducted on firm and level terrain and in a safe environment. A level sensor display in the HMI have been provided to aid the operator in leveling the crane. These capacity ratings are to be reduced in proportion to any deviation from the prescribed conditions. Any unfavorable environmental condition, such as soft, sloping or uneven terrain, high wind, or hazardous surroundings constitutes a deviation.

The main boom capacities are given in relation to the load radius at which the load is being handled. Boom extension capacities depend on the boom angle, the boom extension angle, and load radius. The capacities shown on the capacity chart are the maximum allowable at the indicated radius. The greatest load that may be handled by the RT-400-B is 40,000 lbs (18,143.7 kg), but only at a 10-ft (3.05 m) radius on outriggers. All load ratings, operating radii, work areas, boom extension offsets, and outrigger conditions are shown on the capacity chart. A laminated chart is attached near the operator's seat as well as in the literature compartment. These charts are for the express purpose of informing the operator when a load can or cannot be safely handled.

The capacities shown in the 360° ROTATION and ON RUBBER 360° columns of the capacity chart apply to the entire 360° rotation of the boom. The capacities are maximum allowable at the indicated radius. The capacities ON OUTRIGGERS OVER FRONT and ON RUBBER FRONT are limited to the work area sectors shown on the chart.

Note that the ON RUBBER 360° capacities are much less than the ON RUBBER FRONT capacities. The least stable position of the boom is over the sides of the crane. Use great care when swinging a load from the front or rear of the crane toward the sides of the crane. The load must be known in order to assure that the crane will not tip.

NOTE

Under certain load conditions, torsion induced in the chassis can cause it to twist. This may result in an opposite-side outrigger or tire lifting free from the supporting surface. This is most likely to occur when the boom is positioned over one corner of the machine. The condition does not indicate a loss of stability when working within the limits of the capacity chart. Provided the crane capacity has not been exceeded, operation may continue without restriction. N-5004-WP-0

SECTION 12

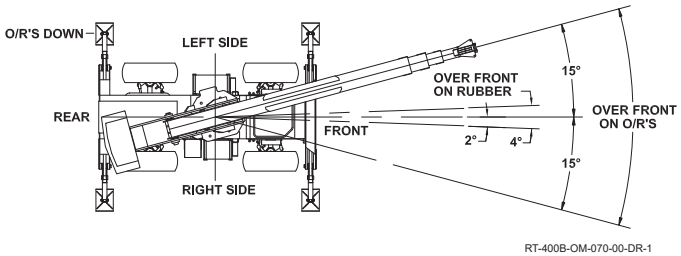
CAPACITY CHART

OPERATION GUIDELINES

- Load radius is the horizontal distance from the center of rotation of the unloaded crane to the vertical load line with the load applied.
- Capacities on outriggers are 85% of tipping loads. Capacities on rubber are 75% of tipping loads. Capacities below bold lines are limited by tipping; other capacities are limited by structural or hydraulic capacity.
- Pick and carry with the shortest practical boom, centered over the front. Operate with the boom as low as possible, with the load close to the ground. Pick and carry capacities are for smooth, level paved surfaces. Speed must be 2 mph (3 km/h) maximum.
- The boom on this unit is steel and has no line voltage rating - no electrical insulation value.
- Maximum hydraulic pressure: 4000 psi (280 bar)
- Boom extension deduct: 500 (220 kg) lbs when stowed on base boom. This is automatically deducted in the RCL program as long as the machine is configured correctly.
- Ensure anti-two-block switch is functional after deploying or stowing boom extension.
- The load hoist line on this unit must be 5/8” dia (16mm), 425 ft (130m) long, compact 35 rotation resistant, grade 2160 wire rope with a minimum breaking strength of 56,400 lbs (251kN).
- Approved tires: 17.5x25/20PR OTR TX-90 - 100 psi (6.9 bar)
- Torque wheel nuts to 475 ft. lbs (645 Nm)

NOTE

These conditions must be maintained to handle rated loads on this crane. N-5012-WP-0



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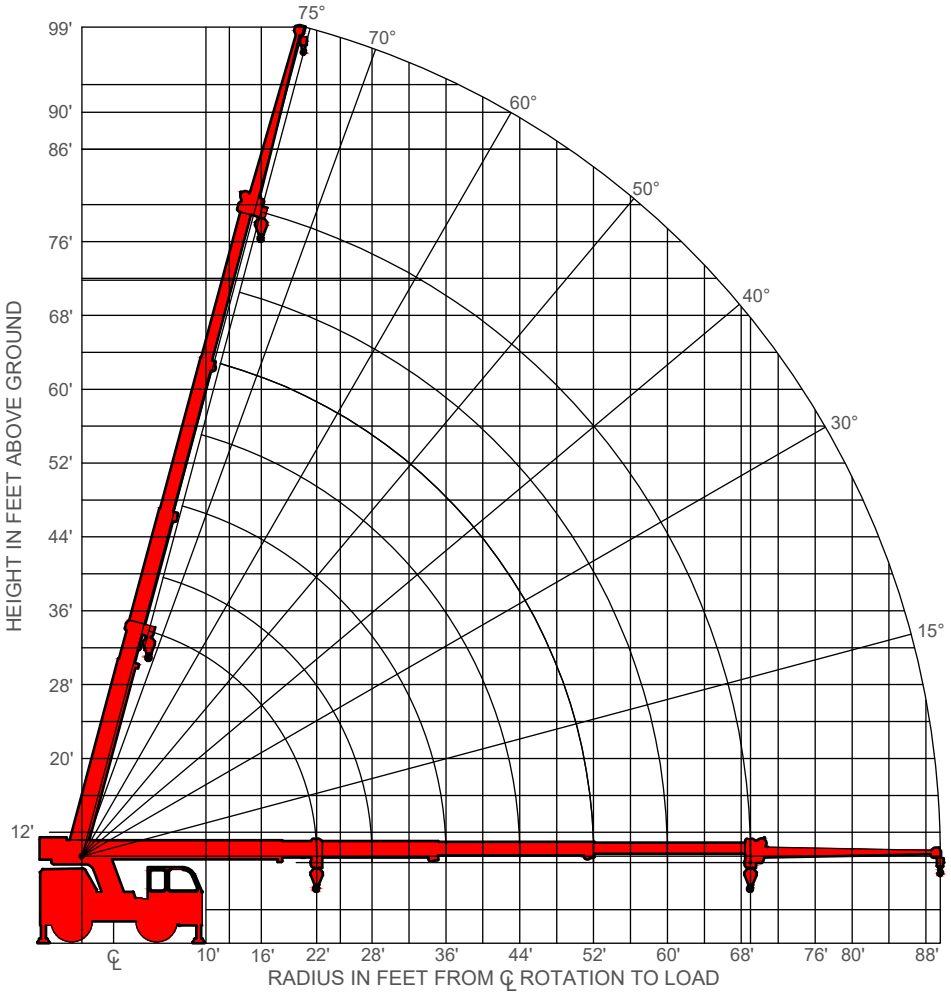
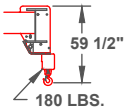
OPERATION

- Read and understand the operator’s manual before operating the crane.
- Check hydraulic and engine oil levels daily.
- Check the unit for visible defects and loose parts.
- Set the vehicle park brake securely.
- Extend outriggers to solid footing and ensure crane is level.
- Operate all hydraulic controls slowly and smoothly. Avoid sudden stops and starts.

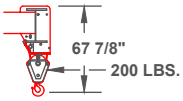
WORKING RANGE CHART



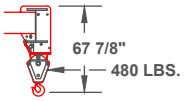
USE SINGLE PART LOAD LINE FOR LOADS TO 10,000 LBS.



USE TWO PART LOAD LINE FOR LOADS TO 20,000 LBS.



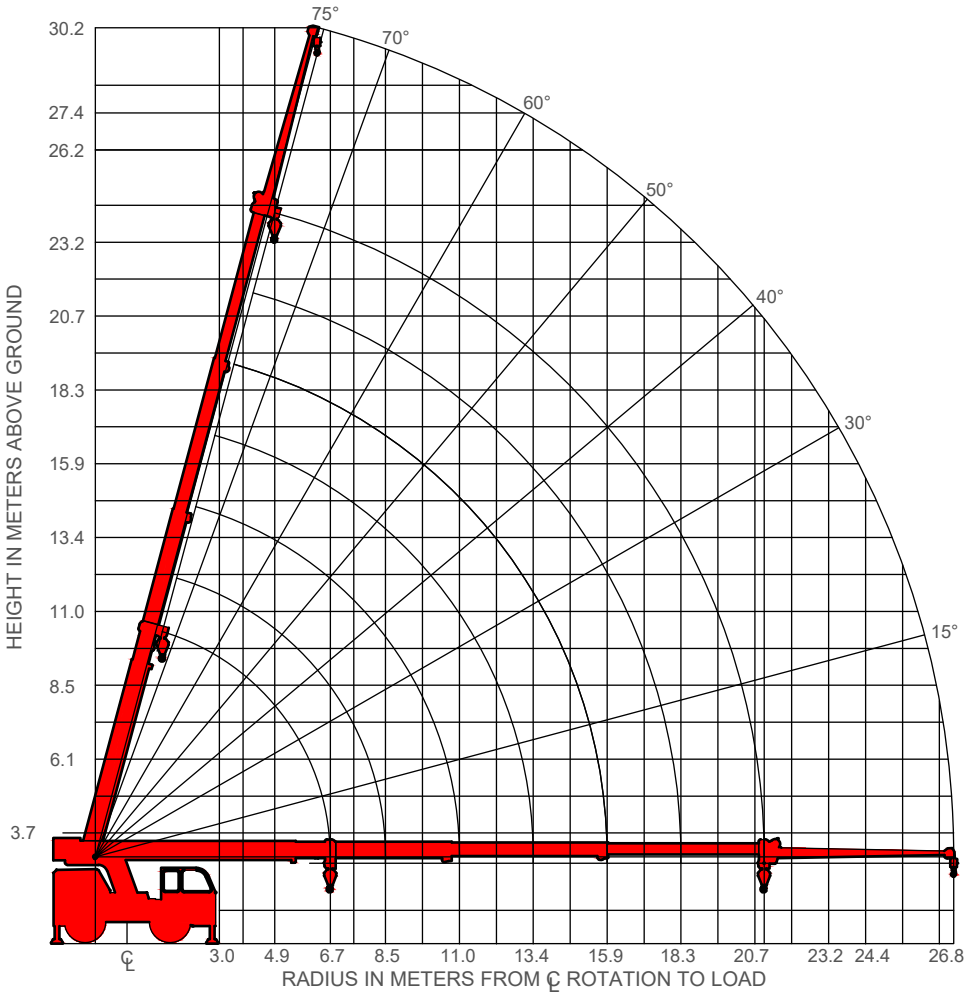
USE FOUR PART LOAD LINE FOR LOADS TO 40,000 LBS



LOAD HOOKS, DOWNHAUL WEIGHTS, HOOK BLOCKS AND OTHER LOAD HANDLING DEVICES SHALL BE CONSIDERED PART OF THE LOAD EXCEPT FOR HOIST ROPE.

RT-400B-OM-070-00-DR-2

WORKING RANGE CHART (METRIC)



LOAD HOOKS, DOWNHAUL WEIGHTS, HOOK BLOCKS AND OTHER LOAD HANDLING DEVICES SHALL BE CONSIDERED PART OF THE LOAD EXCEPT FOR HOIST ROPE.

RT-400B-OM-070-00-DR-3

Capacities Apply to Operation on Firm Level Surface					
	Load Radius (Feet)	Main Boom or Extension Capacities (Pounds)			
		360° Rotation		Over Front	
					
Main Boom	10	18300	40000	26300	40000
	12	13900	34100	22000	34100
	14	10900	29200	18000	29200
	16	8600	25500	14800	25500
	18	7300	23200	12400	22700
	20	6000	22000	10000	22000
	22	5000	19000	8300	20000
	24	4200	17800	7000	18300
	26	3600	16100	6100	16900
	28	3000	13300	5200	15700
	30	2500	12000	4600	14600
	32	2200	10700	4000	13700
	34	1800	9700	3500	12900
	36	1500	8900	3100	11900
	38	1300	8000	2700	10900
	40	1000	7300	2400	9900
	42	800	6700	2000	9200
	46	-	5600	1600	8100
	50	-	4700	1200	7000
	54	-	4000	800	6100
	58	-	3400	500	5300
	62	-	2900	-	4600
	66	-	2400	-	4000
	68	-	2300	-	3600
Boom Extension	72	-	2500	-	2800
	76	-	2000	-	2800
	80	-	1600	-	2800
	84	-	1300	-	2800
	88	-	1100	-	2000

Capacities Apply to Operation on Firm Level Surface					
	Load Radius (Meter)	Main Boom or Extension Capacities (Kilograms)			
		360° Rotation		Over Front	
					
Main Boom	3.0	8300	18140	11920	18140
	3.7	6300	15460	9970	15460
	4.3	4940	13240	8160	13240
	4.9	3900	11560	6710	11560
	5.5	3310	10520	5620	10290
	6.1	2720	9970	4530	9970
	6.7	2260	8610	3760	9070
	7.3	1900	8070	3170	8300
	7.9	1630	7300	2760	7660
	8.5	1360	6030	2350	7120
	9.1	1130	5440	2080	6620
	9.8	990	4850	1810	6210
	10.4	810	4390	1580	5850
	11.0	680	4030	1400	5390
	11.6	580	3620	1330	4940
	12.2	450	3310	1080	4490
	12.8	360	3030	900	4170
	14.0	-	2540	720	3670
	15.2	-	2130	540	3170
	16.5	-	1810	360	2760
	17.7	-	1540	220	2400
	18.9	-	1310	-	2080
	20.1	-	1080	-	1810
	20.7	-	1040	-	1630
Boom Extension	22.0	-	1130	-	1270
	23.2	-	900	-	1270
	24.4	-	720	-	1270
	25.6	-	580	-	1270
	26.8	-	490	-	900

Boom Extension Angle	20-Foot Boom Extension Capacities							
	Main Boom Angle							
	0°	15°	30°	40°	50°	60°	70°	75°
0°	2300	2400	2700	3100	3700	4800	6200	7000
15°	-	2300	2400	2600	2900	3400	4100	4800
30°	-	-	2300	2400	2500	2700	3100	3400

Boom Extension Angle	6.1 Meter Boom Extension Capacities							
	Main Boom Angle							
	0°	15°	30°	40°	50°	60°	70°	75°
0°	1040	1080	1220	1400	1670	2170	2810	3170
15°	-	1040	1080	1170	1310	1540	1850	2170
30°	-	-	1040	1080	1130	1220	1400	1540

⚠ CAUTION

Do not position boom at load radii where no load capacities are shown. C-3018-WP-0

⚠ WARNING

Do not exceed capacity ratings. Do not apply side loads to the boom or boom extension. Failure to comply with these instructions voids the warranty on the machine, and may result in equipment damage, damage to the surrounding work area, personal injury or death. W-2033-WP-0

⚠ WARNING

Boom extension loads must never exceed the main boom capacity. Never pick and carry with a load on the boom extension. Never lift loads on the boom extension when operating on rubber tires. Failure to comply with these instructions voids the machine warranty and may result in equipment damage, work area damage, personal injury or death. W-2015-WP-0

⚠ WARNING

The ON OUTRIGGERS capacities of this crane are based on all outriggers being deployed to a **firm, level surface**, **with no load on the tires.**

- Always adhere to the following criteria:
- Outriggers must always be fully deployed — tires must never carry any load!
- Never operate on a slope with outriggers deployed. The crane will tip at less than rated capacity if the crane is not on a level surface.
- Never deploy outriggers to surfaces that are less than completely firm and able to support the outrigger pad at full rated loads. Inspect the areas prior to deploying the outriggers and ensure the surfaces are firm and secure. Do not deploy outriggers on unstable surfaces, including the following examples, but not limited to:
- Thin or cracked blacktop or concrete
- Dirt that appears dry and firm on the surface but is moist or unpacked beneath the surface
- Dirt with a frozen but thin crust.

Failure to comply with the above may result in machine instability, dropped loads, equipment damage, damage to the surrounding work area, personal injury or death. W-2039-WP-0

CAPACITY EXAMPLE

(Also see the Boom Extension section on page RT-400B-OM-110-00-002).

Refer to the RT-400-B working range chart on page RT-400B-OM-070-00-003. A load 6' X 6' X 6' (1.5 m x 1.5 m x 1.5 m) and weighing 12,700 pounds (5750 kg) is to be lifted to a new location. The load is on a roof 64 ft (20 m) high. The center of the load is 24 ft (7 m) from the center of rotation of the crane.

The chart shows that 10,000 pounds (4500 kg) is the maximum load on one-part line, so the sheave block is required. The chart also shows the weight of the standard sheave block to be 480 pounds (223 kg). The rigger indicates that two slings are required, weighing a total of 50 pounds (23kg). The total load is 12,700 + 480 + 50 = 13,230 lbs (5760 + 218 + 23 = 6001 kg).

The 360° ROTATION, ON RUBBER column of the chart allows lifting up to 18,300 pounds (7700 kg) at a 10-foot (3.048 m) load radius. However, this radius is less than the distance from the center of rotation to the center of the load, so the load cannot be lifted in this configuration. This lift will require the ON OUTRIGGERS columns to be used. Outriggers should always be used whenever possible.

The boom will need to be fully extended to reach the desired height. ON OUTRIGGERS 360° with a fully extended boom at a 24 ft (7 m) load radius, the capacity is 17,800 pounds (8000 kg) which is more than the total load. The load can be lifted over the front on outriggers or over the side on outriggers. If possible, position the crane to lift the load over the front with the outriggers deployed. This is the best position for stability.

NOTE

As the boom is loaded, deflection of the boom, tires, etc. will increase the load radius. Be conservative in your capacity estimate. N-5005-WP-0

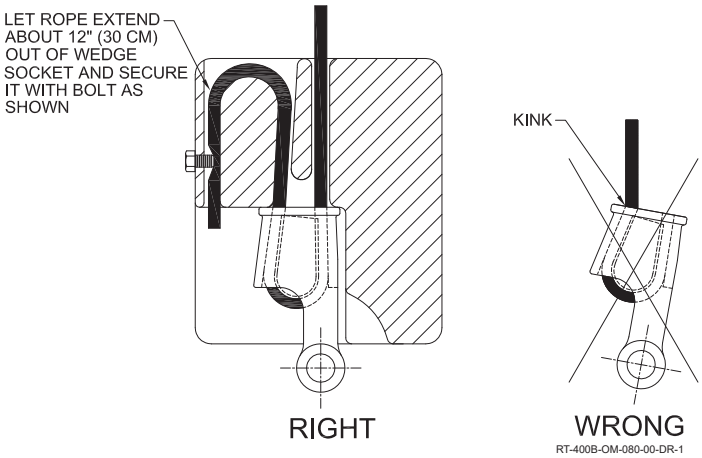
SECTION 13

SHEAVE BLOCK AND DOWNHAUL WEIGHT

OVERVIEW

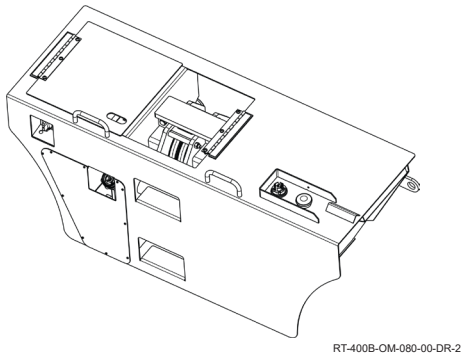
The capacity chart shows the approved hoist rope arrangements. The downhaul weight and sheave blocks supplied by Broderson are specially designed to operate the BMC Anti-Two-Block system. Other blocks or downhauls may bypass this system and create a dangerous condition. All retaining pins that pass through the sheave plates must be locked in place with cotters to hold the hoist rope (also called the load line) on the sheaves. Notice the load limit for each hoist rope arrangement.

For single part reeving the load line must pass through the center of the downhaul, through the wedge socket, and the dead end clamped in the block, as shown in the figure below.



To avoid weakening the rope and risking death or serious injury, do not use a rope clip on the live side of the load hoist rope.

When resting the downhaul or sheave block on the ground for changing it, use the following procedure to prevent fouling the load line on the hoist. Raise the boom about 5 feet (1.5 m) and lower the hoist until the hook nearly touches the ground. Then lay the hook on the ground by lowering the boom, not the hoist.



To stow the sheave block, pull the sheave block then lift the block into the storage compartment by the hook. See figure above.

SECTION 14

BOOM TIP REEVING PATTERN

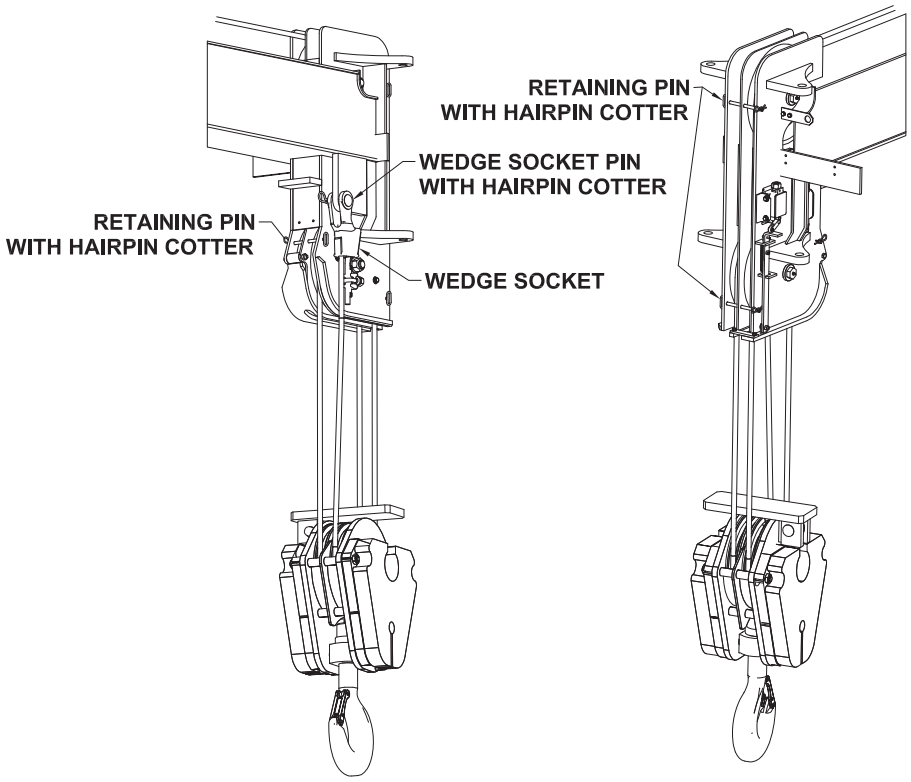
OVERVIEW

For loads above 10,000 pounds (4500 kg) the sheave block must be used. The 4-part-line sheave block can be used for loads up to 40,000 pounds (18,143.7 kg). The wedge socket should be pinned to the wedge socket anchor at the boom tip, as shown in the figure. The dead end of the rope in the wedge socket should be clamped, as shown in the figure below.

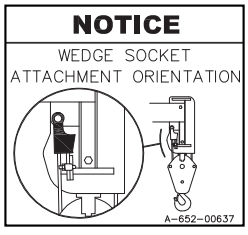
⚠ WARNING

The clamp must not be used on the live part of the rope. This will seriously weaken the rope. W-2044-WP-0

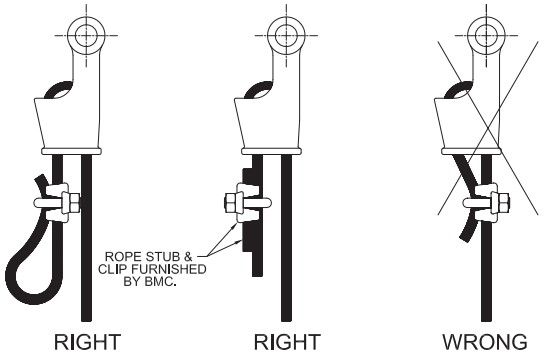
The sheave block should hang straight, and the top of the block should meet the boom sheave plates squarely when pulled up snug.



RT-400B-OM-090-00-DR-1



N-5006-PS-0



RT-400B-OM-090-00-DR-2

SECTION 15

SAFETY DEVICES

SAFETY DEVICES

There are certain safety devices on the RT-400-B that are designed to maintain control of a load even if power or hydraulic line failure occurs. The operator should understand the function and operation of these devices so that a continual check on their performance can be made. There are other safety devices on the RT-400-B designed to assist in the safe operation of the crane. These devices work with the control system, hydraulic system or engine to avert potential hazards. The operator should also understand how these devices work and how to routinely check if the device is functioning properly.

Outrigger Cylinder Counterbalance Valves

A double-acting counterbalance valve is mounted on each of the outrigger cylinders. This valve holds the outrigger in the extended position should power or hydraulic line failure occur. This valve is adjustable but is set from factory. If an outrigger creeps up while supporting a load and adjustment fails to correct the problem, there is an internal leak in the valve or in the outrigger cylinder piston seal. In either case, maintenance is required by qualified maintenance technicians.

Boom Elevation Cylinder Holding Valve

A single-acting holding valve is mounted into the cylinder barrel. This valve holds the boom in the elevated position if power or hydraulic pressure line failure occur. This valve is adjustable to hold the desired load. If the boom creeps down with loads up through maximum capacity, the valve should be adjusted. If adjustment fails to correct the problem, there is an internal leak in the holding valve or the hydraulic cylinder. Refer to the maintenance manual for more information. Repairs and adjustments should be made by qualified maintenance personnel.

Boom Telescope Cylinder Holding Valve

A single-acting holding valve is mounted to the telescoping cylinder. This valve holds the cylinder in the extended position if power or hydraulic pressure line failure occurs. This valve is adjustable to hold the desired load. If the boom creeps in under load, the valve should be adjusted. If adjustment fails to correct the problem, there is an internal leak in the holding valve or the hydraulic cylinder. Refer to the maintenance manual for more information. Repairs and adjustments should be made by qualified maintenance personnel.

Hoist Brake and Holding Valve

The hoist has an automatic brake in the gearbox and a holding valve mounted directly on the hoist motor to hold the load. A clutch in the gearbox allows the winch to turn freely in the RAISE direction. The brake is pilot-released in the LOWER direction and should allow smooth stops of a load on the hoist. In the event of any issues with this system, repairs and adjustments should be made by qualified maintenance personnel.

Anti-Two-Block System

This system prevents damage to the hoist rope and machine components from accidentally pulling the load hook against the boom tip. An electric switch is connected through a cable reel mounted on the boom to the control system, to stop the hydraulic circuit. This system will block the HOIST RAISE, TELESCOPE EXTEND, BOOM LOWER, and SLEW. No other circuits are affected. These circuits are returned to normal operation by operating the HOIST LOWER or TELESCOPE RETRACT control. An emergency override is provided so the boom can be operated in case of system failure. This button is located on the RCL Display. When the override is selected, a countdown timer is displayed, indicating how long the override will be active.

We recommend the emergency override button be used with discretion. Improper or careless use of this operation can cause damage to the crane and endanger people and property. The operator who uses this button in an emergency should use good judgment.

⚠ WARNING

The emergency override button should be used only in the event of system failure where normal operation of the boom is not possible. Ensure the area is clear of personnel and other obstacles prior to use of the emergency override button. Failure to follow the above criteria may result in equipment damage, personal injury or death. W-2012-WP-0

Emergency Stop Switch

A two-position push button switch is located on the top of the left armrest console. It is designed to stop the engine and shut down the hydraulic system. Push switch in to disconnect power to the engine run circuit and control system circuit. Twist and pull to restore power.

Arm Function Button

On the operator's left armrest button panel there is an ARM button (labeled with the letter "A") that must be engaged before the electronic joysticks will function. This protects against inadvertent movement of the joystick while not intending to move the crane. The crane will not move if the ARM function button is not activated. The seat switch must also be engaged to arm the machine. Push and hold the ARM button for 2 seconds to disarm the crane from the ARM state.

Operator-Present Seat Switch

Embedded inside the seat bottom cushion is a switch designed to shut down the hydraulic system when the operator has left the seat. The engine will stay running. If the seat switch is disengaged, the crane movement will stop and the joysticks will be disabled immediately. The crane will also disarm after a few seconds if the switch stays disengaged.

Battery Disconnect Switch

A two-position rotary switch designed to disconnect the battery "positive" terminal from the electrical circuit is located inside the right-side engine compartment cover. Locking tabs allow the use of 'lock-out/tag-out' if needed for maintenance or repair. There is a light by the battery disconnect switch that will power off when the crane can be disconnected from the battery. Do not disconnect battery when the light is on.

⚠ CAUTION

Disconnecting the battery while the light is on can result in damage to the engine electrical system. C-3019-WP-0

RT-400B-OM-100-01-PH-1

Brake Pressure Warning Icon

An indicator icon is included in the main HMI screen to alert the operator when the hydraulic pressure is low in the accumulators. This system should be checked daily. See the Driving the Vehicle section on page RT-400B-OM-040-00-002. If the warning icon shows on the display during normal operations, stop work and contact qualified maintenance personnel immediately.

⚠ WARNING

Do not bypass safety devices! Each device has a specific purpose and should not be tampered with. Death, serious injury, or property damage could result from a safety device that is not functioning. W-2016-WP-0

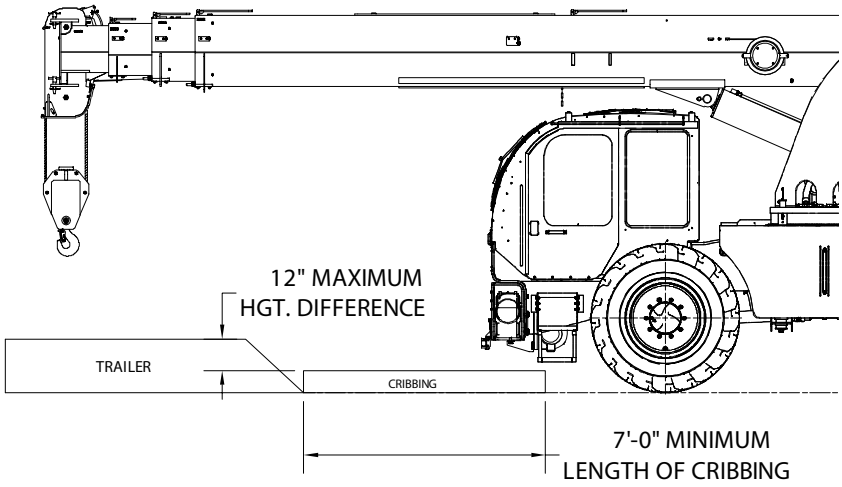
Locking Features

The RT-400-B has several locking features for various covers and compartments. The cab door can be locked to protect the operator's compartment. The master battery disconnect switch can be locked to prevent operation of the machine during maintenance work. The turret lock (see following image) should be engaged for transport of the crane.

RT-400B-OM-100-01-PH-2

Front Auxiliary Winch Clearance

See the following image for reference on the allowable front auxiliary winch clearance. Cribbing is required for loading machines with the front auxiliary winch option on all trailers whose floor exceeds 12 in from the ground. The height difference between the cribbing and any trailer can not exceed 12 in or risk damaging the winch or fairlead. A 7 ft 0 in minimum length of cribbing is required.



SECTION 16

OPTIONAL EQUIPMENT

BOOM EXTENSION

This is a 20-ft offsettable extension. Offsets include 0 degree (in line), 15 degree, or 30 degree.

Use the following QR code to access further instruction on the boom extension:

NOTE

Use appropriate ladders/steps to gain access to the boom tip and deck to perform this installation. N-5007-WP-0

Installing and Stowing Boom Extension

1. Set the outriggers.
2. Raise and extend the boom about 30 feet (9 m) above the ground, paying out the load line until the hook is just above ground.
3. Position boom over front, then lower and retract boom, leaving the load line on the ground.
4. If the sheave block is installed, remove it.
5. Remove load line from tip sheaves and lay over side of boom opposite of the stowed boom extension.
6. Make sure the front stow pin is in place and the attach pins are removed from the lugs on the boom tip and the mating lugs on the boom extension.
7. Remove the rear cotter pin and swing the boom extension away from the rear end of the boom until the attaching lugs mesh on the right-hand side of the boom.
8. Insert the attach pins in the right-hand lugs and retain them with the hairpin cotters.
9. Remove the front stow pin and swing the boom extension around to the front until the left hand lugs mesh.
10. Insert the attach pins in their outer lugs and retain them with hairpin cotters. To insert the fourth pin, it may be necessary to rock boom extension side to side or up and down.
11. Replace the front stow pin in its brackets for storage and insert their hairpin cotters.
12. Lay the load line over the main boom and extension tip sheaves and insert the cable retainer pins and cotters.
13. Install the downhaul weight, wedge socket, and swivel hook on the load line if they are not already installed.
14. Disconnect the anti-two-block wiring cable from the switch on the main boom tip and connect it to the cable connector on the boom extension base.
15. Check the anti-two-block system for proper operation and set Rated Capacity Limiter.
16. Stow the boom extension by performing steps 1-3 and by reversing steps 14-7, and then follow steps 17-20.
17. Lay the load line back in the main boom tip sheaves and insert both retainer pins and cotters.
18. Replace all of the pins in their lugs for storage and insert their hairpin cotters.
19. Install the sheave block on the load line, if desired.
20. Check the anti-two-block system for proper operation, and set Rated Capacity Limiter configuration.

Setting the Offset Angle on the Boom Extension

1. The boom extension must be installed on the main boom tip and the load line; the downhaul weight and wedge socket must be installed on the boom extension and secured with all of the retainer pins.
2. Draw the load line taut with the hoist by pulling the downhaul weight against the bottom of the tip sheave plates, while operating the anti-two-block override button on the RCL Display. Do not operate the TELESCOPE EXTEND function while overriding the anti-two-block system.

⚠ WARNING

Be careful not to operate the TELESCOPE EXTEND while overriding the anti-two-block system. This may break the load line and allow the boom extension and downhaul weight to fall, causing death or serious injury to personnel. W-2017-WP-0

3. Remove the offset index pin from the boom extension knuckle. To loosen the pin it may be necessary to rock the boom extension tip up and down manually while maintaining the proper tension in the load line.
4. Lower or raise the load line with the hoist until the 0, 15, or 30 degree offset holes align in the knuckle.
5. Insert the index pin in the knuckle and retain it with the hairpin cotter.
6. Set Rated Capacity Limiter configuration.

Stowing the Boom Extension

1. If the boom extension is offset to 15 or 30 degrees, return it to the zero offset position as described above.
2. Perform steps 16-20 of the boom extension installation and stowing procedure.
3. Set Rated Capacity Limiter configuration.

FRONT AUXILIARY WINCH

The front auxiliary winch is mounted beneath the front chassis frame and is controlled from the operator compartment. The winch has 125 ft (38 m) of 1/2 inch (13 mm) 6x36 EIP-IWRC with a 26,600 lb (118kN) minimum braking strength and a 5-ton (4.5 metric ton) rated hook.

It is hydraulically powered to provide a bare drum line pull of 15,000 lbs (6800 kg) at 25 ft/min (7.6 m/min) line speed. The winch can pull 10,800 lbs (4890 kg) on the 3rd layer at 34 ft/min (10 m/min). Do not exceed the working strength of the hook and rope. Limit pulls to 10,000 pounds (4.5 metric ton).

The front auxiliary winch is designed for the following uses:

- As a tag line for restraining loads on the boom load line during pick-and-carry operation.
- To drag loads on the ground to a position where they may be safely lifted with the boom.
- To pull the crane out of mud or other obstacles.
- To pull a smaller vehicle that is stuck.

The front winch is not designed for lifting personnel or loads. Observe the following safety rules:

⚠ WARNING

Improper operation of the winch can cause injury or death. W-2045-WP-0

1. Never lift or carry personnel or loads with the winch and wire rope.

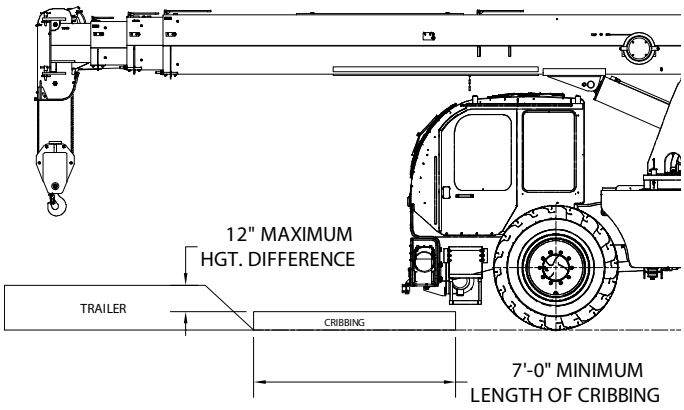
⚠ WARNING

The front winch is not designed for lifting personnel or loads. W-2018-WP-0

2. Do not allow anyone to stand near or under the load being moved.
3. Be sure the cable is securely anchored in the drum and that at least 5 wraps of rope remain on the drum to insure against the rope pulling out of its anchor.
4. Stand clear of a loaded winch cable. If it breaks, it can be very dangerous.
5. Keep hands clear of the winch and any sheaves that the cable passes over when the winch is being operated.
6. Do not over-stow the hook into the roller guide. This may damage the hook, rope, or the roller guide
7. Do not use the drive train to pull a load that is too heavy for the winch to pull. The drawbar pull of the RT-400-B can easily exceed the working strength of a single part of line for the front winch.

Winch Clearance

See the following image for reference on the allowable front auxiliary winch clearance. Cribbing is required for loading machines with the front auxiliary winch option on all trailers whose floor exceeds 12 in from the ground. The height difference between the cribbing and any trailer can not exceed 12 in or risk damaging the winch or fairlead. A 7 ft 0 in minimum length of cribbing is required.



Manual Clutch Shifter

To disengage clutch: Run the winch in the reverse (reel out) direction until load is off the cable. Pull handle out and rotate 90°. With handle in the “disengaged” position, cable may now be free-spooled from drum.

To engage clutch: Pull handle out, rotate 90° and release handle. Run the winch in reverse until the clutch handle snaps fully into the “engaged” position. Do not attempt to pull a load unless the handle is fully at the “engaged” position. If manual shift indicator light is present, the green light is lit when clutch is fully “engaged”.

Do not attempt to pull a load unless the green light is lit.

PINTLE HOOKS

Available pintle hooks allow the crane to tow other disabled vehicles and trailers, and drag loads. Options include a front or a rear pintle hook, either mounted on the front or rear outriggers housing, providing capacity for 6,000 lb (2,700 kg) max vertical load and 30,000 lb (13,600 kg) max gross trailer weight.

1. Observe the capacity ratings marked near the hook when towing.
2. Exceeding the capacities can damage the drivetrain.
3. Use slow and smooth motions to avoid shock loads or overrunning loads. Make sure vehicle being towed is occupied to steer and brake.

Pintle Hooks also allow the crane to be towed.

1. Use appropriately sized straps or chains.
2. Place transmission in neutral. An operator should activate brakes as needed and steer the crane while being towed.
3. Do not exceed a towing speed of 5 mph (8 kph).

TWO-PART LINE SHEAVE BLOCK

This is a single sheave block for two-part-line requirements. It includes 12-inch (305 mm) OD sheaves for 5/8-inch (16 mm) diameter wire rope, as well as a swivel hook with safety latch.

200-pound (90 kg) weight provides positive overhaul.

It also includes bar on top to actuate the trip arm of the Anti-Two-Block Device.

TWO-SPEED HOIST

With a 12 VDC solenoid at motor for speed selection, this is a planetary gear hoist with spring set, hydraulically released brake and load holding valve. It includes a grooved drum, spring applied cable follower, and 3rd wrap indicator. The maximum bare drum line pull is 13,792 lbs and maximum line speed is 297 ft/min (5th layer).

STROBE LIGHTS

Two amber LED strobe lights are mounted on each side of the counterweight for better visibility. The strobe lights are on whenever the outriggers or boom functions are moving. If the machine is in the “On Outriggers” state, they are also on. They can also be manually turned on from the HMI screen.

BOOM WORK LIGHTS

One LED work light is mounted to the boom to illuminate the tip, and one work light is mounted to the turret to illuminate the ground under the boom tip.

NON-CERTIFIED EMISSIONS LEVEL ENGINE (FOR EXPORT)

This is a Cummins model F3.8 diesel engine, turbocharged, charge air cooled, four-cylinder, 3.8 liter (229 CID). EU Stage II rating. Bore 4.02 inches (10.2 cm), stroke 4.53 inches (11.5 cm).

- Rated 154 hp (115 kw) at 2,500 rpm. 435 foot pounds (590 Nm) maximum torque at 1,500 rpm. 130 amp alternator.
- The oil capacity is 11.6 quarts (11 L) and the coolant capacity is 33.6 quarts (31.8 L).

- Includes multiple throttle control modes: foot pedal, auto-idle, speed presets – 1100, 1500 or 2000 rpm, as well as incremental rpm steps at 100 rpm per step between set points.
- The engine protection system derates if the multiple operator fault codes are ignored. This engine also includes a charge air cooler, grid heater, and 120 VAC engine block heater.

SECTION 17

TROUBLESHOOTING

HYDRAULIC TROUBLESHOOTING

Issue	Correction
Control system/engine faults appear on display	First, push the fault reset button. If the fault continues, the system/machine should be shut off and restarted several times as the faults may clear themselves if they are related to a start-up issue. If the fault persists, troubleshooting steps should be taken based off of the direction provided by the fault(s) that are displayed.
Joystick function is disabled	Ensure the “Arm” command and the seat switch are enabled. Both of these can potentially disable the joysticks. Check that the emergency stop switch on the top of the left armrest console is not engaged. If the issue continues, refer the checklist screen of the HMI to confirm there are no other interlocks preventing function. See page RT-400B-OM-020-00-016 for an example of the checklist screen.

TRANSMISSION TROUBLESHOOTING

Issue	Correction
Transmission feels like it’s slipping	Check the transmission oil level. If air bubbles are in the oil and the level is not too high, there may be a leak in the suction line of the transmission pump
Cannot change steering modes	Ensure the machine is placed in park. Reference interlock chart on page RT-400B-OM-020-00-020 and HMI checklist screen on page RT-400B-OM-020-00-016 for more information.
Hoist raise, boom telescope extend, boom lower, or swing function is disabled	Check that the RCL has not disabled these functions to address an overload. Check that the anti-two-block device has not disabled these functions to prevent damage from accidentally pulling sheave block or downhaul weight against boom tip. Reference interlock chart on page RT-400B-OM-020-00-020 and HMI checklist screen on page RT-400B-OM-020-00-016 for more information.

ELECTRICAL TROUBLESHOOTING

Issue	Correction
Control system/engine faults appear on display	First, push the fault reset button. If the fault continues, the system/machine should be shut off and restarted several times as the faults may clear themselves if they are related to a start-up issue. If the fault persists, troubleshooting steps should be taken based on the direction provided by the displayed fault(s).

SECTION 18

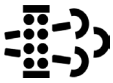
SWITCH AND INDICATOR SYMBOLS

SYMBOL/ICON GUIDE

The following list shows the symbols used to label switches and indicators on BMC cranes. Most symbols are derived from the ISO 3767-1:1998(E) standard. Not all symbols will be included on your BMC crane.

	On/Start		Windshield washer switch
	Off/Stop		Windshield defroster switch
	Battery		Heater switch
	Hour meter		Air conditioner switch
	Read operator’s manual		Ventilation fan switch
	Sound level notification		Parking brake is set
	Mute		Reset
	Headlights (main/high beam)		4-wheel (round) steer
	Work light		Rear-wheel steer
	Hazard lights		Crab steer
	Rotating beacon or strobe lights		2-wheel drive
	Turn signals left/right		4-wheel drive
	Lift point		Chassis steering
	Steering wheel tilt		Front-wheel steer
	Windshield wiper switch		Engine stop
	Tire pressure		Engine oil pressure low
	Brake fluid fill location		Engine coolant fill location

	Tie-down point		Engine coolant temperature high
	Transmission oil fill location		Engine coolant low level mark
	Transmission oil pressure		Engine air filter restriction indicator
	Transmission oil temperature		Engine start
	Hydraulic oil low-level mark		Check engine
	Hydraulic oil filter restriction indicator		Stop engine
	Hydraulic temperature gauge		Wait to start
	Engine rpm setpoint 1 (1 = 1100 rpm)		Engine rpm setpoint 2 (2 = 1500 rpm)
	Engine rpm setpoint 2 (3 = 2000 rpm)		Engine rotational speed
	Engine automatic idle control		Engine decrease rpm
	Hydraulic oil temperature high		Engine increase rpm
	Diesel fuel only		Gas fuel only
	Hydraulic oil pressure gauge or hydraulic oil pressure low		Fuel level gauge
	Positive polarity		Drain
	Negative polarity		Power on/off (HMI)
	Operator seat occupied status (HMI)		Turtle mode (HMI)
	Maintenance screen (HMI)		Info screen (HMI)
	Outriggers screen (HMI)		RCL screen (HMI)

	Engine screen (HMI)		Machine info screen (HMI)
	Home screen (HMI)		User profile (HMI)
	Parking brake (HMI)		Inactive/active fault code switch
	Screen lock (HMI)		DEF system
	High exhaust system temperature		Exhaust system cleaning
	Exhaust system cleaning disabled (inhibit)		On outriggers
	On rubber		