GROVE

OPERATOR'S MANUAL

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

RT600E

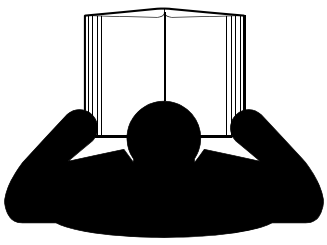
Crane Model Number

This Manual is divided into the following sections:

NOTICE

The crane serial number is the only method your distributor or the factory has of providing you with correct parts and service information.

The crane serial number is identified on the builder's decal attached to the operator's cab. ***Always furnish crane serial number*** when ordering parts or communicating service problems with your distributor or the factory.



⚠ WARNING

To prevent death or serious injury:

- Avoid unsafe operation and maintenance.
- This crane must be operated and maintained by trained and experienced personnel. Manitowoc is not responsible for qualifying these personnel.
- Do not operate or work on this crane without first reading and understanding Operator's Manual and Rating Plate supplied with crane.
- Store Operator's Manual in holder provided on crane.
- Attach laminated Capacity Charts supplied with crane to chain in operator's cab.
- If Operator's Manual or Capacity Charts are missing from cab, contact your distributor for new ones.

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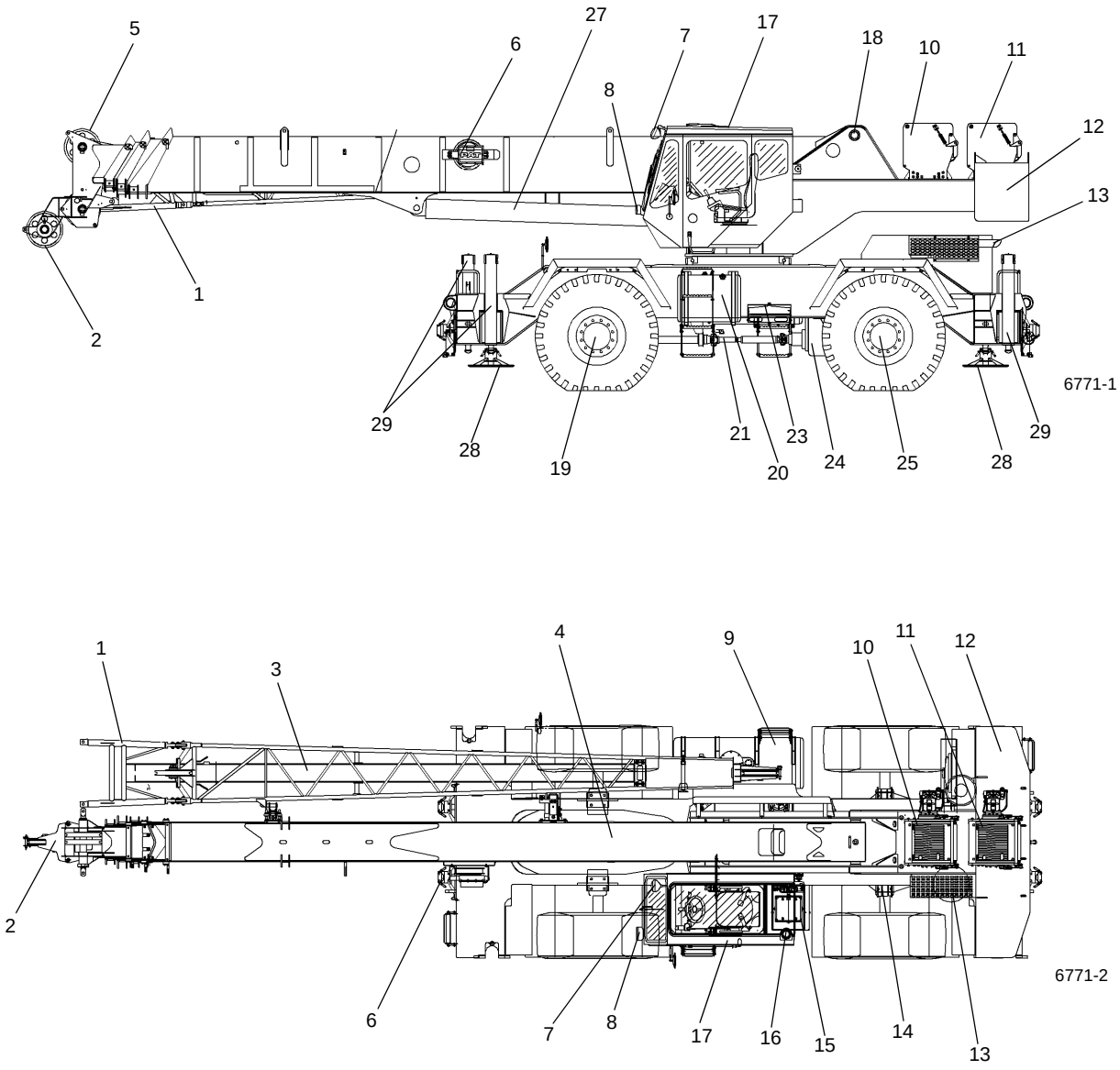
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FIGURE 1-2

1. Secure the services of a qualified engineer to direct the operation.
2. Use one qualified signal person.
3. Coordinate lifting plans with the operator, engineer, and signal person prior to beginning the lift.
4. Communication between all parties must be maintained throughout the entire operation. If possible, provide approved radio equipment for voice communication between all parties engaged in the lift.
5. Use cranes and rigging of equal capabilities and use the same boom length.
6. Use outriggers on cranes so equipped.
7. Be certain cranes are of adequate lifting capacity.
8. Calculate the amount of weight to be lifted by each crane and attach slings at the correct points for proper weight distribution.
9. Ensure the load lines are directly over the attach points to avoid side loading and transfer of loading from one crane to the other.
10. DO NOT TRAVEL. Lift only from a stationary position.

LOAD MOMENT INDICATING (LMI) SYSTEMS

Electronic equipment on this crane is intended as an aid to the operator.

Under NO CONDITION should it be relied upon to replace the use of capacity charts and operating instructions. Sole reliance upon these electronic aids in place of good operating practices can cause an accident.

Know the weight of all loads and always check the capacity of the crane as shown on the Load Chart before making any lifts.

NEVER exceed the rated capacity shown on the Load Chart. Always check the Load Chart to ensure the load to be lifted at the desired radius is within the rated capacity of the crane.

Never interfere with the proper functioning of operational aids or warning devices.

For detailed information concerning the operation and maintenance of the load moment indicating system installed on the crane see the manufacturer's manual supplied with the crane.

Two-Blocking

Two-blocking occurs when the load block (hook block, headache ball, rigging, etc.) comes into physical contact with the boom (boom nose, sheaves, jib, etc.). Two-blocking can cause hoist lines (wire rope) rigging, reeving, and other components to become highly stressed and overloaded in which case the wire rope may fail allowing the load, block, etc. to free fall.

Two-blocking is more likely to occur when both the main and auxiliary hoist lines are reeved over the main boom nose and boom extension/jib nose respectively. An operator, concentrating on the specific line being used, may telescope or lower the boom allowing the other hoist line attachment to contact the boom or boom extension/jib nose, thus causing damage to the sheaves, or causing the wire rope to fail, dropping the lifting device to the ground and possibly injuring personnel working below.

Caution must be used when lowering or extending the boom. Let out load line(s) simultaneously to prevent two-blocking the boom tip(s) and the hook block, etc. The closer the load is carried to the boom nose the more important it becomes to simultaneously let out wire rope as the boom is lowered. Keep load handling devices a minimum of 107 cm (42 in) below the boom nose at all times.

Two-blocking can be prevented. Operator awareness of the hazards of two-blocking is the most important factor in preventing this condition. An anti two-block system is intended to assist the operator in preventing dangerous two-block conditions. It is not a replacement for operator awareness and competence.

To avoid death or serious injury, keep load handling devices away from boom/jib tip when extending or lowering the boom and when hoisting up.

This crane should have a functional ANTI-TWO-BLOCK and CONTROL LOCK-OUT system. Test daily for proper operation.

Do not pass loads or boom over ground personnel.

Barricade the area where the crane is working and keep all unnecessary personnel out of that area. DO NOT allow personnel to be under the load or boom.

Never pass loads, load handling devices, or the crane boom over people on the ground.

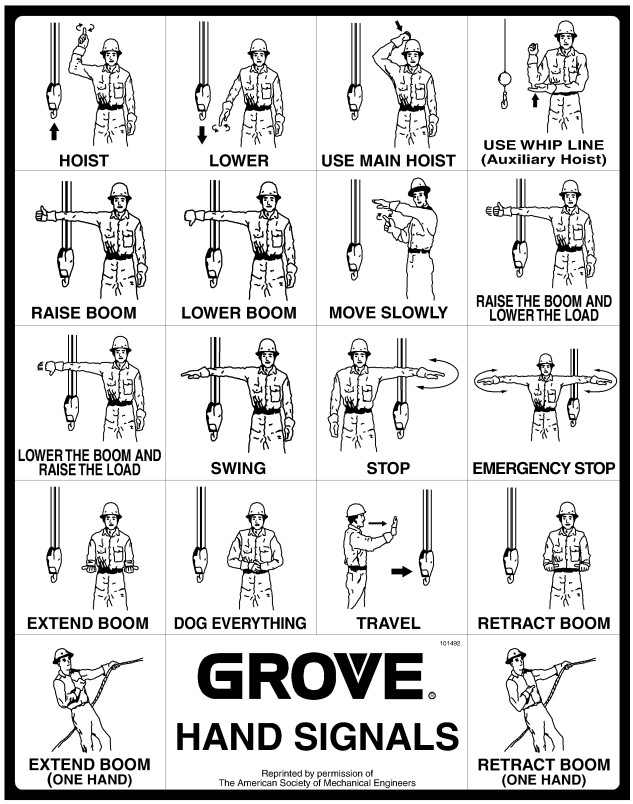
Never operate the crane with less than two wraps of wire rope on the hoist drum.

Never interfere with the proper functioning of operational aids or warning devices.

Work Area Definition System

You must read and understand the manufacturer's Operator's Manual before operating the system. Become familiar with all proper operating procedures and with the identification of symbol usage.

Barricade the area where the crane is working and keep all personnel out of the selected work area definition.



At all times use standardized hand signals - previously agreed upon and completely understood by the operator and signal person.

If communication with the signal person is lost, crane movement must be stopped until communications are restored.

Keep your attention focused on the crane's operation. If for some reason you must look in another direction, stop all crane movement first.

When vision is obscured, use and follow the directions of a single qualified signal person.

Obey a signal to stop from anyone.

TRANSPORTING THE CRANE

When loading or unloading the crane on a trailer or railroad car, use a ramp capable of supporting the weight of the crane.

Ensure the crane is adequately secured to the transporting vehicle.

If it is necessary to take the crane on a road or highway, first check state and local restrictions and regulations.

Check load limits of bridges on the travel route and ensure they are greater than the combined weight of the crane and transporting vehicle.

Always drive the crane carefully, obeying speed limits and highway regulations. Keep lights on and use traffic warning flags and signs and front and rear flag vehicles as applicable.

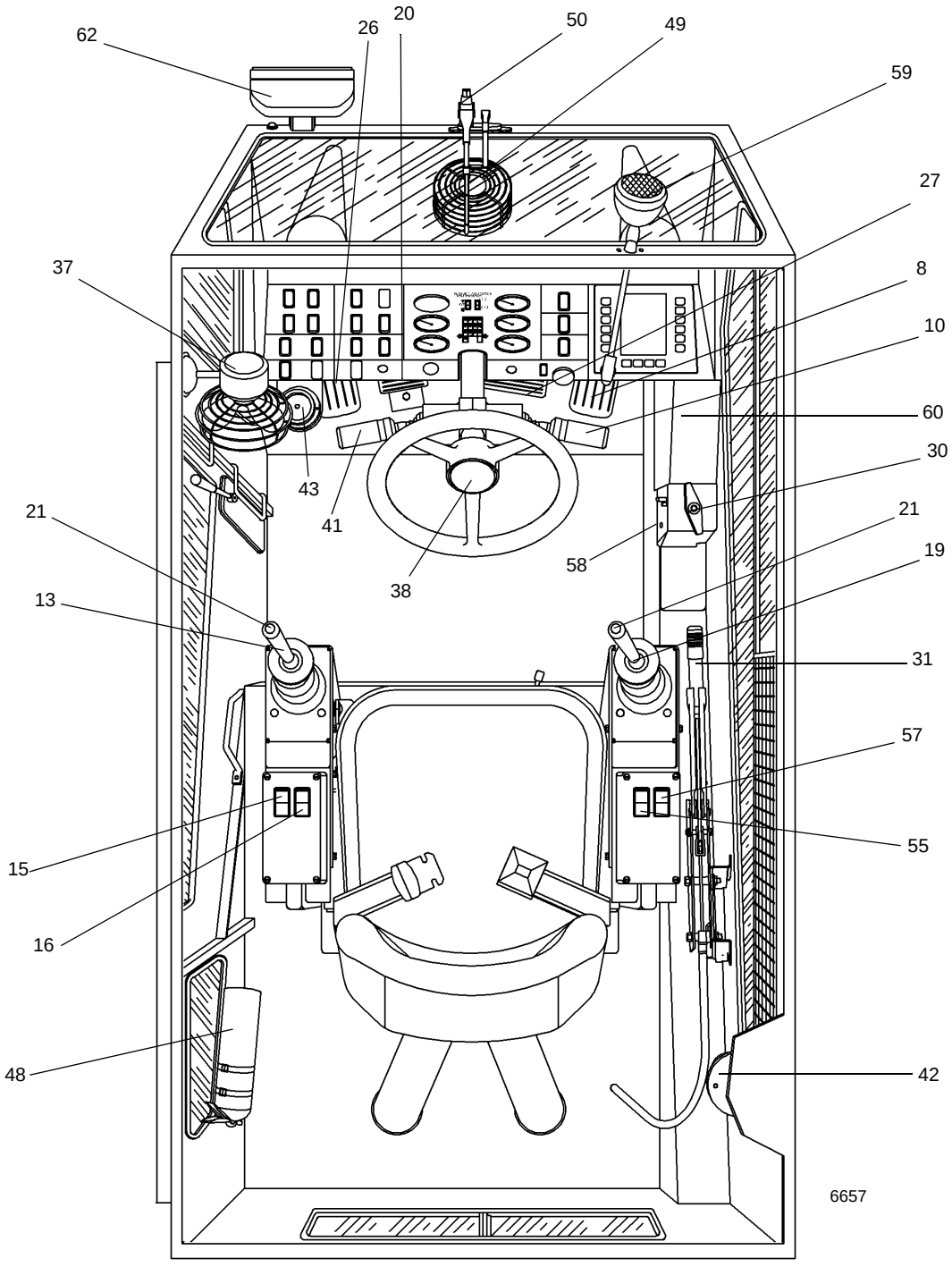
SHUT-DOWN

Never leave the crane with a load suspended. Lower the load to the ground before shutting down the crane.

Use the following steps when shutting down the crane:

- Engage the parking brake.
- Fully retract and lower the boom.
- Engage the pin swing lock or 360 degree swing lock.
- Place controls in neutral position.
- Shut down the engine and remove the ignition key.
- Chock the wheels.
- Lock the operator's cab and install vandal guards, if used.

In cold weather, never park the crane where the tires can become frozen to the ground.



Dual Axis Controller Option

FIGURE 3-2

Cold Weather Operation

The following recommendations are for operating Grove cranes in very low (i.e., sub-zero) temperatures.

Use particular care to ensure that cranes being operated in very cold temperatures are operated and maintained in accordance with the procedures as provided by Grove Worldwide. Cranes should have appropriate hydraulic oil, lubricants, and other auxiliary items required for operation in sub-zero temperatures. Individual crane functions should be operated to ensure they are sufficiently warmed prior to performing a lift.

Operation of cranes at full rated capacities in temperatures between -18°C (0°F) and -40°C (-40°F) or lower should be accomplished only by competent operators who possess the skill, experience, and dexterity to ensure smooth operation. Shock loading shall be avoided.

The correct grade of oil for the prevailing temperature should be used in the crankcase to prevent hard cranking. Diesel fuel should have a pour point of 6°C (10°F) less than the lowest expected temperature. In case of emergency, white kerosene may be added to the fuel to bring the pour point down to the required temperature to prevent clogging of filters and small passages by wax crystals. The addition of kerosene is NOT recommended for general use.

Operation Below -40°C

For crane operation below -40°C, capacities shall be de-rated 3.67 percent of the rated load shown on the capacity charts for each degree below -40°C.

Operation Below -40°F

For crane operation below -40°F, capacities shall be de-rated 2 percent of the rated load shown on the capacity charts for each degree below -40°F.

Battery Disconnect

The battery disconnect switch is located in the battery box on the left side of the crane. To disconnect the batteries, turn the battery disconnect switch to OFF. Turn the switch to ON to connect the batteries.

Engine Operation

Starting and shutdown procedures for most diesel engines generally follow the same pattern. Therefore, the following procedures can be applied except where specific differences are noted. (Refer to the applicable engine manufacturers manual for detailed procedures.)

Starting Procedure

Make an under-the-hood inspection for fuel, oil, and coolant leaks, worn drive belts, and trash build-up.

If the crane was inactive for over 24 hours and the batteries were disconnected, make sure to connect the batteries before proceeding with start-up procedure.

WARNING

Diesel engine exhaust can be harmful to your health. Only operate the engine in a well ventilated area or vent exhaust outside.

DANGER

Before starting the engine, apply the parking brake and engage the swing lock.

CAUTION

Never crank the engine for more than 30 seconds during an attempted start. If the engine fails to start after 30 seconds, stop and allow the starter motor to cool for approximately two minutes before attempting another start.

CAUTION

If the engine fails to start after four attempts, correct the malfunction before attempting further starts.

Warm Engine

WARNING

Do not spray starting fluid into the air inlet. The spray will contact the heater elements and could explode causing personal injury.

NOTE: The engine ECM monitors the engine and, under certain conditions, cycles the air heater on and off at start-up and during operation.

The engine is equipped with an electric air heater grid at the air inlet elbow to aid in cold starting and reduce white smoke at start-up. In the preheat mode, the engine should not be cranked until the WAIT-TO-START lamp turns off.

1. Ensure the parking brake is set and position the transmission in neutral.

NOTE: The engine will not crank unless the transmission is in neutral.

Elevating The Boom (Single Axis Controller Option)

WARNING

Keep the area above and below the boom clear of all obstructions and personnel when elevating the boom.

To elevate the boom, pull the BOOM (lift) control lever back, toward yourself, and hold until the boom reaches the desired elevation level.

Lowering The Boom (Single Axis Controller Option)

WARNING

Keep the area beneath the boom clear of all obstructions and personnel when lowering the boom.

WARNING

Long cantilever booms can create a tipping condition, even when unloaded and in an extended, lowered position.

CAUTION

When lowering the boom, simultaneously let out the hoist cable to prevent two-blocking the boom nose and hook block.

CAUTION

The closer the load is carried to the boom nose, the more important it becomes to simultaneously let out the hoist cable as the boom is lowered.

To lower the boom, push the BOOM control lever forward, away from yourself, and hold until the boom is lowered to the desired position.

Extending The Boom (Single Axis Controller Option)

WARNING

When extending the boom, simultaneously let out the hoist cable to prevent two-blocking the boom nose and hook block.

DANGER

Check the load chart for the maximum load at a given radius, boom angle, and length before extending the boom with a load.

CAUTION

Before extending the boom, ensure the large access cover on top of the boom base section is installed.

NOTE: When the crane is equipped with an auxiliary hoist, the telescope function is controlled by a foot pedal.

To extend the boom, push the TELESCOPE control lever forward, away from yourself, and hold until the boom extends to the desired length.

Retracting The Boom (Single Axis Controller Option)

WARNING

When retracting the boom, the load will lower unless the hoist cable is taken in at the same time

To retract the boom, pull the TELESCOPE control lever back, toward yourself, and hold until the boom retracts to the desired length.

Extending and Retracting the Boom With the Telescope Control Pedal (Single Axis Controller Option)

The telescope control pedal is used on a crane equipped with an auxiliary hoist. Push on the top of the pedal to extend the boom and push on the bottom of the pedal to retract the boom.

Lowering And Raising The Hoist Cable (Single Axis Controller Option)

WARNING

Keep the area beneath the load clear of all obstructions and personnel when lowering or raising the cable (load).

WARNING

Do not jerk the control lever when starting or stopping the hoist. Jerking the lever causes the load to bounce, which could result in possible damage to the crane.

DEAD-END RIGGING/WEDGE SOCKETS

Wedge socket assemblies are popular rigging accessories and have been successfully used for decades to terminate wire ropes on mobile cranes. A wedge socket assembly is easily installed and dismantled but it must be installed and used correctly. It is essential to use only a wedge and socket of the correct size for the rope fitted. Failure to do so may result in the rope pulling through the fitting.

Since state and local laws may vary, alternate attachment methods may be necessary depending upon work conditions. If alternate methods are selected, the user is responsible and should proceed in compliance with the regulations in force. If there are any questions, contact your local Grove Distributor or Manitowoc Crane Care.

Do not mix components from different manufacturers. The selection, installation and use of a wedge socket assembly must be in accordance with the requirements of the wedge socket manufacturer and the wire rope manufacturer upon whose wire rope the wedge socket assembly will be used.

Manitowoc Crane Group specifies the size, type, class and line pulls for wire rope, predominately rotation resistant wire rope, and rigging accessories such as overhaul balls and hook blocks for use with each new crane that it manufactures. Other wire ropes and rigging accessories are available from various vendors. Different wire rope manufacturers have differing requirements for the construction, handling, cutting, seizing, installation, termination, inspection and replacement of the wire ropes they produce. Their advice should be sought for each specific type of wire rope a crane user intends to install on a mobile crane.

When assembly is complete, raise the boom to a working position with a load suspended to firmly seat the wedge and rope into the socket before the crane is used operationally.

CAUTION

If the socket is not positioned with the flat face toward the boom sections, structural damage will occur.

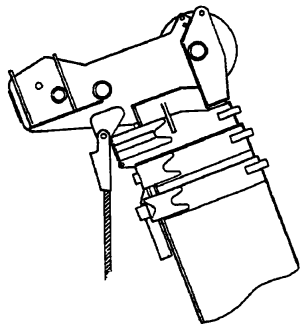


FIGURE 4-4

When anchoring the socket to the boom, ensure the flat face of the socket is in position, as shown, toward the boom sections (Figure 4-4).

Installing Wedge And Socket

1. Inspect the wedge and socket. Remove any rough edges and burrs.
2. The end of the wire rope should be seized using soft, or annealed wire or strand. If the end of the rope is welded, the welded end should be cut off. This will allow the distortion of the rope strands, caused by the bend around the wedge, to adjust themselves at the end of the line.

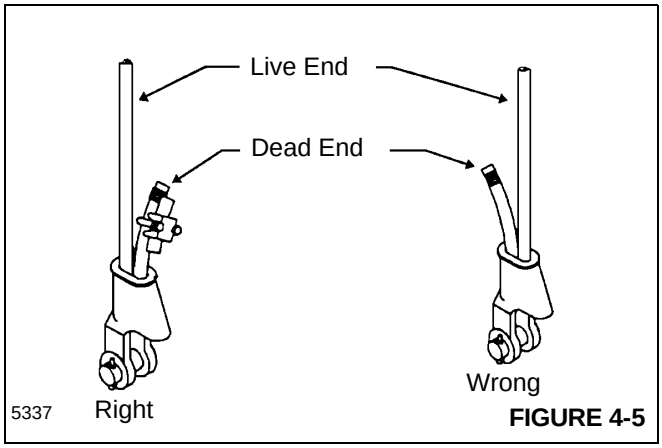


FIGURE 4-5

3. Make sure the live-loaded side (Figure 4-5) of the rope is directly in line with the ears of the socket and the direction of pull to which the rope will be subjected. If the rope is loaded into the socket incorrectly, under a load the rope will bend as it leaves the socket, and the edge of the socket will wear into the rope causing damage to the rope and eventual failure.
4. Insert the end of a wire rope into the socket, form a loop in the rope, and route the rope back through the socket allowing the "dead" end to protrude from the socket. Ensure the dead end of the rope is of sufficient length to apply end treatment to the dead end after the wedge has been seated.
5. Insert the wedge into the loop and pull the live end of the rope until the wedge and rope are snug inside the socket. It is recommended that the wedge be seated inside the socket to properly secure the wire rope by using the crane's hoist to first apply a light load to the live line.
6. After final pin connections are made, increase the loads gradually until the wedge is properly seated.
7. The wire rope and wedge must be properly secured inside the socket before placing the crane into lifting service. It is the wedge that secures the wire rope inside the socket whereas the dead-end treatment is used to

SECTION 5
LUBRICATION

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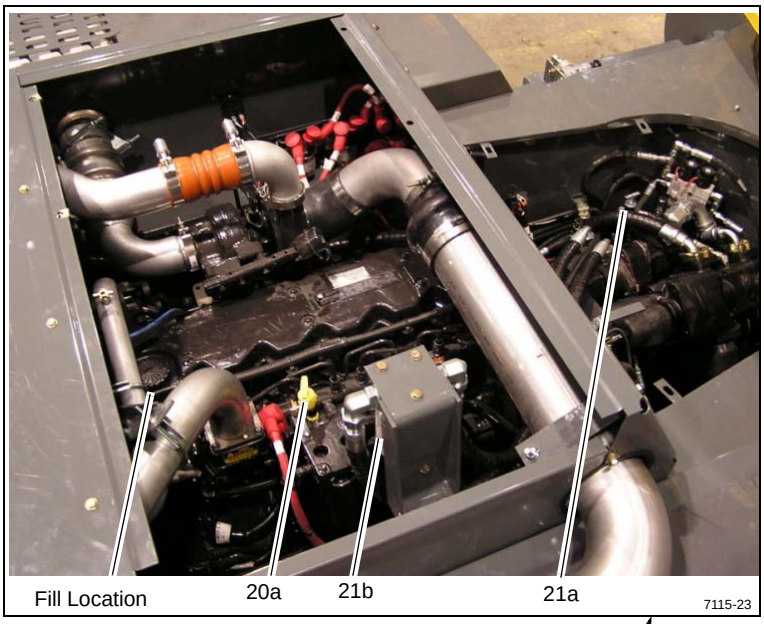
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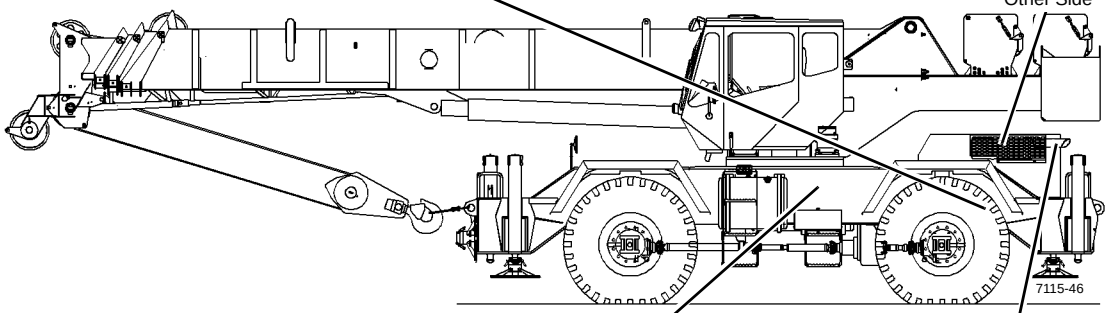
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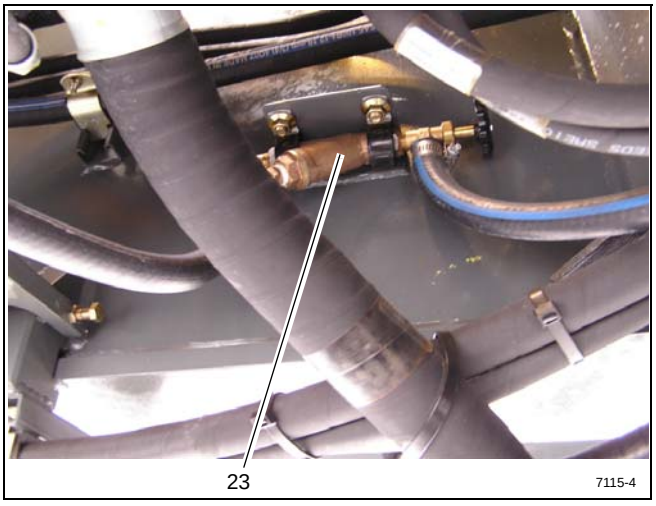
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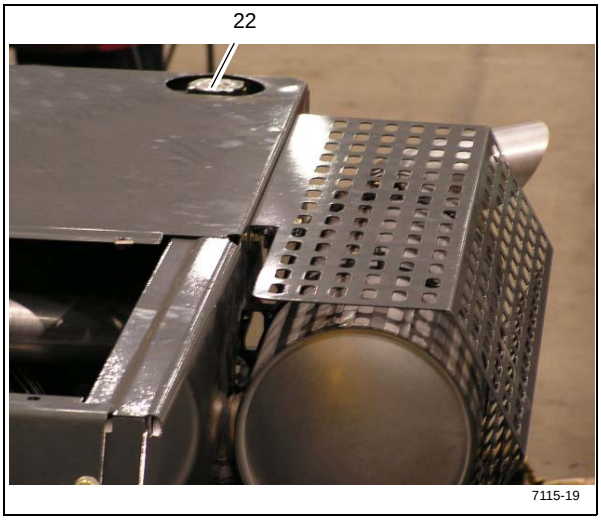
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FIGURE 5-3

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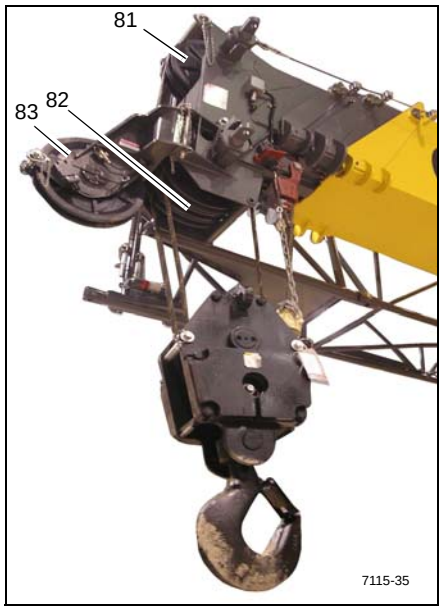
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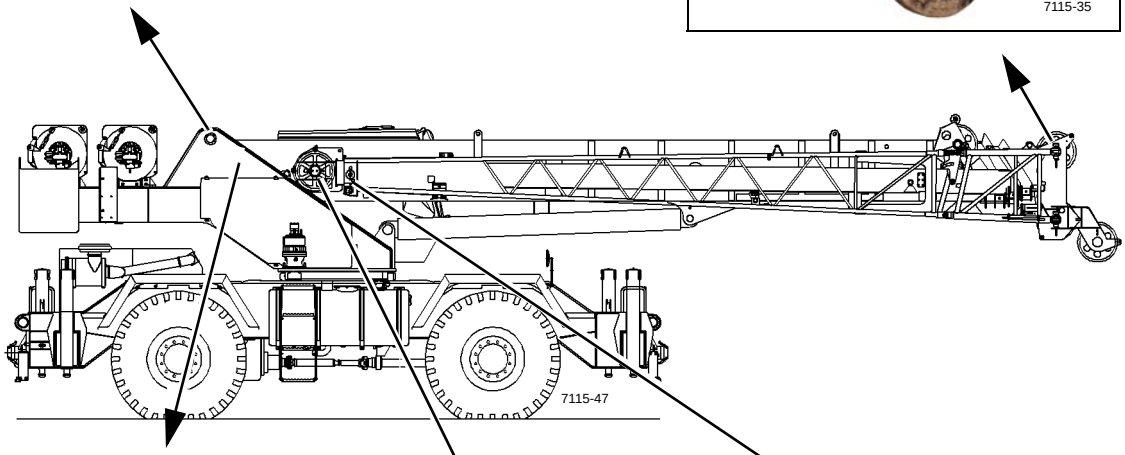
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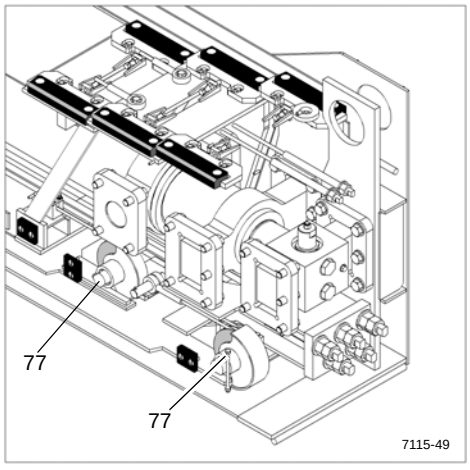
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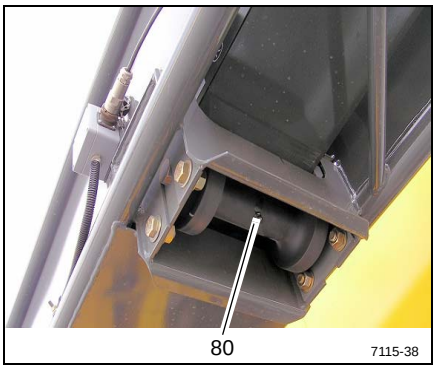
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FIGURE 5-8

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SECTION 6
MAINTENANCE CHECKLIST

GENERAL

This section contains a list of daily inspection and maintenance checks. Performing the checks will help maintain the safety, dependability, and productivity designed into your crane.

Refer to your Inspection & Lubrication Service Log for further requirements.

INSTRUCTIONS

Refer to your Service Manual for specific maintenance and adjustment procedures.

Refer to Section 5 - Lubrication (in this Operator Manual) for lubrication intervals, types of fluids and lube point locations.

Daily or 10 Hour Check List

1 **Operator's Manual**: Is item properly installed on machine?

2 **Signal and Running Lights & Horn**: Check for cracked or broken glass. Check for proper working order.

3 **Back-up Alarm**: Check for proper operation while operating machine.

4 **Gauges and Instruments**: Check for proper working order. Check for proper reading while operating engine. Check for proper operation while operating machine.

5 **Brakes (Swing, Foot & Parking)**: Check for proper working order. Check for proper operation while operating machine.

6 **Boom Angle Indicator**: Check for proper operation while operating machine.

7 **Load Moment Indicator**: Check for proper operation while operating machine. Check connectors and wiring for proper alignment and insulation.

8 **Antitwo-Block (A2B) Electrical and Hydraulic**: Check for proper operation while operating machine. Check connectors and wiring for proper alignment and insulation.

9 **Brakes and Air System (if equipped)**: Check for proper working order. Check for proper operation while operating machine. Drain moisture.

10 **Tires**: Check for proper inflation/pressure. Check for excessive wear.Check for excess dirt, grease or foreign matter.

11 **Hourmeter**: Check for proper working order. Check for proper reading while operating engine. Check connectors and wiring for proper alignment and insulation.

12 **Hydraulic Tank**: Check for proper service/level. Check for excess dirt, grease, or foreign matter.

13 **Hydraulic Oil Filter**: Check for proper service/level.

14 **Wire Rope**: Check for damaged, frayed, or broken strands.

15 **Hoists**: Is item properly installed on machine. Check for excess dirt, grease, or foreign matter.Check for proper operation while operating machine.

16 **Boom and Attachments**: Is item properly installed on machine. Check for excess dirt, grease, or foreign matter. Check for proper operation while operating machine.

17 **Crankcase**: Check for proper service/level. Check for excess dirt, grease, or foreign matter.

18 **Transmission/Torque Converter**: Check for proper service/level.

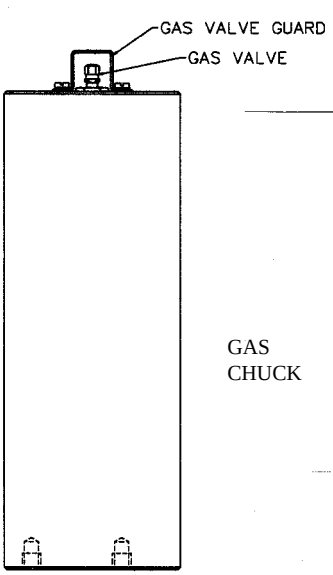
19 **Cooling System**: Check for proper service/level. Check for cracks or leaks.

20 **Fuel/Water Separator**: Drain moisture.

21 **Air Cleaner**: Check for proper service/level.Check for cracks or leaks.

22 **Hook Block & Headache Ball Safety Latch**: Check for proper working order. Check for cracks and leaks. Check for excessive wear.

23 **Lock-out Cylinder & Slew Potentiometer:** Check for proper operation while operating machine. Check for proper adjustment.



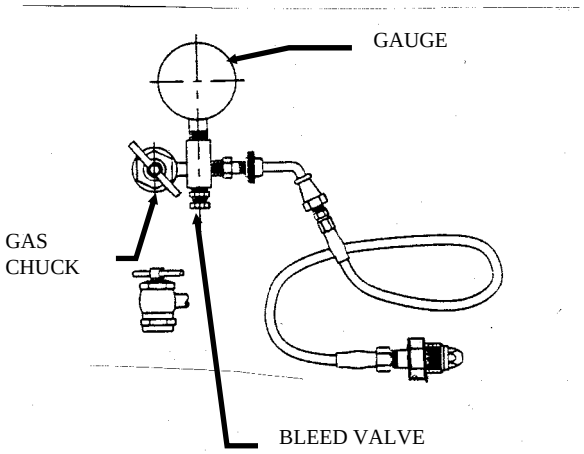


Figure 6: ACCUMULATOR **Figure 7: CHARGING ASSEMBLY**

G. Procedure for Pre-Charging Accumulator (see Figure 6).

1. With the engine off, discharge all oil stored in the accumulators by pushing the service brake pedal several times. Remove the gas valve guard and gas valve cap on the accumulator (see Figure 6).

2. Check that the nitrogen supply bottle valve is shut off, then attach charging assembly hose to nitrogen bottle.

3. Before attaching charging assembly (see Figure 7) to the accumulator gas valve, back the gas chuck "T" handle all the way out (counter-clockwise).

4. Close the charging assembly bleed valve. Without looping or twisting the hose, attach the swivel nut to the accumulator gas valve and tighten (10-15 in. lb).

5. Turn the gas chuck "T" handle all the way down (clockwise) which will depress the core in the gas valve.

6. Crack open the nitrogen bottle valve and slowly fill the accumulator. Shut off the valve when the pre-charge pressure is 1200 +50 PSI/-0 (8.3 +.4/-0 MPa).

8. If the pre-charge pressure is higher than 1200 +50/-0 PSI (8.3 +.4/-0 MPa), then close the nitrogen bottle valve and slowly open the bleed valve on the charging assembly (see Figure 7) until the pre-charge pressure is correct.

9. Remove charging assembly by turning "T" handle all the way out (counter-clockwise) on gas chuck and then open bleed valve.

10. Hold gas valve from turning, loosen swivel nut, and remove charging assembly. Replace gas valve cap and guard.

REVISIONS						
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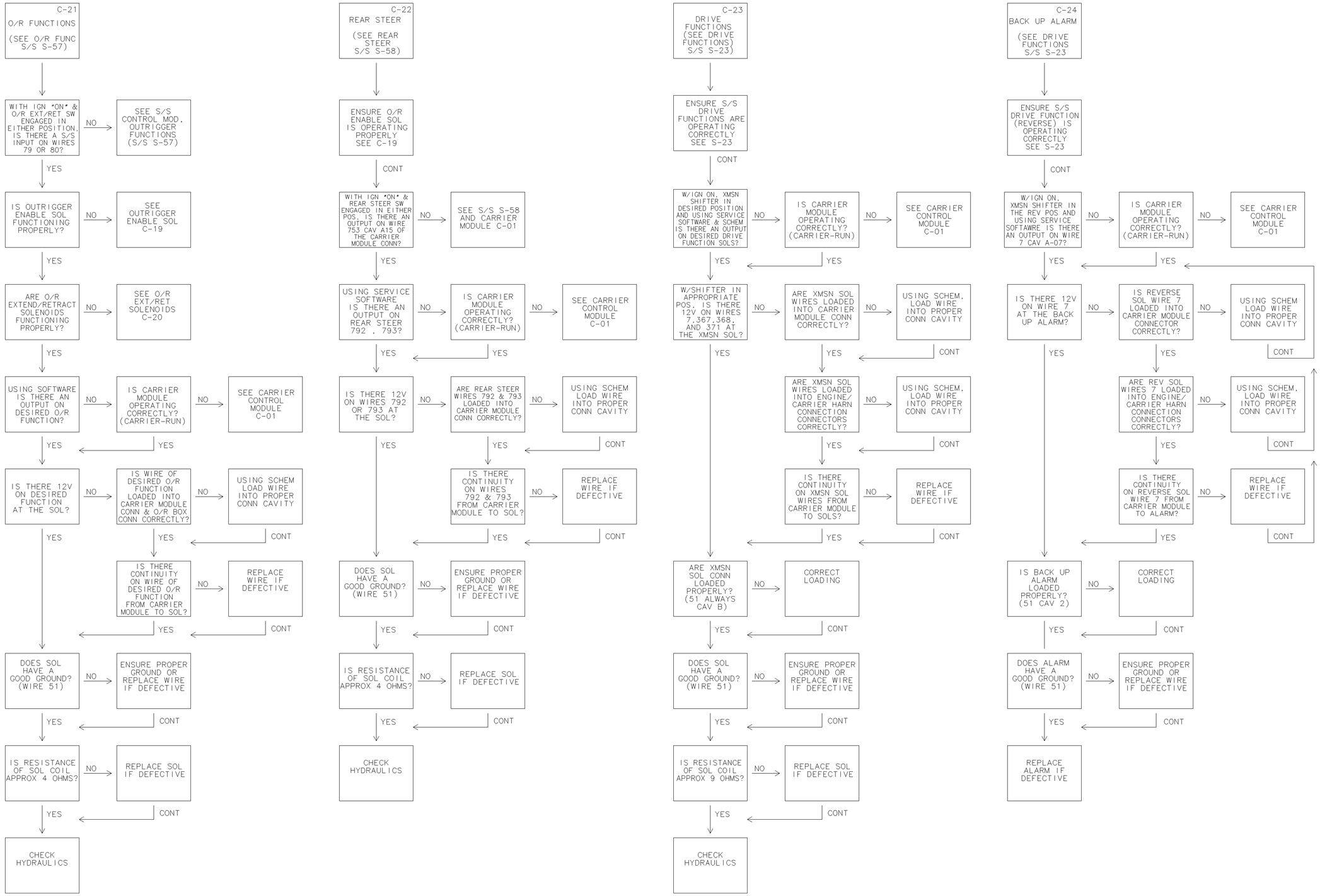

ADDITIONAL APPROVALS	DATE
WEIGHTS	
STRESS	
MATLS / WELDING	
HYD / ELEC / DECAL	
IF IN DOUBT ASK. REMOVE ALL BURRS AND SHARP EDGES.	

MAT'L SPEC. NUMBER (SEE BOM FOR ALTERNATIVES)

3RD ANGLE PROJECTION

MODEL (FIRST USED)
RT700E2

DO NOT SCALE DRAWING

TOLERANCES UNLESS OTHERWISE SPECIFIED

IN.DIM.	DEC. PLACES	MM DIM.
N / A	UNITS & 1 PL DEC	±1.5MM
±.06"	2 PLACE DEC	±0.5MM
±.016"	3 PLACE DEC	±0.3MM
±2°	ANGULAR DIM	±2°

N/A TO MATERIAL THICKNESS

ECO 106374

CONTRACT NO.

APPROVALS	DATE
DRAWN B RIFE	21-MAY-02
CHECKED L SEEDERS	22-MAY-02
APPROVED S SHREINER	23-MAY-02

GROVE.

TITLE
CHART CARRIER
TROUBLESHOOTING GUIDE RT700E2

SIZE	CAGE CODE	DWG NUMBER	REV
E	12361	6-294-101237	#

SCALE N/A | WEIGHT N/A | SHEET 07 OF 10

DWG NO. 6-294-101237 SH 07

CAD-I DWG

REVISIONS						
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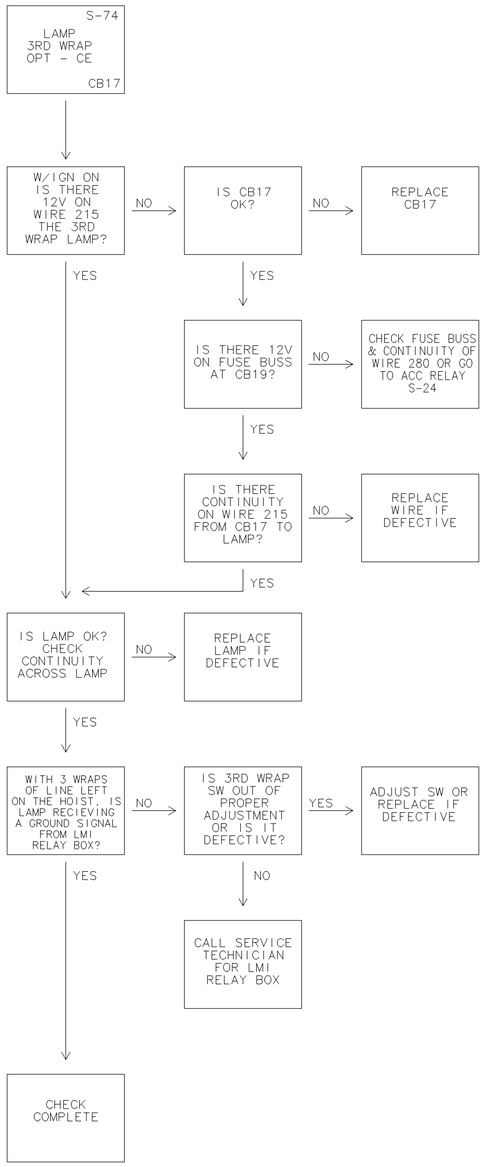

ADDITIONAL APPROVALS	DATE	MAT'L SPEC. NUMBER (SEE BOM FOR ALTERNATIVES)	DO NOT SCALE DRAWING			ECO 106374	GROVE.
WEIGHTS			TOLERANCES UNLESS OTHERWISE SPECIFIED			CONTRACT NO.	TITLE
STRESS		3RD ANGLE PROJECTION	IN.DIM.	DEC. PLACES	MM DIM.	APPROVALS	DATE
MATLS / WELDING			N / A	UNITS & 1 PL DEC	±1.5MM	DRAWN	
HYD / ELEC / DECAL			±.06"	2 PLACE DEC	±0.5MM	B RIFE	15-MAY-02
IF IN DOUBT ASK. REMOVE ALL BURRS AND SHARP EDGES.		MODEL (FIRST USED) RT700E2	±.016"	3 PLACE DEC	±0.3MM	CHECKED L SEEDERS	16-MAY-02
			±2°	ANGULAR DIM	±2°	APPROVED S SHREINER	17-MAY-02
			N/A TO MATERIAL THICKNESS			SIZE E	CAGE CODE 12361
						SCALE N/A	WEIGHT N/A

CHART SUPERSTRUCTURE TROUBLESHOOTING GUIDE RT700E2

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