BUCYRUS®

Technical Manual

SAFETY - SWINGING RESTRAINT & BALLAST BOX SUPPORT

BALLAST BOX SUPPORT

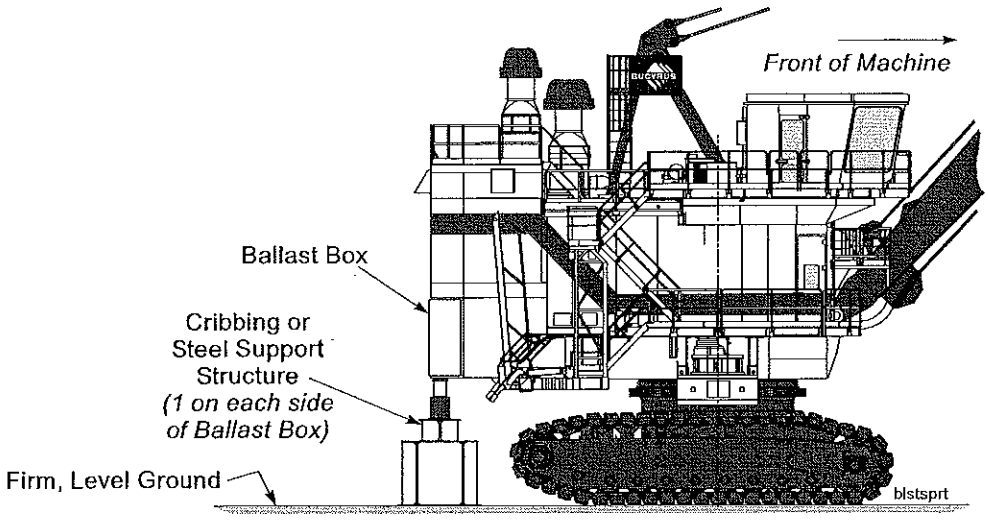
Before performing any maintenance on the mining shovel, it should be resting on a firm, level surface.

Any mining shovel field work that requires the removal or lowering of the boom must incorporate additional support of the ballast box. The supports may be wooden cribbing or steel structures. Two supports positioned side-by-side on level ground are recommended. These supports are intended to accept vertical loads only. To prevent machine rotation use the swing brakes, cable stays, welded ties, etc. Refer to "SWING RESTRAINT" below.

When electric-powered, cable-style mining shovels are properly ballasted and operational, the center of gravity for the machine's upper works lies within the roller circle area. This assumes that the boom is attached to the machine and in its elevated, working position. As such, the machine should not be prone to tipping.

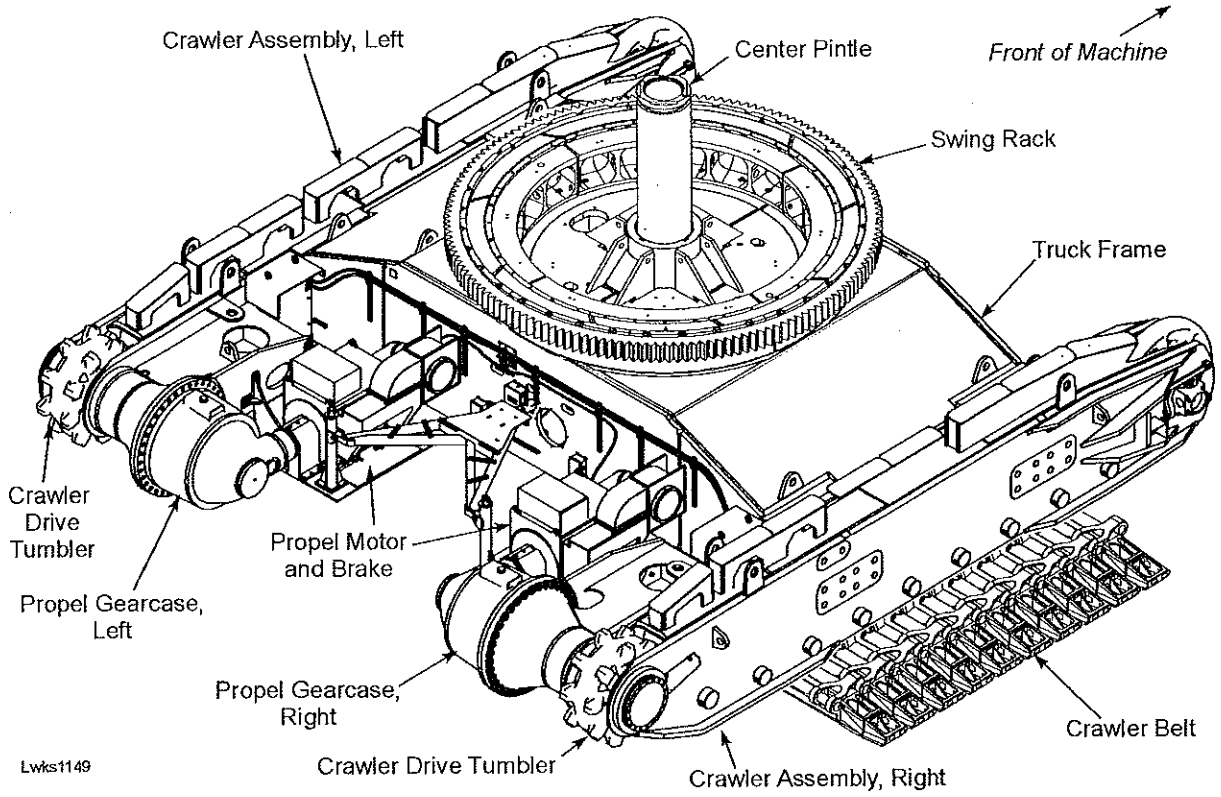
Boom removal or lowering will cause the center of gravity to shift toward the ballast box, decreasing machine stability. Stability is further dependent on the orientation of the upper works relative to the undercarriage. The machine may tip more easily over one of the four quadrants of the crawler mounting than it may over others.

Normally the machine is more likely to tip over the rear-most lower-roller than over the side of a crawler. Therefore, with the boom removed and the ballast box sitting over the rear of the crawlers, the machine may be unstable. Because ballast quantities differ from machine to machine and model to model, it is recommended that the ballast box be supported *before* beginning any procedure to lower and/or remove the boom.



LOWER WORKS

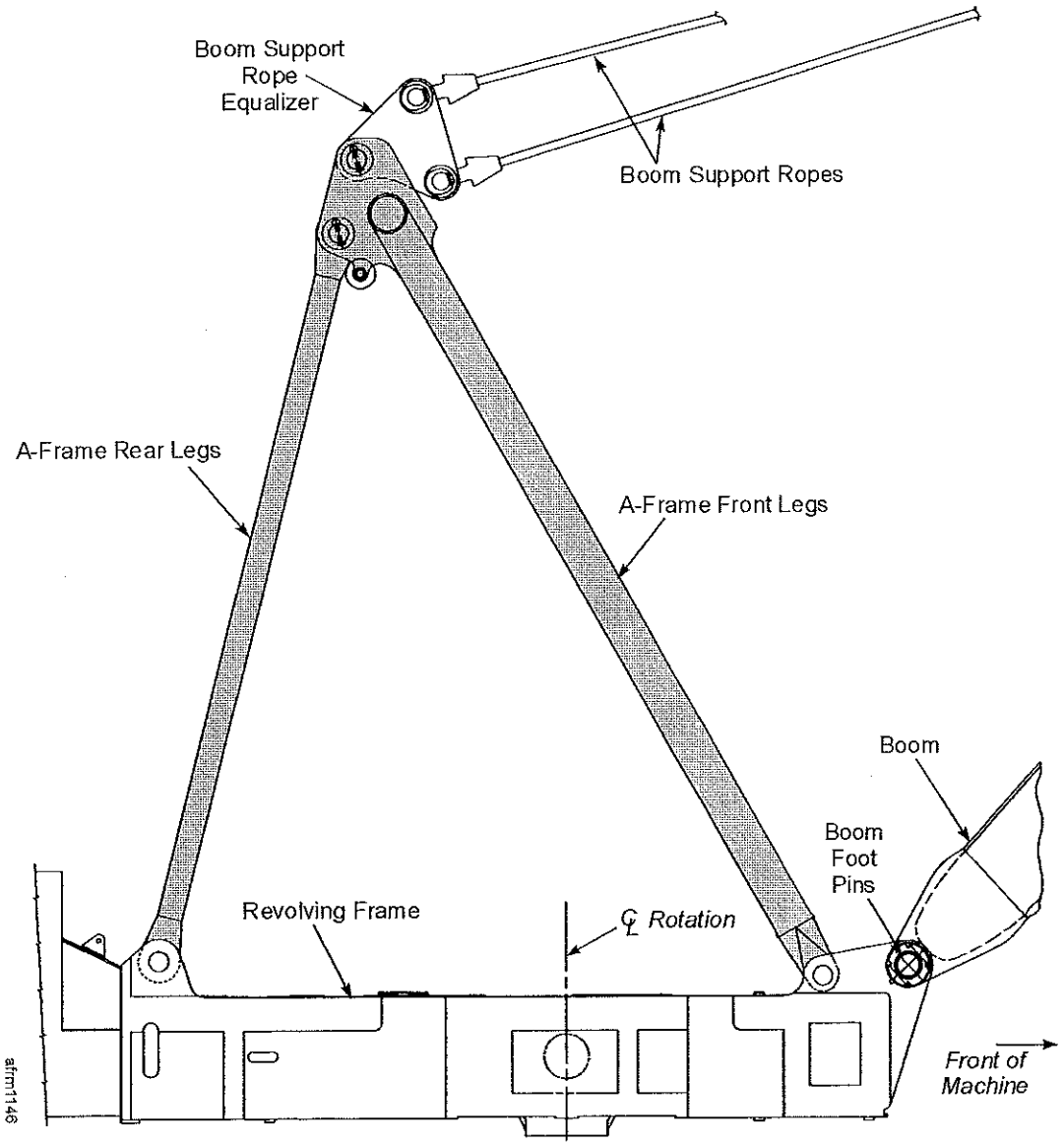
The lower works is comprised of the truck frame, right and left crawler frames, crawler belts, propel machinery, swing rack and roller circle.



Truck Frame and Crawlers

A-FRAME

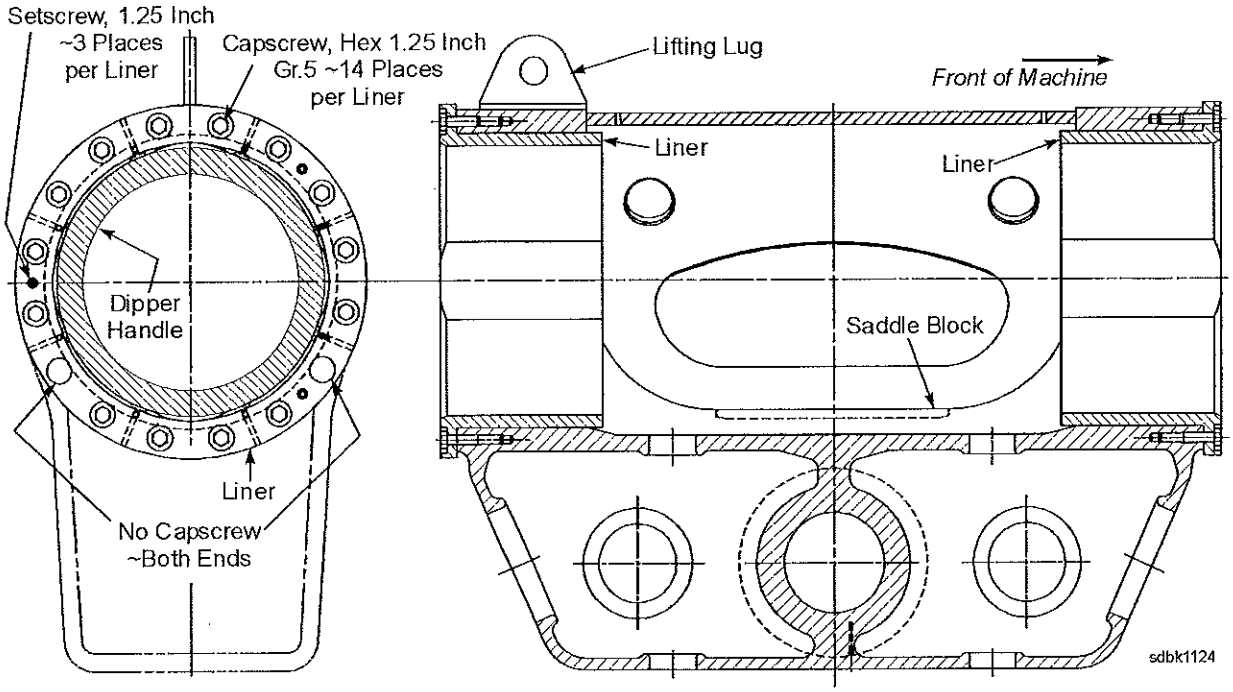
An A-frame with seamless tubular alloy steel front legs provides ample space for the retracted dipper handle end. The rear legs are cold weather steel fabricated beams. Both front and rear legs are pin connected to lugs integral with revolving frame. The A-frame supports the boom via structural strands.



A- Frame and Front End Support Components

SADDLE BLOCK

The saddle block is positioned between the boom side girders in the mid-section of the boom. It pivots on manganese-bronze bushings about the shipper shaft. It acts as a guide for the longitudinal movement of the dipper handle. The free-floating design of the handle in the saddle block eliminates handle torsion.



DIPPER HANDLE

The dipper is attached to one end of the large diameter handle. The crowd rope half-sheave is attached to the other end. A hydraulic rope take-up mechanism at the dipper end, and the crowd rope adjusting mechanism are used to remove slack from the crowd/retract rope system. The dipper handle crowds out and retracts within the saddle block.

An electrical rate reduction circuit, along with the crowd ropes, absorb digging shock loads encountered when the dipper is crowded into the bank.

Section **2**

Operation

Always refer to the safety information in Section 1 of this manual before starting any maintenance procedure on this machine.

Table of Contents

HOIST BRAKE

A selector switch used to set or release the Hoist Brake.

CROWD BRAKE

A selector switch used to set or release the Crowd Brake.

SWING BRAKE

A selector switch used to set or release the Swing Brake.

PROPEL BRAKE

A selector switch used to set or release the Propel Brake.

HVAC UNIT SELECTOR

A 3-position selector switch used to select air conditioner unit No.1, No. 2, or off.

TEMPERATURE

A rheostat used to control the temperature in the operator's cab relative to the selected mode of operation.

HVAC SYSTEM CONTROL

A 4-position selector switch used to select the HVAC system mode of operation.

HVAC FAN SPEED

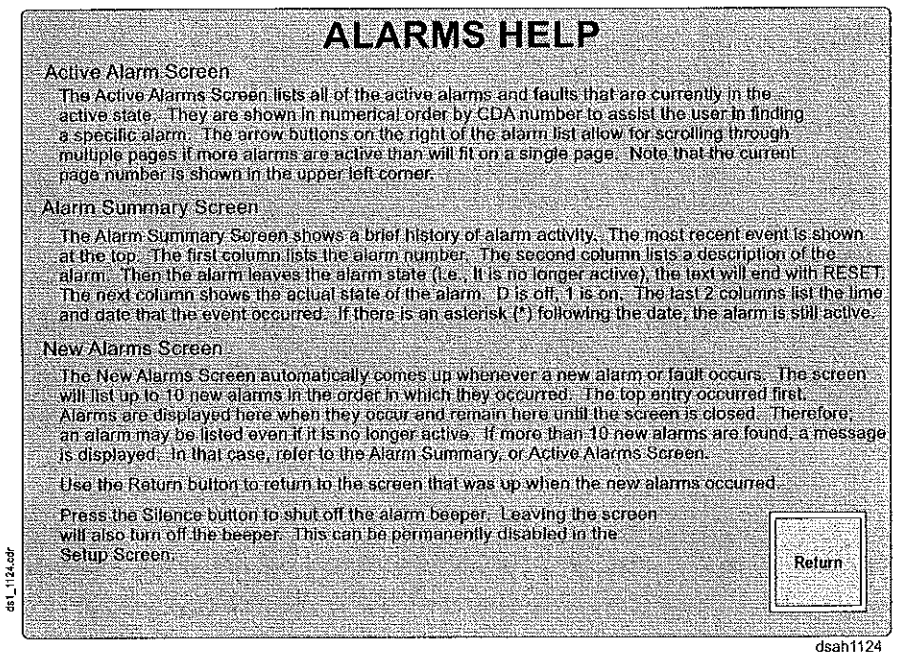
A 3-position selector switch used to control the volume of air moved by the system.

AUXILIARY HEATER

A 3-position selector switch used to control the auxiliary heater.

have occurred. If more than 10 new fault messages are present a message will appear below the white text box indicating that more messages are present.

NOTE: It is important to remember that messages will appear in this screen that are no longer active alarm messages. All messages will appear since the time of the last reset.

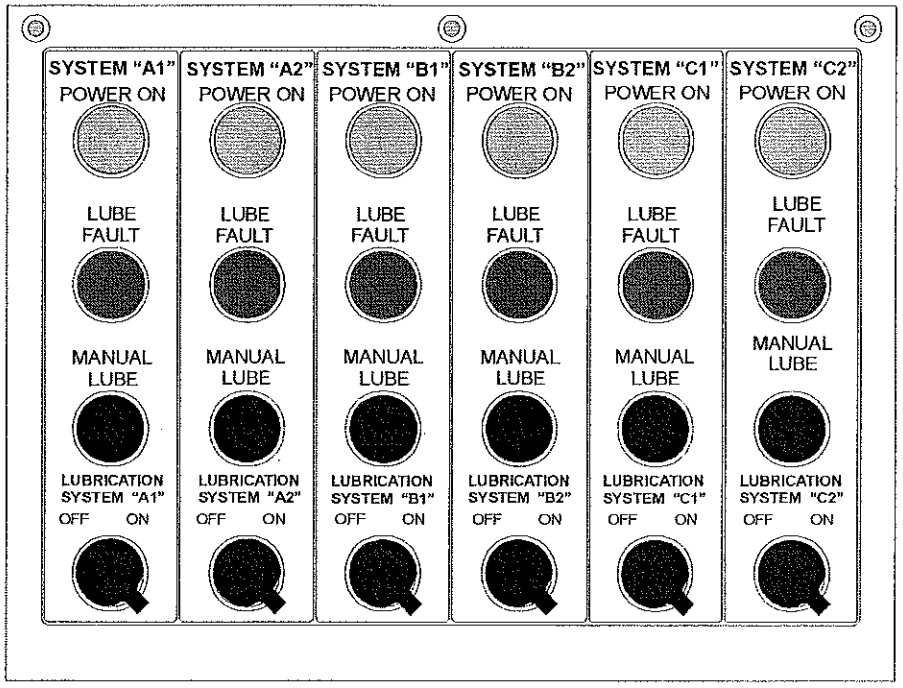


Alarms Help

The Alarms Help screen can be reached from any of the alarm message screens at any time. This screen will provide clarifying information related to the alarm system on your machine.

LUBRICATION CONTROL PANEL

The top row on this panel consists of a group of indicating lights. A red light indicating that the system has a fault and a green light indicating that power for the system is provided for each independent lubricating system (A, B & C). Isolating switches are used to provide power to each system and a means of isolating each system from electrical power. They are also used to reset lubrication faults. These switches are normally on. Manual lube buttons are also provided.



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FIRE SUPPRESSION SYSTEM

Fires on surface mining equipment typically involve faults in electrical equipment, or the combustion of flammable fluids. The time between the onset of the fire and its detection is critical. Early detection and suppression of a fire minimizes hazards to personnel, equipment damage, downtime and loss of production. The optional fire suppression system on this machine is supplied and installed by an outside source. Please refer to the system's manufacturer for maintenance and parts information.

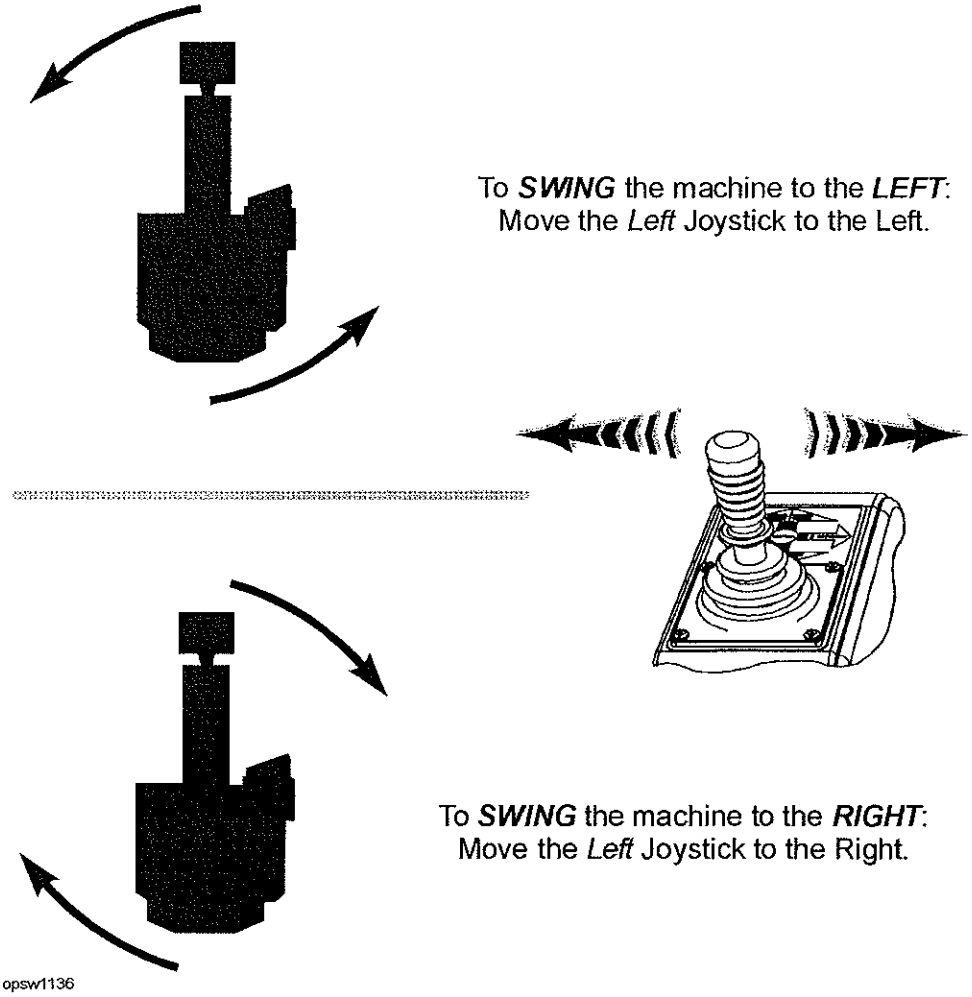
SWING MOTION

Swing motion is controlled by the operator's right joystick. To swing in either direction, move the joystick lever in the direction of swing. Practice swinging in each direction until a "feel" is developed for start-up and stopping.

NOTE: The joy stick also controls the hoisting and lowering of the dipper through forward and backward motions.

DANGER: Each motion - hoist or swing - is fully operational throughout the complete movement of the other motion.

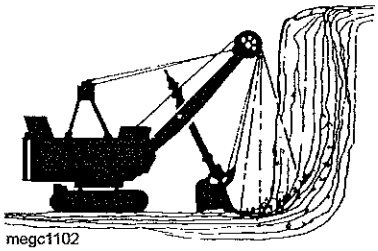
NOTE: When this joystick is used for propelling the machine, the hoist and swing motions are electrically locked out.



To ***SWING*** the machine to the ***LEFT***:
Move the *Left* Joystick to the Left.

To ***SWING*** the machine to the ***RIGHT***:
Move the *Left* Joystick to the Right.

In all types of digging the skilled operator must carefully control the desired depth of cut, and control the hoist power requirements. Often, digging situations are encountered which require hoist and crowd motions to maneuver around oversize or lodged obstructions in the bank, rather than attempting to lift the entire bank.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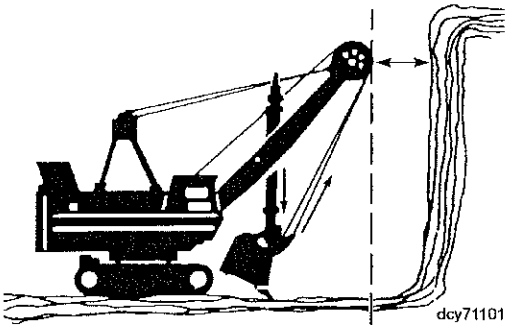
Engage the Bank Under the Boom Point

DANGER: Maintain a digging face which avoids any major slides which could cause an accident. Examine the digging face for large boulders, large rocks, or frozen material which could slide and cause an accident. Avoid overhanging material.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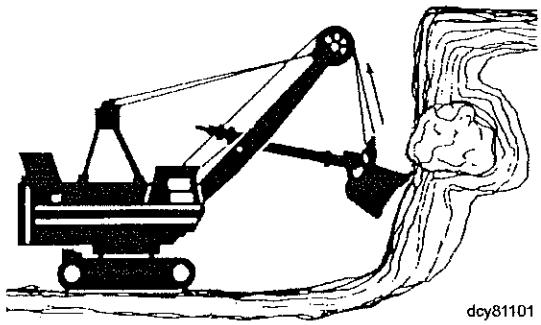
The experienced operator does not repeatedly stall the dipper in the bank, nor maintain a stall condition. The life expectancy of the hoist machinery and hoist ropes is directly related to the operator's skill in avoiding stalling. Whenever stall conditions are encountered, back off on the hoist motion, retract the dipper, or do both. Avoid stall conditions at all times.

DANGER: Do not suspend a loaded or empty dipper in the air with the brakes set for long time periods. Lower the dipper to the ground if the machine is to be idle or unattended for any length of time. Failure to comply can result in personal injury or death of anyone beneath the dipper.

For most efficient production, the dipper should be loaded from the most remote point while waiting for a truck. When the truck is positioned, excavating should begin close to the haulage unit, progressively working away from the unit. This technique saves time by allowing smooth, short dig cycles, and eliminates excessive swing, crowd and retract motions.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GREASING MAIN A.C. DRIVE MOTORS

Main drive motors are shipped from the factory with the bearings packed with grease. A lubrication information plate is mounted on each motor with greasing instructions and the correct quantity or grease to be added. Main drive motors for Bucyrus International machines have their inlet tube filled with greased and include nameplates attached to the motor indicating "grease inlet" and "grease drain".

An improper greasing procedure will cause premature bearing failure. Mixing of non-compatible lubricants will result in lubricant breakdown and bearing failure. Proper lubrication is important for all aspects of bearing life.

NOTE: This information covers main drive motors manufactured by Siemens, Norwood, Ohio. It does not apply to NMA style motors manufactured by Siemens Germany.

1. TYPE OF GREASE

NOTE: Motors are shipped with Mobil SHC 100 NLGI #2 grease installed in the bearings. This grease has a lithium complex soap thickener and a synthetic base fluid having a base oil viscosity of 40 cSt @ 40°C.

Caution: Do not mix greases with different thickeners since the greases may not mix properly and bearing failure may result.

2. INITIAL COMMISSIONING

Prior to initial start-up, the bearings should be greased. The normal maintenance regreasing procedure, item 3, should be used except the quantities should be doubled.

3. MAINTENANCE

This procedure should be used for regular maintenance regreasing. Refer to the following table, item 4, and/or lubrication information plate on each motor for regreasing intervals and type and quantity of grease to be used.

a. Stop the motor and lockout the starter.

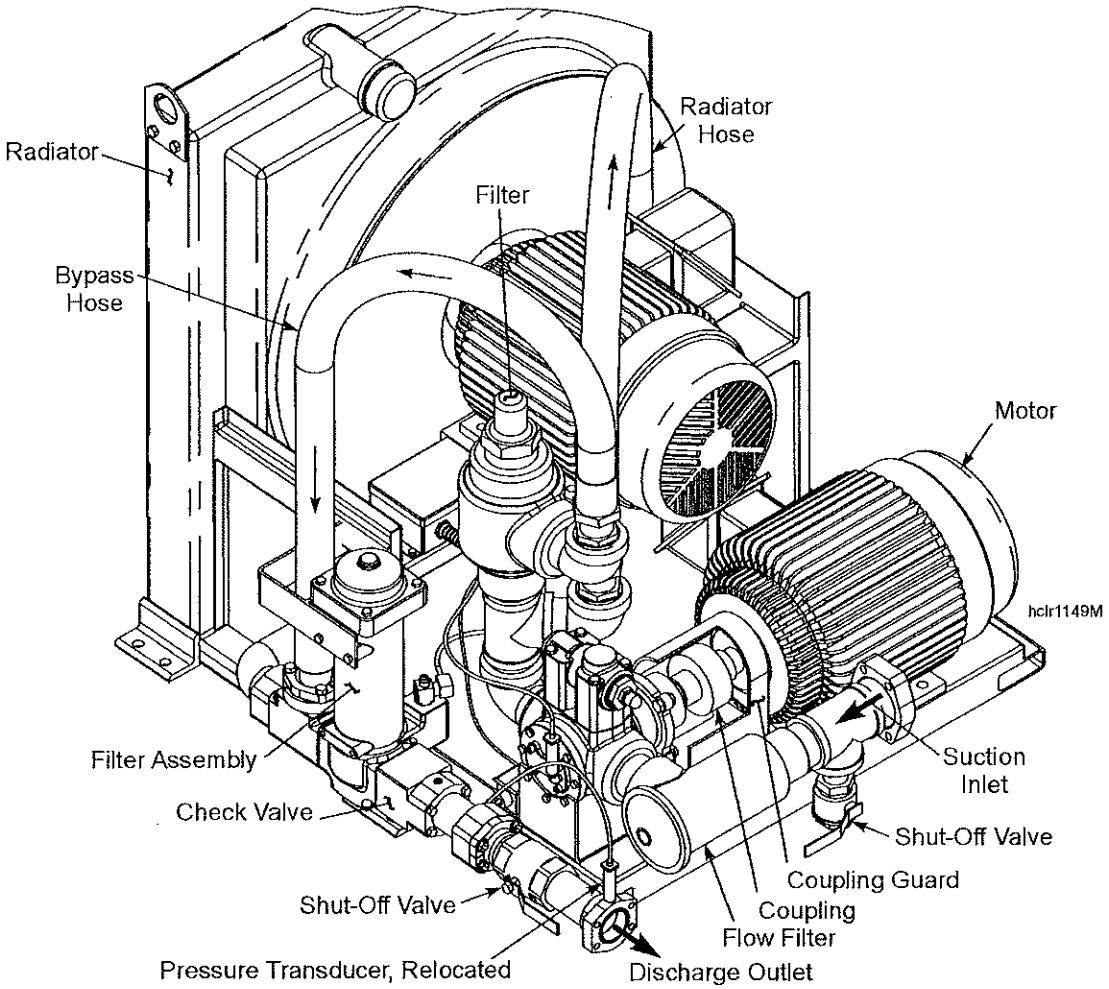
b. Remove and thoroughly clean the grease inlet fitting or plug.

c. Remove the drain plug and clean out any hardened grease.

d. Determine the correct amount of grease required for the bearings.

HOIST OIL COOLER

The Hoist Gearcase temperature is maintained by recirculating lubricating oil through a gearcase oil cooler.



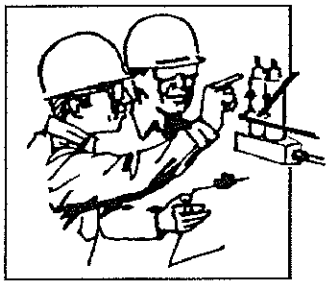
The Gearcase Cooler is located beneath the revolving frame, on the left side of the machine, just behind the hoist machinery. It is supported by a set of beams bolted to the bottom of the revolving frame. *Should the cooler assembly require removal or replacement:*

1. Drain any fluid from the cooler, oil pump and lines between the cooler and the hoist gearcase.
2. Shut off the valves and disconnect the fluid lines at the oil pump and at the oil filter.
3. Support the cooler and support beam assembly with a jack(s) beneath the base of the cooler.

DANGER: DO NOT PROCEED UNTIL THE COOLER AND SUPPORT ASSEMBLY IS FULLY SUPPORTED. The weight of the cooler assembly and support beams is approx. 800 Lbs.

INJECTOR ADVANTAGES

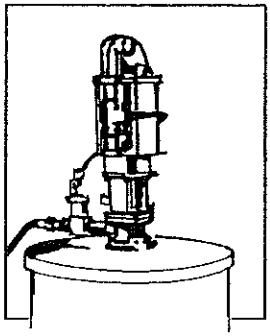
SIMPLICITY



Lincoln Centro-Matic is not only simpler and less expensive to install than other systems-it is also much easier to understand. Your maintenance personnel will appreciate the ease with which they can learn the operation and service of Centro-Matic.

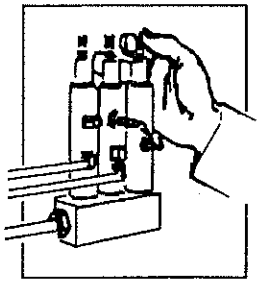
POWERFUL PUMPING UNIT

Lincoln's Power-Master pump widely recognized as a most powerful, trouble-free pump, so much so, that Lincoln Power-Master pumping units often are specified even where other centralized lubrication systems are used.

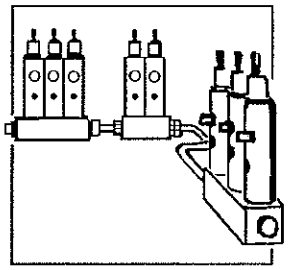


EXTERNAL ADJUSTMENT

A micrometer-type adjustment makes each injector (metering device) adjustable externally, without special tools. The Lincoln Centro-Matic System permits lubricant adjustments to meet actual bearing requirements - not just an approximation, as with all other systems.

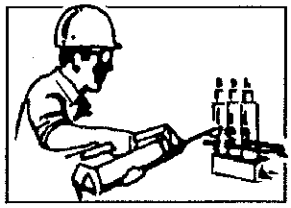


EXTREME PUMPING DISTANCE



Single-line design and powerful pumping unit permit installations at long distances from original refinery containers of bulk tanks to point of application. And if you plan to expand your operation, the Lincoln Centro-Matic System has the design and capacity that lets you do it - normally without adding booster pumps and controls.

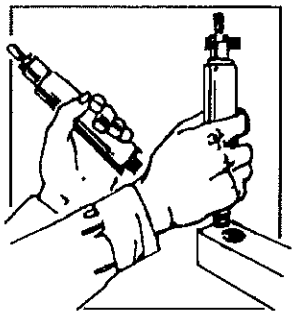
BUILT-IN GREASE FITTING



Lincoln Centro-Matic is the only system that has a capped grease fitting on the injector. This permits easy filling of lines when the system is installed. It also allows hand lubrication of the machine in the event of a pump or power failure, damage to the supply line, or even a malfunction in the air system. NO OTHER SYSTEM OFFERS THIS! The built-in grease fitting can also be used as an inspection system. When the cap is removed, the lubricant normally metered to a bearing will come out of the grease fitting head.

EASY INJECTOR REPLACEMENT

Should the Lincoln injector ever need replacing, it can be done quickly and easily without disturbing adjacent injectors or removing the supply line connections - does not require machine shutdown as do all other systems. As a matter of fact, injector replacement usually can be done between lubricating cycles, thus preventing lubricant loss or machine downtime.



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Bucyrus International, Inc.

SPECIFICATION FOR
ENCLOSED GEARCASE LUBRICANT
Applicable to Models 495BII, 495HF, 495HR and 495HD Electric Mining Shovels.

(September 1, 2005)

Table 2
Approved Mineral Oil Lubricants (ISO VG 320)

Manufacturer	Product Description
BEL-RAY	Bel-Ray 100 Gear Oil 90
BP	Energol GR-XF 320
CASTROL	Alpha SP 320
	Alpha MAX 320
	Optigear BM 320
	Tribol 1100/320
CHEVRON	Chevron Ultra Gear Lube 320
	Gear Compound EP 320
ESSO	Spartan EP 320 (Only Product Originating from Europe)
FUCHS	Renolin CLP 320 Plus
LE (Lubrication Engineers)	Almasol 605
MOBIL	Mobilgear XMP 320
PETRO CANADA	Ultima EP 320
SHELL	Omala F 320
TEXACO	Auriga EP 320
	Meropa 320
	Meropa WM 320
WHITMORE	Paragon 320

- Shaded lubricants are approved for use in the Planetary Hoist, Swing and Propel Gearcases as well as the Non-Planetary type Crowd Gearcase.
- Non-shaded lubricants are approved for use only in the Planetary Propel and Non-Planetary type Crowd Gearcase.

Bucyrus International, Inc.

SPECIFICATION FOR
ENCLOSED GEARCASE LUBRICANT
Applicable to Models 495BII, 495HF, 495HR and 495HD Electric Mining Shovels.

(September 1, 2005)

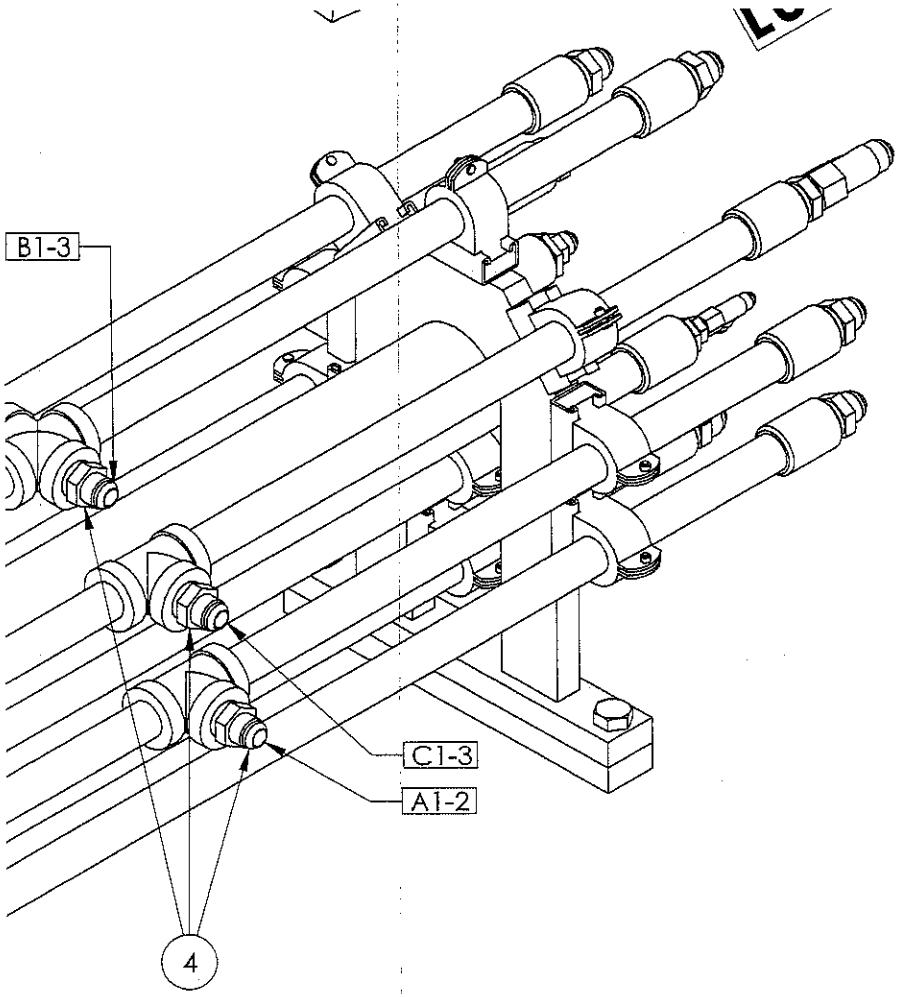
Table 3
Approved Synthetic (Poly-α-olefin) Oil Lubricants (ISO VG 320)

Manufacturer	Product Description
BEL-RAY	Synth. Gear Oil 6692
BP	Enersyn EP-XF 320
	Enersyn HTX 320
CASTROL	Optigear Synth. A 320
	Optigear Synth. X 320
	Alphasyn EP 320
	Alphasyn T 320
	Tribol 1510/320
	Tribol 1710/320
CHEVRON	Tegra Synth. Gear Lube 320
FUCHS	Reholin Unisyn CLP 320
MOBIL	Mobil SHC 632
	Mobilgear SHC XMP 320
PETRO CANADA	Ultima Synth. EP 320
	Traxon E Synth. 80W-140
SHELL	Omala HD 320
TEXACO	Pinnacle EP 320
WHITMORE	Decathlon F 320

- Shaded lubricants are approved for use in the Planetary Hoist, Swing and Propel Gearcases as well as the Non-Planetary type Crowd Gearcase.
- Non-shaded lubricants are approved for use only in the Planetary Propel and Non-Planetary type Crowd Gearcase.

SPECIFICATION REVISIONS:

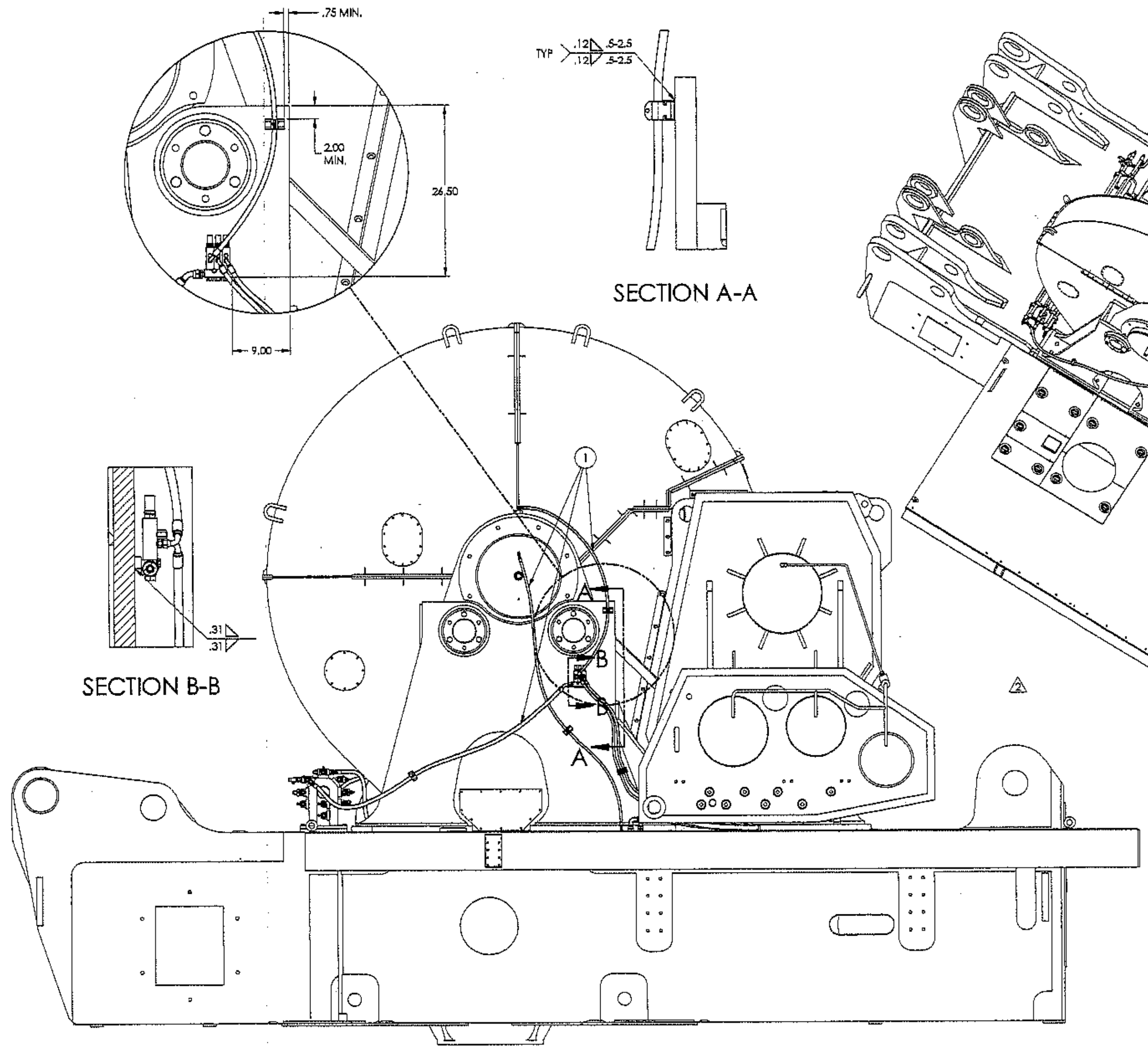
This specification is subject to change without notice. Please refer to the Bucyrus International, Inc. web site www.bucyrus.com for the latest specification.

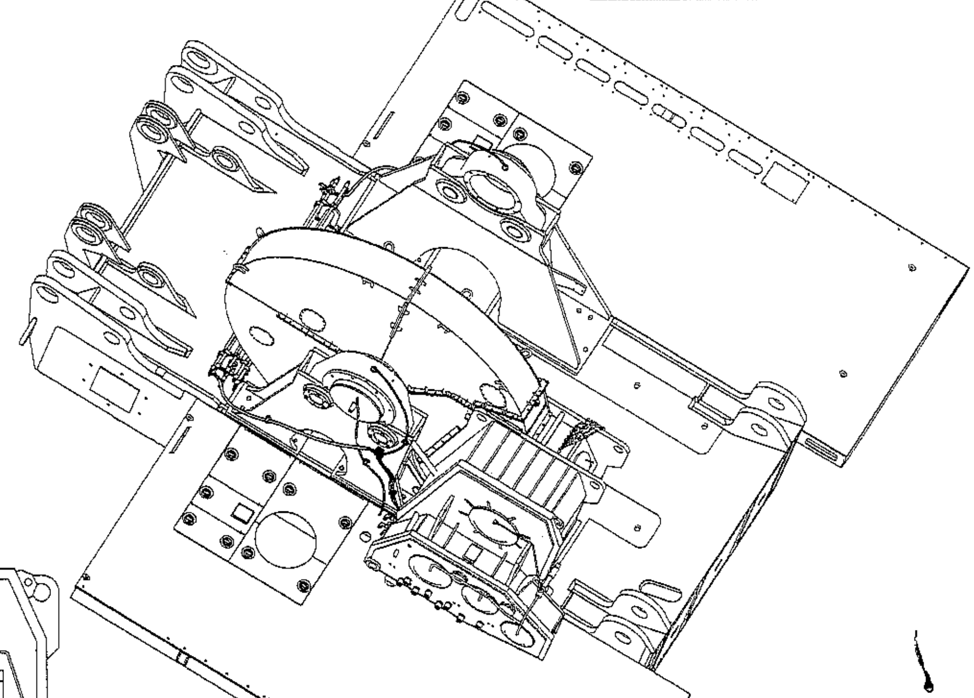


DWG
S023053

PORT NO.	SYSTEM CONNECTION
A1-1	CONNECTS TO "A1" PORT ON LUBE ROOM BULKHEAD PANEL
A1-2	CONNECTS TO LOWER FRONT L.H. BULKHEAD PANEL
A1-3	CONNECTS TO LOWER FRONT R.H. BULKHEAD PANEL
A1-4	CONNECTS TO LOWER FRONT R.H. BULKHEAD PANEL (BOOM SUPPLY)
A2-1	CONNECTS TO "A2" PORT ON LUBE ROOM BULKHEAD PANEL
A2-2	CONNECTS TO "L5" PORT OF CENTER PINTLE
B1-1	CONNECTS TO "B1" PORT ON LUBE ROOM BULKHEAD PANEL
B1-2	CONNECTS TO HOIST GEARCASE INJECTOR "OGL"
B1-3	CONNECTS TO CROWD DRUM GEAR INJECTOR
B1-4	CONNECTS TO R.H. SWING MACHINERY INJECTOR MANIFOLD "OGL"
B2-1	CONNECTS TO "B2" PORT ON LUBE ROOM BULKHEAD PANEL
B2-2	CONNECTS TO LOWER FRONT R.H. BULKHEAD PANEL (BOOM SUPPLY)
C1-1	CONNECTS TO "C1" PORT ON LUBE ROOM BULKHEAD PANEL
C1-2	CONNECTS TO HOIST DRUM BEARING / INTER SHAFT INJECTOR
C1-3	CONNECTS TO L.H. CROWD DRUM BEARING / 2ND INTER SHAFT INJECTOR
C1-4	CONNECTS TO R.H. HOIST DRUM BEARING INJECTOR
C1-5	CONNECTS TO R.H. CROWD DRUM BEARING / 1ST & 2ND INTER SHAFT
C1-6	CONNECTS TO LOWER FRONT R.H. BULKHEAD PANEL (BOOM SUPPLY)
C1-7	CONNECTS TO R.H. SWING MACHINERY INJECTOR MANIFOLD "GREASE"
C2-1	CONNECTS TO "C2" PORT ON LUBE ROOM BULKHEAD PANEL
C2-2	CONNECTS TO "L4" PORT OF CENTER PINTLE
D-1	CONNECTS TO "D" PORT ON LUBE ROOM BULKHEAD PANEL
D-2	CONNECTS TO L.H. SWING BRAKE
D-3	CONNECTS TO R.H. SWING BRAKE
D-4	CONNECTS TO R.H. SWING MACHINERY JUNCTION BLOCK
J-1	CONNECTS TO "J" PORT ON LUBE ROOM BULKHEAD PANEL
J-2	CONNECTS TO SOLENOID VALVE ON HOIST BRAKE
J-3	CONNECTS TO STAIRCASE/AC FILTER PLUMBING
R-1	CONNECTS TO "R" PORT ON LUBE ROOM BULKHEAD PANEL
R-2	CONNECTS TO PROPEL BRAKE VENT VALVE NEAR COLLECTOR RING BOX

QTY.	ITEM NO.	DESCRIPTION	PART NO.
1	1	KIT,HOIST MACHY,PLUMBING	S022352





NOTE:

1. APPLY JOINT COMPOUND TO ALL PIPE THREADS.

REVISION DATA

REV	BY	DATE	ECN	DESCRIPTION
2	RLB	09/12/05	2005201 8214	DELETED LOWER HOIST PINION OVERFLOW HOSE REF NOTE, PICTORIALLY UPDATED HOIST MACHY HOSE KIT.

REISSUE DATE 09/12/05

SOLIDWORKS DRAWING

ALL DIMENSIONS IN INCHES-UNLESS OTHERWISE SPECIFIED

MACHINING TOLERANCES-UNLESS OTHERWISE SPECIFIED

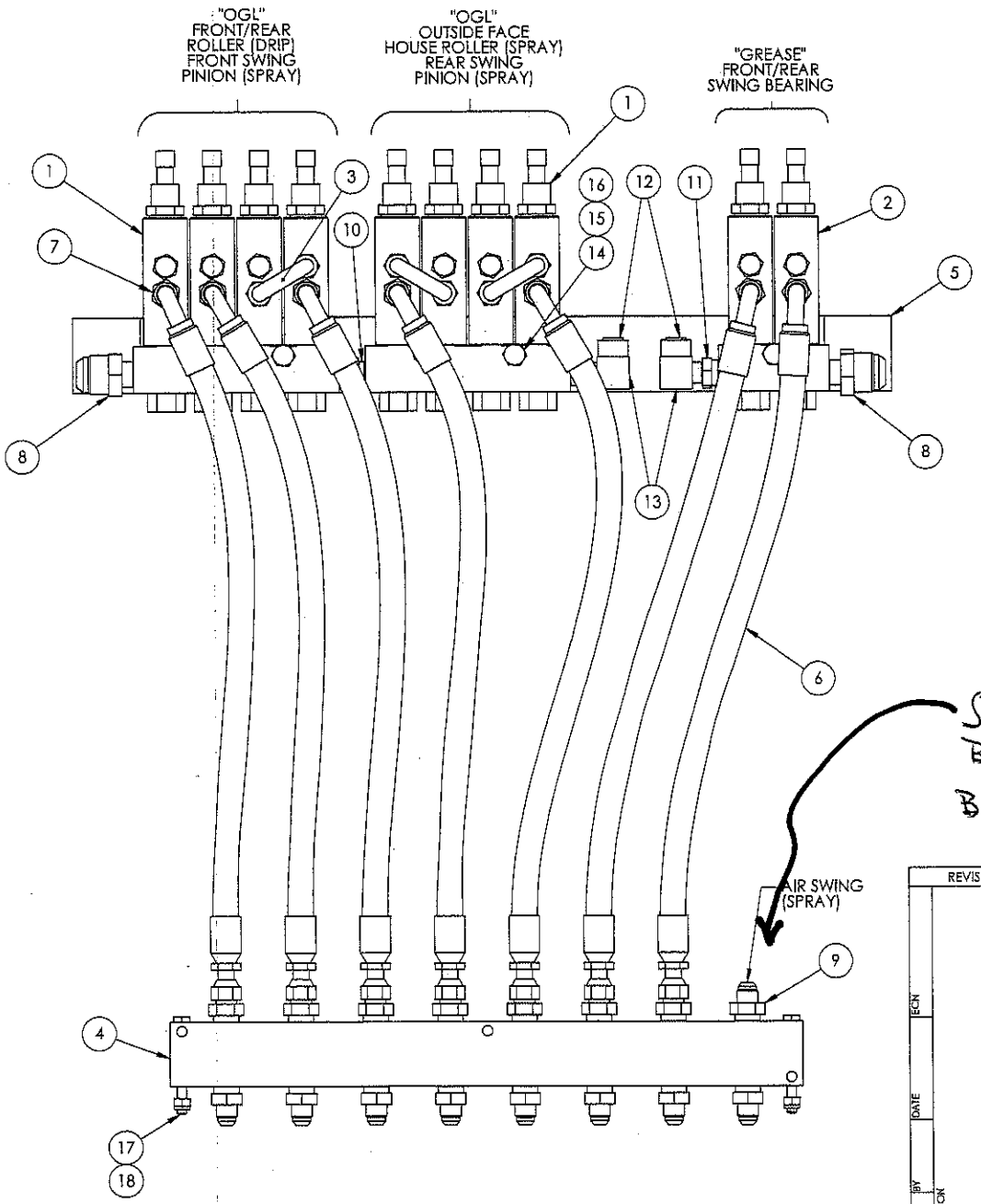
FABRICATING TOLERANCES-UNLESS OTHERWISE SPECIFIED

WELDMENT TOLERANCES-UNLESS OTHERWISE SPECIFIED

Bucyrus International, Inc.

DESCRIPTION	HOIST MACHY,PLUMBING,FLD ASSY				
REF DWGS					
MODEL	495BII	UNIT		FIN WGT	
DET	STOFFEL A.	DATE	03/26/02	REV	2
ENG CONTACT	KERRIGAN T.	DWG SIZE	D		
NO.	S023052			SHEET	1 of 1

BI115425



QTY.	ITEM NO.	DESCRIPTION	PART NO.
2	1	INJECTOR, 4 W/MANIFOLD	57169152
1	2	INJECTOR, 2 W/MANIFOLD	57169150
3	3	CROSSOVER,INJECTOR	57169110
1	4	MANIFOLD,LUBE	S011147
1	5	BRACKET,MTG,INJECTOR	S011148
7	6	HOSE ASSY,-6 STR-90 JIC 37	650367-20
7	7	CONN,37FL,.375Tx.125P	78553780
2	8	CONN,37FL,.75Tx.375P	57123590
16	9	CONN,37FL,.375Tx.375P	78553800
1	10	CONN,PIPE,HEX,.375Px.375P	78600910
2	11	BSHG,RED PFH,.38x.25	MP084468
2	12	PLUG,PIPE PFH .25	MP094522
2	13	ELBOW,TUBE,M,.25Tx.125P	78595285
5	14	SCR,HEX,.375x2,UNC,GR 5	03279640
5	15	NUT,HEX,LOCK,.375,UNC	02786385
5	16	WASHER,FLAT,.375	03951400
2	17	SCR,HEX,.25x2.5,UNC,GR 5	03273800
2	18	NUT,HEX,LOCK,.25,UNC	02786345

SEPERATE AIR LINE PLUMBED FROM B-1 SYSTEM - AIR ACTIVATES WHEN B-1 SYSTEM GREASE PUMP STARTS.

REISSUE DATE

SOLIDWORKS DRAWING

REVISION DATA				
REV	DESCRIPTION	BY	DATE	ECN
0				

ALL DIMENSIONS IN INCHES-UNLESS OTHERWISE SPECIFIED

MACHINING TOLERANCES-UNLESS OTHERWISE SPECIFIED

1. ± PLACE DECIMAL DIMENSIONS ± .01 FOR EACH 12 MAX ± .09
2. 3 PLACE DECIMAL DIMENSIONS ± .005 UP TO 26
   ± .010 OVER 26
3. CONCENTRICITY OF CYLINDRICAL SURFACES = .010 TIR.
4. PARALLELISM, SQUARENESS, OR ANGULARITY BETWEEN SURFACES AND/OR HOLE CENTERLINES ± 0°7' (.002 INCH/INCH)

FABRICATING TOLERANCES-UNLESS OTHERWISE SPECIFIED

1. MATERIAL THICKNESS	DIMENSIONS	± TOLERANCE
A. LESS THAN .12	0 TO 36	.03
	OVER 36	.05
B. .12 TO .50	0 TO 36	.06
	OVER 36	.12
C. .50 TO 1.00	0 TO 36	.09
	OVER 36	.19
D. OVER 1.00	0 TO 36	.19
	OVER 36	.25

2. BEND ANGLES ± 1° (.017 IN/IN) FOR EACH .37 OF MATERIAL THICKNESS (MAX ± 3°)

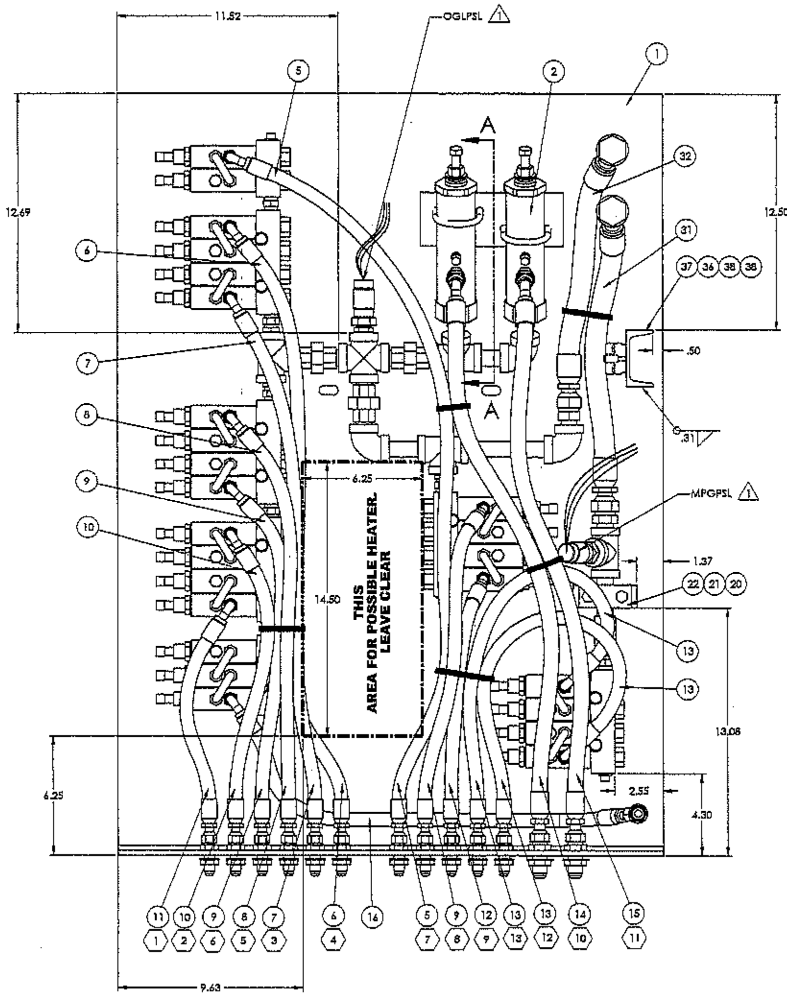
WELDMENT TOLERANCES-UNLESS OTHERWISE SPECIFIED

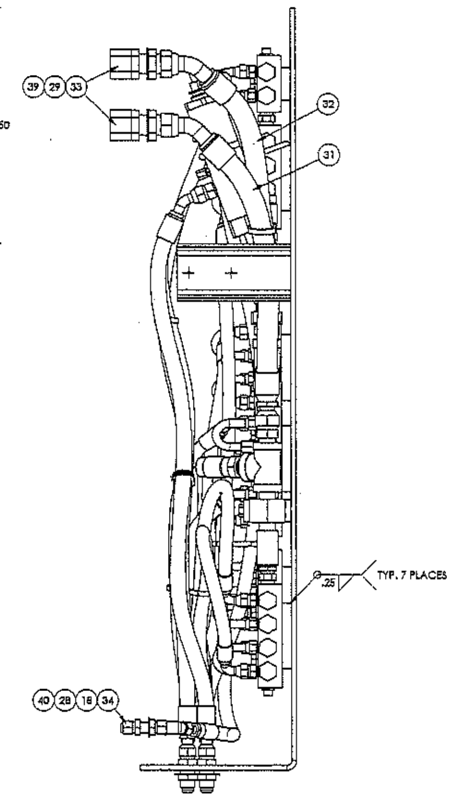
1. DIMENSION	MATERIAL THICKNESS	± TOLERANCE
A. UP TO 24"	UP TO 1"	.06
	1" AND GREATER	.12
B. 24" TO 10'	UP TO 1"	.12
	1" AND GREATER	.19
C. 10' TO 30'	UP TO 1"	.19
	1" AND GREATER	.25
D. OVER 30'	ALL	.25

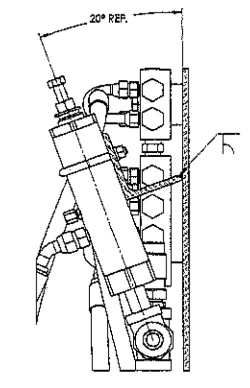
Bucyrus International, Inc.

DESCRIPTION	INJECTOR,ASSY,LUBE,SWING
SIZE DESC	
REF DWGS	
DET	STOFFEL A.
ENG CONTACT	KERRIGAN T.
MFG	
MATL	
HIGH WGT	0.0
FIN WGT	43.5
MODEL	495BII
UNIT	
DATE	02/22/02
PATTERN REF. NO.	
DWG SIZE	C
REV	0
NO.	S011146
SHEET	1 OF 1

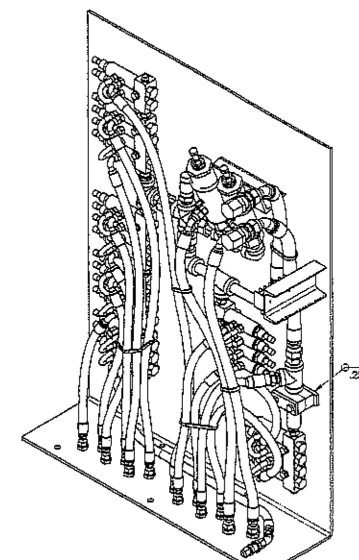
BI1154250

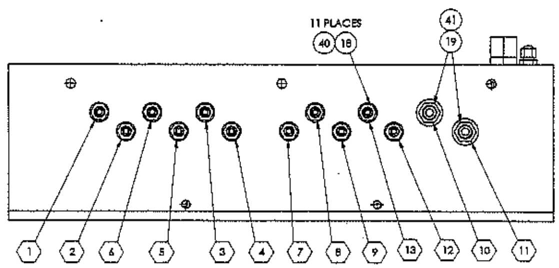






SECTION A-A





CONNECTION NUMBERS

QTY.	ITEM NO.	DESCRIPTION	PART NO.
1	1	PL,.25	S019137
1	2	BANK,LUBE PANEL,LH,ASSY	S019143
1	5	HOSE ASSY,.375x42,100R16	650367-42
1	6	HOSE ASSY,.375x35,100R16	650367-35
1	7	HOSE ASSY,.375x30,100R16	650367-30
1	8	HOSE ASSY,.375x24,100R16	650367-24
2	9	HOSE ASSY,.375x20,100R16	650367-20
1	10	HOSE ASSY,.375x17,100R16	650367-17
1	11	HOSE ASSY,.375x14,100R16	650367-14
1	12	HOSE ASSY,.375x16,100R16	650367-16
2	13	HOSE ASSY,.375x25,100R16	650367-25
1	14	HOSE ASSY,.5x32,100R16	650371-32
1	15	HOSE ASSY,.5x31,100R16	650371-31
1	16	HOSE ASSY,.375x26,100R16	650367-26
12	18	UNION,BLKHD,.375Tx.375T,37FL	78649740
2	19	UNION,BLKHD,.5Tx.5T,37FL	78649980
1	20	PL,BASE,SINGLE CLAMP,45	17112507
1	21	BODY,CLAMP,.839 ID,45	17112536
1	22	PL,COVER, SINGLE CLAMP,45	17112520
1	28	ELBOW,45,.375T,SWIVEL	78596440
2	29	UNION,BLKHD,.75Tx.75T,37FL	78533490
1	31	HOSE ASSY,.75x17,100R16	650373-17
1	32	HOSE ASSY,.75x15,100R16	650373-15
2	33	NUT,CAP,TUBE #12	78623600
1	34	NUT,CAP,.375 TUBE37 FL	78623400
10	35	TY-RAP,SELF LOCKING	MP196807
1	36	BLOCK,TERM,6P,30A,600V	17059009
1	37	CHAN,C3x5	S019172
2	38	SCR,PAN,M,.164x1.25,UNC	03640420
2	39	WASHER,LOCK,INTL T,1.187	03964752
12	40	WASHER,LOCK,INTL T,.687	03964754
2	41	WASHER,LOCK,INTL T,.812	03964753

NOTES:

1. APPLY TY-RAPS AS SHOWN OR AS NEEDED TO PROPERLY SECURE HOSES.

(X) - REPRESENTS LUBE CONNECTION POINTS TO CRAWLER FRAME

REISSUE DATE 11/14/02

SOLIDWORKS DRAWING

REVISION DATA

REV	BY	DATE	ECN	DESCRIPTION
1	JCS	11/14/02	20022025086	ADDED OGLPSL AND MPGPSL NOTE TO PRESSURE SWITCHES.

Bucyrus International, Inc.

DESCRIPTION: PANEL,LUBE CABINET,LH,ASSY

DR: JUUL D. — CONTACT: RIES D. — MODEL: 495HP — DATE: 02/08/02 — DWG SIZE: E — REV: 1

NO. S019144 — SHEET 1 of 1

BI115425

PREVENTIVE MAINTENANCE FOR LUBRICATION

Lubrication may well be the most important portion of a preventative maintenance program. Do not allow anything to interfere with the lubrication of the machine. Experience will dictate how to adjust the amount of lubricant to use at each servicing. However; the extra effort will result in a smooth running machine with less wear and breakdowns.

It is difficult to predict how much lubricant should be applied to a particular bearing. It varies with how hard the machine is being worked, how much the bearing has previously worn and the grade of lubricant being used. Watch all the bearings closely to insure that the lubricant added at one servicing is enough to last until the next.

Most wearing parts require that lubricant be applied regularly in small quantities as with the automatic lubrication system instead of large amounts applied occasionally. Make regular inspections of the machine and watch for signs of improper lubrication such as the accumulation of excess lubricant or discolored lubricant. Ensure that the lubricant has not come from a broken or disconnected line or lubricant pipe. Normally excess lubricant pumped into a plain bearing is not used. However, certain bearings in locations which may collect dirt (such as the lower works and dipper padlocks) should have extra lubricant added to purge all of the old lubricant which may have collected abrasive dirt.

New bushings sometimes overheat because they are too tight to allow normal distribution of lubricant. Old bushings may overheat because they are so worn that lubricant will not stay in until the next time of servicing. In the case of the new bushing, it may be necessary to give it more frequent lubrication until it is worked in. It may be necessary to do the same for the old bushing, until it can be replaced. It is much better to lose a little time on a shift to give some extra lubricant to a point which needs it rather than trying to run it to the end of the shift.

The most common cause of overheating an anti-friction bearing is churning of the lubricant. This happens when the bearing is packed excessively full. If lubricant leaks out of an anti-friction bearing, it is almost a sure sign that too much lubricant was added to the bearing. Continue to lubricate it as often as before, but use less lubricant.

Section 3 of this manual will provide more detailed and specific information on lubricants and their usage.

MONTHLY Check Points *(cont.)*

10. Lube Lines - Inspect all lines and fittings. Repair all leaks and damaged hoses.

11. Auto Lube Control Panel, Lube Reservoirs - Check lubricant levels and re-service. Repair all leaks and clean up spillage.

12. Boom Structure - Inspect the entire boom structure (man basket recommended) for damage, cracks - repair immediately.

13. Boom Foot Pins - Inspect the boom foot pins, clearance keepers and retainers for damage, repair or replace as required.

14. Boom Ladders and Handrails - Inspect for damage and repair immediately.

15. Front and Rear Legs - Inspect visually for cracks and indications of stress.

16. Suspension Ropes - Check for broken wires. If 10% of outer layer of wires are broken replace suspension cable.

17. Dipper Corner and Center Shrouds - Check for tightness, repair as required.

18. Dipper Tooth Points - Teeth should be tight to adapters or dipper lips. Rebuild or repair as required.

BUCYRUS

Electric Mining Shovel

Preventive Maintenance

ITEM #	NOTED DISCREPANCY

prnc_1136

Date: _____

Shift: _____

Inspected By: _____

Supervisor: _____

MAINTENANCE INSPECTION

ANNUAL CHECK POINTS

1. Propel Gearcase - Check for leaks, cracks - repair as required.
2. Crawler Frame Underside - Check for wear, cracks, damage.
3. Tighten all crawler frame connecting rod jack bolts per Section 5 in this manual.
4. Propel motors - Verify motor coupling clearance and alignment using a dial indicator. (refer to manufacturer's information)
5. Propel Gearcase - Pull the bottom plug and and collect a 1/2 gallon of lubricant. Inspect the sample for metal particles.
6. Final Drive Shaft Bearing - Lube must be present! If fresh lube is not present, investigate the problem.
7. Swing Rack - Verify the tension of the rack-to-truck frame mounting bolts and the rack joint assembly bolts.
8. Roller Circle and Rails - Check for wear. Replace rails or rollers when wear exceeds 1/2".
9. Center Pintle Bushing - Check the truck frame bushing and replace if required.

BUCYRUS

Electric Mining Shovel

Preventive Maintenance

ITEM #	NOTED DISCREPANCY

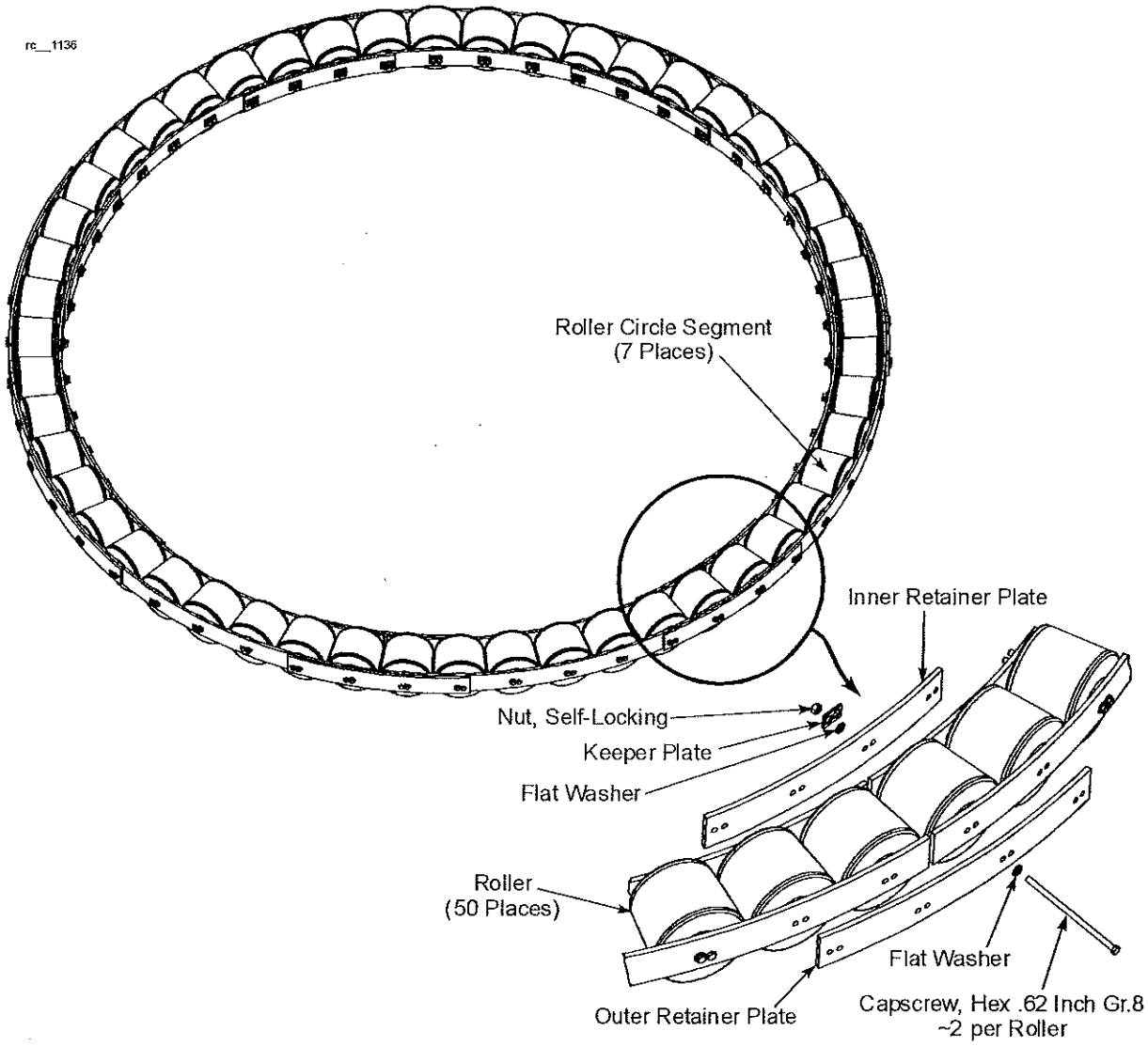
pmc_1136

Date: _____

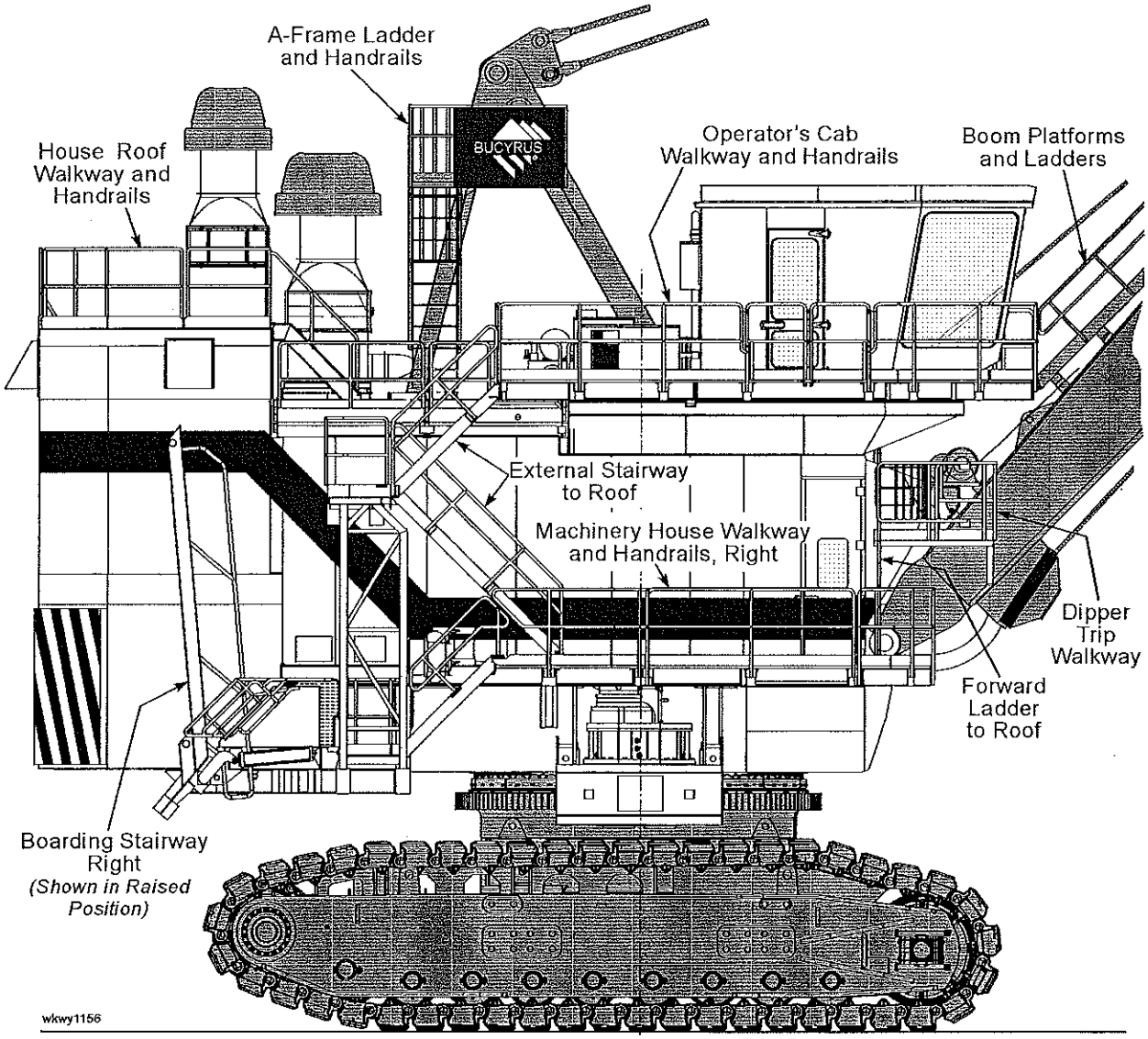
Shift: _____

Inspected By: _____

Supervisor: _____



Roller Circle Assembly



Machinery House Walkways and Platforms

Each propel motor is equipped with a spring set, air released disc brake. These brakes require no adjustment. Inspect friction disc wear by removing the assembly cover and observe remaining amount of friction material on the disc. When wear reaches the change notch, replacement is required. Since these are holding brakes, wear rate will be slow. For brake maintenance, refer to Section 6 - *BRAKES & COUPLINGS* in this manual.

SWING RACK ASSEMBLY

The swing rack or swing gear assembly includes a 4-piece cast gear and 9 lower roller circle rail segments. Capscrews fasten the lower rail flanges to the gear. Capscrews also fasten the swing rack to the truck frame structure.

Should the swing rack need to be replaced, it can be installed without complete separation of upper and lower frame structures. Maintenance inspection of the swing rack consists of a periodic check of torque on capscrews (semi-annual or 2500 hours, whichever comes first).

DANGER: **HIGH VOLTAGE! DO NOT ENTER THE TRUCK FRAME, OR THE AREA BETWEEN THE REVOLVING FRAME AND THE TRUCK FRAME, UNLESS THE POWER SUPPLY TO THE MACHINE HAS BEEN DISCONNECTED. Isolate the machine from the mine substation and confirm that the collector rings have been grounded by a qualified electrician. Failure to comply with these instructions could result in serious injury or death.**

CRAWLER BELTS

The Crawler Belts contact the ground and transfer the entire weight of the machine from the truck frame to the ground. Each belt is an endless shoe assembly that is moved by the propel machinery around the crawler side frame. One belt on each crawler consists of ***47*** cast alloy steel, non-cleated, double-pin connected shoes. The pins are retained in the shoes by lock bolts.

All the shoes assemble into the belt so that the male lugs on each shoe are toward the front of the machine when the shoe is on the bottom of the crawler frame.

CRAWLER BELT MAINTENANCE

1. Replace any missing or broken shoe pin lock bolts immediately.

2. To remove old shoe pins - drive them out if possible, burn them out if necessary.

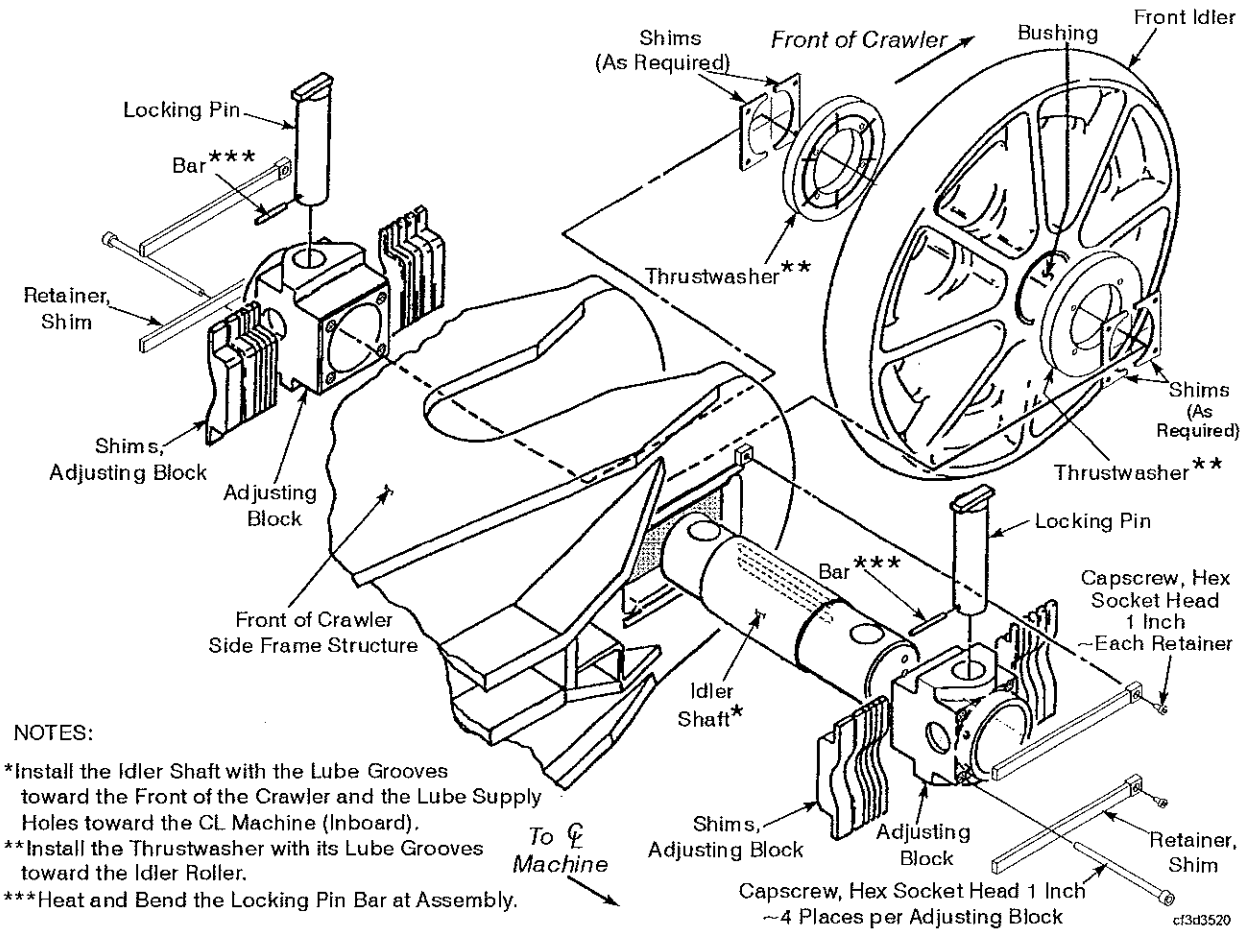
3. Annually (5000 hrs.) remove any metal flow from the roller path on each shoe that interferes with belt motion. Use arc air to within .125 inch of final surface, then grind the remainder.

4. Monitor the fit of the shoes or belt to the drive tumbler monthly (420 hrs.)

   - Record wear rate.
   - Replace shoes or rebuild drive lugs as needed.
   - Replace the tumbler or rebuild wear areas as needed.

5. Replace or rebuild the slide bars on the crawler side frame *BEFORE* the drive lugs on the shoes touch the top of the crawler.

IMPORTANT! *PROPERLY ADJUSTED BELTS REDUCE THEIR WEAR RATE AND PROLONGS THEIR SERVICE LIFE!*



Crawler Front Idler Assembly
(Left Shown, Right Opposite)

CRAWLER FRONT IDLER ROLLER ASSEMBLY

The front idler roller carries the machine weight in conjunction with the load rollers. The roller turns about the idler shaft on bronze bushings. The idler shaft mounting consists of a pair of adjusting blocks which can be moved to the front or rear to compensate for crawler belt wear. Shims located on either side of each adjusting block are used to maintain the roller position. To remove the front idler:

1. Park the machine in a level area leaving several inches of clearance under the front idler to be removed.

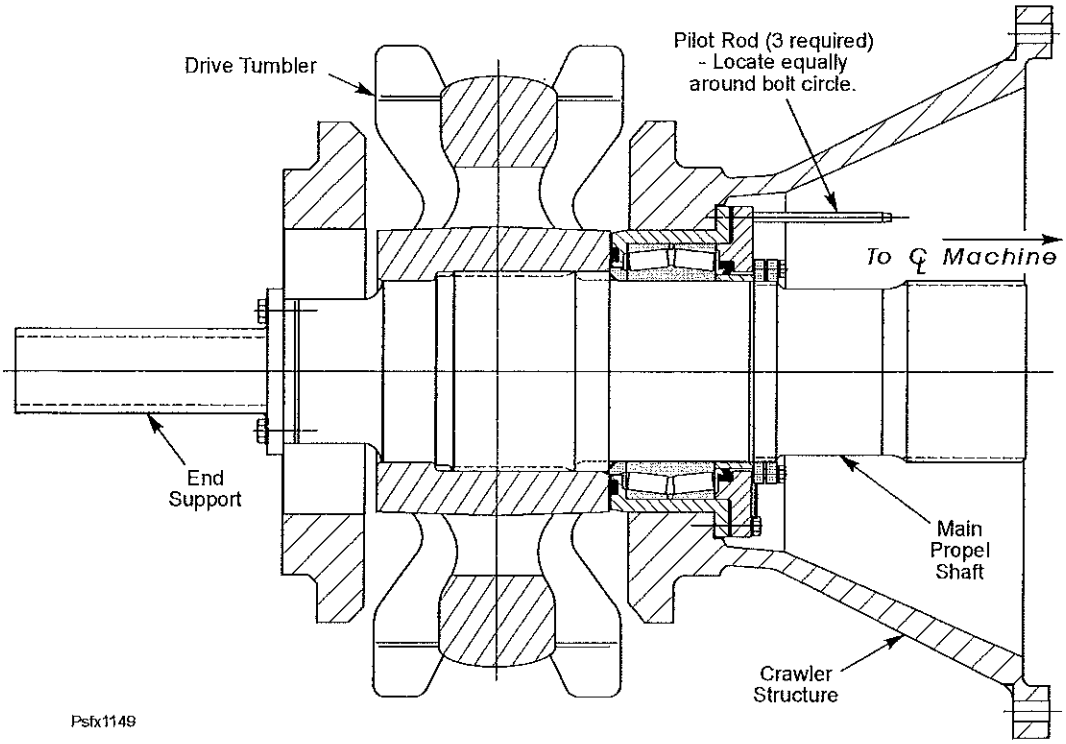
2. Rotate the revolving frame to provide crane access to crawler belt and idler.

3. Remove the shim retainer bars, lube lines and shims ahead of the adjusting blocks.

16. Use the spacer between the bearing race and shaft shoulder as a puller. Six tapped holes (M20 x 25) are provided to attach the threaded rods and hardware required. Hydraulic expansion of the inner race is also provided to ease the pulling force. Attach the hydraulic pump provided with the machine to the .25 inch hole in the end of the drive shaft. Use hydraulic pressure and pulling force simultaneously to remove the bearing race.

17. Remove the 18 - 1 Inch capscrews which secure the cartridge and retainer to the crawler. *DO NOT* remove the 6 capscrews which secure the retainer to the cartridge.

18. Install a pulling eye in the (M42 x 4.5 x 44 mm) tapped hole provided and using the fixtures shown, remove the drive shaft assembly toward the CL machine.



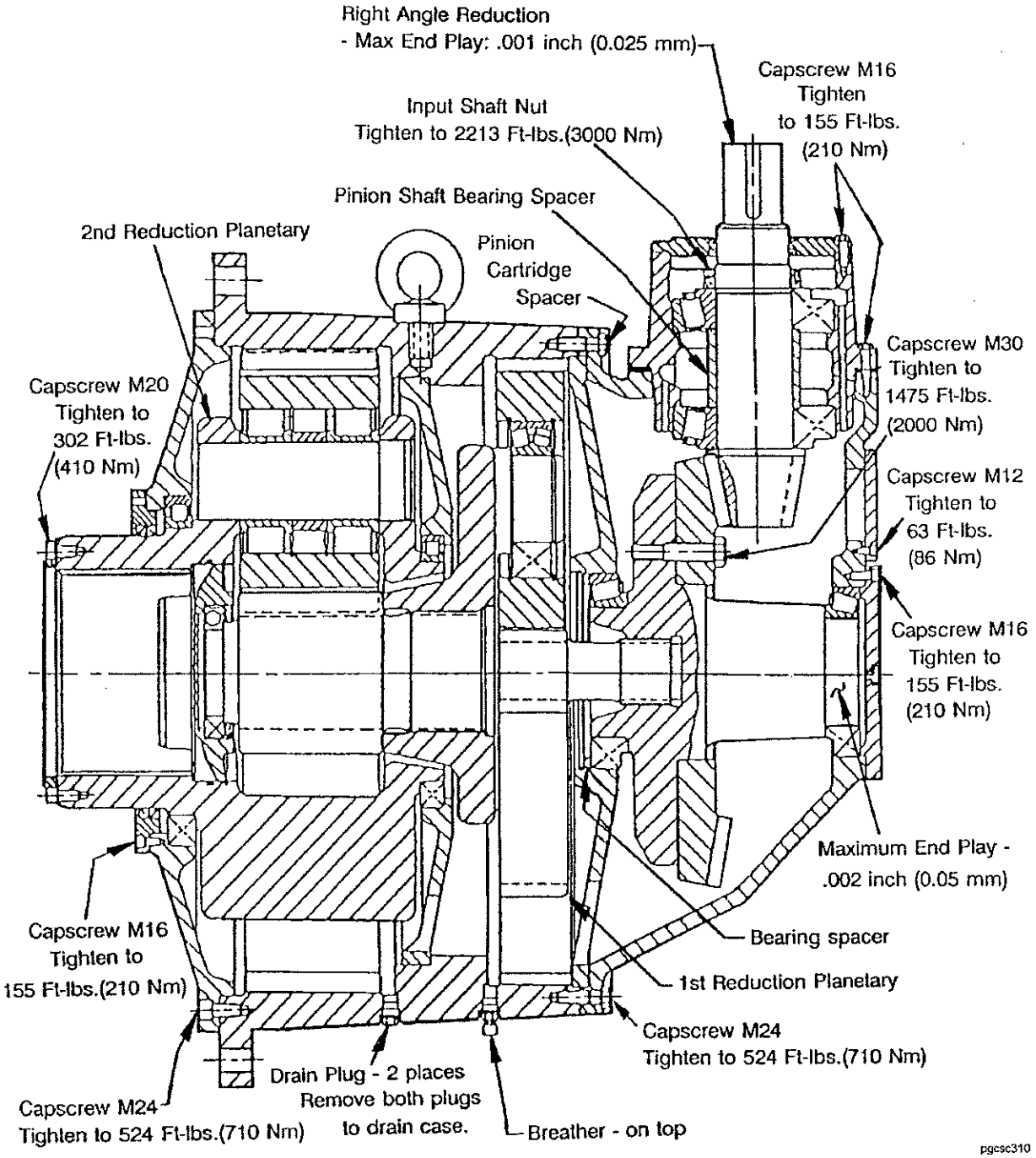
Fixture for the Main Propel Shaft

19. Lift the tumbler clear of the crawler after the shaft has been removed.

20. Inspect all parts for damage or wear. Replace or repair as required. Refer to the "Main Propel Shaft" for disassembly and rework.

NOTES:

1. Bearing spacer - grind to obtain a preload of .002 inch.
2. Bearing spacer - grind to obtain a preload of .001 inch.
3. Cartridge spacer - Grind to fill the gap after adjusting the tooth pattern.



Propel Gearcase ~ Section View

10. Remove the lock bars, lower nut, and thrust washer from the lower end of the pintle sleeve.

CAUTION: Be sure to apply a load to the center pintle lifting lug sufficient to lift the center pintle - before proceeding.

11. Remove the bolts, lockwashers and dowels that fasten the upper collar to the revolving frame. Remove the upper lock bars and their hardware. Remove the upper collar from the pintle sleeve.

12. Install the lifting lug, supplied with the machine, to the top of the pintle and connect the auxiliary winch to the lifting lug.

13. Using the auxiliary winch, lift the sleeve out of the revolving frame. Replace a worn or damaged sleeve with a new one. Check the pintle sleeve bushing for wear or damage. Replace if required. Check the truck frame around the pintle structure for cracks. If the pintle structure area needs repair, contact the Bucyrus International Service Department for instructions.

Center pintle sleeve installation is the reverse of disassembly.

NOTE: If the lower nut was burned apart for removal, reassemble the nut as follows:

a. Install new O-Rings on the alignment pins and insert the pins in the nut halves.

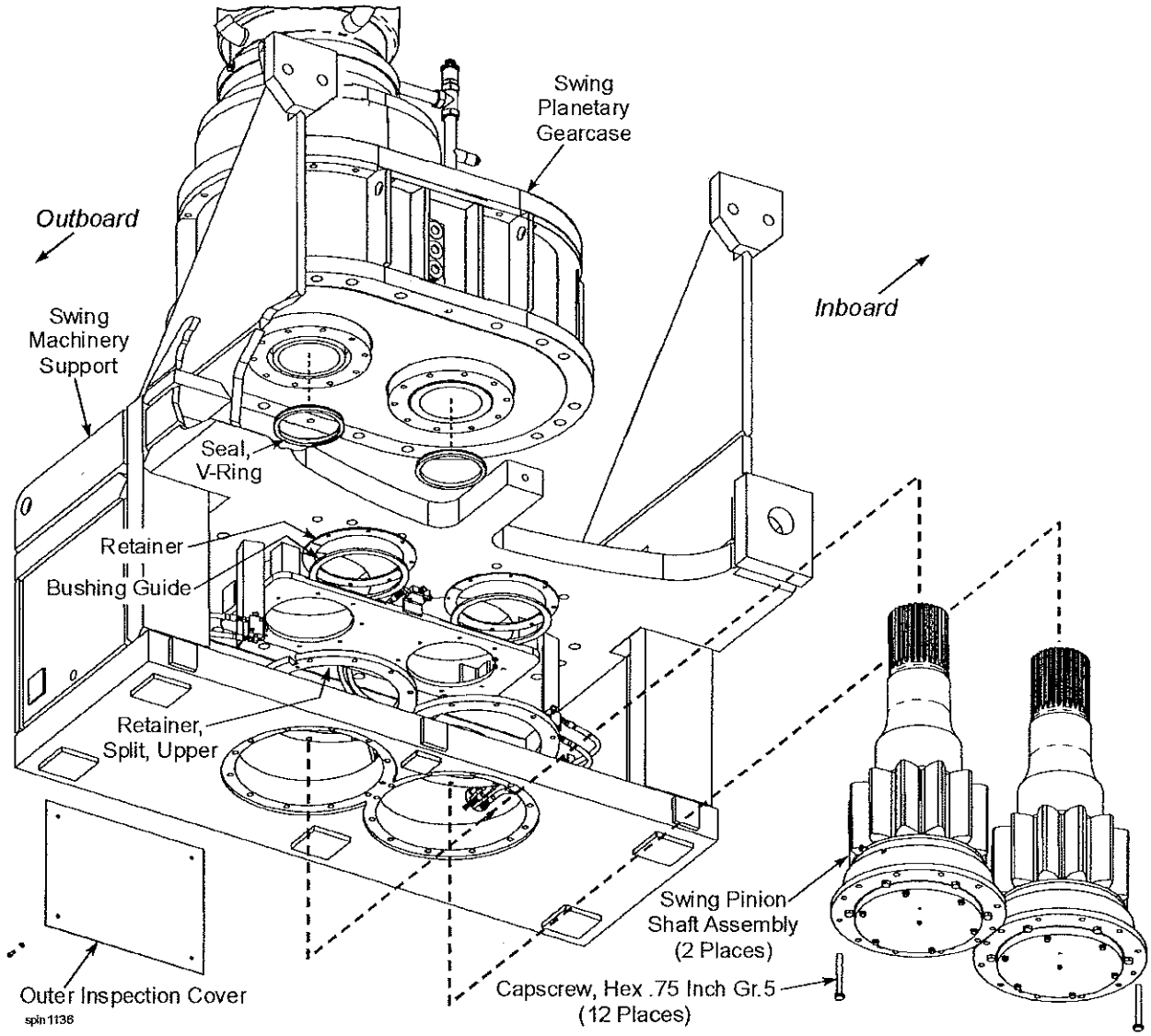
b. Clamp the two halves of the nut together. To install the new T-Bolts which have an interference fit of 0.47 to 0.53 inch to the nut, heat the T-Bolt to 900-950°F. Do not heat the T-Bolts to more than 1,000°F.

c. When installing the heated T-Bolts, be sure the chamfer is facing outward. Clamp the T-Bolts in-place with the T-Bolt retainers.

DANGER: HIGH VOLTAGE! Be sure the electrical lines are correctly connected and all connections are tight. Also make sure that the air and lube lines are connected to the correct outlets in the swivel assembly and that the connections do not leak.

SWING PINION SHAFTS

Dual swing pinion shafts transfer torque from each planetary gearcase to the swing rack on the truck frame. Each pinion shaft is a 1-piece unit.

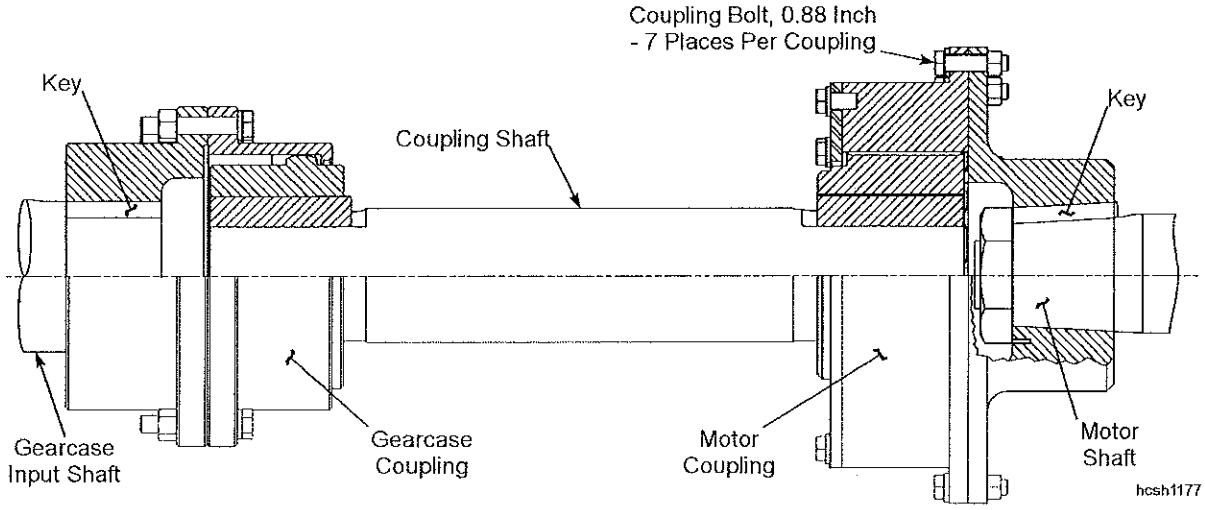


Dual Vertical Swing Shaft Installation

MOTOR COUPLING SHAFT

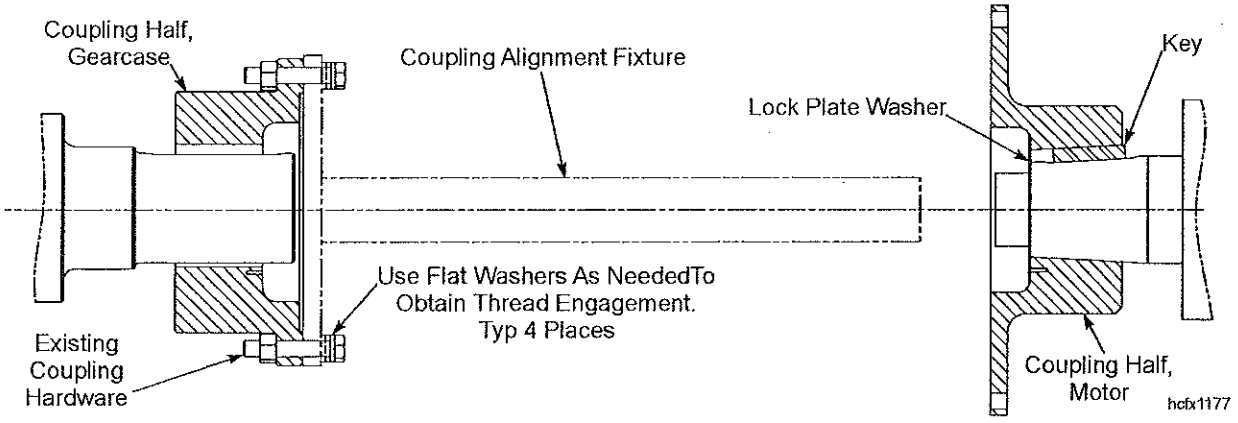
Power is transferred from the hoist motor to the gearcase through a motor coupling shaft with 2 couplings. Using the inspection doors on the coupling guard, check the couplings for evidence of lubricant leakage. Under normal circumstances, a coupling will operate for 3 to 5 years before service is required. However, if leakage from a coupling is noticed, the coupling should be disassembled and repaired.

DANGER: **STORED ENERGY! Gearing or drum must be blocked prior to performing maintenance in order to prevent unwanted movement. Failure to comply could result in death, severe personal injury, or damage to the machine.**



Motor Coupling Shaft

When reinstalling the coupling shaft, it is recommended to use a coupling alignment fixture, part no. C117028-01, or similar.



Coupling Alignment Fixture

HOIST DRUM ASSEMBLY

The hoist drum shaft uses a single-helical hoist gear fastened to a large-diameter drum with the hoist spider and rotates on double-row, tapered roller bearings.

Removal of the hoist drum shaft will require lowering and supporting the boom. *To remove the hoist drum shaft:*

1. Position the machine so that the dipper lip and front are flat on the ground.

DANGER: BEFORE PERFORMING ANY MAJOR MAINTENANCE ON THE HOIST MACHINERY, PRESS AND TAG THE MAIN POWER OFF BUTTON. Failure to comply may result in injury or death.

2. Remove the hoist ropes.

3. Remove the A-Frame ladders and platforms.

4. Remove the two machinery house fan/filter assemblies.

5. Remove the A-Frame shrouds.

6. Remove the center front roof panel, the 6 center roof panels and the 3 left roof panels over the left deck extension. Save all indicated items for re-use.

NOTE: To remove the center roof panel, cut the welds between the channels on the front wall panels and the center roof panel ~ both sides. The rubber sheets can remain attached to the roof panel. All front wall panels can remain in place, however the upper left and upper center wall panels can be removed, with their hardware, and saved for later re-use.

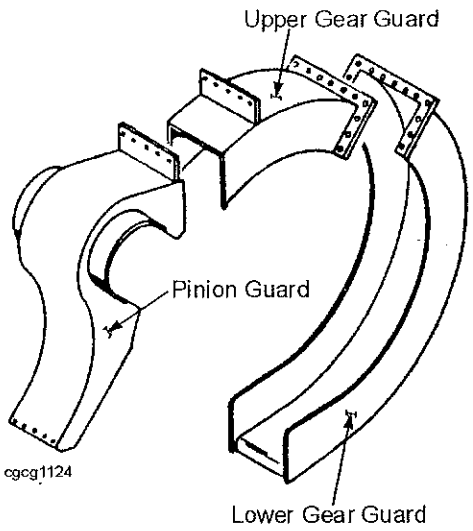
7. Remove 4 center roof cross-beams, 2 left roof cross-beams and 4 center roof fore/aft truss beams.

8. Using the crowd machinery (or a separate crane) support the weight of the boom to unload the A-Frame and main suspension strands.

9. Remove the upper A-Frame pins from the rear A-Frame legs. (Will require a cherry picker.)

10. Rotate the rear A-Frame legs back toward the rear of the machine and secure to the control room roof.

The second reduction lubricant level plug is located on the inboard side of the second reduction portion of the gearcase. Maintain the lubricant level at the bottom of the pipe plug opening. When lubricant sample tests prove it necessary, drain the gearcase immediately after operation, flush out the gearcase and refill with the recommended lubricant. Refer to Section 3 for the correct lubricant.



CROWD GEARCASE DISASSEMBLY

Repair of the crowd reduction gears is basically a matter of component replacement. Use the following procedures to disassemble the crowd machinery whether the crowd is on the machine or separated from the revolving frame.

NOTE: Removal of the appropriate roof panel is necessary to facilitate this procedure.

1. Remove the crowd ropes and retract ropes from the crowd drum. Refer to the instructions in the *FRONT END EQUIPMENT* in this manual.

2. Disconnect any lubrication lines attached to the crowd gearcases and covers. Drain the lubricant from the gearcase.

3. Disconnect the electrical leads to the crowd motor and the blower motor. Identify the leads to ensure correct installation.

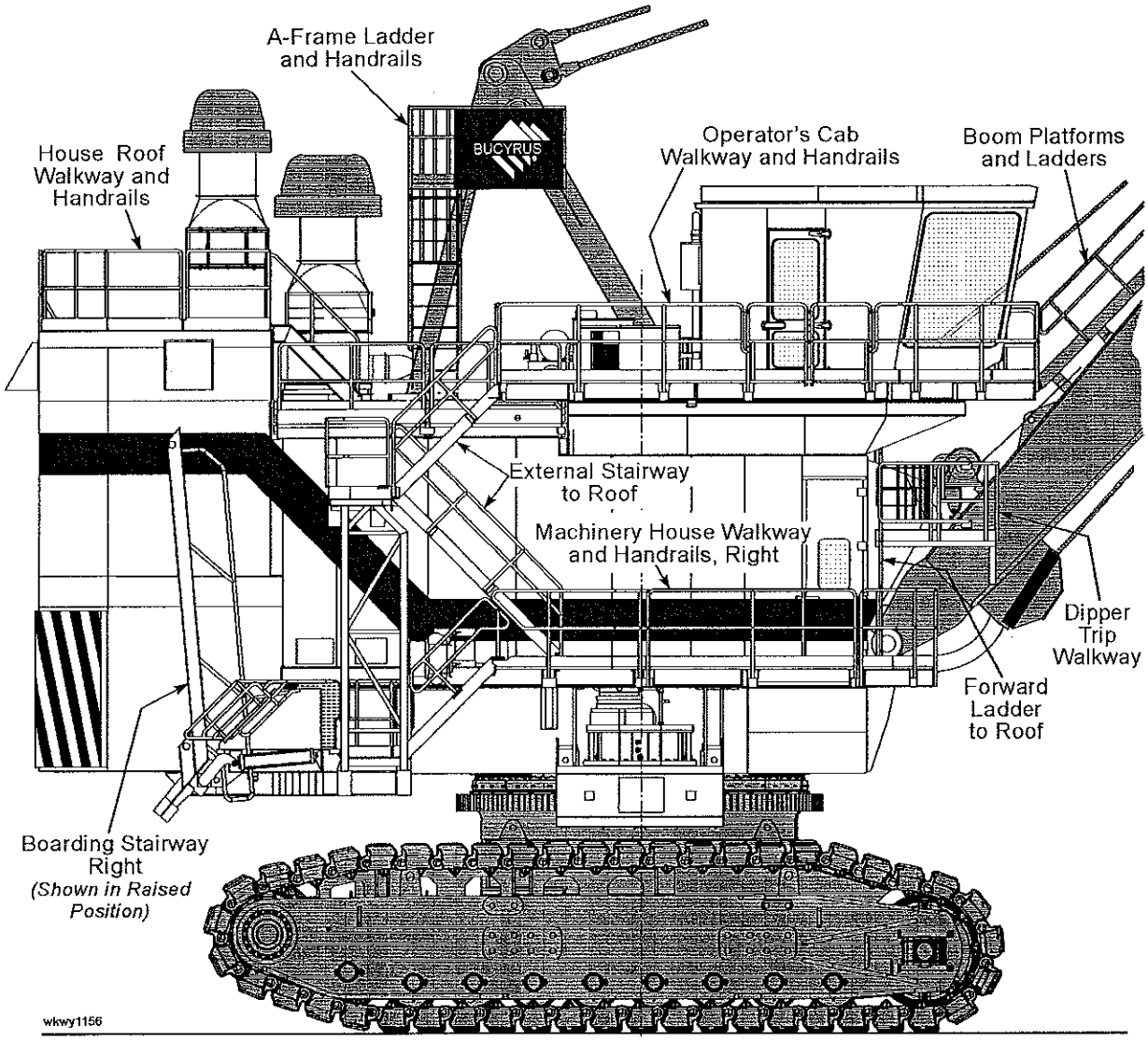
DANGER: BEFORE ATTEMPTING TO DISCONNECT ANY POWER LEADS, PRESS THE *MAIN POWER OFF* BUTTON AND TAG IT TO AVOID INADVERTENT ENERGIZING OF THE ELECTRICAL CIRCUIT. Electrocution may lead to serious injury or death if appropriate safety measures are not followed. Electrical connections should only be handled by trained electrical personnel.

DANGER: STORED ENERGY! Gearing or drum must be blocked prior to removal of components in order to prevent unwanted movement. Failure to comply could result in death, severe personal injury, or damage to the machine.

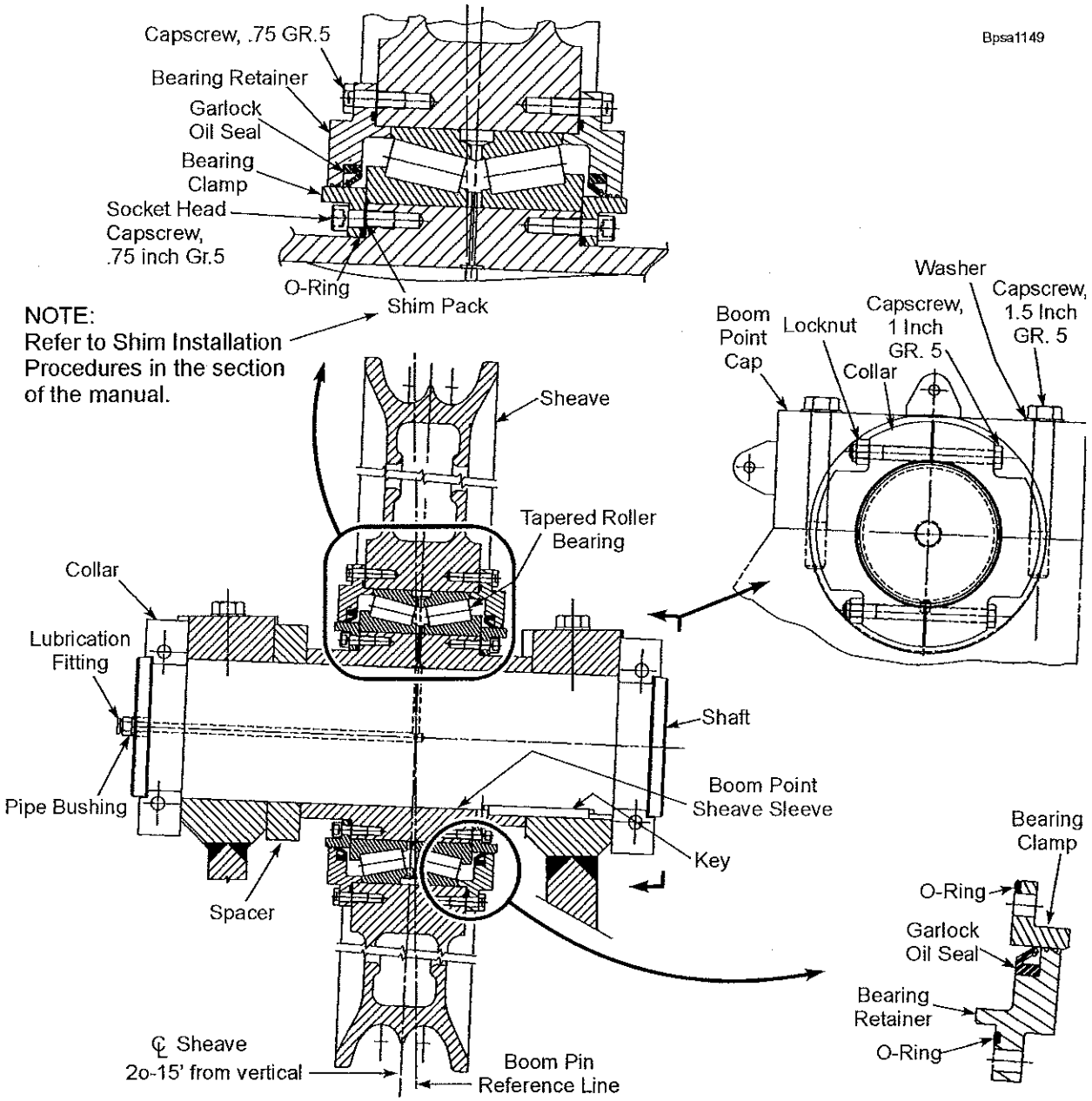
4. Remove the motor coupling guard and separate the coupling.

WALKWAYS, STAIRWAYS AND HANDRAILS

Each day inspect all walkways, platforms, stairways and handrails on the machine. Maintenance personnel should do the inspecting. Should a structural member become damaged, repair or replacement may be necessary. Replace nuts and bolts where required or repair weld to restructure individual access members such as steps and railings.



Eliminate accumulations of wiping rags, oil and grease, dust and dirt and mislaid maintenance tools. They can create a safety hazard. Keep new and used wiping rags in barrel containers rather than draped or tied to railings. Clean off oil and grease in the primary walking and working areas to prevent workers from slipping. Maintain a tool bench and rack for the storage of all tools used in the machine upkeep. Do not let tools lie scattered upon walkways and stairways.



3. Use caution and remove the O-Ring and seal from each retainer.

4. Remove the bearing clamp from each side of the sheave and also the O-Ring from each bearing clamp.

5. Remove the shims from the inboard side of the sheave.

6. Remove the sheave and bearing from the sleeve. Separate the bearing from the sheave.

7. While supporting the dipper handle with a crane, SLOWLY propel the machine in a straight line to the rear. The dipper handle will slide from the saddle block.

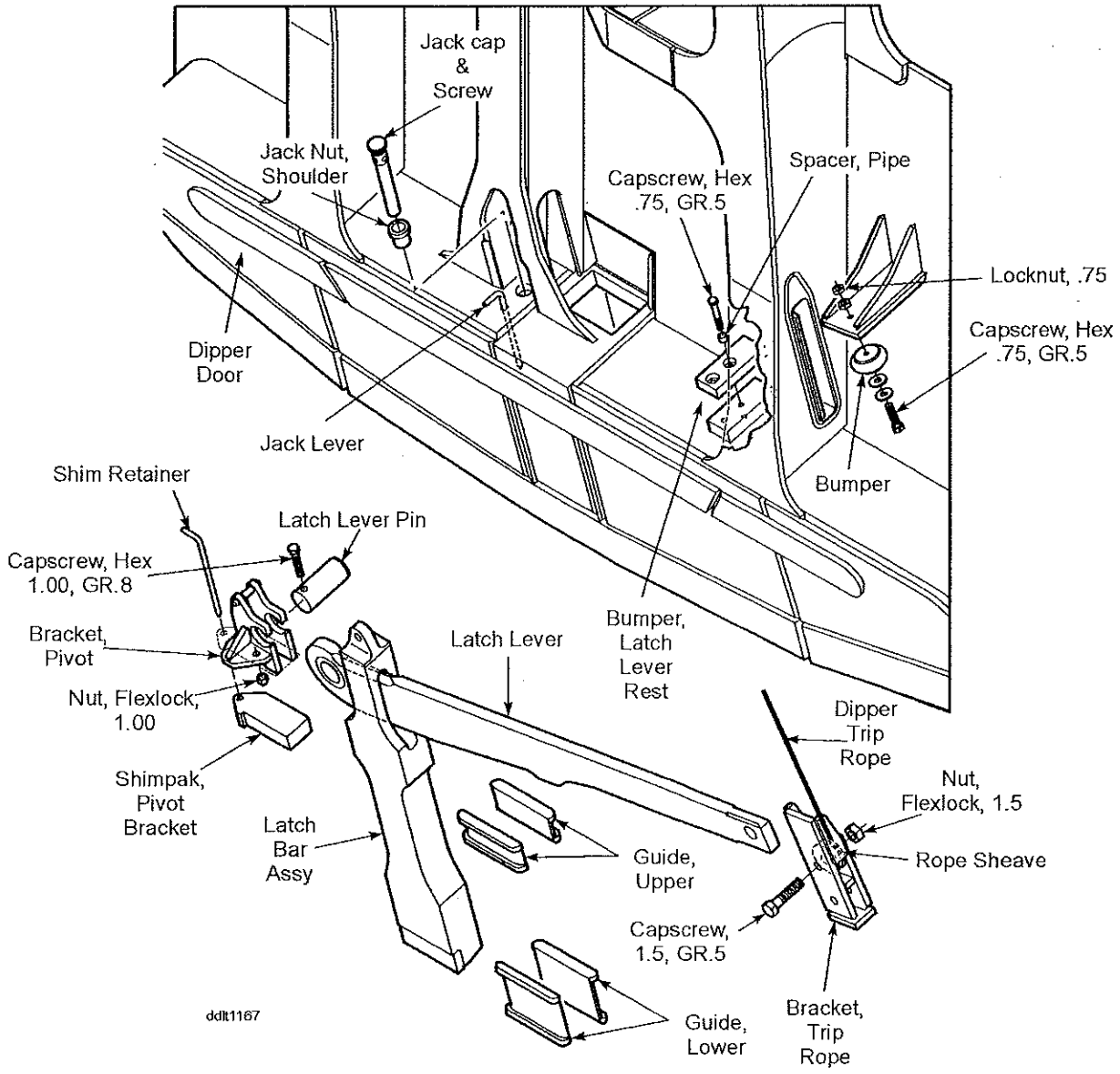
CAUTION: THE DIPPER HANDLE WILL FALL ONCE REMOVED FROM THE SADDLE BLOCK IF IT IS NOT FULLY SUPPORTED.

8. Set the free end of the dipper handle on blocking and perform the required maintenance. While the handle is on the ground, the crowd half-sheave (previously removed) and retract take-up mechanism should be inspected and repaired if required.

Dipper handle installation is the reverse of removal. Note the following:

- Carefully align the free end of the dipper handle and the saddle block before propelling the machine forward.
- The crowd rope screw adjusting mechanism should be completely pre-assembled AND THOROUGHLY LUBRICATED before installing into the end of the dipper handle. Refer to the note in *CROWD ROPE TAKE-UP MECHANISM ASSEMBLY.*
- BE SURE THAT THE WORM GEAR HOUSING AND CROWD HALF-SHEAVE ARE PERFECTLY LEVEL WITH THE DIPPER-TO-HANDLE PINS AND ALSO WITH THE RETRACT ROPE SPREADER AND TAKE-UP MECHANISM.
- Install the crowd and retract ropes using the proper procedures in this section of the manual.

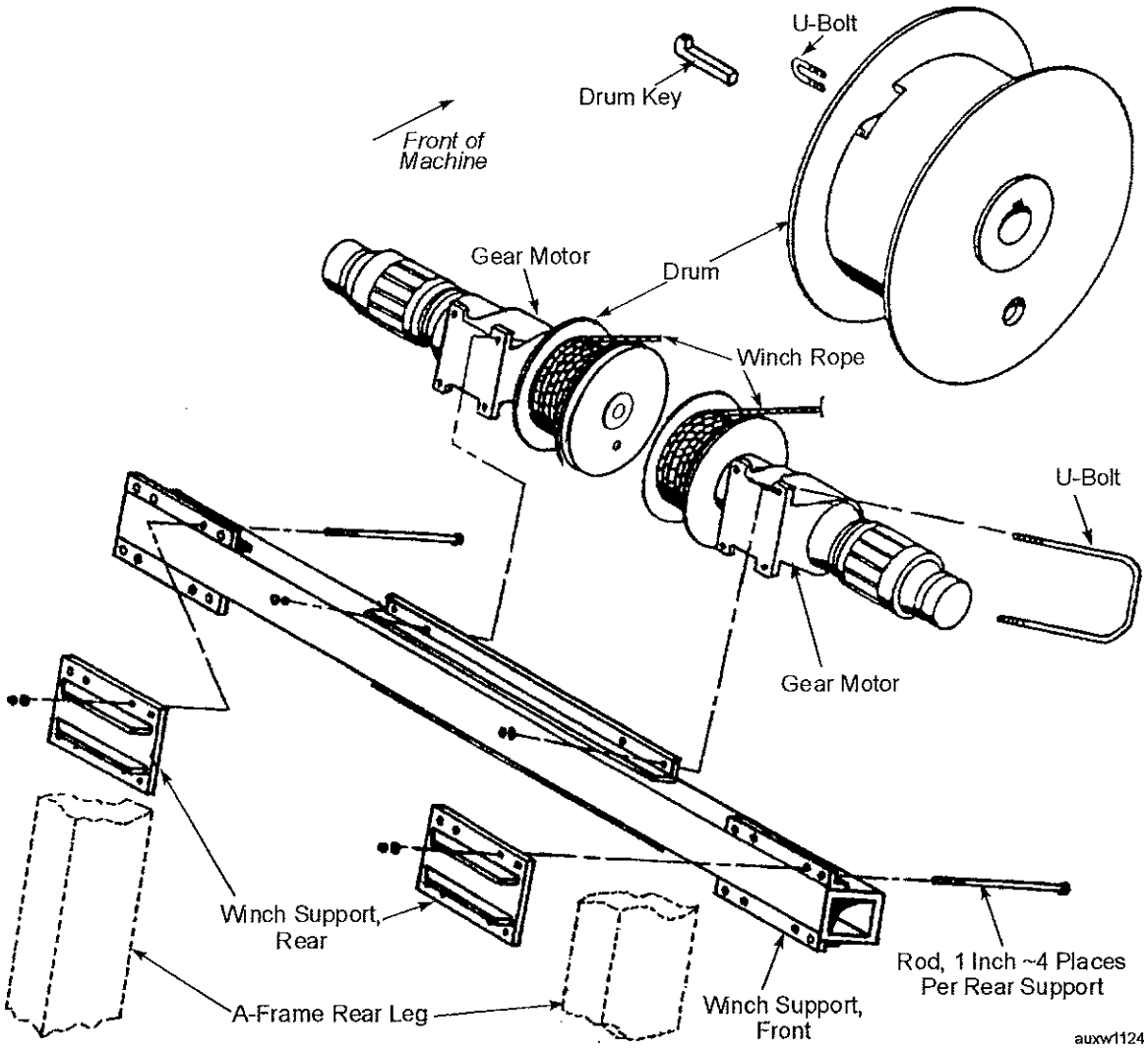
All lubrication points should be inspected and lubricated each shift. The dipper should also be checked for missing or broken teeth or missing wedges. These items if missing or broken must be replaced before digging is started. Check the latch bar and the latch bar keeper insert, if applicable, for wear and replace if required.



Dipper Door Latch Bar and Lever

AUXILIARY WINCH

The auxiliary winch is attached to the hoist ropes to raise and lower the ropes during hoist machinery maintenance and change-out of hoist ropes. The winch consists of a drum and rope mounted to an electric gear motor. The winch can be single or double arrangement. The double arrangement is shown.



The winch can be single or double arrangement. The double arrangement is shown. The winch consists of a drum and rope mounted to an electric gear motor.

6. Continue pulling the ropes into the machinery house. When the ends of the ropes reach a point where the follow rope can be tied off, stop pulling, detach the follow rope from the winch line and tie it off.

7. Pull the lead ropes until they are in a position to be placed in there becket resolvers. Place the lead rope ferrules in the resolvers, install the lead rope keeper and detach the winch line.

8. Slowly rotate the drum 180° in the *HOIST* direction so that the follow ropes can be attached.

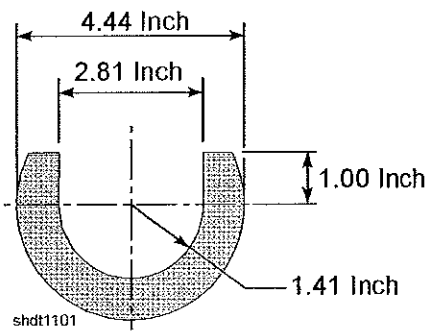
9. Hoist the winch attached to the follow ropes until the ropes can be attached to the drum.

10. Place the follow rope ferrules in the resolvers, install the lead rope keeper and detach the winch line.

11. Slowly rotate the drum in the hoist direction until the hoist ropes are tight. Make sure the ropes stay in the proper grooves.

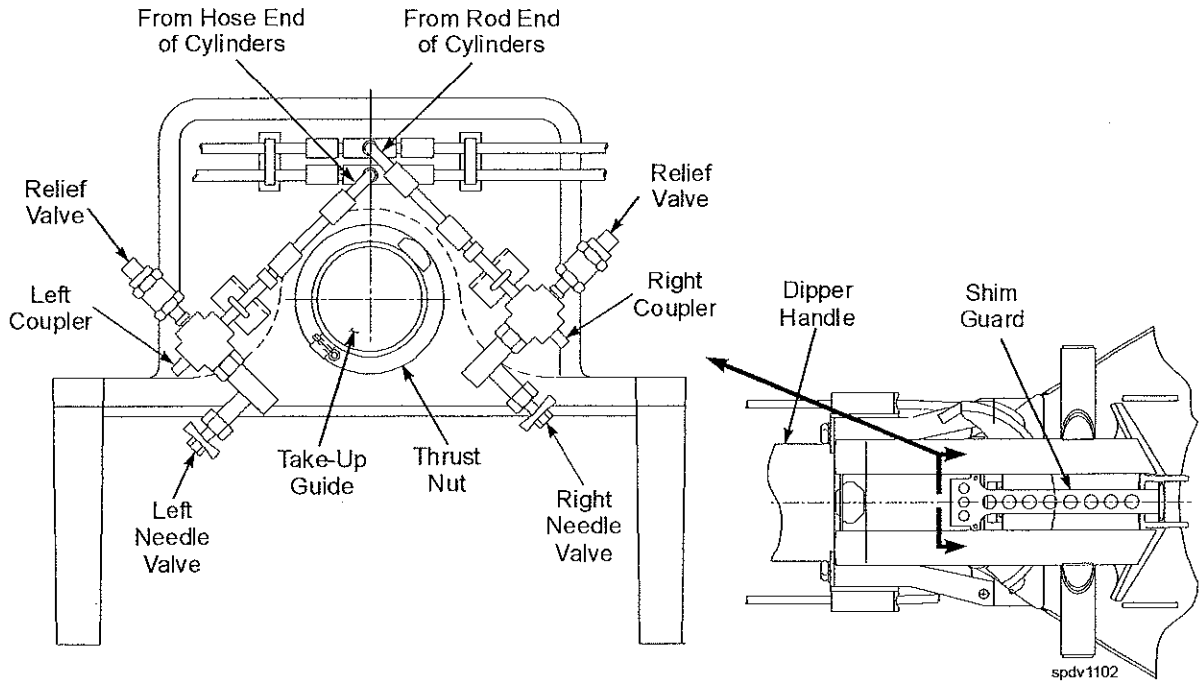
12. Hoist the dipper approximately 1 foot off of the ground. Check to make sure the dipper hangs straight. If not, place shims between the ferrule and the ferrule socket on either the lead or the follow ropes on the side that the dipper hangs lower. If necessary, locally manufactured shims may be placed under both ferrules.

13. Hoist and lower the dipper several times to seat the ropes. Make sure the dipper hangs straight. If not, shim as above. Reset the hoist and crowd limit switches.



Shim for Hoist Rope Socket

NOTE: The above steps are used to remove and replace 1 pair of hoist ropes. When replacing a single hoist rope, be sure to check the alignment of the dipper and shim the old rope if required to level the dipper.



5. Shim the take-up nut at the desired position.

CAUTION: The take-up nut must be shimmed tight, both fore and aft, using all shims originally provided with machine.

6. Slowly open the left needle valve to release the pressure on the cylinders.

CAUTION: Oil within the needle valves is under high pressure. STAY CLEAR OF TAKE-UP NUT, SHIMS AND CYLINDERS WHEN OPERATING NEEDLE VALVE, AS THESE ITEMS COULD MOVE UNEXPECTEDLY AND CAUSE SERIOUS INJURY.

7. Close and secure the shim guard.

DISC BRAKE OPERATION

When air is exhausted, the spring force "Clamps" the rotor between the friction discs or the mounting flange and pressure plate. To disengage the brake, air enters through the end plate into the diaphragm cavity. As air pressure increases, the end plate moves away from the stationary spring housing. The pressure plate is bolted to the end plate and travels in the same direction compressing the springs and releasing the brake.

DANGER: PRIOR TO INSTALLATION OR MAINTENANCE ON A BRAKE, MAKE SURE THAT MACHINE OR MACHINERY IS BLOCKED TO PREVENT MOVEMENT. Failure to do so could result in serious personal injury or machine damage.

CAUTION: Protective means must be used to prevent oil or grease from coming into contact with the disc(s) or the friction discs. Oil or grease will significantly reduce the torque capacity of the brake and decrease its ability to hold the machinery in a safe position. DO NOT RISK INJURY!

CAUTION: DO NOT OPERATE THE MACHINE WITHOUT ALL BRAKE GUARDS INSTALLED.

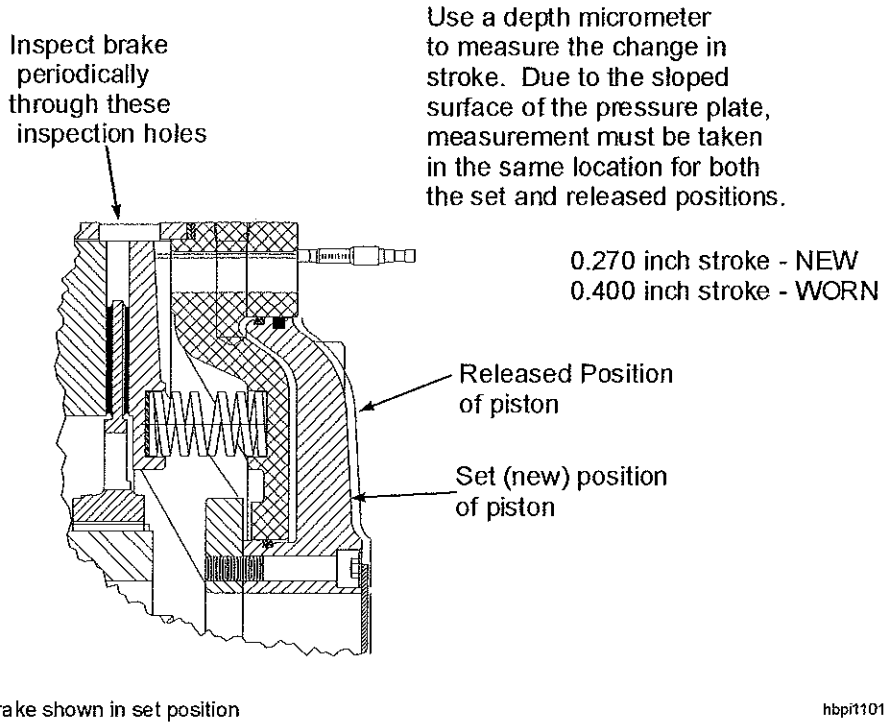
MAINTENANCE

- No lubrication is required.
- Replace friction disc(s) when worn to the step on the friction disc O.D.

HOIST BRAKE ADJUSTMENT

The hoist brake is equipped with 2 adjustment shims to compensate for lining wear. This brake should be checked daily for lining wear and proper piston travel. If out of adjustment it will not be able to support a fully loaded dipper.

To inspect for excessive disc wear use a micrometer as shown in the image below. The reading must be taken from the same location with the brake engaged and released. Due to the tapered surface of the pressure plate, care must be taken to duplicate the position and process as closely as possible. Friction disc adjustment must be performed when the total wear reaches .400 inch.



View - *A*

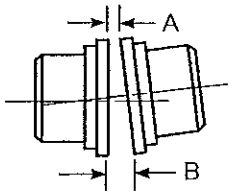
Hoist Brake Friction Plate Inspection

NOTE: Adjustment shims are split for ease of removal and installation. DO NOT DISCARD shims after removal during brake adjustment. These shims will be required when reassembling brake following a friction disc replacement.

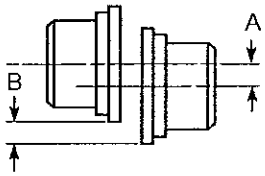
1. When wear has reached 0.400 inch, remove the outer cylinder nuts and a single shim from the stack.
2. Reinstall the nuts and tighten to a maximum of 120 Ft.Lbs.

CAUTION: Tighten the stud nuts as per the instructions on the brake drive ring to a maximum of 120 Ft.Lbs. Excessive or improper tightness can cause the drive ring to become deformed and seriously reduce the effectiveness and life of the brake assembly.

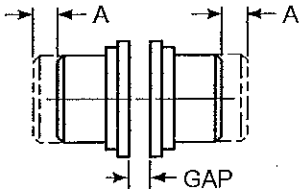
GRID COUPLING ALIGNMENT



ANGULAR ALIGNMENT is the difference between Gap "A" and Gap "B".



OFFSET ALIGNMENT is the amount distance (offset) between shafts.



END GAP is the min. gap between the shaft ends.

cplgimts

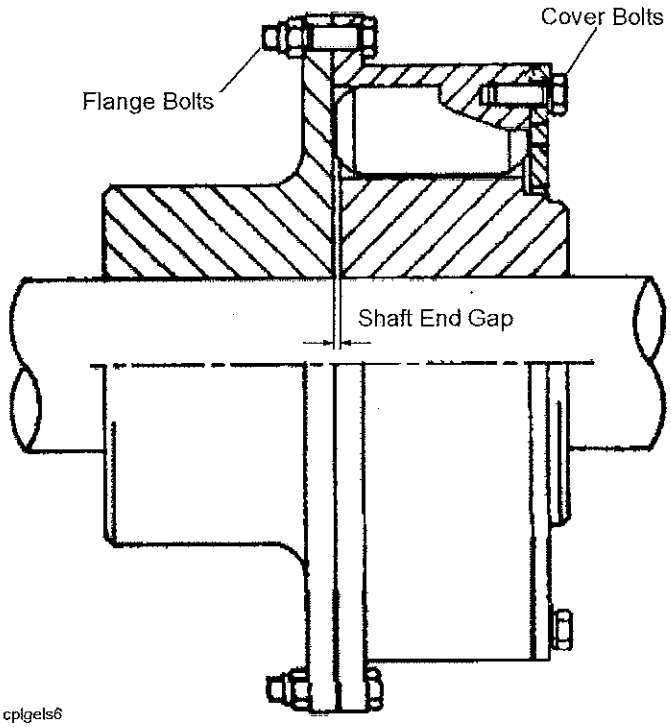
Grid Coupling Data

Coupling	Crowd	Propel
*Part No.	C113194-01	S021581
Type	Grid	Grid
Motor Frame	812	812
# Bolts	14	8
Dia. (inch)	0.5	0.75
Torque (in.lbs.)	650	650
Torque (Ft.Lbs.)	54	54
Max. Parallel Offset (in.)	0.022	0.022
Max. Angular Limit (in.)	0.04	0.04
Min. End Gap Limit (in.)	0.556	0.556
Grease Wt. (Lbs.)	1.6	1.6

NOTES:

- Bolts are NOT Standard Fasteners. Values indicated are for clean, dry threads.
- * Use Parts Book to Verify Part Number.

WARNING: DO NOT SUBSTITUTE STANDARD FASTENERS FOR COUPLING BOLTS.

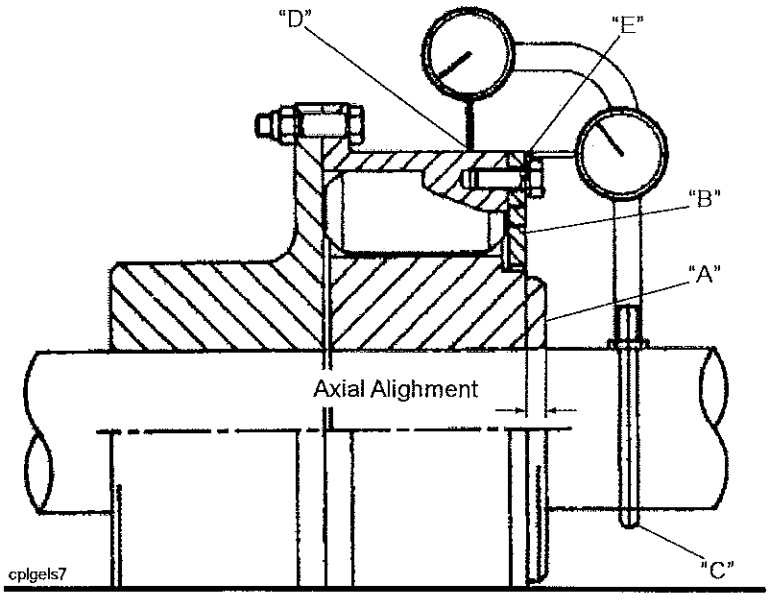


END GAP TABLE

Coupling Size	Shaft End Gap (in)
PM 0.4	0.04
PM 0.7	0.08
PM 1.3	0.08
PM 3	0.12
PM 6	0.12
PM 8	0.12
PM 12	0.14
PM 18	0.16
PM 27	0.18
PM 40	0.20
PM 60	0.22
PM 90	0.26
PM 130	0.28
PM 180	0.31
PM 270	0.35
PM 400	0.41
PM 600	0.47

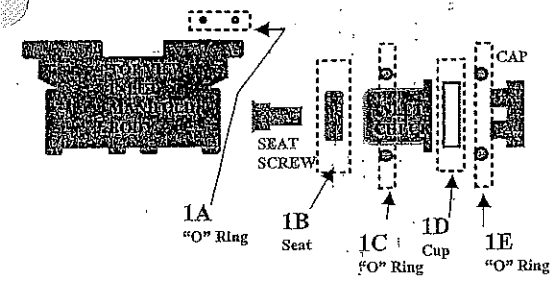
COUPLING ALIGNMENT

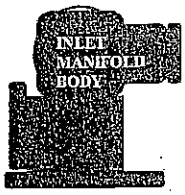
The following describes how to verify that the alignment of the coupling is sufficient to prevent premature deterioration of the rubber elements. Note that the values given in the table are in inches.



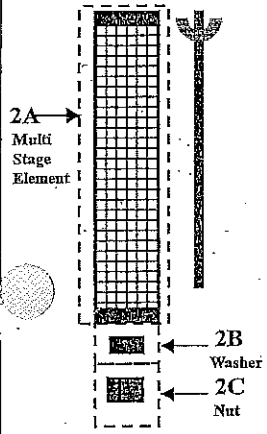
REPAIR ITEMS

FILTRATION TOWER
[INLET MANIFOLD]

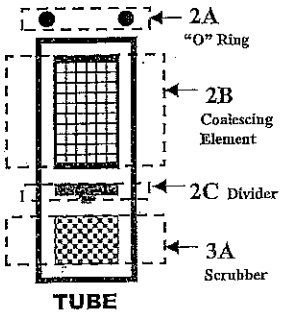


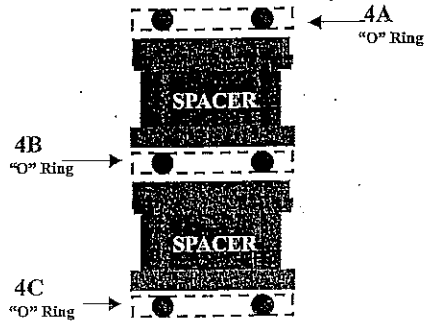


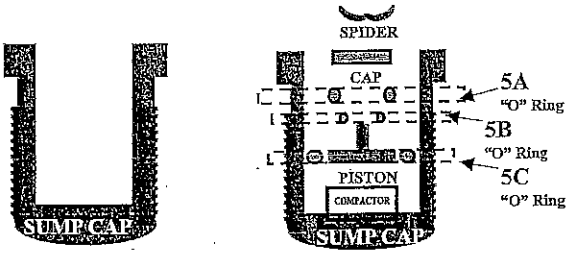
ALL -2 MODELS

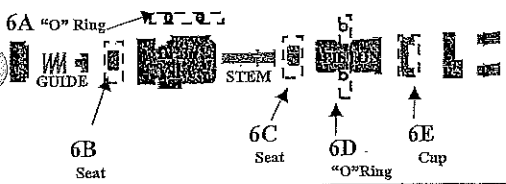


ALL OTHER MODELS

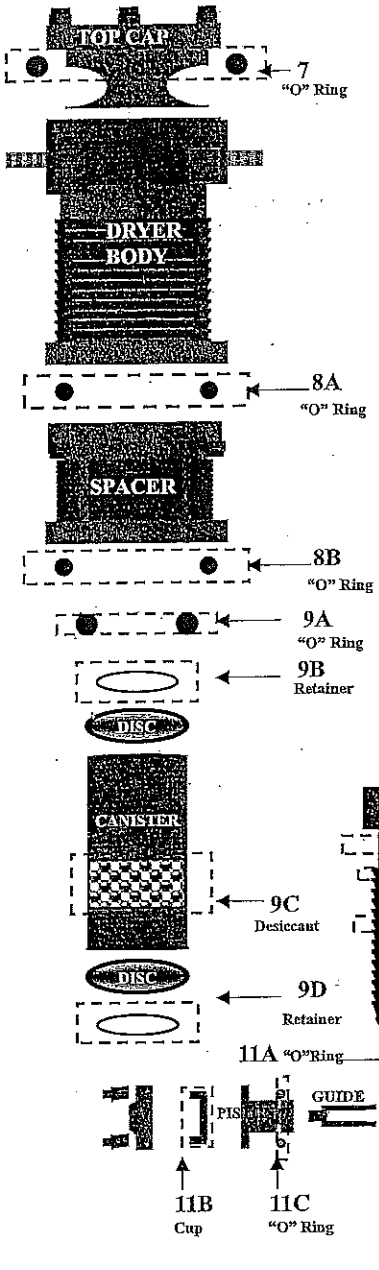




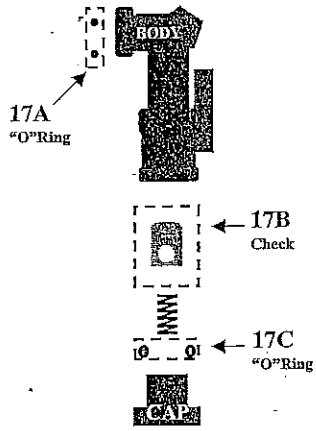




DRYING TOWER



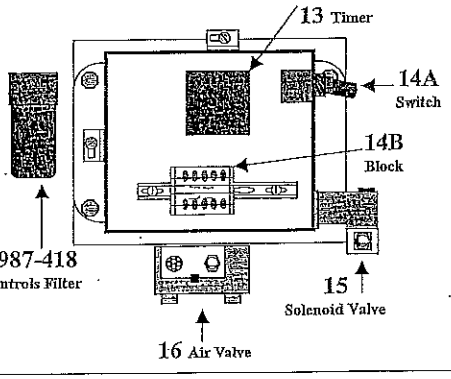
OUTLET MANIFOLD

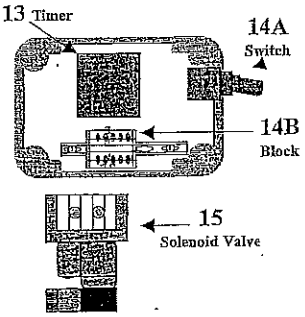


PRESSURE CHECK VALVE

FLOW CHECK VALVE

CONTROL BOX





COMPRESSOR MAINTENANCE

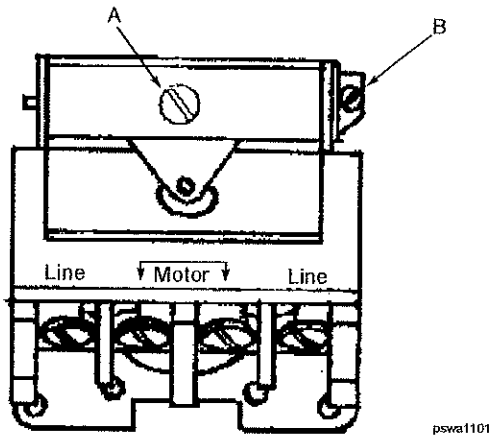
PRESSURE SWITCH

An adjustable pressure switch controls motor and unloader shutdown along with the load/unload signals. The factory setting is at 25 PSI for the differential pressure between the settings that load and unload signals are introduced. This is the maximum differential pressure allowed with this switch. The cutout, or unload, is set at the factory. Refer to the figure.

A. Cutout Pressure, rotate clockwise to increase

B. Differential Pressure, rotate clockwise to increase (DO NOT Overtighten)

The cutout pressure is set by the adjustment screw "A". The differential pressure can be increased by movement of adjustment screw "B" in a clockwise direction. *Do not force this adjustment beyond its limits as this will result in an unreliable differential pressure.* There will normally be no need to adjust the factory setting.



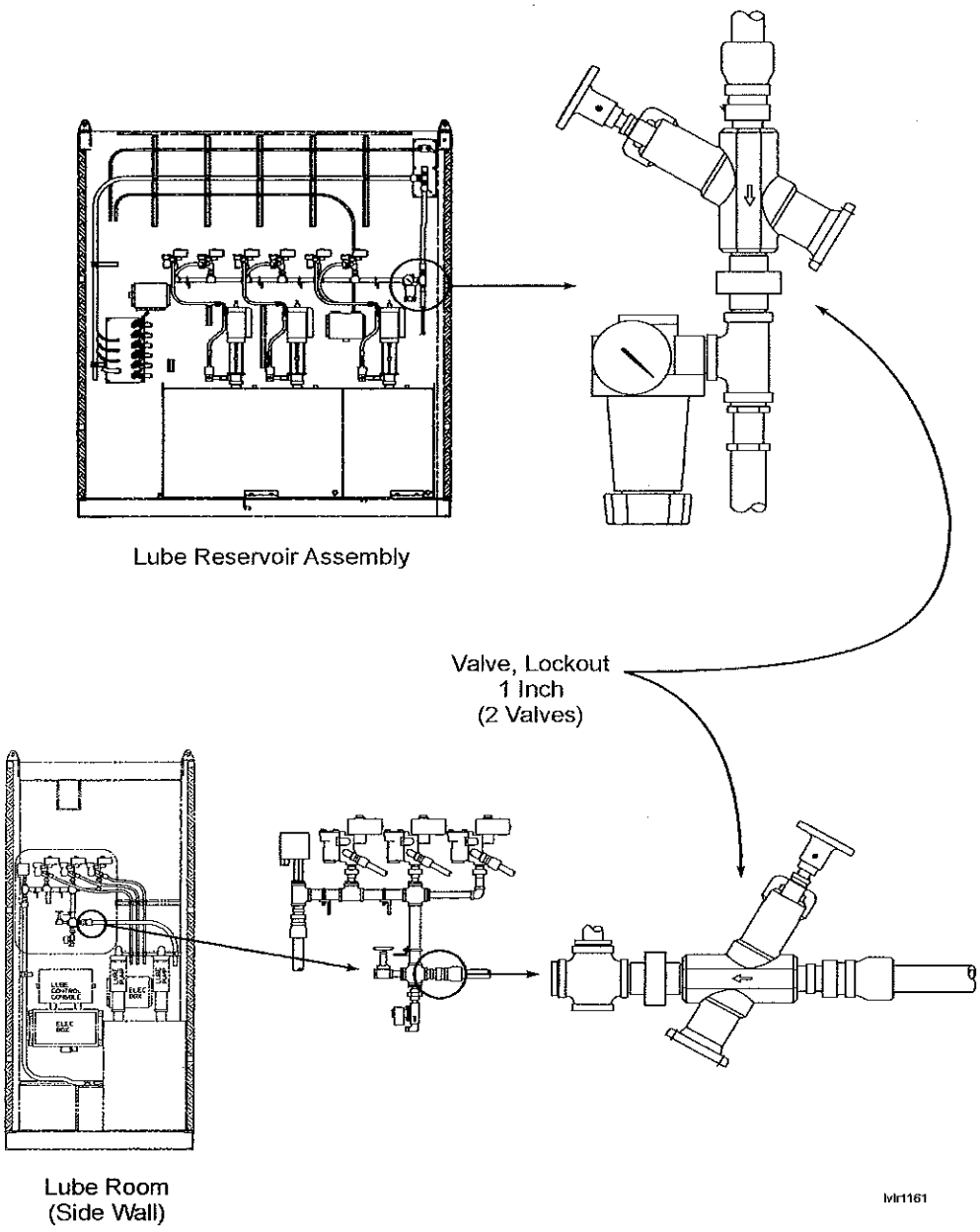
Pressure Switch Adjustment

CAUTION: DO NOT ADJUST THE CUTOUT PRESSURE HIGHER THAN THE MAXIMUM UNIT RATING. Minimum operating pressure is 25 PSI for short periods (under 3 minutes) and 40 PSI for sustained operation.

AIR FILTER

The air filter must receive adequate maintenance if maximum service life is to be received from the compressor unit.

NOTE: A wide range of operating hours is possible between servicing intervals of the air filter. The environmental conditions encountered will directly affect this interval. Conditions may vary with regard to the location and dust conditions that will affect machine operation. Experience and a series of systematic checks will aid in determining the interval required.

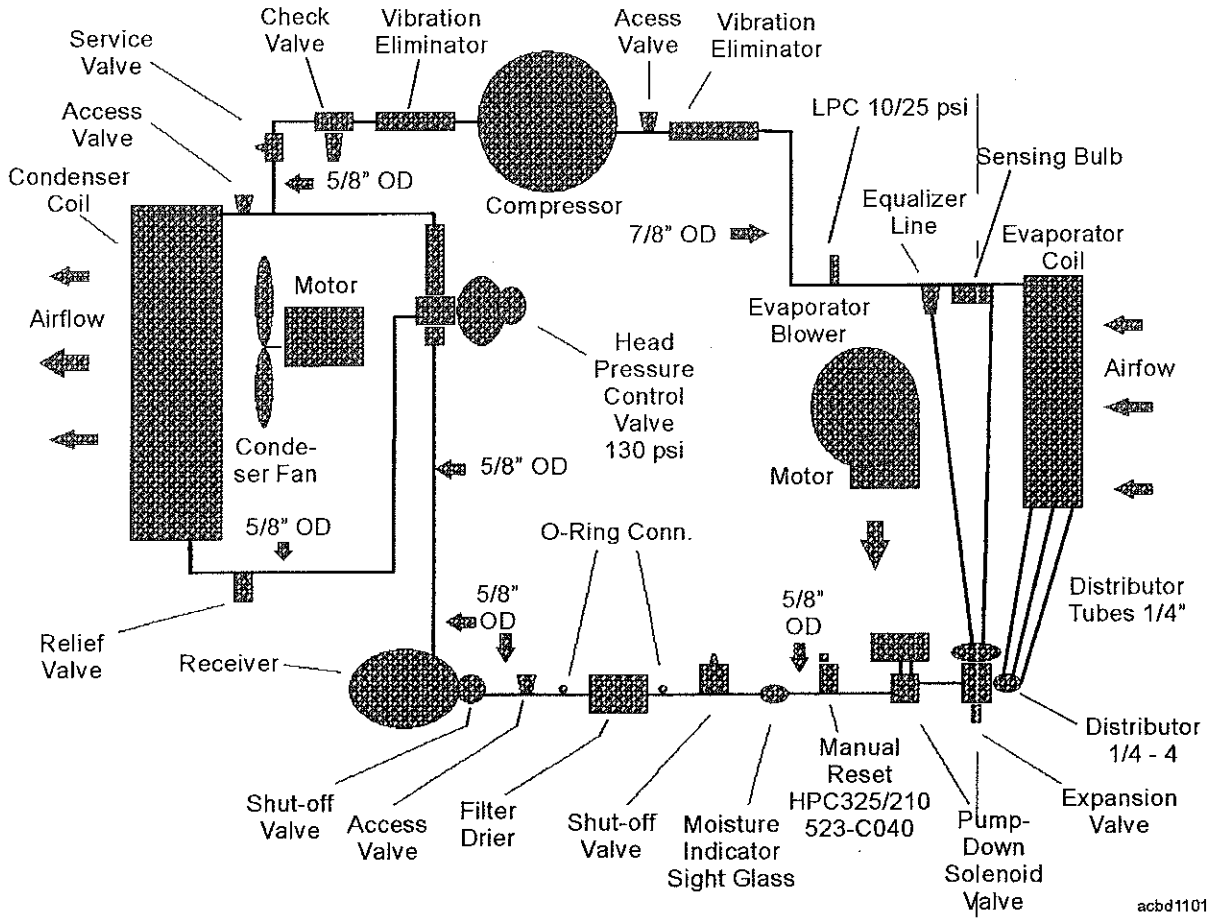


Lube Room Lockout Valves

SPECIFICATIONS

Nominal Cooling Capacity	31,000 Btu/hr@460V/60Hz		
Power requirements	380V/3ph/50Hz	415V/3ph/50Hz	460V/3ph/60Hz
	17.5 Amps	19.0 Amps	21.0 Amps
Refrigerant	HFC 134a – 24 lbs.		
Oil	POE Variety Mobil Arctic EAL22CC or ICI Emcarate RL32CF		
Compressor	Fully sealed, scroll type		
Condensor Coil	5 row, 3/8 inch copper tube with 8 aluminum fins/inch		
Evaporator Coil	4 row, 3/8 inch copper tube with 10 aluminum fins/inch		

Detailed information on the MPV9 can be found in the vendor's documentation that accompanied the machine and the General Arrangement drawings provided by Bucyrus International.

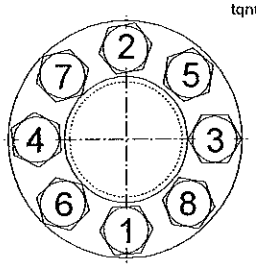


Air Conditioner ~ Block Diagram

TORQUE NUT INSTALLATION

TIGHTENING PROCEDURE FOR ONE 2-INCH TORQUE NUT

tqnut_8



"STAR" Tightening Pattern

1. Ensure that a special steel washer, supplied with the torque nut, is placed beneath the torque nut. DO NOT USE STANDARD COMMERCIAL WASHERS.

2. Check the base of the torque nut to ensure that all jackbolts are flush with the bottom.

3. Spin the torque nut onto the rod or bolt by hand.

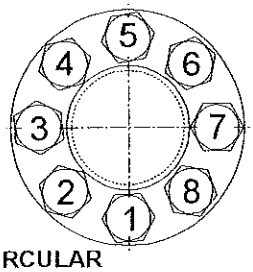
4. Tighten the jackbolts to **100** Ft.Lbs. as follows:

   a. Snug all jackbolts to **10** Ft.Lbs. each.

   b. Using the STAR pattern shown, tighten all jackbolts to **50** Ft.Lbs.

   c. Switch to the circular pattern shown and tighten all jackbolts to **75** Ft.Lbs.

   d. Continue with the circular pattern and tighten all jackbolts to **110** Ft.Lbs.



CIRCULAR Tightening Pattern

Torque Nut with 8 Jackbolts

NOTES:

- With longer rods and bolts, stretch in the rod or bolt occurs during tightening of the jackbolts. Therefore, after tightening with the circular pattern in step 4-d above, the first jackbolt may have loosened. The higher torque value is used in this step only to speed the tightening process. After performing the above steps, use a torque wrench for the final torque values and continue tightening the jackbolts in a circular pattern until all jackbolts are tightened to a value of **100** Ft.Lbs.
- An impact wrench can be used for the initial tightening sequences, *however a torque wrench must be used to achieve the final torque values.*
- Repeat the above steps for all remaining torque nuts.

PINION AND HUB INSTALLATION

REMOVAL FROM A SHAFT

CAUTION: A properly mounted pinion, brake drum or coupling will have an interference fit with the shaft causing it to release suddenly and violently when broken loose. Loosen the shaft nut just enough to allow the pinion, brake drum or coupling to free itself. The shaft nut will stop the pinion or coupling and avoid injury to personnel.

NOTE: When removing the pinion, brake drum or coupling from a motor shaft, always use a suitable puller to avoid causing damage to either the pinion, coupling, motor frame, bearings or shaft. Do not heat the pinion, brake drum or coupling before pulling and do not use wedges between them and the bearing cap. To prevent damage to the anti-friction bearings, avoid the use of a sledge hammer on the puller.

MOUNTING A PINION OR HUB ON A SHAFT

Successful operation of the gearing largely depends on the proper mounting of the pinion, brake drum or coupling on the shaft.

NOTE: Mounting pinions, brake drums or coupling by heating them in boiling water and driving them on the shaft with a blow from a heavy sledge hammer is not recommended. This results in uncontrolled advance of the pinion or coupling on the shaft. Too great an advance can cause breakage of the pinion, brake drum or coupling core, while insufficient advance can cause slippage and wear in spite of the presence of the key. In addition, hammer blows can injure the finished surface of the anti-friction bearings.

Pinions, brake drums or couplings must be mounted to a definite advance on the shaft, without hammer blows. This requires heating them to a higher temperature than is obtainable with boiling water, and is based on a difference in temperature between them and the shaft. *The following is the recommended method for mounting pinions, brake drums or couplings:*

1. Thoroughly clean the pinion, brake drum or coupling seating surface on the shaft and the bore of the pinion, brake drum or couplings. Use toluol or percholoethylene; do not use kerosene.

   CAUTION: Solvents may be toxic or flammable. Adequate ventilation must be provided to minimize fire and health hazards. Use away from sparks, heat or flame to prevent fire or explosion. Follow the manufacturer's instructions.

   Remove any scoring from either part. Spot the cold pinion, brake drum or coupling on the shaft by hand to obtain at least a 75% fit. Check the fit with bluing. Remove the pinion, brake drum or coupling.

2. Break all sharp edges of the key and the keyway with a fine file, so there will be a radius of about 1/64 inch at each edge. Fit the key to the shaft, taking care to avoid upsetting the metal of the shaft adjacent to the key. If previously upset, file lightly, checking the fit with bluing until a 75% fit results. Try the pinion, brake drum or coupling on the shaft to make certain it does not bind on the key.

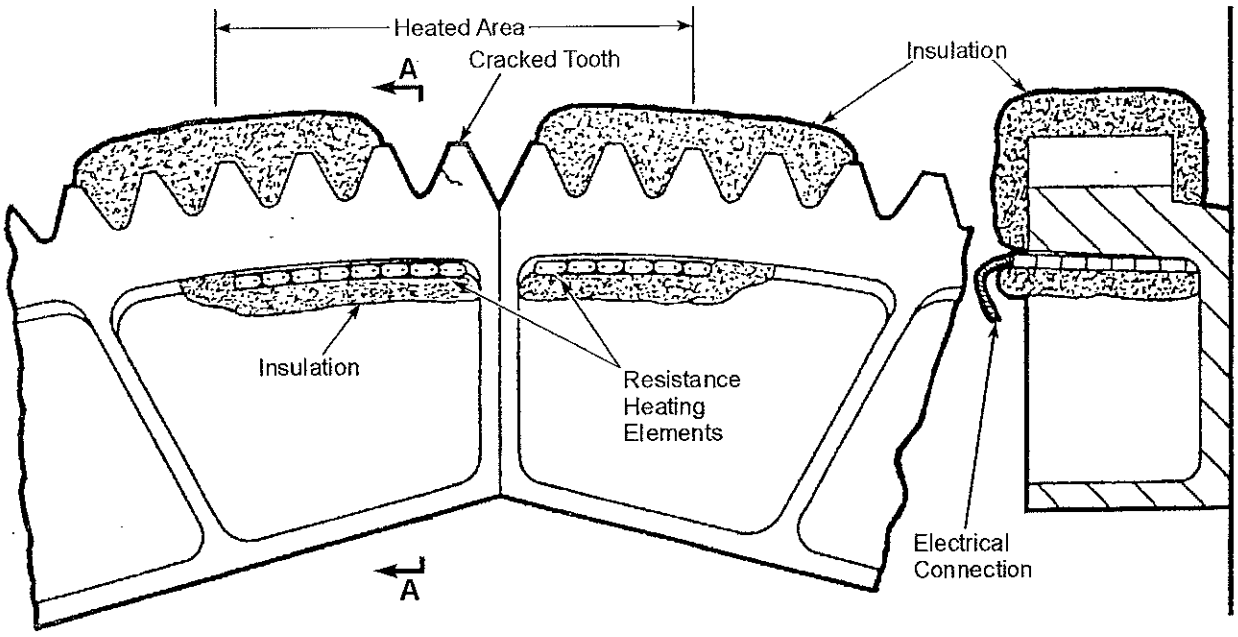
SWING RACK WELDING ELECTRODES

1. All welding is to be done using oven dry E11018-M low hydrogen electrodes. Connect an electrode drying oven as close as possible to the work area. Set the oven temperature at 300°F. As sealed containers of electrodes are opened, place the entire contents of the container in the oven. Remove no more electrodes than can be consumed in one-half hour. If all electrodes are not used in 1/2 hour, return them to the oven. Discard any electrodes which have been wet.

PREHEAT

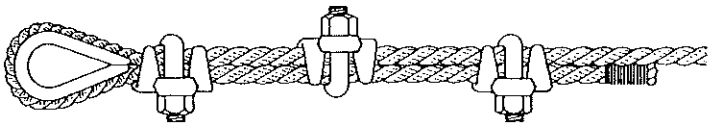
1. Two levels of preheat are required for tooth repair, 250°F minimum for butter welding and 175°F minimum for filling in the groove. Temperatures should be measured with temperature indicating crayons.

2. Preheat will be difficult to maintain because of the mass of metal in the swing rack to draw the heat away from the repair area. It is therefore recommended to apply heat to a large section of the swing rack to offset this quench effect. A section covering at least 3 teeth on either side of the tooth being repaired should be heated so that the minimum preheat temperature is obtained at the repair location. It is suggested that electrical resistance heaters be applied behind the teeth as shown, if such physical arrangement is possible. If the repair area cannot be heated to the required minimum temperature by this arrangement, supplementary heat must be applied from the tooth side of the swing rack. Electrical resistance heaters can be applied, or heat provided by oxy-propane torches. Adjacent areas of the swing rack should be covered with 'heavy insulation to avoid beat loss.

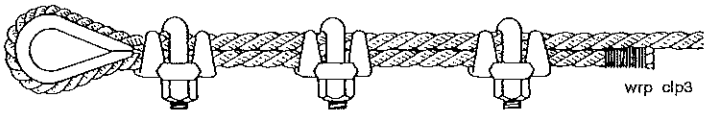


wldswrk3

RIGHT WAY for Maximum Rope Strength.



WRONG WAY: Clips Staggered.



WRONG WAY: Clips reversed.

A termination complying with the above instructions, using the number of clips shown, has approximately an 80% efficiency rating. This rating is based upon the nominal strength of the wire rope. If a pulley is used in place of a thimble where the rope turns back, add one additional clip.

The number of clips shown is based upon using right regular or lang lay wire rope, 6 x 19 class or 6 x 37 class, fiber core or IWRC, IPS or EIP. If Seale construction is to be used for sizes 1 inch and larger, or similar large outer wire type construction in the 6 x 19 class, add one additional clip.

The number of clips shown also applies to right regular lay wire rope, 8 x 19 class, fiber core, IPS, sizes 1-1/2 inch and smaller; and right regular lay wire rope, 18 x 7 class, fiber core, IPS or EIP, size 1-3/4 inch and smaller.

For other classes of wire rope not mentioned, it may be necessary to add additional clips to the number shown. If a greater number of clips are used than shown in the table, the amount of rope turn-back should be increased proportionately. **THE ABOVE IS BASED ON THE USE OF CLIPS ON A NEW ROPE.**

IMPORTANT: Failure to make a termination in accordance with the aforementioned instructions, or failure to periodically check and re-tighten to recommended torque, will cause a reduction in the efficiency rating.

The correct spacing and number of clips is shown above.