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GENRAD/DEVELOPMENT SYSTEMS DIVISION
2300 ADVANCED DEVELOPMENT SYSTEM
INSTALLATION AND MAINTENANCE
INSTRUCTION MANUAL

MANUAL NO. 2300-5003-01

MICROCOMPUTER
SYSTEMS

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LIST OF EFFECTIVE PAGES

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WARNING - SHOCK HAZARD

Dangerous voltages as high as 17kv are present in the console interior when system power is on. Use extreme caution when operating this console with the cover removed.

Use normal safety precautions when measuring voltages. Always use the proper test equipment.

An adequate earth ground must be provided.

ABBREVIATIONS

The following abbreviations are used in this manual.

ABBREVIATION	DEFINITION
ADS	Advanced Development System
CLR	Clear
COM	Common
CPU	Central Processor Unit
CRT	Cathode Ray Tube
DC	Direct Current
DIP	Dual In-line Package
DMA	Direct Memory Access
DTR	Data Terminal Ready
DVM	Digital Voltmeter
EMUL	In-circuit Emulator
EPROM	Erasable Programmable Read-only Memory
EXT	External
GND	Ground
INIT	Initialize
I/O	Input/Output
KB	Keyboard
MPIO	Multi-purpose Input/Output
MPU	Microprocessor Unit
NDOS	Network Disk Operating System
N/S	No Straps
PCB	Printed Circuit Board
PS	Power Supply
PM	Preventive Maintenance
PRGM, PROG	Program
PROM	Programmable Read-only Memory
PWR	Power
RAM	Random Access Memory
RCA	Radio Corporation of America
RDOS	Relocatable Disk Operating System
REF	Reference
ROM	Read-only Memory
R/S	Run/Stop
RTN	Return
RTS	Request to Send
RXD	Received Data
SECU	Slave Emulator Control Unit
SER	Serial
SLA	Slave Logic Analyzer
TTL	Transistor-transistor Logic
TXD	Transmitted Data
USART	Universal Synchronous Asynchronous Receiver/Transmitter
ZIF	Zero Insertion Force

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SECTION I - INSTALLATION

1.0 SCOPE

This section contains basic installation information and preliminary systems checks and operations for the 2300 series systems.

The main intent is to give the user sufficient up-front knowledge about the system to bring it up to operational status.

> NOTE
>
> Throughout this manual, always read the full instructions before proceeding.

1.1 ADS SYSTEM HARDWARE DESCRIPTION

The GenRad/DSD 2300 Series stand-alone hardware/software system, modular development system is functionally diagramed in Figure 1-1, Basic Block Diagram. The basic system consists of two major units, accessories and software: ADS Console, Floppy Disk Unit, EPROM Programmer, and System Software.

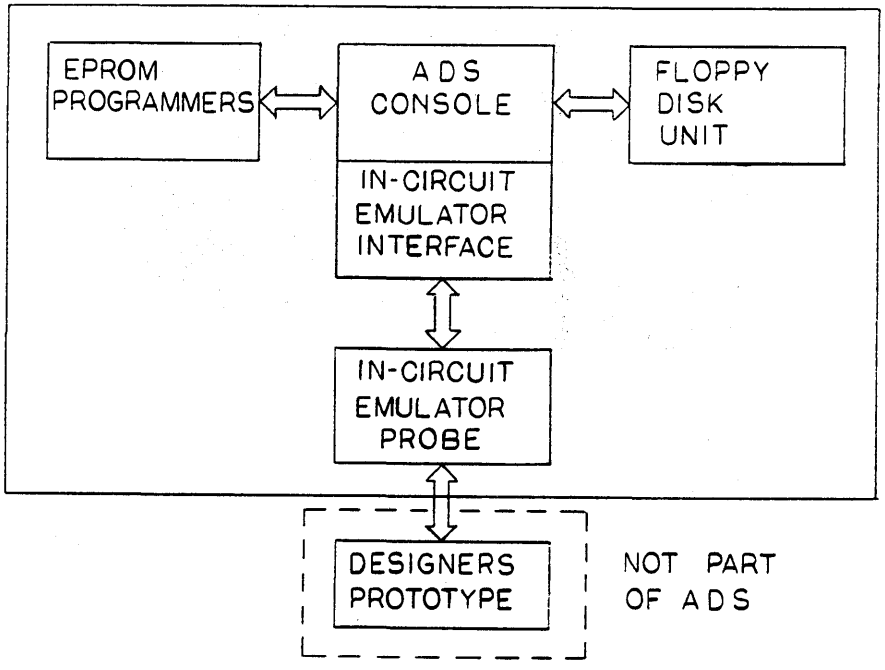


Figure 1-1. Basic Block Diagram

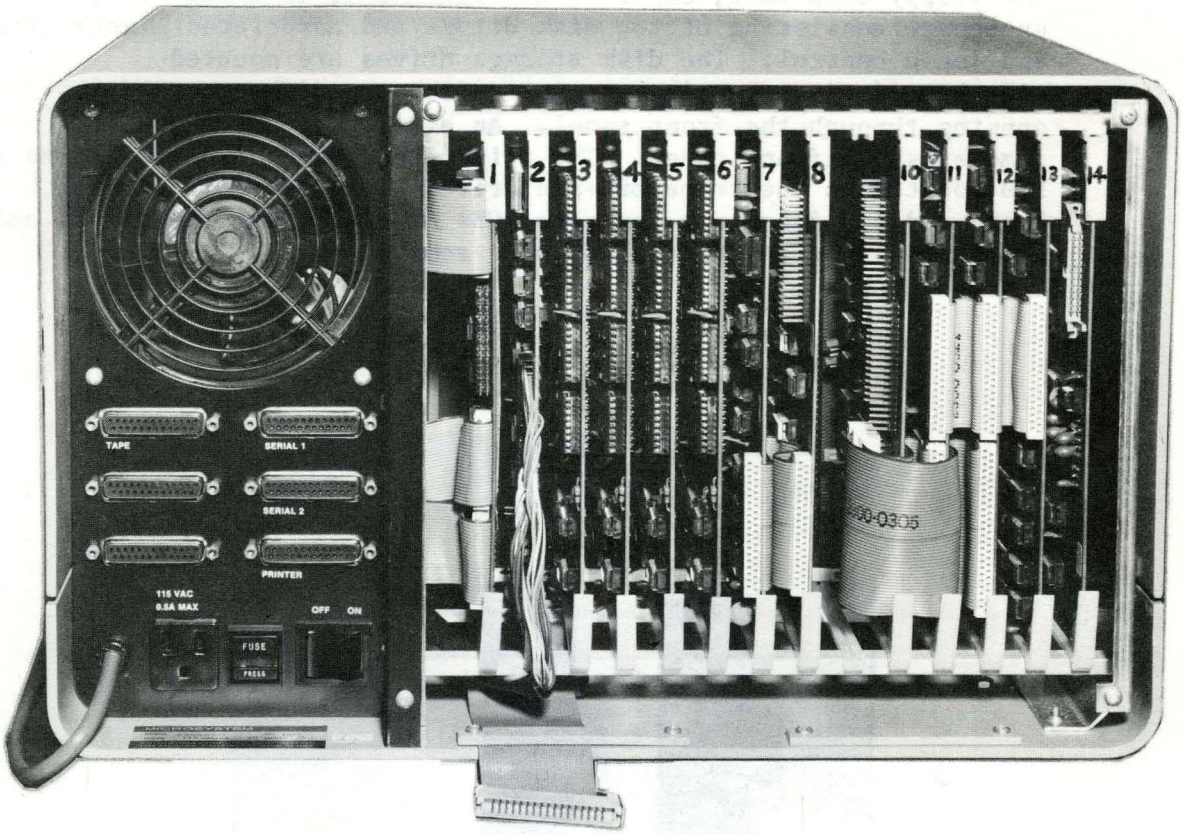
1.1.1 The Console

The ADS console depicted in Figure 1-2 is a desktop enclosure with sculptured exterior features. The front of the console is a removable subchassis consisting of a keyboard assembly with control logic and a transparent plastic window protecting the CRT. ON and RUN indicators are visible in the upper right of the window. A brightness control, the only external adjustment,is located under the console on the right side.

The keyboard switch assembly consists of 72 contact key switches with moulded keytops. All other subassemblies of the console are secured on a baseplate chassis.

Main frame logic circuitry are packaged on 100-PIN PC cards housed in a 14-Position Card Cage Assembly accessible from the rear of the console. When the ADS console is shipped from the factory, all cards are normally in predesignated positions in the card cage. However, because a universal bus structure is used, any card can be repositioned. A rear view of the console is shown in figure 1-3.

Figure 1-2. ADS Console



NOTE
Card positions are referenced with observer facing the rear of the console. Position 1 is the leftmost slot; position 14 is the rightmost slot.

Slot Pos	Designation
1	MPIO
2	CRT
3	RAM 16K
4	RAM 16K
5	RAM 16K
6	RAM 16K
7	8080-1 CPU
8	8080-1 EMUL
9	SPARE
10	LOGIC ANAL INT
11	LOGIC ANAL A
12	LOGIC ANAL B
13	LOGIC ANAL C
14	DEBUG/PROM

Figure 1-3. ADS Console (Rear View).

1.1.2 The Floppy Disk Unit

The floppy disk unit, depicted in Figure 1-4, is a desk top enclosure consisting of two disk drives and associated electronics and logic control. The disk storage drives are mounted side-by-side in a vertical position with the disk access doors opening through the front panel. An a.c. power ON/OFF switch completes the front panel. The drive electronics are mounted on a PCB located on the frame of each drive. The disk unit control logic and I/O Board are separate PCBs mounted below the drives and accessible when the bottom cover is removed.

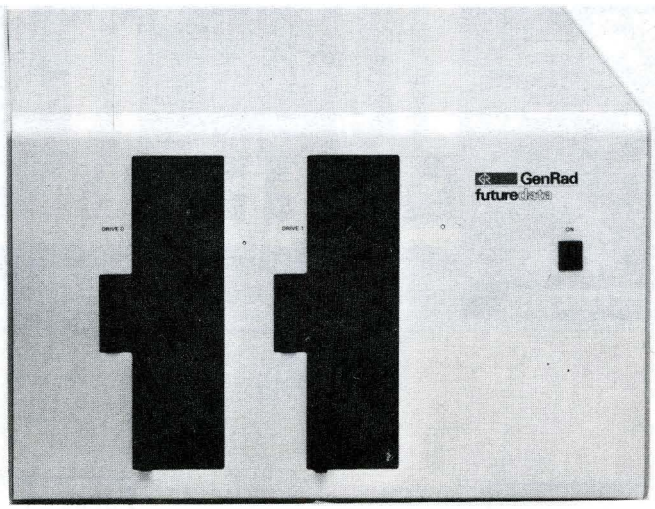


Figure 1-4. Floppy Disk Unit

1.1.3 EPROM Programmer (EPP)

The EPP consists of a single logic board mounted inside a sloping-face box. Mounted on the face is an IC socket into which 24 pin, zero insertion force (ZIF) IC socket is inserted. The EPP connects to the console via a 26 conductor ribbon cable and plug. View A in Figure 1-5 shows the EPROM Programmer with cover on; View B shows the cover removed.

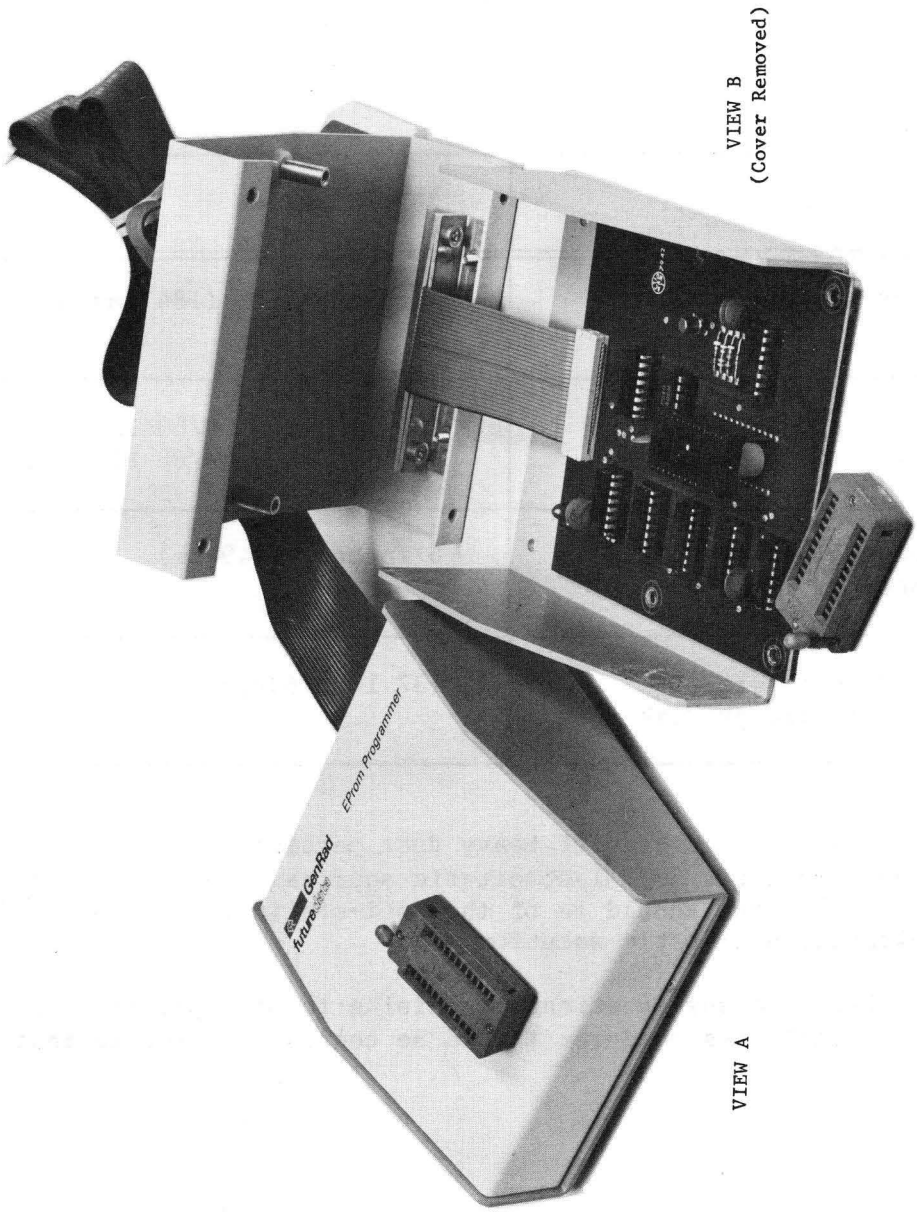


Figure 1-5. EPROM Programmer

1.2 SITE PLANNING

1.2.1 Installation Site

Installation personnel should have a prepared site or plan available to guide the installation. However, where such a plan is not available, some of the worst-case factors that must be considered are summarized in Table 1-1, Installation Consideration.

TABLE 1-1

INSTALLATION CONSIDERATIONS

CONSIDERATION	SPECIFICATION
AC power outlet	Within 6 feet (184 cm) of console
Typical electric utility	100/115 VAC, 50/60 HZ, 15A 200/230 VAC, 50/60 HZ, 15A
Minimum cabinet operating clearance at rear	6 inches (15.9 cm)
Combined weight of ADS console and floppy disk unit	137 lbs (63kg)

1.2.1.1 An ideal site is free of heavy dust particles and strong electromagnetic and electrostatic sources. Carpets in the operating room should be of the anti-static type or sprayed with a suitable anti-static solution.

1.2.1.2 If there are any questions pertaining to site preparation, a qualified facilities engineer should be consulted prior to installation.

1.2.2 Hardware Specifications

1.2.2.1 Bus Configuration: Universal 100 line, including 16 data lines, 24 address lines, 6 processor control lines (Read/Write, I/O Cycle, Memory Cycle, Read Strobe, Write Strobe and Data Enable Strobe), 9 interrupt vector lines; DMA request, DMA enable, cycle delay, reset request, reset, boot request, boot; and 8 group select lines.

1.2.2.2 Processor: Choice of 8080, 8085, Z80, 6800, or 6802. The 8080 operates at 2 MHz, the 6800 at 1 MHz, the 8085 at 4 MHz, the Z80 at 4 MHz and the 6802 at 1 MHZ. The processor card includes clock generator, bootstrap PROM, vectored interrupts, direct memory access and TTL bus drivers.

1.2.2.3 Memory: 64 kilobytes of static RAM, (200nS access time) allows real-time emulation to 5 MHz. Memory is write-protectable on 1K boundaries under software control.

1.2.2.4 Display: 24 lines of 80 high resolution characters. Full ASCII character set is implemented with a high density 7 X 9 dot matrix. Lower case characters such as "g", "j", "p", and "q" have below the line descenders to improve legibility and reduce operator error. Display features include limited graphics, reverse video, highlighting, and blinking fields. Display is directly refreshed from memory with an equivalent rate of up to 20,000 characters per second.

1.2.2.5 Keyboard: 72 keys, encoded into 4 levels (unshifted, shifted, control and control shifted). Special keys are provided for insert, delete, cancel, load, reset, break and cursor positioning.

1.2.2.6 Disk Drive: Two dual density drives with Z80 based controller provide vide over 1,000,000 bytes of formatted disk storage. Diskettes are soft sectored, 128 bytes/sector, 52 sectors/track and 77 tracks/diskette. Average access time of the disk drive is 260ms. Track to track stepping time is 10ms. Head setting time is 10ms. Average transfer rate is 5680 bytes/second.

1.2.2.7 Real-Time Emulation: 8 bit processor emulation at bus speeds to 5MHz allows the substitution of processor memory for prototype memory, with memory mapping in 256 byte segments. Emulator provides control over clocks, I/O operations, memory mapping, and DMA functions to allow program debugging with or without user hardware. High-speed static RAM allows real-time emulation with no wait states or overhead loss for memory refresh.

1.2.2.8 Real-Time Logic Analyzer: 32 channels, up to 16 address lines, 8 data lines and 8 external and control lines. Three 48-bit breakpoints with user controllable break specifications. The break conditions can be ANDed or ORed permitting the specification of multiple breakpoints or the specification of a sequence of breakpoints. 256 deep trace buffer.

1.2.2.9 I/O Ports: Two serial synchronous/asychronous data ports, each software controllable. One port is RS-232C compatible for modem or terminal connection, with software control over transmitted data (TXD), received data (RXD), request to send (RTS), clear to send (CTS), data terminal ready (DTR) an data carrier detect (DCD).

The second port provides for terminal or network connection, with RS-232C, TTY or RS-422A compatible line drivers. The network interface provides for high-speed communication for distances of up to 1000 feet.

1.2.2.10 EPROM Programmers: Personality modules for 2704, 2708, 2732, 2758 and 2716 EPROMs are provided. Programming commands verify that EPROMs are empty, read and verify the contents of EPROMs.

1.2.3 Dimensions/Weight

a. ADS Console

1. 24.25 "(61.6cm) deep x 16.75"(42.55cm) wide x 11.77"(29.77 cm) high.

2. Card size - 8"(20.32 cm) x 6"(15.24 cm)

3. Card-file assembly - 14 card maximum

4. Weight - 63 lbs. (29kg)

b. Disk Unit

1. 15.00 "(38.10 cm) deep x 17.00" (43.18 cm) wide x 10.50" (26.67 cm) high.

2. 74 lbs. (34 Kg.)

1.2.4 Electrical

a. 115 VAC, 103 to 127v@4A

b. 230 VAC, 207 to 253v@2A

1.2.5 Environmental:

a. Operating temperature - 40°F to 105°F (5°C to 35°C)

b. Humidity - 5% to 85% (No Condensation)

1.3 UNPACKING AND INSTALLING

1.3.1 Shipping Configurations

The ADS console, disk units, and accessories are normally shipped separately in cardboard containers. See Figure 1-6, Shipping Configuration. To unpack the system, proceed as follows:

1.3.1.1 To avoid damaging the interior packaging material when opening the cartons, use a Listo carton cutter or any cutting tool with a cutting depth gauge. Open the carton by cutting along the sealing tape.

1.3.1.2 Remove the shipping invoice for later inventory.

1.3.1.3 Remove the top half of the custom molded styrofoam casing from the unit.

> WARNING
>
> To avoid personal injury or equipment damage, it is suggested two people remove the equipment from the carton.

1.3.1.4 Remove all units from their respective cartons and save all packing material for later possible reshipment.

1.3.1.5 Place the console and disk unit side by side with a separation between units that accommodates the length of the I/O cable coming from the Disk Drive.

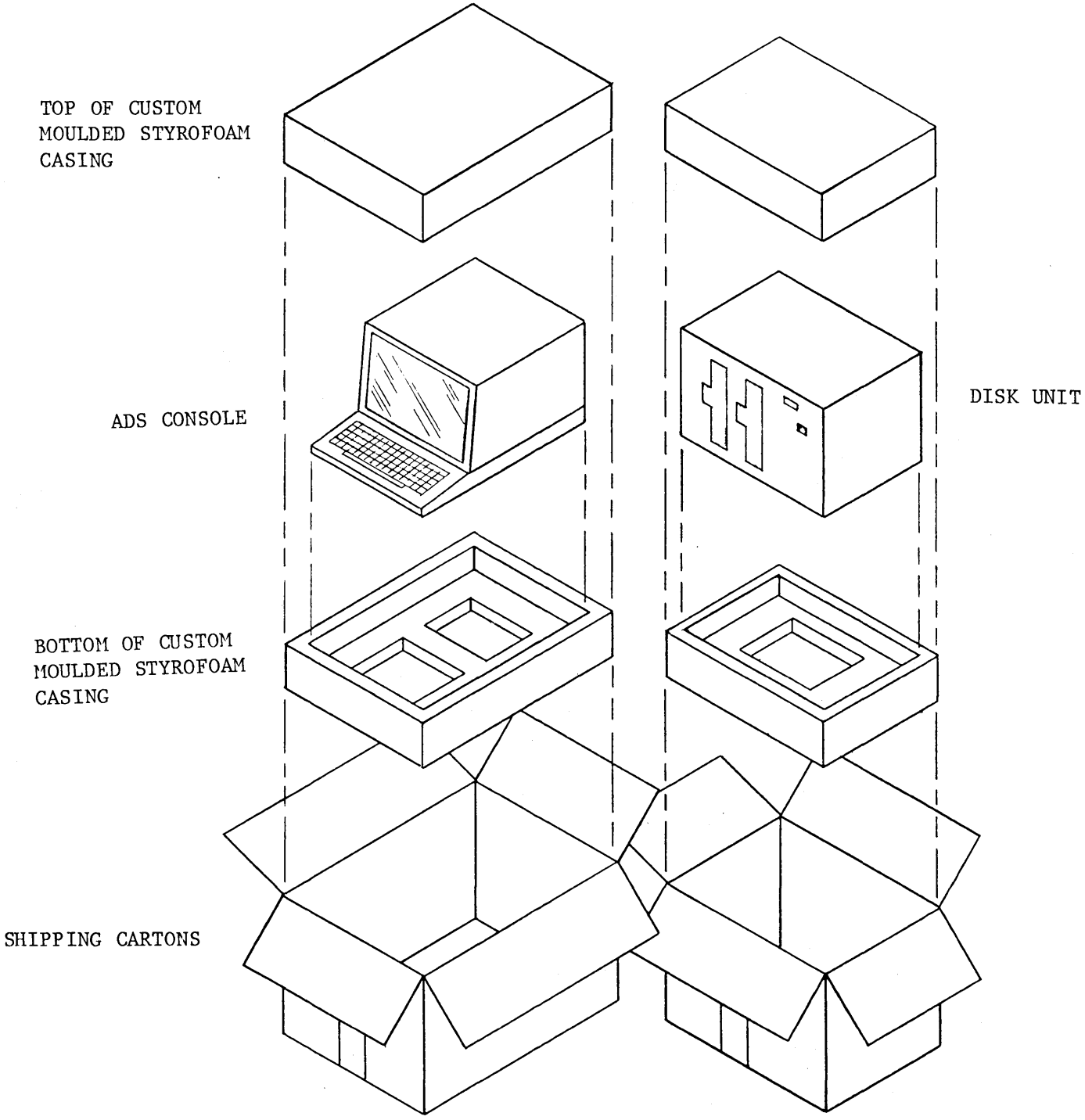


Figure 1-6. Shipping Configuration

1.3.2 Inventory Check

An inventory of the shipment received should be taken immediately after all parts are removed from their shipping containers. The paperwork necessary to accomplish the inventory and acceptance of equipment is fully explained in the documentation section.

1.4 INSPECTION AND CLEANING

a. Inspect all cabinets for evidence of rough handling during shipment, such as deformed frame or frame members, cracked or broken keyboard members, etc.

b. Remove the protective back plate of the console. See Figure 1-7, Back Plate View.

c. Reseat circuit boards in the card cage assembly of the console and verify that harness and connectors are undamaged and fastened in place.

d. If necessary, clean the CRT's plastic face cover and keyboard with a good grade cleaner and a lint-free wiping cloth.

e. Problems found during the preceeding inspection should be corrected before continuing further.

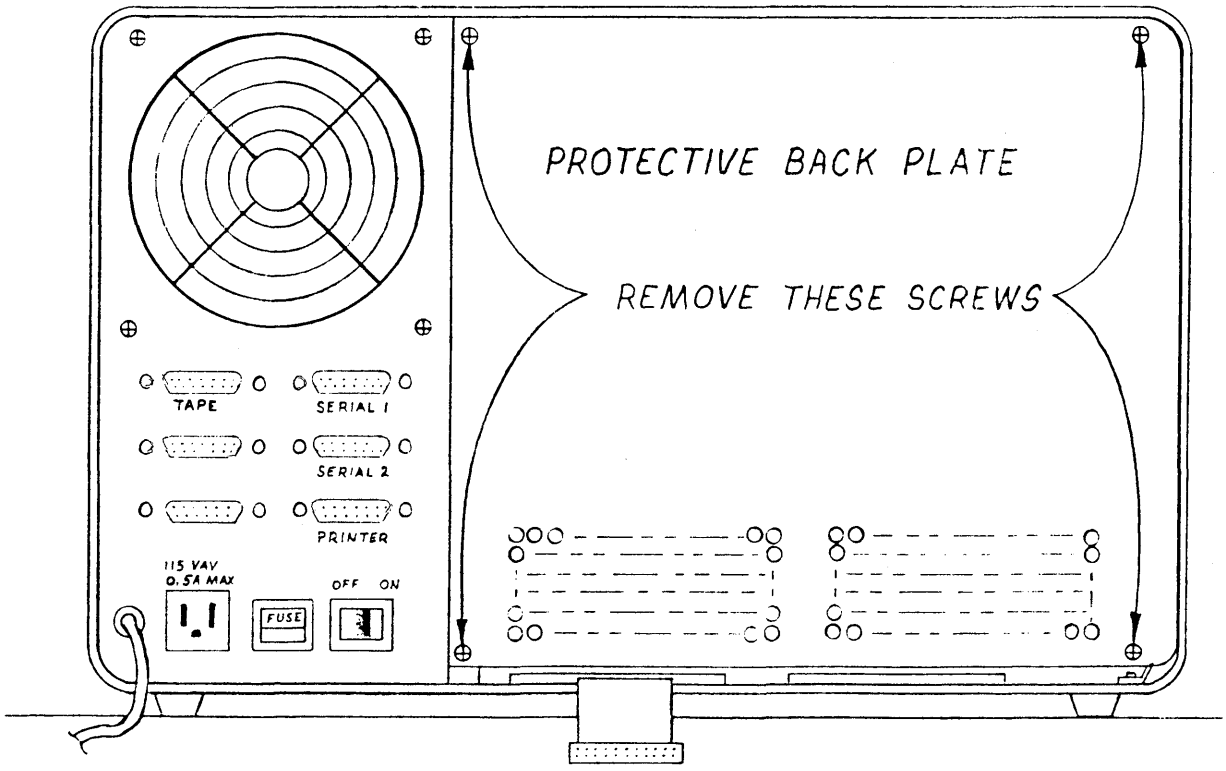


Figure 1-7. Back Plate View

1.5 PRELIMINARY SYSTEM CHECKS

1.5.1 Mechanical

a. Operate the power switches a couple of times and return them to their off positions.

b. Check the rear panel push-to-lock fuse block for fuses on each cabinet.

115 VAC 4A
230 VAC 2A

c. Open and close the diskette access doors on the disk unit a couple of times to assure smooth operation. Depressing the vertical push bar, located to the left of each door, releases a catch causing the door to pop open, sliding to the right. The door is closed by firmly sliding it to the left until it locks shut. See Figure 1-8, Floppy Disk Door.

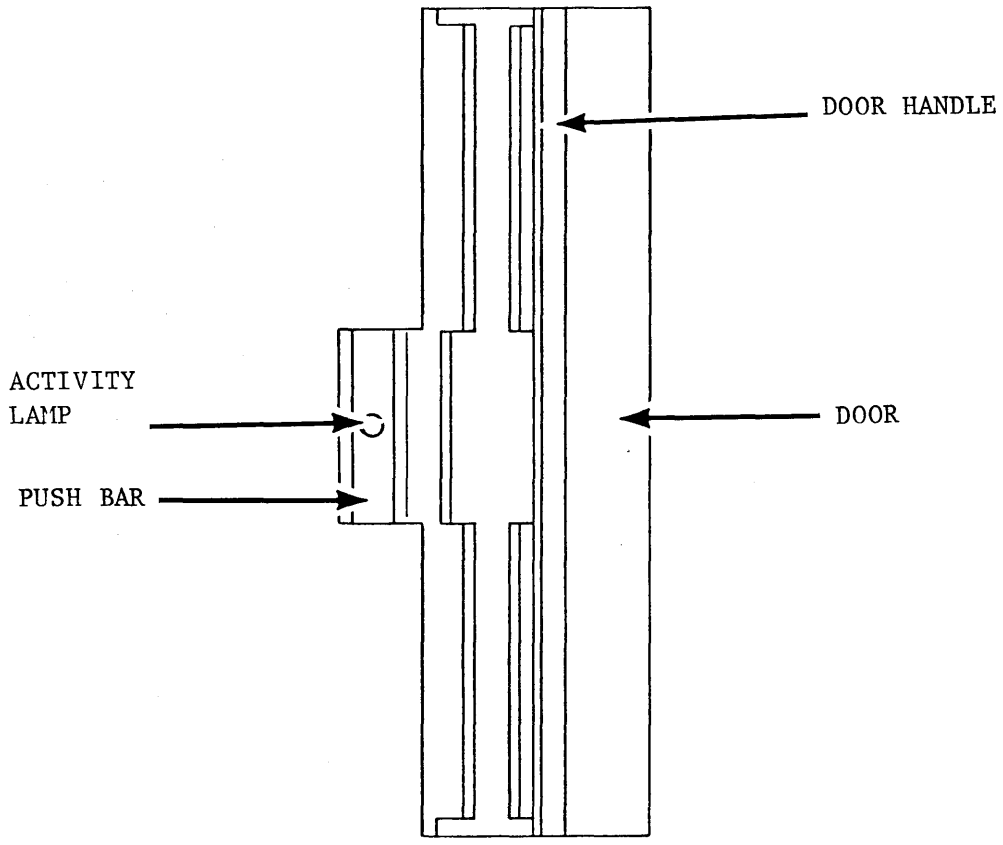


Figure 1-8. Floppy Disk Door

1.5.2 GROUND AND POWER SUPPLY ISOLATION CHECKS

> CAUTION
>
> Remove all power to the ADS

These tests are performed to insure that the ADS will not initially fail due to either shorts or opens in the AC power circuitry.

a. Set the PWR ON/OFF switch to OFF at the rear of the console. Check to see the fuse block is firmly seated. Using a high quality VOM, measure the resistance between the prongs of the plug on the AC power cable. The resistance must be infinite.

b. Measure between the prongs on the 115VAC, .5A convenience outlet next to the AC cable. The resistance must be greater than zero and less than 5 ohms.

c. Set the PWR ON/OFF switch to ON and repeat Step a. The resistance must be greater than zero and less than 5 ohms.

d. Measure the resistance between each prong and center (cylindrical) prong in both positions of the PWR switch. The resistance must always be infinite in either position of the PWR switch.

e. Check for continuity between the metal cabinet, frame, or chassis and the third (cylindrical) prong on the AC line input plug. See Figure 1-9, ADS Chassis Wiring.

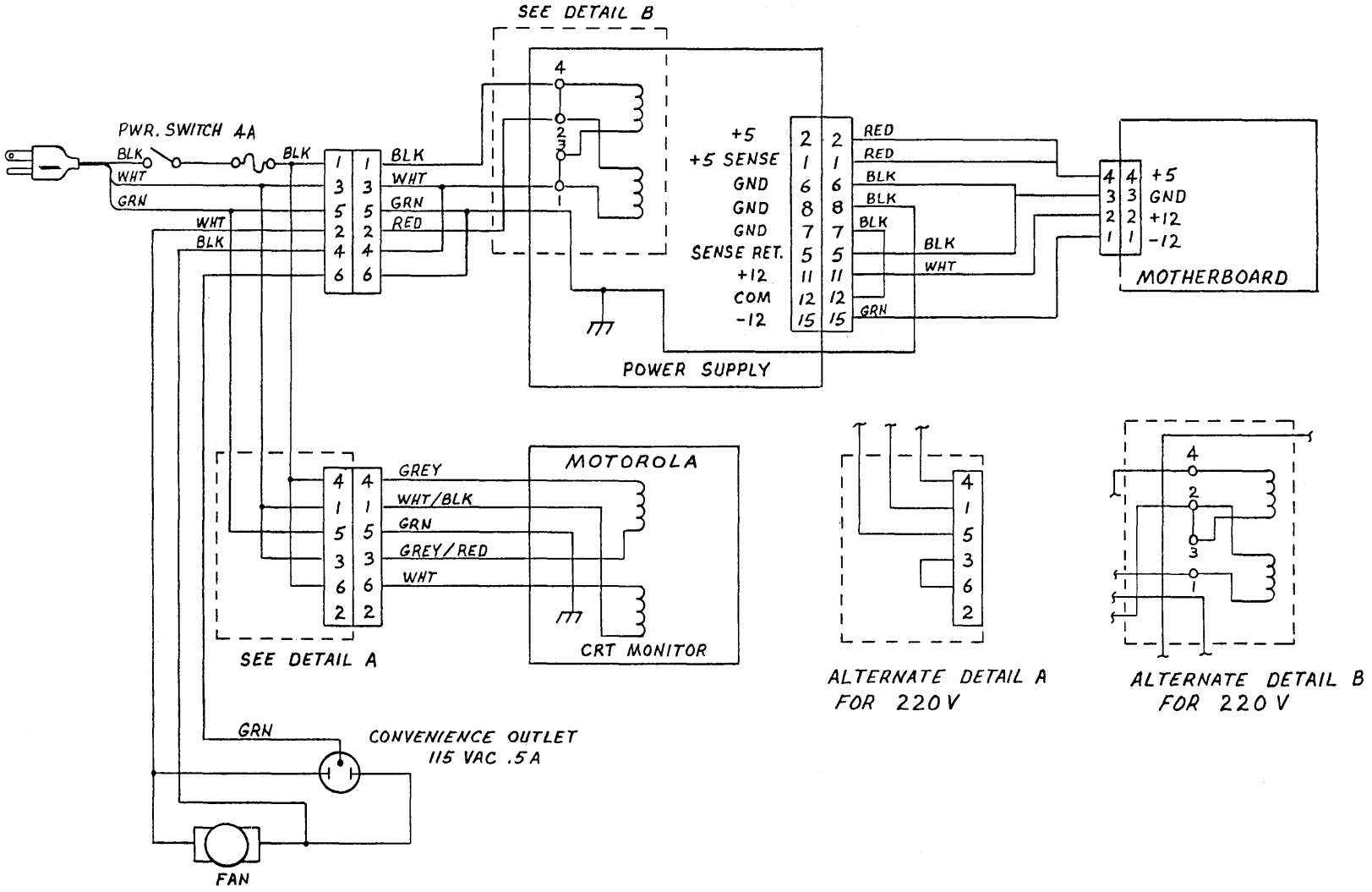


Figure 1-9. ADS Chassis Wiring

1.5.2.1 Set the PWR ON/OFF switch to OFF on the disk unit.

a. Measure the resistance between the flat prongs of the plug on the AC power cable. The circuit resistance reading must be infinite or open circuit.

b. Measure the resistance between each flat prong and the center (cylindrical) prong. The circuit resistance must be infinite or open circuit.

c. Measure the resistance between the cylindrical prong and chassis. The resistance must be zero.

1.5.3 Connecting the System

1.5.3.1 Insert the power plug from the console into the AC power source.

1.5.3.2 Insert the power plug from the disk unit into the AC utility outlet on the back of ADS Console.

1.5.3.3 Connect the jack at the end of the 3 foot I/O cable on the disk drive unit to the plug at the end of the I/O cable on the console. This cable is the 2-inch flat flex cable running under a clamp near the card cage. The colored stripes on both flex cables must be linked on the same side, giving the semblance of a continuous connection. The colored strip on the extreme edge of the cable represents pin one. See Figure 1-10, I/O Connections. As a final check, the arrow heads on both connectors must be aligned.

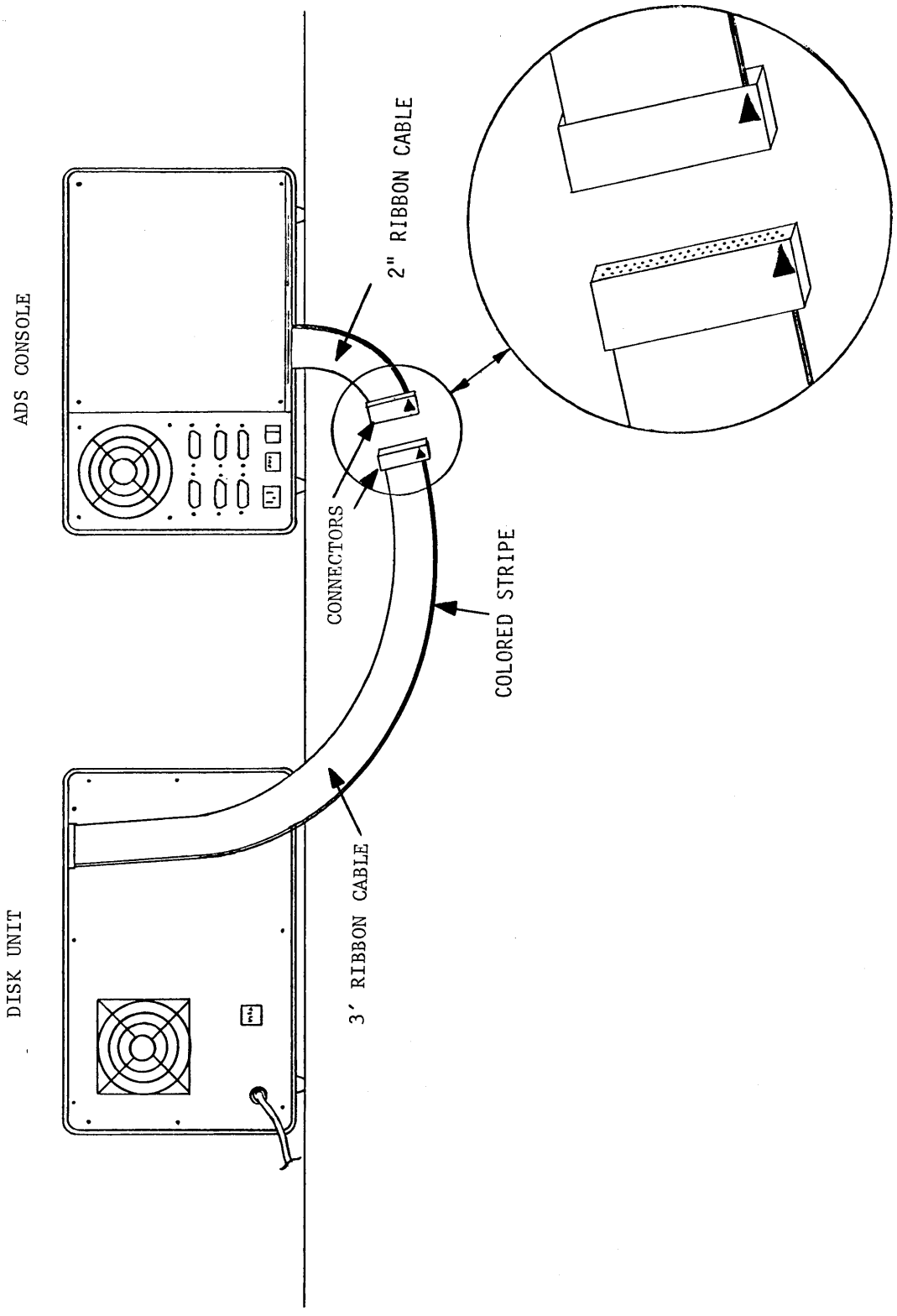


Figure 1-10. I/O Connections

1.5.4 Powering Up the System

> CAUTION
>
> Do not power up (or down) with disk drive doors closed and diskette in the unit. Remove all diskettes from the drives and leave doors open. In case of system faults, consult the troubleshooting chart in Section 6.

a. Turn on the PWR ON/OFF switch located at the rear of the console.

b. On the right side of the CRT screen, two red indicators will light:

   (1) ON indicator

   (2) RUN indicator

c. Turn on the PWR ON/OFF switch located on the front panel of the disk drive.

d. Check the exhaust fans on both cabinets for air flow. The blower motors must be running freely.

e. Open both sliding disk access doors and look inside both openings. The spindles in both disk drives must be rotating.

f. Check the CRT screen. Boot message, and blinking cursor must appear at the top of the screen. See Figure 1-11, Boot Message.

g. Adjust the screen intensity as necessary, using the knob protruding from the underside of the console below the keyboard, on the right side. See Figure 3-5

h. If the Boot message does not appear, press the LOAD key located in the right upper corner of the keyboard. If the Boot message still does not appear, consult the troubleshooting charts in Section 5.

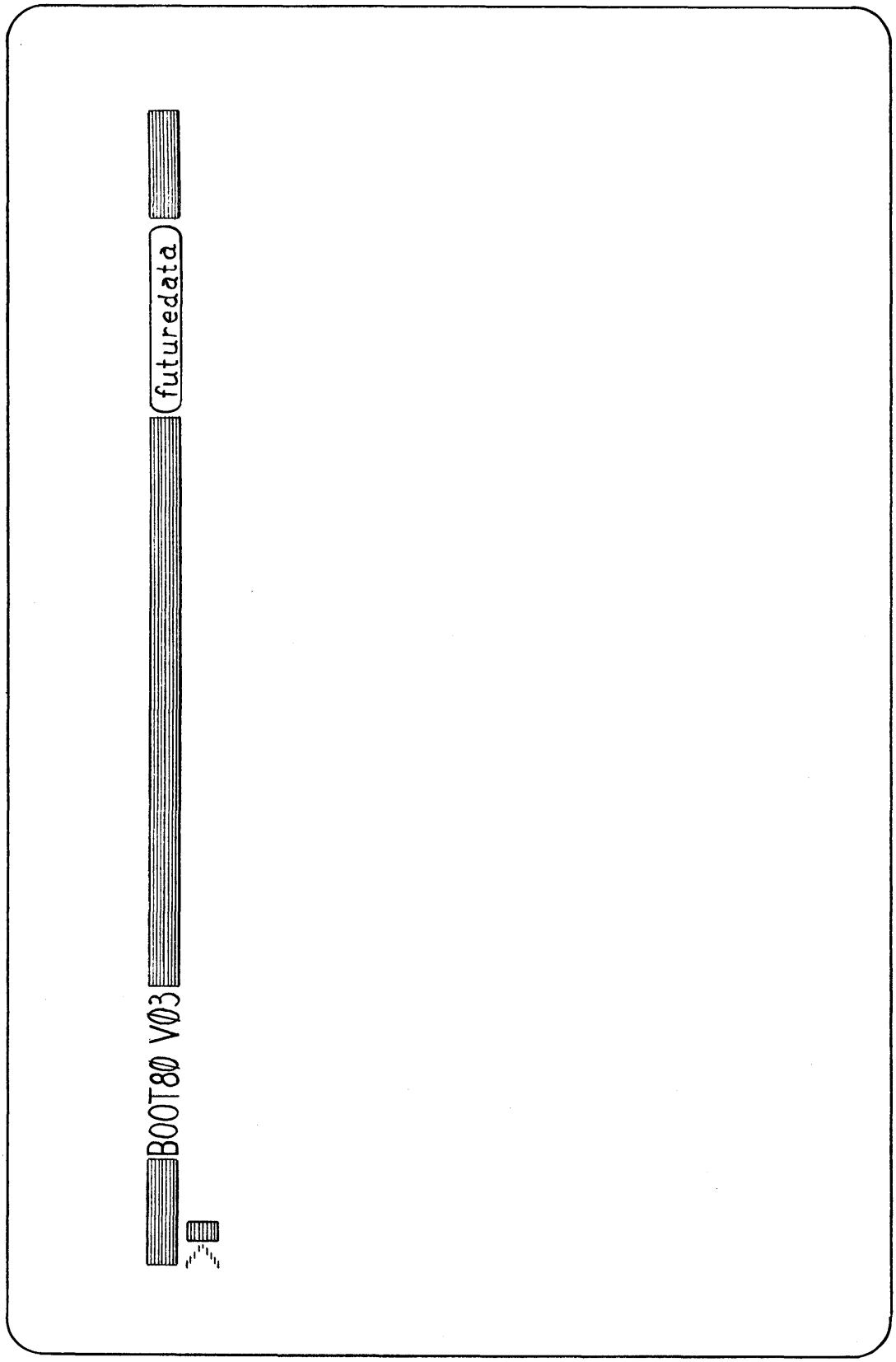


Figure 1-11. Boot Message

1.6 INITIAL SYSTEM OPERATION

1.6.1 Loading the Diskette

Using Figure 1-12, Loading the Diskette, as a guide, insert the RDOS system diskette into drive 0 with the label to your right. Push the diskette all the way in until it stops and locks in place. Close the door.

1.6.1.1 DISKETTES

An example of diskettes in use are the Shugart SA100 and SA101. The SA100 is manufactured without a write inhibit notch. If write inhibit is desired the diskette must be notched. When the write protect notch is open, the diskette is protected; when covered by a tab, writing is permitted.

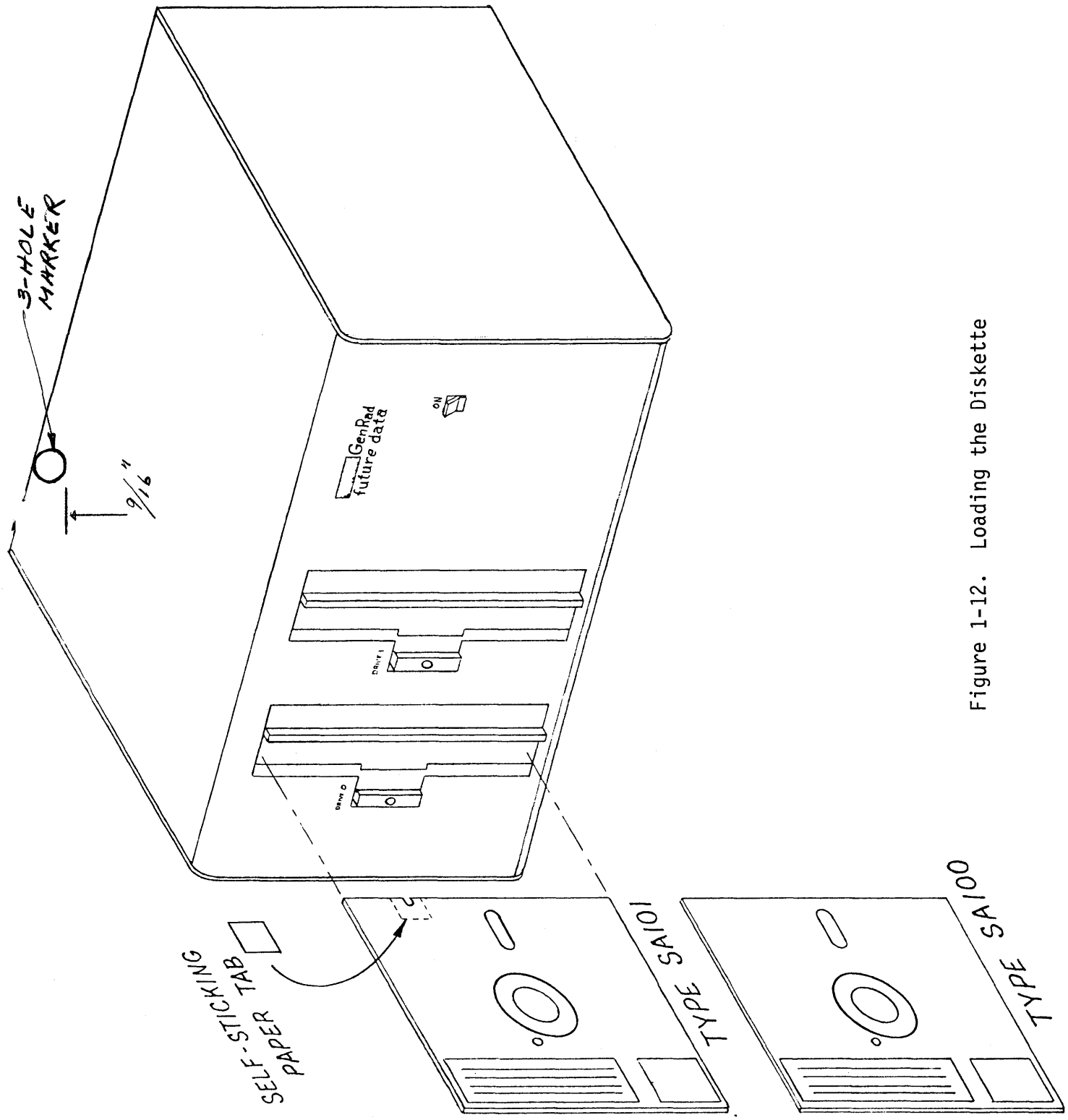


Figure 1-12. Loading the Diskette

1.6.2 Checking for System Programs

1.6.2.1 CONVENTIONS

The following conventions are used in this section:

Letters. Commands and statements are printed in upper case and must be typed exactly as shown.

Keys. If a special character key is required, it will be inclosed in < and >. (eg. <RETURN> is return key).

1.6.2.2 Enter JM<RETURN>.

1.6.2.3 Observe the CRT screen. The display must show MANAGER Vnn at the upper left, a part of the logo. For example, MANAGER V02 or MANAGER V03.

1.6.2.4 Enter D<RETURN>. This lists the diskette directory. See example in Figure 1-0, Typical Directory Display.

```
FILES ON DRIVE 0:                    45 FREE TRACKS


   PW 1 DIR
      1 00-6096-02
    Z 5 ASMRZ80
    Z 2 BINTEL80
    Z 3 DEBUGZ80D
    Z 3 DEBUGZ80L
    Z 3 EDITOR80
    Z 6 ICOM80
    Z 3 LINKER80
    Z 4 MANAGER80
    Z 1 ^CFP80


END OF LIST
```

Figure 1-13. Typical Directory Display

1.6.2.4 Enter the following commands one at a time and observe the CRT display.

JE<RETURN>
JA<RETURN>
JL<RETURN>
JD<RETURN>

After each entry, the manager must display the appropriate logo that includes the name of the system program..

1.6.3 Initialization of New Diskettes

Each new non-ADS diskette must be initialized before it can be used by the system. The initialization process, which takes about 50 seconds per diskette, sets up a directory and defines the sectors on the diskette.

> CAUTION
>
> All information on a diskette is lost during initialization.

1.6.3.1 Load the RDOS diskette in Drive 0.

1.6.3.2 Insert the new diskette in Drive 1.

1.6.3.3 Enter I1<RETURN>. The CRT will display "INITIALIZE DISK IN DRIVE: 1 "SECTOR SPACING 8 ?.

1.6.3.4 Enter Y. The LED on the disk drive push bars will come on and the blinking cursor will disappear. When the LED goes off and the cursor returns to the screen, initialization is complete. The MANAGER will have displayed the directory of the diskette just initialized.

1.6.4 Disk Copy

a. The following procedure will provide a copy of the system disk files in Drive 0 to the new initialized disk in Drive 1.

b. Enter M(Z)*,1: "$"/C <RETURN>. This will start the copy process. During the copy process the manager will display file names and associated data, the cursor leaves the screen and the LEDS indicators will switch between drives 0 and 1. When the cursor returns to the screen and the LEDS are deactivated, the copy parocess has been completed.

c. Enter V*,1:"$"/C <RETURN>. This will start the verification process of matching system files on both diskettes. During this process, the LED indicators will switch between drives 0 and 1. As each file is verified, individual file names will be displayed on the screen. The manager will step through each file and automatically change pages until all files are verified.

d. If a second copy is desired, replace the first copy in drive 1 with another new diskette. Repeat steps 1.6.3.3 through 1.6.4 c.

e. Remove the system diskette from drive 0 and put it away.

f. Move the copied diskette (copy) from drive 1 to drive 0.

g. Enter the following commands one at as time and observe the CRT display to verify the operating system programs were copied. correctly.

1. JE<RETURN>
2. JA<RETURN>
3. JL<RETURN>
4. JD<RETURN>
5. JM<RETURN>

NOTE

The successful completion of diskette initialization and copy, and system file loading portions of your system are operating and ready for use.

SECTION 2 - DOCUMENTATION

2.1 SCOPE

This section provides lists and descriptions of equipment documentation, including schematics and other diagrams. These publications are the most current revisions and are designed to assist GenRad installation personnel and customers in setting up and operating the ADS.

2.2 EQUIPMENT DOCUMENTATION

Each ADS system, including disk units, when assembled and shipped, is furnished with four items of basic documentation:

2300-5000-01 Software Reference Manual (AMDS Reference Manual)

2300-5003-01 Installation/Maintenance Manual

2300-5009-01 System Reference Card

2300-5007 Shugart Disk Manual

The following personality manuals are available for specific emulation operation:

2300-5010 1802 RCA Micromonitor

2300-5013 Z80 Personality Manual

2300-5015 8080/85 Personality Manual

2300-5016 6800/02 Personality Manual

2.3 SHIPPING AUTHORIZATION

Each system or peripheral device shipped to a site is accompanied by the following forms:

a. Quality Assurance Check List.

b. Installation/Quality Report.

c. Certificate of Acceptance.

d. User Registration Card.

2.3.1 Quality Assurance Check List.

The Quality Assurance Check List describes the configuration of the GenRad/DSD products included with each shipment. The form is signed and dated by factory representatives. A column is provided for the customer to check off items as received which should match those shipped. In case of any discrepancy, contact your GenRad/DSD representative. See Figure 2-1, Quality Assurance Check List.

GENRAD/DSD

QA CHECKLIST

TOP ASSEMBLY NO: 2300-9403 SOFTWARE/HARDWARE STATION

CUSTOMER: GENRAD S/O NO: 0000

ADS S/N: 0000 FD-2 S/N: 0000 VOLT: 110V 60HZ

CONFIGURATION		REV	S/N	AS RECEIVED
2300-4711	Z80 CPU	___	___	___
2300-4720	4ea. STATIC RAM	___	___	___
2300-3000	CARDLESS MAINFRAME	___	___	___
2300-4000	DUAL DRIVE	___	___	___
2300-4724	CRT/KBRD/IO CONTROL BOARD	___	___	___
2300-4712	Z80 EMULATOR	___	___	___
2300-4713	Z80 EMULATOR PROBE	___	___	___
2300-3004	VERSION LOGIC ANALYER COMPLETE	___	___	___
2300-4753	POD	___	___	___
2300-4730	/A/	___	___	___
2300-4731	/B/	___	___	___
2300-4732	/C/	___	___	___
2300-4008	PROBE	___	___	___
2300-4725	MULTIPURPOSE I/O	___	___	___
2300-4705	DEBUG BOARD	___	___	___
2300-6096	SYSTEM RDOS	___	___	___
2300-6097	UTILITIES SOFTWARE	___	___	___
2300-6098	DEBUGGER SOFTWARE	___	___	___
2399-4000	2704/08 PROM PROGRAMMER	___	___	___
2399-4001	2716/32 PROM PROGRAMMER	___	___	___
2300-5002	EMULATOR REFERENCE MANUAL	___	___	___
2300-5004	LOGIC ANALYZER MANUAL	___	___	___
2300-5000	ADS OPERATIONAL REFERENCE MANUAL	___	___	___
2300-5001	PROGRAMMING REFERENCE MANUAL	___	___	___
2300-5003	HARDWARE REFERENCE MANUAL	___	___	___
2300-5013	PERSONALITY MANUAL	___	___	___
2300-5009	SYSTEM REFERENCE CARD	___	___	___
2300-5007	FLOPPY DISK HARDWARE MANUAL	___	___	___
2300-	REGISTRATION CARD	___	___	___

ACCEPTED BY:_____ DATE:_____

PACKED BY:_____ DATE:_____

Form QC100-F

Figure 2-1. Quality Assurance Check List

2.3.2 Completion Guide and Installation/ Quality Report

The completion guide shown in Figure 2-2, defines the areas to be filled in on the Installation/Quality Report. A blank Insallation/Quality Report, with circled numbers, is illustrated in Figure 2-3. The circled numbers correspond with those on the Completion Guide.

Figure 2-2. COMPLETION GUIDE

1	ADDRESS	Completed by GenRad/DSD during final inspection.
2	SHIPPING DATA	Completed by GenRad/DSD during final inspection.
3	DATES RECEIVED AND INSTALLED	Completed by Field Installation Personnel
4	SHIPPING CONDITION	Completed by Field Installation Personnel. Comments are required for poor responses.
5	ADDITIONAL COMMENTS	Remarks by the installer or customer are appreciated regarding quality, operation, etc.
6	INITIALS OF INSTALLERS	

GenRad

SHIPPED TO:

FIRM (1)

ADDRESS

CITY/STATE/ZIP

INSTALLATION/QUALITY REPORT

GR FINAL INSPECTION PERSONNEL *(Complete the following)*

CATALOG NO. _____ DATE SHIPPED _____

DESCRIPTION (2) _____ SERIAL NO. _____

SALES ORDER NO. _____ FINAL INSPECTOR _____

GR INSTALLATION PERSONNEL

Please complete the following by checking the appropriate response. Your comments (or explanations) are needed whenever a "poor" response is made or items are missing.

DATE RECEIVED (3) _____

DATE INSTALLED _____

SHIPPING CONDITION (4)

Physical Appearance	☐ GOOD	☐ FAIR	☐ POOR
COMMENTS _____			
Order Contents	☐ COMPLETE	☐ ITEMS MISSING	
COMMENTS _____			
Mechanical Condition	☐ GOOD	☐ FAIR	☐ POOR
COMMENTS _____			
Electrical Operation	☐ GOOD	☐ FAIR	☐ POOR
COMMENTS _____			
Documentation	☐ GOOD	☐ FAIR	☐ POOR
COMMENTS _____			

ADDITIONAL COMMENTS (5) _____

(FOLD/SEAL/MAIL UPON COMPLETION) (6)

Figure 2-3. Circled Installation/Quality Report,

GenRad

INSTALLATION/QUALITY REPORT

SHIPPED TO:

EDDY CURRENT CO.
FIRM

0101 GRAM CIRCLE
ADDRESS

NORTH HARBOR, ALASKA
CITY/STATE/ZIP

GR FINAL INSPECTION PERSONNEL *(Complete the following)*

CATALOG NO. 2300-9903 DATE SHIPPED 2-2-79

DESCRIPTION ADS FD Z80 64K SERIAL NO. ADS 9990 FD8-6901

SALES ORDER NO. 3968 FINAL INSPECTOR CONSTANCE

GR INSTALLATION PERSONNEL

Please complete the following by checking the appropriate response. Your comments (or explanations) are needed whenever a "poor" response is made or items are missing.

DATE RECEIVED 2-10-79

DATE INSTALLED 2-11-79

SHIPPING CONDITION

Physical Appearance	☑ GOOD	☐ FAIR	☐ POOR
COMMENTS			
Order Contents	☑ COMPLETE	☐ ITEMS MISSING	
COMMENTS			
Mechanical Condition	☑ GOOD	☐ FAIR	☐ POOR
COMMENTS			
Electrical Operation	☑ GOOD	☐ FAIR	☐ POOR
COMMENTS			
Documentation	☑ GOOD	☐ FAIR	☐ POOR
COMMENTS	Very pleased with GenRad installation personnel.		

ADDITIONAL COMMENTS

Mike O. Farah, Chief Eng

(FOLD/SEAL/MAIL UPON COMPLETION)

Figure 2-4. Filled-in Installation/Quality Report.

2.3.3 Certificate of Acceptance

The Certificate of Acceptance is a five part, multi-colored, controlled document partitioned as follows:

a. Top copy (white), marked "Accounting".

b. Second copy (white), marked "Customer Copy".

c. Third copy (yellow), marked "Service Department".

d. Fourth copy (pink), marked "Copy".

e. Fifth copy (blue), marked "Regional Office Copy".

A filled in sample copy is depicted in Figure 2-6, Filled-in Certificate of Acceptance.

GenRad

CERTIFICATE OF ACCEPTANCE NO. 03722

ENGINEER Mike O. Farad

REGION FDD

P O NO 3968

SYS TYPE NO. 2300-9903

SYS SERIAL NO ADS 6901

GenRad, Inc. Factory-Culver City Division

I, a duly appointed inspector and authorized representative of Eddy Current, do hereby certify that I have inspected, received, approved and accepted delivery, on behalf of (same) and under Purchase Order No. 3968 the following items of equipment.

INSTALLATION SITE: Eddy Current Co.
0101 Gram Circle
North Harbor, ALASKA

DATE ACCEPTED 2-11-79

DESCRIPTION	MODEL FEATURE	SERIAL NO
ADS FD 780 64K	2300-9903	ADS 6901

ACCOUNTING

The execution of this Certificate will in no way relieve or decrease the responsibility of GenRad for any warranties it has made with respect to the items of Equipment.

SUPPLEMENTAL INFORMATION

Mike O. Farad
(CUSTOMER) INSPECTED AND APPROVED BY

Chief Engineer
TITLE

2-11-79
DATE

THIS IS NOT AN INVOICE

Figure 2-5. Filled-In Certificate of Acceptance

2.3.4 User Registration Card

The User Registration Card is a 3-1/2 X 5-1/2 metered mail post card a detachable flap. The card is filled in by the customer and mailed back to GenRad/DSD. See Figure 2-7, User Registration Card.

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 608 CULVER CITY, CA

POSTAGE WILL BE PAID BY ADDRESSEE

GenRad

futuredata

5730 Buckingham Parkway
Culver City, CA 90230
Attention: Marketing Dept.

USER REGISTRATION CARD

Please print or type.

Firm _____ Address _____

City _____ State _____ Zip _____

Name _____ Dept./Mail Sta. _____

Telephone _____ Ext. ____

Model No. _____

Serial No. _____

☐ Please add my name to your user list to receive newsletters and updates issued.

Figure 2-6. User Registration Card.

2.4 SYSTEM BUS

This bus is wired in parallel to all of the card edge connectors. The edge connector pins, thererfore, have the same signal at all card slots. This feature allows any system module to plug into any card slot, which provides flexibility and eliminates the possibility of error in installing cards. Three DC voltages, +5v, +12v, and -12v are distributed in parallel to all edge connectors.

The signal lines of the bus can be divided into four categories:

(1) Address lines,
(2) data lines,
(3) data control lines, and
(4) system status and control lines.

Refer to Table 2-1, Bus Pin Assignment.

2.4.1 Address Lines

The system bus contains 24 address lines. For 8-bit processors, only the low-order 16 lines are used.

2.4.2 Data Lines

The system provides for a data bus up to 16-bits wide. These lines are bi-directional and accommodate data going to and coming from the CPU. For 8-bit processors, the low-order 8 lines of this bus are used.

2.4.3 Data Control Lines

The data control lines provide information about the signals on the address and data buses, and give timing information which indicates when the other signals are valid.

In particular, the control lines MEM- and IO- indicate whether the address lines contain a memory address or an I/O device address. R/Windicates a read (input) or write (output) cycle. Read and write strobes synchronize transfers on the data bus. The read strobe line (RD-) indicates when the data from the memory or an input device should be enabled on the bus. The write strobe line (WR-) indicates when valid data is available. A ready line (RDY), and delay lines (MEMD1-, MEMD2-) are provided to syncronize the CPU to slower memory.

2.4.4 System Control and Status Lines

System restart and interrupt are controlled by the reset request line (RESRQ-) the bootstrap request line (BOOTRQ-) and the eight interrupt lines (INTRQ0- to INTRQ7-). The reset on the CPU sends out system reset signals (RES-) which are used to clear pertinent logic. The bootstrap line also causes a system reset and invokes the bootstrap loader.

Each of the interrupt lines cause a vectored interrupt, when the CPU's interrupt system is enabled. The eight interrupt lines are priority encoded with line 0 having the highest priority and 7 having the lowest. The interrupt lines cause vectoring to the respective eight restart instruction addresses.

Direct memory access is controlled by the DMARQ- line. When the CPU suspends execution and relinquishes the address, data, and data control lines, the DMAEN- signal provides acknowledgement.

Two status lines are provided; one for interrupts enabled (INTE) and one for halt (HLT-). These lines are used for the operator status displays.

2.4.5 Bus Signal Description

A summary of the function of each bus signal follows. In this summary, inverted signals denoted by a dash (-) are normally at a high logic level, and are taken to a low logic level when active. True signals are normally in the low logic state and are active when high. See Table 2-1, Bus Pin Assignment.

ADDR0-ADDR23	24-Bit Address Bus. ADDR0 is the low-order bit.
DATA0-DATA15	16-Bit Bidirectional Data Bus. All 8-bit versions of the system use only the low-order 8-bits (DATA0=DATA7). DATA0 is the low-order bit.
(SEL0-)-(SEL7-)	Bank Select. The high-order three address bits (ADDR13, 14, and 15) are decoded into 8 select lines to simplify decoding of memory and I/O addresses.
BOOTSEL-	Botstrap Select. Selects the bootstrap PROM.

2.4.5 Bus Signal Description (continued)

MEM	Memory Cycle. Address, data and data control lines are valid for a memory cycle during MEM.

System Control and Status Lines

I/O	Input/Output Cycle. Address, data and data control lines are valid for an Input/Output cycle during I/O.
R/W	Read/Not Write. Read or input cycle when high. Write or output cycle when low.
DEN	Data Enable. Data is transferred on the data bus during DEN. DEN is the "OR" combination of RD and WR.
INTE	Interrupt Enable Status. Indicates that CPU interrupts are enabled.
INTRQ0-INTRQ7	Interrupt Requests. Priority encoded interrupt request lines. INTRQ0 has the highest priority and vectors the program to location 0000. INTRQ7 has the lowest priority and vectors the program to 0038.
DMARQ	Direct Memory Access Request.
DMAEN	Direct Memory Access Acknowledgement.
DMAD151	Direct Memory Access Acknowledgement.
RDY	Ready. CPU runs without delay when RDY line is high.
HLT	Halt Status. Indicates that the processor is in the halt state.

2.4.5 Bus Signal Description (continued)

System Control and Status Lines (continued)

MEMD1	Memory Delay 1. Generates a 1 microsecond delay for slower memory. Delay can be enabled during entire MEM cycle.
MEMD2	Memory Delay 2. Generates a 1.5 microsecond delay for slower memory. Delay can be enabled during entire MEM cycle.
RESQ	System Reset Request. Master reset is generated, synchronized to memory access so that memory cycles are not affected.
BOOTRQ	Bootstrap Request. Activates bootstrap ROM after LOAD.
RES	System Reset. System reset is generated in response to RESRQ or BOOTREQ. It is used to initialize system status registers and flags.
CLK	System Clock. The system clock is 1, 2, or 4 MHz depending on processor.

2.4.5 Bus Signal Description (continued)

NOTES

The following lines are tri-state, have resistor pullups, and are in the high-impedance state during DMAEN':

ADDR0-ADDR23
DATA0-DATA7
MEM-
IO-
R/W-
DEN-
RD-
WR-

The following lines are open collector and have resistor pullups so that they can be wire OR-ed:

(INTRQ0-) - (INTRQ7-)
DMARQ-
RDY

The following lines are standard TTL:

(SEL0-) - (SEL7-)
BOOTSEL
INTE
DMAEN-
HLT-
RES-
CLK-

Table 2-1. GenRad/DSD Bus Pin Assignments

PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
1	GND	34	BOOTSEL-	68	DMARQ-
2	GND	35	MEM	69	DMAEN-
3	+5v	36	IO	70	DMAD151-
4	+5v	37	R/W	71	WR-
5	+12v	38	M1	72	RDY-
6	+12v	39	WAIT (8080 ONLY)	73	MEMD1- (8080 ONLY)
7	-12v	40	DATA0	74	MEMD2- (8080 ONLY)
8	-12v	41	DATA1	75	-
9	HLT-	42	DATA2	76	DBIN (8080 ONLY)
10	ADDR0	43	DATA3	77	SYNC (8080 ONLY)
11	ADDR1	44	DATA4	78	CRTQ-
12	ADDR2	45	DATA5	79	CRTEN-
13	ADDR3	46	DATA6	80	-
14	ADDR4	47	DATA7	81	ADDR16
15	ADDR5	48	DATA8	82	ADDR17
16	ADDR6	49	DATA9	83	ADDR18
17	ADDR7	50	DATA10	84	ADDR19
18	ADDR8	51	DATA11	85	ADDR20
19	ADDR9	52	DATA12	86	ADDR21
20	ADDR10	53	DATA13	87	ADDR22
21	ADDR11	54	DATA14	88	ADDR23
22	ADDR12	55	DATA15	89	MEM H-
23	ADDR13	56	DEN	90	-
24	ADDR14	57	RD	91	RESRQ-
25	ADDR15	58	WR	92	BOOTRQ-
26	SEL0-	59	INTE	93	RES-
27	SEL1-	60	INTRQ0	94	CLK
28	SEL2-	61	INTRQ1	95	-
29	SEL3-	62	INTRQ2	96	HLDA- (8080), 2 (6800 ONLY)
30	SEL4-	63	INTRQ3	97	+5v
31	SEL5-	64	INTRQ4	98	+5v
32	SEL6-	65	INTRQ5	99	GND
33	SEL7-	66	INTRQ6	100	GND
		67	INTRQ7		

SECTION 3 - MAINTENANCE TECHNIQUES

3.1 SCOPE

This section contains maintenance and troubleshooting procedures for the ADS. Included are discussions of general maintenance procedures and the aids which are available to assist in fault isolation, plus specific troubleshooting information pertaining to the static and dynamic RAM memories. Instructions are provided for gaining access to the subsystems of the console.

3.2 MAINTENANCE CONCEPTS

The ADS is designed in such a way that there is a minimal need for preventive maintenance attention. However, certain precautions apply, and these are listed in the preventive maintenance discussion. When the ADS does fail, the repair effort should be directed toward locating the fault, and restoring the system to operation as quickly as possible on site.

As with most devices, a malfunction of the ADS is characterized by its failure to perform one or more of the functions for which it was intended. Unlike simpler systems, however, problems occurring within the system are likely to be difficult to detect and isolate. This is due to the overall complexity of the system and to the fact that control through several levels of software makes establishing a cause-effect relationship difficult.

3.3 TEST EQUIPMENT/ACCESSORIES

A basic kit of test equipment, in addition to the common mechnical and electronic tools and work aids, is required to perform the troubleshooting and maintenance procedures described herein. Some of the following equipment, standard in the microprocessor industry, are essential in performing detailed professional level troubleshooting and maintenance. The list of equipment given is to be used only as a guide and any reference to brand name or model number is of minor consequence.

a. Logic Card Extender (P/N 2300-4700).

b. High quality VOM.

c. A good quality dual trace oscilloscope with about 10ns rise time, operating at 50MHz.

d. Logic Probe (similar to a DP-50 BSK or Global Specialties Corp LP.1).

e. General Electronic Technician Kit that includes but is not limited to:

   1. Test Leads

   2. Various Adjustments Tools

   3. Clamps

   4. Pencil Soldering Iron (about 25 watts)

   5. Cleaning Fluid

   6. Desoldering Tool

f. Other helpful instruments are:

   1. A good temperature probe similar to BSK TP-28.

   2. A good hand-held pulse generator similar to Global's DP-1.

   3. A logic monitor similar to Global's clip-on LM-1 or HP's 548A Logic Clip.

3.4 PREVENTIVE MAINTENANCE

GENERAL

Keeping the hardware in good order is of considerable importance to maintaining an operational and reliable system. The following items should be checked each time some portion of the system is serviced:

a. Ensure that all logic cards and connectors are firmly and accuratly seated in their sockets.

b. Clean all pin surfaces of logic cards (front and back planes) as necessary.

c. Inspect the interior portions of cabinets and subassemblies for dust, foreign matter and corrosion.

d. Check DC power voltages and adjust if required to meet specifications.

e. Ensure that all fans are operational and rotate freely.

f. Clean the viewing surface of the CRT and the inside surface of the protective plastic face cover. The CRT surface should be cleaned whenever a discernable reduction in brightness of the display occurs that is not traceable to electronic defects. Usually, about 500 operational hours between cleaning is the norm.

3.4.1 ADS CONSOLE

Clean the viewing surface of the CRT and the inside surface of the protective plastic face cover. The CRT surface should be cleaned whenever a discernable reduction in brightness of the display occurs that is not traceable to electronic defects. Usually, about 500 operational hours between cleaning is the norm.

3.4.2 DISK UNIT

Details of preventive maintenance operations are listed in Table 3-0. Perform only those operation listed for that PM period. Refer to SA800/801 Diskette Storage Drive Maintenance Manual for further details. Preventive maintenance assumes normal usage.

Table 3-0. DISK UNIT MAINTENANCE

UNIT	FREQ (MONTHS)	ACTION	OBSERVE
Read/Write Head	12	Clean Read/Write Head ONLY IF NECESSARY	Oxide build up
R/W Head Load Button	12	Replace	
Stepper Motor and Lead Screw	12	Clean off all oil, dust and dirt	Inspect for nicks and burrs
Belt	12	Clean	Frayed or weakened areas
Base	12	Clean base	Inspect for loose screws, connectors and switches
Read/Write Head	12	Clean	Check for proper alignment

3.5 SYSTEM TROUBLESHOOTING PROCEDURES

3.5.1 Manual Troubleshooting

3.5.1.1 Approaches to Troubleshooting

If machine assisted troubleshooting, such as automatic testing, is not possible, other alternate approaches may be used. These approaches include, but are not limited to, the following:

a. The use of conventional test equipment such as oscilliscope and meters.

b. Physical examination of the suspected units, subassemblies, or components.

c. Static testing.

3.5.1.2 In addition to these approaches, and before starting to troubleshoot any faults, the maintenance person should have a definite sequence, or set of objectives in mind. A typical sequence should contain the following elements of reason:

a. Define the problem as accurately as possible.

b. Look for obvious solutions. Relate the problem to recent events, such as cleaning, servicing, or the installation of new or replacement parts.

c. Isolate the fault to a functional area.

d. Analyze the isolated area using schematics and appropriate test equipment.

e. Correct the fault through repair or replacement. Take whatever steps are necessary to prevent recurrence.

f. Restore the system to operation.

3.6 SPECIAL CONSIDERATIONS

The following paragraphs discusses a few of the major fault areas and the appropriate troubleshooting philosophy used for rapid solution of problems to get the system back into operation. These discussions are by no means complete and should be used only as a guide. Total knowledge of the system coupled with good field experience are key factors for success in troubleshooting any microprocessor system.

3.6.1 Static Random Access Memory (RAM)

RAM failures in the ADS can produce deviant system behavior. The system will either fail completely or may result in unreliable operation. An effective way of troubleshooting RAM is by relacing RAM boards until the problem is solved. This technique can be used as follows:

a. Turn off AC power to the system.

b. Replace the suspected RAM cards with a known good set.

c. Using odd jumpers, rotate RAM cards into and out of suspected locations.

d. Turn on AC power to the system.

e. Check the system for proper operation.

f. If the problem clears up, start replacing each good RAM card with a corresponding old one, one by one. Always turn power off when inserting or removing cards.

g. Continue this process until you have isolated the defective RAM cards.

3.6.2 Dynamic Ram

Dynamic RAM troubleshooting is handled by removal and replacement of a single card. However, it should be noted that a faulty refresh circuitry is a special factor to consider in diagnosing apparant dynamic RAM failures.

3.6.3 Console Power Supply

The power supply for the ADS console is a regulated DC power supply that is filtered when operating normally. It produces a regulated +5 volts at 12 amps, +12 volts at 1.7 amps, and -12 volts at 1.0 amps, which supply all console operations.

A very important technique for power supply troubleshooting is to use a scope to check for a smooth DC output voltage. All DC supply lines should be monitored to catch spikes if transient voltage is a suspected cause of logic failure.

3.6.4 Console Keyboard

Keyboard problems can be roughly divided into two parts; mechanical and electrical. The most common mechanical faults consist of sticking or bouncy keys.

The recommended procedure for cleaning the key tops consist of spraying a prime grade commercial foam cleaner such as ENZY. The keytops can then be scrubbed using a soft brush.

Dirty or sticky key contacts can be remedied by cleaning with isopropyl alchohol and blowing out the contacts.

Some common electrical, or related, problems are: no DC power, defective address decoder (not feeding signals to the keyboard), shorts in the keyboard matrix, or broken interconnect cables.

The entire keyboard should be replaced if it is found to be defective beyond simple field service attempts to isolate and correct the fault.

3.6.5 Console CRT Monitor

There are currently two types of CRT monitors used in the ADS console. However, regardless of type, the CRT monitor has close similarities to some of the basic circuitry used in commercial television receivers. These circuits include their own fused power supply and various control circuits.

The entire monitor should be replaced if it is found to be defective beyond simple field service attempts to isolate and correct operational defects. The monitor is shown in Figure 3-1, CRT Monitor.

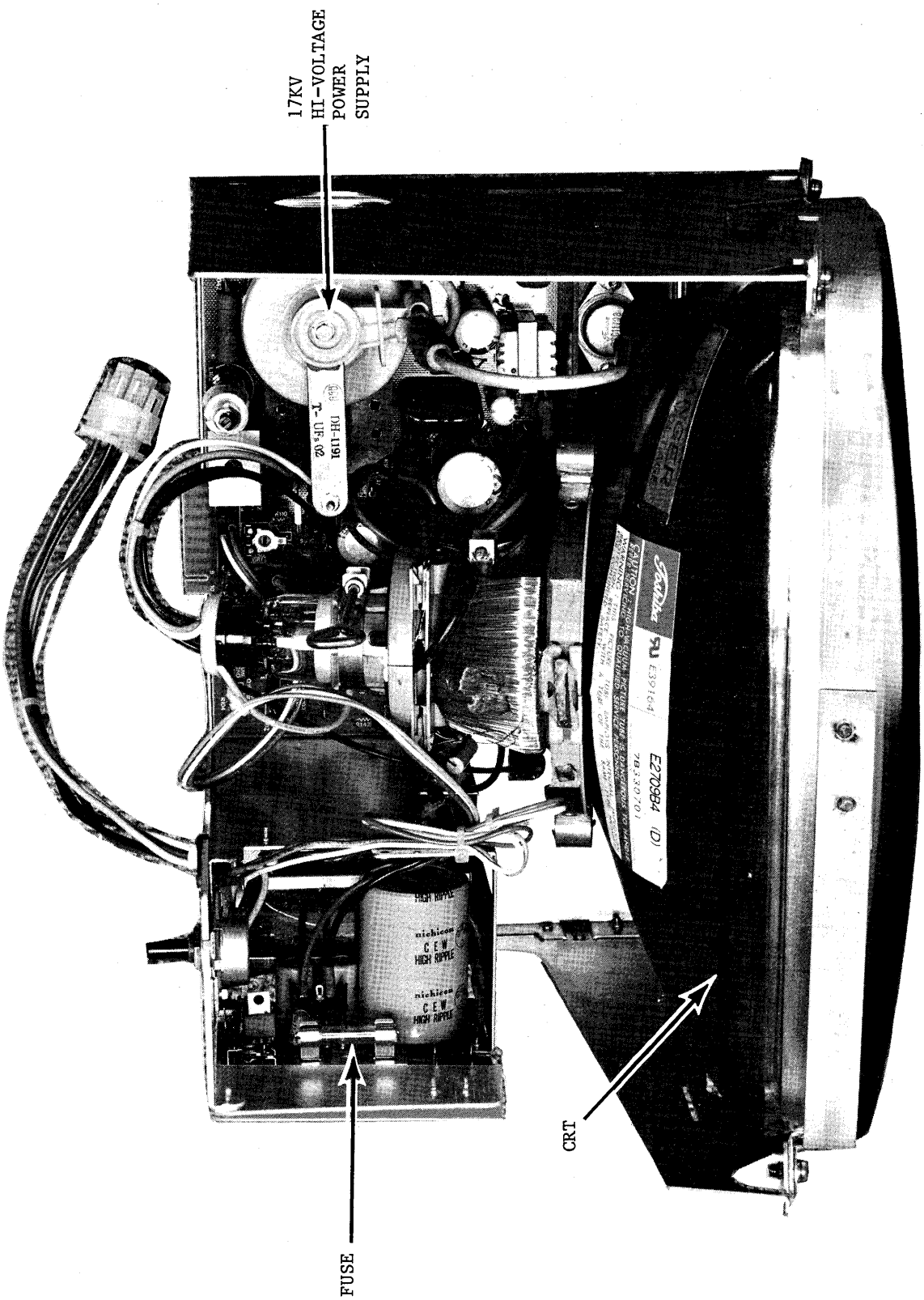


Figure 3-1. CRT Monitor

3.7 REMOVAL OF SUBASSEMBLIES

In the ADS console, there are three major subassemblies which can be readily removed and replaced to facilitate troubleshooting the system. These are:

1) Power supply
2) Keyboard and Front Fan Assembly
3) CRT Monitor Assembly
   (See Figure 3-2, Console Subassembly Locations.)

The following points should be observed when removing subassemblies:

a. Exercise care when unplugging cables to prevent bent pins or damage to wires and other parts.

b. Use padding to protect parts, if necessary, when tipping the console on its side to gain access to screws holding subassemblies in place.

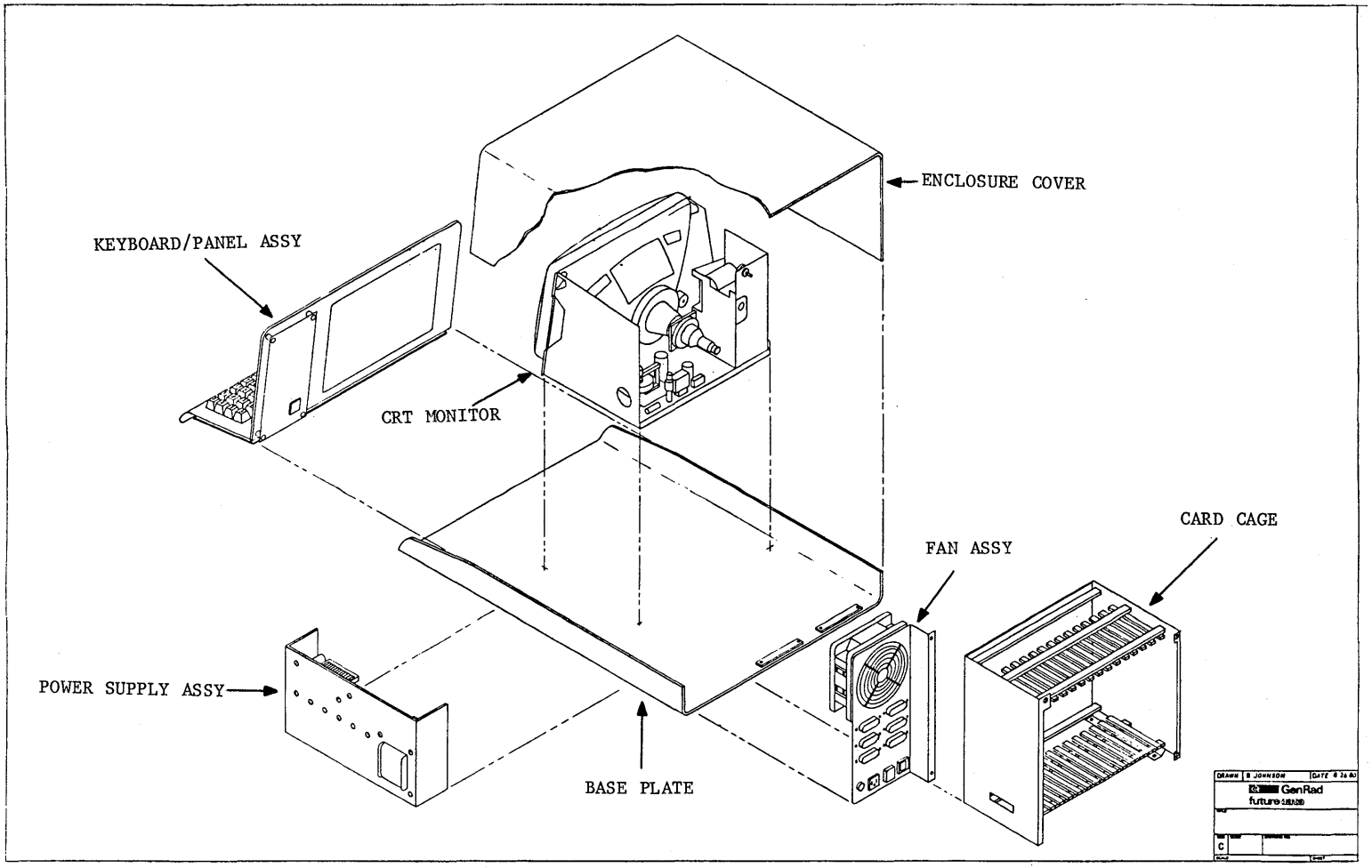


Figure 3-2. Console Subassembly Locations

3.7.1 Removing the Enclosure Cover

a. To remove the cover from the console, first remove the screw in the upper left rear of the cabinet. See Figure 3-3, Retaining Screw Location.

b. Push the cover rearward, at its upper edge in the front, with the heel of the hand. At the same time, lift the cover at the upper edge in the rear and pull back. See Figure 3-4, Removing the Cover.

c. After the cover is removed, access can be gained to the entire inside of the console for subassembly removal.

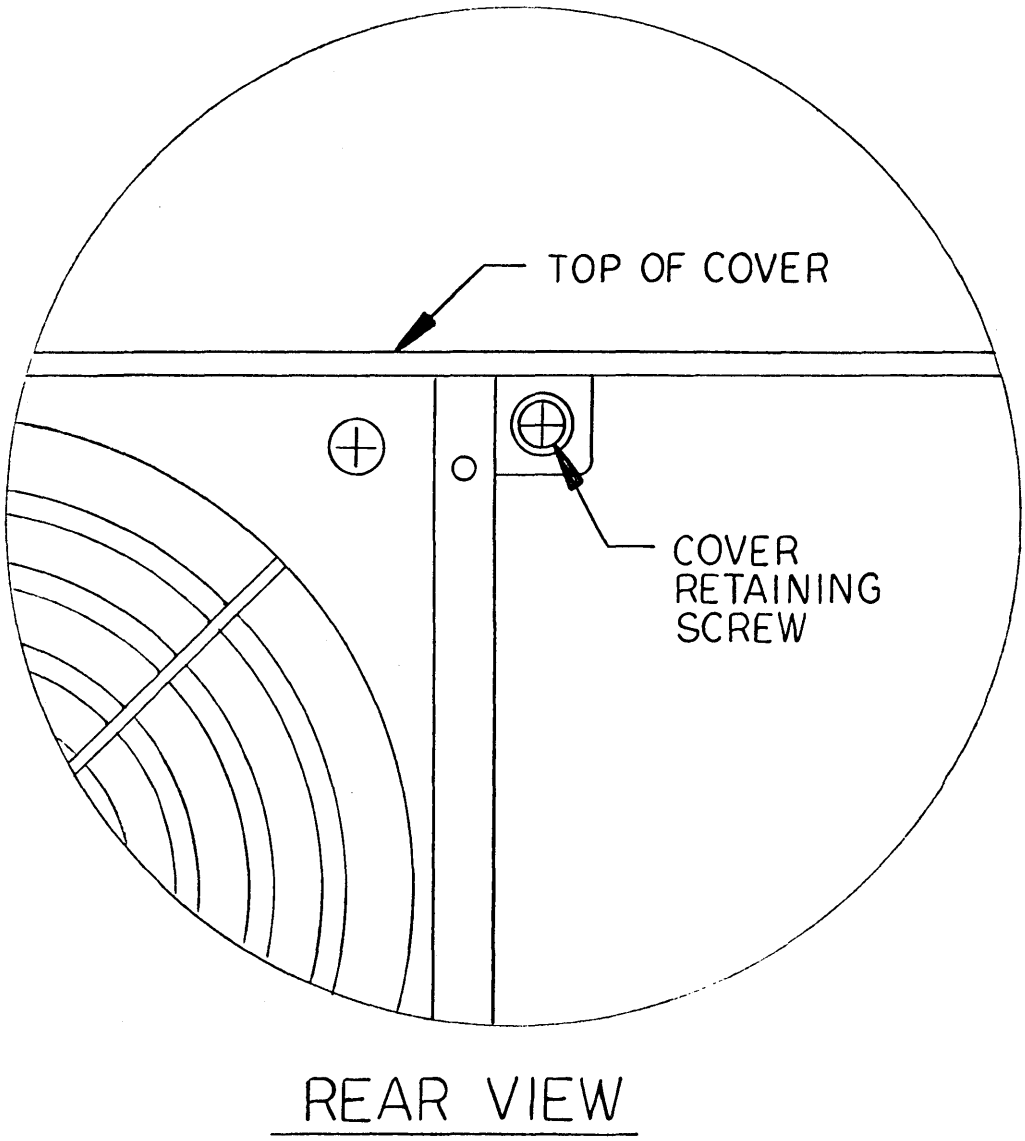


Figure 3-3. Retaining Screw Location

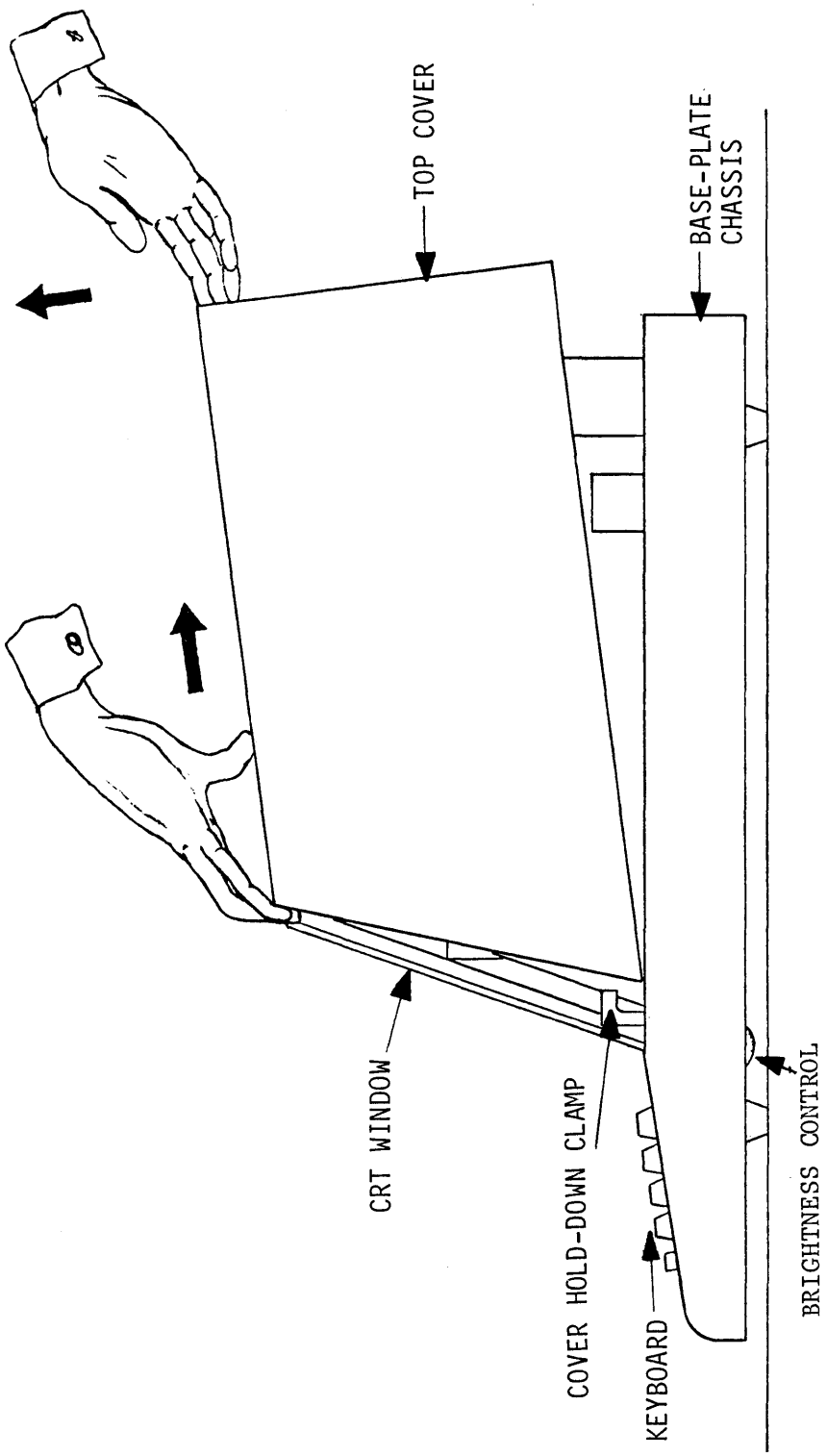


Figure 3-4. Removing the Cover

3.7.2 Removing the Power Supply

a. Unplug these cables and move them aside:

1) The AC power cable (white connector) joining the AC power input to the power supply. This cable consists of black, white, green and red wires.

2) The DC power supply output cable harness (with heavy black sleeving) joining the DC output, through connector J1, to the motherboard at the rear of the card cage.

b. Use a 1/4" hex nut driver and remove the solid red and solid green wires from the power supply frame.

c. Tip the console on its back and remove the four screws holding the power supply in place. See Figure 3-5, Console Bottom View.

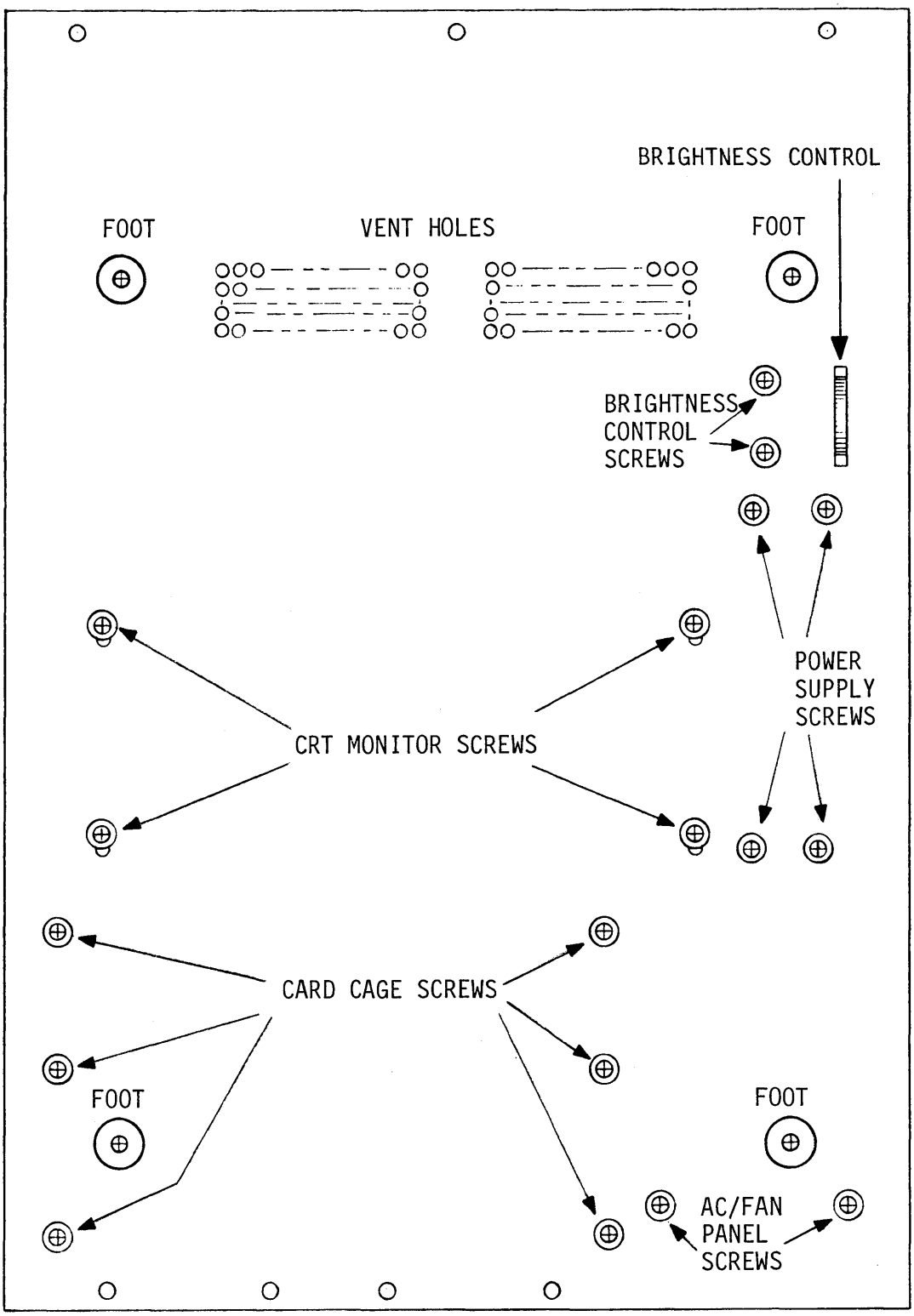


Figure 3-5. Console Bottom View

3.7.3 Removing the Keyboard and Front Fan Assembly

a. Lift the front of the console and tip it back far enough to expose the chassis screws.

b. Remove the three screws holding the keyboard in place.

c. Return the console to its normal upright position.

d. Grasp the keyboard front panel at the sides and pull forward sharply to disengage the spring clips on the keyboard panel from the brackets on the chassis.

e. Pull the keyboard panel forward just far enough to expose the harness cables.

f. Unplug the cables and remove the keyboard panel assembly.

3.7.3.1 To remove the keyboard and control PCB, remove the four screws holding the PCB subassembly to the front panel. See Figure 3-6, PCB Keyboard Subassembly.

3.7.4 Removing the CRT Monitor Assembly

> CAUTION
>
> After turning off AC power to the ADS console, and before removing the CRT monitor, wait a few minutes to allow high voltage residue to bleed through the electronics. Remember that rough handling may cause a CRT to implode due to high vacuum pressure inside the tube. Be careful not to drop, scratch, or nick the glass during troubleshooting, especially the neck or socket area of the tube.

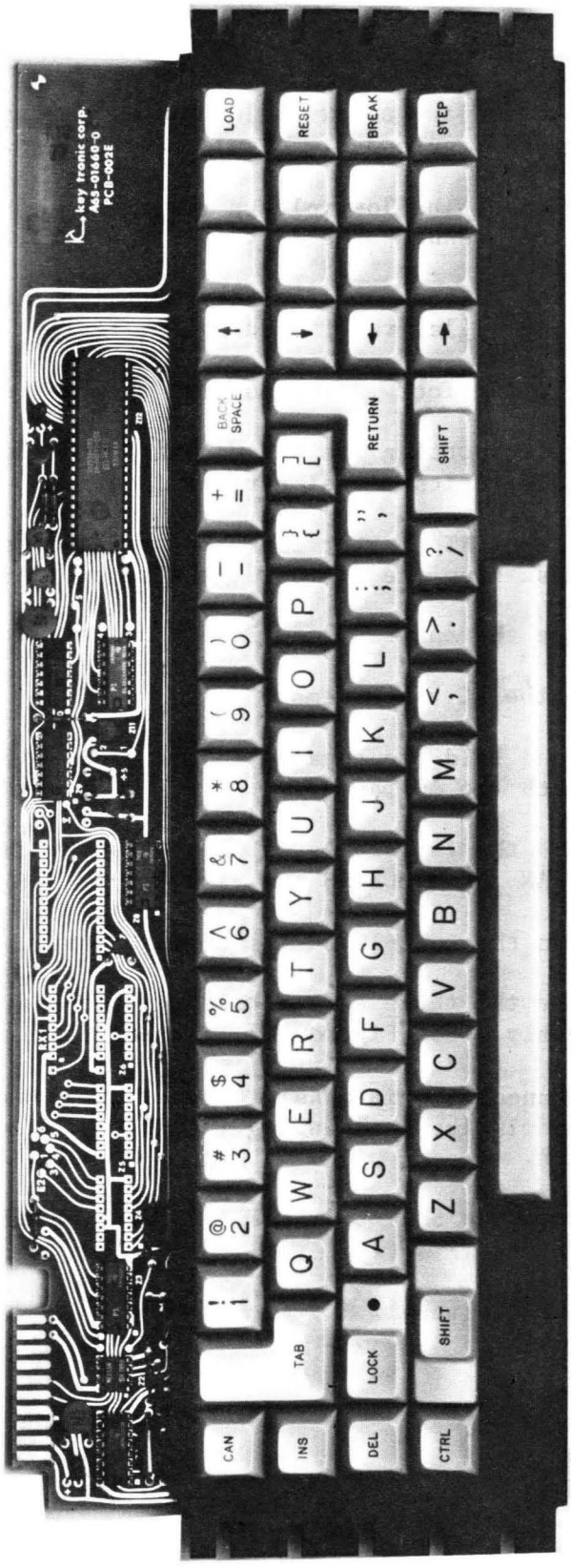


Figure 3-6. PCB Keyboard Subassembly

3.7.4 Removing the CRT MONITOR Assembly (continued)

a. Remove the keyboard.

b. Remove the two screws holding the brightness control in place. Refer to Figure 3-5, Console Bottom View.

c. Disconnect the low voltage power supply cable at the white Amphenol connector near the AC/Fan panel.

d. Lay the console on its side (opposite the logic power supply) on several layers of padding.

e. Remove the four screws holding the CRT monitor in place.

f. While supporting the CRT monitor with one hand, return the console to its normal upright position.

g. Pull the CRT monitor forward a few inches and unplug the cable harness from the circuit board below the CRT.

h. Remove the entire assembly.

3.7.5 Removing the AC Fan Assembly

a. Tip and hold the console to one side to expose the screw beneath the AC panel.

b. Remove the two screws on the bottom of the console labeled "AC/FAN PANEL SCREWS" in Figure 3-6, PCB Keyboard Subassembly.

c. Return the console to its normal upright position.

d. Remove the three screws holding the panel to the card-file assembly. See Figure 3-7, Fan Assembly.

e. Disconnect the internal AC power plug (white translucent Amphenol plug) and unplug the two black wires at the ON/OFF switch.

f. Unscrew the SERIAL 1, SERIAL 2, and PRINTER connectors from the panel.

g. Remove the panel.

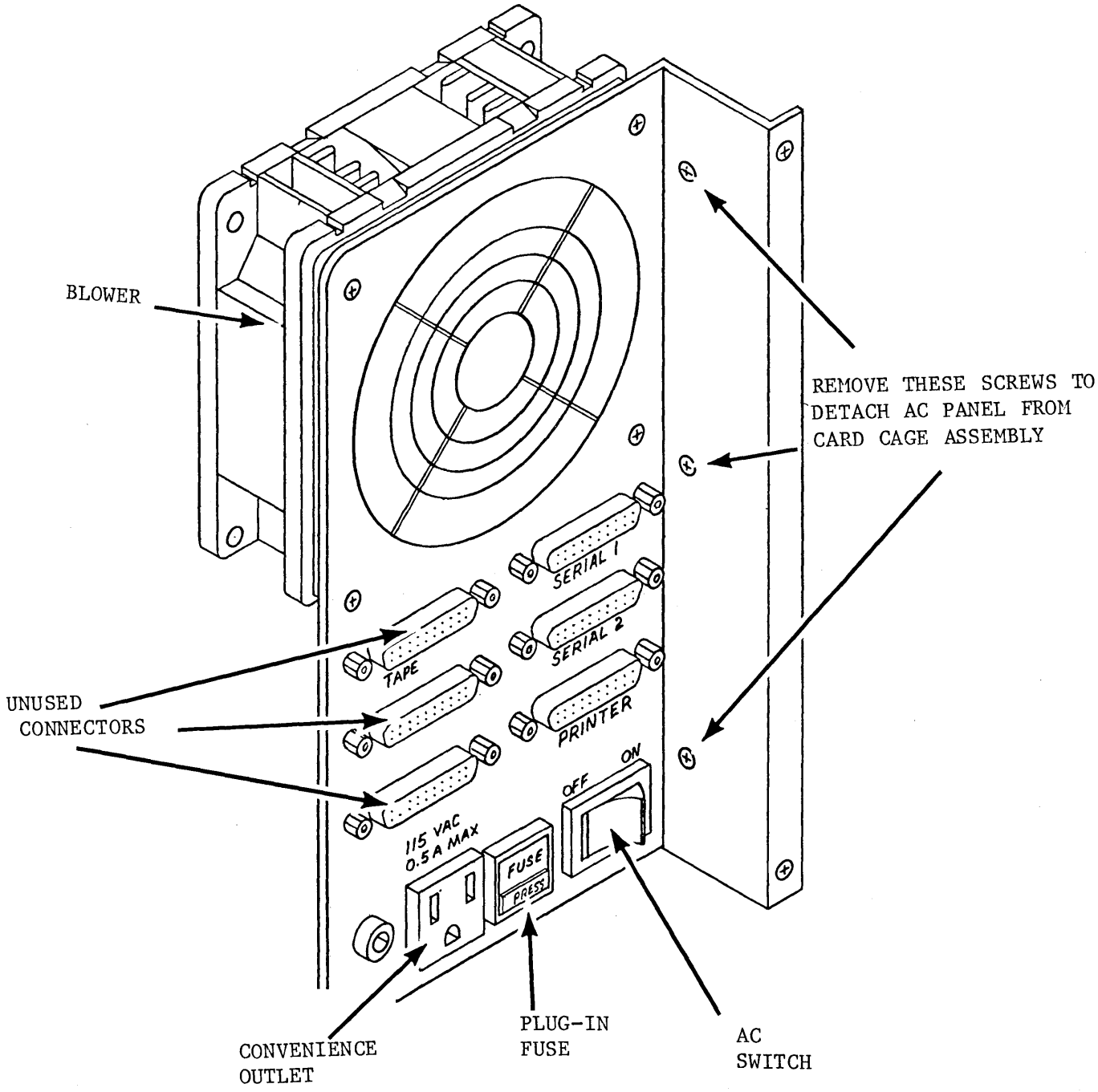


Figure 3-7. Fan Assembly

3.7.5.3 Blower Removal

a. Turn AC power off and unplug the ADS.

b. Remove the enclosure cover.

c. Remove the AC fan assembly.

d. Unplug the AC power cable to the blower (small black cable near the lower outside mounting screw).

e. Remove the blower's mounting screws and nuts.

> NOTE
>
> When replacing the blower, place the recessed side of the grill against the blower. Insert the AC plug in place before putting in the retaining screws.

f. Removal of the remainder of the parts can easily be done once the AC FAN ASSEMBLY has been removed. Use the drawing in Figure f-7, Fan Assembly, as a guide.

3.7.6 Floppy Disk Unit

3.7.6.1 Removal of Top/Bottom Covers

See Figure 3-8, Disk Unit Cabinet Covers.

a. Top Cover

Remove the screws on the lip of the cover at the rear. To remove the cover, lift it up at the rear and pull back. Removing the cover will expose the power supply, blower and dual disk drives.

b. Bottom Cover

1) Rest the unit on its side and remove the three screws on the lip of the cover at the rear.

2) Remove the two screws at the opposite outer edges of the cover. To remove the cover, lift outward and pull back. Removing the cover will expose the control logic on the Micropolis Controller board, the GenRad/DSD DISK I/O INTERFACE board, the flat ribbon and twisted pair cable assembly.

c. To remove the logic boards, unplug the associated cables, then the screws. When removing the connectors, please observe the alignment and general arrangement of the connector and cables.

> CAUTION
>
> Never set the unit upright on its bottom without the bottom cover screwed in place. Remember a flat level surface is essential to prevent stress to the bottom cover and/or subsequent damage to the logic boards and their components.

d. Views of the disk unit, with top and bottom covers removed, are shown in Figures 3-9 and 3-10 respectively.

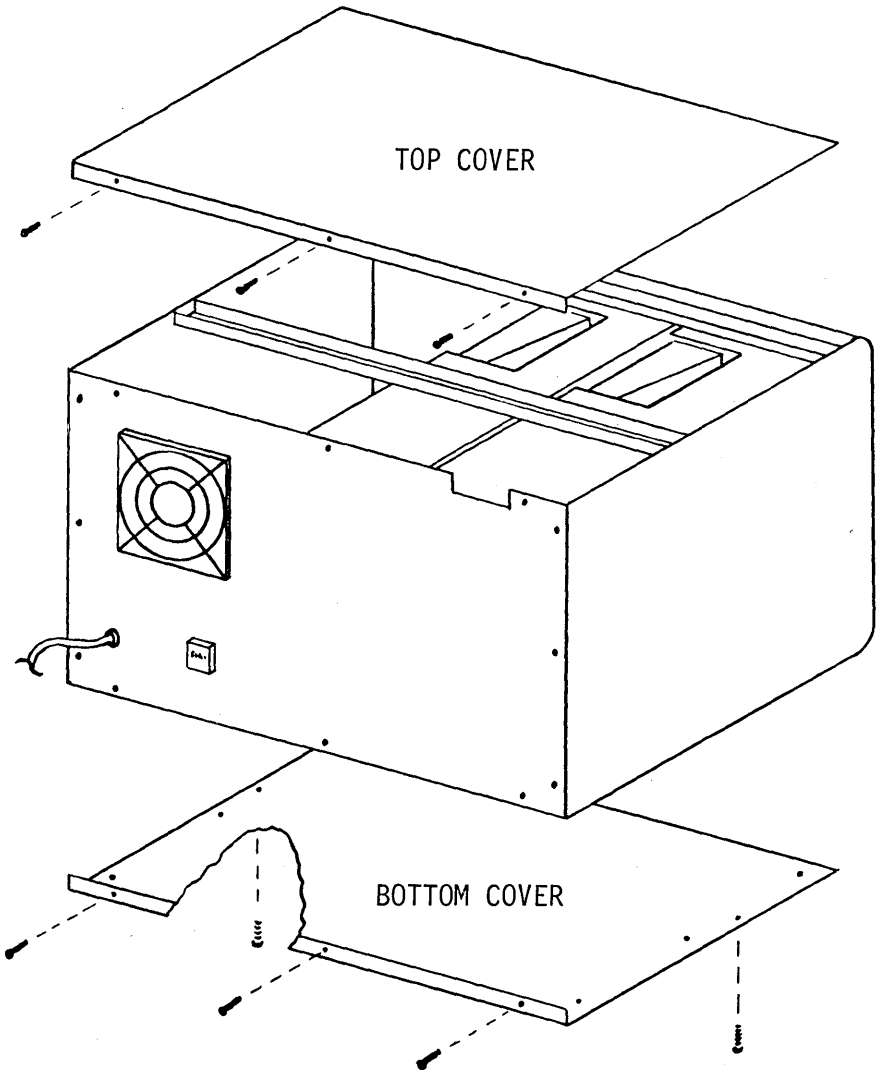


Figure 3-8. Disk Unit Cabinet Covers

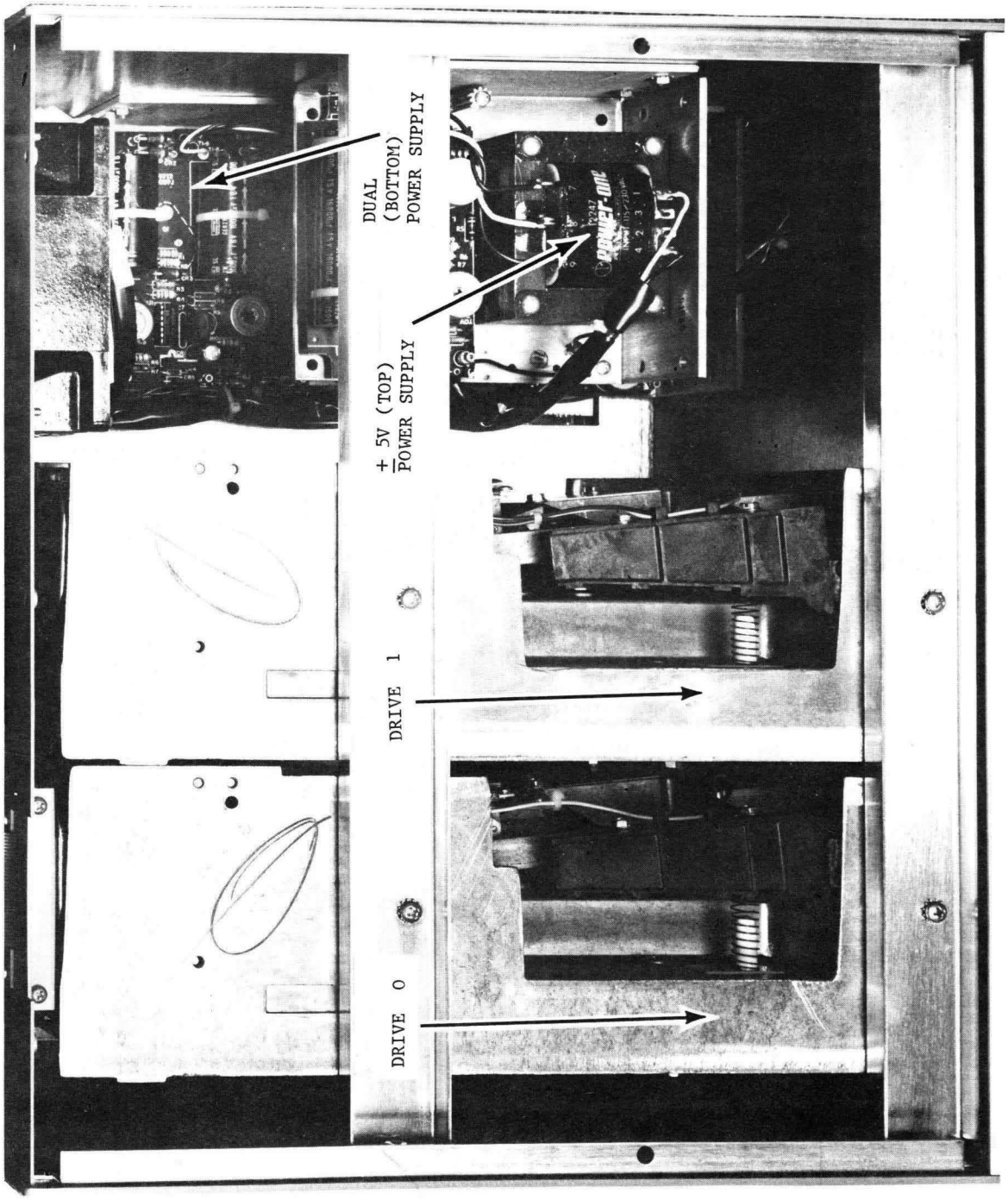


Figure 3-9. Disk Unit (Top View) Cover Removed

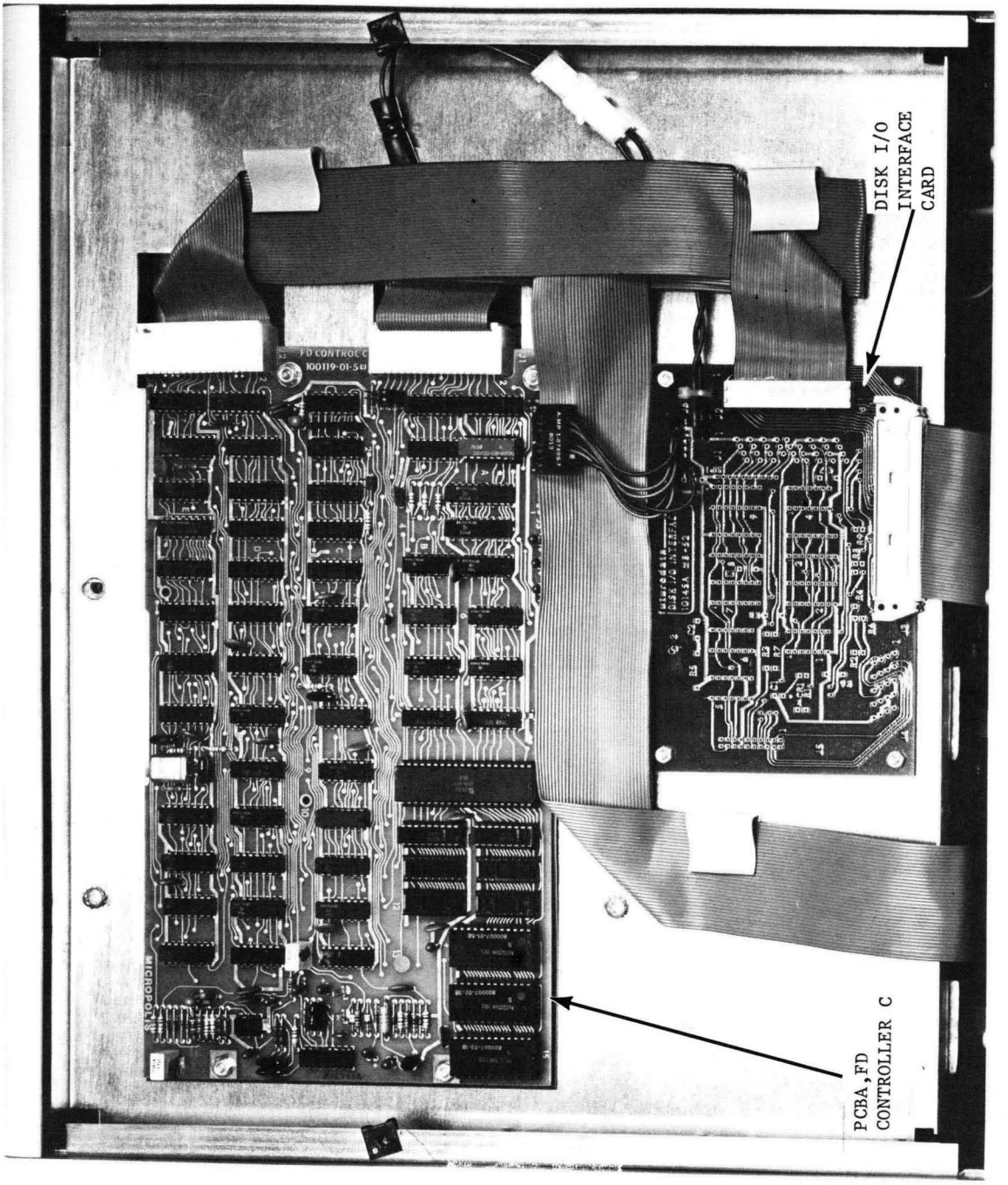


Figure 3-10. Disk Unit (Bottom View) Cover Removed

3.8 Removing/Installing PC Cards

3.8.1 Removing Cards From the Card Cage Assembly

Disconnect any cables from the respective boards and move them aside.

Simultaneously, swing both white plastic card ejectors on their hinges (top one up; bottom one down) to approximate a 90° angle. The card will slide back and separate from the mother board connector. Remove the card by pulling it out.

3.8.2 Installing Cards in Card Cage Assembly

Slide the card all the way in until it stops and rests against the mother board connector. Make sure that the card is indeed in the card rails. Firmly seat the card in the connector by pushing against each card ejector simultaneously until a snap is heard. Replace all cables.

3.9 Card Strapping Information

3.9.1 General

The following pages present strapping information for the various CPUs, ULA interface, and MPIO.

The CPU table provides strapping information for use with and without in-circuit emulation. Six different CPU's are considered. See Table 3-1, CPU Strapping Information.

The ULA table for the six CPUs provide strapping information for use with and without in-circuit emulation. See Table 3-2, ULA Interface Card Jumper Connection.

Table 3-3, Memory Strapping Table, provides information for various card configurations and memory sizes.

3.9.2 CPU Stapping

Strapping data for the six CPUs supported by the ADS are given in Table 3-1, CPU Strapping Information. Jumper points and functions are given for each CPU board. Both in-circuit emulation and no in-circuit emulation data are provided.

3.9.3 Universal Logic Analzyer (ULA) Interface Strapping

Strapping data for the ULA interface board used with the six types of CPU boards are given in Table 3-2, ULA Interface Card Jumper Connection. Strapping data is given when using in-circuit emulation and without in-circuit emulation. There are two types of interface boards: the 2300-4752 for 6800 CPU family and the 2300-4753 for 8080 Series CPU family.

3.9.4 Memory Strapping

To read and apply the Memory Strapping, three selections are made: memory size, board configuration and board type.

For example, first select the memory size on the top row (e.g. 32K MEM), then select the board configuration to make up that memory size (e.g. 16+16 which stands for two 16K boards). Next, select the type board to strap (e.g. 2300-4750 32K Dynamic RAM). Now read across from the board type to intersect the Memory Size and BD Configuration columns. The intersection of these columns depicts the exact strapping requirements (straps on the cards) for specified memory configuration.

TABLE 3-1. CPU Strapping Information

CPU	JUMPER	DESCRIPTION	ICE	NO ICE
8080-1	A, B	CPU CLOCKS	-	X
	C	MEM ENABLE	-	X
	D		N/A	N/A
	E, F	POWER TO BOOT PROM	X	X
8085	A	2 MHz CLOCK		
	B	4 MHz CLOCK	X	X
	C	CPU CLOCK	-	X
	D	DATA ENABLE	-	X
	E	MEM ENABLE	-	X
Z80	E	2 MHz CLOCK		
	F	4 MHz CLOCK	X	X
	G	CPU CLOCK	-	X
	J	DATA ENABLE	-	X
	D	MEMORY ENABLE	-	X
6800	A	MEM ENABLE		X
	B	CPU CLOCK	-	X
	C	CPU CLOCK	-	X
	D	BOOT & RESET REQUEST ENABLE	N/A	N/A
	E	BOOT & RESET REQUEST ENABLE	N/A	N/A
6802	C	CPU CLOCK		X
	M	MEM ENABLE		X
	DMA	BOOT & RESET REQUEST ENABLE	N/A	N/A
	STB	BOOT & RESET REQUEST ENABLE	N/A	N/A

Legend

- = No Jumper

X = Jumper

N/A = Not Applicable

TABLE 3-2. ULA Interface Card Strap Connections

STRAP NAME	6800 No EMUL	6800 EMUL	8080 No EMUL	8080 EMUL	Z80 No EMUL	Z80 EMUL
INT	X	X	X	X		
ICE					X	X
68M	Jumper	Jumper				
STRAP NAME	8085 No EMUL	8085 EMUL	6802 No EMUL	6802 EMUL	8080-1 No EMUL	8080-1 EMUL
INT					X	X
ICE	X	X	X	X		
68M			Jumper	Jumper		

X = Strap required

Jumper = A soldered wire on the card

Strap = Programming Strap (Push-on or socket type)

Logic Analyzer Interface Card:

1. 2300-4752-01 For 6800/02
2. 2300-4753-01 For 8080, 8085, Z80

TABLE 3-3. Memory Strapping

MEMORY SIZE	16K	32K MEM		48K MEM		
BD CONFIG.	16	32	16+16	48	32+16	16+16+16
10143B 10150C (16K PCB)	0 1 5 A6		0 2 1 3 5 A6		4 5 A6	0 2 4 1 3 5 A6
10144A (32K PCB)		5-2 6-3 32K			32K	
10144C* (32K PCB) 10144A (48K PCB)		4 5-2 6-3		 6-5 5-4 48K	N/S	
10144C* (48K PCB)				4 6-5 5-4		
10144A (66K PCB)						
10144C* (64K PCB)						

* - For 6800 systems include strap at position 68.

N/S - NO STRAPS

TABLE 3-3. Memory Strapping, Continued.

MEMORY SIZE	64K MEM					
BD. CONFIG	64	32+32	48+16	32+32	32+16+16	16+16+16+16
10143B or 10150C (16K PCB)			6 A7		4 6 A5 A7	0 2 4 6 1 3 A5 A7
10144A (32K PCB)				32K 32K 5 7 32H	32K	
10144C* (32K PCB)				32H N/S 4 5 32H	N/S	
10144A (48K PCB)		32K 32K 32H	5 48K			
10144C* (48K PCB)		32H * (U) * 32H * (L)	4 5			
10144A (64K PCB)	7 5					
10144C* (64K PCB)	7 5 4					

* - For 6800 Systems include strap at position 68.
N/S - No straps.

*
* - Remove all chips in row #2
*

3.9.5 Multi-Purpose I/O (MPIO) Strapping

Strapping data for the MPIO board used with various peripheral systems are given in Table 3-4, MPIO Board Strapping. There are two separate strapping blocks on the board. A 13-position block numbered 1 through 13, and a 2-position block, numbered 5S and 6S. In addition, strapping requirements are imposed on U18 (QUAD 2-in NAND).

TABLE 3-4. MPIO Board Strapping

System/Prgm Function	Straps Needed	Select Strap	U18 Pin 9 Pin Configuration
ICOM	1, 5, 9, 10, 11	6S	Lift pin 9 of U18
Slave Emulator	2, 3, 4, 6, 7, 8	6S	Install pin 9 of U18
1802 RCA Micromonitor	2, 3, 4, 6, 7, 8	6S	Lift pin 9 of U18
PROLOG PROM Programmer	2, 3, 4, 6, 7, 9	6S	Pin 9 of U18 installed
Data I/O PROM Prgm	1, 5, 9, 10, 11	6S	"
Kontron-PROM Prgm	1, 5, 9, 10, 11	6S	"
Serial Transfer	1, 9	6S	"
Intel Serial Transfer	2, 6, 9, 10	6S	Lift Pin 9 of U18
Network			

3.9.6 Debug Board Strapping

Strapping data for the 2300-4705-01/B DEBUG board is given in Table 3-5, Debug Board Strapping. These requirements are for the new debug board, revision B1 (or higher). All other DEBUG boards require no strapping.

TABLE 3-5. Debug Board Strapping

CPU	SELECT STRAP
Z80 8080 8085	W1
6800 6802	W2

SECTION 4 - MEASUREMENTS

4.1 SCOPE

This section contains measurements to be made whenever diagnostic procedures are performed on applicable portions of the system.

> WARNING - SHOCK HAZARD
>
> Dangerous voltages as high as 17kv are present in the console interior when system power is on. Use extreme caution when measuring voltages with the cover removed. Use normal safety precautions when measuring voltages. Always use the proper test equipment.

4.2 DC VOLTAGES

4.2.1 ADS Logic Power Supply

To test for the proper DC output voltages, proceed as follows:

a. Turn off AC power to the console.

b. Remove the ADS cover.

c. Locate the J1 connector on the power supply control board (white rectangular connector with harness cable joining the motherboard). See Figure 4-1, Power Supply Connector.

d. Obtain a VOM and turn AC power on.

> NOTE
>
> Do not remove J1. Sharp pointed test probes can be inserted through slots in the connector. Do not remove any cards from the card cage.

PIN ASSIGNMENTS	
NUMBER	DESCRIPTION
1	+5V SENSE
2	+5V
6,7,8,12	GND
5	SENSE RET
11	+12V
15	-12V

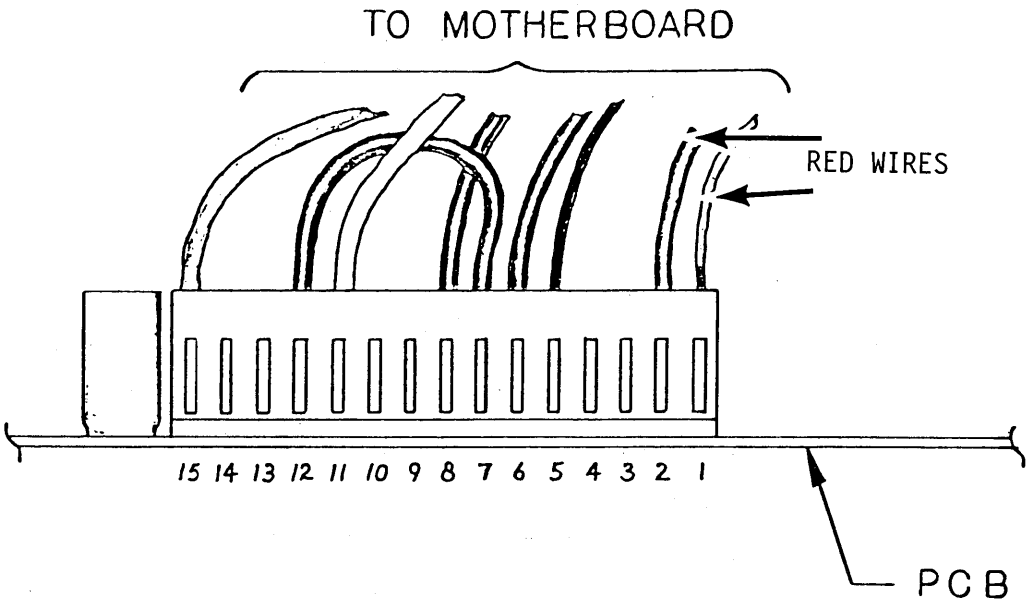


Figure 4-1. Power Supply Connector

4.2.2 Disk Unit Power Supplies

The disk unit is powered by two DC power supplies:

a. Single output ±5VDC/6A

b. Dual output

1. ± 24VDC/3.4A

2. + 5VDC/2.5A and -5VDC/.5A

4.2.2.1 DC Output Measurement

4.2.2.2 Remove the top cover from the disk unit. Refer to paragraph 3.7.6, Floppy Disk Unit.

4.2.2.3 Single output supply (upper board).

With a VOM, measure the output DC voltage at the hollow-stud terminals on the edge of the board. Refer to Figure 4.2, 5VDC Supply Component Layout. The DC output must be between 4.9VDC and 5.1VDC.

4.2.2.4 Dual output Supply (lower board)

With a VOM, measure the output DC voltage at the hollow-stud terminals on the edge of the board. Refer to Figure 4-3, Dual Supply Component Layout.

a. ±24VDC Supply.

The DC output must be betweren 23.9VDC and 24.1VDC.

b. +5VDC.

The DC output must be between 4.9VDC and 5.1VDC.

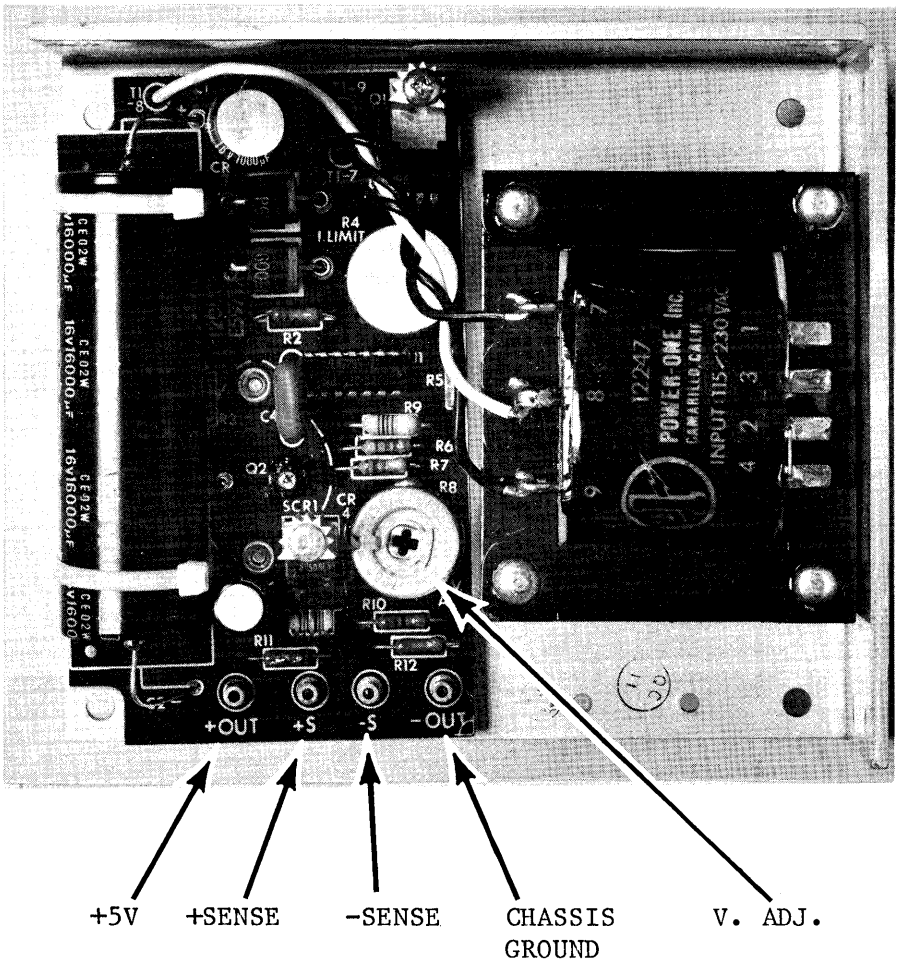


Figure 4-2. 5VDC Supply Component Layout

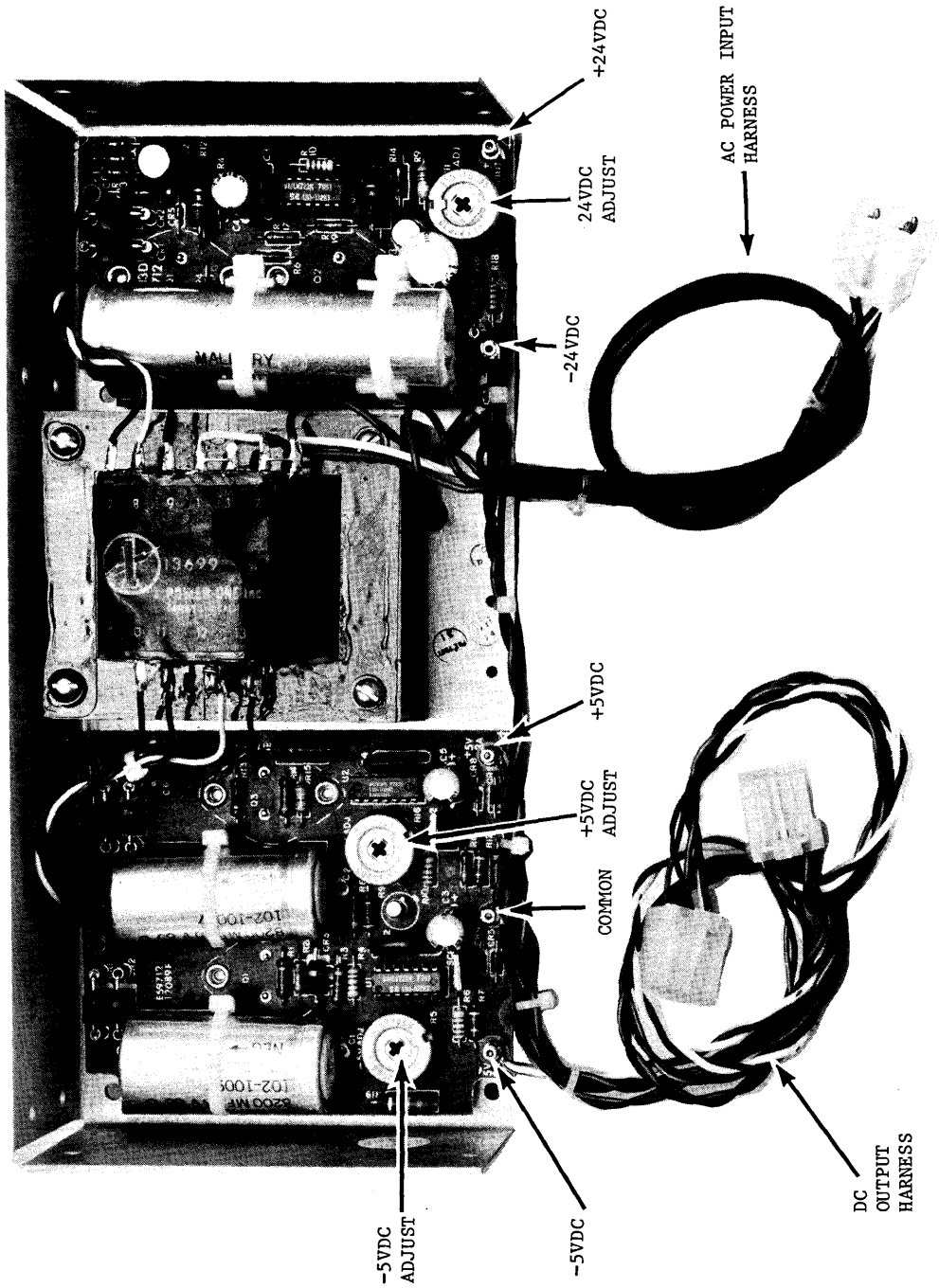


Figure 4-3. Dual Supply Component Layout

SECTION 5 - TROUBLESHOOTING CHARTS

5.1 SCOPE

The troubleshooting charts given in this section provide data on the most probable cause of a given symptom for the suspected defective subsystem(s) under consideration.

Document all probable causes not listed on the chart and forward a copy to your GenRad/DSD service center.

5.1.1 AC Power Circuit

CHART 5-1

ERROR SYMPTOM OR FAULT CONDITION	PROBABLE CAUSE
1. PWR circuit not isolated (shorted).	Defective wiring, blower, connectors, transformer.
2. AC Power circuit open	No fuse, open Power Switch, transformer wiring.
3. Chassis floating.	Defective AC plug, Power Supply, chassis GND wiring.
4. Blowers not rotating.	Defective fuse, open Power Switch, no AC Power, Power Switch off, defective blower.
5. Disk spindle not rotating.	Defective fuse, open Power Switch, no AC Power, defective drive unit.

5.1.2 CRT display and LED indicator

CHART 5-2

ERROR SYMPTOM OR FAULT CONDITION	PROBABLE CAUSE
1. No boot message.	Low brightness adj, CRT defective, keyboard controller board defective, CPU board defective, defective CRT fuse, CRT to keyboard cables.
2. Erratic boot message.	Same as for no boot message, RAM defective.
3. CRT not illuminated.	Defective CRT, defective fuses, open cables, defective Power Supply, low brightness.
4. ON and RUN LED not on.	CRT/KB card, LED module, Power Supply, defective CPU strapping.

5.1.3 Operating System Program Faults

CHART 5-3

ERROR SYMPTOM OR FAULT CONDITION	PROBABLE CAUSE
1. Unable to invoke system program. (e.g., JM, JE, etc. have no effect after powering up console and drives, system diskette in Drive 0 and logo message appearing properly on the CRT.)	Disk drive, disk I/O cable, diskette, RAM, MPIO, CPU, or CRT/KB cards.

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