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BRODERSON MFG. CORP.
LENEXA, KANSAS 66215

OPERATION AND MAINTENANCE MANUAL IC-200-2H & 3H

OWNER: _____

SOLD AND SERVICED BY: _____

MODEL NO. _____ SERIAL NO. _____

BRODERSON MANUFACTURING CORP.

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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.

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BRODERSON MANUFACTURING CORP.

IC-200-H INDUSTRIAL CRANE

INTRODUCTION

The Broderson IC-200-H was designed and built to provide safe, dependable and efficient crane service. This we warrant 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.

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

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

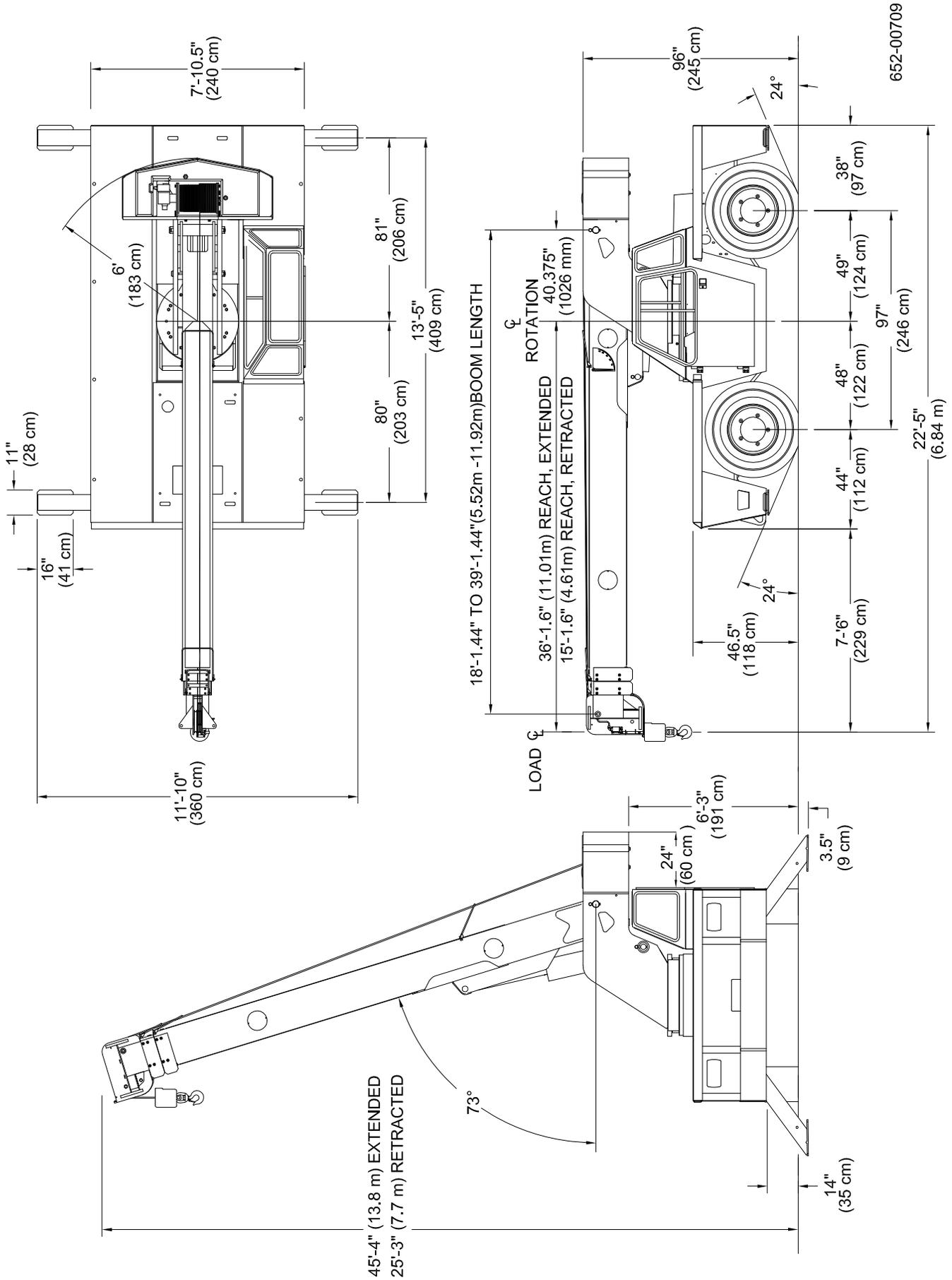
To reorder this manual, ask for IC-200-H Operation and Maintenance Manual, Part Number-990-30204. Contact your Broderson Service Representative at:

Broderson Manufacturing Corp.
P.O. Box 14770
Lenexa, Kansas 66285 USA
913-888-0606

NOTICE

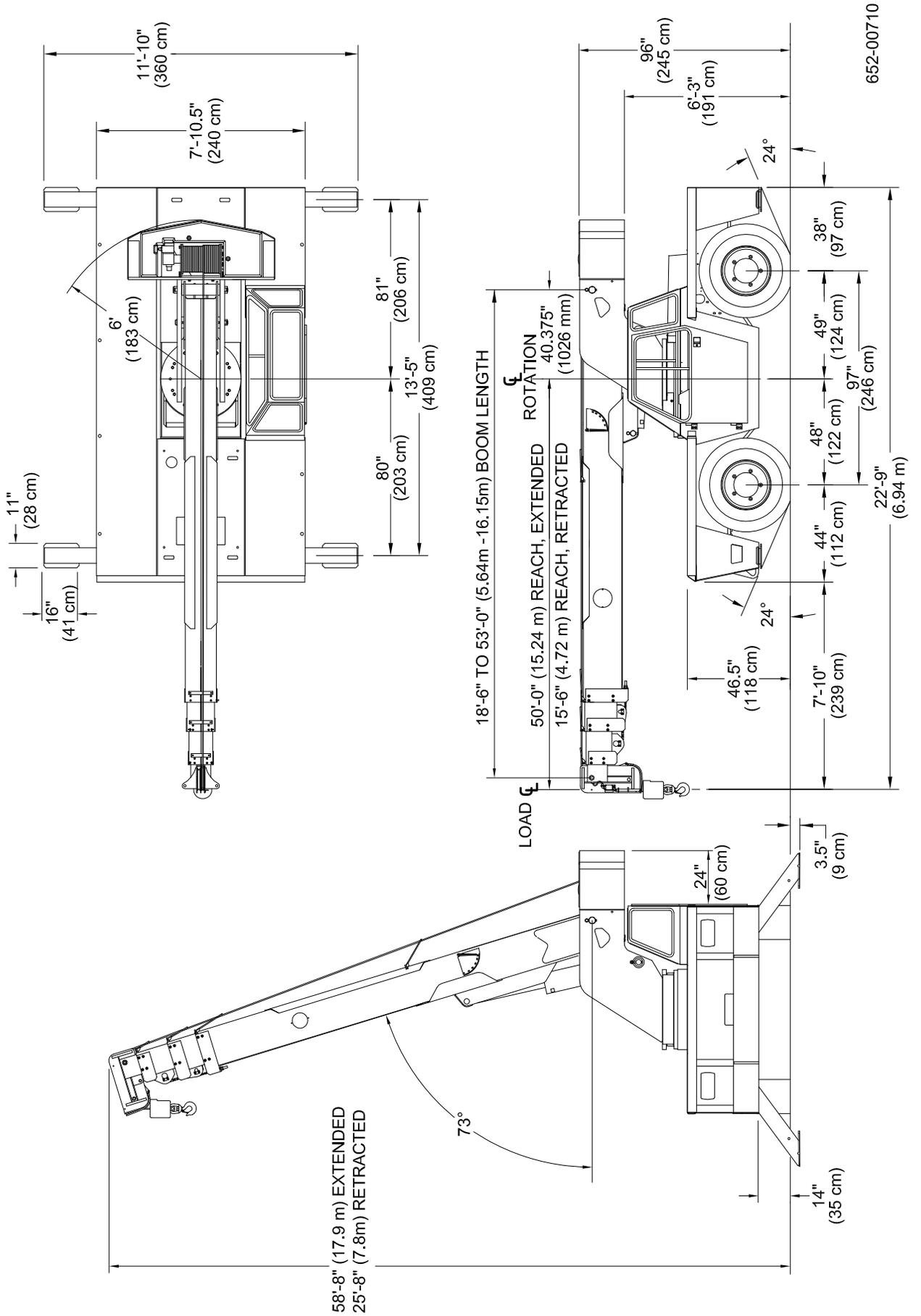
If this crane becomes involved in an accident, please call Broderson Manufacturing Corp. at 913-888-0606, and ask for the Legal Department or the Service Manager. Also, please notify your Broderson dealer.

IC-200-2H DIMENSIONS

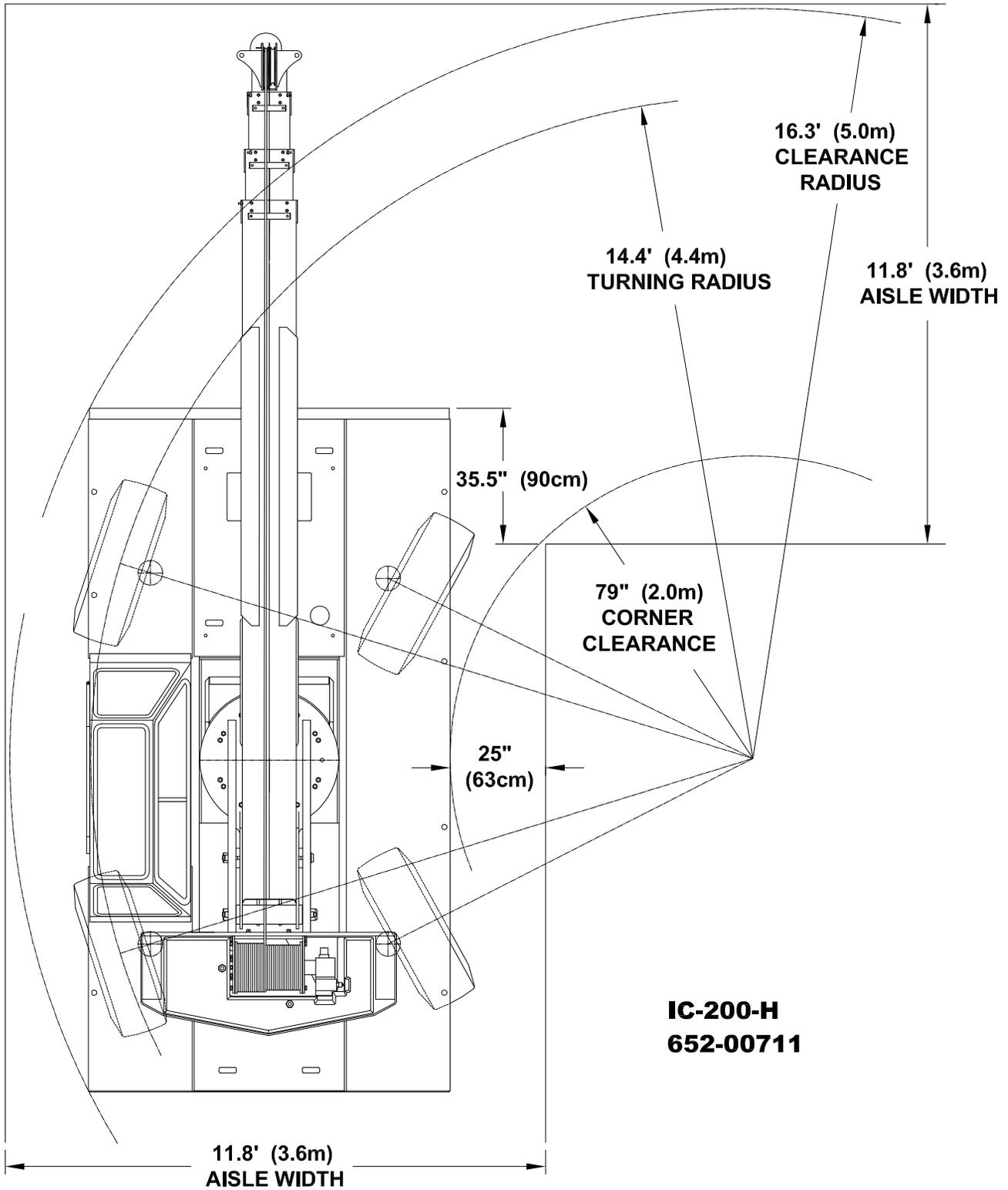


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IC-200-3H DIMENSIONS



IC-200-H TURNING DIMENSIONS



SECTION 1

DESCRIPTION AND SPECIFICATIONS

The IC-200-H is a self-propelled Industrial Crane designed for material handling and installation, maintenance and repair of equipment, with special features of self-loading cargo decks, 4-wheel steer, and front-wheel drive (4-wheel drive optional). The basic unit consists of a chassis and hydraulic boom assembly. The chassis includes a frame, four hydraulic independently controlled outriggers, engine, torque converter, powershift 4-speed transmission, front planetary drive/steer axle and rear steer-only axle, fuel tank, hydraulic tank, control station, power steering and dual power brakes. The boom assembly includes a hydraulic powered continuous rotation turret, 3 or 4-section telescopic boom, hydraulic boom elevating cylinder, hydraulic boom telescope cylinders and hydraulic powered hoist. A Rated Capacity Limiter is standard.

IC-200-2H:

3-section hydraulically extended boom with capacity of 30,000 pounds (13600 kg) at a 6-foot (1.8 m) load radius. Horizontal reach of 36 feet (11.0 m) and vertical reach of 45 feet (13.7 m).

IC-200-3H:

4-section proportional hydraulically extended boom with capacity of 30,000 pounds (13600 kg) at a 6-foot (1.8 m) load radius. Horizontal reach of 50 feet (15.2 m) and vertical reach of 58 feet (17.7 m).

General:

	<u>IC-200-2H</u>	<u>IC-200-3H</u>
Weight:		
Front Axle	13,960 pounds (6340 kg)	15,390 pounds (6,990 kg)
Rear Axle	14,540 pounds (6600 kg)	15,690 pounds (7,120 kg)
Total	28,500 pounds (12940 kg)	31,080 pounds(14,110 kg)
Length:		
Overall	22 feet 6 inches (6.86 m)	22 feet 10 inches (6.96 m)
Chassis	14 feet 11 inches (4.55 m)	14 feet 11 inches (4.55 m)
Width:	7 feet 10.5 inches (2.40 m)	
Height:		
Overall	8 feet (2.45 m)	
Deck	47 inches (1.19 m)	
Wheelbase:	97 inches (2.46 m)	
Ground Clearance:	11 inches (349 mm)	
Angle of Approach:	24	degrees

General (Cont'd):

Angle of Departure:	24 degrees
Outriggers:	
Spread	11.8 feet (3.61 m)
Penetration	3.5 inches (89 mm)
Turning Radius:	
4-Wheel Steering	14.4 feet (4.42 m)
Aisle Width for 90° Turn:	11.8 feet (3.61 m)
Steering Modes:	Rear Steer, Round Steer, Crab Steer
Road Speed:	18 MPH (29.0 km/h)
Gradeability (Calculated):	54 percent (28 degrees) ¹
Grade Limit:	15 percent (9 degrees) ¹
1) Calculated values based on GM 4.3L Gasoline Engine. (Wheels may spin before these values are reached.)	

<u>Boom Movement:</u>	<u>IC-200-2H</u>	<u>IC-200-3H</u>
Rotation	Continuous	Continuous
Elevation	0 to 73 degrees	0 to 73 degrees
Telescope	21 feet (6.40 m)	34.5 feet (10.52 m)

<u>Boom Speeds:</u>		
Rotation	1.7 RPM	1.7 RPM
Elevation	20 seconds	20 seconds
Extension	33 seconds	50 seconds

<u>Sheave Height (Nominal):</u>		
W/O Boom Extension	45 feet 4 inches (13.8 m)	58 feet 8 inches (17.90 m)
With Boom Extension	59 feet 6 inches (18.10 m)	73 feet 8 inches (22.40 m)

<u>Horizontal Reach:</u>		
W/O Boom Extension	36 feet (11.0 m)	50 feet (15.2 m)
With Boom Extension	51 feet (15.5 m)	66 feet (20.1 m)

Engine:

Standard:

GM 4.3L V-6, EPA Tier 2 Woodward Dual Fuel:

GM Model 4.3L V-6 industrial gasoline engine with multiport electronic fuel injection, dual fuel, catalytic converter, and engine management system. Water cooled, 262 CI (4.3L) displacement, 4-inch (102 mm) bore, 3.48-inch (88 mm) stroke, 93 HP (69 kW) at governed speed of 2500 RPM. Maximum torque 206 ft-lbs (279 Nm) at 1650 RPM. Includes special exhaust valves, seats and valve rotators for use with LPG, 70-amp alternator, 30-gallon (113L) fuel tank and 43-pound (19.5 kg) LPG tank. High temperature and low oil pressure shutdown is included in engine management system. Throttle control switch for setting engine speed at 1200 or 1800 RPM.

Optional Engines and Engine Accessories:

Diesel Engine:

Cummins QSB3.3L Turbo, EPA Tier 4i:

Cummins QSB3.3 Tier 4 Interim turbocharged diesel engine. Water cooled, 4-cylinder, 199 CID (3.3L), 3.74-inch (95 mm) bore, 4.53-inch (115 mm) stroke, 100 HP (75 kW) at governed speed of 2600 RPM. Maximum torque is 306 ft-lbs (415 Nm) at 1600 RPM. 120-amp alternator included. 30-gallon (114 L) fuel tank capacity. High temperature and low oil pressure shutdown included in engine management system. Throttle control switch for setting engine speed at 1200 or 1800 RPM. Diesel oxidation catalyst muffler; Air intake pre-cleaner; Charge air cooler; 1500 watt, 120 vac, block heater; and grid heater included. Net Weight: 200 pounds (91 kg)

Spark Arrester Muffler:

Spark arrester muffler used in addition to standard muffler. Net Weight: 10 pounds (5 kg)

Engine Heater for Dual Fuel Engine Only:

Heater for engine. Engine coolant heater installed with hoses in coolant system to circulate warm water through engine. Plug s into 120V AC extension cord. 1500 watts.

Transmission:

Standard 2-Wheel Drive:

Powershift transmission with four speeds in forward and reverse. Provides powershifts at any engine speed in any gear. All shifting is done with a single lever electrical control mounted on the steering column. Multiple-disc clutch packs operated by solenoid valves provide reverse, neutral, forward and speed selection. Equipped with oil cooler and filter.

Optional 4-Wheel Drive Transmission:

Same as 2WD transmission with an additional output shaft to drive the rear axle. Electro-hydraulic control for shifting between 2WD and 4WD. This option includes the 4-wheel drive axle listed below.

Transmission gear ratios:

1st
2nd
3rd
4th

Forward and Reverse (2WD & 4WD)

5.72 to 1.0
3.23 to 1.0
1.77 to 1.0
1.00 to 1.0

Torque Converter:

Standard:

Stall torque ratio of 2.2:1, attached to engine flywheel.

Front Axle:

Standard:

Planetary drive/steer front axle with 15.78 to 1.0 ratio. Differential equipped with "limited slip" feature. Driving effort is applied to wheel that has traction. Front axle mounted rigidly to frame.

Calculated Performance:

<u>Gear</u>	<u>Drawbar Pull (pounds)</u>	<u>Travel Speeds (MPH)</u>
1st	17,000*	3
2nd	8,900*	5
3rd	5,100*	10
4th	2,700*	18

*Calculated for GM 4.3L engine. Wheels will spin in 1st or 2nd gear before these values are reached with 2-wheel drive.

Rear Axle:

Standard 2-Wheel Drive:

Steering axle with 1½ degree oscillation in either direction.

Optional 4-Wheel Drive:

Planetary drive/steer axle with 24.98 to 1.0 ratio. Differential is not "limited slip" in rear axle. 1½ degree oscillation in either direction. (Axle ratio compatible with 4WD transmission output for front axle match.) Net Weight: 160 pounds (73 kg)

Steering:

Standard:

Hydraulic steering unit with two, 3-inch (7.6 cm) cylinders attached to each axle. Allows limited steering when engine is not running. Rear axle is the primary steer. An electric switch in the operator's compartment is used to select rear-wheel steering, four-wheel round steering or crab steering. Electronic sensors and control box automatically align the steering when a new mode is selected.

Brakes:

Standard:

Split-system, four-wheel hydraulically-boosted multiple-plate wet disc brakes. Uses mineral oil. Hand lever actuated disc-type parking brake on transmission.

Tires:

Standard 2-Wheel & 4-Wheel Drive:

15x22.5, 16-ply rating.

Tire Options:

Non-Marking Pneumatic:

385/65D22.5 16-ply rating Net Weight: 20 pounds (9 kg)

Foam Filling of Tires:

Foam filling of four IC-200 tires. Net Weight: 2000 pounds (907 kg)

Spare Tire and Wheel Mounted Standard Tire:

Extra wheel with standard tire (15X22.5, 16-ply) mounted, ready for service. Net Weight: 350 pounds (159 kg)

Spare Tire and Wheel Mounted, Non-Marking Pneumatic:

Extra wheel with Non-Marking tire (385/65D22.5,16 ply) mounted, ready for service. Net Weight: 350 pounds (159 kg)

Chassis:

Standard:

Cargo Deck:

Total Deck Area: 66 Square Feet (6 m²). A maximum of 17,000 pounds (7700 kg) may be carried on the deck at creep speed when centered over or between axles. Seven stake pockets are provided along edges of deck for 1-inch (25 mm) pipe stakes. Stakes furnished. Cargo decks have skid resistant coating.

Lifting Rings:

Consists of four rings, one at each corner of the load deck, so sling can be attached for lifting crane. Rings hang below deck surface when not in use.

Steps:

A step is located on each front corner providing access to deck area.

Outriggers:

Four hydraulic outriggers of box-beam construction. Independent control for each outrigger. Hydraulic cylinders are equipped with direct-connected holding valves. Pad dimensions: 11 inches (28 cm) x 16 inches (41 cm).

Pulling Eyes:

Two heavy eyes in front bumper provide for attachment of hook block so main winch line can be used for pulling loads at or near floor level. Also for anchoring tag lines from load on hook.

Tie Downs:

Two holes in the rear bumper (in conjunction with the pulling eyes) provide tie down locations for transporting crane by truck or cargo container.

Accessory Storage Box:

Consists of front deck plate with removable and lockable cover, and box for carrying sheave block and other items. Storage box is 14 inches (35 cm) deep x 10½ inches (26 cm) wide x 36½ inches (93 cm) long.

Headlight and Taillight Grilles:

Consists of welded steel protective grilles for headlights and taillights. Easily removable for replacing bulbs.

Chassis Options and Accessories:

Auxiliary Winch:

Optional worm gear winch, mounted behind front bumper, with a single lever control at the operator's console. Hydraulic powered to provide bare drum line pull of 10,000 pounds (4540 kg) at 33 feet per minute (10.2 m/min). Winch drum is 3½ inches (90 mm) in diameter by 10 inches (250 mm) long. This winch includes 115 feet (35 m) of 7/16-inch (11.1 mm) wire rope, hook and 4-way roller guide. This rope can pull 5800 pounds (2630 kg) with a safety factor of 3.5:1. Net Weight: 250 pounds (113 kg)

Pintle Hook - Rear:

T-60-AOL Holland pintle hook mounted on rear frame member, provides capacity for 6000-pound (2700 kg) tongue weight and 30,000-pound (13600 kg) trailer weight. Net Weight: 15 pounds (7 kg)

Pintle Hook - Front:

T-60-AOL Holland pintle hook mounted on front frame member, provides same capacity as rear pintle hook. Net Weight: 45 pounds (20 kg)

Rearview Mirrors:

One right-hand and one left-hand mirror, 6 inches (152 mm) wide x 16 inches (406 mm) high, mounted on deck stakes. Pivot out of way when contacted by obstacle at side of deck. Net Weight: 12 pounds (5 kg)

Operator Compartment:

Standard:

Operator control station provides one-position access to all chassis and crane functions. Includes adjustable operator's seat and retracting seat belt, fire extinguisher, and bubble level.

Drum Rotation Indicator:

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

Operator Compartment Options and Accessories:

Operator Guard: (Not Available with Cab)

Tubular steel weldment with heavy expanded steel mesh top section, bolts over the operator's compartment. Operator Guard is not designed, rated or certified as a Falling Objects Protection System (FOPS) or Rollover Protection System (ROPS). Net Weight: 60 pounds (27 kg)

Operator Guard Door:

Hinged door covers operator compartment side opening. Has latch handle outside and knob inside. Rubber gasket contacts chassis. Net Weight: 40 pounds (18 kg)

All Weather Cab:

Consists of rigid mounted canopy section and removable hinged door with safety glass. Rugged canopy structure with laminated glass front and top. Door is equipped with a keyed lock to protect operator's station. Includes defroster fan, dome light, 12,400 BTU heater with 2-speed fan, and 12V electric windshield wiper. There are sliding windows in the door and right-hand side. Net Weight: 220 pounds (98 kg)

Cab Heater Only:

Provides 12,400 BTU heater with 2-speed fan for units without All Weather Cab. Net Weight: 12 pounds (5 kg)

Windshield Washer:

Provides reservoir, pump and nozzle for windshield washer.

Floor Mat:

Vinyl mat with foam backing covers floor, front wall, and lower portion of right hand wall of operator's compartment. Net Weight: 5 pounds (2 kg)

Suspension Seat:

Vinyl seat with a small suspension built in. Net Weight: 15 pounds (7 kg)

Deluxe Seat:

Deluxe seat with upholstery springs provides additional operator comfort. Net Weight: 15 pounds (7 kg)

Noise Reduction Kit - Cab:

Includes vinyl floor mats and control valve cover and side panels of foam-backed, perforated vinyl for noise reduction. Net Weight: 15 pounds (7 kg)

Air Conditioning:

Complete system using R134a coolant has combination cooling and heating unit in cab. Net Weight: 125 pounds (57 kg)

Electrical System:

Standard 12 Volt DC:

Battery:

Gas Units: Group 27 with 540 CCA rating.

Diesel Units: Group 31 with 950 CCA rating.

Lighting Group:

Consists of two 12V lamps, with high and low beams for driving; tail, brake and turn signal lights and back up lights in rear; front turn signals; and emergency flasher switch at operator's station. 12V horn actuated by button located on shifting control.

Instrument Group:

Located at operator's station, includes fuel gauge and hourmeter, which records hours only during actual engine operation. Also included are warning lights for low oil and transmission pressure, check engine, high coolant and transmission temperature, turn signals, high beams, hazard lights, parking brake and four-wheel drive.

Back-Up Alarm:

Provides pulsating sound from a 102 dB alarm when ignition is on and transmission is in reverse. Conforms to SAE J994B.

Outrigger Alarm System:

102 dB alarm with alternating two-tone sound is actuated by a switch when the OUTRIGGER DOWN controls are operated.

Optional Electrical Accessories:

Strobe Lights:

Two yellow strobe lights, one on each side of turret weight box, for high visibility all around crane. Flashes 60- 120 times per minute. Each strobe draws only one-half amp. Includes operator controlled switch. Net Weight: 5 pounds (2 kg)

Rear Work Lights:

Two halogen flood lights mounted between the grille bars in the rear bumper. Includes switch at operator station. Net Weight: 10 pounds (5 kg)

Boom Work Lights:

Two halogen work lights, one on left side of boom to light boom tip, and one on right side of the turret to light ground under boom tip. Includes switch at operator's station. Net Weight: 10 pounds (5 kg)

Hydraulic System:

Standard:

Tandem pump, direct-driven by engine, delivers 29 GPM (110 L/min) at 2600 PSI (179 bar) and 34 GPM (129 L/min) at 2500 PSI (172 bar) at 2500 RPM governed engine speed. System protected by relief valves, suction line strainer and 10-micron return line filter. 54-gallon (204 L) reservoir equipped with breather and locking filler cap. (Maximum pressure on IC-200-3G is 3000 PSI on the 29 GPM (204 L) section of the pump.)

Boom Assembly:

Standard:

Three or four-section, high strength steel construction, equipped with bearing pads for efficient support and extension. Double-acting hydraulic cylinder telescopes booms. The telescope cylinder and the double-acting boom elevation cylinder are equipped with direct-connected holding valves. The four sections on the 3H telescope proportionally. Boom angle indicator is on side of boom.

Boom Swing:

Standard:

Heavy-duty bearing swing gear with external teeth supports boom. Rotation is powered by hydraulic motor and worm gear drive. Swing gearbox may be adjusted as wear occurs to minimize backlash. Boom is attached by high strength steel weldment.

Boom Hoist:

Standard:

Turret-mounted planetary gear hoist is hydraulically powered to provide a bare-drum line pull of 10,000 pounds (4536 kg) at a speed of 100-feet-per-minute (30 m/min). Hoist drum is 9 7/8-inch (251 mm) diameter by 16½ inches (419 mm) long. The hoist includes 240 feet (73 m) of wire rope for 2H and 291 feet (89 m) of wire rope for 3H. Wire rope is ½-inch (13 mm) diameter. 125-pound (57 kg) downhaul weight and swivel hook are included.

Boom Attachments:

Standard:

Anti-Two-Block Device:

Prevents damage to hoist rope and/or machine components from accidentally pulling sheave block or downhaul weight against boom tip. 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 through cable reel mounted on boom to solenoid dump valve in the hydraulic circuit. This valve will dump the HOIST RAISE, TELESCOPE EXTEND, BOOM LOWER, SWING LEFT and SWING RIGHT circuits. No other circuits are affected. These circuits are returned to normal operation by operating the HOIST LOWER, BOOM RAISE or TELESCOPE RETRACT control. There is also an override keyswitch under the dashboard.

Rated Capacity Limiter:

Operational aid that warns operator of impending overload with audible and visual signals. Has read-outs for load, boom angle, boom length and load radius. In the event of an overload, dumps the following boom functions: HOIST RAISE, TELESCOPE EXTEND, BOOM LOWER, SWING LEFT and SWING RIGHT. These circuits are returned to normal by lowering load to a safe resting place with hoist or by retracting or raising boom to a shorter load radius. There is also an override switch under the dashboard.

Four-Part-Line Sheave Block:

Double sheave block for 4-part-line requirements. 10-inch (254 mm) O.D. sheaves for ½-inch (13 mm) diameter wire rope. Swivel hook with safety latch. 200-pound (95 kg) weight provides positive overhaul. Includes bar on top to actuate trip arm of Anti-Two-Block device.

Optional Boom Attachments:

Boom Extension - 15 Feet (4.6 m), 2H:

Provides 15 feet (4.6 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 included. Deduct 400 pounds (180 kg) from Capacity Chart when boom extension is in the stowed position. Includes trip arm for Anti-Two-Block device. Net Weight: 520 pounds (236 kg)

Boom Extension - 15 Feet (4.6 m) Offset, 2H:

Provides 15 feet (4.6 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 included. Deduct 400 pounds (180 kg) from Capacity Chart when boom extension is in the stowed position. Includes trip arm for Anti-Two-Block device. Boom extension will tilt through three positions, in line, 15 degree offset and 30 degree offset. Net Weight: 670 pounds (304 kg)

Boom Extension - 16 Feet (5 m) Offset, 3H:

Provides 16 feet (5 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 included. Deduct 400 pounds from Capacity Chart when boom extension is in the stowed position. Includes trip arm for Anti-Two-Block device. Boom extension will tilt through 3 positions, in line, 15 degree offset and 30 degree offset. Net Weight: 550 pounds (249 kg)

Two-Part-Line Sheave Block:

Single sheave block for 2-part-line requirements. Block is specially designed to reduce height, 23 inches (58 cm) from top to saddle of load hook. 10-inch (254 mm) O.D. sheave for 1/2-inch (13 mm) rope. Swivel hook with safety latch. Includes bar on top to actuate trip arm of Anti-Two-Block device. Net Weight: 124 pounds (56 kg) for 2H and 200 pounds (91 kg) for 3H

Searcher Hook: (Nose Mount)

5000 pound capacity hook bracket is attached to the front of the boom tip with 4 pins through the boom extension attachment lugs. A hook with latch is pinned to the tip of the bracket. Net Weight: 65 pounds (29 kg)

*** Specifications subject to change without notice ***

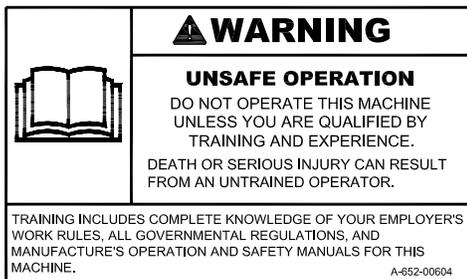
OPERATION SECTION

SAFETY RULES

GENERAL:

1. Since the manufacturer has no direct control over machine application and operation, conformance with good safety practice is the responsibility of the user and his operating personnel.

2.



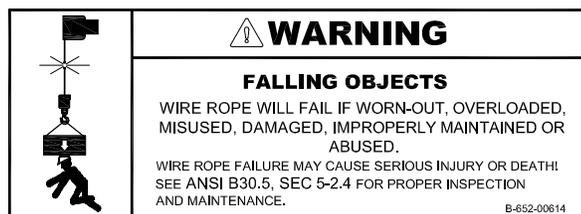
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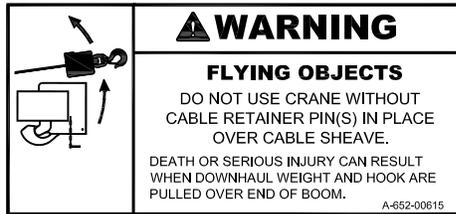
4. The operator shall be responsible for those operations under his direct control. Whenever there is any doubt as to safety, the operator shall have the authority to stop and refuse to handle loads until safety has been assured.
5. The operator shall not engage in any practice which will divert his attention while actually operating the crane.
6. Do not run the engine in an enclosed area or indoors without adequate ventilation.
7. Do not use ether for starting. Ether is highly flammable and can be ignited by the intake manifold heater grid, causing engine damage or operator injury.
8. This list of rules is only a supplement to all federal, state, and local safety rules that may apply.

CRANE CONDITION:

1. Before beginning operation each day, thoroughly inspect the entire crane to be sure it is in good operating condition.
2. Inspect load hoist rope and wedge socket daily. We recommend rope inspection, replacement and maintenance in accordance with ANSI B30.5, Sec. 5-2.4.



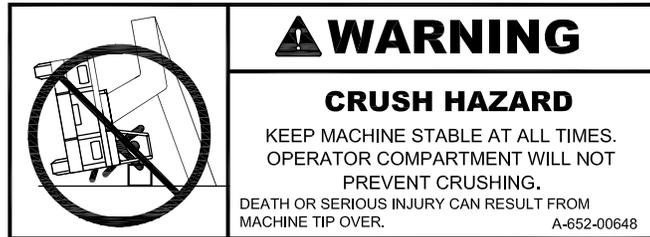
3. Keep operator's compartment and decks free of mud and grease.
4. If crane is equipped with a cab, keep all window glass clean. Keep gauges clean.
5. Tools, lubricants, or rags on the crane should be kept in a secured toolbox.
- 6.
- 7.



8. The Rated Capacity Limiter must be checked before each shift and after each setup for the proper operating configuration on the display. It must be inspected before each shift and tested with a known load at least once a month as described in the RCL operation manual.

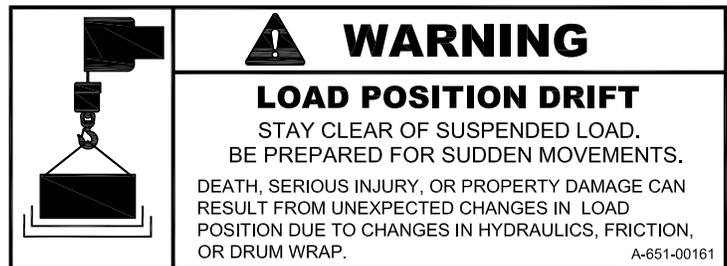
LIFTING:

1. Always refer to Crane Capacity Chart in operator's compartment before handling 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.



2. 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.

3. Do not allow anyone to put any part of his body under a load. 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.



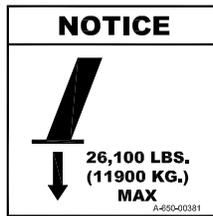
4. Do not use crane to drag loads sideways. Do not use crane to raise grounded or fixed load by using Boom Raise function.



7. Level the crane before lifting. A small incline will significantly reduce the capacity. Use appropriate cribbing under the outriggers for leveling. All outriggers must be fully extended and tires must clear the ground to use the ON OUTRIGGERS ratings.

8. Always use outriggers if possible. If you must lift on rubber, keep the load as close to the ground as possible to prevent tipover. Move the load very slowly and use tag lines to prevent load swinging.

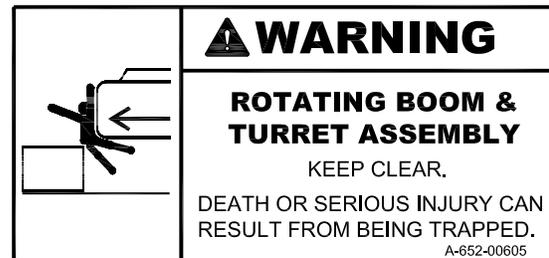
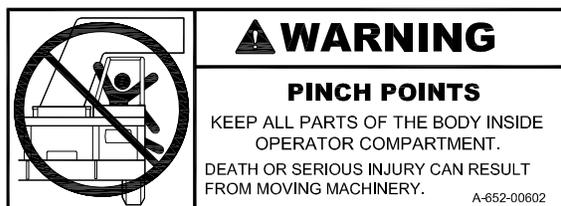
9. Crane may tip at less than rated loads if the surface is uncompacted or wet dirt, or soft soil with frozen crust, thin or cracked pavement, or surface near a hole or ledge. Always use adequate outrigger floats and/or cribbing. See page 2-14.



10. The operator shall not leave the controls while the load is suspended.
11. Always use adequate parts of load hoist line for lifting heavy loads.
12. Always be sure the rope is properly seated and wound evenly on hoist drum.
13. Keep hands away from load hoist rope when hoist is being operated.



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



CAUTION

Keep hands out of Anti-Two-Block mechanism. Serious injury can result from moving parts.

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

DANGER

Two-blocking will abruptly stop boom lowering and boom swing as well as hoist and extend. 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.

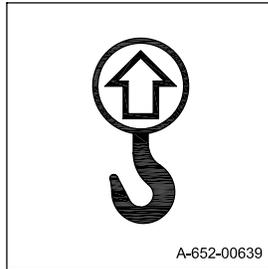
- 18. The amount of counterweight supplied with this crane should never be changed. Unauthorized addition of counterweight in the field to increase lifting ability constitutes a safety hazard.
- 19. Always keep crane boom at least 10 feet (3 m) away from electric power lines. (See chart on side of turntable for boom clearance).

REQUIRED CLEARANCE FOR NORMAL VOLTAGE IN OPERATION NEAR HIGH VOLTAGE POWER LINES AND OPERATION IN TRANSIT WITH NO LOAD AND BOOM OR MAST LOWERED		
Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance	
	ft	(m)
Operation Near High Voltage Power Lines		
to 50	10	(3.05)
Over 50 to 200	15	(4.60)
Over 200 to 350	20	(6.10)
Over 350 to 500	25	(7.62)
Over 500 to 750	35	(10.67)
Over 750 to 1000	45	(13.72)
Operation in Transit With No Load and Boom or Mast Lowered		
to 0.75	4	(1.22)
Over 0.75 to 50	6	(1.83)
Over 50 to 345	10	(3.05)
Over 345 to 750	16	(4.87)
Over 750 to 1000	20	(6.10)

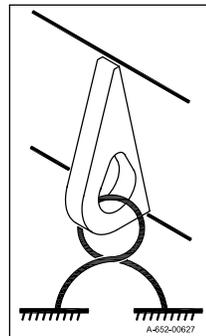
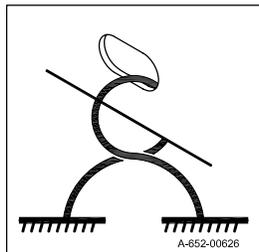
REF. ASME/ANSI B30.5 - 1989 B-651-00097

- 20. If 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. Hop away from the crane with feet together. The ground surface may be energized.
- 21. Do not operate outside during thunderstorms. Avoid all lightning strike opportunities. Consult local weather reports during inclement weather conditions.

22. Crane has four lifting rings, one at each corner of load deck, for lifting the crane. Use proper slings and rigging methods to keep the load balanced during the lift. Do not lift by the boom. Proper lifting and securing practices are the responsibility of the rigger in charge.



23. When transporting the crane, be sure it is properly secured to the vehicle. Utilize the tie-down 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. Proper securement and prudent shipping practices are the responsibility of the carrier.



TRAVEL:

1. For Pick and Carry operation: Traveling with suspended loads involves so many variables, such as ground conditions, boom length and vehicle acceleration, that it is impossible to devise a single standard rating procedure with any assurance of safety. For such operations, the user must evaluate prevailing conditions and determine safe practices using precautions, such as the following:
 - A. The boom shall be centered over front axle.
 - B. Use shortest boom practical.
 - C. Carry load as close to ground as practical.
 - D. Reduce travel speed to suit conditions (2 MPH (3 km/h) maximum).
 - E. Maintain specified tire pressures and lug nut torques.
 - F. Avoid sudden starts and stops.
 - G. Provide tag or restraint lines to snub swinging of the load.
 - H. Hand-held tag lines should be nonconductive.
 - I. Do not carry heavy boom loads and deck loads at the same time.
 - J. Do not pick and carry with boom extension installed.
 - K. Do not exceed the OVER FRONT, ON RUBBER capacity.
2. When raising the boom or moving the unit with boom elevated, be sure there is adequate overhead clearance for boom.
3. For carrying loads on decks:
 - A. Boom must be retracted, centered and lowered as close as possible.
 - B. 2 MPH (3km/h) maximum road speed. Reduce speed below 2 MPH (3km/h) to properly match condition of road surface and deck load stability.
 - C. Remove load hook from load before traveling.
4. Cranes with rear steering require close watch because of "tail swing" when the chassis is turned in tight quarters.

5.



6. Every effort has been made to make the BMC Industrial Crane a stable vehicle. However, with the rigid front axle and the unsprung oscillating rear axle suspension, the operator must take care to control the vehicle speed to be compatible with conditions of rough roads or uneven terrain.
7. When this crane is to be parked on a grade, set parking brake and block wheels or extend outriggers fully.
8. Shut off engine before refueling, and remove fuel cap slowly. Vapor pressure in tank can cause a burst of fuel and vapor when the cap is removed. Always refuel with proper fuel and into proper tank.
9. Know your visibility limitations. Loads being carried on the deck or hanging on the hook can add further limitations to visibility during travel. Always use a signal person when in doubt.

INSTRUMENTS AND CONTROLS

The IC-200 instrument panel is equipped with a fuel gauge, an hour meter and a bubble level. Also included are warning lights for low oil and transmission pressure, check engine, high coolant and transmission temperature, turn signal, high beam, hazard lights, parking brake and optional four-wheel drive.

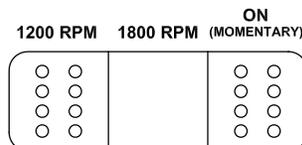
The ignition switch is key operated and has OFF, RUN and START positions. The ignition switch should always be turned off and the key removed when the vehicle is left unattended. A horn button is on the shifting control.

The BMC IC-200 is equipped with a standard lighting package. An on-off switch and a high beam indicator are on the instrument panel. The dimmer switch is located on the left hand steering column control. Stop lights are controlled by operating the foot brakes. The turn signal control is located on the left side of the steering column. Moving the lever down indicates a left turn; up indicates a right turn. The emergency flasher lights are actuated by a toggle switch on the instrument panel near the turn signal lever.

The hand brake lever is located on the right side of the operator's seat. To apply, lift the lever until the over-center position is reached. When adjustment is required, turn the knurled knob on the end of the lever clockwise to tighten. The brake must be released before adjustment can be made. A warning light shows when the hand brake is applied. The brake and accelerator pedals are located and operated as they are in other vehicles already familiar to the operator.

A lever on the steering column controls the powershift transmission. Moving the lever upward engages the transmission clutch for forward travel. Rotating the handle of the lever selects the gear that is desired (first through fourth) and engages the clutch for that gear. To put the transmission in reverse, the machine should be brought to a stop. The lever then is pulled downward, through the neutral position, into reverse. 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 1000 RPM. A neutral safety switch prevents starting the engine with the transmission engaged. The shift lever must be in neutral to start the engine. A parking brake interlock switch prevents driving with the brake on.

Normal engine speed control uses the foot accelerator pedal. A three position switch on the right dash panel provides preset engine speeds. Parking brake must be set to activate system. Press the high idle control switch temporarily to the right, the engine will lock into the preset levels. The center position of the switch enables the engine to dwell at 1,800 RPM. The left switch position will lower the engine speed to 1,200 RPM. To restore the foot accelerator, either temporarily release the parking brake fully or turn the engine off.



HIGH IDLE CONTROL ROCKER SWITCH

The optional four-wheel drive is controlled by a switch on the instrument panel. Select four-wheel drive when extra traction is needed. It is recommended to operate in two-wheel drive except when wheel slip is likely.

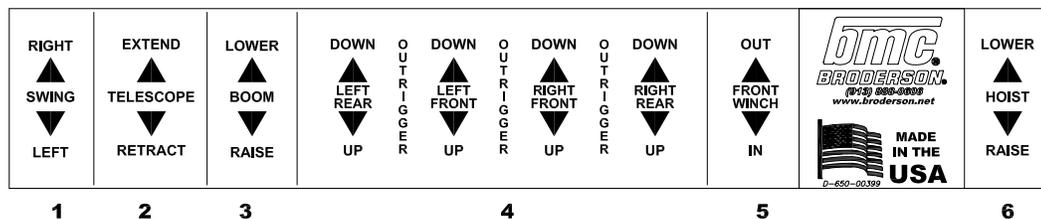
THREE MODE STEERING FUNCTIONS

The IC-200-G is equipped with three-mode steering: four-wheel round steering can be used for making tight turns; two-wheel rear steering should be used for traveling long distances; crab steering can be used for maneuvering in tight places. A switch on the dashboard sets the mode. Electronic sensors and controls automatically align the wheels when a new mode is selected, as the wheels are steered past the centered position. 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 stops running.

The Rated Capacity Limiter display and input panel are mounted on the dashboard. Instructions are in the RCL Operation Manual and additional information is in the Operating the Crane section, the Crane Capacity section and Maintenance Section of this manual.

CONTROL VALVE FUNCTIONS

The controls for operating the outriggers, boom rotation, boom elevation, boom extension and hoist are located along the forward dashboard area. The control handles are directly connected to the 3-position hydraulic valves. The placard located next to these handles identifies the function and direction resulting from each handle movement.



- 1. Swing or Slewing:** Pulling back on the lever will rotate the boom to the operator's left; pushing forward will rotate it to the operator's right.
- 2. Telescope:** Pulling back on the lever will retract the boom; pushing forward will extend the boom. **Retract at a low to medium engine speed only. Overspeed will heat hydraulic fluid and will not increase retraction speed.**
- 3. Boom or Derricking:** Pulling back will raise the boom; pushing forward will lower it.
- 4. Outriggers:** The four outrigger levers may be operated simultaneously or individually. Special attention must be given to avoid hitting personnel or obstacles
- 5. Front Winch (Optional):** Pulling back will pay winch line in; pushing forward will pay winch line out.
- 6. Hoist:** Pulling back on the lever will raise the load line; pushing forward will lower the load line.

All controls may be used 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.

Avoid holding a control lever in the open position after the function has reached the end of its travel. This will impose unnecessary stresses on the components and heat the hydraulic system.

SEQUENCE OF OPERATION

DRIVING THE VEHICLE

The following procedure is recommended for driving the vehicle:

1. Perform the daily inspection and test. (See Page 3-4)
2. Apply park brake.
3. Place transmission control lever in neutral.
4. Start engine and allow a warming period.
5. While warming the engine, set up the Rated Capacity Limiter configuration.
6. Stow boom over front.
7. Pull hoist line snug.
8. Retract outriggers.
9. Step on the brake pedal.
10. Release park brake lever.
11. Shift transmission to desired gear.
12. Place forward/reverse lever in desired position.
13. Release brake and press on accelerator pedal.
14. Slow down when making turns.
15. Set park brake and lower outriggers or chock wheels to park.

W A R N I N G

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.

OPERATING THE CRANE

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

1. Perform daily inspection and test. (See Page 3-4)
2. Apply park brake.
3. Place transmission control lever in neutral.
4. Start engine and allow a warming period at low RPM.
5. While warming the engine, set up the Rated Capacity Limiter configuration.
6. Move accelerator pedal to medium to full speed.
7. Set all outriggers fully down on firm, level surface. Use timber or steel plate cribbing under outrigger shoes as needed on soft or uneven surfaces. Outriggers should remain set during all crane operations except for pick and carry.
8. Meter the controls when beginning or ending 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.
9. You may use the throttle control switch to set the engine speed to 1200 or 1800 RPM when the park brake is on. Return to idle by releasing park brake momentarily.
10. Release accelerator during idle time and shut off engine, if practical.

NORMAL GAUGE READINGS

Level Indicator: Do not operate crane if it is not level.

Fuel: 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.

WARNING

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

RATED CAPACITY LIMITER (RCL)

A rated capacity limiter is installed on the crane to assist the operator in estimating loads and measuring load radii. Please read the RCL Operation Manual for complete instructions on operation of the system. Following are some additional operating tips.

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 the hoist control, if safe. The boom raise and telescope retract may also be used if this is safer. In some unusual circumstances it may be necessary to swing the boom before lowering the load. If you are sure this will not cause an overload, you can press and hold the CANCEL button on the RCL control and swing the boom to a safer position.

If the load is the maximum for the loadline or attachment, the load should be set down in a safe place using the hoist lower control and the load or attachment changed. Telescope retract may also be used and swing may be used, if safe, as described in the preceding paragraph. **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 the hoist control. If the boom extension is at its angle limit, the boom must be raised or the load hoisted down.

If the boom is fully lowered until it stops, (about 0°) the RCL will show an overload condition because the boom lift pressure sensors cannot read a useful pressure in this condition. To remedy this, raise the boom slightly. Or, if the boom is fully raised, (about 73°) the RCL may show an overload condition because the trapped pressure in the boom lift cylinder is sensed to be an overload. To correct this condition, the CANCEL button on the RCL control can be pushed and held and the boom lowered just slightly. Then check for other conditions before lowering further.

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 keyswitch under the dashboard may be required to move the boom.

WARNING

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

There is a light on the dashboard to warn that one or more outriggers is not fully extended when using the ON OUTFITTERS setup on the RCL. Check the light daily when the outriggers are down and there is no load on the hook by raising and lowering each outrigger about three inches. The light should come on when an outrigger is up.

CRANE CAPACITY

Before lifting loads, the operator must read the **Crane Capacity Chart** and adhere to the load capacities and radii of handling given. The information provided on this chart is based on stability, structural strength and 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 Section 5-2.2. The person responsible for the lift must be sure that the load does not exceed the crane ratings at any radius at which the load may be during the entire lifting operation. The weights of the hooks, blocks, downhaul weights, slings, and other handling devices must be added with the load.

The **Rated Capacity Limiter** on the crane is intended to assist the operator in estimating loads and 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 paragraph. Verified weights and measured radii must take precedence over the Rated Capacity Limiter readings. Please read the RCL Operation Manual.

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. In general, the smaller the load and the higher the boom angle, the larger the percent of error.

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 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 the second paragraph above.

The Rated Capacity Limiter is designed to stop crane functions at the limitations of the capacity chart. These are: BOOM LOWER, TELESCOPE EXTEND, HOIST RAISE, SWING LEFT and SWING RIGHT. 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 and swing functions, causing the load to bounce or swing. Use great care when handling a load near capacity limits or near a two-blocking condition.

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, it is recommended to use the load radius with the lower capacity and not try to interpolate between the numbers.

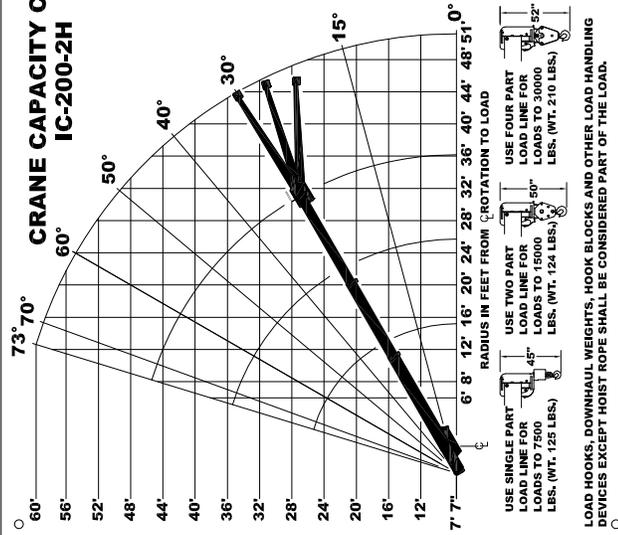
Load capacity ratings on this equipment are given on the basis that operations are to be conducted on firm and level terrain and in a safe environment. These capacity ratings are reduced in proportion to the deviation from the prescribed conditions. Any unfavorable environmental condition, such as soft, sloping or uneven terrain, high wind, or hazardous surroundings constitutes a deviation.

The main boom capacities are given in direct relation to the radius at which the load is being handled. Boom extension capacities depend on the boom angle as well as the 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 BMC IC-200 is 30,000 pounds (13600 kg), but only at a 6 foot (1.8 m) radius and on outriggers. All variances of loads and radii of handling are shown on the crane capacity chart. A metal chart is attached near the operator's seat and a laminated chart is included in the literature compartment for the express purpose of informing the operator when a load can or cannot be safely handled.

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

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

CRANE CAPACITY CHART IC-200-2H



LOAD RADIUS FEET	CAPACITIES APPLY TO OPERATION ON FIRM LEVEL SURFACE		
	MAIN BOOM OR EXTENSION	360° ROTATION ON RUBBER	OVER FRONT ON OUTRIGGERS
6	16200	30000	17000
8	13200	24000	13800
10	10600	19800	11500
12	7800	16100	9600
14	6100	13500	7900
16	4900	11200	6300
18	4000	10000	5100
20	3300	8800	4300
22	2800	7700	3600
24	2350	6600	3000
26	1950	5750	2600
28	1600	5150	2300
30	1400	4650	2100
32	1150	4200	1850
36	900	3400	1500
40	650	3050	1200
44	450	2600	950
48	250	2200	750
51	250	1900	600
15-FOOT BOOM EXTENSION - STRAIGHT OR OFFSET			
BOOM EXT. ANGLE	MAIN BOOM ANGLE		
	0°	15°	30°
0°	3100	3450	3900
15°	3000	3100	3300
30°	3000	3050	3200
70° BOOM EXT.			
BOOM EXT. ANGLE	MAIN BOOM ANGLE		
	0°	15°	30°
0°	4650	6000	7500
15°	3650	4250	5200
30°	3450	3450	3900

LOAD RADIUS IS THE HORIZONTAL DISTANCE FROM THE CENTER OF ROTATION OF THE UNLOADED CRANE TO THE VERTICAL LOAD LINE WITH THE LOAD APPLIED.

EXCEEDING CAPACITY RATINGS OR APPLYING SIDE LOADS TO THE BOOM OR BOOM EXTENSION IS MISUSE, IS HAZARDOUS, AND VOIDS THE WARRANTY.

CAUTION: BOOM EXTENSION LOADS MUST NOT EXCEED MAIN BOOM CAPACITY. DO NOT PICK AND CARRY WITH LOADS ON BOOM EXTENSION. CAPACITIES ON OUTRIGGERS ARE 85% OF TIPPING LOADS. CAPACITIES ON RUBBER ARE 75% OF TIPPING LOADS. CAPACITIES BELOW BOLD LINE ARE LIMITED BY TIPPING. OTHER CAPACITIES ARE LIMITED BY STRUCTURAL OR HYDRAULIC CAPABILITY.

DECK CAPACITY 17000 LBS. WITH EMPTY BOOM RETRACTED OVER FRONT. DECK LOADS MUST BE WITHIN 30 MINUTES ON SMOOTH PAVEMENT.

PICK AND CARRY WITH THE SHORTEST PRACTICAL BOOM, CENTERED OVER THE FRONT. OPERATE WITH BOOM AS LOW AS POSSIBLE, WITH THE LOAD CLOSE TO GROUND. PICK AND CARRY CAPACITIES ARE FOR SMOOTH, LEVEL PAVED SURFACE.

THE BOOMS ON THIS UNIT ARE ALL STEEL AND HAVE NO LINE VOLTAGE RATING. NO ELECTRICAL INSULATION VALUE.

MAXIMUM HYDRAULIC PRESSURE 2600 PSI.

BOOM EXTENSION DEDUCT: 400 LBS. WHEN STOWED ON MAIN BOOM.

ENSURE ANTI-TWO-BLOCK SWITCH IS FUNCTIONAL AFTER DEPLOYING OR STOWING BOOM EXTENSION.

OPERATION:

1. UNDERSTAND OPERATION MANUAL BEFORE OPERATING CRANE.
2. CHECK LEVEL OF HYDRAULIC OIL AND ENGINE OIL DAILY.
3. CHECK UNIT FOR VISIBLE DEFECTS AND LOOSE PARTS.
4. SET VEHICLE PARK BRAKE SECURELY.
5. OPERATE ALL HYDRAULIC CONTROLS SLOWLY AND SMOOTHLY.
6. OPERATE ALL HYDRAULIC CONTROLS SLOWLY AND SMOOTHLY. AVOID SUDDEN STOPS AND STARTS.

THE LOAD HOIST LINE ON THIS UNIT MUST BE 1/2" DIA. 6X25 EIP-RL-IWRC WIRE ROPE (OR EQUIVALENT) WITH A MINIMUM BREAKING STRENGTH OF 26,250 LBS.

APPROVED THRES. 38565022.5, 16 PLY - 120 PSI

TORQUE WHEEL NUTS TO 500 FT.-LBS. (THESE CONDITIONS MUST BE MAINTAINED ON TO HANDLE RATED LOADS ON THIS CRANE.)

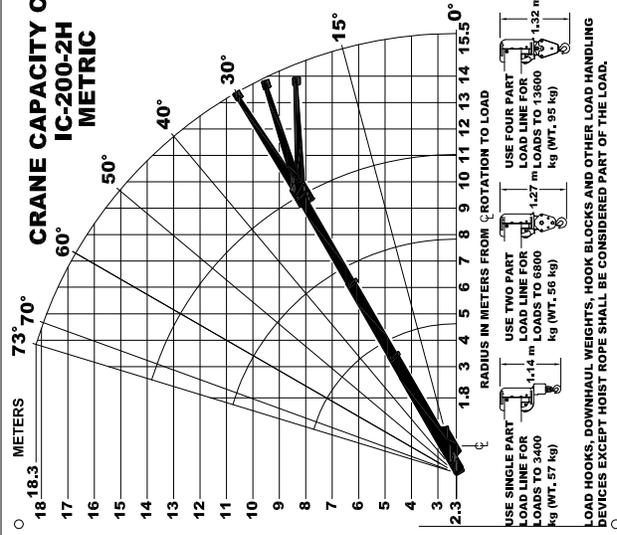
MODEL NO. SERIAL NO. DATE OF MFR.

IC-200-2H

BRODERSON MANUFACTURING CORP.
LENEXA, KANSAS

65400900

CRANE CAPACITY CHART IC-200-2H METRIC



LOAD RADIUS METERS	CAPACITIES APPLY TO OPERATION ON FIRM LEVEL SURFACE		
	MAIN BOOM OR EXTENSION	360° ROTATION ON RUBBER	OVER FRONT ON OUTRIGGERS
1.8	7350	13600	7710
2.0	6940	12700	7240
2.5	5870	10700	6150
3.0	4900	9120	5290
3.5	3850	7690	4560
4.0	3040	6620	3920
4.5	2540	5700	3300
5.0	2130	4970	2720
6.0	1540	4080	2000
7.0	1170	3250	1490
8.0	910	2570	1160
9.0	750	2160	970
10.0	610	1820	800
11.0	520	1530	680
12.0	420	1410	560
13.0	330	1250	460
14.0	250	1090	390
15.0	170	940	310
15.5	120	870	270
4.5 m BOOM EXTENSION - STRAIGHT OR OFFSET			
BOOM EXT. ANGLE	MAIN BOOM ANGLE		
	0°	15°	30°
0°	1400	1560	1770
15°	1360	1400	1650
30°	1360	1380	1450
70° BOOM EXT.			
BOOM EXT. ANGLE	MAIN BOOM ANGLE		
	0°	15°	30°
0°	4650	6000	7500
15°	3650	4250	5200
30°	3450	3450	3900

LOAD RADIUS IS THE HORIZONTAL DISTANCE FROM THE CENTER OF ROTATION OF THE UNLOADED CRANE TO THE VERTICAL LOAD LINE WITH THE LOAD APPLIED.

EXCEEDING CAPACITY RATINGS OR APPLYING SIDE LOADS TO THE BOOM OR BOOM EXTENSION IS MISUSE, IS HAZARDOUS, AND VOIDS THE WARRANTY.

CAUTION: BOOM EXTENSION LOADS MUST NOT EXCEED MAIN BOOM CAPACITY. DO NOT PICK AND CARRY WITH LOADS ON BOOM EXTENSION. CAPACITIES ON OUTRIGGERS ARE 85% OF TIPPING LOADS. CAPACITIES ON RUBBER ARE 75% OF TIPPING LOADS. CAPACITIES BELOW BOLD LINE ARE LIMITED BY TIPPING. OTHER CAPACITIES ARE LIMITED BY STRUCTURAL OR HYDRAULIC CAPABILITY.

DECK CAPACITY 7700 kg, WITH EMPTY BOOM RETRACTED OVER FRONT. DECK LOADS MUST BE CENTERED WITHIN 30 MINUTES ON SMOOTH PAVEMENT.

PICK AND CARRY WITH THE SHORTEST PRACTICAL BOOM, CENTERED OVER THE FRONT. OPERATE WITH BOOM AS LOW AS POSSIBLE, WITH THE LOAD CLOSE TO GROUND. PICK AND CARRY CAPACITIES ARE FOR SMOOTH, LEVEL PAVED SURFACE.

THE BOOMS ON THIS UNIT ARE ALL STEEL AND HAVE NO LINE VOLTAGE RATING. NO ELECTRICAL INSULATION VALUE.

MAXIMUM HYDRAULIC PRESSURE 179 bar

BOOM EXTENSION DEDUCT: 180 kg WHEN STOWED ON MAIN BOOM.

ENSURE ANTI-TWO-BLOCK SWITCH IS FUNCTIONAL AFTER DEPLOYING OR STOWING BOOM EXTENSION.

OPERATION:

1. UNDERSTAND OPERATION MANUAL BEFORE OPERATING CRANE.
2. CHECK LEVEL OF HYDRAULIC OIL AND ENGINE OIL DAILY.
3. CHECK UNIT FOR VISIBLE DEFECTS AND LOOSE PARTS.
4. SET VEHICLE PARK BRAKE SECURELY.
5. OPERATE ALL HYDRAULIC CONTROLS SLOWLY AND SMOOTHLY.
6. OPERATE ALL HYDRAULIC CONTROLS SLOWLY AND SMOOTHLY. AVOID SUDDEN STOPS AND STARTS.

THE LOAD HOIST LINE ON THIS UNIT MUST BE 12.7 mm DIA. 6X25 EIP-RL-IWRC WIRE ROPE (OR EQUIVALENT) WITH A MINIMUM BREAKING STRENGTH OF 117 kN.

APPROVED THRES. 38565022.5, 16 PLY - 827 kPa

TORQUE WHEEL NUTS TO 678 Nm. (THESE CONDITIONS MUST BE MAINTAINED ON TO HANDLE RATED LOADS ON THIS CRANE.)

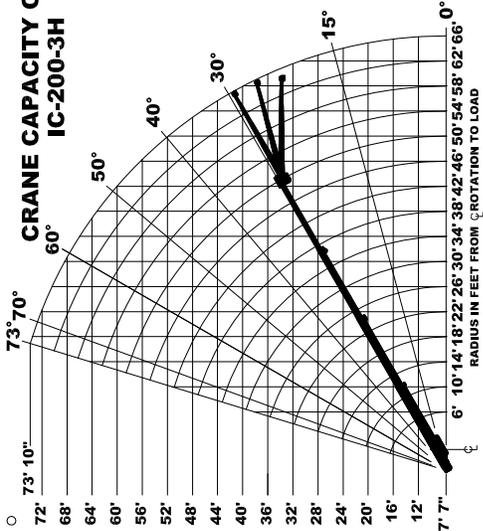
MODEL NO. SERIAL NO. DATE OF MFR.

IC-200-2H

BRODERSON MANUFACTURING CORP.
LENEXA, KANSAS

65400912

CRANE CAPACITY CHART IC-200-3H



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

USE SINGLE PART LOAD LINE FOR LOADS TO 15000 LBS. (WT. 200 LBS.)

USE TWO PART LOAD LINE FOR LOADS TO 30000 LBS. (WT. 400 LBS.)

USE FOUR PART LOAD LINE FOR LOADS TO 60000 LBS. (WT. 800 LBS.)

LOAD RADIUS FEET	CAPACITIES IN POUNDS FOR OPERATION ON FIRM LEVEL SURFACE			
	MAIN BOOM ONLY		BOOM EXTENSION	
	ON RUBBER	ON OUTRIGGERS	ON RUBBER	ON OUTRIGGERS
6	16000	30000	30000	3600
8	12500	22400	22400	7500
10	10000	18500	18500	7500
12	8050	15700	15700	7500
14	6500	13500	13500	7500
16	5200	11600	11600	7500
18	4100	9900	9900	7500
20	3100	8500	8500	7500
22	2350	7300	7300	7500
24	1800	6300	6300	7500
26	1400	5500	5500	7500
28	1100	4800	4800	7500
30	900	4200	4200	7500
32	750	3700	3700	7500
34	630	3300	3300	7500
36	540	2950	2950	7500
38	470	2650	2650	7500
40	410	2400	2400	7500
42	360	2150	2150	7500
44	320	1950	1950	7500
46	280	1750	1750	7500
48	250	1550	1550	7500
50	220	1400	1400	7500
52	200	1250	1250	7500
54	180	1150	1150	7500
56	160	1050	1050	7500
58	140	950	950	7500
60	120	850	850	7500
62	100	750	750	7500
64	80	650	650	7500
66	60	550	550	7500

LOAD RADIUS IS THE HORIZONTAL DISTANCE FROM THE CENTER OF ROTATION OF THE UNLOADED CRANE TO THE VERTICAL LOAD LINE WHT.

BOOM EXTENSION - STRAIGHT OR OFFSET

BOOM EXT. ANGLE	MAIN BOOM ANGLE			
	0°	15°	30°	40°
0°	3000	3100	3450	3900
15°	3000	3000	2500	2400
30°	3000	2500	2000	2000

LOAD RADIUS IS THE HORIZONTAL DISTANCE FROM THE CENTER OF ROTATION OF THE UNLOADED CRANE TO THE VERTICAL LOAD LINE WHT.

BOOM EXTENSION - STRAIGHT OR OFFSET

BOOM EXT. ANGLE	MAIN BOOM ANGLE			
	0°	15°	30°	40°
0°	3000	3100	3450	3900
15°	3000	3000	2500	2400
30°	3000	2500	2000	2000

DECK CAPACITY 17000 LBS. WITH EMPTY BOOM RETRACTED OVER FRONT. DECK LOADS MUST BE CENTERED BEHIND FRONT AXLE. SPEED MUST BE LESS THAN 2 MPH. MAXIMUM TRAVEL 200 FT. IN 30 MINUTES ON SMOOTH PAVEMENT.

PICK AND CARRY WITH THE SHORTEST PRACTICAL BOOM, CENTERED OVER THE FRONT. OPERATE WITH BOOM AS LOW AS POSSIBLE, WITH THE LOAD CLOSE TO GROUND. PICK AND CARRY CAPACITIES ARE FOR SMOOTH, LEVEL PAVED SURFACE.

THE BOOMS ON THIS UNIT ARE ALL STEEL AND HAVE NO LINE VOLTAGE RATING. NO ELECTRICAL INSULATION VALUE.

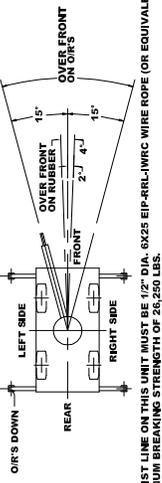
MAXIMUM HYDRAULIC PRESSURE 3000 PSI.

BOOM EXTENSION DEDUCT 400 LBS. WHEN STOWED ON MAIN BOOM.

ENSURE ANTI-TWO-BLOCK SWITCH IS FUNCTIONAL AFTER DEPLOYING OR STOWING BOOM EXTENSION.

OPERATION:

1. READ AND UNDERSTAND OPERATION MANUAL BEFORE OPERATING CRANE.
2. CHECK LEVEL OF HYDRAULIC OIL AND ENGINE OIL DAILY.
3. CHECK LEVEL OF HYDRAULIC OIL AND ENGINE OIL DAILY.
4. SET VEHICLE PARK BRAKE SECURELY.
5. EXTEND OUTRIGGERS TO SOLID FOOTING AND LEVEL CRANE.
6. OPERATE ALL HYDRAULIC CONTROLS SLOWLY AND SMOOTHLY. AVOID SUDDEN STOPS AND STARTS.



THE LOAD HOIST LINE ON THIS UNIT MUST BE 1/2" DIA. 6X25 EIP-RRL-IWRC WIRE ROPE (OR EQUIVALENT) WITH A MINIMUM BREAKING STRENGTH OF 45,250 LBS.

APPROVED TIRES: 385R5D22.5, 16 PLY - 120 PSI

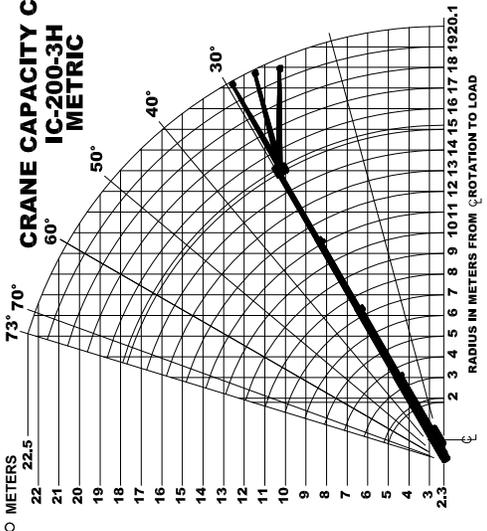
TORQUE WHEEL NUTS TO 500 FT. LBS. (THESE CONDITIONS MUST BE MAINTAINED ON TO HANDLE RATED LOADS ON THIS CRANE.)

MODEL NO. SERIAL NO. DATE OF MFR.

IC-200-3H

BRODERSON MANUFACTURING CORP.
LENEXA, KANSAS 65400906

CRANE CAPACITY CHART IC-200-3H METRIC



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

USE SINGLE PART LOAD LINE FOR LOADS TO 3400 kg (WT. 57 kg)

USE TWO PART LOAD LINE FOR LOADS TO 6800 kg (WT. 94 kg)

USE FOUR PART LOAD LINE FOR LOADS TO 13600 kg (WT. 188 kg)

LOAD RADIUS METERS	CAPACITIES IN KILOGRAMS FOR OPERATION ON FIRM LEVEL SURFACE			
	MAIN BOOM ONLY		BOOM EXTENSION	
	ON RUBBER	ON OUTRIGGERS	ON RUBBER	ON OUTRIGGERS
2.2	16000	30000	30000	3600
2.4	12500	22400	22400	7500
2.6	10000	18500	18500	7500
2.8	8050	15700	15700	7500
3.0	6500	13500	13500	7500
3.2	5200	11600	11600	7500
3.4	4100	9900	9900	7500
3.6	3100	8500	8500	7500
3.8	2350	7300	7300	7500
4.0	1800	6300	6300	7500
4.2	1400	5500	5500	7500
4.4	1100	4800	4800	7500
4.6	900	4200	4200	7500
4.8	750	3700	3700	7500
5.0	630	3300	3300	7500
5.2	540	2950	2950	7500
5.4	470	2650	2650	7500
5.6	410	2400	2400	7500
5.8	360	2150	2150	7500
6.0	320	1950	1950	7500
6.2	280	1750	1750	7500
6.4	250	1550	1550	7500
6.6	220	1400	1400	7500
6.8	200	1250	1250	7500
7.0	180	1150	1150	7500
7.2	160	1050	1050	7500
7.4	140	950	950	7500
7.6	120	850	850	7500
7.8	100	750	750	7500
8.0	80	650	650	7500
8.2	60	550	550	7500

THE LOAD HOIST LINE ON THIS UNIT MUST BE 12.7 mm DIA. 6X25 EIP-RRL-IWRC WIRE ROPE (OR EQUIVALENT) WITH A MINIMUM BREAKING STRENGTH OF 117 kN

APPROVED TIRES: 385R5D22.5, 16 PLY - 827 kPa

TORQUE WHEEL NUTS TO 678 Nm. (THESE CONDITIONS MUST BE MAINTAINED ON TO HANDLE RATED LOADS ON THIS CRANE.)

MODEL NO. SERIAL NO. DATE OF MFR.

IC-200-3H

BRODERSON MANUFACTURING CORP.
LENEXA, KANSAS 65400918

DECK CAPACITY 7700 kg. WITH EMPTY BOOM RETRACTED OVER FRONT. DECK LOADS MUST BE CENTERED BEHIND FRONT AXLE. SPEED MUST BE LESS THAN 3 MPH. MAXIMUM TRAVEL 60 m IN 30 MINUTES ON SMOOTH PAVEMENT.

PICK AND CARRY WITH THE SHORTEST PRACTICAL BOOM, CENTERED OVER THE FRONT. OPERATE WITH BOOM AS LOW AS POSSIBLE, WITH THE LOAD CLOSE TO GROUND. PICK AND CARRY CAPACITIES ARE FOR SMOOTH, LEVEL PAVED SURFACE.

THE BOOMS ON THIS UNIT ARE ALL STEEL AND HAVE NO LINE VOLTAGE RATING. NO ELECTRICAL INSULATION VALUE.

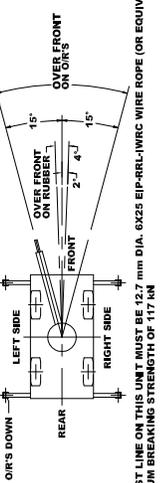
MAXIMUM HYDRAULIC PRESSURE 207 BAR

BOOM EXTENSION DEDUCT 180 kg WHEN STOWED ON MAIN BOOM.

ENSURE ANTI-TWO-BLOCK SWITCH IS FUNCTIONAL AFTER DEPLOYING OR STOWING BOOM EXTENSION.

OPERATION:

1. READ AND UNDERSTAND OPERATION MANUAL BEFORE OPERATING CRANE.
2. CHECK LEVEL OF HYDRAULIC OIL AND ENGINE OIL DAILY.
3. CHECK LEVEL OF HYDRAULIC OIL AND ENGINE OIL DAILY.
4. SET VEHICLE PARK BRAKE SECURELY.
5. EXTEND OUTRIGGERS TO SOLID FOOTING AND LEVEL CRANE.
6. OPERATE ALL HYDRAULIC CONTROLS SLOWLY AND SMOOTHLY. AVOID SUDDEN STOPS AND STARTS.



CAUTION

A capacity load may be carried on the boom, or a capacity load may be carried on the deck, but not at the same time. The total of the percent of deck load and the percent of boom load must not exceed 100%. For example, if the boom load is 100% of its capacity at its current load radius, the deck load capacity is 0%. If the boom load is 60% of the load rating for its load radius, the deck load capacity is 40% of maximum.

CAUTION

The ON OUTRIGGER capacities of this crane are based on all outriggers being FULLY EXTENDED to a FIRM, LEVEL surface with no load on the tires. The crane may tip at less than capacity loads if operated in the following manner:

- A. Outriggers only partially extended and resting on curbing, shoring, etc. If the outriggers are not all the way DOWN, they are not all the way OUT.
- B. Crane operated on a hill or sloping surface. Crane will tip at less than rated capacity when load is lifted on downhill side.
- C. Outriggers extended to a surface that appears to be firm, but is unable to support the outrigger pad at full rated loads. Examples of this type of surface are:
 1. Thin or cracked blacktop or concrete.
 2. Dirt that appears dry and firm on top but is moist or unpacked beneath the surface.
 3. Dirt with a frozen but thin crust.

CAPACITY EXAMPLE (See Boom Extension Capacity Example Page 2-22)

Refer to the IC-200-H capacity chart on the preceding page. A load 5' X 5' X 5' (1.5 m x 1.5 m x 1.5 m) and weighing 14,000 pounds (6350 kg) is to be lifted onto the deck of the crane for transport to a new location. We see on the chart that 7500 pounds (3400 kg) is the maximum load on one-part line, so the sheave block is required. The charts show the weight of the standard sheave block to be 210 pounds (96 kg). The rigger says that two slings are required, weighing a total of 50 pounds (23 kg). The total load is $14,000+210+50=14,260$ (6350 + 96 + 23 = 6469 kg).

Looking at the 360° ROTATION, ON RUBBER column we see that we can lift 16,000 pounds (7250 kg) at a 6-foot (1.8 m) load radius. However, this radius is less than the distance from the center of rotation to the center of the load, with the crane parked next to the load, so the load cannot be lifted this way. This leaves the ON OUTRIGGERS columns. The outriggers should always be used whenever possible anyway. We see that we can lift up to 18,500 pounds (8520 kg) at a 10-foot (3.0 m) load radius, either over the front or over the side. If possible, position the crane to lift the load over the front. This is the best position for stability. Checking the chart again, we see that the load is within the deck load limit of 17,000 pounds (7700 kg) and that the travel speed with the load must be limited to creep speed. Creep speed is less than 2 MPH (3 km/h) and not to exceed 200 feet (60 m) in a 30 minute period. This is an approved relationship between load, tire pressure and speed.

CAUTION

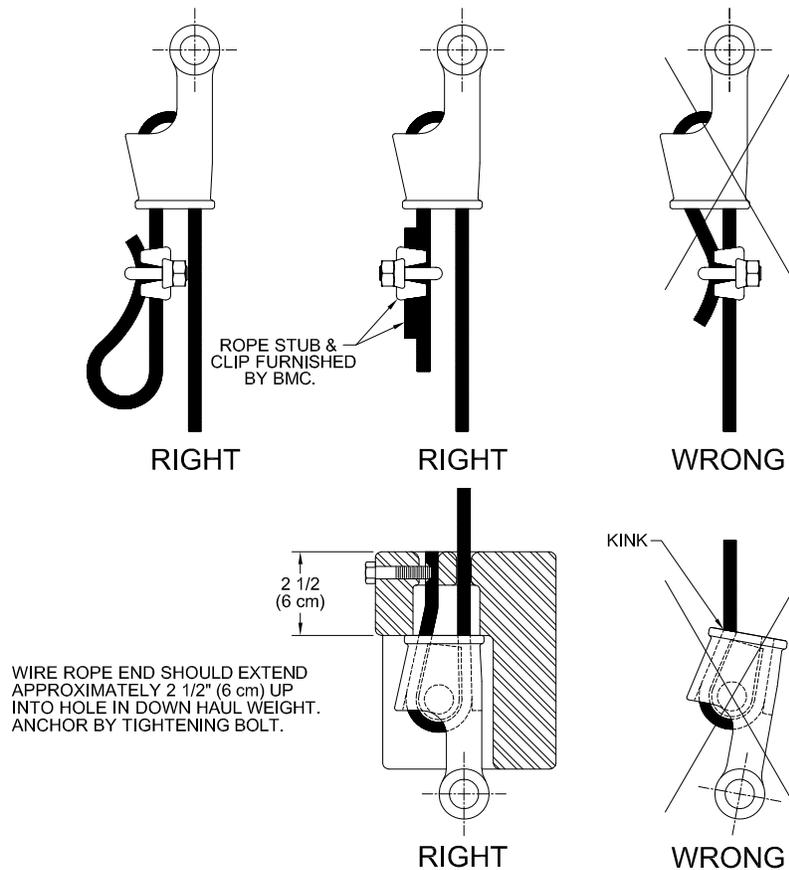
REMEMBER THAT AS THE BOOM IS LOADED, DEFLECTION OF THE BOOM, TIRES, ETC. WILL INCREASE THE LOAD RADIUS. SO BE CONSERVATIVE IN YOUR CAPACITY ESTIMATE.

SHEAVE BLOCK AND DOWNHAUL WEIGHT

The capacity chart shows the approved hoist rope arrangements. The downhaul weight and sheave blocks supplied by Broderson are specially designed to operate the Anti-Two-Block system. Other blocks or downhauls may bypass this system and create a dangerous condition. Notice the load limit for each hoist rope arrangement.

The keeper pins that pass through the sheave plates must be locked in place with cotters to hold the line on the sheaves. 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.

WIRE ROPE INSTALLATION



WIRE ROPE END SHOULD EXTEND APPROXIMATELY 2 1/2" (6 cm) UP INTO HOLE IN DOWN HAUL WEIGHT. ANCHOR BY TIGHTENING BOLT.

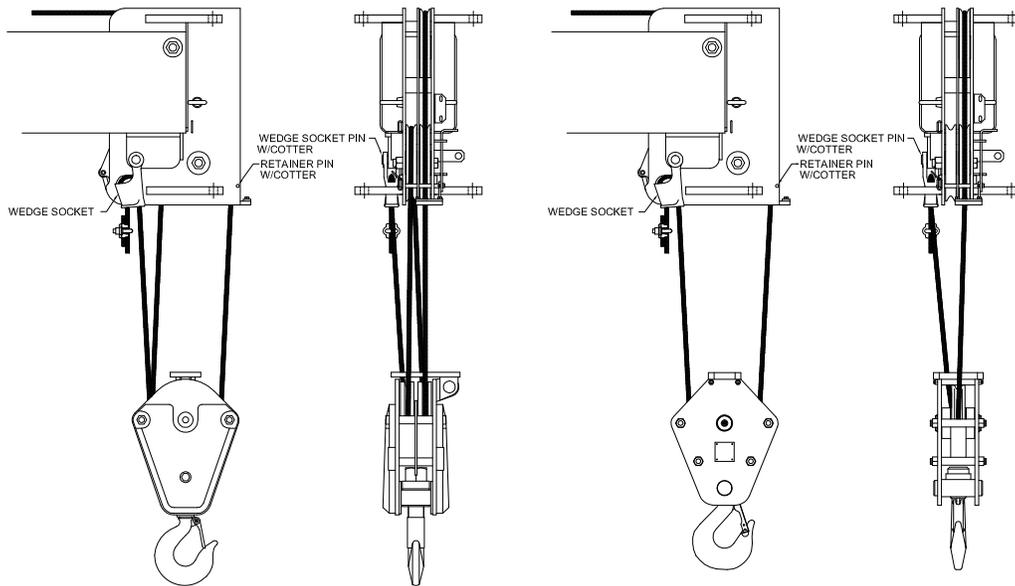
	<p style="text-align: center;">▲ WARNING</p> <p style="text-align: center;">FALLING OBJECTS</p> <p style="text-align: center;">DO NOT USE ROPE CLIP ON LIVE SIDE OF THE LOAD HOIST ROPE.</p> <p style="text-align: center;">DEATH OR SERIOUS INJURY CAN RESULT FROM A SERIOUSLY WEAKENED ROPE CAUSED BY A ROPE CLIP.</p>
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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.

MULTI-PART LINE REEVING

For loads above 7500 pounds (3400 kg) the sheave block must be used. The 4-part-line sheave block can be used for loads up to 30,000 pounds. The optional 2-part-line sheave block can be used for loads up to 15,000 pounds. The wedge socket should be pinned to the wedge socket anchor as shown in the figure. The dead end of the rope in the wedge socket should be clamped as shown in the figures. **The clamp must not be used on the live part of the rope.** This will seriously weaken the rope. The sheave block should hang straight, and the top of the block should meet the boom sheave plates squarely when pulled up snugly.

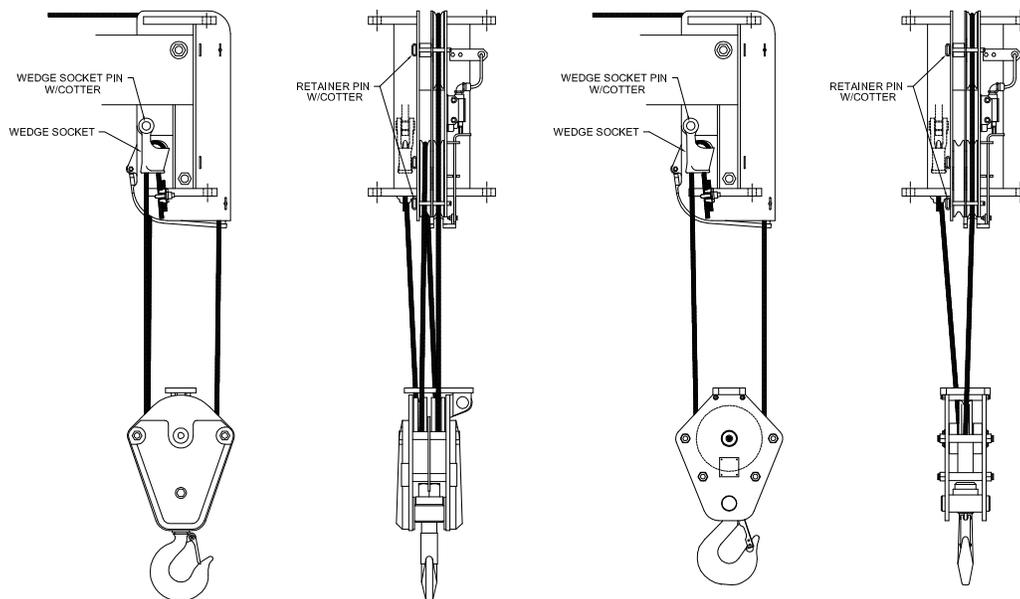
IC-200-2



FOUR-PART-LINE REEVING

TWO-PART-LINE REEVING

IC-200-3



FOUR-PART-LINE REEVING

TWO-PART-LINE REEVING

SAFETY DEVICES

There are certain safety devices on the IC-200 that are designed to maintain control of a load even if power or hydraulic line failure should occur. The operator should understand the function and operation of these devices so that a continual check on their performance can be made.

OUTRIGGER CYLINDER CHECK VALVE:

A double-acting check valve is integrally 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 has no adjustment. If an outrigger creeps up while supporting a load, there is an internal leak in the valve or in the outrigger cylinder piston seal. In either case, maintenance is required.

BOOM ELEVATION CYLINDER HOLDING VALVE:

A single-acting holding valve is integrally mounted on the cylinder barrel. This valve holds the boom in the elevated position should 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, this 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 instructions.

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.

BOOM TELESCOPE CYLINDER HOLDING VALVE:

A single-acting holding valve is flange-mounted to the cylinder rod end. This valve holds the cylinder in the extended position should power or hydraulic pressure line failure occur. This valve is adjustable to hold the desired load. If the boom creeps in under load, this 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 instructions.

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. A pivot arm-actuated electric switch is connected through a cable reel mounted on the boom to a solenoid dump valve in the hydraulic circuit. This valve will dump the HOIST RAISE, TELESCOPE EXTEND, BOOM LOWER, SWING LEFT, and SWING RIGHT circuits. No other circuits are affected. These circuits are returned to normal operation by operating the HOIST LOWER or TELESCOPE RETRACT control. An emergency override switch is provided so the boom can be operated in case of system failure. This key-operated switch is located under the left side of the instrument panel.

WARNING

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

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.

OPTIONAL EQUIPMENT

NOTICE

Use appropriate ladders/steps to gain access to the boom tip and deck to perform this installation.

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 load line until hook is just above ground.
3. Position boom over front, 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 locking 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 rear stow pin and front stow pin in their 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 boom tip sheaves and insert both retainer pins & 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 OFFSETTABLE BOOM EXTENSION:

1. The boom extension must be installed on the main boom tip and the load line, downhaul weight and wedge socket 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 holding the anti-two-block override switch under the control panel.

WARNING

Be careful not to operate the TELESCOPE lever 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.

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:

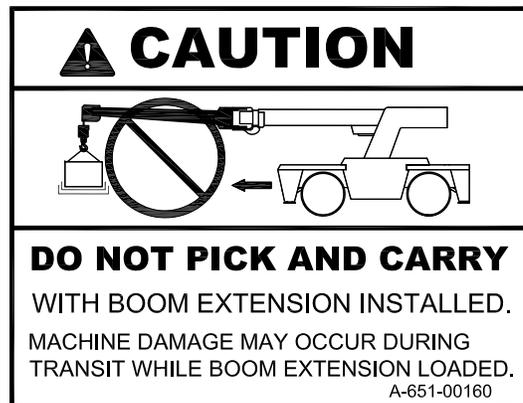
1. If the boom extension is offset to 15 or 30 degrees, return it to the zero offset position as described above.
2. Perform steps 16-20 of the boom extension installation and stowing procedure.
3. Set Rated Capacity Limiter configuration.

CAPACITY EXAMPLES FOR BOOM EXTENSION

The BOOM EXTENSION ANGLE and the LOAD RADIUS capacity charts must both be considered when using the boom extension. The smaller capacity specified by the 2 charts must be used. Refer to the IC-200-3H, Capacity Chart on page 2-15 for the following examples:

In this first example the boom is elevated to 30° over the side of the crane. The boom extension is offset to 15°, and the load radius is 32 feet (10.0 m). The outriggers are fully extended on concrete pavement and the crane is level. The column for BOOM EXTENSION, ON OUTRIGGERS 360° shows the capacity at the 32 foot (10.0 m) load radius to be 4550 pounds (2010 kg). The column for BOOM EXTENSION, MAIN BOOM ANGLE 30° shows the capacity at the 15° boom extension angle to be 3000 pounds (1369 kg). Since 3000 pounds (1369 kg) is less than 4550 pounds (2010 kg), the load (including the downhaul weight and slings) must be limited to 3000 pounds (1369 kg).

In the second example the boom is elevated to 40° over the side of the crane. The boom extension is offset to 0°, and the load radius is 38 feet (12.0 m). The outriggers are fully extended on concrete pavement and the crane is level. The column for BOOM EXTENSION, ON OUTRIGGERS 360° shows the capacity at the 38 foot (12.0 m) load radius to be 3500 pounds (1500 kg). The column for BOOM EXTENSION - STRAIGHT OR OFFSET, MAIN BOOM ANGLE 40° shows the capacity at the 0° boom extension angle to be 3900 pounds (1770 kg). Since 3500 pounds (1500 kg) is less than 3900 pounds (1770 kg), the load must be limited to 3500 pounds (1500 kg).



FRONT AUXILIARY WINCH:

The front auxiliary winch is mounted behind the front bumper and is controlled from the operator compartment. The winch has 115' (35 m) of 7/16" (11 mm) diameter 6x36 EIP-IVRC wire rope (20,200 pound (91 kn) minimum breaking force) and a 5-ton (4.5 metric ton) hook. Limit pulls to 5000 pounds (22 kn). It has a single-part-line pull of 10,000 pounds (4540 kg) on the bare drum.

The front auxiliary winch is designed for the following uses:

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

WARNING

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

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



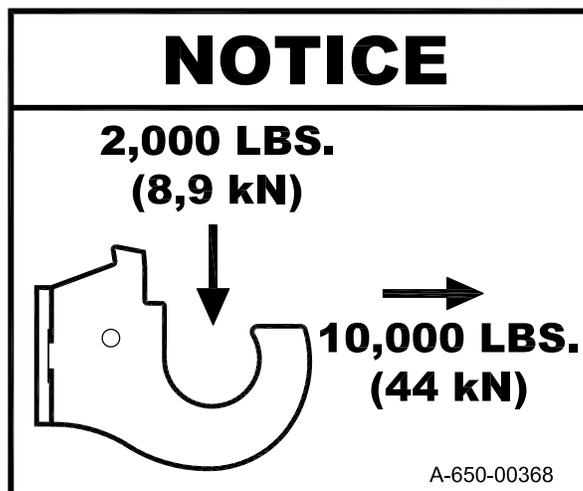
PINTLE HOOKS:

Available Pintle Hooks allow the crane to tow other disabled vehicles and trailers, and drag loads.

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 other vehicle is occupied and controlling the vehicle being towed.

Pintle Hooks also allow the crane to be towed.

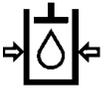
1. Use appropriately sized straps or chains.
2. Place transmission in Neutral. Utilize an Operator to activate brakes as needed and steer the crane while being towed.
3. Do not exceed a towing speed of 5 mph (8 kph).

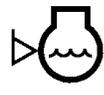


SWITCH AND INDICATOR SYMBOLS ON BMC CRANES

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 not charging		Heater switch
	Hour meter		Air conditioner switch
	Read operator's manual		Ventilation fan switch
	Sound level notification		Parking brake is set
	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
	Windshield wiper switch		Tire pressure

	Lift point
	Tie-down point
	Transmission oil fill location
	Transmission oil pressure
	Transmission oil temperature
	Brake fluid fill location
	Brake malfunction
	Hydraulic oil low-level mark
	Hydraulic oil filter restriction indicator
	Hydraulic temperature gauge
	Hydraulic oil temperature high
	Hydraulic oil pressure gauge OR hydraulic oil pressure low
	Positive polarity
	Negative polarity

	Engine oil pressure low
	Engine coolant fill location
	Engine coolant temperature high
	Engine coolant low level mark
	Engine air filter restriction indicator
	Engine start
	Engine idle set
	Check engine
	Stop engine
	Wait to start/ engine preheat/ grid heater/ glow plug switch
	Control lever travel
	Diesel fuel only
	Fuel level gauge
	Drain

MAINTENANCE

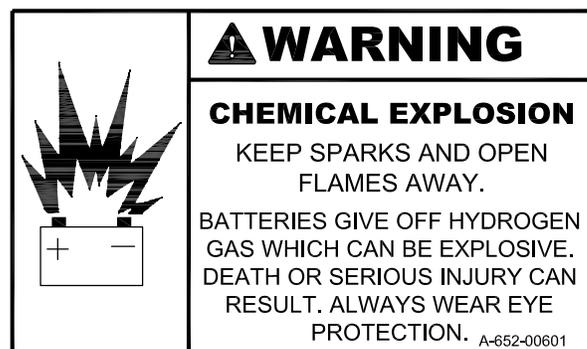
SAFETY RULES

1. Lower load and boom , shutdown engine, remove key and put it in a safe place. Place warnings on the ignition switch and crane controls to prevent unauthorized starting or movement during maintenance. Disconnect battery when disabling crane. Disconnect battery, RCL and engine electronic module when welding on crane.
2. Relieve hydraulic pressure when working on hydraulic parts by cycling the controls with the engine shut down.
3. Allow fluids and parts to cool before working on them.
4. Read maintenance instructions before beginning work.
5. 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 location of leaks. High pressure fluid leaking from a small hole, can be almost invisible, yet have enough force to penetrate the skin. If injured by escaping fluid, see a doctor at once. Serious reaction or infection can occur.
6. Wear safety glasses and shoes.
7. Do not wear loose-fitting or torn clothing.
8. Remove rings and other jewelry.
9. Wear heavy leather gloves when working on wire rope.
10. Keep fingers, clothing and hair away from moving parts.
11. To prevent falls, clean areas of crane that are stepped on for access to crane parts. Wear slip resistant footwear. Use appropriate ladders/steps to gain access to boom tip and deck.
12. Avoid placing body parts in pinch points. Use tools that extend through the pinch points when possible. Block the moving parts securely when it is necessary to work in pinch point areas.
13. When inflating or adding air to a tire, place a tire cage over the tire and use a clip-on inflater chuck with an extension hose that will permit standing behind the tire tread when inflating. Use proper tire handling equipment when changing any tires of this size.
14. Do not work on any machine that is supported only by jacks or a hoist. Always use adequate blocks or jack stands.
15. If it is necessary to work on the boom in an unstowed condition, block it to prevent it from dropping unexpectedly.

16. Use a hoist when lifting components that weigh 50 pounds (22 kg) or more. Follow all hoist and rigging safety rules.
17. Do not use lower grade fasteners if replacements are necessary.
18. When reinstalling wiring or plumbing after repairs, be sure that it will not be damaged by rubbing against sharp, rough or hot surfaces or edges.
19. Never use a rope clip on live side of the load hoist rope. This will seriously weaken the rope. Death or serious injury can result from the misuse of a rope clip on the hoist rope.
20. Replace any instruction or warning placards that are lost or damaged or not readable.
21. Always replace all guards and covers after working on the crane.
22. After working on the hydraulic system, remove air from the lines and cylinders involved by cycling them full stroke with the engine running until the functions operate smoothly.
23. When welding on the crane or on anything connected to the crane by wire rope or other conducting link, disconnect the battery, the Rated Capacity Limiter display and computer and the engine electronic control module. When welding on the boom or turntable assembly, remove the cable reel and any other electronic components bolted to these assemblies.
24. When using pressure spray to clean the crane, cover all electronic components with sheets of plastic to protect them from spray.
25. Do not allow antifreeze to contact skin. Rinse off spills immediately with plenty of water. Antifreeze is highly toxic if ingested.
26. Always disconnect negative cable first and refasten last to prevent accidental short through chassis components.

CAUTION

Even with low voltage electrical systems, severe arcing can occur. Electrical shock or component damage can result from contact with energized conductors. Use caution when working with any electrical device.



MAINTENANCE

The Broderson IC-200 Industrial Crane will perform better and longer if a program of inspection, lubrication, adjustment and general preventive maintenance is followed. We recommend the following schedule:

NEW UNIT INSPECTION AND TEST

The following inspection and test should be made before placing the unit on the job. This will insure that no damage or loss of operating capability occurred during shipment.

1. Check for physical damage.
2. Check for leaks at fittings and drips under chassis.
3. Check radiator coolant level.
4. Check engine oil level.
5. Check hydraulic oil reservoir level.
6. Check transmission oil level.
7. Check fuel tank level.
8. Check tire pressure.
9. Check for loose pins, bolts, and retainers.
10. Check for operation of foot brake.
11. Check for operation and adjustment of parking brake. (pg. 3-27)
12. Check for operation of accelerator pedal.
13. Start engine.
14. Check power steering for operation.
15. Check operation of transmission gear selector lever.
16. Check lights for operation.
17. Test-drive unit and check for normal operation.
18. Check operation of hydraulic outriggers.
19. Check boom rotation.
20. Check boom elevation.
21. Check boom extension (pay out hoist cable during power extension).
22. Check boom chains and chain sheaves on IC-200-3.
23. Perform cable break-in procedure as described on page 3-14.
24. Check anti-two-block system for proper operation and cutout of boom functions.
25. Perform a load test according to the Rated Capacity Limiter Operation Manual.
26. Check the outrigger warning light for proper operation as described on page 2-12.

WARNING

When the Rated Capacity Limiter is inoperative or malfunctioning, it must be repaired as soon as reasonably possible. When a lift must be made without a properly functioning load indicator or RCL, the designated lift supervisor must establish procedures for determining load weights and load radii and conducting the lift safely.

OPERATOR INSPECTION AND TEST

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 hydraulic filter indicator gauge after running at least twenty minutes.
9. Check hydraulic brake operation.
10. Check parking brake operation. (See park brake test and adjustment.)
11. Check power steering operation.
12. Observe chassis for normal driving operation.
13. Observe boom operation for normal power and speed.
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 (if equipped) and check for cracks.
20. Check operation of all warning and safety devices.
21. Check operation of Rated Capacity Limiter according to the RCL Operation Manual.
22. Check the outrigger warning light for proper operation as described on page 2-12.
23. GM 4.3L Gas or Dual Fuel Engine, per engine manual:
 - a. Inspect foot pedal travel and operation
 - b. Verify "Check Engine" light illuminates with key on and engine off
 - c. Inspect for exhaust leaks
24. Cummins QSB 3.3L Diesel Engine, per engine manual:
 - a. Check crankcase breather tube
 - b. Drain water from diesel fuel filter.
 - c. Inspect cooling fan
 - d. Check dust ejection valve
 - e. Inspect drive belts
 - f. Check air cleaner restriction indicator

W A R N I N G

Vapor can form inside a fuel tank and cause a buildup of pressure. This can result in a sudden expulsion of gasoline and vapor from the filler neck when the fuel cap is removed from a hot tank. Remove cap slowly. Fuel spray may cause injury.

OPERATOR INSPECTION AND TEST

Weekly:

1. Check tire pressure: 120 PSI (827 kPa).
2. Check for loose wheel nuts. (500 foot-pounds (680 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 horn.
7. Check operation of hoist brake for smoothness.
8. Check outrigger holding valves for operation.
9. Check boom lift holding valve for operation.
10. Check rotation gears for looseness or backlash.
11. Check boom extension cylinder holding valve for operation.
12. Check operation of windshield wipers (if equipped).
13. Boom extension (if equipped) properly pinned with retainers in place.
14. On IC-200-3, check boom chains and chain sheaves.

IC-200 MAINTENANCE CHECKLIST

Refer to the component maintenance section of this manual and to the engine operator's manual for complete instructions.

50 HOUR INTERVAL:

1. 50 hour lubrication as shown on lube schedule.
2. Inspect wire rope thoroughly.
3. Inspect for physical damage and leaks.
4. Clean radiator fins and check coolant level.
5. Check tire pressure and condition. Inflate tires to 120 PSI (827 kPa).
6. Check fluid levels in engine, transmission, hydraulic tank, and brakes.
7. Clean air filter inlet screen and empty the precleaner dust cup.
8. Inspect air intake and exhaust systems for cracks, leaks and loose bolts.
9. Change engine oil and filter after first 50 hours. Replace at intervals specified by engine manufacturer thereafter.
10. Check tension and condition of fan and alternator belts.
11. Check the hydraulic filter indicator with warm oil; change element if indicated.
12. Check rotation gear and pinion fit and gear train backlash.
13. Check rotation bearing and gearbox bolt tightness.
14. Check axle mounting bolts and pins.
15. Torque wheel mounting nuts. (500 foot-pounds (680 N-m) torque)
16. Check for loose pins or pin retainers.
17. Check steering lines for damage.
18. Inspect sheaves and hooks for damage or excessive wear.
19. Visually inspect welds on boom, turret and outriggers.
20. Perform a load test according to the Rated Capacity Limiter Operation Manual.
21. Check operation of outrigger warning light as described on page 2-12.
22. Clean the two steering alignment proximity sensors' tips with a rag.
23. Check park brake cable adjustment as described on page 3-27.
24. Check horn, outrigger alarm, and backup alarm.

250 HOUR OR 3 MONTH INTERVAL:

1. 50 hour maintenance.
2. 50 and 250 hour lubrication.
3. Clean engine and battery.
4. Check engine mounts and radiator mounts.
5. Inspect all bolts on the machine for tightness.
6. Visually inspect all welds for cracks.
7. Check hydraulic fittings and centerpost for leaks.
8. Adjust and lubricate boom chains and chain sheaves.
9. Perform all maintenance required by engine manual.

500 HOUR OR 6 MONTH INTERVAL:

1. 250 hour maintenance.
2. 50, 250 and 500 hour lubrication.
3. Check antifreeze for protection level and cleanliness.
4. Change hydraulic filter element, if not changed in the last 250 hours and inspect oil from element.
5. Change transmission filter element and inspect oil from element.
6. Check condition of all operational and warning placards.
7. Torque mounting bolts on rotation bearing and gearbox, winch and axles.
8. Inspect boom sections for signs of overload, excessive wear, or other damage.
9. Perform all maintenance required by engine manual.

1000 HOUR OR 12 MONTH INTERVAL:

1. 500 hour maintenance.
2. 50, 250, 1000 hour and 12 month lubrication.
3. Change hydraulic fluid and filter and clean breather and reservoir.
4. Change transmission fluid and filter and clean strainer.
5. Replace vapor block inside slip ring. See turret installation in parts manual.
6. Perform all maintenance required by engine manual.
7. Place vapor block inside slip ring. See turret installation in parts manual.

24 MONTH INTERVAL:

1. 12 month maintenance.
2. Pressure test engine cooling system.
3. Flush cooling system.
4. Fill with new coolant and distilled water.
5. Perform all maintenance required by engine manual.

S/N: _____ HOURS: _____ DATE: _____ BY: _____

COMMENTS & PARTS REQUIRED: _____

FLUID VOLUME

Hydraulic reservoir – 54 gallons (204 L)

Fuel tank – 30 gallons (113 L)

Planetary hoist – 2.5 quarts (2.4 L)

Front auxiliary winch – 2 pints (0.9 L)

4x2 & 4x4 Front axle – 5.98 gallons (22.6 L) housing, 39 gallons (1.5 L) each hub

4x4 Rear axle – 4.68 gallons housing (17.7 L), .44 gallons (1.7 L) each hub

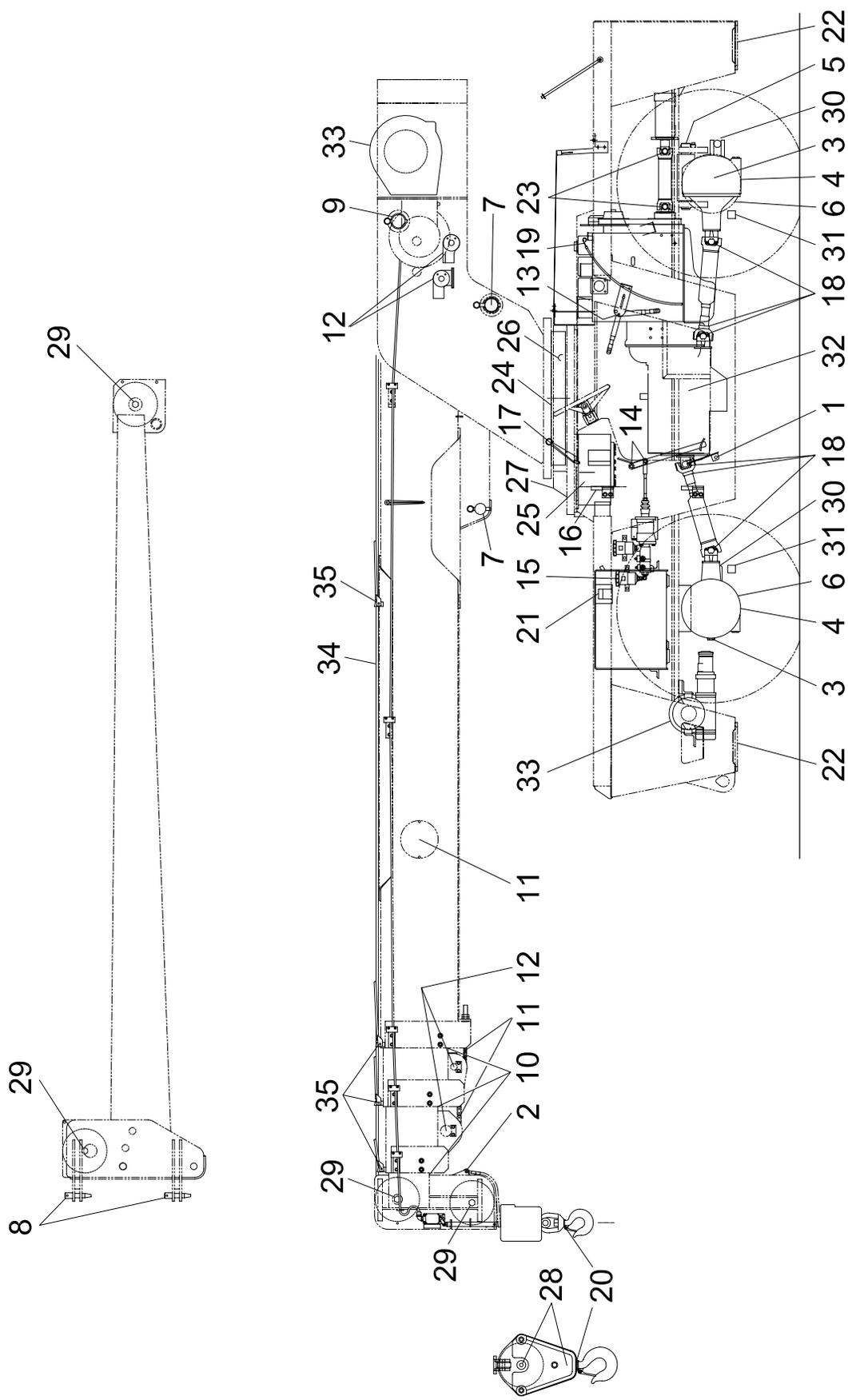
4x2 Rear axle – 0 gallons housing, .44 gallons (1.7 L) each hub

Transmission – 17.5 quarts (16.6 L)

Engine cooling system (Gas) - 15 (14.2L) to 17 (16.1 L) quarts depending on engine and heater.

Engine cooling system (Diesel) - 20 (18.9 L) to 24 (22.7 L) quarts depending on engine and heater; fill to bottom of fill neck in surge tank.

IC-200 LUBRICATION CHART



IC-200 LUBRICATION SCHEDULE

ITEM	DESCRIPTION	LUBE	LUBRICATION INTERVALS					NOTES
			50 HOUR	250 HOUR	500 HOUR	1000 HOUR	MONTHS	
1	Accelerator Pedal	MPG			X			1 Zerk, Diesel
2	Anti-Two-Block Arm	SIL	X					2 Points - Oilcan
3	Axle Differential	424	X				12	Check @50, Change @12 Mo.
4	Axle Kingpins	MPG	X					4 Zerks
5	Axle Pivot Pin	MPG			X			1 Zerk
6	Axle Planetary Hubs	424	X				12	Check @50, Change @12 Mo.
7	Boom Cylinder Pins	MPG			X			2 Zerks
8	Boom Ext. Pins	MPG	X					Wipe on.
9	Boom Hinge Pin	MPG			X			1 Zerk
10	Boom Rub Pads	SIL	X					Spray or Wipe
11	Boom Chain	EO		X				Spray or Wipe* IC-200-3
12	Boom Chain Sheaves	MPG		X				6 Zerks* IC-200-3
13	Brake Lever, Parking	SIL	X					
14	Brake Linkages	SIL	X					
15	Brake Reservoirs	DTE	X					Check @50, Change When Brakes are Serviced.
16	Cab Hinges & Latches	SIL	X					
17	Control Valve Links	SIL	X					
18	Drive Shaft Joints	MPG	X					3 Zerks 2WD, 6 Zerks 4WD
19	Engine Oil (Gas Engine)	EO	X	X			3 Max.	Check Daily, Change @50, then at 250 or 3 Mo. Max.
20	Hook Swivel & Pin	SIL	X					
21	Hydraulic Oil	HO	X			X	12 Max.	Check Daily, Change @1000 Hours or 12 Mo. Max.
22	Outrigger Legs	MPG	X					Wipe on Legs.
23	Pump Shaft	MPG	X					2 Zerks
24	Rotation Bearing	MPG	X					1 Zerk*
25	Rotation Gearbox	WGO						Repack @ overhaul
26	Rotation Gear Teeth	OGG	X					Brush On.*
27	Rotation Pinion Bearing	MPG	X					1 Zerk*
28	Sheave Block	MPG			X			3 Zerks
29	Sheave Pins	MPG			X			2 Zerks Std, 2 Optional.
30	Steering Cyl. Ends	MPG			X			8 Zerks
31	Steering Link Ends	MPG			X			4 Zerks
32	Transmission, 4-Speed	TPF		X			12 Max.	Check @250, Change @12 Mo.
33	Winch(es)	MPL		X			12	Check @250, Change @12 Mo.
34	Wire Rope	2-X	X					Spray, Brush or Soak.*
35	Wire Rope Retainers	SIL	X					

*See Procedures in Manual

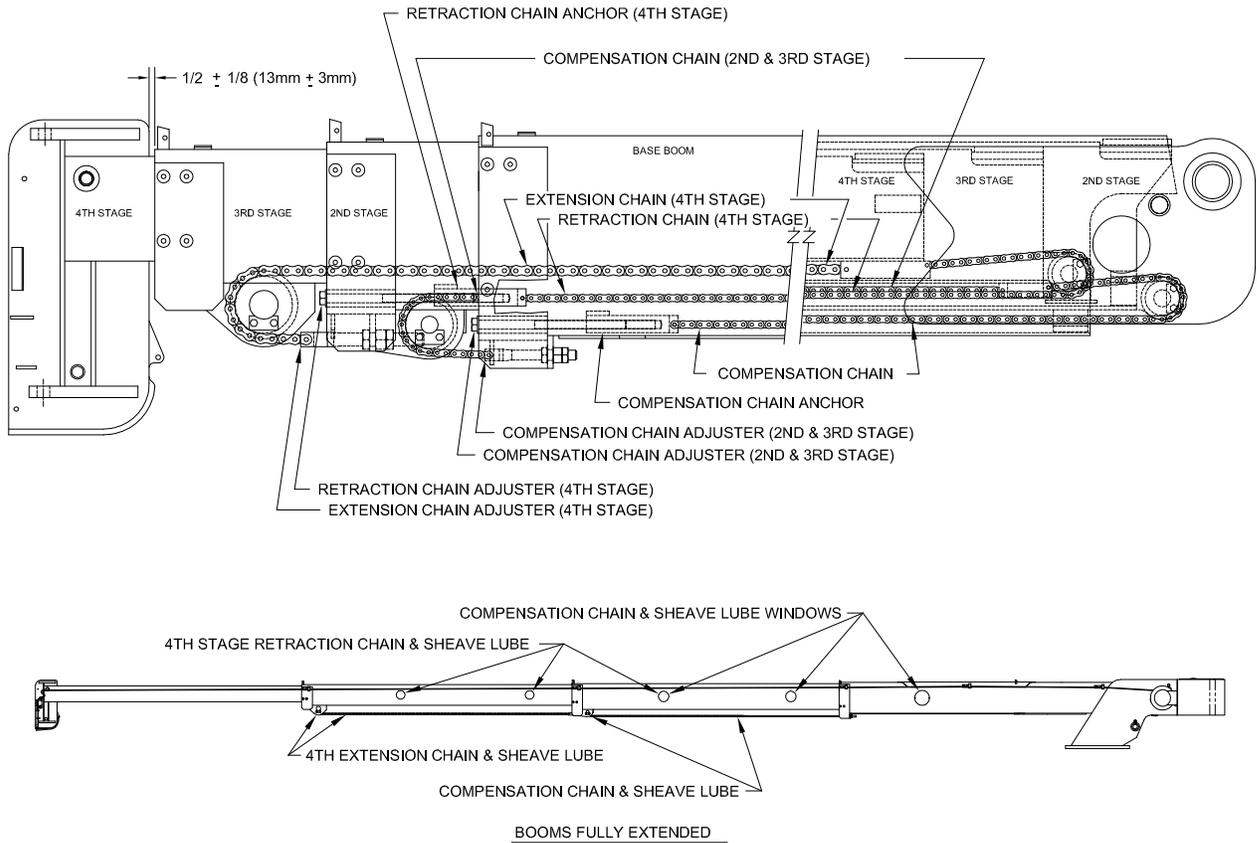
LUBE SYMBOLS

TPF - ATF Type F
 2-X - AMOVIS #2-x
 424 - Mobil Fluid 424 or Equivalent
 DTE - Mobil DTE 10, Excel 15 or Equivalent
 - (Do Not Use Brake Fluid)
 EO - Engine Oil - See Specs in Engine Manual

HO - Hydraulic Fluid - See Specs in Hyd. Sec.
 MPG - Multi-Purpose Gun Grease
 MPL - Multi-Purpose Gear Lube, SAE 80W-90
 OGG - Open Gear Grease, Such as Mobilkote S
 OGG - Silicone Lube, Aerosol with Concentrating Tube
 WGO - Worm Gear Oil, Exxon Cyclesstic TK460

IC-200-3 BOOM CHAIN LUBRICATION

Lubricate inner chains and chain sheaves through windows with boom fully extended and set horizontally. There are grease fittings on chain sheave shafts both inside and outside the boom. Reach in through boom windows with a long tipped oil can and spray chains generously and grease sheave fittings. Do not attempt to grease chain shafts or oil chains inside boom with engine running as boom may move while your hands are inside.



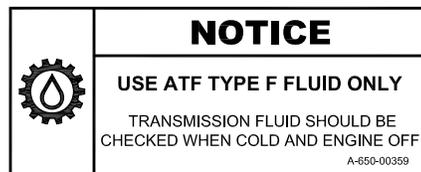
ROTATION BEARING LUBRICATION:

There is one grease zerk in a hole on the right-hand side of the turntable base plate. This should be used to lubricate the bearing every 50 hours. Rotate the turntable about 45 degrees and pump some grease into the zerk. Repeat until the turntable has rotated 2 revolutions. Use about 8 ounces (230 cc) of grease each time the bearing is lubricated.

Lubricate the gear teeth of the rotation bearing at the 50 hour interval. Remove the pinion cover. Brush open gear grease, such as Mobilkote-S, on the teeth on each side of the pinion at four places around the bearing. Rotate the boom several times and check the coverage of the grease on all of the teeth. Also, lubricate the pinion bearings at the zerk below the pinion teeth. Replace the pinion cover.

TRANSMISSION:

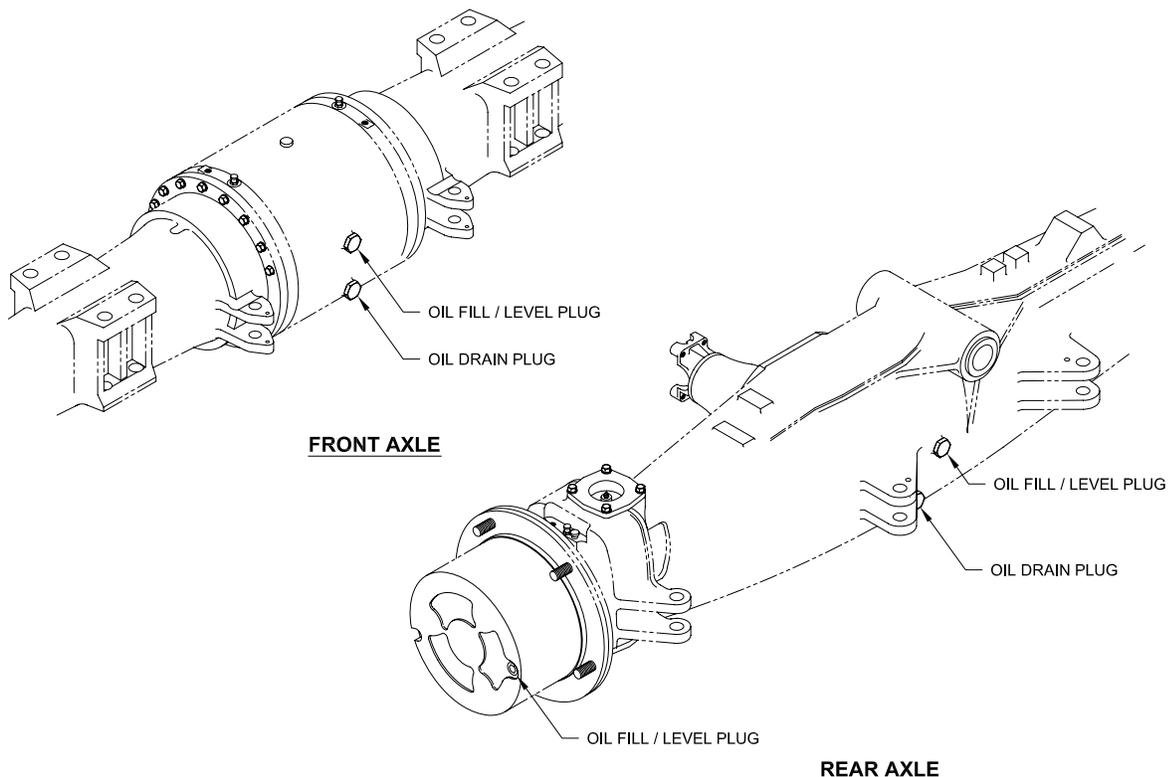
Check the transmission fluid with the dipstick and add fluid through the dipstick tube as required. Use Mobil ATF Type F or equivalent. Transmission factory service manuals are available from Broderson. Order BMC Part Number 990-00021.



DRIVE AXLES-HUBS AND DIFFERENTIALS:

Maintain lubricant to levels shown here with Mobil 424 or equivalent. Axle factory service manuals are available from Broderson. Order BMC Part No. 990-00020.

*No lubricant is required in the center section of the 2WD rear axle.



WIRE ROPE LUBRICATION

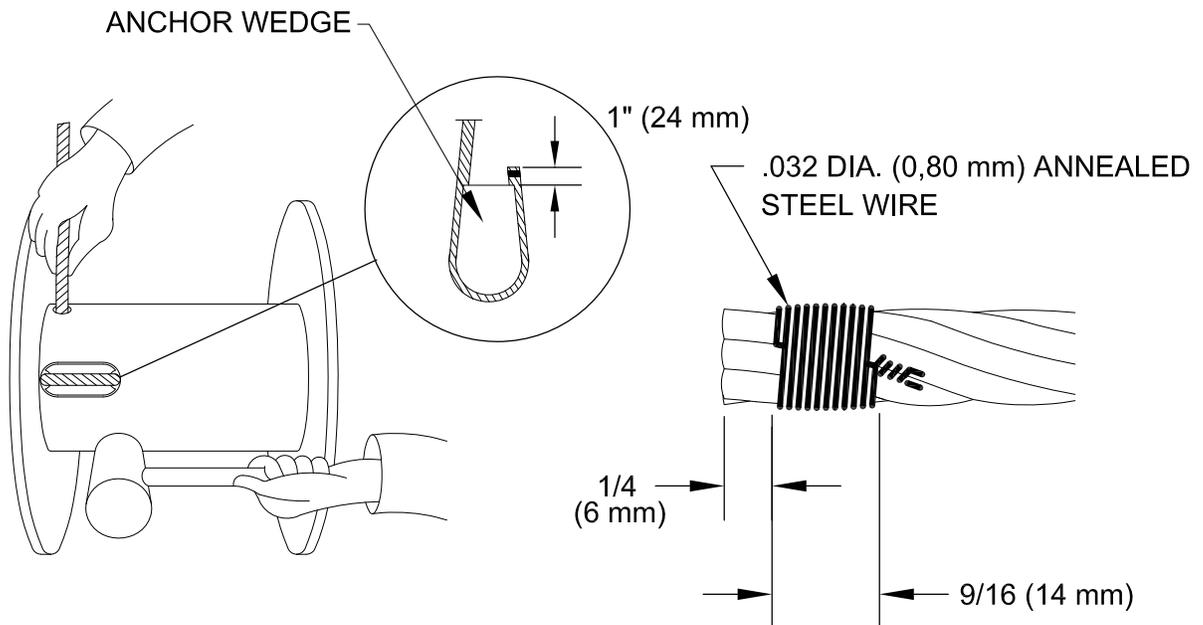
The wire rope should be cleaned and lubricated every 50 hours of normal operation and more frequently when used in dirty or corrosive environments. Whenever the rope is dirty or dry, it should be serviced. The rope should be cleaned with solvent and compressed air or solvent and rags. A wire brush may be used for difficult areas.

The recommended lubricant is AMOVIS #2-X. It should be sprayed or dripped onto the rope where it is bent as it passes over the tip sheave. Wrap rags around the wire rope behind the sheave and swab the excess oil that is carried along on the rope. Always wear heavy leather gloves when handling wire rope.

HOIST CABLE INSTALLATION AND INSPECTION

The following steps will assure that the wire rope winds smoothly and evenly on the hoist and will yield greater safety and longer cable life:

1. If the cable needs to be replaced use $\frac{1}{2}$ diameter (12.7 mm) 6X 25-EIP-RRL-IWRC wire rope, minimum breaking force 26,600 lbs (117 kn).
2. If possible, the cable should be rolled off a storage spool and straightened out on the ground in line with the boom. If the ground is not clean or the space is too limited, the cable can be wound directly from the storage spool onto the hoist, but the spool must rotate in the same direction as the hoist.
3. Check the seizings on the ends of the cable and replace them if they are missing or damaged.
4. Install the cable over the boom tip sheave and route it through the cable retainer loops to the hoist drum.



HOIST CABLE ANCHOR

WIRE ROPE SEIZING
FOR 9/16" DIA.(14 mm) ROPE

5. Position the hoist drum with the cable anchor on top.

6. Insert the cable through the anchor slot and wrap it around the anchor wedge. The end of the cable should extend past the wedge by about one inch (24 mm).
7. Slide the cable and wedge into the drum socket and pull firmly on the free end of the cable to set the wedge. Seat the wedge securely with a brass or rawhide mallet.
8. Slowly rotate the hoist while applying tension on the cable in front of the boom. Wear heavy leather gloves and wrap rags around the cable to wipe off any dirt from the cable. Keep hands away from the sheaves and hoist drum while the cable is moving.
9. After two turns of the hoist drum, stop the hoist and push the cable into the drum groove if it has come out.
10. Slowly rotate the drum until the first layer of cable is on the drum. If any gaps between the rope appear, back up the hoist and rewind. There must be no gaps.
11. After the first layer is on the drum, the hoist may be turned a little faster until the remainder of the cable is installed.
12. Leave about 30 feet (9 m) of cable on the ground to install the sheave block. See the Operation Section for instructions on reeving and wedge socket attachment.
13. Install the cable retainer pins and cotters in the tip sheave plates.
14. For the cable preloading, extend the outriggers and attach a load of about 2000 pounds (900 kg). Extend the boom fully. Position the load at a 10-foot (3 m) load radius over the right-hand side of the crane. Hoist and lower the load three times and check winding of the rope on the hoist.
15. Attach about 5000 pounds (2300 kg) and repeat. Be sure that the cable winds evenly on the hoist.
16. If the cable appears to twist too much, remove the sheave block and rewind the cable on the drum as in Steps 7-11.
17. Never lift more than the rated load on the Capacity Chart for the parts of line and type of wire rope being used.
18. Lubricate the cable as recommended in the "Wire Rope Lubrication" section. Inspect, maintain and replace the cable in accordance with ANSI B30.5-1982, Section 5-2.4.

HYDRAULIC SYSTEM

The IC-200 hydraulic system consists of 2 subsystems, driven by a double pump with a single inlet port. The 29 GPM (110 L/min) vane pump supplies the hydrostatic steering function and the boom and outrigger functions. The hoist and brake booster are powered by the 34 GPM (129 L/min) vane pump.

The boom, outriggers, hoist and optional front winch are controlled by one valve assembly. The 29 GPM (110 L/min) pump flow enters the steering flow control valve first and then flows into the left-hand section of the control valve assembly supplying the swing, telescope, boom and outrigger sections. The flow from the 32 GPM (129 L/min) pump enters the brake booster flow control valve first and all but 4 GPM (15 L/min) is directed to the inlet section to the left of the hoist valve. Adjustment procedures for the crane hydraulic functions are given on page 3-21 through 3-23. The schematic of the hydraulic system is shown on the next page.

STEERING SYSTEM

The steering system is shown in the schematic on the next page. The IC-200 steering system is a load-sensing, demand-type system that takes only as much flow as is needed when steering and directs the excess flow to the control valve for boom and outrigger functions. The priority flow-control valve is in the line between the 29 GPM (110 L/min) pump section and control valve.

Oil from the 29 GPM (110 L/min) section of the pump goes into the priority valve at port "P." When no steering is required, the entire flow goes through the priority valve and leaves through port "EF" to the crane valve. The crane operating speed is not affected, since there is no loss of volume passing through the priority valve.

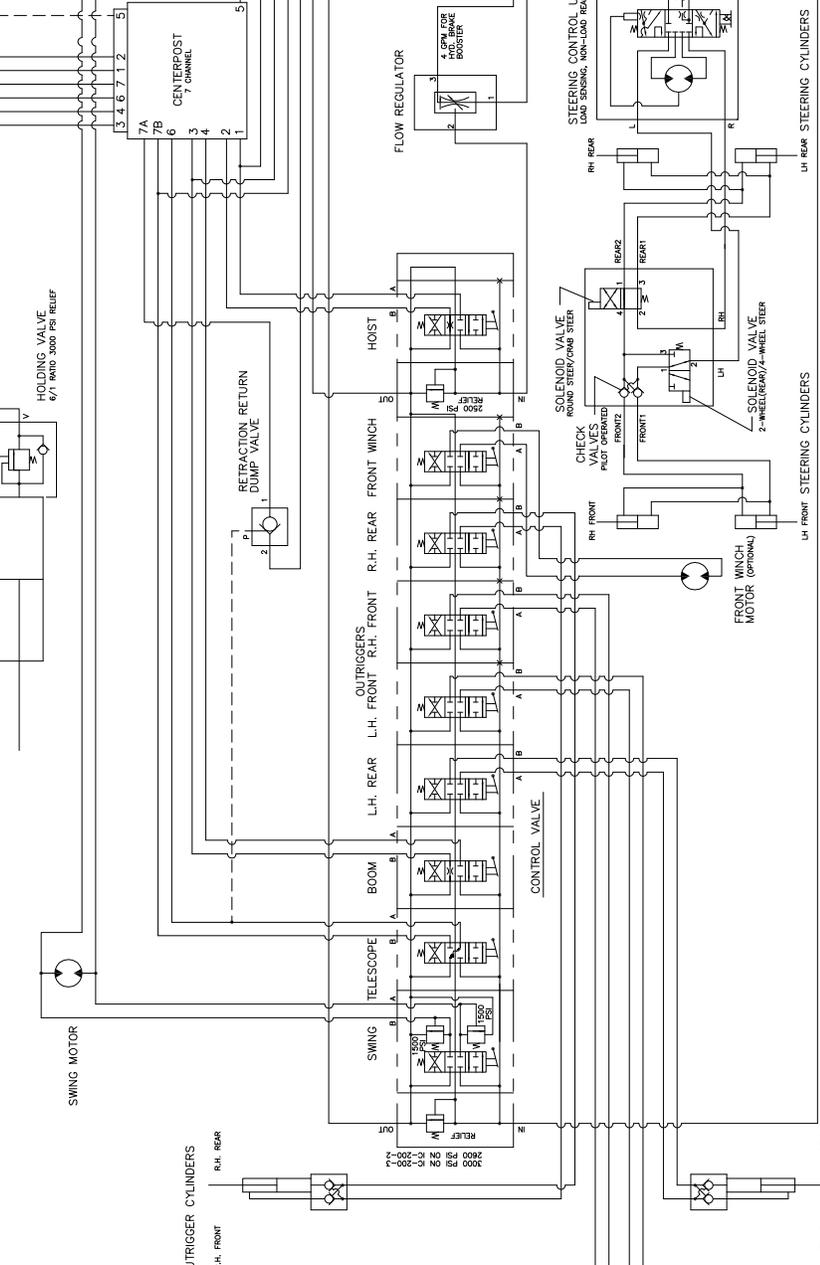
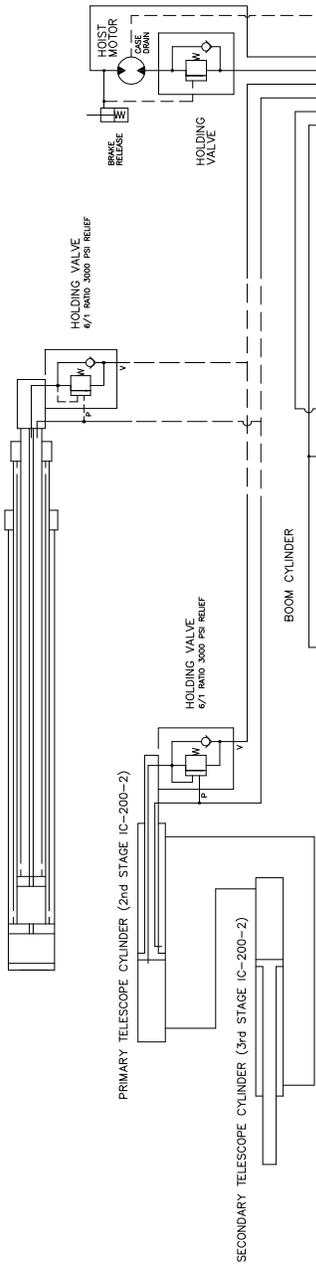
When the steering wheel is turned, the load-sensing line signals the priority valve to divert the required amount of oil to the steering control unit to meet the steering system requirements. The excess oil, not required for steering, flows to the crane control valve as usual. Since the amount of oil required for steering is usually a small portion of the pump output, the crane control valve is always operational while the unit is being steered. Crane operation speed is reduced such a slight amount it is usually not noticed.

The steering control unit is non-load reactive. This means that bumps, curbs, and obstacles cannot change the steering angle and are not felt in the steering wheel. It also means that the wheels do not recenter when the steering wheel is released. The steering wheel must be turned back to center at the end of a turn. The steering system pressure was set at 1800 PSI (124 bar) at the factory, and this should not need adjustment.

The three steering modes are selected by a switch on the dashboard, which activates the automatic alignment system. Electronic proximity sensors and logic controls delay the switching of the steering mode until the wheels are centered. The proximity sensors should be cleaned periodically with a rag to prevent dirt buildup from blocking their operation.

IC-200-H JIC SCHEMATIC

IC-200-3 TELESCOPE CYLINDER

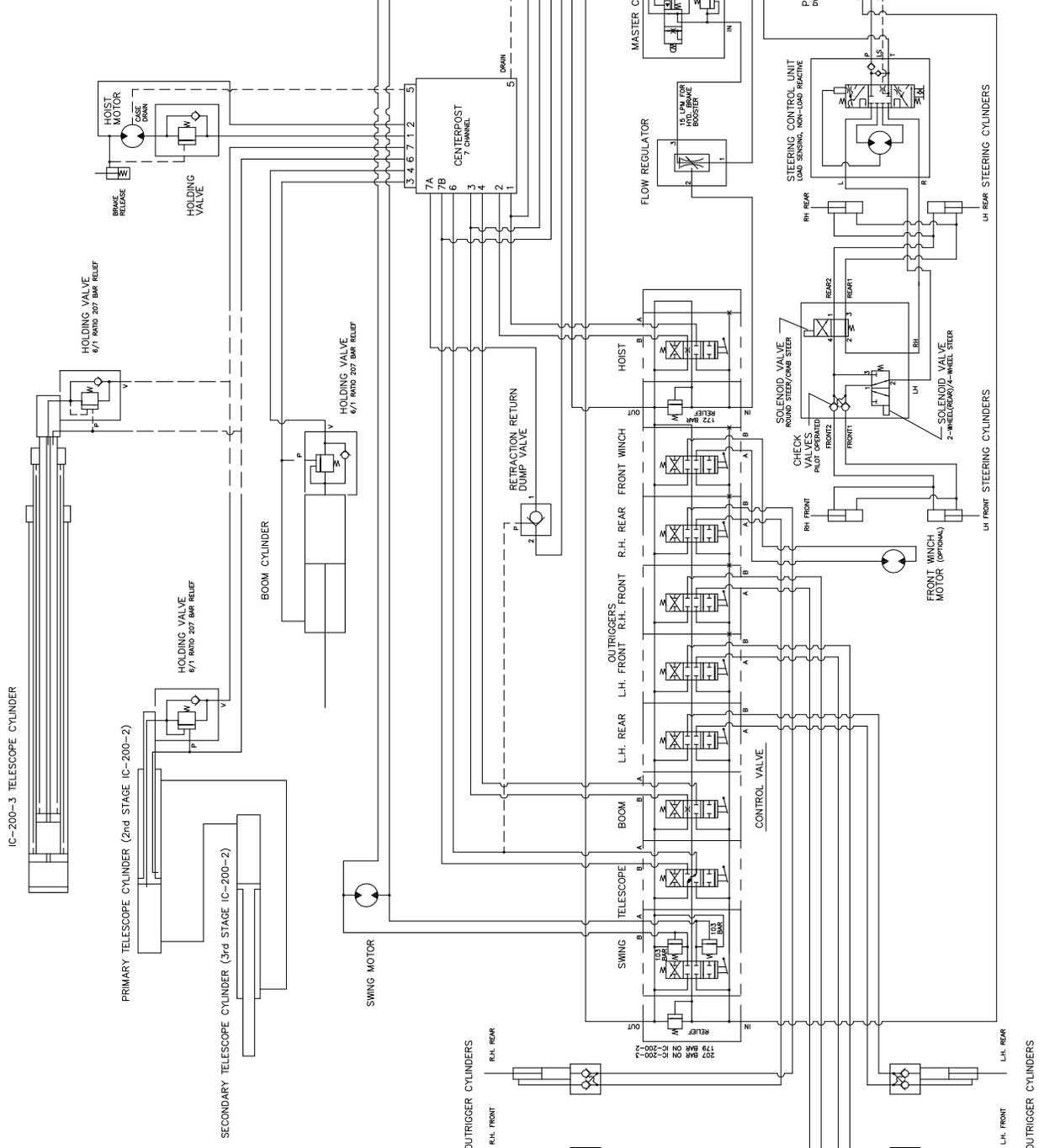


FUNCTION CHART	
1	HOIST RAISE
2	HOIST LOWER
3	BOOM LOWER
4	BOOM RAISE
5	DRAIN
6	TELESCOPE RETRACT
7A	TELESCOPE EXTEND
7B	TELESCOPE EXTEND BYPASS

NOTE: PPS SHOWN AT 2500 RPM

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IC-200-H METRIC JIC SCHEMATIC



FUNCTION CHART	
1	HOIST RAISE
2	HOIST LOWER
3	BOOM LOWER
4	BOOM RAISE
5	DRAIN
6	TELESCOPE RETRACT
7A	TELESCOPE EXTEND
7B	TELESCOPE EXTEND BYPASS

NOTE: SWE SHOWN AT 2000 PSI

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CARE OF HYDRAULIC OIL

The hydraulic system contains many highly pressurized, precision components. To protect these, it is very important to keep the hydraulic oil clean, at proper temperature, within the oil specification and to the proper fill level.

The IC-200 is equipped with a 100-mesh suction strainer, a breather filter, a 10-micron return-line filter and a 54-gallon (204 L) tank. The filter must be changed whenever the filter indicator gauge under the control panel points to the red sector at full engine speed or at 500 hours or six months maximum. Note: The oil should be warmed by at least 15 minutes of normal operation to get a good reading. The indicator should be checked daily.

The filter is located to the rear of the front axle. Clean the filter and the surrounding parts with pressure washer before changing, to prevent dirt from getting into the clean oil tube. To minimize oil loss, close the shutoff valves under the tank.

BE SURE SHUTOFF VALVES ARE FULLY OPENED BEFORE STARTING ENGINE.

Remove the filter element and catch the hydraulic oil in a clean container. Pour the remaining oil out of the old element into the clean container and inspect the oil for water and excessive contaminants. If water is found, the oil should be changed in the reservoir and purged out of the cylinders. If excessive particles are found, the source should be located and fixed, and the oil should be purged.

Lubricate the new element seal and install the new element. Open the shutoff valves. Run the engine and check for any leaking around the seal.

The hydraulic oil should be changed every 1000 hours or once a year, whichever is sooner. Wash the oil tank and filters before changing the oil. Retract the telescope, boom and outrigger cylinders. Leave the shutoff valves open and remove the drain plug. Catch the oil and dispose of it properly. Remove the breather from the top of the tank and clean the element with solvent and compressed air. Clean out the tank with solvent and compressed air.

The suction strainer is located under the hydraulic tank and has a reusable element. To service, remove the four bolts holding the two parts of the housing together. Remove the element from the housing by turning the element counter-clockwise. Wash the element in clean solvent and allow to dry. Reassemble the strainer.

Replace the filter as described previously and refill the tank with new hydraulic oil that meets the specifications in the table below. Start the engine and run it at low idle for 15 minutes to filter the new oil. Then cycle all of the hydraulic cylinders at low idle and low pressure. Add hydraulic oil to the dipstick full mark, if necessary, with cylinders retracted.

HYDRAULIC OILS FOR IC-200

AMBIENT TEMP RANGE:	-40° to 75°F (-40° to 24°C)	-15° to 110°F (-26° to 43°C)	50° to 130°F (10° to 54°C)
POUR POINT:	-40°F MAX (-40°C)	-15°F MAX (-26°C)	0°F MAX (-18°C)
VISCOSITY INDEX:	140 MIN	95 to 100	95 to 100
VISC. SSU @ 100°F (38°C):	200 MAX	230 MAX	340 MAX
SSU @ 210°F (100°C):	44 MIN	47 MIN	53 MIN
EXAMPLES:	MOBIL DTE-13 MOBIL UNIV.-ATF TEXAMATIC TYPE F TEXACO HD 46	MOBIL AW-46 MOBIL DTE-25 CONOCO SUPER 46 TEXACO HD 68	MOBIL AW-68 MOBIL DTE-26 CONOCO SUPER 68

OTHER REQUIREMENTS: Must contain rust and oxidation inhibitor, and antifoam and antiwear agents. Must pass Vickers Vane Pump Test.

The IC-200 is factory filled with hydraulic oil for the -15° to 110°F (-26° to 43°C) range. If significant portions of time are spent operating below 20°F (-7°C) or above 100°F (43°C), the oil should be replaced with an extreme temperature oil.

The oils shown are compatible with and may be combined with SAE 10W or SAE 20W-20 motor oil if it is necessary to add oil between changes and the recommended oils are not available. These motor oils are not suitable substitutes when changing hydraulic oil because they lack certain additives that are needed for hydraulic system use.

CAUTION

Never add kerosene or other "thinners" to hydraulic oil. These fluids have low aniline points and consequently will cause rapid deterioration of certain packings and seals in the hydraulic system.

CAUTION

Serious damage to the pump will result if it is run with the shutoff valve closed or with insufficient oil level in the reservoir.

Observe the operation of the machine. If the oil is too cold, the machine will be sluggish and should be warmed up further to prevent damage before sustained hard work is attempted. If the oil is too hot, leakage will increase, pump efficiency will go down, and moving parts will not be properly lubricated. If operating temperature is excessive, rapid deterioration of the oil will result and moving parts and seals will wear more quickly. The cause of the excess heat should be determined and corrected. A possible indication of excessive oil temperature is a control valve lever that becomes hard to operate or sticks instead of returning to neutral.

REMOVAL OF AIR FROM HYDRAULIC CIRCUITS

To remove air from hydraulic circuits, perform the following steps:

1. Ensure all main shutoff valves on the reservoir are open.
2. Start the engine.
3. Raise and lower the boom minimum five times. Ensure that the cylinder travels full stroke.
4. With the boom retracted and elevated to at least 65°, raise and lower the hook at least once.
5. Extend and retract the boom minimum five times.
6. Swing the turret left one full revolution. Swing the turret right one full revolution.
7. Extend and retract each outrigger minimum five times. Outriggers can be operated in pairs.
8. With the crane on outriggers, steer the crane wheels fully left and right three times in each steering mode.
9. BMC uses multiple types of RCL computer. If the RCL computer is connected to the topping cylinder by hose, it may be necessary to bleed this hose. Perform the following:
 - a. Raise the boom to approximately 5°.
 - b. Turn off engine.

WARNING

The boom will lower during this procedure. Failure to keep the boom free of obstructions could lead to destruction of property, injury, or death.

- c. The boom **will** lower during this procedure. Ensure no personnel are in potential pinch points, especially around the topping cylinder and between turret side plates. Ensure that the boom is free of obstructions. Ensure that the hook will not hit the ground and foul the hoist line.
 - d. Find the small hose that connects to the piston side of the cylinder, and follow it back to the RCL computer. Find the hose that connects to the rod side of the cylinder, and follow it back to the computer.
 - e. Loosen the piston-side fitting at the computer until the boom begins to lower. Allow the boom to lower 1-2 degrees, or until no more air appears to be leaking out. Then re-tighten the fitting. Use a bucket or other means to catch as much oil as possible. If little or no air is present in the line, the boom may not visibly lower before the line is purged.
 - f. Loosen the rod-side fitting at the computer. The boom should not move.
 - g. Start the engine.
 - h. SLOWLY lower the boom until no more air is leaking out of the rod-side fitting. Oil may come out of the fitting before the boom begins to move. Use a bucket or other means to catch as much oil as possible.
 - i. Re-tighten the rod-side fitting.
 - j. Turn off the engine.
10. Check the level of oil in the hydraulic reservoir and add more if necessary.
 11. Set the crane on outriggers. With the boom about halfway extended and about 45° elevated, lift a load near maximum capacity using the hoist. Raise the boom an additional 10-15°. Extend the boom. Check for “spongy” operation.
 12. If necessary, cycle functions again to remove remaining air.

HYDRAULIC SEALS

W A R N I N G

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 location of leak. High pressure fluid leaking from a small hole, can be almost invisible, yet have enough force to penetrate the skin. If injured by escaping fluid, see a doctor at once. Serious reaction or infection can occur.

All hydraulic fittings and hose connections should be kept tight to prevent loss of fluid from the system and unnecessary dripping from the machine. Most hydraulic fittings on the IC-200 crane use o-ring seals, and if tightening the fitting fails to stop the leak, the o-ring should be replaced.

Notes:

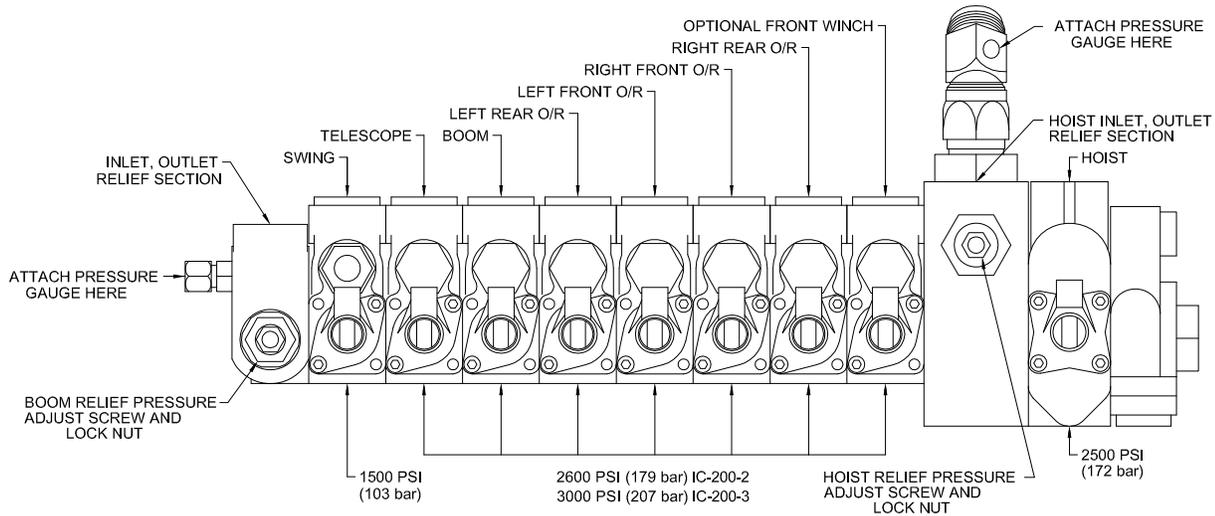
1. When installing an o-ring fitting with an adjustable nut and washer, be sure to back off the nut, washer and o-ring as far as possible before threading the fitting into the port. Then turn the fitting into the port as far as possible with fingers and turn it backward until it is oriented properly. Torque the nut with a wrench, while holding the fitting with a wrench.
2. Lubricate all seals before assembling.
3. Take care not to over tighten pipe threads.
4. Do not use Teflon tape to seal pipe threads. Loctite-type (anaerobic) sealant is preferred.

Leaks in component parts, such as pumps, valves and motors, that cannot be stopped by tightening bolts, can usually be stopped by replacing the seals in the component. Seal and packing replacement is the only maintenance which owners should attempt on component parts, unless they have a well-equipped shop with mechanics trained in hydraulic component overhaul.

Leakage in the pump suction line may not cause oil to appear externally, but may allow air to enter the line during operation. The air entrained in the oil will cause pumps to be noisy, and if allowed to continue, can damage the pump. If a pump becomes noisy, immediately check the fluid level in the reservoir and be sure all suction fittings are tight. If noise continues, squirt hydraulic fluid on the suction connections. Listen for a change in the noise and watch for oil being sucked into a small opening in the connection. When the reservoir is full, the shutoff valve is open and all suction connections are tight, most pump noises will disappear. If they do not, a worn or faulty pump is indicated. On a routine basis, all hoses should be checked for wear, deterioration, and physical damage. Defective hoses should be replaced for maximum economy for the user.

PRESSURE SETTINGS:

The hydraulic system is divided into two pressure circuits, each having its own protective adjustable relief valve in the inlet sections of the control valve. The functions operated by the control valve sections require different pressures for different functions. These are shown below:



1. Hoist Circuit -- 2500 PSI (172 bar) at full flow.
2. Boom and Outrigger Circuit -- 3000 PSI (207 bar) at full flow, on IC-200-3, 2600 PSI (179 bar) on IC-200-2.
3. Boom swing work ports -- 1500 PSI (103 bar) at full flow.

A good quality pressure gauge with at least a 3000 PSI (207 bar) scale is required to make adjustments properly. A 3000 PSI (207 bar) working pressure hose with adapters to fit the 3/8 tube pressure ports is required to install the gauge where it can be read easily.

The following procedures are suggested when taking pressure readings:

HOIST CIRCUIT:

Remove the 3/8" JIC cap from the fitting on the front of the control valve near the hoist control section and install a 3000 PSI (207 bar) pressure gauge. To obtain full flow reading, run pump full speed, pull hoist control to the RAISE position and hold until maximum reading is made. The anti-two-block override switch must be actuated. If a pressure of 2500 PSI (172 bar) is not possible, check the following:

1. Broken mechanical connection to the pump shaft.
2. Low oil level in the reservoir.
3. Clogged suction filter or shutoff valve not fully opened.
4. Valve spool linkage not allowing control valve to fully open. Valve spool should move 3/8" (9.5 mm) each way from neutral position.
5. Anti-two-block system malfunction.
6. Adjust relief valve by loosening nut on top of relief cartridge above winch gauge port and turning socket-head screw clockwise to increase pressure or counter-clockwise to lower pressure.
7. Foreign particle in pilot operated relief.
8. Worn or defective hydraulic pump.

BOOM AND OUTRIGGER CIRCUIT:

The relief valve pressure setting at the inlet for boom control sections is 2600 PSI (179 bar) for IC-200-1 & 2, 3000 PSI (207 bar) for IC-200-3. This pressure is required for all but the swing control section. Two work port relief valves are installed in the swing section. These relief valves are set at 1500 PSI (103 bar).

The relief pressure at the inlet end of the valve can be adjusted with a wrench and an allen wrench. Loosen the nut and tighten the threaded stem with an allen wrench to increase pressure, and loosen the stem to decrease pressure. Lock in place with the nut. Actuate the BOOM LOWER or TELESCOPE RETRACT function with the cylinder fully retracted when making this adjustment.

While the pressure gauge is attached, the swing function may be checked by capping the two work ports of the swing section and actuating the swing control lever in each direction. If these pressures are improper, the work port relief valve can be removed and shims added or removed as needed. Part numbers for the work port relief valves and shims are listed below:

9-340-00070	Work Port Relief Valve-Gresen #7460-002 PS 1500 C
9-340-00032	Shim -- .010" -- Gresen #0462-001
9-340-00031	Shim -- .020" -- Gresen #0459-001
9-340-00030	Shim -- .040" -- Gresen #0458-001

(Pressure is changed approximately 100 to 125 PSI (7 to 9 bar) for each .010" shim).

BOOM CYLINDER HOLDING VALVE:

A holding valve is directly connected to the base of the boom lift cylinder barrel and to the base of the primary telescope cylinder rod. These valves are designed to hold the boom in position should loss of power or pressure line failure occur.

To check the boom lift cylinder holding valve, set the outriggers, place the boom in the horizontal position over the front of the crane and raise rated load about six inches (15 cm) above the ground using the boom lift cylinder (not the hoist). The best load for this test is the rated load at the 16 foot (5.0 m) load radius with outriggers extended and the boom over the front. Turn the engine off and move the BOOM lever to the LOWER position. If the boom moves down, adjust the holding valve.

WARNING

Before working on the holding valves or plumbing to the boom lift cylinders, always relieve trapped pressure by lowering the boom fully, turning off the engine, and cycling the BOOM lever.

To adjust the holding valve, loosen the jam nuts on the adjusting screw and tighten the screw until unpowered boom movement stops. Retighten the jam nuts. If adjusting the valve does not help, the cylinder may have internal leakage or the valve may be malfunctioning.

TELESCOPE CYLINDER HOLDING VALVE:

A holding valve is directly connected to the base of the primary telescope cylinder rod. The valve is designed to hold the boom in position should loss of power or pressure line failure occur.

The holding valve should be checked with the boom elevated to the maximum angle and the boom extended to a 6 foot (1.8 m) load radius. A 30,000 pound (13600 kg) load on a 4-part line is required for this test. Use the hoist to lift this load about 6 inches (15 cm) above the ground. The radius of the test load should be within the rating on the capacity chart. Use great care to prevent the load from hitting the crane.

Turn the engine off and pull the TELESCOPE lever to the RETRACT position. If the boom retracts, the valve should be adjusted.

To adjust the holding valve, loosen the lock nut on the adjusting screw and tighten screw until unpowered movement stops. Retighten the lock nut to hold the proper adjustment.

IC-200-3 BOOM CHAIN ADJUSTMENT

Study Illustrations 1,2 and 3 to understand the chain adjustment procedure. Proper adjustment is critical at time of boom assembly or scheduled maintenance.

Initial adjustment: Retract boom completely. The 4th stage extension and retraction chains set the position of the 4th stage relative to the 3rd stage. As shown in Illustration 1, ½” (13 mm) clearance must be held between the 4th stage tip and 3rd stage tip. To increase this distance, loosen the retraction adjustment and tighten the extension adjustment. To decrease this distance, loosen the extension adjustment and tighten the retraction adjustment.

Final adjustment: Extend boom completely while horizontal, then slightly retract the boom to let the chains relax. Measure the chain drape at the center of the rear 3rd stage and 2nd stage windows as shown in Illustration 3. See arrows in the windows for measuring locations. Snug the 4th stage extension and retraction chains until the chain tightness allows the dimensions of approximately 1” (25 mm) and 5” (125 mm) as shown in Illustration 3. Also snug the 2nd and 3rd stage compensation chains to the dimensions of 1 1/8” (29 mm) and 3 7/8” (98 mm) as shown. Assure that the drape in each pair of chains is matched so each chain carries its share of the load. Run boom in and out a few times and recheck all of the above dimensions. After proper settings, retighten the adjustment lock nuts.

The numbers “3” shown in the small windows on the bottom of the 2nd stage and base boom show the adjustment is about midrange. These numbers run from 1 to 6 (25 to 150 mm) in 1” (25 mm) increments. Numbers in these windows are approximate adjustment and cannot be used for final adjustment. Important are the dimensions stated above taken at the large side windows.

IC-200-3 BOOM CHAIN ADJUSTMENT

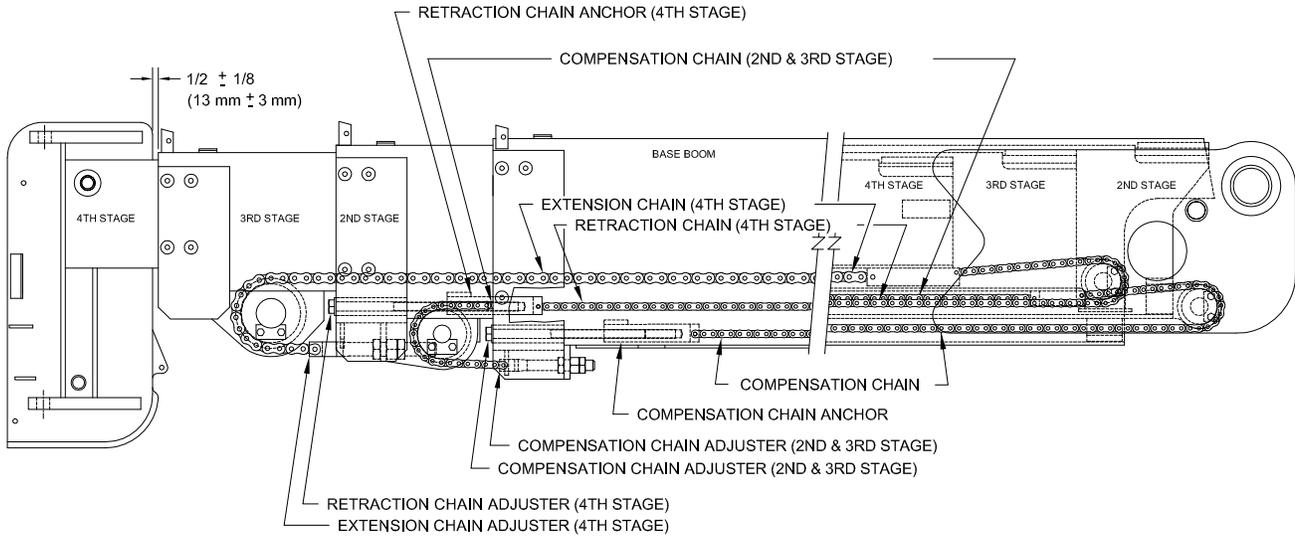


ILLUSTRATION 1

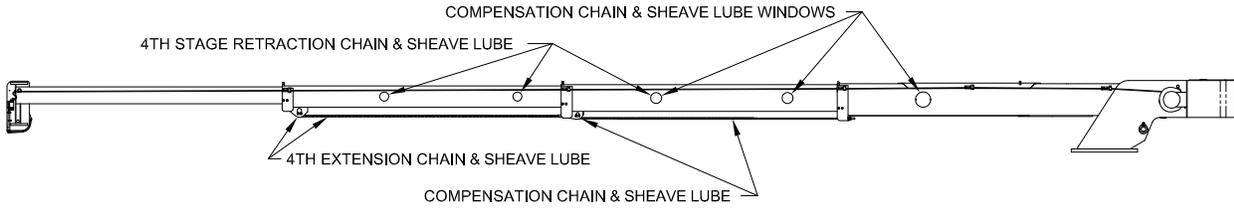


ILLUSTRATION 2

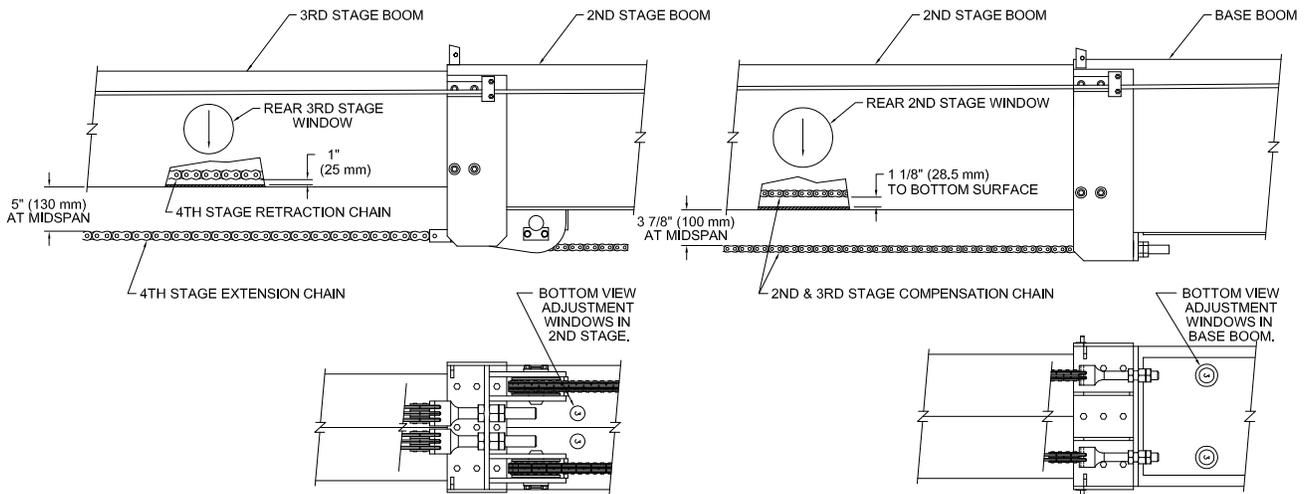


ILLUSTRATION 3

ENGINE MAINTENANCE:

Refer to the engine manual for engine maintenance.

AIR CLEANER SERVICE:

Gas or Dual Fuel Engine:

Clean out the dust cup every 50 hours. Loosen the clamps around the cup and housing and remove the cup. Dump dust out of cup. Clean gasket and sealing surfaces with a damp cloth. Replace cup gasket if it shows signs of damage. Replace cup with arrows pointing up and tighten clamp.

Clean the intake cap screen every 50 hours, and perform a thorough inspection of the air intake pipes and joints.

Clean the filter element every 250 hours or every 3 months, whichever comes sooner and replace the element every 500 hours or 6 months. Remove and clean the dust cup and gasket, and the intake cap. Remove the wing nut on the element and gently remove the element. Bumping the element during removal may cause dirt to fall into the clean air tube. Clean the inside of the housing carefully with a damp cloth. To clean the element, use a compressed air blower nozzle with less than 100 PSI and blow air from the inside of the element. Shake dust off of the outside of the element. Make sure the gaskets and element fit properly and reassemble, being careful not to allow any dust into the intake pipe.

Do not remove an element just for inspection. This may do more harm than good. You cannot judge the element condition by its appearance. If you think the filter may need service, remove it and replace or clean it before reassembling air cleaner.

Conditions where more dirt than usual is in the air, especially soot, will make more frequent service necessary. If there is a significant amount of dust in the dust cup when it is cleaned every 50 hours, clean the element every 100 hours and replace it every 200 hours--or more frequently in extremely dusty conditions. Excessive exhaust smoke or loss of power may indicate a plugged filter.

Diesel Engine:

Check the air filter restriction indicator daily with the engine running. If the indicator is in the "Replace" zone, replace the primary and secondary filter. If the filter has not been changed for over 1000 hours, replace the filter regardless of the restriction indicator reading.

COOLING SYSTEM:

Check the level of coolant in the radiator overflow tank daily. Add a mixture of antifreeze and distilled water to the overflow tank as required to maintain the coolant level. Check the radiator fins for dirt or debris daily and wash the fins with a pressure or steam cleaner every 50 hours or as required. Check the antifreeze protection level every 500 hours. Every 2 years, flush the cooling system and replace the thermostat and coolant. Pressure test the system as specified by the engine manufacturer.

SPARE PARTS LIST:

A spare parts list (including oil filter, fuel filter, etc.) may be found in the Parts Manual, under Engine Installation.

MAJOR ENGINE SERVICING OR OVERHAUL:

Major servicing or overhaul is beyond the scope of this manual. Consult authorized engine service manual or rely on an authorized engine service center.

MECHANICAL ADJUSTMENTS

FASTENERS:

All fasteners on the IC-200 should be checked and retightened if required, as a part of the preventive maintenance program. Particular attention should be given to the drive axle mounting bolts, pump mounting bolts, pump drive shaft bolts, rotation bearing bolts, rotation gearbox bolts, winch bolts, etc. All bolts used in assembly are heat-treated Grade 5 or 8. Torque the rotation bearing mounting bolts (3/4", Gr. 8) to 325 foot-pounds (440 Nm), or the nuts to 325 foot-pounds (440 Nm). Torque the wheel nuts to 500 foot-pounds (678 Nm). The torque chart on the next page can be used on all other bolts.

ROTATION GEARBOX:

The rotation gearbox assembly is attached to the chassis top plate by four capscrews. It is held in proper engagement with the external teeth on the bull gear by two setscrews. It is further restrained from torsional movement by two bolts on each side of the gearbox mounting flange. The gearbox should be adjusted with the boom centered over front of the chassis. This centers the gearbox pinion on the "high side" of the bearing gear teeth. Adjust the gearbox inward until there is "light contact" between pinion and bull gear teeth. Retighten the four mounting bolts and the four side bolts.

TRANSMISSION AND AXLE TROUBLESHOOTING AND OVERHAUL:

Procedures for transmission and axle troubleshooting and overhaul are beyond the scope of the BMC Maintenance and Parts Manuals. International Transmission Ltd. factory service manuals are available from BMC as follows:

Transmission Service Manual, BMC Part Number 990-00021

Axle Service Manual, BMC Part Number 990-00020

PARK BRAKE TEST AND ADJUSTMENT:

1. Fully apply the parking brake.
2. Start the engine, retract the boom to the appropriate traveling position and raise the outriggers.
3. Select fourth gear.

4. Push down hard on the foot brake pedal.
5. Select forward gear.
6. Move the park brake lever fractionally downward, just over center, slightly releasing it. Hold park brake lever switch in the off position (located in the lever bracket).
7. Slowly release the foot brake pedal.
8. If the machine has not moved, use maximum engine speed. The machine should not move.
9. Do not do this test for longer than 30 seconds.
10. Reduce engine speed to an idle.
11. Return the park brake lever to the fully ON position from its partially applied position. Place transmission in neutral.
12. If the machine moved during the test, adjust the parking brake by checking the clearance between the park brake pad and brake disc. Maximum clearance is .010" (0.254 mm) with park brake lever in the OFF position, and repeat the test.

TORQUE DATA

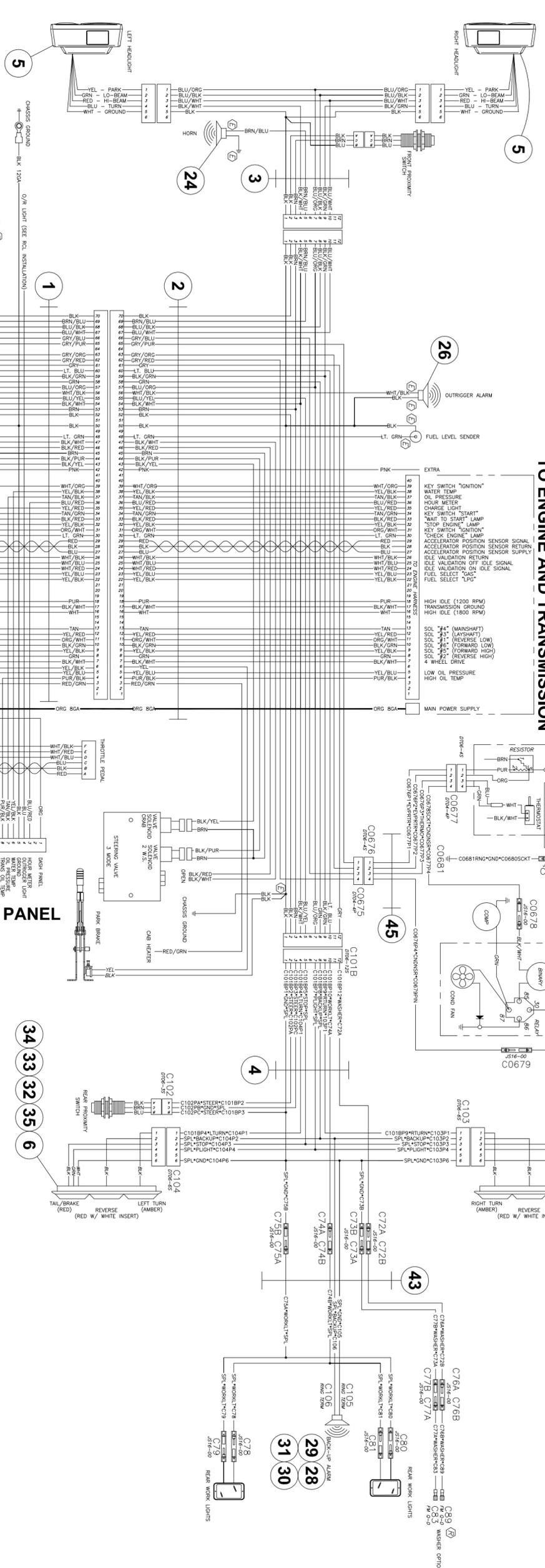
BOLT GRADE	SAE GRADE 1 OR 2	SAE GRADE 5	SAE GRADE 8
MARKING			
MATERIAL	LOW CARBON	MEDIUM CARBON STEEL Q & T	MEDIUM CARBON ALLOY STEEL Q & T
MINIMUM TENSILE STRENGTH	64,000 PSI (441 MPa)	120,000 PSI (827 MPa)	150,000 PSI (1034 MPa)
BOLT SIZE	RECOMMENDED TORQUE VALUES FT-LBS (N·m)		
1/4	5 (6.7)	7 (9.5)	10.5 (14)
5/16	9 (12)	14 (19)	22 (30)
3/8	15 (20)	25 (34)	37 (50)
7/16	24 (32)	40 (54)	60 (81)
1/2	37 (50)	60 (81)	92 (125)
9/16	53 (72)	88 (119)	132 (179)
5/8	74 (100)	120 (163)	180 (244)
3/4	120 (163)	200 (271)	296 (401)
7/8	190 (258)	302 (409)	473 (641)
1	282 (382)	466 (632)	714 (968)



THE FOLLOWING RULES APPLY TO THE CHART:

1. Consult manufacturers' specific recommendations when available.
2. The chart may be used with coarse and fine thread fasteners lightly lubricated.
3. Increase torque by 20% when multiple tooth (shakeproof) lockwashers are used.
4. The torque values are given in foot-pounds (N·m).
5. Inch-pounds equivalent may be obtained by multiplying by 12.

TO ENGINE AND TRANSMISSION



POSITION 3
BREAKERS AND DIODES

