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**CONTROL DATA®**

**LARK<sup>TM</sup> MICRO UNIT**

**MODEL 9454/9455**

**GENERAL DESCRIPTION  
OPERATION  
INSTALLATION AND CHECKOUT**

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**MAGNETIC PERIPHERALS INC.**

 a subsidiary of  
CONTROL DATA CORPORATION

**VOLUME 1**

**HARDWARE INSTALLATION/OPERATION MANUAL**



## PREFACE

This Manual provides the information needed to install and operate the LARK™ Micro Unit (LMU) (BJ 7B7-A) and is intended to serve customer engineers and operators.

The total content of the Manual is comprised of three sections, each having a unique publication number, and is contained in one volume. The manual's publication number, (77683717) along with the unit series code number, should be used when making reference to the LARK Micro Unit Hardware Installation/Operation Manual.

The following table identifies the content of this manual:

<u>SECTION NUMBER</u>	<u>TITLE</u>	<u>PUBLICATION NO.</u>
1	General Description	77669540
2	Operation	77669541
3	Installation and Checkout	77669542

### NOTE

The Lark Micro Unit (LMU) and the power supply with I/O adapter (PIO) are separate and distinct devices with their own unique documentation. The LMU is identified as Model 9454 and requires Installation/Operation Manual (Volume 1) Publication No. 77683717. The Installation/Operation Manual (Volume 1) for the PIO is Publication No. 77683568. When the equipment configuration includes both the LMU and PIO, it is identified as the Lark Module Drive (LMD) (Model 9455) and requires both Installation/Operation Manuals.

### EMI NOTICE

**NOTICE:** This equipment has been designed as a component to high standards of design and construction. The product, however, must depend on receiving adequate power and environment from its host equipment in order to obtain optimum operation and to comply with applicable industry and governmental regulations. Special attention must be given by the host manufacturers in the areas of safety, power distribution, grounding, shielding, audible noise control, and temperature regulation of the device to insure specified performance and compliance with all applicable regulations. This equipment is a component supplied without its final enclosure and therefore is not subject to standards imposed by FCC Rules for Electro-Magnetic Interference (EMI). Federal Docket 20780/FCC 80-148 Part 15.

## OPERATOR SAFETY INSTRUCTIONS

1. All operator controls can be found on the front panel.

### 1.1 Start/Stop Switch

This switch energizes the spindle motor. The indicator light flashes until motor is up to speed.

### 1.2 Requirements

The following conditions must be met to initiate operation of the On/Off switch:

- a. The external power source must be on.
- b. The disk cartridge must be properly inserted and the access door tightly closed.

### 1.3 Fixed Prot Switch

This switch has an error interrupt indicator lamp. An error is present in the drive when the lamp is flashing.

## 2. OPERATING TEMPERATURE

The operating temperature of the drive is 10° to 40° C with a maximum temperature change of 10° C per hour.

3. Additional information on the drive can be found in Hardware Installation/Operation Manual 77683717.
4. The corresponding VDE regulations must be observed during installation.
5. Note: The spindle drive motor may reach a temperature of 70° C.
6. In case of a malfunction the unit is to be serviced only by trained personnel. The access door can be opened only by trained personnel after the power has been switched off.

## BEDIENUNGSANLEITUNG

1. Alle Bedienungseinrichtungen befinden sich an der Frontseite.

### 1.1 Ein- und Ausschalter:

Dieser Schalter hat die Funktion den Motor und die Logik mit Strom zu versorgen. Die eingebaute Kontrolllampe blinkt so lange bis der Antriebsmotor seine Drehzahl erreicht hat.

### 1.2 VORAUSSETZUNG

Voraussetzung zur Funktion des Aus-Einschalters ist:

- a) Die aussere Stromversorgung muss einschaltet sein.
- b) Die Kasette ist eingeschoben und die Bedienungsklappe ist geschlossen.

1.3 Der zweite Druckschalter (FIXED PROT) ist ebenfalls mit einer Fehleranzeigelampe ausgestattet. Ein Fehler im Gerät ist vorhanden wenn diese Anzeige blinkt.

## 2. BETRIEBSTEMPERATUR

10°C bis 40°C bei einer Änderung von 10°C innerhalb einer Stunde.

3. Zusätzliche Informationen sind zu ersehen im Hardware Installation/Operation Manual - 77683717.
4. Beim Einbau des Gerätes sind die einschlagigen VDE-Vorschriften einzuhalten.
5. Zu beachten ist, dass der Antriebsmotor eine Betriebstemperatur von ca. 70°C erreichen kann.
6. In Falle eines Defektes darf das Gerät nur von Fachpersonal nach Abschalten der Stromzufuhr geöffnet werden.

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## 1.1 INTRODUCTION

The Lark Micro Unit (9454) is a small, low cost, medium performance, random access, rotating disk mass memory device featuring both removable and fixed storage. The Lark Micro Unit (LMU) employs the latest 8 inch rigid disk technology using low mass flying read/write heads attached to a precisely controlled linear head positioner. The unformatted storage capacity of the LMU is 16.7 Mbytes. 8.35 Mbytes of storage is provided by the removable disk (cartridge) and 8.35 Mbytes of storage is provided by the non-removable disk.

### NOTE

If unit as shipped from the factory is to be changed from 32 to 64 sectors or from 64 to 32 sectors the baseboard PWA must be changed per Table 3-6.

## 1.2 GENERAL DESCRIPTION

### 1.2.1 STANDARD FEATURES

The following are standard features of the LMU:

- 8.35 MB front-loading cartridge receiver (cartridge not included)
- 32 or 64 hard sector configurations
- Early/late data strobing
- Independent manual write protect on fixed and/or cartridge media (switch for fixed; special tab on cartridge)
- Internal fault monitoring
- LSI and Microcomputer control
- No electrical adjustments required
- No head alignment required
- Low power consumption
- Low acoustic noise
- Small physical size
- Embedded servo
- Self circulating air filtration system
- Vertical or Horizontal Operation

### 1.2.2 MAJOR COMPONENTS

The LMU consists of major assemblies as illustrated in Figure 1-1.

The following major components make up the LMU:

- Electronics

The logic is implemented using low power Schottky for commands and control logic and standard Schottky and ECL for the read/write and servo logic. The microprocessor is designed with standard microcomputer building blocks. The logic is mounted on three PWA's: Base PWA, Read/Write Preamp PWA and Read Signal Processor PWA.

- Voice-Coil Head Positioner

Head positioning is performed using a closed-loop proportional servo system with acceleration, velocity and position feedbacks. The carriage is driven by a voice-coil linear actuator utilizing positioning information from embedded servo information.

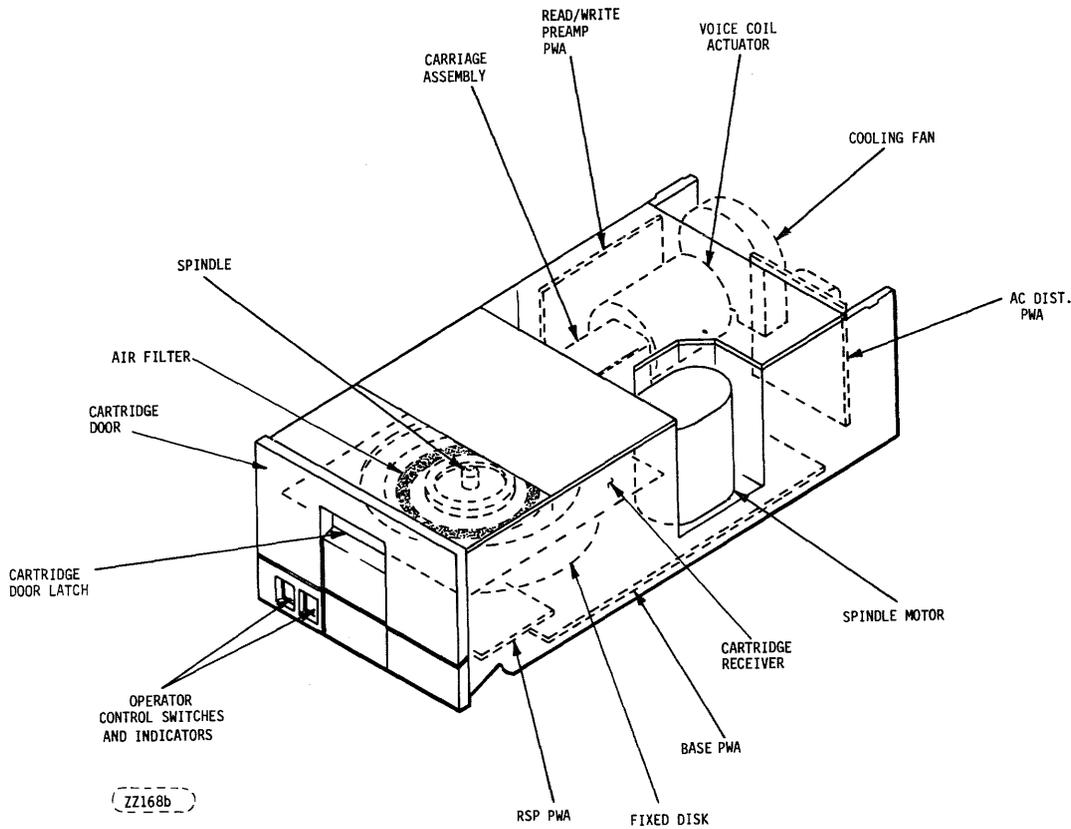
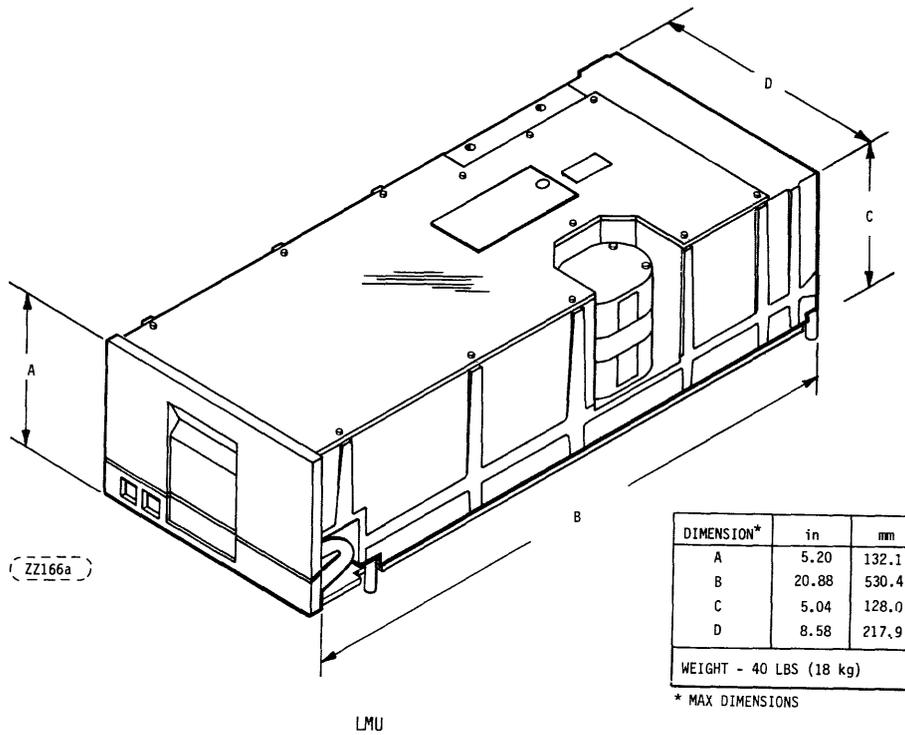


FIGURE 1-1. LMU MAJOR COMPONENTS



DIMENSION*	in	mm
A	5.20	132.1
B	20.88	530.4
C	5.04	128.0
D	8.58	217.9

WEIGHT - 40 LBS (18 kg)  
\* MAX DIMENSIONS

FIGURE 1.2. LMU PHYSICAL CHARACTERISTICS

- Deck and Spindle

A rigid cast-aluminum deck and precision spindle insures positive registration and seating of cartridge. An AC induction motor provides spindle rotation through a belt and pulley.

- Air Supply and Filtering

A direct drive blower provides external cooling air for the electronics located outside sealed area. Internal air in the sealed area of the unit is continually recirculated through a filter that separates the fixed disk area from the cartridge receiver area, provided the disk cartridge is installed.

- Cartridge Receiver

A front-load cartridge-receiving mechanism integral to the deck assembly facilitates the insertion and removal of cartridge media.

- Operator Control Panel

Controls and indicators for use by the operator are located in the LMU front panel. These are START/STOP switch, READY indicator (part of START/STOP switch), FIXED PROT switch, and FAULT indicator (part of FIXED PROT switch).

NOTE

The LMU is a component and therefore does not require a FCC label.

### 1.2.3 OPERATIONAL CHARACTERISTICS

Operational characteristics of the LMU are summarized in Table 1-1.

### 1.3 FUNCTIONAL BLOCK DIAGRAM

A functional block diagram of the LMU is shown in Figure 1-3. The majority of the electronics is located on one large printed circuit board called the Base PWA which is mounted in the base of the LMU (shown enclosed by dotted lines in Figure 1-1). The Preamp PWA and the RSP PWA amplify and process the signals read from the disk. The AC Distribution PWA controls the AC power distribution to the fan motor and the spindle drive motor.

TABLE 1-1. OPERATIONAL CHARACTERISTICS SUMMARY

TOTAL CAPACITY (UNFORMATTED) *	
Removable Disk Cartridge (CDC MODEL 91208)	8.35 MB
Fixed Disk	8.35 MB
Total	16.7 MB
Number Cylinders (Total)	206
Number Heads:	
Removable	2
Fixed	2
Total	4
Unformatted Track Capacity	20672 Bytes
Recording Mode	(2,9)
FRI	6774
TPI	237
Spindle Speed	3510 $\pm 2.5\%$ / $-4.8\%$ r/min
Data Transfer Rate (Nominal)	9.677 MHz
Maximum Latency	17.94 ms
Average Latency	8.55 ms

\*Based on 202 cylinders. Does not include 4 spares per surface.

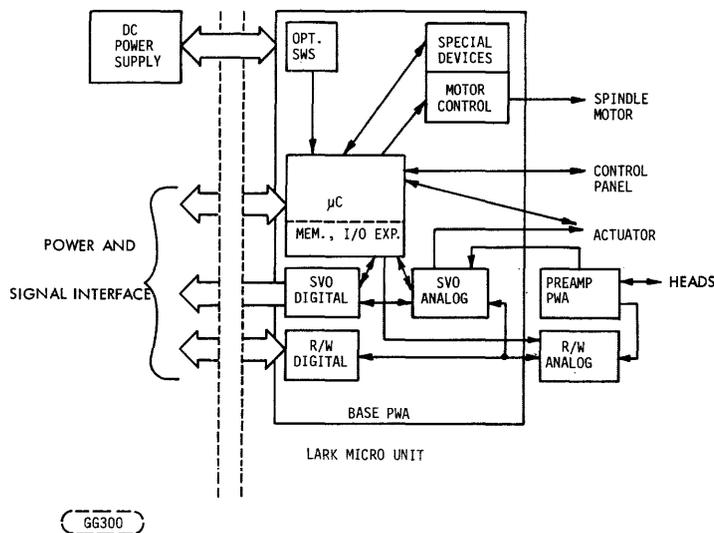


FIGURE 1-3. LMU FUNCTIONAL BLOCK DIAGRAM

## 2.1 INTRODUCTION

This section provides the instructions and information required to operate the Lark Micro Unit.

## 2.2 OPERATOR CONTROLS AND INDICATORS

Figure 2-1 shows the location of the operator controls and indicators. All operator controls and indicators are on the front panel. A functional description of these controls and indicators is given in Table 2-1.

## 2.3 OPERATING PRECAUTIONS

The following precautions and practices are to be observed while operating the LMU to obtain best performance and reliability of the equipment:

1. Keep a cartridge in the unit at all times and keep the access door closed to prevent unnecessary entry of atmospheric contaminants.
2. To prevent damage and/or data loss, follow the Disk Cartridge Installation procedure of this section.
3. The operator should not attempt to override any interlocks in the system.

### WARNING

Removing seal or top cover on sealed area voids warranty.

### CAUTION

Observed sudden increases in Read/Write Error Rates while the Fault Indicator is blinking and the Ready Indicator is OFF (indicating a Head Retract Fault) means that the unit should be stopped and powered DOWN. Do not insert this cartridge into another unit or insert a different cartridge into this unit because Head/Media contract may have occurred. Call Customer Engineer for inspection prior to subsequent operation of the unit.

### NOTE

In the event of a device failure, which allows opening of front door while spindle is rotating, remove drive and cartridge from use and call customer engineer for inspection prior to subsequent operation.

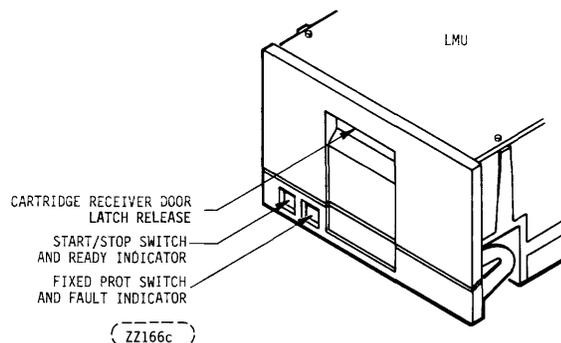


FIGURE 2-1. OPERATOR CONTROLS AND INDICATORS

TABLE 2-1. CONTROLS AND INDICATORS

CONTROL OR INDICATOR	FUNCTION
START/STOP switch/indicator	<p>Start switch energizes spindle motor and initiates the first seek mode provided the following conditions are met:</p> <ol style="list-style-type: none"> <li>1. AC Power is present (ON) at the LMU.</li> <li>2. Disk cartridge loading door closed and latched with cartridge in place.</li> <li>3. WRITE PROT indicator is not blinking, indicating a no fault condition.</li> </ol>
READY indicator	<p>Located within the START/STOP switch. READY indicates unit ready status. READY indicator is illuminated whenever unit has completed purge cycle and heads are loaded.</p> <p>The READY light will blink throughout the spindle start and stop procedure.</p> <p>As long as the heads are on cylinder, the READY indicator will be illuminated even though the WRITE/PROT indicator may blink to show a fault.</p>
FIXED PROT switch/FAULT indicator	<p>When operated to the inward position, this alternate action switch disables the write driver to the fixed media. The indicator, when illuminated steadily, indicates that the fixed disk is write protected. When the indicator blinks, it indicates a fault condition occurred or exists.</p>
Disk Cartridge Access Door Latch	<p>The Disk Cartridge Access Door is unlatched by lifting with the fingers on the latch that is under the lip of the recess in the access door. The latch will not release the door catch until the spindle motor has stopped rotating and the interlock solenoid releases the catch. The START/STOP switch must also be released (OUT) before the solenoid will release the catch. In the event of the loss of AC power the interlock solenoid does not release the catch in order to prevent damage to the cartridge.</p>

### 2.3.1 POWER UP FOR ON-LINE OPERATION

The following procedure is to be performed after the installation procedure has been completed including initial checkout and for normal day-to-day on-line operation.

1. Install disk cartridge in accordance with "Disk Cartridge Installation Procedure". Insure correct cartridge is selected (correct number of sectors, etc.).
2. Position START/STOP switch to START (Push-in). Head loading sequence is initiated, START/STOP indicator blinks until heads are loaded then, remains illuminated. Also, front panel door locks when spindle rotation begins.

If START/STOP indicator continues to blink or does not illuminate after approximately 120 seconds, a fault may exist. Re-initiate the head loading sequence by recycling the START/STOP switch.

3. Within approximately 120 seconds after START/STOP switch had been positioned to START, the READY indicator will illuminate indicating the LMU is ready to receive commands from controller.

### 2.3.2 WRITE PROTECT OPERATION

1. Prepare disk cartridge by sliding write protect tab to the "up" position in slot (see Figure 2-3).
2. Perform "Power up for on-line operation" procedure.
3. Place drive in "Write Protect Mode" by pushing in FIXED PROT switch. FIXED PROT indicator will illuminate.

### 2.3.3 STOP OPERATION

The drive may be stopped when it is performing operations as well as when it is idle.

1. Depress the START/STOP switch to STOP. The READY indicator will blink until spindle has stopped rotating and then extinguish when spindle has stopped.
2. Remove the disk cartridge (if desired) in accordance with the "Normal Disk Cartridge Removal" procedure. The LMU front door panel does not unlock until READY indicator stops blinking and then extinguishes.

### 2.3.4 POWER DOWN

Position the AC power source switch to OFF (ON/OFF switch is not on the LMU). Preferably, this is to be done only after the LMU has been stopped in accordance with the normal "Stop Operation" procedures.

#### NOTE

Operating the AC power ON/OFF switch is normally performed by maintenance personnel.

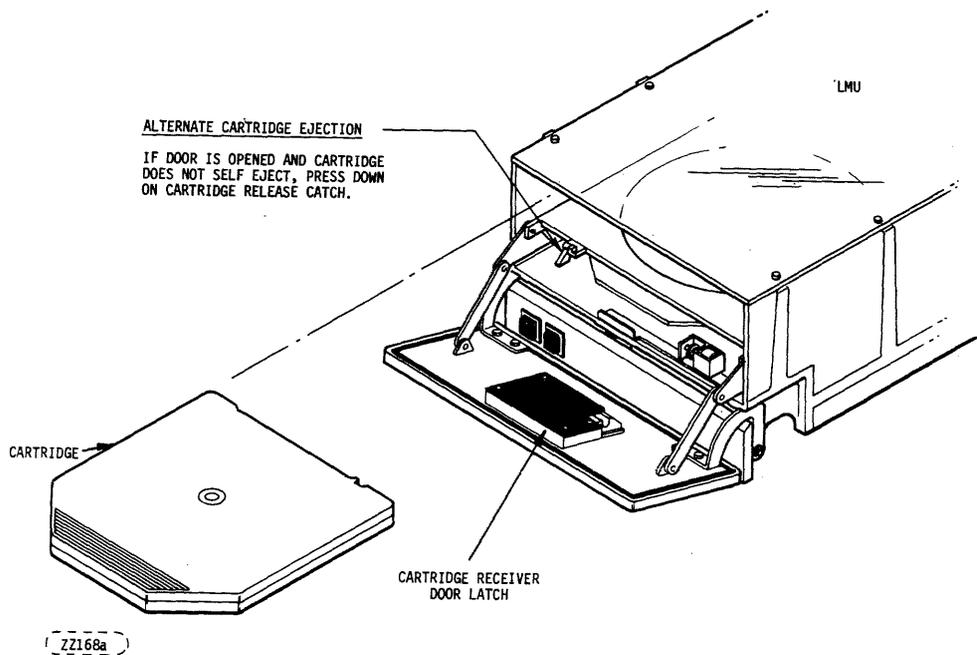
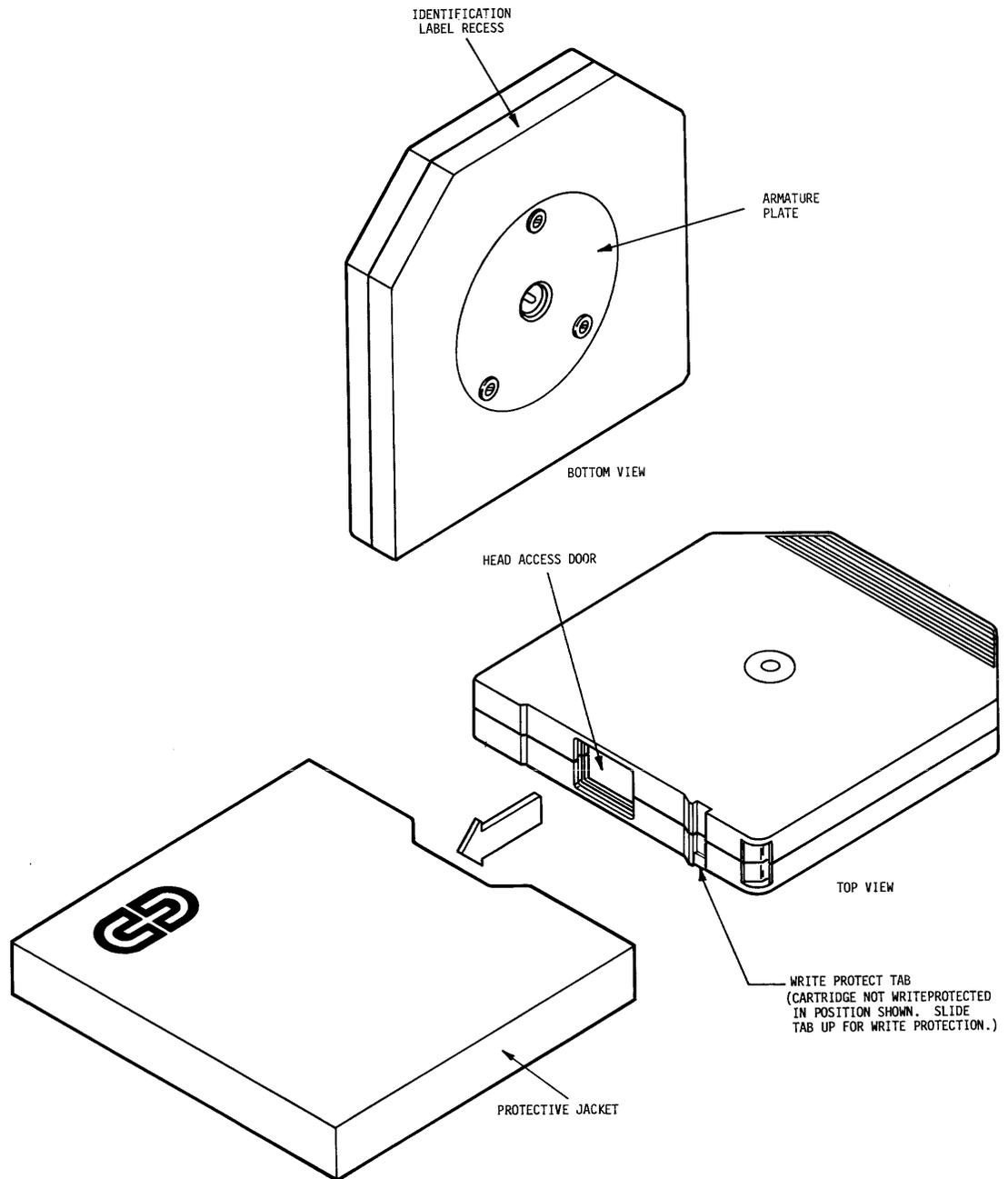


FIGURE 2-2. DISK CARTRIDGE; CARTRIDGE INSTALLATION AND REMOVAL



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FIGURE 2-3. DISK CARTRIDGE SHOWING PROTECTIVE JACKET AND WRITE PROTECT TAB

## 2.4 FAULT OPERATING INSTRUCTIONS

A blinking FIXED PROT indicator indicates a fault exists in the drive. If this condition occurs, proceed as follows:

1. Actuate FIXED PROT switch twice to initiate a Fault Reset and return switch to original position. If FIXED PROT has ceased blinking, normal operation can be resumed. If the indicator still blinks, proceed to step 2.
2. Perform the "Stop Operation" and "Power Down" procedures then power up and start the unit again. If the FIXED PROT indicator still blinks, contact qualified maintenance personnel.

## 2.5 REMOVABLE DISK CARTRIDGE HANDLING AND STORAGE

The following practices should be observed when handling or storing disk cartridges.

### NOTE

Cartridge not to be shipped in the disk drive.

1. The cartridge should be stored in its protective jacket when not in the disk receiver, see Figure 2-3.
2. Cartridges can be stored flat or on edge. Avoid stacking Disk Cartridges on one another.

## 2.6 REMOVABLE DISK CARTRIDGE INSTALLATION

The removable disk cartridge must be stored in the same environment as the LMU for 60 minutes immediately preceding its use. In the event that it becomes necessary to use a Cartridge which has not been allowed to stabilize at the ambient LMD environment temperature for at least one hour or; a cartridge which was exposed to temperatures below 60°F (16°C) immediately prior to the stabilization period then the following procedures must be employed:

- a. The cartridge must be visually inspected or examined to insure that condensation is not present on any part of cartridge and;
- b. The cartridge must be allowed to spin on the LMU for a period of not less than five minutes prior to attempting to read or write on that cartridge.

Install the disk cartridge using the following procedure and refer to Figure 2-2.

1. Release latch under lip of front panel door recess and pull down cartridge area access door.

### NOTE

Power must be applied to LMU, START/STOP in STOP (outposition), READY indicator off and FIXED PROT indicator not blinking to release latch on front door panel.

2. Remove cartridge from protective jacket. Store jacket in such a way as to prevent dust from collecting inside the jacket.

3. Slide disk cartridge into receiver track, ensuring that the head opening is towards rear of drive and top surface\* of cartridge is up.
4. Push disk cartridge in until it stops.
5. Close disk cartridge access door and press the door closed until it is latched. The disk cartridge seats into place on the spindle automatically as the access door is closed.
6. Operate the START/STOP switch to apply power to the spindle motor.
7. If the spindle motor will not rotate, the disk cartridge access door may not be completely closed or the disk cartridge may not be properly seated on the spindle chuck or the cartridge receiver/base may not be positioned properly on the lower chassis. If this occurs remove the cartridge and reinstall as outlined in the previous steps.

## 2.7 DISK CARTRIDGE REMOVAL

### 2.7.1 NORMAL REMOVAL

Refer to Figure 2-2 for the following procedure.

1. Operate START/STOP switch to STOP (out).
2. Pull down the Cartridge access door after the READY indicator ceases blinking and extinguishes entirely. When the access door is completely open the disk cartridge will partially eject out of the receiver.
3. Pull the cartridge out of the receiver.
4. Close the access door if another disk cartridge is not to be installed at this time. However, a disk cartridge should be in the drive at all times to prevent unnecessary entry of atmospheric contaminants into the sealed area of the drive. The drive will not operate without the disk cartridge installed.

#### NOTE

It is important that the door on the LMU remain closed when the drive is not in use. Good housekeeping accentuates high reliability.

### 2.7.2 POWER FAILURE OR EMERGENCY STOP REMOVAL

In case of an emergency need to remove the cartridge, perform the following procedure. (Refer to Figure 2-4):

#### NOTE

The procedures below should be performed only by qualified maintenance personnel.

1. If possible, check to see if the heads are unloaded. A small area of clear plastic over the carriage area is provided for that purpose.

\*Top is marked "TOP".

2. If the heads are loaded (they are still flying over the disks), they must be carefully retracted manually before stopping the spinning of the disks (if they are still spinning). To manually retract the heads, carefully lift the front of the unit until the heads slide back into unloaded position. When the carriage is fully retracted, screw the lock pin into place to prevent the heads from rolling out of the fully unloaded position. There is a carriage locking solenoid, but it does not lock the carriage back until AC power is removed. However, the cartridge door cannot be opened in the normal manner if power is removed from the LMU.
3. Stop the unit and wait approximately 3 minutes for the disk cartridge to stop spinning.

CAUTION

Verify spindle rotation does not exist prior to defeating the door interlock. Refer to Disk Cartridge Removal Procedure. The cartridge removal procedure must be performed only by qualified maintenance personnel and should be only for drive failure. The cartridge access door should always be closed after the cartridge is replaced with a dummy cartridge.

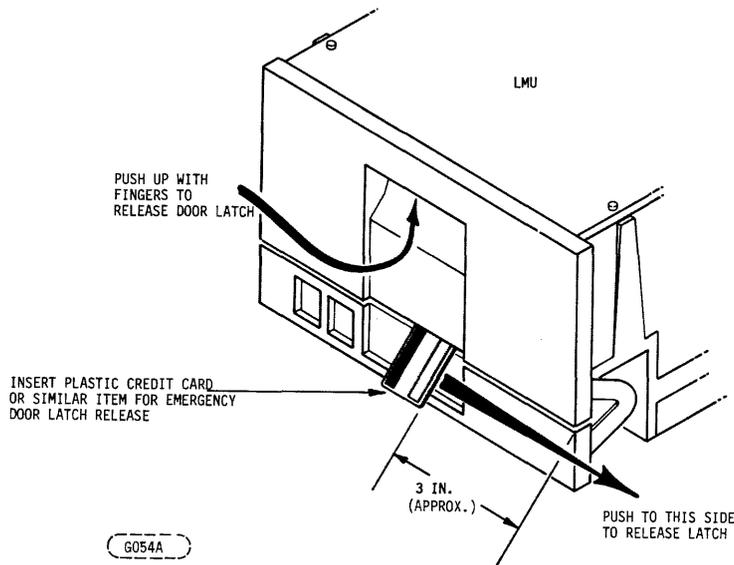


FIGURE 2-4. EMERGENCY/DRIVE FAILURE CARTRIDGE  
DOOR OPENING PROCEDURE

4. Open the disk cartridge access door. This automatically removes disk cartridge from spindle chuck. Door will not open if a fault exists. Power must be ON and START/STOP switch out to retract door latch solenoid. Pull disk cartridge out and store in protective jacket. Close door if another disk cartridge is not to be installed. However, it is best to install a scratch disk cartridge having no valuable data.

In an emergency (emergency only) if the disk cartridge access door will not open proceed as follows:

1. Make sure the spindle motor has completely stopped. Either observe the motor or wait a full 3 minutes after initiating a stop. Make sure heads are retracted.
2. See Figure 2-4. Insert a plastic credit card or similar object into the space between the access door and the lower front panel. Push the small release tab behind the panel (about 3 inches from the right edge) toward the right with the card and hold while pushing up with the fingers on the door latch release. Pull the door open and remove cartridge. Close front door.

## 2.8 MAINTENANCE FEATURES

The FAULT indicator blinks when a fault is detected in the drive. The I/O lines to the controller do not report the specific fault conditions, however, test points are available in LMU.

The AC ON/OFF power switch (not on the LMU) when operated applies AC power to the LMU. The LMU fan motor energizes and the front door panel will unlock. This control is not available to the operator.

The LMU requires no electrical/mechanical adjustments or preventative maintenance procedures.

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### 3.1 INTRODUCTION

This section provides the information and procedures necessary to install the LMU.

### 3.2 UNPACKING

During the unpacking, exercise care so that tools being used do not cause damage to the unit. As the unit is unpacked, inspect it for possible shipping damage. All claims for this type of damage should be filed promptly with the transporter involved.

Retain the shipping container and packing material if a claim is to be filed for damage, unit is to be reshipped, or shipped to service center.

Unpack the unit as follows:

- a. Remove the tape from the shipping container.
- b. Open the container and remove the LMU assemblies and cables.

CAUTION

DO NOT LIFT OR TRANSPORT WITH DOOR HANDLE. Do not release the carriage lock until the LMU is installed in its designated location. Damage may occur as a result of accidental loading of the heads. The carriage is to be locked in the retracted position any time the LMU is to be removed (even from table to table).

- c. Do not connect the input power cable until all other installation steps have been completed and the LMU is ready for initial checkout.
- d. Remove the isolation mounts from the accessory pack in the shipping container. Shown in Figure 3-1 is the location of isolation mounts for a horizontally mounted LMU. Figure 3-2 shows the location of isolation mounts for the vertically mounted LMU. Screw the four isolation mounts into the four 8-32 tapped holes in the base deck.

CAUTION

In handling the LMU care should be taken to not damage the exposed Base PWA in the bottom of the LMU.

### 3.3 SPACE ALLOCATION

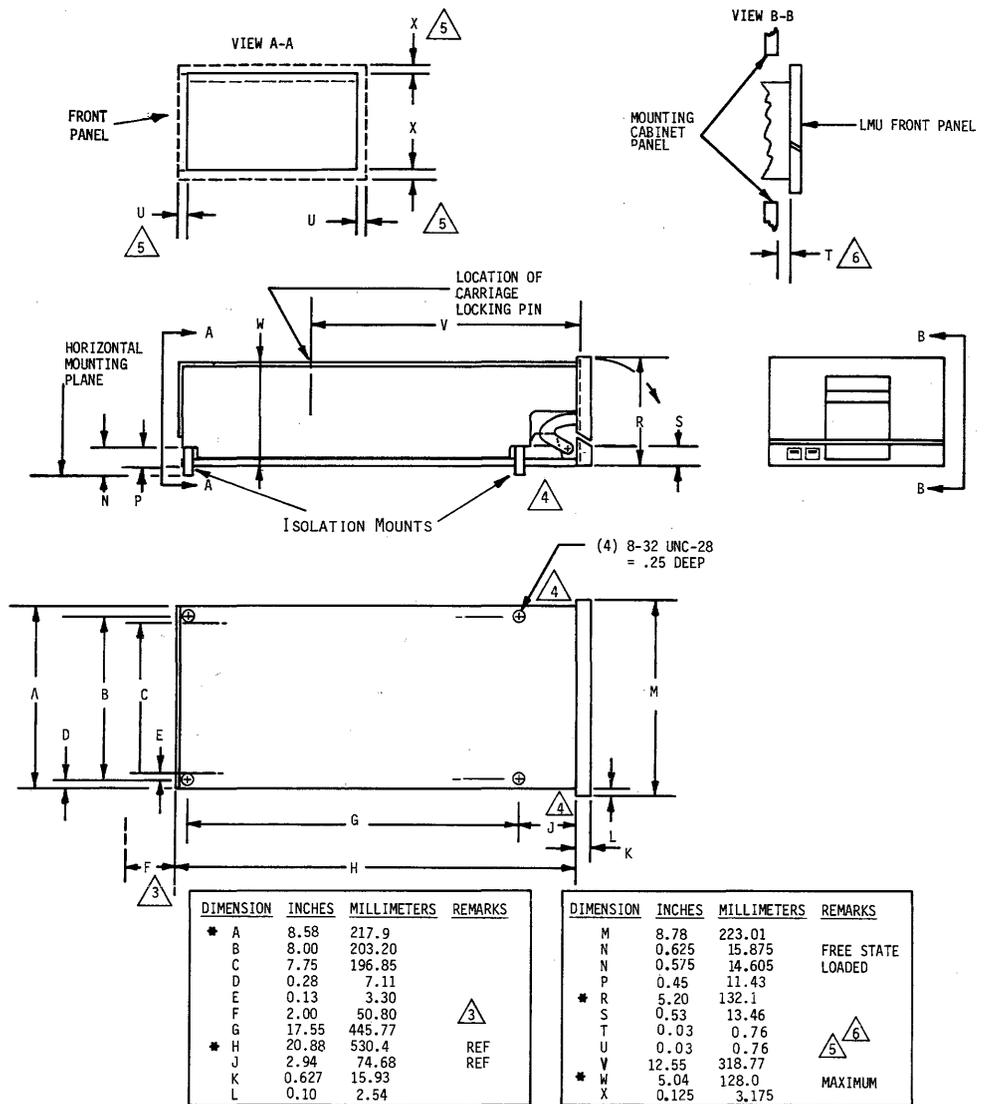
Figure 1-2 shows the LMU overall dimensions for determining space allocation. Detailed mounting hole data is provided in Figures 3-1 and 3-2. Example configurations are shown in Figure 3-3.

The LMU is designed so that, in its final installed configuration, only the LMU front panel is to be accessible to the operator.

### 3.4 COOLING REQUIREMENTS

#### 3.4.1 LMU COOLING

A fan draws air in at the rear of the LMU that is used to cool the electronics and PWA's. The air is exhausted on each side of the unit near the front. A minimum of 0.75 inch (19.05 mm) clearance must be provided at the air exits for both vertical and horizontal mountings. The maximum ambient air temperature at the blower inlet is not to exceed 104°F (40°C). The maximum ambient air temperature when measured 1/4 inch (8.4 mm) from the LMU surface shall not exceed 120°F (49°C) excluding hot spots. Positive pressure near the exhaust holes should not exceed 0.06 inches of water (14.9 Pascal).



NOTES: 1. ALL DIMENSIONS SHOWN ARE NOMINAL UNLESS \* THEN MAX.

△3. AIR ENTRY AND CABLE CLEARANCE.

△4. CLEARANCE OF 0.75 INCHES (19.1 mm) MUST BE PROVIDED AT AIR EXITS.

△5. MAINTAIN CLEARANCE BETWEEN LMU AND SURROUNDING STRUCTURE FOR RELATIVE MOTION.

△6. MAINTAIN CLEARANCE BETWEEN LMU FRONT PANEL AND FRONT SURFACE OF MOUNTING CABINET PANEL FOR RELATIVE MOTION.

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FIGURE 3-1. LARK MODULE UNIT MOUNTING HOLE DATA

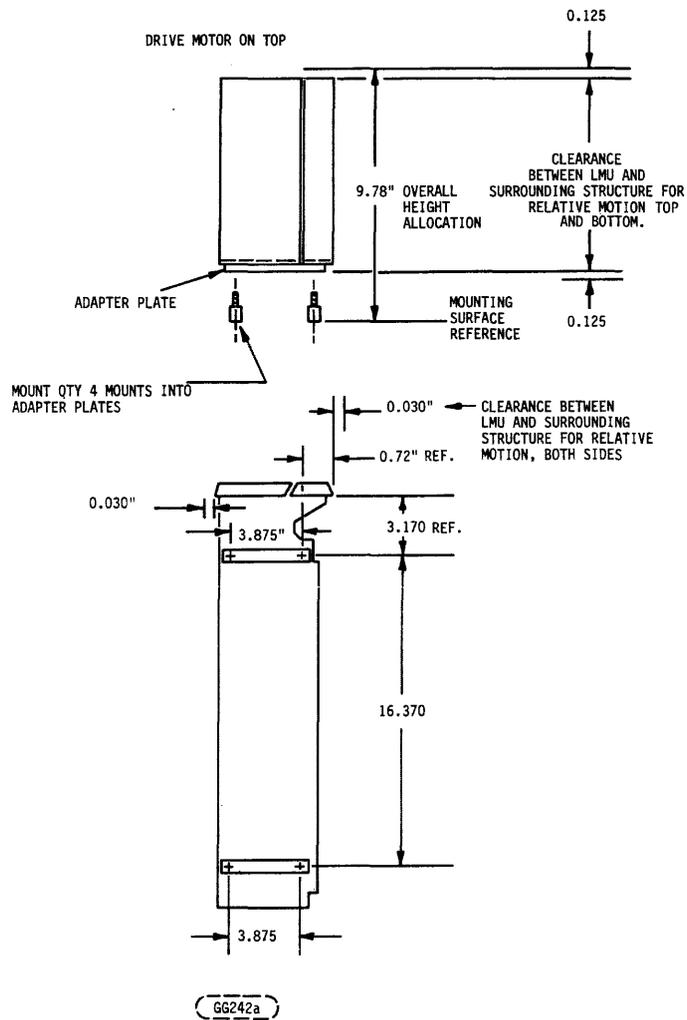
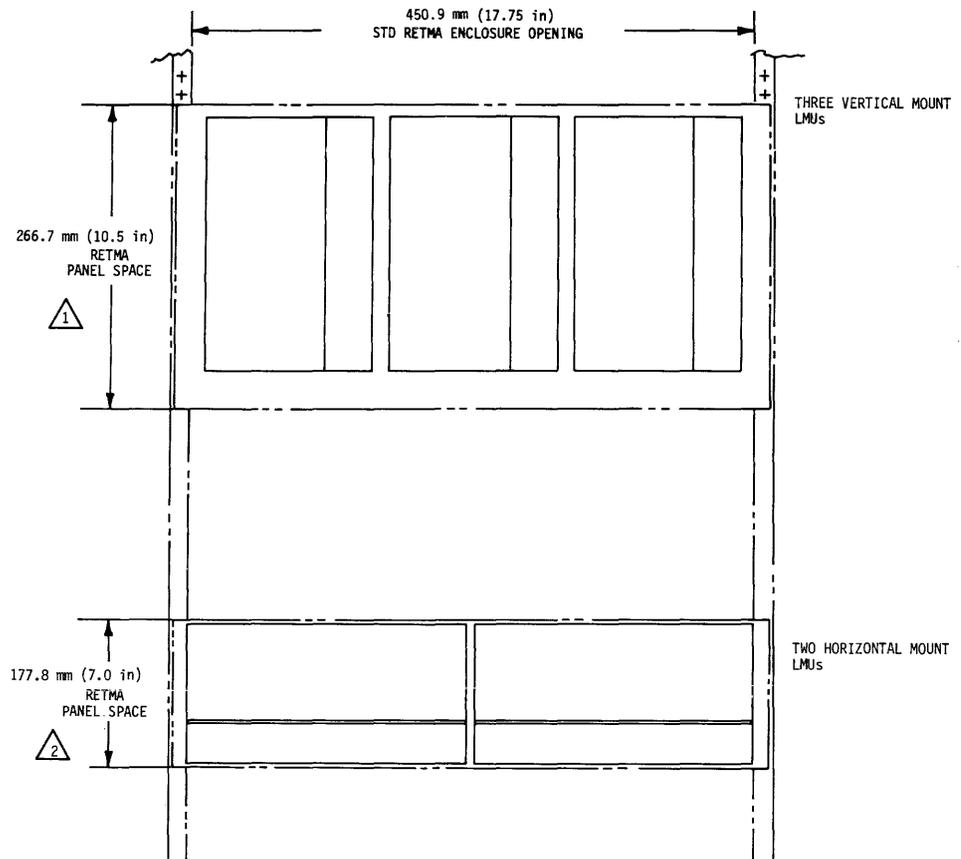


FIGURE 3-2. LMU VERTICAL MOUNTING DIMENSIONS



- ① DIMENSION INCLUDES SPACE FOR SUPPORT STRUCTURE AND SLIDES.
- ② REFERENCE ONLY  
DIMENSION DOES NOT INCLUDE SPACE FOR SUPPORT STRUCTURE.  
STANDARD RACK REQUIRES MODIFICATION TO UTILIZE SLIDES.

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FIGURE 3-3. EXAMPLE LMU CONFIGURATIONS

### 3.5 POWER REQUIREMENTS

#### 3.5.1 PRIMARY POWER REQUIREMENTS

The primary voltage and current requirements are shown in Tables 3-1 and 3-2. The operational line currents are described in Figure 3-4.

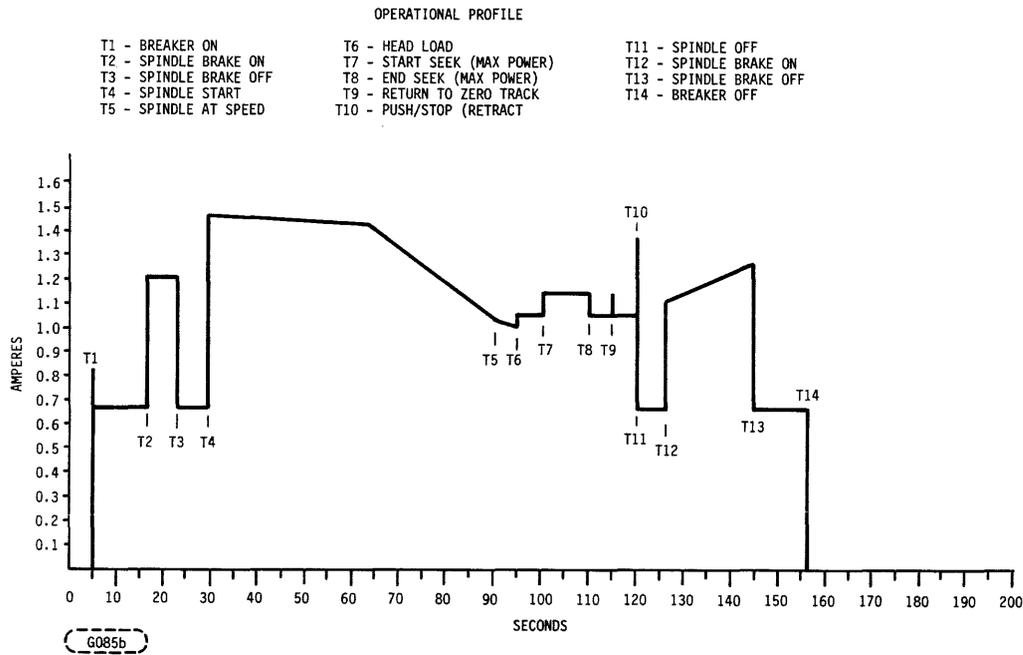


FIGURE 3-4. OPERATIONAL NOMINAL LINE CURRENTS TO POWER SUPPLY VS TIME (120 V INPUT)

TABLE 3-1. PRIMARY VOLTAGE REQUIREMENTS

VOLTAGE (VAC)	TOLERANCE (VAC)	FREQUENCY (Hz)	TOLERANCE (Hz)
120	+8, -16	60	+0.6, -1.0
220 *	+15, -29	50	+0.5, -1.0
230 *	+16, -32	50	+0.5, -1.0
240 *	+16, -32	50	+0.5, -1.0

\* Voltage can be anything in 220 - 240 volt range, though this table only shows tolerances at three points in the range.

TABLE 3-2. CURRENT/POWER REQUIREMENTS

DRIVE INPUTS	CURRENTS AND (WATTAGE)					
	ON TRACK		SEEKING		STARTING	
	NOMINAL	MAXIMUM	NOMINAL	MAXIMUM	NOMINAL	MAXIMUM
120 VAC	0.5 A (60 W)		0.5 A (60 W)		0.85 A (102 W)	
220-240 VAC	0.35 A (60 W)		0.35 A (60 W)		0.8 A (190 W)	
+16.5 V	0.4 A (6.6 W)		0.72 A (11.9 W)		-	-
-16.5 V	0.35 A (5.8 W)		0.67 A (11.1 W)		-	-
+5 V	0.91 A (4.55 W)		0.91 A (4.55 W)		-	-
-5 V	2.88 A (14.4 W)		2.88 A (14.4 W)		-	-
TOTAL WATTAGE	(91.1 W)		(102 W)		-	-
VOLTAGE (V dc)	REGULATION	MAX RIPPLE P/P	CURRENT DRAIN			
			MIN	MAX		
+5	±2%	50 mV	0.05 A	2.8 A		
-5.2	±2%	50 mV	0.07 A	3.5 A		
+16.5	±10%	500 mV	0.1 A	1.3 A		
-16.5	±10%	500 mV	0.04 A	1.3 A		
NOTE 1:	PEAK CURRENT FOR THE ±16.5 VOLT SUPPLIES MAY REACH 2.4 AMPERES FOR 24 MILLISECONDS DURATION FROM EITHER SUPPLY (NOT BOTH) WITH A 38 MILLISECOND MINIMUM INTERVAL BETWEEN CURRENT PULSES.					
NOTE 2:	THE ±5 VOLTS SHALL SHARE A DC COMMON. THE ±16.5 VOLTS SHALL SHARE A SEPARATE DC COMMON.					
NOTE 3:	IN REGARD TO DC POWER SEQUENCING, THE ±5 V DC SUPPLY MUST NOT PRECEDE THE REMAINING DC VOLTAGES IN EXCESS OF 50 MILLISECONDS.					

## 3.6 CABLING AND MATING CONNECTORS

### 3.6.1 GENERAL

The connectors for interfacing LMU command/data signals to the Host Adapter and the DC power are located on the Base PWA at the rear of the unit. (See Figure 3-5.). The connector for the AC power is located on the AC Distribution PWA (See Figure 3-6).

### 3.6.2 COMMAND/DATA INTERFACE CABLING AND CONNECTORS

The Command/Data physical interface consists of a 40-pin command ("C") cable and a 26-pin data ("D") cable. The command cable can be daisy-chained. However, since there is only one command I/O connector provided on the LMU Base PWA, the user must provide the daisy-chain facilities. A maximum of four LMU's can be daisy-chained. The data cable must be radially connected. The maximum cumulative daisy-chained cable length is 4.0 feet. The maximum radial cable length is 4.0 feet. Refer to Figure 3-7.

Figure 3-8 illustrates the type of connector used on the Base PWA and the cable connector required to mate with it. Section 3-10 lists the recommended components that can be used to interconnect the drive(s) to the user adapter. The connector pin and signal name assignments are shown in Figures 3-9 and 3-10. Timing and electronic information about the interface command/data signals is given in more detail in Volume II of the LMU Manual (P/N 77683706), Section 5.6.

### 3.6.3 AC AND DC POWER CABLING AND CONNECTORS

The AC power input connector is mounted on the AC Distribution PWA. It is a three circuit position Mate 'N' Lock Type female housing with male contacts. The DC power connector is an 8 circuit position male header mounted on the Base PWA. Locations of the above connectors are shown in Figure 3-6. Recommended mating connectors for the AC and DC power input cables are given in Section 3-10 "ACCESSORIES."

### 3.6.4 I/O AND POWER CABLE ROUTING

For sliding rack mounted drives; it is recommended that a cable retract mechanism be incorporated in the rack design. Retract mechanisms can be purchased from a number of available manufacturers.

## 3.7 GROUNDING

In order to ensure reliable interface operation and prevent damage to drivers or receivers, a DC ground should exist between the drive and the adapter. This ground should be carefully incorporated into the overall grounding system to prevent circulating ground currents. The ground connection, while necessary, is not within the scope of this manual. Figure 3-6 shows the location of the LMU system ground tie point.

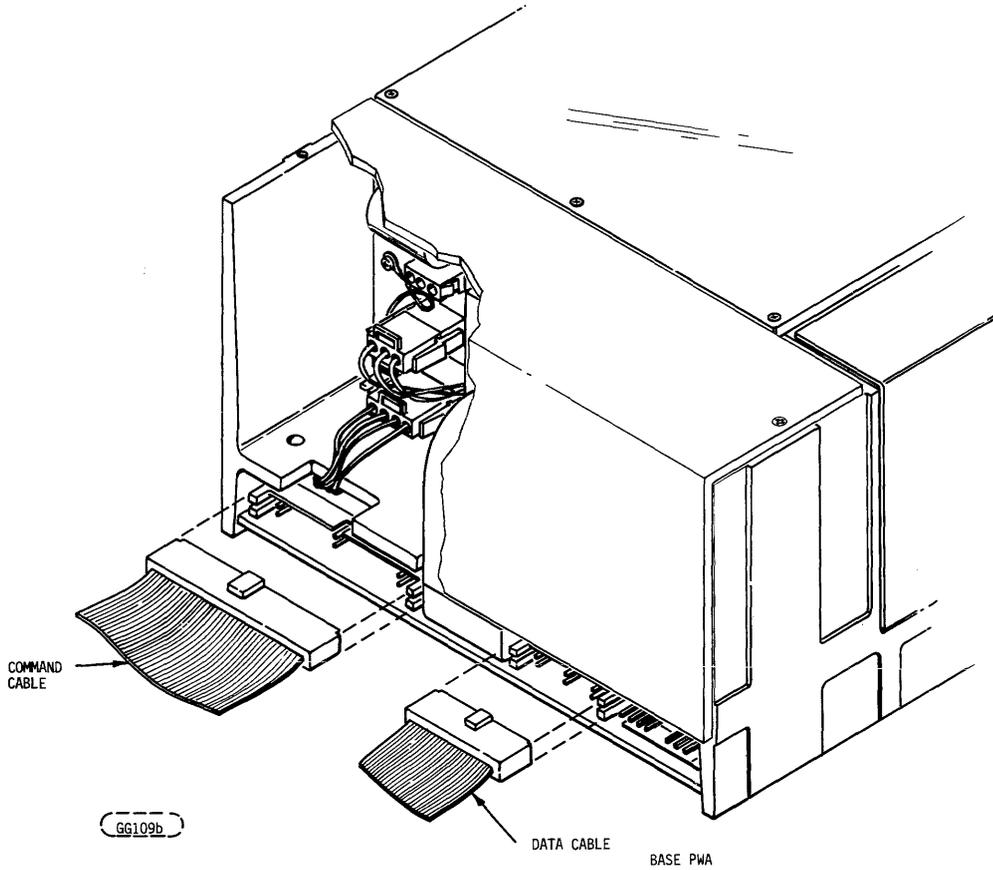


FIGURE 3-5. COMMAND/DATA CABLE CONNECTIONS

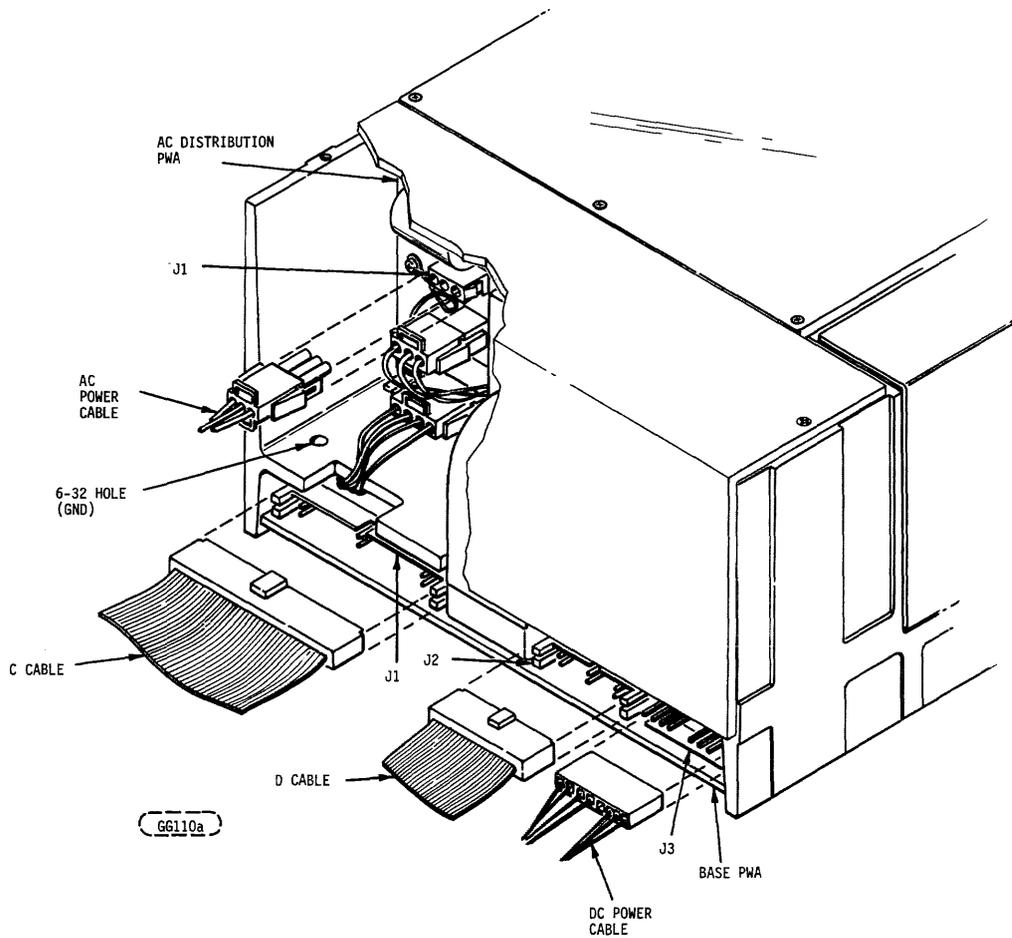
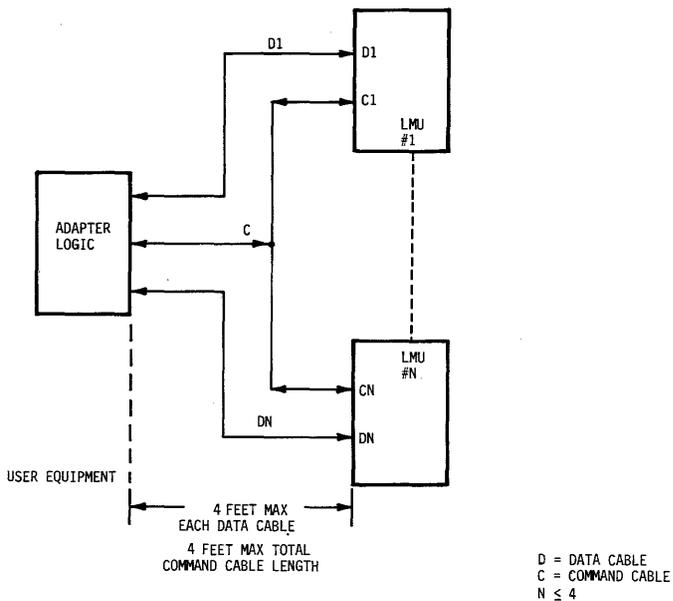
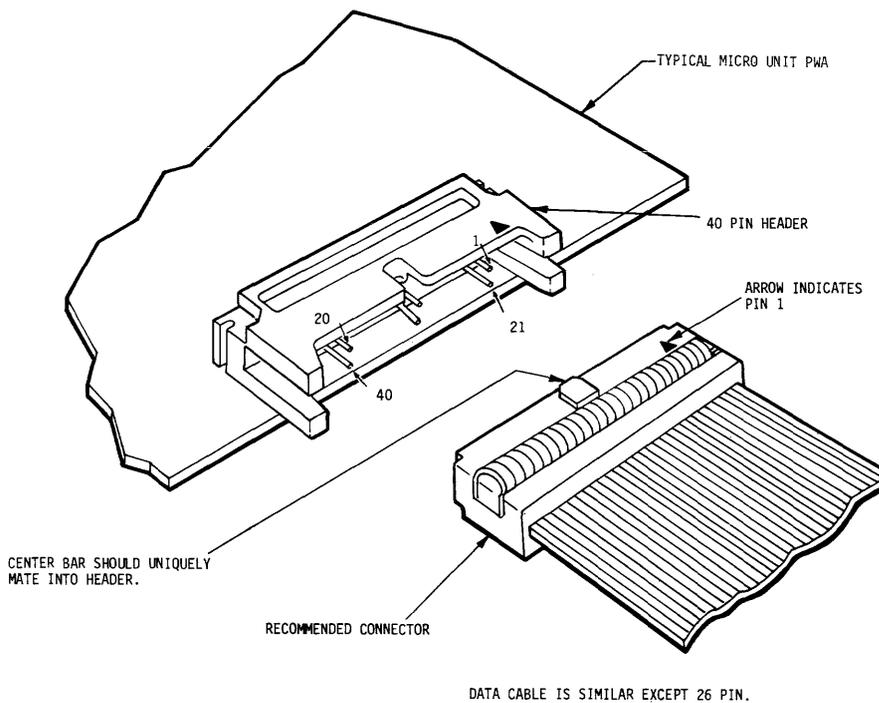


FIGURE 3-6. AC AND DC CABLING



Z172a

FIGURE 3-7. LARK MICRO INTERFACE CABLING



G043b

FIGURE 3-8. PICTORIAL REPRESENTATION OF COMMAND CABLE AND CONNECTOR

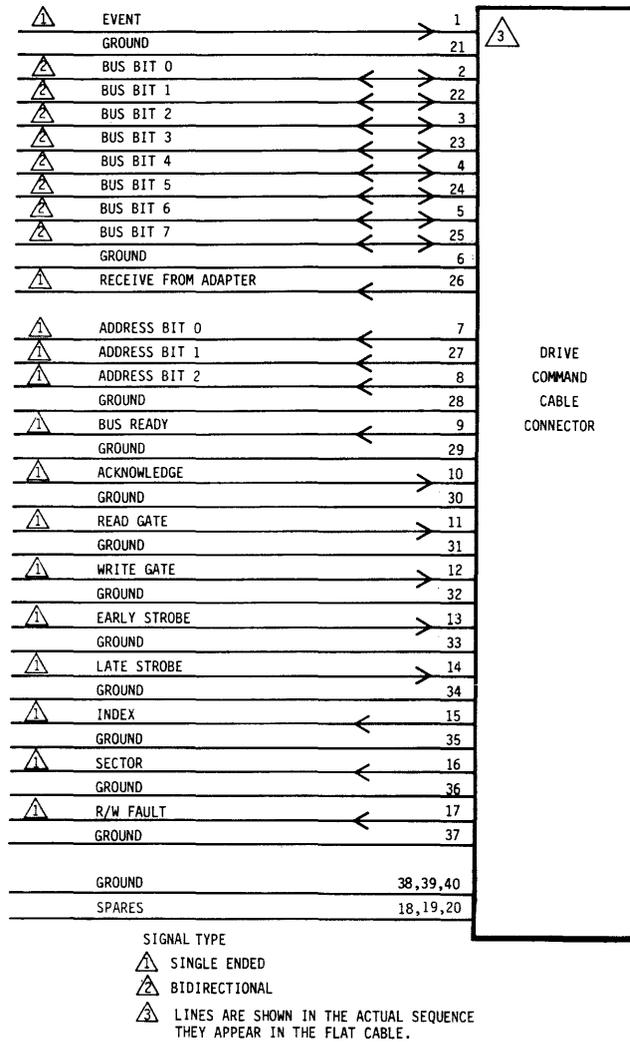


FIGURE 3-9. COMMAND CABLE PIN ASSIGNMENTS

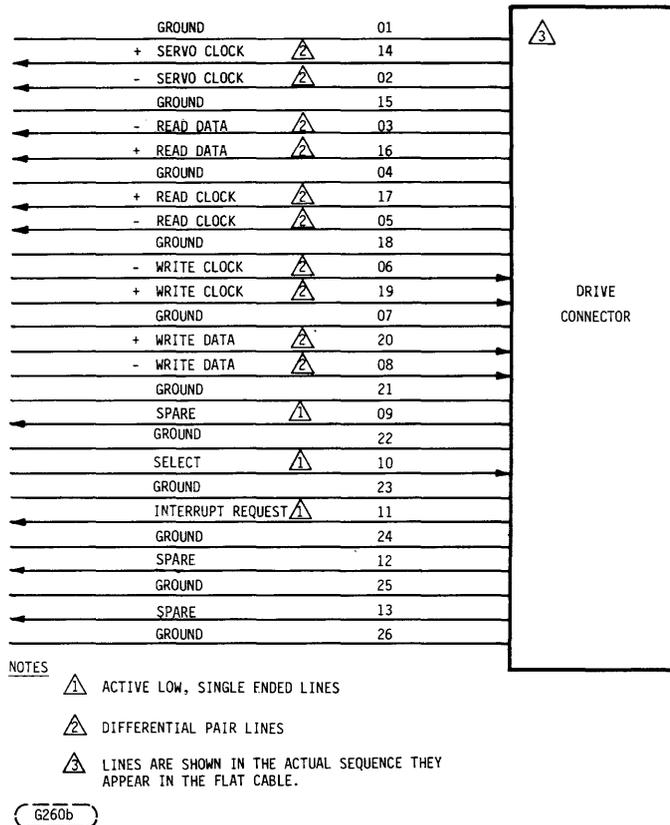


FIGURE 3-10. DATA CABLE CONNECTOR ASSIGNMENTS

### 3.8 ENVIRONMENT

#### Temperature

##### a. Operating

50°F (10.0°C) to 104°F (40°C) with a maximum gradient of 18°F (10°C) per hour. Maximum operating temperature should be reduced as a function of altitude by 1.95°F/1000 ft. (-15.5°C/304.8 m).

##### b. Transit Temperatures

-40°F (-40.4°C) to 140°F (60.0°C) with a maximum gradient of 36°F (20°C) per hour. This specification assumes that the LMU is packaged in the shipping container designed by manufacturer for use with the LMU.

##### c. Storage Temperature

14°F (-10°C) to 122°F (50.0°C) with a maximum gradient of 27°F (15.°C) per hour.

If it becomes necessary to use an LMU cartridge which has not been allowed to stabilize at the ambient drive operating room temperature for at least one hour or if the cartridge was exposed to temperatures below 61°F (16°C) immediately prior to the stabilization period, then the following procedures must be employed:

1. The cartridge must be visually inspected or examined to ensure that condensation is not present on any part of the cartridge.
2. The cartridge must be allowed to spin on the LMU for a period of not less than five minutes prior to attempting to read or write on the cartridge.

#### Relative Humidity

##### a. Operating

20% to 80% RH (providing there is no condensation) with a maximum gradient of 10% per hour.

Transit (as packed for shipment)

5% to 95% (providing there is no condensation).

##### b. Storage

10% to 90% (providing there is no condensation).

##### c. Altitude (actual or effective)

###### 1. Operating

983 ft (300 m) below sea level to 6560 ft (2000 m) above sea level.

###### 2. Transit (as packed for shipment)

983 ft (300 m) below sea level to 8200 ft (2500 m) above sea level.

### 3.9 INITIAL CHECKOUT AND STARTUP PROCEDURE

This procedure should be used to make the first power application to the unit. The procedure assumes that the preceding procedures and requirements of this section have been performed.

1. Insure system AC power circuit breaker is OFF.
2. Insure Subsystem Power Supply power switch is positioned to OFF.
3. Verify START/STOP switch is in STOP (out) position.
4. Unscrew carriage locking pin (CCW direction) until head of screw is flush with top of cover (see Figure 3-11). Resistance to turning will be felt as locking pin nears the correct position.

#### CAUTION

Do not remove the carriage locking pin at any time. The air system seal integrity requires that this screw remain in the top cover at all times.

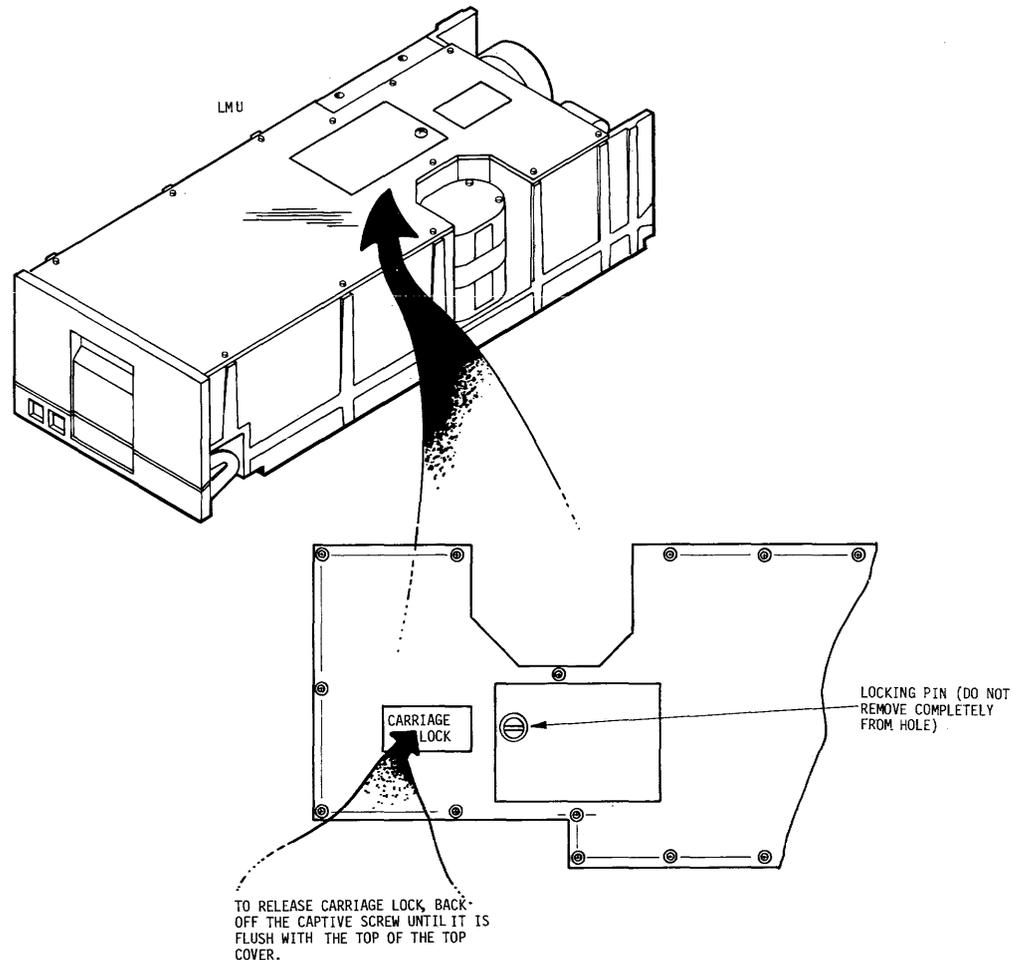
#### NOTE

All testing must be done with the Lark Micro Module mounted on the isolation shock mounts to insure performance of the drive.

### CAUTION

The carriage is to be locked during shipping using the carriage locking pin (Figure 3-11). This prevents damage to the drive as a result of the heads loading.

5. Install the AC power cable between power source and Subsystem Power Supply AC power input receptical.
6. Turn on Subsystem AC power circuit breaker.
7. Position Subsystem Power Supply AC power switch to ON. (If applicable to subsystem.) The LMU cooling fan should operate and front panel door should unlock when START/STOP switch is in STOP position (out).
8. Verify proper disk cartridge is available and insert into LMU.
9. Operate START/STOP switch to START (in). Spindle motor should rotate. Head loading sequence is initiated, START/STOP indicator blinks until heads are loaded then, remains illuminated. Also, front panel door locks when spindle rotation begins.
10. Perform on-line diagnostics, as applicable.



G054b

FIGURE 3-11. CARRIAGE LOCKING PIN

### 3.10 ACCESSORIES

Accessory items required, but not furnished with the drive, are the cables described in this section.

#### 3.10.1 I/O CABLE CHARACTERISTICS AND CONNECTOR PART NUMBERS

All critical read/write signals are implemented using balanced, terminated, differential pair lines across a flat cable. All other signals are implemented using single-ended, LS TTL compatible lines. Signal lines are separated by ground lines to reduce crosstalk. (Refer to Figures 3-9 and 3-10 for pin assignments.) These ground lines must be grounded both at the adapter and the drive(s). Polarized connectors should be used on all cables to prevent reversal of ground and signal lines. (Refer to Figure 3-8.) Further component details are given in Table 3-3. Grounding is discussed in Section 3-7.

##### 3.10.1.1 I/O CABLE AND CONNECTOR PART NUMBERS

TABLE 3-3. I/O CABLE AND CONNECTOR PART NUMBERS

ITEM NO.	DESCRIPTION	CDC PART NUMBER	VENDOR/ PART NUMBER
1	Connector (40 conductor)	92014152-0/54-6	Berg 65948-440/640
2	Connector (40 conductor daisy chain)	92014153-8/55-3	Berg 65948-540/740
3	Connector (26 conductor)	92014136-3/38-9	Berg 65948-426/626
4	Right angle header (40 conductor)	51847515	Berg 65496-025
5	Right angle header (26 conductor)	51847513	Berg 65496-013
6	Vertical header (40 conductor)	95433303	AMP 102154-9
7	Vertical header (26 conductor)	95433301	AMP 102154-6
8	Cable (40 conductor)	65832230	3 M 3365-40
9	Cable (26 conductor)	75884912-9	3 M 3476-26
10	Shielded cable (40 conductor)	TBS	TBS
11	Shielded cable (26 conductor)	TBS	TBS

Items 1 and 3 are closed-end cover connectors to be used at the end of cables to prevent the cable from shorting with drive board runs. Item 2 is an open-end cover connector which can be used for daisy chaining. Items 8 through 11 are part numbers for the cables described.

### 3.10.1.2 I/O CABLE CHARACTERISTICS

The cables described in this section may be used when cables are carefully routed and remain inside an RFI shielded enclosure. The shielded cables described in this section must be used to prevent RFI leakage where cables are used outside a shielded enclosure. The shield should be terminated to the outside skin of the enclosure.

#### Command Cable Characteristics

---

Type:	40 wire flat cable (not twisted)
Wire Size:	28 AWG, 7 strand
Voltage:	300 V (maximum)
Length:	4 feet (maximum) [including all daisy chain]
Impedance:	100 Ohms
Wire Spacing:	0.050 inch

#### Data Cable Characteristics

---

Type:	26 wire flat cable with ground plane and drain wire
Wire Size:	28 AWG, 7 strand
Voltage:	300 V (maximum)
Length:	4 feet (maximum)
Impedance:	65 Ohms
Wire Spacing:	0.050 inch

#### Shielded Command and Data Cable Characteristics

---

Type:	40/26 wire flat cables with shield and jacket
Wire Size:	28 AWG, 7 strand
Voltage:	300 V (maximum)
Length:	4 feet (maximum)
Impedance:	TBD
Wire Spacing:	0.050 inch

### 3.10.2 AC AND DC POWER CONNECTOR PART NUMBERS

Connectors required to supply power to the LMU are described in this section. These or equivalents are to be supplied by the user. Table 3-4 lists the part numbers of acceptable connectors and Table 3-5 lists the pin assignments for the AC and DC power connectors, whatever they may be.

TABLE 3-4. AC AND DC POWER CONNECTORS

ITEM NO.	DESCRIPTION	CDC PART NO.	VENDOR/ PART NO.
<u>AC POWER CONNECTOR</u>			
1	3 CIRCUIT POSITION MAT 'N' LOCK TYPE MALE HOUSING WITH FEMALE CONTACTS	83435302-1	AMP 1-480700-0
2	CONTACT (3 REQ)	83435507-5	AMP 350536-1 or 350550-1
<u>DC POWER CONNECTOR</u>			
1*	8 CIRCUIT POSITION FEMALE CONNECTOR WITH HIGH PRESSURE CONTACTS	10128944	AMP 641570-8
2	8 CIRCUIT POSITION FEMALE CONNECTOR WITH HIGH PRESSURE CONTACTS	10128937-9	AMP 640629-1
*KEYING PLUG IN #5 CIRCUIT POSITION.			

TABLE 3-5. AC/DC PIN ASSIGNMENTS

AC CONNECTOR	
PIN	SIGNAL
1	AC RETURN
2	SAFETY GROUND
3	AC LINE

DC CONNECTOR	
PIN	SIGNAL
1	+16.5 V
2	+5 V
3	GROUND
4	GROUND
5	KEY
6	-5 V
7	-5 V
8	-16.5 V

TABLE 3-6. BASE BOARD MATRIX

LMU HPC	SECTORS	FREQ	32/64 SELECT JUMPER
77654601 77654603	32	60 50	JUMPER INSTALLED
77654600 77654602	64	60 50	JUMPER NOT INSTALLED
32/64 SELECT JUMPER LOCATED ON BASE PWA			



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