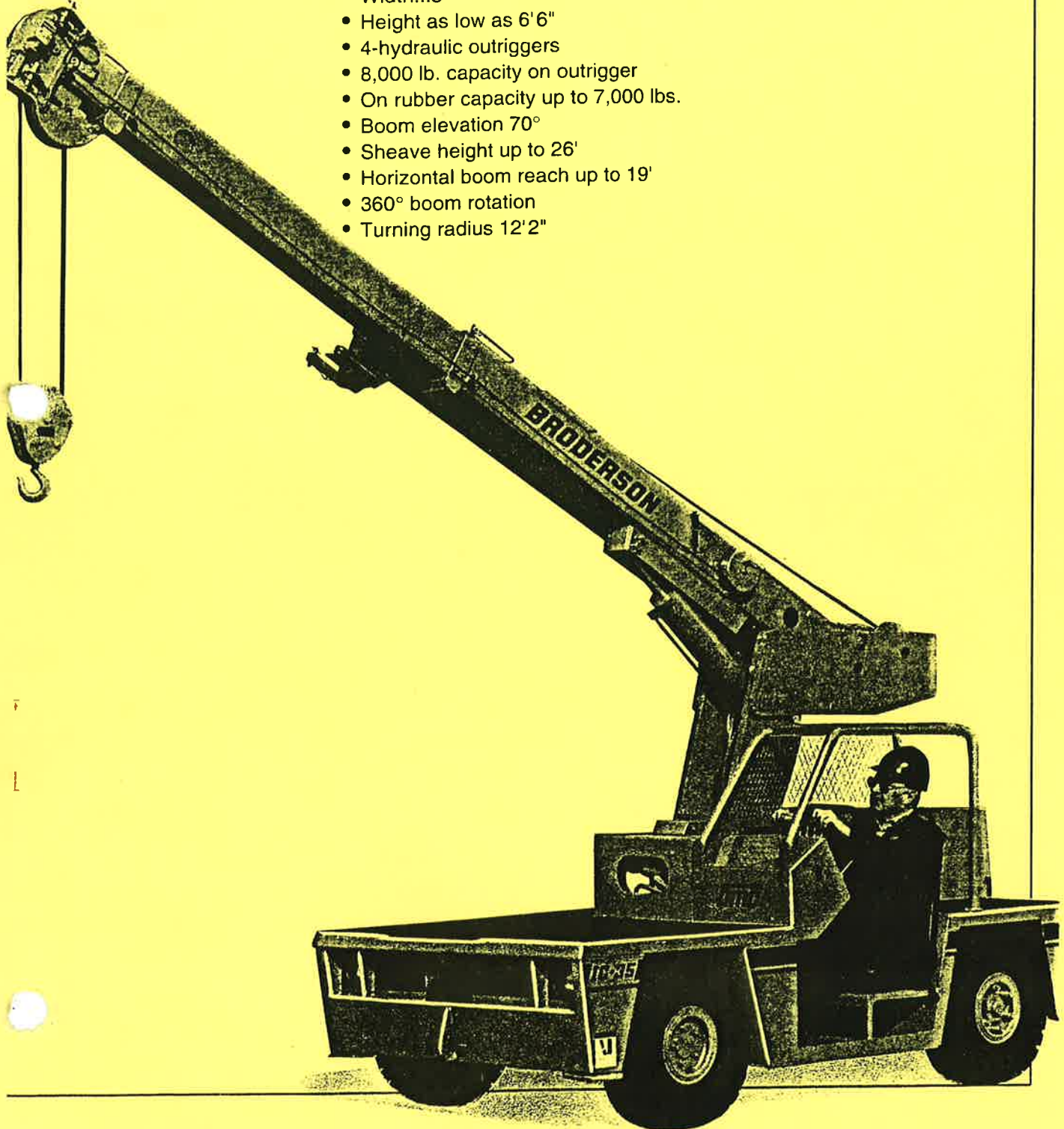


Jon Brown

BRODERSON IC-35 2C SERIES CRANE OPERATION AND SAFETY MANUAL

**IC-35...small in size
with big crane features.**

- Width...5'
- Height as low as 6'6"
- 4-hydraulic outriggers
- 8,000 lb. capacity on outrigger
- On rubber capacity up to 7,000 lbs.
- Boom elevation 70°
- Sheave height up to 26'
- Horizontal boom reach up to 19'
- 360° boom rotation
- Turning radius 12'2"



OPERATION

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.

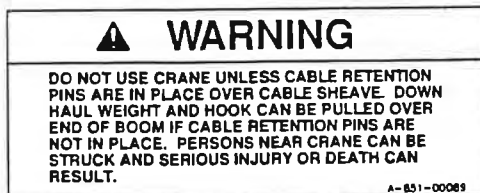


3. The operator shall be responsible for those operations under his direct control. Whenever there is any doubt as to safety, the operator shall have the authority to stop and refuse to handle loads until safety has been assured.
4. The operator shall not engage in any practice which will divert his attention while actually operating the crane.
5. This list of rules is only a supplement to all federal, state, and local safety rules that may apply.

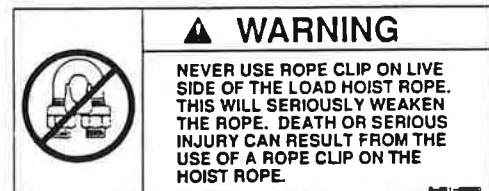
CRANE CONDITION:

1. Before beginning operation each day, thoroughly inspect the entire crane to be sure it is in good operating condition.
2. Inspect load hoist rope and wedge socket daily. We recommend rope inspection, replacement and maintenance in accordance with ANSI B30.5-1994, Sec. 5-2.4.
3. Keep operator's compartment and decks free of mud and grease.
4. If crane is equipped with a cab, keep all window glass clean. Keep gauges clean.
5. Tools, lubricants, or rags on the crane should be kept in a secured toolbox.

6.



7.



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

LIFTING:

1. Always refer to Crane Capacity Chart in operator's compartment before handling load. Do not exceed load ratings. Under some conditions the standard capacity ratings cannot be recommended and must be adjusted downward to compensate for special hazards, such as weak supporting ground, wind, hazardous surroundings, operator inexperience, etc. The weight of the load should always be known.
2. Be careful to prevent load swinging. A swinging load can cause instability or loss of control of the load. Be aware that the Anti-Two-Block System and the Rated Capacity Limiter can cause sudden stopping of boom movement which can cause the load to swing. Swing the boom slowly whenever these systems might stop the boom.
3. Do not allow anyone to put any part of his body under a load. The load may lower or fall if there are damaged parts in the crane. Also, the load may drop a short distance due to thermal contraction of the hydraulic oil in the cylinders.
4. Do not use crane to drag loads sideways.



- 5.
- 6.



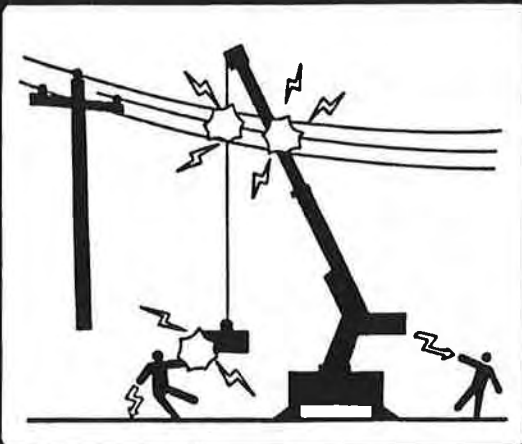
7. Level the crane before lifting. A small incline will significantly reduce the capacity. Use appropriate cribbing under the outriggers for leveling. All outriggers must be fully extended and tires must clear the ground to use the "ON OUTRIGGERS" ratings.
8. Always use outriggers if possible. If you must lift on rubber, keep the load as close to the ground as possible to prevent tipover. Move the load very slowly and use tag lines to prevent load swinging.
9. Crane may tip at less than rated loads if the surface is uncompacted or wet dirt, or soft soil with frozen crust, thin or cracked pavement, or surface near a hole or ledge. Always use adequate outrigger floats and/or cribbing. See page 2-11.
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 level 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 insure 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 operator guard or in access holes of a telescoping boom.
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.

D A N G E R

Two blocking will abruptly stop boom lowering and boom swing as well as hoist and extend. If the boom is moving fast, this will cause the load to bounce or swing which could cause loss of control of load or tipping.

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

	<p style="font-size: 2em; font-weight: bold; margin: 0;">! DANGER</p> <p style="font-weight: bold; margin: 5px 0;">ELECTROCUTION HAZARD DEATH OR SERIOUS INJURY</p> <p style="font-size: 0.8em; margin: 0;">WILL RESULT FROM BOOM, LOAD LINE, OR LOAD CONTACTING ELECTRIC LINES. DO NOT USE CRANE WITHIN 10 FEET OF ELECTRIC LINES CARRYING UP TO 50,000 VOLTS. ONE FOOT ADDITIONAL CLEARANCE IS REQUIRED FOR EVERY ADDITIONAL 30,000 VOLTS OR LESS.</p> <p style="font-size: 0.8em; margin: 0;">IF IT IS NECESSARY TO PLACE ANY PART OF THE CRANE OR LOAD CLOSER THAN 10 FEET FROM A POWER LINE, CONTACT THE ELECTRIC POWER COMPANY AND ASK THEM TO DE-ENERGIZE THE POWER LINES AND VISIBLY GROUND THEM BEFORE YOU GO TO WORK.</p> <p style="font-size: 0.6em; margin: 0; text-align: right;">C-851-00037</p>
<p style="font-weight: bold; margin: 0;">THIS CRANE IS NOT INSULATED</p>	

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.

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 maximum).
- E. Maintain specified tire pressures.
- F. Avoid sudden starts and stops.
- G. Provide tag or restraint lines to snub swinging of the load.
- H. Hand-held tag lines should be nonconductive.
- I. Do not carry heavy boom loads and deck loads at the same time.
- J. Do not pick and carry with boom extension installed.
- K. Do not exceed the OVER FRONT, ON RUBBER capacity.

2. When raising the boom or moving the unit with boom elevated, be sure there is adequate overhead clearance for boom.

3. For carrying loads on decks:

- A. Boom must be retracted, centered and lowered as close as possible.
- B. 3 MPH maximum road speed. Reduce speed below 3 MPH to properly match condition of road surface and deck load.
- C. Remove load hook from load before traveling.

4. Cranes with rear steering require close watch because of "tail swing" when the chassis is turned in tight quarters.

5.



6. Every effort has been made to make the BMC Industrial Crane a stable vehicle. However, with the rigid front axle and the unsprung oscillating rear axle suspension, the operator must take care to control the vehicle speed to be compatible with conditions of rough roads or uneven terrain.

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

8. Shut off engine before refueling, and remove fuel cap slowly. Vapor pressure in tank can cause a burst of fuel and vapor when the cap is removed.

OPERATION

INSTRUMENTS AND CONTROLS

The Broderson IC-35 instrument panel is equipped with a standard instrument package showing electrical system amperage, fuel level, oil pressure, water temperature, hydraulic oil temperature, and engine hours. Also included is a bubble level to level the machine. (When unit is equipped with optional diesel engine, a glow plug light and glow plug button are included.)

The IC-35 is equipped with a lighting package, including an on-off switch, two headlights and two taillights. A horn button is located on the instrument panel.

The ignition switch is key operated and has "ACC", "IGN" and "OFF" positions. A push-button start switch is located to the left of the ignition key switch. The ignition switch should always be turned off and the key removed when the vehicle is left unattended. A choke knob is located on the dashboard of some gasoline powered units.

The hydrostatic transmission control switch is also located on the instrument panel. It has "FORWARD, NEUTRAL, REVERSE" positions. The speed of the transmission is controlled by the engine speed, which is controlled with the accelerator pedal.

A pedal-activated brake is provided to hold the machine on slopes. Normal braking is provided by the hydrostatic transmission when the accelerator pedal is released. The brake pedal actuates disc brakes attached to each torque hub. The parking brake is applied by moving the brake switch to the "on" position.

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.

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

CONTROL FUNCTIONS

The controls for operating the outriggers, boom swing, boom elevation, boom telescope, and hoist are located on the control panel. The handles are directly connected to the 4-way hydraulic control valves. The placards adjacent to these handles identify the function controlled and the movement resulting from each handle actuation.

RIGHT ▲ SWING ▼ LEFT	EXTEND ▲ TELESCOPE ▼ RETRACT	LOWER ▲ BOOM ▼ RAISE	DOWN ▲ REAR ▼ UP OUTRIGGER	DOWN ▲ FRONT ▼ UP OUTRIGGER	DOWN ▲ FRONT ▼ UP OUTRIGGER	DOWN ▲ REAR ▼ UP OUTRIGGER	▲ CAUTION THE LOAD HOIST LINE ON THIS UNIT MUST BE 3/8" DIA. 6X37- IWRC-EP WIRE ROPE (OR EQUIVALENT) WITH A MINIMUM BREAKING STRENGTH OF 15,100 LBS. WITH ROPE IN GOOD CONDITION. THE MAXIMUM LOAD WITH SINGLE PART LINE IS 4,000 LBS. <small>C-400-0001</small>	OUT ▲ FRONT ▼ WINCH IN	LOWER ▲ HOIST ▼ RAISE
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Swing: 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: Pulling back will raise the boom; pushing forward will lower it.

Telescope: Pulling back on the lever will retract the boom; pushing forward will extend the boom.

Hoist: Pulling back on the lever will raise the hook; pushing forward will lower the hook.

Outriggers: The four outriggers may be operated simultaneously or individually. Special attention must be given to avoid hitting personnel or obstacles.

All controls may be used for simultaneous operation to achieve combinations of movements. Some controls must be used together. For instance, the boom telescope and the hoist controls must be used together to maintain clearance between boom and load line hook.

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

SEQUENCE OF OPERATION

DRIVING THE VEHICLE

The following procedure is recommended for driving the vehicle to the job site:

1. Perform the daily inspection and test. (See Page 3-4)
2. Apply park brake.
3. Leave hydrostatic transmission switch in neutral.
4. Start engine and allow a warming period. (If equipped with Safety Shutdown System, depress reset button while starting and for a few seconds after.)
5. While warming the engine set up the Rated Capacity Limiter configuration.
6. Stow boom over front.
7. Pull hoist line snug.
8. Retract outriggers.
9. Step on the brake pedal.
10. Turn parking brake off.
11. Place transmission switch in forward or reverse.
12. Release brake and press on accelerator pedal.
13. Slow down when making turns.
14. Release accelerator pedal gradually to slow down and stop.
15. Step on brake pedal for abrupt stop.
16. Set park brake and outriggers or wheel chocks to park.

To start the engine, the transmission switch must be in "NEUTRAL." The switch should always be kept in neutral except for travel. Step on the brake before switching to "FORWARD" or "REVERSE." Then release the brake and push the accelerator pedal to begin travel. Motion begins at about 1500 RPM engine speed. (Idle speed is about 700 RPM and maximum speed is about 2800 or 3000 RPM.)

The hydrostatic transmission will normally stop the crane on a grade -- but some oil will slip through the wheel drive motors and allow the crane to creep. ALWAYS apply parking brake

when operating the crane, or leaving the crane unattended. Also extend the outriggers if possible. Remember the hydrostatic transmission is NOT a parking brake.

On level surfaces the brake pedal is not required for normal stopping. On slopes the operator may have to coordinate the brake and the accelerator to make smooth starts and stops. Emergency stops can be made more quickly by stepping on the brake pedal. This combines hydrostatic braking with the action of the disc brakes. Operating both accelerator and brake pedal with the right foot is preferred. Using the left foot on the brake pedal while simultaneously using the right foot on the accelerator will allow the engine to overspeed.

WARNING

Abrupt braking from stepping on the foot brake at travel speeds may cause loss of control of a load on the hook or on the deck. The operator should anticipate stops and slowly let up on the accelerator pedal to make smooth stops.

DANGER

Like other mobile cranes, the IC-35 will tip over more readily than some types of vehicles. The operator should always control the vehicle speed to be compatible with terrain or road conditions.

OPERATING THE CRANE

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

1. Perform daily inspection and test. (See Page 3-4)
2. Apply park brake.
3. Leave transmission control switch in neutral.
4. Start engine and allow a warming period at low RPM.
5. While warming the engine set up the Rated Capacity Limiter configuration.
6. Move accelerator pedal to medium to full speed.
7. Set all outriggers fully down on firm, level surface. Use timber or steel plate cribbing under outrigger shoes as needed on soft ground. Outriggers must remain set during all crane operations except for pick and carry.
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 speed. The throttle may be moved to high position for maximum operating speed.
9. Release accelerator during idle time.

NORMAL GAUGE READINGS

Engine Coolant Temperature - Allow engine to warm up to 100° Fahrenheit before operating crane. Stop engine if temperature exceeds 220° degrees.

Engine Oil Pressure - Stop engine if oil pressure does not exceed 10 PSI at low idle. Pressure varies with engine RPM.

Ammeter - The ammeter should read about zero at moderate temperatures after the engine has run several minutes with low lighting and accessory loads. With the engine stopped and high accessory loads, the reading may be around -20 amps. If the battery has been discharging very long from accessories or starting, the ammeter reading may show +20 amps

for a short time after the engine is started. Watch the ammeter for trends that may indicate a weak battery or charging system.

Transmission Temperature – Normal operating temperature is in the range of 75° to 200°F. If the reading on the gauge (which starts at 100°) exceeds 200°F, shut down the unit and determine the cause of excessive heating.

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

Fuel - Do not allow fuel tank to become empty. The engine will be difficult to restart and may require "bleeding" of diesel injectors. Keep tank full when idle to prevent condensation in tank.

WARNING

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

RATED CAPACITY LIMITER (RCL)

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

Always be aware that the RCL can stop boom movement at capacity load conditions and in two-blocking conditions. Use good judgment in controlling the speed of boom movements to prevent shock loads and swinging loads.

If the RCL system stops the crane movement there are various remedies that may be used to restart operation. If the hook is two-blocked, it should be lowered using the hoist control, if safe. The boom raise and telescope retract may also be used if this is safer. In some unusual circumstances it may be necessary to swing the boom before lowering the load. If you are sure this will not cause an overload, you can turn the override key that is under the left instrument panel and swing the boom to a safer position.

If the load is the maximum for the loadline or attachment, the load should be set down in a safe place using the hoist lower control and the load or attachment changed. Telescope retract may also be used and swing may be used, if safe, as described in the preceding paragraph. **DO NOT USE THE BOOM RAISE CONTROL** as this may increase the overload.

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

If the boom is fully lowered until it stops, (about 0°) the RCL will show an overload condition because the boom lift pressure sensors cannot read a useful pressure in this condition. To remedy this, raise the boom slightly. On the otherhand, if the boom is fully raised, (about 70°) the RCL may show an overload condition because the pressure in the boom lift cylinder is sensed to be an overload. To correct this condition, the override key may be turned 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.

W A R N I N G

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 the switch in an emergency should use good judgment.

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. Please read the RCL Operation Manual.

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.

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. And 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, and the person responsible for lifts must establish procedures for determining load weights and radii and conduct the lifts according to the second paragraph above.

The Rated Capacity Limiter is designed to stop crane functions that could cause an overload or two blocking. These are: BOOM LOWER, TELESCOPE EXTEND, HOIST RAISE, SWING LEFT and SWING RIGHT. Great care must be exercised when handling a load near capacity or near a two-blocking condition. If the boom is being lowered or

swung, the load will tend to swing if the Rated Capacity Limiter stops the boom movement. If the load is moving too fast, the sudden stopping by the system can cause dangerous load swinging which can cause death or injury to personnel or property damage by impact with the load or by the crane tipping.

WARNING

The Rated Capacity Limiter can suddenly stop the boom lower and swing functions, causing the load to bounce or swing. Use great care when handling a load near capacity limits or near a two-blocking condition.

CRANE CAPACITY CHART DEFINITIONS AND RULES:

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

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

The main boom capacities are given in direct relation to the radius at which the load is being handled. Boom extension capacities depend on the boom angle as well as the load radius. The capacities shown on the capacity chart are the maximum allowable at the indicated radius. The greatest load that may be handled by the BMC IC-35 is 8,000 pounds, but only at a 4 foot 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 as follows:

On Outriggers: Boom rotation is limited to an arc of 20° either side of the crane centerline.

On Rubber: Boom rotation is limited to the boom centered over front. Pick and carry operations are limited to the boom centered over front.

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

A capacity load may be carried on the boom, or a capacity load may be carried on the deck. DO NOT carry capacity deck loads and capacity boom loads at the same time.

CAUTION

The capacities of this crane are based on all outriggers being FULLY EXTENDED to a FIRM, LEVEL surface. The crane may tip at less than capacity loads if operated in the following manner:

- A. Outriggers only partially extended and resting on curbing, shoring, etc. If the outriggers are not all the way DOWN, they are not all the way OUT.
- B. 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 on top, but is moist or unpacked beneath the surface.
 - 3. Dirt with a frozen but thin crust.
- C. Crane operated on a hill or sloping surface. Crane will tip at less than rated capacity when load is lifted on downhill side.

CAPACITY EXAMPLE

Refer to the IC-35-2C Capacity Chart on the following page. A load weighing 4500 pounds is to be lifted onto the deck of the crane for transport to a new location. The closest we can get to the load is at a 6 foot load radius over the side. We see on the chart that 4000 pounds is the maximum load on one-part line, so the sheave block is required. The charts show the weight of the standard sheave block to be 60 pounds. The rigger says that two slings are required, weighing a total of 40 pounds. The total load is $4500+60+40=4600$.

Looking at the "360° ROTATION, ON RUBBER" column we see that the load is too heavy for this condition. The "OVER THE FRONT, ON RUBBER" column shows that we can lift 5100 pounds at a 6 foot load radius. However, we cannot get that close to the load, so the load cannot be lifted this way. This leaves the "ON OUTRIGGERS" columns. The outriggers should always be used whenever possible anyway. We see that we can lift up to 5850 pounds at a 6 foot load radius, either over the front or over the side. Checking the chart again, we see that the load is within the deck load limit of 6000 pounds. Note: The travel speed with the load must be limited to 3 MPH -- or less if conditions dictate.

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

CRANE CAPACITY CHART FOR IC-35-2C

CRANE CAPACITY CHART IC-35-2C

CAPACITIES APPLY TO OPERATION ON FIRM LEVEL SURFACE						
LOAD RADIUS FEET	MAIN BOOM OR EXTENSION CAPACITIES IN POUNDS					
	360° ROTATION			OVER FRONT		
	ON RUBBER	OUTRIGGERS	ON RUBBER	ON RUBBER	ON RUBBER	ON OUTRIGGERS
4	5000	8000	8000	6700	8000	8000
5	4000	6800	6800	5800	6800	6800
6	2850	5850	5850	5100	5850	5850
8	1800	4150	4150	3500	4150	4150
10	1250	3200	3200	2350	3400	3400
12	900	2350	2350	1750	2850	2850
14	700	1850	1850	1350	2450	2450
16	600	1500	1500	1100	2150	2150
18	500	1250	1250	950	1950	1950
19	450	1150	1150	900	1850	1850
20	400	1100	1100	850	1800	1800
22	300	900	900	700	1450	1450
24	250	800	800	600	1300	1300
26	200	700	700	500	1150	1150
27	150	650	650	450	1100	1100
MAIN BOOM						
8-FOOT BOOM EXTENSION - STRAIGHT OR OFFSET						
BOOM EXTENSION ANGLE	MAIN BOOM ANGLE					
	0°	10°	20°	30°	40°	50°
	1100	1200	1300	1450	1600	1850
+ * 0°	1100	1250	1350	1500	1700	2050
+ * 15°	—	—	—	—	—	—
+ * 30°	—	—	—	1100	1200	1300
—	—	—	—	1450	1600	1600
8-FOOT BOOM EXTENSION - STRAIGHT OR OFFSET						

OPERATION:

1. READ AND UNDERSTAND OWNERS MANUAL BEFORE OPERATING THIS CRANE
2. CHECK LEVEL OF ENGINE OIL AND HYDRAULIC OIL DAILY
3. CHECK UNIT FOR VISIBLE DEFECTS DAILY
4. OUTRIGGERS MUST BE FULLY SET ON SOLID SURFACE
5. AVOID QUICK STARTS AND STOPS WHEN OPERATING OR DRIVING CRANE

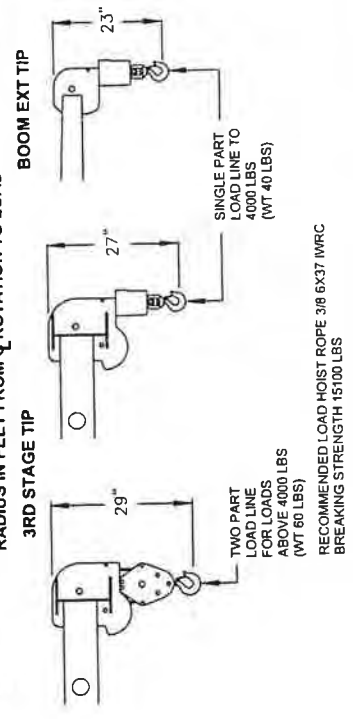
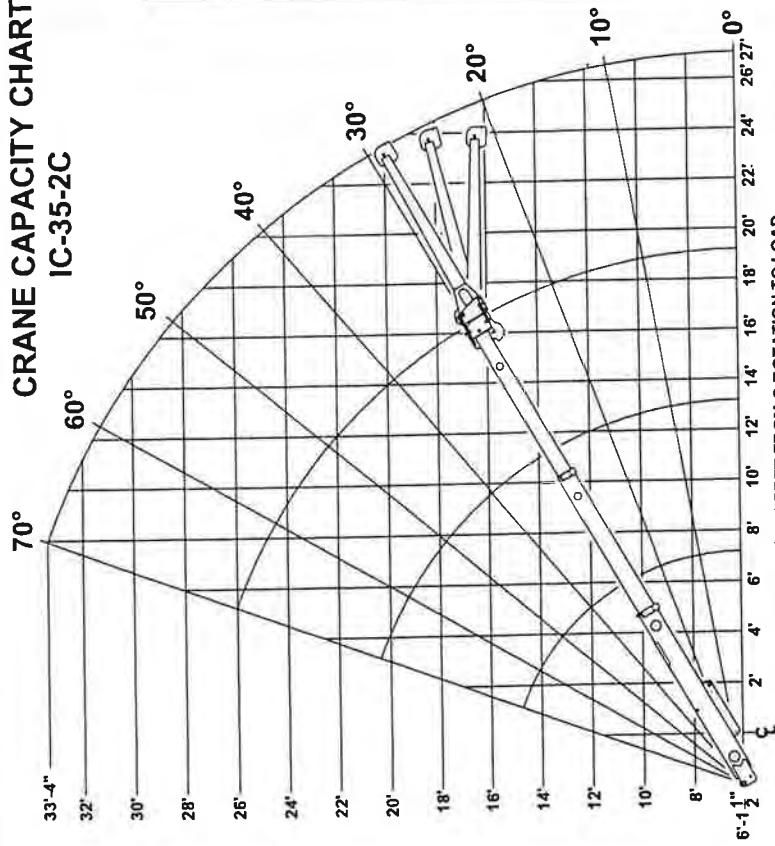
TIRE PRESSURE 7.50 X 10-16PL 150 PSI

MODEL NO. SERIAL NO. DATE OF MFR.

IC-35-2C

BRODERSON MANUFACTURING CORP.
LENEXA, KANSAS

C-654-00382



LOAD RADIUS IS THE HORIZONTAL DISTANCE FROM CENTERLINE OF ROTATION TO THE VERTICAL LOAD HOOK WITH LOAD APPLIED. LOAD HOOK, DOWNHAUL WEIGHT, HOOK BLOCKS AND OTHER LOAD HANDLING DEVICES SHALL BE CONSIDERED PART OF THE LOAD EXCEPT FOR HOIST ROPE.

DECK LOAD 6000 LBS MAX (CENTERED BETWEEN WHEELS)

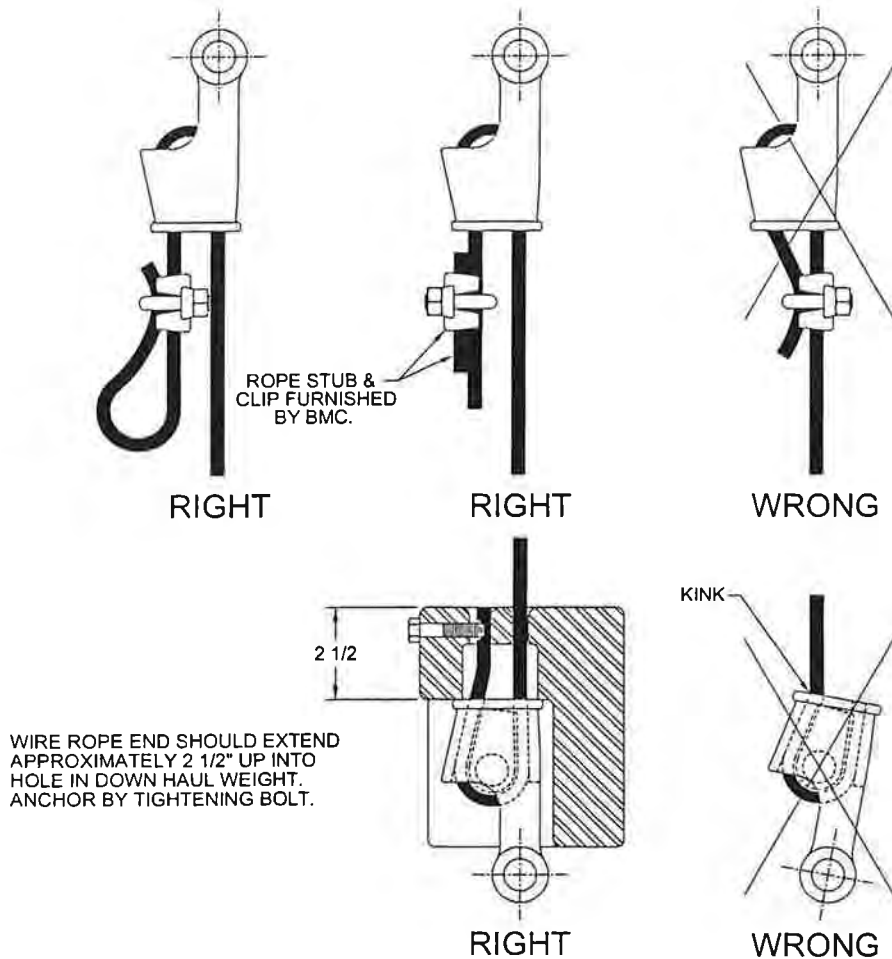
MAXIMUM HYDRAULIC PRESSURE 2600 PSI.

SHEAVE BLOCK AND DOWNHAUL WEIGHT

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

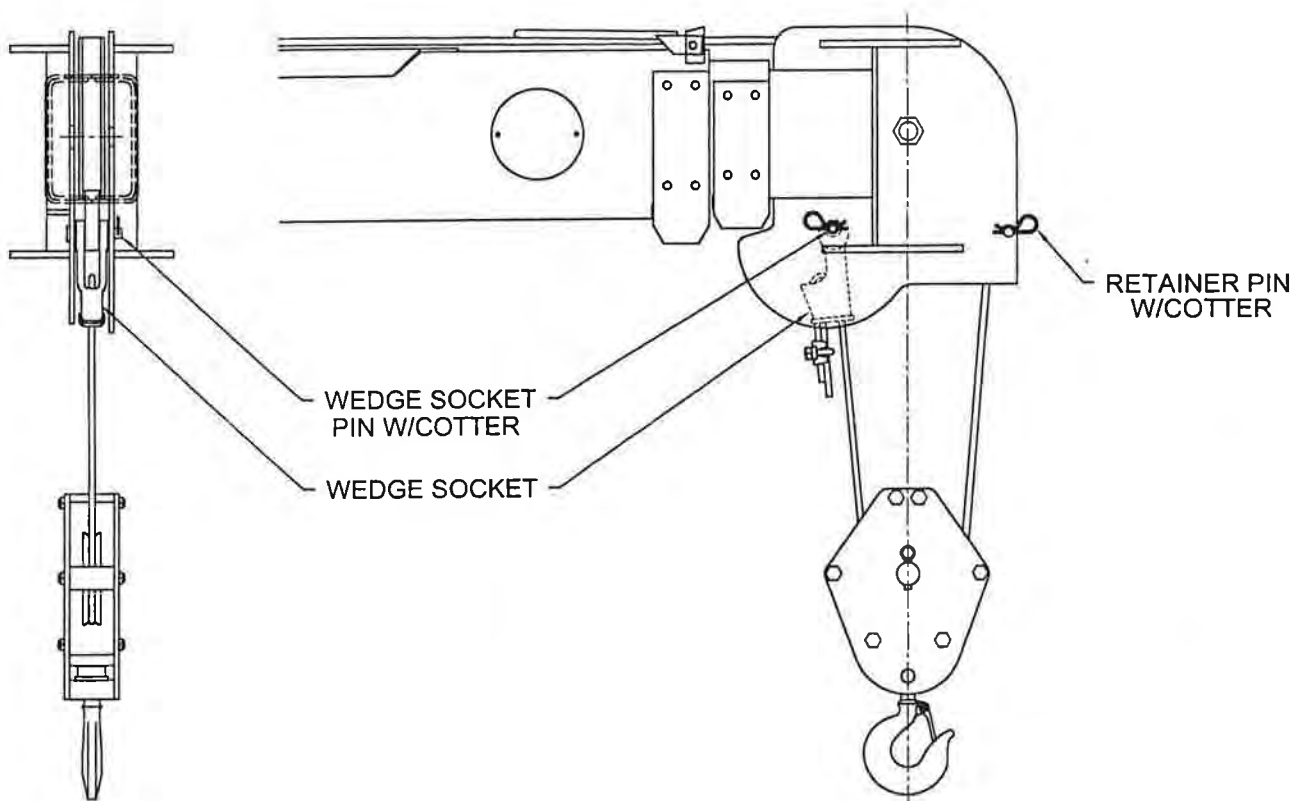
The keeper pins that pass through the sheave plates must be locked in place with cotters to hold the line on the sheaves. The load line must pass through the center of the downhaul, through the wedge socket, and the dead end clamped in the block as shown in the figure below.

WIRE ROPE INSTALLATION



For loads above 4,000 pounds the sheave block must be used. 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 by metal fatigue over a number of cycles. The sheave block should hang straight, and the top of the block should meet the boom sheave plates squarely when pulled up snugly.

TWO-PART LINE REEVING



When resting the downhaul or sheave block on the ground for changing it, use the following procedure to prevent fouling the load line on the hoist. Raise the boom about 5 feet 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 IC-35 to maintain control of a load in case of power or hydraulic line failure or human error. 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 flange-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 flange-mounted on the cylinder barrel. This valve holds the boom in the elevated position should power or hydraulic pressure line failure occur. This valve is adjustable to hold the desired load. If the boom creeps down with loads to maximum capacity, this valve 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 EXTENSION 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, TELESCOPE EXTEND BOOM LOWER, SWING LEFT and SWING RIGHT circuits. No other circuits are affected. These circuits are returned to normal operation by operating the HOIST LOWER, TELESCOPE RETRACT or BOOM RAISE 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.

WARNING

Even though the crane is equipped with anti-two-block device, we strongly recommend that the operator always watch the downhaul and stop lifting before two blocking occurs. Two blocking can break the load hoist rope and let the load fall. This could cause death or serious injury.

HOIST BRAKE AND HOLDING VALVE:

The hoist has an automatic brake in the gearbox and a holding valve mounted directly on the hoist motor to hold the load. A clutch in the gearbox allows the winch to turn freely in the "RAISE" direction. The brake is pilot released in the "LOWER" direction and should allow smooth stops of a load on the hoist.

OPTIONAL EQUIPMENT

BOOM EXTENSION CAPACITY CHART:

The boom extension will increase the main boom length by 8 feet. The main boom and boom extension capacity charts must both be considered when using the boom extension. The smaller capacity specified by the two charts must be used.

INSTALLING BOOM EXTENSION ON TIP OF BOOM:

1. Set the outriggers.
2. If the sheave block is installed, remove it.
3. Pay out 20 feet of load line.
4. Lower and retract boom and position over front.
5. Remove load line from tip sheaves and lay over left-hand side of boom.
6. Make sure the front stow pin is in place and the attach pins are removed from the lugs on the boom tip and the mating lugs on the boom extension.
7. Remove the rear locking pin and swing the boom extension away from the rear end of the boom until the attaching lugs mesh on the right-hand side of the boom.
8. Insert the attach pins in the right-hand lugs and retain them with the hairpin cotters.
9. Remove the front stow pin and swing the boom extension around to the front until the left-hand lugs mesh.
10. Insert the left-hand attach pins in their lugs and retain them with hairpin cotters.
11. Replace the lock pin and 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.

STOWING THE BOOM EXTENSION:

1. Reverse the procedure described in steps 7 through 14 in the installation procedure above.
2. Lay the load line back in the tip sheaves and insert both retainer pins and cotters.
3. Replace all of the pins in their lugs for storage and insert their cotters.
4. Install the sheave block or downhaul weight on the load line.

FRONT AUXILIARY WINCH:

The front auxiliary winch is mounted behind the front bumper and is controlled from the operator compartment. The winch, with the 5/16" wire rope (10,500 pound breaking strength) and 2-ton hook, has a single-part-line capacity of 3,000 pounds. A pulling eye is provided below the winch for two parting the line with a sheave block allowing 6,000 pound pulls. (An additional sheave block is not provided with this option.)

The front auxiliary winch is designed for the following uses:

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

WARNING

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

1. Never lift or carry personnel with the winch and wire rope.
2. Do not allow anyone to stand near or under the load being moved.
3. Be sure the cable is securely anchored in the drum and that at least 5 wraps of rope remain on the drum to insure against the rope pulling out of its anchor.
4. Stand clear of a loaded winch cable. If it breaks, it can be very dangerous.
5. Keep hands clear of the winch and any sheaves that the cable passes over when the winch is being operated.



MAINTENANCE

SAFETY RULES

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

16. Use a hoist when lifting components that weigh 50 pounds or more. Follow all hoist and rigging safety rules.
17. Do not use lower grade fasteners if replacements are necessary.
18. When reinstalling wiring or plumbing after repairs, be sure that it will not be damaged by rubbing against sharp, rough or hot surfaces or edges.
19. Never use a rope clip on live side of the load hoist rope. This will seriously weaken the rope. Death or serious injury can result from the use of a rope clip on the hoist rope.
20. Replace any instruction or warning placards that are lost or damaged.
21. Always replace all guards and covers after working on the crane.
22. After working on the hydraulic system, remove air from the lines and cylinders involved by cycling them full stroke with the engine running until the functions operate smoothly.
23. When welding on the crane or on anything connected to the crane by wire rope or other conducting link, disconnect the battery, the Rated Capacity Limiter display and computer and the engine electronic control module.
24. When using pressure spray to clean the crane, cover all electronic components with sheets of plastic to protect them from spray.

MAINTENANCE

The Broderon IC-35 Industrial Crane will perform better and longer if a program of inspection, lubrication, adjustment and general preventive maintenance is followed. We recommend the following schedule:

NEW UNIT INSPECTION AND TEST

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

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

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 radiator coolant level.
2. Check engine oil level.
3. Check general condition of tires.
4. Visually inspect for loose pins and physical damage.
5. Check fuel level.
6. Check engine oil pressure.
7. Check engine coolant temperature.
8. Check battery charging amperage.
9. Check hydrostatic transmission temperature.
10. Check hydrostatic transmission control switch and accelerator operation.
11. Check parking brake operation.
12. Check power steering operation.
13. Observe chassis for normal driving operation.
14. Observe boom operation for normal power and speed.
15. Check load line and hooks for damage.
16. Check condition of sheaves and load line retainers.
17. Check hydraulic oil level.
18. Check anti-two-block system for proper operation.
19. Check back-up alarm for proper operation.
20. Check operation of Rated Capacity Limiter according to the RCL User Manual.

Weekly:

1. Check tire pressure -- 150 PSI.
2. Visually inspect wheel nuts.
3. Check lights.
4. Check power steering lines for damage.
5. Check operation of horn.
6. Check operation of hoist brake for smoothness.
7. Check outrigger holding valves for operation.
8. Check boom topping holding valve for operation.
9. Check boom extension cylinder holding valve for operation.
10. Check operation of windshield wipers (if equipped).
11. Boom extension (if equipped) properly pinned with retainers in place.
12. Clean all glass (if equipped) and check for cracks.

WARNING

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

Accuracy Verification and Routine Maintenance

A Daily inspection by the operator before starting the crane operation shall include:

- A visual inspection of all system components (see "System Structure" on page 8) to insure that no external damage will affect proper system operation.
- A visual inspection of all system cables for cuts or other physical damage.
- A test of the Two-Block system by lifting the trip arm. The red warning light on the display, a text message indicated on the bottom of the display and an audible alarm shall occur
- Check the cable of the cable reel connected to the boom tip for proper spooling and spring tension by extending and retracting the boom. Verify the length indicator is correct checking the readout at the fully retracted and fully extended boom lengths.
- Check the Angle Sensor accuracy by using a level at zero degrees. Then check the difference between the minimum and maximum angles and compare with the results of the weekly test.
- Check the Hydraulic Pressure Sensors and hydraulic connections for any leaks.

A Weekly inspection by the operator before starting the crane operation shall include:

- Performing the daily inspection procedure as listed above.

Below procedures require checking the actual information against the RCL readout.

- Accuracy verification of the boom angle checking the display readout indication by using an angle finder at minimum boom angle and at ten (10) degree increments up to the maximum boom angle. Record the difference between the minimum and maximum angles for for daily inspection.
- Accuracy verification of the load radius display indication by using a tape measure, checking load radius at minimum boom length, a medium boom length and maximum boom length.
- Accuracy verification of the actual load indication by lifting a known weight within the load chart rating.
- Accuracy verification of the RCL for shutdown of functions by lifting a known weight and using the machine load capacity chart, lifting the load and bringing it to the radius as per the load chart and verifying the system shuts down the hoist up, boom down and telescope extend functions. This should be checked for all configurations per the machine load chart.

WARNING!

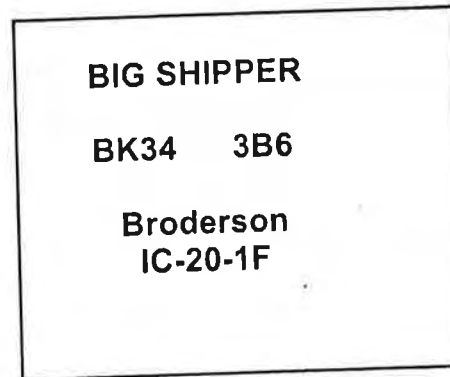
Above procedures shall be done as a minimum verification of the RCL's operational functions. Any system damage or function issues should be reported immediately to the person responsible for safe crane operations.

An annual inspection (or whenever required by local regulations) by an authorized Testing Company, shall include accuracy verification.

OPERATING INSTRUCTIONS

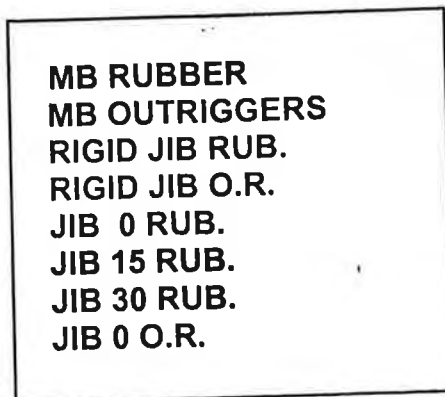
After power is applied, the system will run an automatic systems self test and the display will indicate product (Big Shipper), software version (BK34), company name (Broderson) and Crane model number (IC-20-1F). See Fig 3.

(Fig 3)

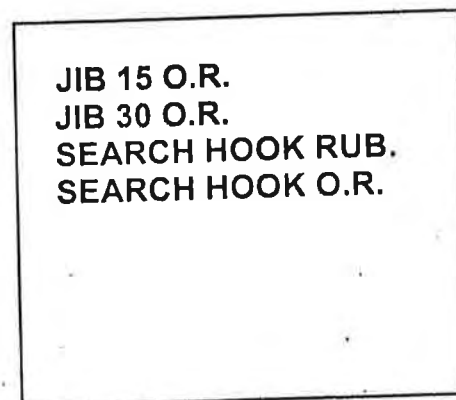


After the self test is completed the system will indicate the configuration menus, which consists of two pages. See fig 4 and 5.

(Fig 4) Page 1



(Fig 5) Page 2



Press and releasing the **SEL/INDEX** pushbutton will scroll the cursor down the page. Once the configuration mode is highlighted, press and release the **MAX/ENTER** pushbutton to confirm your selection.

WARNING!

The configuration of the Big Shipper must match the crane model number. All configuration modes may not be equipped on all machines. See the machine load chart for machine configurations.

Once the configuration is selected and confirmed the display will indicate the parts of line selection menu; See Fig 6

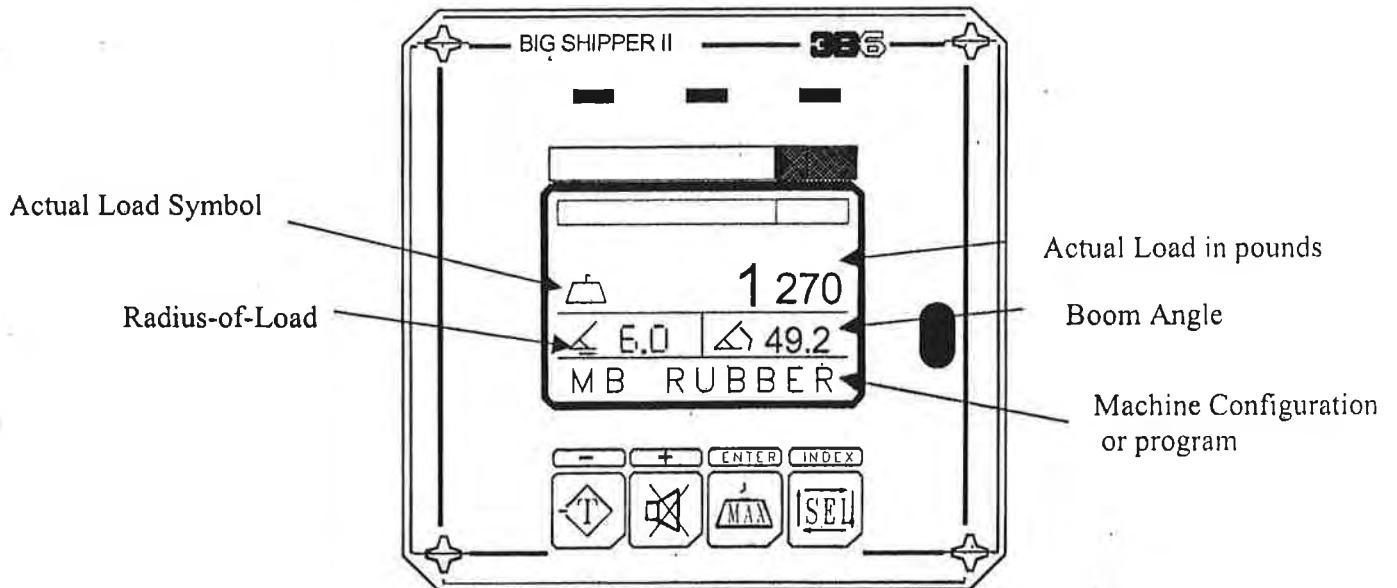
(Fig 6)

No. ROPES	1
No. ROPES	2
No. ROPES	3
No. ROPES	4

Press and release the SEL/INDEX pushbutton to scroll the cursor to the proper number of ropes and then press and release the MAX/ENTER pushbutton to confirm the information. The system will indicate the normal operating mode. To select a different operating mode, Press and release the SEL/INDEX pushbutton and to confirm your selection, press and release the MAX/ENTER pushbutton.

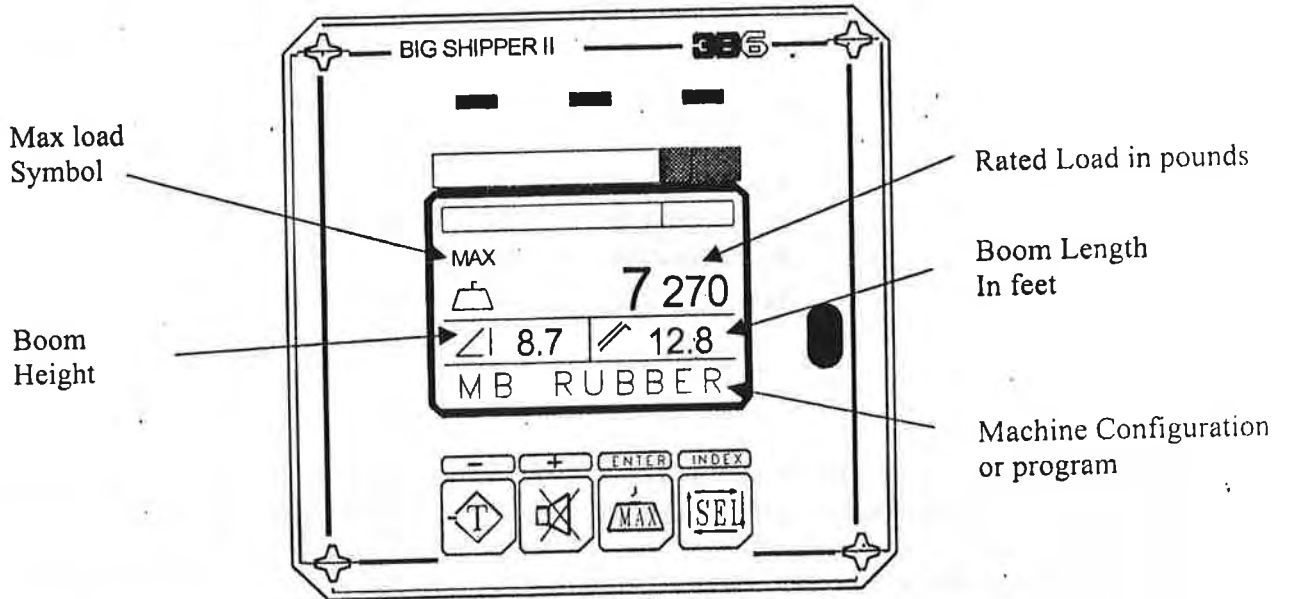
The display then will change to the operating mode. See Fig 7

(Fig 7)



To change from Actual Load to (Max) Rated Load, from Radius-of-Load to Boom Height and from Boom Angle to Boom Length press and hold the MAX/ENTER pushbutton and the display will change to indicate accordingly:

(FIG 8)



To return to Actual Load, Radius-of-Load and Boom Angle release the **MAX/ENTER** pushbutton. To change the system configuration, press **SEL/INDEX** pushbutton until the display will change to the configuration chart (see page 15).

SELF TEST DIAGNOSTICS