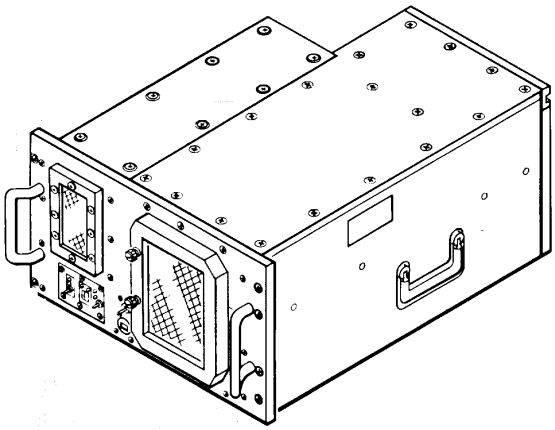
OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL



PRINCIPLES OF OPERATION

OPERATOR'S MAINTENANCE

ORGANIZATIONAL MAINTENANCE

TROUBLESHOOTING

DISK MEMORY UNIT MU-768/G
(NSN 7025-01-155-0172)

HEADQUARTERS, DEPARTMENT OF THE ARMY
5 SEPTEMBER 1985

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

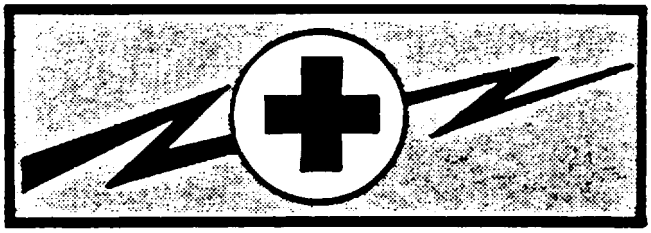
2 IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING



HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections or 115 volt ac input connections when Installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through the body.

Warning: Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11.

WARNING

COMPRESSED AIR

Compressed air shall not be used for cleaning purposes except where reduced to less than 29 psi and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when TRICHLOROTRIFLUOROETHANE has been used. Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent chips or particles (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel.

Technical Manual

NO. 11-7025-229-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 5 September 1985

Operator's and Organizational Maintenance Manual

DISK MEMORY UNIT MU-7681G
(NSN 7025-01-155-0172)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications - Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. In either case, a reply will be furnished direct to you.

LIST OF ILLUSTRATIONS

LIST OF TABLES

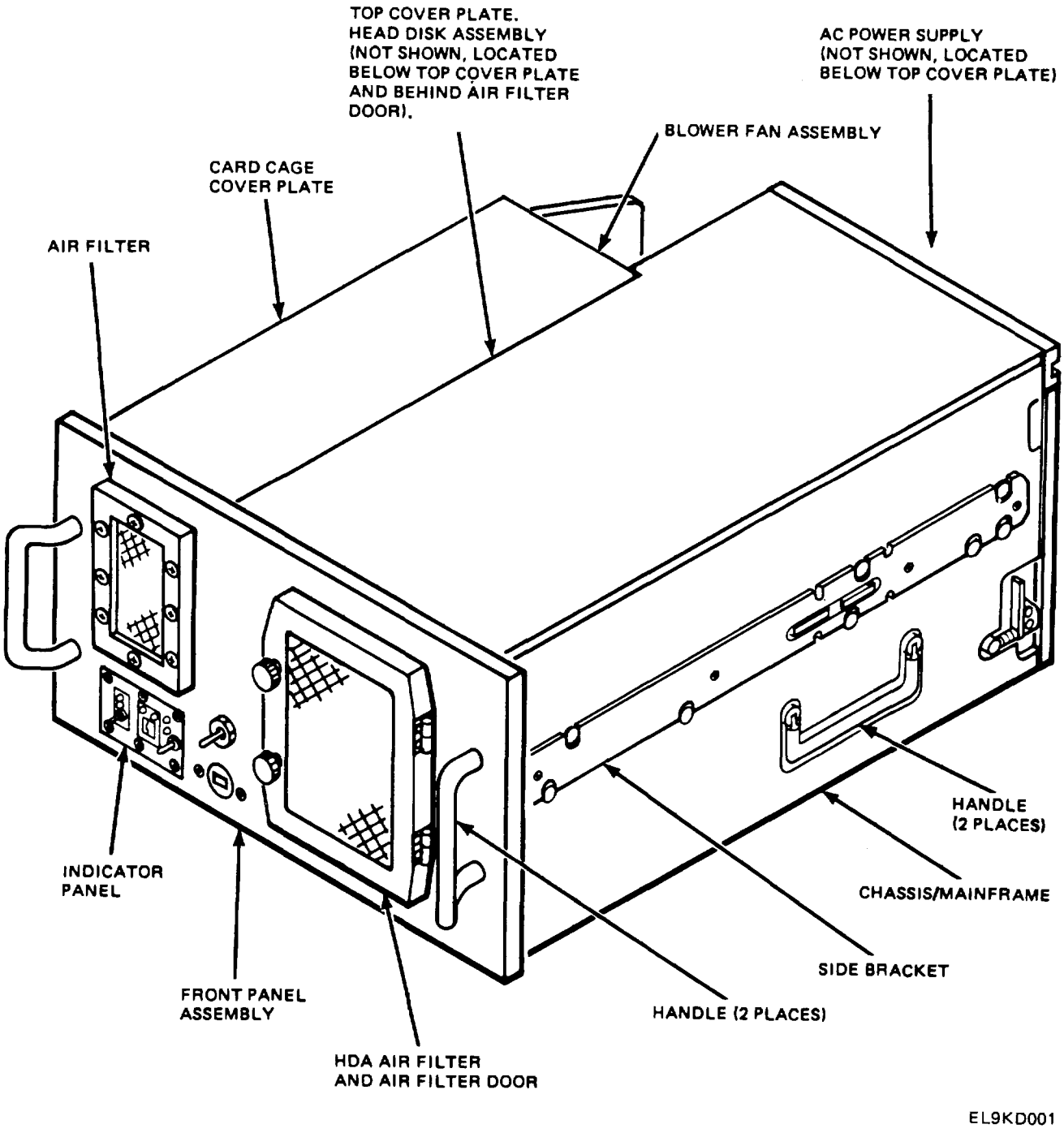


Figure 1. Disk Memory Unit MU-768/G.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

This manual contains detailed operating instructions and Operator/Organizational Maintenance information for Disk Memory Unit MU-768/G (figure 1). Appendices to this manual provide a glossary, index, list of references, and other items of information applicable to the operation and maintenance of Disk Memory Unit MU-768/G. References to the disk unit apply to Disk Memory Unit MU-768/G.

This chapter contains data relating to forms, records, and reports, and it provides general information that familiarizes the reader with the equipment. Equipment characteristics, capabilities, features, major component descriptions, and a discussion of equipment operating principles are included. In addition, equipment interface information and instructions concerning safety, care, and handling of the equipment are provided.

1-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest Issue of DA PAM 310-1 to determine whether there are new editions, changes, or additional publications pertaining to Disk Memory Unit MU-768/G.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750 as contained in Maintenance Management Update.

b. Reports of Packaging and Handling Deficiencies. Fill out and forward SF 364, Report of Discrepancy (ROD), as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward SF 361, Discrepancy in Shipment Report (DISREP), as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCOP4610.19D/DLAR 4500.15.

1-4. ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed on the equipment in accordance with the Preventive Maintenance Checks and Services (PMCS) charts in chapter 2 before storing. When removing the equipment from administrative storage, the PMCSs should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in chapter 5.

1-5. DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be accomplished in accordance with TM 750-244-2.

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If the Disk Memory Unit MU-768/G needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the disk unit. Let us know why you don't like the design. Put it on an SF 368, Quality Deficiency Report. Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. We will send you a reply.

1-7. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATORS

Table 1-1 provides a list of the disk unit major assemblies and subassemblies. The list identifies each item by its common name, official nomenclature, and equipment designator (if applicable).

Table 1-1. Nomenclature Cross-Reference List, Disk Memory Unit MU-768/G

Common Name	Official Nomenclature
Disk Unit	Disk Memory Unit MU-768/G
Chassis/Mainframe	Disk Unit Chassis Assembly (A9)
Power Supply	Multi-Voltage Power Supply Assembly (A8)
HDA	Head Disk Assembly (A7)
Front Panel	Front Panel Assembly (A11)
Indicator Panel	Indicator Panel Assembly (A10)
Terminator Plug	Terminator Plug Assembly (A12)

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT DESCRIPTION

The disk unit is a ruggedized disk-memory system that is able to operate in severe operating environments. The unit mounts in a standard 19-inch rack or may be configured for counter-top operation. The disk unit supports scientific and real-time applications requiring fast read/write times (figure 1).

The disk unit is comprised of the chassis/mainframe, front panel, exhaust fan, power supply, control electronics, and Head Disk Assembly (fig. 1-1).

The Head Disk Assembly (HDA) is an exchangeable unit that is vibration isolated when installed in the unit's chassis/mainframe. The HDA consists of the head/disk itself and the commutator electronics, which controls the speed of the drive motor and preamplifies the signals from the servo and data heads. The disk drive has 8-inch diameter rigid media and uses Winchester technology. The read/write heads are mounted on a statically-balanced rotary arm mechanism that is driven by a voice coil. The heads are positioned by a closed- loop servo system that uses prerecorded servo data on one of the surfaces of the rigid disks. The rigid disks and rotary arm mechanism are contained within a sealed volume of the HDA. There are no active electronics within this sealed volume.

The power supply furnishes all the voltages needed for the operation of the disk unit. The power supply is a self-contained package that plugs into the rear of the disk unit (fig. 1-1). The control electronics are contained in the disk units card cage and are comprised of three printed-circuits boards (PCB). The boards plug into a motherboard and are mechanically constrained by guides along their sides and by the disk units top cover. The motherboard interconnects the three boards, and is wired to connectors on the rear of the disk unit.

1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

Table 1-2 provides a list of the disk units characteristics, capabilities, and features.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The disk unit is comprised of the Chassis Assembly, AC Power Supply, Head Disk Assembly, Front Panel Assembly, Indicator Panel Assembly, and Terminator Plug Assemblies (table 1-1). The following subparagraphs provide component locations and descriptions.

a. Chassis Assembly The chassis is comprised of the mainframe, card cage, card cage top and bottom cover plates, HDA tray, the HDA top and bottom cover plates and the motherboard assembly (fig. 1-1).

b. Power Supply. The AC Power Supply is contained in the rear of the disk unit. The supply converts external 115V ac primary power into dc voltages required for disk unit operation (fig. 1-1.)

c. Head Disk Assembly. The Head Disk Assembly (HDA) mounts in the HDA Tray Assembly, which is located immediately behind the HDA air filter and air filter door (fig. 1-1). The HDA is easily removed and replaced as operating requirements may require.

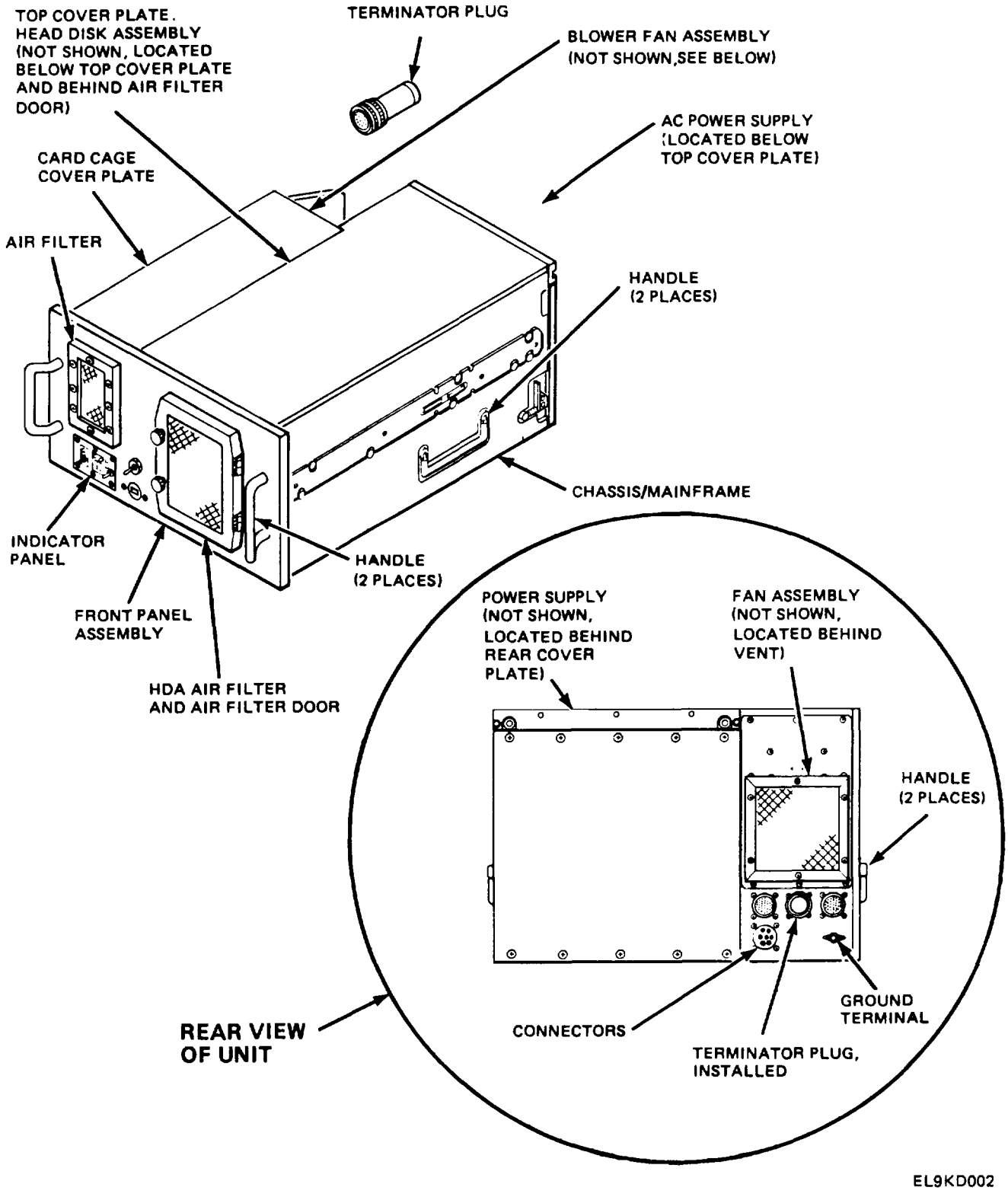


Figure 1-1. Disk Unite, Component Locations, Front Oblique View and Rear View

Table 1-2. Disk Unit Characteristics, Capabilities, and Features

Item	Data
CAPACITY	
Total Formatted Capacity:	35.6 megabytes
Addressable Cylinders:	580
	Number of Tracks: 2900
	Sectors per Track: 24
	Bytes per Sector: 512
PERFORMANCE	
Data Transfer Rate: (full track)	253 kB per second when used with Model 8142 Adapter I/O PCB.
Access Time: (includes settling time)	12 msec (minimum) 42 msec (average) 85 msec (maximum)
Average Rotational Latency:	8.3 msec
POWER	
Standard Input:	100-130V ac, 400 Hz, Single-phase
Dissipation:	200 watts
PHYSICAL	
Height:	12.25 in. (31.12 cm)
Width:	19.9 in. (48.26 cm)
Depth:	24.0 in. (60.96 cm)
Weight:	110 lb. (50 kg)

Table 1-2. Disk Unit Characteristics, Capabilities, and Features-Continued

Item	Data
ENVIRONMENTAL	
Temperature (operating):	32°F to 104°F (0.0°C to 400C)
Altitude (operating):	30,000 ft. (9.0 km)
Inclination	15° static, 60° cyclic
Humidity:	95% relative, noncondensing per MIL-STD-810C
Sand and Dust:	Per MIL-STD-810C
Salt Fog:	Per MIL-STD-810C
Shock (operating)	15g for 11 msec, per MIL-STD-810C
Shock (crash safety):	30g for 11 msec, per MIL-STD-810C
Vibration (operating):	2.5g (max, 5.0 to 2000 Hz, 0.075-inch DA (max), per MIL-STD-810C
Vibration (transportation):	1.5g (max), 5.0 to 200 Hz, 0.075-inch DA (max), per MIL-STD-810C
Acceleration:	Per MIL-STD-810C
Explosive Atmosphere:	Per MIL-STD-810C
EMI:	Per MIL-STD-461A, Notice 3
RELIABILITY	
Soft Read Error Rate:	1 in 10 to the 10 power
Hard Read Error Rate:	1 in 10 to the 12 power

d. Front Panel and Indicator Panel Controls and Indicators. Table 1-3 lists and describes front and indicator panel controls and indicators (fig. 1-1 and 1-2).

Table 1-3. Front Panel and Indicator Panel Controls and Indicators

Item	Function
FRONT PANEL	
PWR ON/PWR OFF Switch	Circuit-breaker power toggle switch. The two-position power switch serves as the ac power circuit breaker. It applies the 115V ac to the unit and provides overload protection by opening both sides of the ac input lines when it trips.
ELAPSED TIME (Meter M1)	Numerical indicator. Shows the accumulated time the disk unit has been running (power application). Elapsed time is shown in hundreds of hours, plus first place decimal.
INDICATOR PANEL	
PWR RDY Indicator	LED indicator. Indicates when ac power has been applied to the disk unit and the + 5V logic voltage is being outputted from the power supply to the control electronics.
OVER TEMP Indicator	LED indicator. Indicates an over-temp condition in the HDA.
LED TEST Switch	Test toggle switch. Used to test the functioning of the six LEDS.
SEL Indicator	LED indicator. Indicates that the disk unit has been (UNIT SELECT) selected and brought on line by the host computer.
RDY Indicator	LED indicator. Indicates that the units disk drive is (UNIT SELECT) up to speed and the read/write heads are positioned over track zero (0).
UNIT SELECT Switch	Thumbwheel selector switch. Used to assign a number (0-3), or address, to this unit. This enables the host computer to select this unit or any one of three additional slave units that might be connected to this unit.

Table 1-3. Front Panel and Indicator Panel Controls and Indicators-Continued

Item	Function
SUB SYS TEST Switch	Non-latching toggle switch. This momentary action switch is used to initiate self-testing of the disk unit (and any slave disk units).
PASS Indicator (SUB SYS TEST)	LED indicator. Indicates that the unit has successfully passed system readiness testing and is ready for operation. If additional disk units are connected to this unit, and the UNIT SELECT switch is dialed to the appropriate position (1, 2, or 3) the PASS indicator will indicate that the slave disk unit has also undergone self-testing, and passed.
FAIL Indicator (SUB SYS TEST)	LED indicator. Indicates that the unit (or the slaved disk units) has failed the system readiness testing.

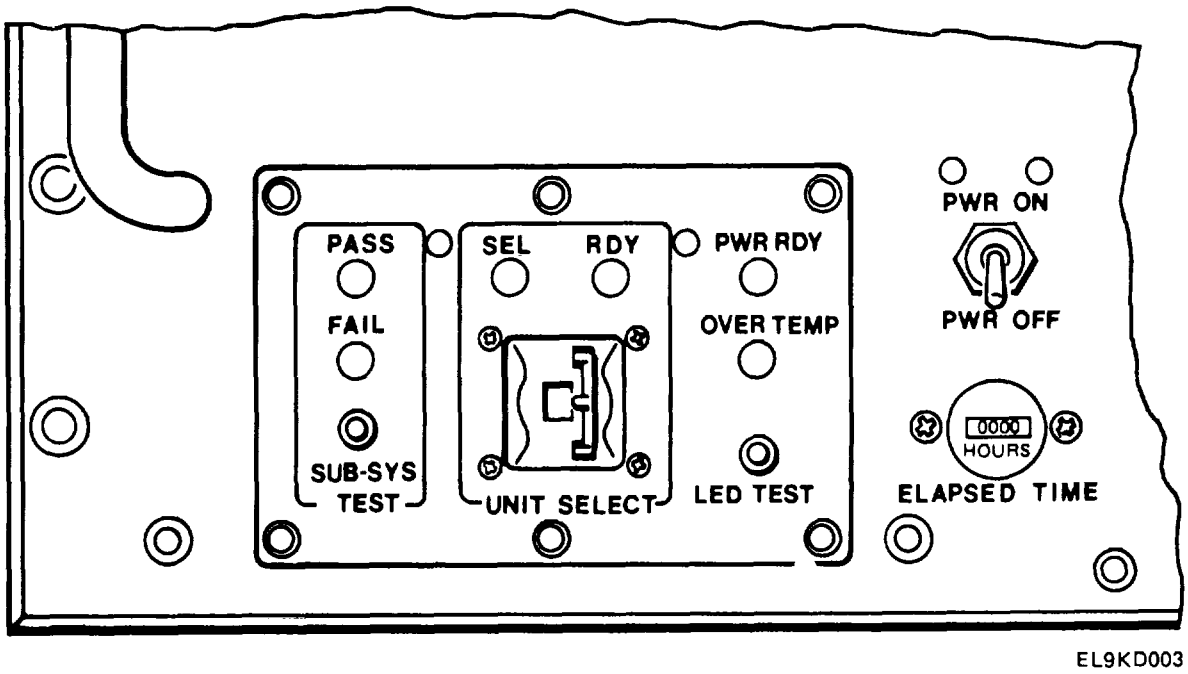


Figure 1-2. Front Panel and Indicator Panel Controls and Indicators, Cut-Away View

e. Rear Chassis Connectors. Table 1-4 lists and describes the functions of the connectors located at the rear of the disk unit's chassis (fig. 1-1 and 1-3).

Table 1-4. Rear Chassis Connectors

Item	Function
J4, 7-Pin **PWR**	Power input connector used to connect externally supplied 115V ac power, plus system ground.
J1, 55-Pin	Used to connect a slave disk unit.
J2, 55-Pin	Used to connect a slave disk unit.
J3, 55-Pin	Used to connect this unit to the host computer; via the adapter I/O PCB in the host computer.
GND Wing-Nut Stud	Provides a chassis ground connection capability.

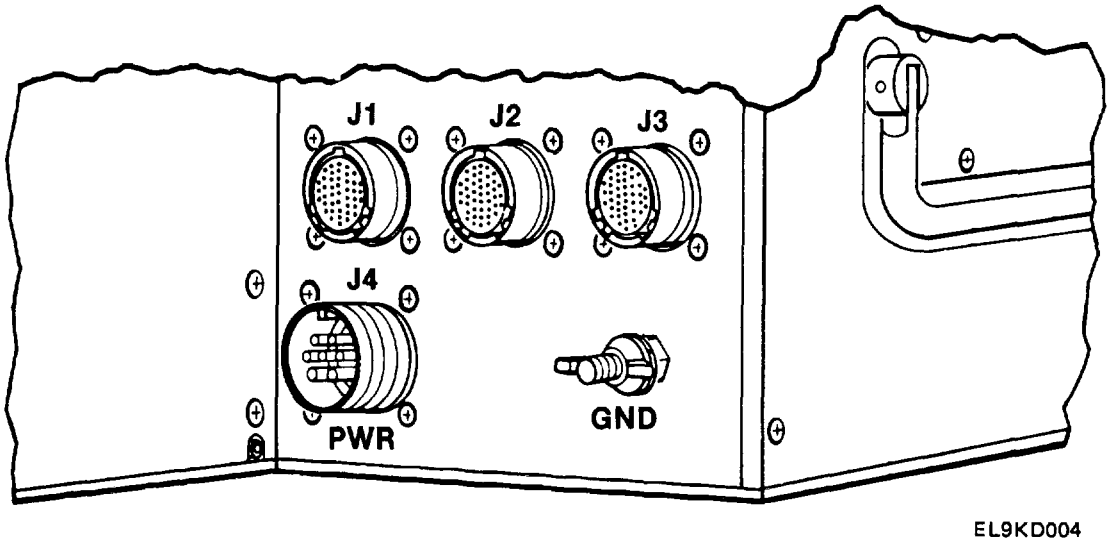


Figure 1-3. Rear Chassis Connectors, Cut-Away View

f. Terminator Plug. Disk unit Input/output connectors not being used must have a terminator plug (fig. 1-1) installed on the connector to provide continuity for certain I/O bus interface signals.

1-11. SAFETY PRECAUTIONS

The disk unit is a heavy piece of equipment. Four technicians are employed when moving the unit. Handles are provided on the disk unit as an aid when moving the disk unit. Use them (fig. 1-1).

A periodic review of safety precautions in TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment, is recommended. When the equipment is operated with covers removed, DO NOT TOUCH exposed connections or components. MAKE CERTAIN you are not grounded when making connections or adjusting components inside the test instrument.

Section III. PRINCIPLES OF OPERATION

1-12. INTRODUCTION

This section provides a brief explanation of disk unit operating principles.

1-13. FUNCTIONAL OVERVIEW

The disk unit operates under the control of programs running in a host computer. An adapter card, plugged into an I/O slot of the host computer, translates commands from the host computer into the format required by the disk units controller PCB. The adapter transfers data between the disk unit and the host computer memory using the data channel or the burst multiplexer channel of the host computer.

If additional disk units are slaved to the master disk unit to increase the overall storage capacity, they are connected in a serial fashion using standard cables (fig. 1-4). The total length of cabling allowed in the serial hookup is 10 feet. Model 3840 terminator plug assemblies are required to electrically terminate critical signals.

The slave disk units are identical to the master disk unit except they do not contain a controller PCB. Up to three slave units can be connected in series to the master disk unit. The controller in the master disk unit, using commands from the computer I/O adapter card, can transfer data to or from any of the four disk drives. Since the master disk unit has a storage capacity of 35.6 Mbytes, the addition of three slave disk units increases the total system storage capacity to 142.4 Mbytes.

1-14. OPERATING PRINCIPLES

NOTE

The asterisk that is used with signal names (WSTR*) in this chapter refers to an inverted signal.

The following paragraphs describe the operating principles of the six major assemblies that make up the disk unit. The descriptions also apply to any slave disk units that may be employed, except that the slave units would have no Disk Controller PCB.

a. Disk Controller PCB. The Disk Controller PCB occupies slot A3 in the card cage of the disk unit. The controller communicates with the I/O adapter PCB in the host computer and with the Device Electronics PCB in slot A2 of the disk unit's card cage. A one-byte, bidirectional bus and nine control signals handle all communications with the I/O adapter while the signals to the electronics PCB consist of a one-byte, out-bus and control signals.

The controller accepts commands from the adapter and controls all disk operations and all transfers to or from the I/O adapter. It provides all the necessary control for the master disk unit and up to three slave disk units. All data, commands, and status are transferred between the I/O adapter and the controller PCB over the one-byte, bidirectional bus (IBUS 0-7). The byte on the bus is loaded into the output buffer of the controller by signal WSTR*

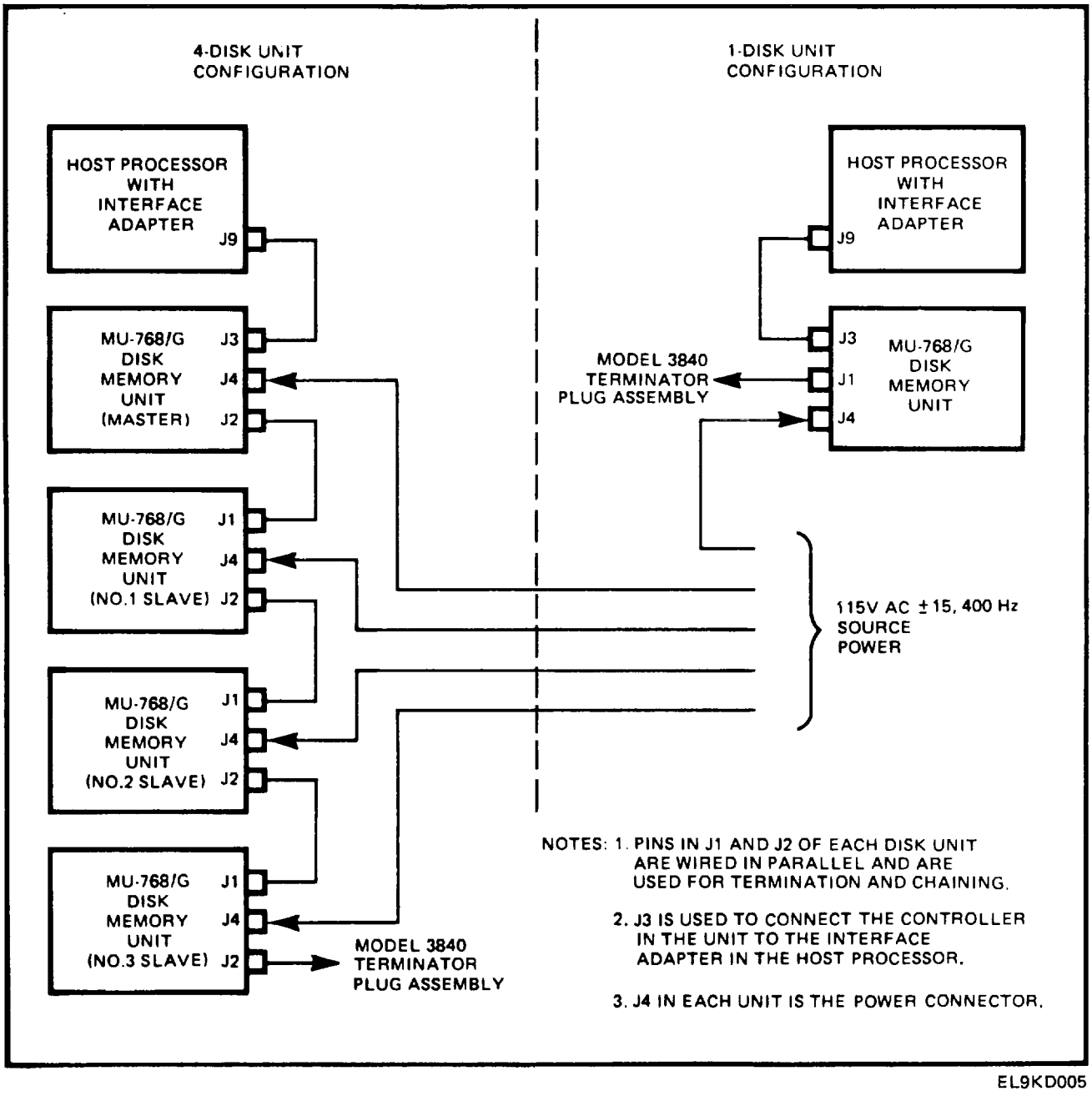


Figure 1-4. Processor/Disk Unit System Interface Configurations

when the transfer is from the adapter, and the byte is loaded from the input buffer of the controller onto the bidirectional bus by signal RSTR* when the transfer is to the adapter. As explained previously, the direction of a transfer is defined to be with respect to the host computer. Therefore, the output buffer of the controller is loaded by the adapter when the adapter outputs a byte.

Byte transfers are either from the input buffer or to the output buffer. These two buffers transfer the byte to or from two ports, the command port or data port. The command port transfers commands on output from the adapter and transfers status on input to the adapter. The data port transfers data bytes in both directions. The port used, actually the source or destination of the byte within the Disk Controller PCB, is determined by signal DATA*. When this signal is true, the data port is selected.

A Z-80 microprocessor controls the operation of the controller PCB. A 2K x 8 PROM contains the microprogram that the microprocessor executes. The microprocessor interprets and executes commands from the adapter by issuing commands to the rest of the subsystem and by transferring status to the adapter and data between the adapter and the disk.

There are three major buses on the controller: DB0-7, D0-7, and A0-15. Bus DB0-7 is a bidirectional bus that handles byte transfers between the input and output registers and the ports. Bus D0-7 is the bidirectional bus of the microprocessor and bus A0-15 is an address bus.

Bus DB0-7 transfers command, status, and data bytes between the input and output buffers and the rest of the controller. Data read from the disk is transferred from the read/write control circuitry to a 2K RAM buffer on the bus and then, over the same bus, to the input buffer for transfer to the adapter. During a write operation, data from the output buffer is stored in the 2K RAM via the bus, and then transferred on the bus to the read/write control circuitry. Under the control of the microprocessor, bytes can be exchanged between the DB0-7 bus and the D0-7 bus. Command bytes from the adapter are loaded in the output buffer, enabled onto the CB0-7 bus, transferred to the D0-7 bus, and loaded into the command register. Status bytes stored in the status register are enabled onto the D0-7 bus, transferred to the DB0-7 bus and loaded in the input buffer for the adapter to read.

The D0-7 bus is the bidirectional bus of the microprocessor. As input to the microprocessor, this bus supplies the contents of the command register, the disk status, and microinstructions from the PROM. On output from the microprocessor, the microprocessor uses this bus to load the status register and issue bit-oriented commands to the control logic of the controller PCB and electronics PCB. The bus is also used to transfer commands a byte at a time to the electronics PCB over the BUS 0-7 bus.

The A0-A15 bus is the address bus of the microprocessor. The microprocessor uses the bus to address the PROM containing the microprogram and the 2K RAM buffer used for data transfers to or from disk. In addition to addressing, bits A8 and A11-A15 are used as control signals.

Controls signals coordinate transfers between the disk and the adapter. When the controller can not accept another command from the adapter because it is busy performing the current command, the signal CBUSY will be true; otherwise it will be false. When the controller completes a command from the adapter, it causes signal ATTN* to go true, informing the

adapter that the command has been completed. When data is being transferred between the controller and the adapter, the controller will cause signal DREQ* to go true whenever the controller wants to transfer a byte. The OUT* signal is used to inform the controller of the direction of data transfer.

b. Device Electronics PCB. The Device Electronics PCB contains the power-up and power-down sequencing circuitry and the head-position control logic. It accepts commands from the Disk Controller PCB and, along with the Motor Control PCB, controls the storage and retrieval of data to and from the disk. The electronics PCB uses a microprocessor to supervise, control, and monitor all drive operations.

The electronics PCB receives its instructions from the controller PCB over an 8-bit, unidirectional bus (BUS0-BUS7). Two other bits from the controller, BA0 and BA1, are decoded by the electronics PCB to determine if the byte is a command, a cylinder or sector address, or a seek.

A command byte can be any of the following commands: Offset P (positive), Offset N (negative), Write Enable, and Fault Reset. The commands are decoded by discrete logic sent to the Head Disk Assembly (HDA) for implementation.

If the byte is a cylinder address, sector address, or seek, motion of the rotary arm actuator to move the heads is required. The microprocessor interprets these commands and causes the motion of the actuator.

The microprocessor uses the output of a "bad track" PROM, located on the Commutator PCB in the HDA, and the cylinder address to determine if the track being requested is bad. If so, the actual track address on the disk for the requested cylinder address is generated. The distance, in number of tracks, from the current head position and the direction of movement is also calculated by the microprocessor.

The servo controller that controls the motion of the actuator is a combination of circuitry on both the Device Electronics PCB and Motor Control PCB.

Movement of the actuator is initiated by the microprocessor. Based upon the distance the heads must move, a velocity profile is determined. That is, the heads are not moved with a constant velocity; rather a current is applied to the voice coil in such a manner as to cause the actuator to increase in velocity in a ramp fashion. The actuator may or may not reach maximum velocity, depending upon the distance that must be traveled. As the heads approach the desired track, the current to the voice coil is ramped down such that the actuator movement is slowed gradually, finally stopping when the heads are over the desired track.

Based upon the velocity profile, the microprocessor generates velocity reference signals VR0-VR3. The signals are sent to the Motor Control PCB where the Velocity Digital-to-Analog Converter (DAC) converts them to an analog current that is used to drive the actuator's voice coil.

Feedback to the servo system is from the servo head, which generates signal Track Pulse. The positioner PROM uses this signal and other signals related to actuator movement to generate the signals S0-S3. These signals are sent to the Motor Control PCB where the Velocity-Synthesis Circuit uses them to generate a velocity feedback signal.

The servo head signal is received on the electronics PCB as the differential signal SERVO R and SERVO B. This differential signal is amplified and filtered and becomes signal SS. A feedback circuit between pins 4 and 11 of the differential amplifier, consisting of a FET transistor resistor, provides Automatic Gain Control (AGC).

The Position Signal Generator uses signal SS to generate signal POSX and then POS. Signal POS is sent to the Motor Control PCB, which uses it to keep the servo heads alined over the correct servo track.

POSX and its inverted signal POSXN are compared with a reference voltage by dual differential amplifiers. If either signal exceeds 400 millivolts, the OFF TRACK signal will become true. When OFF TRACK signal is true, the Write Enable (WEN) signal is automatically disabled.

In addition to controlling the position of the heads over a track, the electronics PCB also selects which of the five heads are to be used and whether the operation is to be a read or write operation. Signals CHIP ENABLE 1* and CHIP ENABLE 2* are used to select one of the two preamplifier chips on the preamplifier PCB in the HDA. Signals HSLT1* and HSLT2* are used to select one of the four heads connected to each preamplifier chip. Since there are only five read/write heads in the HDA, only the second chip has one head connected to it.

c. Motor Control PCB. The Motor Control PCB controls the rotation of the disk drive motor and, in conjunction with the electronics PCB, controls the position of the read/write heads by controlling the movement of the rotary actuator.

Two relays, K1 and K2, are deenergized when the disk unit is turned on. When they are deenergized, the current limiting resistor in the HDA is in series with the +24V to the drive motor, limiting the current to 5.0 amperes during motor startup, and the WRITE POWER signal to the disk is disabled. The rotary arm actuator is also held in the fully retracted position. When the motor reaches approximately 2500 rpm, the HEAD LOAD ENABLE* signal, generated by the electronics PCB, energizes the two relays (K1 and K2). The current limiting resistor is switched out of the motor circuit, the WRITE POWER signal is enabled, and the rotary arm actuator is connected to the POWER AMP.

The signals generated by the LEDs and photo transistors on the Commutator PCB, X, Y, and Z, along with two other motor control signals, MOTOR ENABLE and IMS (Increase Motor Speed) are decoded by the Motor Control PROM. The six outputs from the PROM are combined by six separate transistor drivers to provide a sequence of 3-phase motor power signals, OA, OB, and OC, which rotate the motor in the desired direction with nearly constant torque.

The speed of the motor is controlled by a digital servo loop consisting of a pulse generator, multistage counter, and flip-flop. The signal X from the Commutator PCB triggers a one-shot every time it occurs, generating a negative going pulse. This pulse is used to load a counter. The counter is clocked by a 400 kHz clock on the electronics board. If the counter reaches a count of 2048 before the next X pulse restarts it, the signal SPEED LOW is generated. The next X pulse will set a flip-flop, generating signal IMS. The IMS signal will remain true until the SPEED LOW signal goes false. When the motor reaches its desired speed of 3600 rpm, it coasts until speed correction is again necessary.

The Motor Control PCB receives velocity reference signals VR0-VR7 from the electronics PCB. These signals are converted to an analog signal by the Velocity Digital-to-Analog Converter (DAC). The resulting analog signal is used to generate signal SA. SA is used by the servo power amplifier to generate signals VC1 and VC2 (Voice Coil 1 and 2), which drive the voice coil of the rotary actuator.

The signal POS, from the electronics PCB, is used to correct the position of the heads when they are on track, but drifting slightly. POS along with the synthesized velocity signals, S0-S3, from the electronics PCB are converted to an analog signal, VEL, by the velocity synthesis circuit. The signals VEL and POS are used, along with VR0-VR3, to generate the signal SA and cause actuator movement.

If power to the disk unit is lost, relay K1 will deenergize. The contacts of the relay will disconnect VC1 and VC2 from the voice coil and connect a capacitor across it. The capacitor, in the HDA, is charged by +5V and polarized to force the positioner to move to the outer stop, a safe position away from the data zone.

d. Indicator Panel. The indicator panel, located on the front panel, provides controls and status indicators for the disk unit.

The panel has six light-emitting diode (LED) indicators and three switches. The function of the indicators and switches is explained in table 1-3. Each of the six LEDs has a current limiting resistor connected to its cathode. The other ends of the six resistors are connected to +5V. The anode of each LED is connected, through the connector, to a logic signal within the disk units circuitry. When the logic level goes true (low level) the appropriate LED will illuminate.

The anodes of the LED are also connected, each through an isolation diode, to switch S2, LED Test. When this switch is raised, the anodes of the six isolation diodes are grounded, simulating a true signal to the six LEDs; all six LEDs are then illuminated.

Switch S1 generates the signal SUB SYS TEST. When the switch is raised, the signal causes the adapter to perform its GO/NO GO test. The thumbwheel switch generates signals DEV SEL 1 and DEV SEL 2 to assign a unit number to the chassis.

e. Head Disk Assembly. The Head Disk Assembly (HDA) contains the disk itself and the electronics necessary to supply drive pulses to the disk drive motor. A major component of the HDA is a large die-cast aluminum casting. All other components of the HDA mount on this casting.

(1) Interior of the HDA Subassembly. The lower half of the HDA Subassembly consists of a large cavity which is sealed by a bottom cover. Within this cavity are the recording media, read/write heads, and rotary arm actuator.

The recording media consists of three 8-inch diameter, rigid, Winchester-technology disk platters. Five of the six surfaces are used for data storage. The sixth surface, the bottom side of the lower disk platter, has prerecorded servo information, which is used by the servo system to position the read/write heads on the desired cylinder.

The read/write heads and the servo head are mounted on the end of the rotary arm actuator. When the disk unit is turned off, these heads are resting on the outer edge of the disk platter; an area where data is not recorded. When the disk unit is turned on and the drive motor begins to spin the disk platters, the heads slide on the lubricated surface of the disk platters. As the speed of the platters increases, air pressure, and the aerodynamic characteristics of the head design, cause an air-bearing to form which causes the heads to take off from the disk surface and "fly." The head assemblies are designed such that between the air-bearing force that tries to lift the heads and the spring force that causes them to land on power-off, they fly at approximately 19-microinches above the disk surface.

The rotary arm actuator positions the heads over the disk surface. The heads are mounted on one end of the arm and the other end, a permanent magnet, is within a linear voice coil. Changes of current in the voice coil, caused by the servo system, make the permanent magnetic end of the arm move and hence cause the heads to move. The rotary arm actuator is statically balanced to make it less sensitive to shock, vibration, and physical orientation.

All electrical connections to the sealed volume are made through a small PCB on the top of the casting. This PCB also contains the preamplifiers that amplify the weak read signals from the heads before sending them to the electronics PCB.

There are no active components within the sealed cavity of the HDA subassembly. The bottom cover and the small PCB seal the cavity and they must not be removed unless the HDA is in a clean-room; otherwise, the cavity will become contaminated. The legs of the component sockets on the PCB, when soldered in place, are also part of the seal; they also must not be removed except in a clean-room. The interior of the cavity was designed such that the rotation of the disk platters causes high- and low-pressure areas. The resulting circulating air flow is directed through a 0.3 micron absolute filter within the sealed cavity. Thus, the air within the cavity is being continually filtered. Another 0.3 micron absolute filter on the bottom cover is used to allow the cavity pressure to equalize with the outside ambient pressure.

(2) Exterior of the HDA Subassembly. The exterior of the HDA, formed by the exposed area on the top of the casting, contains the drive motor, motor-starting resistor, brake solenoid, and Commutator PCB.

The drive motor for the HDA is a brushless dc motor. The rotating portion of the motor consists of the permanent magnets, while the stationary portion consists of the coils that cause the permanent magnet to move. The dc commutated voltage to the coils is provided by electronic circuitry on the Commutator PCB. The rotating portion of the motor consists of the permanent magnets and an aluminum hub with fins to create air movement for cooling. The aluminum hub acts as a flywheel and counter balances the weight of the disk platters within the sealed unit.

The motor starting resistor is a high-wattage resistor, which is used to limit the current to the dc motor as it starts up. Approximately 20 seconds after the unit is turned on, circuitry on the Motor Control PCB will switch the starting resistor out of the motor circuit and thus apply the full +24V commutated voltage to the motor coils.

The brake solenoid is powered by +24V. When the unit is turned off, the solenoid is deenergized and a pad on the end of the solenoid arm, through a mechanical spring powered mechanism, puts pressure on the aluminum hub of the drive motor and prevents it from rotating. When power is applied to the unit, the solenoid energizes, which releases the hub and allows the motor to rotate. The solenoid serves two functions. The first, and most important function, is to rapidly stop the rotation of the disk platters when power is turned off. This prevents unnecessary rotational contact between the heads and the disk surfaces after the air-bearing is lost and the disks are slowing down. The second function of the solenoid is to help prevent rotation of the spindle when the unit is turned off.

The Commutator PCB provides the commutated dc voltage to the coils of the brushless dc motor. Three light-emitting diodes (LEDs) are mounted on a small PCB beneath the aluminum hub of the motor. These LEDs are illuminated whenever the power to the unit is on. A vane on the aluminum hub is over the LEDs and rotates with the hub. Slots on the vane alternately uncover the LEDs and allow light to pass through. Photo-sensitive transistors on the commutator board are used to sense this light and generate signals X, Y, and Z. The relative on/off relationship of the three signals is used by the Motor Control PCB to control the speed of the motor by controlling the frequency of the pulses to the coils of the motor.

Signals CE1* and CE2* are used to select one of the two pre-amplifiers on the small PCB that forms part of the seal to the sealed cavity. Signals HSLT1* and HSLT2* select one of the four heads being received by the preamplifiers. Read or write selection to the disk is also done through the commutator board by the signal WRITE SELECT.

An LM135 temperature sensitive Zener diode is used to measure the temperature of the air over the commutator board. Three circuits are provided to generate over-temperature signals at three different temperatures. Only one is used to light the OVER TEMP indicator on the indicator panel. The remaining two are reserved for special applications.

A Bad Track PROM generates signals BSOO-BS03. These signals are used by the electronics PCB to map logical track addresses into physical track addresses, based upon the number of defective tracks on the disk discovered during surface analysis.

f. Power Supply. The AC Power Supply supplies all the dc voltages required by the disk unit. The supply meets a variety of military standards, including MIL-STD-461 Notice 3, CE01 and CE02, and MIL-STD-704A.

The power supply (using an EMI filter) operates from an input voltage of 115V ac, 360-440 Hz. Three dc voltages, +5V, -12V, and +24V are generated by the supply. The outputs are protected with current limiting and automatic overvoltage shutdown.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. GENERAL INFORMATION

2-1. GENERAL

This chapter provides instructions for operating Disk Memory Unit MU-768/G. Additionally, the chapter contains required preventive maintenance information.

2-2. ARRANGEMENT OF CHAPTER

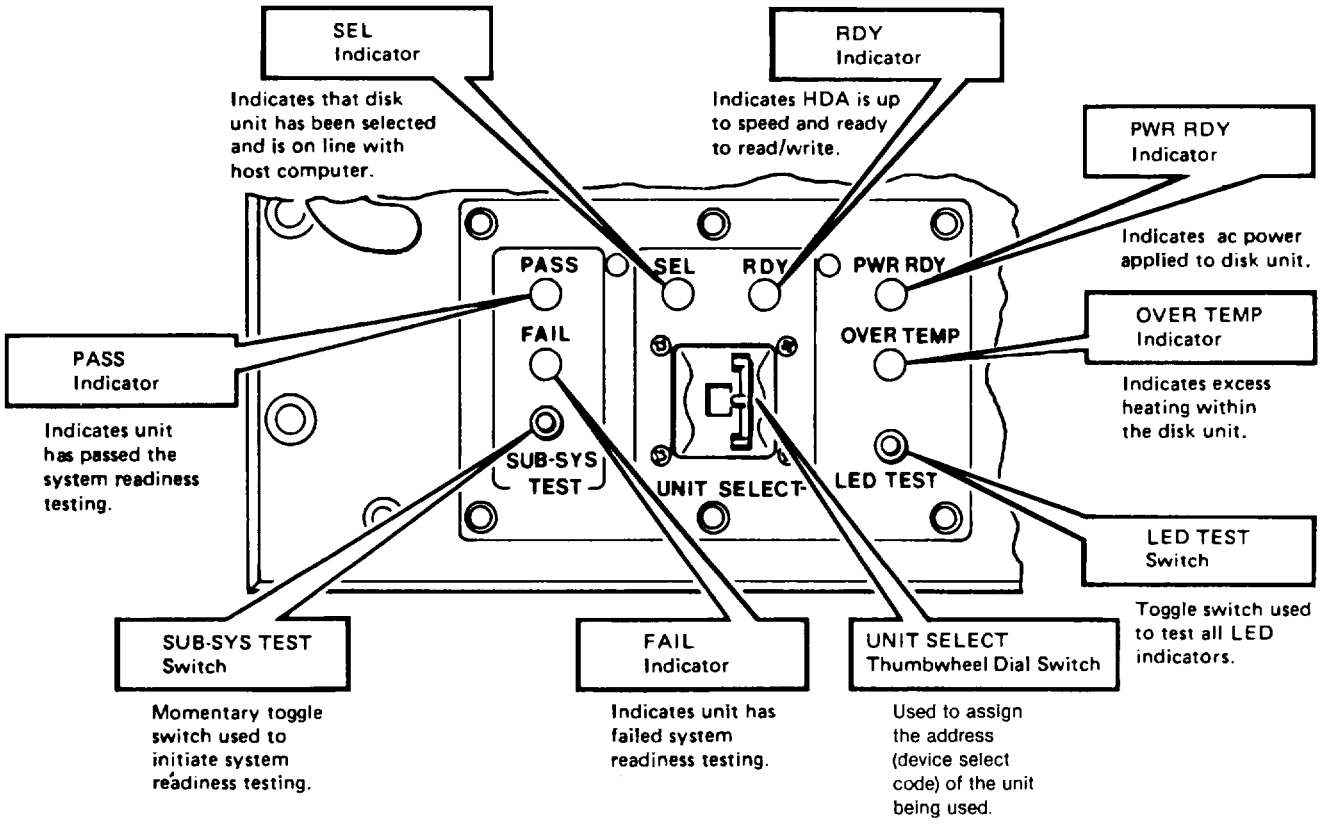
The content of this chapter is presented in sections as follows:

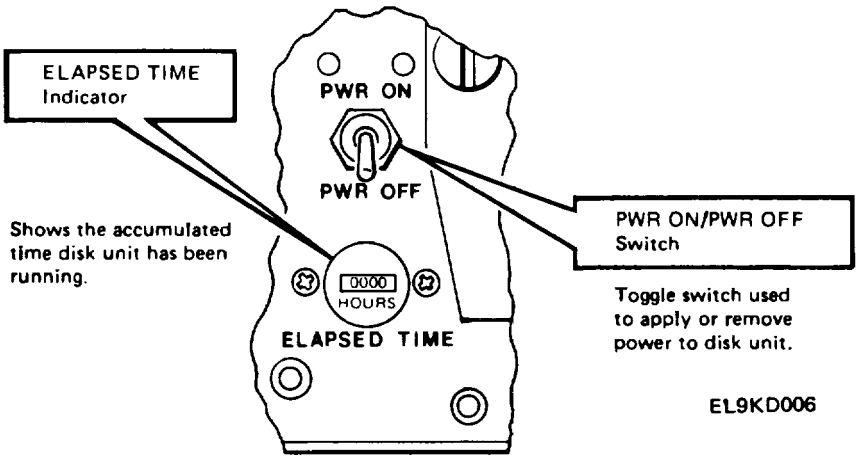
Section I	General Information
Section II	Operator Preventive Maintenance Checks and Services (PMCS)
Section III	Operation Under Usual Conditions
Section IV	Operation Under Unusual Conditions

2-3. DESCRIPTION OF OPERATOR'S CONTROLS AND INDICATORS

Operators and maintenance technicians must be familiar with the purpose, function, and general physical characteristics of the disk unit before attempting to operate or perform maintenance on the unit. Chapter 1, in its entirety, must be studied prior to proceeding further into this chapter or the balance of the manual.

The following narrated illustrations provide a description, the location, and the use of the operator's controls and indicators on the disk unit (table 1-3).





Section II. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-4. INTRODUCTION

The maintenance duties of the Operator include the performance of Preventive Maintenance Checks and Services (PMCS). PMCS are the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble and reduce downtime by detecting operational problems. PMCS are required to maintain Army electronic equipment in a combat serviceable and mission-ready condition. PMCS are performed:

- **Before Operation.** Always keep in mind the CAUTIONS and WARNINGS noted throughout this manual. Perform the before (B) PMCS.
- **During Operation.** Always keep in mind the CAUTIONS and WARNINGS noted throughout this manual. Perform the during (D) PMCS.
- **After Operation.** Be sure to perform the after (A) PMCS.
- **If Processor Fails to Operate.** Troubleshoot with proper equipment. Report any deficiencies using the proper forms (DA PAM 738-750).

a. PMCS Table. The following subparagraphs define the purpose of the PMCS table, service intervals, and procedure columns. Also provided are operator instructions for reporting equipment operating deficiencies.

(1) Purpose of PMCS table. The PMCS table 2-1 lists the inspections and care of the equipment, which are performed by the Operator to ensure that the equipment remains in the proper operational readiness.

(2) Service Intervals. The INTERVAL column of the PMCS table 2-1 informs the Operator as to how often checks and services are to be performed. Following is an explanation of the internal codes:

NOTE

ALL PMCS must be done as regularly scheduled and also under the following conditions:
- When the disk unit is first installed.
- When the disk unit is being operated for the first time.
- When the disk unit is reinstalled after being removed for any reason.
- Before the disk unit is used on a mission.

BEFORE OPERATION - Do the (B) PMCS before operating the disk unit.

DURING OPERATION - Do the (D) PMCS during the operation of the disk unit.

AFTER OPERATION - Do the (A) PMCS after operating the disk unit.

WEEKLY - Do the (W) PMCS weekly.

(3) Procedure column. The PROCEDURE column of PMCS table 2-1 informs the Operator as to how checks and services are to be performed. Instructions are to be carefully followed.

(4) Equipment Not Ready/Available If: Procedures. The EQUIPMENT NOT READY/AVAILABLE IF column of PMCS table 2-1 informs the Operator when the equipment cannot be usedand why it cannot perform the assigned mission requirements. If the equipment fails to operate as required, refer to chapter 3 for maintenance instructions. Report any malfunctions on DA Form 2404 (DA PAM 738-750).

NOTE

The terms "ready/available" and "mission capable" refer to the same status; equipment is on hand and is able to perform its combat missions (DA PAM 738-750).

b. Special Instructions. If the disk unit must be in use most of the time, check and service those items that can be checked and serviced without stopping its operation. Make complete checks and services only when the disk unit is finally shut down.

c. Deficiency Reporting and Correcting. Should the equipment fail to operate properly, the Operator reports the problem to Organizational Maintenance for corrective action. All such equipment failures are recorded on DA Form 2404 (DA PAM 738-750).

d. Equipment Removal. There is no requirement for the Operator to remove the disk unit in order to perform the PMCS.

e. Tools, Materials, and Equipment Required for Maintenance. No tools or equipment are required for Operator Maintenance. The following cleaning materials are required (appx E):

- Lint-free cloths (item 3, appx E)
- Soft-bristle brush (item 2, appx E)
- Isopropyl alcohol (item 1, appx E)
- Detergent (item 4, appx E)

f. Routine Services. Routine services are a collection of checks and observations performed by the Operator. Routine services are not listed in the PMCS table 2-1 in order to separate the nonoperational from the operational services. Refer to Chapter 3 for additional information. The operator will perform the following routine services as necessary:

Clean

Dust

Check for cut and frayed cables.

Check for rusting and corrosion.

Check controls for smooth operation.

Check for unusual odors (e.g., overheating of processor, smoke, etc.).

Check for loose nuts, bolts, and connectors.

Check for completeness of equipment.

Check for completeness of, and current changes to, publications.

Check for noisy blower fan.

Table 2-1. Operator Preventive Maintenance Checks and Services

B = Before Operation **D** = During Operation **A** = After Operation

Item No.	Interval B	Interval D	Interval A	Item To Be Inspected Procedure	Equipment is Not Ready/Available If:
1	•	•		**PWR RDY** indicator: Check to see that light turns on when power is applied.	Power not supplied to disk unit.
2	•	•		**FAN:** Listen for proper operation.	Fan does not run.
3	•	•	•	**OVER TEMP** indicator: Check to see that light is not lit. **NOTE** System must be operational for this test.	**OVER TEMP** indicator is lit.
4	•			**PASS** indicator: Check to see that light is lit after SUB SYS TEST is completed.	**PASS** indicator won't light.
5	•	•		**ELAPSED TIME** indicator: Check to see that elapsed time indicator is functioning.	
6	•	•		**LED TEST:** Check to see that all LEDs light when LED TEST toggle switch is held in the up position.	

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750: the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1.ORGANIZATION	2.NOMENCLATURE AND MODEL

3.REGISTRATION/ SERIAL/ FSN	4a.MILES	b.HOURS	c.ROUNDS FIRED	d.HOT STARTS	5.DATE	6.TYPE INSPECTION

7. APPLICABLE REFERENCE

TM NUMBER	TM DATE	TM NUMBER	TM DATE

INSTRUCTIONS - Perform each check listed in the TM applicable to the inspection performed. Following the sequence listed in pertinent TM, complete form as follows:

COLUMN a - Enter TM item number.

COLUMN b - Enter the applicable condition status symbol.

COLUMN c - Enter deficiencies and shortcomings.

COLUMN d - Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e - Individual ascertaining completed corrective action initial in this column.

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10.MAN HOURS REQUIRED

TM ITEM NO.	STATUS	DEFICIENCIES AND SHORTCOMINGS	CORRECTIVE ACTION	INITIAL WHEN CORRECTED

USE PMCS ITEM NO

Section III. OPERATION UNDER USUAL CONDITIONS

2-5. INTRODUCTION

This section provides instructions for operating the disk unit under usual conditions. Should equipment operating problems arise when attempting to use the disk unit, report the malfunction on DA Form 2404 (DA PAM 738-750).

WARNING

DO NOT operate equipment without a suitable ground connection. Electrical defects in the unit, test equipment, or load equipment can cause **DEATH** by electrocution when contact is made with an ungrounded system.

HIGH VOLTAGE is used in this equipment. **DEATH ON CONTACT** may result if safety precautions are not observed.

2-6. OPERATING PROCEDURES

a. Preliminary Procedures.

(1) Connect disk unit to prime power source.

(2) Ensure that PMCS has been accomplished before operating the equipment (para 2-4).

NOTE

Rapid changes in temperature may cause the disk unit to fail until the ambient temperature has stabilized throughout.

(3) If required, exchange the Head Disk Assembly (HDA). Refer to paragraph 2-7 for HDA change-over instructions.

b. Operating Procedure.

(1) Position the PWR ON/PWR OFF toggle switch to PWR ON.

(2) Verify that the PWR RDY indicator lights.

NOTE

If upon application of power to the disk unit any unusual noises from the HDA area are noted, turn off power immediately. Refer to chapter 3 for maintenance instructions.

(3) Verify that after approximately 30 seconds, the RDY light illuminates.

(4) Set the UNIT SELECT switch to the correct position. Refer to applicable system manual.

NOTE

If the UNIT SELECT switch is not set to the correct position, the PASS and SEL indicators will flash.

(5) When the host computer is loaded and ready to conduct a system test of the disk unit, momentarily position the SUB SYS TEST toggle switch up.

(6) Verify that after about 15 seconds, the PASS indicator starts blinking. If the FAIL indicator lights, rerun the test. If the problem persists, refer to chapter 3 for maintenance instructions.

(7) For more detailed operating instructions of the disk unit in the specific operating system, refer to the applicable system manual.

d. Turn Off Procedures. Refer to applicable system manual. Position the PWR ON/PWR OFF toggle switch to PWR OFF.

2-7. HDA CHANGE-OVER

Periodically, it will be necessary to exchange Head Disk Assemblies because of system operational requirements. Also, it is absolutely essential that the HDA be removed from the disk unit prior to installing, removing, or moving the disk unit. The text to follow provides an illustrated step-by-step procedure for removing and installing the HDA. See illustration on next page.

WARNING

DO NOT remove the HDA or cabling with the units power on. Position PWR ON/PWR OFF switch to PWR OFF first.

CAUTION

Great care must be exercised by the Operator when handling the HDA. Avoid subjecting the HDA to bumping, rough handling, or dropping. Shocks due to improper handling can cause the heads to score the disk surfaces or crack the heads; a drop of one-half inch onto a hard surface may cause a head crash.

1. Unscrew the two retaining screws (1) on the HDA air filter door (2).

2. Swing the filter door (2) outward to its fullest position, or lift it off its hinges and set aside.

3. Loosen the two swing-bolt knobs (3) on the HDA tray (4) by turning knobs fully counter-clockwise. Then move the swing bolts (3) to the left and out of the way. Knobs (3) must be square to side of tray (4).

CAUTION

DO NOT rock HDA back and forth when removing it from the disk unit. HDA must be pulled straight out of HDA tray. Failing to heed this caution could cause damage to connector pins at rear of HDA.

4. Grasp the release/extractor handle (5) and pull forward to cause the HDA to become unconnected from the connectors at the rear.

5. Grasp the handle (6) on the HDA and pull the HDA straight out.

6. Remove the HDA from the HDA tray (4) and carefully set the removed HDA in a secure location.

7. Set positioner locking screw (7) in the LOCK position.

8. Set the positioner locking screw (7) of the change-over HDA to the UNLOCK position.

9. Gently place the rear edge of the change-over HDA on the front edge of the HDA tray (4).

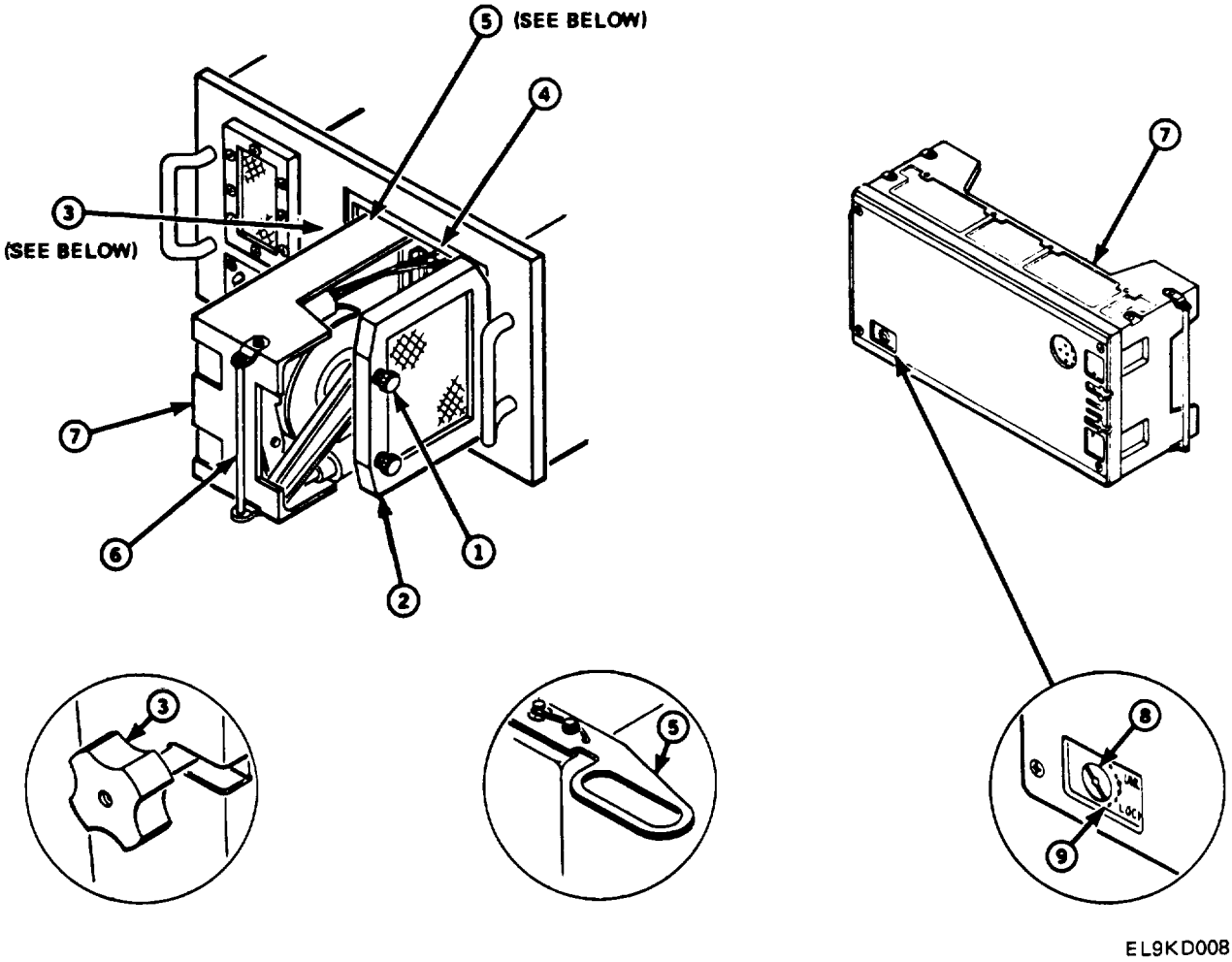
10. While firmly holding the bottom of the HDA against the left side of the HDA tray (4), slowly slide the HDA inward.

NOTE

A small amount of resistance will be felt as the tray's guide pins engage the HDA bushings. More resistance will be felt as the connectors begin to engage.

11. Ensure that the HDA is firmly seated in the HDA (4), then make the full connector seating by moving the swing bolts (3) to the right and into position. Then screw the swing bolts until finger tight; ensures that the HDA is firmly and fully seated and secured.

12. Close the HDA air filter door (1), tighten the door's two retaining screws (2), and position the unit's PWR ON/PWR OFF toggle switch to PWR ON and observe that the RDY indicator lights.



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Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-8. OPERATION IN UNUSUAL WEATHER

It may be necessary to operate the disk unit under abnormal conditions where extreme cold, heat, humidity, moisture, or sand and dust conditions prevail. Instructions for minimizing the effects of these unusual operating conditions are given in the following subparagraphs.

NOTE

Rapid changes in temperature may cause the disk unit to fail until the ambient temperature has stabilized throughout.

a. Arctic Climates. Subzero temperatures and climatic conditions effect the proper operation of the equipment. Handle the equipment carefully. Parts, especially plastics and wiring insulation, become brittle at subzero temperatures. When equipment is exposed to cold air, moisture will condense on it. Dry the equipment thoroughly. Equipment should be operated in a heated environment (table 1-2).

b. Tropical Climates. In tropical climates, the high relative humidity causes condensation of moisture on the unit whenever equipment temperature becomes lower than that of the surrounding air (table 1-2). Adequate ventilation will minimize this condition. Check frequently for fungus or moisture on the unit. Remove any fungus or moisture, using a lint-free cloth and alcohol.

c. Desert Climates. The main problem arising in desert operation is sand, dust, or dirt getting into the equipment. Keep the equipment as free of foreign material as possible.

2-9. EMERGENCY PROCEDURES

If an emergency occurs, shut down main power source to the equipment. Refer to the applicable system manual for additional emergency shut-down procedures. However, if the OVER TEMP indicator lights, it is not necessary to shut down main power until the end of a mission.

CHAPTER 3

OPERATOR'S MAINTENANCE

3-1. GENERAL

This chapter provides the operator's maintenance instructions and procedures for the Disk Memory Unit MU-768/G. Operator maintenance is limited to cleaning and replacing air filters.

3-2. LUBRICATION

No lubrication or lubricants required.

3-3. CLEANING

The following cleaning procedure is to be performed by the operator as required.

a. Remove dust and dirt from exterior surfaces using a clean, lint-free cloth (item 3, appx E).

WARNING

Isopropyl alcohol is extremely flammable; use is well ventilated area away from fire, sparks, or any other heat source. When not in use, keep alcohol container closed.

b. Remove grease using a clean, lint-free cloth (item 3, appx E) soaked with isopropyl alcohol. Wipe dry using a clean, lint-free cloth.

c. Use a bristle brush (item 2, appx E) to remove dirt from hard to reach areas.

NOTE

ELAPSED TIME indicator can be checked by observing the movement of the flag between the first and second digits.

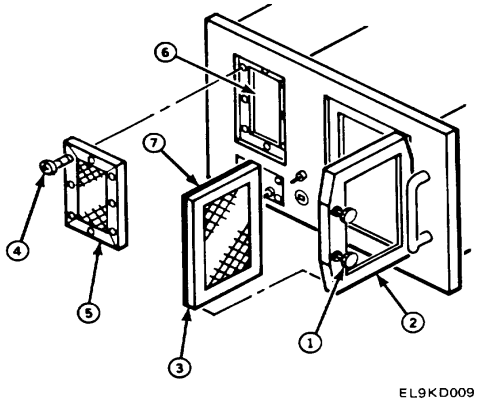
d. Verify that the ELAPSED TIME indicator appears to be operating.

WARNING

The following step involves high pressure air and loose particles. Always wear safety goggles during this step. Serious injury and loss of sight is possible.

e. Remove each air filter (paragraph below) and inspect them for accumulated dust, oil deposits, debris, etc. If required, wash the filter (s) in a light solution of water and detergent. Rinse clean with clear water. Blow dry. Replace filter (paragraph below).

3-4. REMOVING AIR FILTERS



a. Loosen the two retaining screws (1) holding the HDA filter door (2) in the closed and secured position. Swing the door outward

b. Pop out the HDA air filter (3) from the inside of the door (2).

c. Remove the eight screws (4) holding the card-cage air filter (5) in place.

d. Remove the card-cage filter (5).

3-5. REPLACING AIR FILTERS

a. Place card-cage air filter (5) back into its receptacle (6).

b. Secure the filter (5) using the eight screws (4).

c. Press the HDA air filter (3) back into the inside of the HDA air filter door (2) with gasket (7) away from the air filter door (2).

d. Close the door (2) and tighten the retaining screws (1) finger tight.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE

Section I. INTRODUCTION

4-1. GENERAL

This chapter provides Organizational maintenance instructions and procedures for the Disk Memory Unit MU-768/G. Organizational maintenance is limited to tasks defined in this chapter. The more difficult tasks are referred to higher levels of maintenance.

At the completion of a repair procedure, turn the disk unit on and repeat the test originally used to detect the problem. This ensures that repairs were accomplished satisfactorily and the unit is operating properly. Refer to paragraph 2-6 for disk unit turn-on procedures. Instructions for preparation of the unit for storage and shipment are given in chapter 5.

4-2. TOOLS AND TEST EQUIPMENT

Tools and test equipment required for Organizational maintenance of the disk unit are listed in the Maintenance Allocation Chart (MAC), appendix B.

4-3. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

There are no special tools, TMDE, or item of support equipment required at this level of maintenance.

4-4. REPAIR PARTS

For authorized list and illustrated repair parts, refer to TM 11-7021-202-20P.

4-5. ORGANIZATIONAL MAINTENANCE TASKS

Following is a list summarizing the maintenance tasks to be performed as required by Organizational maintenance personnel:

- Organizational PMCS
- Troubleshooting
- Equipment removal and replacement
- Cleaning
- Testing after replacements or repairs

Section II. TROUBLESHOOTING

4-6. INTRODUCTION

The disk unit is a complex piece of electronic equipment. Organizational maintenance personnel perform only those troubleshooting procedures contained within this manual. If a malfunction occurs that is not covered in this manual, or if the listed maintenance action does not correct the trouble, the disk unit is removed from its mounting and replaced with a functioning spare disk unit. The defective disk unit is then referred to higher levels of maintenance for repair.

NOTE

This manual cannot list all malfunctions that might occur, or all tests, inspections, and corrective actions required. If a malfunction is not listed, or is not resolved by the listed corrective actions, notify the shift supervisor.

4-7. USE OF TROUBLESHOOTING FLOWCHARTS

a. Locate the malfunction in the Symptom Index.

b. Note that the troubleshooting flowcharts and procedures are indexed by malfunction/symptom.

c. Review the sample flowchart (fig. 4-1) to become familiar with the proper use of troubleshooting flowcharts.

4-8. SYMPTOM INDEX

Table 4-1 provides an index of probable equipment malfunction symptoms. Use the index to quickly locate applicable troubleshooting flowchart and/or procedures to determine the required corrective action(s).

CAUTIONS

DO NOT remove the HDA or cabling with the unit's power on. Position PWR ON/PWR OFF switch to PWR OFF first.

Always handle the disk unit with extreme care, especially the HDA. Improper handling of the unit can cause head crashes.

CAUTION

Always remove the HDA from the chassis/mainframe before attempting to install, remove, or move the disk unit (para 2-7).

Table 4-1. Disk Unit Malfunction/Symptom Index

Malfunction/Symptom	Flowchart/Para
1. Smoke and fire.	Para 4-10a
2. Noisy HDA operation.	Para 4-10b
3. Noisy blower fan.	Para 4-10c
4. PWR ON/PWR OFF switch keeps tripping.	Para 4-10d
5. PWR RDY indicator not lit.	Flowchart (1)
6. All LEDs won't light.	Para 4-10e
7. OVER TEMP indicator lit.	Para 4-10f
8. Slave disk cannot be selected.	Flowchart (2)
9. SEL indicator won't light.	Para 4-10g
10. RDY indicator won't light.	Para 4-10h
11. System readiness test won't run.	Para 4-10i
12. PASS indicator won't light.	Para 4-10j
13. FAIL indicator won't light.	Para 4-10k
14. Defective ELAPSED TIME indicator.	Para 4-10l

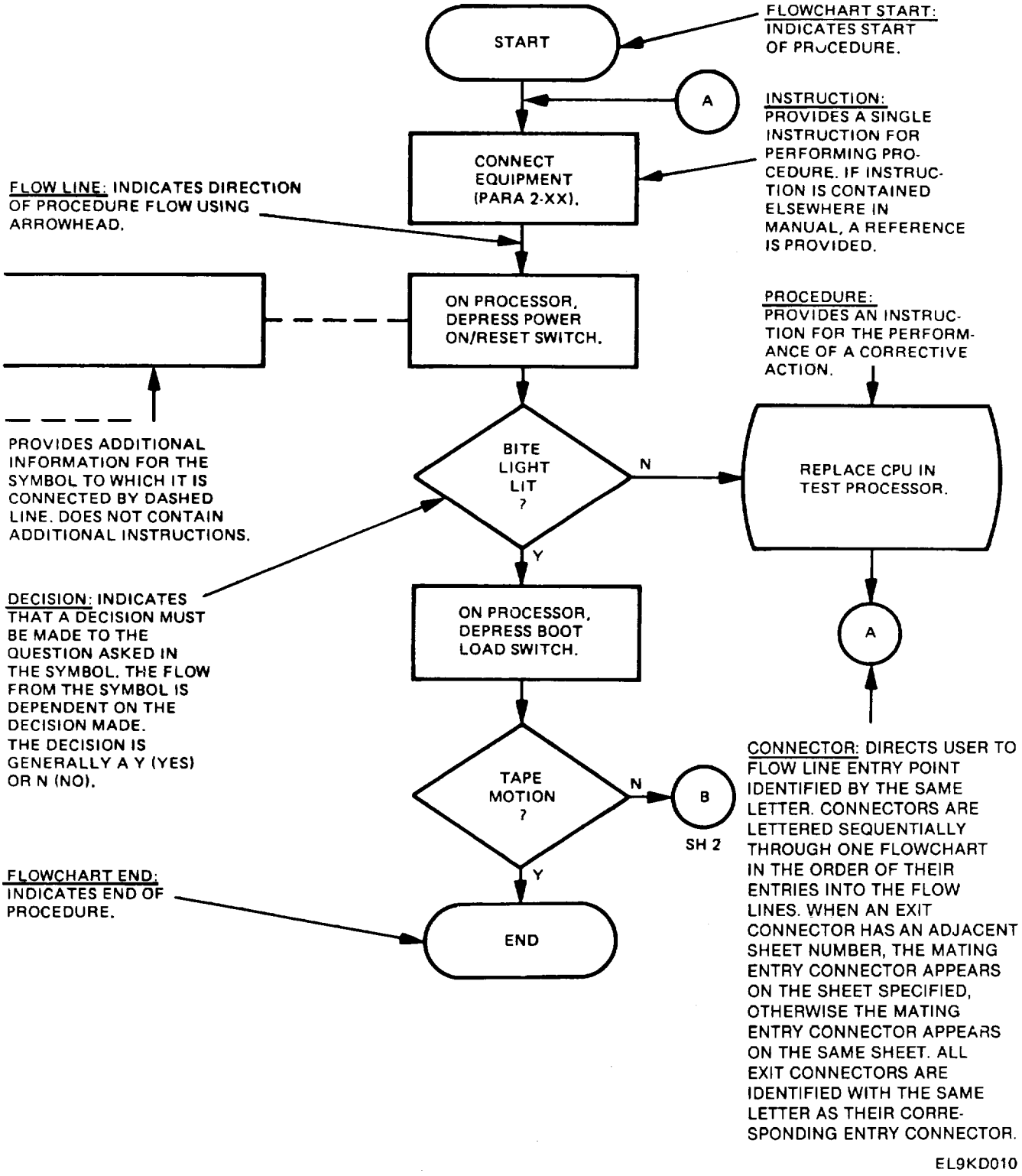


Figure 4-1. How to Use the Flowchart, Sample Flowchart

4-9. TROUBLESHOOTING

a. The first step in troubleshooting the disk is to locate the symptom in the troubleshooting Symptom Index (table 4-1).

b. Next, go to the applicable flowchart or procedure for that symptom.

c. The following general rules apply while performing troubleshooting:

(1) Follow the troubleshooting flowcharts and procedures in the order indicated by the flow arrows or sequence of procedural steps.

(2) Perform only one instruction at a time.

(3) Start at the beginning of the troubleshooting flowchart or procedure. Do not start in the middle.

4-10. TROUBLESHOOTING PROCEDURES

The procedures to follow provide the user with troubleshooting instructions and corrective action procedures required when maintaining the disk unit.

WARNING

HIGH VOLTAGE is used in this equipment. **DEATH ON CONTACT** may result if safety precautions are not observed.

DO NOT remove the HDA or cabling with the unit's power on. Position PWR ON/PWR OFF switch to PWR OFF first.

CAUTIONS

Always handle the disk unit with extreme care, especially the HDA. Improper handling of the unit can cause head crashes.

Always remove the HDA from the chassis/mainframe before attempting to install, remove, or move the disk unit (para 2-7).

a. Smoke and Fire. In the event smoke and fire are encountered when operating the disk unit, immediately disconnect the unit from the power source.

WARNING

DO NOT replace defective disk unit with a spare unit until the cause of the smoke and fire has been determined and all power cabling has been checked out as operational and safe.

b. **Noisy HDA Operation**. Whenever noise is detected during the operation of the HDA, immediately turn off the power to the disk unit. Exchange the HDA with an operational HDA (para 2-7). Apply power to the disk unit.

If noise Is no longer noted, the problem was the HDA itself. Forward the defective HDA to Depot Maintenance for repairs.

If the noise persists, immediately turn off the power to the disk unit. Remove the HDA (para 2-8), replace the defective disk unit with an operative spare, and forward the defective unit to the next higher level of maintenance for repair.

c. **Noisy Blower Fan**. Should the blower fan become noisy, the disk unit is removed and replaced with an operational spare unit (para 4-14).

d. **PWR ON/PWR OFF Switch Keeps Tripping to PWR OFF**. This equipment malfunction is beyond the scope of this manual. Replace the defective disk unit with an Operational spare unit (para 4-14).

e. All LEDs Won't Light. This equipment malfunction is beyond the scope of this manual. Replace the defective unit with an operational spare unit (para 4-14).

f. **OVER TEMP Indicator Lit**. Whenever the OVER TEMP indicator lights, overheating within the disk unit is being indicated.

CAUTION

An overheated condition within the disk unit **WILL NOT** shut the unit down; it will continue to operate until the operator removes power to the unit.

Following are recommended actions to be taken by the maintenance personnel whenever an overheating condition is indicated:

(1) Do not operate unit when ambient temperature exceeds 1100F, if possible.

(2) Verify that the unit's blower fan is operating properly.

(3) The unit's air filters (on front of unit) are not clogged with dirt, oil, or debris.

(4) The air flow in front of and behind the unit is not impaired in any way.

(5) If all items above appear to be as required, the disk unit is defective. Replace it with an operational spare unit (para 4-14).

g. **SEL Indicator (UNIT SELECT) Won't Light**. If the SEL indicator won't light, even after repeated tries by the host computer, the problem is beyond the scope of this manual. Replace the defective disk unit with an operational spare and forward the defective unit to the next higher level of maintenance (para 4-14).

h. **RDY Indicator (UNIT SELECT) Won't Light**. In the event that the RDY indicator won't light, even though the disk unit has been successfully selected by the host computer, the problem is beyond the scope of this manual. Replace the defective disk unit with an operational spare and forward the defective unit to the next higher level of maintenance (para 4-14).

i. **System Readiness Test Won't Run**. This problem is beyond the scope of this manual. Replace the defective disk unit with an operational spare and forward the defective unit to the next higher level of maintenance (para 4-14).

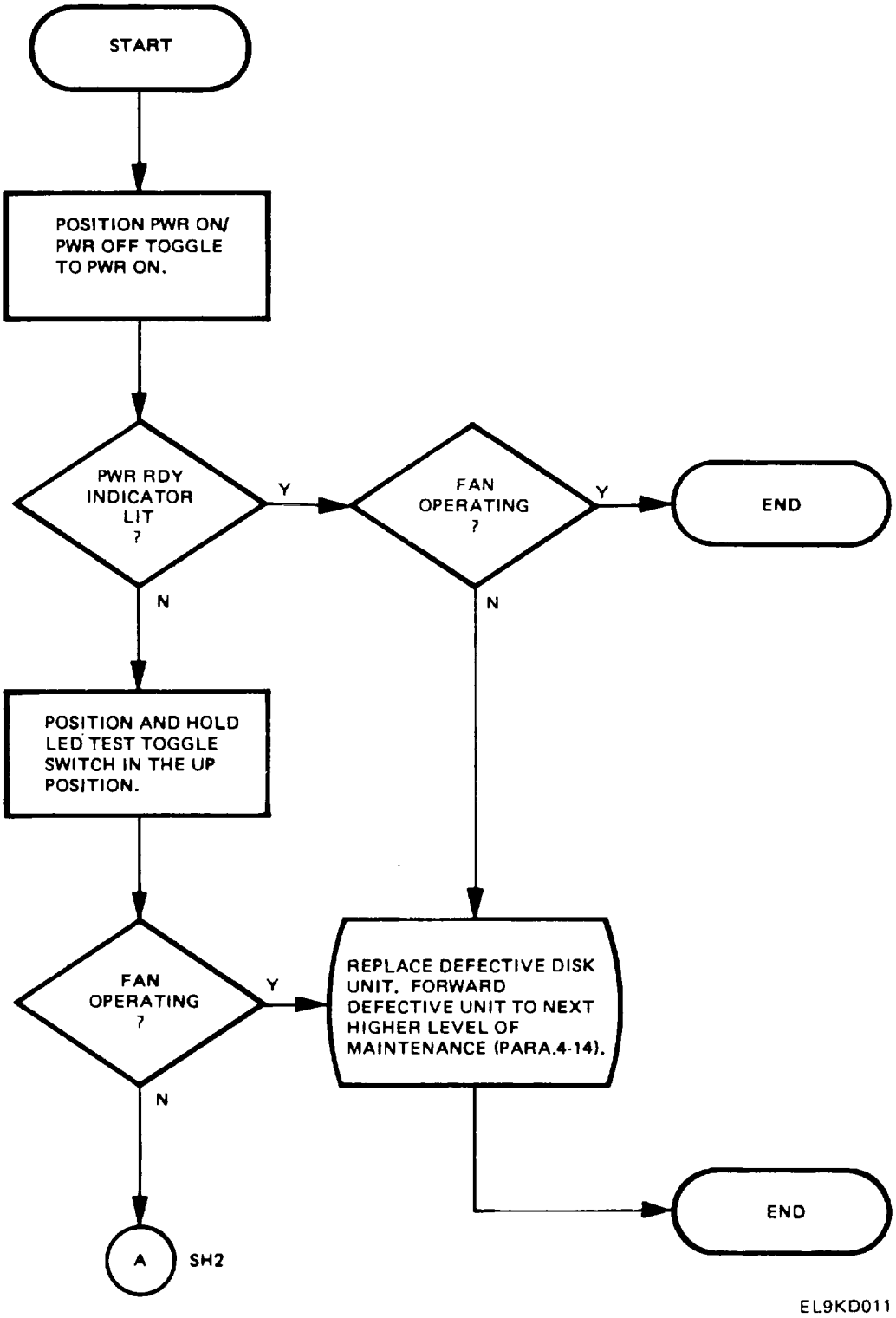
j. **PASS Indicator (SYS TEST) Won't Light**. In the event that the PASS indicator won't light, and host computer has verified that the system readiness test was successfully completed, the problem is beyond the scope of this manual. Replace the defective disk unit with an operational spare and forward the defective unit to the next higher level of maintenance (para 4-14).

k. **FAIL Indicator (SYS TEST) Won't Light**. In the event that the FAIL indicator won't light, and the host computer has verified that the system test was unsuccessful, the problem is beyond the scope of this manual. Replace the defective disk unit with an operational spare unit and forward the defective unit to the next higher level of maintenance (para 4-14.).

l. **Defective ELAPSED TIME Indicator**. A daily visual inspection of the ELAPSED TIME indicator will detect that the meter is not functioning properly. When it is noticed that the meter is not operating properly, replace the defective disk unit with an operational spare and forward the defective unit to the next higher level of maintenance (para 4-14).

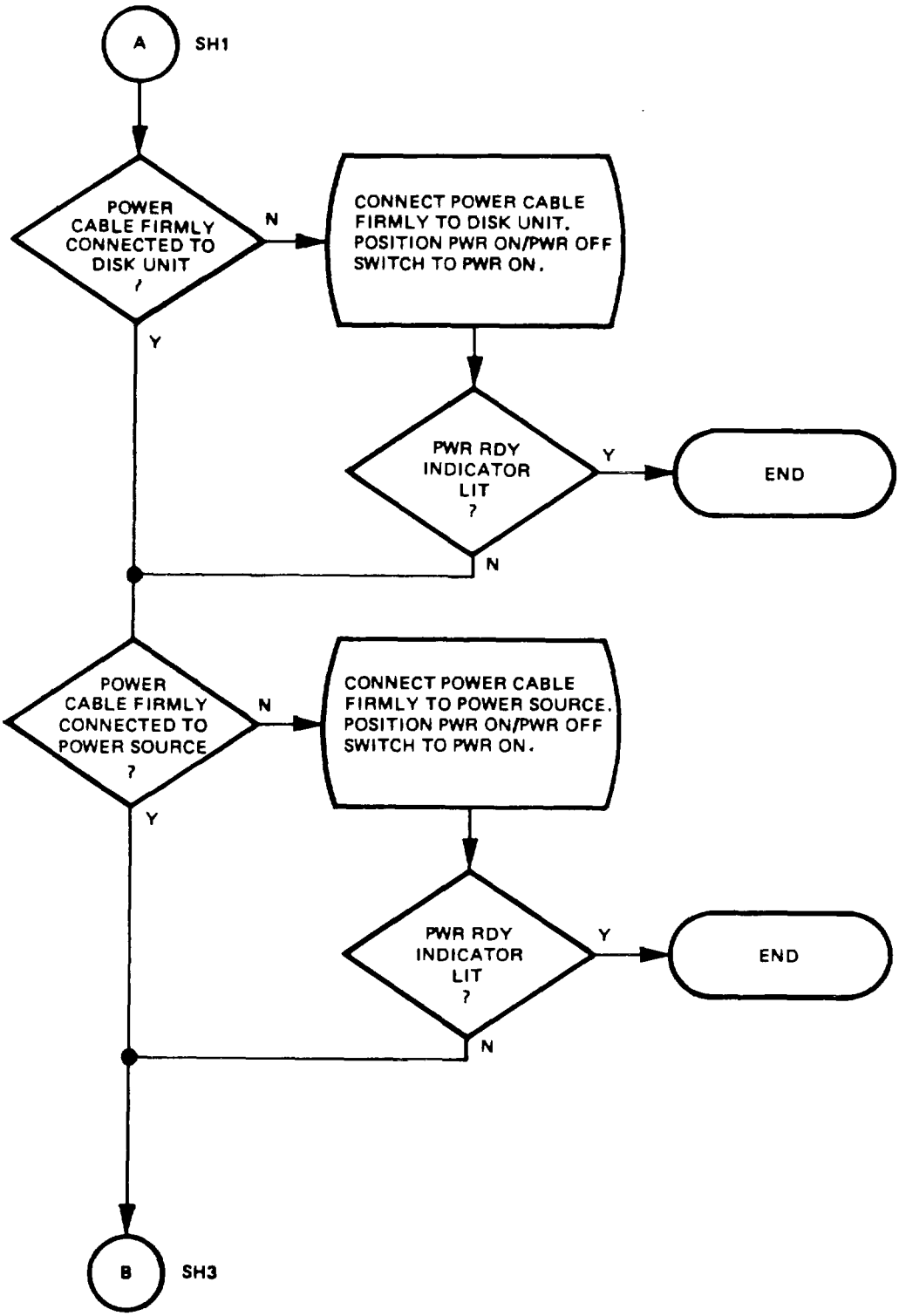
TROUBLESHOOTING FLOWCHART 1

PWR RDY INDICATOR NOT LIT (SHEET 1 OF 4)



TROUBLESHOOTING FLOWCHART 1

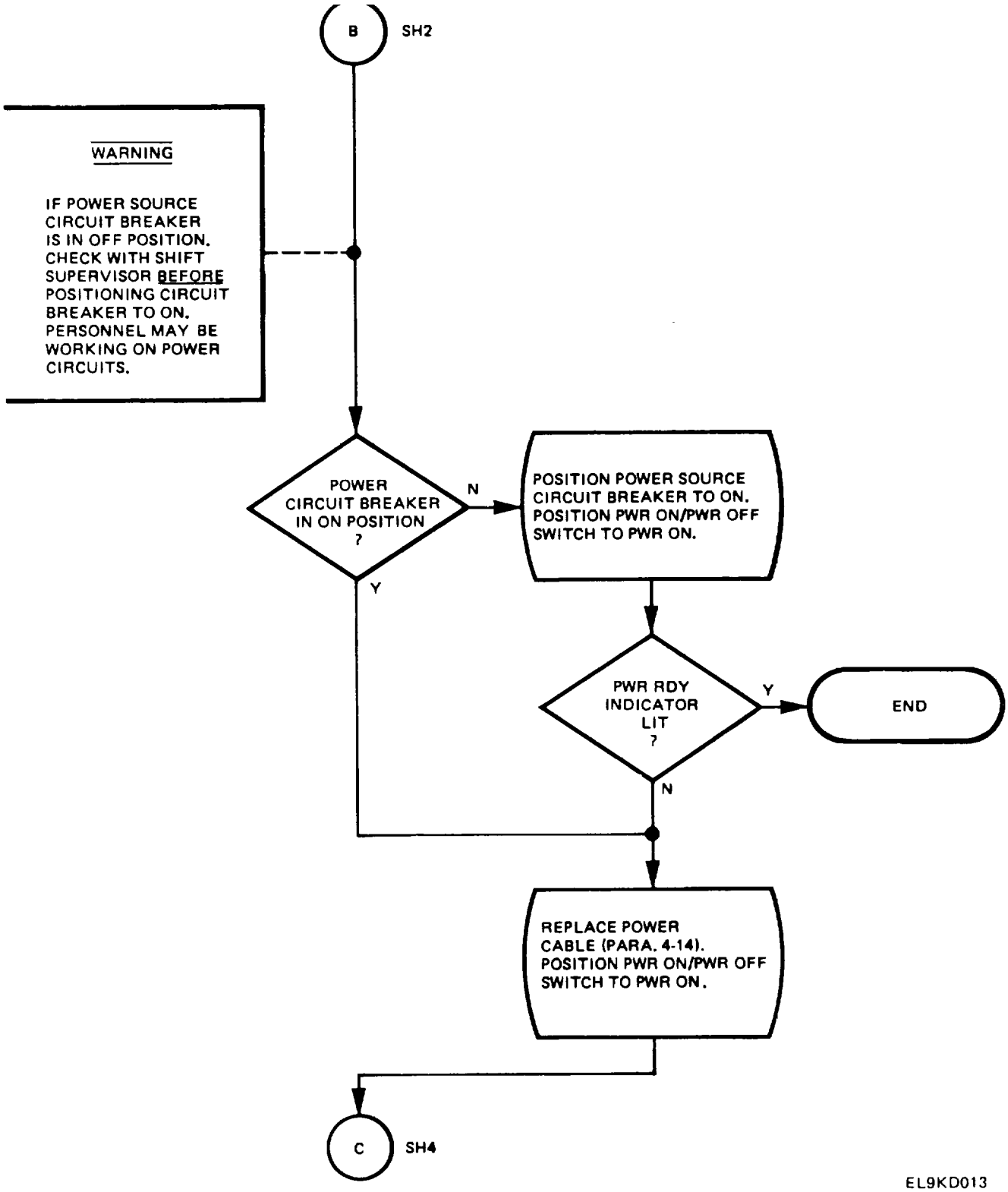
PWR RDY INDICATOR NOT LIT (SHEET 2 OF 4)



EL9KD012

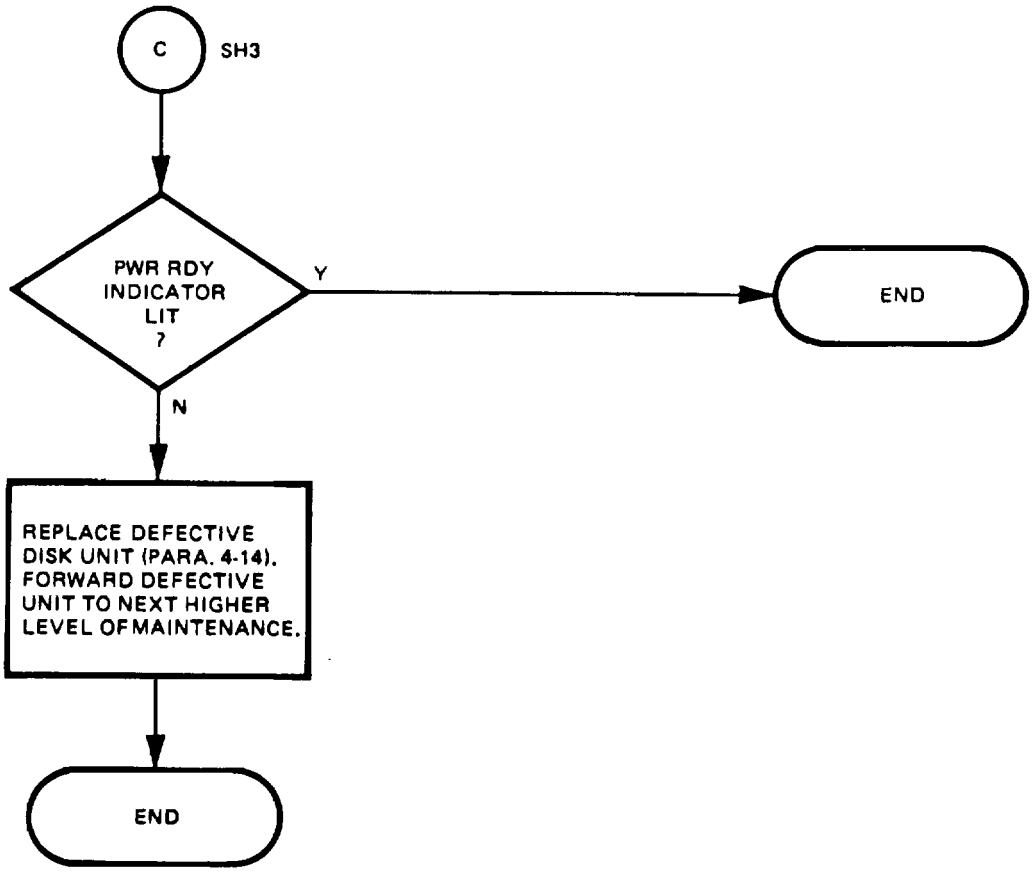
TROUBLESHOOTING FLOWCHART 1

PWR RDY INDICATOR NOT LIT (SHEET 3 OF 4)



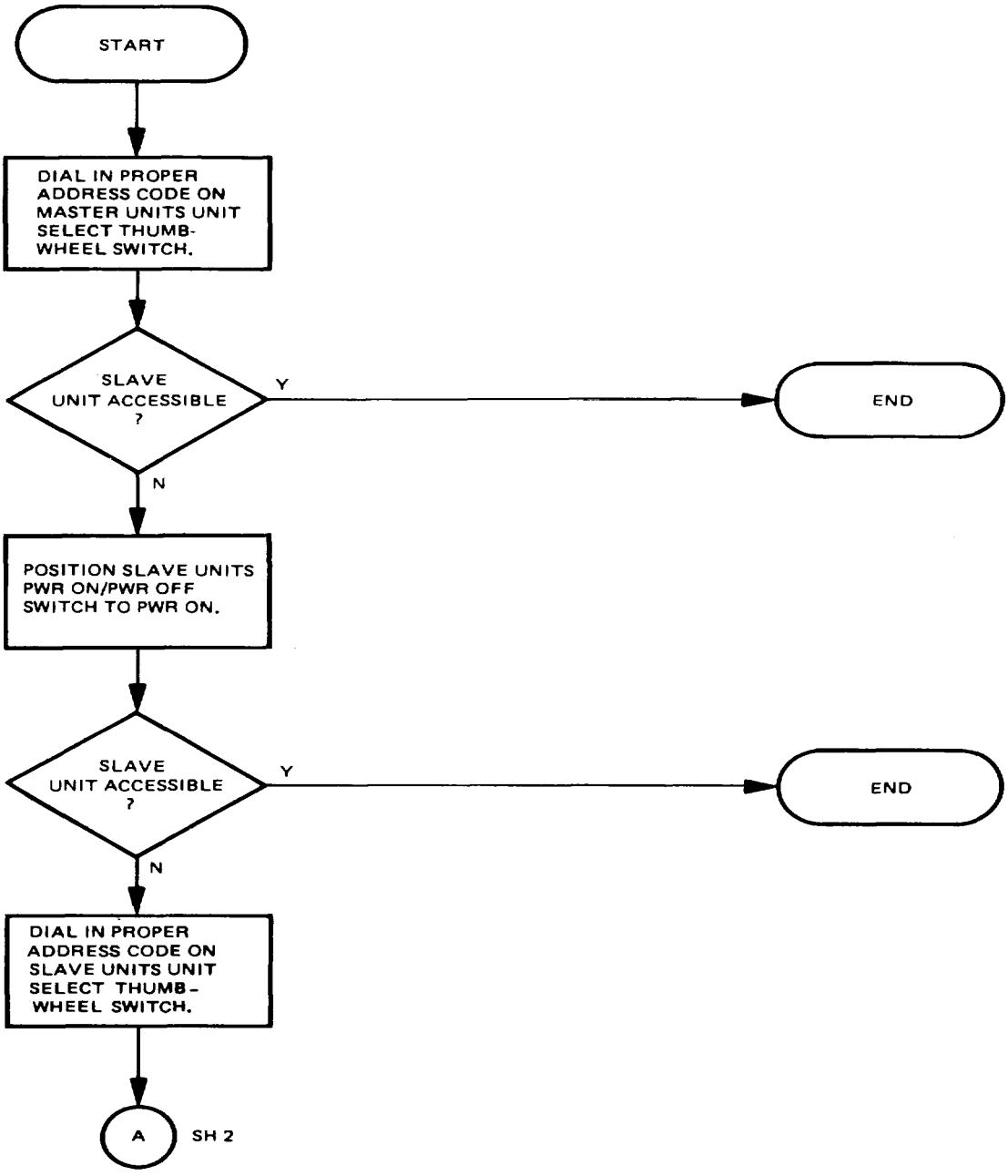
TROUBLESHOOTING FLOWCHART 1

PWR RDY INDICATOR NOT LIT (SHEET 4 OF 4)



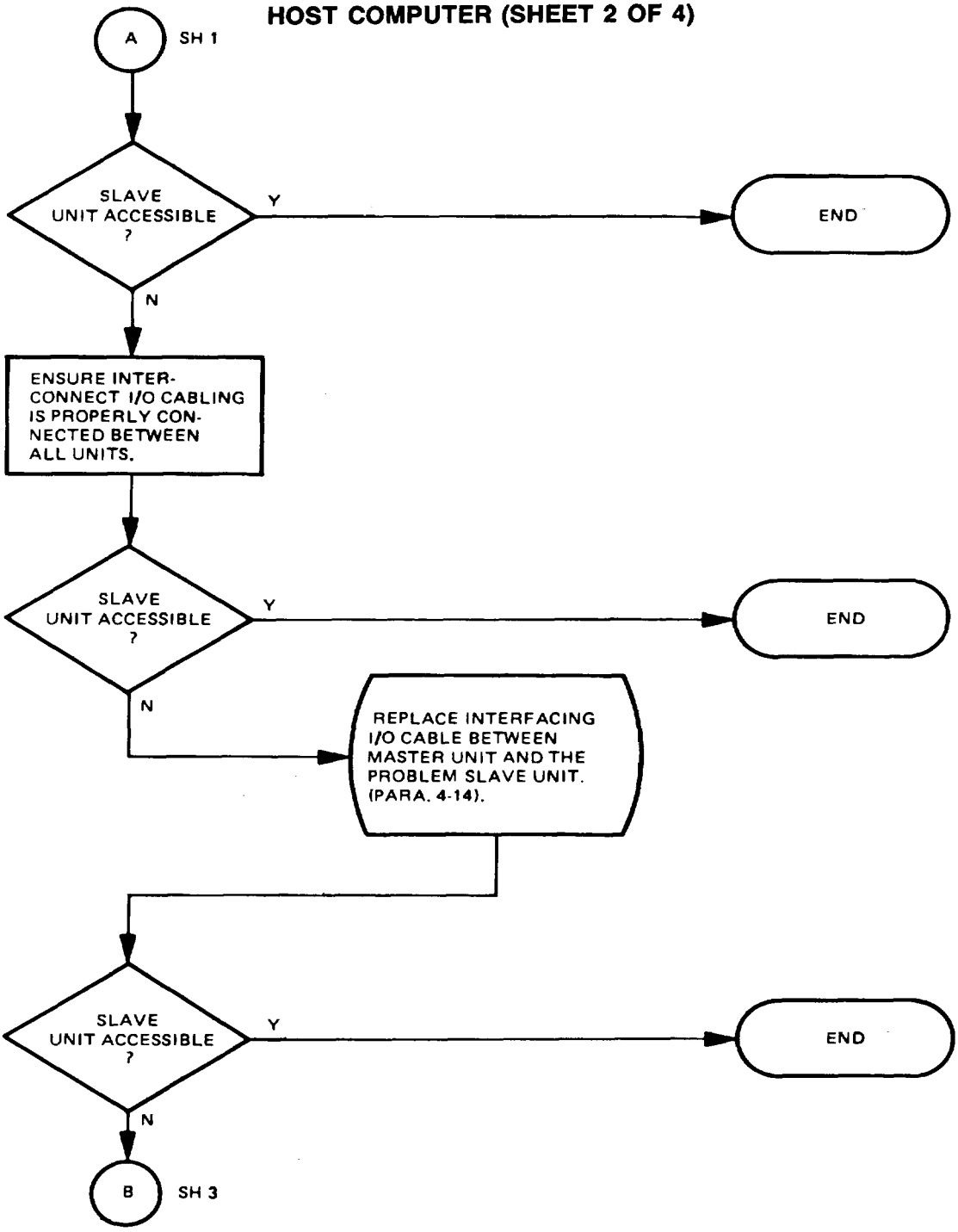
TROUBLESHOOTING FLOWCHART 2

SLAVE DISK UNIT CANNOT BE ACCESSED BY HOST COMPUTER (SHEET 1 OF 4)



TROUBLESHOOTING FLOWCHART 2

SLAVE DISK UNIT CANNOT BE ACCESSED BY HOST COMPUTER (SHEET 2 OF 4)



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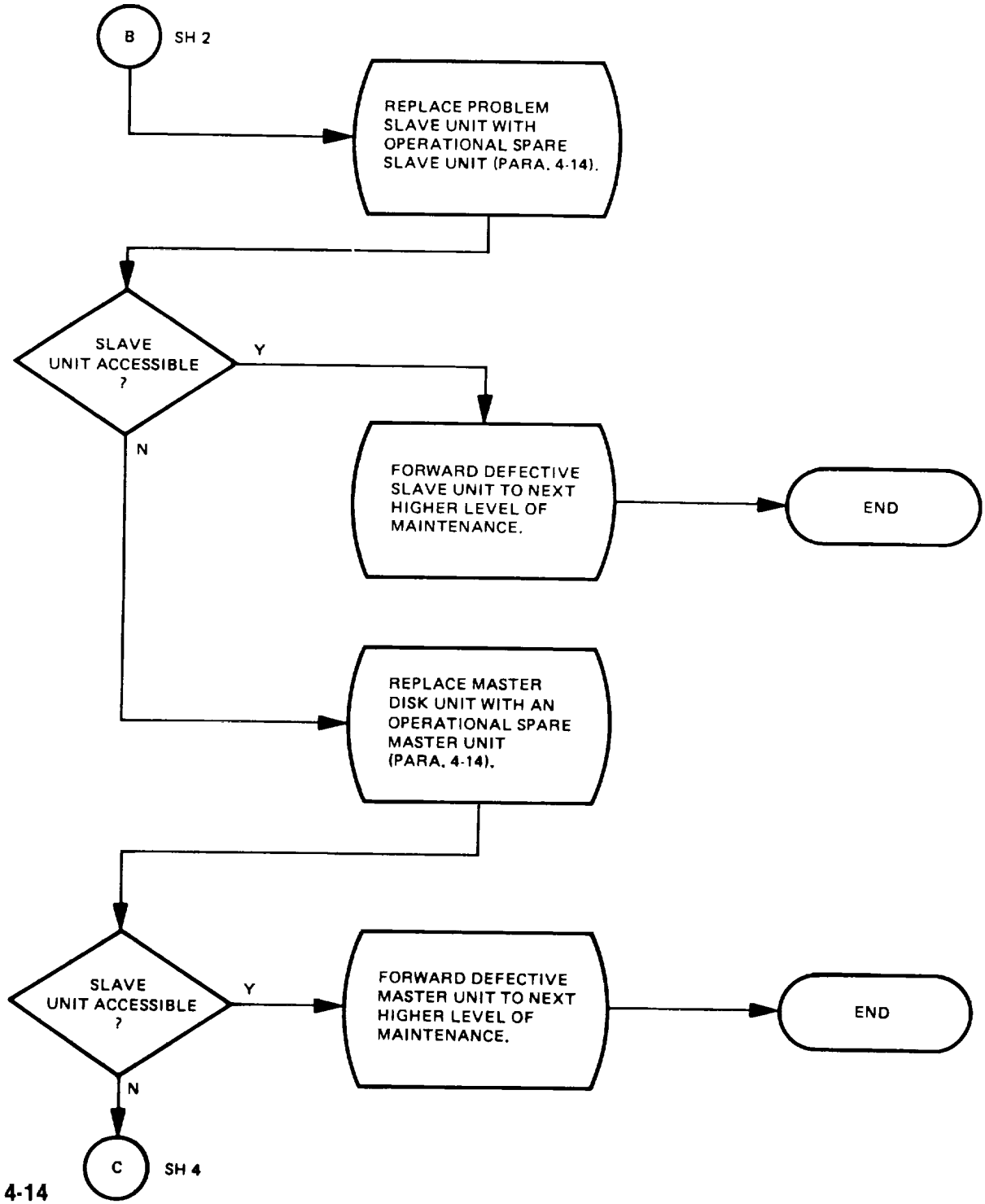
TROUBLESHOOTING FLOWCHART 2

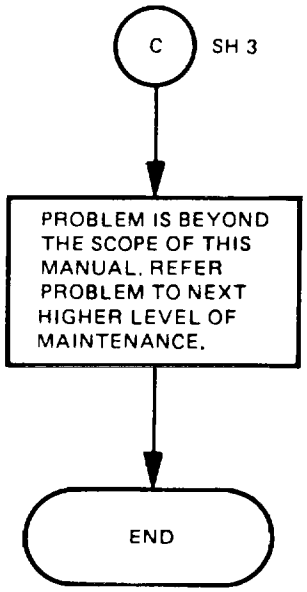
SLAVE DISK UNIT CANNOT BE ACCESSED BY HOST COMPUTER (SHEET 3 OF 4)



4-14

TROUBLESHOOTING FLOWCHART 2

SLAVE DISK UNIT CANNOT BE ACCESSED BY HOST COMPUTER (SHEET 4 OF 4)



EL9KD018

Section III. ORGANIZATIONAL MAINTENANCE PROCEDURES

4-11. INTRODUCTION

This section provides the Organizational Maintenance PMCS procedures for the disk unit.

4-12. ORGANIZATIONAL PMCS

Table 4-2 provides PMCS to be performed at the organizational maintenance level.

Table 4-2. Organizational PMCS
W = Weekly

Item No.	Interval W	Item To Be Inspected Procedure
1	•	FAN: Vacuum inside housing.
2	•	FILTERS: Vacuum HDA front door filter and card cage filter.
3	•	PUBLICATIONS: Check for completeness of, and current changes to publications.

Section IV. REMOVAL AND REPLACEMENT PROCEDURES

4-13. INTRODUCTION

Following are procedures for removing and replacing the disk unit and its components. Refer to the system manual for system configuration removal and replacement requirements.

WARNING

The disk unit is a heavy piece of equipment. Always use four technicians when moving or lifting the unit to prevent injury to personnel.

4-14. REMOVING DISK UNIT

a. Remove the HDA (para 2-7) and place it in a secure and clean location until needed. If the HDA is to be stored, refer to chapter 5 for applicable packing instructions.

b. If the disk unit is rack mounted, extend the unit out of the rack to its fullest position.

WARNING

Turn off power before working on equipment. Failure to do so can cause serious injury to personnel.

c. Disconnect disk unit's power cable from prime power source (para 4-16).

d. Disconnect all I/O cabling from the disk unit (para 4-18). If applicable, disconnect all ground straps/cables. Place dust caps over all connectors on the unit and disconnected cable connectors.

WARNING

The disk unit is a heavy piece of equipment. Always use four technicians when moving or lifting the unit to prevent injury to personnel.

NOTE

If the disk unit is positioned in a counter-top (free-standing) configuration, the performance of step e is not required.

e. Lift unit out of the rack assembly and set it on a clean workbench or maintenance cart.

f. Complete applicable documentation and tagging before forwarding the unit to the next higher level of maintenance (para 1-3).

g. Package and pack the defective unit in accordance with instructions provided in chapter 5.

h. Forward defective unit to Direct Support Maintenance.

4-15. INSTALLING DISK UNIT

WARNING

The disk unit is a heavy piece of equipment. Always use four technicians when moving or lifting the unit to prevent injury to personnel.

a. Remove unit from the packing and packaging in which it was received. File documents (i.e., reports, tags, etc.) that accompanied the unit.

b. Remove dust caps from the connectors on the unit. Remove dust caps from the cables to be connected up to the unit.

c. Position the disk unit in its operating location (rack-mount or counter-top configuration).

WARNING

Turn off power before working on equipment. Failure to do so can cause serious injury to personnel.

d. Connect power cable to disk unit (para 4-17).

e. Connect 1/0 cabling to the disk unit In accordance with the cabling diagram requirements listed and shown in the system manual. If applicable, connect ground strapping/cabling in accordance with requirements of system manual. Also, install a terminal plug assembly (fig. 1-1) on any unused 1/0 connectors (J1, J2).

f. Ensure that airflow around installed unit is not restricted in any way.

g. Install the HCA (para 2-7).

h. Connect power cable to prime power source (para 4-17). Apply power to the unit (para 2-6).

i. Perform applicable Preventive Maintenance Checks and Services (PMCS).

4-16. REMOVING POWER CABLE

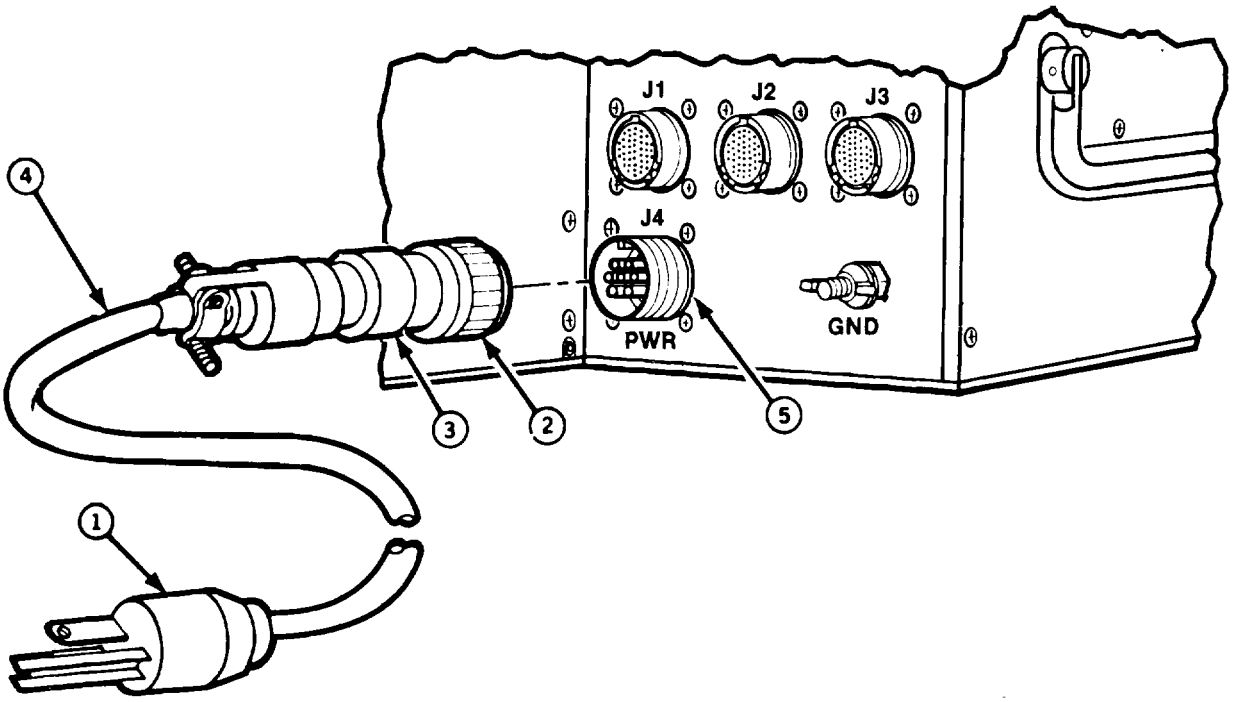
WARNING

Turn off power before working on equipment. Failure to do so can cause serious injury to personnel.

a. Remove plug (1) from power source.

b. Unscrew knurled nut (2) to left and unplug connector (3).

c. Remove power cable (4).

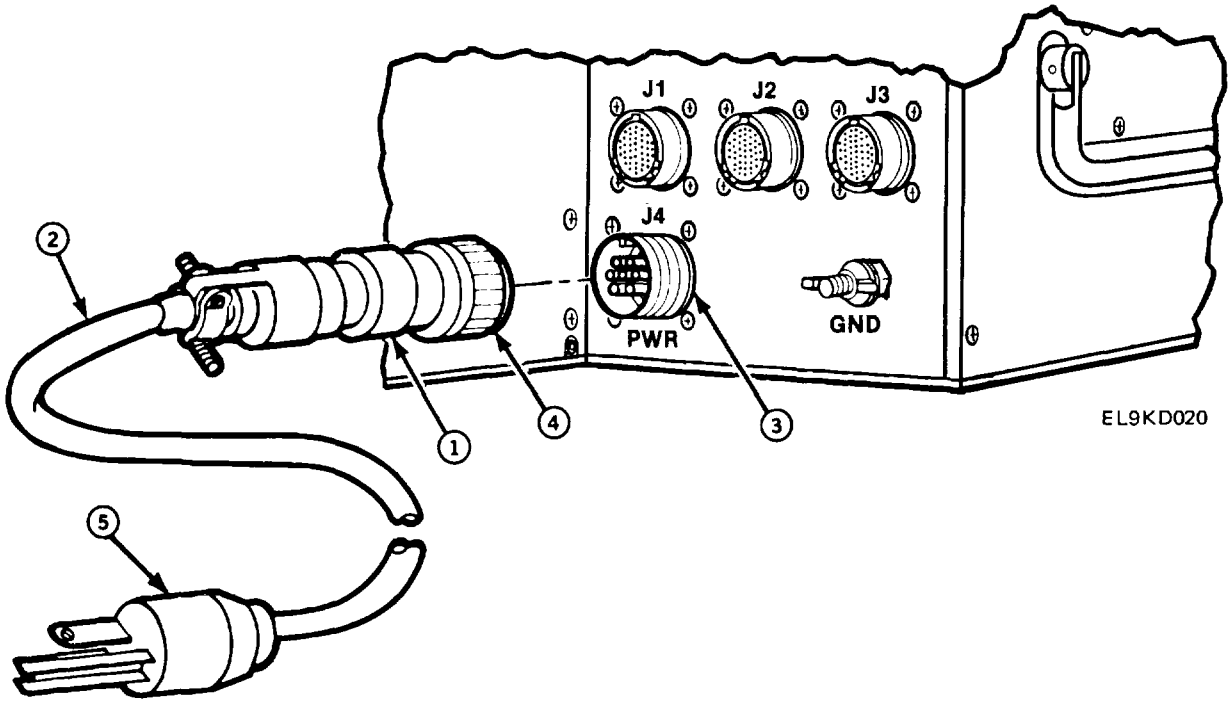


4-17. INSTALLING POWER CABLE

a. Aline slot of connector (1) on power cable (2) with key on power connector (3).

b. Plug connector (1) into power connector (3) and screw on knurled nut (4) to the right until tight.

c. Connect plug (5) to power source.



4-18. REMOVING I/O SIGNAL CABLES

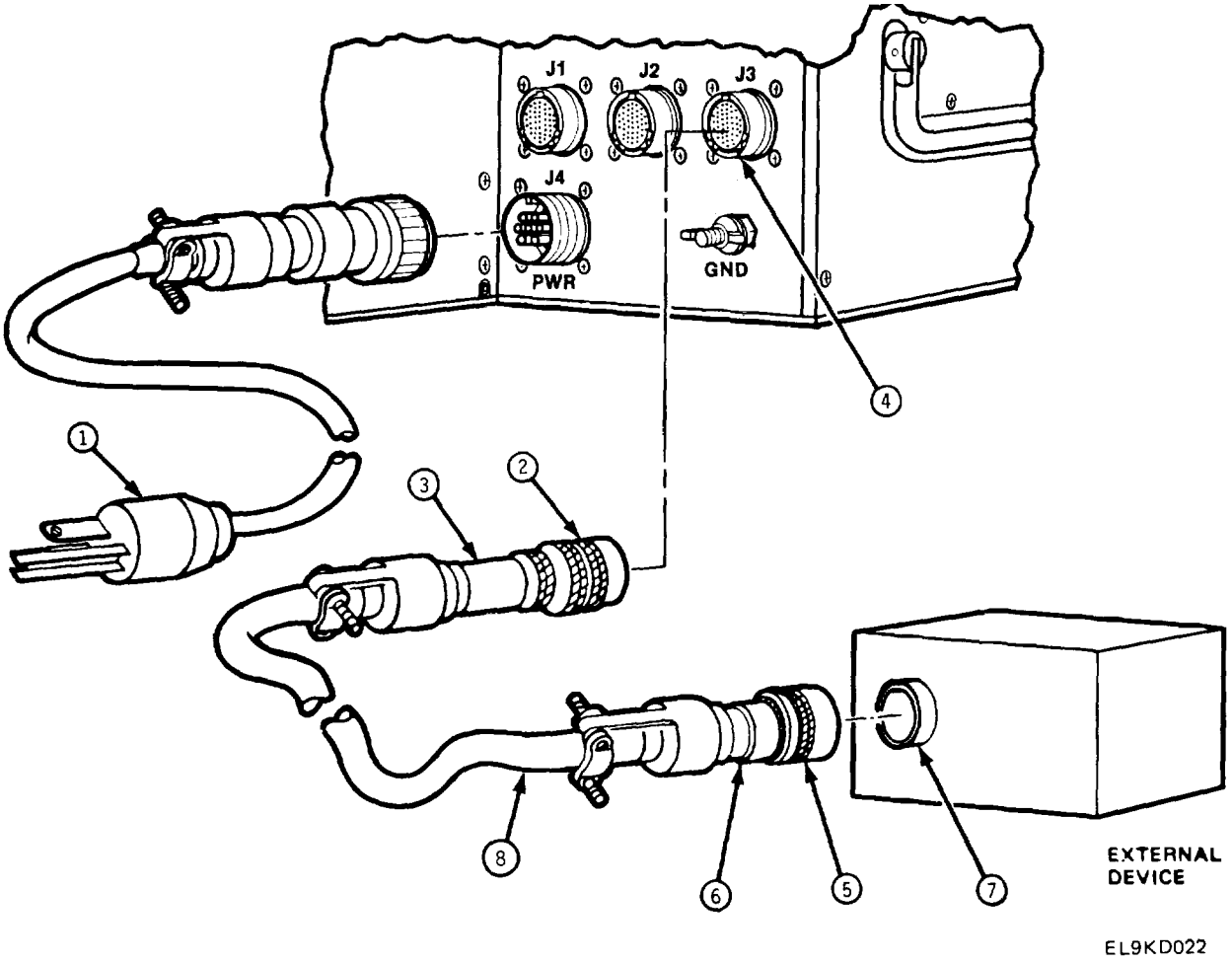
WARNING

Turn off power before working on equipment. Failure to do so can cause serious injury to personnel.

a. Disconnect power cable plug (1) from power source.

b. Turn knurled ring (2) to the left and unplug 110 cable connector (3) from disk unit connector (4).

c. Turn knurled ring (5) to the left and unplug 110 cable connector (6) from connector (7) on the external device.



4-19. INSTALLING I/O SIGNAL CABLES

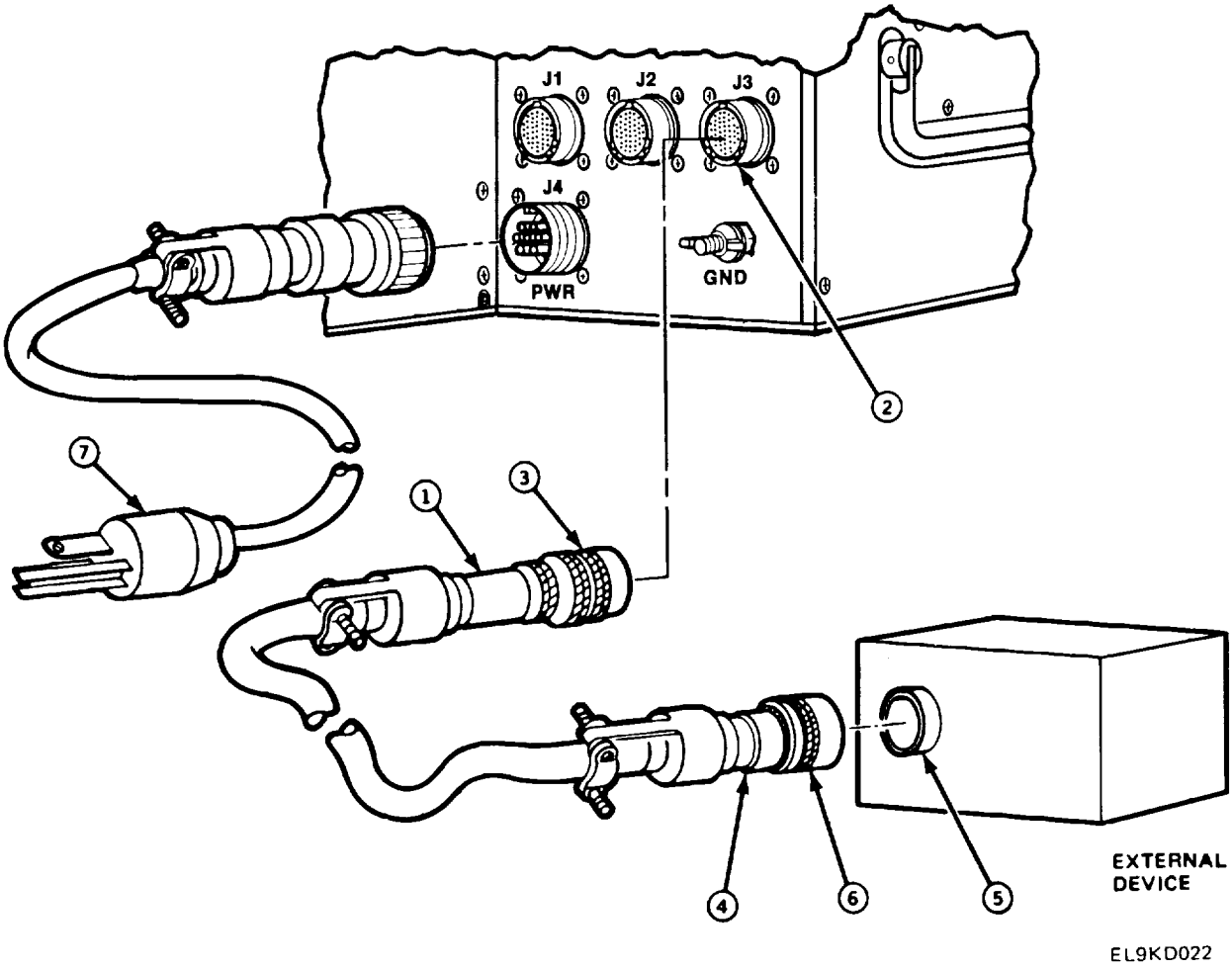
a. Aline keys on 1/0 cable connector (1) with slots on processor 1/0 connector (2).

b. Plug connector (1) into connector (2). Turn knurled ring (3) to the right until it clicks in place.

c. Aline keys on 1/0 cable connector (4) with slots on external device connector (5).

d. Plug connector (4) into connector (5). Turn knurled ring (6) to the right until it clicks in place.

e. Connect power cable (7) to power source.



4-20. CLEANING

a. Tools and Materials. The following tools and materials are required when cleaning the disk unit (appx E):

- Lint-free cloths (item 3, appx E)
- Soft-bristle brush (item 2, appx E)
- Dishwashing compound or detergent (item 4, appx E)
- Alcohol isopropyl (item 1, appx E)
- Vacuum cleaner with attachments.

b. Cleanlng. Cleaning of the disk unit is limited to the following activities:

WARNING

Turn off power before working on equipment. Failure to do so can cause serious injury to personnel.

Use alcohol only in well-ventilated area away from fire, sparks, or any other heat source that might ignite it.

(1) Dusting of all external surfaces.

(2) Wiping off smudges and deposits of foreign matter.

(3) Clearing debris off of the disk unit and from the immediate area around the disk unit.

(4) Vacuuming dust/debris from the blower assembly at the rear of the disk unit.

4-21. TESTING AFTER REPLACEMENTS OR REPAIRS

Upon completion of all replacements and/or repairs, the disk unit should be operated in a stand-alone configuration (no I/O cables connected) with an HDA installed. Upon application of power to the unit (para 2-6), the maintenance technician should ensure that the unit appears to be operating normally (i.e., the indicators are showing the proper equipment status, blower fan is operating quietly, and the HDA is running smoothly and quietly).

CHAPTER 5

PACKING FOR SHIPMENT OR STORAGE

5-1. INTRODUCTION

This section provides procedures for packing the disk unit. Material used for packing is listed in the Expendable Supplies and Materials List (ESML), appendix E. Instructions reference each item in the ESML as it is used.

5-2. PREPARATION FOR STORAGE OR SHIPMENT

Prior to packing the disk unit for storage or shipment, perform routine Preventive Maintenance Checks and Services (PMCS). Refer to paragraph 1-4. If the disk unit is being forwarded to a higher level of maintenance for repairs, prepare the required equipment failure report in accordance with paragraph 1-3.

5-3. DISK UNIT PACKAGING AND PACKING

When packaging and packing disk unit for shipment or storage, see figure 5-1 and perform each of the following steps:

NOTE

Packaging and packing the disk unit intact is not recommended. The units power supply and printed-circuit boards (PCB) should be removed and packaged and packed in separate containers. The HDA must be removed and packed and shipped separately.

1. Install two desiccant bags (item 5, appx E) in a plastic bag (item 6, appx E).

WARNING

The disk unit is c heavy piece of equipment. Always use two technicians when moving or lifting the unit to prevent injury to personnel.

2. Place the unit in the plastic bag (item 6, appx E).

3. Place all maintenance forms and tags in the plastic bag with the unit and seal the plastic bag with tape (item 7, appx E).

4. Place the bag containing the unit in a polyurethane foam container (item 8, appx E).

5. Place the polyurethane cover (item 10, appx E) on the container and seal with pressure sensitive tape (item 9, appx E).

6. Wrap the polyurethane container with a barrier material (item 11, appx E).

7. Secure the wrapping material with tape (item 7, appx E).

8. Complete shipping label (item 14, appx E) and affix it to the carton (item 12, appx E).

9. Complete shipping forms, place forms in packing list envelope (item 13, appx E), and affix the envelope to the carton as shown.

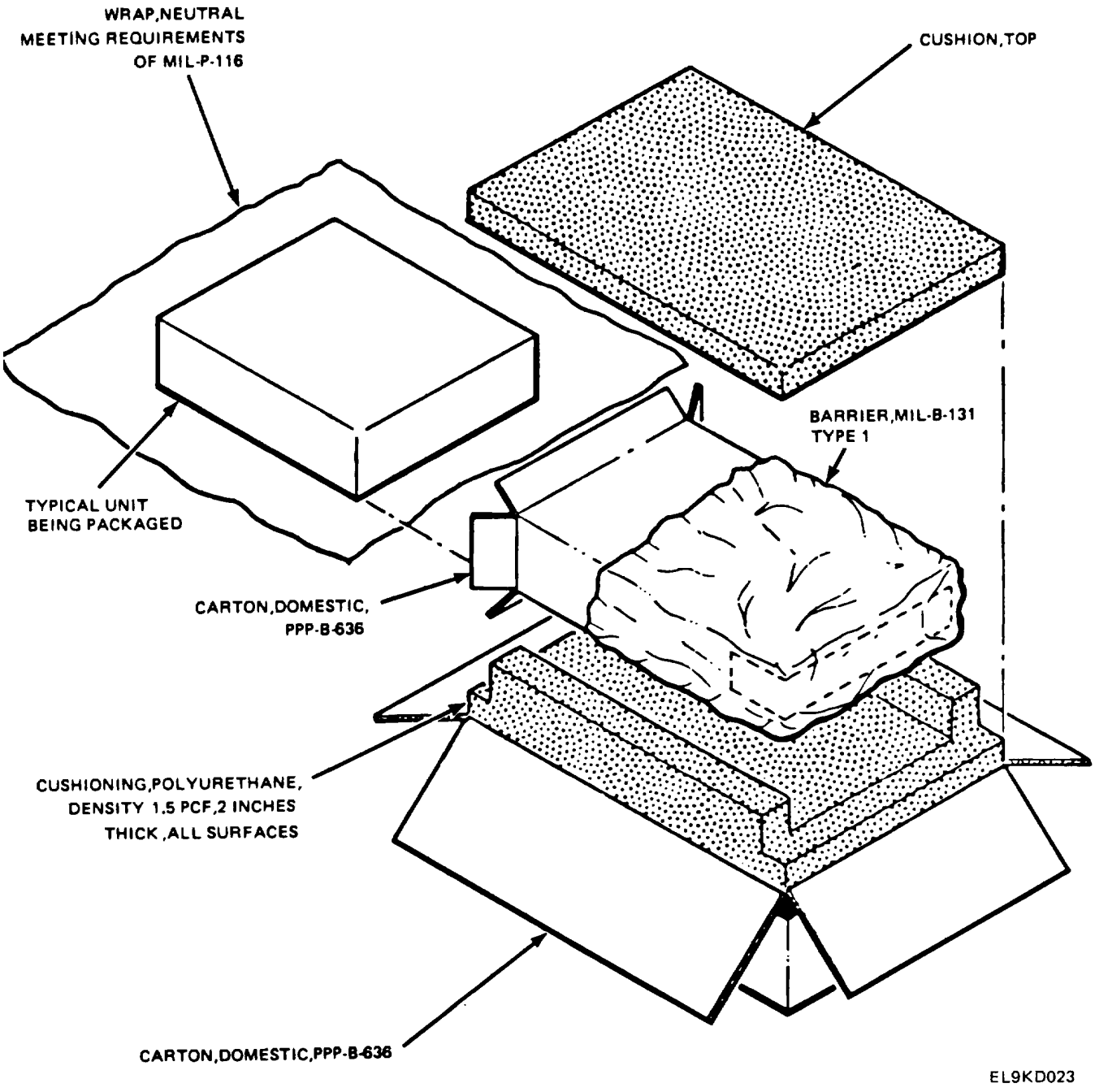


Figure 5-1. Packing a Typical Unit

APPENDIX A

REFERENCES

A-1. SCOPE

This appendix lists all forms and technical publications referenced in this manual.

A-2. FORMS

Recommended Changes to Equipment Technical Manuals ..... DA Form 2028-2

Recommended Changes to Publications and Blank Forms ..... DA Form 2028

Equipment Inspection and Maintenance Work Sheets ..... DA Form 2404

Maintenance Request ..... DA Form 2407

Equipment Log Assembly (Records) ..... DA Form 2408

Equipment Daily Log ..... DA Form 2408-1

Discrepancy in Shipment Report ..... SF 361

Report of Discrepancy ..... SF 364

A-3. TECHNICAL BULLETINS None

A-4. TECHNICAL MANUALS

Organizational Maintenance Repair Parts and Special Tools List, Disk Memory Unit MU-768/G ..... TM 11-7025-229-20P

Packaging of Material Preservation ..... TM 38-230-1

Packaging of Material; Packing ..... TM 38-230-2

The Army Maintenance Management System (TAMMS) ..... DA PAM 738-750

Administrative Storage of Equipment ..... TM 740-90-1

Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command) ..... TM 750-244-2

First Aid for Soldiers ..... FM 21-11

A-5. SUPPLY BULLETINS

Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used By the Army ..... SB 38-100

Common Table of Expendable Items ..... CTA 50-970

A-6. PAMPHLETS

Consolidated Index of Army Publications and Blank Forms ..... DA PAM 310-1

A-7. ARMY REGULATIONS

Dictionary of United States Army Terms ..... AR 310-25

Catalog of Abbreviations and Brevity Codes ..... AR 310-50

Reporting of Transportation Discrepancies in Shipments ..... AR 55-38

APPENDIX B

MAINTENANCE ALLOCATION CHART FOR DISK MEMORY UNIT MU-768/G

Section I. INTRODUCTION

B-1. GENERAL

This appendix provides a summary of the maintenance operations for the Disk Unit. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. MAINTENANCE FUNCTION

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) for an unserviceable counterpart.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

I. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul Is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. COLUMN ENTRIES

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to indentify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun name of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the
group numbers In the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies by the listing of a "worktime" figure In the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the Indicated category of maintenance. If the number of complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of task-hours specified by the "worktime" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C Operator/Crew

O Organization

F Direct Support

H General Support

D Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets, (not individual tools) and special tools, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in Section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. TOOL AND TEST EQUIPMENT REQUIREMENTS (SECTION III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-5. REMARKS (SECTION IV)

a. Reference Code. This code refers to the appropriate item in Section II, Column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in Section II.

SECTION II. MAINTENANCE ALLOCATION CHART

FOR

DISK MEMORY UNIT MU-768/G

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
00	MU-768/G	Inspect		0.2					
		Test		0.2				1	C
		Replace		0.1				1	A, B
		Repair		0.5				1	
		Test			0.5			2,3,5	
		Repair			1.0			1,6	
		Test				0.5			
		Repair				2.0		8	G
		Overhaul					20.0	Depot Facilities	
01	MU-768/G	Inspect			0.1				
	Disk Memory Unit	Test			0.3			4,5,8	
	Chassis Assembly	Repair			0.6			4	D
0101	Frame Assembly	Inspect			0.1				
		Repair					2.0	Depot Facilities	
0102	Motherboard	Inspect			0.1				
		Test			0.2			4	
		Repair			0.6			1	E,F
		Test				0.2		4	F,G
		Repair				1.0		1	G
		Replace					3.0	Depot Facilities	
0103	Fan Assembly Card Cage	Test			0.1			4	F
		Replace			0 2			1	
		Repair			0.3			1	
0104	Tray Assembly	Repair			0.5			1	
		Repair				1.0		1	
		Replace				10		1	
0105	EMI Filter	Inspect			0.1			1,4	
		Replace			0 5			1	
02	Power Supply (4061)	Test		0.1				4,8,9	
		Replace		0.1				1	
		Test					0 5	8,9	
		Repair					4 0	Depot Facilities	
03	Motor Control PCB (4060A)	Test			0 5			3,5	
		Replace			0.1			1	
		Test				1 0		8	G
		Repair				1 0		1	G

SECTION II. MAINTENANCE ALLOCATION CHART

FOR

DISK MEMORY UNIT MU-768/G

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
04	Device Electronics PCB (4059A)	Test			0.5			3.5	
		Replace			0.1			1	
		Test				1.0		8	G
		Repair				1.0		1	G
05	Controller PCB (4058)	Test			0.5			3,5	
		Replace			0.1			1	
		Test				1.0		8	G
		Repair				1.0		1	G
06	Indicator Panel Assembly (4062)	Test			0.2			4	
		Repair			0.5			1	
07	Head Disk Assembly (4057)	Test			0.3			3.4,5	
		Replace			0.1				1
		Test					2.0	Depot Facilities	
		Repair					20.0	Depot Facilities	
08	Front Panel Air Filters (4064)	Inspect	0.1						A
		Replace		0.1					
09	Cable- I/O	Test			0.5			4	F
		Replace			0.1			1	
		Repair			1.0			6	
10	Cable - Power	Test			0.5			4	F
		Replace			0.1			1	
		Repair			1.0			6	

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS FOR DISK MEMORY UNIT MU-768/G

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/ NATO STOCK NUMBER	TOOL NUMBER
1	O,F,H,D	Tool Kit, Electronic Equipment TK-101/G	5180-00-064-5178	
2	F	Tool Kit, Electronic Equipment TK-105/G	5181-00-610-8177	
3	F	Test Set Group OQ-329/U	6625-01-157-9052	
4	F	Multimeter AN/USM-451	6625-01-060-6804	
5	F		Diagnostic Tape	
6	D,F,H	Connector Tool Kit Turret Head	5120-00-146-6558 2-09 Pin M22520/ 2-00 Socket	M22520/
7	D,H	Extender Card	Model 5621 16-106458**	
8	D,H H	Maintenance Facilities W/AN/MSM-105 OQ-290 (V) 1/MSM	U 6525-01-095-9312	
	D,F	AN/USM-410 (V)	6625-00-614-9535	
	D,F	AN/USM465A	6625-01-091-4819	
9	D,F	Test Adapter Cables		
		*NSN to be assigned by US Army **Model/part numbers are ROLM Corporation FSCM 14345		

SECTION IV. REMARKS FOR DISK MEMORY UNIT MU-768/G

REFERENCE CODE	REMARKS
A	Clean Air Filters
B	Organizational level replacement accomplished with spares obtained from Direct Support, based on system level diagnostic testing and system requirements
C	System Level Diagnostics
D	Repair, replace mounting hardware, handles, shock mounts
E	Connector and wiring repairs
F	Continuity tests on connectors and backplane wiring
G	Special Repair Activity (SRA)

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

E-1. SCOPE

This appendix lists expendable supplies and materials needed to operate and maintain the Disk Memory Unit MU-768/G. These items are authorized by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts and Heraldic Items).

E-2. EXPLANATION OF COLUMNS

a. **Column (1) - Item Number.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material; e.g., "Use cleaning compound (item 5, appx E)."

b. **Column (2) - Level.** This column identifies the level of maintenance that requires the listed item.

C = Operator/Crew
O = Organizational

c. **Column (3)- National Stock Number.** This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. **Column (4) - Description.** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parenthesis followed by the part number.

e. **Column (5) - Unit of Measure (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character, alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy the requirements.

E-3. SPECIAL INFORMATION

National Stock Numbers (NSN) that are missing from Section II have been applied for and will be added to this technical manual by future change/revision when they are entered in the Army Master Data File (AMDF). Until the NSN's have been established and published, submit exception requisitions to Commander, US Army Communications Electronics Command and Fort Monmouth, ATTN: AMSEL-MM, Fort Monmouth, New Jersey 07703-5006 for the part required to support the equipment.

SECTION II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NUMBER AND CAGE	(5) UNIT OF MEAS
1	C,O	6810-00-753-4493	Alcohol: Isopropyl (81349) MIL-A-10428, Grade A	OZ
2	C,O	7920-00-356-4694	Brush: Bristle (81348)	EA
3	C,O	8305-00-267-3015	Cloth: Cheesecloth Cotton: Lint-less (81348) CCC-C-440, Type II, Class 2.	YD
4	C,O		Detergent: Mild: Liquid (TBD)	OZ
5	O		Dessicant Bags	EA
6	O		Plastic Bags (Chassis Size)	EA
7	0		Tape: Adhesive	EA
8	O		Container: Foam: Chassis Size	EA
9	O		Tape: Adhesive: Waterproof	FT
10	O		Cover: Foam: Chassis Size	EA
11	C,O		Material: Barrier	FT
12	O		Box: Fiberboard: Chassis Size	EA
13	0		Bag: Plastic: Forms and Tags	EA
14	0		Label: Shipping	EA

GLOSSARY

AGC	Automatic Gain Control
ATTN	Attention (command completed)
CBUSY	Command Busy (command bus in use)
DAC	Digital-to-Analog Converter
DEV SEL	Device Select (address selected on UNIT SELECT thumbwheel switch)
DISREP	Discrepancy in Shipment Report
DREQ	Data Request
EIR	Equipment Improvement Recommendations
ESML	Expendable Supplies and Materials List
HDA	Head Disk Assembly
HEAD LOAD ENABLE	Signal that releases brake
HSLT	Head Select
IMS	Input Motor Speed
LED	Light-Emitting Diode
PCB	Printed-Circuits Boards
PMCS	Preventive Maintenance Checks and Services
POSX	Positioner control and reference
PROM	Programmable Read Only Memory
RAM	Random Access Memory
ROD	Report of Discrepancy
RSTR	Read Signal Transfer
SPEED LOW	Spindle feedback signal that indicates the spindle is not up to speed.

GLOSSARY - Continued

TAMMS	The Army Maintenance Management System
TP	Track Pulse
VC	Virtual Console
VEL	Velocity
WEN	Write Enable
WSTR	Write Serial Transfer

INDEX

INDEX - Continued

INDEX - Continued

N

O

P

INDEX - Continued

R

S

T

U

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