AT&T 3B20D Model 1 Computer Power Systems Description and Theory of Operation

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1. Overview

1.01 This practice describes the power systems used in the AT&T 3B20D Model 1 computer. This practice illustrates the equipment and discusses the power used in the operation of the computer. The practice contains the following:

(a) Part 1 introduces the practice.

(b) Part 2 describes the physical equipment and AC power requirements.

(c) Part 3 describes the functions of the power equipment.

(d) Part 4 covers theory of operation and is limited to a discussion of power distribution to include the operation of converters and inverters and alarms.

1.02 This practice is being reissued to include information about the Small Computer System interface (SCSI). Since this is a general revision, revision arrows used to denote significant changes have been omitted. The Equipment Tests Lists are not affected.

1.03 The addition of the SCSI feature to the 3B20D Model 1 computer requires the addition of a SCSI disk cabinet. The SCSI disk cabinet may be located up to 100 cable feet from the processor when retrofitted to existing 3B20D computers. The SCSI cabinet is 6 feet tall, 30 inches wide, and 24 inches deep.

1.04 This practice contains no admonishments.

1.05 AT&T welcomes your comments on this practice. Your comments will aid us in improving the quality and usefulness of AT&T documentation. Please use the Feedback Form provided at the back of this practice.

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2. Physical Description

2.01 The AT&T 3B20D Model 1 computer consists of control unit (CU) frames, peripheral controller (PC) frames, moving head disk (MHD) frames, a tape unit frame, and a power distribution frame (PDF). Since the 3B20D computer can support many applications, the quantity of some frames may be increased to meet the needs of a particular office. When additional secondary storage is required, additional MHD frames are added. PC frames are added to increase computer input/output (I/O) capacity. A tape/disk cabinet containing a tape drive and one, two, three, or four 340-megabyte disk drives may be added to or substituted for the MHD frame and tape unit frame. Tape/disk cabinets equipped with up to eight disk drives may also be added. The *UNIX** RTR operating system, release 1 and later, is required for support of the tape/disk cabinet. A SCSI disk cabinet may be added or substituted for the tape/disk cabinet. A SCSI disk cabinet is equipped with two SCSI DFCs and up to sixteen disk drives. The *UNIX* RTR operating system, release 6, is required for the SCSI disk cabinet.

2.02 Frames are 7 feet tall, 26 inches wide, and 24 inches deep. The tape/disk cabinet is 6 feet 4 inches tall, 26 inches wide, and 30 inches deep although some cabinets designed to bolt to the floor are 6 feet tall, 30 inches wide, and 30 inches deep. Two CU frames, two PC frames, two MHD frames, and a tape unit frame make up the minimum system. A typical 3B20D computer office will have frames installed in a 2-aisle lineup. A maintenance terminal and a receive-only printer (ROP) are positioned nearby for manual control, maintenance, and administration.

Control Unit Frame

2.03 Each CU frame (J1C129A) (Figure 1) contains the following units:

- Direct memory access input/output unit (J1C129AA)
- Central CU (J1C129AB)

* Registered trademark of UNIX System Laboratories, Inc.

- Main store module 0 (J1C129AC)
- Main store module 1 (J1C129AD) (optional)
- Cooling unit (J1C129AF)
- Power unit (J1C129AE)
- Four 244C or three 244D power units
- Four fuse units (ED-4C481-30, G4-G7).

2.04 Power is routed from the PDF to the CU frame over six bus pairs (-48 V and RTN). These buses are designated bus A through bus F. Each bus is terminated by a 2-pronged polarized connector at the top of the frame. Power is then routed down the right frame upright to fuses in the power unit (J1C129AE). From power unit (J1C129AE), the -48 V DC power is distributed to power converters (244C/D-, 203A-, and 132-type), cooling units, and the power switch (ABB1). The outputs of the power converters, +5 and +12 V DC, are routed through the four fuse units (ED-4C181-30, G4-G7) to supply power to the various circuit packs.

Peripheral Control Frame

2.05 The PCF can have three configurations (Figure 2): a basic PCF (J1C168A or J1C130B), an input/output processor (IOP) growth frame (J1C136A), or a DFC (gp) growth frame (J1C137A). The PCF contains the following units:

- Input/output processor basic unit (J1C130BA)
- Input/output processor growth unit (J1C130BB) (optional)
- Cooling unit (J1C129AF)
- Port switch unit (J1C130BC) (peripheral control frame 1 only)
- Disk file controller unit (J1C130AC).

2.06 The IOP growth frame (Figure 2) may contain one or two of the following units:

- Input/output processor basic unit (J1C130BA)
- Input/output processor growth unit (J1C130BB)
- Cooling unit (J1C129AF).

2.07 The DFC growth frame (Figure 2) may contain one or two storage module drive (SMD) interface DFC units (J1C130AC). No cooling unit is required in this frame.

2.08 Power for these PFCs is routed from the PDF over four bus pairs (-48 V and RTN). These buses are designated bus A through bus D and each terminates in a two-pronged, polarized connector at the top of the frame. All bus pairs may not be needed when frames are not fully loaded. Each bus is protected by fuses at the inputs to the various power converters, cooling units, or power switches (ABB1s) in the units listed above.

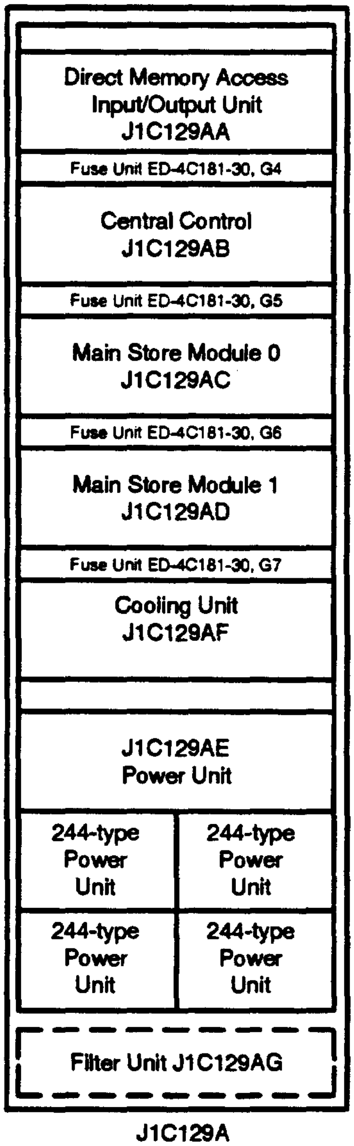


Figure 1. Control Unit Frame

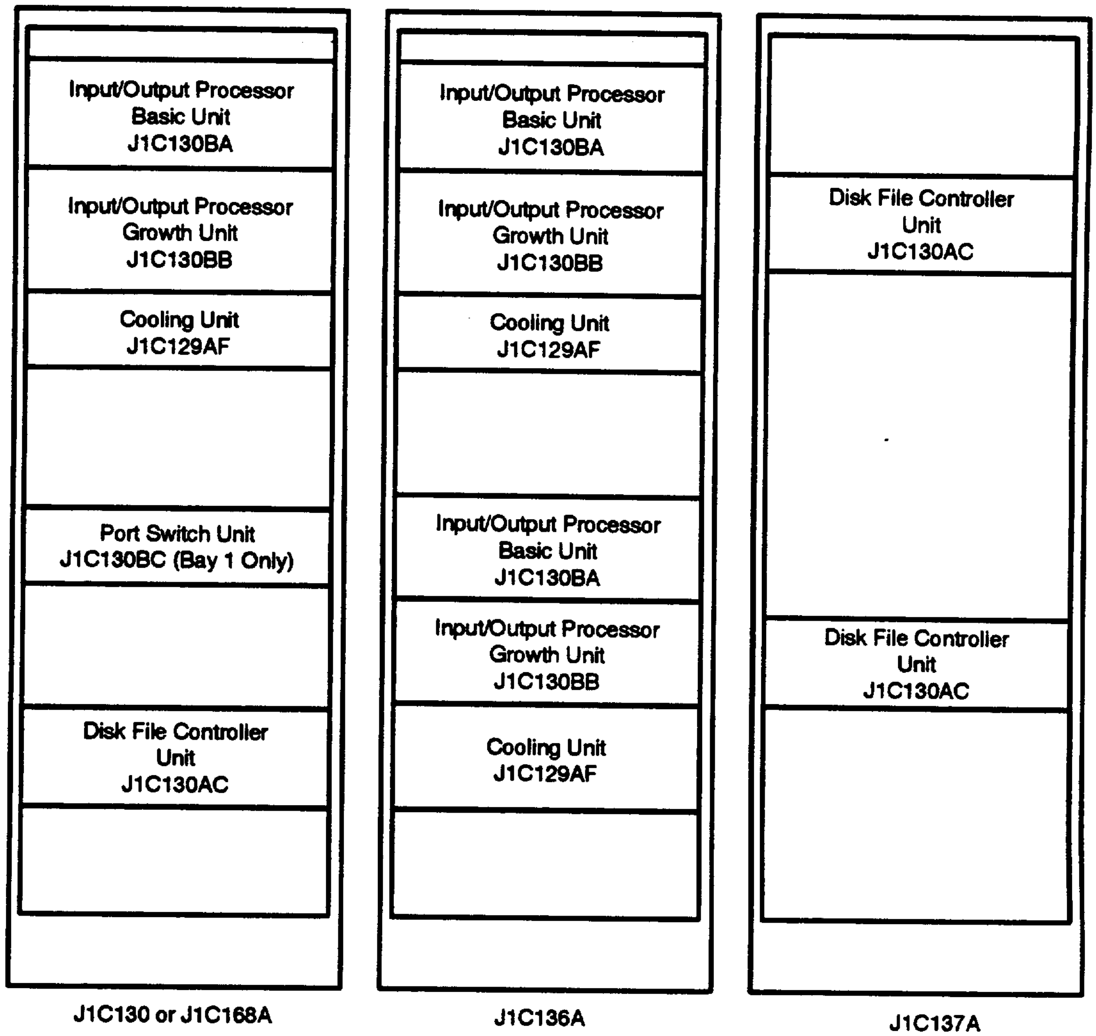


Figure 2. Peripheral Control Frames

Moving Head Disk Frame

2.09 The MHD frame (J1C131B) is shown in Figure 3. The system is capable of using 11 moving head disks on each DFC. The MHD frame contains the following units:

- 2000VA disk file inverter (ED-4C172-30)
- Power CU (J1C131AA)
- 300-megabyte moving head disk (KS-22072 or KS-22707).

2.10 The 2000VA disk file inverter converts a high current -48 V DC directly from the PDF to 208 V AC to power the 300-megabyte disk drive. The power CU also receives a separate -48 V DC from the PDF for internal power to control the disk file inverter. Input power is not fused at the disk file inverter. The fuses on the disk file inverter protect logic circuits.

Tape/Disk Cabinet

2.11 The tape/disk cabinet (J1C186A or J1C192A) can be configured four ways. One configuration consists of a tape drive and two, three, or four disk drives. The second configuration consists of up to eight 340 MB disk drives. The third configuration may be with or without the tape drive and with up to four disk drives. A fourth configuration may contain two tape drives. The common systems office configuration allows two tape drives and sixteen disk drives in three tape/disk cabinets. Two configurations of the tape/disk cabinet are shown in Figure 4. The tape/disk cabinet may be retrofitted into the 3B20D computer to replace or add disk and tape drives. Components of the tape/disk cabinet are listed below:

- Power distribution unit (J1C186AB)
- Tape drive (KS-22762)
- 340-megabyte disk drive (KS-22875)
- Power supply (KS-22997)
- Power switch (ED-4C481).

2.12 Each disk drive requires a power supply and a power switch. The power supply converts -48 V DC to five different DC voltages for disk operation. Each disk has a separate -48 V DC circuit from the power cabinet. The power supply and the power switch are fused separately in the power distribution unit (PDU) at the top of the cabinet. The tape drive requires 120 V AC from a local AC power panel.

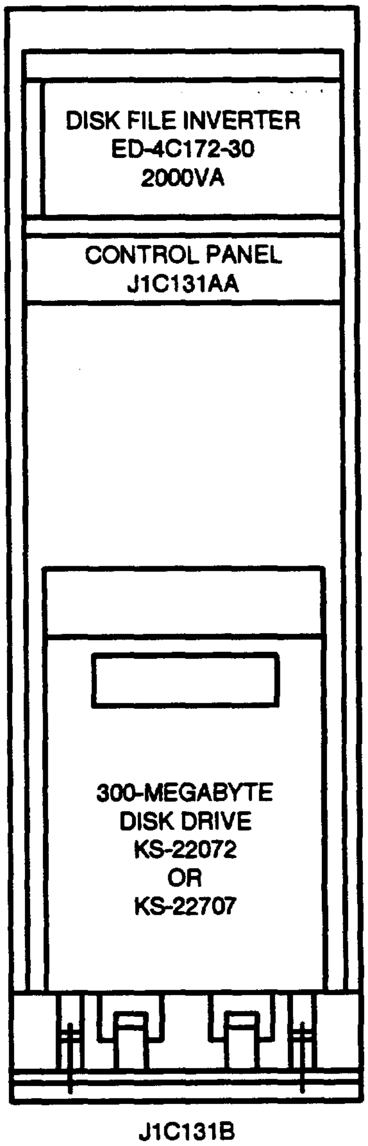


Figure 3. Moving Head Disk Frame

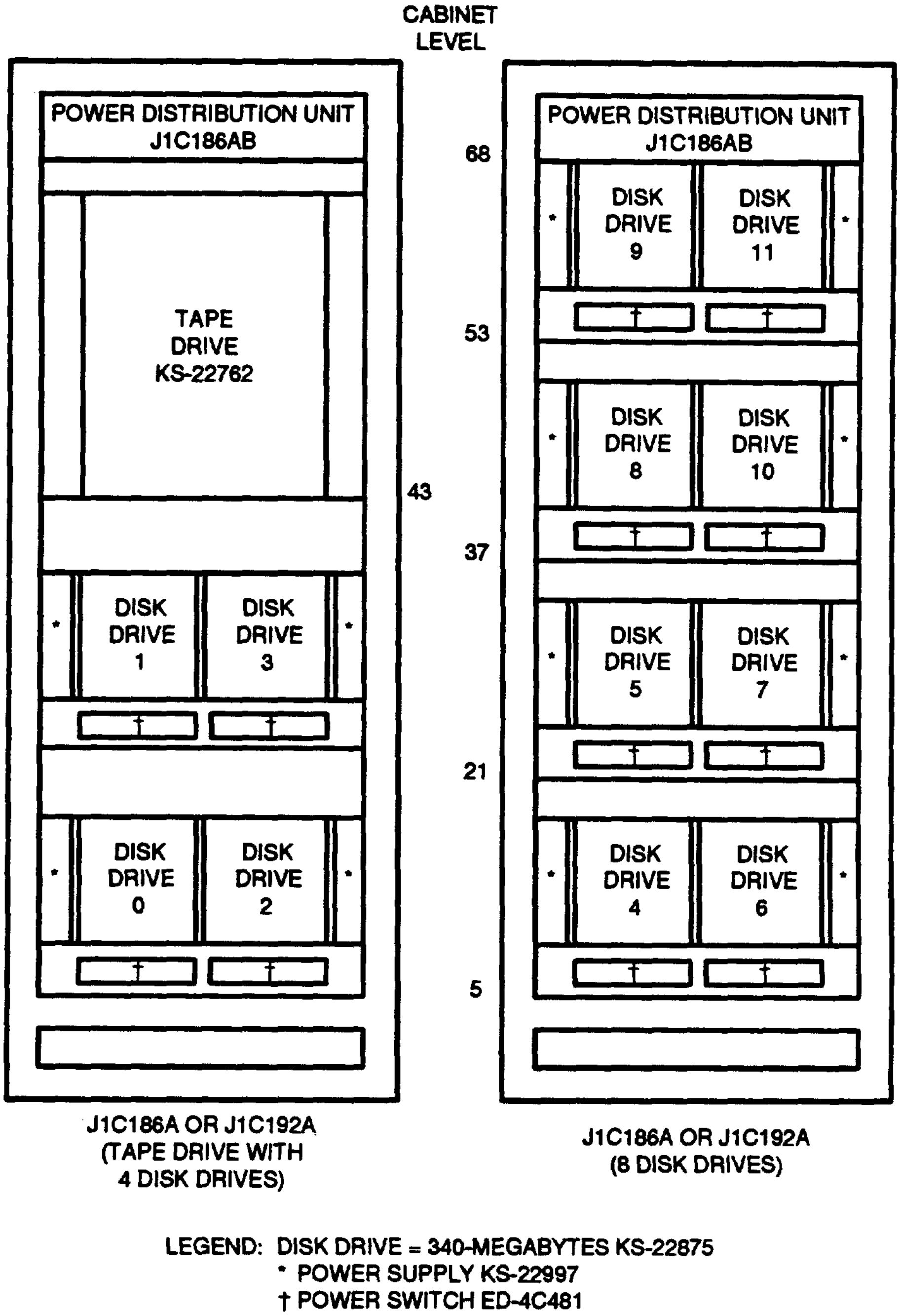


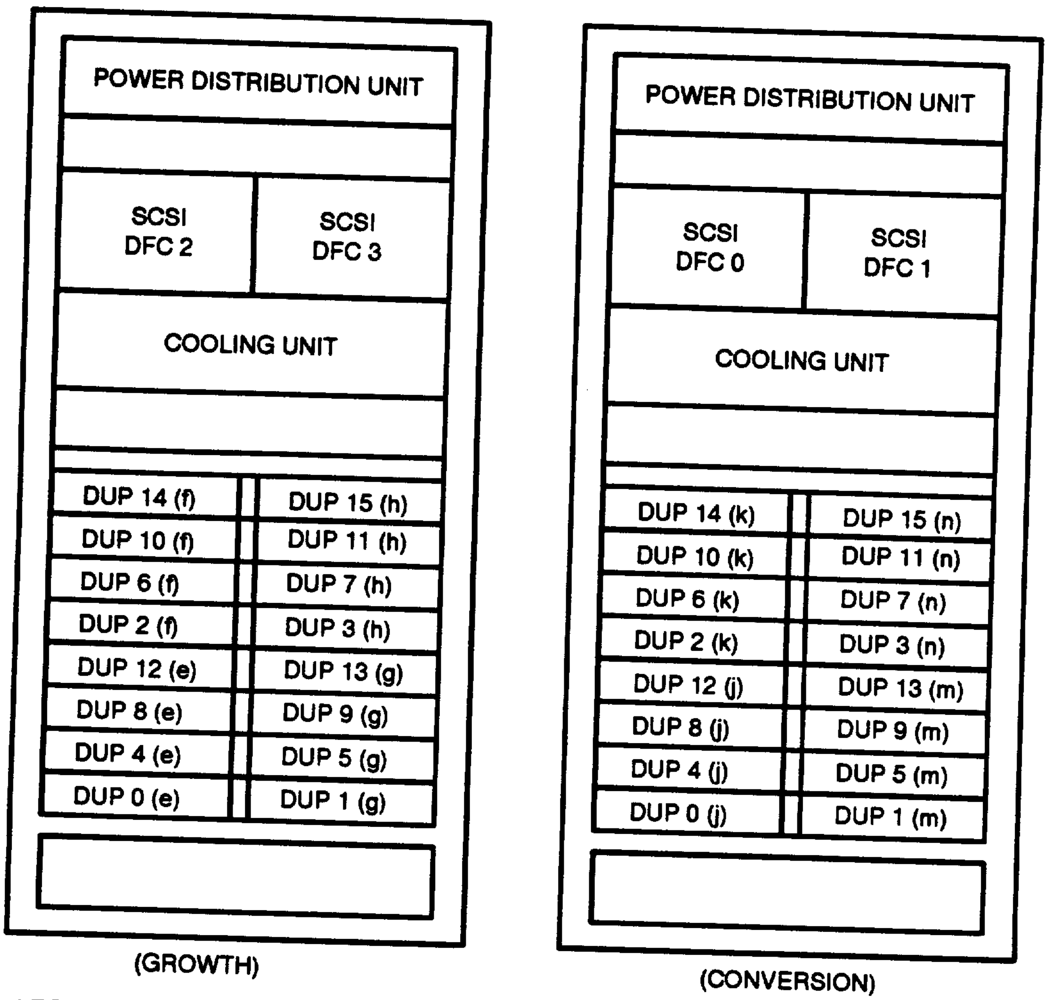
Figure 4. Tape/Disk Cabinet

SCSI Disk Cabinet

2.13 The SCSI disk cabinet is available as an option to an existing 3B20D Model 1 computer. The cabinet can be configured two ways. The first configuration, used when the SCSI hardware is grown onto an existing 3B20D computer, is equipped with two SCSI DFCs, a cooling unit, and up to 16 disk unit packages (DUPs) (see Figure 5, GROWTH). The other configuration is used when an existing 3B20D SMD-DFC is converted to a SCSI-DFC (see Figure 5, CONVERSION). Components of the SCSI disk cabinet in these two configurations are:

- Power distribution unit
- SCSI DFCs (two)
- Cooling unit
- SCSI DUPs.

2.14 A PDU at the top of the cabinet contains fuses for the -48 V DC power feeders that supply the DFCs, the cooling unit, and each DUP.



LEGEND:

(e) = SCSI DUPs on DFC 0 - Bus 4
(f) = SCSI DUPs on DFC 0 - Bus 5
(g) = SCSI DUPs on DFC 1 - Bus 6
(h) = SCSI DUPs on DFC 1 - Bus 7

(j) = SCSI DUPs on DFC 0 - Bus 0
(k) = SCSI DUPs on DFC 0 - Bus 2
(m) = SCSI DUPs on DFC 1 - Bus 1
(n) = SCSI DUPs on DFC 1 - Bus 3

Figure 5. SCSI Disk Cabinet

Tape Unit Frame

2.15 The tape unit frame (Figure 6) contains at least one tape transport (KS-22091) to meet system requirements, but the frame contains space for two. Power (-48 V and RTN) is provided from the PDF on two buses that terminate at two-pronged, polarized connectors at the top of the frame. The frame contains neither fuses nor power units. The tape transport contains fuses and power converters. This frame with the tape transports may be replaced with the tape/disk cabinet through retrofit.

Power Distribution Frame

2.16 The PDF supplies only -48 V DC distribution. There are two configurations of the PDF and their use depends on the source of office power. The J86334B PDF is used when office power originates from a battery plant. The J86344C PDF is used in offices that have converter supplied -48 V DC. Both PDFs are illustrated in Figure 7. Components of the PDF are listed below:

- Filter fuse panel (ED-82947-30, G2)
- Control panel (ED-82947-30, G10)
- High-current fuse panel (ED-82947-30, G6) (used on J86334B only)
- High-current fuse panel (ED-82947-30, G5) (used on J86334C only)
- Capacitor panel (ED-82947-30, G4) (used on J86334C only).

2.17 The PDF receives -48 V DC input on cable pairs (-48 V DC and RTN). Each fuse panel is divided in half with each half receiving a dedicated bus pair. The high-current fuse panel (ED-82947-30, G6) on the J86334B PDF and the high-current fuse panel (ED-82947-30, G5) with the capacitor panel (ED-82947-30, G4) on the J86334C PDF are used in offices that are equipped with the 300-megabyte disk drives. The control panel is equipped with alarm and charging circuits to include a charging probe.

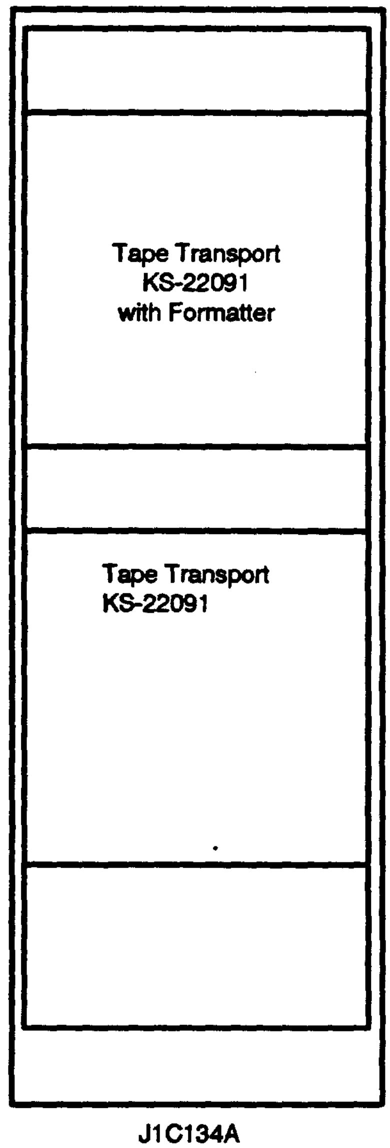


Figure 6. Tape Unit Frame

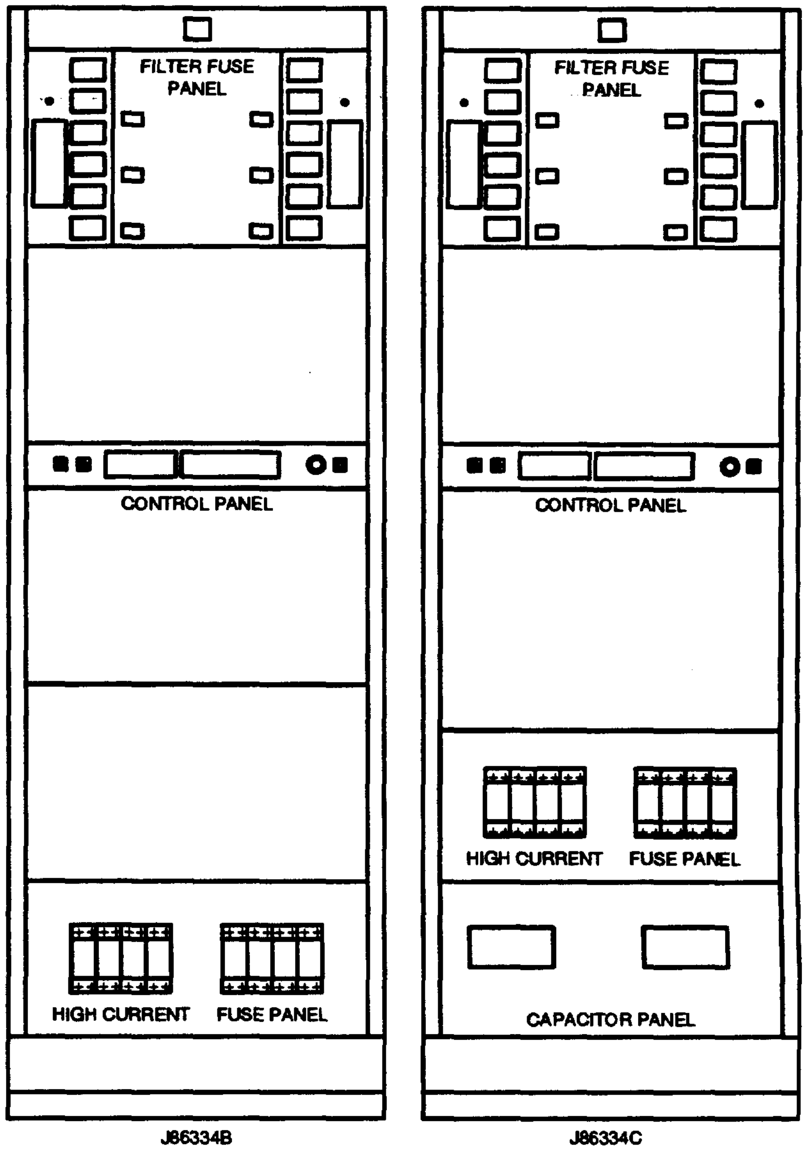


Figure 7. Power Distribution Frames

AC Power

2.18 The 3B20D computer requires standard AC electrical service. The customer provides a local AC power panel and branch circuits that are individually protected by circuit breakers and terminated with designated receptacles. The maintenance terminal and ROP require 120 volts single-phase, protected AC electrical service. Data sets should also connect to this protected AC. The tape drive when mounted in the tape/disk cabinet requires AC power, not necessarily protected alternating current. Circuit breaker assignments within the AC power panel should be selected to balance the currents on each phase.

Receptacles

2.19 System devices that connect to the AC line are equipped with flexible cords terminated in standard plugs. Receptacles that terminate branch circuits must be of the isolated-ground type (the grounding terminal does not make contact with the mounting yoke). It is recommended that the isolated-ground feature be made easily recognizable by use of orange-colored or clearly-labeled receptacles. Nonsystem equipment, (for example, floor polishers, tools, appliances, and so forth) shall not be plugged into these isolated-ground receptacles. Adherence to these recommendations will prevent certain types of electrical noise from interfering with system operation and will eliminate potential hazards to equipment and personnel.

Single-Point Ground

2.20 The 3B20D computer must be grounded using a single-point ground. A single-point ground system assures that the computer system connects to a building ground at one and only one point and that all system grounds are bonded to this point. A single-point ground system also eliminates ground loops and guarantees that voltage disturbances to the building's electrical system caused by stray currents will not affect the computer system. A typical overhead single-point ground system is shown in Figure 8.

Isolating The System

2.21 To protect the integrity of the single-point ground, an electrical conductor must be insulated from all building grounds wherever it extends beyond the single-point ground. Thus, equipment cabinets and frames must be insulated from the floor, air conditioning duct work, suspended cable trays, lighting fixtures, etc. Likewise, customer-supplied equipment which interfaces with the computer should also be insulated from the floor and building grounds. This requirement also dictates the use of isolated-ground receptacles. With nonisolated-ground receptacles, the conduit itself must be insulated from building grounds wherever it extends beyond the single-point ground. This would be an extremely difficult condition to maintain over the life of the computer.

Framework Grounding

2.22 The computer system is grounded to the single-point ground in two distinct ways:

- Via the equipment ground (green wire) in each AC branch circuit
- Via a separate cabinet or frame ground.

2.23 The frame ground consists of a network of conductors which connect frames to each other and to splice plates which lead to the single-point ground. Frame grounds are terminated in lugs crimped to the wire and bolted to the frame. The ROP and the maintenance terminal are adequately grounded using the ground (green wire) in the power cord.

Raised-Floor Ground

2.24 Raised floors up to 100 feet by 100 feet must be grounded to the single-point ground via an insulated, stranded No. 6 wire crimped to the support grid at a location in the approximate center of the floor.

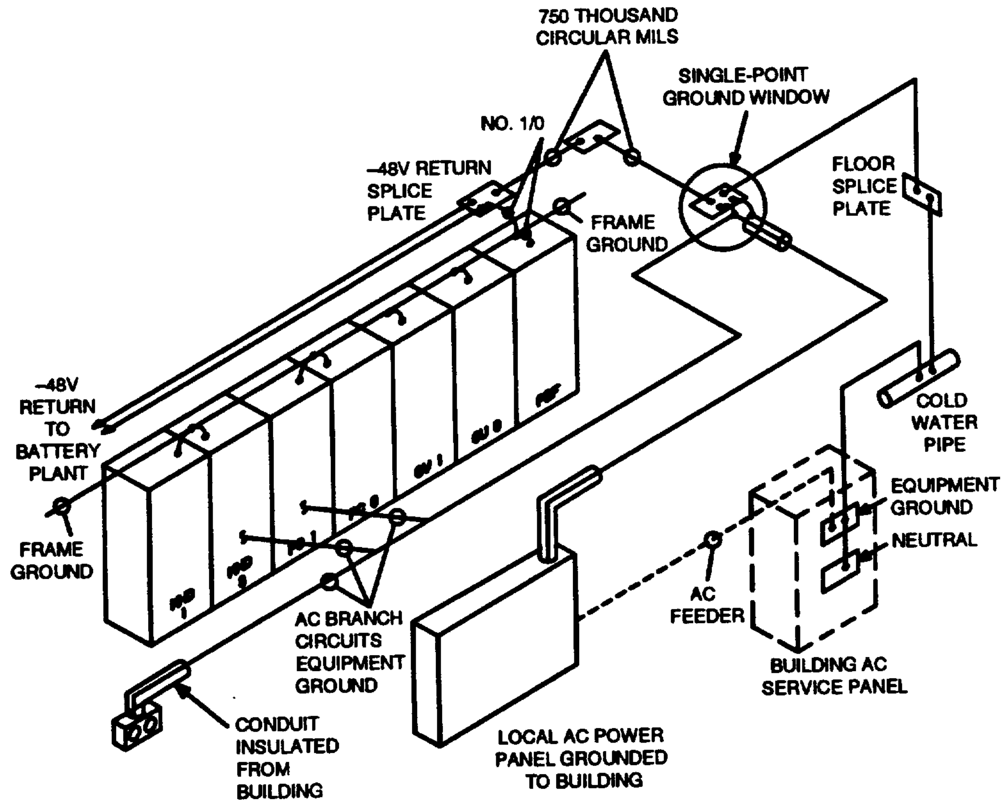


Figure 8. Typical Overhead Single-Point Ground System

3. Functional Description

3.01 This part discusses the power components and power distribution within the frames of the 3B20D Model 1 computer. Depending on the application, differences exist in quantities of tape drives, disk drives, and other optional equipment.

Control Unit Frame

A. Direct Memory Access Input/Output Unit

3.02 The direct memory access (DMA) I/O unit (J1C129AA) contains the interfaces to connect the CU to various types of peripheral devices. This unit permits rapid transfer of blocks of data between peripheral devices and main store (MAS) independent of central control (CC). One dual serial channel and one DMA controller (DMAC) are always required. Additional units may be added to meet application requirements. Power is routed to the DMA from a +5 V DC bus via fuse panel (ED-4C181-30, G4). Power is controlled by an ABB1 power switch contained in MAS module (MASM) 0. Circuit packs that make up the DMA and I/O unit are shown with fuse assignments in Table A.

Table A. Direct Memory Access Input/Output Unit

Fuse Unit (G4)				Load		
Location	Pilot Fuse	Label	Load Fuse	Circuit Pack	Title	Notes
008	70F	+5V00				Job engineered
016	70F	+5V01				Job engineered
024	70F	+5V02				Job engineered
032	70F	+5V03				Job engineered
040	70F	+5V04				Job engineered
048	70F	+5V06	74D	UN9	Dual Serial Channel	Job engineered
056	70F	+5V06				Job engineered
068	70F	+5V07				Job engineered
076	70F	+5V08				Job engineered
084	70F	+5V09	74D	UN37	Direct Memory Access Controller	
092	70F	+5V10	74D	UN36	Direct Memory Access Controller	
100	70F	+5V11	74D	UN35	Direct Memory Access Controller	
108	70F	+5V12	74D	UN35	Direct Memory Access Controller	
116	70F	+5V13				Job engineered
128	70F	+5V14				Job engineered
136	70F	+5V15				Job engineered
144	70F	+5V16				Job engineered
152	70F	+5V17				Job engineered
160	70F	+5V18				Job engineered
168	70F	+5V19				Job engineered
176	70F	+5V20				Job engineered

B. Central Control Unit

3.03 The central CU (CCU) (J1C129AB) provides the high-speed logic, control, and arithmetic functions required by the CU. The CC contains the data manipulation unit, microstores, special registers, store address controller and translator, MAS update unit, cache, and a maintenance channel (MCH). Power is routed to the CCU from a +5 V DC bus via fuse panel (ED-4C181-30, G5). Power is controlled by an ABB1 power switch contained in MASM 0. Circuit packs that make up the CCU are shown with fuse assignments in Table B.

C. Main Store Module 0

3.04 The MAS is a dynamic, random-access, volatile, semiconductor memory. It stores the instructions, information, and data necessary for the operation of the computer. MASM 0 (J1C129AC) consists of main store array (MASA) circuit packs and a MAS controller that make up the computer memory. All MASA slots in this unit may not be used depending on the application. An ABB1 power switch and a TN11 emergency action interface (EAI) circuit pack are also contained in this unit. The ABB1 controls power for the CU frame. A section within the TN11 monitors various output voltages from the power supplies. Power is routed to the MAS 0 from a +5 V DC bus through fuse panel ED4C181-30, G6. A +12 V DC and -5 V DC is also supplied from a 132AJ power converter when this MASM contains TN14 MASAs . Circuit packs that make up MAS module 0 are listed in Table C with their respective fuse assignments.

D. Main Store Module 1

3.05 This optional growth unit (J1C129AD) may be located under MAS module 0. This unit has slots for 16 MASA circuit packs and, when equipped, requires the ED-4C181-G7 fuse panel. When equipped with TN14 MASAs, this unit also requires +12 V DC from the 132AJ power unit. Power is controlled by the ABB1 power switch located in MASM 0. When MASM 1 is not equipped, the cooling unit is installed at this location.

Table B. Central Control Unit

Fuse Unit (G4)				Load		
Location	**Pilot Fuse**	**Label**	**Load Fuse**	**Circuit Pack**	**Title**	**Notes**
008	70F	+5V21	74D	UN28	Writeable Microstore MC4C00A1	<G1>
				UN28B	Writeable Microstore MC4C077A1B	<G2>
				UN28	Writeable Microstore MC4C077A1C	<R1>
016	70F	+5V22	74D	UN18	Writeable Microstore	<G1>
				UN48B	4K Microstore	<G2><R1>
024	70F	+5V23	74D	UN28B	Writeable Microstore	Job Engr
032	70F	+5V24	74D	UN28B	Writeable Microstore	Job Engr
040	70F	+5V25	74D	Vacant	(For MLTS - UN16B)	
048	70F	+5V26	74D	UN22	Maintenace Channel	<G1>
				UN22B	Maintenance Channel	<G1>
				UN22C	Maintenance Channel	<R1>
056	70F	+5V23	74D	UN44	Writeable Microstore	<G1>
				UN135	Writeable Microstore	<G2><R1>
068	70F	+5V28	74D	UN1	Data Manipulation Unit 0	<G1>
				UN1C	Data Manipulation Unit 0	<G1><R1>
076	70F	+5V29	74D	UN23	Data Manipulation Unit 1	<G1>
				UN23B	Data Manipulation Unit 1	<G1><R1>
084	70F	+5V30	74D	UN2	Special Register 0	<G1>
				UN2B	Special Register 0	<G2><R1>
092	70F	+5V31	74D	UN3	Special Reqister 1	<G1>
				UN3B	Special Register 1	<G1><R1>
100	70F	+5V32	74D	UN6	Store Data Control	<G1>
				UN6B	Store Data Control	<G2><R1>
108	70F	+5V33	74D	UN45	Data Manipulation Unit 0	<G1>
				UN43B	Store Address Controller	<G1><R1>
116	70F	+5V34	74D	UN45	Store Address Translator	<G1><G2>
				UN45B	Store Address Translator	<R1>
128	70F	+5V35	74D	UN21	Utility Circuit	<G1>
				UN21B	Utility Circuit	<G2><R1>
136	70F	+5V36	74D	UN10	Cache Control	<G1>
				UN10B	Cache Control	<G2><R1>
144	70F	+5V37	74D	UN10	Cache Control	<G1>
				UN10B	cache Control	<G2><R1>
152	70F	+5V38	74D	UN11	cache Memory	<G1>
				UN11B	Cache Memory	<G2><R1>
160	70F	+5V39	74D	UN34	Main Store Update	<G1>
				UN133	Main Store Update	<G2><R1>
168	70F	+5V40				Job Engr
176	70F	+5V41				Job Engr

LEGEND: <G1> DMERT Operating System, Generic 1
<G2> DMERT operating System, Generic 2
<R1> UNIX Operating System, Release 1

Table C. Main Store Module 0

Fuse Unit (G4)				Load		
Location	**Pilot Fuse**	**Label**	**Load Fuse**	**Circuit Pack**	**Title**	**Notes**
008	72A	+5V42	74C	ABB1	Power Switch	
016	70F	+5V43	74B	TN11	Emergency Action Interface	<G1><G2><R1>
024	70F	+5V44	74A	Vacant		
032	70F	+5V45	74C	TN14	Main Store Array	<G1>
				TN28	Main Store Array	<G1>
040	70F	+5V46	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
048	70F	+5V47	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
056	70F	+5V48	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
062	70F	+12VA	74C	–	Main Store Module 0	For TN14s only
068	70F	+5V49	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
076	70F	+5V50	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
084	70F	+5V51	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
092	70F	+5V52	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
100	70F	+5V53	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
108	70F	+5V54	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
116	70F	+5V55	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
122	70F	+12VB	74B	–	Main Store Module 0	For TN14s only
128	70F	+5V56	74C	TN14	Main Store Array*	<G1>
				TN28	Main Store Array	<G2><R1>
136	70F	+5V57	74D	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
144	70F	+5V58	74D	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
152	70F	+5V59	74D	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
160	70F	+5V60	74D	TN14	Main Store Array*	<G1>
				TN28	Main Store Array*	<G2><R1>
168	70F	+5V61	74D	UN39	Main Store Controller	
					(MC4C036A1)	<G1>
				UN59	Main Store Controller	<G2><R1>
176	70F	+5V62	74C	UN40	Main Store Controller	<G1>
				Vacant		<G2><R1>

LEGEND: *All main store arrays may not be equipped. <G2> DMERT operating System, Generic 2
<G1> DMERT Operating System, Generic 1 <R1> UNIX Operating System, Release 1

E. Cooling Unit

3.06 The cooling unit (J1C129AF) (Figure 9) forces air up through the CU frame. The cooling unit contains three plug-in fan units. Each fan unit contains a fan, control circuits, an air filter, and a DC to AC inverter. A light emitting diode (LED) on the front panel indicates alarm status. The cooling unit is powered by -48 V DC from the J1C129AE power unit and started by a signal from the ABB1 power switch. Input power to each fan is protected by fuses in the power unit fuse block. In the absence of store module 1, the cooling unit is installed directly under store module 0.

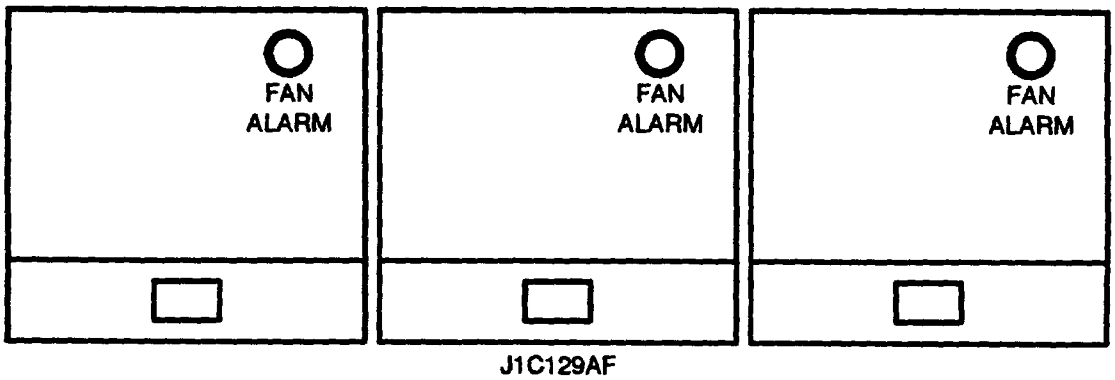


Figure 9. Cooling Unit

F. Power Unit

3.07 The power unit (J1C129AE) (Figure 10) is the central point in the CU frame for all power. It contains the following units:

- Fuse panel assembly (ED-4C187-30, GC).
- 132AJ plug-in power unit
- Reference power unit (ED-4C188-30, G1)
- Telephone and teletypewriter jack unit (ED-4A134-30, G4).

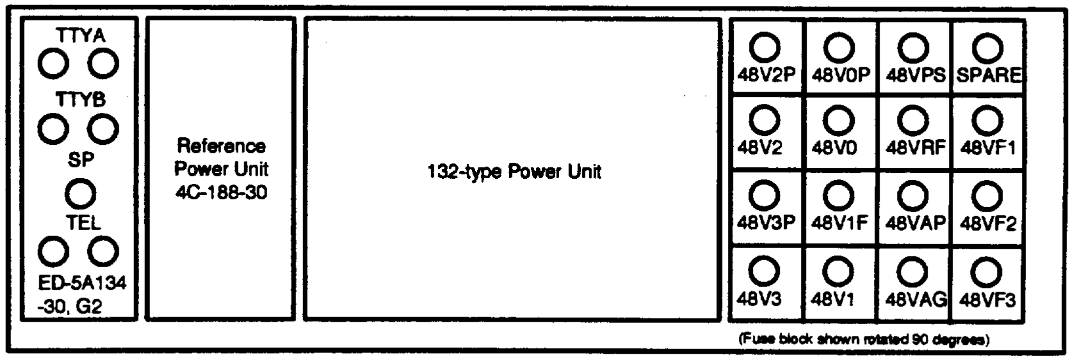


Figure 10. Power Unit

3.08 All six input bus pairs, designated A through F (-48 V DC and Rtn), from the PDF are routed, via polarized plugs at the top of the CU frame, to this power unit. However, bus A and bus B are filtered first through a filter unit (J1C129AG) at the bottom of the CU frame. These inputs are protected by fuses in the fuse panel assembly. Table D indicates the fuses and their respective loads.

3.09 The 132AJ power unit is a plug-in DC-to-DC converter which converts the -48 V DC input (bus B) to -5 V DC and +12 V DC outputs for memory power. The outputs are monitored to determine a high or low voltage condition. The 132AJ power unit provides a -5 V DC signal to the ABB1 power switch as an alarm signal. An alarm lamp indicates a low voltage fault. The outputs of the 132AJ are not required when the memory modules are equipped with the TN28 MASAs.

3.10 The reference power unit (ED-4C188-30, G4) is a hardwired power converter that houses a 203A1 power unit. The 203A1 unit converts the -48 V DC input (also Bus B) and supplies reference voltages (+5 V DC and +12 V DC) to the TN11 circuit pack. The reference power unit receives a -48 V DC reference voltage (48 V56) from the ABB1 power switch circuit pack.

G. 244-Type Power Units

3.11 The CU frame may contain four 244C or three 244D power units. The 244C power units are capable of 66 amperes output while the 244D power units can supply 90 amperes output. These units convert the -48 V DC inputs to +5 V DC parallel outputs to a +5 volt bus that supplies power through the fuse panels to the various circuit packs in the CU frame. The output of each of the 244-type power units is monitored by the TN11 EAI circuit pack.

Table D. Power Unit Fuse Assignments

Label	Type	Load
SPARE	-	-
48VF1	70D	Cooling unit 0
48VF2	70D	Cooling unit 1
48VF3	70D	Cooling unit 2
48VPS	70C	ABB1 and TN11
48VRF	70H	Ref power unit
48VAP	70F	132AJ power unit (pilot)
48VAG	70D	132AJ power unit (load)
48VOP	70F	244C/D 0 (pilot)
48VO	74E	244C/D 0 (load)
48V1P	70F	244C/D 1 (pilot)
48V1	74D	244C/D 1 (load)
48V2P	70F	244C/D 2 (pilot)
48V2	74D	244C/D 2 (load)
48V3P	70F	244C/D 3 (pilot)
48V3	70E	244C/D 3 (load)

Peripheral Control Frame

A. Input/Output Processor Basic Unit

3.12 This unit (J1C130BA) (Figure 11) is used to transfer, receive, and buffer data between complementary peripheral devices and CC and DMA access. The IOP basic unit is is divided into three sections: a controller and two input/output communities (0 and 1). The controller portion consists of a dual duplex serial bus selector (DDSBS), a bus interface unit, a microcontrol store, a peripheral interface controller (PIC), an IOP interface, and an ABB1 power switch. Peripheral communities 0 and 1 each contain a TN71 power monitor circuit pack and provide four slots for PCs. Community 0 consists of a maintenance TTY controller, a scan/signal distributor controller, a TTY controller, and a magnetic tape controller, which are always required. Community 1 can be job engineered to meet application requirements. Each community and the controller portion of the IOP basic unit receives power from 136H power converter installed directly under their respective circuits. Each section also receives -48 V DC from the PC frame.

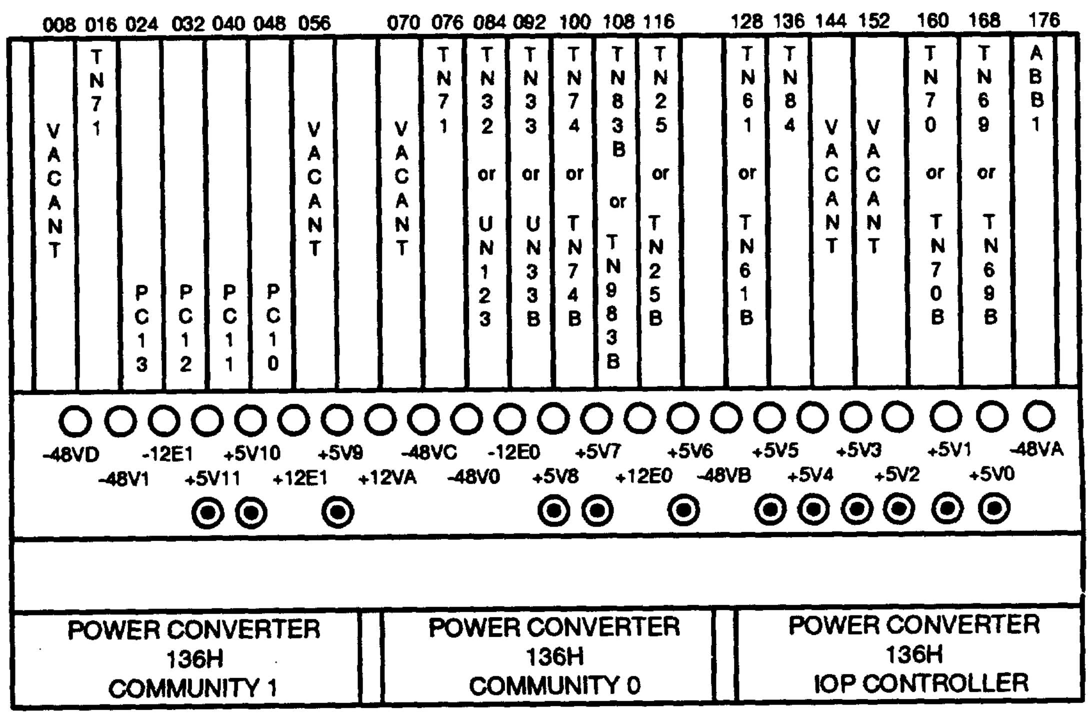


Figure 11. Input/Output Processor Basic Unit

3.13 Power (-48 V DC) for the IOP basic unit is routed from polarized plugs (bus B and C) at the top of the frame to a terminal strip on the rear of the basic unit. From the terminal strip, -48 V DC is sent to each TN71 power monitor circuit pack, each 136H power converter, and the ABB1 power switch. Each power lead is protected by fuses in the ED-4C181-30, G1 fuse panel. The ABB1 power switch controls the application of power to the IOP basic unit and, when equipped, the growth unit. The TN71 monitors output voltages from converters and sequences voltage application during power up and voltage removal during power down. The TN71 also produces a -5 V DC and a +12 V DC internally for memory devices. The -48 V DC input to the TN71 is also routed to the backplane for use by PCs in their respective communities. The 136H power converter produces +5, +12, and -12 V DC outputs for the circuit packs in their respective communities. However, the 136H power converter in the controller section supplies only +5 V DC. Power is segmented in the peripheral communities so that a community can be powered down without affecting the remaining active portions of the IOP.

3.14 Power produced within the IOP is distributed as follows:

- -48 V DC to each community for TTY current loops when needed on PC circuit packs.
- +12 V DC and -12 V DC to each community is available for synchronous and asynchronous line drivers and receivers.
- +12 V DC and -5 V DC for each community from the TN71 for memory devices.
- +5 V DC to the controller portion and each community for circuit packs. Each +5 V DC fuse protects the inputs to two circuit packs in the peripheral communities.
- +12 V DC for reference circuits on the TN71 power monitor.

A fuse assignment list with respective loads is shown in Table E.

Table E. Input/Output Processor Basic Unit Fuse Assignments

Fuse Unit (G1)				Load		
Location	**Pilot Fuse**	**Label**	**Load Fuse**	**Circuit Pack**	**Title**	**Notes**
008	–	-48VD	70C	136H	PC 1 Power Converter	
016	–	-48V1	70A	TN71	PC 1 Power Monitor	
023	-	-12VE1	70A	–	PC 1 Power Monitor	PC10,11,12,13
031	70F	+5V11	74C	–	PC 12, PC 13	Job Engr
039	70F	+5V10	74C	–	PC 12, PC 13	Job Engr
047	–	+112VE1	70A	TN71	PC 1 Power Monitor	PC10,11,12,13
054	70F	+5V9	74C	–		Job Engr
062	–	+12VA	–	–	spare	
070	–	-48C	70C	136H	PC 0 Power Converter	
076	–	-48VO	70A	TN71	PC 1 Power Monitor	
085	–	-12VEO	70A	TN71	PC 1 Power Monitor	PC 10,11,12,13
093	70F	+5V8	74C	UN32	Magnetic Tape Cont	<G1>
				UN134	Magnetic Tape Cont	<G2> <R1>
				UN33	Scan Signal Dist Cont	<G1> <G2>
				UN33B	Scan Signal Dist Cont	<R1>
101	70F	+5V7	74C	TN74	TTY Controller	<G1>
				TN74B	TTY Controller	<G2> <R1>
				TN83B	Maintenance TTY Cont	<G1> <G2>
				TN983B	Maintenance TTY Cont	<R1>
109	–	12VEO	70A	TN71	PC 0 Power Monitor	PC 00,01,02,03
116	70F	+5V6	74C	UN25	Input/Output Micro-Processor Interface	<G1>
				UN25B	Input/Output Micro-Processor Interface	<G2> <R1>
124	–	-48VB	70A	136H	Cont Power Converter	
132	70F	+5V5	74C	TN61	Peripheral Interface Cont	<G1>
				TN61B	Peripheral Interface Cont	<G2> <R1>
139	70F	+5V4	74C	TN84	Microcontrol Store	<G1>
147	70F	+5V3	74C	–	–	vacant
155	70F	+5V2	74C	–	–	vacant
163	70F	+5V1	74C	TN70	Bus Interface Cont	<G1>
				TN70B	Bus Interface Cont	<G1> <G2>
170	70F	+5VO	74C	TN69	Duples Dual Serial Bus Selector	<G1>
				TN69B	Duplex Dual Serial Bus Selector	<G2> <R1>
178	-	FAN	70A	–	Cooling Unit	(-48VA)

LEGEND: PC = peripheral community (slot)
<G1> DMERT Operating System, Generic 1
<G2> DMERT operating System, Generic 2
<R1> *UNIX* Operating System, Release 1

B. Input/Output Processor Growth Unit

3.15 The IOP growth unit (J1C130BB) (Figure 12) provides two communities of four PCs each which may be added to the IOP basic unit. This growth unit contains two 136H power converters and two TN71 power monitor circuit packs to support the peripheral communities. Input power (-48 V DC) is routed from a terminal strip on the rear of the IOP basic unit. The ABB1 power switch in the IOP basic unit controls application of power for this growth unit. The 136H power converters and TN71 power monitors handle the same voltages as in the IOP basic unit.

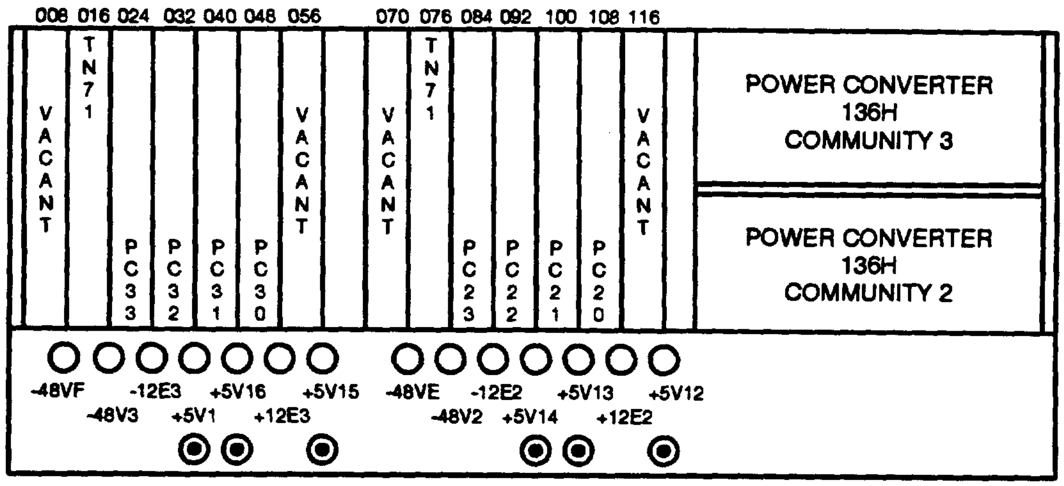


Figure 12. Input/Output Processor Growth Unit

C. Cooling Unit

3.16 The cooling unit is identical to the cooling unit in the CU frame. It receives -48 V DC from the IOP basic unit and is controlled by the ABB1 power switch. When the IOP growth unit is not used, the cooling unit is installed directly below the IOP basic unit.

D. Port Switch Unit

3.17 The port switch unit (J1C130BC) (on PC frame 1 only) contains two port switch subunits and may contain scanner signal distributor interface circuit packs. The port switch subunits (one for the maintenance terminal and the other for the ROP) automatically switch these units to the active maintenance teletypewriter controller in the basic IOP. Controls are available to manually switch these units. The port switch unit receives -48 V DC from the polarized plug (bus D) at the top of the peripheral control frame. It is protected by local fusing on a fuse panel assembly on the port switch unit. The optional scanner signal distributor interface circuit packs connect system alarms to office alarms and require no power. The port switch unit is shown in Figure 13.

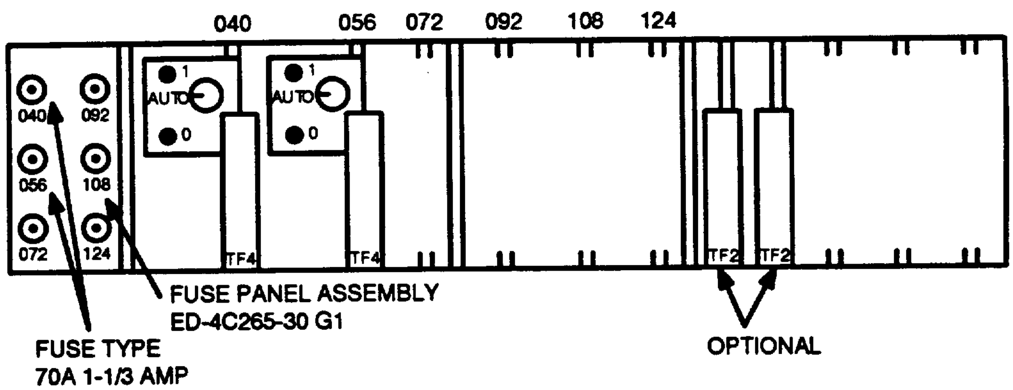


Figure 13. Port Switch Unit

E. SMD Disk File Controller Unit

3.18 The storage module drive (SMD) interface DFC unit (J1C130AC) (Figure 14) transfers large blocks of data between secondary-storage MHDs and the CU memory over the DMA channel. The DFC consists of a fixed and writeable microcontrol store, PIC, parallel serial data interface, MHD control, MHD data clock, BIC, DDSBS, power monitor, 133J power converter, and an ABB1 power switch.

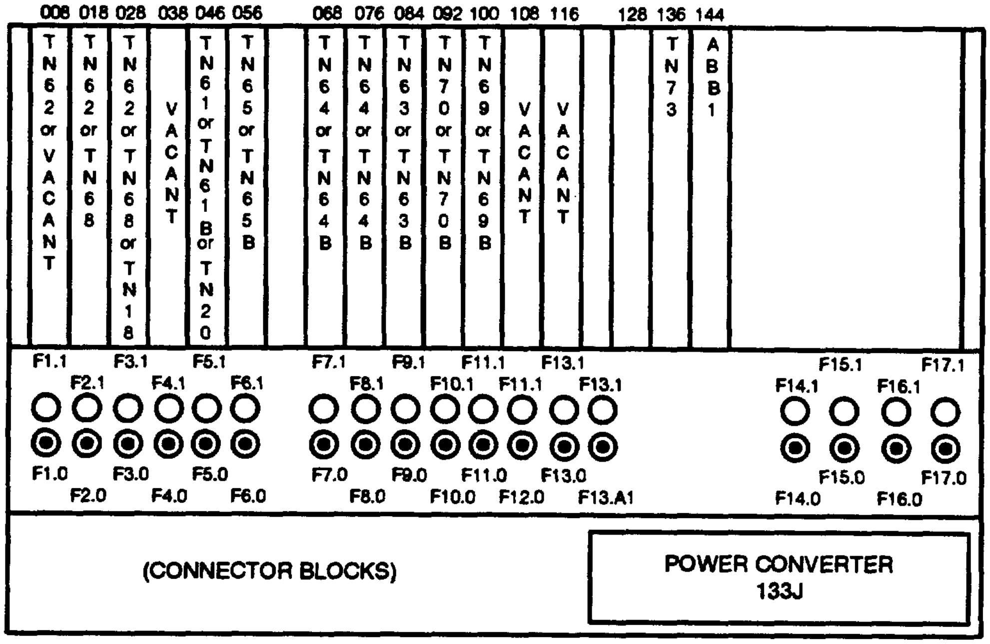


Figure 14. SMD Disk File Controller Unit

3.19 Power (-48 V DC) for the DFC unit is routed from polarized plugs (bus A) at the top of the frame to a terminal strip on the rear of the unit. From the terminal strip, -48 V DC is sent to the TN73 power monitor circuit pack, the 133J power converter, and the ABB1 power switch. Each power lead is protected by fuses in the ED-4C181-30, G3 fuse panel. The ABB1 power switch controls the application of power to the DFC unit. The TN73 monitors output voltages from the converter.

3.20 Fuse assignments with their respective loads are shown in Table F.

Table F. SMD Disk File Controller Unit Fuse Assignments

Fuse Unit (G4)				Load		
Location	**Pilot Fuse**	**Label**	**Load Fuse**	**Circuit Pack**	**Title**	**Notes**
008	70F	F1.1/0	74D	TN62	Microcontrol Store	<G1>
				–	Vacant	<G2> <R1>
018	70F	F2.1/0	74D	TN62	Microcontrol Store	<G1>
				TN68	Microcontrol Store	<G1>
				TN18	Writeable Microcontrol	<G2>
028	70F	F3.1/0	74D	TN62	Microcontrol Store	<G1>
				TN68	Microcontrol Store	<G1>
				TN18	Writeable Microcontrol	<R1>
038	70F	F4.1/0	–	--	vacant	
046	70F	F5.1/0	74D	TN61B	Peripheral Interface Cont	<G1> <G2>
				TN20	Peripheral Interface Cont	<R1>
056	70F	F6.1/0	74D	TN56	Parallel Serial Data Interface	<G1>
				TN65B	Parallel Serial Data Interface	<G2> <R1>
068	70F	F7.1/0	74C	TN64	Moving Head Disk Data Clock	<G1>
				TN64B	Moving Head Disk Data Clock	<G2> <R1>
076	70F	F8.1/0	74C	TN64	Moving Head Disk Data Clock	<G1>
				TN64B	Moving Head Disk Data Clock	<G2> <R1>
084	70F	F9.1/0	74C	TN63	Moving Head Disk Cont	<G1>
				TN63B	Moving Head Disk Cont	<G2> <R1>
092	70F	F10.1/0	74C	TN70	Bus Interface Cont	<G1>
				TN70B	Bus Interface Cont	<G2> <R1>
100	70F	F11.1/0	74C	TN69	Duplex Dual Serial Bus Selector	<G1>
				TN69	Duplex Dual Serial Bus Selector	<G2> <R1>
108	70F	F12.1/0	–	–	Spare	
116	70F	F13.1/0	–	–	Spare	
124	70F	F13A.1/0	74C	–	Terminal Strip	
142	70F	F14.1/0	74C	ABB1	Power Switch	(+5 V DC)
162	70F	F15.1/0	74C	ABB1	Power Switch	(-48 V DC)
170	70F	F16.1/0	74C	TN73	Power Monitor	(-48 V DC)
178	70F	F17.1/0	74C	133J	Power Converter	(-48 V DC)

LEGEND <G1> DMERT operating system, Generic 1
<G2> DMERT operating system, Generic 2
<R1> *UNIX* operating system, Release 1

Tape/Disk Cabinet

A. Power Distribution Unit

3.21 The PDU (J1C186AB) (Figure 15) contains, when the tape/disk cabinet is fully equipped for eight disk drives, eight polarized input jacks, eight terminal blocks, and four fuse blocks. The PDU is configured to match power feeders and fuses with the number of disk drives mounted in the cabinet. Power (-48 V DC) is distributed to each power switch and each power supply. A tape drive, when mounted in this cabinet, is powered by 120 V AC from a local ac power panel. Fuse assignments for various configurations of the tape/disk cabinet are shown in Table G.

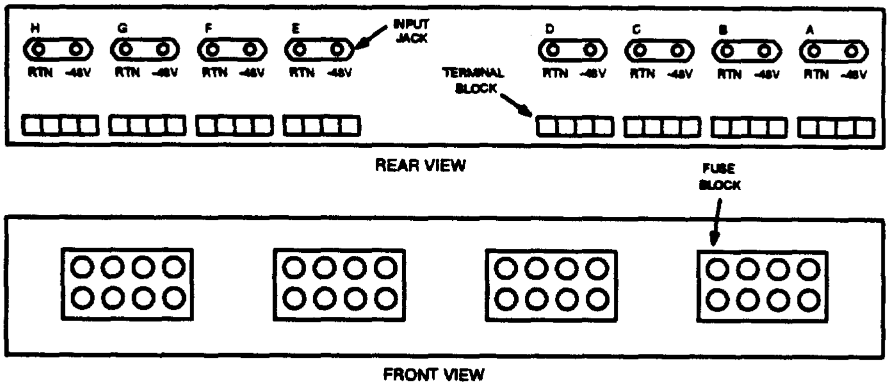


Figure 15. Power Distribution Unit

Table G. Tape/Disk Cabinet Fuse Assignments

Bus	Label	Type/Amps	Moving Head Disk (MHD)
A	Power Switch 07-056 Power Supply 16-012	70F/.25 72A/Dum 70F/.25 74D/10A	0*/4†
E	Power Switch 07-128 Power Supply 16-176	70F/.25 72A/Dum 70F/.25 74D/10A	2*/6†
B	Power Switch 23-056 Power Supply 32-012	70F/.25 72A/Dum 70F/.25 74D/10A	1*/5†
F	Power Switch 23-128 Power Supply 32-176	70F/.25 72A/Dum 70F/.25 74D/10A	3*/7†
C	Power Switch 39-056 Power Supply 48-012	70F/.25 72A/Dum 70F/.25 74D/10A	8†/12*‡
G	Power Switch 39-128 Power Supply 48-176	70F/.25 72A/Dum 70F/.25 74D/10A	10†/14‡
D	Power Switch 55-056 Power Supply 64-012	70F/.25 72A/Dum 70F/.25 74D/10A	9†/13‡
H	Power Switch 55-128 Power Supply 64-176	70F/.25 72A/Dum 70F/.25 74D/10A	11†/15‡

*Equipped in tape/disk cabinet with or without tape drive.

†Equipped in second tape/disk cabinet.

‡Equipped in third tape/disk cabinet.

B. Power Supply

3.22 The power supply (KS-22997) receives the -48 V DC from the PDU and supplies multiple DC outputs to operate a dedicated 340-megabyte disk drive. Internally generated voltage alarms are sent to the power switch. The faceplate of the power supply is shown in Figure 16. (The local power switch in the center of the power supply is disabled.)

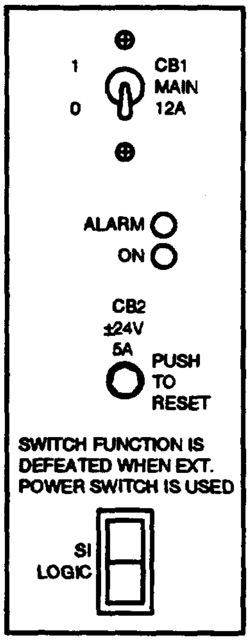


Figure 16. Power Supply Faceplate

C. Power Switch

3.23 A dedicated power switch (ED-4C481) is used for manual control of the disk drive. Controls request the system to remove and restore the disk drive to and from service, power up and power down, lamp test, and alarm cutoff. Indicators provide status. Alarms from the disk drive and power supply and alarms generated internally are indicated on the faceplate and sent to the office alarm system. The faceplate of the power switch is shown in Figure 17.

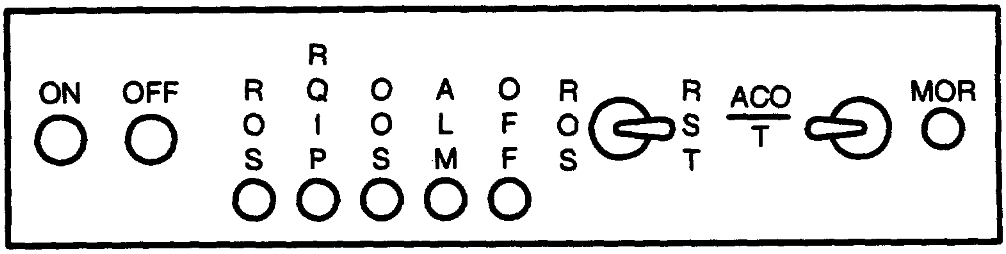


Figure 17. Power Switch

Moving Head Disk Frame

A. Disk File Inverter

3.24 Each disk file inverter (ED-4C172-30) receives -48 V DC power from a dedicated 50-ampere fuse in the PDF and supplies 208 volt pseudo-sine wave power to the 300-megabyte disk drives. Due to the high current involved, -48 V DC power is connected directly to the input terminals of the disk file inverter. The disk file inverter contains two cooling fans (one AC and one DC) with filters, a thermal switch detector, a fuse, and two plug-in circuit packs. One circuit pack contains the microprocessor and control circuitry while the other contains the silicon-controlled rectifiers used for generating the output AC power. An interlock switch is provided which removes power from the circuit pack area when access to the circuit pack is required. The disk file inverter with the air filters removed is shown in Figure 18.

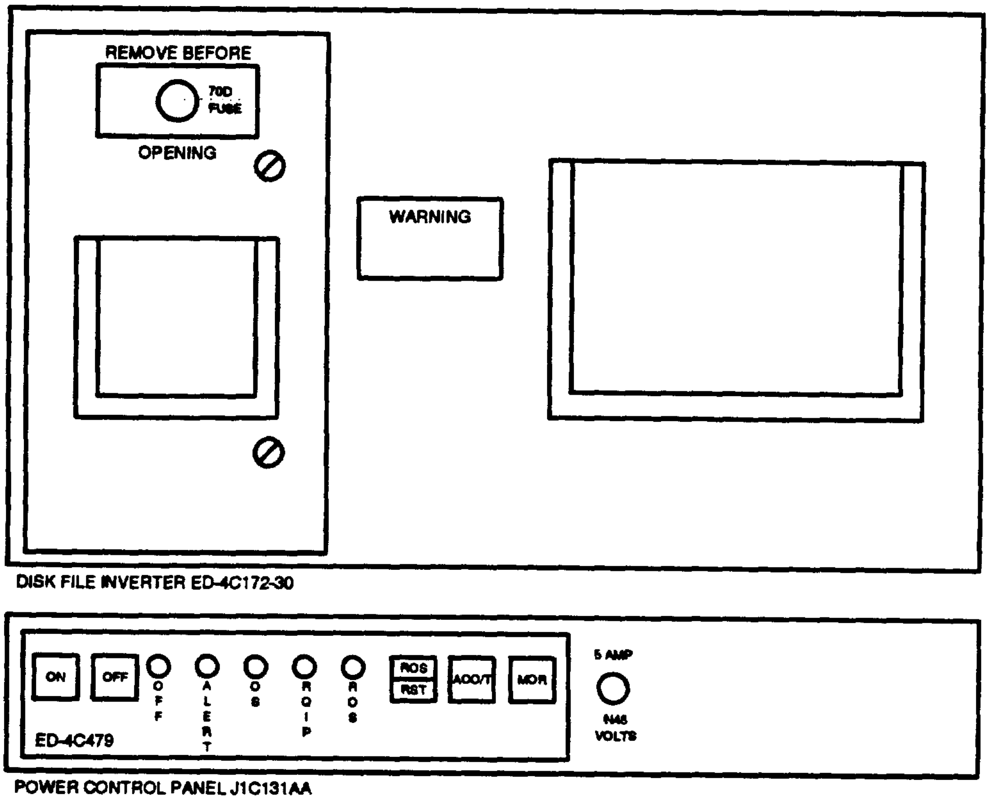


Figure 18. Disk File Inverter and Power Control Panel

B. Power Control Unit

3.25 Power for the disk drives is delivered from the disk file inverter through the power control panel (J1C131AA). The power control panel also contains a power switch, ED-4C479, which is the focal point for controlling the inverter and the disk drive. The power switch contains scan and SDPs that forward alarm conditions and permit software control. The front panel applies or removes power via ON and OFF switches, requests the system to remove or restore the disk drive to or from service via ROS/RST switch and tests lamps or retires hardware alarms via the alarm cutoff/test (AC)/T) switch. The MOR switch is used in an emergency to immediately remove power. Indicators on the power switch reflect status: OFF indicates power is removed from the disk drive, ALM indicates an alarm condition, OOS indicates out of service, RQIP indicates a software request is in progress, and the ROS indicates a request to remove the disk drive from service. The power CU is shown in Figure 20.

SCSI Disk Cabinet

A. Power Distribution Unit

3.26 The PDU (J1C147BE) contains the same components (input jacks, fuse blocks, and terminal blocks) in the same arrangement as shown in Figure 17. The J1C147BE PDU is configured to match power feeders and fuses with the number of disk drives and other units that may be mounted in the cabinet. Power (-48 V DC) is distributed to each unit as shown in Table H.

B. SCSI Disk File Controller Unit

3.27 The SCSI DFCs are present in the SCSI disk cabinet only in the growth and conversion configurations. A SCSI DFC consists of the DDSBS (TN69) and a two circuit board host adapter (UN294 and TN2116). Power (-48 V DC) is supplied by the SCSI disk cabinet PDU to a 495FA power unit and is controlled by a TN6B power switch.

C. Cooling Unit

3.28 A cooling unit is mounted in the SCSI disk cabinet when SCSI DFCs are present. The cooling unit consists of two fan trays, with two fans and an air filter per tray. Each fan tray is supplied -48 V DC from the PDU. The cooling unit has power controls and alarm indicators on the front panel.

Table H. SCSI Disk Cabinet Fuse Assignments

	Fuse				Load	
Bus	**Label**	**Location**	**Type**	**Rating**	**Unit**	**Location**
A	DISK 06-045	F4/F4A	74B/70F	3A/.25A	DUP 0	006-045
	DISK 24-045	F3/F3A	74B/70F	3A/.25A	DUP 2	024-045
	DISK 11-045	F2/F2A	74B/70F	3A/.25A	DUP 4	011-045
	DISK 28-045	F1/F1A	74B/70F	3A/.25A	DUP 6	028-045
C	DISK 15-045	F8/F8A	74B/70F	3A/.25A	DUP 8	015-045
	DISK 32-045	F7/F7A	74B/70F	3A/.25A	DUP 10	032-045
	DISK 19-045	F6/F6A	74B/70F	3A/.25A	DUP 12	019-045
	DISK 36-045	F5/F5A	74B/70F	3A/.25A	DUP 14	036-045
D	DFC* SUPPLY	F12/F12A	74D/70F	10A/.25A	DFC* Pwr Sup	056-016
	DFC* SWITCH	F11/F11A	72A/70C	Dum/3A	DFC* Pwr Sw	056-024
	FAN CTL 0	F10/F10A	72A/70C	Dum/3A	Fan 0 Ctrl	047-016
	FAN 0 A & B	F9/F9A	74C/70F	5A/.25A	Fan 0 A & B	047-038
F	FAN 0 A & B	F16/F16A	74C/70F	5A/.25A	Fan 0 A & B	047-128
	FAN CTL 1	F15/F15A	74C/70F	Dum/3A	Fan 1 Ctrl	047-104
	DFC † SUPPLY	F14/F14A	74C/70F	Dum/3A	DFC † Pwr Sw	056-112
	DFC † SWITCH	F13/F13A	74D/70F	10A/.25A	DFC † Pwr Sw	056-104
G	DISK 36-134	F20/F20A	74B/70F	3A/.25A	DUP 15	036-134
	DISK 19-134	F19/F19A	74B/70F	3A/.25A	DUP 13	019-134
	DISK 32-134	F18/F18A	74B/70F	3A/.25A	DUP 11	032-134
	DISK 15-134	F17/F17A	74B/70F	3A/.25A	DUP 9	015-134
J	DISK 28-134	F24/F24A	74B/70F	3A/.25A	DUP 7	028-134
	DISK 11-134	F23/F23A	74B/70F	3A/.25A	DUP 5	011-134
	DISK 24-134	F22/F22A	74B/70F	3A/.25A	DUP 3	024-134
	DISK 06-134	F21/F21A	74B/70F	3A/.25A	DUP 1	006-134

* 0 or 2
† 1 or 3

D. SCSI Disk Unit Package

3.29 The SCSI disk unit package (DUP) contains the power supply (CGG2), a power switch (CGG1), the disk drive, and a cooling fan. The power supply receives the -48 V DC from the PDU and supplies two DC outputs (+5 V DC and +12 V DC) to operate a dedicated SCSI disk drive and the cooling fan. The -48 V DC goes through the power supply for input power to the power switch.

3.30 A dedicated power switch is used for manual control of the disk drive. Controls send requests to the computer to remove and restore the disk drive from and to service, power up and power down, lamp test, and alarm cutoff. Indicators provide status. The controls and indicators are available through the front panel of the DUP The power switch monitors the outputs of the power unit and generates alarms when output voltage drops. The cooling fan has a fan performance sensor which is monitored by the power switch to generate an alarm if the fan fails.

3.31 Alarms are indicated on the faceplate and are sent to the office alarm system. A low voltage alarm turns off power. A fan alarm will turn off power only when the DUP is out of service. The front panel of the SCSI DUP is shown in Figure 19.

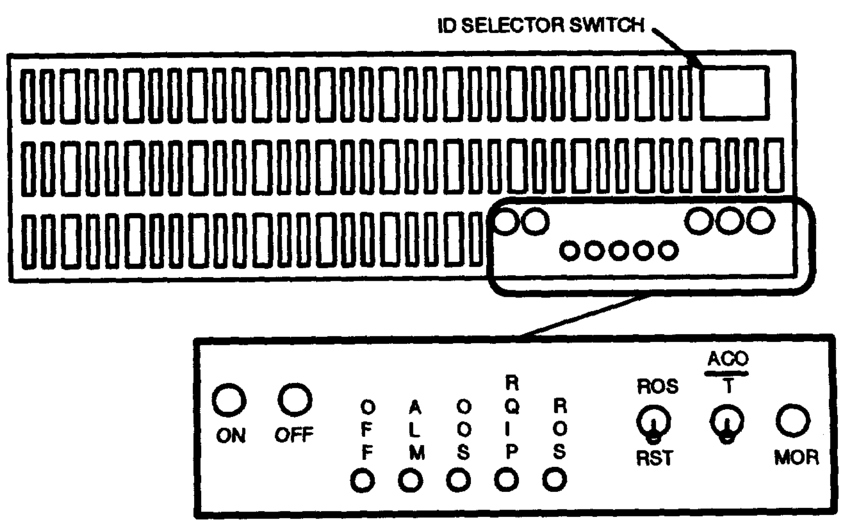


Figure 19. SCSI Disk Unit Package

Power Distribution Frame

A. Filter Fuse Panel

3.32 The filter fuse panel (ED-82947-30, G2) is a distribution panel with positions for 48 load fuses and 48 indicator fuses in parallel. The filter fuse panel is divided in half with each side containing 24 load and 24 indicator fuses, three filter capacitors, and an alarm LED to indicate blown fuses. There are also three filter fuses and three LEDs that monitor the capacitors on each side. A discharged capacitor will light the LED and will produce a minor alarm. Each of the 24 indicator fuses connect to a common panel alarm LED in each of the upper corners of the panel. These indicator fuses have a rod that protrudes from the fuse cap when the fuse blows. A blown fuse will cause a major alarm. Alarms are connected to the control panel. The filter fuse panel is shown in Figure 20.

B. Control Panel

3.33 The control panel (ED-82947-30, G10) consists of two plug-in, modular circuit packs; an alarm module and a charging circuit module. Each is fused and contains controls and indicators. A charging probe is used to charge filter capacitors. The control panel is shown in Figure 20.

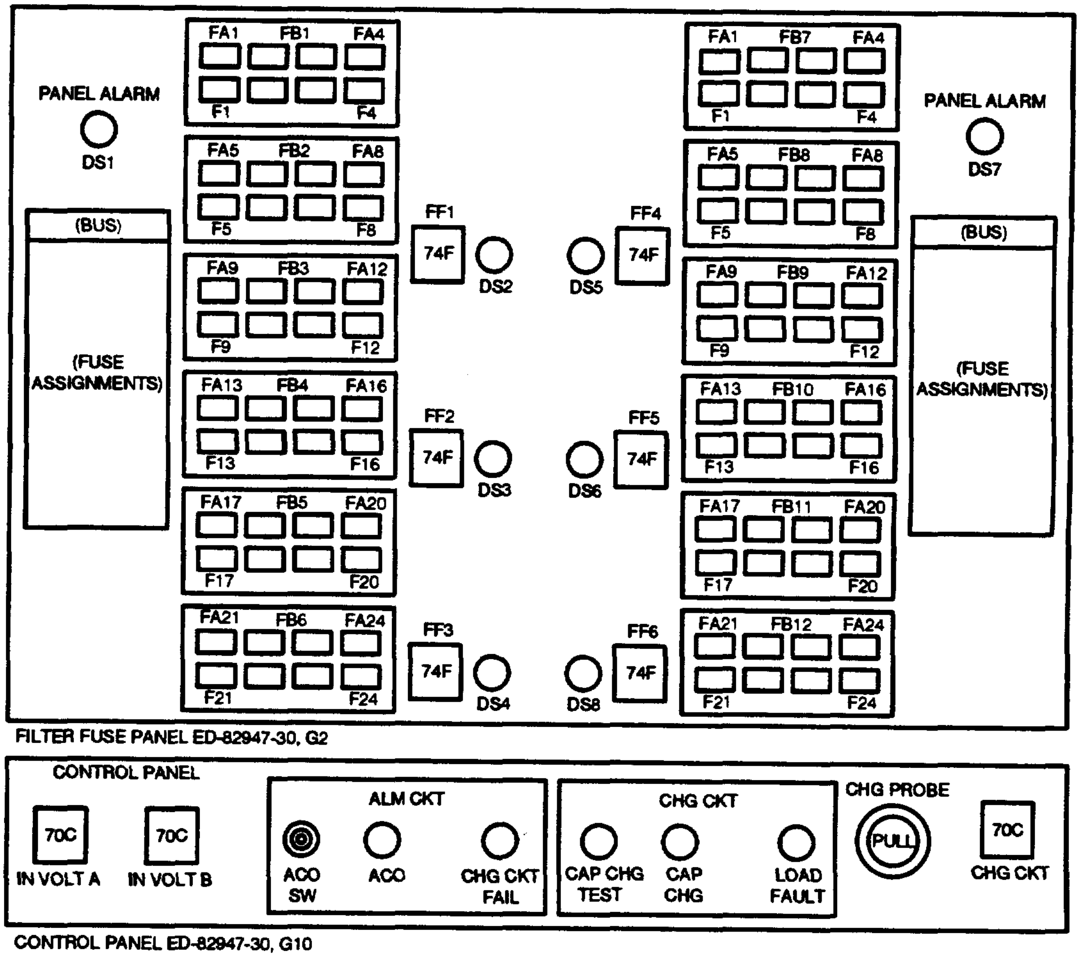


Figure 20. Filter Fuse Panel and Control Panel

C. High-Current Fuse Panels

3.34 The high-current fuse panel (ED-82947-30, G6) is used only on the J86334B PDF to supply 50-amp current to inverters for the 300-megabyte disk drives. This panel has a capacity for eight fuse blocks with each containing a 50-amp fuse and an indicator fuse. The indicator fuse is visible from the front. This panel is divided in half with each side receiving a dedicated -48 V DC and return cable pair from the battery plant. Each side contains four fuse blocks and three capacitors connected across the input bus and return. Each capacitor is monitored by a LED. The indicator fuses are tied together to a common panel alarm LED in the upper corner. Alarm conditions are sent to the control panel. The high-current fuse panel (ED-82947-30, G6) is shown in Figure 21.

3.35 The high-current fuse panel (ED-82947-30, G5) is used only on the J86334C PDF and requires the capacitor panel (ED-82947-30, G4) to stabilize the bus voltages. The ED-82947-30, G5 panel has a capacity for eight fuse blocks with each containing a 50-amp fuse and an indicator fuse. This panel is divided in half with each side receiving a dedicated -48 V DC and return cable pair from the battery plant. Each side contains four fuse blocks. The indicator fuses are tied together to a common panel alarm LED in the upper corner. Alarm conditions are sent to the control panel. This high-current fuse panel is used to power inverters for 300-megabyte disk drives. The high-current fuse panel (ED-82947-30, G5) is shown in Figure 22.

3.36 The capacitor panel (ED-82947-30, G4) contains 16 high-value capacitors, eight on each half. This panel is used on the J86334C power distribution frame only. The eight capacitors on the left are tied to the left-hand bus bar. Conversely, the eight capacitors on the right connect to the right-hand bus bar. The capacitors on each side are paralleled, each protected by a dedicated indicator fuse. A LED on each side of the capacitor panel indicates that one or more of the eight capacitors have generated an alarm that is also sent to the control panel. An extended fuse rod on the indicator fuse indicates a capacitor that has discharged. The capacitors on each half are filters and hold the bus voltage to an acceptable level. The capacitor panel (ED-82947-30, G4) is shown in Figure 22.

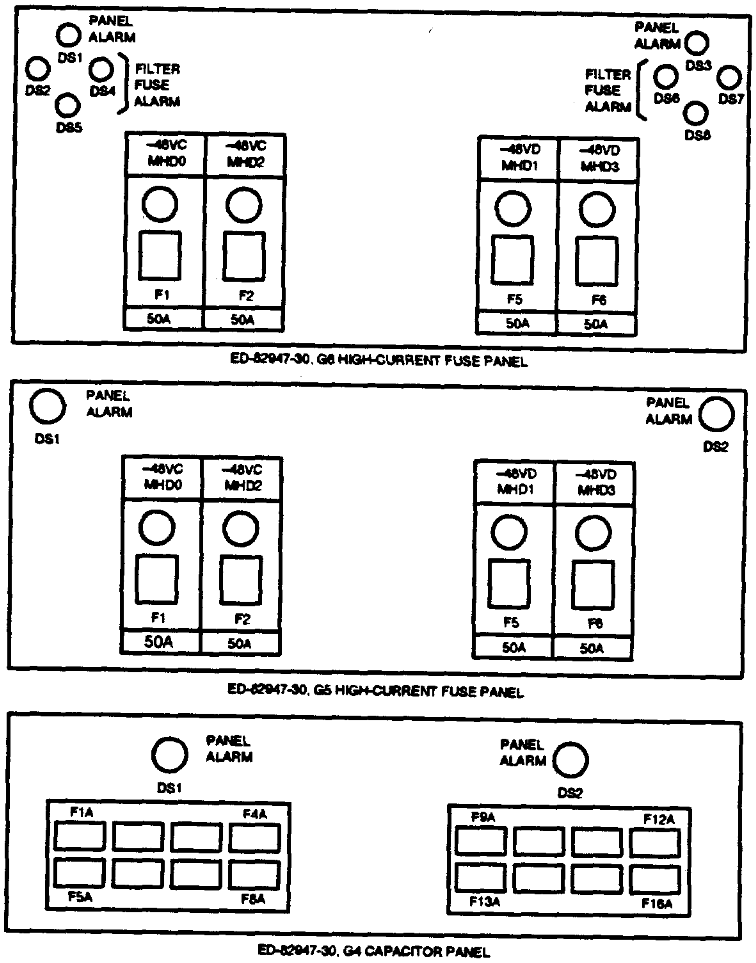


Figure 21. High-Current Fuse Panels

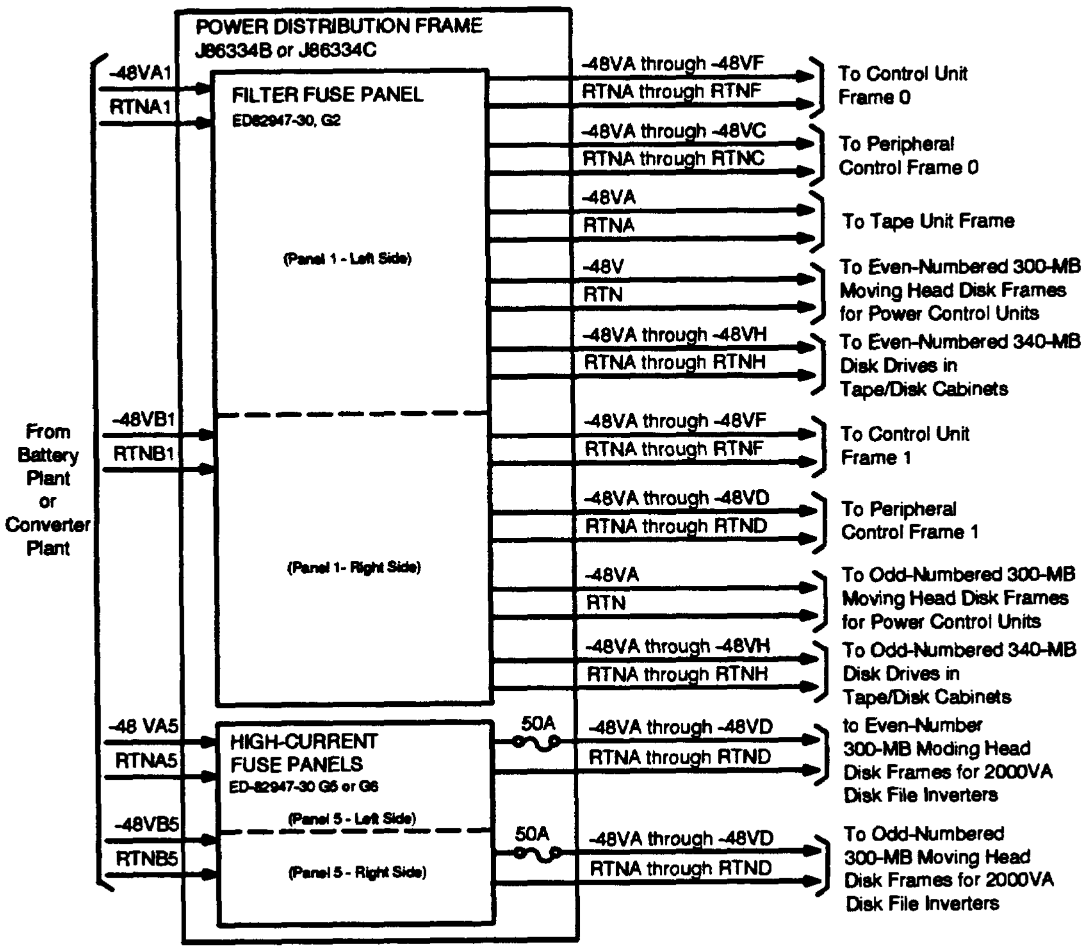


Figure 22. Power Distribution Frame Block Diagram

4. Theory of Operation

4.01 The theory of operation for power systems will deal with power distribution to include converter and inverter operation and alarms.

Power Switches

4.02 Each of the functional units in the computer requires its own control/display facility; this is necessary to turn unit power on and off, display power and alarm states, and provide out-of-service (OSS) request and display features. These facilities are a common circuit arrangement and are found on the unit power switches. Although not identical, the power switches contain common switches and LEDs that result in the same actions. The power switches for the various units are listed below:

- Control unit - ABB1
- SMD Disk file controller - ABB1
- Input/output processor - ABB1
- 340-megabyte disk drive power switch - ED- 4C481
- Disk file inverter - ED-4C479
- SCSI Disk File Controller - TN6B
- SCSI Disk Unit Package - CGG1

4.03 These power switches contain controls and indicators to control the application and removal of power and to indicate status. Power may be manually turned on and off. Power may be removed from the unit by simultaneously pressing the OFF and manual override (MOR) switches, but the MOR switch is used only during emergencies. When power is removed, the OFF LED will light. Pressing only the OFF switch will not power down the unit when the unit is in service. The unit may be powered up by operating the ON switch, and the OFF LED will extinguish. Power alarms may be retired and the LEDs tested by operating the alarm cutoff/test (ACO/T) switch. A power alarm is in effect when the ALM LED is lighted.

4.04 Each power switch interfaces the system through two scan (SCX and SCY), two signal distributor (OOS and RQIP), and two alarm (MJ and PA) points. Each scan and alarm point consists of an isolated metallic contact. An active (1) state appears as a resistance of less than 200 milliohms, while the inactive state (0) appears as an open circuit. The scan point (SCX) monitors requests (ROS and RST) while scan point (SCY) monitors the status (power on/off and alarm fault). The MJ alarm point closes when the system powers a unit down and remains closed until the ACO/T switch is depressed. When power is left on in the presence of a fault, both MJ and PA alarm points close. The MJ point remains closed until the ACO/T switch is depressed or the fault is cleared. Scan point and alarm point states are shown in Table I.

Table I. Scan Point and Alarm Point States

Condition	SCX	SCY	MJ	PA
Normal in service	0	0	0	0
Request out of service	1	0	0	0
Manual power off	1	1	0	0
System power off	1	1	1	0
Major fault present*	0	1	1	1
Minor fault present*	0	1	0	1

*When powering up.

4.05 The signal distributor points (SDPs) act on requests and provide the system response. An active (1) state of the RQIP SDP indicates system acknowledgement that a request for removal or restoral of the associated unit has been made. If the request is granted, the RQIP point will become inactive (0) state. If it is denied, the RQIP point will intermittently flash for a few seconds, then extinguish. The OOS SDP becomes active when the unit has been taken out of service. States of SDPs are shown in Table J.

Table J. Signal Distributor Point States

Condition	RQIP	OOS
Normal in service	0	0
Request remove from service	1	0
Request restore to service	1	1
Remove request denied	Flash	1
Restore request denied	Flash	1
Remove granted	0	1

Power Distribution

A. Power Distribution Frame

4.06 All direct current power for the 3B20D computer comes from a power distribution frame (Figure 22). A dedicated -48 V DC is supplied from the power plant or converter to each half of each filter fuse panel and to each half of each high-current fuse panel installed.

4.07 Six dedicated buses (A through H) supply -48 V DC from each half of the filter fuse panel to polarized jacks at the top of the CU frame. The left side supplies CU 0 and the right side supplies CU 1. Likewise, three buses (A through C) supply power to peripheral control frame 0 from the left half of the filter fuse panel and four buses (A through D) feed peripheral control frame 1 from the right half. Another bus is dedicated to the tape unit frame.

4.08 Each power CU in the MHD frame is supplied with -48 V DC from the filter fuse panel. The power CUs for even-numbered 300-megabyte disk drives are connected to the left side and odd-numbered disk drives are connected to the right side. At installations retrofitted with the 340-megabyte disk drives, the same scheme is used to supply -48 V DC to their respective power supplies. Specific buses are not designated for specific units. Labels on the filter fuse panel are stenciled at installation to reflect fuse (and bus) assignments.

4.09 High current (50-ampere) power for the 2000VA disk file inverters is furnished from the high-current fuse panels. Disk file inverters for even-numbered 300-megabyte disk drives are supplied from the left half of the high-current fuse panel and disk file inverters for odd-numbered disk drives are supplied from the right half in the same manner. Fuse blocks on the high-current fuse panels are labeled to indicate assignment.

4.10 The maximum voltage drop from the battery plant to the input terminals should not exceed 0.25 volt for a 60-foot run, 0.50 volt for a 120-foot run, or 0.75 volt for a 200-foot run. The maximum voltage drop from the PDF to computer frames should not exceed 1 volt. There are no voltage regulating circuits on either PDF. Only blown fuses are monitored.

B. Control Unit Frame

4.11 ***Logic Power:*** Logic power is provided using DC-to-DC converters as follows:

- The I32AJ converter supplies -5.0 V DC at 0.25 amperes and +12.15 V DC at 10 amperes for memory. Later MAS arrays do not require these voltages.
- The 203A1 converter provides +5 V DC and ±12 V DC as reference voltages.
- The 244C converter supplies +5.125 V DC at 60.0 amperes as the main source of logic power for circuit packs.
- The 244D converter is a replacement for the 244C and can supply +5.125 V DC at 90 amperes. Three 244D converters can replace four 244C converters.

4.12 These power converters consist of an input filter, a switching power amplifier drive circuit, a power transformer, output rectifiers, output filters, and control circuitry. They operate by converting a -48 V DC input to a chopped, pulse-width-controlled square wave. The square wave is passed through a transformer, rectified, and each isolated DC output filtered. Voltage stabilization is achieved by sensing the output or the summation of several outputs and by using the sensed voltage to control the pulse width of the chopped square wave.

4.13 The 244C/D and 132AJ power converters will shut down for a high- or low-output voltage, high-output current, or a low-input voltage condition. An alarm indicator and a low-voltage relay contact is provided on these converters. The 244C/D converters contains a front-mounted on/off switch.

4.14 ***Power Control:*** Power control in the CU frame is provided by the ABB1 power switch (Figure 23) together with a power monitoring circuit on the TN11 emergency action interface circuit pack. The ABB1 power switch contains the following controls and indicators:

ON	A momentary switch that applies power.
OFF	A momentary switch that removes power provided the system has taken the unit out of service.
OFF	A red indicator that lights when the power is off.
ALM	A red indicator that lights when a hardware fault has occurred.
OOS	A yellow indicator that lights when the system has taken the unit out of service.
RQIP	A green indicator that lights during the time that the system is processing a request to remove the unit from service or to restore the unit to service and flashes for a few seconds then extinguishes if the request has been denied.
ROS	A green indicator that lights when a request has been made (via the ROS switch) to remove the unit from service.
ROS/RST	A rocker (toggle) switch used to send a request to the system to remove the unit from service or to restore the unit to service.

ACO/T A rocker (toggle) switch used to retire a hardware alarm and test indicators.

MOR A momentary manual override switch that is used simultaneously with the OFF switch to remove power from the unit in an emergency.

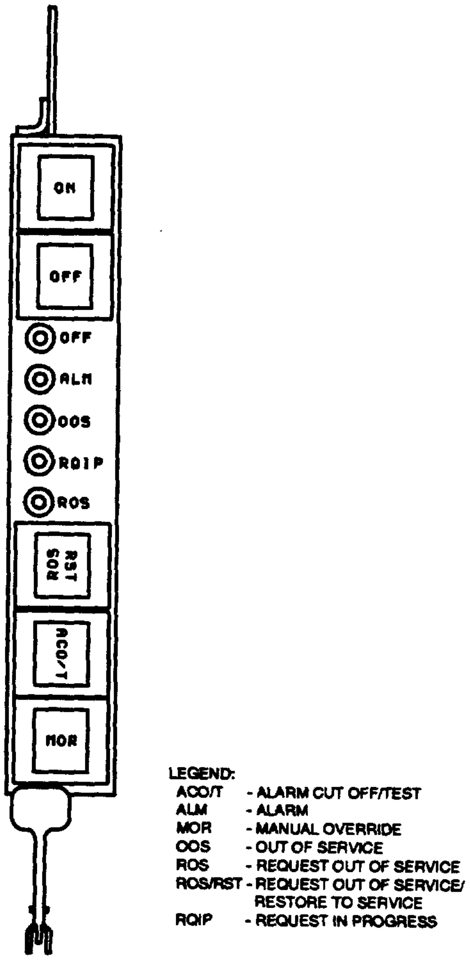


Figure 23. ABB1 Power Switch

4.15 ***Power-Up Sequence:*** Refer to the block diagram of the CU frame power distribution shown in Figure 24. Provided no alarms exists (PAA0 and PAC0) and fan units are in place (CPP0), pressing the ON switch at the ABB1 power switch will start the power-up sequence. The ABB1 supplies two initialization signals (INIT0 and INITD0), five start A signals (STA10-50), one start B signal (STB10), and one power start signal (PWRSTRT). These signals ensure that power is supplied in the proper sequence. The initialization signals are 800 millisecond pulses, whereas the start signals remain active. When the ON switch is depressed on the ABB1 power switch, the initialization pulse and the start A signals go active simultaneously, while the start B signal begins 500 milliseconds later.

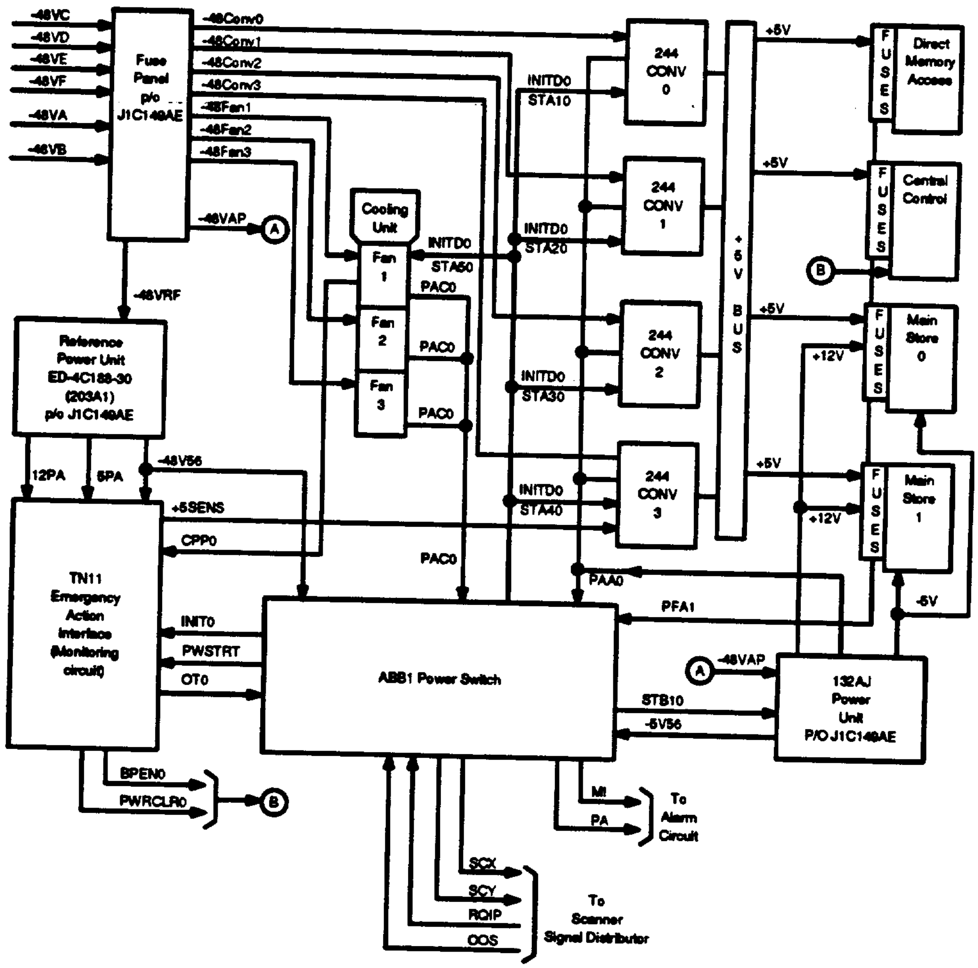


Figure 24. Control Unit Power Block Diagram

4.16 The initialization signals start the power-up sequence. They set up the circuitry for the start signals. This allows the ABB1 power switch to be removed and reinserted while -48 V DC is present without inadvertently enabling the converters. The INIT0 triggers the TN11 monitoring circuits to send a PWRCLR signal to the special registers in the CC to clear bus circuits. The INITD0 signals the 244C/D converters.

4.17 The start A signals enables the 244C/D converters and starts the cooling fans. The start B signal enables the -5 V DC and +12 V DC memory voltages provided by the 132AJ converter. The +5 V DC output from the converters must be present for the memory arrays before the -5 V DC and +12 V DC are applied from the 132AJ converter to prevent damage. Internal circuitry within the 132AJ converter also applies the -5 V DC before the +12 V DC. (-5 V DC and +12 V DC are only required with the TN14 main store arrays.) The 203A1 converter is on whenever -48 V DC is applied and requires no start signal.

4.18 The TN11 monitoring circuits continually check that voltages generated by the 244C/D and 132AJ converters are within tolerance. They generate power clear and bus power enable signals after voltages are stabilized following the power-up sequence. The TN11 monitoring circuits buffer the fan alarm signal from the cooling units to the ABB1 power switch. The TN11 has no power related indicators.

4.19 The OFF indicator on the ABB1 power switch, lighted in the power off state, will extinguish when the power-up sequence is complete. If any alarms that preclude sane operation exist, the ALM indicator lights and the CU remains powered down.

4.20 ***Power-Down Sequence:*** The OFF switch on the ABB1 power switch is interlocked with a system- generated, OSS circuit that prevents inadvertent removal of CU power. Pressing the OFF switch causes no change in the state of the CU unless the OSS signal distribute point has lighted the OOS indicator. On power down, the start B signal is removed approximately 500 milliseconds before the start A signal. Thus, converters are disabled in reverse order. The OFF indicator will light on the ABB1 power switch when the power-down sequence is complete. In an emergency, the MOR switch can be depressed simultaneously with the OFF switch to override the OSS interlock, and the CU will power down.

C. Peripheral Control Frame

Input/Output Processor

4.21 ***Logic Power:*** Logic power within the IOP basic and growth units (Figure 25) is provided by 136N power converters. The 136N converters supply +5 V DC at 15 amperes, +12 V DC and -12 V DC at 1.0 amperes. The 136N power converter consists of an input filter, a switching power amplifier drive circuit, a power transformer, output rectifiers, output filters, and control circuitry. The 136N operates by converting a -48 V DC input to a chopped, pulse-width-controlled square wave. The square wave is passed through a transformer, rectified, and each isolated DC output filtered. Voltage stabilization is achieved by sensing the output and using the sensed voltage to control the pulse width of the square wave.

4.22 The 136N power converter will shut down for a high- or low-output voltage, high-output current, or a low-input voltage. An alarm indicator, a low-voltage relay contact, and a front-mounted, on/off switch is provided.

4.23 ***Power Control:*** Power control for the IOP (basic and growth) unit is provided by an ABB1 power switch for the combined units together with a TN71 power monitor circuit pack for each peripheral community. The ABB1 was illustrated and described earlier in the CU section. The TN71 power monitor supplies -5 V DC and +12 V DC to the backplane for PC memory voltages. The TN71 monitors the backplane to ensure that the voltages generated on-board are present and within appropriate tolerances. The +5 V DC logic voltage is also monitored since its presence is required to generate the other voltages. Five LEDs are edge mounted on the faceplate of the TN71. These indicate:

+5 LOGIC	When (red) that the +5 V DC logic from the 136N converter is out of tolerance.
EIAOT	When (red) that the +12 and -12 V DC are out of tolerance.
MEMOT	When (red) that the -5 and +12 V DC memory voltages are out of tolerance.
+5 REF	When (red) that the +5 V DC reference voltage is missing. The presence of the reference voltage guarantees the presence of the TN71 +5 V DC logic power, the +12 V DC monitor circuit, and the -48 V DC input.
OOS	When (yellow) that the peripheral community is out of service.

4.24 The ACO/T switch on the ABB1 power switch tests the LEDs on the TN71. When an out-of-tolerance condition is detected by the TN71 in any community, an OTO signal is sent to the ABB1 power switch. The TN71 provides tighter voltage control than the 136N converter by using a voltage preregulator circuit. The output of the 136N converter is compared with a +5.01 V DC reference voltage, amplified, and fed back to the 136N converter. The +5.01 V DC is provided by a +6 V DC reference regulator and an extremely accurate voltage divider.

4.25 The -48 V DC for use by PCs is wired through the respective TN71; thus removal of

4.26 ***Power-Up Sequence:*** Refer to the block diagram of the IOP power distribution as shown in Figure 25. Provided no alarms exist, pressing the ON switch at the ABB1 power switch will start the power-up sequence. The ABB1 supplies start A signals (STA00 through STA30) to start the fans and enables the 136N converters. The start signals reach the 136N converters through the TN70 circuit pack in the IOP controller and the TN71 in each community. This prevents the 136N converters from powering-up if the TN70 or any associated TN71 in a community is missing. As soon as the +5 V DC logic power is sensed, the TN71 on-board -5 V DC and +12 V DC memory power converters power up. To prevent damage to memory devices, internal circuitry within the TN71 applies the -5 V DC before the +12 V DC. The OFF indicator on the ABB1 power switch, lighted in the power-off state, will extinguish when the power-up sequence is complete. If any alarms exist, the ALM indicator lights and the IOP remains powered down.

4.27 ***Power-Down Sequence:*** The OFF switch on the ABB1 power switch is interlocked with a system generated, OSS circuit that prevents inadvertent removal of IOP power. Pressing the OFF switch causes no change in the state of the IOP unless the OSS signal distribute point has lighted the OOS indicator. On power down, converters are disabled in reverse order. The OFF indicator will light on the ABB1 power switch when the power-down sequence is complete. In an emergency, the MOR switch can be depressed simultaneously with the OFF switch to override the OSS interlock, and the IOP basic and growth units will power down.

4.28 Power is segmented in the IOP so that any community may be individually powered down without affecting the remaining active portions. Since the start signal to each 136N converter is wired through the associated TN71 power monitor in each community, removing the TN71 will power down that community. Likewise, removing the TN70 in the IOP controller section will power down the controller section. However, when the IOP controller section is powered down, the entire IOP powers down as well.

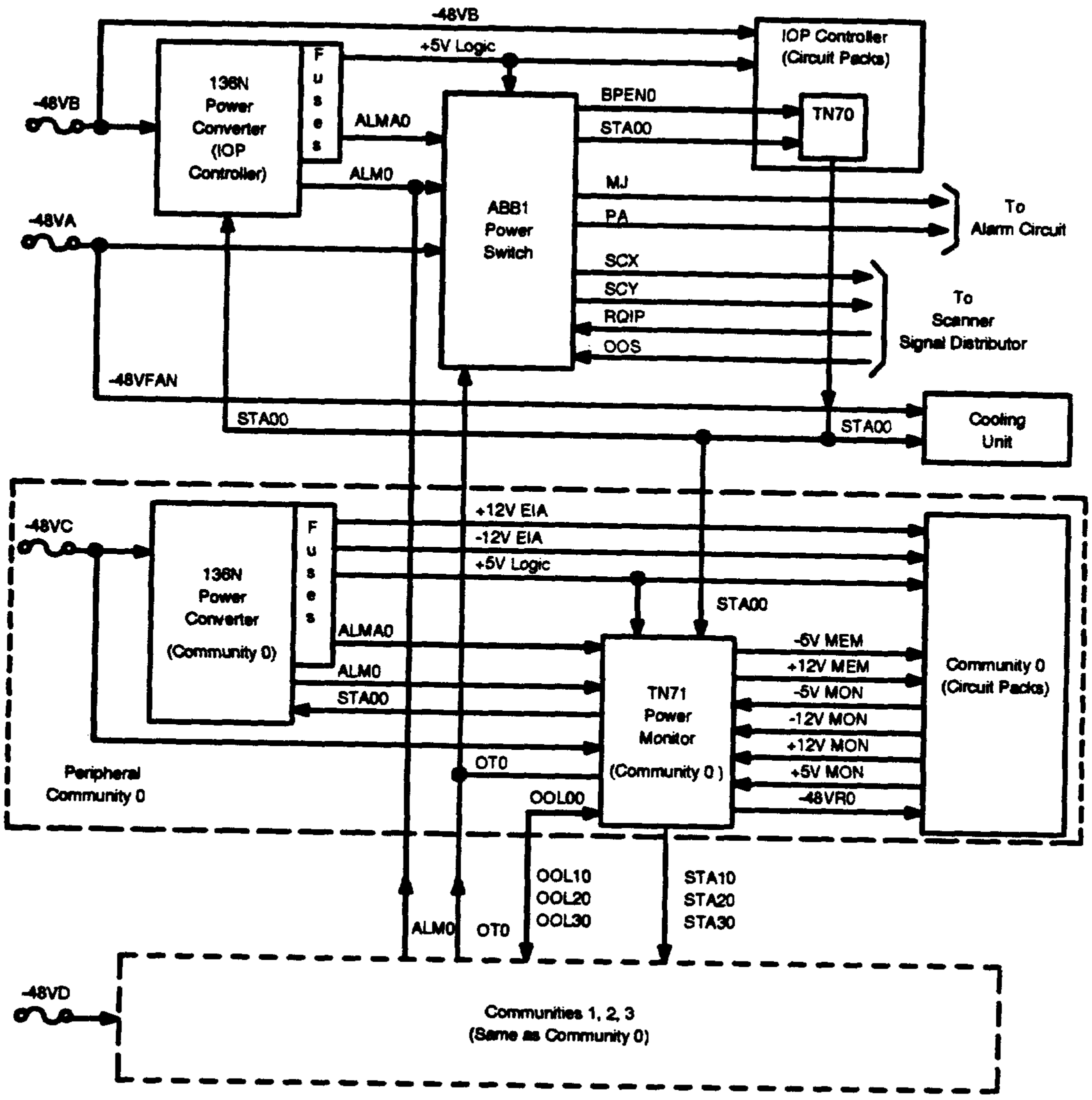


Figure 25. Input/Output Processor Power Block Diagram

SMD Disk File Controller

4.29 ***Logic Power:*** Logic power within the DFC unit (Figure 26) is provided by a 133J power converter. The 133J converter supplies +5 V DC at 40 amperes. The 133J power converter consists of an input filter, a switching power amplifier drive circuit, a power transformer, output rectifiers, output filters, and control circuitry. The 133J operates by converting a -48 V DC input to a chopped, pulse-width-controlled square wave. The square wave is passed through a transformer, rectified, and each isolated DC output filtered. Voltage stabilization is achieved by sensing the output and using the sensed voltage to control the pulse width of the square wave.

4.30 The 133J power converter will shut down for a high- or low-output voltage, high-output current, or a low-input voltage. An alarm indicator, a low-voltage relay contact, and a front mounted on/off switch is provided.

4.31 ***Power Control:*** Power control for the DFC unit is provided by an ABB1 power switch together with a TN73 power monitor circuit pack. The ABB1 was illustrated and described earlier in the CU section. The TN73 power monitor supplies -5 V DC to the backplane for memory voltages and generates a +12 V DC for use internally. The TN73 monitors the backplane to ensure that the voltages generated on-board are present and are within appropriate tolerances. The +5 V DC logic voltage is also monitored since its presence is required to generate the -5 V DC. Five LEDs are edge mounted on the faceplate of the TN73. These indicate:

+5 LOGIC	When (red) that the +5 V DC logic from the 133J converter is out of tolerance.
EIAOT	This indicator is disabled.
MEMOT	When (red) that the -5 and +12 V DC voltages are out of tolerance.
+5 REF	When (red) that the +5 V DC reference voltage is missing. The presence of the reference voltage guarantees the presence of the TN73 +5 V DC logic power, the +12 V DC monitor circuit, and the -48 V DC input.
OOS	When (yellow) that the DFC is out of service.

4.32 The ACO/T switch on the ABB1 power switch tests the LEDs on the TN73. When an out-of-tolerance condition is detected by the TN73, an OT0 signal is sent to the ABB1 power switch.

4.33 ***Power-Up Sequence:*** Refer to the block diagram of the DFC power distribution as shown in Figure 26. Provided no alarms exist, pressing the ON switch at the ABB1 power switch will start the power-up sequence. The ABB1 supplies start A signals (STA20 and STA50) to start the fans and to enable the 133J converters. The start signal (STA20) reaches the 133J converter through the TN70 circuit pack in the DFC and the TN73. This prevents the 133J converter from powering up if the TN70 or the TN73 are missing. As soon as the +5 V DC logic power is sensed, the TN73 on-board -5 V DC and +12 V DC power converters power up. The OFF indicator on the ABB1 power switch, lighted in the power-off state, will extinguish when the power-up sequence is complete. If any alarms exist, the ALM indicator lights and the DFC remains powered down.

4.34 ***Power-Down Sequence:*** The OFF switch on the ABB1 power switch is interlocked with a system-generated OSS circuit that prevents inadvertent removal of DFC power. Pressing the OFF switch causes no change in the state of the DFC unless the OSS signal distribute point has lighted the OOS indicator. On power-down, the converter and power monitor are disabled in reverse order. The OFF indicator will light on the ABB1 power switch when the power-down sequence is complete. In an emergency, the MOR switch can be depressed simultaneously with the OFF switch to override the OSS interlock, and the DFC will power down.

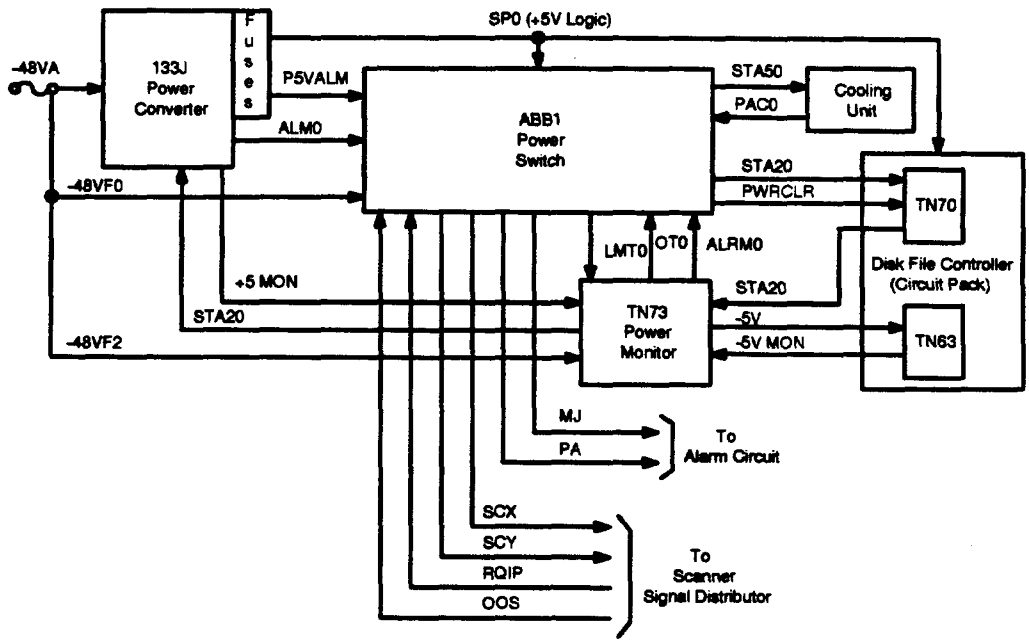


Figure 26. Disk File Controller Power Block Diagram

D. Tape/Disk Cabinet

4.35 The KS-22997 power supply (Figure 27) receives -48 V DC fused at the PDU at the top of the cabinet and supplies +5.1, -5.1, +24, -24, and +40 V DC to its dedicated 340-megabyte disk drive. Input -48 V DC and the ±24 V DC are protected from overload by circuit breakers. Except for the +40 V DC, all voltages are applied to the disk drive on power up. The +40 V DC is applied when enabled (EN40V) by control circuitry within the disk drive. The disk drive also has internal circuits that monitor the +5 V DC input and other voltages generated on the control board and signals the power supply when these voltages become unreliable.

4.36 The power supply front panel (see Figure 22) has a 12-ampere circuit breaker for input power and two 5-ampere circuit breakers for ±24 V DC. The front panel also has a local power switch which is disabled, a green ON lamp to indicate the power supply is active, and a red ALM lamp to indicate that a fault exists.

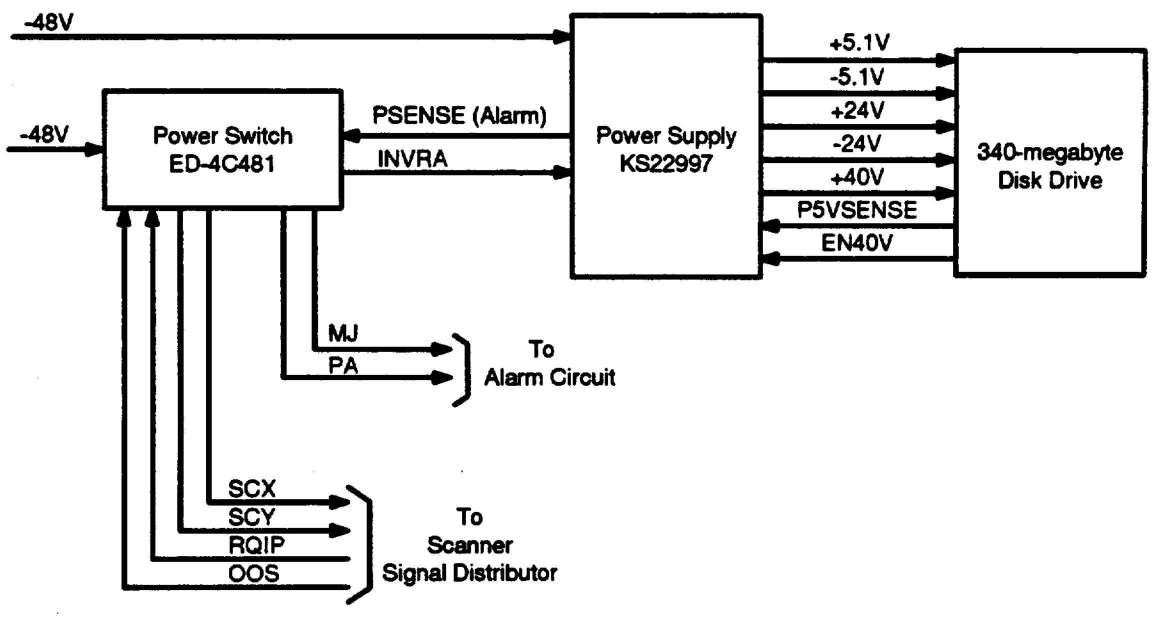


Figure 27. 340-Megabyte Disk Drive Power Block Diagram

4.37 Power control for the power supply is provided by the ED-4C481 power switch which in turn controls the 340-megabyte disk drive. Power for internal circuitry in the power switch is -48 V DC fused at the power distribution unit at the top of the cabinet. The power switch is used as a remote control for the power supply. Provided the -48 V DC circuit breaker is on and no alarms exist, pressing the ON switch on the faceplate of the power switch sends an enabling signal (INVRA) to start the power supply. The power switch monitors the power supply for power faults (PSENSE), removes power for a fault condition, and lights an ALM LED.

4.38 The ED-4C481 power switch (see Figure 27) contains the following controls and indicators:

ON	A momentary switch that applies power.
OFF	A momentary switch that removes power provided the system has taken the unit out of service.
OFF	A red indicator that lights when the power is off.
ALM	A red indicator that lights when a hardware fault has occurred.
OOS	A yellow indicator that lights when the system has taken the unit out of service.
RQIP	A green indicator that lights during the time the system is processing a request to remove the unit from service or to restore the unit to service and flashes for a few seconds then extinguishes if the request has been denied.
ROS	A green indicator that lights when a request has been made (via the ROS switch) to remove the unit from service.
ROS/RST	A toggle switch used to request the system to remove the unit from service or to restore the unit to service.
ACO/T	A toggle switch used to reset a hardware alarm and test indicators.
MOR	A momentary manual override switch that is used simultaneously with the OFF switch to remove power from the unit in an emergency.

E. Moving Head Disk Frame

2000VA Disk File Inverter

4.39 The 2000VA disk file inverter is a power conversion unit that changes -48 V DC to a 208 volt root mean square (RMS) pseudo-sine wave. The disk file inverter is used in conjunction with the power CU. A block diagram of the disk file inverter and power CU are shown in Figure 28. Components of the DFC are:

- Inverter input and regulator
- Transformer and transformer drive
- Waveshaper (TM72)
- Output section
- Fan control
- Inverter control (TM482).

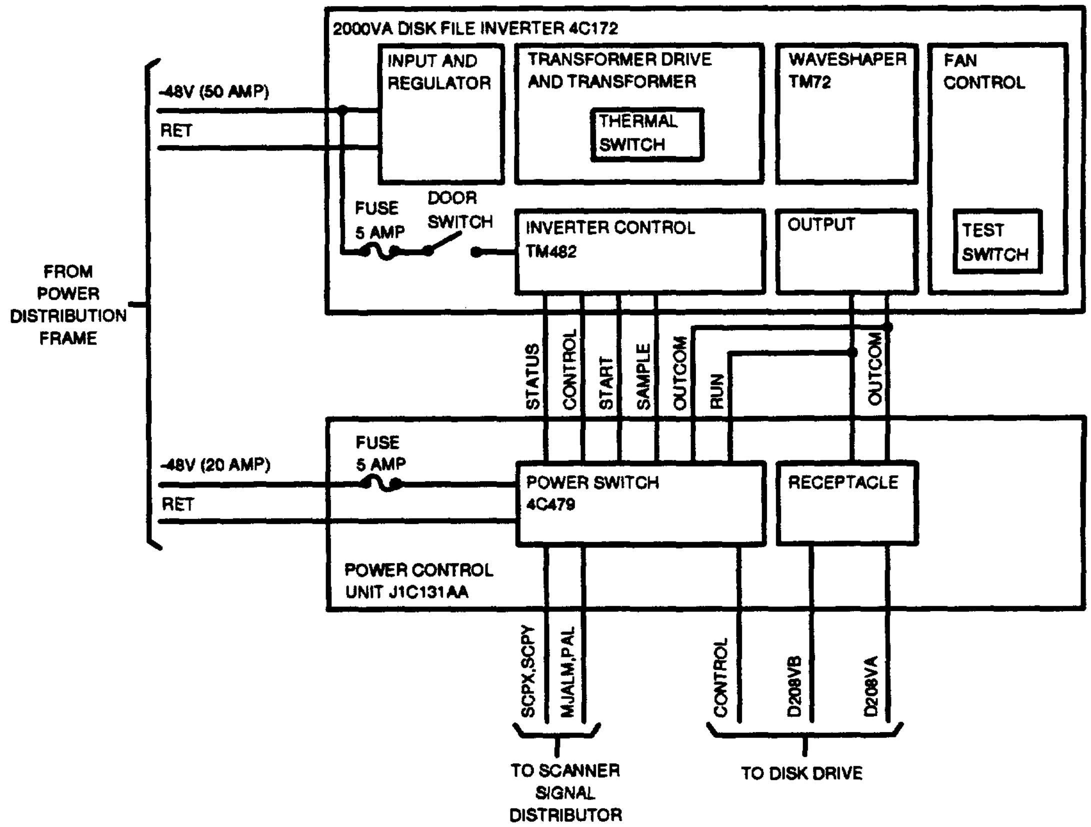


Figure 28. 300-Megabyte Disk Drive Power

4.40 The inverter input and regulator include the -48 V DC input connections, high-current rectifiers for the reflex regulator, and a filtering circuit. The transformer drive consists of level-shifting and amplifying circuits to drive the transformer. The transformer primary at 50 volts peak is stepped up to 300 volts peak on the secondary winding. Five taps on the secondary furnish 150 volt square waves as inputs to the waveshaper (TM72). Other taps on the secondary are stepped down for internal power. Under microcontrol, the waveshaper (TM72) generates a pseudo-sine wave from the square wave input by turning on rectifiers in a predetermined sequence. The inverter control (TM482) contains drive, clamping, and regulator circuits. It samples the output voltage, receives control signals from the power control unit, and monitors the DC fans. The DC fans will continue to cool after the disk file inverter has been turned off. The output section contains feed-through capacitors.

4.41 The fan control consists of an AC fan, a DC fan, and control circuitry. The AC fan cools the TM72 and TM482 circuit packs. The DC fan cools the main transformer and the remainder of the disk file inverter. The fan monitoring circuits will power down the disk file inverter and generate an alarm if the DC fan fails. A speed monitoring circuit is contained in the DC fan housing. If rotational velocity falls below 65 percent of rated speed for more than 10 seconds, detection circuitry will signal a low condition. This low condition is latched and will not reset until a power cycle occurs. A test switch in the fan control allows the alarm circuit to be tested. This switch, located behind the air filter, disables the fan motor as long as the switch is depressed. If the switch is depressed longer than 10 seconds, the fan speed detector will signal the fan failure condition. Release of the switch will restore the fan voltage; however, the alarm circuits will not reset until a power down occurs. The disk file inverter must be power cycled to reset alarms.

4.42 A thermal switch on the transformer secondary monitors temperature. This switch will close, initiate an alarm, and shut down the disk file inverter should an over-temperature condition exist. If the temperature decreases below the thermal switch reset point, the switch will close. The disk file inverter cannot be restarted until the thermal switch has reset; therefore, a cooldown interval may be necessary.

4.43 The power CU (Figure 28) is an interface between the disk file inverter and the disk drive. It consists of a receptacle, a power switch (ED-4C479), and some discreet high-power components. Control signals from the power CU to the disk file inverter consist of ON and OFF signals from the power switch, samples of the ac delivered to the disk drive, and disk drive status. Connections from the power CU to the disk drive carry the two AC power leads, a ground lead, and leads to the spindle motor centrifugal switch, the main and start windings, and the start switch. A signal from the disk drive to the power CU indicates that the disk drive has power. The power switch (ED-4C479) handles the standard manual inputs and software functions via scanner and SDPs.

F. SCSI Disk File Controller

4.44 The SCSI DFC power distribution is shown in Figure 29. The 495FA power unit (495FA) converts the -48 V DC input from the PDU to +5 V DC logic power for use in the SCSI DFC circuit packs. The TN6B power switch controls the 495FA power unit. The output of the power unit is connected directly to a backplane segment and to a screw-lug terminal at the side of the backplane. Before power can be applied, the TN6B must have a converter interlock (DINTLO) signal that indicates the power unit is in place and latched. This signal (ground) is available at the power unit. When the ON switch is pressed, the TN6B sends a start (DSCTP and DSCTN) signal to the power unit and sends a power clear signal (DPWRCLR0) to the UN294 host adapter. An alarm condition in the power unit will send the DCALM0 signal to the TN6B power switch.

4.45 The status indicators and controls of the TN6B power switch operate similarly to the indicators and controls of the ABB1 power switch.

4.46 The host adapter, consisting of two circuit packs (UN294 and TN2116) connects to two SCSI buses. Each SCSI bus is terminated at each end by bus terminating resistors. The UN294 supplies +5 V DC power to the terminating resistors on each SCSI bus through diodes that provide disjunctivity - if +5 V DC to one bus is shorted, +5 V DC on the other bus is not affected.

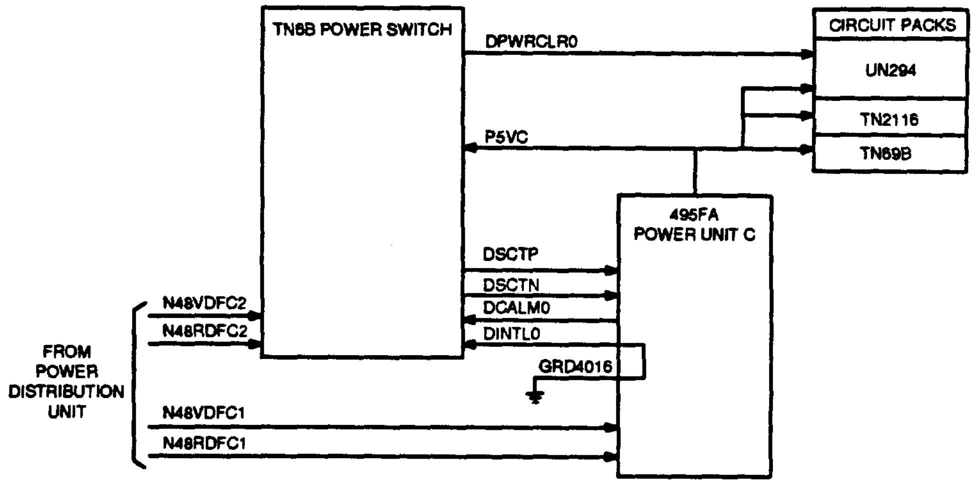


Figure 29. SCSI Disk File Controller Power Distribution

G. Cooling Unit

4.47 The cooling unit receives fused -48 V DC power from the power distribution unit within the SCSI disk cabinet.

H. SCSI Disk Unit Package

4.48 The SCSI disk unit package (DUP) power distribution is shown in Figure 30. The SCSI DUP contains a power supply (CGG2), a power switch (CGG1), a disk drive, and a cooling fan. Input -48 V DC is fused at the PDU at the top of the cabinet and routed to the DUP. Within the DUP, -48 V DC is provided to the CGG2 and CGG1 circuits. The power supply converts the -48 V DC to =5 V DC and +12V DC which is routed to the disk drive and monitored by the power switch. The fan is also powered by +12 V DC and receives +5 V DC for a performance sensor. In the event of a fault, an alarm signal will be produced.

4.49 The power supply regulates the +5 and +12 V DC. The power supply provides low voltage protection, over-voltage protection, and output current limiting. In the event of a fault, the power supply will shut down and provide an alarm signal to the power switch.

4.50 The status indicators and controls of the CGG1 power switch operate similarly to the indicators and controls of the ABB1 power switch.

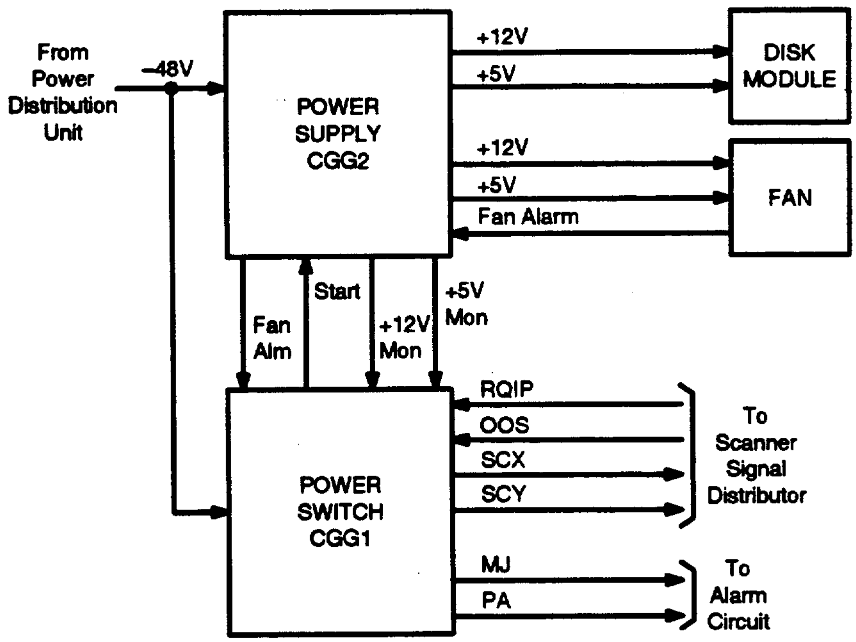


Figure 30. Disk Unit Package Power Block Diagram

Alarms

4.51 The power system generates major and minor alarms when a fault occurs. A power fault is indicated as follows:

- A lighted alarm LED on the faceplate of the unit power switch
- An audible alarm (when equipped by the application)
- An alarm output message on the receive-only printer
- A flashing, reversed-video alarm label on the maintenance terminal.

A. Control Unit

4.52 The CU power control system (Figure 28) responds to the following alarm conditions:

- When the ABB1 detects a converter failure, a critical circuit pack is missing or the -5 V DC is missing; causes a major alarm and shuts down the CU.
- When the ABB1 detects a blown fuse, the TN11 detects the 203A1 converter failure or a fan is missing; causes a major alarm, but does not shut down the CU.

- When the TN11 detects a voltage out-of-tolerance or the loss of the reference +5 V DC; causes a minor alarm. (This may be wired to a higher priority alarm.)

B. SMD Disk File Controller

4.53 The SMD DFC power control system (Figure 29) responds to the following alarm conditions:

- The TN73 detects blown fuse, loss of +5 V DC logic voltage, loss of reference +5 V DC voltage; causes major alarm and shuts down the DFC.
- The ABB1 detects converter failure, fuse alarm, or loss of -5 V DC; causes major alarm and shuts down the DFC.
- The TN73 detects voltage out-of-tolerance; causes a minor alarm.

C. Input/Output Processor

4.54 The IOP power control system (Figure 25) responds to the following alarm conditions:

- The ABB1 detects converter failure, a blown fuse, or a TN70 interlock missing; causes a major alarm and shuts down the IOP.
- The TN71 detects a converter failure, a blown fuse, or the ABB1 detects a TN71 interlock missing; causes a major alarm and shuts down the peripheral community but does not power down the IOP.
- The TN71 detects a voltage out-of-tolerance; causes a minor alarm. (This can be wired to a higher-priority alarm.)

D. Power Distribution Frame

4.55 The alarm circuits for the PDF are shown in Figure 31 and are discussed in subsequent paragraphs.

Alarm Circuit ED-82949

4.56 A major alarm is generated when any of the load distribution fuses blow. Actually, the low- current indicator fuse in parallel with the load fuse generates the alarm signal. The major alarm signals are ORed to energize a relay on the alarm circuit pack. When the major alarm relay is operated, two sets of contact closures are provided: one set for office alarm use and one set for scan point monitoring. A major alarm is continuously generated from the alarm circuit pack until the fault is corrected or until the blown indicator fuse is removed. A major or minor alarm causes an incandescent lamp at the top of the PDF to be lighted.

4.57 A minor alarm is generated when a filter capacitor fuse blows or when a fuse blows on the control panel. All of the minor alarm signals are ORed to the alarm circuit pack. A major or minor alarm causes a dedicated LED to light on the panel containing the fuse. Operating a minor alarm relay generates a contact closure to the scan point monitoring circuit.

4.58 The minor alarm may be turned off by momentarily pressing the alarm cutoff switch (ACO SW) on the alarm circuit pack. An ACO LED on the alarm circuit pack is lighted at the same time. A minor alarm may also be removed by correcting the source of the alarm. Fuses FF1 and FF2 on the control panel are ORed to provide -48 V DC power to the plug-in alarm panel and the charge circuit board. The charge circuit board is protected by FF3. Fuses FF1 and FF2 contain a visual blown-state indicator only; should both fuses blow, the alarm generating and capacitor charging circuits will not function.

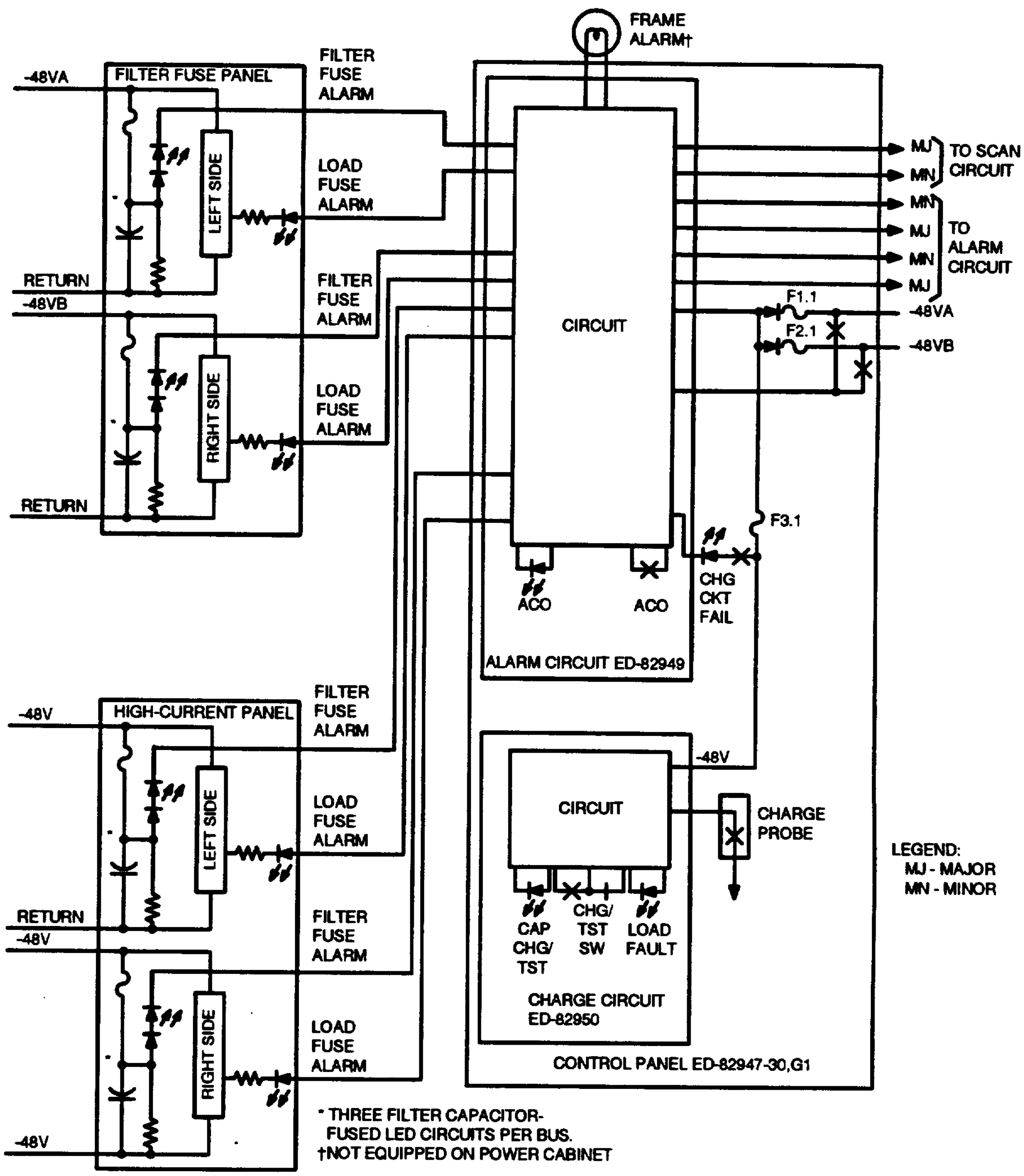
Capacitor Charging Circuit ED-82950

4.59 The capacitor charging circuit limits inrush current to individually precharge the input capacitance of each load protected by the 20-ampere fuses on the filter fuse panel. A pull-out charge probe (reel mounted) is used to precharge the 20-ampere fuse protected loads through the indicator fuse holder. A CAP CHG (capacitor charge) switch must be pushed to actually charge a load. Load and/or indicator fuses must not be installed until after the load is charged. The load fuse is installed first after charging, the charging probe is removed, and then the indicator fuse is installed. A CAP CHG TEST switch is depressed to test the circuit prior to inserting the charge probe in a fuse holder. The CAP CHG LED should light momentarily. This indicates that the charging circuit is functioning. When the probe is inserted, the CAP CHG TEST switch is depressed and its associated LED should light and then extinguish. On the same charge circuit panel, a LOAD FAULT LED will light after 30 seconds of charging (CAP CHG TEST switch depressed), which indicates that 2.5 amperes of charge current is being drawn from the charge circuit. Further charging should not be attempted. When charging a filter capacitor on the filter fuse panel, care should be taken to install the fuse (which has no indicator fuse) within 12 seconds after the CAP CHG LED is extinguished and the charge probe removed. The CHG CKT FAIL LED lights if the CHG CKT fuse blows.

4.60 The high-current fuse panel has provisions for up to four fuse blocks on each bus. See Figure 31. Each fuse block contains a load fuse and a plug-in indicator fuse visible from the front. A common alarm LED lights when one of the load (and indicator) fuses has blown. One of the six (three on each side) filter fuse LEDs lights to indicate that a filter fuse has blown. The charge circuit may be used to precharge the disk inverter load in the same manner as on the filter fuse panel. A spare fuse block that contains neither load nor indicator fuse is used. The spare fuse block is substituted for the fuse block to be charged, and the charging probe is installed in the indicator fuse holder. The CAP CHG switch is depressed until the LED extinguishes; then the spare fuse block is removed, the original fuse block installed, and the indicator fuse installed. This must be accomplished in 12 seconds or the fuse will blow.

Frame Alarm

4.61 The frame alarm indicator panel contains four (two in parallel) incandescent lamps to indicate that a major or minor alarm is active. The lamps are energized via a ground from the alarm circuit pack and are lighted as long as an alarm condition exists in the power distribution frame.



* THREE FILTER CAPACITOR-FUSED LED CIRCUITS PER BUS.
†NOT EQUIPPED ON POWER CABINET

Figure 31. Power Distribution Alarms

SCSI Disk File Controller

4.62 The SCSI-DFC power control system (Figure 29) responds to the following conditions:

- An overcurrent fault occurring in either the circuit packs or backplane; causes power converter shut down and an alarm signal.
- A programing bus fault; causes an alarm signal.
- An overvoltage fault; causes power converter shut down and an alarm signal.
- A low-voltage fault; causes an alarm signal.

SCSI Disk Unit Package

4.63 The SCSI-DUP power control system (Figure 30) responds to the following conditions:

- A low-voltage fault; causes power converter shut down and an alarm signal.
- Loss of -48 V DC input; causes power converter shut down and an alarm signal.
- Fan alarm when DUP is in service; causes an alarm signal.
- Fan alarm when DUP is out of service; causes power converter shut down and an alarm signal.

5. Acronyms and Abbreviations

5.01 The following is a list of acronyms and abbreviations used in this practice.

ACO/T	Alarm Cutoff/Test
CC	Central Control
CCU	Central Control Unit
CH	Channel
CU	Central Unit
CSU	Cache Store Unit
CTRL	Controller
DDSBS	Duplex Dual Serial Bus Selector
DFC	Disk File Controller
DHA	Device Handlers
DMA	Direct Memory Access

DMAC	Direct Memory Access Controller
DUP	Disk Unit Package
EIA	Electronic Industries Association
I/O	Input/Output
IOP	Input/Output Processor
LED	Light Emitting Diode
MAS	Main Store
MASA	Main Store Array
MASM	Main Store Module
MCH	Maintenance Channel
MHD	Moving Head Disk
MOR	Manual Override
OOS	Out of Service
PC	Peripheral Controller
PCF	Peripheral Control Frame
PDF	Power Distribution Frame
PDU	Power Distribution Unit
PIC	Peripheral Interface Controller
ROP	Receive Only Printer
RMS	Root Mean Square
SAR	Store Address
SCSI	Small Computer System Interface
SDP	Signal Distribution Point
SMD	Storage Module Drive

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