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CAPACITOR LOADING EQUIPMENT MODULE (CLEM) OPERATION MANUAL

by

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Approved for Publication

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1. INTRODUCTION

1.1 SCOPE

The purpose of this manual is to provide the necessary information to safely operate and maintain the capacitor loading equipment module designed and built by EG&G, Inc. for the Lawrence Livermore Laboratory Shiva Laser System (SAN-L 463-099).

1.2 GENERAL DESCRIPTION

The system (Figures 1-1 and 1-2) consists of two primary pieces of equipment: a Clark forklift and the Platform Assembly (CLEM). The forklift transports CLEM to and from capacitor module racks and repair/storage areas, and provides 24-volt d-c power to CLEM. The CLEM system is used to place or remove capacitor modules to or from shelves and provides a platform for transport. Capacitor modules are approximately 15 in. high and 30 in. deep. The widths and weights range from 42 in. to 75 in. and 600 lb. to 1125 lb., respectively. The storage racks are 7 shelves high and spaced 20.5 in. apart. The fourth through seventh shelf are considered the upper level.

CLEM also has a manlift and remote control station to provide the operator access to capacitor modules on shelves higher than 5 feet. The CLEM platform translates right and left from the center position to the shelf. A drawbar, which pulls a capacitor module onto the platform or pushes the module from the platform onto the shelf, translates the full width of the platform. Capacitor modules can be handled from either side of CLEM. Maximum load and critical data are listed on a name plate attached to CLEM. CLEM is finished with a durable, baked-on epoxy powder coating.

1.3 SYSTEM COMPONENTS

CLEM has been designed to be used with a Clark NST-30, 24-volt-battery-powered forklift as the prime mover. The forklift was specified and purchased with the power steering option, a 131-inch maximum mast elevation, and a remote operating station pendant for vertical lift control. The supplied forks and load backrest extension have been removed to reduce the overall system size and facilitate easier handling during coupling/un-coupling operations. A cable reel has been added to pay out or retract the remote station pendant cable as CLEM is raised and lowered to service capacitor modules.

The forklift can be changed back into standard configuration for ordinary use by sliding the supplied forks and a modified load backrest onto the carriage assembly.

1-2

Figure 1-1. CLEM System.

Figure 1-2. CLEM System Platform Assembly.

CLEM consists of three major assemblies (drawing number LJ106053): the carrier frame, the platform, and the manlift.

CLEM has two main load-carrying wheels and one swivel castor located under the carrier frame for independent manual movement. A retractable handle stored in the CLEM forklift interface area of the carrier frame is provided for manual movement. An interface assembly to couple CLEM to the forklift carriage consists of a pushbar and associated linkage to lift and engage the lower clamps onto the forklift carriage. A spring-loaded latching assembly automatically locks CLEM to the forklift. CLEM can be uncoupled from the forklift by manually pulling the locking bar lever, lowering the carriage and backing the forklift away (Figure 1-3).

CLEM has three bi-directional powered movements: lift and lower, platform horizontal translation, and drawbar push-pull. The platform and drawbar drive to the right and left at approximately 6 feet per minute. All power is provided by the forklift battery and is operator-controlled with a six-button pendant (Figure 1-4). The pushbuttons are arranged in three sets of two. The top two buttons raise and lower CLEM, the middle two buttons translate the platform right and left approximately 13 inches from center, and the bottom two buttons control the drawbar translation for loading and unloading SHIVA capacitor modules.

The CLEM platform is totally captive and guided by cam followers on the carrier frame. All bearings are sealed and do not require maintenance.

The CLEM platform and drawbar translations are powered by 1/20-horsepower and 1/6-horsepower, 24-volt d-c, reversible motors, respectively (Figure 1-5). The motors are housed in the CLEM platform. A 9/16-inch hex bar shaft extender is provided on each gear reducer input shaft for manual operation in case of any type of electrical or motor failure. All that is required to hand crank the platform and drawbar operations is a standard ratchet wrench, extension, and 9/16 socket combination.

Limit switches are positioned to cut power to the motor control relays at the end of platform and drawbar travel. Torque limiters are provided on the gearbox output shafts as an additional overload safety to prevent equipment damage (Figures 1-6 and 1-7).

Shelf latches are located on each side of the platform to counteract reaction forces that would push CLEM away from the storage rack when pushing a capacitor module onto a shelf. The latches are retractable by manual levers located on the end of the platform (Figure 1-8).

A manlift is located on a storage rack over the CLEM platform when not in use. The storage frame also guides the manlift platform when it is pulled down for use by an operator. Handholds are an integral part of the manlift structural design and a safety belt is provided for operator safety when elevated on the platform. Two wheels mounted on the bottom of the manlift platform allow the platform to roll outward and to the top of the storage frame when CLEM is being lowered to the floor. The platform is then pushed manually onto the storage frame. Cam followers at the outboard end of CLEM support the manlift and allow it to remain centered on CLEM while the platform is translated right or left.

Figure 1-3. Interface Assembly.

Figure 1-4. Pendant.

PLATFORM DRIVE SHAFT SPROCKET
NO. 40 x 1/2 PITCH, 15 TEETH, 3/4-IN. BORE

DALTON OSD337 TORQUE LIMITER,
7/8 BORE W/40A25G SPROCKET

BOSTON WA318 100 TO 1 GEAR REDUCTOR

DRAWBAR DRIVE SHAFT SPROCKET
NO. 40 x 1/2 PITCH, 12 TEETH, 3/4-IN. BORE

SPROCKET

NO. 40 x 1/2 PITCH, 18 TEETH, 3/8-IN. BORE

SPROCKET - 2 PLACES

NO. 40 x 1/2 PITCH, 12 TEETH, 5/8-IN. BORE

DRAWBAR DRIVE MOTOR
APPLIED MOTORS #BA3620-1144-48B

MORSE 250A-1 TORQUE LIMITER
5/8-IN. BORE W/250-AG420 SPROCKET

BOSTON TWA113A 100-TO-1
GEAR REDUCTOR

RELAY PANEL
(FIGURE 1-7)

PLATFORM DRIVE MOTOR
APPLIED MOTORS #BA3608-2384-48B

SPROCKET
NO. 40 x 1/2 PITCH, 12 TEETH, 1/2-IN. BORE

NOTE: No. 40 x 1/2-in. pitch chain standard throughout CLEM.

Figure 1-5. Motor Tray.

Figure 1-6. Limit Switches.

NOTE: Refer to Drawing LD107259.

Figure 1-7. Relay Board.

NOTE: Platform has been translated left.

Figure 1-8. Shelf Latch Levers.

1.4

PHYSICAL AND ELECTRICAL CHARACTERISTICS

The CLEM platform assembly has an envelope 30.5 inches wide by 72 inches long by 38.5 inches high with the manlift on the storage frame. With the manlift in the use position the length increases to 84 inches and the height is increased to 77.5 inches. Note that as the CLEM is lowered to the floor, the manlift rotates outward as it moves onto the storage frame. The forklift is 34 inches wide by 57 inches long by 89.75 inches high with the carriage fully lowered. The forklift and CLEM have a coupled length of 127.5 inches with the manlift in the stored position.

The 24-volt d-c electrical power for the system is supplied by the forklift battery. Anderson Type SB standard connectors are required on the recharging cable. Refer to manufacturer's literature in Appendix A.

2. OPERATION

2.1 GENERAL

The CLEM system is a two-man operation and requires all operators to be qualified to drive forklifts. While operation of the CLEM platform assembly is simple, safety precautions are necessary since CLEM will be operated in narrow, 40-inch-wide aisles between delicate, high-voltage electrical equipment. Also, a safety belt must be worn whenever an operator uses the manlift to reach the upper-level shelves.

2.2 OPERATING CONTROLS

For operation of the Clark forklift refer to Appendix A.

The CLEM platform and drawbar are operated from the remote station pendant. The cable coming from the bottom of the pendant must be connected to CLEM to provide power to the motors. The forklift lift control is independent of CLEM operation and may be operated from the pendant or forklift driver positions at any time. Only one platform and drawbar movement can be operated at a time. Pushing the button for opposite direction will cut power to the motor and stop movement. Limit switches are at each end of travel for the drawbar and platform to cut power to the respective motor. Shelf proximity switches are located on each side of the platform to cut power to the platform motor when contact with a shelf is made. Both limit and proximity switches are used to prevent overloading motors and mechanical parts.

2.3 OPERATING PROCEDURE

In operating the system, two people shall form an operating team. One team member will operate the forklift and the other will operate CLEM. The following describes the CLEM operating procedure:

1. Unplug forklift from battery charger.

CAUTION: CLEM must always be lifted clear of the floor before transporting with forklift to prevent damage to CLEM and forklift.

2. Insert key, lift CLEM clear of floor, and drive to aisle where failed capacitor module is located. Stop with CLEM short of the aisle to be entered.

NOTE: The capacitor shelf layout has restricted the access aisle to 64 inches, which requires uncoupling CLEM from the forklift.

CAUTION: To couple or uncouple CLEM, the forklift mast should be vertical or tilted slightly forward.

3. Pull locking bar arm to the "red" position while driver lowers forklift carriage and backs up the unit about 2 feet. Electrical disconnects are not required.
4. Lift and latch CLEM handle and maneuver CLEM into aisle. Store the handle.
5. Drive forklift into aisle and couple CLEM to forklift by engaging CLEM interface assembly with forklift carriage, then raise carriage. CLEM will automatically lock on.

WARNING: Be sure that locking bar arm is in "black" locked position before proceeding. If not locked on, CLEM could come loose from the forklift and injure personnel and damage equipment.

6. Lift CLEM clear of floor and drive CLEM into position centered on failed capacitor module.

NOTE: Assume the failed capacitor module is on an upper shelf and that the manlift must be used.

7. Pull manlift out to fully extended position.
8. Raise CLEM to about 6 feet above floor. Manlift platform should automatically lower into position.

NOTE: Lifting operation is more accurately controlled with the proportional valve control on the Clarklift.

WARNING: The CLEM manlift has been designed for a maximum load of 200 pounds.

9. Step onto platform, buckle and snap in with safety belt.
10. Elevate to shelf and check final alignment with capacitor module and shelf.
11. Run platform to shelf. Platform drive will stop automatically when platform contacts shelf.

NOTE: When a capacitor module is offloaded to the shelf, the shelf latch is engaged to compensate for the reactive forces trying to push CLEM away from the shelf. The shelf latch is not needed when pulling a capacitor module onto CLEM.

12. Throw direct shunt busbar on the capacitor module using the special electrically insulated tool.

13. Translate drawbar until it snaps under the tray.

14. Pull tray onto platform.

NOTE: Drawbar drive will stop automatically when module is on platform.

15. Disconnect bus cables from module. Reconnect cables if capacitor is being placed in service on shelf.

NOTE: If a capacitor module has been offloaded, the shelf latch must be retracted before proceeding.

16. Push button to center platform.

17. Push button to lower CLEM to about 6 feet above floor.

18. Unsnap safety belt and step off platform.

CAUTION: Manlift platform will swing out as CLEM is lowered.

19. Lower CLEM to just above floor.

20. Push manlift platform onto storage frame and secure pendant.

21. Transport capacitor module to repair area by reversing procedure to enter aisle.

2.4 POWER FAILURE

Should the CLEM platform or drawbar drives fail to respond to pendant controls and there are no apparent loose cable connections, the platform and drawbar can be crank-operated manually by inserting a socket wrench with extension through holes in the end of the platform power tray and connecting to the input shafts of the gear reducers. A 9/16-inch socket and 12-inch extension are required for manual cranking (Figures 1-5 and 1-7).

3. MAINTENANCE

3.1 GENERAL

CLEM is made of high-quality, industrial-grade components to provide superior performance and minimum maintenance. With proper care and maintenance, CLEM should provide a minimum of 10 years' service.

3.2 QUARTERLY OPERATION INSPECTION

Refer to Table 3-1 for the Quarterly Operation Inspection.

Table 3-1. Quarterly Operation Inspection.

1. Uncouple CLEM from forklift.
2. Check for worn parts.
3. Couple CLEM to forklift.
4. Check clearance between interface assembly and forklift carriage.
5. Operate lift up and down from remote station pendant.
6. Translate CLEM platform right and left. Limit switches should cut power to motor at ends of travel.
7. While translating platform push proximity switches for each direction. Power to motor should be cut when proximity switch is depressed.
8. Translate drawbar right and left. Limit switches should cut power at ends of travel.

3.3 LUBRICATION

Sealed bearings and permanently lubricated rollerchain have been used throughout and should not require lubrication for the life of CLEM. The only parts requiring occasional lubrication are those making up the interface assembly, external chain surfaces, manlift wheels and swivel caster. Slides, bars, levers and chains should be lubricated with "Lubriplate" grease every 6 months or as required. (See Table 3-2.)

Table 3-2. Maintenance Chart.

ITEM	MAINTENANCE
Chains	Tension after 1 month, then semiannually. Apply grease externally semiannually.
Swivel Caster (Zirk Fittings)	Grease semiannually.
Manlift Wheels (Zirk Fittings)	Grease semiannually.
Interface Assembly	Grease quarterly.
Safety Belt	Check for wear quarterly.
Bolts, Cam Rollers	Check quarterly. Tighten if required.
Stainless Steel Deck Surface	Clean and wipe with a thin coat of light oil (WD-40) every 2 weeks or as required.

3.4 ADJUSTMENTS

3.4.1 Chain

A rollerchain drive is essentially a flexible medium in respect to installation. Installation is less difficult than for many other forms of power transmission. However, careful aligning and timing during installation will more than repay the time involved.

a. Shaft Alignment. Shafts must be parallel. The use of a spirit level is recommended to ensure that shafts are horizontal; then, if the distance between the shafts is equal on both sides of the drive, the shafts are parallel.

b. Sprocket Alignment. Sprickets must be aligned accurately to assure even tension. This can best be accomplished by checking with a straight edge along the finished sides of the sprockets as shown in Figure 3-1.

Figure 3-1. Sprocket Alignment.

c. Chain Tension. Chains should be tight with only a small amount of slack. In the drawbar the chain should be kept snug. New chains will loosen up slightly as the joints seat themselves, causing initial elongation which is many times greater than the elongation occurring during the balance of the chain life. After the first several weeks of operation, it is advisable to adjust the centers, particularly on long center drives. After this initial elongation, with proper care and lubrication, roller-chains will give long service without undue elongation or wear.

Adjustments for proper chain tensioning is provided for by slotted holes under motors, gear reducers and idler shaft bearings. Jacking screws are provided at the idler shaft bearings to maintain a snug drawbar chain.

d. Troubleshooting. As in the case of any precision-built mechanism, proper maintenance contributes toward a long, satisfactory service life.

Each chain drive should be checked periodically for alignment. Misalignment is conclusively indicated when the sides of sprocket teeth or inside surfaces of the roller link plates show wear. Immediate steps should be taken to realign the drive when these defects are evident.

The chain should be checked for excessive slack. If the chain is running close to the tops of the teeth of the larger sprocket, the chain should be replaced. This can be checked visually while the drive is running or, with drive stopped, by lifting the chain away from the large sprocket, making sure the chain is in mesh with the sprocket teeth as indicated by arrows in Figure 3-2. Excessive clearance is conclusive evidence that the chain has elongated in pitch and no amount of tension adjustment will keep it properly meshed with the sprocket teeth. Continued operation will quickly destroy the sprocket teeth which otherwise may be perfectly good.

Do not install a new chain on sprockets that are badly worn. Worn sprockets should be replaced to insure proper chain fit on the sprockets, thus eliminating the possibility of premature wear of the replacement chain.*

Figure 3-2. Chain in Mesh With Sprocket Teeth.

*"D 74 Dodge Engineering Catalog," Dodge Manufacturing Division, Reliance Electric Co., Mishawaka, Indiana, 46544. First edition, March 1974.

3.4.2 Interface Assembly

The interface assembly has been set by EG&G for proper engagement with the forklift carriage. There should be a 0.030-inch clearance between the forklift carriage and CLEM interface assembly when coupled. This setting can be adjusted by loosening the jam nuts on the studs and turning the stud right to increase clearance and left to decrease clearance. The stud has 3/4-16 fine threads at the top end and 3/4-10 coarse threads at the lower end. When 0.030-inch clearance is achieved, torque the jam nuts to 90 to 100 foot-pounds.

3.4.3 Torque Limiter

The torque limiters have been run-in and set by EG&G as specified in Table 4-2. To check either torque limiter assembly, clamp the sprocket in a vise with brass jaws. Use a torque wrench on the adjusting nut to check the release torque. If release torque is not as specified in Table 4-2, reset per manufacturer literature in Appendix A.

3.5 TROUBLESHOOTING

Refer to Table 3-3 for possible causes and correction of problems.

3.6 ASSEMBLY PROCEDURE

Refer to all figures in text and drawings listed in Appendix B.

3.6.1 Assembly Carrier Frame - LJ106291-1

1. Bolt cam guide bar LE106385-1 to frame.
2. Bolt gear racks LD106384-1 to frame.
3. Bolt angle bracket-cam LD106382-1.
4. Install wheels and castor.
5. Install locking bar lever LD106309-1.
6. Install locking bars LD106308-1.
7. Bolt guide blocks LD106293-1 and LD106294-1 finger tight--do not tighten further at this time.
8. Pin lower clamp LD106296-1 to lower slide bar LD106295-1 (2 each).
9. Spin jam nuts on studs LD106298-1.
10. Screw stud into lower slide bar.

Table 3-3. Troubleshooting.

PROBLEM	CAUSE	CORRECTIVE ACTION
Interface assembly won't lock	Misalignment of CLEM and forklift	Realign.
	Obstruction of locking mechanism	Remove obstruction or clean locking mechanism as required.
	Out of adjustment. Not enough clearance between interface clamps and carriage	See paragraph 3.3.2 for adjustment.
CLEM power failure	Loose cable connector	Check all connectors and retighten.
	Broken wire	Check leads to CLEM with ohmmeter. Replace as required.
One motor fails to operate	Broken motor lead wire	Check leads with ohmmeter. Replace motor lead cable.
	Motor failure	Replace motor.
Motor will operate in one direction only	Bad switch or relay	Determine bad component with ohmmeter and replace it.
	Broken wire	Find broken wire with ohmmeter and replace it.
Motor runs, but platform or drawbar won't move	Broken chain	Replace.
	Missing or failed shaft key	Replace.
	Torque limiter out of adjustment or faulty	Repair as required and/or reset.
	Foreign material in platform gears	Clean gear teeth.

11. Screw upper slide bar LD106296 onto other end of stud.
12. Insert slides in guides--their relative positions should be close to that shown in drawing LJ106053.
13. Install lever arms LD106300-1.
14. Install locking bar arm LD106310-1.
15. Install push bar LD106299-1.
16. Bolt upper clamp LD106301 to frame. Shim if necessary.
17. Drive forklift into CLEM interface clamps and adjust position of lower clamps by turning stud.
18. Install springs (LE-037CD-2).
19. Torque guide bolts to 40 to 45 foot-pounds.
20. Tighten stud jam nuts to approximately 90 foot-pounds.
21. Bolt handle assembly LD106312 to frame.
22. Install cam followers. Be sure that Torrington CRS-20 cams are aligned parallel to top of frame and CRS-12 cams are perpendicular to side of frame.

3.6.2 Assembly of Platform

1. Bolt guide bar LD106132 to platform. Torque to 20 foot-pounds.
2. Pin and bolt cam follower mounting bracket LD106148-1.
3. Install power unit mounting tray LD106499-1 on platform.
4. Bolt adjustment blocks LD106334-1 to idler shaft bearing bracket. Torque bolts to 20 foot-pounds.
5. Bolt drawbar guide rails LD106443-1 to platform. Torque to 5 foot-pounds.
6. Install springs (Lee #LE-049D-6) in shelf latch.
7. Install shelf latches.
8. Install drawbar drive shaft LD106302-1, sprockets, and bearings.
9. Install idler shaft LD106302-2, sprockets, and bearings. Use adjusting screws to take slack out of chain.

10. Attach cam followers to drawbar translating block LD106594-1.
11. Attach drawbar translating blocks LD106594-1 to chain. Install set screws to secure pins.
12. Install cam followers. Be sure that Torrington CRS-20 cams are aligned parallel to platform top and CRS-12 cams are perpendicular to side of platform.
13. Roll platform onto frame.
14. Install table shaft LD106302-3, spur gears, bearings, and sprocket.
15. Mount gear reducers with input sprockets. Torque limiters and chain.
16. Bolt manlift guidebar LD106584-1 to platform.
17. Mount drive motors with sprockets and chain.
18. Install limit switches.
19. Attach drawbar limit switch cam block to chain.
20. Install relay box and relays.
21. Install cable connector and lead-in cable.
22. Complete wiring in platform.
23. Install flexible shafts.
24. Install platform deck LD106450-1, LD106451-1, and LD106452-1.
25. Pin drawbar mounting block LD106595-1 to translating block.
26. Attach springs (LE-037CD-2) to drawbar mounting block and translating block.
27. Bolt drawbar LD106596-1 to mounting block. Torque bolts to 6 foot-pounds.
28. Attach latching levers (Balcrank #H-319) to flexible shafts with 6-32NF set screws.

3.6.3 Manlift Frame Assembly - LJ106569

1. Install cam followers. Insure that Torrington CRS-12 cams are parallel to horizontal part of frame and RBC-16-S cams are parallel to vertical part of frame.
2. Slide manlift frame onto platform and bolt to carrier frame. Torque bolts to 18 to 20 foot-pounds.
3. Install Albion #TM-03001 3-inch wheels of manlift platform with Albion #KZ-0845 1/2-inch $\emptyset$ axle.
4. Install cam followers Torrington CRS-22 (McGill CF-1-3/8-S) parallel to platform channel on which mounted. Install spacer LD106627-1 on inside of channel.
5. Bolt on load limit sign.
6. Install manlift platform on manlift frame from CLEM interface assembly end.

3.6.4 Electrical

1. Install switches in pendant with operation plates clamped on by switches.
2. Install connector and cable to CLEM.
3. Mount cable reel on forklift.
4. Install power cable in pendant.
5. Wire pendant.
6. Wire cable reel to forklift.

4. SPECIFICATIONS

4.1 BOLT TORQUE

Refer to Table 4-1.

Table 4-1. Bolt Torque.

<u>BOLT SIZE (DIA)</u>	<u>TORQUE (FT-LBS) OILED THREADS</u>
1/4-in. $\emptyset$	5-6
3/8-in. $\emptyset$	18-20
1/2-in. $\emptyset$	40-45
3/4-in. $\emptyset$	50-55

4.2 TORQUE LIMITERS

The torque limiters installed on the output shaft of each gear reductor for overload safety are set by EG&G, INC. to the values shown in Table 4-2. Consult the respective manufacturer's literature in Appendix A to adjust the torque limiter settings.

Table 4-2. Torque Limiters.

<u>TORQUE LIMITER</u>	<u>SETTING (FT-LBS)</u>
Morse 250A Platform Translation	8
Dalton OSD 337D Drawbar Translation	75

APPENDIX A

EQUIPMENT

50-24

DL Self-Lubricating Chain

① Sintered steel bushing carries lubricant for life of chain.

② Lubricates bearing surfaces — inside and outside — pins, bushing surfaces and sprocket teeth.

③ Lubricates bearing surfaces of link plates—no tight joints.

For Use Where External Lubrication is a Problem

This chain lubricates itself! Sintered steel bushings, impregnated with oil, release lubricant to all bearing surfaces during operation, and re-absorb it when at rest.

By perpetually "taking care of itself" DL chain solves the troublesome problems that arise in situations where lubrication maintenance is impossible or difficult to perform.

DL chain runs free and clean—making it ideal for use in food processing, packaging, printing, textiles and the like. Its ever-present oil film protects against damaging corrosion as encountered in outdoor installations, farm machinery, chemical operations. It eliminates the wear and power loss of dry contacts between sprocket and chain, pin and bushing, bushing and pin link plates.

The self-lubricating property of DL chain, coupled with its quality construction, insures better performance and longer life than the finest standard roller chain in all cases where external lubrication is prohibited or severely limited.

However, if it is practical to provide adequate external lubrication, standard roller chain is recommended for longer and better service.

If DL chain is to operate where temperatures will exceed 120°F or under prolonged exposure to solvents

or detergents, it is suggested that the conditions be checked with DODGE®.

Highest Quality Features

Advanced features of construction that contribute so much to the superiority of standard roller chain are used also in DL. Pins are case-hardened and finished to close tolerances. Link plates are heat treated and shot-peened. Press-fit assembly insures exact positioning of link plates. And all DL chain is pre-stressed to seat parts firmly, eliminate initial stretch, increase resistance to fatigue.

Interchangeable

DL chain is interchangeable with the same size ANSI roller chain.

Standard and Extended Pitch

DL chain is available in single strand, standard pitch or double pitch, for power transmission and conveyor needs.

Standard Pitch

Extended Pitch

1. General

Before assembly, the pressure plates, facings and center member (sprocket, sheave, plate, etc.) should be free of oil, grease, dirt and rust. The center member should have a 125 micro-inch finish in the bore and a 63 micro-inch finish on the area where the friction facings rub in order to obtain maximum rated capacity and optimum life from the Torque Limiter.

2. Assembly

Refer to the appropriate sketch (see below) and assemble on the torque limiter hub the following: (A) Friction facing (B) Bushing (C) Center member (not shown) (D) Friction facing (E) Pressure plate (F) spring(s) (G) Pilot plate (500A and 700A models only) (H) Lockwasher (250A and 350A models only) (J) Adjusting nut.

3. Running-In

Torque Limiters should be run-in for the most consistent results. To run-in, adjust the Torque Limiter to 70-80% of the maximum single spring capacity and slip the center member approximately 60 RPM for approximately 4 minutes. (See steps 4 and 5 for setting and checking instructions.)

Torque Limiter Size	250A	350A	500A	700A
Run-In Torque—Lb. Ft.	14-16	38-44	108-125	290-330

4. Torque Setting

- (A) For the 250A and 350A models: To adjust the Torque Limiter to carry the required torque, tighten the adjusting nut an appropriate

amount. *Do not* completely flatten the disk spring. Check setting per step 5.

- (B) For the 500A and 700A models:

Maximum Rated Torque

With the 3 capscrews backed out until the points are below the surface of the nut, run the nut up finger tight or slightly less than finger tight, and alternately tighten the capscrews no more than $\frac{1}{2}$ turn at a time until their heads bottom. Do not over-tighten the capscrews nor completely flatten the disk spring. This should give the maximum rated torque, but since there are several variables that affect the setting, it should be checked per step 5 and readjusted if necessary.

Less Than Maximum Rated Torque

With the 3 capscrews backed out until the points are below the surface of the nut, run the nut up finger tight; then back off an appropriate amount. Alternately tighten the capscrews no more than $\frac{1}{2}$ turn at a time until their heads bottom. Check setting per Item 5. Do not over-tighten the capscrews nor completely flatten the disk spring.

5. Torque Checking

To check the Torque Limiter for the required slip torque, mount the Torque Limiter on a stub shaft and fasten in a bench vise. Wrap the center member (if a sprocket) with a chain and load the chain with weights until the center member rotates. If the center member is a plate, attach a chain or cable to the center member. The breakaway torque will be equal to the radius of the center member in feet times the weight in lbs. on the chain. The breakaway torque should be slightly higher (5% to 10%) than the required slip torque.

If the slip torque is too high or too low, readjust torque limiter as in step 4—tightening or loosening the adjusting nut as required. On the 500A and 700A sizes, back off the capscrews until the spring force is relieved before tightening or loosening adjusting nut. After readjustment, check the breakaway torque in the manner outlined above.

After final adjustment, lock the adjusting nut by bending lockwasher tab over nut (models 250A and 350A). On models 500A and 700A, the 3 capscrews have cup ends which lock into the pilot plate.

6. This additional step is applicable to the torque limiter coupling only:

- NEVER USE A TORQUE LIMITER ALONE AS A COUPLING. When shaft coupling is required in conjunction with slip protection, use a torque limiter coupling.
- After setting torque limiter per steps 4 and 5 above (including "A" plate sprocket center member), mount it on the shaft, then mount the coupling half (type "B" sprocket) on the shaft to be coupled leaving a gap between adjacent sprocket faces.

Torque Limiter Size	250A	350A	500A	700A
Gap Width-Inches	5/16	13/32	15/32	5/8

- Align the shafts as accurately as possible to obtain the maximum service life from the coupling.

Maximum Angular Misalignment— $\frac{1}{2}^{\circ}$

Torque Limiter Size	250A	350A	500A	700A
Maximum Parallel Misalignment—Inches	.010	.012	.015	.020

- When the shafts are properly aligned, wrap the coupling chain around the sprocket teeth and connect the chain ends by inserting the pin which is furnished loose with the coupling. The chain will wrap and connect easily on properly aligned sprockets.

7. Caution

The operating characteristics and capacity of Torque Limiters are affected by atmospheric conditions, moisture, lubricants, and surface corrosion. To illustrate, the life of the friction facings may be greatly reduced by rust on the center plate. The Torque Limiter ratings are based on average conditions. For best results, the Torque Limiter should be adjusted under conditions similar to those in which it will be used.

8. Maintenance

At periodic intervals, or if proper torque is not being maintained, inspect Torque Limiter for presence of oil, grease, moisture, or corrosion on the driving surfaces and for proper setting of spring load. Clean and adjust as required. Friction facings and bushings are the only parts that should normally require replacement.

NO.	DESCRIPTION	MATERIAL	NO REQ'D
1	WUB	STEEL	1
2	FIBER	RAYON STOS	2
3	SPROCKET	STEEL	1
4	BEARING	TORINGTON	1
5	PLATE	STEEL	1
6	SPRING	STEEL	1
7	NUT	STEEL	1
8	SETScrew	STANDARD	2
9	SETScrew	STANDARD	1

Adjust nut until proper torque is indicated. Do not completely flatten the bellville spring.

SEALMASTER Ball Bearings

INSTALLATION INSTRUCTIONS

SEALMASTER Ball Bearing extended inner race, zone hardened rings are ground for a sliding fit over the shaft. They are easily and securely locked to the shaft by means of two self-locking, cup point, socket head set screws, or with two slotted head half dog point set screws and a locking wire. This positive race-to-shaft lock is attained when the hardened cup point set screws are securely tightened through the soft, extended ends of the inner race.

MOUNTING INSTRUCTIONS

1. Use clean shafting free of nicks and burrs. If old shafting is used, locate SEALMASTER bearing on an unused section.
2. Make certain set screws are clear of bore.
3. Slide SEALMASTER into position on shaft — never hammer the ends of the inner race, as they are soft and may be damaged. If necessary to apply force, use a brass bar or pipe against the inner race only to drift bearing into place. Never strike housing as it may damage the bearing.
4. Bolt housing to support.
5. Rotate shaft to make certain it turns freely.
6. Tighten self-locking, cupped point set screws securely onto the shaft. If a torque wrench is used, see Table II.
7. Do not spot drill shaft through set screw holes when using half dog point set screws. Due to zone hardening, the threads are in their original metallurgically soft state and may be injured by the drill.
8. When using half dog point set screws, position bearing, center punch through set screw holes to mark positions. Back off bearing and spot-drill hole deep enough to receive the full length of half dog points. Replace bearing, bolt in position, tighten set screws and place wires in position.

TABLE II

TORQUE FOR TIGHTENING SET SCREWS			
SET SCREW DIAM.	HEX. SIZE ACROSS FLATS	RECOM. TORQUE	
		INCH LBS.	FOOT LBS.
1/4	1/8	66	5.5
5/16	5/32	126	10.5
3/8	3/16	228	19.0
7/16	7/32	348	29.0
1/2	1/4	504	42.0
5/8	5/16	1104	92.0

SEALMASTER BEARINGS
MORSE CHAIN DIVISION
 BORG-WARNER CORPORATION
 Aurora, Illinois 60507

Factory Representatives
 & Dealers
 In All Principal Cities

LUBRICATION INSTRUCTIONS

All SEALMASTER bearing units are prelubricated with grease chosen for its chemical and mechanical stability. SEALMASTER bearings are designed for lubrication with grease. Units furnished with a grease fitting should be periodically relubricated. The relubrication interval depends on bearing operating conditions: speed, temperature, and environment. (See Conditions in Table I below for typical relubrication schedules.)

Figure I shows the locking pin and dimple feature of the SEALMASTER relubricable units. This feature provides positive means for relubrication while allowing several degrees of misalignment. If the grease fitting supplied with the unit is replaced, make certain the same length of thread engagement is maintained. Adaptor fittings are available for this purpose and also for extended line systems.

RELUBRICATION

1. Add grease slowly with shaft rotating until a slight bead forms at the seals.
2. Relubrication is generally accompanied by a slight rise in operating temperature until the bearing chamber is stabilized with the proper amount of grease.
3. If necessary to relubricate while bearing is stationary, refer to SEALMASTER catalog for maximum grease capacity for the size bearing.
4. For abnormal operating conditions of high temperature or abnormal environments, consult SEALMASTER Engineers.

TABLE I

CONDITIONS			
SPEED	TEMPERATURE	CLEANLINESS	GREASING INTERVAL
100 RPM	Up to 120° F.	Clean	6 to 12 Months
500 RPM	Up to 150° F.	Clean	2 to 6 Months
1000 RPM	Up to 210° F.	Clean	2 Weeks to 2 Months
1500 RPM	Over 210° F.	Clean	Weekly
Any Speed	Up to 150° F.	Dirty	1 Week to 1 Month
Any Speed	Over 150° F.	Dirty	Daily to 2 Weeks
Any Speed	Any Temp.	Very Dirty	Daily to 2 Weeks
Any Speed	Any Temp.	Extreme Conditions	Daily to 2 Weeks

For normal operating conditions, relubricate with a grease conforming to NLGI No. 2 penetration, free from chemical impurities, such as dust, rust, metal particles or abrasives.

BOSTON GEAR 300 SERIES DOUBLE REDUCTION WORM & HELICAL GEAR REDUCTORS

IMPORTANT INSTRUCTIONS File for future reference

INSTALLATION

When installing Boston Reductors or Ratiomotors on any application, the following procedure should be carefully followed:

1. Mount securely on a rigid foundation. Use proper size bolts to hold securely. Periodic inspection of all bolts, including foundation bolts, is recommended.
2. Align all shafts accurately. The shafts of the motor, Reductor or Ratiomotor and the driven machine must be in line as near perfectly as possible. Failure to maintain proper alignment can result in excessive noise or over-heating. Flexible couplings should be used to compensate for slight shaft misalignment.
3. Sprockets, gears or pulleys should be mounted as closely as possible to the housing of the Reductor or Ratiomotor to prevent excessive overhung loads. Sprockets, pulleys or gears should not have a hard drive fit requiring hammering since bearings may be damaged. Refer to current Boston Gear Catalog for Maximum Overhung Load and Thrust Capacity.
4. Fill Reductor or Ratiomotor to "Oil Level" with proper oil before starting. See Lubrication Instructions below.
5. Standard Reductors and Ratiomotors are designed for all angle operation simply by relocating oil plugs. Refer to mounting page for proper locations of oil plugs.

LUBRICATION

IMPORTANT - BOSTON GEAR REDUCTORS AND RATIOMOTORS ARE SHIPPED WITHOUT OIL IN THE HOUSING. Care should be taken to make sure that the proper type oil is used. This is important since not all kinds of oils are suitable for lubrication of gears. E. P. Lubricants are not recommended.

RECOMMENDED LUBRICANTS FOR ENCLOSED WORM GEARING

AMBIENT (ROOM) TEMPERATURE	RECOMMENDED OIL (OR EQUIVALENT)	VISCOSITY SUS AT 210°F	POUR POINT
-20° to 40°F 40° to 90°F 80° to 125°F	Mobil Compound BB Mobil 600W Cylinder Oil Mobil Extra Hecla Super Cyl. Oil	75 137 to 143 190 to 205	-10°F 40°F 50°F

Ratings of Worm gear units were made with the use of #600W Cylinder Oil.
See Chart below for A.G.M.A. Lubrication Specifications.

A.G.M.A. LUBRICATION SPECIFICATIONS -- ENCLOSED WORM GEAR DRIVES

Ambient Temp.*	A.G.M.A. No. ‡	Viscosity S.U.V. At 210°F
+15°F. to + 60°F. +50°F. to +125°F.	7 Comp.** 8 Comp.**	125 to 150 Seconds 150 to 190 Seconds

* Pour point of oil should be less than minimum ambient temp. expected.

** These oils are compounded with 3 to 10% of acidless tallow or other suitable animal fats.

‡ Lubricants corresponding to A.G.M.A. numbers are available from major oil companies.

RELUBRICATION - Service life and efficiency of gears and bearings will be affected by oxidation or contamination of the lubricating oil. Improved performance will be obtained by periodic relubrication in accordance with the following recommendations:

1. After an initial operating period of approximately 80 hours, the housing should be completely drained, preferably while warm.
2. Refill housing to proper level with fresh gear oil.

Under normal conditions, the drive should be relubricated again after the next 250 hours and thereafter at intervals of approximately 1000 hours of operation.

CAUTION: Relubricate more frequently if unit is operated in abnormally high ambient temperatures or unusually contaminating atmospheres.

Motor bearings of Ratiomotors should be lubricated in accordance with motor manufacturers recommendations. During the initial period of operation, the temperature of Double Reduction Worm Gear Reducers may reach 160°F and Single Reduction Worm Gear Reducers approximately 200°F, but this should not be cause for alarm.

SEE BACK FOR ASSEMBLIES & MOUNTINGS

Assemblies

Mountings

Any of these assemblies may be installed in the various mounting positions shown by relocating oil plugs to proper position.

(*) Indicates proper oil level plug location.

Vented oil filler plug must be located in the uppermost position of basic unit, except for mounting position 5, when it will be in the attachment housing.

For all mounting positions where the vented filler plug is located in a horizontal plane the arrow on plug top and vent hole must point upward.

For all mounting positions where the vented filler plug is located in a vertical plane the arrow on plug top and vent hole must point toward center of housing.

Square head pipe plug (oil drain) must be located in the lowest position. Install socket head pipe plugs in all remaining pipe tapped holes.

300 SERIES SINGLE REDUCTION WORM GEAR REDUCTORS

IMPORTANT INSTRUCTIONS

File for future reference

INSTALLATION

When installing Boston Reductors or Ratiomotors on any application, the following procedure should be carefully followed:

1. Mount securely on a rigid foundation. Use proper size bolts to hold securely. Periodic inspection of all bolts, including foundation bolts, is recommended.
2. Align all shafts accurately. The shafts of the motor, Reductor or Ratiomotor and the driven machine must be in line as near perfectly as possible. Failure to maintain proper alignment can result in excessive noise or over-heating. Flexible couplings should be used to compensate for slight shaft misalignment.
3. Sprockets, gears or pulleys should be mounted as closely as possible to the housing of the Reductor or Ratiomotor to prevent excessive overhung loads. Sprockets, pulleys or gears should not have a hard drive fit requiring hammering since bearings may be damaged. Refer to current Boston Gear Catalog for Maximum Overhung Load and Thrust Capacity.
4. Fill Reductor or Ratiomotor to "Oil Level" with proper oil before starting. See Lubrication Instructions below.
5. Standard Reductors and Ratiomotors are designed for all angle operation simply by relocating oil plugs. Refer to mounting page for proper locations of oil plugs.

LUBRICATION

IMPORTANT - BOSTON GEAR REDUCTORS AND RATIOMOTORS ARE SHIPPED WITHOUT OIL IN THE HOUSING. Care should be taken to make sure that the proper type oil is used. This is important since not all kinds of oils are suitable for lubrication of gears. E. P. Lubricants are not recommended.

RECOMMENDED LUBRICANTS FOR ENCLOSED WORM GEARING

AMBIENT (ROOM) TEMPERATURE	RECOMMENDED OIL (OR EQUIVALENT)	VISCOSITY SUS AT 210°F	POUR POINT
-20° to 40°F	Mobil Compound BB	75	-10°F
40° to 90°F	Mobil 600W. Cylinder Oil	137 to 143	40°F
80° to 125°F	Mobil Extra Hecla Super Cyl. Oil	190 to 205	50°F

Ratings of Worm gear units were made with the use of #600W Cylinder Oil. See Chart below for A.G.M.A. Lubrication Specifications.

A.G.M.A. LUBRICATION SPECIFICATIONS -- ENCLOSED WORM GEAR DRIVES

Ambient Temp.*	A.G.M.A. No. †	Viscosity S.U.V. At 210°F
+15°F. to + 60°F.	7 Comp.**	125 to 150 Seconds
+50°F. to +125°F.	8 Comp.**	150 to 190 Seconds

* Pour point of oil should be less than minimum ambient temp. expected.

** These oils are compounded with 3 to 10% of acidless tallow or other suitable animal fats.

† Lubricants corresponding to A.G.M.A. numbers are available from major oil companies.

RELUBRICATION - Service life and efficiency of gears and bearings will be affected by oxidation or contamination of the lubricating oil. Improved performance will be obtained by periodic relubrication in accordance with the following recommendations:

1. After an initial operating period of approximately 80 hours. the housing should be completely drained, preferably while warm.
2. Refill housing to proper level with fresh gear oil.

Under normal conditions, the drive should be relubricated again after the next 250 hours and thereafter at intervals of approximately 1000 hours of operation.

CAUTION: Relubricate more frequently if unit is operated in abnormally high ambient temperatures or unusually contaminating atmospheres.

Motor bearings of Ratiomotors should be lubricated in accordance with motor manufacturers recommendations. During the initial period of operation, the temperature of Double Reduction Worm Gear Reducers may reach 160°F and Single Reduction Worm Gear Reducers approximately 200°F, but this should not be cause for alarm.

SEE BACK FOR ASSEMBLIES & MOUNTINGS

Assemblies and Mountings

ASSEMBLIES

BASIC
UNIT

TYPES

C & E ARE HIGH BASES
D & F ARE LOW BASES

A

TYPE
B

TYPE
C & D

TYPE
E & F

MOUNTING POSITIONS

NOTE:

Any of these assemblies may be installed in the various mounting positions shown by relocating oil plugs to proper position.

⊛ Indicates proper oil level plug location.

Vented oil filler plug must be located in the uppermost position.

For all mounting positions where the vented filler plug is located in a horizontal plane the arrow on plug top and vent hole must point upward.

For all mounting positions where the vented filler plug is located in a vertical plane the arrow on plug top and vent hole must point toward center of housing.

Square head pipe plug (oil drain) must be located in the lowest position.

Install socket head pipe plugs in all remaining pipe tapped holes.

AERO-MOTIVE MFG. CO.

P.O. Box 2678 • Kalamazoo, Michigan 49003

Telephone (616) 381-1242 • Telex: 224420

**INSTRUCTION PRM-12-73
1174-P-64****SERIES 200-a AND 300-a POW-R-MITE****I. INSTALLATION OF REEL****A. MOUNTING:**

Reel may be mounted base up, base down, or in any position which allows mainshaft to be horizontal. Reel should be mounted with centerline of drum in line with cable run.

B. PIVOT BASE:

If optional pivot base (64-43) is used, reel will be self-aligning to direction of cable run. The four-roller guide (64-53) must be used with pivot or swivel mounts.

C. WIRING:

Input power connections are made at terminal board (64-47) through a connector or coupling which is inserted into the 3/4 inch pipe thread opening at the bottom of the enclosure. Due to various types that may be used, this connector is not supplied with reel. Individual conductors are then connected to open side of terminal board (64-47).

D. SAFETY INTERNAL GROUNDING:

Standard reels are not grounded internally with exception of reels built to CSA standards and the model 228a-H. Internal grounding must be accomplished by the user by running one jumper wire from brushholder (64-21) to screw(s) (64-32) and a second wire from terminal (64-47) and screw(s) (64-48).

E. SECONDARY SAFETY CABLE:

It is strongly recommended that a secondary safety cable be attached to all reels mounted overhead to prevent reel from falling. A hole is provided in the side of the stand assembly (64-10) for this purpose.

II. ADJUSTMENT**A. RATCHET LOCK:**

All models are supplied with ratchet lock which works in any position. If ratchet lock is not required (constant tension), place lock-adjustment plate in position shown in diagram on opposite side. For ratchet lock action, move plate to position shown with phantom lines.

B. CABLE GUIDE:

The cable guide arm (64-1) may be set at any fixed position around the cable drum. The guide (64-53) must be set so the cable pays off reel in a straight line without bends. If guide arm is to be free-swinging (self-aligning), loosen screw (64-2) on back of guide arm.

C. SPRING TENSION:

Before making final connections of cable (64-18), pretension reel by pulling cable out far enough to allow one full wrap of cable to be thrown back over spool, hold spool from turning, and place cable back on reel. Repeat until desired cable tension is set. After tension is set, pull cable out completely to insure enough spring travel remains for operating. Failure to test in this manner can lead to spring damage.

III. SERVICE

CAUTION: BEFORE PERFORMING ANY SERVICE TO REEL, REMOVE ALL SPRING TENSION AND ELECTRIC POWER.

A. MAINSPRING AND CUP:

If reel will not develop tension or retract cable, mainspring and cup (64-41) may need to be replaced. To replace mainspring, remove junction box (64-51), disconnect wires on terminal board (64-47) which enter junction box through mainshaft, remove set screw (64-11), and remove spool from stand. Remove mainspring and cup assembly from spool and replace with new part if necessary. Reverse above to reassemble.

B. SLIP RING:

Remove cover (64-27) and drum (64-36) exposing slip ring. Brush (64-25) and brushholder (64-21) may be removed from mounting studs by loosening screw (64-22) and lifting brushholder from mounting studs. Slip ring (64-31) may be removed by removing all brushholders, set screw (64-26) and wires on terminal board (64-47). Slip ring will now slide off mainshaft. To reassembly, reverse above procedure.

PARTS LIST

REF. NO.	DESCRIPTION	REF. NO.	DESCRIPTION	REF. NO.	DESCRIPTION
64-1	Guide Arm	64-20	Screw (#10-24 x 1/2")	64-39	Mainshaft
64-2	Screw (5/16-18 x 2")	64-21	Brush Holder	64-40	Hub
64-3	Lockwasher (5/16")	64-22	Screw (#10-24 x 1/2")	64-41	Mainspring and Cup Assy.
64-4	Screw (1/4-28 x 1/2")	64-23	Washer (#10)	64-42	Ratchet Spring
64-5	Lockwasher (1/4")	64-24	Nut (#10-24)	64-43	Pivot Base
64-6	Junction Box Cover	64-25	Brush		(opt., See Kit 64-A)
64-7	Screw (1/4-28 x 1/2")	64-26	Set Screw (5/16-18 x 1/2")	64-44	Screw (3/8-16 x 7/8")
64-8	Lockwasher (1/4")	64-27	Slip Ring Cover		(opt., See Kit 64-A)
64-9	Gasket	64-28	Nameplate	64-45	Lockwasher (3/8")
64-10	Stand Assembly	64-29	Locknut (#10-24)		(opt., See Kit 64-A)
64-11	Set Screw (5/16-18 x 3/4")	64-30	Gasket	64-46	Nut (3/8-16 Hex.)
64-12	Nut (5/16-18 Jam)	64-31	Slip Ring		(opt., See Kit 64-A)
64-13	Ratchet Lever	64-32	Screw (#10-24 x 3/8")	64-47	Terminal Board
64-14	Retaining Ring	64-33	Lockwasher (#10)	64-48	Screw (8-32 x 9/16")
64-15	Locknut (#10-24)	64-34	Mounting Stud	64-49	Lockwasher (#10)
64-16	Cable Packing	64-35	Washer	64-50	Screw
64-17	Cable Nut	64-36	Drum and Flange Assy.	64-51	Junction Box
64-18	Cable	64-37	Flange and Drum Assy.	64-52	Gasket
64-19	Gasket	64-38	Clamp	64-53	Cable Guide
				64-54	Nut (5/16-18 Jam)
				64-55	Lockwasher (5/16")
				64-56	Screw (5/16-18 x 7/8")
				64-57	Ground Wire
				64-58	Ground Wire

SERVICE KITS

KIT 64-A Pivot Base Assembly (Includes 64-43, 44, 45 and 46)

IMPORTANT WHEN ORDERING PARTS, ALWAYS SPECIFY MODEL NUMBER AND SERIAL NUMBER OF REEL

This manual covers all models produced after January 1, 1973. The two letter date code shown with the serial number will be D, E, F, etc. plus A-L, indicating the year and month, respectively, the reel was manufactured. JE.: DB-1973, February, EC-1974, March.

APPENDIX B

CLEM DRAWING LIST

CLEM Drawing List

LJ106053	Platform Assembly, CLEM Top Drawing
LJ106290	Frame Assembly, Platform
LJ106291	Frame Assembly, Platform Carrier
LJ106311	Platform Assembly, Manlift
LJ106569	Frame Assembly, Manlift
LD106132	Guide Bar
LD106148	Mounting Bracket, Cam Follower
LD106293	Guide, Lower Interface
LD106294	Guide, Upper Interface
LD106295	Slide Bar, Lower Interface
LD106296	Slide Bar, Upper Interface
LD106297	Clamp, Lower Interface
LD106298	Stud, Interface
LD106299	Push Bar, Interface
LD106300	Lever Arm, Interface
LD106301	Clamp, Upper Interface
LD106302	Shaft
LD106308	Bar, Locking Interface
LD106309	Lever, Locking Bar
LD106310	Arm, Locking Bar
LD106312	Handle Assembly
LD106380	Rib, Inner
LD106381	Rib, Outer
LD106382	Angle Bracket, Cam Follower
LD106383	Mounting Plate, Cam Follower
LD106384	Gear Rack
LD106390	Panel, Top
LD106414	Mounting Plate, Guide Bar
LD106443	Guide Rail, Drawbar
LD106450	Deck, Forward
LD106451	Deck, Center
LD106452	Deck, Aft
LD106570	Guide Rail, Vertical
LD106571	Roller Stop
LD106572	Guide Rail, Horizontal
LD106573	Quadrant Channel
LD106584	Guide Bar, Manlift
LD106594	Translating Block, Drawbar
LD106595	Mounting Block, Drawbar
LD106596	Drawbar
LD106627	Spacer, Cam Follower
LD106634	Adjustment Block
LD106661	Arm, Outboard
LD106662	Arm, Inboard
LD106667	Hook
LD106668	Frame
LD106669	Shelf Latch Assembly
LD106688	Clip, Spring
LD106739	Handle Assembly, Shelf Latch
LD107259	Schematic Wiring Diagram, CLEM
LE106499	Mounting Tray, Power Unit

APPENDIX C

PLATFORM TOP ASSEMBLY DRAWING

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LJ 106053

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PART NO.		REVISIONS		DATE	APPROVED
LJ106053-1	REV	DESCRIPTION	DATE		
A		MODIFIED, CHECKED AND CORRECTED	4-29-77	LA 14-5

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8	SCREW, HEX HD, 3/8-24 UNF-2 x 3/4 L	STL	76	71
9	SCREW, HEX HD, 1/2-28 UNF-2 x 3/4 L	STL	70	70
4	NUT, HEX, 6-32 UNC-2	STL	89	69
4	SCREW, PAN HD, 6-32 UNC-2 x 1/2 L	STL	89	69
7	LOCKWASHER, MED, 1/2	STL	98	67
2	NUT, HEX, 1/8-20 UNF-2	STL	98	66
2	SCREW, HEX HD, 1/4-28 UNF-2 x 1/2 L	STL	68	65
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1	LD106653-1	SHAFT, TABLE	4D	15
1	LD106653-1	SHAFT, IDLER	6D	14
1	LD106653-1	SHAFT, DRAWBAR DRIVE	6B	13
2	LD106653-1	SPACER, CAM FOLLOWER	12	
2	LD106653-1	LEVER ARM - INTERFACE	4C	11
1	LD106653-1	PUSH BAR - INTERFACE	3C	10
2	LD106653-1	STUD, INTERFACE	2B	9
2	LD106653-1	CLAMP, LOWER-INTERFACE	2C	7
1	LD106653-1	SLIDE BAR, UPPER-INTERFACE	2C	7
2	LD106653-1	SLIDE BAR, LOWER-INTERFACE	2B	6
2	LD106653-1	GUIDE, UPPER-INTERFACE	3C	5
4	LD106653-1	GUIDE, LOWER-INTERFACE	2B	4
1	LD106653-1	DRAWBAR	6B	3
1	LD106653-1	FRAME ASSY, PLATFORM CARRIER	6A	2
1	LD106653-1	FRAME ASSY, PLATFORM	7B	1

END 244

LJ106053

A

LAST PART USED
REVISIONS AND TOLERANCES PER
AUST 118
VALUES SHALL BE FULL STRENGTH OF
MATERIAL UNLESS OTHERWISE
NOTED
DO NOT SCALE THIS DRAWING

DATE
DRAWN
CHECKED
APPROVED
DATE
DRAWN
CHECKED
APPROVED

LIST OF MATERIAL OR PART LIST
VIMATSONE-18-76
F. & S. INC. 100 W. 10TH AVE. ST. LOUIS, MO. 63103
PLATFORM ASSEMBLY
CLEM
MAY 4 1977
LJ106053 A

LEFT SIDE
(FACING LIFT)

FRONT

PART NO.	REV.	REVISIONS				
		SYM	ZONE	DESCRIPTION	DATE	APPROVED

QTY. REQ'D.	PART NO.	DESCRIPTION	2000
LIST OF MATERIAL OR PART LIST			

PART NO	L-C-A-2	CROSS IN USE / USED ON ASSY

LAST DATUM USED

DIMENSIONS AND TOLERANCES PER
 UNAS1 Y14.5

WELDS SHALL BE FULL STRENGTH OF PARENT MATERIAL AND IN ACCORDANCE WITH AWS OR AISC STANDARDS

MACHINED SURFACES TO BE
UNLESS OTHERWISE SPECIFIED

DO NOT SCALE THIS DRAWING

DRAWN	<i>S. J.</i>	12-22-77
CHECKED	KOLB	1-19-77
DESIGNED		
ENGINEER		
PROD. ENG.	<i>S. J.</i>	2-22-77

81

EG&G
ANALYTICAL SYSTEMS

P. O. BOX 204, SAN RAMON, CALIFORNIA 94583

SCHEMATIC WIRING DIAGRAM
CAPACITOR LOADING EQUIPMENT M
(CLEN)

CODE OR IDENT NO.	SIZE	
99626	D	LD107259

77020	B	
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SCALE	_____	CALC. WT.	_____	DR.	_____
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DATE

FILMED

8/11/94

END