

# Model # SC700DD

	<u>PAGE</u>	<u>Key Code</u>
FOREWORD-----	0- 1	---00-000-030-00
CONSTRUCTION-----	0- 2	---00-010-062.00
OPERATING SAFETY-----	0- 3	---00-041-004.00R
GENERAL SAFETY RULES-----	0- 4	---00-042-003.00R
Operator Awareness-----	0- 4	
Electrical Dangers-----	0- 7	
Protective Equipment-----	0-11	
Signalmen And Bystanders-----	0-12	
Crane Inspections And Adjustment-----	0-13	
Wire Rope-----	0-15	
Crane And Area Clearance-----	0-16	
Weights, Lengths, And Radii-----	0-16	
Traveling-----	0-22	
Leaving Station-----	0-23	
Hand Signals-----	0-24	
 SECTION 1 - OPERATING ENGINE CONTROLS		
Check Before Starting Operations-----	1- 1	---01-000-048.01
Engine Fan Belt Tension-----	1- 1	
Fuel, Oil And Cooling Water Levels-----	1- 1	
Hydraulic Reservoir Oil Level-----	1- 3	
Power Divider Oil Level-----	1- 3	
Unusual Conditions-----	1- 3	
Control Levers-----	1- 4	---01-010-137.02R
Arrangement In Cab-----	1- 4	
Control Panel-----	1- 5	
Control Levers And Pedals-----	1- 5	
Operator's Seat-----	1- 5	
Safety Devices-----	1- 6	---01-013-003.00
Bubble Level-----	1- 6	
Switches-----	1- 7	---01-014-002.00
Heater-----	1- 7	
Heater Fan Switch-----	1- 7	
Working Light Switch-----	1- 8	
Wiper Switch-----	1- 8	
Fan Switch-----	1- 8	
Dome Lamp Switch-----	1- 8	
Horn Switch-----	1- 8	
Before Starting The Engine-----	1- 9	---01-020-048.00

Starting The Engine	1-10	01-030-055.02
Service Monitor Lamps	1-11	
Brake Mode Switch	1-12	
Stop Release Lamp	1-12	
During Operation	1-13	01-040-036.00
Service Monitor	1-13	
Fuel Gauge	1-13	
Oil Pressure Gauge	1-13	
Tachometer	1-13	
Hourmeter	1-13	
Hydraulic Oil Temperature Gauge	1-14	
Engine Water Temperature Gauge	1-14	
Exhaust Color	1-15	
Stopping The Engine	1-16	01-050-041.00

## SECTION 2 - ASSEMBLING MACHINES AND ATTACHMENTS

Extending Side Frames	2- 1	02-001-028.01
Summary Of Procedure	2- 1	
Extending Procedures	2- 2	
Assembly Of The Basic Boom And Boom Hoist Wire Rope Reeving	2- 3	02-050-069.00
Summary Of Procedure	2- 3	
Assembly Procedures	2- 3	
Setting The Gantry In High Position (With Helper Crane)	2- 7	02-020-040.00
Summary Of Procedure	2- 7	
Procedures With Helper Crane	2- 7	
Installing The Counterweight (With Helper Crane)	2- 9	02-030-070.00
Summary Of Procedure	2- 9	
Installation Procedures	2- 9	
Winding Of Main Hoist Rope	2-11	02-018-083.00
Boom Connecting Pins	2-13	02-049-002.00R
Pin Installation	2-13	
Pin Removal	2-13	
Tubular Boom Assembly	2-14	02-052-055.00
Tubular Boom	2-14	
Lifting Capacity	2-14	
Main Pendants	2-15	
Boom Inspection	2-16	
Boom Label inspection	2-16	
Assembling Booms 50-120 Feet (15.2m to 36.6m) In Length	2-17	

## SECTION 3 - OPERATING INSTRUCTIONS AND HANDLING SAFETY DEVICES

Boom Hoisting	3- 1	03-001-061.01
Boom Raising	3- 1	
Boom Lowering	3- 2	
Boom Hoist Limiting Device	3- 2	
Boom Angle Indicator	3- 3	

Load Raising And Lowering-----	3- 4	03-011-052.01
Raising And Lowering The Main Hook (When Foot Brake Is Used)	3- 4	
Pump Control Operation-----	3- 5	
Swinging-----	3-10	03-030-039.02
Swing Operation-----	3-10	
Swing Alarm (Optional)-----	3-11	
Swing Lock-----	3-12	
Travel-----	3-13	03-050-050.03
Forward And Backward Travel-----	3-13	
Inching Travel-----	3-14	
Steering-----	3-14	
Traveling On A Slope-----	3-15	
When Climbing Up Or Down A Slope-----	3-15	
Machine Direction-----	3-16	
Steering On A Slope-----	3-16	
Reinforcing The Top And Bottom Ends Of A Slope To Form-----	3-16	

## SECTION 5 - DISASSEMBLY OF MACHINES AND ATTACHMENTS

Hazardous Boom Disassembly Work-----	5- 1	05-010-003.00
Boom Connecting Pins-----	5- 3	02-049-002.00R
Pin Installation-----	5- 3	
Pin Removal-----	5- 3	
Disassembling The Top Boom-----	5- 4	05-020-041.00
Summary Of Procedure-----	5- 4	
Disassembly Procedures-----	5- 4	
Disassembly Procedure Of Long Boom-----	5- 6	05-030-040.00
Removing Counterweights (With Helper Crane)-----	5- 8	05-040-039.00
Summary Of Procedure-----	5- 8	
Removal Procedures-----	5- 8	
Folding The Gantry (Without Using A Helper Crane)-----	5-10	02-045-025.00
Summary Of Procedure-----	5-10	
Procedures-----	5-10	
Folding The Gantry (With Helper Crane)-----	5-12	02-045-026.00
Summary Of Procedure-----	5-12	
Procedures-----	5-12	
Retracting Side Frames-----	5-14	05-060-032.01
Summary Of Procedure-----	5-14	
Retracting Procedures-----	5-15	

## SECTION 6 - TRANSPORTATION • STORAGE

Machine Transportation-----	6- 1	06-010-095.02
Disassembly Procedures Into Basic Configuration-----	6- 1	
Transportation Procedures-----	6- 1	
Loading Operation-----	6- 1	
Weights And Dimensions For Transportation-----	6- 3	06-020-051.00

Crane Storage -----	6- 6	06-080-009.00R
Short Term Storage-----	6- 6	
Long Term Storage -----	6- 6	

## SECTION 7 - INSPECTION AND MAINTENANCE

Maintenance And Inspection -----	7- 1	07-000-004.02
Periodical Inspection-----	7- 2	
Monthly Or Every 200 Hours-----	7- 2	
Every 500 Hours -----	7- 2	
Front And Rear Drum Brakes -----	7- 3	07-020-049.01
Adjusting The Brakes -----	7- 4	
Removing The Brake Band-----	7- 4	
Adjusting The Automatic Brake -----	7- 5	
Periodic Battery Inspection -----	7- 6	07-002-003.00
Troubleshooting -----	7- 7	07-001-004.00
Clutch -----	7- 8	07-040-035.01
One-Cylinder Type-----	7- 8	
Two-Cylinder Type-----	7-11	
Travel Reduction Gear Case-----	7-12	07-090-021.00
Inspection And Supplying Method Of Oil-----	7-12	
Oil Replacement-----	7-12	
Wire Rope Handling -----	7-13	07-060-007.01
Measuring Wire Rope Diameter-----	7-13	
Ordering Wire Ropes -----	7-13	
Wire Rope Inspection And Replacement-----	7-14	
Lubrication -----	7-15	
Unreeling Wire Rope -----	7-16	
Sheave Inspection-----	7-17	
Cutting Wire Rope-----	7-17	
Socket And Wedge Connections-----	7-18	
Use Of Wire Rope Clips With Sockets -----	7-19	
Instructions In Setting Wire Rope On Drum -----	7-20	
Caution When Using New Rope -----	7-20	
Cause Of Irregularly Wound Rope -----	7-20	
Checking For Wire Breakages-----	7-21	
Hydraulic Control System -----	7-22	07-070-020.00
Hydraulic Oil Reservoir-----	7-23	
Remote Control Valve-----	7-23	
Rotating Joint -----	7-24	
Oil Filters-----	7-25	07-074-008.00
Line Filter-----	7-25	
Return Filter-----	7-27	
Inspection Of Accumulator Gas Pressure-----	7-29	07-073-004.00R
Checking The Nitrogen Gas Pressure -----	7-29	
Checking The Air Valve -----	7-29	

Adjustment Of Lower Mechanism-----7-30  
 Track Shoe Tension Adjustment-----7-30  
 Track Shoe Removal-----7-30

**SECTION 8 - LUBRICATION**

Points Of Lubrication And Servicing Upper Machinery-----8- 1  
 Lubrication And Servicing Points-----8- 1  
 Servicing • Lubrication Chart-----8- 2  
 Points Of Lubrication And Servicing Lower Machinery-----8- 4  
 Lubrication And Servicing Points-----8- 4  
 Servicing • Lubrication Chart-----8- 5  
 Points Of Lubrication And Servicing Attachments-----8- 6  
 Lubrication And Servicing Points-----8- 6  
 Servicing • Lubrication Chart-----8- 6  
 Antifreeze -----8- 7 ---08-021-029.00  
 Types Of Antifreeze Compound-----8- 7  
 Mixing Ratio Of Antifreeze In Cooling Water-----8- 7  
 Fuel And Lubricants Per Ambient Temperatures -----8- 8 ---08-022-005.01

**SECTION 14 - CAPSCREW TORQUE**

Check And Retightening Interval-----14- 1 --20-051-002.00  
 Tightening Torques (Dry)-----14- 1  
 Tightening Torque Applicable Where Lubricant Is Applied -----14- 2



## FOREWORD

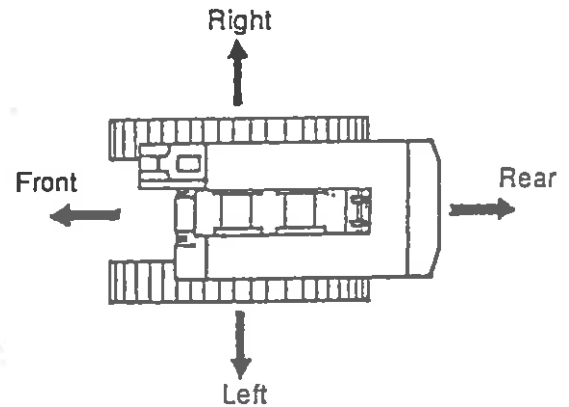
This Operator's And Maintenance Manual was prepared to explain correct and efficient operating practice, lubrication and preventive maintenance, all periodic adjustments that may be required, and boom/jib assembly and disassembly procedures. Read this book and make sure you understand it before operating, lubricating, or adjusting the machine. If there is any thing you don't understand, contact your nearest distributor.

When ordering parts, always use the parts manual to ensure receiving the correct parts for your machine. Refer to the parts manual for the correct ordering procedures.

If any instructions, Caution, Warning, or Danger label, decal or plate becomes lost, damaged, or unreadable it should be replaced. These may be ordered through your distributor. Information contained on these labels is important and failure to follow it may result in an accident.

• The terms "left, right, front and rear" in the sentences are the relative terms when the machine is viewed by the operator seated on the operator's seat.

• In the case of lower, the drive sprocket side is the rear side, so that the terms in the sentences do not differ even if the upper swing body reverses.



CB0-6

## CAUTION

CONSTRUCTION EQUIPMENT CAN BE DANGEROUS IF IMPROPERLY OPERATED OR MAINTAINED. THIS MACHINE SHOULD BE OPERATED AND MAINTAINED ONLY BY TRAINED AND EXPERIENCED PEOPLE WHO HAVE READ, UNDERSTOOD, AND COMPLIED WITH THE OPERATORS MANUAL.



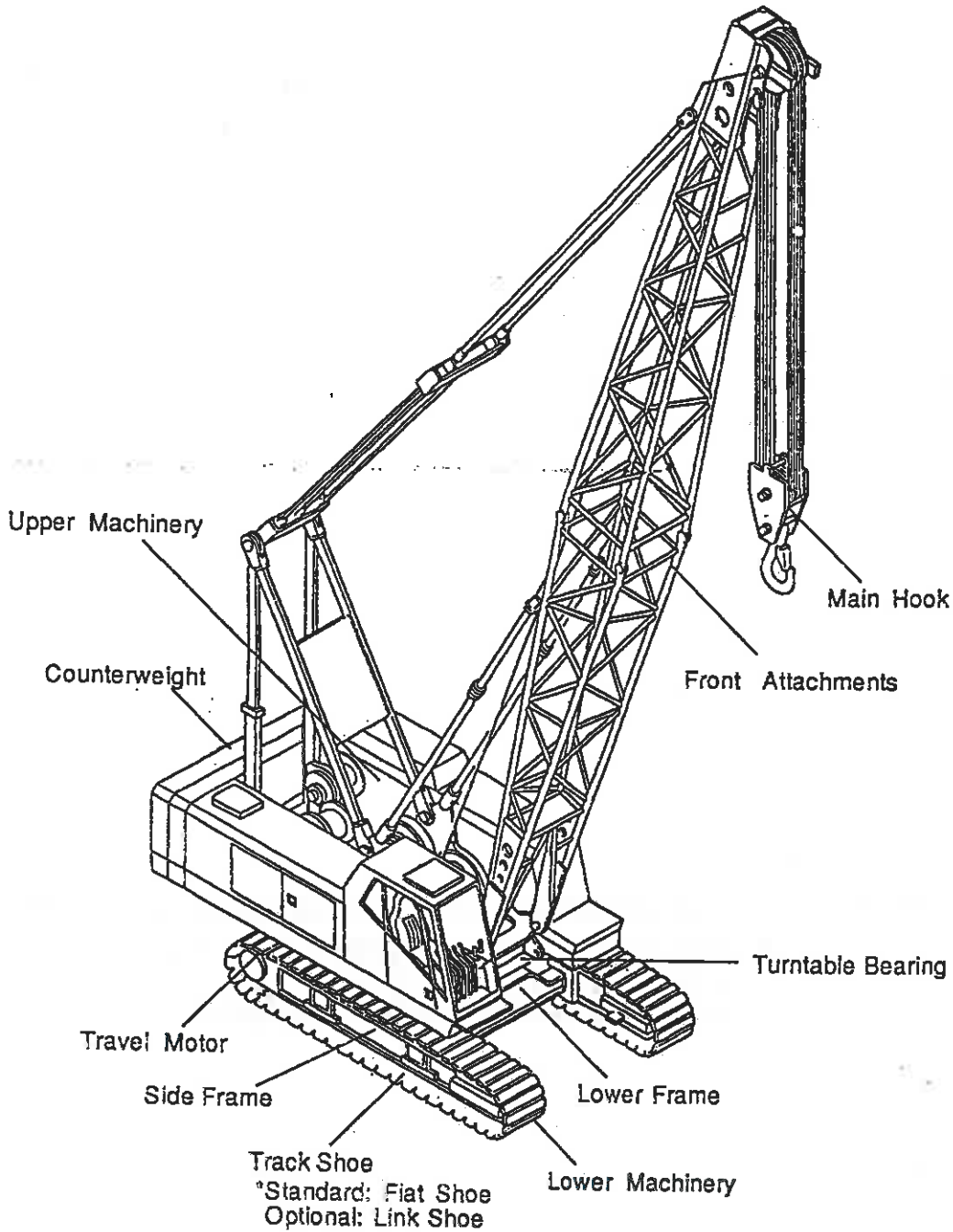
# CONSTRUCTION

The machine consists of the upper revolving frame, lower traveling frame, and front attachments. The upper revolving frame swings 360° on the turntable mounted on the lower frame.

Major components of the upper revolving frame include the engine, hydraulic motor, and winch, all enclosed in a housing.

The front attachments are incorporated into the revolving frame front; in the rear, there is a counterweight attached to ensure machine stability.

The lower traveling frame consists of the lower frame that supports the upper revolving frame, driving mechanism to travel the machine, and side frames which support track shoes.



CA0-1

Operating Safety

Remember **SAFETY** every day.

Someone's **LIFE** may depend on it,

**MAYBE YOUR OWN.**

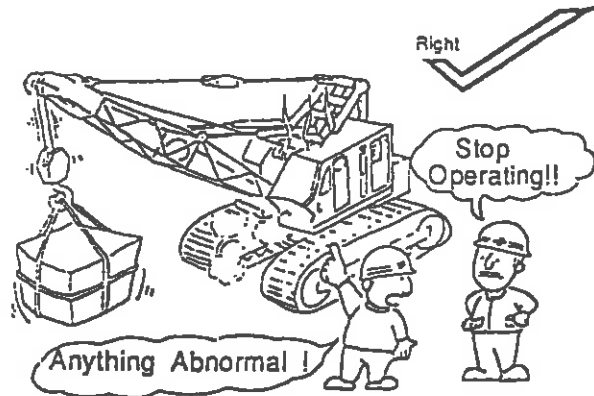
Cranes are easy to operate. So easy in fact that almost anyone can operate them. This very "ease of operation" leads to careless operation, or operation by unqualified personnel.

Any of the above can result in an accident. When a crane is maintained and used properly it can be a safe, highly useful piece of equipment, but if not used properly, it can be dangerous.

Think Safety - You, the operator, are in charge of an important piece of equipment. It is very important that you know what it can do. It is also important that you know what it should not do. No set of instructions can anticipate all of the situations you will encounter. The rules given here cover general usage, and some of the more specific cases. If conditions arise not covered by these rules, consult your local Distributor. A phone call could save someone's life.

- When opening the roof window, be sure to lock it by tightening the lock screw completely, or the window lock may be disengaged by the wind. As a result, glass may be broken and an injury may result.

- If there is anything unusual of the machine, shutdown the machine until the problem is found and corrected. Especially, take care of heat and abnormal smell.



Remedy Any Abnormality

AM99R

- When the work is handed over to another person, be sure to tell him about machine conditions, whether there are problems or not, etc. If necessary, note them.



Always Tell Next Person

AM100R

The following is a list of safety rules which should be followed during all crane operations.

Operator Awareness

1. Read this operator's manual and heed it. The manual contains important information.
2. An operator must not eat, read, or otherwise divert his attention while operating a crane.

Remember - operating is a full-time job.

3. Don't smoke when fueling, or fuel up near an open flame. Keep the nozzle in contact with the filler neck to prevent static electric sparks. Shutdown the engine when fueling.
4. Keep fingers, feet, and clothing away from sheaves, drums, and ropes unless the crane is shutdown and everyone knows what you are doing. Do not place a hand on wire ropes when climbing on the crane.  
A sudden movement could pull you into the drums or sheaves.

5. The operator, supervisor, or person in charge of the load must observe the following rules.

A. Loads must be well secured before lifting. Be sure that the rigging cannot slip off or pull away from the load, or get out of position on the load. Be sure the load is rigged so it will not turn over.

B. Chains and slings must be of adequate size, in good condition, and not twisted around each other.

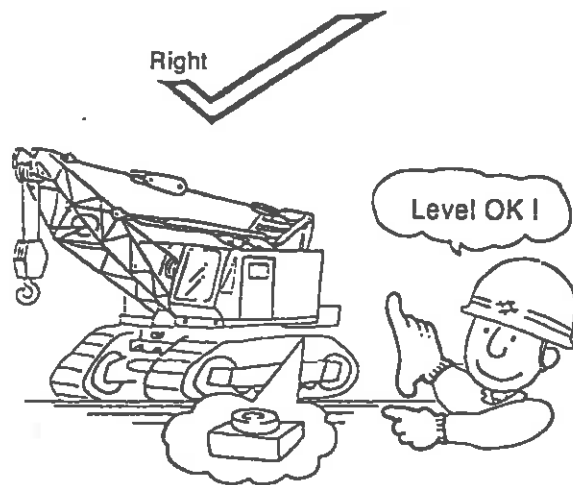
C. The load must not catch on an obstruction when lifting or swinging. Be sure load, fall lines, or any other parts of the crane does not snag or strike any obstruction.

D. Avoid sudden starts and stops.

Lift carefully, swing gently, brake smoothly, lower and set loads carefully. Jerking the load, swinging and engaging swing brake roughly, and lowering the load rapidly and slamming on brakes, will put shock loadings and possible side loadings on the boom. Unnecessary abuse labels the operator as a beginner. Be a professional.

E. Do not wrap the hoist rope around the load. Do not use discarded, worn, or damaged wire ropes for slings. They may break and drop the load.

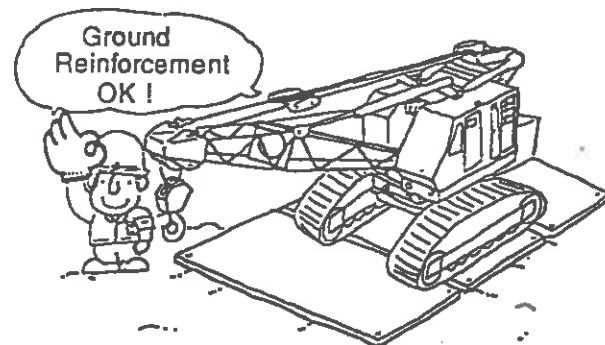
F. The crane must be level before making a lift. Use bubble level, to level the crane. Check its accuracy frequently with a carpenter's level. Remember, a three degree side tilt can reduce capacities by 50% or more.



Level Machine

AM26

G. Choose flat, level and hard ground for the working area. If the crane has to be operated unavoidably on relatively soft ground, reinforce the ground by placing steel plates, mats or other matter on it to secure operation on such soft ground. Extra care should be exercised to observe the ground conditions to avoid inclination of the crane.

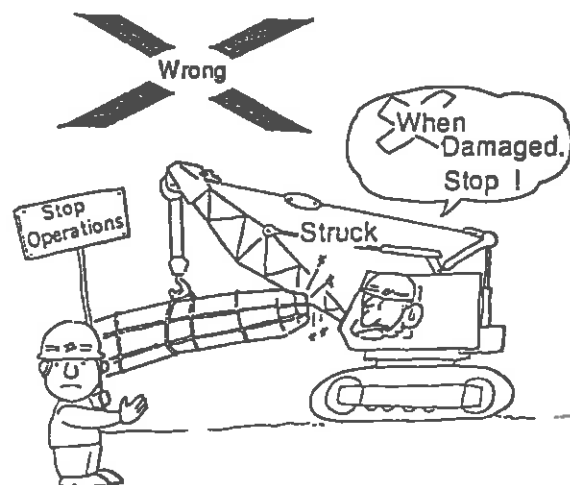


Reinforcement Of Ground

AM30R

6. Don't let the load or bucket hit the boom or jib. Don't let the attachment rest on, or hit, a building or any other object. A dented or damaged boom could result, which will weaken the boom.

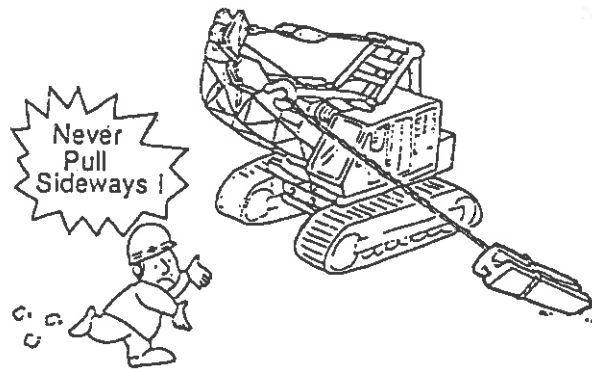
If the damage is severe, the boom may collapse. If a lattice or diagonal bracing member on the boom or jib is broken, cracked, or bent, contact your local distributor for repair procedures. If the boom or jib is struck, or damaged by anything, **STOP**. The loading on a boom or attachment increases as they are lowered, therefore a damaged boom, or their suspension systems could collapse during lowering. Use another crane to lower a damaged boom or attachment.



Do Not Let The Load Hit The Boom

AM33

7. Don't pull sideways on the boom, not even a little. Lift straight up on every load. Moving trucks, rail cars, barges, or anything else pulling sideways on the hoist rope could buckle the boom. It could also damage the swing mechanism. Pulling sideways on a boom, set at a high angle, can overturn the crane.



AM20

8. Watch out for "two blocking" (pulling the hook block into the head machinery) as this can cause hoist rope and sheave breakage resulting in an accident.

9. After slack hoist rope operation, make sure hoist rope is properly seated in sheaves and on drums before continuing to operate. Use a stick or mallet to set the hoist rope, not your hands.

compared to straight over the side) the crane capacity is not increased. Any time loads exceed the rated capacities listed on the Capacity Chart, the crane is overloaded. Overloads can damage the crane and such damage could cause failure and accidents.

10. Do not lower the boom or load beyond the point where two full wraps of hoist rope are left on the drum. This condition could occur when lowering a load below ground level. If all the hoist rope runs off the drum, the load will jerk which could break the hoist rope.

11. Make sure there is a safety latch on the hook, and that it works properly. Without a latch, it is possible for slings or chains to come off the hook and allow the load to fall.

12. Don't alter any part of the crane.

Additions to or changes in any part of the equipment can create loadings for which the crane was not designed. Such changes may seriously affect the usable capacities and make the entire Capacity Chart invalid. Such changes can dangerously overload or weaken critical parts and may cause disastrous failure.

13. Do not exceed the rated capacities of the crane under any circumstances. While a crane has stability when lifting over a corner (as

Electrical Dangers

1. All Electrical Power Lines Are Dangerous.

Contact with them, whether insulated or not, can cause death or injury. When operating near power lines, the best rule is to have the power company turn off the power and ground the lines.

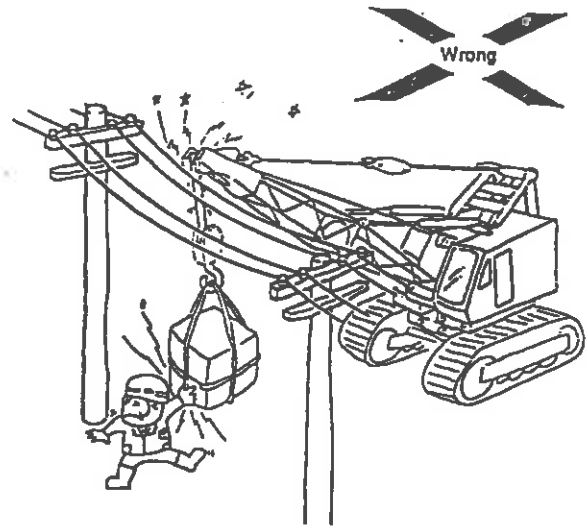
However, in some cases, the operator may be unable to have the power turned off. Follow these rules whether the power is turned off or not.

A. Be alert. You are working around conditions which can cause death.


B. Keep all parts of the crane, fall lines, hook block, and load, at least 15' (4.5m) from the electrical lines or other distance specified by applicable codes. Slow down crane operation.

C. Assume that every line is "Hot".

D. Appoint a reliable person equipped with a loud signal (Whistle or horn) to warn the operator when any part of the crane or load moves near the power line. This person should have no other duties while the crane is working around the power line.



**⚠ DANGER**  
Electrocution hazard. Keep all parts of machine and load at least 15 feet (4.57m) away from all electrical power lines or such distance as specified by local safety code. 1J3515



**⚠ DANGER**  
Stay away from machine if close to power lines. Machine, load, and ground can become electrified and deadly.

Stay Away From Power Line

AM195

E. Warn all personnel of danger.

Don't allow unnecessary persons in the area. Don't allow anyone to lean against or touch the crane. Don't allow ground workers to hold load lines, or rigging gear unless absolutely necessary.

Use dry plastic ropes as tether lines. Make certain everyone stays 15 ft (4.5m) away from the load, or such distance as required by applicable code.

F. The use of boom point guards, proximity devices, insulated links, hooks, or blocks, or swing limit stops do not assure safety. Even if codes or regulations require the use of such devices, you must follow rules listed here. If you do not follow them, the result could be serious injury or death.

G. Grounding the crane can increase the danger. Poor grounding such as a pipe driven into the ground, will give little or no protection.

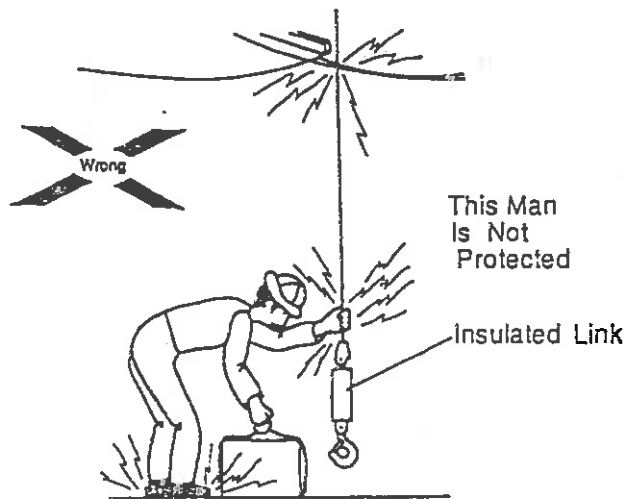
In addition, a grounded crane may strike an arc so heavy that a live line may be burned down. This could cause the crane and the area around it to be electrified.

H. When operating near radio or T.V. transmitting stations, high voltage can be induced in metal parts of cranes, or in their loads.

This can occur even if the crane is some distance from the transmitter or antenna.

Painful, dangerous shocks could occur.

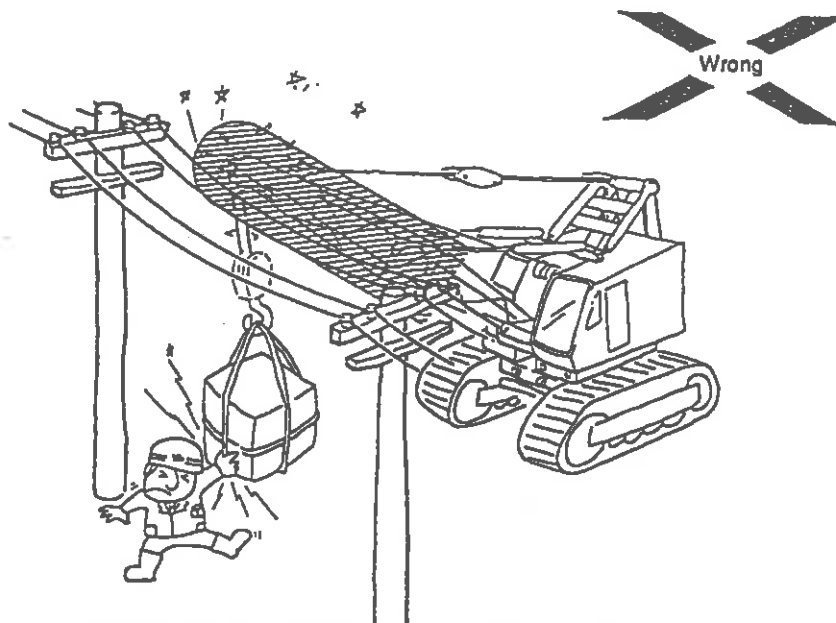
Consult trained electronic personnel before operating crane to determine how to avoid electrical hazards.



Crane Equipped With Insulated Link

AM196

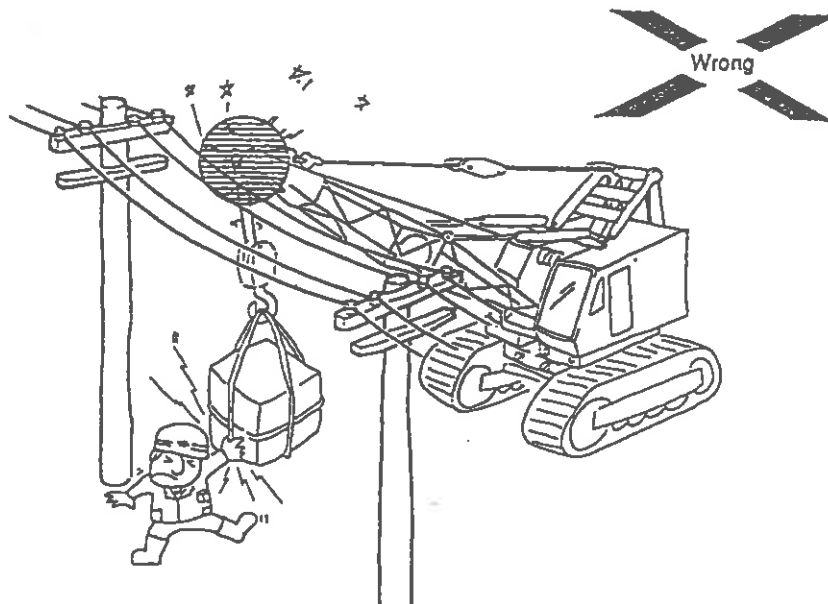
Shaded area shows "sensitivity zone" with full boom length sensor used, and adjusted for 10 ft (3m) clearance. Contact can be made outside this zone by the fall lines, hoist rope, cab, etc. In such cases, the alarm will not sound until the crane is electrified and deadly.



Crane Equipped With Proximity Warning Device

AM197

Shaded area shows "sensitivity zone" with the probe near the boom peak and adjusted for 10 ft (3m) clearance. Contact can be made outside this zone by fall lines, hoist ropes, cab, etc. In such cases, the alarm will not sound until the crane is electrified and deadly.



Crane Equipped With Proximity Warning Device

AM198



2. What Do You Do If A Power Line Is Touched By A Crane Or Load?

A. Keep cool - think - a mistake can kill someone.

B. Warn all personnel to keep clear.

C. If crane will still operate, try to move it away from contact.

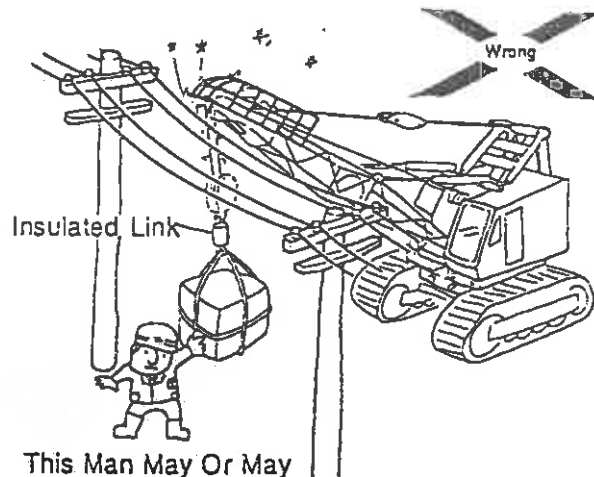
You, the operator, are reasonably safe in the cab unless the crane is on fire or an arc is cutting through the cab near you.

D. Move away from contact in reverse to that which caused the contact.

Example: If you swing left into the wire, swing to the right to break contact.

Remember - once an arc has been struck, it will stretch out much farther than you think before it breaks. Keep moving until the arc has been broken.

E. When the arc breaks, continue moving away until you are at least 15 ft (4.5m) away or as specified by local code. Stop the crane. Make a thorough inspection for crane damage further use.



This Man May Or May Not Be Protected

Crane Equipped With Insulated Link And Boom Point Guard

AM199

F. If you cannot disengage from the line, and crane is not on fire or no arc is cutting through the cab, stay in your seat until power line can be turned off.

G. If you must leave the crane, don't step off. Leap from the crane as far as you can, landing with feet together, then hop away from the crane with feet together, or shuffle feet to keep them close together. This could help prevent personnel injury.

3. When Using A Magnet:

- A. Lifting magnet generators produce voltage in excess of 200 volts and present an electrical shock hazard. Only trained personnel should work on the magnet, controller, or wiring. Don't open the controller door with the generator running.
- B. Do not let workmen touch magnet or load.
- C. Do not let workmen get between magnet and a metal object.
- D. If necessary to position a load, use a dry, wooden stick.
- E. Open magnet disconnect switch at magnet control panel before connecting or disconnecting leads.

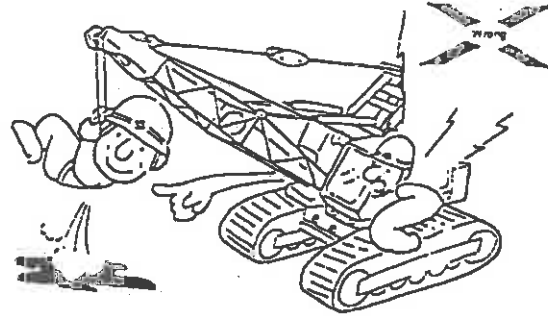
Protective Equipment

- 1. Always replace protective guards and panels before operating crane.
- 2. Always wear hard hats, safety glasses, steel toe shoes, and any other safety equipment required by local job conditions or regulations.
- 3. Always wear safety glasses when drilling, grinding, or hammering on metal. Flying chips could injure the eyes.
- 4. Keep a dry chemical or carbon dioxide fire extinguisher of 5BC rating or larger in the cab or in the immediate area of the crane at all times. Instruct all operating and maintenance personnel in proper use of the extinguisher. Check periodically to make sure it is fully charged and in working order.

- 5. Do not tamper with safety devices. Keep them in good repair and properly adjustment. They were put on the crane for your protection.
- 6. When operating a crane equipped with any form of load indicating mechanism, overload warning system, or any automatic safety device, remember that such devices cannot replace the skill and judgement of a good operator. For instance, such devices cannot tell when a crane is located on a supporting surface that will give way, that too few parts of line are being used to hoist a load, cannot correct for the effects of wind, warn that the device may be improperly adjusted, correct for side pulls on the boom, or for many conditions which could occur and create hazards. It requires all the skill, experience, judgement, and safety consciousness that a good operator can develop to attain safe operation. Many safety devices can assist the operator in performing his duties, but he should not depend on them to keep him out of trouble.

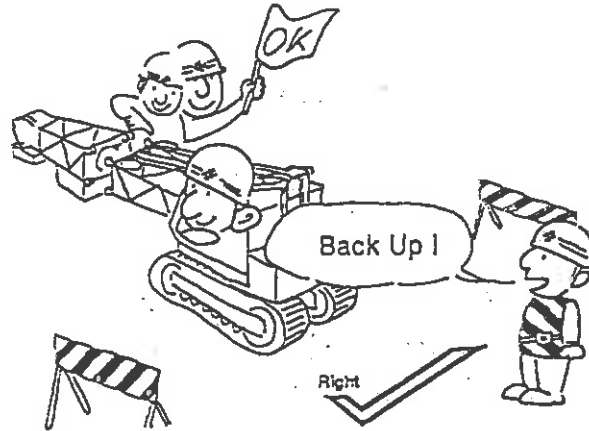
Signalmen And Bystanders

1. Don't allow crane loads to pass over people, or endanger their safety. All unnecessary personnel should leave the immediate area when crane is operating.
2. Don't let anyone ride the hook block or load. These cranes are intended to lift objects, not people. They are not elevators.
3. Always look before you back up, or better yet, post a signalman to guide you. If crane is equipped with a back up alarm, make sure it is working properly. If not, use the horn as a signal. Use a code such as one beep - stop, two beeps - forward, and three beeps - backward. Make sure everyone on the job site knows the code.
4. Do not make a lift which is not in plain sight without a signalman.  
This can lead to an accident or crane damage.



No Hook Riders

AM17



Use Signalman, Back Safely

AM68

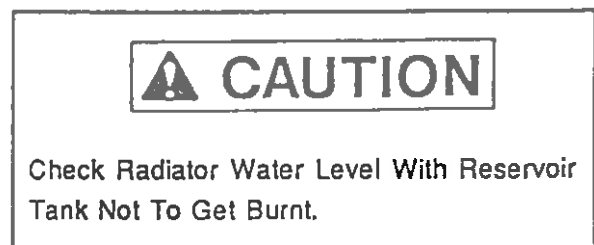
Crane Inspections And Adjustments

1. Inspect the crane daily. Do not operate a damaged or poorly maintained crane. Pay particular attention to the clutches, brakes, attachments, and wire ropes. If a component is worn or damaged, replace it before operating.
2. When working on the crane, do the following if possible:
  - A. Lower the boom on the ground.
  - B. Shutdown the engine, disengage the main pump, and work all control levers back and forth to relieve pressure and relax the attachment.
  - C. If the above instructions cannot be followed, block securely under the attachment so it cannot move.
  - D. Bleed any precharge off the hydraulic reservoir before opening it or disconnecting a line.
  - E. Hydraulic oil becomes hot during operation. In some cases, it becomes hot enough to cause severe burns. Be careful not to let hot hydraulic oil contact the skin.
3. When making repairs which require welding, use proper or factory for proper procedures.



Removing The Radiator Cap AM200

4. Keep the crane clean, in good repair, and in proper adjustment.  
Oil or grease on the decks may cause falls. Improper adjustments can lead to crane damage, load dropping, or other malfunctions.
5. Use extreme caution when removing radiator caps, hydraulic pressure caps, etc. They can fly off and hit you, or you could be burned by hot oil, water, or steam.

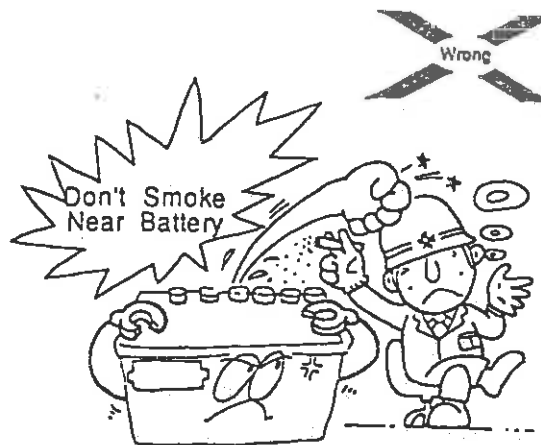


6. When checking battery level, use a flashlight, not an open flame. If the battery explodes, you can get acid in your eyes, which could cause blindness. Don't check battery charge by shorting across posts. The resulting spark could cause the battery to explode. Check with a tester or hydrometer. Don't smoke near batteries, especially when they are being charged.

7. When using jumper cables to start an engine, be sure to connect negative post to negative, and positive post to positive post. Always connect the two positive posts first. Then make one negative post connection. Make the final negative connection a safe distance from the battery. It can be made on almost any bare metal spot on the crane. any spark could cause the battery to explode.

8. Test the automatic brake by raising the load a few inches and holding. It should hold without slipping. It takes more braking power to hold a load in the air when the drum is full of rope than when it is a few inches above the ground with only a few wraps on the drum.

9. Always reduce pressure in hydraulic system to zero before working on any part of the system.



Never Use An Open Flame Near The Battery

AM9

10. Use Extreme Care when working with circuits with accumulators. Check that hydraulic pressure is relieved before opening the circuit for repairs.

11. When setting pressures, never exceed manufacturer's ratings.

Always follow instructions exactly.

Over pressurization can cause hydraulic component damage or failure of mechanical parts on the crane. Any of the above can lead to an accident.

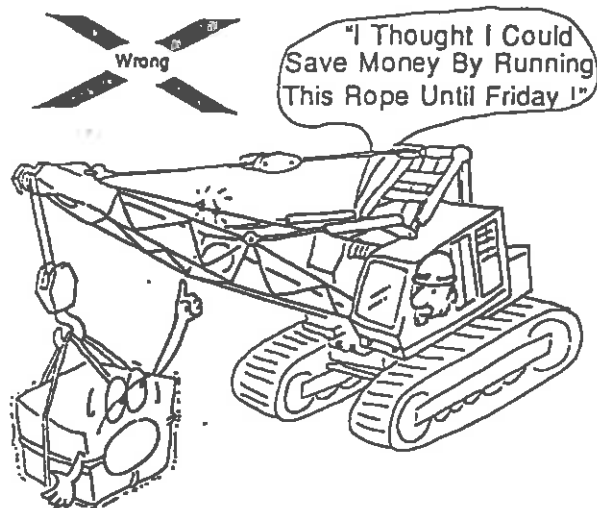
Wire Rope

1. Some regulations state, "a thorough inspection of all ropes shall be made once a month and a full written, dated, and signed report of rope condition be kept on file where readily available". Replace any worn or damaged ropes. Pay particular attention to hoist ropes. Check end connections (pins, sockets, wedges, etc.) for wear or damage. For more details, refer to the regulations of your country.

2. Use at least the number or parts of hoist line specified on the Wire Rope Capacity Chart to handle the load.

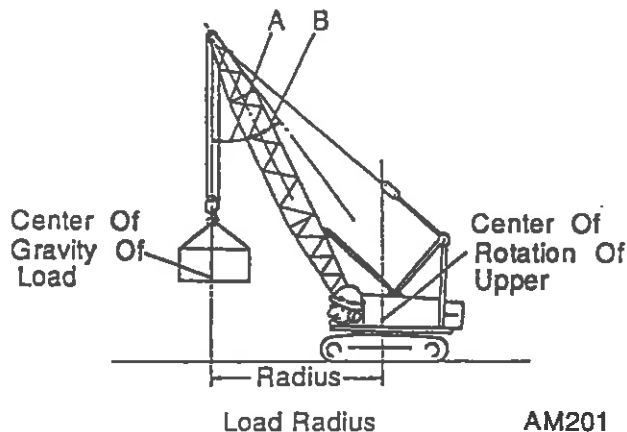
Local codes may require more parts of line than is shown. Check code requirements and use them where applicable.

3. Use special care when handling loads on single part line with boom at a short radius. This is especially important when hoist line is off rear drum. The boom may be whipped back over machine in single line operation, make sure angle A is always greater than angle B.



Do Not Operate With Worn Or Damaged Rope

AM18



AM201

## Crane And Area Clearance

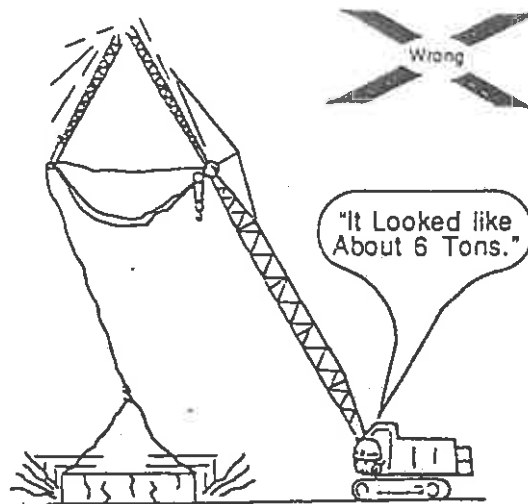
### 1. Be sure your work area is clear.

Make sure you have proper clearance for the crane, boom, or load.

Don't swing, travel, hoist, or lower loads, raise or lower jacks, without first making sure no one is in the way. If your vision is obscured, locate a signalman so you can see him, and he can see all areas you can't. Follow his signals. Be sure you and the signalman understand each others signals. See Hand Signal Chart in this section. Use the horn to signal or warn. Make sure everyone on the job site understands signals before starting operations.

### 2. When working inside a building, check overhead clearance to avoid a collision. Check load limits on floors or ramps so you won't crash through.

### 3. Always check for areas with dangerous features. Don't operate close to an overhang or deep ditch. Avoid falling rocks, slides, etc. Don't park crane where a bank can fall on it, or it can fall in an excavation. Don't park where rain can wash out footing.



## **SAFETY INSTRUCTIONS**

Operation under conditions which exceed listed capacities may result in overturning.

Swinging, extending or lowering boom to radii where no capacities are listed may result in overturning even without load.

Know Your Load

AM202

## Weights, Lengths, And Radii

1. Know your load. Don't try to guess or estimate the load. Use a scale or a load indicating system to determine exact weight. Remember the weight you are lifting includes the weight of any lifting slings or gear, the hook block, and any other weight on the hook. If lifting off the boom with the jib installed, the weight of the jib and rigging must also be considered as part of the load.

## General Safety Rules

The total load weight must never exceed the rated capacity of the crane, as listed on the Capacity Chart, for the position, boom length, load radius, and condition of operating being used.

Remember - Capacity Chart ratings are based on ideal conditions:

- A. Standing on firm, level surface.
- B. Calm wind.
- C. No side loads or outswing of load.
- D. Good visibility.
- E. Crane in A-1 condition and equipped as when leaving the factory.

When such conditions can not be attained, loads being handled must be reduced to compensate. The amount loads are reduced depends upon how good or how poor, the actual operating conditions are. It is a matter of judgement and experience. Some factors which may require reduction of capacities are:

- A. Soft or unpredictable supporting surfaces.
- B. Wind.
- C. Hazardous surroundings.
- D. Inexperienced personnel.
- E. Poor visibility.
- F. Fragile loads.
- G. Crane in poor condition.

When in doubt, do not take a chance. Reduce rating more than you think you need.

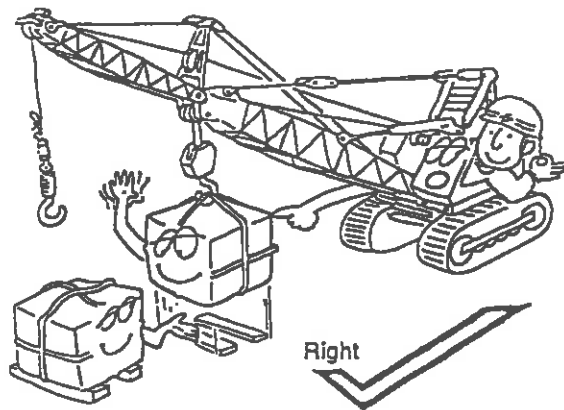
### 2. Avoid working a crane in high winds.

If you must work in a wind, reduce capacities considerably below those shown on the Capacity Chart. Wind blowing against the load and the boom produces a side load on the boom and reduces its capacity.

When lifting large loads such as building panels in a wind, the movement of the load may pose a danger to working or building structures. Outswing of a load will increase load radius, and may overload the crane. This could lead to boom failure or crane tipping.

### 3. Don't lift loads on main boom and jib at the

same time, even if total load weight is within crane capacity. Loads on the boom and jib at the same time, stress the boom and drastically reduce its ability to handle loads. Your full attention cannot be given to both loads, creating a dangerous situation.



Do Not Pick Two Loads  
At The Same Time

AM22

### 4. Most capacities on cranes are based on strength of materials.

In these cases, overloads will cause something on the crane to break, before it will tip. Do not use signs of tipping as a warning of overload.

### 5. Don't lash a crane down. Lashing a crane down encourages overloading, and if crane can't tip, you can be seriously overloaded with no indication of it. Crane damage or injury could result.

### 6. Always refer to the Capacity Chart after changing the arrangement of the attachments for the correct lifting capacities.



7. The boom must be make-up in the correct manner before making a lift.
  
8. Know the load radius. Don't guess at it. Determine radius by using the boom angle indicator, and the Capacity Chart, or measure it with a steel tape. Remember - radius is the horizontal distance from the centerline of rotation of the upper to the center of gravity of the load, when the load is hanging free.
  
9. Do not operate a crane at radii or boom length where Capacity Chart shows no capacity. Don't use a boom or jib not shipped with or for your crane. Any of the above can tip the crane over or cause attachment failure. In some cases, the crane can tip over with no load on the hook. Also, if the boom is make-up long at a low angle, the crane may tip until the boom touches the ground. In any of these cases, injury or crane damage could result.
  
10. When you lift a load with any crane, the load may swing out, or sideways. The load radius will increase. Due to the design of crane booms, this increase is more pronounced. The increase or outswing of the load can overload the boom, and lead to boom failure or tipping. Also, movement of the load can cause it to hit something.  
Make sure the load being lifted will remain within capacity as it is lifted and the boom deflects.
  
11. When lowering a boom with a load, the load radius increases. As radius increases, capacity decreases. If capacity is exceeded the boom may bend, as the safety factor in the boom exceeds the strength of the boom, or the crane may tip over.
  
12. Know the boom length. Don't guess.  
Use of an incorrect boom length can cause an accident.

13. When lowering the boom, the load will lower. To compensate for this, the operator must hoist up on the hoist rope. Otherwise, movement of the load may cause an accident. When raising the boom, the load will raise. The operator must hoist down the hoist rope to keep the load in place.

14. The hoist rope must be vertical when starting to lift. If not, the load will swing in, out, or sideways when lifted from the ground. The crane will lean toward the load when lifting heavy loads.

This is caused by elasticity of the crane and the boom. This lean will increase operating radius so that load will swing outward when it clears the ground. This outswing is dangerous to anything in the path of the load, and because of the increase in load radius may overload the crane. To overcome this outswing, boom up as the load is lifted so hoist ropes remain vertical. When setting the load on the ground, lower boom after the load touches down to avoid hook block swing when it is unhooked from load.

15. Pinch points, which result from relative motion between mechanical parts can cause injury. Keep clear of rotating upper or moving parts.

16. Lifting heavy loads can cause the crane to tilt or lean towards the load. When swinging a load from over the end to over the side, the tilt of the crane will increase.

Since tilt acts to increase load radius, it must be compensated for when swinging the load. Swing slowly. And change boom angle (raise or lower boom) while swinging, to maintain a constant radius, and prevent inswing or outswing of load.

If not, a dangerous condition could result.



Pinch Point Label

AM203

17. Watch out for centrifugal force when swinging a load. Swing gently.

Centrifugal force tends to increase load radius. This increase in radius could overload the crane and cause crane damage or tipping. When stopping the swing, overswing of the load can side load the boom.

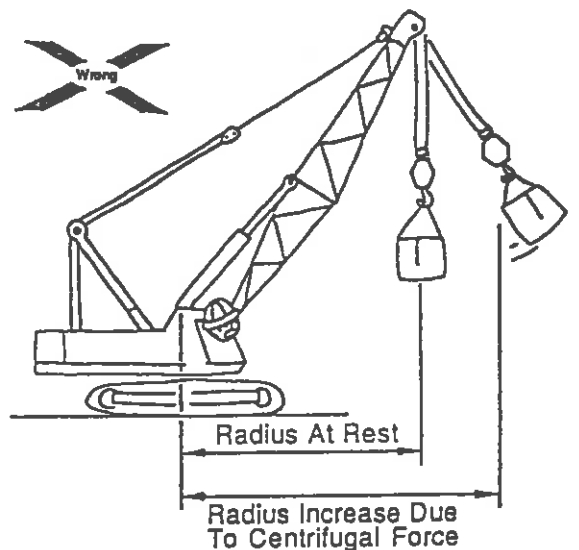
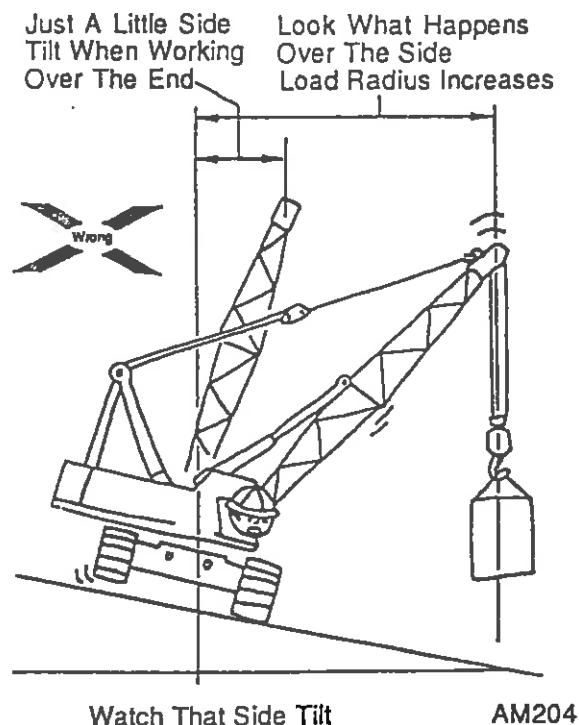
18. Keep the hoist ropes as short as possible to prevent excessive swinging. Always use the shortest boom length which will do the job.

Remember - the shorter the boom, the stronger it is.

19. Do not move a crane away from the load while handling near capacity loads. Due to load inertia (weight) the load will tend to stay in position when the crane starts to move, and then will swing in towards the crane. The inertia effect will tend to increase load radius and decrease stability. This could lead to boom failure or crane tipping.

20. Don't increase the counterweight.

Don't add anything to the crane that will act as additional counterweight. Remember that anything which has weight, if carried behind the crane's center of gravity, acts as a counterweight. Adding counterweight affects backward stability of the crane, particularly when working over the side. It also encourages overloading of the crane which can cause a disastrous accident.



21. Working areas for cranes are defined as per the Working Area Plate. Permissible loads per the Crane Capacity Chart will vary from lifting quadrant to lifting quadrant. The operator must make sure capacity ratings are not exceeded no matter within what quadrant he is operating, or when swinging from one quadrant to another.

### Traveling

1. Traveling with a suspended load should be avoided if possible.

It is especially hazardous when terrain is rough or irregular, on a side slope, or in a hilly area.

When traveling with a load, observe the following rules:

A. Use a hand line to control the load and reduce load swing.

B. Travel by the smoothest, most level route. If a smooth, level route is not available, don't travel with a suspended load.

Grade the route to provide a smooth, level path. If it is not possible to grade the route, move the load by stepping. Lift the load and set it down ahead of the crane. Travel the unloaded crane beyond the load, level the crane, lift the load, swing, and set it down farther along the route. Continue this procedure until the load is at its destination.

C. Carry load as close to the ground as possible.

D. Do not allow side swing of the load.

E. Don't attempt to carry loads which exceed the crane's maximum capacity rating.

F. Don't travel with a load on soft ground. If crane sinks into ground, stability can be affected to the point of tipping the crane.

G. Keep all personnel clear of crane and load. be prepared to set load down quickly at any time.

2. When moving the machine around on the job site with the attachment in the air, observe the following precautions:

A. Swing upper so it is in line with tracks over front or rear of lower. Engage the swing lock.

B. Shift to low speed travel.

C. The terrain must be smooth and solid. If not, grade the area before moving the machine.

D. Tie down the hook block to prevent its swinging when moving.

E. It is recommended the boom be at minimum radius where jobsite conditions permit. Consult machine chart for minimum radius for each boom length.

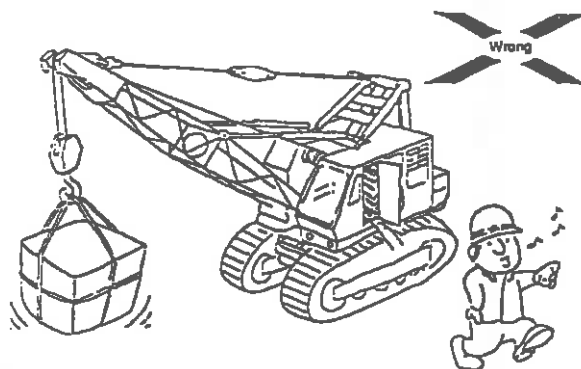
F. Position a signalman to guide you.

G. Avoid traveling on a grade, particularly a side slope. If you must travel up a slope, go straight up, or better yet back up the grade for maximum machine stability and minimum side loadings.

C. Do not depend on a brake to suspend a load unless the operator is at the controls, alert, and ready to handle the load.

Brake slippage, vandalism, or mechanical malfunction could cause the load to drop.

3. Do not leave crane unattended with the engine running.



Do Not Leave A Load Suspended

AM19

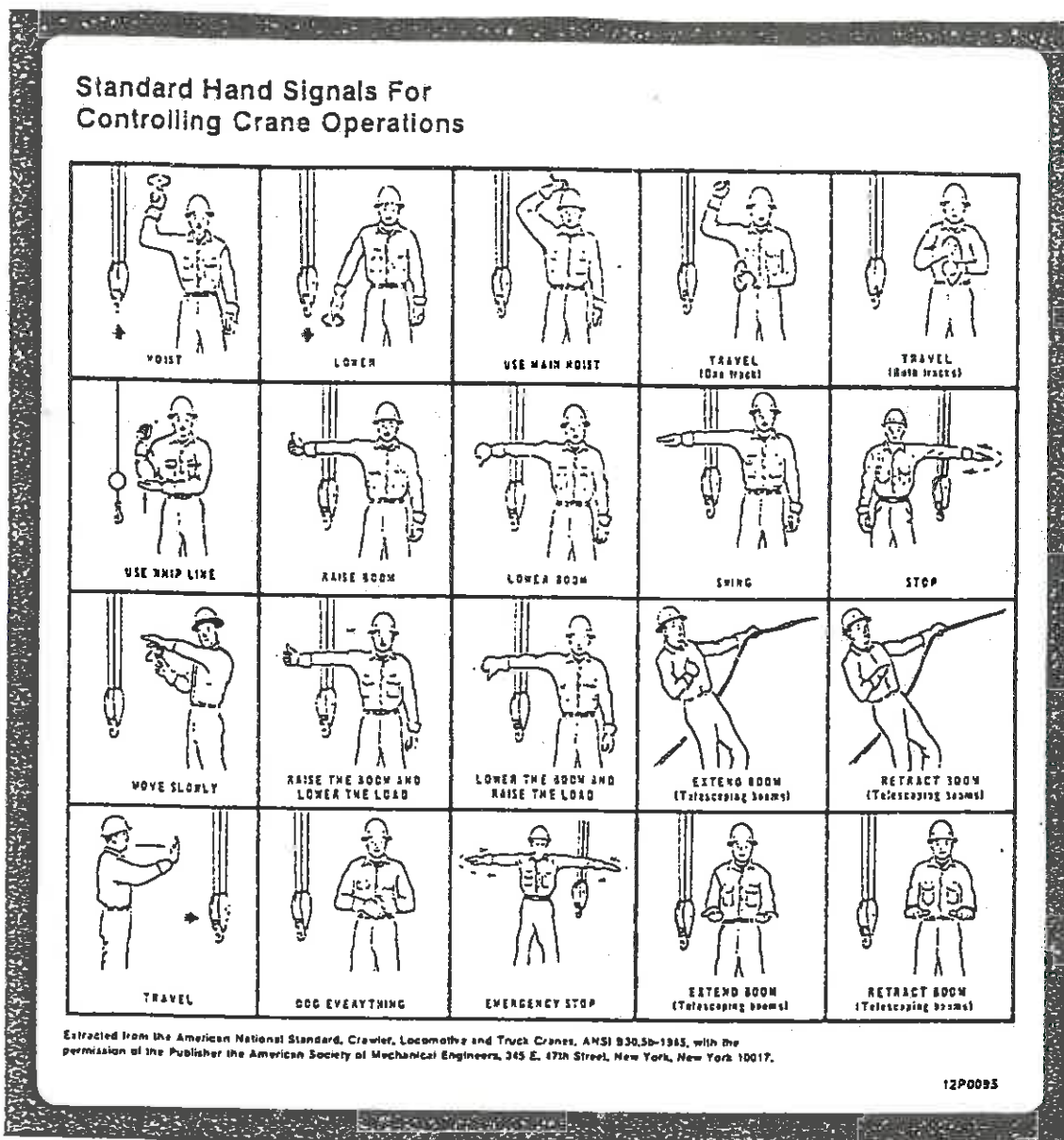
Leaving Station

1. Do not get on or off a crane in motion. Use both hands when climbing in or out of a crane. If a ladder is provided, use it.

2. Whenever an operator leaves the control station for any reason, the following must be done.

A. Lower the load to the ground.

B. Engage the swing lock. Engage the park brake. Shutdown the engine and remove the keys.



### Hand Signals

Hand signals are important for communications between the designated signalman and the operator. A hand signal chart is included above.

One person should be designated as a signalman and his/her signals obeyed by the operator.

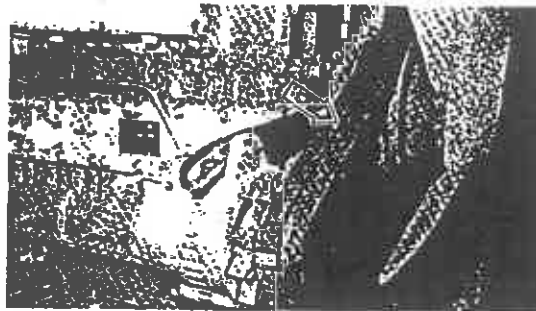
Obey a stop signal from anyone.

## Check Before Starting Operations

Before starting daily operations, make the following checks.

### 1 Check the engine fan belt tension:

To check the fan belt, apply a 22 lbs. (10 kg) force at the center of V-belt between the driving and driven pulleys. Proper deflection is in the range between 13/32" (10mm) and 19/32" (15mm).



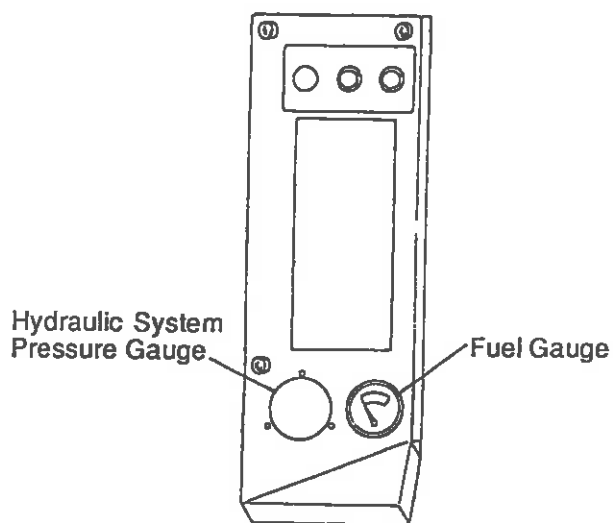
Fan Belt

CN7-1

### 2 Check the fuel, oil, and cooling water levels:

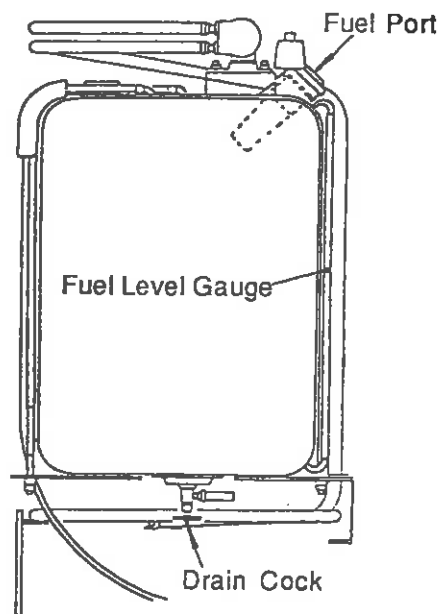
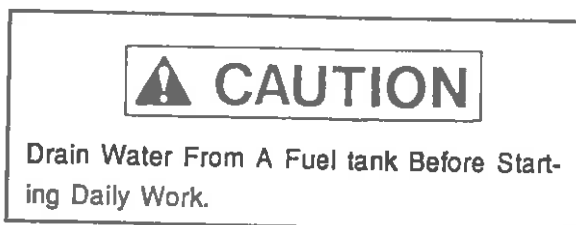
#### A. Check the fuel level:

Check the fuel level on the fuel gauge on the control panel or on the fuel level gauge attached on the side of the fuel tank. (Located in the access hole on the right rear side of the house.) Add fuel if required.



Fuel And Hydraulic System Pressure Gauge

CA1-29



Fuel Tank

CD1-31

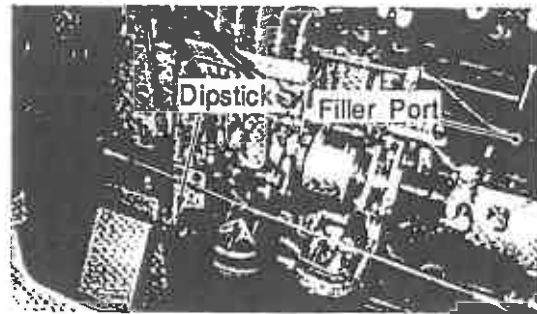


B. Check the engine oil level:

Check the engine oil level with dipstick. The oil level must be between the "H" and "L" marks on the dipstick. Fill as required by removing the filler cap, and filling through the filler port. (Refer to the engine manual for additional information.)

**CAUTION**

Check The Level Before The Engine Is Started Or More Than 30 Minutes After The Engine Has Been Shutdown.

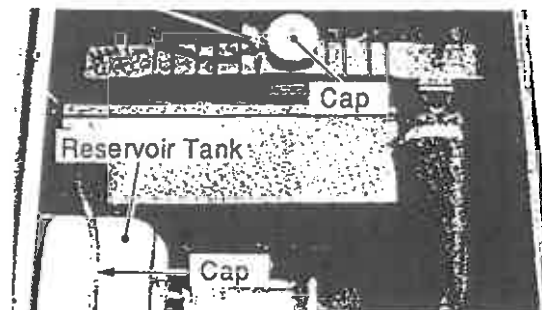


Engine Oil

CN7-2

C. Check the radiator cooling water level:

(The pressure radiator has a reservoir tank located behind the door at the left front of the house.) Use soft water (tap water) for the cooling water. Check reservoir tank to ensure that the water level is within the specified range on the reservoir tank. If level is low, add water at the cap.



Radiator

CN7-3

**CAUTION**

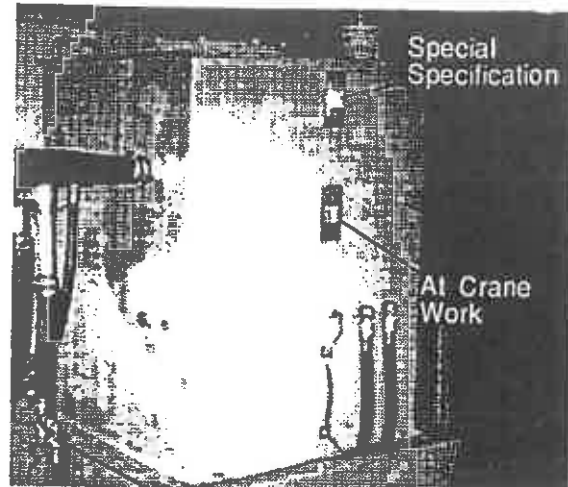
If A Large Amount Of Water Is To Be Added, Remove The Radiator Cap To Fill Water Up To Top Level In The Radiator. Add Anticorrosive To Prevent Corrosion Of Radiator And Engine Water Jacket. For Addition Of Antifreeze, See Section 8.

## Check Before Starting Operations

### 3 Check the hydraulic reservoir oil level:

Check the oil level with the oil level gauge attached on the side of the hydraulic reservoir (located at the left rear of the house). The oil level must be slightly above the midpoint between the "H" and "L" levels with all cylinders retracted.

Add hydraulic oil by removing the filler cap, if required.

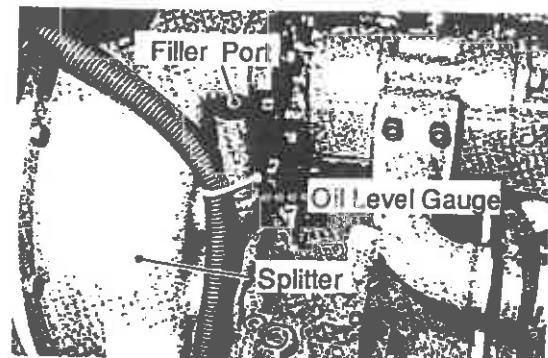


Hydraulic Oil Reservoir Tank

CD7-7

### 4 Check the power divider (pump splitter) oil level:

Check the oil level with the dipstick. Add oil by removing the filler cap as required (located in the engine compartment at the rear of the engine).



Power Divider (Pump Splitter)

CN7-5

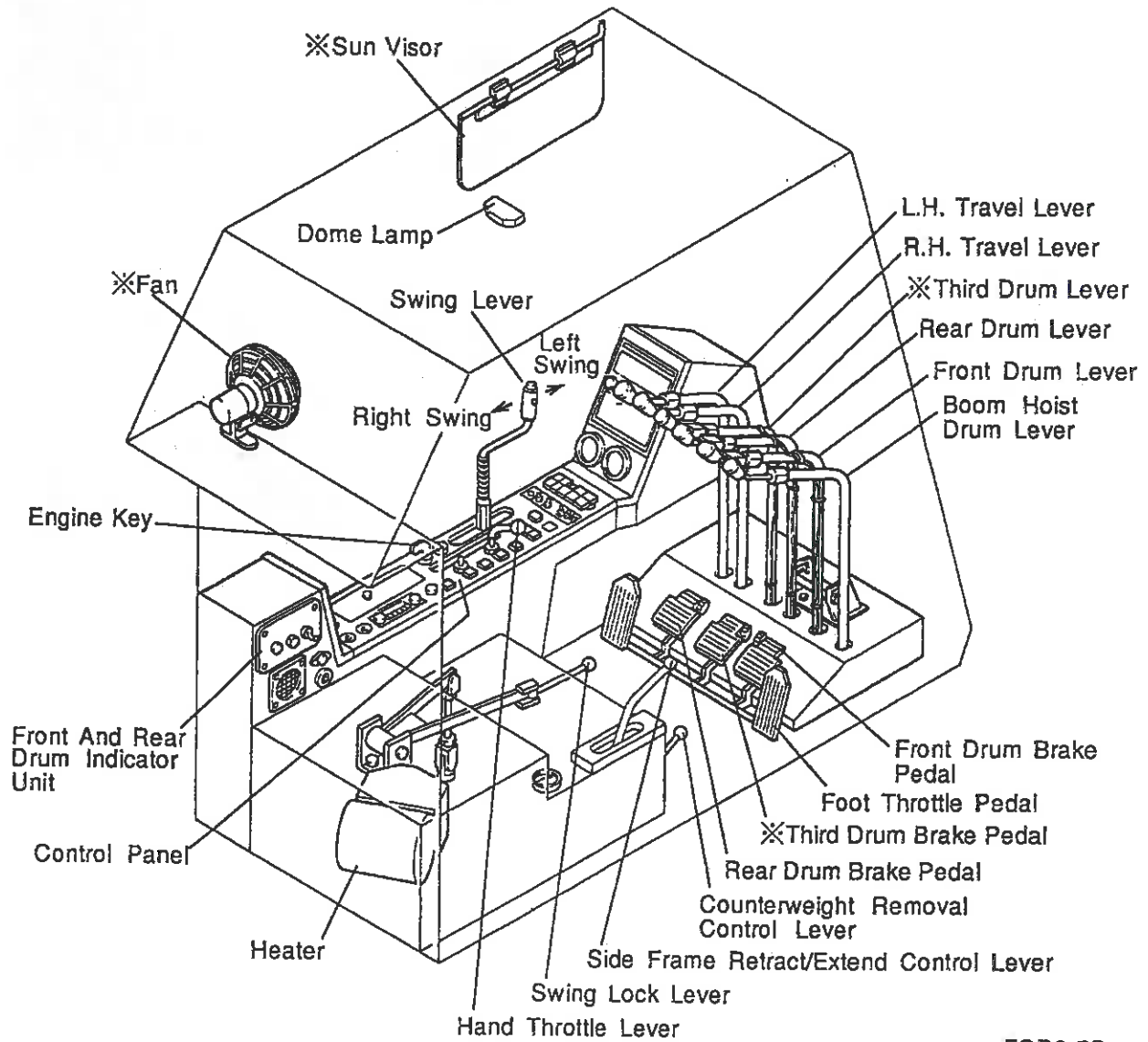
### 5 Check for other unusual conditions:

- Adjust clutch.
- Check front and rear drum brakes for proper operation.
- Check automatic brake system for proper operation
- Check hook for wear, damage, its rotating condition, and safety latch. Ensure that moving parts are properly lubricated.
- Check wire rope for damage.
- Check buckets of clamshell, drag line, etc. for damage.
- If attachments (such as vibro) are to be used, ensure they operate properly.

Note: For inspection and lubrication procedures, refer to Section 7 and 8.

1 Arrangement In Cab

Before operating the machine, familiarize yourself with locations of control levers. Note that optional equipment may not be installed.

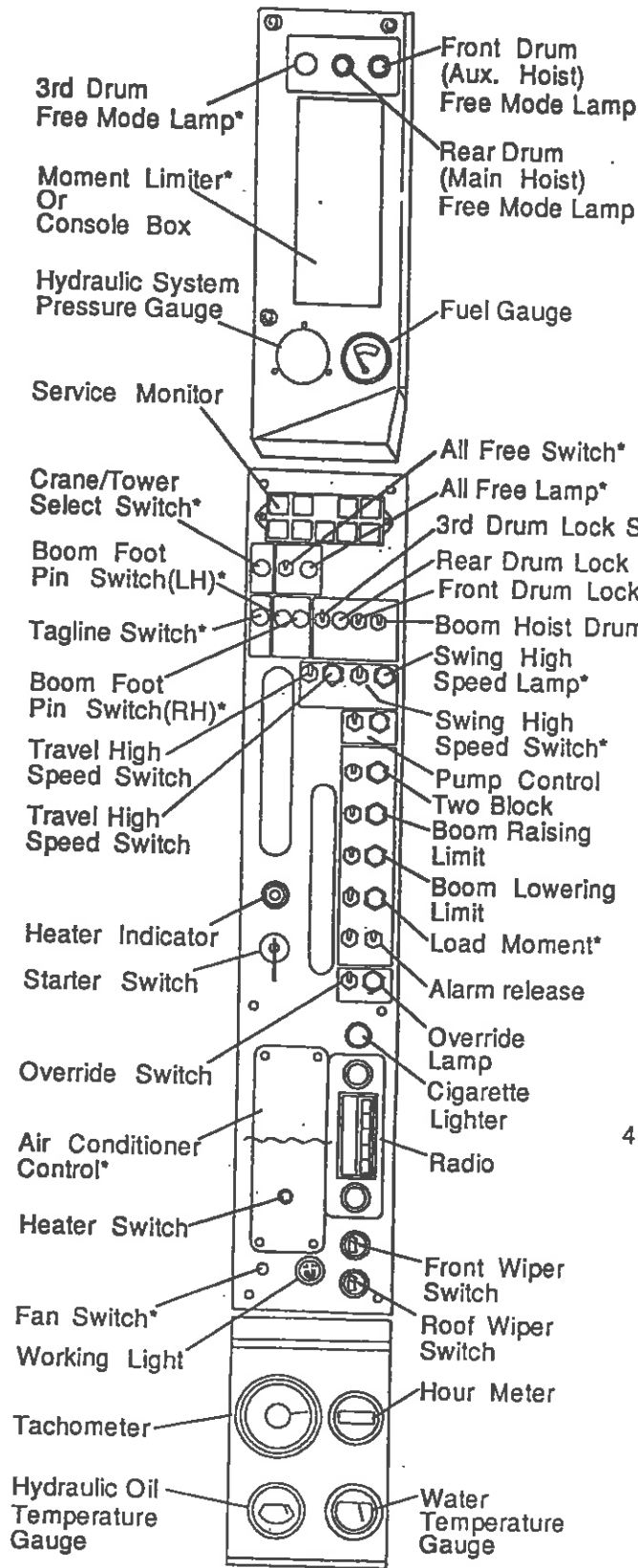


ECD0-5S

Note: Mark "※" indicates optional.

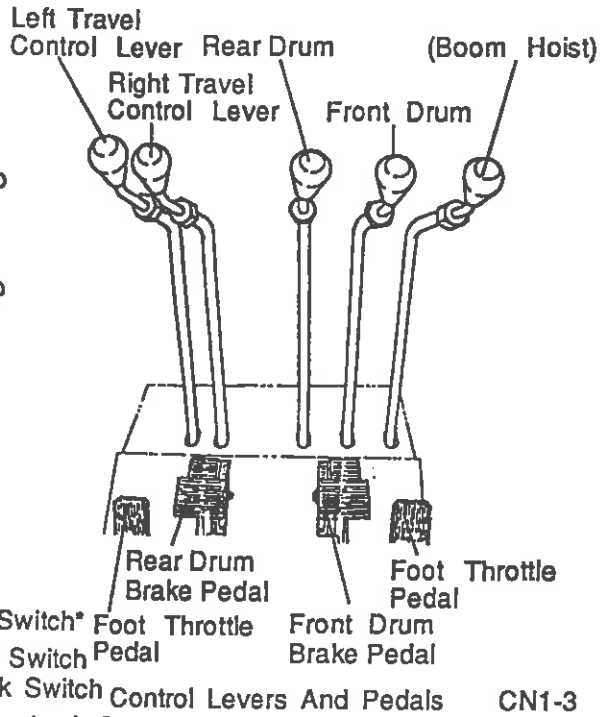
2 Control Panel

Switches and equipments with mark (\*) may be available as an option.

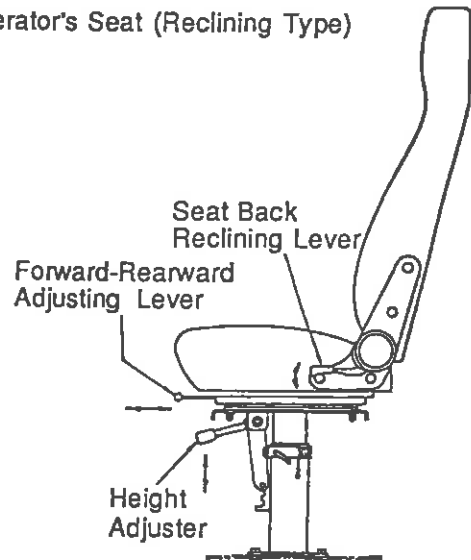


Control Panel CE1-51

3 Control Levers And Pedals



4 Operator's Seat (Reclining Type)

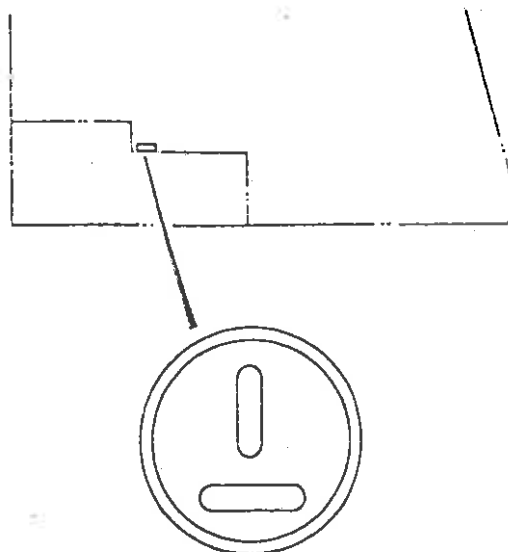


Seat Adjuster Levers CD1-12

### 1 Bubble Level

The bubble level is installed in the operator's cab to indicate front-rear and left-right inclination.

The level is installed so that the bubble comes to the center of the scale when the main body is in horizontal position. The bubble shifts when the main body tilts, with 1 scale showing the inclination of approximately one half degree and the maximum inclination indication being approximately 2°.



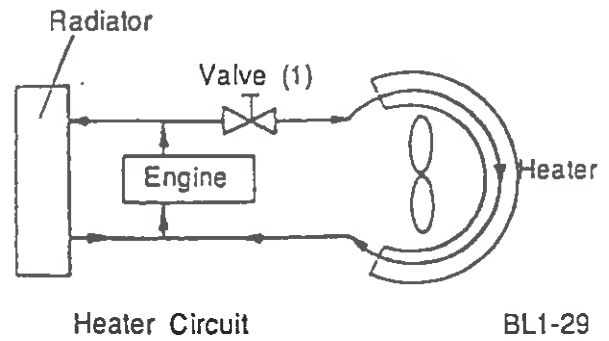
Bubble Level

CD1-16

### 1 Heater With Defroster Fan

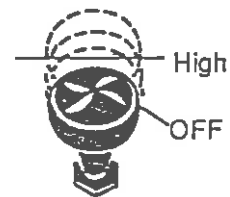
#### Operation

- 1) Open valve (1) on the engine water manifold.
- 2) When the heater fan switch is pulled, warm air will be supplied to the cab.
- 3) Pushing the heater fan switch all the way down will shut off the fan.



### 2 Heater Fan Switch

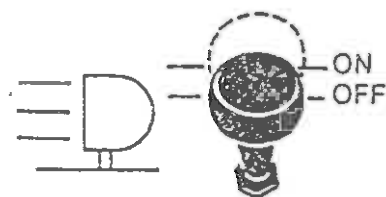
This is used to operate the cab heater fan. The fan speed can be adjusted by raising or lowering the fan switch.



Heater Fan Switch BL1-30

### 3 Working Light Switch

Pull this switch and working lights come on. Push this switch down and working lights go off.

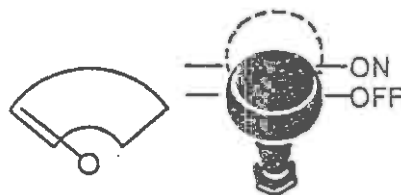


Working Light

BL1-31

### 4 Wiper Switch

Pull this switch up and the wiper will operate. Push this switch down and the wiper will go off.

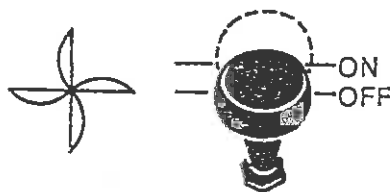


Wiper

BL1-32

### 5 Fan Switch

Pull this switch up and the fan will operate. Push this switch down and the fan will go off.

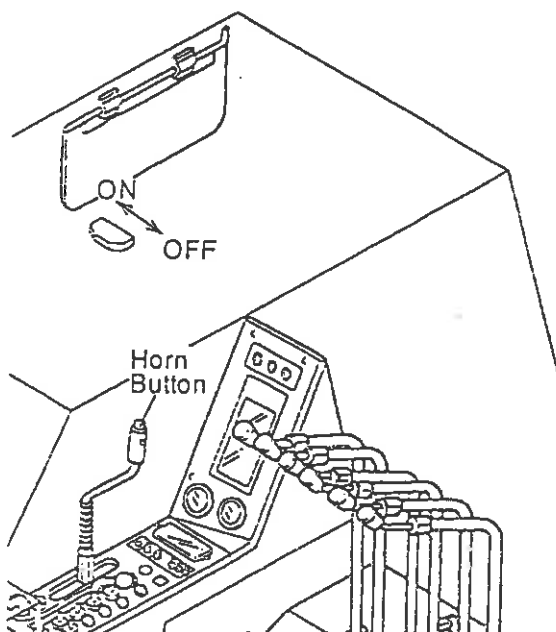


Fan

BL1-33

### 6 Dome Lamp Switch

To turn the dome lamp on, move the control switch to "ON". To turn the dome lamp off, move the control switch to "OFF".



### 7 Horn Button

Pushing the horn button on the swing control lever will sound the horn. Be sure to sound horn before starting the engine, swinging the upper, etc...

CB1-64

## Before Starting The Engine

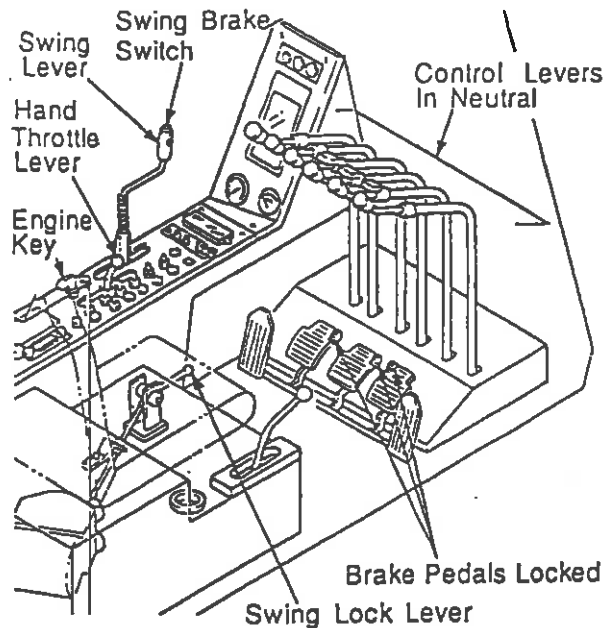
Check the following before either starting or stopping engine.

- Brake pedals must be locked.

### **WARNING**

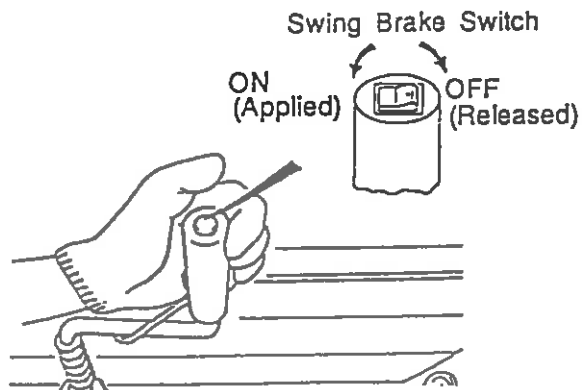
The Brake Pedal Locks Are Intended To Allow The Operator To Rest His Legs When Suspending A Load For A Short Period Of Time, But The Operator Must Remain In The Seat With His Feet On The Pedals.

- All control levers must be in the neutral position.
- All drum lock switches must be in the "ON" position. (Switches do not actuate after the engine is stopped.)
- Swing lock lever must be in the down (locked) position.
- Swing brake switch must be in the "ON" (locked) position.



Engine Stop Lever Positions

CP0-4S



Swing Brake Switch

CD3-12

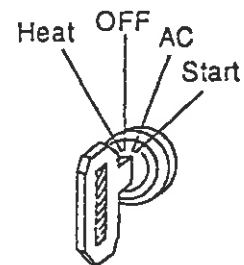
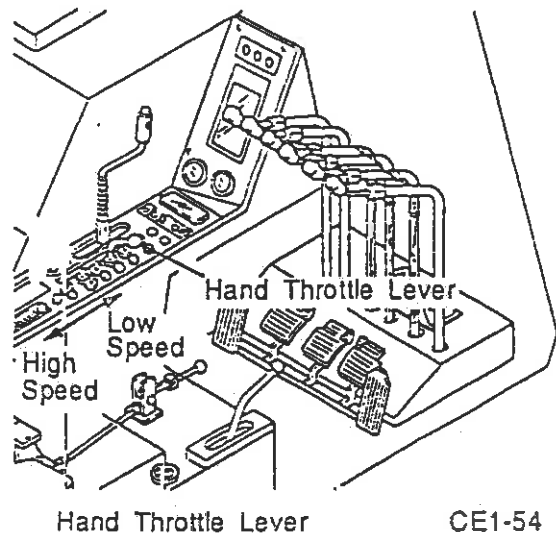


## Starting The Engine

- 1) Pull the hand throttle lever back slightly.
- 2) Insert the engine key and turn it counter-clockwise to preheat the engine for 20 to 30 seconds.
- 3) After the control resistance has become red-hot, fully turn the key clockwise until the engine starts. Release the key when the engine starts.

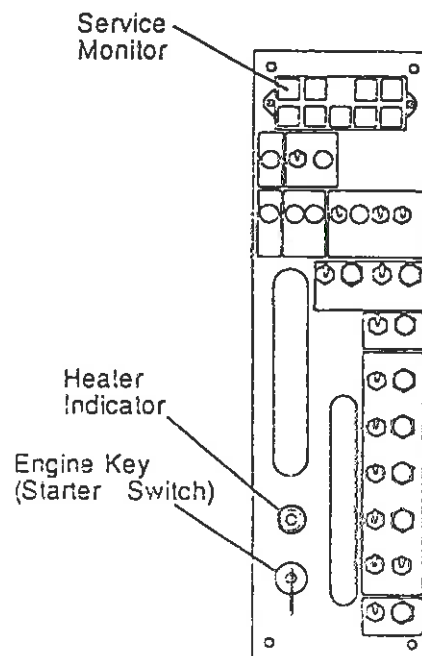
### **WARNING**

To Avoid Possible Starter Motor Failure From Overheating. Do Not Engage The Starter For More Than 30 Seconds At A Time. If The Engine Does Not Start, Do Not Turn The Starter Switch Again Until The Starter Motor Comes To A Complete Stop. Take Care Because The Starter May Be Damaged. Check The Fuel System If The Engine Does Not Start Within 3~4 Trials.



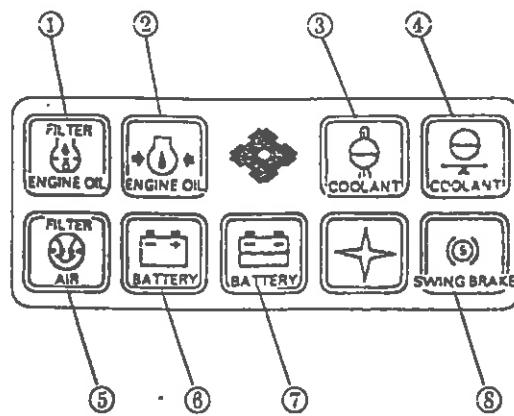
- 4) Check for unusual noises:  
Listen for any unusual noises from the engine, pump, etc. If any, shutdown the engine until the problem is found and corrected.
- 5) Check the service monitor.  
(The swing brake lamp may be lit.)

Note: All service monitor lamps come on and stay lit for about three seconds when the engine key is turned to "Start" position. While the engine is running, they come on to indicate that there is an unusual condition in equipment or a fluid level is lower than the normal level. If they do not come on at all, the light bulbs have probably burnt out or the service monitor may be defective. Consult your nearest Distributor.



6) Service monitor lamps

- ① Engine oil filter warning lamp  
(Comes on when the filter gets clogged)
- ② Engine oil pressure warning lamp  
(Comes on when engine oil pressure is low)
- ③ Coolant overheat lamp  
(Comes on when radiator cooling water temperature is excessive high)
- ④ Radiator cooling water level  
(Comes on when reservoir tank coolant becomes low)
- ⑤ Engine air cleaner warning lamp  
(Comes on when air filter gets clogged)
- ⑥ Battery lamp  
(Comes on when the charging voltage drops)
- ⑦ Battery electrolyte level  
(Comes on when electrolyte level is low)
- ⑧ Swing brake  
(Comes on (in red) when the swing brake is applied)



Service Monitor

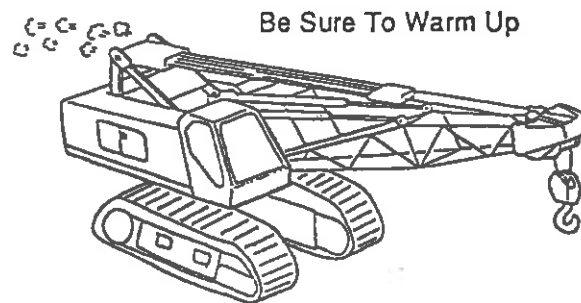
CD1-21

The lamps ① through ⑦ come on (in red) when there is an unusual condition as described above. If any of these lamps comes on, set the machine in a safe position and stop operation. Then, inspect and repair.

**CAUTION**

Do Not Depend Only On The Service Monitor Lamps For Inspection. Perform The Normal Daily Inspection Procedures According To Instructions Given In This Manual.

Warm Up The Engine Before Starting Work. If Operation Is Started Right Away Without This Warming Up, The Pump Cannot deliver The Specified Amount Of Oil Due To High Viscosity, Especially In Cold Weather, And The Engine, Pump, Etc. May Be Damaged.



Be Sure To Warm Up

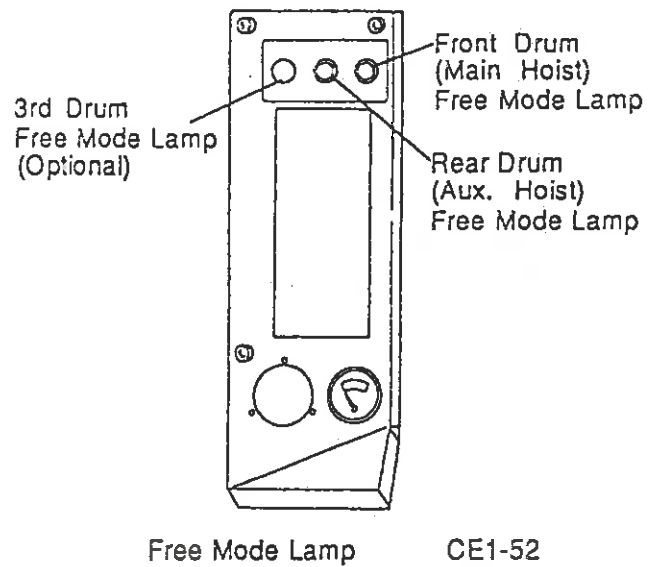
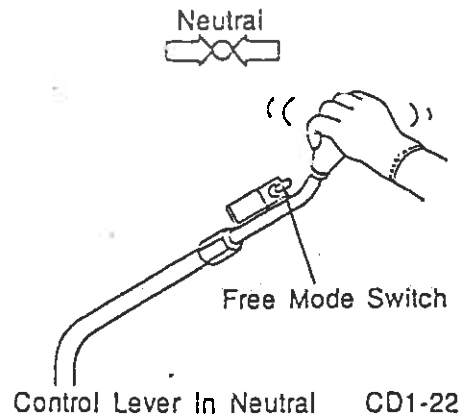
Idling Process

AM134

7) Check the brake free mode switch.

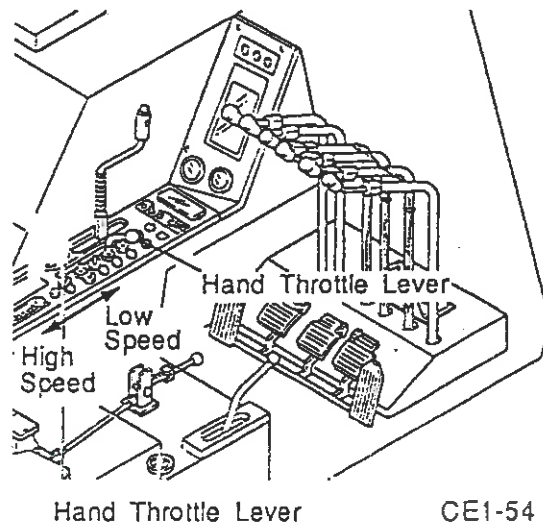
Check the free mode switch in the house.

- Lamp on: (brake mode) (free mode)  
When the control lever is in neutral, the drum brake is in free mode making it necessary to operate the brake pedal. (When the free mode is engaged, the appropriate lamp will come on.)
- Lamp off: (automatic brake)  
When the control lever is in neutral, the drum brake is applied to hold a load.



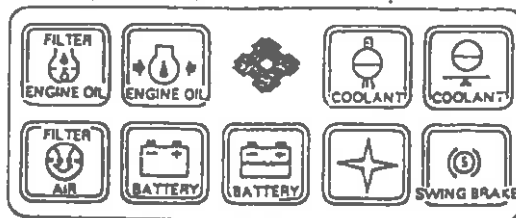
8) Run the engine at idle for 5 to 10 minutes.

After the oil temperature gauge pointer is in the green range, start operation.



1) Service monitor

Check to see if any service monitor lamp is lit. If any lamp is lit, stop operation and correct as required. Normally off (except swing brake lamp if swing brake is applied).



Service Monitor Lamps

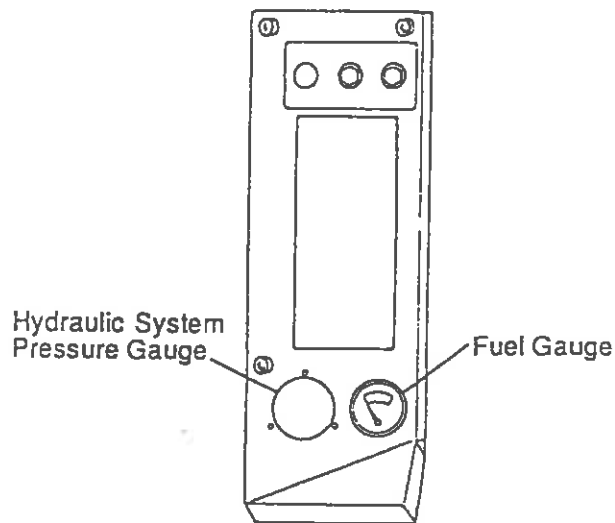
CD1-21

2) Fuel gauge

If the pointer reads "E", refill fuel.

3) Hydraulic system pressure gauge

This gauge registers the pressure in the range between 0 psi (0 kg/cm<sup>2</sup>) and 1500 psi (105 kg/cm<sup>2</sup>). The pointer returns to 0 gradually when the engine is stopped. If the pointer reads any value out of the range 953 to 1280 psi (67 to 90 kg/cm<sup>2</sup>), stop operation and contact your distributor.



Fuel And Hydraulic System Pressure Gauge

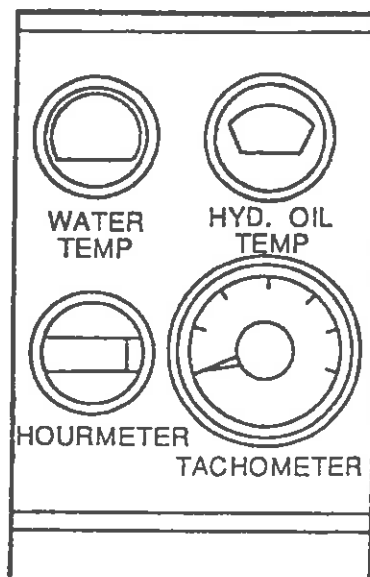
CA1-29

4) Tachometer

The tachometer registers the engine rpm.

5) Hourmeter

The hours are indicated in five digits, the last one representing 1/10 of an hour. The hourmeter is activated only while the engine is running.

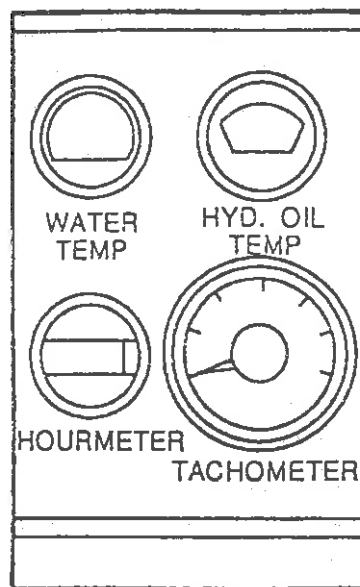


Tachometer And Hourmeter

CD1-23

6) Hydraulic oil temperature gauge

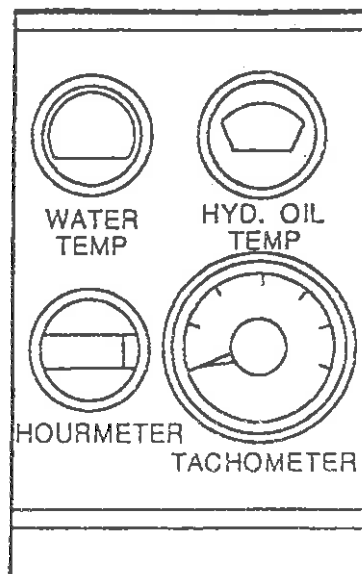
This gauge shows the temperature in the hydraulic oil tank. The normal temperature range during operation is indicated by the green marking; the pointer may, however, move to the red range after continuous travel or long period of full load operation. In this case, open the engine compartment lid to release heat into the air, or throttle the engine to idle and wait for the gauge to return to the green range.



Hydraulic Oil Temperature Gauge CD1-23

7) Engine water temperature gauge

The engine coolant temperature range is shown on this gauge. Normal running should be in the green range. The gauge may read in red range when the engine is run under full load. When temperature reaches high in the red range, the overheat warning lamp of the service monitor comes on; in which case, throttle the engine down to idle to allow the temperature to decrease before resuming operation.

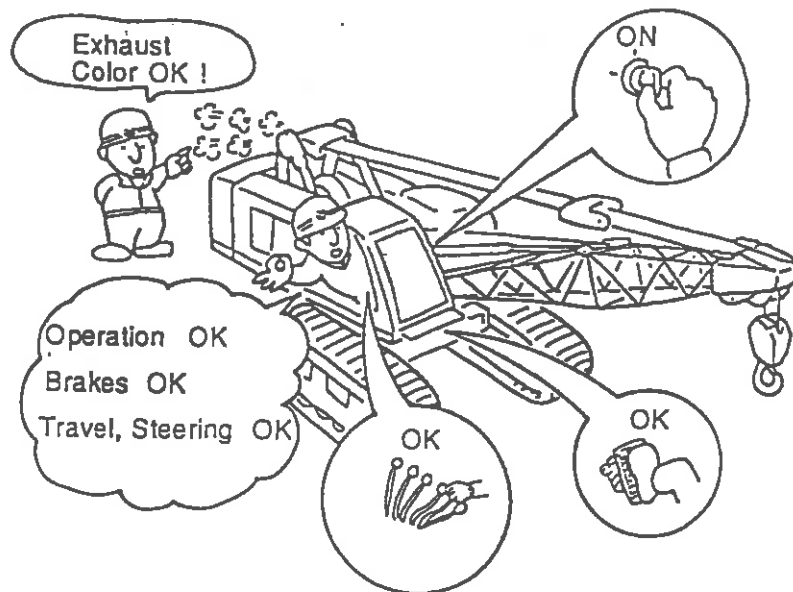


Water Temperature Gauge CD1-23

8) Check the color of exhaust.

Normal exhaust color: Colorless or light purple

Unusual exhaust color: White or black



Check Before Starting Operation

AM135

## Stopping The Engine

- 1) Lock the brake pedals and move the control levers to the neutral position.  
The lock switches do not cause the pawl to operate if pressed after the engine key is turned to "Start" position.
- 2) Engage the drum locks.
- 3) Engage the swing lock.
- 4) Engage the swing brake.  
The swing brake is applied when the switch on top of lever grip is turned on.
- 5) Idle the engine for 5 minutes.
- 6) With the throttle lever fully returned to its idle position, turn the engine key to the "OFF" position. (Make sure that the engine has been brought to complete stop.)
- 7) Remove the engine key from ignition switch to prevent starting by unauthorized persons.

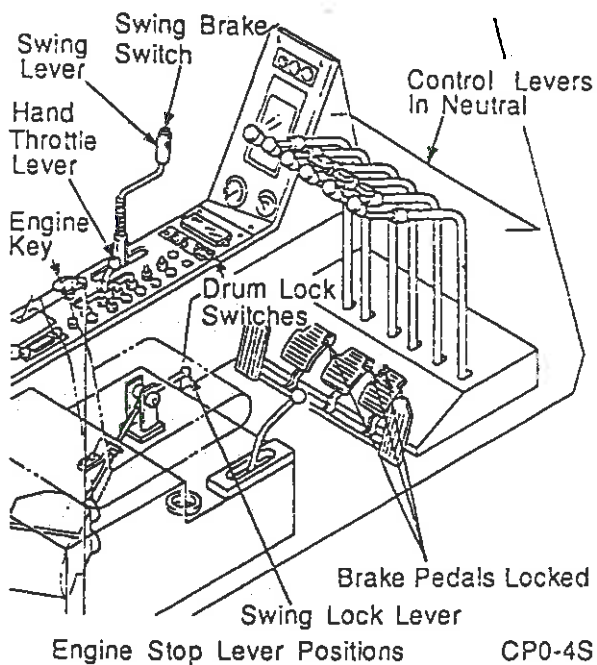
Note: After the machine is shutdown, make sure the ignition switch remains in the "OFF" position to avoid battery drain.

### CAUTION

Remove The Key From The Switch At Night To Prevent Unauthorized Persons From Operating The Machine.

Ensure the following.

- To prevent diesel fuel from absorbing moisture, fill the tank immediately after daily operation.  
(Tank capacity: 119 gal. (450 lit.))



## Extending Side Frames

On this machine, the side frames are retracted and extended hydraulically.

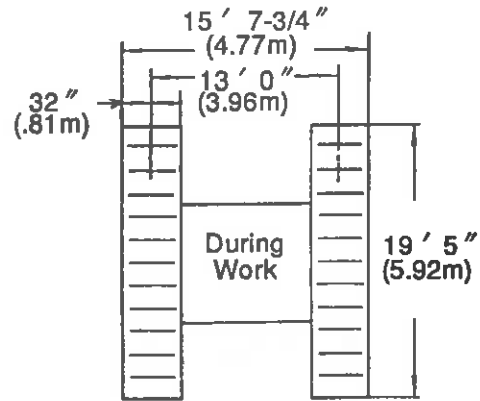
Note: The machine must be operated with the side frames in the extended position.

### **WARNING**

The Extending And Retracting Operation Must Be Done On Firm, Level Ground.

Do Not Swing The Machine With A Counterweight Installed When The Side Frames Are Retracted. It May Cause The Machine To Tip Over.

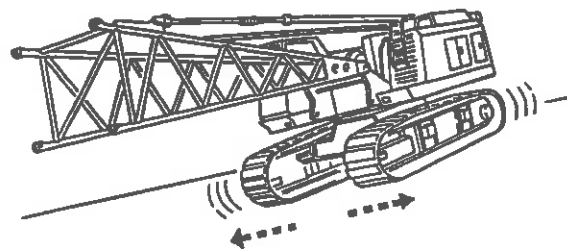
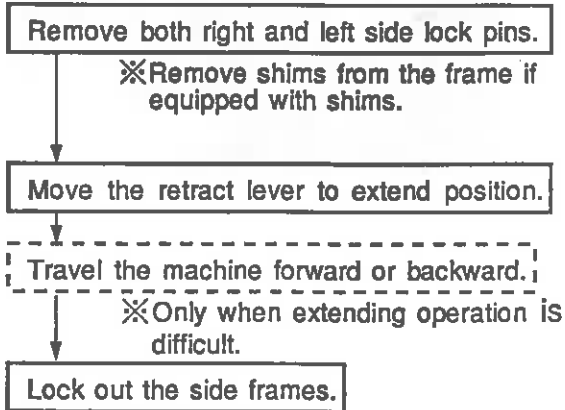
Place The Upper Parallel With The Side Frames And Engage The Swing Lock.



Dimensions With Side Frames Extended

CB2-1

### Summary Of Procedure



Never Work On A Slope

CB2-2



Extending Procedures

- 1) Park the machine on level ground.
- 2) Remove the right and left side frame spring pins and lock pins. If lock pins are hard to remove, move the retract control lever forward and backward.

**⚠ WARNING**

Stay Clear Of All Moving Machinery During Extending Or Retracting Of Side Frames. Position A Signalman To Observe All Areas Of Motion And Warn Operator Of Danger.



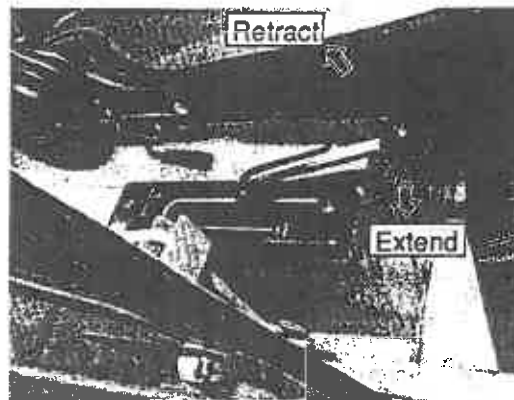
Removing The Side Frame Lock Pins CB2-4

- 3) Move the retract control lever (located to the right of the operator's seat) to the "Extend" position and extend the side frames to the stroke end of the extend position.

Note: If extension is difficult, move travel control lever forward or backward.

**⚠ WARNING**

Protect Workers From Hazard With Adequate Means In Dangerous Areas. Place Guards Where Necessary.



Retract Control Lever CB2-5

- 5) Install the side frame lock pin and fix with spring pin.

**⚠ WARNING**

When Installing The Lock Pin, Do Not Insert Your Finger To Attempt To Align Pin With Pin Hole. A Movement In This Area Could Sever Fingers.

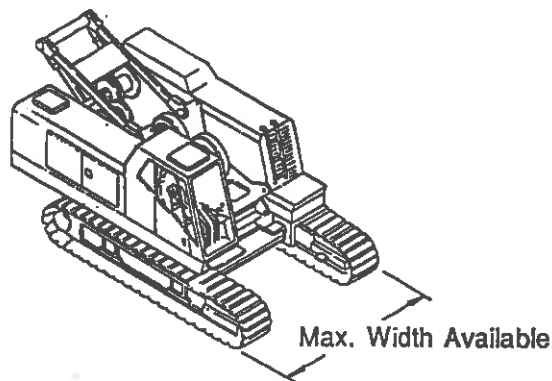


Installing The Side Frame Lock Pins CB2-6

The boom involves frequent reconfiguration, and thus, higher possibility of personal injury. The following paragraphs contain only the basic procedures and therefore all possible measures must be taken to prevent hazard.

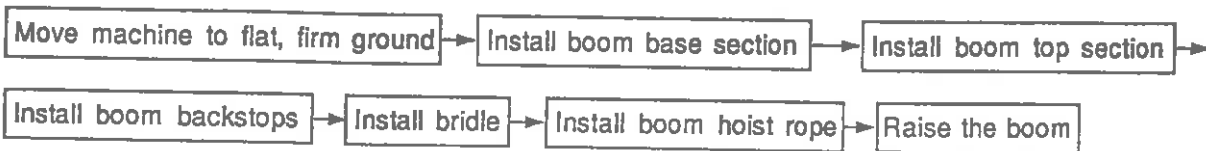
**WARNING**

- Prerequisites For Basic Boom Assembly. Prior To Basic Boom Assembly, Ensure That The Following Conditions Are Met:
- Side Frames In Extended Position
  - Gantry In Low Position
  - No Counterweight Installed



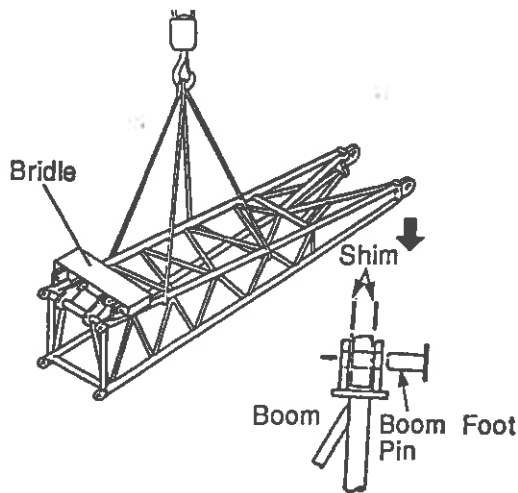
Prerequisites For Basic Boom Assembly CB2-8

1 Summary Of Procedure



2 Assembling Procedures

- 1) Move machine to flat, firm ground.
- 2) Using a helper crane, install the bottom boom section. Position boom base section so that both left and right lugs are brought into alignment.
- 3) Insert the boom foot pins from the inside of the boom. Ensure that the grease hole in pin faces the downward.

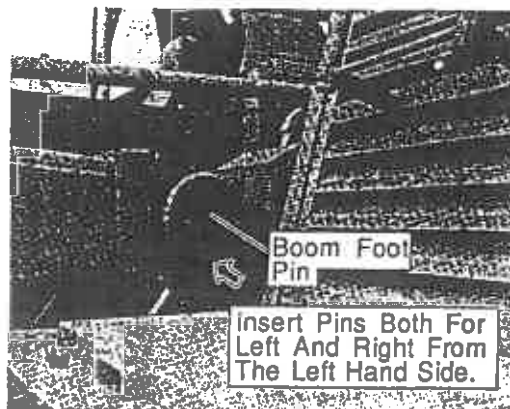


CB2-9

**WARNING**

Use Shims (3/32" (2.4mm), 1/64" (.4mm)) To Adjust Clearance In Boom Foot Within 1/8" (3mm). The Thicker Shim Must Be Placed Next To The Boom Lug.

- 4) Install key plates to secure the boom foot pins using capscrews.

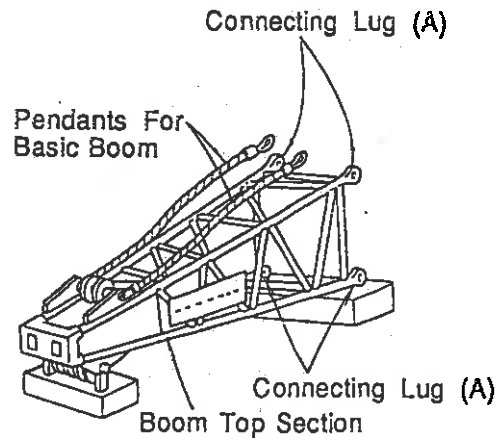


Boom Foot Pin

CB2-10

- 5) Lift the boom top section with using a helper crane, direct it toward the boom base section. Then align the upper connecting lug (A).

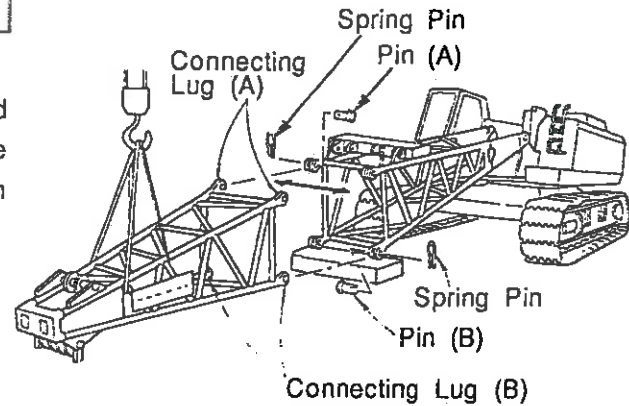
**CAUTION**  
Inserting Your Finger To Align Pin Holes Can Be Extremely Dangerous.



Boom Top Section With Pendants CB2-17

- 6) Connect upper connecting lugs with pin (A) and lock them with spring pins.

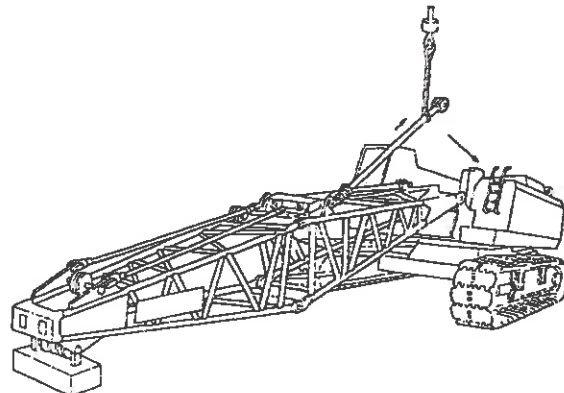
**CAUTION**  
When Assembling The Boom, The Upper Connecting Lugs Must Be Connected First.  
Drive Pins Into Place From Inside To Outside.



Boom Pin Connection CB2-18

- 7) Align the lower connecting lug holes and drive pin (B), and lock them with To reeve the boom hoist wire rope, refer to "Boom Hoist Rope Reaving" in this section.

- 8) Install the boom backstops. Secure the larger diameter ends to the upper frame and the telescoping ends to the boom base section with pins.

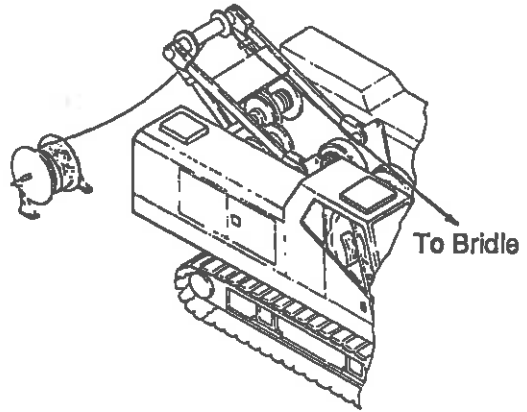


Installing Boom Backstops CB2-15

9) Reeve the boom hoist wire rope, working from behind the machine, to the bridle and bail as illustrated. Start reeving from the left gantry sheave.

**⚠ CAUTION**

During Reeving, Keep The Rope Straight. It Is Recommended That A Supply Reel Be Used To Protect The Rope From Mud.

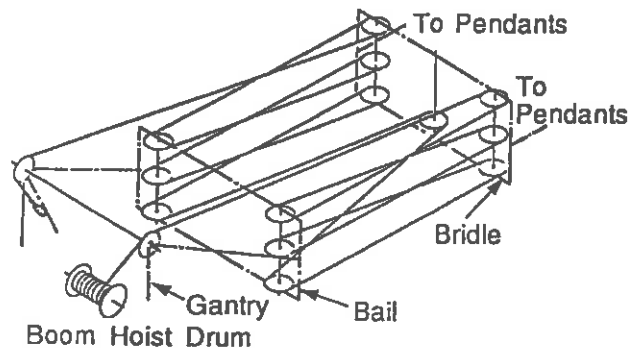


Reeving The Boom Hoist Rope CB2-12

10) With the rope reeved through the bridle and bail, secure one end to the boom hoist drum with a wedge and the other end to the gantry link with a socket.

**⚠ WARNING**

Avoid Injury To Yourself. Replace Or Rearrange Rope Carefully To Avoid An Accident. Rope Wrapped Around Sheaves May Become Twisted. When Released, The Rope Can Spin As The Dead End Pins Or Sockets Are Removed.

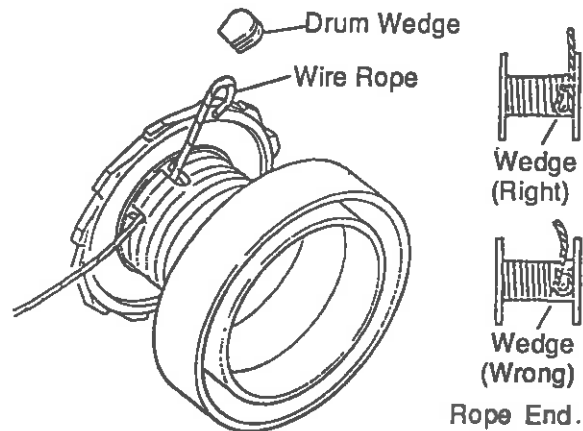


Reeving The Boom Hoist Rope CB2-51

**⚠ WARNING**

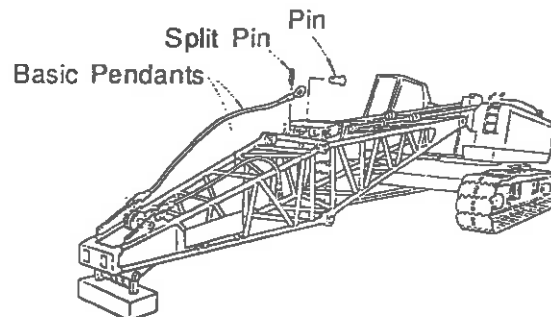
Insert Rope End From Behind And Secure With A Wedge As Illustrated.

Ensure Rope Length Around The Wedge So That The Rope End Does Not Come Out From The Drum. Short Length Causes The Rope To Fall Free.



Securing The Rope End CD2-100

11) Install the basic boom pendants between the boom end lugs and bridle.

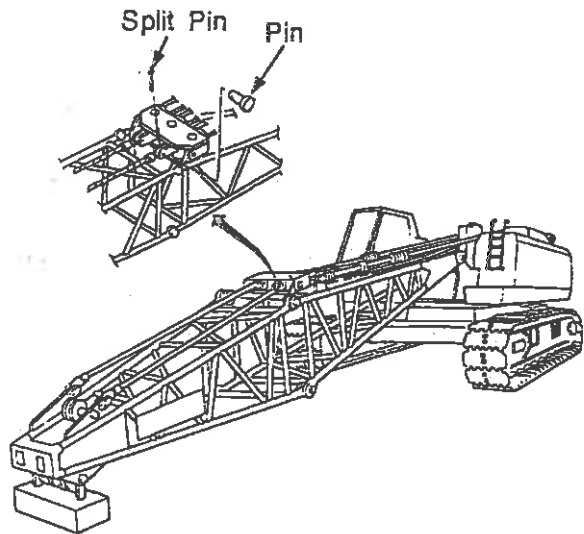


Installing The Basic Pendants CB2-19

12) Remove the pins that connect bridle to the boom base section.

**WARNING**

With The Spring Pins Removed, Drive Out The Pins From Outside With A Bar.



Removal Of Bridle

CB2-20

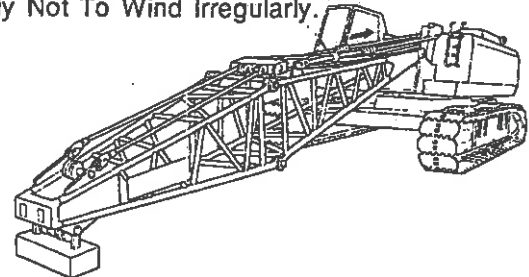
13) Install the pin that has been removed in step 12) onto the bridle frame and lock with a split pin.

14) Place the boom hoist control lever to the "Hoist" position to take up the rope onto the drum.

**WARNING**

Slowly Wind Up The Rope Continuously To Prevent Irregular Winding. Watch And Correct Irregular Winds As Required Until Sufficient Tension Is Given To The Rope.

Wind The Rope Continuously And Slowly Not To Wind Irregularly.



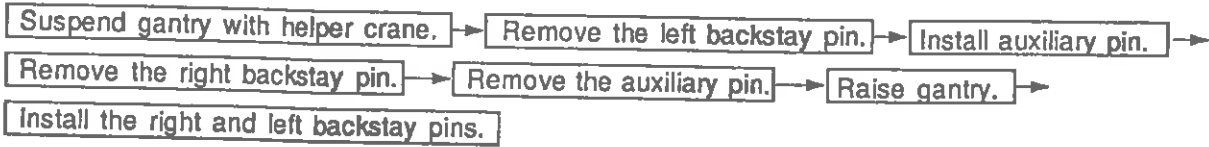
Winding The Boom Hoist Rope

CB2-16

**WARNING**

Wire Rope Winding Involves Hazards. The Operator, Guard, And Corrector Must Work In Coordination.

Summary Of Procedure



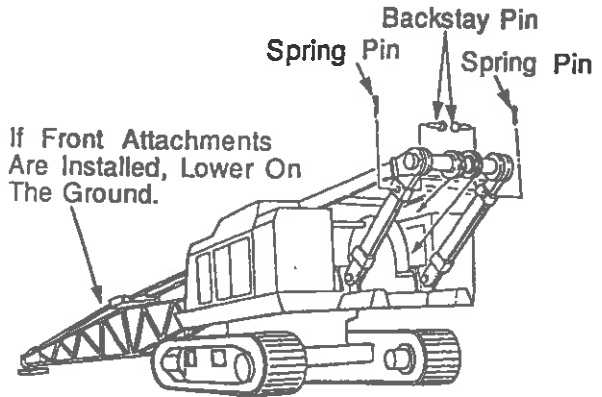
Procedures With Helper Crane

**CAUTION**  
If Attachments Are Installed, Lower Boom Down On Ground And Relieve Tension On Boom Hoist Rope.

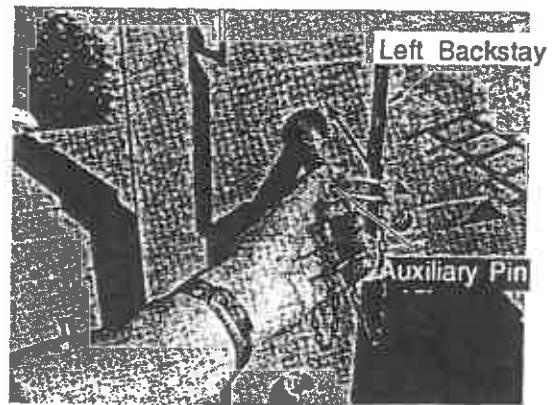
- 1) With a sling reeved through the shaft on gantry, suspend gantry with helper crane.
- 2) Remove the left backstay spring pin and pin and install auxiliary pin. (Install auxiliary pin with head of pin to outside position.)
- 3) Remove the right backstay spring pin and pin.

**CAUTION**  
Ensure That There Is Free Play In The Auxiliary Pin. If It Is Too Tight, Move The Boom Hoist Control Lever To The "Lower" Position To Remove Tension From The Rope.

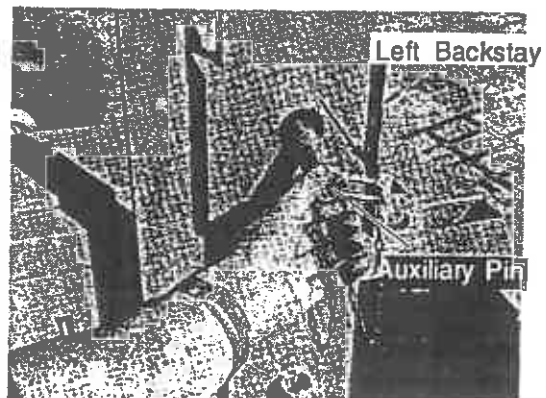
- 4) Remove the auxiliary pin installed in step 2 above.



Removal Of Backstay Pins CB2-34



Installing The Auxiliary Pin CB6-6

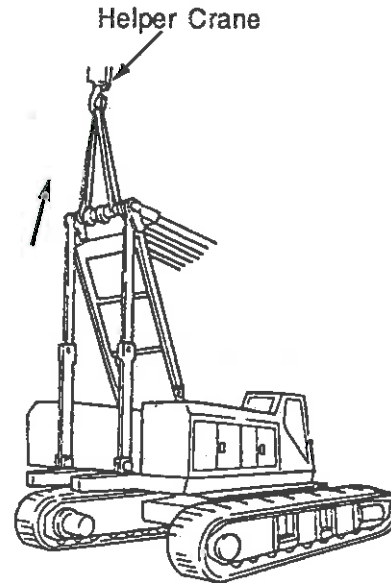


Removing The Auxiliary Pin CB6-6

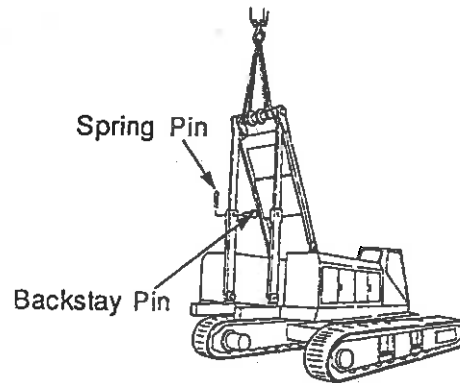
- 5) Lift gantry to the high position and install both right and left backstay pins and spring pins.

**WARNING**

To Avoid Accidents, Insert Pins From The Inside To Outside Of Two Backstays So As To Have Spring Pins Installed Outside.



Lifting The Gantry With Helper Crane CB6-5



Installing The Backstay Pin CB6-5

## Installing The Counterweight (With Helper Crane)

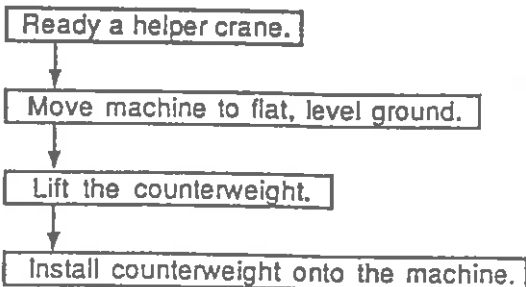
Extreme care should be exercised during installation.

### **WARNING**

Prior To Installation, Ensure The Following Conditions Are Met:

- Gantry In High Position
- Side Frames Fully Extended

#### Summary Of Procedure

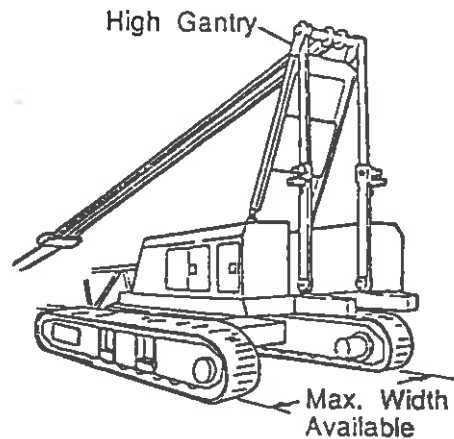


#### Installation Procedures:

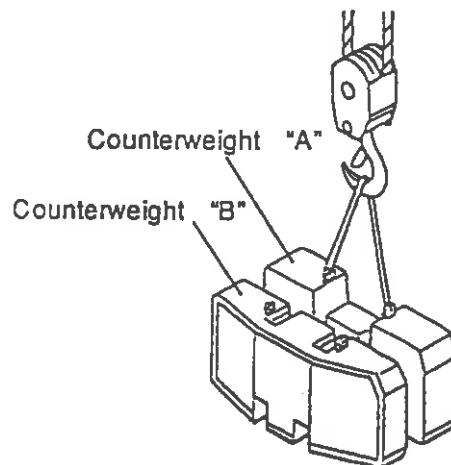
- 1) Position the upper over the front and engage the swing lock.
- 2) Install a sling to the counterweight "A" and lift it with the helper crane.

### **WARNING**

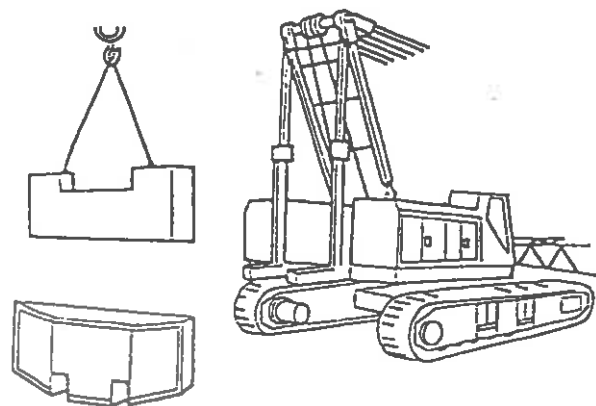
Use A Wire Rope Sufficiently Strong To Lift Counterweight Safely. The Counterweight "A" Weighs 23,965 lbs. (10,870 kg).



Prerequisites For Counterweight Installation CB2-37



Installing A Sling Rope CA2-1





- 3) Move the counterweight "A" to the correct position to mount on the main frame.

**WARNING**

Do Not Allow Workmen Under The Revolving Frame Or Counterweight During The Procedure.

- 4) Install the counterweight bolts ① to attach the counterweight to the main frame.

**WARNING**

The Counterweight Must Be Supported By The Helper Crane Until It Is Secured In Position With The Bolts.

- 5) Install a sling to the counterweight "B" and lift it with the helper crane.

Note: Bolt tightening torque: 651 to 796 ft-lbs. (90 to 110 kg-m)

**WARNING**

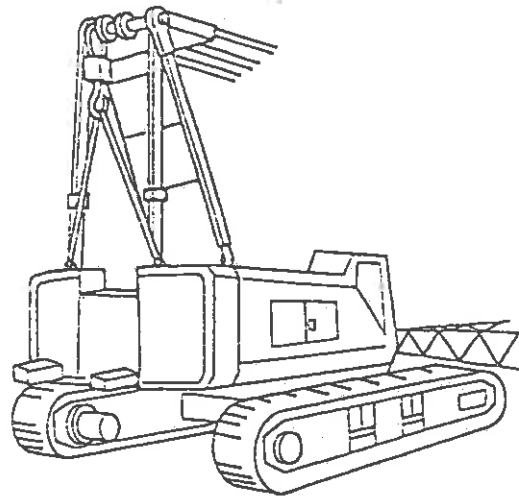
Use A Wire Rope Sufficiently Strong To Lift Counterweight Safely. The Counterweight "B" Weighs 20,128 lbs. (9,130 kg).

- 6) Move the counterweight "B" to the correct position to mount on the main frame.

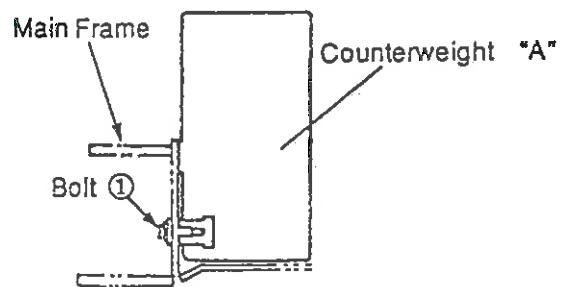
- 7) Install the counterweight bolts to attach the counterweight to the main frame.

**WARNING**

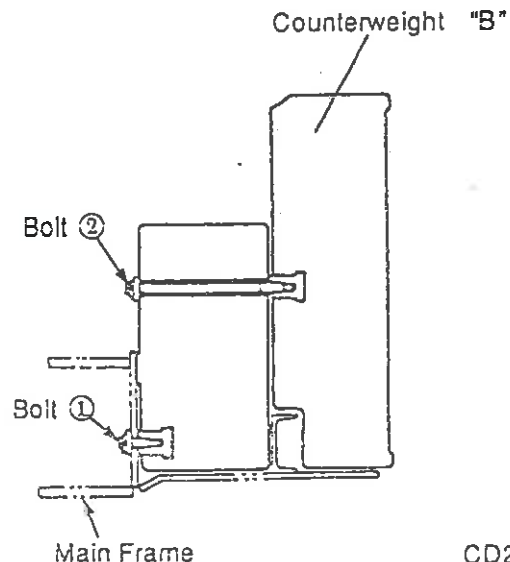
The Counterweight Must Be Supported By The Helper Crane Until It Is Secured In Position With The Bolts.



Securing The Counterweight CD2-30



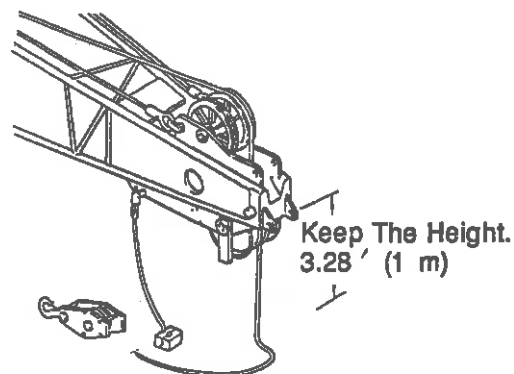
CD2-28



CD2-5

## Winding Of Main Hoist Rope

- 1) Raise the boom peak about 3.28' (1 m) from the ground to facilitate work.



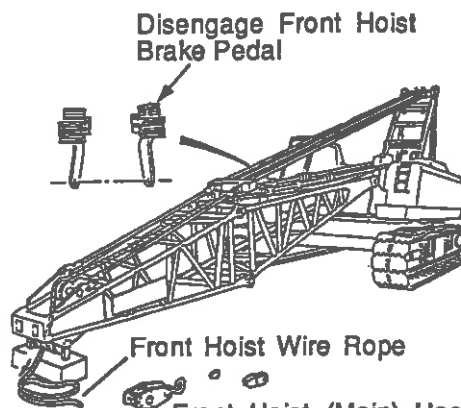
Height Of Boom Head

CB2-22

- 2) With the engine running at idle, press the brake pedal for locking.

- 3) Place the front hoist free mode switch in "Free" to release the brake.

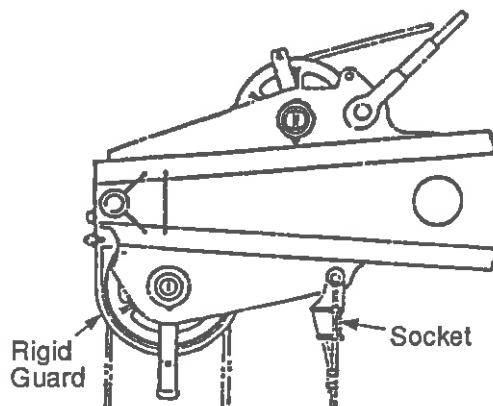
Note: The brake will not be released with only changing the switch. To free the drum, operate the switch after latching the brake pedal.



Letting Out Front (Main) Hoist Rope CB2-21

- 4) Release the main hoist drum brake to let out the main hoist rope. Pull rope off the drum to reeve over boom point sheave. Hoist down using main hoist control lever to ease pulling the rope off the drum.

- 5) Lock the main hoist drum brake.



Boom Peak

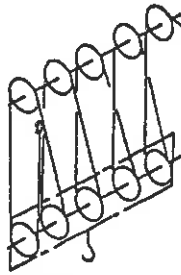
CD2-251

6) Reeve wire rope through the boom and hook.

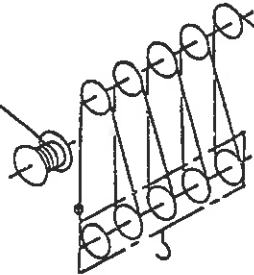
Note: The parts of line must be selected according to the boom length. The maximum lifting capacities include the weight of the hook block and other attachments. Operation must be made within wire rope and rated capacity chart ranges.

**WARNING**

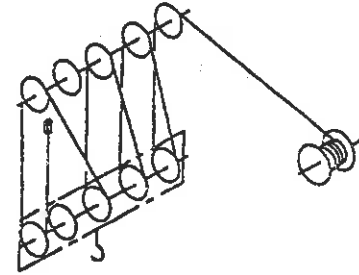
Avoid Injury To Yourself. Replace Or Rearrange Rope Carefully To Avoid An Accident. Rope Wrapped Around Sheaves May Become Twisted. When Released, The Rope Can Spin As The Dead End Pins Or Sockets Are Removed.



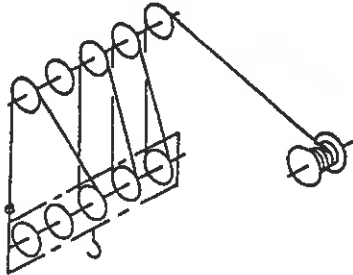
10 Part Reeving



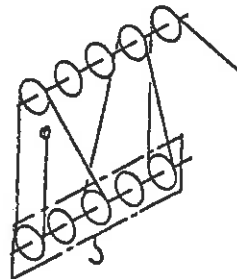
9 Part Reeving



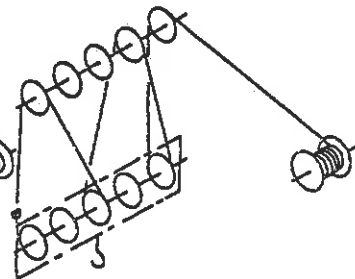
8 Part Reeving



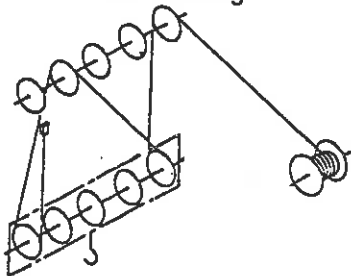
7 Part Reeving



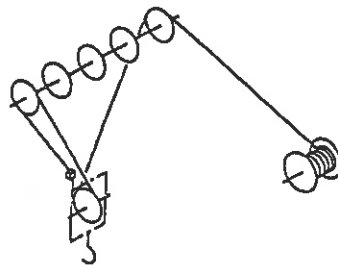
6 Part Reeving



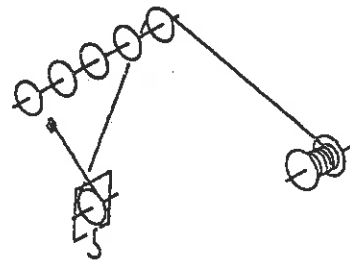
5 Part Reeving



4 Part Reeving



3 Part Reeving



2 Part Reeving

AA0020-C

7) Install a socket at the rope end and secure it to the boom with a pin.



Setting The Wire Rope

CB2-26

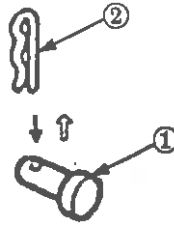


Fig. 1

**⚠ WARNING**

To Avoid Serious Injury, You Must Carefully Read And Understand The Boom Assembly And Disassembly Instructions In This Manual. Read These Instructions Before You Begin Boom Assembly Or Disassembly.

**1 Pin Installation**

- 1) First read and completely understand the boom assembly instructions in the Operator's Manual.
- 2) Stand outside the boom connecting pin lug. Do not stand inside or under the boom at any time.

**⚠ WARNING**

Do Not Stand Or Work Inside Or Under The Boom At Any Time. If The Boom Falls, You May Be Serious Injured Or Killed.

- 3) Drive connecting pin through the boom connection from outside to the inside of the boom. Install spring pins (② in Fig. 1) in one end of boom connecting pins. See Fig. 1.
- 4) Use this procedure to install all boom connecting pins required for all boom assembly.

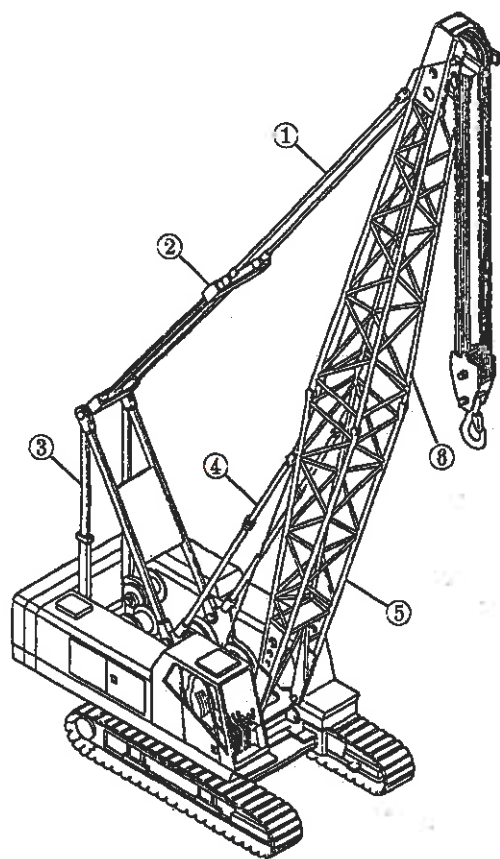
**2 Pin Removal**

- 1) First read and completely understand the boom disassembly instructions in the Operator's Manual.
- 2) Stand outside the boom connecting pin lug. Do not stand inside the boom at any time.

**⚠ WARNING**

Do Not Stand Or Work Inside Or Under The Boom At Any Time. If The Boom Falls, You May Be Serious Injured Or Killed.

- 3) Remove the outside spring pin (② in Fig. 1) from boom connecting pin. Drive connecting pin from the outside to the inside of the boom to remove the connecting pin.
- 4) Use this procedure to remove boom connecting pins required for all boom disassembly.



- ① Basic Pendants
- ② Bridle
- ③ Gantry
- ④ Boom Backstops
- ⑤ Boom Lower Section
- ⑥ Boom Upper Section

Machine With Basic Boom

CA0-1

### 1 Tubular Boom

The basic tubular boom for this machine is 40' (12.2m) in length, and consists of a 20' (6.1m) base and 20' (6.1m) top section. The two sections are connected by four pins, in line with the boom chords. Additional boom extensions are available in 10, 20 and 30' (3.05, 6.1 and 9.1m) lengths and may be combined to form a maximum boom length of 140' (42.7m).

### 2 Lifting Capacity

The lifting capacity of a machine is based upon several factors:

- Boom length.
- Load radius.
- Number of parts of line used to lift load.
- Position of upper machinery.
- Strength of materials.
- Machine weight and center of gravity.

Maximum rated capacity is based upon:

- Basic boom.
- Minimum radius.
- Ten parts of specified size and type of wire rope (front or rear drum).
- "ABCD" counterweight installed.

Before making any lifts, always consult the lifting capacity chart located in the operator's cab. Make sure the load being lifted is within the rated capacity of the machine under the existing conditions. (Boom length, load radius, rope requirements, levelness, firmness of ground, etc.)

3 Main Pendants

3.1 Basic pendants

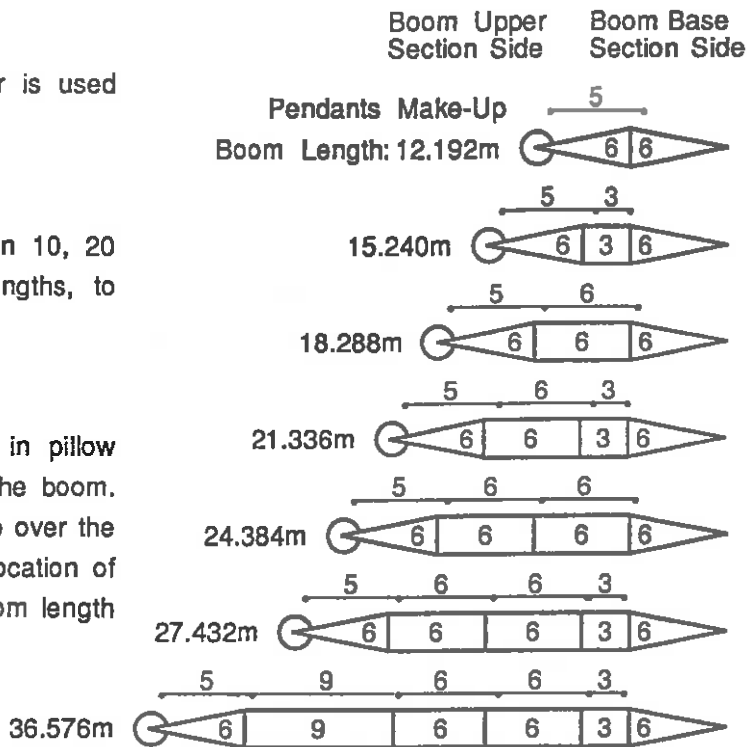
A 19' (5.82m) basic pendant pair is used with all boom lengths.

3.2 Pendants (General)










Additional pendants are available in 10, 20 and 30' (3.04, 6.1 and 9.14m) lengths, to match the available boom extensions.

3.3 Deflector rollers

The deflector rollers are mounted in pillow block bearings bolted to the top of the boom. They are used to guide the hoist rope over the top of the boom. The number and location of rollers required will vary with the boom length being used.



Abbreviation:

-  6 — 6.096m Upper Section
-  6 — 6.096m Lower Section
-  3 — 3.048m Extension Boom
-  6 — 6.096m Extension Boom
-  9 — 9.144m Extension Boom
-  5 — 5.820m Basic Pendant
-  3 — 3.048m Pendant
-  6 — 6.096m Pendant
-  9 — 9.144m Pendant

Note: All boom assembly and disassembly must be done with boom directly over end of machine.

**⚠ WARNING**

The Counterweight Must Be Mounted On The Machine Prior To Any Boom Assembly Beyond The Basic Boom Length.

Boom And Pendant Make-Up  
(Boom Length: 12.192m to 36.576m)

#### 4 Boom Inspection

Inspect the boom periodically to make sure it has not been damaged. If a boom or jib section has been damaged, it must be repaired or replaced before the boom is used. Damaged lattice can be replaced. Consult factory for information on lattice replacement.

Note: If a main chord is bent or damaged, the boom section must be replaced before making any lifts.

#### 5 Boom Label Inspection

Boom extensions, boom top section and boom lower sections must be equipped with boom pin removal danger labels. Refer to illustration. These danger labels are placed on all pin connected boom extensions, at the factory, as a reminder of the importance of using correct procedures to remove pins from these booms.

Before starting boom assembly or after boom disassembly, check each boom section for warning labels. Any labels that are scratched, painted over, worn, or unreadable must be replaced. Contact your nearest distributor for replacement boom pin removal danger label.



### **▲ DANGER**

**Avoid injury to yourself. Boom can fall when pins are removed. Do not remove pins until boom is supported properly by blocking or boom suspension ropes are relocated as described in operator's manual.**

Boom Pin Removal Danger Label

AA0038-A

6 Assembling Tubular Booms 50 ' To 120 ' (15.2 To 36.6m) In Length

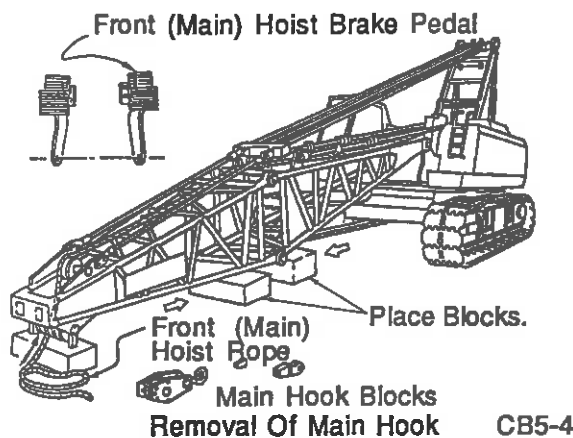
Note: All boom assembly and disassembly must be done with boom directly over end of machine.

**WARNING**

Never Get Under A Boom, Especially When Boom Sections Are Being Raised, Lowered, Or Positioned. Boom May Fall And Cause Injury.

6.1 Boom assembly - Step 1

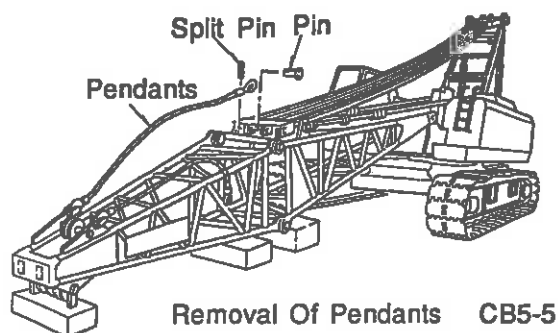
Place three blocks under the basic boom. Place the boom peak on it also place on blocks under the center and lower parts of boom. Remove the main hoist rope and hook block. Be sure to wind all of the main hoist rope around the front drum and engage the front drum brake pedal.



6.2 Boom assembly - Step 2

Unwind the boom hoist rope and let the bridle rest on the lower boom, and then remove the pendants. Pin-connect the bridle to the lugs on the boom lower section.

Note: Insert pins from inside to avoid accident.



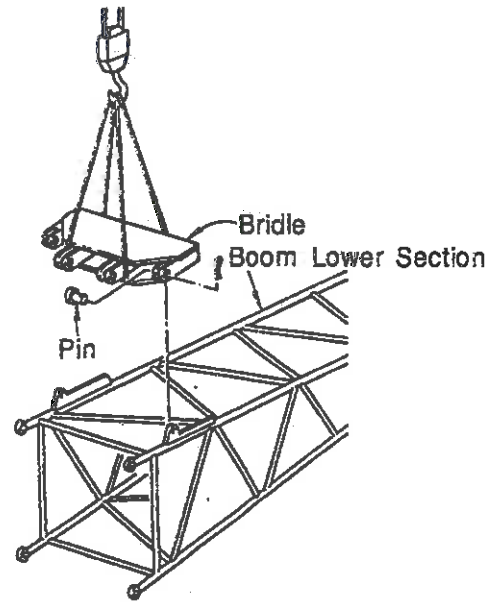


6.3 Boom assembly - Step 3

Wind the boom hoist rope to the extent that the boom top will not be off ground. Remove spring pins. Remove the lower pins tapping from outside of boom.

**WARNING**

Be Very Careful About Blocks Under The Boom And Keep Tension On Boom Hoist Rope So That The Boom Does Not Fall.



Resetting Of Bridle

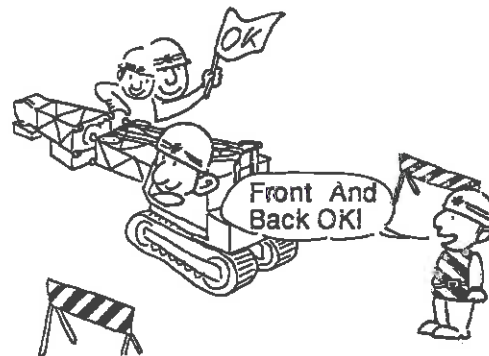
CB2-11

6.4 Boom assembly - Step 4

Then, remove the upper pins.

**CAUTION**

Make Sure That Blocks Are Placed Under The Top Boom Before Removing The Pins. If Not, Lower The Boom Until The Boom Upper Section Rests On Blocks.



Checking Front And Back

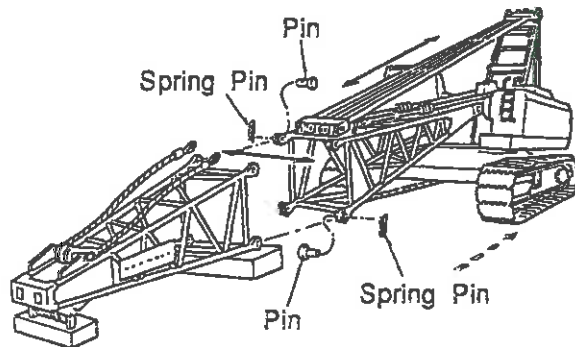
AM68

6.5 Boom assembly - Step 5

Travel crane backward slowly to completely disconnect the boom upper section from the boom lower section.

**CAUTION**

Do Not Travel Crane Backward Until You Make Sure No One Is Behind Crane.



Removal Of Boom

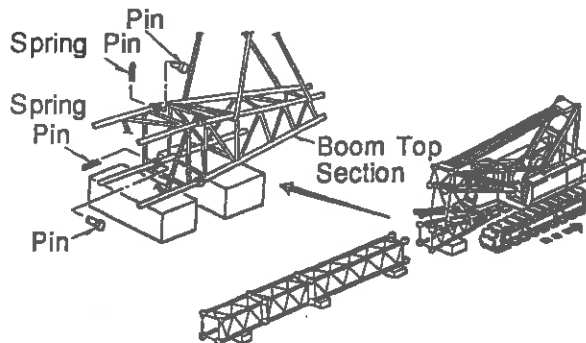
CB5-7

6.6 Boom assembly - Step 6

Install the sling to the boom upper section to use it as a crane. Connect the sling on the bottom boom to the top boom. Install the top boom to the pre-assembled extension booms.



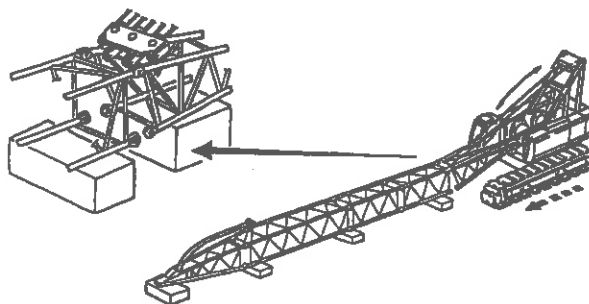
Do Not Raise The Base Section More Than 30 °



Connection Of Boom Top Section CB5-8

6-7 Boom assembly - Step 7

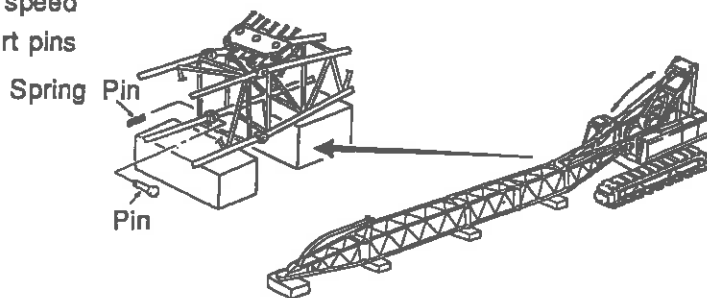
Travel crane again. Install the boom lower section to the extension boom, and insert upper connecting pins.



Installation Of Upper Pins CB5-9

6-8 Boom assembly - Step 8

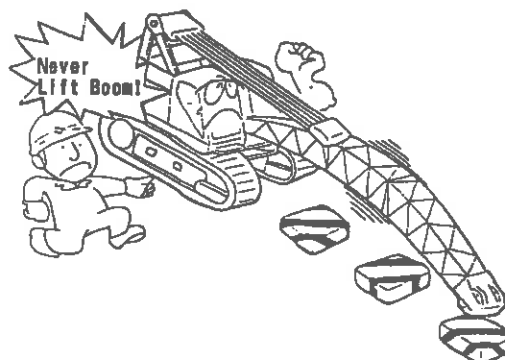
After installing upper connecting pins, wind the boom hoist rope at a low engine speed and align the lower pin holes. Then, insert pins from inside of the boom.



Installation Of Lower Pins CB5-10-1



In This Case, Do Not Wind The Boom Hoist Rope To The Extent That The Boom Top Will Be Off The Blocks. Otherwise Whole Boom Will Be Destroyed.



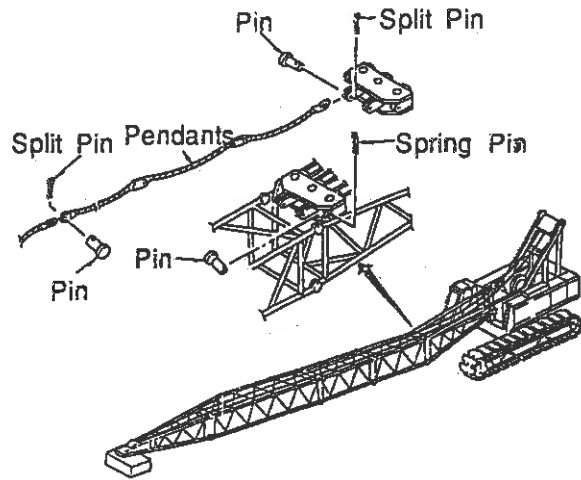
Never Lift Boom Peak AM144

6-9 Boom assembly - Step 9

After connecting booms, unwind the boom hoist rope to let the bridle rest on the bottom boom again. Then, with pendants of proper length installed, remove the bridle attaching pins.

6-10 Boom assembly - Step 10

Let out the main hoist wire rope and install the hook block.



Installation Of Pendants

CB5-11

The boom can be raised or lowered with the boom hoist lever. Placing the lever forward causes the boom to lower; placing it backward raises the boom.

**CAUTION**

When Operating The Pump Control Switch, Throttle The Engine Down To Idle. Higher Engine Speeds Cause A Sudden Speed Change, Resulting In Load Oscillation.

**CAUTION**

When operating the pump control switch, be sure all control levers are in the neutral position. CDP0042

1 Boom Raising

1) When raising the boom, keep the boom hoist drum lock toggle switch placed in the "ON" position. The lock pawl slides over a ratchet mechanism causing a clicking sound, which does not represent any faulty conditions.

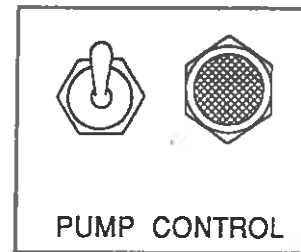
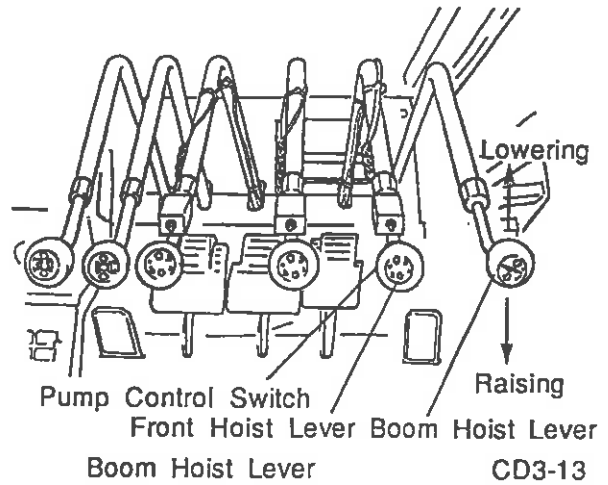
**CAUTION**

The Boom Hoist Pawl Must Be Engaged By Placing The Toggle Switch to "ON" Position, Whenever The Boom Is Raised From The Ground.

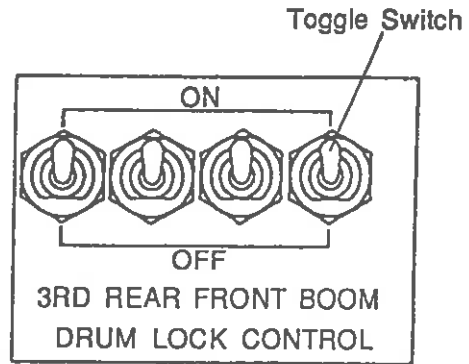
Engage the boom hoist pawl lock whenever the boom hoist control is not in use.

Note: The boom may be raised with the pawl engaged but it must be disengaged to lower the boom.

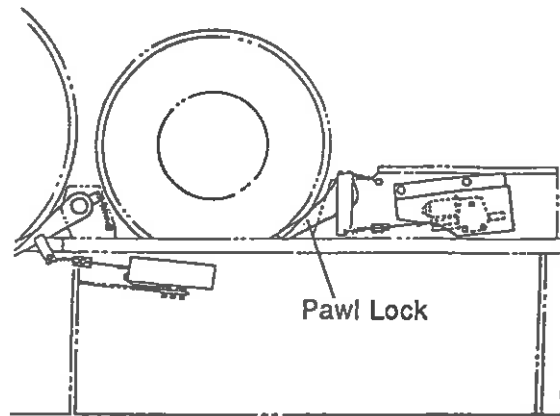
2) Pulling the boom hoist lever backward causes the boom to raise.



Pump Control Lamp



Drum Lock Toggle Switch CB1-34



Boom Hoist Drum Lock Pawl CD3-14

2 Boom Lowering

1) To lower the boom, first turn off the boom hoist pawl lock toggle switch. If the pawl binds and is not disengaged, hoist the boom slightly by pulling the boom hoist lever toward you. Then move the lever forward to lower the boom.

2) When the boom hoist lever is fully moved forward, the boom will be lowered.

3) When the boom has reached a desired position, return the boom hoist lever to the neutral position and be sure to engage the pawl lock by placing the toggle switch to "ON" position.

3 Boom Hoist Limiting Device

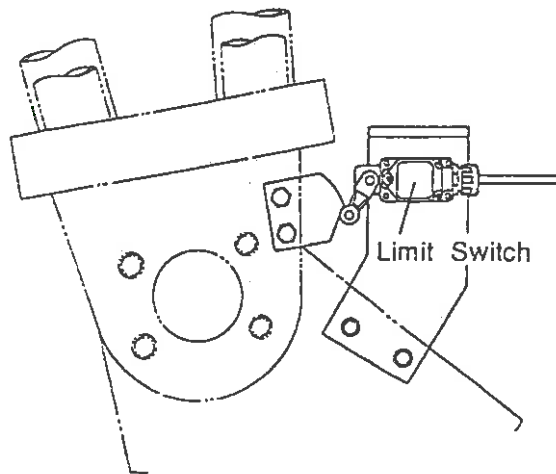
The boom hoist limiting device, located near the boom foot pin, prevents overhoisting of the boom, functioning as an operator's aid. When the boom angle approaches 82°, this device is activated automatically to turn off the boom hoist limit switch. It also causes a buzzer to sound and the brakes to be applied to stop hoisting the boom.

The spring at the end of boom backstop is preadjusted to start compressing at this time.

When the boom hoisting limiting device is activated and the boom hoist drum pawl is engaged with boom angle approaching 82°, the boom hoist lever is inactive. In this case, press the boom hoist limit override switch (boom raising) to the "release" position (then the lamp comes on). Hoist the boom slightly to disengage the boom hoist pawl lock, and next, lower the boom.

**CAUTION**

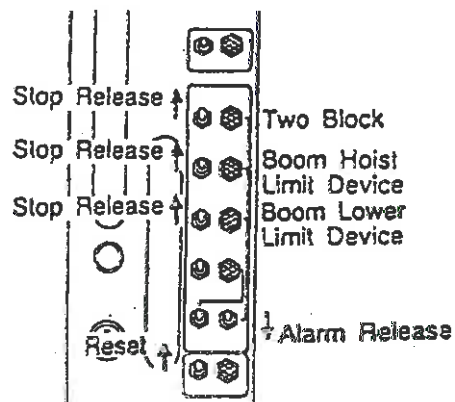
Don't Engage The Boom Hoist Pawl During Lowering The Boom. It Can Cause An Accident Or Crane Damage.



Boom Hoist Limiting Device CD3-15

**CAUTION**

When Hoisting The Boom More Than 82° Of Boom Angle, Exercise Extreme Care As The Boom Hoist Limiting System Is Bypassed By Pressing And Holding The Override Switch.



Reset Button

#### 4 Boom Angle indicator

The indicator is mounted on the boom base section, indicating the boom angle, visible from the operator's cab.

#### Boom Angle Indicator Installation

The boom angle indicator, when properly adjusted will give the approximate working angle of the boom.

The indicator must be installed as follows:

- (a) Position the boom horizontally. Check this by placing a level on a straight boom extension.
- (b) Install the boom angle indicator.
- (c) Adjust the pendulum until the pointer rests on zero with the boom horizontal.
- (d) After installation, boom up slowly and observe the movement of the pointer in various boom positions. If the indicator sticks or drags, repair it before use. An inoperative or damaged boom angle indicator must never be used to determine boom angle.

Recheck the indicator once a month, or at any time freedom of pendulum action or position of zero is questioned.

Raising and lowering operations of the load vary with the type of brake system used. A standard automatic brake system is incorporated into the front/rear hoist and the third drum (as an option) brakes. The brake "Free Mode" switch in the house selects the mode: automatic or foot brake.

Note: When the brake free mode switch lamp is lit and the drum control lever is in the neutral position, the brake system is turned off causing a load (hook) to automatically lower. In this case, use the brake pedal to sustain the load.

Note: When the lamp is off, automatic brake is automatically applied with the front (main) or rear (auxiliary) hoist control lever in neutral.

**CAUTION**

To Prevent Hazardous Operation, Ensure That The Brake Free Mode Lamps Come On And Off Properly Before Operation.

**1 Raising And Lowering The Main Hook (When Foot Brake Is Used)**

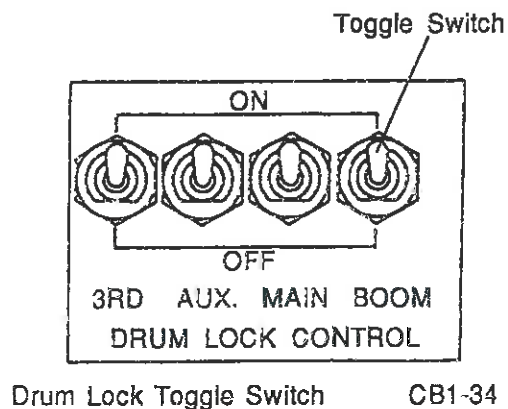
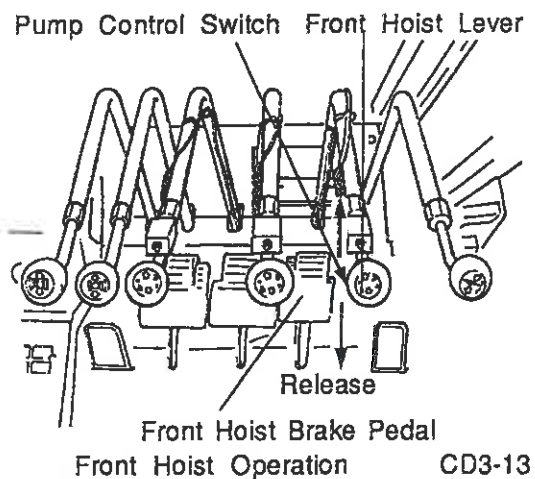
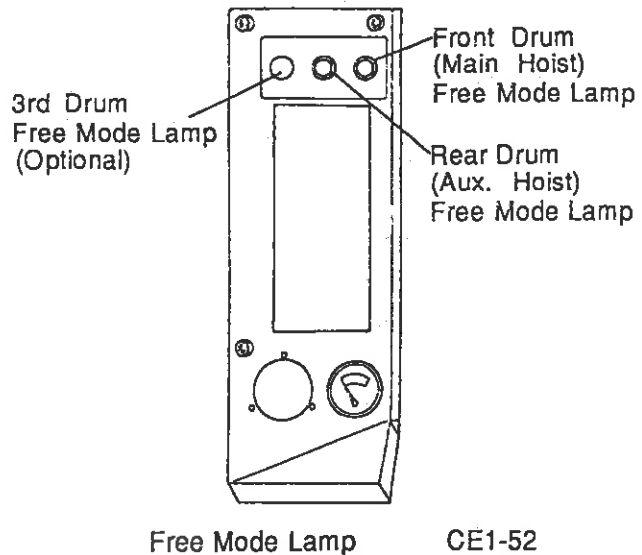
The main hook can be raised or lowered by operating the front (main) hoist lever and front (main) hoist brake pedal.

Note: To set free the mode, press the free mode switch with the lever in neutral and pedal kept depressed at the same time (then the lamp comes on).

- 1) With the hoist lever in neutral, fully engage the brake pedal and change the free mode switch to set the foot brake mode (lamp comes on).

**CAUTION**

The Front (Main) Hoist Drum Lock Is A Safety Device: Always Place The Toggle Switch To "ON" Position To Lock The Drum Before Turning Off The Switch When Load Is Suspended In The Air And Stopping The Engine Or Leaving The Operator's Cab.



**CAUTION**

For Free-Fall Operations, Usually, Lowering Operation With Clutch Is Not Made. Therefore, The Lock Pin Must Be Located At Operator's Seat Side.

2) Pull the front (main) hoist lever backward into the "Raise" position. At the same time, release the front (main) hoist drum brake pedal.

Hoisting/lowering speed can be varied in two steps: 1st and 2nd speeds. (See illustration.)

3) When the load has reached a desired height, depress the front (main) hoist drum brake pedal fully and, at the same time, place the front (main) hoist lever to "Neutral" position.

4) To raise a load from suspended position, place the front (main) hoist lever to the "Raise" position and then release the front (main) hoist brake pedal slowly.

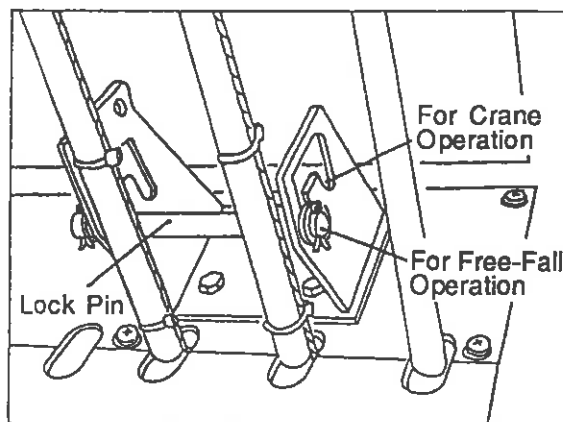
Note: The load hoisting device is equipped with a safety device to cause buzzer to sound and to stop hoisting when the hook is overhoisted. Refer to "Anti-Two Block System".

5) To lower a load, place the front (main) hoist lever to the "Lower" position and then release the front (main) hoist drum brake pedal slowly.

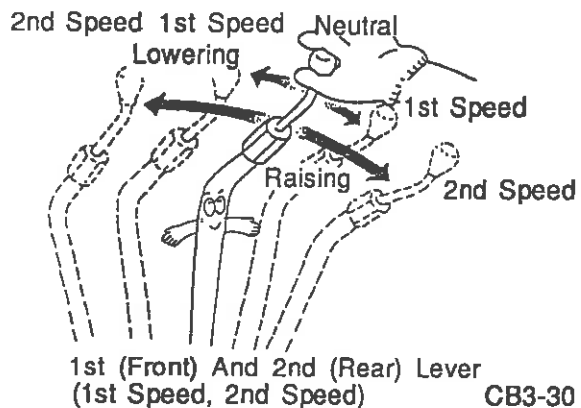
6) To stop lowering, place the front (main) hoist lever in the neutral position, after fully engaging the front (main) hoist drum brake pedal.

**2 Free-Fall Operation**

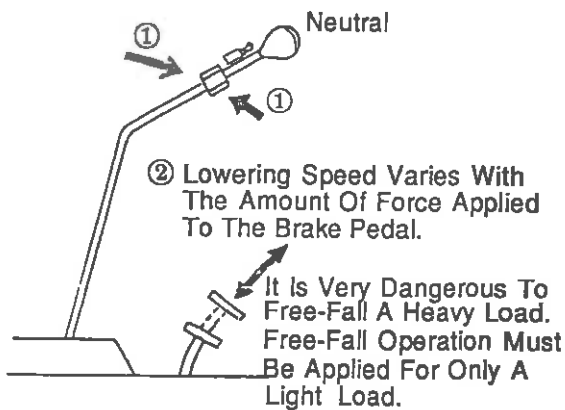
For bucket operations or lowering a light load, free-fall operation may be made, lever to the "Lower" position in free mode.



Front/Rear Hoist Lever Lock Pin CN2-62



1st (Front) And 2nd (Rear) Lever (1st Speed, 2nd Speed) CB3-30



CB3-47



**CAUTION**

For Bucket Operations, Usually, Lowering Operation With Clutch Is Not Made. Therefore, The Lock Pin Must Be Located At Operator's Seat Side.

- 1) After locking the brake pedal with a load in the air, place the front (main) hoist control lever in neutral.
- To lower the load disengage the brake pedal gradually in free mode. The lowering speed varies with the amount of brake pedal force.
- 2) When stopping the load, engage the brake pedal fully.

**CAUTION**

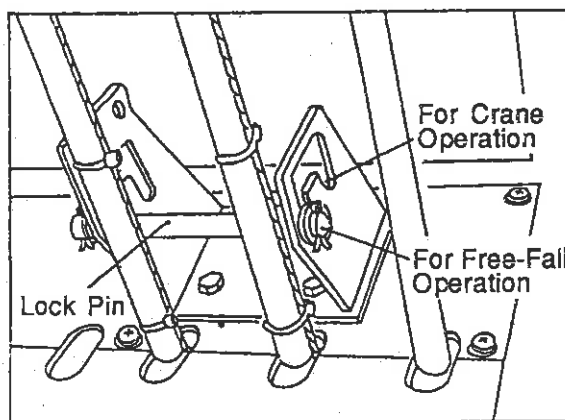
Engaging The Brake Pedal Suddenly, Will Cause The Load To Stop Suddenly And May Result In Damage To The Machine. Make A Smooth Brake Operation.

When Stopping The Free-Fall Operation, Operate The Foot Brake To Avoid Damage. Never Place The Front (Main) Hoist Lever In "Lower" Position During Free-Fall.

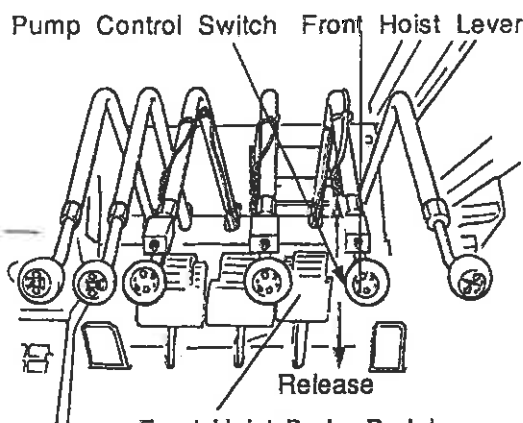
Free-Fall With Brake Only Is Dangerous. Lower A Heavy Load With Power Operating The Control Lever To The "Lower" Position.

3 Raising And Lowering The Auxiliary Hook (When Foot Brake Is Used)

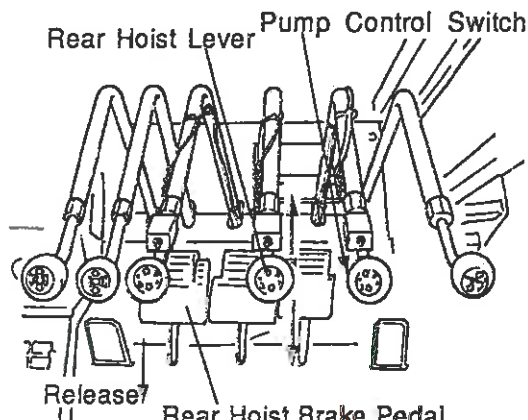
Operate the auxiliary hook with the rear (auxiliary) hoist lever and rear (auxiliary) hoist drum brake pedal, in the same manner as in operating the main hook.



Front/Rear Hoist Lever Lock Pin CN2-62



Front Hoist Brake Pedal Front Hoist Operation CD3-13



Rear Hoist Brake Pedal Rear Hoist Operation CD3-13

4 Raising And Lowering The Main Hook  
(When Automatic Brake Is Used)

The main hook can be raised or lowered with the front (main) hoist lever.

- 1) Push the free mode switch in the house to change the brake in "Automatic Brake Mode".

Note: When operating the main hook with the automatic brake, make sure that the brake free mode lamp on the control panel is off.

- 2) Disengage the front (main) hoist drum brake pedal lock.

Note: Make sure that the hook will not fall without load.

- 3) Pull the front (main) hoist lever backward to raise the load.

- 4) When the load has reached a desired height, it can be stopped by returning the front (main) hoist lever to "Neutral" position.

Operate the lever the same way when raising a suspended load.

Note: When the load is stopped automatically with overhoisting, refer to the "Anti-Two Block System".

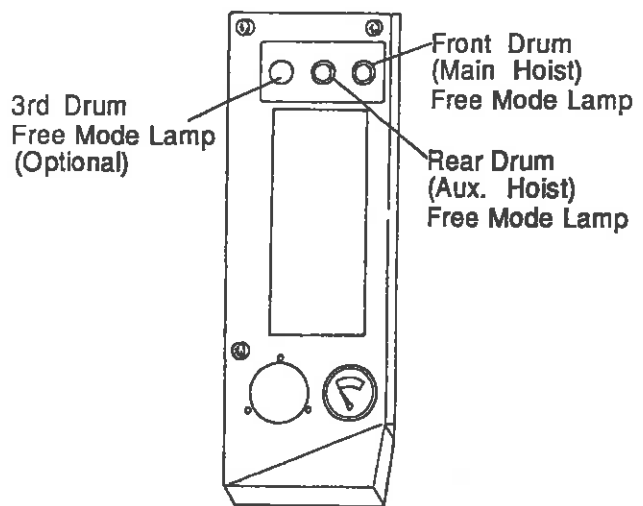
- 5) To lower a load from suspended position, move the front (main) hoist lever forward.

**CAUTION**

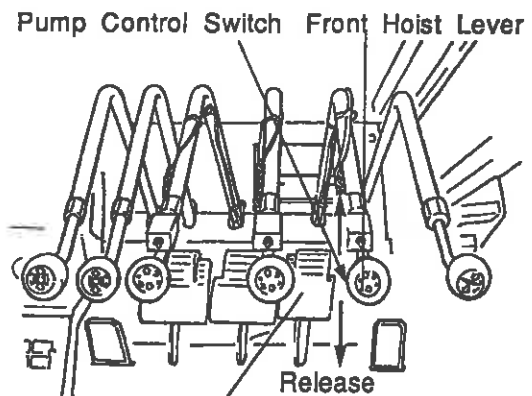
When Suspending The Load In The Air For A Long Time And Leaving The Operator's Cab With Engine Stopped, Be Sure To Lock The Brake Pedal And Engage The Drum Pawl Lock.

5 Raising And Lowering The Auxiliary Hook  
(When Automatic Brake Is Used)

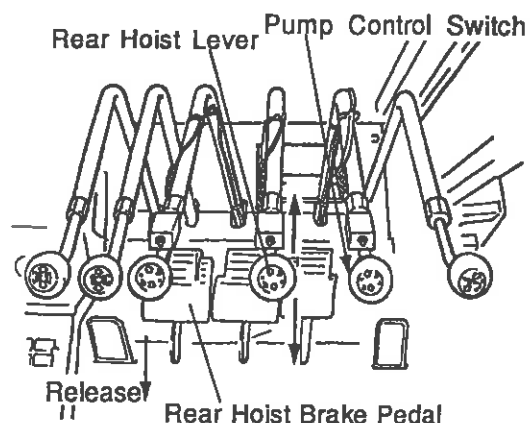
Operate the auxiliary hook with the rear (auxiliary) hoist lever and rear (auxiliary) hoist drum brake pedal, in the same manner as in operating the main hook.



Free Mode Lamp CE1-52



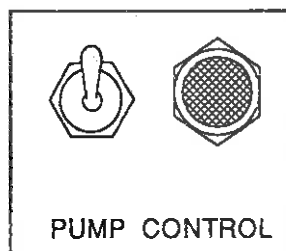
Front Hoist Operation CD3-13



Rear Hoist Operation CD3-13

### 6 Pump Control Operation

If an inching operation of load raising and lowering is required, the delivery of pump is minimized when the pump control switch on the control panel is placed "ON" (Lamp turns on.) and the switch (green) on the front (main) hoist lever is placed "ON". The switch also slows down front (main)/rear (auxiliary) hoist, 3rd drum and traveling.



Pump Control Lamp

**⚠ CAUTION**

When Operating The Pump Control Switch, Throttle The Engine Down To Idle. Higher Engine Speeds Cause A Sudden Speed Change, Resulting In Load Oscillation.

**⚠ CAUTION**

When operating the pump control switch, be sure all control levers are in the neutral position. CDP0042

### 7 Anti-Two Block System

Overhoisting of the load can damage the sheaves. This system is provided to protect the sheave by activating the switch hanging on the boom peak which causes a buzzer to sound, and, at the same time, stops hoisting. Before starting operation, make sure that the device operates properly, with releasing the drum pawl lock switch.

#### 1) Release of automatic stop

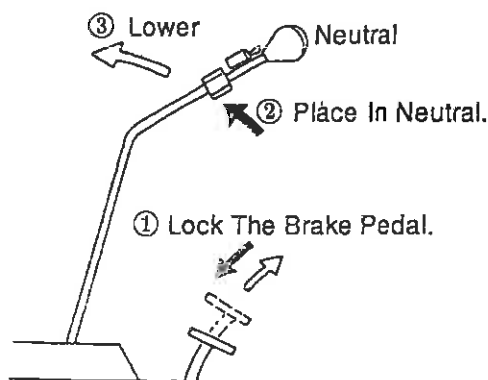
By activating the limit switch hanging on the boom peak, it gives a buzzer sound to the operator and at the same time, stops raising the load.

The release operation when the automatic brake is used differs from that when the foot brake is used.

#### 2) Release of foot brake (at free mode)

Lock the brake pedal (position ①) and place

the front and rear hoist lever in neutral (position ②). Next, disengage the lock with the brake pedal engaged and lower the load by releasing the brake pedal gradually after placing the front (main) or rear (auxiliary) hoist lever in "Lower" position until the buzzer sound stops ringing. Keep a foot on the brake pedal. The rest is the same as the usual operation.



CB3-45

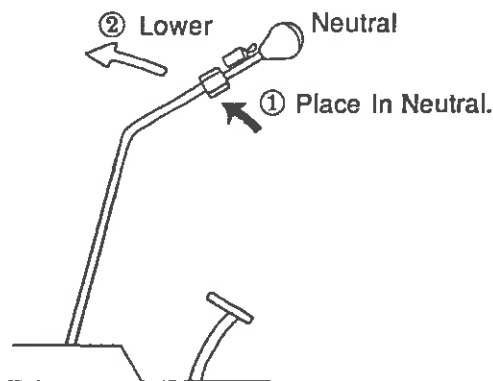
3) Release of automatic brake

Lower the load until the buzzer sound stops ringing, after placing the front (main) or rear (auxiliary) hoist lever in "Lower" position.

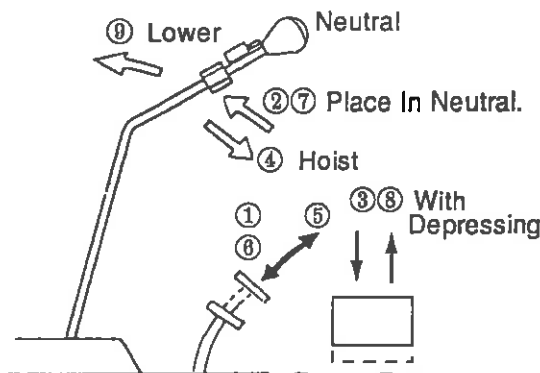
4) Release of engaged drum lock

When the load is not lowered with step 2) and 3), with the pawl lock engaged make a following operation.

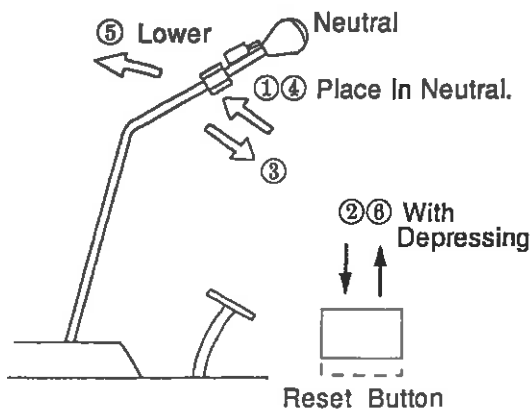
- a) Place the drum pawl lock switch of the front (main) or rear (auxiliary) hoist in the front to release the lock.
- b) After supporting the load by engaging the brake pedal, place the front (main) or rear (auxiliary) hoist lever in neutral.
- c) Depressing the reset button, move the front (main) or rear (auxiliary) hoist lever forward or backward. Raise the load slightly, loosening the brake pedal. Immediately engage the brake pedal and return the hoist lever to neutral.
- d) While depressing the reset button place the front (main) or rear (auxiliary) hoist lever in "Lower" position and at the same time, release the brake pedal. Lower the load until the buzzer sound stops.
- e) After releasing the alarm, free the hand from the reset button and make an usual operation.



In Case Of Safety Brake CB3-46



In Case Of Foot Brake (Free Mode) CB3-48



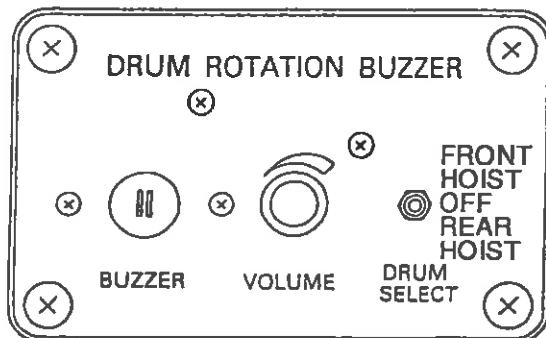
In Case Of Foot Brake (Free Mode) CB3-48

8 Drum Rotation Buzzer (Optional)

Intermittent buzzer sounds while the front and rear hoist motors are rotating.

**CAUTION**

During Free-Fall Operation Of Front And Rear Drums, The Drum Rotation Device Does Not Function.



Drum Rotation Buzzer CD3-8

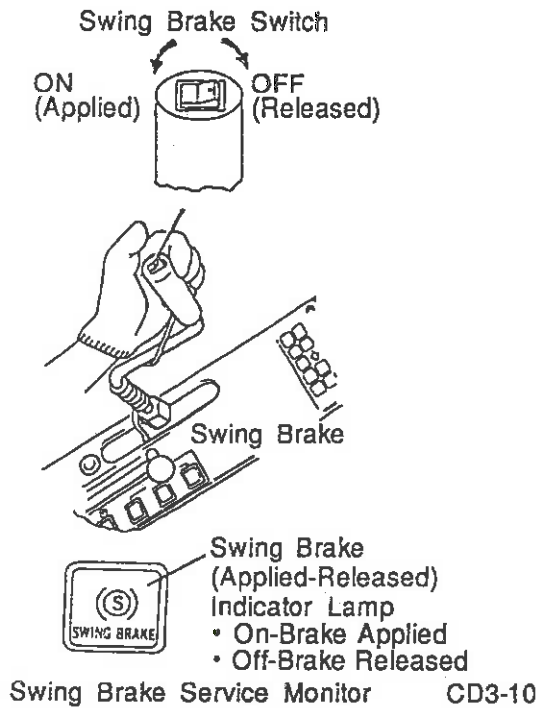
1 Swing Operation

- 1) Press the switch at top of the swing lever grip (to place the switch in the "Released" position) to release the swing brake. The lamp on service monitor comes on.

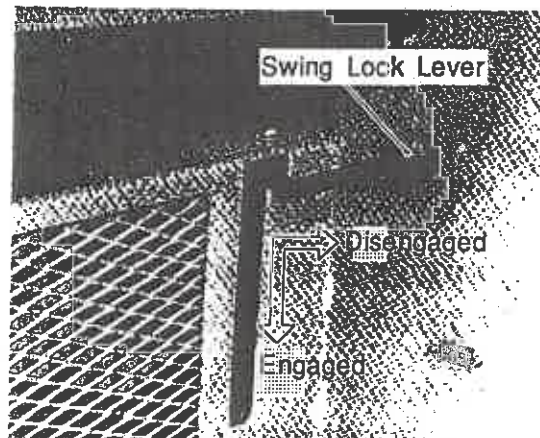
**CAUTION**

Never Use The Swing Brake As A House Lock When Traveling, Transporting, Or Leaving The Machine For Any Reason. It Is Not A Position Lock And May Allow The Upper To Swing.

Avoid Using The Swing Brake For Making Sudden Swing Stops, As Damage To The Upper Machinery May Result.



- 2) Pull up the swing lock lever to lock in the "Disengaged" position. If the swing lock lever sticks, swing the upper slightly, which will make swing lock lever operation smooth.

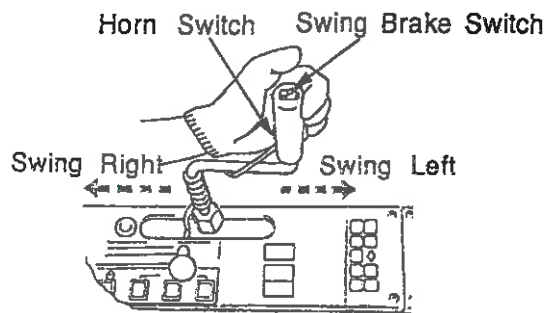


Swing Lock Lever

- 3) Push the swing lever forward to swing left, or pull the lever to the rear to swing the machine to the right.

**CAUTION**

Make Sure The Swing Lock Is Disengaged Before Attempting To Swing.



Swing Lever

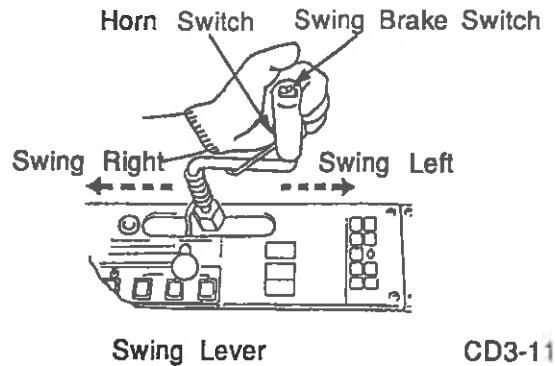
CD3-11

- 4) Stop the swing by easing the lever in the opposite direction to that which started the swing.

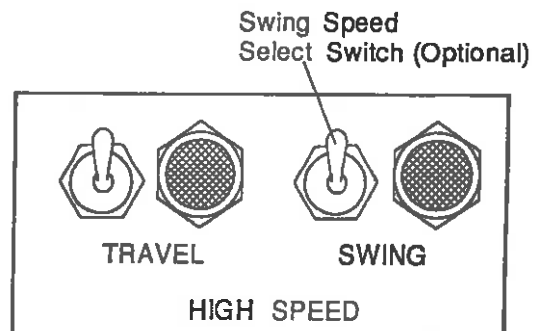
**⚠ CAUTION**

Never Apply The Swing Brake When The Upper Is Swinging As Damage To The Machine Will Result. Make Sure The Swing Lock Is Disengaged Before Attempting To Swing.

Avoid Using The Swing Brake For Making Sudden Swing Stops, As Damage To The Upper Machinery May Result.

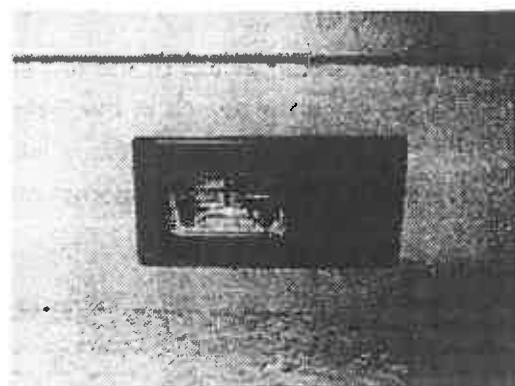


- 5) A swing can be made at a higher speed when the high speed switch on the control panel is selected. Placing this switch forward causes the lamp to come on, indicating that the swing is made at high speed. (Optional)



## 2 Swing Alarm (Optional)

This alarm notifies workers near the machine, while the upper is swinging, by buzzer and lamp flickering.



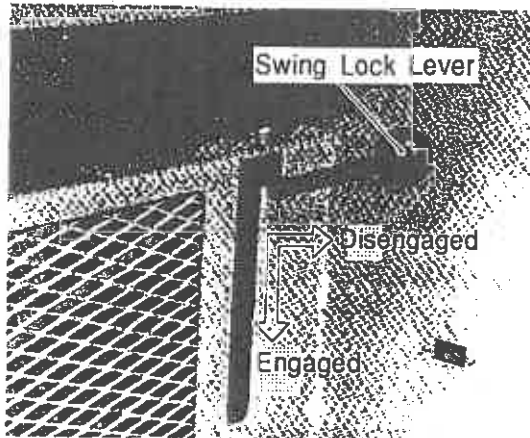
Swing Alarm Device

CE3-13

3 Swing Lock

**CAUTION**

Never Apply The Swing Lock When The Upper Is Swinging As Damage To The Machine Will Result. Never Attempt To Swing The Upper With The Swing Lock Engaged.

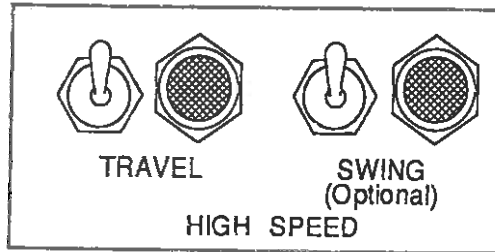


Swing Lock Lever

Since four swing lock bosses are provided on the lower frame, positively set one of them. The swing lock cannot be engaged except in the above positions.

When stopping the machine temporarily at any desired position without the swing lock, apply the swing brake.

Note: Engage the swing lock when leaving the machine for any reason. Engage the swing lock when traveling or transporting the machine.



To travel the machine, proceed as follows.

- 1) Engage the swing lock and apply the swing brake to lock the upper revolving frame.

**CAUTION**

Failure To Do So Causes The Upper To Swing Right And Left During Traveling, Leading To An Unexpected Accident.

- 2) Make certain the machine faces to the front correctly.

Note: The machine is facing backward when you see a travel motor through the window. The following instructions are therefore reversed if that is the case.

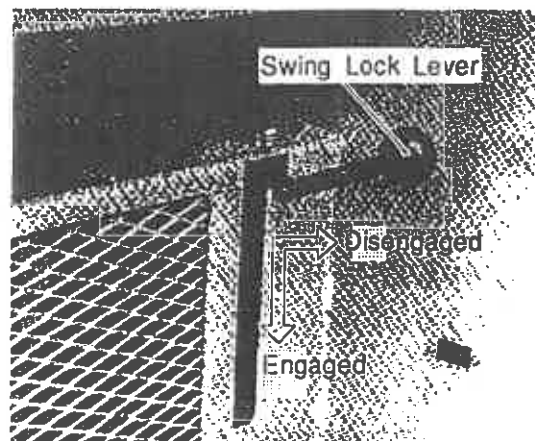
- 3) Forward And Backward Travel

The machine travels forward when right and left travel levers are pushed forward; it travels backward when the two levers are pulled to rear.

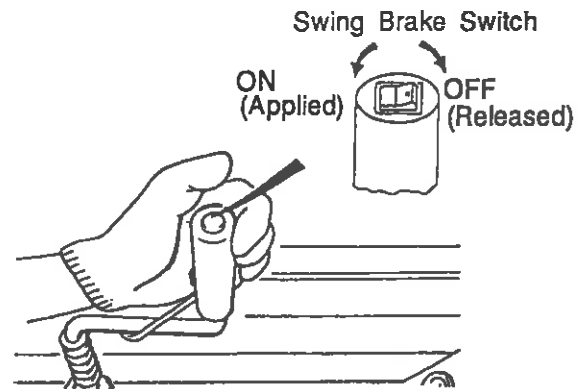
For an inching operation of travel, the inching can be made when the pump control switch on the control panel is placed "ON" where by the discharging amount of the main pump is controlled to a minimum when the toggle switch on the 1st drum (front drum) lever is placed "ON". (This switch also allows slowing of the front/rear hoist and boom hoist operations.)

**CAUTION**

When operating the pump control switch, be sure all control levers are in the neutral position.

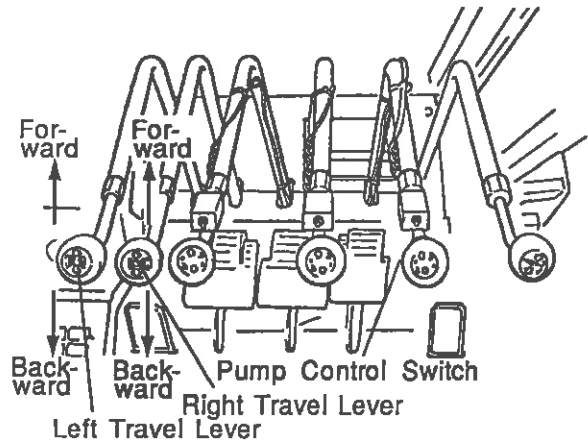


Swing Lock Lever



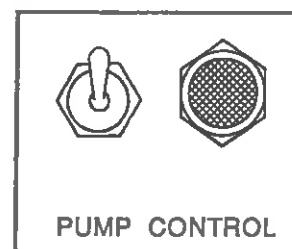
Swing Brake Switch

CD3-12



Travel Operation

CD3-13



PUMP CONTROL



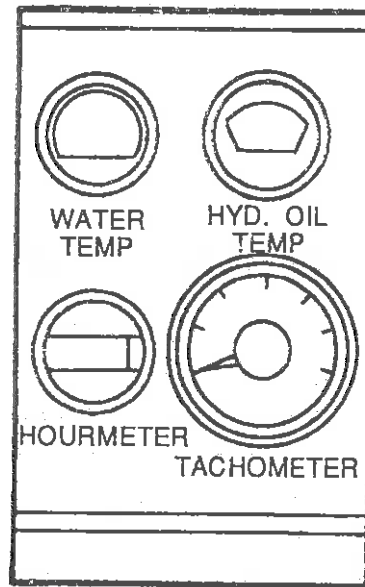
4) Inching Travel

- a) Throttle the engine down to low speed.
- b) Change the pump control switch.

Note: While the machine is in motion, set the engine speed to the mid range (1000 - 1500 rpm).

Note: When traveling over a long distance, ensure that the travel motor is at the rear of machine.

Note: Be careful front, rear or boom hoist operation during traveling may steer the machine.

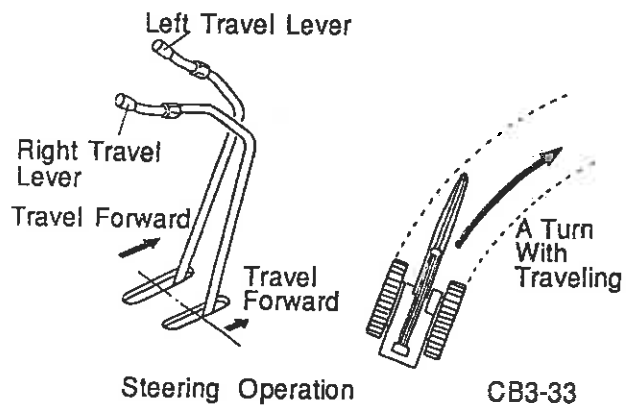


Hydraulic Oil Temperature Gauge CD1-23

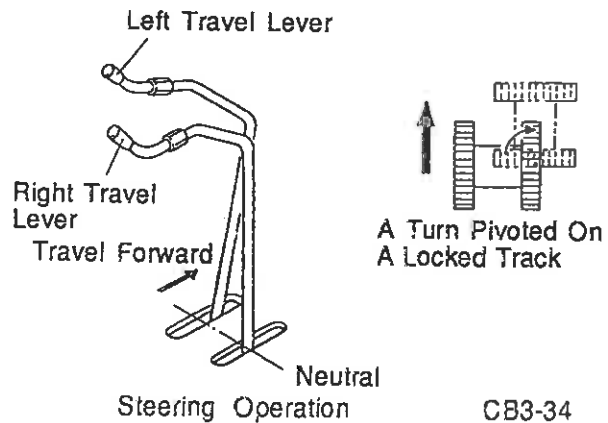
5) Steering

There are three methods of steering the machine.

- a) Moving right and left travel levers a different amount to make a wide turn.



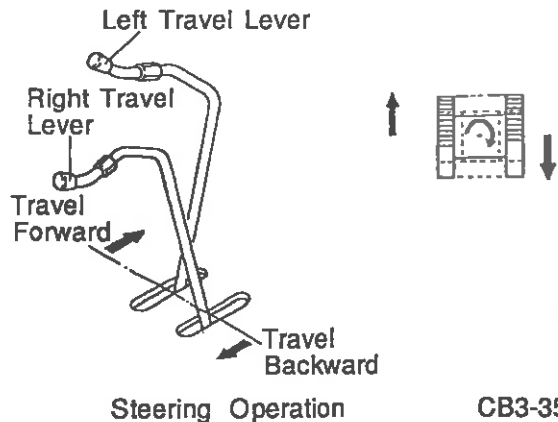
- b) Steering with either one of the travel levers left in neutral.



c) Moving each lever in different direction to counter rotate the machine.

Note: Turning the machine in one motion on soft ground tends to damage the ground. Turn the machine in stepped motion.

Note: The machine can be turned when traveling backward in the direction opposite to that when traveling forward.

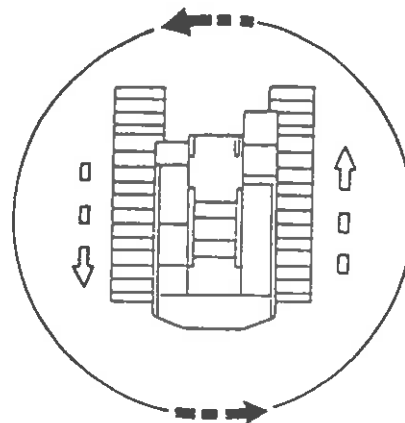


Steering Operation

CB3-35

6) Traveling On A Slope

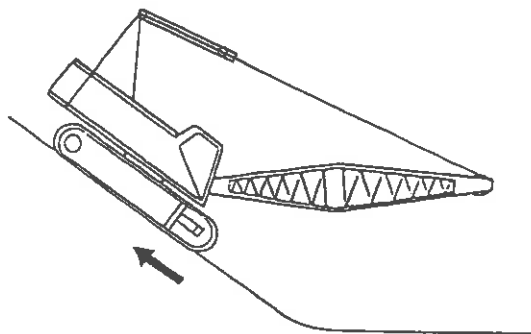
Face the machine toward front and place the swing lock lever and swing brake switch to the "Engaged/Applied" position. When traveling the machine on an upward slope, run the engine in the mid speed range; when traveling downward, run the engine at low.



Off-And On Spinning

CB3-36

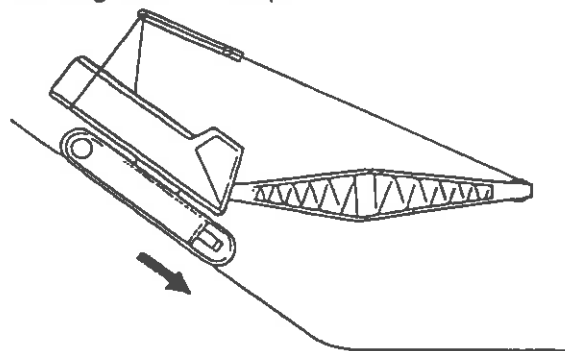
Climbing Up A Slope



Machine Climbing Up A Slope

CB3-37

Climbing Down A Slope



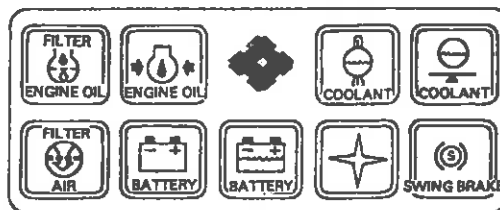
Machine Climbing Down A Slope

CB3-38

7) When Climbing Up Or Down A Slope

Always keep your hands on the travel levers, ready to take control of the machine if necessary. Be alert to the service monitor during traveling. Lamps should be off under normal operating conditions (except for the swing brake lamp).

Note: On a steep slope, the lamp may come on temporarily.



Service Monitor Lamps

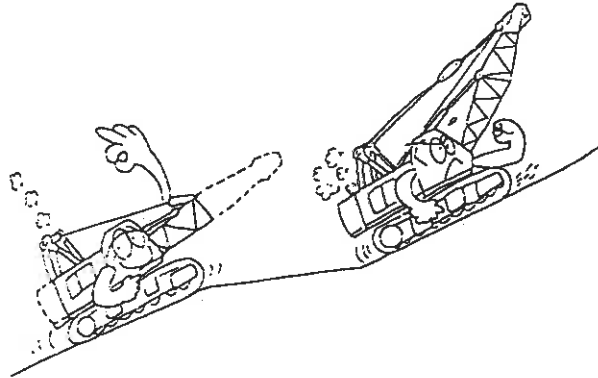
CD1-21

8) Machine Direction

Keep the boom as low as possible. Travel the machine only with the basic boom on a maximum allowable inclination of slope.

**CAUTION**

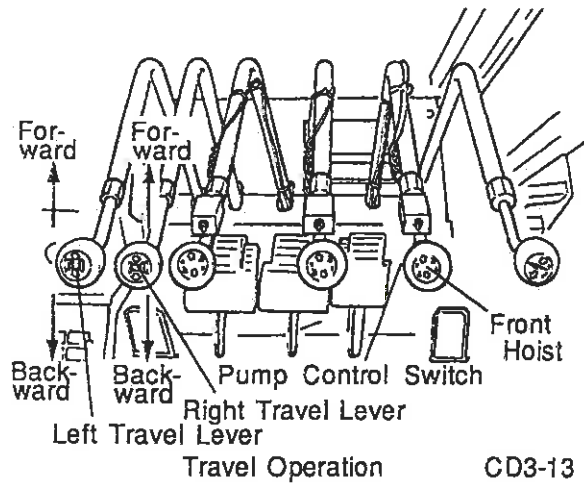
when Traveling The Machine On A Slope With The Rated Gradeability, The Specified Performance May Not Be Obtained Depending On The Condition Of Ground. For Safety Reasons, Remove The Counterweight And Booms To Reduce The Overall Machine Weight.



Climbing Up With Counterweight AM140 And Boom Removed

9) Steering On A Slope

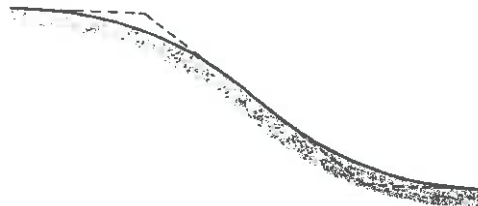
To steer the machine when climbing down a steep slope, use the pump control system, which allows the machine to move slowly levers are operated.



10) Reinforce the top and bottom ends of a slope to form a gentle curve as shown at right, preventing the center of gravity of the machine from shifting radically.

Note: When traveling the machine from flat ground to a slope, stop the machine when its center of gravity shifts to the front. Then resume traveling.

Note: When the slope is short with no dangerous objects ahead, or when the slope provided with running boards is so narrow that it may invite tracks' slipping, travel the machine straight ahead without stopping.



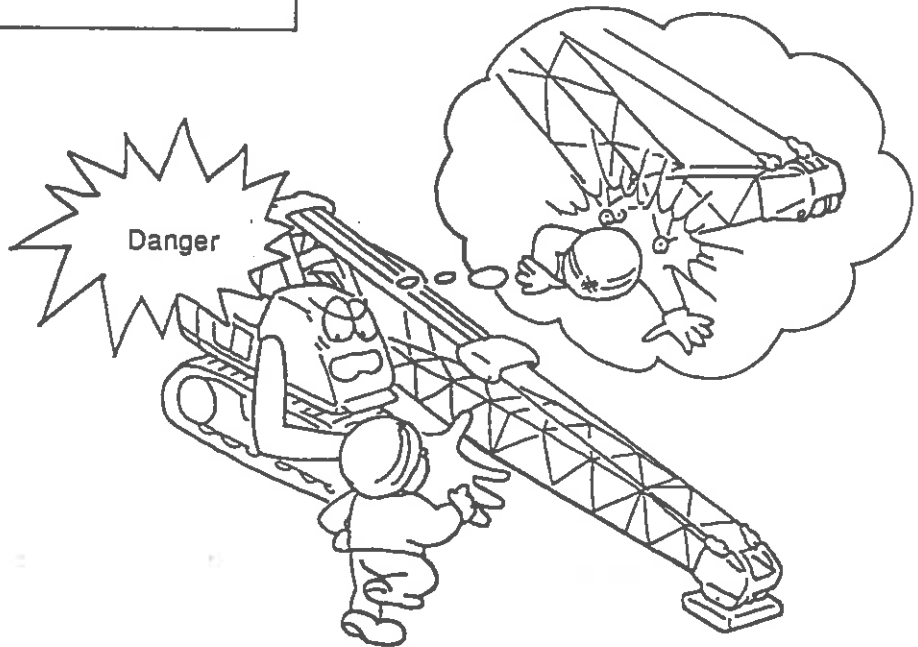
Reinforcing The Slope At Top And Bottom

BL164

Using the wrong procedure in the disassembly of boom results in serious accident. Be sure to follow the correct disassembly.

**⚠ CAUTION**

During The Disassembly Of Boom, Never Get Under The Boom For Any Reason. Also, Never Put A Finger Into Holes, Such As Pin Hole.

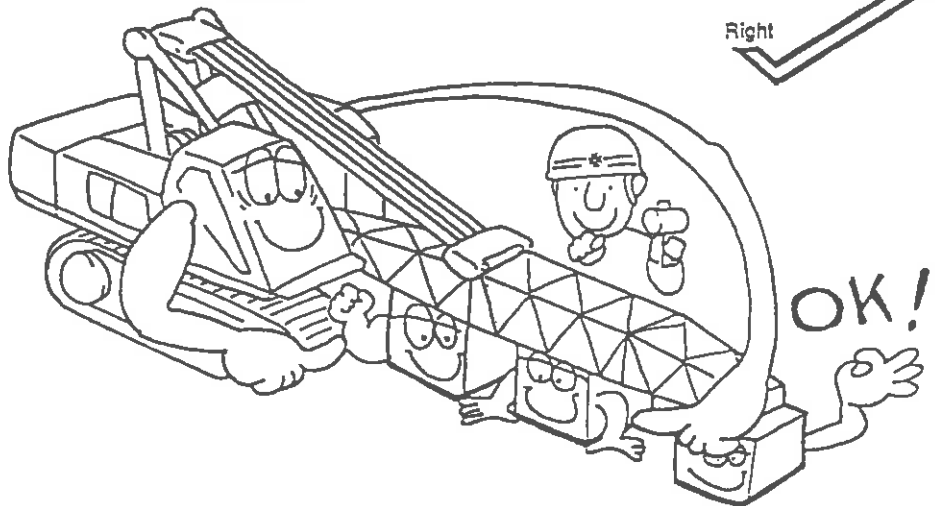


Never Get Under The Boom

AM145

**⚠ CAUTION**

Place Blocks With High Strength And Good Stability Under Booms which May Be Removed.

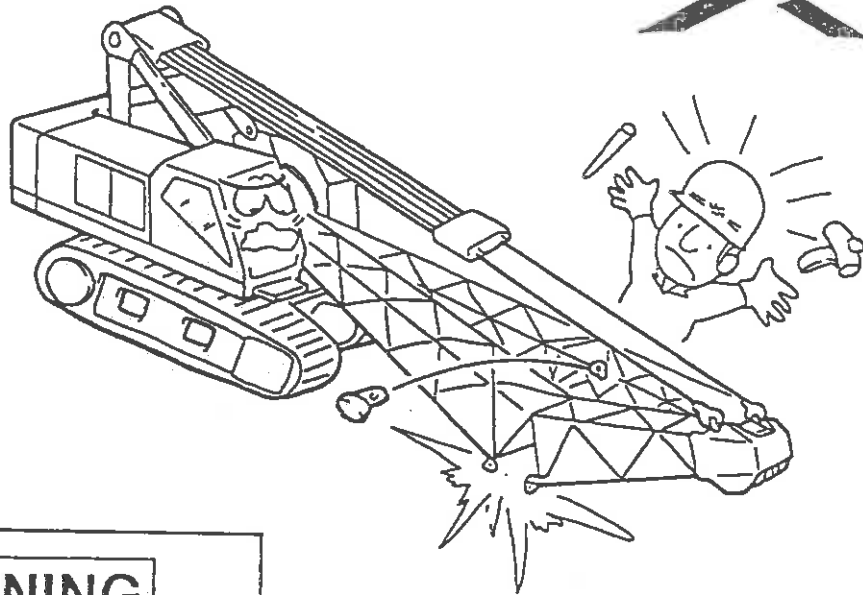
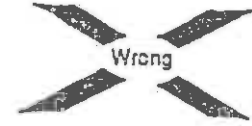


Place Blocks Or Mats

AM146

**⚠ WARNING**

Never Disconnect Connecting Pins With The Pendants Installed To The Upper Section. Especially, If The Lower Pin Is Removed, The Boom Will Fall, Resulting In Hazard.

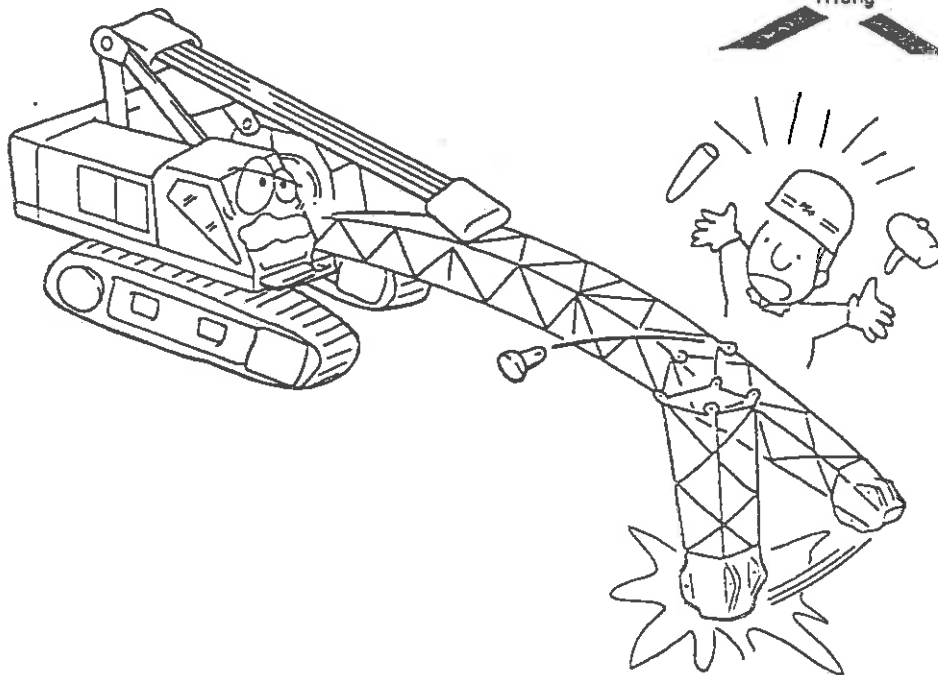


Boom Will Fall

AM147

**⚠ WARNING**

If The Upper Pin Is Removed With The Bottom Boom Supported By The Bridle, The Boom Will Fall, Resulting In Hazard.



Removal Of Connecting Pins

AM148

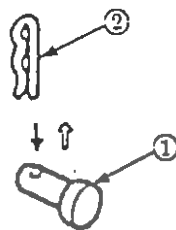


Fig. 1

**WARNING**

To Avoid Serious Injury, You Must Carefully Read And Understand The Boom Assembly And Disassembly Instructions In This Manual. Read These Instructions Before You Begin Boom Assembly Or Disassembly.

**1 Pin Installation**

- 1) First read and completely understand the boom assembly instructions in the Operator's Manual.
- 2) Stand outside the boom connecting pin lug. Do not stand inside or under the boom at any time.

**WARNING**

Do Not Stand Or Work Inside Or Under The Boom At Any Time. If The Boom Falls, You May Be Serious Injured Or Killed.

- 3) Drive connecting pin through the boom connection from outside to the inside of the boom. Install spring pins (2 in Fig. 1) in one end of boom connecting pins. See Fig. 1.
- 4) Use this procedure to install all boom connecting pins required for all boom assembly.

**2 Pin Removal**

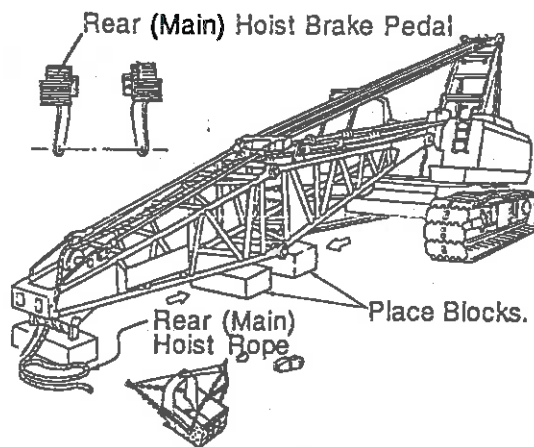
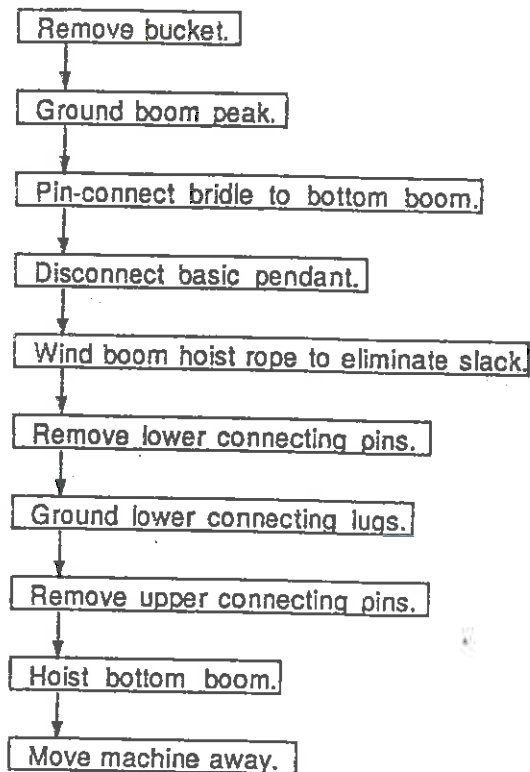
- 1) First read and completely understand the boom disassembly instructions in the Operator's Manual.
- 2) Stand outside the boom connecting pin lug. Do not stand inside the boom at any time.

**WARNING**

Do Not Stand Or Work Inside Or Under The Boom At Any Time. If The Boom Falls, You May Be Serious Injured Or Killed.

- 3) Remove the outside spring pin (2 in Fig. 1) from boom connecting pin. Drive connecting pin from the outside to the inside of the boom to remove the connecting pin.
- 4) Use this procedure to remove boom connecting pins required for all boom disassembly.

1 Summary Of Procedure



Removal Of Bucket CB5-4/CD2-250

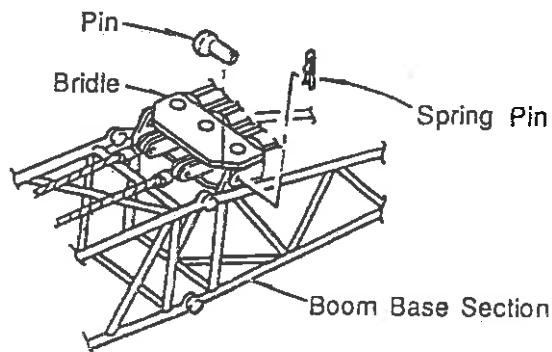
2 Disassembly Procedures:

- 1) Lower the boom peak to a position about 3.28' (1m) off the ground.
- 2) Place three blocks under the basic boom, one block under each end of peak section and one under the top end of the boom section. Lower the boom on the blocks.

**⚠ WARNING**

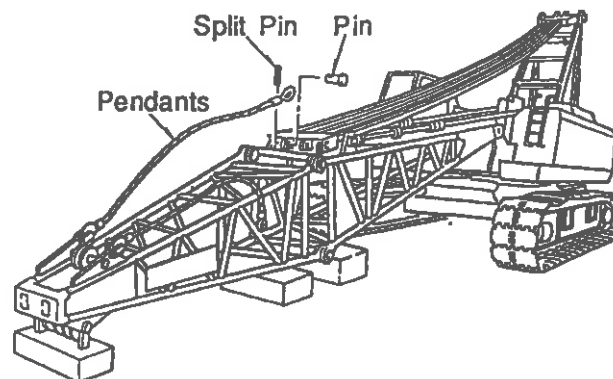
Workers Should Not Put Hands Between Boom And Block.

- 3) Remove the hoist rope from the socket and bucket.
- 4) Wind all of the rear (main) hoist rope around the drum and engage the rear (main) hoist brake lock.
- 5) Place the boom hoist control lever in "Lower" position to lower the bridle. Pin the bridle to bottom boom.
- 6) Remove the pendant pins from the live mast.



Remounting The Bridle CB5-23

- 7) Remove the pendant pins from the bridle.
- 8) Wind the boom hoist rope to the extent that the boom top will not be off the ground.
- 9) Drive out the lower connecting pins (A), tapping from out side of the boom.

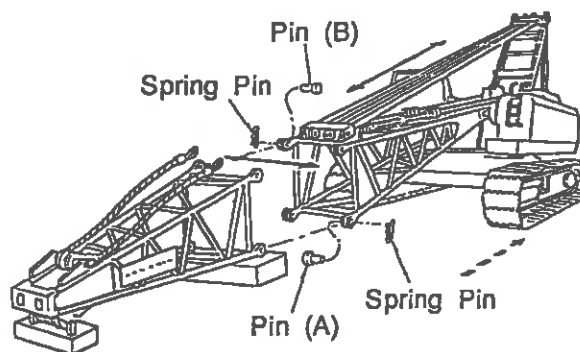


Removal Of Pendants CB5-5

**WARNING**  
Be Careful About Blocks Under The Boom And Keep Tension On Boom Hoist Rope So That The Boom Does Not Fall.

- 10) Place the boom hoist control lever in "Hoist" position to give a sufficient tension to the wire rope.

- 11) Then remove the upper pin (B).

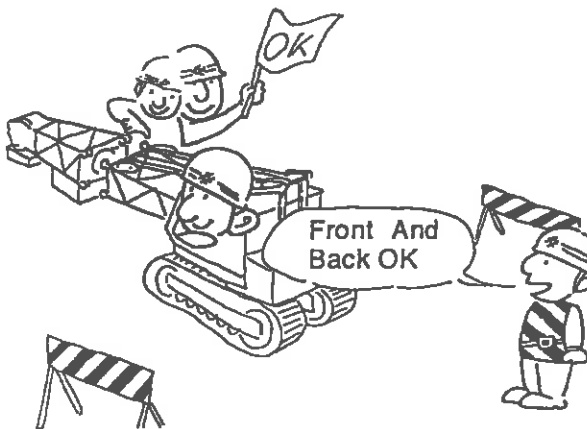


Removal Of Boom Top Section CB5-7

**WARNING**  
Make Sure That Blocks Are Placed Under The Top Boom Before Removing The Pins. If Not, Lower The Boom Until The Top Boom Rests On Blocks.

- 12) Slowly travel crane backwards to completely disconnect the top boom from the bottom boom.

**WARNING**  
Do Not Travel Crane Backward Until You Make Sure No One Is Behind Crane.



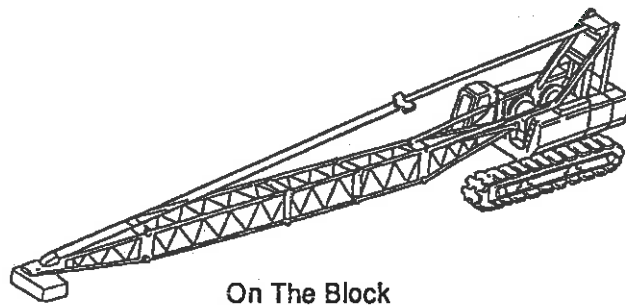
Checking Front And Back AM68



There are various types of disassembly procedures. This section describes the disassembly procedure without a helper crane.

- 1) Lower the boom peak on the block placed on the ground.

Note: Use blocks with high strength and good stability.



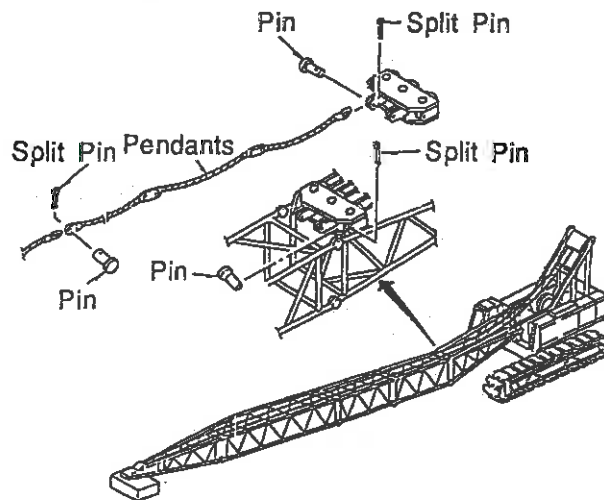
On The Block

- 2) Unwind the boom hoist rope and let the bridle rest on the bottom boom.

- 3) Install the bridle to bottom boom lugs and remove pendants.

Note: Unwind the boom hoist rope fully.

Note: Pendants must be removed after the bridle has been installed to the bottom boom lugs.



Removal Of Pendants

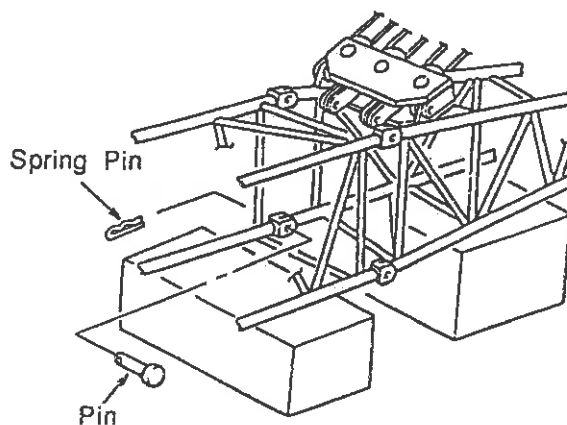
CB5-11

- 4) Hoist the rope slowly by operating the boom hoist control lever, exercising care not to wind the rope irregularly, and provide tension to the rope, using care not to raise the boom peak.

- 5) Remove lower pins from the bottom boom and lower extension boom by tapping the connecting portions from outside of boom.

**CAUTION**

Proceed With Pin Removing work After Placing The Blocks Ahead And Behind The Position where Booms Are Disconnected.



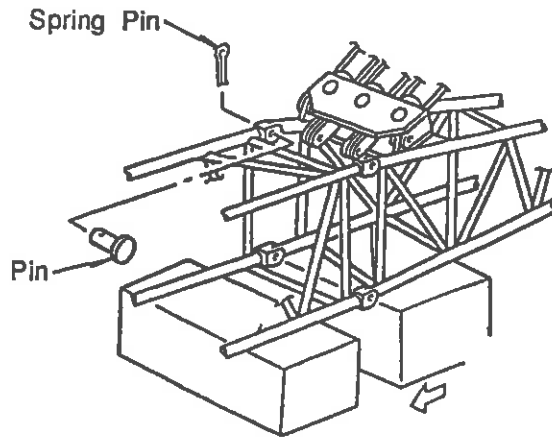
Removal Of Lower Pin

CB5-10

- 6) Remove the boom blocks, and by operating the control lever forward, lower the boom slowly.

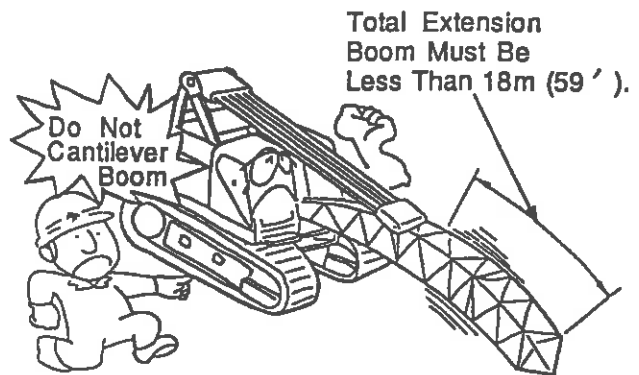
**⚠ CAUTION**

If The Boom Blocks Can Not Be Removed Due To The Weight Of Boom, Hoist The Boom Slightly And Remove The Blocks. Since Overhoisting Damages The Boom, Exercise Extreme Care.



Removal Of Upper Pins CB5-14

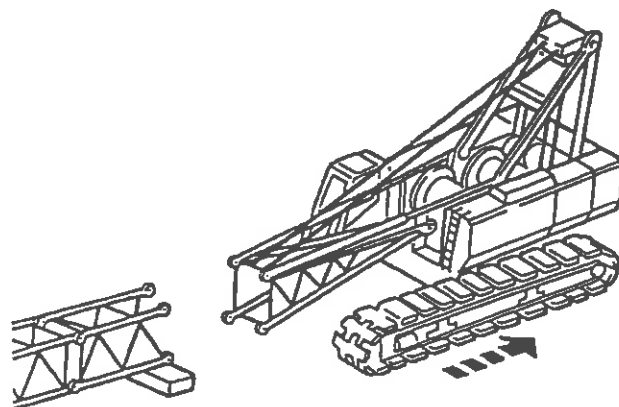
- 7) After lowering the extension boom on the blocks, stop lowering the boom.
- 8) Place a block also under the bottom boom allowing no clearance from the boom.



Overall Extension Boom Length For Lift/Transport AM149

- 9) Remove upper pins.

Note: The length of extension booms which can be lifted and transported with the bridle directly fixed to the lugs at the boom base section is up to 18m (59').



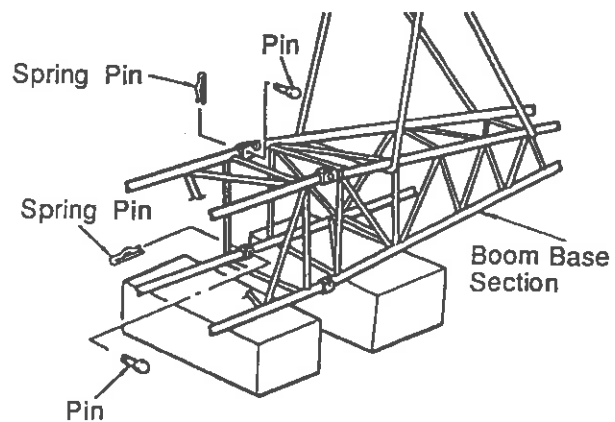
Move The Machine CB5-15

- 10) Move the machine to disconnect the bottom boom from the extension boom.

- 11) Disassemble each boom section by use of a helper crane or the machine equipped with the bottom boom.

**⚠ CAUTION**

Do Not Raise The Bottom Boom More Than 30°.



Disconnection Of Extension Boom SD2-1

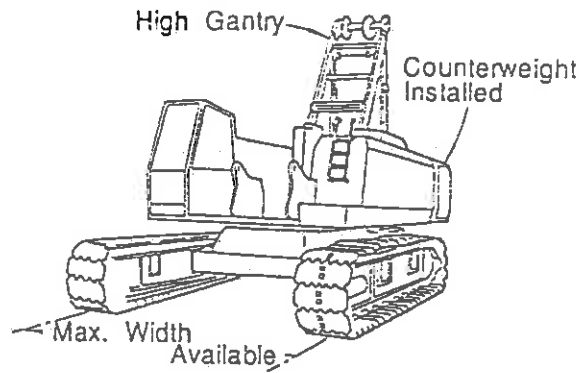
Extreme care should be exercised during removing the counterweight.

**WARNING**

Prior To Removal, Ensure The Following Conditions Are Met:

- Gantry In High Position
- Side Frames Fully Extended

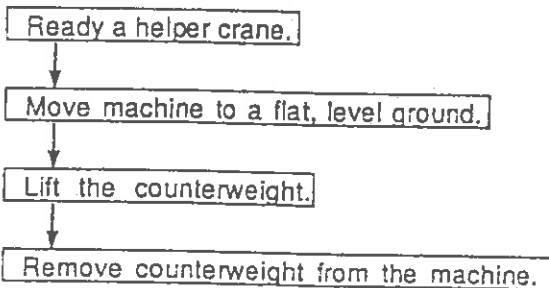
If Any Is Not Met, Ensure The Correct Position According To The Respective Procedures.



Prerequisites For Basic Boom Assembly

CD5-3

Summary Of Procedure



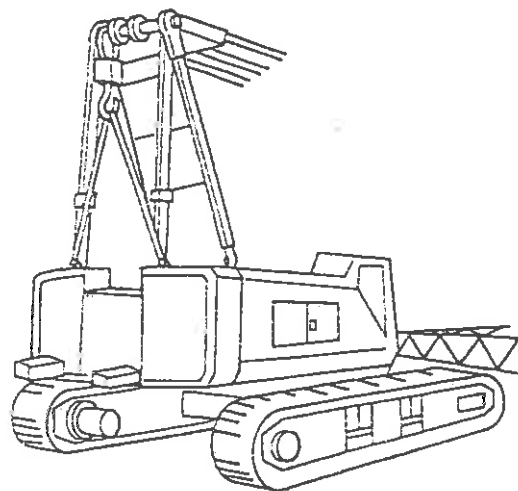
Procedures:

- 1) Bring the upper and lower to a position shown in the figure and engage the swing lock.
- 2) Install the sling wire rope onto the counterweight "B".

Note: Do not give too much tension to the slings. It causes the upper frame, etc. to damage.

**WARNING**

Use A Wire Rope Sufficiently Strong To Lift Counterweight Safely.



Removing The Counterweight

CD2-30

**WARNING**

Do Not Allow Workmen Under The Revolving Frame During The Procedure.

- 3) Remove a bolt ② by turning it counter-clockwise from the revolving frame side.

**WARNING**

The Counterweight Must Be Supported By The Helper Crane Until It Is Lowered On The Ground.

- 4) Lower the counterweight "B" at a desired position.
- 5) Install the sling wire rope onto the counterweight "A".

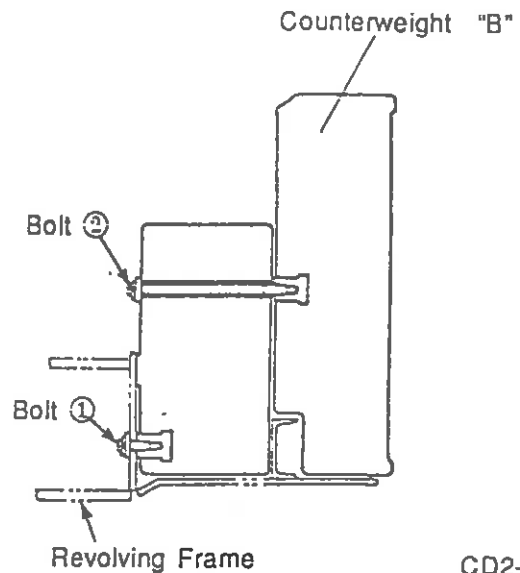
Note: Do not give too much tension to the slings. It causes the upper frame, etc. to damage.

- 6) Remove a bolt ① by turning it counter-clockwise from the revolving frame side.

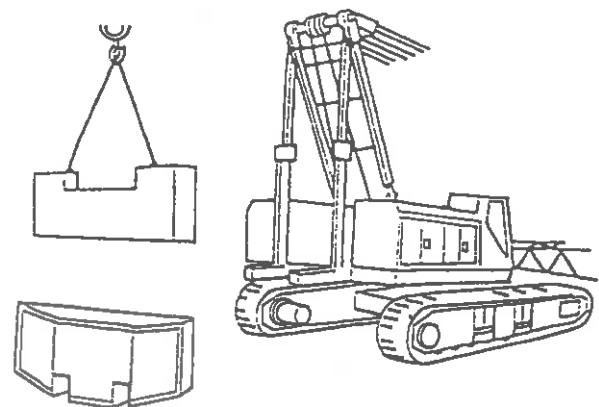
**WARNING**

The Counterweight Must Be Supported By The Helper Crane Until It Is Lowered On The Ground.

- 7) Lower the counterweight "A" at a desired position.



CD2-5



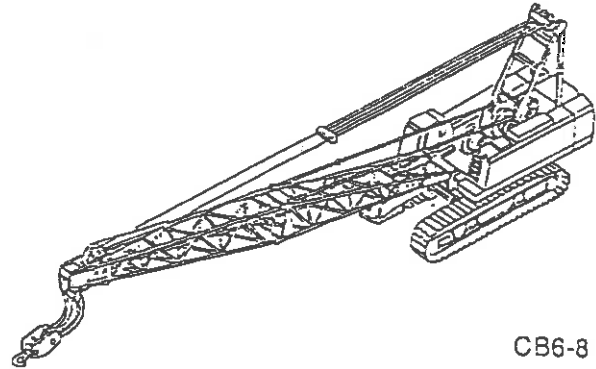
Removing The Counterweight

CD2-29

1 Without Using A Helper Crane

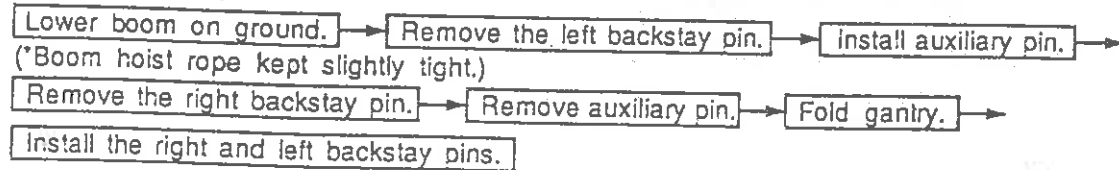
**WARNING**

The Following Procedures Assume That The Basic Boom Or Longer Is Installed. Never Make The Following Procedures With Only The Base Section Installed.



CB6-8

Summary Of Procedure

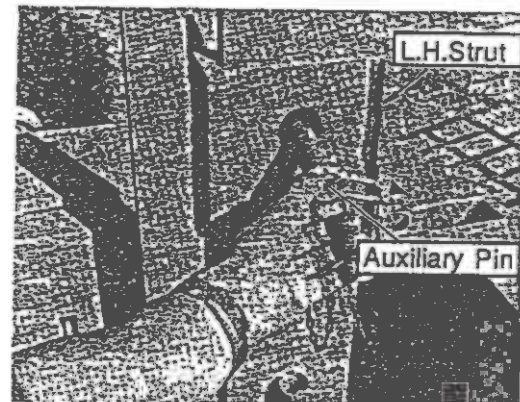


Procedures

**WARNING**

This Process Is Dangerous If Not Followed Exactly.

- 1) Lower the boom until the boom peak lightly touches the ground.
- 2) Remove the left backstay spring pin and pin and install auxiliary pin. (Install auxiliary pin with head of pin to outside position.)
- 3) Remove the right backstay spring pin and pin.

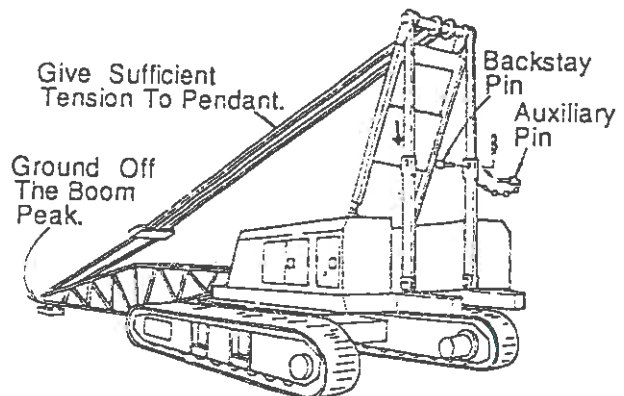


Installation Of Auxiliary Pin

CB6-6

**CAUTION**

The Gantry Lowers Then Pins Are Removed, It Indicates That The Boom Hoist Rope Is Not Tight Enough. Hoist Boom As Required.



Gantry In High Position

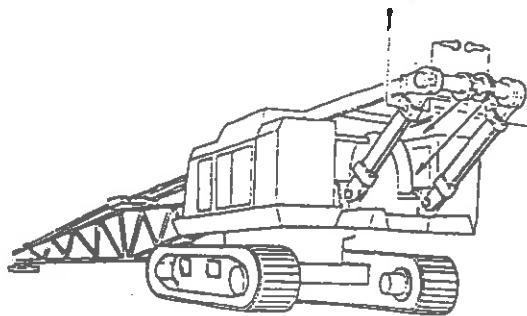
CB6-9

- 4) Remove auxiliary pin installed in step 2 above.

- 5) Lower the boom until the gantry folds down.

**CAUTION**

Keep All Personnel Away From The Gantry. Excessive Lowering Of The Boom Causes The Boom Hoist Rope To Be Irregularly Wound.



Gantry In Lower Position  
(During Transport)

CB2-34

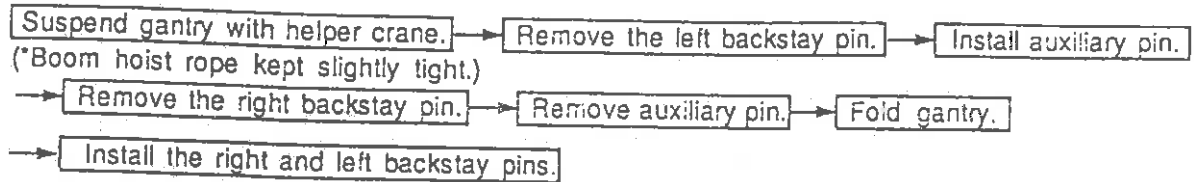
- 6) Insert right and left backstay pins and lock with spring pins.

**WARNING**

To Avoid Accidents, Insert Pins From Inside Outward Of Two Struts So As To Have Spring Pins Installed Outside.

1 With A Helper Crane

Summary Of Procedures



Procedures

**WARNING**

This Process Is Dangerous If Not Followed Exactly.

1) With a sling reeved through the shaft on gantry, suspend gantry with a helper crane.  
Note: If attachments are installed, lower boom down on ground and slacken boom hoist rope.

2) Remove the left backstay spring pin and pin and install auxiliary pin. (Install auxiliary pin with head of pin to outside position.)

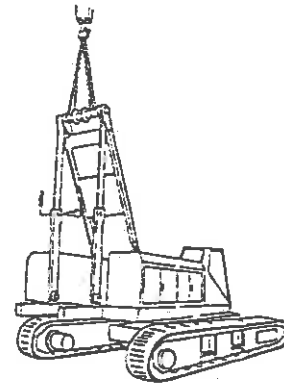
3) Remove the right backstay spring pin and pin.

**CAUTION**

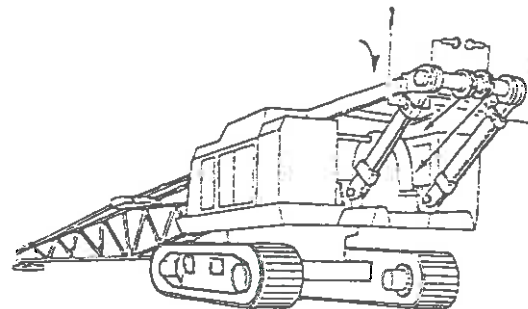
The Gantry Lowers Then Pins Are Removed, It Indicates That The Boom Hoist Rope Is Not Tight Enough. Hoist Boom As Required.

4) Remove the auxiliary pin, accessed from the left hand side of the machine, only after confirming the gantry suspended securely by a helper crane.

5) Lower the hook of helper crane to allow the gantry to fully fold down.



Folding The Gantry With Helper Crane CB6-5<sub>g</sub>



Gantry In Low Position (During Transport)

CB2-34

 **CAUTION**

Keep All Personnel Away From The Gantry. Excessive Lowering Of The Boom Causes The Boom Hoist Rope To Be Irregularly Wound.

- 6) Insert right and left backstay pins and lock with spring pins.

 **WARNING**


To Avoid Accidents, Insert Pins From Inside Outward Of Two Struts So As To Have Spring Pins Installed Outside.

 **WARNING**

Stay Clear Of All Moving Machinery During Raising Or Lowering Of High Gantry. Position A Signalman To Observe All Areas Of Motion And Warn Operator Of Danger.



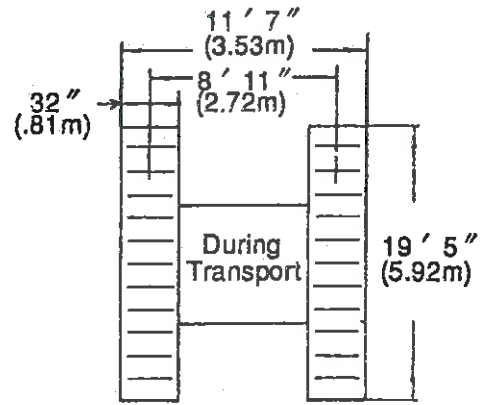
On this machine, the side frames are retracted and extended hydraulically.


WARNING

The Extending And Retracting Operation Must Be Done On Firm, Level Ground.

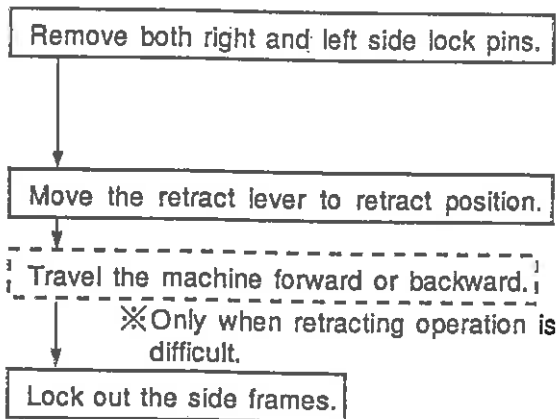
Do Not Swing The Machine With A Counterweight Installed When The Side Frames Are Retracted. It May Cause The Machine To Tip Over.

Place The Upper Parallel With The Side Frames And Engage The Swing Lock.

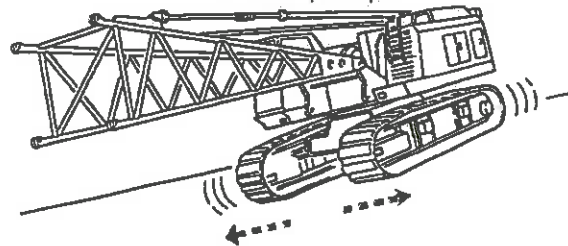


Dimensions With Side Frames Retracted CB2-1


Summary Of Procedures



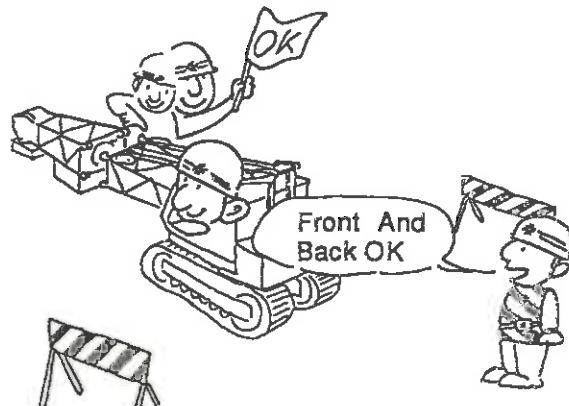
※ Never swing the upper when side frames are retracted. The machine is less stable in this position.



Retracting Side Frames Side Frames When Retracted CB2-2


WARNING

Stay Clear Of All Moving Machinery During Extending Of Side Frames. Position A Signalman To Observe All Areas Of Motion And Warn Operator Of Danger.

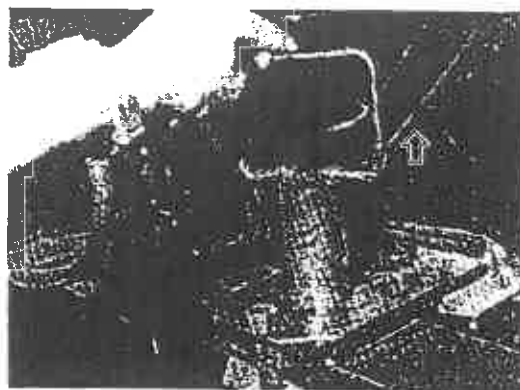


AM68

## Retracting Side Frames

### Retracting Procedures

- 1) Park the machine on level ground.
- 2) Remove the right and left side frame lock pins. If lock pins are hard to remove, move the retract control lever forward and backward.



Removing The Side Frame Lock Pins CB2-4

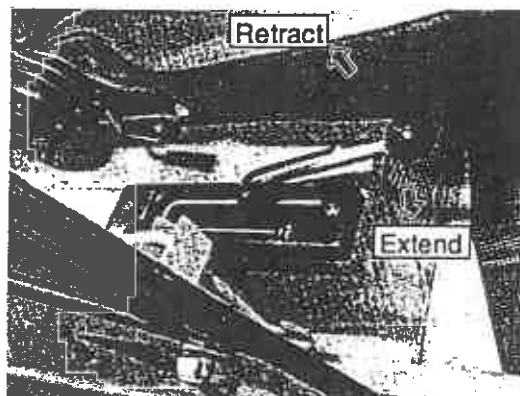
- 4) With the retract control lever placed in the "Retract" position, fully retract the side frame.

Note: If retracting is difficult, move travel control lever forward or backward.

### **WARNING**

When Retracting The Side Frame, Keep Workers Away From The machine.

Protect Workers From Hazard With Adequate Means In Dangerous Areas. Place Guards Where Necessary.

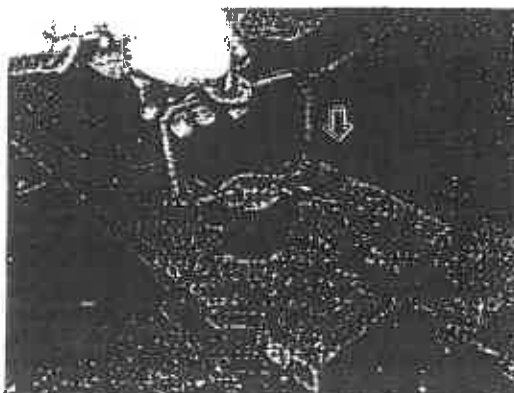


Retract Control Lever CB2-5

- 5) With the retract control lever in neutral, install the side frame lock pins and fix with spring pins.

### **WARNING**

When Installing The Lock Pins, Do Not Insert Your Finger To Attempt To Align Pin With Pin Hole. A Movement In This Area Could Sever Fingers.



Installing The Side Frame Lock Pins CB2-6

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Faint, illegible text in the middle left section, possibly a paragraph or list item.

Faint, illegible text in the bottom left section, possibly a footer or page number.

Vertical text on the right edge of the page, possibly a page number or a reference mark.

In the preceding pages, we have dealt with disassembly procedure of the machine and removal of attachments for hauling the machine by trailer.

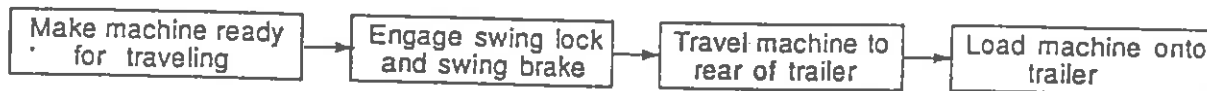
Here, we review the disassembly procedures of the machine into the basic configuration.

### 1 Disassembly Procedures Into Basic Configuration



These procedures make the machine suitable for transportation.

### 2 Transportation Procedures



### 3 Loading Operation (Ensure Correct Approaching)

**CAUTION**

To Prevent Trailer From Swaying, Place Lumber Or Jacks Under Trailer Frame.

- 1) Ensure upper mechanism is parallel with lower mechanism. Swing lock and swing brake should be engaged.

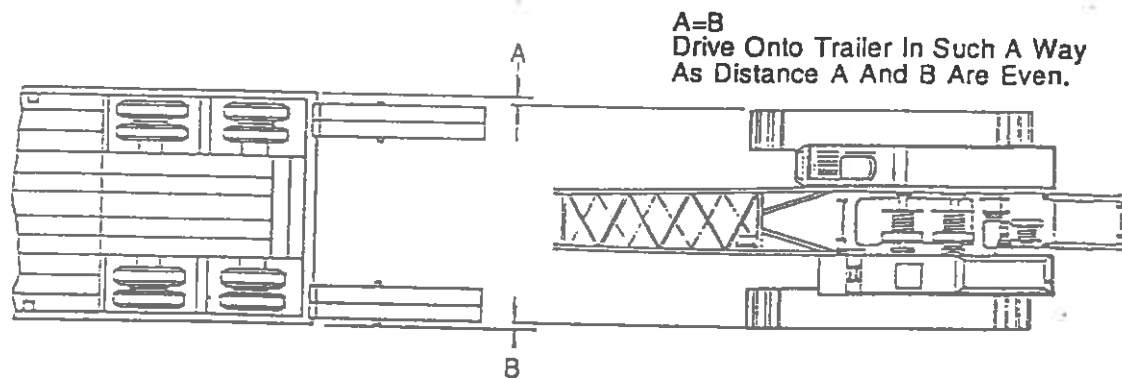
**WARNING**

Apply Swing Lock With A Travel Motor Positioned In Rear.

- 2) Move machine forward to rear of trailer. Ensure running boards matching the width of crawlers and its direction before driving machine onto a trailer.

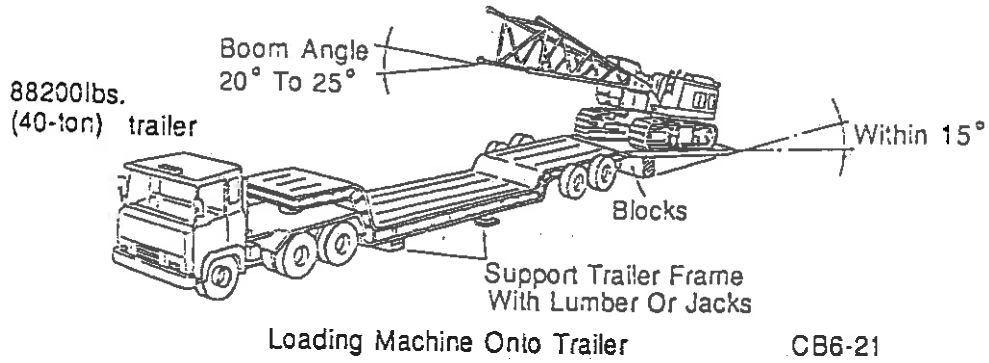
**CAUTION**

Steering Machine On Boards Is Extremely Dangerous. Leave An Equal Width On Right And Left Side Of Crawlers.



Centering The Loading Width

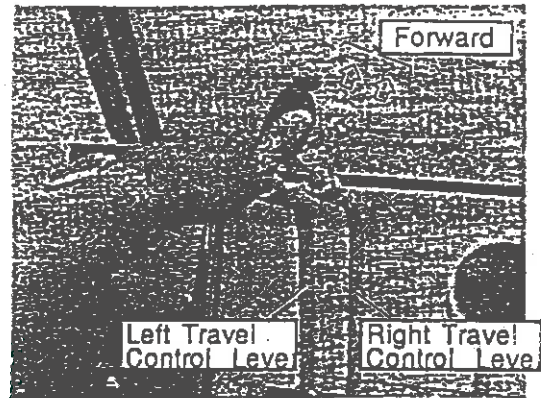
- 3) Keep boom angle at 20° to 25°



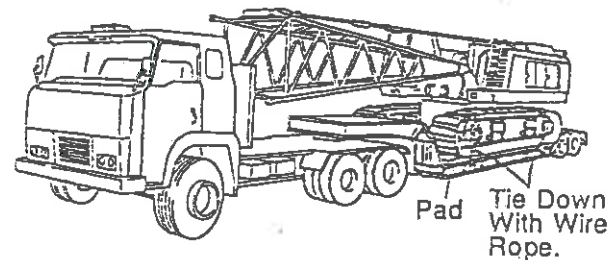
- 4) Push travel levers forward simultaneously to move machine.

**CAUTION**

Assign A Signal Man. During Crawling Up, Watch For His Signal Indication A Deviation From Centerline Of Running Boards. If Machine Deviates, Backup Until The Machine Is Back On The Ground. Then Make Correction. Stopping In An Unstable Weight Balance Is Extremely Dangerous. Climb Up At A Steady Speed.



- 5) If machine ends up off-center on trailer, steer little by little to bring machine onto the center line of trailer.
- 6) Lock crawlers with wooden block latches and tie crawlers down with wire ropes.  
Note: Apply pads to crawlers to prevent damage of wire ropes.



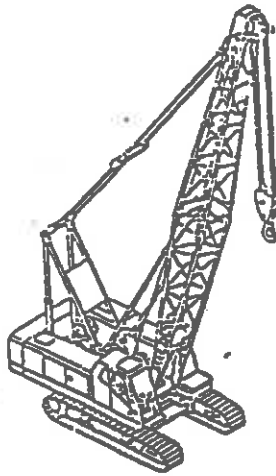
- 7) Lower boom down below the level of the highest portion of upper machinery.
- 8) Stop engine and lock doors and covers to prevent them from an accidental opening during the course of transportation.

**CAUTION**

Ensure That Swing Lock And Brakes Are Securely Engaged And Applied.

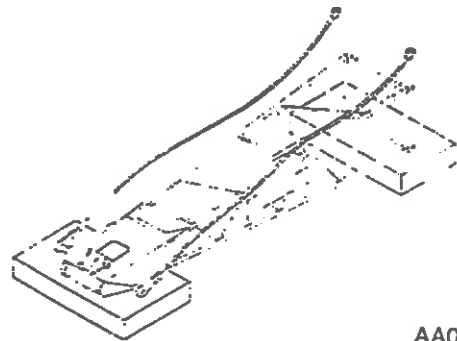
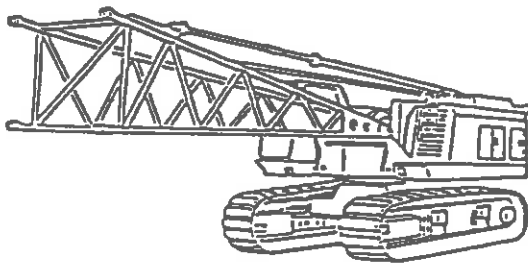
Units And Symbols In The Tables

L (Length) : inch (cm)  
 W (Width) : inch (cm)  
 H (Height) : inch (cm)  
 Weight : inch (kg)



**Machine Weights With Basic Boom**

32" Shoe	125380 (56900)
39" Shoe	127150 (57680)



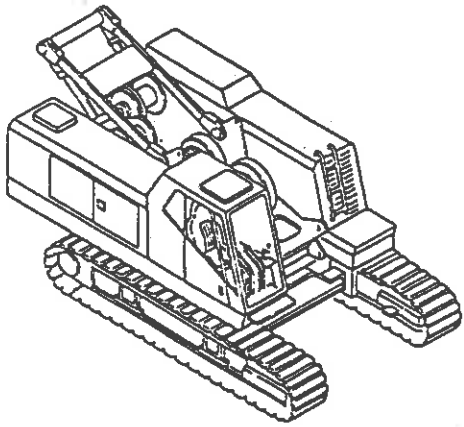
AA0021-C

**Machine For Transportation W/O Counterweight**

Shoe Width	Weight	Dimensions (L x W x H)
32"	81190 (36830)	
36"	82960 (37630)	

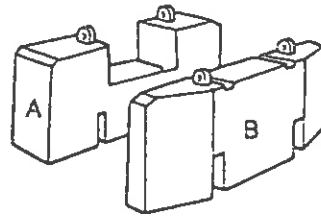
**Top Boom With Basic Pendants**

Weight	2840 (1290)
Dimensions (L x W x H)	240 x 54 x 44 (610 x 138 x 112)



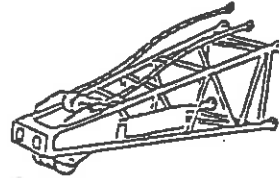
Machine Weight (Including Wire Rope)		
Shoe Width	Weight	Dimensions (L x W x H)
32"	76270 (34600)	305 x 143 x 134 (775 x 363 x 340)
36"	78040 (35400)	305 x 143 x 134 (775 x 363 x 340)

ECB6-28



ECD6-1

Counterweight		
Nominal	Weight	Dimensions (L x W x H)
A	19600 (8890)	121-5/8" x 18-1/8" x 56-1/2" (309 x 46 x 143)
B	20130 (9130)	121-5/8" x 16-3/4" x 56-1/2" (309 x 42 x 143)



Bottom Boom With Live Mast & Spreader Bar	
Weight	4150 (1885)
Dimensions (L x W x H)	240 x 54 x 44 (610 x 138 x 112)



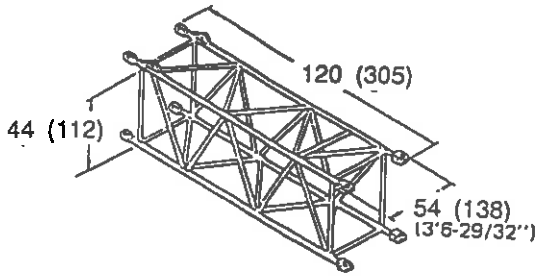
ECB6-31

Backstop (1 pc.)	
Weight	265 (120) x 2 pcs.
Dimensions (L x W x H)	135-1/2 x 6-1/4 x 6-1/4 (344 x $\phi$ 16 x $\phi$ 16)

Weights And Dimensions For Transportation

Extension Booms

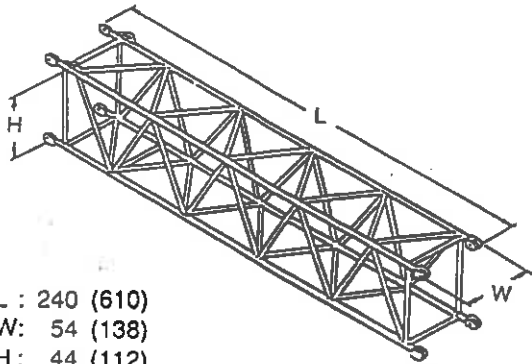
10' (3m) Extension (Pendants With Two Pins)



ECB6-33

Weight: 450 (204)

20' (6m) Extension (Pendants With Two Pins)

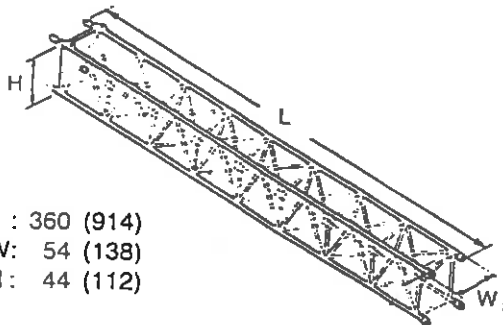


L : 240 (610)  
W : 54 (138)  
H : 44 (112)

ECB6-34

Weight: 791 (359)

30' (9m) Extension (Pendants With Two Pins)

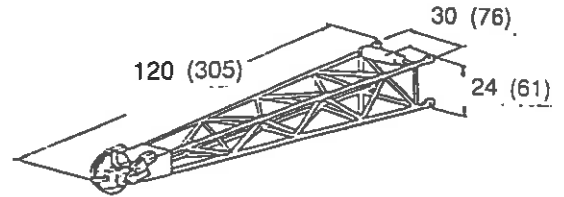


L : 360 (914)  
W : 54 (138)  
H : 44 (112)

ECB6-40

Weight: 1132 (514)

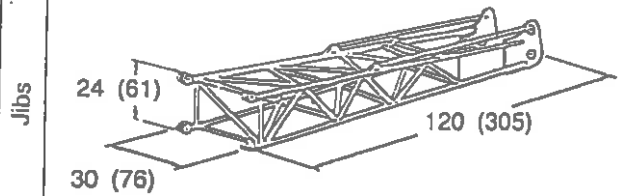
Top Section



ECB6-35

Weight: 200 (91)

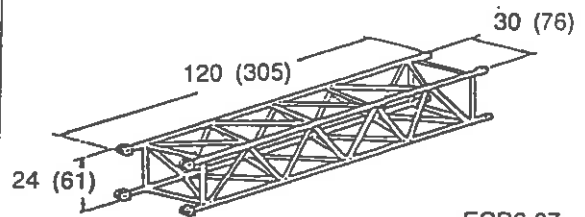
Bottom Section



ECB6-36

Weight: 200 (91)

15' (4.57m) Extension



ECB6-37

Weight: 150 (68)



Anytime the crane is going to be left unattended it should be prepared so that it will not be damaged by the elements, be an attraction to vandals, or a plaything for children.

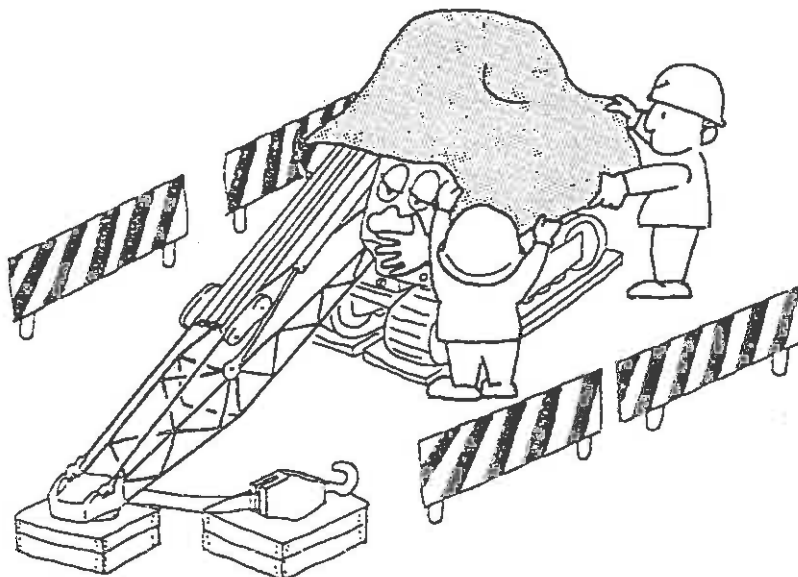
### 1 Short Term Storage

- 1) Do not leave the crane where it will be a traffic hazard.
- 2) Lower all loads to the ground.
- 3) The swing lock must be engaged.
- 4) Fully lower the boom down to the ground.
- 5) Tie off the hook block to the towing shackles (if equipped). Hoist lines should be snug.
- 6) All control levers must be in the neutral position.
- 7) Shift the control lever to neutral, engage the park brake, and shutdown the engine.
- 8) Support the crane so it will remain level.
- 9) In cold weather, locate the crane where it will not freeze to the ground.
- 10) Lock all windows and doors. Remove the keys from the crane.

### 2 Long Term Storage

- 1) Store the crane inside a building if possible.
- 2) Thoroughly clean the crane.

- 3) Touch up any spots where paint has chipped. This will prevent rusting.
- 4) Lubricate per the Lubrication Chart. Make sure all gear cases are full of oil.
- 5) Fully retract all hydraulic cylinders if possible. Cover all cylinder rods, machined and unpainted surfaces with a coat of grease.
- 6) Leave all control levers in neutral.
- 7) Engage the park brake.
- 8) Cover all open areas around the engine, cab, etc. to prevent entry of water. Cover the entire engine area with a tarp if possible.
- 9) Prepare the engine as per the engine manufacturer's manual. Make sure antifreeze protection is sufficient to prevent the engine from freezing. If antifreeze protection is not adequate, completely drain the engine block.
- 10) If in a location where vandalism may occur, lock the cab doors. Cover all cab glass with plywood or boards to prevent glass breakage. You may wish also, to provide a means of locking the engine access doors, fuel tank, and hydraulic reservoir.
- 11) Store the crane so it does not provide a plaything for children. Such a unit can be an "attractive nuisance" for children to play on. If they fall off it or get entangled, serious injury may result.

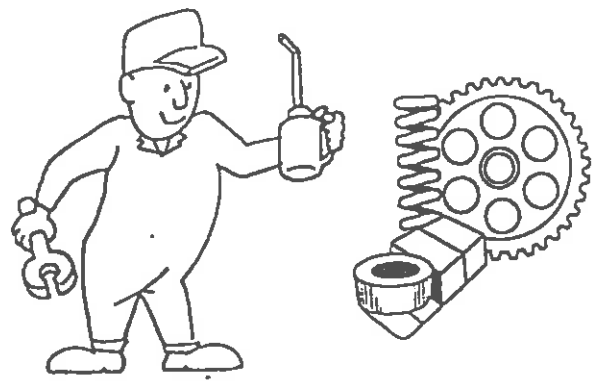


Storage

AM208

# CAUTION

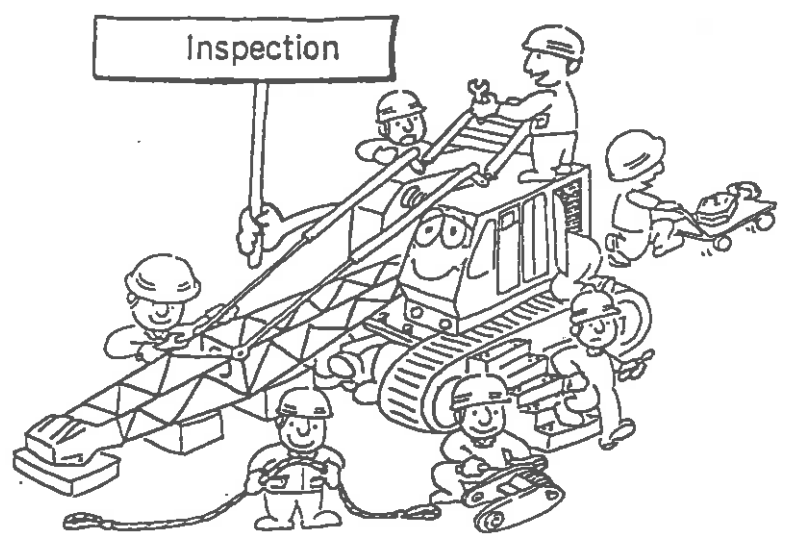
For Inspection And Lubrication, Be Sure To Shutdown The Engine And Take Actions That Insure Safe Work. During Inspection And Lubrication, Be Sure To Put Up A Notice That Inspection And Lubrication Is Being Made, Thus Exercising Extreme Care To Make Inspection And Lubrication Safe.



BL243

Cranes must undergo, by law, periodical inspection and maintenance. Dated records for periodic inspections shall be made on critical items such as brakes, crane hooks, ropes, hydraulic and pneumatic cylinders, and hydraulic and pneumatic relief pressure valve, records should be kept where available to appointed personnel.

Inspection is generally made on the following items.



M209

Periodic Inspection: Periodic inspection must be carried out on the following items of the crane.

- 1) Check of all safety devices, brakes, clutches and lock devices for abnormality.
- 2) Check of wire rope and suspension chain for damage.
- 3) Check of hooks, grab buckets, etc. for broken lifting hooks.
- 4) Check of crane structure for breakage.
- 5) Check of gear train for abnormality.
- 6) Check of all indicators for abnormality.
- 7) Check of power plant for abnormal function.
- 8) Check of hydraulic and pneumatic hoses for abnormality.
- 9) Check of hydraulic and pneumatic equipment for abnormality.
- 10) Check of wiring wiring, switch board and controller for abnormality.

• Frequent Inspection (Inspection Before Starting Operation)

Inspection must be carried out on all control mechanism, safety devices, hydraulic hoses, crane hooks, electric parts and oil levels of hydraulic system every day before starting the work using a crane.

• Inspection Record (Record Of Self-Inspection)

The results of periodic inspection must be recorded.

• Adjustment And Repair

Should some abnormality be found during inspection, it must be immediately repaired only by designated personnel.

Monthly Or Every 200 Hours

• Front/Rear Drum brake

- (1) Visually check band connecting lugs, actuating linkage, and related pins, and the mounting bracket pin hole for any signs of wear or cracking.
- (2) Visually check band for any indications of bending, interference, or unusual lining wear which would indicate excessive wear of the above parts.
- (3) Check condition of band adjusting nut and bolt. Make sure the self locking nut will hold against rotation during operation.

Every 500 Hours

• Front/Rear Drum brake

- (1) Remove the band and all related parts for a detailed, visual inspection. If any parts show signs of undue wear, cracks, or other distress, replace them. Reassemble and adjust the brake mechanism.

**⚠ CAUTION**

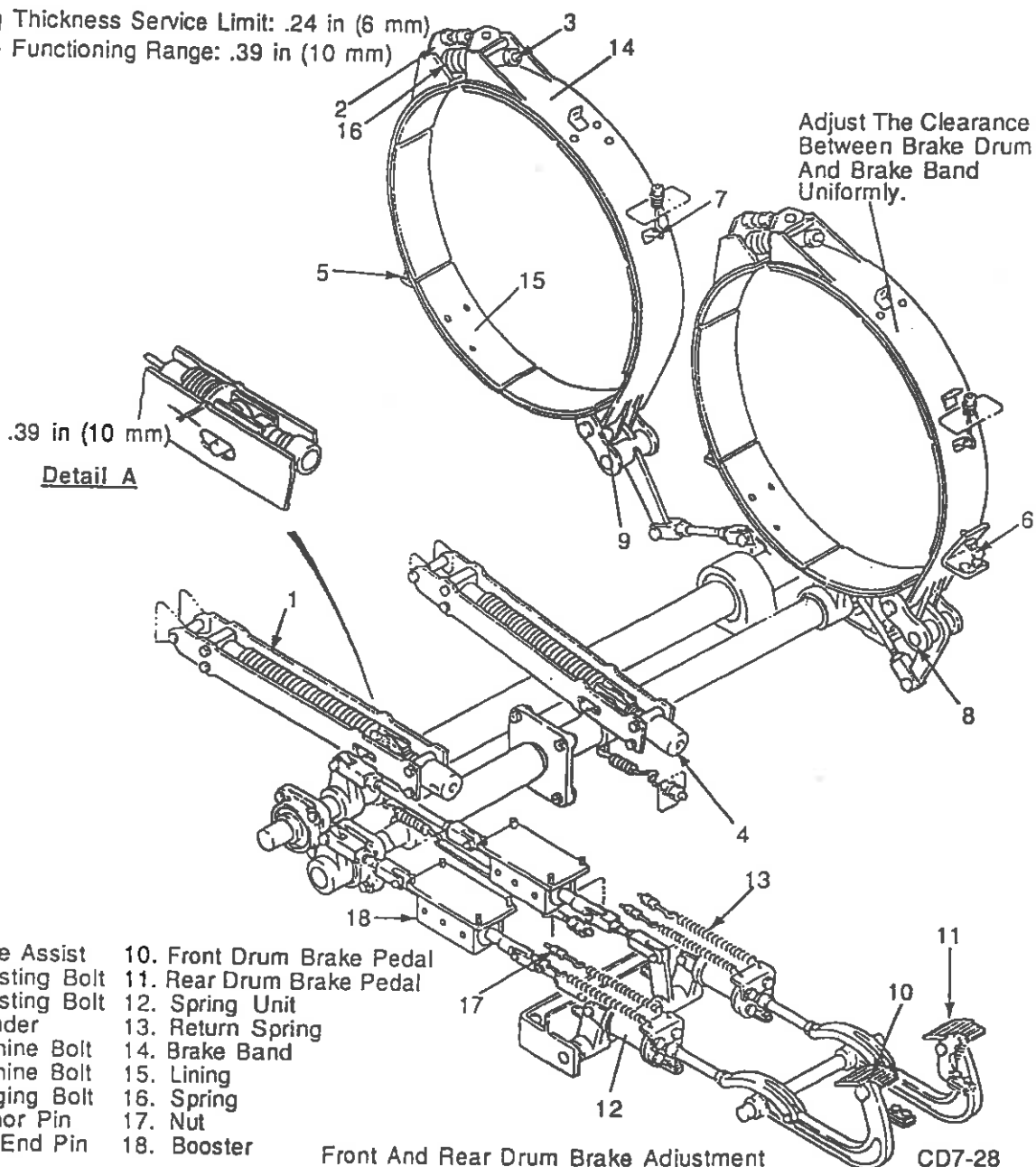
Loose Brake Can Be Extremely Dangerous: Adjust Loosen Brakes Immediately.

The pedal at right is for the front (main hoist) drum brake and the one at left is for the rear (auxiliary hoist) drum brake. A select switch is provided for the machine that selects mode of operation: either "Automatic brake at lever neutral" or "Foot brake without using automatic brake".

**⚠ CAUTION**

When Adjusting The Brake, Make Sure That The Hydraulic Pressure Oil Is Not Supplied To The Automatic Brake Cylinder By Starting Engine And Operating Select Switch To Foot Brake. (Free Fall Mode) Let The Hook Block Rest On Ground To Remove Hoist Rope Tension.

- Lining Thickness Service Limit: .24 in (6 mm)
- Brake Functioning Range: .39 in (10 mm)



- |                   |                            |
|-------------------|----------------------------|
| 1. Brake Assist   | 10. Front Drum Brake Pedal |
| 2. Adjusting Bolt | 11. Rear Drum Brake Pedal  |
| 3. Adjusting Bolt | 12. Spring Unit            |
| 4. Cylinder       | 13. Return Spring          |
| 5. Machine Bolt   | 14. Brake Band             |
| 6. Machine Bolt   | 15. Lining                 |
| 7. Hanging Bolt   | 16. Spring                 |
| 8. Anchor Pin     | 17. Nut                    |
| 9. Live End Pin   | 18. Booster                |

Front And Rear Drum Brake Adjustment

CD7-28

### 1 Adjusting The Brakes

Adjust brakes when brakes display poor braking performance due to worn lining and other causes. Adjust the clearance between brake drum and brake band between .02 in (.5 mm) to .03 in (.75 mm) uniformly with the hanging and machine bolts (5), (6) and (7).

- 1) Check if each rod does not loosen. If loosened, fix the rods by tightening nuts.
- 2) Lock the brake pedal and adjust the band by turning the adjusting bolt (3) and so that the dimension at Detail A becomes .39 in (10 mm). After adjusting the band, fix it with the bolt (2).
- 3) With the free mode brake position, make sure that the brake is operated properly with pressing the brake pedal.
- 4) Adjust the machine bolt and hanging bolt so that the clearance between the brake band and the brake drum is .02 in (.5 mm) to .03 in (.75 mm).

Note: Excessive tightening of the band with the adjusting bolts makes it impossible to lock the pedal.

### 2 Removing The Brake Band



Let The Hook Block Rest On Ground To Remove Hoist Rope Tension.

Do Not Stop The Engine: Stopping The Engine Actuates The Automatic Brake.

- 1) With the brake free mode switch changed, release the brake pedal to disengage brakes.
- 2) With the hanging bolt (7) removed from the brake band, remove the brake cover and drum undercover.
- 3) Remove machine bolts (5) and (6). Loosen brake band adjusting nut (3) and remove the bolt.

- 4) Remove brake anchor pin (8) and live end pin (9).

- 5) Move brake band sideways to remove.

Note: When replacing the band, keep rope on drum to a minimum, which facilitates the replacement work.



Use Special Care Not To Touch The Control Lever While You Are Working On Brakes.

#### Monthly Or Every 200 Hours

- Front/Rear Drum brake
- 3rd Drum Brake (Optional)

- (1) Visually check band connecting lugs, actuating linkage, and related pins, and the mounting bracket pin hole for any signs of wear or cracking.
- (2) Visually check band for any indications of bending, interference, or unusual lining wear which would indicate excessive wear of the above parts.
- (3) Check condition of band adjusting nut and bolt. Make sure the self locking nut will hold against rotation during operation.

#### Every 500 Hours

- Front/Rear Drum brake
- 3rd Drum Brake (Optional)

- (1) Remove the band and all related parts for a detailed, visual inspection. If any parts show signs of undue wear, cracks, or other distress, replace them. Reassemble and adjust the brake mechanism.

### 3 Adjusting The Automatic Brake

Change the free mode switch on the control lever to set the free mode (lamp comes on.). Depress foot pedals to see if they operate properly. Then, change the free mode switch again to set the automatic brake mode (lamp goes off.). Disengage the foot brake pedal latch. With the automatic brakes applied, make sure that the dimension A (spring set length) is 15-3/4 in (400 mm). If the dimension measures 16-9/64 in (410 mm) due to lining wear, readjust the brake adjusting bolts (2) and (3) to obtain 15-3/4 in (400 mm).

## CAUTION

When Dimension A Reaches 16-9/64 in (410 mm), Readjust The Brake Band Adjusting Bolts To Obtain 15-3/4 in (400 mm).

Readjust The Brake Band With Adjusting Bolts To Obtain .39 in (10 mm) At B With The Brake Pedal Locked.

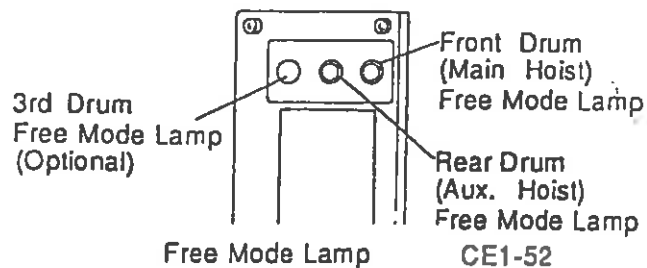
## CAUTION

Use White Gasoline To Clean The Lining Soiled With Oil Or Grease.

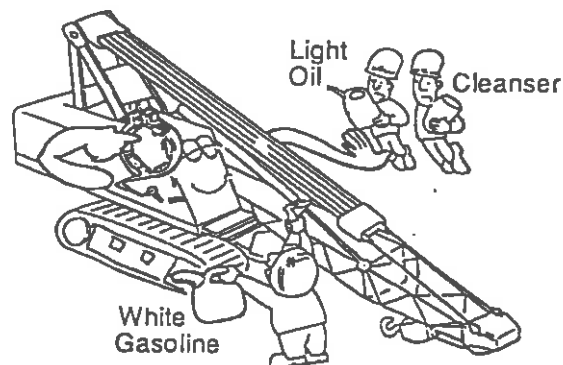
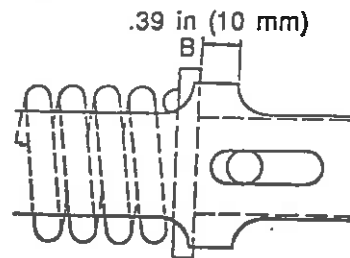
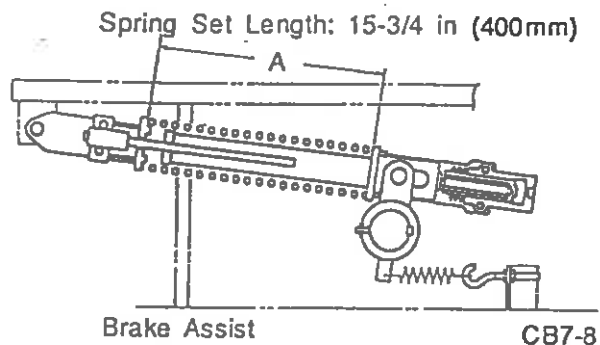
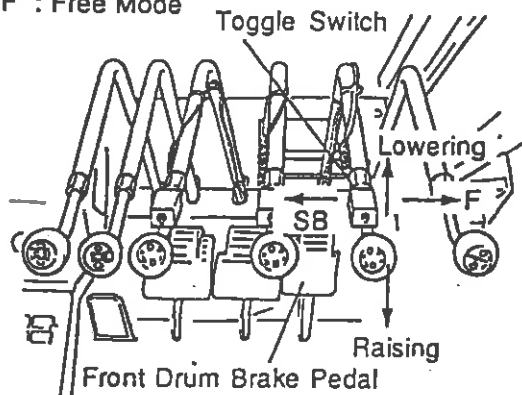
Do Not Use Cleanser Or Ash, As They Cause Premature Wear Of The Lining Or Damage The Brake Drum. Never Use Light Oil Either.

## WARNING

Brake Linings Contain Asbestos Fibers Which May Be Hazardous To Your Health. Caution Should Be Exercised In Handling And Maintenance.



SB: Automatic Brake Mode  
F : Free Mode



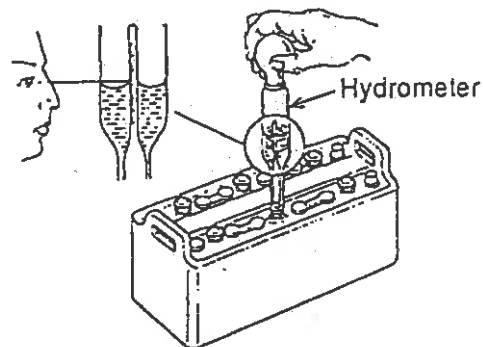
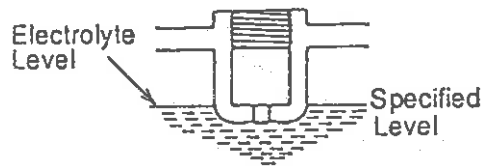
Cleaning Of Brake Band

AM151

Proper battery maintenance is necessary because batteries are important for starting the engine and lighting various lights.

Note: Inspection for liquid volume and specific gravity . . . every 120 hours (every two weeks, every week in summer).

- 1) Remove the cap from the battery and the electrolyte should be found to be up to .39 to .59 in (10 to 15 mm) above the plate. If sufficient, replenish using distilled water. Replenishment should be performed before charging (before operation).
- 2) Specific gravity tells condition of the battery. When the specific gravity is below 1.220 (68° F (20° C)), be sure to charge.



BL414S

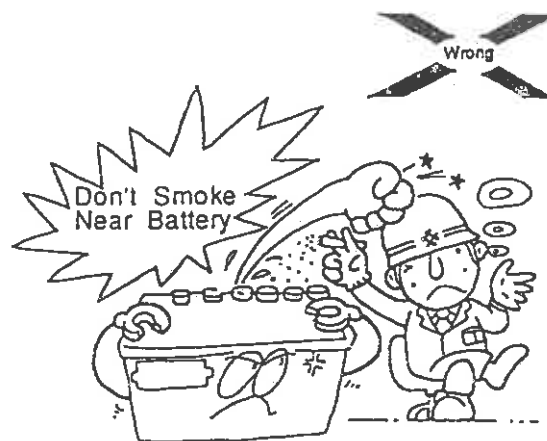
Specific gravity (At 68° F (20° C))	Condition	Treatment
1.300 or over	Too high	Adjusting the specific gravity
1.300 to 1.220	Good	When completely charged 1.260
1.220 to 1.110	Insufficiently charged	Charge
1.000 or below	Too low	Measure again after charging

- 3) Concurrent with battery inspection, inspect the electric wiring and connections for looseness or damage, etc.

**⚠ WARNING**

Since Battery Electrolyte Is Diluted Sulfuric Acid, Be Careful To Keep Eyes, Skin, Cloth And Other Metal Surfaces Absolutely Away From It. If It Sticks, Wash It Off Immediately With Water.

Since Inflammable Hydrogen Gas Is Generated From The Battery, Do Not Use Fire Near The Battery.



Never Use An Open Flame Near The Battery.

AM9

Incidents	Presumption of causes	Remedy
Brake overheating	Improper gap adjustment (Friction with drum)	Readjust the adjusting bolt.
Hydraulic fluid overheating	Insufficient fluid	Supply additional fluid. Clean the filter element.
No electricity	Broken wire	Repair the harness.
	Burnt fuse	Replace it with new one.
	Discharged battery	Recharge it.
	Insufficient key turning	Turn it properly.
	Defective switch	Replace it with new one.
	Defective relay	Replace it with new one.
Engine failure of starting	Insufficient fuel	Supply additional fuel.
	Clogged air cleaner	Clean it.
	Defective starter motor	Replace it with new one.
	Defective generator motor	Replace it with new one.
	Loose V belt	Adjust its tension.
Clutch malfunctions	Accidentally disconnected hydraulic line	Repair the disconnection.
	Sticky control valve	Clean away the adhered foreign particles.
	Worn shoe lining	Readjust the clearance.



The clutch is an internal expanding type provided with 2-shoes and transmits the power by engaging its shoes to clutch drum by means of hydraulic cylinder actuated by control lever.

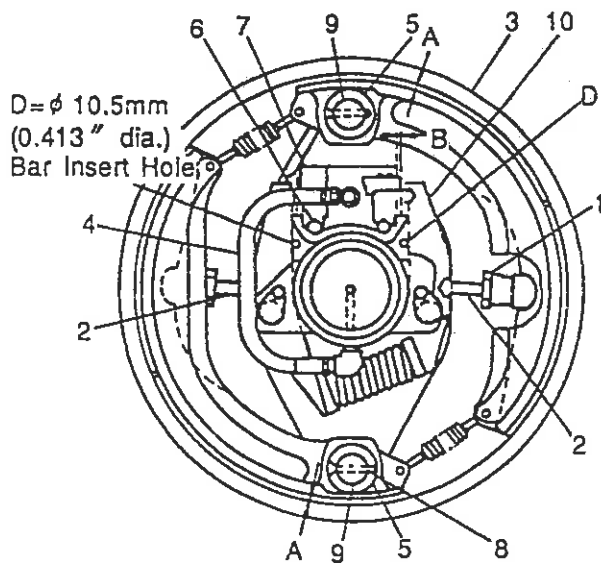
This clutch is interchangeable between front drum and rear drum. With a monolithic construction of brake drum, clutch drum and wire drum, it is very easy to maintain the clutch. The drum shaft is connected with the winch motor via the reduction gear and the clutch is interlocked with the motor rotation by operating the control lever and at the same time, the brake is released. As the result, the drum shaft starts to rotate.

**CAUTION**

When The Clutch Is Replaced, The New One Could Be Installed In Opposite Hand. In This Case, However, The Clutch Actuating Force To Half. Therefore, Extreme Care Should Be Taken To Install The Clutch Properly.

**CAUTION**

When Checking And Adjusting The Clutch And Replacing The Cylinder, Be Sure To Lower The Hook Block On The Ground.



- |                  |                |
|------------------|----------------|
| 1 Lock Nut       | 6 Bolt         |
| 2 Adjusting Bolt | 7 Cylinder     |
| 3 Shoe Assembly  | 8 Split Pin    |
| 4 Hose           | 9 Dead End Pin |
| 5 Keeper Plate   | 10 Arm         |

- A: Dead End  
 B: Piston Travel  
 D:  $\phi$  10.5mm (0.413" dia.) Bar Insert Hole (For Cylinder Mounting And Removal)

Checking Of Clutch And Adjusting Dimension

CA7-8

1 One Cylinder Type

1.1 Clutch adjustment due to lining wear

The clutch scarcely needs and readjustment if it is initially adjusted to a correct clearance. However, it is necessary to conduct a periodic clearance adjustment so that the travel of clutch cylinder piston will not become too large due too wear of lining.

Clearance adjustment between the clutch drum and lining should be made in the following procedure.

## Clutch Adjustment

- 1) Loosen the lock nut (1) and turn the adjusting bolt (2) to press the clutch shoe (3) against the clutch drum.
- 2) Remove the keeper plate (5) of the dead end "A" and add necessary shims at square hole to the extent until the dead end "A" comes in contact with the clutch drum.

Note: Shim thickness

- 2.3mm (0.09 " )
  - 1.6mm (0.06 " )
  - 0.35mm (0.01 " )
- 3) Loosen the adjusting bolt (2) slightly to adjust the clearance between the clutch drum and the lining from 0.35mm (0.014 " ) to 0.65mm (0.026 " ). Securely lock the bolt with the lock nut (1).

Note: Tighten the lock nut (1) by locking the adjusting bolt (2) with a wrench.

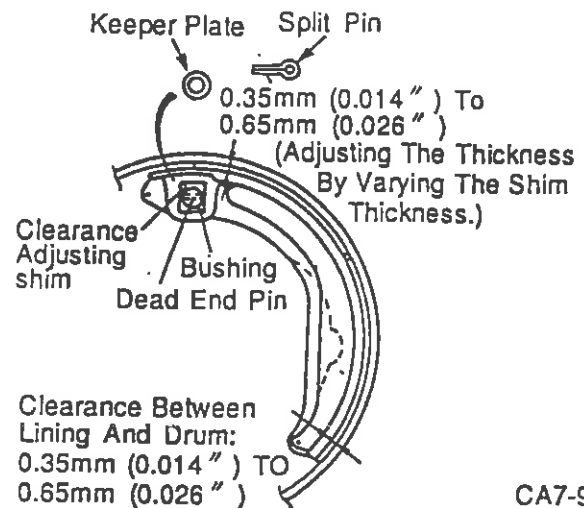
Tightening torque of lock nut:

20kg-m (145 ft-lbs.)

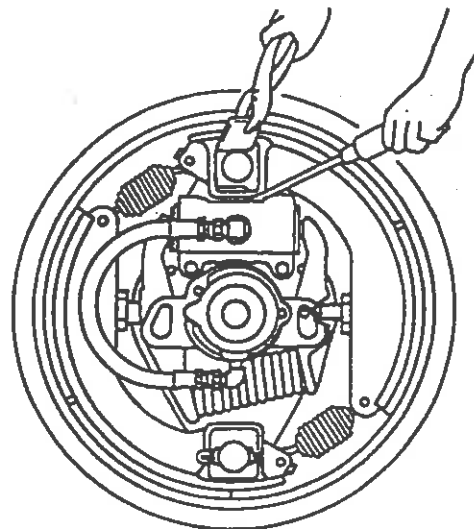
- 4) Apply a small amount of oil to dead end pin (9) and attach the keeper plate (5) and then fix it with the split pin (8).

### **WARNING**

Clutch Linings Contain Asbestos Fibers Which May Be Hazardous To Your Health. Caution Should be Exercised In Handling And Maintenance.



CA7-9

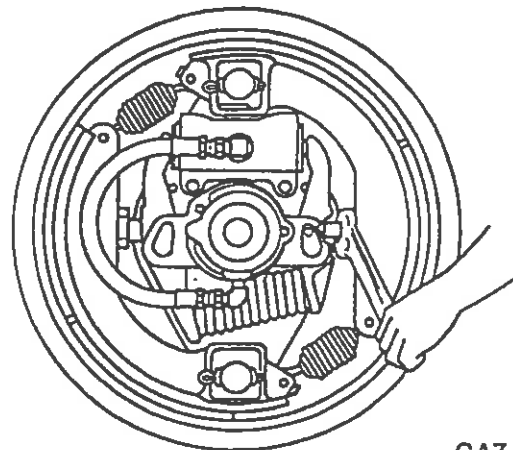


CA7-10

### 1-2 Replacement of clutch cylinder

When it is necessary to replace the clutch due to wear or oil leakage of the cylinder, proceed as follows.

- 1) After locating the clutch cylinder upward, shutdown the engine.
- 2) By operating the control lever forward and backward several times, remove the remaining hydraulic pressure in clutch line.



CA7-11

**CAUTION**

Watching The Pressure Gauge, Make Sure That The Pressure Is Reduced To 0 (Zero). After Then, Make The Following Procedures.

- 3) Loosen the lock nut (1) and turn the adjusting bolt (2) to retract the shoe.
- 4) Disconnect the hydraulic hose from the clutch cylinder.

Note: Keep lining clean, free from grease.

Note: Put dust cap on the piping disconnected so that dust does not get into the piping.

- 5) Place  $\phi$  10mm (0.394" dia.) bar in the holes provided at the clutch spider to hold the arms (10) in applied position.

**CAUTION**

Be Sure To Insert The Bar Fully Not To Fall Out.

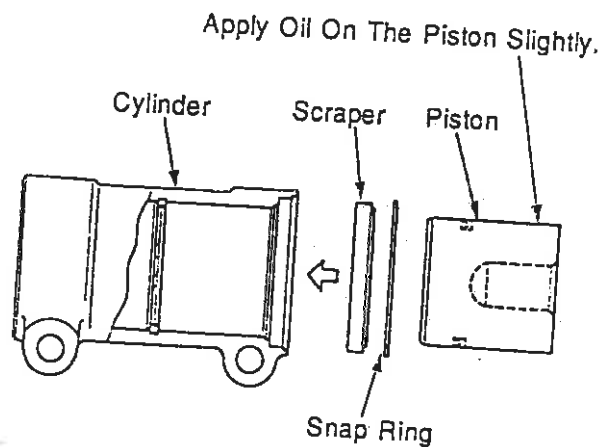
- 6) Remove the bolts (6) and dismount the cylinder (7).
- 7) Pull out the piston and install new packing and dust-seals.

Note: When installing, apply hydraulic oil on the piston slightly.

**CAUTION**

After Making Sure That There Is Not Fault And Damage On The Piston And Inside Of The Cylinder.

- 8) Insert the piston into the cylinder.
  - 9) Install the cylinder on the clutch.
- Tightening torque of cylinder:  
5.5 kg-m (440 ft-lbs.)



CA7-12

2 Two-Cylinder Type

2.1 Checking the clutch cylinder

- 1) Check for oil leaks.
- 2) Check cylinder mounting bolts for looseness.

Tightening torque: 903 to 1215 in/lbs. (1040 to 1400 kg-cm)

2.2 Clutch adjustment

**CAUTION**

Extreme Care Should Be Exercised To Ensure Proper Adjustment Of The Clutch. Improperly Adjusted Clutch Can Cause Hoisting Power To Be Reduced And A Load Lowered By Lowering Clutch To Fall.

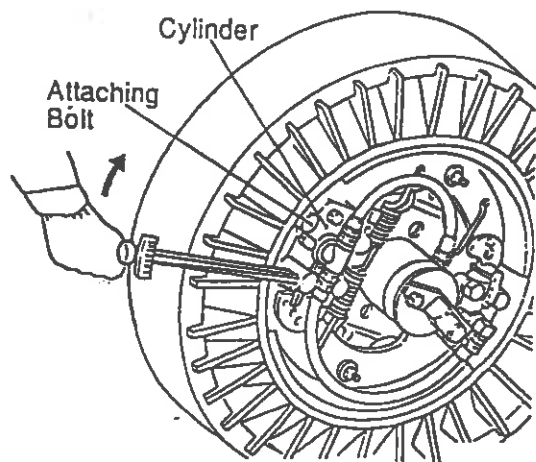
2.3 Double cylinder clutch lining clearance adjustment

- 1) Loosen the jam nuts (1) and bolts (2) on either cylinder (8).
- 2) On the other cylinder, rotate the adjustment wheel (7) until the clutch lining (5) between the two cylinder firmly contacts the drum (6).
- 3) Tighten the bolts (2) and jam nut (1). Torque the bolts to 72 ft/lbs. (10 kg-m) and the jam nuts to 50 ft/lbs. (7 kg-m).
- 4) Rotate the adjustment wheel (7), in the opposite direction from step 2, until the clearance between lining (5) and drum (6) at the center (4) of the shoe (3) is .015 in (.381 mm).
- 5) Repeat steps 1 through 4 on the other clutch shoe.
- 6) Test the function controlled by the clutch before putting the machine into service.

Note: After adjustment, keep clutch clean, free from water and grease.

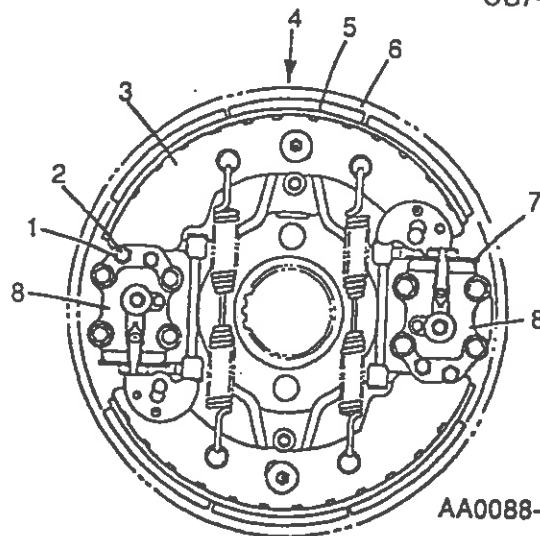
**WARNING**

Clutch Linings Contain Asbestos Fibers Which May Be Hazardous To Your Health. Caution Should Be Exercised In Handling And Maintenance.



Retightening Of Cylinder Attaching Bolt

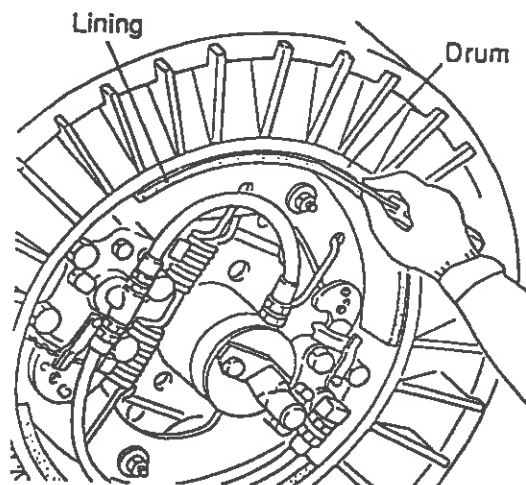
CB7-12



AA0088-A

Double Cylinder Clutch Lining Adjustment

- |                   |                     |
|-------------------|---------------------|
| 1) Jam Nut        | 5) Clutch Lining    |
| 2) Bolt           | 6) Drum             |
| 3) Clutch Shoe    | 7) Adjustment Wheel |
| 4) Center Of Shoe | 8) Clutch Cylinder  |

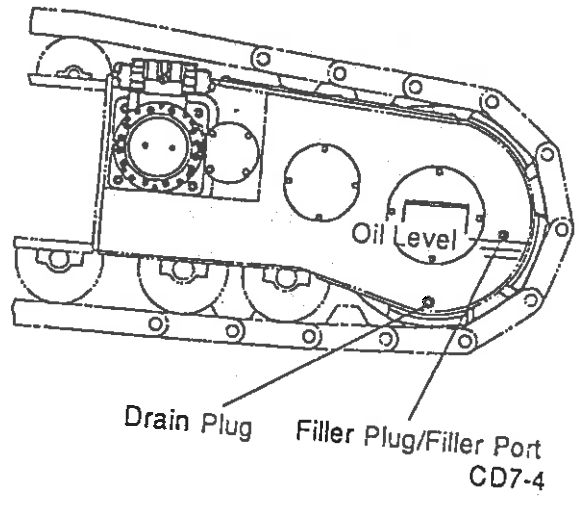


Shoe Clearance

CB7-14

### 1 Inspection And Supplying Method Of Oil

- 1) Park the machine on level ground.
- 2) Wipe off an area around the filler plug and filler port to prevent entry of foreign material.
- 3) Remove the filler plug. The gear case should be full of lubricant to the level of the filler plug hole.
- 4) If low, fill the gear case with lubricant through the filler hole.
- 5) See the lubrication capacity chart for proper lubricant.



### 2 Oil Replacement

- 1) Travel the machine slowly to warm oil up.
- 2) Park the machine on level ground.
- 3) Place an oil pan under the drain plug.
- 4) Remove the filler plug on the case.
- 5) Install the drain plug on the case.
- 6) Fill the gear case with lubricant through the filler hole.
- 7) Install the filler plug.

Note: Check for foreign materials in the drained oil. If many foreign materials are found, check the case internally.

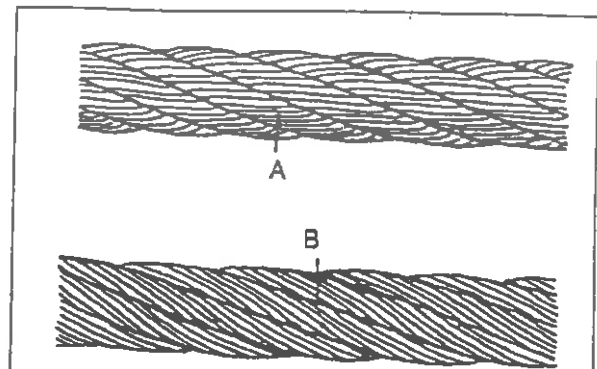
Wire rope are made with two types of "Lay". Lay refer to the direction in which the wires and strands are twisted to form the rope.

Regular lay as opposed to lang lay denotes the direction of wire twist in the individual strands. In regular lay rope, the wires in each strand lay in the opposite direction from the strands.

In lang lay rope the wires in each strand lay in the same direction as the strands.

Right or left are used to refer to the lay of the strands.

Right regular lay rope is the most commonly used, and will be furnished on an order unless other lay is specified.



Wire Rope  
(A) Right Regular Lay  
(B) Right Lang Lay

BL7-30

Nominal diameter in inches	mm	Allowable over size in inches	mm
To 3/4	19.05	1/32	.79
13/16 to 1-1/8	20.6 to 25.6	3/64	1.19
1-3/8 to 1-1/2	25.6 to 38.1	1/16	1.58
1-9/16 to 2-1/4	39.6 to 51	3/32	2.38
2-5/16 and larger	61.1 and larger	1/8	3.17

1. Measuring Wire Rope Diameter

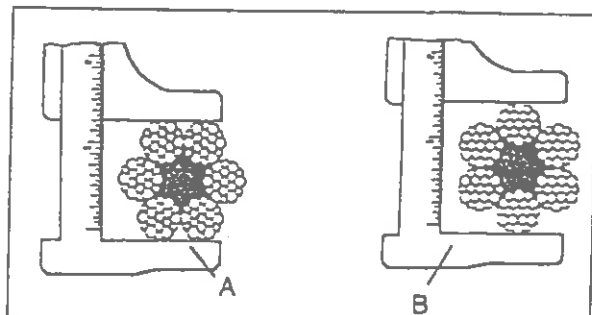
As the illustrations in Fig. BL7-31 indicate, there is a right and wrong way to measure wire rope diameter. Wire rope is always measured across the largest diameter that will fit inside a true circle.

Wire rope is always made larger, not smaller, than the nominal diameter. The allowable tolerances on wire rope diameters are: In standard practice, the nominal diameter is the minimum diameter. A rope is not considered oversized until its diameter exceeds the maximums listed above.

2. Ordering Wire Ropes

When ordering wire ropes, the following information must be furnished, to be sure of receiving the correct with rope.

- (a) Length required.
- (b) Diameter
- (c) Construction (type and number of strands, and wires per strand).
- (d) Type of core (hemp or wire center).
- (e) Grade of steel.



Measuring Wire Rope Diameter  
(A) Incorrect (B) Correct

BL7-31

- (f) Direction of lay (right or left lay).
- (g) Regular lay or lang lay.
- (h) Class of service wire rope is intended for; that is drag wire rope on a drag line, hoist wire rope on a shovel, etc.
- (i) Preformed or not preformed.

When the above information is not specified, the wire rope manufacturer will generally furnish right, regular lay, ordinary fabrication, hemp center wire ropes.

### 3. Wire Rope Inspection And Replacement

All wire rope will eventually deteriorate to the point where it must be replaced. There are three basic reasons for this deterioration as follows :

- (1) Abrasion or wear.
- (2) Corrosion.
- (3) Fatigue, caused by the constant pulling, bending, crushing, or kinking forces acting against the rope during normal usage.

When wire rope is replaced, use the type specified in the parts manual. Machines are designed to use a specific type and size of rope. Using anything but the recommended rope may result in short life, or even breakage.

All wire ropes in active service must be inspected daily. Dated records should be kept on this inspection. A sample inspection report is shown in Fig. BL7-32.

This inspection should determine the degree of deterioration at the worst rope lay. This will determine the suitability of the rope for continued service. By definition, a rope lay is the axial distance along the rope in which one strand makes one complete turn around the ropes.

Conditions such as the following would be reason to question rope safety.

- (a) Evidence of rope deterioration from corrosion should be cause for replacement.
- (b) More than one broken wire in any one strand should be cause for caution. Breaks that occur on the worn crowns of the out-

side wires indicate normal deterioration. Breaks that occur in the valleys between strands indicate some abnormal condition, possibly fatigue and breakage of other wires not readily visible one or more valley breaks should be cause for replacement.

(c) Wire breaks generally occur in those portions of a wire rope which pass over sheaves, wind onto drums, or receive mechanical abuse. Breaks that occur near attached fittings are apt to result from fatiguing stresses concentrated in these localized sections.

Breaks of the latter type should be cause for replacement of the rope or renewal of the attachment to eliminate the locally fatigued area.

Place of Inspection _____ Date _____			
Description of Crane _____			
No. _____ Serial No. _____			
Type and Arrangement of Attachments _____			
Date of Last Rope Inspection: _____			
Hours and Type of Service Since Last Inspection: _____			
Results of Inspection:			
Rope Inspected	Type and Size	Conditions noted	Recommendation
Inspector _____			

Wire Rope Inspection Report
BL7-32

- (d) Heavy wear or broken wires may occur in sections under equalizer sheaves or the other sheaves where rope travel is limited, or in contact with saddles. Particular care should be taken to inspect ropes at these points.
- (e) Rope stretch is generally greatest during initial stages of operation when the strands are becoming adjusted and seated. This is accompanied by some reduction in rope diameter, but not the extent that the condition of the rope can be judged on this basis.
- (f) Time for rope replacement is indicated by the extent of abrasion, scrubbing, and peening on the outside wires, broken wires, evidence of pitting or severe corrosion, kink damage, or other mechanical abuse resulting in distortion of the rope structure.
- (g) Sheaves, guards, guides, drums, flanges and other surfaces contacted by wire rope during operation should be examined at the time of inspections.  
Any condition harmful to the rope in use at the time should be corrected. The same equipment and particularly sheave and drum grooves, should be inspected and placed in proper condition before a new rope is installed.
- (h) Any of the following listed conditions should be cause for rope replacements.
  - (1) In running ropes, six randomly distributed broken wire in one rope lay, or three broken wires in one strand in one rope lay.
  - (2) In pendants or standing ropes, evidence of more than one broken wire in one rope lay.
  - (3) Abrasion, scrubbing or peening causing loss of more than 1/3 the original diameter of the outside wires.
  - (4) Evidence of rope deterioration from corrosion.
  - (5) Severe kinking, severe crushing, or other damage resulting in distortion of the rope structure.
  - (6) Evidence of any heat damage resulting from a torch or arc caused by contact with electrical wires.

(7) Reduction from nominal diameter of more than 3/64 inch (1.19mm) for diameters up to and including 3/4 inch (15.8mm); 1/16 inch (1.58mm) for diameters 7/8 to 1-1/8 inch (22.22mm to 28.6mm); 3/32 inch (2.38mm) for diameters 1-1/4 inch to 1-1/2 inch (25.6mm to 38.1mm). Marked reduction in diameter indicates deterioration of the core resulting in lack of proper support for the load carrying strands. Excessive rope stretch or elongation may also be an indication of internal deterioration.

(8) Evidence "bird-caging" or other distortion resulting in some members of the rope structure carrying more load than others.

(9) Noticeable rusting or development of broken wires in the vicinity of attachments.

Note: If this condition is localized in an operating rope and the section in question can be eliminated by making a new attachment, this can be done rather than replacing the entire rope.

#### 4. Lubrication

Each time a wire rope bends over a sheave, or straightens from a slack position, many wires move against each other. Lubrication is necessary to help prevent wear caused by this movement. Lubrication also helps prevent deterioration of wire rope due to rust and corrosion.

Note: Rusty rope in dangerous since there is no way of determining its remaining strength.

Most wire ropes are lubricated during manufacture, but the lubricant doesn't last the life of the rope. The lubricant is squeezed out of the rope as it runs over sheaves under tension, washed off by rain, etc.

For the previous reasons, wire ropes MUST BE periodically lubricated. Crude or used oil and grease should not be used as lubricants because they may be grit or acid laden. Either or these conditions would be bad for the rope. No set rule can be given for lubrication frequency. This will depend on the conditions



of rope operation. A rope operating in wet conditions would need lubrication more often than one operating under dry conditions to prevent rust and corrosion.

Note: It is not recommended to lubricate ropes used for dragline operation.

Lubricants used for wire rope lubrication should have the following properties :

- (a) They must contain no acids or alkalis.
- (b) They must have enough adhesive strength to stay on the rope.
- (c) They must be able to penetrate between the wires and strands.
- (d) They must have high film strength.
- (e) They must resist oxidation.
- (f) They must remain soft and pliable.

Application of Lubricant: Wire ropes that have been in service must be cleaned before lubrication. Use a wire brush, and compressed air to clean the rope.

All possible foreign material and old lubricant must be removed from the rope before lubrication. Use one of the following method to apply the lubricant :

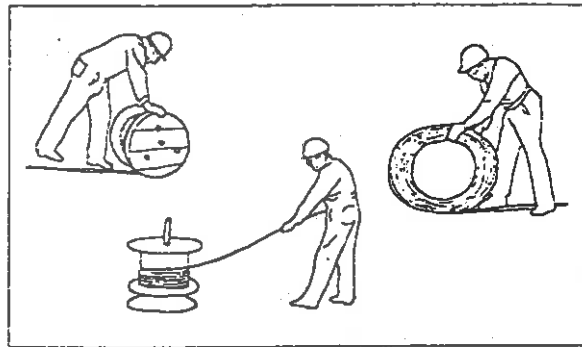
- (a) Continuous bath: Run the rope through a container filled with lubricant. A sheave mounted in the center of the container will hold the rope submerged as it passes through the container.  
Use swabbing to remove excess lubricant as the rope leaves the container.
- (b) Dripping: Place a container above a sheave so that a spigot may be opened to drip oil on the wire rope as it passes through the sheave groove.
- (c) Swabbing and painting: Two fast methods are swabbing the lubricant on with rags, or painting it on with brush.
- (d) Spraying: Light lubricants may be applied with a spray gun. Aerosol cans of lubricant are also available.

### 5. Unreeling Wire Rope

When unreeling wire rope, set the reel up horizontally so it can rotate as the rope is

reeled off. Reel the rope off slowly, so the reel won't tend to "throw" the rope off.

Avoid reverse bends. If installing rope over the top (overwinding drum) of a drum, set the reel up so the rope is removed over the top of the reel. When installing rope around the bottom of a drum (underwinding drum) set the reel up so rope is removed under the bottom of the reel. To obtain snug and uniform winding on the drum, brake the reel with a large timber to provide back tension.



Uncoiling Wire Rope

BL7-33

Proper winding on the first rope layer on a multiple wrap drum is important. If the first layer is properly wound, succeeding layers will automatically be controlled. This is especially important on "plain" faced drums.

When stating new wire rope on such drums, drive each wrap of the first layer lightly with a wooden mallet so each wrap barely contacts the preceding one.

When uncoiling wire rope, roll the coil along the ground and the rope will be as straight as it was before being coiled for shipment.

Don't uncoil rope where it may be run over by trucks or other equipment.

Note: A new rope should be broken in by running it slowly through its working cycle for a short period under a light load.

 **CAUTION**

Avoid Injury To Yourself. Replace Or Rearrange Rope Carefully To Avoid An Accident. Rope Wrapped Around Sheaves May Become Twisted. When Released, The Rope Can Spin As The Dead End Pins Or Sockets Are Removed.

6. Sheave Inspection

Whenever wire rope is replaced, the sheaves and grooves in drums should be checked for wear of damage and replaced if necessary.

Damaged, worn, or undersized sheaves will damage the rope. On older equipment remember that new rope is always bigger in diameter than the worn rope it replaces.

The sheave grooves may be worn to the smaller diameter of the old rope.

7. Cutting Wire Rope

When wire rope is to be cut, seizing should be placed on each side of the point where the rope is to be cut, to keep the strands in place. On preformed rope, one seizing on each side of the cut is enough. On non-preformed rope less than 7/8 inch (22.2mm) diameter, two seizings are recommended. On non-preformed ropes over 7/8 inch (22.2mm) diameter, three seizings are recommended. Three basic methods of cutting wire rope are recommended;

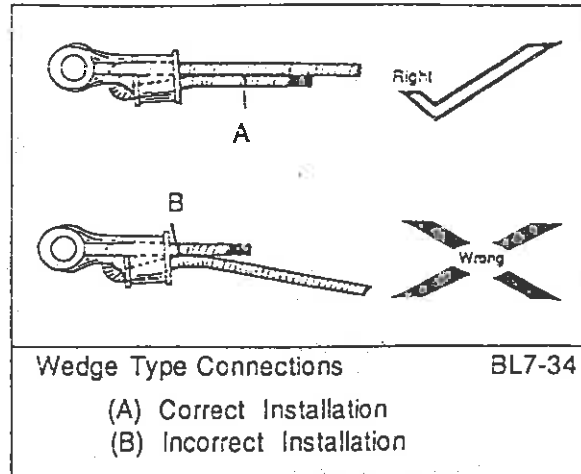
- (1) Abrasive cutting tools.
- (2) Shearing tools. (Wire cutters on small rope, a wire rope cutter and hammer for larger ropes)
- (3) Acetylene cutting torch.

8. Socket And Wedge Connections

The correct and incorrect methods of attaching a wedge and socket to wire rope are shown in Fig. BL7-34. The dead end of the wire rope must always be on the sloped portion of the socket.

The load line must be in a straight line pull with the eye of the socket.

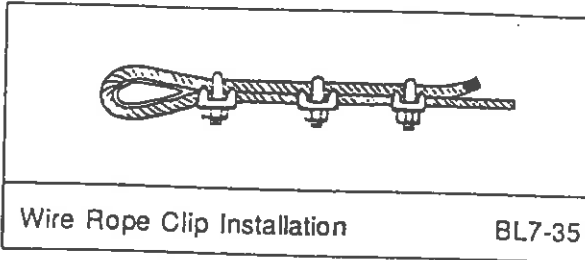
If the rope is installed backwards, as shown at (B) in Fig. BL7-34, a kink will develop at the point where the rope enters the socket.



Clip size	Minimum No. of clips	Amount of rope to turn back	Tightening Torque in ft-lbs (N-m)
1/8 in ( 3.175 mm)	2	3-1/4 in ( 8.26 mm)	- ( - )
3/16 in ( 4.763 mm)	2	3-3/4 in ( 9.53 mm)	- ( - )
1/4 in ( 6.350 mm)	2	4-3/4 in (12.07 mm)	15 ( 20.04)
5/16 in ( 7.938 mm)	2	5-1/4 in (13.34 mm)	30 ( 40.07)
3/8 in ( 9.525 mm)	2	6-1/2 in (16.51 mm)	45 ( 60.11)
7/16 in (11.113 mm)	2	7 in (17.78 mm)	65 ( 86.83)
1/2 in (12.700 mm)	3	11-1/2 in (29.21 mm)	65 ( 86.83)
9/16 in (14.288 mm)	3	12 in ( .30 m)	95 ( 126.90)
5/8 in (16.875 mm)	3	12 in ( .30 m)	95 ( 126.90)
3/4 in (19.050 mm)	4	18 in ( .46 m)	130 ( 173.66)
7/8 in (22.225 mm)	4	19 in ( .48 m)	225 ( 300.56)
1 in (25.400 mm)	5	26 in ( .66 m)	225 ( 300.56)
1-1/8 in (28.575 mm)	6	34 in ( .86 m)	225 ( 300.56)
1-1/4 in (31.740 mm)	6	37 in ( .94 m)	360 ( 480.89)
1-3/8 in (34.925 mm)	7	44 in ( 1.12 m)	360 ( 480.89)
1-1/2 in (39.100 mm)	7	48 in ( 1.22 m)	360 ( 480.89)
1-5/8 in (41.275 mm)	7	51 in ( 1.30 m)	430 ( 574.39)
1-3/4 in (44.450 mm)	7	53 in ( 1.35 m)	590 ( 788.12)
2 in (50.800 mm)	8	71 in ( 1.80 m)	750 (1001.85)
2-1/4 in (57.150 mm)	8	73 in ( 1.85 m)	750 (1001.85)
2-1/2 in (63.500 mm)	9	84 in ( 2.13 m)	750 (1001.85)
2-3/4 in (69.850 mm)	10	100 in ( 2.54 m)	750 (1001.85)
3 in (76.200 mm)	10	106 in ( 2.69 m)	1200 (1602.96)

If a greater number of clips are used than shown in the table, the amount of rope turn back should be increased proportionately.

Note: The use of wire rope clips with socket and wedge connections is not recommended. Addition of wire rope clips will actually weaken the connection.



Wire Rope Clip Installation

BL7-35

### **CAUTION**

Use The Proper Size Wedge With A Wire Rope, A Socket Or Lagging. The Use Of An Off Size Wedge In A Socket Or Lagging Is Dangerous As It May Not Hold. Wedges And Sockets Shipped From SCM Are Stamped With Size And Type Identification. A Lagging Or Socket May Be Stamped For Two Or More Size Of Rope, And A Wedge For One Or Two. The Size On The Lagging, Socket And Wedge, Must Correspond To The Rope Size Used.

#### 9. Wire Rope Clip Installation

The correct method of installing wire rope clips is as shown in Fig. BL7-35. The "U" bolt must always be over the short end of the wire rope, and the base must always contact the long end. Clips should not be staggered; that is "U" bolt of one clip over short end, "U" bolt of next clip over long end, etc. This practice will not only distort the wire rope excessively, but will prevent maximum strength of this type fastening. Placing all clips with the "U" bolt over the long end of the wire rope will damage strands, and result in an unsafe condition.

The distance between clips should not be less than six times the wire rope diameter. In relation to size of wire rope, the minimum number of clips recommended for a safe connection is as follows:

### **CAUTION**

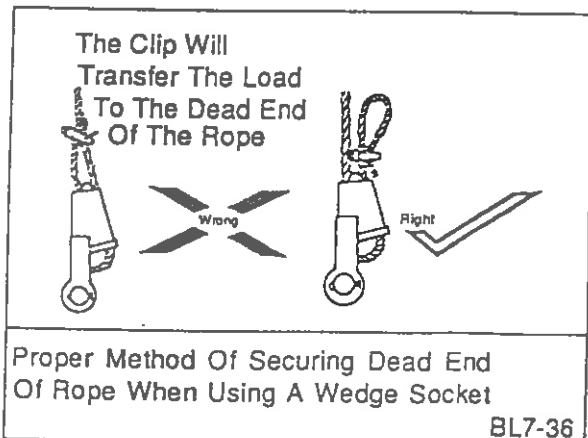
Apply The Initial Load And Retighten Nuts To Recommended Torque. Rope Will Stretch And Shrink In Diameter When Loads Are Applied. Inspect Periodically And Retighten.

#### 10. Use Of Wire Rope Clips With Sockets

Some codes require the use of wire rope clip in conjunction with a wedge socket. In some cases, particularly in wrecking ball work, there is a chance that the wedge can loosen, releasing the socket from the rope. This could be caused by the banging action, and alternate loading and unloading of the rope that occurs during this type work.

As noted before, use of wire rope clips with a wedge socket connection can weaken the connection.

Do not attach the dead end of the rope to the live side with the clip as this will seriously weaken the connection. The clip will ultimately take the load as shown in Fig. BL7-36, and may deform or break the rope. Either install the clip on the dead end of the rope, or loop the dead end over Fig. BL7-36, and install a clip. The loop thus formed must not be allowed to enter the wedge, or the connection will be weakened.

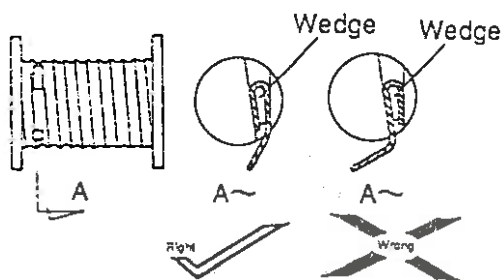


BL7-36

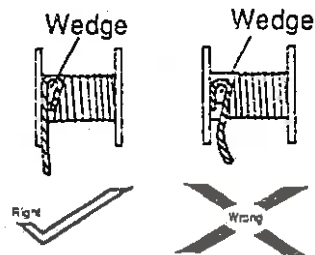
11. Instructions In Setting Wire Rope On Drum

When installing the wire rope to the drum, set it with a large rope winding radius by use of a wedge which is suitable to the rope diameter.

Also install the rope so that it comes out along the drum flange.



※Set So That Rope Bending Radius Is Larger.



※Set So That Rope Comes Out Along The Drum Flange.

Instructions For Setting Rope On Drum

BL265

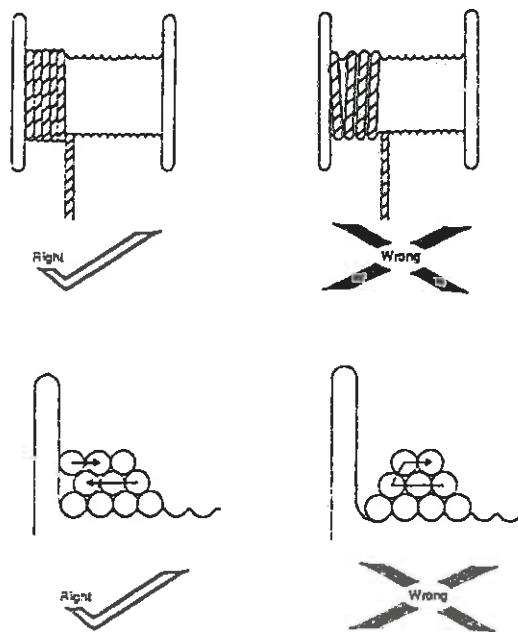
13. Cause Of Irregularly Wound Rope :

- 1) Disorderly winding of the first layer on a drum. Never leave any gap between winds.
- 2) Insufficient approach. A transition from a layer to the next layer must be made after the layer comes into contact with the drum flange.
- 3) Rope should be wound up on a drum with sufficient tension. Lifting a heavy load with a loosely wound rope will cause irregular winding of rope on the drum or breaking of rope wires.

Rope Tension

φ 9/16 inch dia. (14mm): 551 to 1654 lbs  
(.25 ton to .75 ton)

φ 5/8 inch to φ 3/4 inch dia. (φ 16 to φ 20mm): 2205~6614 lbs (1 to 3ton)



Rope Winding

BL268

4) If the machine is provided with a guide sheave on the front of a drum, smooth movement of the guide sheave is essential to prevent irregular winding of rope on the drum. Check the guide sheave for smooth rotation and lubricate.

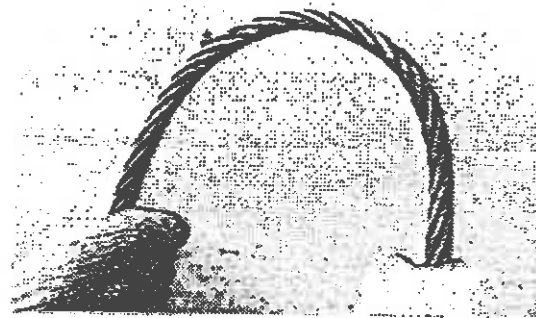
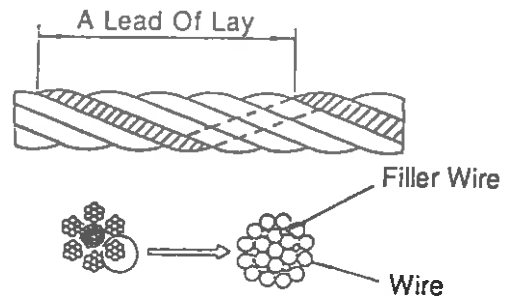
**CAUTION**

If Irregular Winding Caused By Any Reason Is Left Unattended, The Rope Will Become Difficult To Smooth Out. Whenever Irregular Winding Occurs, Stop Operating The Crane. Check And Remove The Cause.

**14. Checking For Wire Breakages :**

If wire breakages are found, check the number of broken wires and distance between breakage locations, and also check if breakages have occurred in the same strand or the same wire. When breakages have occurred within a close range, the cutting of rope near the end prevents the progress of damage to the rope.

If a few wires are broken in appearance, the internal wires of such rope may be broken. Therefore, check the rope for internal wire breakage by bending it (bending radius is up to approximately 5 times the rope diameter) at the time of inspection.



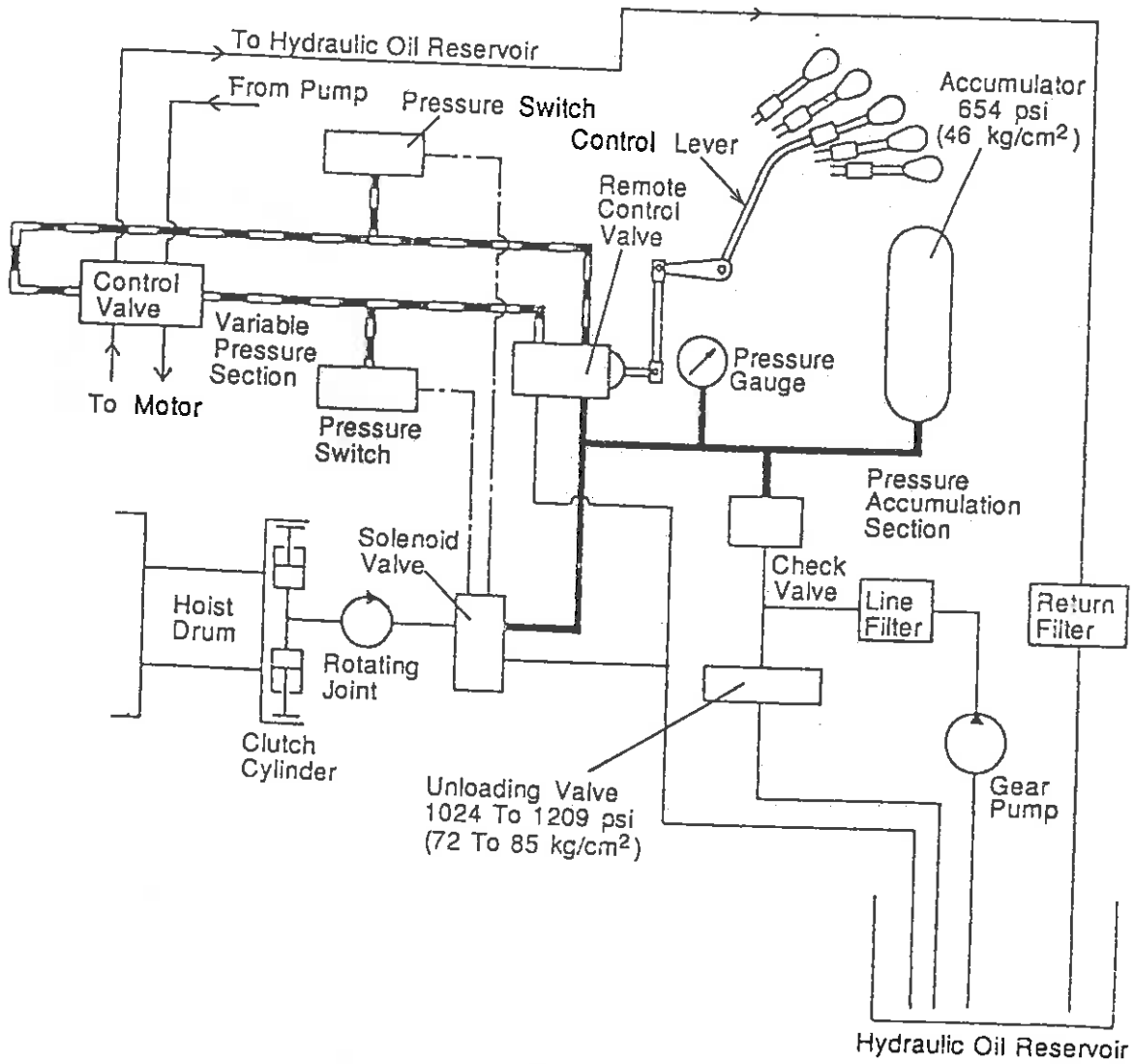
Checking For Internal Breaking

BL270

# Hydraulic Control System (Clutch Circuit)

The clutch hydraulic control system uses a pump that is direct-driven by the engine to generate as well as accumulate hydraulic pressure. It also actuates the remote control valve to change the hydraulic pressure to variable pressure, thereby operating the control valve. When the control valve opens or closes, the pressure switch is activated to operate the solenoid valve, which in turn activates the clutch cylinder to operate the clutch.

The system consists of the hydraulic pressure generation/accumulation section and the variable hydraulic pressure section.



Clutch Hydraulic Lines

CB7-2

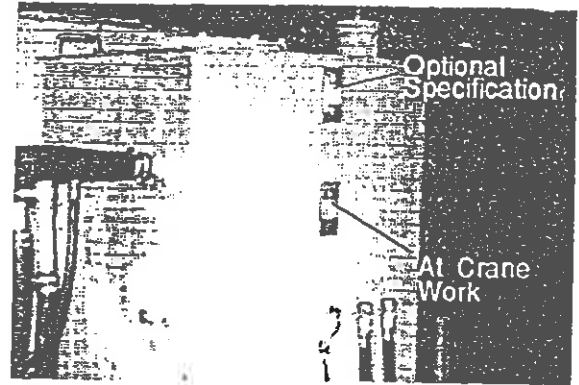
### 1 Hydraulic Oil Reservoir

The hydraulic oil, when used for a long time under high pressure, will deteriorate.

Change the oil every 1500 hours of operation. When filling fresh oil, use oil strainer to prevent entry of dust. Flush sludge and dust deposited on the tank bottom with a cleaning oil.

Check the hydraulic oil level:

The oil level must be slightly above the mid-point between the "H" and "L" levels with all cylinder retracted.



Hydraulic Oil Reservoir Tank

CD7-7

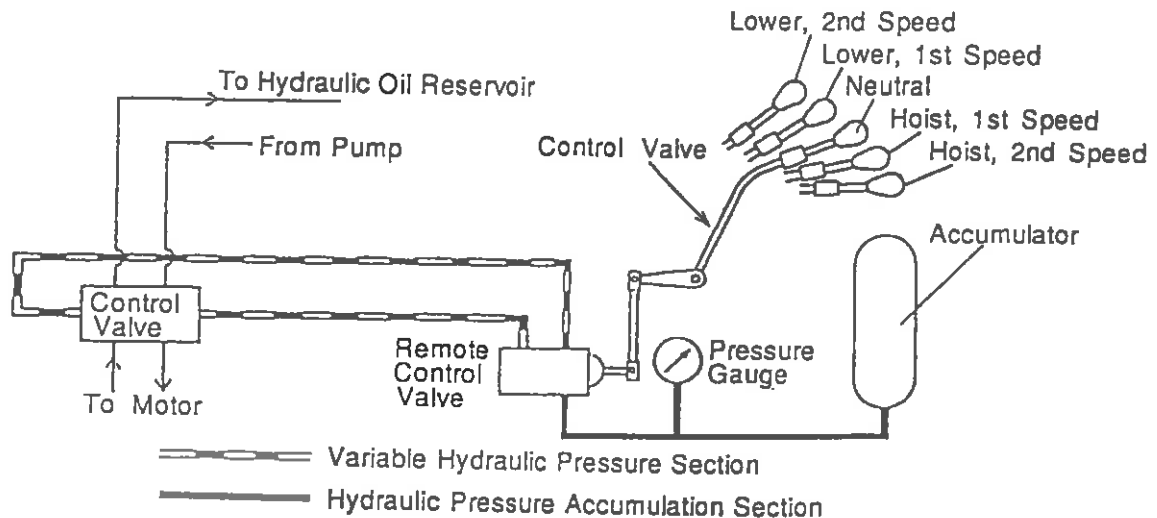
## CAUTION

Hydraulic Oil Becomes Hot During Operation. In Some Case, It Becomes Hot Enough To Cause Severe Burns. Be Careful Not To Let Hot Hydraulic Oil Contact The Skin When Changing Oil.

### 2 Remote Control Valve

The remote control valve changes the accumulated hydraulic pressure of a set pressure into a variable pressure in the range 57 to 213 psi (4 to 15 kg/cm<sup>2</sup>) at 1st speed and the pressure in the range 213 to 398 psi (15 to 28 kg/cm<sup>2</sup>) at 2nd speed according to the amount of movement of the control lever. The control lever returns to its original position by the spring in the remote control valve.

The control valve spool operates in proportion to the variable hydraulic pressure generated by the remote control valve. This allows the hydraulic motor to develop speeds according to the amount of movement of the control lever.



Remote Control Valve

CB7-5

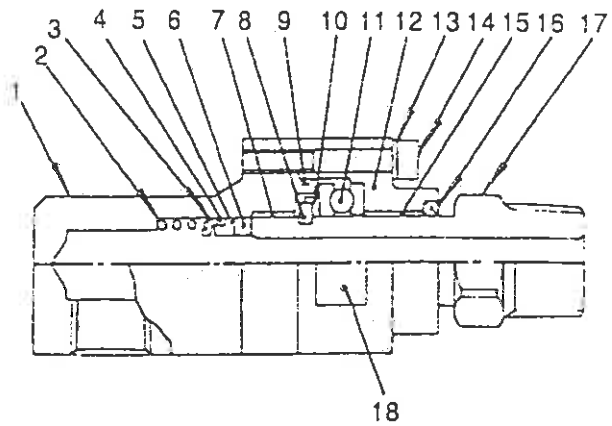


### 3 Rotating Joint

The rotating joint sends hydraulic oil from fixed solenoid valve to rotating clutch cylinder. Mend any leakage immediately as leaked oil may stick to clutch.

#### 3.1 Resealing rotating joint

- 1) Stop engine and move control lever back and forth to lower hydraulic pressure in line to "0".
- 2) Remove lines from rotating joint.
- 3) Turn the head of shaft (17) and remove the rotating joint.
- 4) Replace a new seal tape around threads and install the rotating joint back.
- 5) If oil leakage is not remedied by the seal tape, replace a set of "O-ring" and slipper seal or change an assembly of rotating joint.



1 Sody	10 Washer Cover
2 Spring	11 Bearing
3 Spring Washer	12 Cap
4 O-Ring	13 Washer
5 Seal Ring	14 Bolt
6 Seal	15 Bushing For Cap
7 Body Bushing	16 Oil Seal
8 Washer	17 Shaft
9 O-Ring	18 Name Plate

Rotating Joint

BL328

### CAUTION

Be Cautions To Keep Dust Particles From Getting Into The Joint While Replacing Seal Tape.

A Leakage With Not Be Remedied By A Mere Retightening Without Replacing A New Seal Tape.

If A Seal Tape End Sticks Out Of Screw, It Will Be Torn As Is Threaded-In And it May Lead To A Leakage Of Hydraulic Oil.

#### 3.2 Retightening of rotating joint

### WARNING

Hydraulic Oil Flows To Clutch Through This Rotating Joint. Oil Leakage Or Loose Shaft Will Lead To Slippage Of Clutch Or Cause The Joint To Come Off, Resulting in An Accident. Be Sure To Check It Before Daily Operation And Retighten The Shaft As Required: Tightening Torque is 4.4 in-lbs. (5.0 kg-cm<sup>2</sup>).

## WARNING

When Removing The Filter Immediately After Shutting Down The Engine, Hot Oil Will Spout Out. Care Must Be Taken To Avoid Burns. Before Starting This Work, Shutdown The Engine And Remove The Oil Pressure In The Circuit By Operating The Control Lever Forward/Backward.

### 1 Line Filter

#### 1.1 Outline

The line filter mounted on the pressure side of the pump helps to remove contaminants and dust from the hydraulic oil resulting in a longer lasting system.

#### 1.2 Inspection

As the filter is one of the important hydraulic components to manage the hydraulic oil, be sure to inspect and replace it periodically.

Failure to change the filter element at the recommended time interval may result in a clogged (bypassing) filter. A bypassing filter permits unfiltered oil to pass through the system causing unnecessary wear to the hydraulic components.

#### • Outline:

- (1) Check for oil leaks, deformation, damage and corrosion.
- (2) When abnormal or in doubt, disassemble and repair.

#### • Mounting portion:

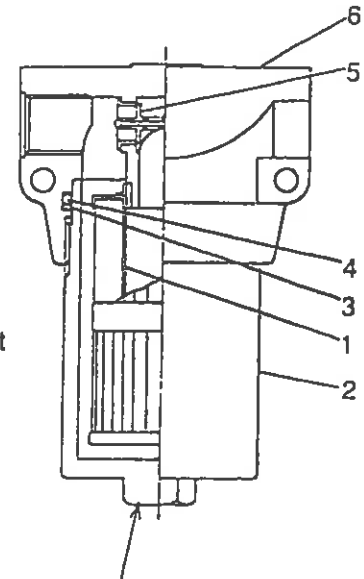
- (1) Check bolts for looseness and failing.
- (2) Retighten.

#### • Element:

- (1) Replace periodically.
  - Periodically: First 50 hours and every 500 hours thereafter.
  - On occasion: When the hydraulic system is overhauled.

## CAUTION

Hydraulic Oil Becomes Hot During Operation. In Some Cases, It Becomes Hot Enough To Cause Severe Burns. Be Careful Not To Let Hot Hydraulic Oil Contact The Skin When Changing Oil.



1. Filter Element
2. Case
3. Backup Ring
4. O-Ring
5. Bypass Valve
6. Head

※ To replace an element, loosen the square head with a wrench.

※ When installing new element, fill case with hydraulic oil before reinstalling.

Line Filter

CB7-3

### 1.3 Disassembly

- 1) Shutdown the engine.

## WARNING

A Sudden Release Of Unrelieved Pressure Can Cause Serious Injury.

- 2) Exhaust the pressure from the hydraulic lines and the filter. Confirm the release of the pressure by moving one control lever back and forth slowly, carefully watching the pressure gauge.

## CAUTION

When Servicing The Filter, Keep Hands, Tools, And Working Areas As Clean As Possible Or More Contamination May Be Added To The System Than The Filter Has Removed.

- 3) Place an oil pan or container under filter bowl and remove the case (2).
- 4) Remove the filter element (1).
- 5) Remove the bypass valve (5).
- 6) Pry O-ring (4) and backup ring (3) from the head with spatula and discard them.

### 1.4 Inspection and parts replacement

- 1) Inspect inside of filter case for foreign material.

## CAUTION

Clean Filter Case With Diesel Fuel Or Approved Solvent.

Check the bypass valve (5) as follows.  
/alve opening pressure: 15 psi (1.05  
7/cm<sup>2</sup>))

Thoroughly clean it in an approved solvent and inspect for wear or damage.

Check for smooth actuation.

- c) Replace filter assembly with new one, if defective.

- 3) Replace all seal parts with new ones.

- 4) For genuine repair parts, refer to "Parts Manual".

### 1.5 Assembly

- 1) Install the bypass valve (5).

- 2) Install a new O-ring (4) and backup ring in the filter case.

## CAUTION

Install O-Ring Without Twisting It In The Head. Don't Allow The O-Ring To Get Scratched While Installing It.

- 3) Install a new element (1).
- 4) Install the case (2). Do not allow O-ring and backup ring to be damaged.
- 5) Wipe dirty oil from the filter assembly.
- 6) Start machine and build up the hydraulic pressure. Inspect filter assembly for leaks. If any, repair before further operation.

## 2 Return Filter

### **WARNING**

When Replacing The Element Immediately After Shutting Down The Engine, Hot Oil Will Spout Out. Replace The Filter After The Oil Temperature And Pressure Go Down.

### **CAUTION**

Hydraulic Oil Becomes Hot During Operation. In Some Cases, It Becomes Hot Enough To Cause Severe Burns. Be Careful Not To Let Hot Hydraulic Oil Contact The Skin When Changing Oil.

#### 2.1 Outline

The return filter mounted on the return line of the hydraulic system helps to remove contaminants and dust that came from the system resulting in a longer lasting system.

#### 2.2 Inspection

As the filter is one of the important hydraulic components to manage the hydraulic oil, be sure to inspect and replace it periodically.

Failure to change the filter element at the recommended time interval may result in a clogged (bypassing) filter. A bypassing filter permits unfiltered oil to pass through the system causing unnecessary wear to the hydraulic components.

##### • Outline:

- (1) Check for oil leaks, deformation, damage and corrosion.
- (2) When abnormal or in doubt, disassemble and repair.

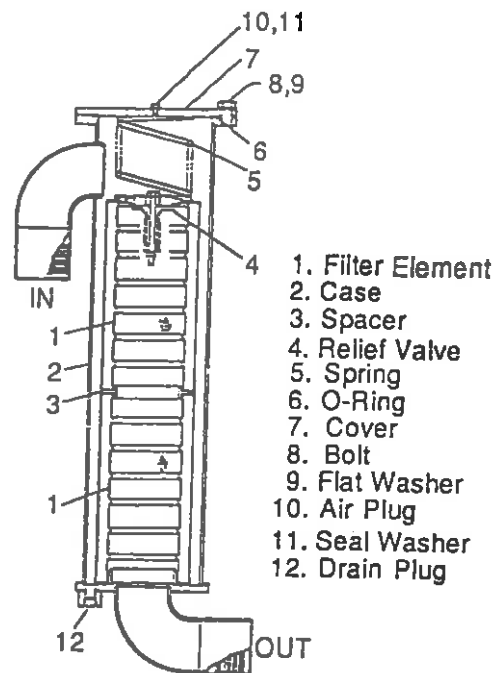
##### • Mounting portion:

- (1) Check bolts for looseness and failing.
- (2) Retighten.

##### • Element:

- (1) Replace periodically.
  - Periodically: First 50 hours and every 500 hours thereafter.
  - On occasion: When the hydraulic system is overhauled.

※ On delivery, the element ( $5\mu$ ) is installed. Whenever the element is replaced, install one of  $10\mu$ .



Return Filter

CB7-4

### 2.3 Disassembly

- 1) Shutdown the engine.
- 2) Keep the machine for approx. 30 minutes as it is.

#### **WARNING**

A Sudden Release Of Unrelieved Pressure Can Cause Serious Injury.

When Servicing The Filter, Keep Hands, Tools, And Working Areas As Clean As Possible Or More Contamination May Be Added To The System Than The Filter Has Removed.

- 3) Remove the air plug (10) or all of hydraulic oil flows out.
- 4) Place an oil pan or container under drain plug (12) and remove it to drain oil.
- 5) Unscrew the bolt (8) and remove the case cover (7).

#### **CAUTION**

The Spring Is Compressed. When Removing The Cover, Use Caution.

- 6) Remove the spring (5) and relief valve (4).
- 7) Remove the element (top) (1), spacer (3) and the element (bottom) (1) in order. Discard the element.

### 2.4 Inspection and parts replacement

- 1) inspect inside of filter case for foreign material.

#### **CAUTION**

Clean Filter Case With Diesel Fuel Or Approved Solvent.

- 2) Check the relief valve (4) as follows.  
(Valve opening pressure:  $14.2 \pm 2.8$  psi  
( $1.0 \pm .2$  kg/cm<sup>2</sup>))

- a) Thoroughly clean it in an approved solvent and inspect for wear or damage.
  - b) Check for smooth actuation.
  - c) Replace filter assembly with new one, if defective.
- 3) For genuine repair parts, refer to "Parts Manual".

### 2.5 Assembly

- 1) Install new element with element (bottom) (1), spacer (3) and element (top) (1) in order in the filter case (2).
- 2) Install the drain plug (12) on the filter case.
- 3) Fill with a new hydraulic oil.
- 4) Install the relief valve (4) and spring (5).
- 5) Install the case cover (7) with bolts, confirming the spring positioning.
- 6) Install the air plug (10).
- 7) Wipe dirty oil from the filter assembly.
- 8) Start machine and build up the hydraulic pressure. Inspect filter assembly for leaks. If any, repair before further operation.
- 9) Check the hydraulic oil reservoir tank level, and add oil as necessary.

## 1 Checking The Nitrogen Gas Pressure

The handy inspection procedures are as follows.

- 1) Place all control levers in neutral.
- 2) Raise the pressure to 1209 psi (85 kg/cm<sup>2</sup>) on pressure gauge on the control panel and shutdown the engine.
- 3) Operate the control lever back and forth to lower the pressure watching the pressure gauge.

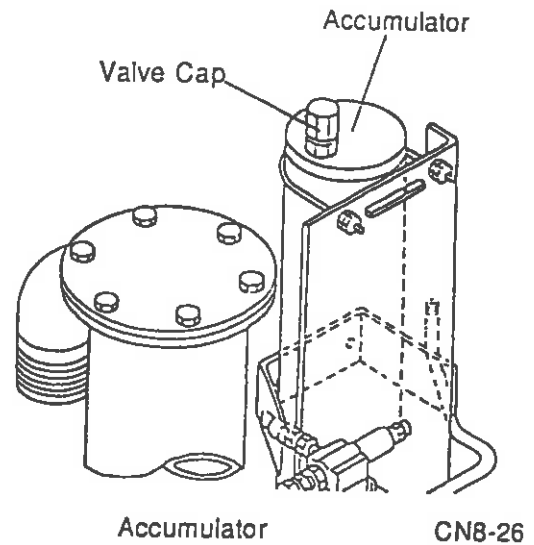
### • Normal Function

The pointer of the gauge drops rapidly from the vicinity of 654 psi (46 kg/cm<sup>2</sup>) to 0 psi (kg/cm<sup>2</sup>).

### • Abnormal Function

The pointer starts to fall rapidly below 498 psi (35 kg/cm<sup>2</sup>). The pointer falls rapidly from 1209 psi (85 kg/cm<sup>2</sup>).

Note: In these cases, the accumulator is defective and it is required repair it or recharge the nitrogen gas.



## 2 Checking The Air Valve

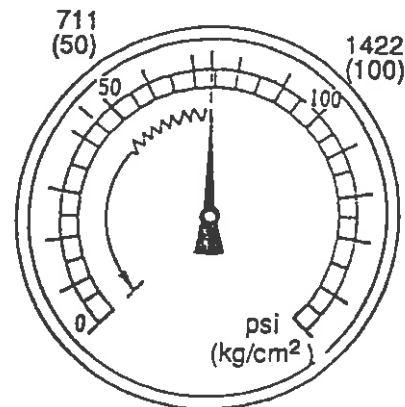
If there is any doubt, check the air valve.

- 1) Remove the cover of the cap of air valve.
- 2) Apply soapy water to top of the valve and valve mounting thread.
- 3) If bubbles appear at air valve top, the valve is defective, requiring replacement.
- 4) If bubbles appear at mounting thread, sealing at the thread is defective. Apply sealing component for perfect sealing.

**⚠ CAUTION**

Do Not Remove The Valve Body From Accumulator. The Accumulator Is Charged With Nitrogen Gas Under Pressure.

Note: When replacing the valve or charging nitrogen gas, consult your nearest LBCE Distributor.



Normal Motion Of Pointer

CN8-27

## 1 Track Shoe Tension Adjustment

Excessively loose track shoes can cause the drive sprockets to climb on the shoe lugs or the track shoes to be off from the track rollers during steering. Adjust the track shoe tension if the track sags more than the specified value.

Adjust the shoe tension as follows by moving the take-up roller shaft.

- 1) With the lock nut (1) fully loosened, inch the travel lever forward or backward to supply oil to the cylinder (2). This makes the shoes tight.
- 2) Turn the lock nut (1) in the tightening direction until it comes in contact with the frame.
- 3) With the engine shutdown, loosen the hexagonal plug (3) located under the long elbow to drain oil from the shoe tension cylinder.

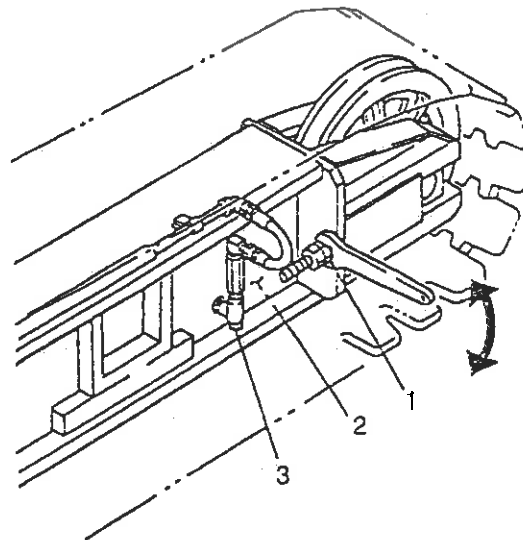
### **WARNING**

The Oil In The Cylinder May Spray Out Due To High Pressure. Loosen Hexagonal Plug Slowly Until Pressure Is Relieved.

- 4) With clearance between the lock nut (1) and frame approaching  $13/32$ " (10 mm), tighten hexagonal plug to stop draining the oil.
- 5) Turn lock nut (1) one complete turn in the tightening direction.

Note: An adjusting take-up bolt is provided on each side of the side frame. Adjust each bolt equally.

Note: Tension adjustment also can be made by turning the nut one complete turn by using a wrench without draining the oil after step 2) above.

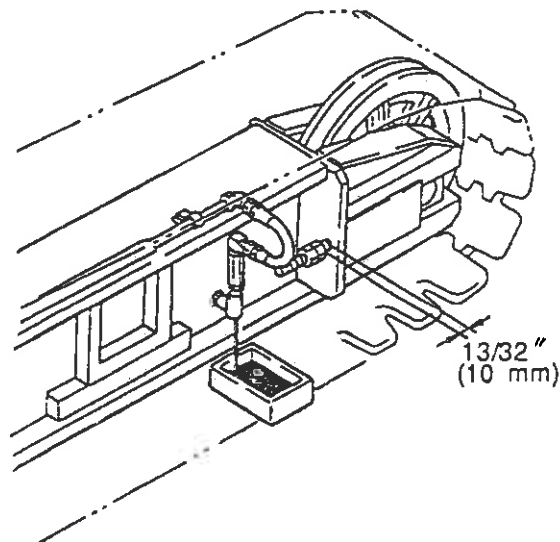


Track Shoe Tension

CD7-5

## 2 Track Shoe Removal

To remove the track shoes, proceed as follows. With the engine stopped, remove the hexagonal plug (3) located under the long elbow to drain oil. This causes the cylinder (2) to compress, relieving tension from the shoes. The shoe can be removed by removing the bolt and shoe pin.



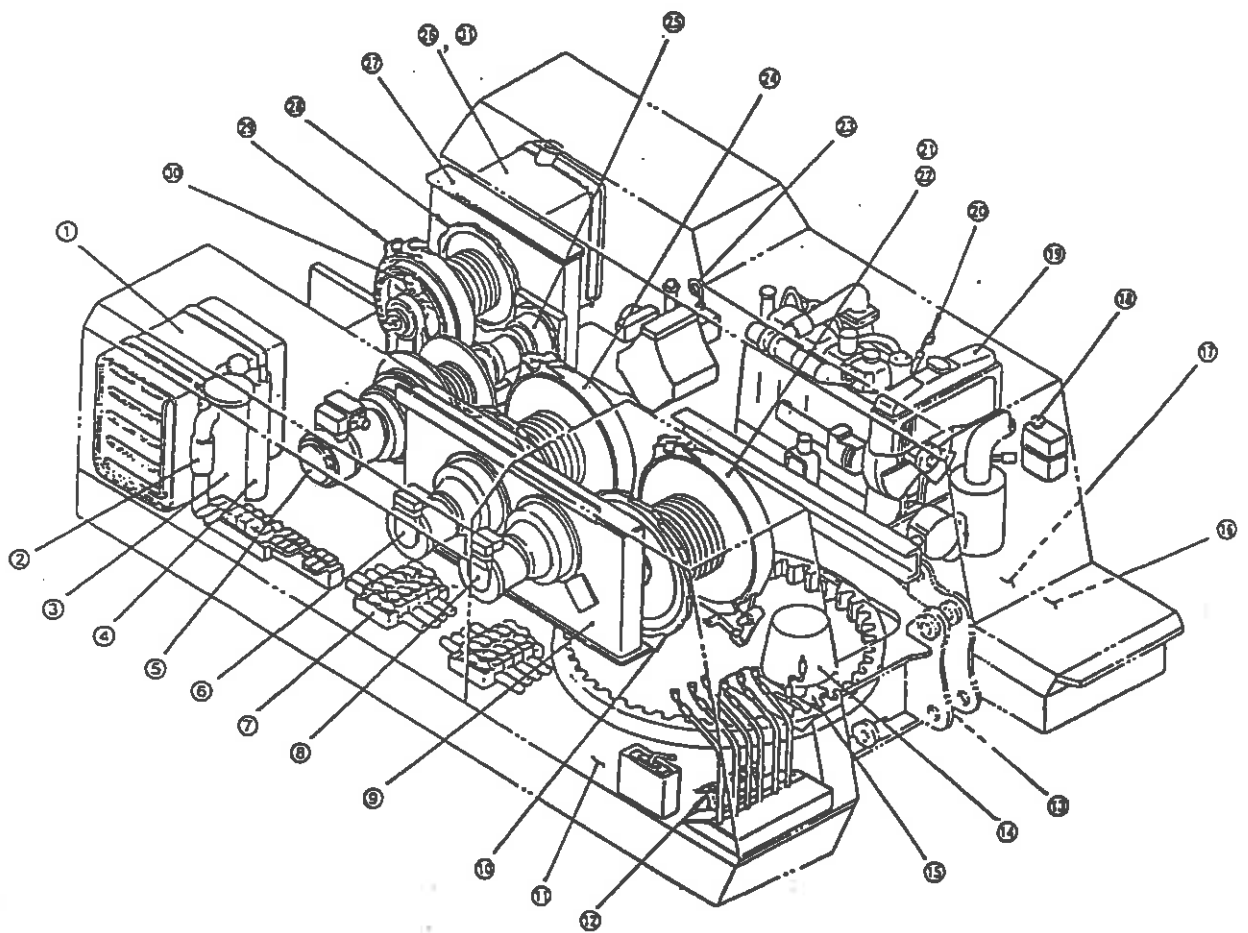
Draining Oil From Shoe Tension Cylinder

CD7-6

**CAUTION**

For Inspection And Lubrication, Be Sure To Shut Down The Engine.

1 Lubrication And Servicing Points



ECD8-1



2 Servicing/Lubrication Chart

	Point	Grease Capacity gal. (lit.)	Spec.	No. of points	Intervals (hrs.)				
					10	50	250	500	1000
1	Fuel tank	76.6 (290)	Light oil	1	When required Drain water as required				
2	Hoses and pipes	—	—	All points	Visually check				
3	Return filter	3.7 (14)	—	1		△		●	
4	Accumulator	—	Nitrogen gas	1			Check for gas pressure		
5	Boom hoist hydraulic motor reduction gear	1.1 (4)	Gear oil	1			◎		●
6	Aux. hoist hydraulic motor reduction gear	1.1 (4)	Gear oil	1			◎		●
7	Control valve	—	—	All points		Check for oil leaks			
8	Main hoist hydraulic motor reduction gear	1.1 (4)	Gear oil	1			◎		●
9	Main/Aux. hoist gear case	3.4 (13)	Gear oil	1			◎		●
10	Drum lock (main, aux. boom hoist)	—	—	3					
11	Control valve rod	—	—	All points	Rod for bends, Loose nut				
12	Drum brake pedals (main, aux. 3rd optional)	—	—	3	◎	Check pedal stroke			
13	Turntable bearing	*	E.P. Grease	4		○	Check bolt		
14	Swing reduction gear	2.9 (11)	Gear oil	1			◎		●
15	Swing gear	Grease bath	E.P. Grease	1			◎		●
16	Fuse	—	—	All points			Check for deterioration		
17	Battery	As required	Distilled water	2		◎			
18	Reservoir tank (excl. radiator coolant)	H=0.4 (1.5) L=0.11 (0.43)	Soft water	1	◎				●
19	Radiator (incl. coolant)	7.4 (28)	Soft water	1					●
20	Engine oil (incl. oil cooler)	6.6 (25)	Engine oil	1	◎	△	●		

# Points Of Lubrication And Servicing Upper Machinery

	Point	Grease Capacity gal. (lit.)	Spec.	No. of points	Intervals (hrs.)				
					10	50	250	500	1000
21	Main hoist drum brake	—	—	1		Check and adjust			
22	Clutch and related parts	—	—	All points		Check and adjust			
23	Pump drive gear case	1.8 (7)	Gear oil	1		⊙		●	
24	Aux. hoist drum brake	—	—	1		Check and adjust			
25	3rd drum hydraulic motor reduction gear (Optional)	0.3 (1)	Gear oil	1			⊙		●
26	Hydraulic oil reservoir	52.8 (200)	Hyd. oil	1	⊙			Change oil every 1500 hours	
27	3rd drum gear case (Optional)	1.3 (5)	Gear oil	1			⊙		●
28	3rd drum lock	—	—	1		Check			
29	3rd drum brake (Optional)	—	—	1		Check and adjust			
30	3rd drum clutch (Optional)	—	—	1		Check and adjust			
31	Line filter	—	—	1		△		●	

⊙: Check and add.

○: Lubricate grease.

△: Change initially.

●: Change oil, grease or coolant or replace element.

Note: Grease capacity is for one unit.

Note: For points marked by \*, apply grease by the amount to let it come out at the ends. Do not apply too much grease.

## CAUTION

Hydraulic Oil Becomes Hot During Operation. In Some Cases, It becomes Hot Enough To Cause Severe Burns. Be Careful Not To Let Hot Hydraulic Oil Contact The Skin When Changing Oil.

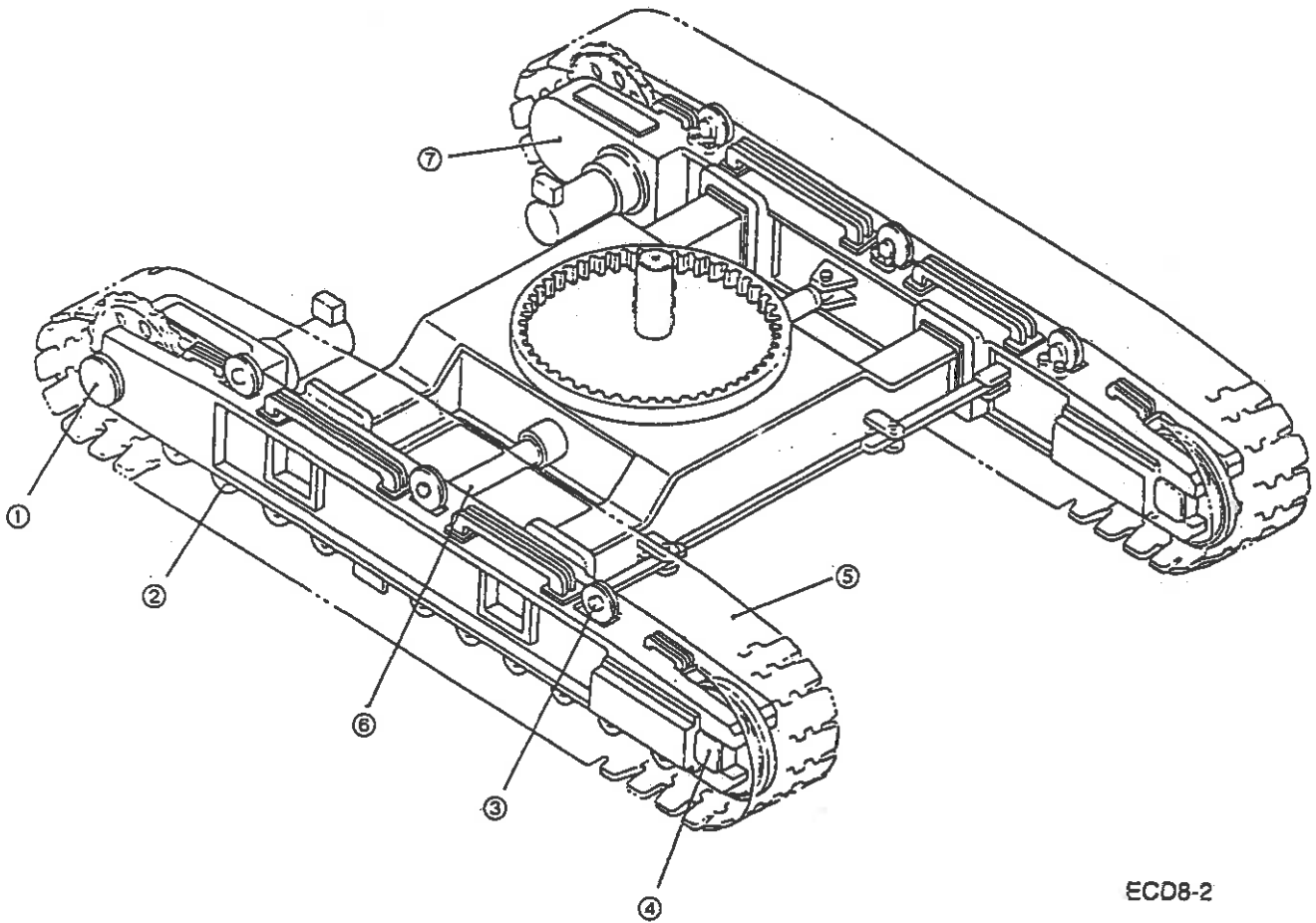
## CAUTION

Engine Oil Becomes Hot During Operation. In Some Cases, It Becomes Hot Enough To Cause Severe Burns. Be Careful Not To Let Hot Engine Oil Contact The Skin When Changing Oil.

**CAUTION**

For Inspection And Lubrication, Be Sure To Shut Down The Engine.

1 Lubrication And Servicing Points



EC08-2

**CAUTION**

Do Not Place Your Foot Between Shoes When Getting On Or Off A Machine. Use Steps Provided.

2 Servicing/Lubrication Chart

	Point	Grease Capacity gal. (lit.)	Spec.	No. of points	Intervals (hrs.)				
					10	50	250	500	1000
1	Drive tumbler (both sides)	0.2 (0.6)	Gear oil	2	Check for oil leak		⊙		●
2	Track roller	0.6 (2.1)	Engine oil	20	Check for oil leak				●
3	Carrier roller cc/part	1.0 (3.6)	Engine oil	6	Check for oil leak				●
4	Idler tumbler	0.2 (0.6)	Engine oil	2	Check for oil leak				●
5	Track shoe	—	—	All points		Check tension	Check every 500 hours		
6	Retraction cylinder	—	—				Check for oil leak		
7	Traveling reduction gear (both sides)	13.2 (50)	Gear oil	2			Check for oil leak		●

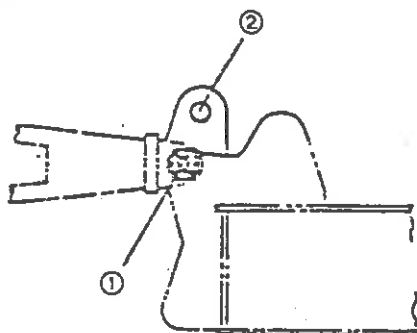
- ⊙: Check and add.
- : Lubricate grease.
- △: Change initially.
- : Change oil, grease or coolant or replace element.

Note: Grease capacity is for one unit.

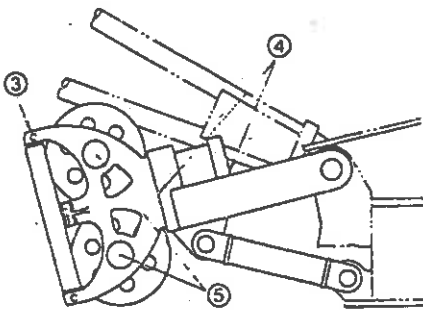
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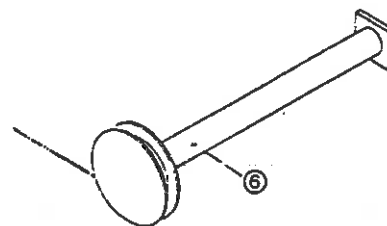
1 Lubrication And Servicing Points



ECD8-3



ECD8-4



ECD8-8

2 Servicing/Lubrication Chart For Upper Machine

	Point	Grease Capacity gal. (lit.)	Spec.	No. of points	Intervals (hrs.)				
					10	50	250	500	1000
1	Boom foot pin	*	E.P. Grease	2	○				
2	Gantry foot pin	*	E.P. Grease	2	○				
3	Fairleader roller	*	E.P. Grease	4		○			
4	Fairleader base	*	E.P. Grease	2		○			
5	Fairleader sheave	*	E.P. Grease	2		○	Check wear of groove		
6	Tagline	3.4 (13)	Engine oil	1	Check oil leakage		◎		

- ◎: Check and add.
- : Lubricate grease.
- △: Change initially.
- : Change oil, grease or coolant or replace element.

Note: Grease capacity is for one unit.

Note: For points marked by \*, apply grease by the amount to let it come out at the ends. Do not apply too too much grease.

## Antifreeze

An antifreeze is used to prevent freezing of the engine cooling water in cold weather. The amount of antifreeze to be mixed into the cooling water is dependent upon the ambient temperature.

Full capacity of cooling water in MITSUBISHI 6D22TC/6D22CT engine	10.7gal. (40.5 lit.)
Amount of antifreeze added at shipping	(55%) 5.9gal. (22.3 lit.)

Table 1

### 1 Types Of Antifreeze Compound

- Permanent type (Standard)
- Alcohol type

Because the permanent type antifreeze does not evaporate by heating, add only water to restore original level.

Antifreeze mixing ratio (%)	Freezing temperature
10%	Approx. 26.6° F (- 3°C)
15%	Approx. 21.2° F (- 6°C)
20%	Approx. 17.6° F (- 8°C)
25%	Approx. 10.4° F (-12°C)
30%	Approx. 5.0° F (-15°C)
35%	Approx. -4.0° F (-20°C)
40%	Approx. -13.0° F (-25°C)
45%	Approx. -23.8° F (-31°C)
50%	Approx. -34.6° F (-37°C)
55%	Approx. -47.2° F (-44°C)
60%	Approx. -63.4° F (-53°C)
65%	Approx. -72.4° F (-58°C)

Table 2

### 2 Mixing Ratio Of Antifreeze In Cooling Water

On machines to be shipped out from our works, the antifreeze is mixed at the ratio given in Table 1. However, depending upon the area where the machine will be operated, alter the mixing ratio referring to Table 2.

1 Fuel Oil

Use per the chart below, according to the ambient temperature.

2 Antifreeze

Below temperature of 32° F (0° C), add antifreeze.

See the manual for cold-weather use for the correct ratio.

Supply point	Oil type	Use according to ambient temperature				
		-10 14	0 32	10 50	20 68	30° C 86° F
Engine oil pan	Engine oil API-CD class	SAE 30				
		SAE 10W · 30				
Swing reduction gear Travel reduction gear Hoist gear box	Gear oil API-GL-4 class	SAE 90				
Hydraulic oil tank	Hydraulic oil Anti-wear type	ISO-VG 46				
Fuel tank	Light oil ASTM-D-975	No. 2D				
		No. 1D				
Cooling system	Water with long life coolant ASTM D3306	Add antifreezing solution				
Turntable bearing	E.P. Grease Extreme pressure type	EP 1				
		EP 2				
Pump drive gear case	Gear oil with Anti-wear additive	SAE 140 & A.S.O.				

Note: When operating in an ambient temperature above or below those shown here contact your nearest distributor.

See chart below for the bolt tightening torque where particular torque is not specified.

1 Check And Retightening Interval

Bolts should be retightened in the first 40 hours of new machine operation in accordance with the chart below. Thereafter, check in every 200 hours of operation.

Torques are indicated for new metric thread of nominal M6~M36 diameter. Torque tolerance of within  $\pm 7.7\%$  should be observed, which however, should not be applied to the following cases:

- 1) When a tightening torque is particularly specified.
- 2) Where nylon packing or other non-ferrous washer is in use.
- 3) Where bolt and nut are plated.

2 Tightening Torques (Dry)

Classification	4TSN	7TVN	10.9YN	12.9	Classification	4T	7T	10.9	12.9
Tensile strength kg/mm <sup>2</sup> (PSI)	56880 (40)	99540 (70)	142200 ~170640 (100~120)	170640 ~199080 (120~140)	Tensile strength kg/mm <sup>2</sup> (PSI)	56880 (40)	99540 (70)	142200 ~170640 (100~120)	170640 ~199080 (120~140)
Nominal diameter	Punch mark None	7	10.9	12.9	Nominal diameter	None	7	10.9	12.9
*M6x1	2.5 (0.35)	5.5 (0.76)	9.9 (1.37)	11.9 (1.65)	*M20x2.5	102.0 (14.1)	222.1 (30.7)	399.3 (55.2)	478.8 (66.2)
*M8x1.25	6.1 (0.85)	13.4 (1.85)	24.1 (3.33)	28.9 (4.00)	**M20x1.5	112.1 (15.5)	243.0 (33.6)	438.3 (60.6)	525.8 (72.7)
*M10x1.5	12.2 (1.68)	26.4 (3.65)	47.6 (6.58)	57.1 (7.89)	*M22x2.5	(19.2) 138.9	301.6 (41.7)	543.2 (75.1)	651.7 (90.1)
M10x1.25	12.7 (1.76)	27.7 (3.83)	49.9 (6.90)	59.9 (8.28)	**M22x2	(20.0) 144.7	314.6 (43.5)	566.3 (78.3)	679.9 (94.0)
**M10x1	13.4 (1.85)	29.1 (4.02)	52.3 (7.23)	62.7 (8.67)	M22x1.5	(20.8) 150.4	327.7 (45.3)	590.2 (81.6)	707.4 (97.8)
*M12x1.75	21.2 (2.93)	46.0 (6.36)	83.2 (11.5)	99.1 (13.7)	*M24x3	176.5 (24.4)	383.3 (53.0)	690.0 (95.4)	828.2 (114.5)
M12x1.5	22.1 (3.05)	48.0 (6.63)	86.1 (11.9)	104.2 (14.4)	**M24x2	190.2 (26.3)	414.4 (57.3)	745.0 (103)	896.9 (124)
**M12x1.25	22.9 (3.17)	49.8 (5.89)	89.7 (12.4)	107.8 (14.9)	*M27x3	257.5 (35.6)	560.5 (77.5)	1005.4 (139)	1193.4 (165)
*M14x2	33.8 (4.58)	73.8 (10.2)	132.4 (18.3)	158.4 (21.9)	**M27x2	275.6 (38.1)	599.6 (82.9)	1077.7 (149)	1294.6 (179)
M14x1.5	36.2 (5.00)	78.8 (10.9)	141.8 (19.6)	170.0 (23.5)	*M30x3.5	350.1 (48.4)	759.5 (105)	1367.0 (189)	1641.9 (227)
M14x1	38.6 (5.34)	83.9 (11.6)	151.2 (20.9)	181.5 (25.1)	**M30x2	383.3 (53.0)	831.8 (115)	1497.2 (207)	1801.0 (249)
*M16x2	52.2 (7.22)	113.6 (15.7)	204.7 (28.3)	245.2 (33.9)	*M33x3.5	475.2 (65.7)	1034.3 (143)	1858.9 (257)	2235.0 (309)
**M16x1.5	55.4 (7.66)	120.1 (16.6)	217.0 (30.0)	260.4 (36.0)	**M33x2	515.7 (71.3)	1121.1 (155)	2018.0 (279)	2423.0 (335)
*M18x2.5	72.3 (10.0)	157.7 (21.8)	293.5 (39.2)	339.9 (47.0)	*M36x4	611.2 (84.5)	1330.9 (184)	2394.1 (331)	2864.2 (396)
M18x1.5	80.3 (11.1)	175.0 (24.2)	314.6 (43.5)	377.6 (52.2)	**M36x2	675.6 (93.4)	1468.3 (203)	2647.2 (366)	3168.0 (438)

\*: Metric Coarse Thread

\*\* : Metric Fine Thread (SHI Engineering Standard For Nagoya Works)



Punch Mark On Bolt Head



Rank such as 4T or 7T in the chart indicates the grade of bolt by mechanical characteristics and are normally punched on bolt head except for 4T bolt. 4T means the bolt for which the material with at least 56880psi (40kg/mm<sup>2</sup>) of tensile strength used, and 7T bolt has the minimum tensile strength of 99540psi (70kg/mm<sup>2</sup>). (T=Tensile Strength). The greater the number, the stronger the material, but it should be noted that it is not proportionate to the specified torque.

### 3 Tightening Torque Applicable Where Lubricant Is Applied

The tightening torque where grease containing molybdenum disulfide has been applied to the thread portion of bolt, should be rated as follows depending on the way of coating:

- 1) 85% of value in chart, when thread portion only is coated.
- 2) 65% of the same, if thread and thread seat surface are coated.

An antifreeze is used to prevent freezing of the engine cooling water in cold weather. The amount of antifreeze to be mixed into the cooling water is dependent upon the ambient temperature.

Full capacity of cooling water in MITSUBISHI 6D22TC/6D22CT engine	10.7gal. (40.5 lit.)
Amount of antifreeze added at shipping	(55%) 5.9gal. (22.3 lit.)

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Engine oil pan	Engine oil API-CD class	SAE 30				
		SAE 10W • 30				
Swing reduction gear Travel reduction gear Hoist gear box	Gear oil API-GL-4 class	SAE 90				
Hydraulic oil tank	Hydraulic oil Anti-wear type	ISO-VG 46				
Fuel tank	Light oil ASTM-D-975	No. 2D				
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Cooling system	Water with long life coolant ASTM D3306	Add antifreezing solution				
Turntable bearing	E.P. Grease Extreme pressure type	EP 1				
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Pump drive gear case	Gear oil with Anti-wear additive	SAE 140 & A.S.O.				

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Nominal diameter	Punch mark				Nominal diameter	Punch mark			
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