OPERATION AND MAINTENANCE MANUAL
RT-300-2G

OWNER:

SOLD AND SERVICED BY:

MODEL NO. SERIAL NO.
STATEMENT OF WARRANTY FOR MOBILE CRANES

Broderson Manufacturing Corp. ("BMC") warrants its products to be free from defects in material or workmanship at the date of shipment from BMC. This warranty shall be effective only when validated by the return to BMC of its standard form of Warranty Validation Certificate, duly completed and signed by the original purchaser from BMC and any subsequent purchaser who buys a BMC product as a new product, and then only as to defects reported to BMC in writing within 1 year or 2000 hours, whichever occurs first, from the date a product is placed in service, as evidenced by such warranty validation certificate. **THIS WARRANTY APPLIES TO ALL PARTS OF BMC'S PRODUCTS EXCEPT ENGINES, DRIVE TRAINS, HYDRAULIC SYSTEM COMPONENTS, OR ACCESSORY EQUIPMENT, WITH RESPECT TO WHICH BMC MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND NO OTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED; the sole warranties, if any, with respect thereto being those made by the respective manufacturers thereof.**

The sole remedy for breach by BMC of this warranty shall be the replacement of any parts of its products which were defective at the date of shipment or, if (and only if) replacement of defective parts is impossible or is deemed by BMC to be impractical, replacement of the entire product or, at BMC's option, refund of the purchase price. The replacement remedies include labor in connection with the removal of defective parts and the installation of their replacements, as well as the cost of delivery and transportation of defective products or parts and the replacements thereof. The sole purpose of these remedies is to provide the purchaser with free replacement of defective parts or the entire product or to refund the purchase price. These exclusive remedies shall not be deemed to have failed of their essential purpose so long as BMC is willing and able to replace defective parts or the entire product or to refund the purchase price. The remedies herein provided shall be available only if BMC is given reasonable access to the product, including all allegedly defective parts, promptly after the defect is discovered. BMC shall have the right to return any allegedly defective parts to its plant or any other location selected by it, for inspection and testing to determine whether they were defective at the date of shipment, prior to replacement thereof.

The warranty herein made is extended only to the original purchaser from BMC and any subsequent purchaser who buys a BMC product as a new product. **WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, BMC EXPRESSLY DISCLAIMS THAT THE WARRANTY MADE HEREIN EXTENDS TO A PERSON WHO RENTS OR LEASES ANY BMC PRODUCT OR WHO PURCHASES ANY BMC PRODUCT AS A USED PRODUCT.** For purposes hereof, a BMC product shall conclusively be deemed "used" after the expiration of twelve (12) months from its placement in service, as evidenced by a duly completed and signed warranty validation certificate actually received by Broderson, or after such earlier time as it has been operated for more than one hundred (100) hours. BMC shall have no liability hereunder with respect to products which have been subjected to misuse, negligence, accident or other external forces which may have caused or accentuated any apparent failure of such products to conform to the warranty herein made.

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

**THE WARRANTY HEREIN MADE IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED. BMC MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER EXPRESS OR IMPLIED WARRANTY OF ANY KIND, TO ANY PURCHASER, LESSEE OR RENTER OF NEW OR USED BMC PRODUCTS OR ANY OTHER PERSON WHATSOEVER. NO PERSON IS AUTHORIZED TO ACT ON BEHALF OF BMC IN MODIFYING THE WARRANTY HEREIN MADE OR IN MAKING ANY ADDITIONAL OR OTHER WARRANTY.**

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

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

## SECTION 1 DESCRIPTION AND SPECIFICATIONS
- Introduction .................................................................... 1-1
- Dimensions and Orientation ........................................... 1-2
- Turning Dimensions...................................................... 1-3
- Description and Specifications....................................... 1-4

## SECTION 2 OPERATION
- Safety Rules.................................................................. 2-1
- Instruments and Controls.............................................. 2-9
- Control Functions........................................................ 2-10
- Sequence of Operation.................................................. 2-12
  - Driving the Vehicle.................................................. 2-12
  - Normal Gauge Readings............................................ 2-12
  - Operating the Crane.................................................. 2-13
- Rated Capacity Limiter.................................................. 2-13
- Crane Capacity............................................................ 2-14
  - Capacity Chart......................................................... 2-17
  - Capacity Chart Metric.............................................. 2-18
- Sheave Block and Downhaul.......................................... 2-21
  - Boom Tip Reeving Pattern........................................ 2-22
- Safety Devices............................................................. 2-23
- Optional Equipment..................................................... 2-25
  - Boom Extension...................................................... 2-25
  - Front Auxiliary Winch.............................................. 2-27
  - Pintle Hooks............................................................. 2-28
  - Switch and Indicator Symbols...................................... 2-29

## SECTION 3 MAINTENANCE
- Safety Rules.................................................................. 3-1
- New Unit Inspection and Test........................................ 3-3
- Operator Inspection and Test........................................ 3-4
- Maintenance Checklist.................................................. 3-6
- Chain Lubrication.......................................................... 3-8
- Lubrication Chart........................................................... 3-9
- Wire Rope Lubrication.................................................... 3-11
- Rotation Bearing Lubrication.......................................... 3-11
- Brake System Maintenance............................................ 3-11
- Engine Maintenance...................................................... 3-14
  - Air Cleaner Service.................................................. 3-14
  - Cooling System....................................................... 3-14
  - Spare Parts List....................................................... 3-14
  - Major Engine Servicing.............................................. 3-14
- Care of Hydraulic Oil.................................................... 3-15
- Hydraulic Oil Specification.......................................... 3-16
- Purging the Hydraulic System........................................ 3-17
- Hydraulic System........................................................ 3-19
- JIC Hydraulic System Schematic.................................... 3-20
- JIC Hydraulic System Schematic Metric........................ 3-21
- Steering System.......................................................... 3-22
SECTION 3  MAINTENANCE (cont’d)

Hydraulic System Adjustments........................................ 3-23
  Control Valves..................................................... 3-23
  Boom Sequence Valves......................................... 3-24
  Boom Cylinder Holding Valves.................................. 3-25
  Crowd Cylinder Holding Valves.............................. 3-26
  Hydraulic Seals.................................................. 3-27
Mechanical Adjustments................................................ 3-28
  General................................................................... 3-28
  Chain Adjustments................................................. 3-28
  Crowd Cylinder Assembly....................................... 3-31
  Boom Assembly..................................................... 3-31
  Rotation Gearbox Adjustment.................................. 3-32
  Wheel Alignment.................................................. 3-33
Transmission Maintenance............................................ 3-34
  Transmission Oil................................................... 3-34
  Filter....................................................................... 3-34
  Oil Change............................................................ 3-35
  Shift Control........................................................... 3-35
  Transmission Hydraulic System............................... 3-36
Parking Brake, Bleeding & Adjusting................................. 3-37
Transmission Troubleshooting......................................... 3-37
Towing....................................................................... 3-38
Hoist Cable................................................................... 3-39
Torque Data............................................................... 3-41
INTRODUCTION

The Broderson RT-300 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 RT-300-2G Operation and Maintenance Manual Part Number 0-990-30209. 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.
RT-300-2G TURNING DIMENSIONS

12'4" (3.76 m) AISLE WIDTH

23" (58 cm)

15" (38 cm)

16'2" (4.93 m) TURNING RADIUS CORNER CLEARANCE

8'8" (2.64 m) CLEARANCE CIRCLE

12'4" (3.76 m) AISLE WIDTH

ø36'2" (11.02 m)
DESCRIPTION AND SPECIFICATIONS

BMC’s RT-300 Rough Terrain Crane is a self-propelled crane designed for lifting and material handling applications, with the special features of high maneuverability, high flotation, 4-wheel steer and 4-wheel drive. The basic unit consists of a chassis and hydraulic boom assembly. The chassis includes a frame, four hydraulic outriggers, engine, 6-speed transmission, front steering-driving axle, rear steering-driving axle, fuel tank, oil tank, control station, three-mode full-power steering, all-weather cab, and lighting package. The boom assembly includes a hydraulic-powered rotating turret, hydraulic telescopic boom, hydraulic boom elevation, hydraulic-powered planetary gear winch, sheave block and downhaul. A Rated Capacity Limiter (RCL) is standard.

RT-300-2G:
4-section hydraulically extended boom with capacity of 30,000 pounds (13,600 kg) at 10 feet (3.05 m). Horizontal reach of 60 feet (18.3 m) and maximum height of 70 feet (21.3 m).

General:
Length:
Overall 29 feet 10 inches (9.09 m)
Chassis 16 feet 10 inches (5.13 m)
Width 8 feet 4 inches (2.54 m)
Height 11 feet 2 inches (3.40 m)
Wheelbase 9 feet 5 inches (2.87 m)
Ground Clearance (Chassis) 15 inches (38 cm)
Angle of Approach 24 degrees
Angle of Departure 22 degrees
Turning Radius 4-Wheel Steer: (Min.)
Outside Tire Centerline Radius 15 feet 7 inches (4.75 m)
Vehicle Clearance Circle Diameter 35 feet 2 inches (10.72 m)
Road Speed 23 miles per hour (37 km/h)
Gradeability (Calculated) 70 percent grade (35 degrees)
(Wheels may spin before values are reached)
Grade Limit 20 percent grade (11 degrees)
Outriggers:
Spread:
Pin-to-Pin of Shoe 12 feet 9 inches (3.89 m)
Overall Width 14 feet 5 inches (4.39 m)
Ground Penetration 5 inches (13 cm)
Weight For Basic Machine:
- Total: 44,800 pounds (20,320 kg)
- Front Axle: 23,730 pounds (10,310 kg)
- Rear Axle: 22,070 pounds (10,010 kg)

Drawbar Pull: 30,000 pounds (13,600 kg)

Hoist Pull (Bare Drum): 13,100 pounds (5940 kg)

<table>
<thead>
<tr>
<th>Boom Functions</th>
<th>Boom Movement</th>
<th>Boom Speeds</th>
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<tbody>
<tr>
<td>Rotation</td>
<td>Continuous</td>
<td>3.5 rpm</td>
</tr>
<tr>
<td>Elevation</td>
<td>0-70 degrees</td>
<td>22 Seconds</td>
</tr>
<tr>
<td>Extension</td>
<td>40 feet (12.19 m)</td>
<td>25 Seconds</td>
</tr>
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Hoist Line Speed: 240 ft/min (73 m/min)

Maximum Boom Height:
- Without Boom Extension: 70 feet 0 inches (21.34 m)
- With Boom Extension: 87 feet 11 inches (26.80 m)

Horizontal Reach:
- Without Boom Extension: 60 feet 0 inches (18.29 m)
- With Boom Extension: 80 feet 0 inches (24.38 m)

Engine:

**Cummins - QSB4.5L Turbo, EPA Tier 4i:**
Cummins QSB4.5L Tier 4 Interim turbocharged diesel engine. Water and charge air cooled, 4-cylinder, 272 CID (4.5L). It has a bore of 4.21 inches (107mm), a stroke of 4.88 inches (124mm) and is rated at 163 hp (125kW) at 2500 rpm with 468 foot pounds (635 Nm) maximum torque at 1500 rpm. 100 amp alternator included. 50 gallon (190 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. Tier 4 Interim engines must use Ultra Low Sulfur Diesel (ULSD) fuel that meets the EPA defined sulfur content of 15 parts per million (ppm).

**Cummins - QSB4.5 Turbo EPA Tier 3:**
Cummins Model QSB4.5 diesel engine, turbocharged, charge air cooled, four cylinder, 4.5 liter (275 CID). U.S. EPA Tier 3 certified. Bore 4.21 inches (107 mm), stroke 4.88 inches (124 mm). Rated 160 hp (119 kw) at 2,500 rpm. 460 foot pounds (624 Nm) maximum torque at 1,500 rpm. 95 amp alternator. Oil capacity, 11.6 quarts (11 L). Coolant capacity, 14 quarts (13.2 L). Electronic controls for three engine speeds during crane operation – 640, 1200 or 1840 rpm. Protection system shuts down engine when coolant is too hot or oil pressure is too low. Charge air cooler, grid heater and engine block heater which plugs into 120 volt AC extension cord are included. Tier 3 engines require the use of Low Sulfur Diesel (LSD) that meets the EPA defined sulfur content of 500 parts per million (ppm). Tier 3 engines may also use Ultra Low Sulfur Diesel (ULSD) fuel that meets the EPA defined sulfur content of 15 ppm.

Net Weight: -110 lbs. (-50kg)

**Fuel Tank:** 50 gallon (190 L) capacity.
Transmission:

Standard:
Funk Manufacturing Co. Model 2000 powershift transmission with 6 forward speeds and 3 reverse. Provides full powershifts at maximum engine speed in all gears. All shifting is done with a single-lever electrical control in the operator compartment. The transmission includes an automatic rear axle disconnect for two-wheel drive in speeds 4, 5 and 6 in forward and speed 3 in reverse. The other speeds are four-wheel drive. A torque converter with a stall torque ratio of 2.640:1 attaches directly to engine flywheel to drive transmission. Equipped with oil cooler and filter.

<table>
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<tr>
<th>GEAR RATIO</th>
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<th>GEAR RATIO</th>
<th>SPEED</th>
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<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>8.20 2.7 mph (4.3 km/h)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>8.20 2.7 mph (4.3 km/h)</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>4.64 4.8 mph (7.7 km/h)</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>3.53 6.3 mph (10.1 km/h)</td>
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<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>3.53 6.3 mph (10.1 km/h)</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>1.41 15.8 mph (25.4 km/h)</td>
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<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2.00 11.2 mph (18.0 km/h)</td>
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<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1.41 15.8 mph (25.4 km/h)</td>
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<tr>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>0.80 23.0 mph (37.0 km/h)</td>
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Front Axle:

Standard:
AxleTech planetary driving-steering axle with 16.42 to 1 ratio. Rigid mounted on front. Axle has limited-slip differential.

Rear Axle:

Standard:
AxleTech planetary driving-steering axle with 16.42 to 1 ratio. Rear axle is mounted with rubber elements to allow oscillation. Axle is not available with no-spin or limited-slip differential.

Brakes:

Standard:
Service brakes are four-wheel hydraulic disc brakes. 18.48 inch (46.9 cm) diameter disc at each wheel. System includes two 0.5 gallon (1.9 L) accumulators, unloading valve, and brake malfunction warning light. Parking brake is disc-type, spring applied, and hydraulically released. Mounted on front drive shaft at transmission.

Steering:

Standard:
Hydraulic steering unit with two 3.5 inch (8.9 cm) cylinders attached to each axle. Allows limited steering when engine is not running. A switch on the control panel is used to select front-wheel steering, 4-wheel steering or crab steering. Electronic sensors and control box automatically align the steering when a new mode is selected. Steering wheel and electronically controlled selector valve control 3-mode steering: crab, round and 2-wheel front axle steering.

Tires:

Standard:
17.5 x 25, 20-ply rating, mud lug.

Optional Tires:
Spare Wheel and Tire, Standard Size: Extra wheel with 17.5 x 25, 20-ply rating tire mounted, ready for service. Net Weight: 530 pounds (240 kg)
Chassis:

Standard:

Engine Covers:
Flip-up side covers.

Steps:
Grip-strut steps and grab bars provide easy two-step access to operator's compartment.

Outriggers:
Four independently controlled outriggers of swing-down design. Hydraulic cylinders are equipped with direct connected holding valves. Foot pad dimensions: 20 inches (51 cm) by 16 inches (41 cm).

Sheave Block and Downhaul Weight Storage:
Tray on left-hand side behind hydraulic tank for storing sheave block and downhaul weight for single-part line. Sheave block and downhaul weight are securely retained by chain and locking device.

Tie Downs:
Four holes (two front, two rear) that provide tie down locations for truck transport.

Optional Chassis Accessories:

Fenders:
Four bolt on steel fenders over tires. Designed to reduce mud and rocks thrown from wheels in off-road applications. Also acts as platform for entrance and egress to cab. Includes rubber mud flaps and additional steps. Net Weight: 750 pounds (340 kg)

Auxiliary Front Winch:*
Optional planetary gear winch, mounted on front outrigger frame, with a single-lever control on the operator console. Hydraulic powered to provide bare drum line pull of 15,000 lbs (6800 kg) and 29 ft/min (9 m/min) line speed on the fourth layer. Winch drum is 4.75 inches (12 cm) diameter by 9 inches (23 cm) long. Includes 125 feet (38.1 m) of 9/16 inch (14 mm) diameter 6x36 EIP-RRL-IWRC wire rope, minimum breaking force 33,600 pounds (150 kN). Also includes 10,000 lb (4500 kg) eye hook. A pintle hook is recommended for two-parting the line with a sheave block (pintle hook and sheave block not included). Winch is mounted to heavy-duty bracket with hook storage features. Net weight: 685 pounds (310 kg) *Requires operator guard

Lifting Eyes:
Consists of four eyes on chassis and turntable so slings can be attached for lifting crane. Net Weight: 40 pounds (18 kg)

Towing Eyes:
Consists of four eyes, two on front and two on rear, for towing. Net Weight: 40 pounds (18 kg)

Pintle Hook Front:*
T-60-AOL Holland pintle hook mounted on front outrigger frame member, rated for 30,000 pounds (13,600 kg) trailer weight. Net Weight: 15 pounds (6.8 kg) *Recommended with auxiliary front winch.
Pintle Hook Rear:  
T-60-AOL Holland pintle hook mounted on rear frame member, rated for 30,000 pounds (13,600 kg) trailer weight. Net Weight: 15 pounds (6.8 kg)

Operator Compartment:
Standard:
Operator control station provides one-position access to all chassis and crane controls.

Mirrors:
A 7 inch x 16 inch (18 cm X 41 cm) mirror on each side of the operator’s compartment provides visibility behind the crane.

All Weather Cab:
Consists of rigid-mounted canopy section and two removable hinged doors with safety glass. Rugged canopy structure with laminated glass front and top. Doors are equipped with keyed locks to protect operator’s compartment. Includes heater with two-speed fan, interior light, electric windshield wiper, 12-volt power outlet and a variable-speed electric defroster fan.

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:
Window Wiper - Top Window:
12-volt electric wiper on top window operated with its own switch.

Operator Guard:* 
Tubular steel weldment with heavy expanded steel mesh top and grille front section. Guard will tilt to allow cab windows to be cleaned. Operator Guard is not designed, rated or certified as a Falling Objects Protection System (FOPS) or Rollover Protection System (ROPS). Net Weight: 140 pounds (64 kg)  
*Required with auxiliary front winch.

Operator's Suspension Seat - Cloth: 
Full-suspension with adjustments for height, tilt, fore-aft, operator weight and with armrest angle adjustment. Net Weight: 0

Operator's Suspension Seat - Vinyl: 
Full-suspension with adjustments for height, tilt, fore-aft, operator weight and with armrest angle adjustment. Net Weight: 0

Air Conditioning:
Provides factory system using R134a refrigerant. Compact AC unit mounted in operator area, fan cooled condenser mounted on hood and belt driven compressor with magnetic clutch driven by engine. Net Weight: 125 pounds (57 kg)

Floor Mats:
Removable rubber mats in cab.
Electrical System:
Standard
Battery:
12 Volt, Group 31, 950 CCA battery.

Instrument Group:
Located at operator’s station, and includes fuel gauge, transmission oil temperature gauge, and hydraulic oil temperature gauge. Units with EPA Tier 3 engine include voltmeter, oil pressure gauge, and water temperature gauge. Units with EPA Tier 4i engine include an electronic display for engine data. Key switch and horn button on instrument panel. Hour-meter records only during actual engine operation. Also included are indicator lights for two-wheel drive, four-wheel drive, parking brake, outrigger position, and rear axle center position.

Lighting Kit:

Back-Up Alarm:
Provides pulsating sound from 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 Light:
Yellow strobe light mounted on top of engine hood for high visibility. Flashes 60-120 times per minute. Strobe draws only one-half amp. Includes switch in operator compartment.

Boom Work Lights:
Two halogen work lights, one on left side of boom to light boom tip and one on the turret to light ground under boom tip. Includes switch in operator compartment. Net Weight: 10 pounds (4.5 kg)

Hydraulic System:
Standard:
Triple gear pump, mounted on and driven by the main transmission, delivers 14, 28 and 40 gpm (53, 106 and 151 L/min) at 3,000 psi (207 bar) and 2,500 rpm engine speed. System protected by relief valves, 100 mesh suction-line strainer and 10 micron return-line filter.

Hydraulic Reservoir:
70 gallon (265 L) capacity, equipped with 40 micron breather filter on top and oil level gauge on side.
Boom:

Standard:
High strength steel construction, equipped with bearing pads for efficient support and extension. Double-acting hydraulic cylinders extend and retract the second and third boom sections. Double runs of high strength leaf chain extend and retract the fourth section. The second stage extends first and retracts last, controlled by sequencing valves in the boom. The third and fourth sections extend and retract together proportionally, controlled by chains. The extension system is equipped with a holding valve. Twin, double-acting hydraulic cylinders control the boom elevation and are equipped with direct connected holding valves. Boom angle indicator is provided on left side of the boom. Boom tip sheaves are provided for four-part line.

Boom Hoist:
Turret-mounted, planetary gear winch, is hydraulically powered to provide a bare-drum line pull of 13,100 pounds (5940 kg) and a speed of 185 feet per minute (56m/min). Line speed of the fourth layer on the drum is 240 feet per minute (73 m/min). Drum diameter is 9.75 inches (24.8 cm), length is 16 inches (40.6 cm). Includes 350 feet (107 m) of 9/16 inch (14 mm) wire rope, 6 X 36-EIP-RRL-IWRC, 33,600 pound (150 kN) breaking strength.

Downhaul Weight and Hook:
Downhaul weight and 10,000 pound (4540 kg) swivel hook to use with existing wedge socket on 9/16 inch (14 mm) load line. Specially designed to work with the anti-two-block system and to clamp the dead end of the rope. Weighs 180 pounds (82 kg)

Boom Rotation:
Heavy-duty ball bearing with external teeth supports boom. Rotation is by hydraulic motor and compound planetary gear drive. A spring-applied hydraulically released brake and an over-running load valve are provided. Hydraulic centerpost and electric slip rings allow continuous rotation.

Anti-Two-Block Device:
Designed to prevent damage to hoist rope and/or machine components from accidentally pulling sheave block or downhaul weight against boom tip. Consists of pivot arm at boom tip that is moved upward by sheave block or downhaul weight as hook approaches boom tip. Pivot arm actuates electric switch that is connected by cable reel to solenoid dump valve in hydraulic circuit. This valve will dump the HOIST RAISE, TELESCOPE EXTEND, BOOM LOWER circuits. No other circuits are affected. These circuits are returned to normal operation by lowering the load to a safe resting place with hoist or by retracting or raising boom to a shorter load radius. Key-operated, momentary override switch located under 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. 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 button on the RCL control panel and an override switch under the dashboard.
Sheave Block:
Double sheave block for four-part-line requirements. 12-inch (30.5 cm) O.D. sheaves for 9/16 inch (14 mm) diameter wire rope. Swivel hook with safety latch. Includes bar on top to actuate trip arm of anti-two-block device. 440-pound (200 kg) weight provides positive overhaul.

Optional Boom Attachments:
Boom Extension - 20 Ft. (6.1 m), Offset:
Provides 20 feet (6.1 m) of additional length for lifting loads with load line. May be set at 0 (in-line), 15 or 30 degrees offset. Swing-away boom extension may be stowed alongside base boom section when not in use. Tip sheave, knuckle sheave, attaching brackets and pins included. When boom extension is in the stowed position, the crane payload must be reduced by 500 pounds (230 kg). Includes anti-two-block system. Net Weight: 770 pounds (350 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. 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.

3. The operator shall not engage in any practice which will divert his attention while actually operating the crane.

4. Do not run the engine in an enclosed area or indoors without adequate ventilation.

5. 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.

6. 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 ASME B30.5, Sec. 5-2.4.
3. Keep operator's compartment and steps free of mud and grease.


5. Tools, lubricants, or rags on the crane should be kept in a secured toolbox.

6. **WARNING**

   **FALLING OBJECTS**
   DO NOT USE ROPE CLIP ON LIVE SIDE OF THE LOAD HOIST ROPE. DEATH OR SERIOUS INJURY CAN RESULT FROM A SERIOUSLY WEAKENED ROPE CAUSED BY A ROPE CLIP.

   **WARNING**

   **FLYING OBJECTS**
   DO NOT USE CRANE WITHOUT CABLE RETAINER PIN(S) IN PLACE OVER CABLE SHEAVE. DEATH OR SERIOUS INJURY CAN RESULT WHEN DOWNHAUL WEIGHT AND HOOK ARE PULLED OVER END OF BOOM.

7. 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. Move 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.

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

6. 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 2-19.

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 five 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, hoist lowering 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 20 feet (6.0 m) away from any electric power lines of unknown voltage. If voltage is known, use chart on side of turntable to determine the required clearance distance. When in doubt, contact the local power authority.

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. 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 (3 mph (5 km/hr) 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 deployed.
   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. Cranes with booms that extend ahead of the chassis require close watch because of "boom swing" when the chassis is turned in tight quarters.

4. **WARNING**

   PINCH POINTS

   KEEP ALL PARTS OF THE BODY INSIDE OPERATOR COMPARTMENT.
   DEATH OR SERIOUS INJURY CAN RESULT FROM MOVING MACHINERY.

5. Every effort has been made to make the BMC Rough Terrain Crane a stable vehicle. However, with the rigid front axle and the 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.

6. When this crane is to be parked on a grade, set parking brake and block wheels or extend outriggers fully.

7. 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. See your engine manual for fuel requirements.

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

INSTRUMENTS AND CONTROLS

The Broderson RT-300 dashboard is equipped with a standard instrument package showing, fuel level, transmission oil temperature, hydraulic oil temperature and engine hours. Also included are indicator lights for two-wheel drive, four-wheel drive, and parking brake. Units with EPA Tier 3 engine include gauges for electrical system volts, oil pressure and water temperature. Units with EPA Tier 4i engine include an electronic display for engine data.

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.

The RT-300 is equipped with a lighting package. An on-off switch and a high beam indicator are on the dashboard. The dimmer switch is located on the cab floor to the left of the brake pedal. Stop lights are controlled by operating the foot brakes. The turn signal control is located on the left side of the steering column. The emergency flasher lights are actuated by pulling outward on the lower lever. This turn signal is not self canceling. To cancel, actuate upper lever.

The parking brake switch is located on the right side of the operator. To apply, pull the switch toggle upward, then to the ON position. The brake is applied automatically if the engine stalls or is shut down. An indicator light shows when the brake is applied. A parking brake interlock switch prevents driving with the brake on.

The brake and accelerator pedals are located and operated as they are in other vehicles already familiar to the operator.

For units with Tier 3 engine: a switch operated 3-speed engine control is provided for use when operating the crane controls only. Low speed is the normal idle speed, about 700 RPM. To set the speed at 1200 or 1800 RPM, the transmission must be in neutral and the park brake on. Push the HIGH IDLE pushbutton and select 1200 or 1800 with the toggle switch. Speed may be toggled between 1200 and 1800 while the engine is running. To return to normal idle speed, press the brake pedal and turn off the park brake momentarily.

For units with Tier 4i engine: A three position switch on the left dash panel provides preset engine speeds. Transmission must be in neutral and parking brake must be set to activate system. Press the high idle control switch temporarily to the left, the engine will lock into the preset levels. The center position of the switch enables the engine to dwell at 1,200 RPM. The right switch position will increase the engine speed to 1,800 RPM. To restore the foot accelerator, ensure transmission is in neutral. Press firmly on the brake pedal, then temporarily release the park brake.

The powershift transmission control lever is located to the right of the operator's seat. The shifting pattern is shown on the control unit. There are six forward speeds and three reverse speeds. The shifter is an electric control. There is no clutch pedal. 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. The shift lever must be in neutral to start the engine. The parking brake switch prevents driving with the brake on.
Lights on the dashboard indicate two-wheel or four-wheel drive operation. Four-wheel drive is automatically disengaged in forward gears 4, 5 and 6 and in reverse gear 3. Avoid four-wheel drive operation on pavement except for short distances.

The steering wheel is directly mounted to the steering control unit of the all-hydraulic power steering system. The system will provide limited steering even if the engine stops running.

This system has three optional steering modes controlled by a switch on the dashboard and an electronic control module. This crane should not be driven until the driver is familiar with the steering modes and their resultant effect on vehicle movement. Round steer: Turning the steering wheel left will turn front wheels left and rear wheels right to give a tight turn. Front axle steer: Is like normal front axle steering with rear axle stationary and in line.

Crab: The vehicle will move at an angle depending on the degree of turn given. After moving the selector switch the wheels must be turned through the straight position before the new mode takes effect. An indicator light on the dash panel illuminates when the steering on the rear axle is centered.

**D A N G E R**

Like other mobile cranes, the RT-300 will tip over more readily than other types of vehicles. The operator should always control the vehicle speed to be compatible with terrain or road conditions.

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.

Units with an EPA Tier 4i engine have an electronic display module for engine data. The module can display a tachometer, water temperature indicator, system voltmeter, and other data. Please refer to the manual provided with the unit for detailed operation instructions.

**CONTROL VALVE FUNCTIONS**

The controls for operating the outriggers, boom swing, boom elevation, boom crowd, and hoist are located on the dashboard. The handles are directly connected to the hydraulic control valves. The placards adjacent to these handles identify the function controlled and the movement resulting from each handle actuation.

<table>
<thead>
<tr>
<th>RIGHT SWING ▲ LEFT</th>
<th>EXTEND ▲</th>
<th>LOWER ▼</th>
<th>OUTRIGGERS</th>
<th>LOWER ▲</th>
<th>EXTEND ▲</th>
<th>LOWER ▼</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWING ▲ LEFT</td>
<td>SLOW</td>
<td>SLOW</td>
<td>DOWN ▼</td>
<td>▲ LEFT</td>
<td>▼ LEFT</td>
<td>▼ RIGHT</td>
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<tr>
<td>CRADDLE ▼ RETRACT</td>
<td>HOIST</td>
<td>HOIST</td>
<td>REAR UP</td>
<td>FRONT</td>
<td>FRONT</td>
<td>FRONT</td>
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**Swing or Slew**: Pulling back on the lever will rotate the boom to the operator's left; pushing forward will rotate it to the operator's right.

**Boom or Derricking**: Pulling back will raise the boom; pushing forward will lower it.
**Crowd or Telescope:** There is a SLOW CROWD lever and an INTERMEDIATE CROWD lever. Pulling back on either lever will retract the boom; pushing forward will extend the boom. Pushing simultaneously on both levers produces fast extension speed. Maximum retraction speed is produced with the INTERMEDIATE CROWD lever alone. Attempting to retract with both levers will stall the engine or produce excess heat in the hydraulic system.

**Hoist:** Pulling back on either the SLOW HOIST or the INTERMEDIATE HOIST lever will raise the hook; pushing forward will lower the hook. Maximum hoist speed is obtained by actuating both levers simultaneously.

**Outriggers:** The four outriggers may be operated independently or simultaneously. Special attention must be given to avoid hitting personnel or obstacles. Assure that the outrigger shoe is properly positioned before making contact with the ground.

**Front Winch** (optional): Pulling back will pull the winch line in; pushing forward will pay the winch line out.

These controls may be used for simultaneous operation to achieve combinations of movements. For example, the crowd and 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 to the job site:

1. Perform the daily inspection and test. (See Page 3-4)
2. Switch park brake on.
3. Place powershift transmission lever in neutral.
4. With ignition on but engine not running, step on brake pedal 5-6 times. Brake warning light on dash should illuminate.
5. Start engine and allow a warming period.
6. Brake warning light should not be illuminated after engine start. If it remains illuminated, do not drive the crane.
7. While warming the engine set up the Rated Capacity Limiter configuration.
8. Stow boom over front.
9. Place steering selector in "Front Axle Steer."
10. Pull hoist line snug.
11. Retract outriggers.
12. Push outrigger feet over into stowed position.
13. Apply foot brake.
14. Switch park brake off.
15. Place transmission lever in a low gear.
16. Release the brake and depress the accelerator pedal.
17. Shift into higher gears as desired.
18. Slow down when making turns.
19. Set park brake and lower outriggers or chock wheels to park.

WARNING

Engine exhaust contains carbon monoxide, a poisonous gas that is invisible and odorless. Breathing engine exhaust fumes can cause death or serious illness. Do not run the engine in enclosed areas without adequate ventilation.

NORMAL GAUGE READINGS

Engine Coolant Temperature -- Allow engine to warm up to 150°F (65°C) before operating crane. Stop engine if temperature exceeds 215°F (102°C).
Engine Oil Pressure -- Stop engine if oil pressure does not exceed 15 PSI (1 bar) at low idle. Pressure varies with engine RPM.
Voltmeter -- The voltmeter should read about 13 to 14 volts when the engine is running.
Fuel -- Do not allow fuel tank to become empty. The engine will be difficult to restart and may require "bleeding" of injectors. Keep fuel tank full when idle to prevent condensation in tank.
Hydraulic Oil Temperature -- Stop operations if temperature gauge exceeds 200°F (93°C).
Transmission Temperature -- The normal transmission oil temperature is between 100°F (38°C) and 200°F (93°C). If the oil temperature is lower, try to use a higher gear. If the temperature is higher, try to use a lower gear. If the temperature rises to 250°F (120°C), stop the vehicle immediately, shift to neutral and run the engine at 1000-1200 RPM (just above idle).
Level Indicator -- Do not operate crane if it is not level. Small inclines can drastically reduce stability.
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. Switch park brake to "on."
3. Place transmission shift lever in neutral.
4. Start engine and allow a warming period.
5. While warming the engine set up the Rated Capacity Limiter configuration.
6. Set all outriggers fully down on firm, level surface. Use timber or steel plate cribbing under outrigger shoes as needed on soft ground. Outriggers should remain set during all crane operations except for pick and carry.
7. You may use the throttle control switch to set the engine speed to 1200 or 1800 rpm when the park brake is on and transmission is in neutral. Return to idle by releasing the park brake momentarily.
8. Meter the controls when beginning or terminating movement to prevent sudden starting or stopping, imposing undue shock loads on the equipment, especially when handling heavy loads. The control should be slightly actuated to begin movement and then slowly increased to desired operating speed. The results obtained from metering the control lever can also be achieved by coordinating the foot throttle control.

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.

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, the parts of line or the attachment changed. Telescope retract may also be used, if safe. DO NOT USE THE BOOM RAISE OR LOWER CONTROL as these 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 lowered to the ground with the hoist control.

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. On the other hand, if the boom is fully raised, (about 70°) the RCL may show an overload condition because the pressure in the boom lift cylinders 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 these switches 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 out (e.g. above horizontal). Check the light daily when the outriggers are down and there is no load on the hook. Raise each outrigger above horizontal, then lower. The light should come on when an outrigger is above horizontal.

**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 of **CRANE CAPACITY** above.
The Rated Capacity Limiter is designed to stop three crane functions at the limitations of the capacity chart. These are: BOOM LOWER, TELESCOPE EXTEND and HOIST RAISE. Great care must be exercised when handling a load near capacity or near a two-blocking condition. If the boom is being lowered and the Rated Capacity Limiter stops the boom movement, the load will tend to swing out. 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 function, 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 RT-300 is 30,000 pounds (13600 kg), but only at a 10-foot (3.0 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 following:

   On Outriggers -- Boom rotation is limited to an arc not to exceed the eight-foot wide front outrigger housing.
   On Rubber – Operations, including pick and carry, are limited to the boom centered over front, in line with the chassis.

Note that the 360 DEGREE 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.
**CAUTION**

The “ON OUTRIGGER” capacities of this crane are based on all outriggers being 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. One or more outriggers not set on firm surface or cribbing with all tires off ground.
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 surface are:
   1. Thin or cracked blacktop or concrete.
   2. Dirt that appears dry and firm but is moist or unpacked beneath the surface.
   3. Dirt with a frozen but thin crust.

**CAUTION**

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

The boom must sequence properly for the Rated Capacity Limiter to be accurate and for the load to be supported safely. That is, the second stage must extend completely before the third and fourth stages begin to extend. Also, the third and fourth stages must retract completely before the second stage begins to retract. Adjust the sequencing per the maintenance section of this manual if the boom does not sequence properly.

Do not operate the crane at a load radius where no capacity is listed on the chart. Even an empty boom may tip the crane on rubber if it is extended over the side past 44 feet (13.4 m).

**CAPACITY EXAMPLE (Also see Boom Extension Capacity Example)**

Refer to the RT-300-2G capacity chart on the preceding page. A load 5' X 5' X 5' (1.5m X 1.5m X 1.5m) and weighing 14000 lbs (6350 kg) is to be lifted for transport to a new location. The load is next to a narrow aisle, and must be lifted over the side, then swung over the front for transport. The center of the load is 8 ft (2.4 m) from the side of the crane. The distance from the center of rotation to the side of the crane is just over 4' (1.2 m). The load radius is therefore at least 5/2+8+4=14.5' (1.5/2+2.4+1.2=4.35 m). We must round up to the next higher load radius, rather than interpolate between numbers on the chart.

We see on the chart that 7500 lbs (3400 kg) is the maximum load on one-part line, so the sheave block is required. The chart shows the weight of the standard sheave block to be 440 lbs (200 kg). The rigger says that two slings are required, weighing a total of 50 lbs (23 kg). The total load is 14000+440+50=14490 lbs (6350+200+23=6573 kg).
Looking at the "360° ROTATION, ON RUBBER" column, we must use the capacity at the 16 ft (4.5 m) radius, which is the next larger radius on the chart from the actual load radius of 14.5 ft (4.4 m). The capacity on rubber is 8300 lbs (4320 kg). This leaves the ON OUTRIGGER columns. The outriggers should always be used whenever possible anyway. We see that we can lift up to 16900 lbs at a 20 ft load radius (7850 kg at a 6.0 m load radius). If possible, the crane should be positioned to lift the load over the front. This is the best position for stability. However, in this example, the load must be lifted over the side.

The load can be lifted, swung over the front. The boom can be retracted to set down at a 12' (3.7 m) load radius. The outriggers can now be raised. Checking the chart, we see that the capacity at 12' (4.0 m) is 22500 lbs (12290 kg). The load can be picked up and transported, provided the surface is smooth, level and paved.
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.

When installing the downhaul weight, the load line must pass over the upper tip sheave and the lower tip sheave that is directly below it. 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 a 12-inch (30cm) long dead end clamped in the block as shown in the figure below.

For loads above 7500 lbs (3400kg) a four-part line must be used on the sheave block as shown on the following page. The rope must be reeved as shown in the following figure. The lines must not cross over each other and the wedge socket should be pinned to the boom sheave plates as shown in the figure.
The dead end of the rope in the wedge socket should be clamped as shown in the figure. 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 striker plate bolted on top of the block should meet the boom sheave plates squarely when pulled up snugly.

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 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.
SAFETY DEVICES

There are safety devices on the RT-300 to maintain control of a load in case of power or hydraulic line failure. 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 piston seal. In either case, maintenance is required.

BOOM ELEVATION CYLINDER HOLDING VALVE:
A single-acting holding valve is integrally-mounted on each cylinder barrel. These valves hold the boom in the elevated position should power or hydraulic pressure line failure occur. These valves are adjustable to hold the desired load. If the boom creeps down with loads to maximum capacity, these valves should be adjusted. If adjustment fails to correct the problem, there is an internal leak in a holding valve or a hydraulic cylinder. Refer to the maintenance instructions.

BOOM CROWD 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 DEVICE:
The anti-two-block device prevents damage to hoist rope or machine components from accidentally pulling load hook against boom tip. There is a pivot arm at the boom tip that is moved upward by the load hook as it approaches the boom tip. An electric switch connected to a hydraulic solenoid valve dumps the HOIST RAISE, CROWD EXTEND, and BOOM LOWER circuits. No other circuits are affected. These circuits are returned to normal operation by operating the HOIST LOWER or CROWD 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 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.

SWING BRAKE AND HOLDING VALVE:
The boom swing position is held by a spring-applied, hydraulically released, parking brake in the swing gearbox and by an overrunning load valve in line with the swing motor. The valve relief cartridges, set at 2200 psi (152 bar), and the brake are designed to allow smooth starts and stops of the boom swing. A shuttle valve is also built into this valve to fully release the brake before swing begins.
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 hoist 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.

PARKING BRAKE:
A spring-applied, hydraulically released brake on the transmission holds the crane on slopes when the power is off or the park brake switch is in the ON position. If the engine dies while the crane is in motion, the brake will automatically be applied.

BOOM SEQUENCING VALVES:
The boom sequencing valves allow the stronger second stage boom section to extend before, and retract after, the lighter third and fourth stages. This arrangement assures that the boom is as strong as possible. The third stage must not extend until the RCL boom length reads 32 feet (9.7 m). The second stage must not retract until the third stage is fully retracted. If the boom extension or retraction does not follow this sequence, the sequencing valves need adjusting. See the maintenance instructions.

BRAKE WARNING LIGHT:
An indicator light is installed on the dash to alert the operator when the pressure is low in the brake accumulators. The function of this light should be checked daily. See Driving the Vehicle section on page 2-12.

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 no functioning.
OPTIONAL EQUIPMENT OPERATIONS

BOOM EXTENSION CAPACITY CHART:

The boom extension will increase the main boom reach by 20 feet (6.1 m). It will also pin in 3 positions relative to the main boom: In Line, 15° Offset, and 30° Offset. The main boom and boom extension capacity charts must both be considered when using the boom extension. The smaller capacity selected between the 2 charts must be used.

Consider this example: The boom extension is offset to 15° and the main boom angle is 40°. The load radius is 52 feet (15.8 m). The boom is over the side on outriggers. The main boom load chart (on page 2-16) shows a capacity of 3100 pounds (1380 kg) at 52 feet (16 m). The boom extension chart shows a capacity of 2600 pounds (1180 kg) at the angles described. Since 2600 (1180 kg) is the lower of the two capacities, it is the limiting capacity. Remember that the downhaul weight is 180 pounds (82 kg). The actual load on the hook is limited to 2600 (1180) minus 180 (82), which equals 2420 pounds (1100 kg).

INSTALLING BOOM EXTENSION ON TIP OF BOOM:

NOTICE

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

1. Set the outriggers.
2. Raise and extend boom 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 opposite side of stored 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 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. Extend boom to disengage from storage bracket. Swing the boom extension around to the front until the outer 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 the Rated Capacity Limiter configuration.

16. Store 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 the 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.

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 the Rated Capacity Limiter configuration.
STOWING THE OFFSETTABLE 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 the Rated Capacity Limiter configuration.

FRONT AUXILIARY WINCH:

A front auxiliary winch mounted on the front outrigger housing and controlled from the operator compartment. The winch has 125' (38m) of 9/16" (14mm) diameter 6x36 EIP-RRL-IWRC wire rope (33600 pound (150kN) minimum breaking force) and a 5-ton (4.5 metric ton) hook. Limit pulls to 10,000 pounds (4500kg). It has a single-part line pull of 15,000 pounds (6800kg) on the bare drum.

A front auxiliary winch may be used for the following:

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
A front winch must not be used 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 five wraps of rope remain on the drum to insure against the rope pulling out of its anchor.
4. Stand clear of a loaded winch cable. If it breaks, it can be very dangerous.
5. Keep hands clear of the winch and any sheaves that the cable passes over when the winch is being operated.
6. Do not over-tighten the hook on the storage bracket. This may damage the hook or the bracket.
7. Do not use the drive train to pull a load that is too heavy for the winch to pull. The drawbar pull of the RT-300 greatly exceeds the breaking strength of a single part of line for the front winch.
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 towing speed of 5 mph (8 km/hr).

---

**CAUTION**

**FLYING OBJECTS**

DO NOT EXCEED THE WORKING STRENGTH OF THE ROPE. SERIOUS INJURY OR MACHINE DAMAGE CAN RESULT FROM OVERLOADING.

---

**NOTICE**

6,000 LBS. (26 kN)

↓

30,000 LBS. (133 kN)
### 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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="On/Start" /></td>
<td>On/Start</td>
</tr>
<tr>
<td><img src="image" alt="Off/Stop" /></td>
<td>Off/Stop</td>
</tr>
<tr>
<td><img src="image" alt="Battery not charging" /></td>
<td>Battery not charging</td>
</tr>
<tr>
<td><img src="image" alt="Hour meter" /></td>
<td>Hour meter</td>
</tr>
<tr>
<td><img src="image" alt="Read operator's manual" /></td>
<td>Read operator's manual</td>
</tr>
<tr>
<td><img src="image" alt="Sound level notification" /></td>
<td>Sound level notification</td>
</tr>
<tr>
<td><img src="image" alt="Headlights (main/high beam)" /></td>
<td>Headlights (main/high beam)</td>
</tr>
<tr>
<td><img src="image" alt="Work light" /></td>
<td>Work light</td>
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<tr>
<td><img src="image" alt="Hazard lights" /></td>
<td>Hazard lights</td>
</tr>
<tr>
<td><img src="image" alt="Rotating beacon or strobe lights" /></td>
<td>Rotating beacon or strobe lights</td>
</tr>
<tr>
<td><img src="image" alt="Turn signals left/right" /></td>
<td>Turn signals left/right</td>
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<tr>
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<tr>
<td><img src="image" alt="Drain" /></td>
<td>Drain</td>
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</tbody>
</table>
MAINTENANCE

SAFETY RULES

1. Lower load and boom, raise outriggers, 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.

2. Disconnect battery when disabling crane or when welding on crane. Disconnect the transmission shifter, RCL, and battery when welding on crane.

3. Relieve hydraulic pressure when working on hydraulic parts by cycling the controls with the engine turned off.

4. Allow fluids and parts to cool before working on them.

5. Read maintenance instructions before beginning work.

6. 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.

7. Wear safety glasses and shoes.

8. Do not wear loose-fitting or torn clothing.

9. Remove rings and other jewelry.

10. Wear heavy leather gloves when working on wire rope.

11. Keep fingers, clothing and hair away from moving parts.

12. 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.

13. 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 points.

14. When inflating or adding air to a tire, place a tire cage over the tire and use a clip-on inflator 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.
15. Do not work on any machine that is supported only by jacks or a hoist. Always use adequate blocks or jack stands.

16. If it is necessary to work on the boom or outriggers in an unstowed condition, block them to prevent them from dropping unexpectedly.

17. Use a hoist when lifting components that weigh 50 (22 kg) pounds or more. Follow all hoist and rigging safety rules.

18. Do not use lower grade fasteners if replacements are necessary.

19. 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.

20. 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 use of a rope clip on the hoist rope.

21. Replace any instruction or warning placards that are lost or damaged or are not readable.

22. Always replace all guards and covers after working on the crane.

23. 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.

24. 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.

25. When using pressure spray to clean the crane, cover all electronic components with sheets of plastic to protect them from spray.

26. Do not allow anti-freeze to contact skin. Rinse off spills immediately with plenty of water. Anti-freeze is highly toxic if ingested.

27. Always disconnect negative cable first and refasten last to prevent an 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.

**WARNING**
CHEMICAL EXPLOSION
KEEP SPARKS AND OPEN FLAMES AWAY.
BATTERIES GIVE OFF HYDROGEN GAS WHICH CAN BE EXPLOSIVE.
DEATH OR SERIOUS INJURY CAN RESULT. ALWAYS WEAR EYE PROTECTION.
MAINTENANCE

The Broderson RT-300 Rough Terrain 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 fuel tank level.
7. Check tire pressure.
8. Check for loose pins, bolts, and retainers.
9. Check the park brake reservoir for fluid level.
10. Operate foot brake. Check for operation.
11. Operate park brake. Check for operation.
12. Operate accelerator pedal. Check for operation.
14. Check oil pressure.
15. Check voltmeter.
16. Check power steering for operation.
17. Check steering operation in each steering selector valve position.
18. Check rear axle indicator for operation.
20. Check transmission shift lever for operation.
21. Check the transmission oil level in neutral and idle with oil at 160° to 200°F (71° to 93°C).
22. Check lights and turn signals for operation.
23. Test drive unit and check for normal operation.
24. Check operation of hydraulic outriggers.
25. Check boom rotation.
26. Check boom elevation.
27. Check boom crowd function. (Pay out hoist cable during power extension.)
28. Check anti-two-block system for proper operation and cutout of boom functions.
29. Check outrigger warning light for proper operation.
30. Perform a load test according to the Rated Capacity Limiter Operation Manual.

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 and able to perform safely.

Daily:

1. Check levels of engine oil, coolant and transmission fluid.
2. Drain fuel-water separator.
3. Check crank case breather tube for cracks, ice or sludge.
4. Check cooling fan.
5. Check exhaust system for cracks or leaks.
6. Check air cleaner intake system for cracks or looseness. Check air filter restriction indicator if equipped.
7. Check general condition of tires.
8. Visually inspect for loose pins, bolts, physical damage and leaks.
9. Check hydraulic hoses, particularly those that flex during crane operation.
10. Check hydraulic oil level.
11. Check fuel level.
12. Check engine oil pressure.
13. Check engine coolant temperature.
14. Check battery charging voltage.
15. Check transmission temperature.
16. Check hydraulic filter indicator gauge after running at least twenty minutes.
17. Check hydraulic brake operation. Check warning light operation, as shown in brake maintenance section on page 3-11.
18. Check parking brake operation.
19. Check power steering operation.
20. Observe chassis for normal driving operation.
21. Observe boom operation for normal power and speed.
22. Check load line and hooks for damage.
23. Check condition of sheaves and load line retainers.
24. Check anti-two-block system for proper operation.
25. Check horn, back-up alarm, and outrigger alarms for proper operation.
26. Check operation of all transmission gears, forward and reverse.
27. Clean all glass and check for cracks.
28. Check operation of all warning and safety devices.
29. Check operation of Rated Capacity Limiter according to the RCL Operation Manual.
30. Check that the Drum Rotation Indicator is functioning.
31. Check the outrigger warning light for proper operation as described in page 2-14.
OPERATOR INSPECTION AND TEST (continued)

Weekly:

1. Check tire pressure -- 100 psi (690 kPa).
2. Visually inspect axle mounting bolts.
3. Check for loose wheel nuts (475 ft.-lbs. (645Nm) torque required.
4. Check lights and turn signals.
5. Check brake lines and power steering lines for damage.
6. Check operation of boom sequence valves.
7. Check operation of swing brake for smoothness.
8. Check operation of hoist brake for smoothness.
9. Check outrigger holding valves for operation.
10. Check boom topping holding valve for operation.
11. Check boom crowd holding valve for operation.
12. Check three steering modes.
13. Check operation of windshield wipers.
14. Boom extension (if equipped) properly pinned with retainers in place.
15. Clean all glass and check for cracks.
16. Check hydraulic oil level in parking brake intensifier reservoir in the engine bay.

Monthly:

1. Check accumulator pre-charge as shown in brake maintenance section on page 3-12.
RT-300 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. Check fluid levels in engine, transmission, hydraulic tank and parking brakes.
3. Check tension and condition of engine belts.
4. Inspect air intake and exhaust system for cracks, leaks, and loose bolts.
5. Visually inspect welds on boom, turret and outriggers.
6. Check outrigger warning light as described on page 2-14.
7. Clean steering proximity sensor tips.
8. Inspect wire rope thoroughly.
9. Inspect for physical damage and leaks.
10. Check tire pressure and condition (100 psi (690 kPa) on 17.5 x 25, 20 ply).
11. Clean radiator fins and check coolant level.
12. Tier 3 engine: Clean air cleaner inlet, dust cap and dust cup.
13. Change engine oil and filter after first 50 hours. Replace at intervals specified by engine manufacturer thereafter.
14. Change the hydraulic filter after first 100 hours and at 500 hours thereafter.
15. Check rotation gear and pinion fit and gear train backlash.
16. Check rotation bearing and gearbox bolt tightness.
17. Check axle mounting bolts.
18. Torque wheel mounting nuts to 475 foot-pounds (645 N-m).
19. Check for loose pins or pin retainers.
20. Check brake lines and steering lines for damage.
21. Measure extension and retraction chain sag and adjust, if necessary.
22. Inspect sheaves and hooks for damage or excessive wear.
23. Change transmission fluid and filter after the first 20 hours. Change filter whenever the indicator light stays on with the fluid above 100°F (38°C) or every 200 hours or 6 months, whichever is sooner. When the filter is changed because the indicator shows it is plugged, change the fluid at every other filter change. When the filter is changed at 200 hour intervals and the indicator light has not been on, change fluid every 600 hours.
24. Perform a load test according to the Rated Capacity Limiter manual.
25. Check horn, outrigger alarm, and backup alarm.

250 HOUR INTERVAL:
1. 50 hour maintenance.
2. 50 and 250 hour lubrication.
3. Check engine mounts and radiator mounts.
4. Adjust and lubricate boom chains and chain sheaves.
5. Inspect all bolts for tightness.
6. Clean engine and battery.
7. Visually inspect all welds for cracks.
8. Check hydraulic fittings and centerpost for leaks.
9. Check parking brake pad-to-disc clearance.
500 HOUR INTERVAL:
1. 50 and 250 hour maintenance.
2. 50, 250 and 500 hour lubrication.
3. Check antifreeze for protection level and cleanliness.
4. Change hydraulic filter element and inspect oil from element.
5. Check condition of all operational and warning placards.
6. Torque mounting bolts on rotation bearing and gearbox, winch, axles and front outrigger. See instruction at beginning of the Mechanical Adjustments Section.
7. Inspect boom sections for signs of overload, excessive wear, or other damage.
8. Check axle toe-in.

1000 HOUR INTERVAL:
1. 50, 250 and 500 hour maintenance.
2. 50, 250, 500 and 1000 hour lubrication.
4. Change hydraulic oil and filter and clean breather, tank and suction strainer.
5. Replace vapor block in slip ring. See turret installation in parts manual.
6. Remove tires and inspect brake pads and rotors. Refer to Brake System Maintenance on page 3-12 for replacement criteria.

6 MONTH INTERVAL: (For usage less than 250 hours in 6 months)
1. Perform 250 hour maintenance and lubrication.
2. Change transmission filter if not changed in last six months and inspect fluid.
3. Change hydraulic filter element and inspect oil.

12 MONTH INTERVAL: (For usage less than 500 hours per year)
1. Perform 6 month maintenance.
2. Perform 500 hour maintenance.
3. Change hydraulic oil and filter and clean breather, tank and suction strainer.
4. Change transmission fluid if not changed in last 12 months.

24 MONTH INTERVAL:
1. 12 month maintenance.
2. Pressure test engine cooling system.
3. Flush cooling system.
5. Fill with new coolant and distilled water.

S/N: ___________ HOURS: ______ DATE: ________ BY: _______________________

COMMENTS & PARTS REQUIRED
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
CHAIN AND CHAIN SHEAVE LUBRICATION

The chains and chain sheaves should be lubricated every 250 hours. Chain sheaves have lubricated bearings and can be reached with the boom retracted or fully extended as shown below. Use all-purpose grease in a grease gun. The boom must be fully extended and horizontal to lubricate the chains. The extension chains are exposed under the bottom of the boom. A series of access windows exposes the retraction chains. Lubricate the chains with 30-weight engine oil by either spraying or brushing. Do not attempt to grease chain shafts or oil chains inside the boom with engine running. The boom may move while your hands are inside. Relieve any trapped pressure by cycling the control valve with the engine off.
## RT-300 LUBRICATION SCHEDULE

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>LUBE SYMBOL</th>
<th>LUBRICATION INTERVALS</th>
<th>NOTES</th>
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<td></td>
<td></td>
<td></td>
<td>50 HOUR</td>
<td>250 HOUR</td>
</tr>
<tr>
<td>1</td>
<td>Accelerator Linkage</td>
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<tr>
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<td>Anti-Two-Block Arm</td>
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<tr>
<td>3</td>
<td>Axle Differential</td>
<td>MPL</td>
<td>X</td>
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<td>4</td>
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<td></td>
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</tr>
<tr>
<td>5</td>
<td>Axle Planetary Hubs</td>
<td>MPL</td>
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<td>6</td>
<td>Boom Extension Pins</td>
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</tr>
<tr>
<td>7</td>
<td>Boom Ext/Retr Chains</td>
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<td></td>
</tr>
<tr>
<td>8</td>
<td>Boom Ext/Retr Sheaves</td>
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<td>X</td>
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<tr>
<td>9</td>
<td>Boom Rub Pads</td>
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<td>10</td>
<td>Cab Hinges &amp; Latches</td>
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<td>Hook Swivel &amp; Pin</td>
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<td>Steering Cylinder Ends</td>
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<td>Winch</td>
<td>MPL</td>
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<td>Wire Rope Retainers</td>
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### LUBE SYMBOLS

- **EO** - Engine Oil - See Specs in Engine Manual
- **HO** - Approved Hydraulic Fluids - See Specs in Hydraulics Section
- **MPG** - Multi-Purpose Gun Grease
- **MPL** - Multi-Purpose Gear Lube - SAE 80W-90
- **OGG** - Open Gear Grease, Such as Mobilkote S
- **SIL** - Silicone Lube - Aerosol with Concentrating Tube
- **2-X** - AMOVIS #2-x
- **ATF** - Mobil ATF D/M or equivalent

*See Procedures in the Manual*
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.

WARNING
Always wear heavy leather gloves when handling wire rope.

ROTATION BEARING LUBRICATION

There are two grease zerks, one each in a hole on the left-hand and right-hand side of the turntable plate. These should be used to lubricate the bearing every 50 hours. Rotate the turntable about 45° and pump some grease into each zerk. Repeat until the turntable has rotated two revolutions. Use about one 14 ounce (0.4 L) cartridge of grease each time the bearing is lubricated.

Also, lubricate the gear teeth of the rotation bearing at the 50 hour intervals. 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. Replace the pinion cover.

BRAKE SYSTEM MAINTENANCE

WARNING
The brake system of the RT-300 requires routine maintenance to ensure proper operation. Failure to properly maintain the brake system may result in property damage, injury, or death.

Brake Malfunction Light: Mounted on the dash panel. If the light illuminates during normal crane operation, driving the crane, or operating the brakes, discontinue operating the crane and take out of service. This light indicates that the pressures in the brake accumulators are too low for reliable brake operation. The problem must be found and fixed before driving the crane any further.

To check that the brake malfunction light is operating correctly, turn the ignition key to the ON position but do not start the engine. Pump the brake pedal several times to discharge the accumulators. If the light does not illuminate, there is a malfunction in the sensor or in the power supply to the light. The problem must be found and fixed before driving the crane.
Brake dust may be hazardous. Observe precautions to prevent breathing large amounts of brake dust.

Brake Pads and Rotors: Recall that the steering system on the RT-300 is non-load reactive. The operator will not be able to “feel” pad or rotor problems in the steering wheel. On a weekly basis, check to see if the rotors appear worn, grooved, warped, or otherwise damaged. When applying the brakes, listen for squeaking. Observe the wheels for any vibration or unusual motion during braking. If any of these conditions are present, a thorough inspection is required to find and fix the source of the problem.

Regardless of other indications, a thorough inspection of the pads and rotors must be performed at least every 1000 hours. Remove the tire and wheel assemblies. Note that proper tire handling equipment must be used when removing tires of this size. Inspect the pads, and replace them if they are cracked, worn. Replace pads if the lining without metal back plate is less than 0.125” thick. Inspect the rotors, and replace them if they are grooved or warped. Replace rotors if they are less than 0.5” thick.

Brake Unloading Valve: Mounted under the floorboard of the operator’s compartment. Also called an accumulator charging valve. The brake unloading valve sends pressure to the accumulators if low pressure is detected. No routine maintenance is needed on the brake unloading valve. The operator can hear the accumulators charge. If the accumulators charge frequently without depressing the brake pedal, the brake unloading valve, accumulators, or brake hoses may be leaking. If no leaks can be found, check accumulator pre-charge pressure. If pre-charge pressure is adequate, it may be necessary to repair or replace the brake unloading valve. If the accumulators do not charge, take a long time to charge, or cycle very rapidly, it may be necessary to repair or replace the brake unloading valve. Relief pressure for the brake circuit is located in the unloading valve. It is set at 2925 psi (202 bar) at the factory. The relief pressure cannot be adjusted. The relief pressure can be checked by installing a pressure gauge at the P port of the valve.

Brake Modulating Valve: Directly connected to the brake pedal. This valve sends pressure and flow to the brake calipers when the brake pedal is depressed. Lubricate the pedal hinges with a silicone lubricant as shown on the lubrication chart on page 3-10. No other routine maintenance is required. If the brakes do not apply and the Brake Malfunction Light is not illuminated, the brake modulating valve may need repair or replacement. If the brakes do not fully release and the brake calipers are functioning properly, the brake modulating valve may need repair or replacement.
**Brake Accumulators:** Mounted under covers behind the operator’s seat. The brake accumulators store hydraulic oil under pressure for use at the brake calipers. They are bladder-type accumulators, and require a pre-charge pressure in the gas bladder. The brake accumulator pre-charge pressure must be maintained on a monthly basis as follows:

1. Set park brake or put machine on outriggers. Turn off engine.
2. Pump the brake pedal several times to discharge stored oil pressure.
3. Remove the covers above the accumulators. If oil is found on the covers, determine the source before proceeding.
4. Remove protective cap from the accumulator.
5. Connect a pressure gauge to the accumulator valve stem.

**WARNING**
Accumulator pressure gauges will not detect accumulator pre-charge pressure if improperly used. Carefully review pressure gauge and pre-charging instructions included with commercially available gauge kits.

6. Measure accumulator gas pre-charge pressure. Nominal pressure is 1000 ± 100 psi (69 ± 6.8 bar).

**WARNING**
NEVER use shop air or oxygen to pre-charge accumulators. ONLY use inert dry nitrogen (N$_2$) gas. Failure to use proper gas can cause accumulator damage or failure, leading to property damage, injury, or death.

7. If necessary, add only dry nitrogen gas (N$_2$).

**CAUTION**
Always replace caps and covers after pre-charging accumulators. In the event of a leak, missing covers could allow high pressure oil to enter the operator’s compartment. High pressure hydraulic oil can be injected into the skin, causing serious injury.

8. Disconnect all gauges. Replace valve caps and covers.

If the accumulators are unable to hold a pre-charge pressure, or if the brakes fail to operate properly, they may be damaged. The accumulator pressures should cycle between 2175 psi (150 bar) and 2675 psi (184 bar). Accumulator bladder replacement instructions and accumulator replacement instructions ship with replacement parts. In the event that instructions are not included, contact BMC. Proper procedure is necessary to prevent damage or premature failure of replacement parts.
ENGINE MAINTENANCE

Refer to the engine manual for engine maintenance.

AIR CLEANER SERVICE
Tier 3 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. Perform a thorough inspection of the air intake pipes and joints every 250 hours.

Replace the filter element every 500 hours or every year, whichever comes sooner. 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. Make sure the gaskets and element fit properly and reassemble.

Never remove an element for inspection. This will do more harm than good. You cannot judge the element condition by its appearance. Also do not try to clean a used element. It is safer to keep the used element in place until a replacement can be obtained.

Conditions where more dirt than usual is in the air, especially soot, will make more frequent changes necessary. Excessive exhaust smoke or loss of power may indicate a plugged filter.

Tier 4i Engine:
Check the air filter restriction indicator daily with the engine running. If necessary, use a ladder or steps to view the restriction indicator. 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 two 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 and Transmission 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.
CARE OF HYDRAULIC OIL

The hydraulic system contains many precision, highly pressurized 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 RT-300 is equipped with a 100-mesh suction strainer, a breather filter and a 10-micron, return-line filter on a 70-gallon (265 L) tank. The filter must be changed after the first 100 engine hours to eliminate the contaminants generated during run-in. Thereafter, it is to be changed at every 500 hour maintenance interval.

The filter is located in the return line near the tank. Clean the filter and the surrounding parts with pressure washer before changing, to prevent dirt from falling into the clean oil tube. To minimize oil loss, close the shutoff valves near the filter. Be sure shutoff valves are fully opened before starting engine.

Remove the filter element and catch the hydraulic oil in a clean container. 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.

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.

The hydraulic oil should be changed every 1000 hours or once a year, whichever is sooner. Wash the oil tank and filter before changing the oil. Retract the crowd, topping and outrigger cylinders. Leave the shutoff valves open behind the tank and remove the drain plug. Catch the oil and dispose of it properly.

Remove the cleanout cover on top of the tank and take out the suction strainer that is below the cleanout and near the bottom. It is threaded onto a pipe nipple at the suction port. Clean the strainer with solvent and compressed air and reinstall it. Disassemble the breather element on top of the tank and clean it with solvent and compressed air. Clean out the tank with solvent and compressed air. Clean the cleanout cover, seal, and the plug and reinstall them.

Replace the return-line 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, if necessary, with cylinders retracted.
HYDRAULIC OILS FOR RT-300

<table>
<thead>
<tr>
<th>AMBIENT TEMP:</th>
<th>-40° to 75°F (40 to 24°C)</th>
<th>-15° to 110°F (26° to 43°C)</th>
<th>50° to 130°F (10° to 54°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>POUR POINT:</td>
<td>-40°F MAX (-40°C MAX)</td>
<td>-15°F MAX (-26°C)</td>
<td>0°F (-18°C)</td>
</tr>
<tr>
<td>VISCOSITY INDEX:</td>
<td>140 MIN</td>
<td>5 to 100</td>
<td>5 to 100</td>
</tr>
<tr>
<td>VISC. SSU@100°F:</td>
<td>200 MAX</td>
<td>230 MAX</td>
<td>40 MAX</td>
</tr>
<tr>
<td>SSU@210°F:</td>
<td>44 MIN</td>
<td>47 MIN</td>
<td>53 MIN</td>
</tr>
<tr>
<td>EXAMPLES:</td>
<td>MOBIL DTE-13</td>
<td>MOBIL AW-46</td>
<td>MOBIL AW-68</td>
</tr>
<tr>
<td></td>
<td>MOBIL UNIV-ATF</td>
<td>MOBIL DTE-25</td>
<td>MOBIL DTE-26</td>
</tr>
<tr>
<td></td>
<td>TEXACO TYPE F</td>
<td>CONOCO SUPER 46</td>
<td>CONOCO SUPER 68</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TEXACO HD 46</td>
<td>TEXACO HD 68</td>
</tr>
</tbody>
</table>

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

The RT-300 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 (38°C), the oil should be replaced with an extreme temperature oil. The fluid level in the reservoir should be checked with all hydraulic cylinders retracted.

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 valves closed or with insufficient oil level in the reservoir.

Observe the operation of the machine. If the oil is too cold, the machine will get sluggish and should be warmed up further before sustained hard work is attempted. If the oil is too hot, leakage will increase, pump efficiency will go down, system will lose pressure, and moving parts will not be properly lubricated. Be certain machine is filled with the proper oil for the prevailing operating temperature. 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. Oil temperature should never exceed 200°F (93°C).

Indications of an excessive operating temperature are:
1. Control handles become more difficult to operate.
2. Control handles stick instead of returning to neutral.
3. Excessive heat around valves and reservoir.
PURGING THE HYDRAULIC SYSTEM

If excessive water or other contamination is found in the hydraulic oil, the source should be found and fixed, and the oil should be changed. However, there will still be a large quantity of contaminated oil in the hydraulic cylinders. This oil should be purged by the following procedure:

1. After the reservoir is cleaned and the filter replaced, fill the reservoir with clean oil. Do not start the engine or move any controls until the proper point in this procedure.

2. Monitor the oil level and do not allow it to fall below 15" (40 cm) from the top of the fill neck during this procedure.

3. Run the engine at low idle during this procedure to minimize oil loss and the possibility of pump damage from cavitation due to low oil level.

4. Remove the hook from the load line and pull the load line out of the boom tip.

5. With the engine still stopped, close the shutoff valve on the two 1-½" (3.8 cm) return lines, but not on the 3" (7.6 cm) suction line. Disconnect all six return line hoses near the reservoir and run them into a waste oil sump or barrel.

6. Start the engine and run at low idle for about 17 seconds after flow starts from return lines into waste oil sump. This should purge about 7 gallons (27 L) from the pressure and return lines, which is about what they contain. Stop the engine.

7. Reconnect the return lines, open the shutoff valves and fill the reservoir.

8. Run the engine at low idle for thirty minutes to filter the oil in the reservoir.

9. Disconnect the steering return hose from the steering control unit at the point where it connects at the tank. Cap the fitting on the tank tee. Run the hose into the waste oil sump. Open all shutoff valves.

10. Run the engine at low idle and turn the steering wheel fully to the right, then fully to the left and then back to straight.

11. Reconnect the steering return hose. Be sure all shutoff valves are open.

12. Position the crane so that the boom may later be fully extended, the outriggers fully extended and the boom rotated and fully topped up while retracted. Do not operate these functions until the proper step.

13. Disconnect the return hose from the return filter inlet and cap the fitting on the filter. Run the hose into the waste oil sump. Shutoff valves must be open.

14. Pull the BOOM RAISE lever fully back in the raise position and start the engine. Run at low idle until the boom is fully topped up, then stop engine quickly.

15. Reconnect the return hose and open the shutoff valve.

16. Lower the boom back to the stowed position, and stop engine.

17. Close the center shutoff valve on the reservoir and disconnect the two return lines from it. Run the hoses into the waste oil sump.
18. Push all four outrigger levers fully forward and run engine until the outriggers all touch the ground. Stop the engine.

19. Release the outrigger levers and pull the SWING lever fully. Run the engine for 3 seconds and stop engine.

20. Release SWING lever and pull SLOW HOIST lever to full raise position and run engine for 7 seconds, then stop engine.

21. Fill hydraulic reservoir.

22. Release hoist lever and push SLOW CROWD lever fully forward in the extend position. Run the engine until the boom extends fully, then stop engine.

23. Reconnect the return hoses. Be sure all shutoff valves are open.

24. Retract the boom and fill the reservoir.

25. Run engine and cycle all of the cylinders in and out several times.

**REMOVAL OF AIR FROM HYDRAULIC CIRCUITS**

If air has been introduced into the hydraulic oil or trapped in a hydraulic cylinder, performance of the machine may suffer. The source of the air should be found and fixed. Purge remaining air from hydraulic circuits as follows:

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. Raise and lower 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. With the crane on outriggers, bleed the fluid lines to the brake calipers.
10. 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 hoses that connect to the piston sides of the cylinders, and follow back to the RCL computer. Find the hoses that connect to the rod sides of the cylinders, and follow 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.

11. Check the level of oil in the hydraulic reservoir and add more if necessary.

12. 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.

13. If necessary, cycle functions again to remove remaining air.

**HYDRAULIC SYSTEM**

The RT-300 hydraulic system consists of three open-center circuits, driven by a triple vane pump. The 40-gallon-per-minute (151 L/min.) section of the pump supplies the three-spool control valve that controls the intermediate speed hoist and crowd and the boom topping functions.

The 28-gallon-per-minute (106 L/min.) section supplies the seven-spool control valve (8 spools with auxiliary winch option), which controls the slow speed hoist and crowd and the swing and outrigger functions. The 28-gpm (106 L/min.) circuit also includes the steering system, in series, ahead of the seven-spool valve. The steering system is a load-sensing, demand-type system that takes as much flow as required for steering.

The 14-gpm (53 L/min) section supplies the brake system. The flow passes through an unloading valve. If the brake system pressures are adequate, the flow is diverted back to tank to avoid placing unnecessary load on the engine. If the brake system pressures are low, the unloading valve shifts and allows flow into the brake system accumulators. The two accumulators are separated in a front/back split, such that each provides flow either to the front or rear brakes. Flow and pressure to the brake calipers is controlled by a valve directly connected to the foot pedal in the cab.

The schematic of the hydraulic system is shown on the next page. The steering system is also shown separately on the following page for clarity. The transmission has its own hydraulic system that is shown in the transmission maintenance section.
The RT-300 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 28-gpm (106 L/min.) pump section and control valve.

Oil from the 28 gpm (106 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 and power are not affected, since there is no loss of volume or pressure by passing through the priority valve.

When the steering wheel is turned and steering power is required, 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.

There is a check valve in the pressure line to the steering control unit. This prevents pressure in the steering cylinders from venting back into the pressure line when the pressure is low. This eliminates steering wheel kickback when the steering wheel is released.

The steering system pressure relief valve inside the priority valve is set at 2000 psi (138 bar) at the factory and 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.
HYDRAULIC SYSTEM ADJUSTMENTS

CONTROL VALVES

The hydraulic system is divided into three main circuits, each having its own protective relief valve. The relief valves are adjustable on the boom control valves, but not on the brake system.

1. Intermediate speed boom and hoist -- 3000 psi (207 bar) at full flow.
2. Slow boom, hoist and outriggers -- 3000 psi (207 bar) at full flow.
3. Brake system -- 2925 psi (202 bar) at the unloading valve inlet.

A recently calibrated pressure gauge with at least 3000 psi (207 bar) scale is required to make adjustments on the control valves. A high pressure hose or hydraulic tube assembly to fit the gauge and the 3/8" tube size pressure ports is required to install the gauge where it can be read easily.

The following procedure is suggested when taking pressure readings on either of the control valves for the boom, winch and outrigger circuits.

Remove the 3/8" tube cap from the test fitting on the side of the control valve and install 3000 psi (207 bar) test gauge. To obtain full flow reading, run pump at 2000 RPM and actuate CROWD control lever to RETRACT position, and hold until maximum reading is made. If a pressure of 3000 psi (207 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 shut-off valve not fully opened.
4. Valve spool linkage not allowing control valve to fully open. Valve spool should move 3/8" (1 cm) each way from neutral.
5. Adjust relief valve by removing plug in top of relief cartridge and turning slotted screw clockwise to increase pressure or counter-clockwise to lower pressure.
7. Worn or defective hydraulic pump.
Swing and slow hoist have spools that bleed pressure from work ports to return galley of valve. Slow crowd and topping have spools that bleed pressure from the retract side work port only, to return galley. All other spools are blocked-port spools.

The relief valve pressure setting at the inlet end of the valve is 3000 psi (207 bar). This pressure is required for all except swing. Two work port relief valves are installed in the swing circuit. These relief valves are set at 2200 psi (152 bar) as indicated in the illustration above.

With a pressure gauge attached and the swing valve work ports plugged, the swing circuit may be checked by actuating the swing control lever. If the pressure is improper, the work port relief valves can be removed and shims added or removed as needed. Part numbers for the work port relief valve and shims are listed in the PARTS section. Pressure is changed approximately 100 to 125 psi (6.9 to 8.6 bar) for each .010" (.25 mm) shim.

BOOM SEQUENCE

The RT-300 boom crowd function is designed to extend and retract in predictable sequence. First the second stage extends 12 feet (3.7 m). After which the third and fourth stages extend together 14 feet (4.3 m) each. Total extension is 40 feet (12.2 m). Retraction is the opposite sequence, with the third and fourth stages retracting together first, after which the second stage retracts. The reason for this sequence is to get the largest (strongest) section out first and in last.

Special valving is required to control the sequencing of the boom stages. Also special internal passages are required in the primary extension cylinder (see the illustration below). Sequence valves are located at the rear of the boom, directly above the hinge pin. Separate valves are required for extension and retraction.
VALVE SETTINGS:
Approximate factory settings are 300 psi (21 bar) on extension (upper valve) and 800 psi (55 bar) on retraction (lower valve). Valves are fine tuned, however, to control boom stage sequencing at all boom angles and normal hydraulic oil temperatures. Setting the valves higher than required will generate additional heat in the hydraulic system and also waste fuel. Turning the adjustment screw in on the sequence valve adjustment will increase the valve setting.

TROUBLESHOOTING:
If boom stages fail to sequence properly, it is probably due to a sequence valve being set too low to overcome a tight boom stage, or there is contamination or malfunction of the sequence valve. Dirt in either cartridge (relief or check) could cause a sequencing failure. All cartridges may be removed for cleaning or replacement. Disconnection of hydraulic hoses is not required to remove the valve cartridges.

BOOM CYLINDER HOLDING VALVE
A holding valve is directly connected to the base of each boom lift cylinder barrel and to the base of the primary crowd 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 a rated load about three feet above the ground using the boom lift cylinders (not the hoist). An example of rated load is 7500 pounds (3390 kg) at a 36-foot (11 m) load radius, with outriggers extended and the boom over the front. The 7500 pounds (3390 kg) includes a 7060 pound (3190 kg) load and the 440 pound (200 kg) sheave block. Turn the engine off and move the BOOM lever to the LOWER position. If the boom moves down, a holding valve may be malfunctioning or a boom lift cylinder may have leakage past the piston seal.

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 determine whether the problem is in the left or right-hand cylinder, put a pressure gauge with a range of at least 5000 psi (350 bar) on the 1/4" size port on the side of one of the holding valves.

WARNING
Disconnecting the RCL hose from a single holding valve may cause the boom to lower if the other holding valve is faulty. Ensure that the boom is fully lowered or blocked before disconnecting the hose.

NOTICE
The RCL will not function properly with one hose disconnected from a cylinder.

BMC uses multiple RCL models. If your crane has hoses connecting the cylinder to the RCL computer, the cylinders are hydraulically connected. They must be isolated for the following procedure. Fully lower the boom. Isolate the cylinders from each other by disconnecting the piston and rod side RCL hoses from one cylinder. Cap the hoses and plug the hole in the holding valve. Note that the caps and plugs will experience full system pressure, and adequate care must be taken to ensure the caps and plugs are properly installed. Note the RCL will not function properly with one cylinder disconnected.
With rated load on the hook, the boom over the front and outriggers extended, record the pressure on the gauge while slowly raising the boom tip about three feet above its horizontal position. Then return the boom control lever to neutral and record the pressure. Then turn the engine off, push the BOOM lever to the LOWER position and record the pressure on the gauge. Repeat on the other holding valve. If the pressure to hold the load is lower at one valve than the other, the lower pressure side is the problem side.

Try to raise the pressure in the problem side to match the pressure on the other valve by tightening the adjusting screw on the holding valve after removing the adjustment cover and loosening the lock nut.

If adjusting the holding valve does not fix the problem, continue troubleshooting. Lower the boom fully, turn off the engine and push the BOOM lever to the full LOWER position. Switch the holding valves from left-hand to right-hand and vice-versa. Repeat the pressure tests. If the problem side changes, the holding valve is at fault; if the problem side is the same, then the piston seal is leaking.

After the problem has been solved, remember that twin lift cylinders must have matched settings on holding valves. If RCL hoses were disconnected, reconnect them. Bleed the hoses per instructions on page 3-18.

**CROWD CYLINDER HOLDING VALVE**

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

The crowd cylinder valve should be checked with the boom elevated to the maximum position and the boom extended several feet. 30,000 pounds (13,600 kg) on a 4 part line is required for this test. Use the crowd cylinder to lift this load off the ground. The radius of the test load should be within the rating on the capacity chart.

If the holding valve needs to be set higher, loosen the lock nut on the holding valve adjusting screw and tighten screw until unpowered movement stops. Retighten the lock nut to hold the proper adjustment.
HYDRAULIC SEALS

WARNING
Do not check for hydraulic leaks with hands. If a mist of hydraulic oil is noticed around a line or component, use cardboard or other material to check for 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 BMC RT-300 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 on which Teflon sealer is used, particularly in aluminum or castings.

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 hose should be replaced for maximum economy for the user.
MECHANICAL ADJUSTMENTS

GENERAL
All fasteners in the RT-300 should be checked, and retightened if required, as a part of the preventive maintenance program. Particular attention should be given to the axle mounting bolts, outrigger bolts, pump mounting bolts, rotation bearing bolts, rotation gearbox bolts and winch bolts. All bolts used in assembly are heat-treated Grade 5 or 8. Torque the wheel nuts to 475 ft.-lbs. (645Nm). Torque the rotation bearing fasteners as shown below.

Top locking nuts can be identified by the curved top surface. Torque the rotation bearing mounting bolts to 180 foot-pounds (245Nm) while holding the nuts stationary – or torque the nuts to 150 foot-pounds (200Nm) while holding the bolts stationary.

Grade 9 hex nuts can be identified by the flat top surface. Torque the rotation bearing mounting bolts to 175 foot-pounds (240 Nm) while holding the nuts stationary – or torque the nuts to 140 foot-pounds (190 Nm) while holding the bolts stationary.

CROWD CHAIN ADJUSTMENT AT TIME OF ASSEMBLY

Before boom assembly, an exact measurement of the crowd extension and retraction chains must be determined. Exact length, number of pitches and end configuration must be assured. (Reference Illustration B)

The 3/8" (1 cm) hardened pins (extension) and 5/16" (8 mm) hardened pins (retraction) used to secure the chains to the attaching components must be a snug drive fit. (Reference Illustration B)
Set the space between fourth stage boom tip and third stage tip at 9-3/4" (24.8 cm) (Illustration A). Use a 9¾" (24.8 cm) long wood block to hold this distance while making initial adjustment on the extension and retraction chain adjusters. Snug tighten the retraction chain adjusters first. Then snug tighten the extension chain adjusters until they are even with each other. While this adjustment is being done, the 9-3/4" (24.8 cm) tip spacing must be held, as it is critical for alignment of the boom extension.

Inspection windows are provided on the bottom of the second stage to assure the proper position of the retraction chain anchors. The number "3" or "4" should be visible in the window on each chain anchor. (Illustration A). Remove wood spacer after extending boom hydraulically. See final chain adjustment.
FINAL CHAIN ADJUSTMENT AND FIELD ADJUSTMENT

Cycle boom extension from full extension to retraction five times while varying the boom angle. Then set the boom horizontal and fully extended for the final adjustment. (Illustration C)

Check both extension and retraction chain "drape" at the center of the 8" (20 cm) third stage inspection windows.

First adjust the extension chains until the "drape" is matched. Then adjust the retraction chains (using adjuster bolts with 1-1/8" hex heads). Do not exceed a torque of 20 foot-pounds (27 N-m). Chain "drape" should be 2-5/8" ±1/8" (6.7 ±0.3 cm) for retraction chains and 5-5/8" ±1/8" (14.3 ±0.3 cm) for extension chains as shown. (Illustration C). Chain "drape" for both extension chains and retraction chains should be as closely matched as possible. Check the position of the retraction chain anchors through the inspection windows (Illustration A). Number "2, 3 or 4" on the bottom of each retraction chain anchor should be visible through the windows, but not necessarily centered or in line with each other.

The chains should be inspected every 50 hours for proper adjustment and for signs of excessive wear.
CROWD CYLINDER ASSEMBLY AND INSTALLATION PROCEDURE
(REFER TO CYLINDER ASSEMBLY IN PARTS MANUAL)

It is very important to follow this procedure prior to assembling the boom for the RT-300. The primary and secondary cylinder dimensional relationship must be held to assure that the hoses clamp and terminate properly. The holding fixture (600-70087) should be used at the rod end of the cylinders and band clamp (201-00127) should be used on the barrel end to support the cylinders. Pins (870-60076 and 870-80006) from the boom assembly should be used with the holding fixture. Without the holding fixture and band clamp it is extremely difficult to control the cylinders while the hoses are being installed. The holding fixture and band clamp will be removed during boom assembly.

BOOM ASSEMBLY
(REFER TO BOOM ASSEMBLY IN PARTS MANUAL)

READ SECTION ON CHAIN ADJUSTMENT BEFORE STARTING BOOM ASSEMBLY.

The following steps should be taken during the boom assembly:

1. Install rub pads and two retraction and extension chains on the rear of the fourth stage boom. Take care to keep the chains as clean as possible.

2. Install the fourth stage into the third stage. Guide the chains on through the third stage.

3. Install chain sheaves on each end of third stage. Install cylinder assembly into rear of third stage. It will be necessary to remove band clamp and holding fixture from cylinder assembly at this time. Install trunnion pins through third stage into secondary cylinder. Add spacer bar with rub pads at outer end of third stage. Add rub pads at rear of third stage.

4. Install third stage into outer end of second stage. It will be necessary to remove crowd cylinder sequence valves at this point. Cap ports and hose ends. Add retraction chain anchor nuts, anchor plate and jackscrews at tip of second stage. Attach retraction chains to anchor nuts. Add rub pads at outer and base end of second stage. Install primary trunnion pins and secondary cylinder pin at rear of second stage. Add extension chain adjustment clevises and attach chains. Reinstall sequence valves for crowd cylinders at rear of second stage.

5. Install second stage into base boom. Install primary cylinder pin at rear of base boom.

6. Go through entire boom assembly and add miscellaneous parts not yet installed. Again, refer to chain adjustment procedure (Page 3-25) as it is critically important.
ROTATION GEARBOX INSTALLATION
AT TIME OF ROTATION BEARING INSTALLATION

The spacing between the rotation bearing and rotation gearbox is preset and non adjustable. However, a set procedure is necessary at the time of assembly. The following sequence should be followed when replacing the rotation bearing:

1. Set the turntable upside down on the floor and loosely mount the rotation bearing and gearbox on the turntable with the "high point" of the bearing against the pinion. This is the painted tooth on the bearing. (The outer race bolts should be inserted in their holes in the bearing before mounting the bearing.)

2. Release the gearbox brake with a portable hand pump (300 psi (20.7 bar) minimum). This will let the pinion teeth center between the "high point" teeth on the bull gear. With the brake released the pinion will move. Use a pry bar to rotate the pinion teeth until contact is made. This will leave some clearance on the other side of the tooth for inserting a feeler gauge.

3. While the bearing inner race bolts (turntable bolts), and gearbox bolts are installed, but loose, use a large "C" clamp to snug the pinion and rotation gear teeth together. With the bearing teeth and pinion teeth still clamped, tighten the turntable rotation bearing bolts and gearbox bolts.

4. Check the tooth parallel contact by sliding a 0.002" (0.05 mm) feeler gauge between the bearing and pinion teeth. If the 0.002 (0.05 mm) gauge slides completely down the full length of the tooth, try a 0.003 (0.07 mm) gauge. If the 0.003 (0.07 mm) gauge will go completely down the length of the tooth, try a 0.004 (0.1 mm) gauge (maximum acceptable). The 0.004 (0.1 mm) gauge may start but should not slide completely to the other end of the tooth face. If the gauge will start but stops partly down the face of the tooth, the rotation gearbox must be shimmed. A gauge larger than 0.004 (0.1 mm) should not be able to slide completely down the tooth face. If the clearance is great enough to allow this to happen, consult factory before proceeding.

5. 0.005" (0.13 mm) shims (P/N 209-00302) are provided to go under the gearbox mounting flange to set tooth parallelism. These must be used in equal numbers under two adjacent gearbox bolts. The shims will tilt the pinion shaft about 25%. (Example: 0.020 (0.5 mm) shims under the gearbox mounting flange will tilt the bottom of the pinion shaft about 0.005" (0.13 mm).) The mounting flange should be shimmed until the face of the teeth have full contact.

6. Torque the 5/8" bearing bolts or the 5/8" bearing nuts as specified on page 3-28. Torque the 3/4" gearbox bolts (4) to 200 foot-pounds (270 N-m) (see torque chart). Then tighten the jackscrews (4) tightly against the gearbox flange and set the lock nuts.

7. Install the turntable subassembly with gearbox and bearing included on the chassis frame. Torque the outer race 5/8" bolts and nuts as specified on page 3-28.

8. During test of the machine and with the bearing teeth lubricated, check the tooth match between the gear and pinion teeth. If full tooth contact is not apparent, add additional shims to the gearbox flange as required.
FIELD REMOVAL AND REPLACEMENT OF THE ROTATION GEARBOX
WITHOUT REPLACING ROTATION BEARING

Be sure that the boom is well supported from rotation before removing the rotation gearbox. **IF NOT SUPPORTED, THE BOOM WILL SWING UNCONTROLLABLY WITHOUT THE GEARBOX IN PLACE.** Always replace the same number of shims under the gearbox flange that came from the factory. If the bearing has been replaced since the machine was built, the proper number of shims should have been installed at that time. Check the bearing and pinion tooth surface match to assure that contact is even along the full length of the teeth. If contact is not even, add additional shims as required. Use the shims listed with the turntable installation parts in the Parts Manual.

WHEEL ALIGNMENT

Toe-in, which is the setting of the front wheels so they are closer together at the front than at the rear, is adjusted by lengthening or shortening the tie rod. Proper toe-in for the front wheels is 1/16" to 1/8" (1.6 mm to 3.2 mm) measured at the tire outer diameter. The rear wheels should be set at zero toe-in.
TRANSMISSION MAINTENANCE

The transmission is a six-speed-forward, three-speed-reverse, Funk Model 2000, powershift transmission. The transmission is bolted directly to the flywheel housing of the engine and is connected by drive shafts to the front and rear axles. A torque converter transmits power from the flywheel to the transmission. The transmission gears are all constantly in mesh, and there is a series of clutches that control the direction and speed of the output.

TRANSMISSION OIL:
The oil used in this transmission is Mobil ATF D/M automatic transmission fluid, with the Allison C-3 rating. See the recommendations below. Other oils can cause shortened transmission life due to material incompatibility and inadequate frictional properties for clutch discs. The refill capacity is about four to five gallons (15 L to 19 L).

<table>
<thead>
<tr>
<th>AMBIENT TEMPERATURE</th>
<th>TRANSMISSION FLUID SPECIFICATIONS</th>
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</thead>
<tbody>
<tr>
<td>Above -10°F (-23°C)</td>
<td>Hydraulic Transmission Fluid Type C-3 or C-4, except Grade 30</td>
</tr>
</tbody>
</table>
| Below -10°F (-23°C) | Type C-3 or C-4, except Grade 30  
Auxiliary preheat required to raise oil temperature above -10°F. |
| Above 32°F (0°C)    | Type C-3 or C-4 or C-3 Grade 30 |

**CAUTION:** Do not use any oil with an EP additive.

Check the oil level weekly. The dipstick is located near the front end and right-hand side of the transmission, below the small fluid reservoir for the parking brake. Make sure the area around the dipstick is clean before removing. Check the oil level in neutral at idle speed with the oil warm. Raise the oil temperature to 200°F (90°C) by stalling the transmission.

**WARNING**
When stalling the transmission, make sure it is in sixth gear, the service and parking brakes set and the area is clear of personnel and obstacles. Do not exceed 30 seconds or 200°F (90°C) oil temperature, whichever comes first, at full governed speed. Do not leave the operator seat while stalling the transmission.

Idle the engine and return the shifter to neutral. Check the oil level quickly, before the oil cools to 100°F (40°C). Maintain the oil level to the full mark on the dipstick at these conditions.

TRANSMISSION FILTER: (Note--The transmission filter may be found in the Parts Manual under "Oil Cooler and Filter Installation.")
The transmission is equipped with a cooler behind the radiator and a filter under the battery box, behind the fuel tank. Change the filter on a new machine after the first 20 hours. Thereafter, the filter should be changed whenever the indicator light on the dashboard stays on with the oil above 100°F (40°C) or every 200 hours or 6 months, whichever is sooner. Use the following procedure:
1. Clean the filter housing, element and nearby hoses.

2. Remove the used filter element and catch the oil in a clean bucket.

3. Empty the element into the bucket and examine the oil for foam, water and excessive particles. By checking the oil at every filter change, trends may be observed which could help in troubleshooting if problems develop.

4. Lubricate the seal on the new element and thread it onto the housing.

5. Tighten the element three-fourths of a turn after the seal contacts housing.

6. Run the engine at low idle and check for leaks.

7. Check the oil level as described on the previous page.

**TRANSMISSION FLUID CHANGE:**
Change the transmission fluid on a new machine after the first 20 hours. If the filter is changed every 200 hours and the indicator light has not been on, change the fluid every 600 hours. If the filter has been changed more frequently because the indicator light has come on, change the fluid every other filter change. Use the following procedure:

1. Operate the transmission long enough to warm the oil above 100°F (40°C).

2. Remove the transmission drain plug and drain the oil. Check for water, foam or excessive particles in the oil.

3. Change the filter element as described previously.

4. Clean the suction screen.

5. Remove the transmission breather, wash it in clean solvent, blow it dry and re-install.

6. Clean and install the transmission drain plug.

7. Fill the transmission through the dipstick tube with four gallons (15 L) of Mobil ATF D/M or equivalent.

8. Run the engine at low idle and check for leaks.

9. Check the oil level as described on the previous page.

**TRANSMISSION SHIFTER:**
The transmission shift lever assembly is an electrical device. There are three fuses under the dash in the power lines to the shifter, a 5-amp fuse for the back-up alarm circuit, a 5-amp for the neutral start circuit and a 15-amp for the power shifter circuit. These are 12-volt, automotive, fast-acting fuses.

Before welding on the crane, disconnect the cable connector under the shifter assembly, the battery, the rated capacity limiter, and engine control unit.
TRANSMISSION HYDRAULIC SYSTEM:
A pump in the transmission provides hydraulic power for operating the clutches and the parking brake and provides flow for the torque converter and for lubrication. The hydraulic schematic is shown below.

There is a pressure intensifier on the right-hand frame rail near the transmission. This device multiplies the transmission pump pressure by five times and supplies the higher pressure to the parking brake release cylinder. Whenever the engine is running, this pressure is available through a solenoid valve to release the brake. If the engine stops or there is an electric or hydraulic malfunction that stops the pressure, a spring will apply the parking brake.

Another solenoid valve connected to the transmission pump operates the shift cylinder for two-wheel drive. If pressure is lost at this control due to electric or hydraulic malfunctions, a spring will shift the cylinder to four-wheel drive.

There is a small reservoir located at the front of the engine compartment that supplies oil to the pressure intensifier. This should be checked weekly and maintained at the full mark with the same hydraulic oil used in the transmission.
BLEEDING THE PARKING BRAKE:
If the parking brake hydraulic lines are disconnected for any reason, the lines will have to be bled. This is done at three points in the system: the pressure switch hose connection, the brake caliper bleed screw and the intensifier bleed screw. The bleeding must be done with the engine running and the parking brake switch in the OFF position. It may require several repetitions to remove all of the air. In between each repetition, turn the brake ON for about 30 seconds.

ADJUSTING THE PARKING BRAKE
Before working on the parking brake, set the outriggers or chock the wheels to prevent rolling. Release the parking brake. Find the adjustment bolt on the front of the brake caliper. Turn the adjustment bolt counterclockwise until loose. Slip a 0.012 (0.3 mm) inch feeler gauge between the disk and brake pad. Turn the adjustment bolt clockwise until the feeler gauge will just slip out.

TRANSMISSION TROUBLESHOOTING
If the transmission does not function properly, there are several simple checks that may reveal the cause. Try these first, and an unnecessary service call may be avoided.

NOTE: FOR TRANSMISSION SERVICE OR OVERHAUL WHICH IS BEYOND THE SCOPE OF THIS MANUAL PLEASE CALL YOUR BRODERSON DEALER OR THE BRODERSON SERVICE DEPARTMENT TO HAVE A FUNK MANUFACTURING COMPANY SERVICE REPRESENTATIVE CONTACT YOU.

1. Check the transmission oil. High or low level can cause problems. If air bubbles are in the oil and the oil level is not too high, there may be a leak in the suction line of the transmission pump.

2. Check the parking brake. With the ignition switch on, move the brake switch from ON to OFF. The brake indicator light should go from ON to OFF. If you suspect that the brake is dragging, raise the crane up on the outriggers, put the machine in third gear and spin the tires. If the disk is hot, the brake is dragging. Adjust the brake by the above procedure. If the brake still does not release, and there is no electrical problem, the cause may be low pressure in the transmission control circuit. Transmission pressure is approximately 260 psi (18 bar). Brake release pressure out of the intensifier is approximately 1300 psi (90 bar). It takes approximately 1300 psi (90 bar) to completely release the park brake.

3. Transmission overheating may be caused by plugged radiator fins or using too high a gear.

4. Check the fuses under the dash that supply power to the shift lever. If the transmission fails to shift, the engine fails to crank when in neutral, or the back-up alarm fails to operate, check the three inline fuses located under the right-hand side of the dashboard. See the wiring diagram in the Parts Manual for the wire color, capacity and function of the fuse. Replace only with fuses of the specified capacity. Shift solenoid damage could result with use of larger fuses. If fuses continue to fail, check for a short circuit in the transmission harness.
5. Check the connectors under the shift lever and near the solenoids in the engine compartment.

6. Check the solenoids on the transmission control valve. The coils of two of the solenoids should be magnetized whenever the shift lever is out of neutral and the ignition switch is on. The following chart shows the solenoids that are energized as each gear is selected:

![Solenoid Chart]

7. If there are problems with power, speed or shifting that are not caused by the engine or by electrical problems, check the oil. Drain the transmission, remove the filter and suction screen, check them for excessive contamination and save the contaminants for further examination.

If abnormal contamination is found or a problem cannot be diagnosed and fixed by the above steps, please call your Broderson dealer or the Broderson Service Department to have a Funk Manufacturing service representative contact you.

**TOWING**

If the crane must be towed, run the engine at low idle to release the parking brake and lubricate the transmission and do not exceed 10 mph (16 km/hr). If the engine cannot be run, release the parking brake by turning the adjustment screw counterclockwise until loose. Do not exceed 3 mph (5 km/hr) and one mile (1.6 km) total distance while towing. Afterward, readjust the park brake by the procedure on Page 3-34. If these conditions cannot be met, disconnect the drive lines and do not exceed 10 mph (16 km/hr).
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 350 feet (107m) of 9/16” (14mm) dia. 6 x 36-EIP-RRL-IWRC wire rope (26,250 pounds (117kn) minimum breaking force).

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 upper boom tip sheave and route it through the cable retainer loops to the hoist drum.

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 (2.5 cm).

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 40 feet (12 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 break in, lower the outriggers and attach a load of about 2,000 pounds (900 kg). Elevate and extend the boom fully. Raise and lower the load three times and check winding of the rope on the hoist.

15. Attach about 10,000 pounds (4500 kg) and repeat. Be sure that the cable winds evenly on the hoist. Never lift more than the rated load on the Capacity Chart for the parts of line and type of wire rope being used.
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. Lubricate the cable as recommended in the "Wire Rope Lubrication" section. Inspect, maintain and replace the cable in accordance with ANSI B30.5-2007, Section 5-2.4.
## TORQUE DATA

<table>
<thead>
<tr>
<th>BOLT GRADE</th>
<th>SAE GRADE 1 OR 2</th>
<th>SAE GRADE 5</th>
<th>SAE GRADE 8</th>
</tr>
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<td>![Square]</td>
<td>![Star]</td>
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<tr>
<td>MATERIAL</td>
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<td>MEDIUM CARBON STEEL Q &amp; T</td>
<td>MEDIUM CARBON ALLOY STEEL Q &amp; T</td>
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<tr>
<td>MINIMUM TENSILE STRENGTH</td>
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<td>120,000 PSI (827 MPa)</td>
<td>150,000 PSI (1034 MPa)</td>
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<td>BOLT SIZE</td>
<td>RECOMMENDED TORQUE VALUES FT-LBS (N-m)</td>
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<td>7 (9.5)</td>
<td>10.5 (14)</td>
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<td>9 (12)</td>
<td>14 (19)</td>
<td>22 (30)</td>
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<td>15 (20)</td>
<td>25 (34)</td>
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<td>24 (32)</td>
<td>40 (54)</td>
<td>60 (81)</td>
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<tr>
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<td>60 (81)</td>
<td>92 (125)</td>
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<td>53 (72)</td>
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<tr>
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<td>466 (632)</td>
<td>714 (968)</td>
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</table>

### 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.