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SERIES 64/68/70 CE HANDBOOK

HP 3000 Computer Systems

HEWLETT PACKARD

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CONTENTS

CONTENTS (Continued)

ILLUSTRATIONS

TABLES

PREFACE

The Customer Engineering Handbook is used to correct faults reported by customers. The customer engineer refers to the CE handbook for specifications, procedures, replaceable parts list, troubleshooting data, and pertinent reference information. This handbook is divided into sections to logically arrange data in subject groups. The user is advised to check both the table of contents and the index to locate data.

The Product Information section contains system specifications, a description of the front panel controls and indicators, and general power supply panel indicators.

The Environmental, Installation, and Preventative Maintenance section contains reference to pertinent manuals for installation procedures and provides environmental requirements and preventative maintenance check lists.

The Configuration section supplies the required complement of printed circuit card assemblies, internal & external cables, and system software required to operate the system.

The Troubleshooting section contains SleuthSM diagnostics, error codes/messages, and overtemperature troubleshooting procedures to assist the CE in diagnosing system faults.

The Diagnostic section contains information on how to use both the system built-in diagnostic system and external diagnostic programs to checkout the system.

The Adjustment section contains procedures required to adjust the system power supply.

The Peripheral section contains interface data and data-word formats for supported peripherals.

The Replaceable Parts Catalog section contains lists of replaceable parts and part-locating illustrations to assist with parts replacement procedures.

The Diagrams section contains selected hardware drawings to aid the CE in isolating system faults.

The Reference section contains conversion charts to assist the CE in troubleshooting.

The Service Note section is a depository for special procedures and troubleshooting data developed in the field.

Reference Documents

The documents listed below represent the full complement of hardware manuals supporting the HP3000 Series 64/68/70. The user should refer to these manuals to obtain additional information as required.

Block Diagram/Assembly Drawings Manual, Part Number 30140-90004

Reference/Training Manual, Part Number 30140-90005

Installation Manual, Part Number 30140-90007

Diagnostic Manual Set, Part Number 32342-60001 (prior to Q3, 1991) 30070-60068 (Q3, 1991 and later)

Site Preparation Manual Set, Part Number 30140-60085

Memory Add-On Installation Manual, Part Number 30142-90001

GIC Add-On Installation Manual, Part Number 30079-90003

System Support Log, Part Number 03000-90117

Communications Handbook, Part Number 30000-90105

Microcode Manual, Part Number 30140-90045

Engineering Diagrams Manual, Part Number 30140-90046

Series 64/68/70 Hardware Upgrade Manual, Part Number 30163-90001

Shift String Reference Manual, Part Number 30140-90052

Series 64/68 IMB IOA Add-On Installation Manual, Part Number 30143-90001

Power Supply Upgrade for a Series 64A/68A/70A (3-IMB) System, Part Number 30143-90006

Series 68A I/O Expansion Bay Product #30464A Installation Manual, Part Number 30164-90007

Series 68B I/O Expansion Bay Product #30464B Installation Manual, Part Number 30164-90008

Series 64/68 4 Megabyte Memory Add-On Installation Manual, Part Number 30165-90001

List of Abbreviations

The following table lists abbreviations used in this manual.

Series 64/68/70 Abbreviations

AIB	Asynchronous Interface Board	IMB	Intermodule Bus
ALU	Arithmetic Logic Unit (CPU)	IMBI	Intermodule Bus Interface
ATP	Advanced Terminal Processor	INP	Intelligent Network Processor
BCM	Battery Control Module	IOA	Input/Output Adapter
CAB	Cache Address Bus	IOB	Input/Output Buffer
CAC	Cache Controller (8 Kbytes)	KHD	Kernel Hardware Diagnostic
CACX	Cache Controller (128 Kbytes)	LED	Light Emitting Diode
CAM	Content Addressable Memory	MCS	Memory Correction and Storage
CBI	Common Bus Interface	MMA	Main Memory Array
CDB	Cache Data Bus	MMC	Main Memory Control
CIB	Common Interface Bus	MPE	Multi-Programming Executive
CIR	Current Instruction Register (CPU)	MPL	MicroProgram Load
CMA	Cache Memory Array (8 Kbytes)	MUX	Multiplexer
CMAX	Cache Memory Array (128 Kbytes)	PCA	Printed Circuit Assembly
CPU	Central Processor Unit	PCM	Power Control Module
CSAR	Central Store Address Register	PDB	Processor Data Bus
CSOR	Central Store Output Register	PDM	Power Distribution and Monitor
CSB	Central System bus	PFT	Power Fail Tester
CSD	CPU Software Diagnostic	PFW	Power Fail Warning
CTLA	Control A (CPU)	PON	Power-ON
CTLB	Control B (CPU)	PSC	Power System Controller
DCU	Diagnostic Control Unit	RALU	Register/Arithmetic Logic Unit
DMA	Direct Memory Access	SIB	System Interface Board
DRT	Device Reference Table	SKSP	Skip Special (CPU)
ECL	Emitter-Coupled Logic	SSDP	System Status and Display Panel (A Power System)
FCA	Flat Cable Assembly		
FLD	Fault Locating Diagnostics	SSDP-B	System Status and Display Panel (B and Scott T Power Systems)
GIC	General I/O Channel		
HP-IB	Hewlett Packard Interface Bus	SPU	System Processor Unit
ICB	Intra-Cache Bus	VBUS	V-bus (CPU)
		WCS	Writeable Control Store

PRODUCT INFORMATION

SECTION 1

This section provides an overview of the HP 3000 Series 64/68/70 computer system specifications and a description of the display and power supply panels. (See Figure 1-1.)

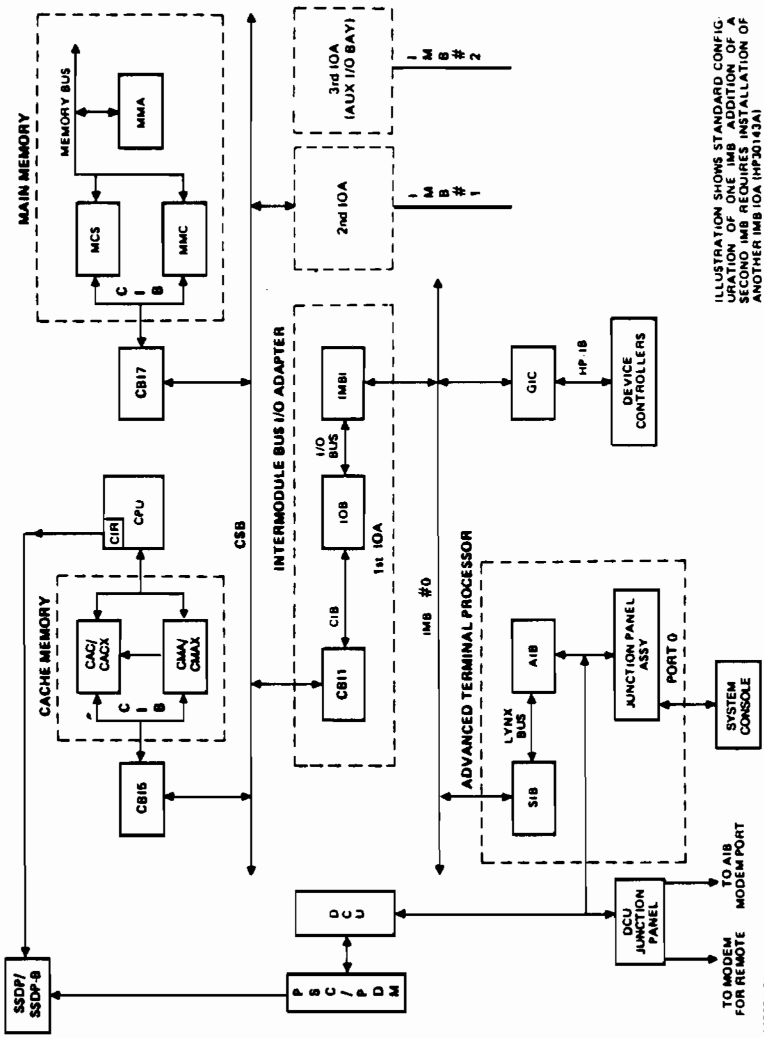


Figure 1-1. HP 3000 Series 64/68/70 Functional Block Diagram

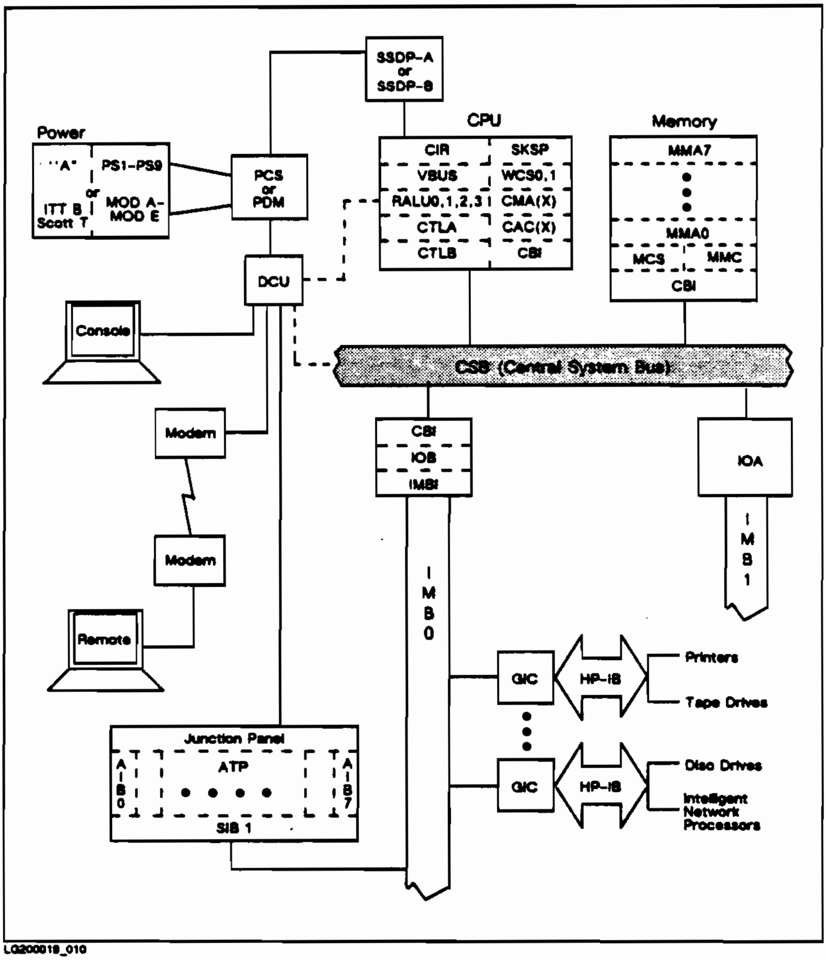


Figure 1-2. HP 3000 Series 64/68/70 Hardware Organization

SERIES 64/68/70 SYSTEM SPECIFICATIONS

The following is a listing of general specifications for the HP 3000 Series 64/68/70 computer. For a system functional block diagram see Figure 1-1.

Processor

ECL processing unit technology. Hardware-implemented stack architecture with code and data segmentation.

Word Length	16 bits
WCS Size	8KW (64 bits per word)
Main Bus	CSB (Central System Bus)
Main Bus Bandwidth	14 MHZ
CPU Clock Crystal	53.333MHZ
CPU Cycle Time	75NS (4 clock periods)

Memory

Semiconductor memory with single-bit error correction and double-bit error detection.

Word Length	32 bits
Memory Module Size	1MB/4MB
Maximum Memory per System	16MB
Battery Backup Time	15 minutes minimum

Input/Output Structure

Common asynchronous bus structure with individual data channels.

	Series 64	Series 68/70
I/O Bus Type	IMB	IMB
Maximum Number of I/O Buses	2	3
Bandwidth	3MB	3MB
Max. # of Channel types per IMB	5	5
Maximum Number of devices per GIC	8 max 6 high speed	8 max 6 high speed
Max Modem Ports	84	143*/168
Number of Hardwired RS-232 and RS-442	144	144*/336**
Maximum RS-232-C Cable Length per Port	15m (50ft)	15m (50ft)
Maximum RS-442 Cable Length per Port	1230m (4000ft)	1230m (4000ft)
Maximum Total HP-IB Cable Length	15 meters total---1.5 meters internal per GIC (7 meters + 1.5 + 1 meter per device)	

* MPE V/P
** MPE V/E

SYSTEM STATUS AND DISPLAY PANEL (SSDP-A and SSDP-B)

The System Status and Display Panel (SSDP) displays the operating status of the computer system. The panel informs the user, via indicator LEDs, what the current system status is (i.e., run, halt, overtemperature, battery condition, and current instruction. (See Figures 1-3 and 1-4.) The following panel functions pertain to the HP 32460A and 32468A ("A" Power System), and to the HP 32460B, 32468B, and 32471A ("B" and Scott T power systems), except where individually indicated:

LINE:
When LED is lit, AC power is applied to system.

REMOTE:
When LED is lit, indicates maintenance switch is set to remote and remote has been established.

BATTERY:
Three mode function LED (off, slow flash, and fast flash).
Off indicates batteries are fully charged.
Slow flash indicates batteries are being charged.
Fast flash indicates batteries are being discharged.

RUN:
When LED is lit, the SPU is in the run state.

HALT:
When LED is lit, the SPU is halted.

16-BIT LED READOUT:
Indicates contents of Current Instruction Register (CIR).

OVERTEMP (HP 32460A, 32468A):
When LED is lit, the internal temperature of system has exceeded exhaust temperature of 40 degrees centigrade. Overtemperature warning message is also displayed on the system console.

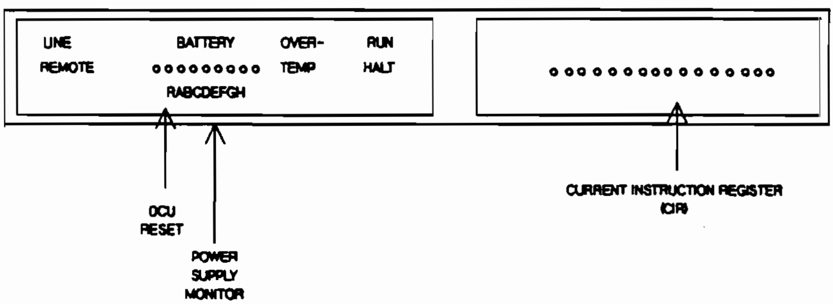
OVERTEMP (HP 32460B, 32468B/C, 32471A with "B" power system):
Same function as HP 32460A except the overtemperature LED on SSDP is battery backed-up.

POWER SUPPLY MONITOR LED DISPLAY (HP 32460A, 32468A):
Each power supply is monitored by a corresponding LED. Supplies 1-9 have a corresponding A-H display. (See Figure 1-3 for further detail.) The R on the panel correlates with DCU RESET.

POWER SUPPLY MONITOR LED DISPLAY (HP 32460B, 32468B/C 32471A):
Each power supply is monitored by a corresponding LED. (See Figure 1-4 for further detail.)
A: module A failure.
B: module B failure.
C: module C failure.
D: module D failure.
E: module E failure. (Aux I/O Bay)
F: +5VB not available, but battery voltage is available.
G: DCU, PDM pair not communicating for more than 10 seconds.
H: Transformer over-temp, rectifier failure, or fan failure (Series 64/68 only).
H: Fan failure only (Series 70).
P: PON is down.
R: DCU is at reset, initial powerup reset, AC low with PON set LOW.

SERIES 64A/68A/70A (Upgrade)

SSDP



POWER SUPPLY MONITOR INDICATORS

A PS1	+5.0V
B PS1	+12V
C PS1	-12V
D PS2/3	-5.2V
E PS5	-2.1V
F PS6/7	+5.0V
G PS4	BATT
H PS8/9 (Aux I/O)	+5.0V

Figure 1-3 System Status and Display Panel (HP 32460A, 32468A)*70 Upgrade

Note: Refer to Section 6 for power system layout.

SERIES 64B/68B,C/70

SSDP

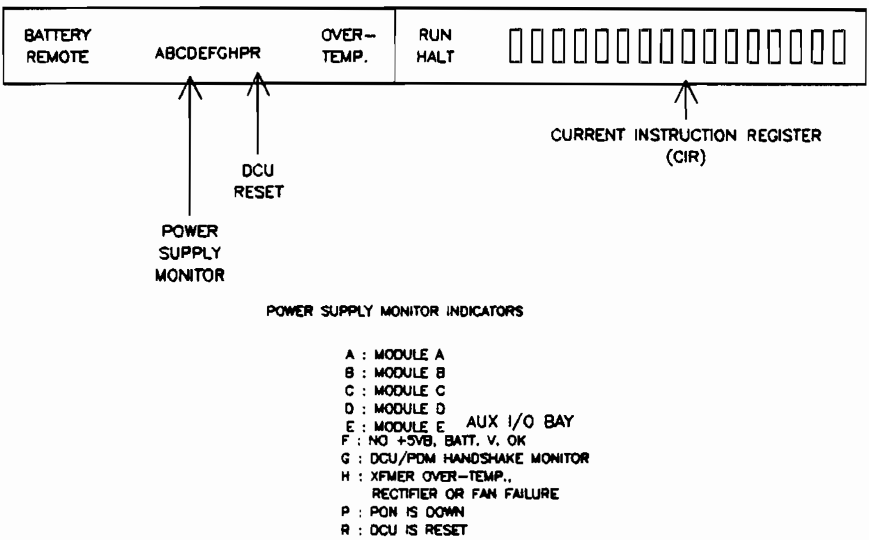


Figure 1-4. System Status and Display Panel (HP 32460B, 32468B/C, 32471A)

Note: Refer to Section 6 for power system layout.

POWER SUPPLY SYSTEM

Four different power systems have been used in the Series 64/68/70, as shown in the following table.

Table 1-1. Series 64/68/70 Model Numbers

	8 Kbyte no MPE disk caching	8 Kbyte cache with MPE disk caching	128 Kbyte cache
A Power System	64A (32460A)	68A (32468A)	70A
B Power System (ITT B)	64B (32460B)	68B/C*(<2620) (32468B/C)	70A(<2620) (32471A)
Scott T Power System	-	68B/C*(>2620) (32468B/C)	70B(>2620) (32471A)
ACDC Power System YEW Power Modules	- -	- -	70A(>2851) 70A(>2845)

* The 68B was shipped with two 1-MB boards; the 68C is shipped with one 4-MB board.

The A Power System is used in Series 64A/68A/70A. (A 70A is a 64A/68A that has been upgraded to have a 128 kbyte cache.)

The B power system (ITT B) is used in Series 64B, and in Series 68B/Cs and 70s that have a serial prefix below 2620.

The Scott T Power System is used in Series 68B/Cs and 70s with a serial prefix (date code) above 2620.

The ACDC Power System is used in Series 70s with a serial prefix (date code) above 2851.

The YEW Power System is used in Series 70s with a serial prefix (date code) above 2845.

NOTE

After date code 2620, a few 50Hz systems were shipped with ITT B transformers. ITT B transformers can not be restrapped for 60Hz. If a customer is changing from a 50Hz to a 60Hz environment, check the transformer. If the customer has an ITT B transformer, order the AC Front End (ACFE) Kit.

AC Power

In the A Power System, AC power is provided by a Power System Controller (PSC) and a three-phase isolation transformer, both mounted in the bottom of the I/O Bay. Cable harnesses provide distribution.

With the B Power System, the AC power is supplied by 3 ferro-resonant transformers mounted in the bottom of the I/O Bay. Cable harnesses provide distribution. The Scott T power system is very similar to the B Power System, differing only in the AC Unit and the ferro-resonant transformers; the Scott T has 2 ferro-resonant transformers instead of 3.

The computer must be connected to 208 VAC, 60-Hz, three-phase power in the United States. In other countries, it can be connected to 415 VAC, 50-Hz, or 380 VAC, 50-Hz three-phase power.

DC Power

DC power in the A Power System is provided by seven power supplies and a battery pack. A bus bar and cable harnesses provide distribution. If a Series 70A has a power system upgrade for 3 IMBs, power supplies 2 and 3 are replaced by a single one manufactured by ACDC.

DC power in the ITT B, Scott T, and YEW power systems is provided by six power modules arranged in four module sets, including a battery pack. Bus bars and cable harnesses provide distribution.

Battery backup in the Series 64/68/70 supplies 5 volts to Main Memory when normal AC power is supplied to the computer. When AC power is interrupted, the backup supplies 5 volts for at least 15 minutes.

Backup in the A Power System consists of a dual DC-to-DC converter, a Battery Control Module (BCM) PCA, and a battery assembly containing 12 five-ampere-hour cells.

Backup in the ITT B, Scott T, and YEW power supplies consists of a Battery Charger, a Converter, and a battery assembly containing 12 five-ampere-hour cells.

Power Control Module for 64/68/70 ("A" Power System)

Series 64/68/70 computers with the "A" Power Supply (HP 32460A and 32468A) contain a Power Control Module (PCM) with the following panel controls: main circuit breaker, remote maintenance key-switch and power supply breaker. The Power Control Module is located at the lower rear of the I/O Bay. (See Figure 1-5.) The PCM is used to protect the HP 3000 Series 64/68/70 AC system; routes AC power to DC power supplies and cooling systems; and contains the remote maintenance key-switch circuit and monitoring AC receptacle which provides AC Power Monitoring for secondary side of isolating transformers. See Figure 1-6 for PCM cable connectors. Panel functions are defined as follows:

MAIN POWER CB1 (ON/1, OFF/0):
50-Ampere 3-pole circuit breaker used as a switch. When set to ON, supplies AC power to computer system. Also has integral switch which connects/disconnects battery dropout relay.

POWER SUPPLY BREAKER CB2 (ON/1, OFF/0):
20-Ampere 3-pole circuit breaker. When set to ON, supplies AC power to activate the SPU DC power supplies.

THREE POSTION KEY SWITCH:
Controls access to Maintenance/Remote Maintenance functions.

a. Control Mode - Provides operator with minimum amount of control functions.
b. Maint Mode - Gives full system control to CE.
c. Remote Maint Mode - Provides full system control plus remote dial-up capabilites.

AUXILIARY I/O CIRCUIT BREAKER - CB3 (ON/1,OFF/0):
20-Ampere 3-pole circuit breaker. If an Auxiliary I/O Bay is installed circuit breaker CB3 will be present. CB3 is physically located on the inside frame of the Auxiliary I/O Bay, and electrically like CB2 it is at the secondary of the isolation transformers. Switching CB3 ON switches AC power supplies 8 and 9 in the Auxiliary I/O Bay.

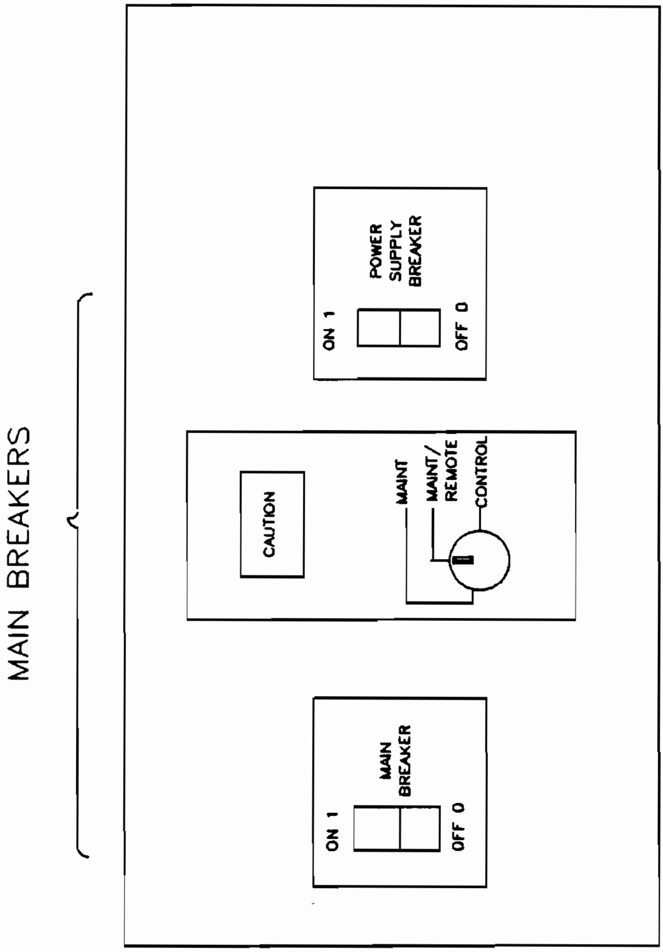


Figure 1-5. Power Control Module for 32460A/68A ("A" Power System)

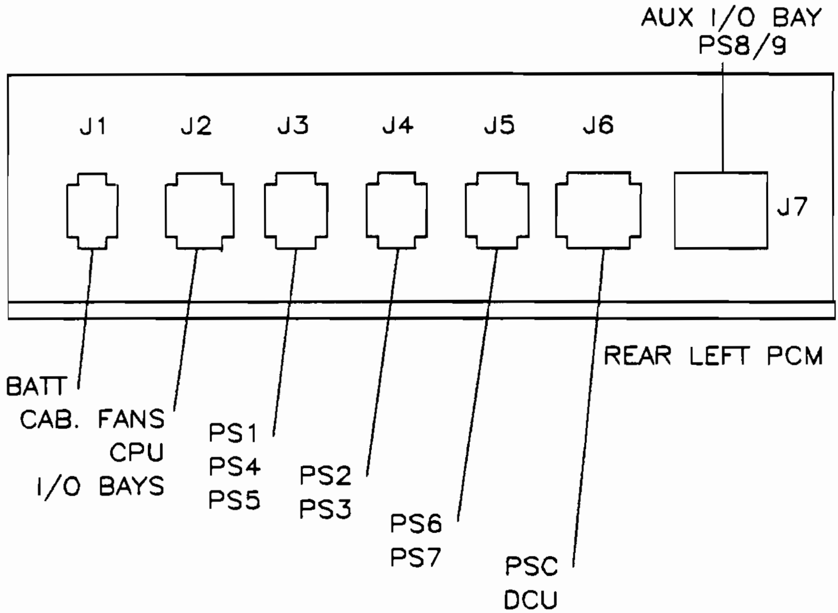


Figure 1-6. PCM Cable Connections for 32460A/68A ("A" Power System)

AC Unit for HP 32460B, 32468B/C, 32471A (ITT B and Scott T Power Systems)

The Series 64 (32460B), 68 (32468B/C) and 70 (32471A) contains an AC Unit with the following panel control and functions: power supply switch, Power Fail Test (PFT) button, fuses, bay alarm, and input program connectors.

The AC Unit is located at the lower rear of the I/O Bay. The AC unit sends line voltage to the ferro-resonant transformers and then distributes the outputs. The output voltage powers the fans (220 VAC) and power supplies (300 VDC), and the unit also sends alarms for internal overtemperature, rectifier failure, AC power fail, and ferro-transformers overtemperature. (See Figure 1-7 or 1-8 for AC Unit panel layout.) AC panel functions are defined as follows:

AC INPUT:
There are three types of ITT B power systems, each requiring a different AC input voltage. Before installing a replacement AC unit, ensure the new AC unit is the correct one for the site voltage.

The AC unit in the Scott T power system may be strapped to accommodate any of three input voltages; 208, 380, 415.

ALARM PLUG:
Alarms to Power Distrubution Monitor (PDM):

1. Internal AC Unit overtemp.
2. CPU or I/O Bay fan power fail.
3. AC power fail.
4. Internal rectifier failure.

FUSES:	ITT B Power System	Scott T Power System
	F1 3A, 250V	F1 3A, 250V
	F2 3A, 250V	F2 3A, 250V
	F3 3A, 250V	
	F4 1A, 250V	

POWER FAIL TEST (PFT) button:
Used to test power fail/recovery circuitry and battery.

AUXILIARY I/O BAY:
The 220VAC and 300VDC are routed to the Auxiliary I/O Bay to power the DC power modules (E1 and E2), the fans internal to the modules and cabinet fans in the Auxiliary I/O Bay. Refer to Section 6, Adjustments, for specifications on modules E1 and E2.

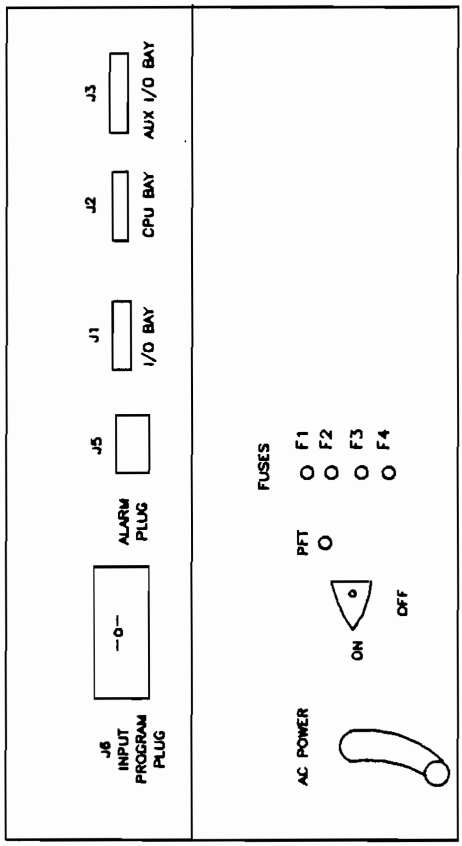


Figure 1-7. AC Unit for Series 64B, 68B/C (ITT B Power System)

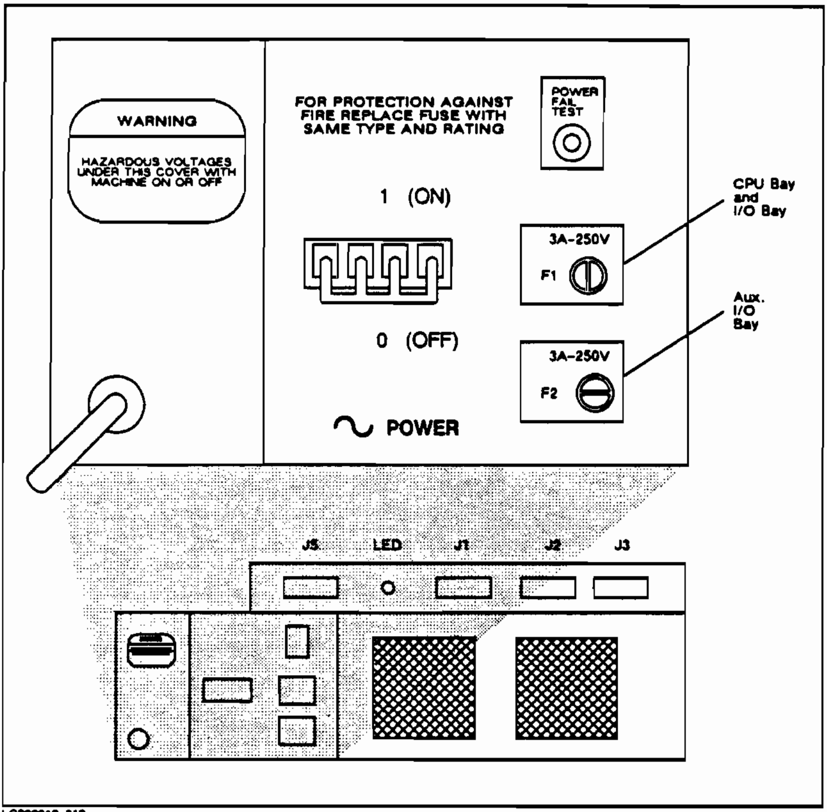


Figure 1-8. AC Unit for Series 68B/C, 70B (Scott T Power System)

ENVIRONMENTAL/INSTALLATION/ PREVENTIVE MAINTENANCE

SECTION 2

This section describes the environmental, installation and preventive maintenance requirements for the HP 3000 Series 64/68/70 computer.

ENVIRONMENTAL/INSTALLATION/ PREVENTIVE MAINTENANCE

ENVIRONMENTAL REQUIREMENTS

The environmental requirements include physical and AC power requirements. Unless otherwise noted, all specifications are for HP 32460A, 32460B, 32468B/C, 32471A.

PHYSICAL REQUIREMENTS

	1 I/O Bay	Aux. I/O Bay
Dimensions:		
Height	122 cm (48 in.)	122 cm (48 in.)
Width	176 cm (69 in.)	268 cm (105 in.)
Depth	66.04 cm (26 in.)	66 cm (26 in.)
Weight	522 kg (1150 lbs.)	658 kg (1450 lbs.)
Altitude:		
Operating	0-4,600 m (0-15,000 ft.)	0-4,600 m (0-15,000 ft.)
Nonoperating	0-15,300 m (0-50,000 ft.)	0-15,300 m (0-50,000 ft.)
Heat Generation (at 208V):		
Measured Values (B Power Supply)	12,871 BTU/hr 3224 KCALs/hr	16,000 BTU/hr 4022 KCALS/hr
Rated Values (B Power Supply)	28,077 BTU/hr 7075 KCALS/hr	28,077 BTU/hr 7075 KCALS/hr

Environment:	
Operating Temperature	20 to 25.5 deg C (68 to 78 deg F)
Nonoperating (Shipping/Storage)	-40 to 75 deg C (-104 to 167 deg F)
Rate of temperature change	10 deg C/hr (50 deg F/hr) max.
Instantaneous rate of change	0.90 deg C/min (0.167 deg F/min)

Relative Humidity:	
Operating (noncondensing)	40 to 60 %
Maximum	80% (48 hrs, max)
Minimum	30% (48 hrs, max)
Nonoperating (Shipping/Storage)	30 to 80 %

ELECTRICAL REQUIREMENTS

System Power:	
Input Frequency:	50 HZ Nom, 48.75 - 51.25 HZ (+2.5%,-2.5%)
	60 HZ Nom, 58.2 - 61.88 HZ (+3%,-3%)

"A" Power System

AC Input Voltage (HP 32460A):	3 Phase 208V, 4 wire Y + gnd (USA)
	3 Phase 380V, 3 or 4 wire Y + gnd (EUR)
	3 Phase 415V, 3 or 4 wire Y + gnd (UK)
Input Voltage tolerance (HP 32460A) (ph to ph):	208V Nom, 187V to 220V (+6%,-10%)
	380V Nom, 342V to 403V (+6%,-10%)
	415V Nom, 374V to 440V (+6%,-10%)

ITT B, ACDC, & Scott T Power Systems

AC Input Voltage (HP 32460B, 32468B/C, 32471A):	3 Phase 208V, 4 wire Y + gnd (USA)
	3 Phase 380V, 3 or 4 wire Y + gnd (EUR)
	3 Phase 415V, 3 or 4 wire Y + gnd (UK)
Input Voltage Tolerance (HP 32460B, 32468B/C, 32471A) (ph to ph):	208V Nom, 177V to 231V (+10%,-15%)
	380V Nom, 323V to 418V (+10%,-15%)
	415V Nom, 353V to 451V (+10%,-15%)

	Two Bays (Measured)	Three Bays (Measured)	Two/Three Bays (Rated)
Current (ITT B & YEW Power Supply, full load)	11A/ph (208V)	13.5A/ph	24A/ph
	6.0A/ph (380V)	7.5A/ph	14A/ph
	5.5A/ph (415V)	6.9A/ph*	12A/ph

* Estimated value (not measured). The volt-amp product is constant between 380 and 415V, allowing use of the formula: 415V A/Phase = (380V A/Phase/415V) 380V

Circuit Breaker Rating:

HP 32460A ("A" Power System)	20 Amps (Internal)
HP 32471A (ITT B, Scott T, & ACDC Power Systems)	20 Amps (Internal)

Surge Current for HP 32460A ("A" Power System):	208V line, 200A peak, 1 cycle
	380V line **
	415V line **
Surge Current for HP 32460B, 32468B/C, 32471A (ITT B, Scott T, & ACDC Power Systems):	208V line, 625A peak/phase, 1 cycle
	380V line, 325A peak/phase, 1 cycle
	415V line, 300A peak/phase, 1 cycle

** Not tested in UK or Europe.

Isolation Xmfr (HP 32460A):	3 @ 5KVA each
Power Connections:	50 HZ: Power cord not provided
	60 HZ: Power cord provided

DC Power Requirements for HP 32460A
("A" Power System):

Module Set	Output Voltage/ Max. Current	# of Modules in Set
PS1	+5V @ 50A	1
PS1	-/+12V @10A	1
PS2/3	-5.2V @200A	2
PS4	+5V	1
PS5	-2V @100A	1
PS6/7	+5V @200A	2
PS8/9*	+5V @200A	2

DC Power Requirements for 32460B, 32468B/C, 32471A
(ITT B, Scott T, & YEW Power Systems):

Module Set	Output Voltage/ Max. Current	# of Modules in Set
A	-5.2 @200A	2
B	+5B @30A	1
C	-2.1V @115A	1
	+/-12V @10A	
D	+5.1V @200A	2
E**	+5.1V @200A	2

* Power module set 8/9 will exist if an auxiliary I/O bay is installed.
** Power module set E will exist if an auxiliary I/O bay is installed.

Refer to Site Preparation Manual, Part Number 30140-60085 for further detail.

INSTALLATION

Refer to Installation Manual, Part Number 30140-90007.

PREVENTIVE MAINTENANCE (PM)

Preventive maintenance procedures are performed periodically to insure the system will operate continuously without failures. (Refer to Table 2-1.) Refer to System Support Log, Part Number 03000-90017 for additional details.

Table 2-1. Preventive Maintenance Procedures

PREVENTIVE MAINTENANCE	PROCEDURE
Check all fan operation in individual power supplies.	Observe spin-up and spin-down characteristics.
Fan and filter replacement as needed.	Power supply fans are replaced every two years.
Power Fail Recovery and Battery Test for HP 32460A.	Turn off secondary breaker (CB2) for 30 seconds then turn back on. System should auto restart and battery should charge. Battery light should show discharge while CB2 is off; this indicates battery is good.
Power Fail Recovery and Battery Test for HP 32460B, 32468B/C, 32471A.	Press and hold PFT button in and turn AC power switch off for 10 seconds and then turn switch back on. System should auto restart and battry should charge. Battery light should show discharge while CB2 is off; this indicates battery is good.

CAUTION

Do not force the CPU boards in order to seat them. The pins and connectors will break.

CONFIGURATION

SECTION 3

The configuration section of the CE handbook provides both hardware and I/O software data required to operate a standard configuration HP 3000 Series 64/68/70 computer system. The hardware data contains card cage assignments, cable routing and connections, and channel and device assignments. I/O software data consists of a list of I/O drivers required to support an I/O device. Refer to HP 3000 System Configuration Guide, part number 5953-7573 for additional information on system configuration.

CONFIGURATION

CARD CAGE CONFIGURATIONS

The card cage configurations consist of CPU card cage assignments and I/O card cage assignments.

CPU Card Cage Configuration

The CPU card cage must be configured as shown in Figure 3-1 or 3-1A and listed in Table 3-1.

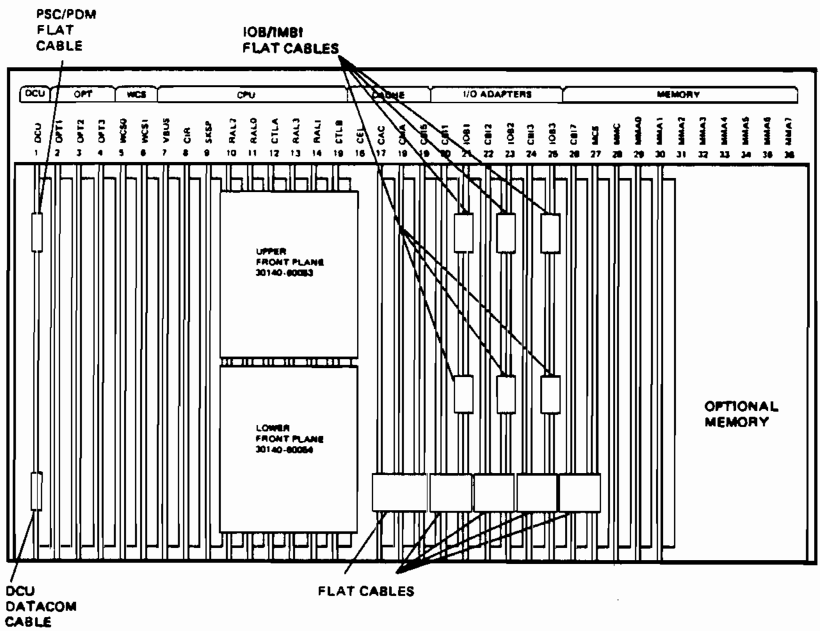


Figure 3-1. Series 64/68 CPU Cage and Cabling Assignment

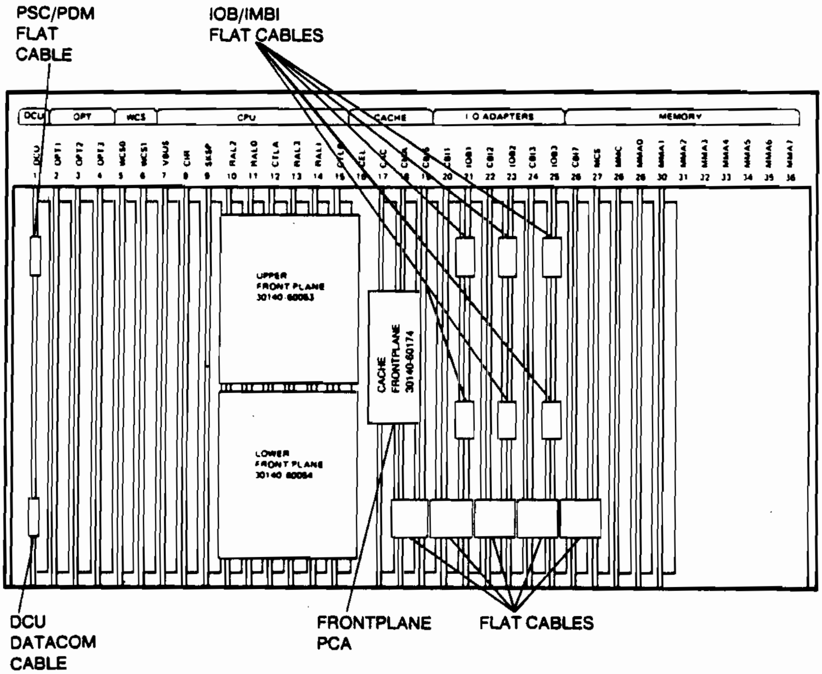


Figure 3-1A. Series 70 CPU Cage and Cabling Assignment

Table 3-1. CPU Card Cage Configuration

SLOT	SLOT#	NAME
DCU	1	Diagnostic Control Unit
OPT1	2	Reserved
OPT2	3	"
OPT3	4	"
		--WCS
WCS0	5	Writable Control Store
WCS1	6	Writable Control Store
		--CPU--
VBUS	7	V-Bus
CIR	8	Current Instruction Register
SKSP	9	Skip Special
RAL2	10	Register/Arithmetic Logic Unit
RAL0	11	Register/Arithmetic Logic Unit
CTLA	12	Control A
RAL3	13	Register/Arithmetic Logic Unit
RAL1	14	Register/Arithmetic Logic Unit
CTLB	15	Control B
		--CACHE--
CEL	16	Reserved
CAC	17	Cache Controller
or		
CACX		(For Series 70)
CMA	18	Cache Memory Assembly
or		
CMAX		(For Series 70)
CBI5	19	Common Bus Interface
		--I/O ADAPTORS--
CBI1	20	Common Bus Interface
IOB1	21	Input/Output Buffer
CBI2	22	Common Bus Interface
IOB2	23	Input/Output Buffer
CBI3	24	Common Bus Interface
IOB3	25	Input/Output Buffer
		--MEMORY--
CBI7	26	Common Bus Interface
MCS	27	Memory Correction and Storage
MMC	28	Main Memory Control
MMA0	29	Main Memory Array 0
MMA1	30	Main Memory Array 1
MMA2	31	Main Memory Array 2
MMA3	32	Main Memory Array 3
MMA4	33	Main Memory Array 4
MMA5	34	Main Memory Array 5
MMA6	35	Main Memory Array 6
MMA7	36	Main Memory Array 7

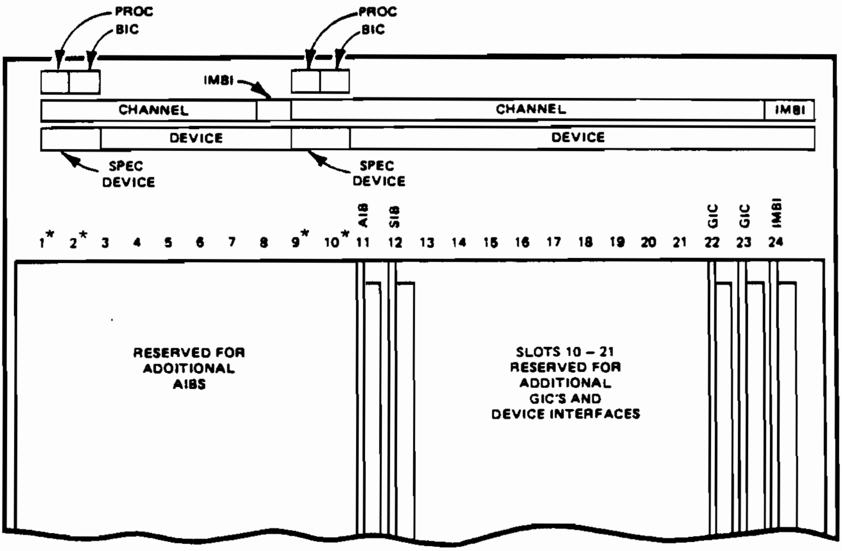
I/O Card Cage Configuration

The I/O card cage(s) must be configured as listed in Table 3-2 and as shown in Figures 3-2 through 3-4. (Refer to Section 4 for IMBI PCA LED definitions.)

Table 3-2. First, Second and Third IMB Configuration

SLOT	ASSEMBLIES	CHANNEL No.	"TO" DEVICE
IMB No. 1 (Logical IMB 0)			
24	IMBI		
23	GIC	2	MAG TAPE
22	GIC	3	SYSTEM DISC
21-13*	GIC or DEV. INTF.	4-15	OTHER DISCS, INPS, MAG TAPES, PRINTERS ETC.
17	SIB	1	AIB
11-4	AIB		ASYNCHRONOUS TERMINALS 2687A PAGE PRINTER
IMB No. 2 (Logical IMB 1)			
8	IMBI No. 2		
7-1*	GIC, DEVICE INTERFACES, SIB, AIB	1-15	PERIPHERALS, INPs, ETC.
Auxiliary Card Cage, IMB No. 3 (Logical IMB 2)			
24	IMBI No. 3		
9-23	GIC, DEVICE INTERFACES, SIB, AIB	1-15	PERIPHERALS, INPs, ETC.

*Ensure that the GIC and SIB PCAs are always installed within nine physical slots of each other on the same IMB.

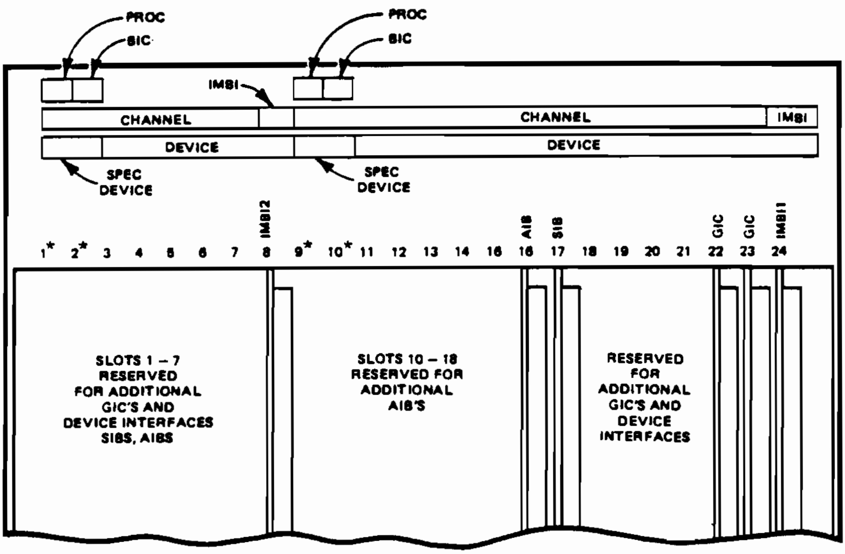


NOTE:
The "PROC" and "BIC" labels in the top row are intended for a possible future enhancement. Slots 1 and 2 are reserved for a Channel Program processor denoted above as Proc.-BIC (not implemented) special device slots 1 and 2; 9 and 10 have restricted INP usuage but may be used by other device interfaces.

Figure 3-2. I/O Card Cage Assignment for First IMB

CAUTION

On an IMB, there can be a maximum of nine slots between two channels(GIC, SIB, or LANIC); thus the SIB PCA is configured in slot 12 to ensure standard configuration. If optional GIC PCAs are installed, the SIB PCA should be installed in slot nine, with the AIB PCAs in slots one thru eight. *TWO INP PCAs SHOULD NEVER BE INSTALLED IN SLOT PAIRS ONE AND TWO, OR NINE AND TEN. FAILURE TO COMPLY WITH THIS CAUTION CAN RESULT IN PERMANENT HARDWARE DAMAGE.

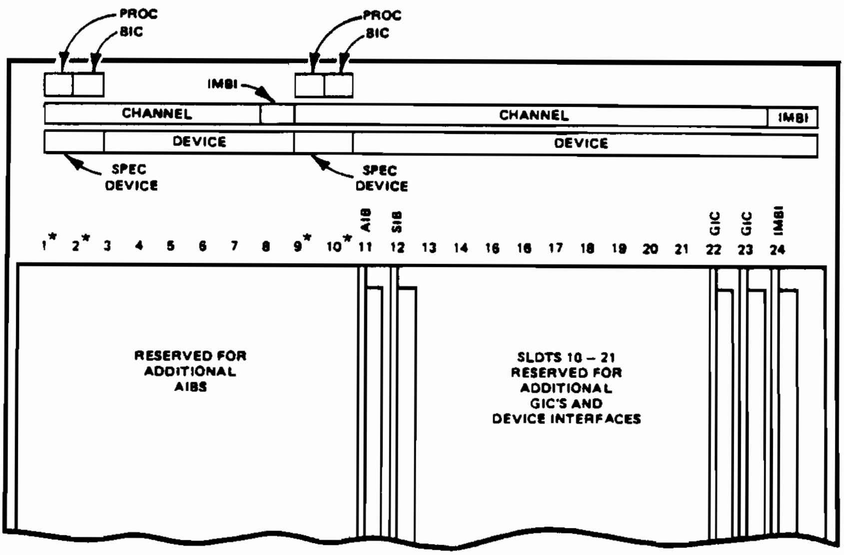


NOTE:
The "PROC" and "BIC" labels in the top row are intended for a possible future enhancement. Slots 1 and 2 are reserved for a Channel Program processor denoted above as Proc.-BIC (not implemented) special device slots 1 and 2; 9 and 10 have restricted INP usuage but may be used by other device interfaces.

Figure 3-3. I/O Card Cage Assignment for First and Second IMBs

CAUTION

On an IMB, there can be a maximum of nine slots between two channels (GIC, SIB, or LANIC); thus the SIB PCA is configured in slots 12 or 17 to ensure standard configuration. If optional GIC PCAs are installed, the SIB PCA should be installed in slot nine, with the AIB PCAs in slots one thru eight. *TWO INP PCAs SHOULD NEVER BE INSTALLED IN SLOT PAIRS ONE AND TWO, OR NINE AND TEN. FAILURE TO COMPLY WITH. THIS CAUTION CAN RESULT IN PERMANENT HARDWARE DAMAGE.



NOTE:
The "PROC" and "BIC" labels in the top row are intended for a possible future enhancement. Slots 1 and 2 are reserved for a Channel Program processor denoted above as Proc.-BIC (not implemented) special device slots 1 and 2; 9 and 10 have restricted INP usuage but may be used by other device interfaces.

Figure 3-4. I/O Card Cage Assignment for Third IMB (Aux I/O Bay)

CAUTION

On an IMB, there can be a maximum of nine empty slots between two channels (GIC, SIB, LANIC); thus the SIB PCA is configured in slot 12 to ensure standard configuration. If optional GIC PCAs are installed, the SIB PCA should be installed in slot nine, with the AIB PCAs in slots one thru eight. *TWO INP PCAs SHOULD NEVER BE INSTALLED IN SLOT PAIRS ONE AND TWO, OR NINE AND TEN. FAILURE TO COMPLY WITH THIS CAUTION CAN RESULT IN PERMANENT HARDWARE DAMAGE.

JUNCTION PANELS

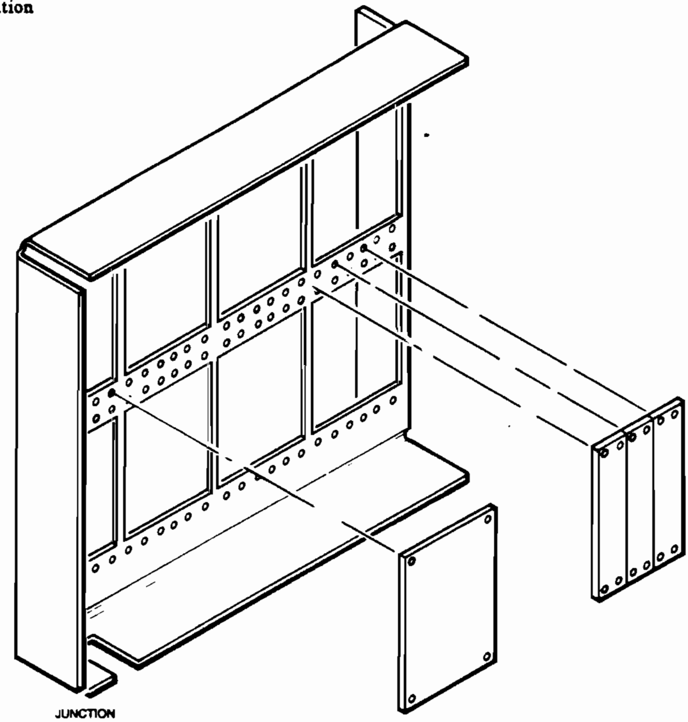
Removing the right side panel (front view) exposes two junction panel assemblies. Each assembly is subdivided into eight full blank panels which interface with different peripheral and terminal connections. A full blank is further divided into three mounting panels. One third of a panel accommodates individual HP-IB, INP, and LP INTF connectors. These connectors should be started in the lower junction panel row. (See Figure 3-5.) The System Disc drive, Magnetic Tape drive and Line Printer HP-IB connectors should start in junction panel 16.

A full panel accomodates either twelve Direct Connect Ports or six Modem Connect Ports. All Terminal Ports should start in junction panel nine. The System Console should be installed in Port zero of the junction panel nine. (See Figure 3-6.) Junction Panels provide:

- Multiplex Modem and Data Control for AIB.
- RS 232 Direct Connect.
- RS 422 Direct Connect.
- RS 232 Modem Connect.

The ATP Port Connector Assembly consists of one (1) Mother Board and one or more mini-boards.

If an Auxiliary I/O Bay is installed, it provides a second junction panel.



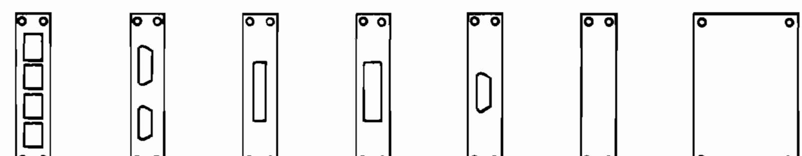


Figure 3-5. Junction Panel Assembly and Mounting Panels

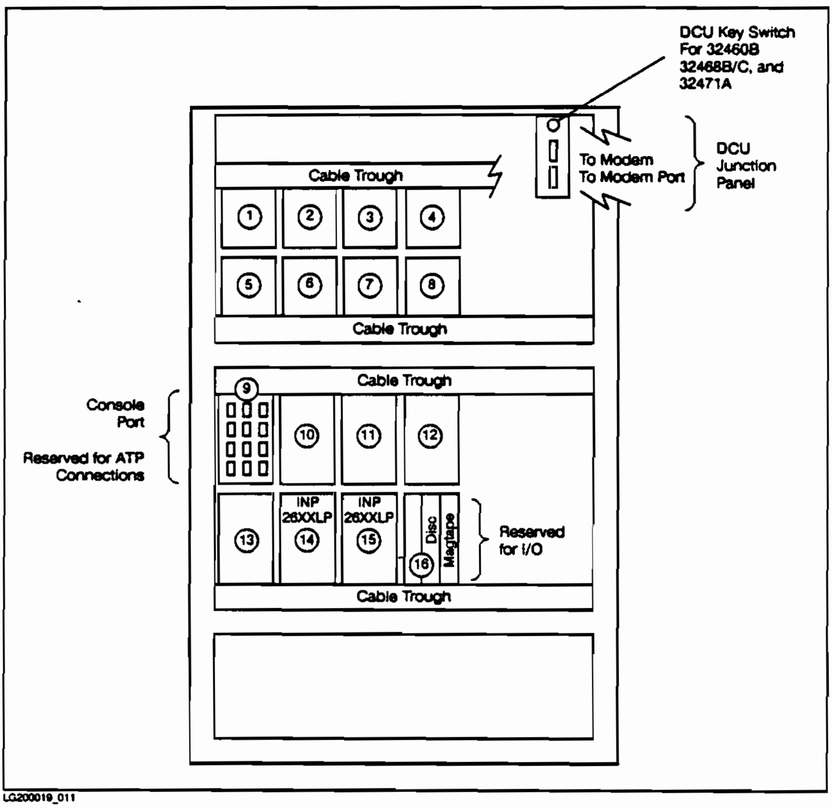


Figure 3-6. Junction Panel Layout

LOADING OF GENERAL I/O CHANNELS

Each General I/O Channel (GIC) supports up to eight HP-IB device loads. The number of peripherals which may be connected to a GIC is determined by the peripherals HP-IB device load and speed. (Refer to Table 3-3.)

Table 3-3. GIC Requirements For Peripherals

HP Peripherals	Peripheral Speed	HP-IB Electrical Device Loads
Cartridge Tape in 7911P/12P/14P/14TD/14ST	Low	1 (Dedicated GIC)
7911/12/14 Disc Drives	High	1
7920M/25M, 7945A, 7933C/H, and 7935C/H Disc Drives	High	1
7936/37, 7957A/58A Disc Drives	High	1
7970E/71A Master Tape Drive	Low	1 (Dedicated GIC)
7974A/78A/78B 1/2" Tape Drive	High	Shipped w/1 (variable from 1 to 3)
7976A 1/2" Tape Drive	High	Shipped w/2(variable from 1 to 4)
7979A/80A/80XC 1/2" Tape Drive	High	Shipped w/1(variable from 1 to 3)
9144A/7914CT (Tape Portion)	High	1
35401A Multi-Cartridge Tape	High	1
7914ST Integrated Storage Unit	High	Shipped w/2 (variable from 2 to 4)
2608A Line Printer	Low (Do not mix w/high)	1
2608S Line Printer (Do not mix with 7906/20/25)	High	Shipped w/1 (Variable from 1 to 7)
2563A/64B/65A/66A/67B Line Printers	High	Shipped w/1 (variable from 1 to 8)
2563A/64B/65A/66A/67B and 2680A/88A Printers	Low	If configured via HP-IB Extenders
2611A/13A//17A/19A Line Printer Interface Card	Low	1
2680A/86A/87A/88A Page Printer	High	Shipped w/4(variable from 1 to 8)
9895A Opt 010 Flex. Disc Drive	Low	1
26075A Multiple System Access Selector	High (Do not mix w/discs)	(Dedicated GIC for each system)
37203A HP-IB Extender	Low	1 (Dedicated GIC)
30106A Card Reader	Low	1 (Dedicated GIC)
Network/INP Card	Low	1

In addition to the limit of eight electrical device loads per GIC, other rules for loading GICs are:

1. The maximum length of an HP-IB cable connecting a peripheral device to a GIC PCA is seven meters plus 1.5 meters internal to SPU, plus one meter per device load, to a maximum of 15 meters per GIC. High-speed peripherals can be attached to no more than two GICs on each Intermodule Bus (IMB).

2. With two IMBs, high-speed peripherals can be attached to as many as four GICs.

3. A maximum of six devices can be attached to a GIC with a high-speed peripheral.

4. Low-speed peripherals (except an HP 2608A) can be attached to any GIC.

5. An HP 2608A and a high-speed peripheral cannot be attached to the same GIC.

6. HP also recommends that separate GICs be used for an HP 7976A and the system disc. System performance can degrade if this recommendation is ignored.

HP 3000 Series 64/68/70 Supported Peripherals
(See Notes for Differences in Support on MPE-V/P and MPE-V/E)

Devices	1 I/O Bay	2 I/O Bays	Notes
Max IMBs	2	3	8,12
Max High Speed GICs	4	6	1,2
Max GICs	10	15	3
Max INPs	16	24	7,13
Discs:			
7906M	0	0	4
7906S	0	0	4
7911/7912	1	1	4
7914	8	8	4
7920/7925M	16	16	4
7920/7925S	14	14	
7933H/7935H	16	24	4
7936H/36XP/37H/37XP	16	24	4
7945A	4	4	4
7957A/58A	4	4	4
7959B	4	4	4
7962B	4	4	4
7963B(w/up to 3 mechanisms)	4	4	4
C1707A	1	1	
C2200A	16	24	
C2202A	16	24	
C2203A	16	24	
Max Disc Drives	16	24	
Tapes:			
7970E-M	2	2	5
7970E-S	6	6	
7974A/7976A	2	2	4
7978A/79A/80A/80XC	4		
Max 1/2" Mag Tape Drives	8	8	
9144A/45A	4	4	4,14,15
35401A Multi-Cart. Tape	4	4	4,14,15
C1511A	4	4	
Max integrated Tape Cart.	1	1	5
Printers:			
2563A/64B/64C/67B/67C/62C & 63B/63C/66B/66C	4	4	
2611A/13A/17A/19A	4	4	
2608A	4	4	6
2608S	4	4	9
Max Line Printers	8	8	
Page Printers:			
2680A	2	2	4
2688	4	4	4
Max Page Printers	4	4	

HP 3000 Series 64/68/70 Supported Peripherals (con't.)

Devices	1 I/O Bay	2 I/O Bays	Notes
Serial Connected Printers:			
2601A/2602A/2603A (RS-232)	16	16	
2687 (RS-232) ADCC			10,11
2687 (RS-422) ATP	4	4	10,11
2631B	16	16	12
2686A/D	5	5	
2932/2933/2934A	16	16	
2562C/2563B/C	6	6	
2564B/C	6	6	
LaserJet Series II	5	5	
LaserJet IID	5	5	
LaserJet III	5	5	
Other Devices:			
9895A-010 Flexible Disc Dr.	1	1	
30106A Card Reader	1	1	5

NOTES:

1. Maximum of six high-speed device controllers per GIC. The number of controllers may be further limited by cable lengths and loads.
2. Only two high-speed GICs per IMB allowed on A Series 64/68/70.
3. Up to five GICs per IMB on A Series 64/68/70.
4. High-speed GIC only.
5. Requires a dedicated GIC.
6. Cannot share a GIC with disc or tape drives.
7. Up to 16 INPs will function at 19.2K bps (2400 CPS); only 10 will run at 56 bps (7000 CPS).
8. Third IMB requires Auxiliary I/O Bay.
9. Must be on a high-speed GIC, but cannot be on the same GIC as a 792x disc.
10. The HP 2687 cannot be a "System" printer.
11. These maximums are not additive.
12. Only two IMBs are supported on a 1 or 2 I/O Bay Series 68 with MPE-V/P.
13. Maximum of 16 INPs on a 1 or 2 I/O Bay Series 68 with MPE-V/P.
14. Cannot be placed on the same GIC as the System Disc.
15. DCU with date code >= 2641 and MPE V/E UB MIT or later required.

Maximum Terminal Configurations

Device	1 I/O Bay		2 I/O Bays	
	MPE-V/E	MPE-V/P	MPE-V/E	MPE-V/P
Terminals Attached*				
Direct Connect	144	144	336	144
Modem Conect	84	84	168	143
Total Point-to-Point	144	144	336	144
Total Multipoint	400	151	400	151
Total Terminals Attached	400	152	400	152
Sessions**				
Total Sessions Logged On:				
MPE-V/P	N/A	110	N/A	110
MPE-V/E	400	N/A	400	N/A

* This includes Remote Spooled Printers (HP 2631B, 2687A, etc.)
** These session limits include all point-to-point, multipoint, system console, and DSN/DS virtual terminals.

Disc Support Matrix

Disc	LDEV1	System Disc	Private Volume	Serial Disc
9895A	No	No	Yes	Yes
7906M/S	No	Yes	Yes*	Yes*
7920/25M	Yes	Yes	Yes	Yes
7920/25S	No	Yes	Yes	Yes
7911/12	No	Yes	Yes	No
7914	Yes	Yes	Yes	No
7933A/C/H	Yes	Yes	Yes	Yes
7935A/C/H	Yes	Yes	Yes	Yes
7936/7937	Yes	Yes	Yes	Yes
7945A	No	No	Yes	No
7957A/58A	No	No	Yes	No
7959B	No	No	Yes	No
7962B	No	No	Yes	No
7963B	Yes	Yes	Yes	Yes
C1707A	No	No	No	Yes
C2200A/02A/03A	Yes	Yes	Yes	Yes

* Only the 10Mb removable portion of the HP 7906 disc is supported in this configuration.

SYSTEM CABLES

The system cables consist of standard configuration cables that are internal and external to the system.

Internal Cables

Internal cables consist of standard cables that are located in the CPU and I/O card cages (Table 3-4) and Input/Output Buffer (IOB) cable connections (Figure 3-7 and 3-8).

Table 3-4. Internal Cables

CABLE PART NO.	FROM		TO	
	CONN REF	SLOT	CONN REF	SLOT
30140-60029 (Flat)	J5 CPU CAC	CPU 17	J5 CPU CMA	CPU 18
30140-60028 (flat)	J5 CPU CBI5	CPU 19	J5 CPU CMAX	CPU 18
30140-60028 (Flat)	J5 CPU CBI1	CPU 20	J5 CPU IOB1	CPU 21
30140-60028 (Flat)	J5 CPU CBI7	CPU 26	J5 CPU MCS	CPU 27
30140-60082 (Flat Flat)	J3 CPU IOB1	CPU 21	J1 I/O IMBI1	I/O 24
30140-60082 (Long Flat)	J4 CPU IOB1	CPU 21	J2 I/O IMBI1	I/O 24
(32460A)				
30140-60048 (Data)	J5 CPU DCU	CPU 1	*J3 I/O AIB	I/O 11
(32460B,32468B, or 32471A)				
30140-60100 (Data)	J5 CPU DCU	CPU 1	*J3 I/O AIB	I/O 11
30140-60051	J2 SSDP/J2 SSDP-B		J2 PSC/J2PDM	
30140-60052	J1 SSDP/J1 SSDP-B		CIR BACKPLANE	
5061-2503	IO GIC (Ch.2)	I/O 23	JUNC PNL 13 SUB 3	
5061-2503	IO GIC (Ch.3)	I/O 22	JUNC PNL 13 SUB 2	
30140-60050	J3 CPU DCU	CPU 1	J1 PSC/J1 PDM	
30170-60021	J1 TO AIB	I/O 11	J1 TO SIB	I/O 12

*Remote junction panel, key switch.

External Cables

External cables consist of standard configuration cables that interface the HP 3000 Series 64/68/70 to peripherals. (Refer to Table 3-5.)

Table 3-5. External Cables

CABLE PART NO.	FROM CONN REF	FROM SLOT	TO CONN REF	TO SLOT
02640-60131	2647 OPT 890 CONSOLE		JUNC PNL 19,	PORT 0
13242N (U.S. MODEM)	HP 150 II CONSOLE		JUNC PNL 19,	PORT 0
13242M (Eur. MODEM)	HP 150 II CONSOLE		JUNC PNL 19,	PORT 0
13242P (RS-422)	HP 150 II CONSOLE		JUNC PNL 19,	PORT 0
13242X (RS-232C)	HP 150 II CONSOLE		JUNC PNL 19,	PORT 0
8120-3446(HP-IB)	7933/7935 DISC		JUNC PNL 13,	SUB 2
8120-3446(HP-IB)	7974/78 MASTER MAGTAPE		JUNC PNL 13,	SUB 3

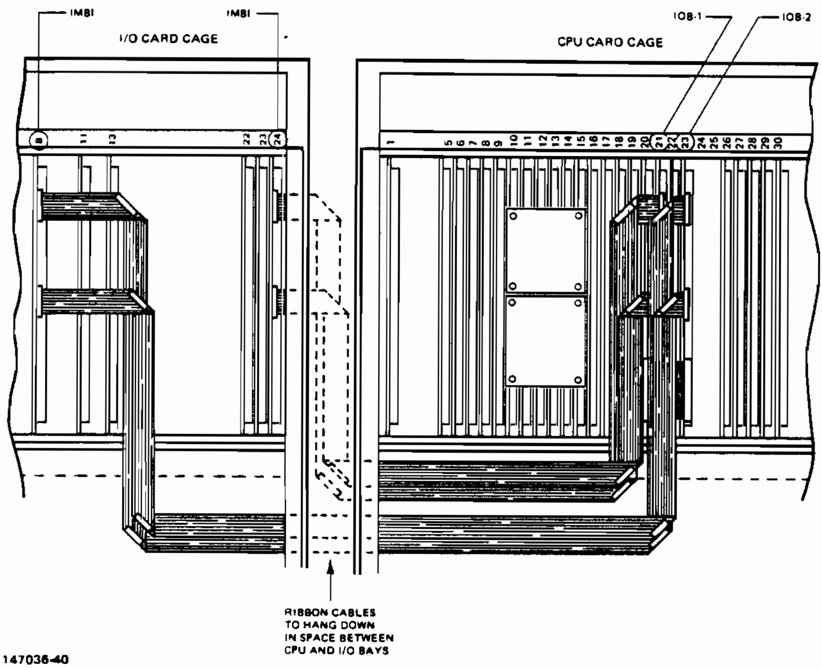


Figure 3-7. IOB Cable Connection, First and Second IOA

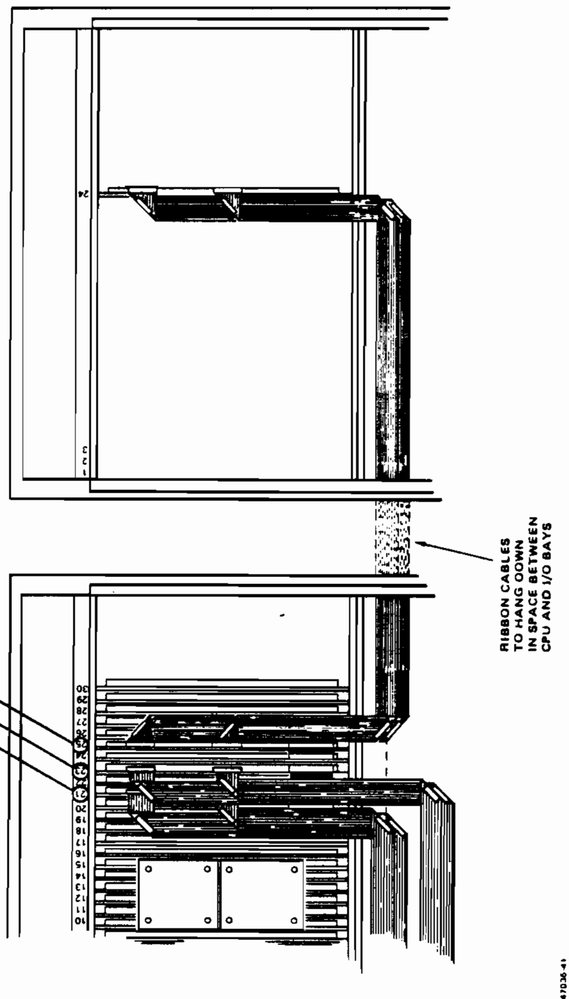


Figure 3-8. IOB Cable Connection, Third IOA

POWER SYSTEM MONITOR BOARD CONFIGURATION

The Series 64/68A power system is monitored and controlled by the Power Supply Controller (PSC) PCA.

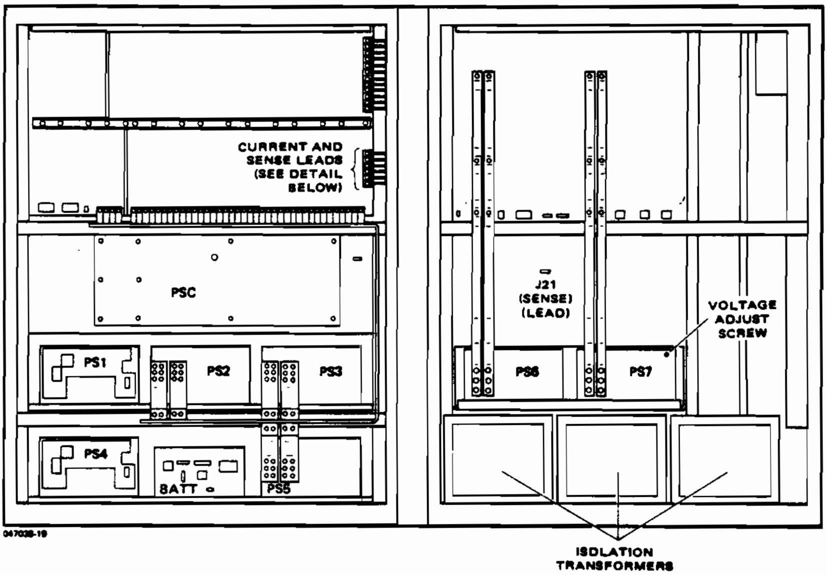
The Series 64B/68B/70 power system is monitored and controlled by the Power Distribution Monitor (PDM) PCA.

Power System Controller (HP 32460A)

The Power Supply Control (PSC) circuit board is located in the front of the CPU Bay. (See Figure 3-9.) The PSC acts as an interface between the DCU and the power system. Its primary function is to monitor the power system. A LED display has been incorporated into the PSC to facilitate troubleshooting as descripted in Table 3-6. This diaplay is not to be used for adjustments. Power supply adjustments are critical and require greater accuracy than this meter allows. There is also a Power Supply Monitor on the System Status Display Panel which will indicate which power supply is not functioning. The system may run without the PSC connected to the DCU; however, this is not recommended. If the PSC seems to be causing problems for the DCU, all Control/Indicator functions will be disabled without the DCU connection. Refer to Table 3-7 for a discription of PSC cable connections.

Table 3-6. PSC LED Functions

CONTROL/INDICATOR	FUNCTION
DISPLAY ON/OFF	When pressed ON, activates the PSC readout circuit.
DISPLAY ADVANCE	Selects meter function. Each time switch is pressed, advances meter to next function. Corresponding function LED will light.
LED Readout	
V	Indicates voltage measurement
I	Indicates current measurement
AC1	Indicates ac 1 phase reading.
AC2	Indicates ac 2 phase reading.
AC3	Indicatee ac 3 phase reading.
DC OV	Indicatee PS voltage is high.
DC UV	Indicatee PS voltage is low.
AC OV	Indicates ac voltage is high.
AC UV	Indicates ac voltage is low.
PS NO.	Bank of LED's indicating power supply being measured. These will also light if a PS fails during normal operation.



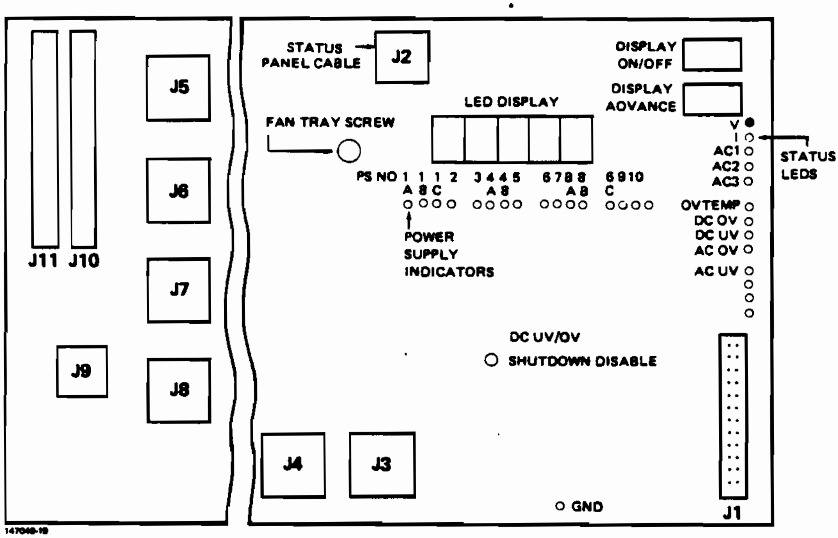


Figure 3-9. Power Supply Control Layout (HP 32460A)

Table 3-7. PSC Connections

Connectors	Description
J1	DCU Signals
J2	SSDP - Power & Indicators
J3	PSC Power
J4	Aux I/O Bay Control
J5	PCM - AC Sense & DC Enable switch
J6	CPU & I/O Bay Power Supply Voltage Sense & Shutdown
J7	CPU & I/O Bay Power Supply Sense
J8	Aux I/O Bay Power Supply Voltage & Current Sense
J9	Current Limit Reference - All Bays
J10	CPU & I/O Bay Test
J11	Aux I/O Bay Test

Power Distribution Monitor (HP 32460B, 32468B/C, 32471A)

The PDM monitors all DC voltages, A.C. unit alarms, and over-temperature switches. It also controls power modules for correct power levels, works with DCU in diagnosing and troubleshooting power module failures, and redistributes +/-12V and battery backed-up +5 VB. It also establishes a common ZERO VOLT bus plane from which all voltage measurements are made. Refer to Table 3-8 for a description of PDM connectors.

CAUTION

There is a slight space between the ZERO VOLTS BUS BAR and the CPU backplane. When removing the CPU backplane or the CPU top cover be careful not to drop screws between this space. It is possible to short together different voltages.

CAUTION

J5 and J12 sockets on the PDM are not keyed. These two connectors can be plugged into each others sockets causing fatal backplane damage. Do not mix up those connections.

Table 3-8. PDM Connections

Connectors	Description
J1	DCU Signals
J2	SSDP - B Indicators
J3	Module B and charger
J4	A.C. Unit
J5	SSDP - B Power
J6	Module E
J7	Module C
J8	Module A
J9	Module D
J10	Production test interface
J11	Production test interface
J12	+12S and -12S (inputs)
J13	+5B (input)
J14	+12, -12, and +5B (outputs)
J15	COMMON (GROUND)
J16	+5, -5.2V and -2V inputs +12V, -12V (outputs)
J17	+12V -12V (inputs)
J18	+12V, -12V, +5B (outputs) AUX I/O +5V Input

POWER SUPPLY CONFIGURATION

Refer to Section 6 for power supply configuration.

DRT CALCULATION

Since the Series 64/68/70 uses dual IMBs, a nine bit DRT is required. To calculate the DRT# use the following formula:

IMBI 1 = IMB # 0
IMBI 2 = IMB # 1
IMBI 3 = IMB # 2

DRT # = (IMB # x 128) + (chan # x 8) + HP-IB Device #

Standard Examples

Console DRT = (0 x 128) + (1 x 8) + 0 = 8

Sys Disc DRT = (0 x 128) + (3 x 8) + 1 =25

CHANNEL AND DEVICE ASSIGNMENTS

Channel and device assignments are listed in Table 3-9.

Table 3-9. I/O Channel and Device Configuration

CHANNEL NAME	PERIPHERAL	CHANNEL #	DEVICE #	PCA SLOT	DRT #
AIB			(BD#)		
SIB		1			8
GIC	7920MOM 7925M CTLR	3	1	22	25
GIC (TAPE)	7970E/7976	2	1	23	17

I/O SOFTWARE CONFIGURATION

Table 3-10 shows the I/O drivers required to support I/O devices.

Table 3-10. I/O Driver Supports

DEVICE	PART NO.	DRIVER NAME	TYPE	SUB-TYPE	RECORD WIDTH
Advanced Terminal Processor (ATP)	30196C	HIOTERM1	16	0	40
Hardwired Terminal, Speed Sensing[1]				0	
Full duplex modem (103, 202T, 212A or V.21), Speed Sensing				1	
Asynchronous half-duplex modem (202S or V.23), Data Rate Select ON, Speed Sensing[2]				2	
Asychronous half-duplex (202S or V 23), Data Rate Select OFF, Speed Sensing[2]				3	
Hardwired Terminal or 202T 4-Line leased Line, Speed Specified				4	
Full Duplex modem (103,202T,212A, or V.21), Speed Specified				5	
2601		IOTERMO		0,1	
Printers					
2608A		HIOLPRTO	32	4	66/68
2608S, 256X		HIOCIPRO	32	9,13[3]	66-110
2611A/13A/17A /19A		HIOLPRT2	32	2	
2631A		HIOLPRT1	32	5	
2631B[3]		HIOASLPO	32	14-hard-wired 15-full duplex modem	

Table 3-10. I/O Driver Supports (con't.)

DEVICE	PART NO.	DRIVER NAME	TYPE	SUB TYPE	RECORD WIDTH
Printers (cont'd)					
2680A		HIOPPRTO	8	0	66
2932/33/34A		HIOTERM2 (ADCC)	32	14-hard -wired 15-	
		HIOTERM1 (ATP)		modem	
		HIOLPRTO (System)	32	4	
2563A/63B/63C/64B & 66B/66C/67B/67C		HIOCIPRO	32	9	66
LaserJet Series II					
LaserJet IID					
Card Reader (2893A)		HIOCDRDO	8	0	40
Nine Channel Mag- netic Tape Unit					
7970E		HIOTAPEO	24	0[1],8	128
7974A/B		HIOTAPE2	24	3	128
7976A		HIOTAPE1	24	1[2],9	128
7978A/B		HIOTAPE2	24	2	128
7979A		HIOTAPE3	24	4	128
7980A/80XC		HIOTAPE3	24	5	128
C1511A					
35401A		HIOCTAP2	3	6	128
Intregrated Cart- ridge Tape Unit		HIOCTAPO	3	0	128
Disc Drive					
9895/7902		HIOFLOPO	2	0	128
7906		HIOMDSC1		10	
7906(removable platter)					
7906(fixed platter)				11	
7906(both platter)				12	
7911		HIOMDSC2	3	1	
7912		HIOMDSC2	3	2	
7914		HIOMDSC2	3	4	
7920		HIOMDSC1	0	8	
7925		HIOMDSC1	0	9	
7933/35		HIOMDSC2	3	8	
7936H/XP		HIOMDSC2	3	9	128
7937H/XP		HIOMDSC2	3	10	128

Table 3-10. I/O Driver Supports (con't.)

DEVICE	PART NO.	DRIVER NAME	TYPE	SUB TYPE	RECORD WIDTH
Disc Drive (con't)					
7945A		HIOMDSC2	3	5	128
7957A		HIOMDSC2	3	11	128
7957B		HIOMDSC2	3	13	128
7958A		HIOMDSC2	3	12	128
7958B		HIOMDSC2	3	14	128
7959B		HIOMDSC2	3	15	128
7961B		HIOMDSC2	3	13	128
7962B		HIOMDSC2	3	14	128
7963B		HIOMDSC2	3	15	128
C1707A		HIOCD0	4	4	128
C2200A		HIOMDSC3	4	1	128
C2202A		HIOMDSC3	4	2	128
C2203A		HIOMDSC3	4	2	128
DSN/RJE	30130E				
Intelligent Network work Processor	30020B	IOINPO	17		N/A
Line with modem				0	
Nonswitched (private line with modem)				1	
DSN/DS	32190A				
Intelligent Network Processor	30020B	IOINPO	17		N/A
Switched (dialup) Line with Modem				0	
Nonswitched (leased) Line with Modem or hardwired INP to SSLC				1	
Hardwired INP to INP				3	

[1]Available via the HP-IB Interface Module.
[2]For automatic allocation, use subtype 9.
[3]Subtype 9 is for feature access, 13 is for transparent access

POWER BAY CONFIGURATION

AC Power Requirements

See Section 2 for electrical requirements.

Power Cord and Plug

Power cords and plugs are supplied for North America (US and Canada), 60Hz installations only. Product shipped to North American customers has the power cord and plug already connected to the system.

50Hz systems are shipped without power cords and plugs, and require that the customer furnish the appropriate cord and plug. In this case, it is recommended that a qualified electrician familiar with local electrical codes determine the proper cord and plug.

CAUTION

Make sure that the AC line voltage agrees with the voltage requirements specified on the rear of the computer. Incorrect power may cause permanent damage to the computer.

Check the power outlet used to supply AC power to the computer to ensure that it furnishes the proper voltage.

The power outlet and associated wiring and fuses (or circuit breakers) must be capable of carrying the specified V AC.

Power Cord Installation

This following procedure describes power cord installation, and is applicable to both 50Hz and 60Hz systems.

CAUTION

All connections must be firmly tightened. Loose connections overheat, restrict current flow and may burn! Double check all connections. Before proceeding, make sure the cord rating is adequate to carry system load.

The AC Power Cord attaches to the left side of the AC unit. (See Figure 3-10.)

Remove Power Cord from ITT & SCOTT-T AC Units

Proceed as follows: (See Figure 3-10.)

1. Place the AC Unit on a comfortable work surface.
2. Remove the four (4) terminal block cover screws.
3. Remove the power cord and terminal block cover from the AC Unit chassis.
4. Disconnect all wires from the terminal block, and disconnect the ground wire.
5. Remove the power cord from the cover with channel lock pliers.

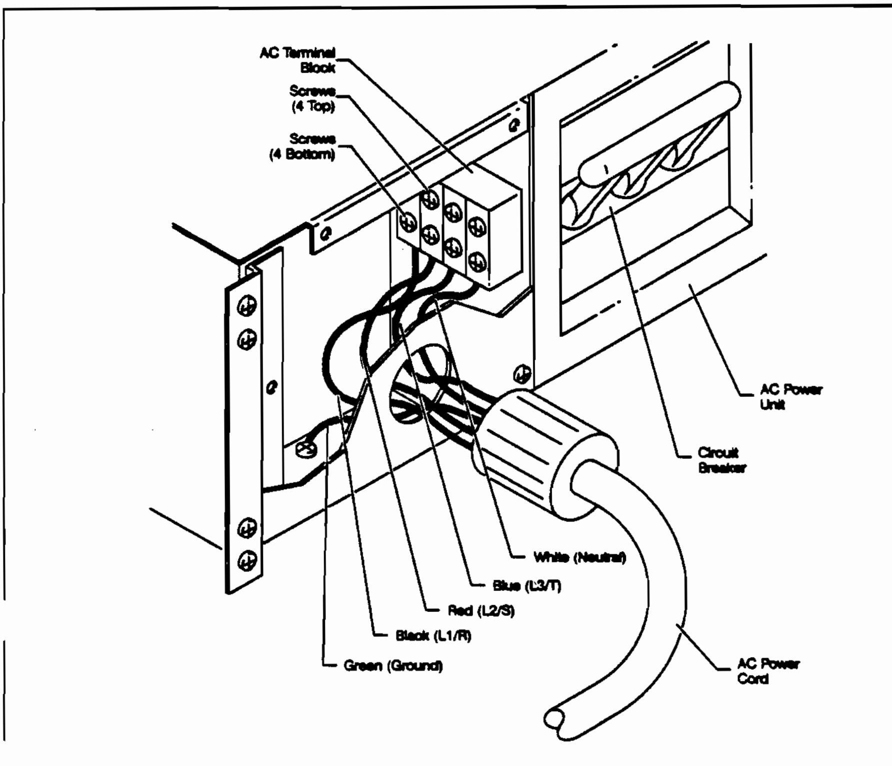


Figure 3-10. AC Power Cord Replacement

Install Power Cord Into ACDC AC Unit

Wires are labeled from left to right when viewing the terminal block from the top. Refer to Figure 3-11 and proceed as follows:

1. Remove the access cover plate, as shown in Figure 3-11.
2. Detach the terminal block from the cover plate.
3. Attach the strain relief to the AC unit.
4. Insert the power cord into the AC unit through the strain relief.
5. Connect the leads of the power cord to the terminal block according to the chart (Table 3-11) below (color codes may not apply at all installation sites).

Table 3-11. ACDC - TB1 Color Code Designations (USA only)

Wire Color	Usage	TB1 Designator
Black	Phase A (1)	R
Red	Phase B (2)	S
Blue or violet	Phase C (3)	T
White	Neutral	N
Green/yellow	Safety Gnd	G

6. Connect the ground lead (green/yellow) to the ground lug.
7. Attach the terminal block to the cover plate.
8. Adjust the length of the power cord within the AC unit to avoid excess bunching, and tighten the strain relief.
9. Replace the cover plate.

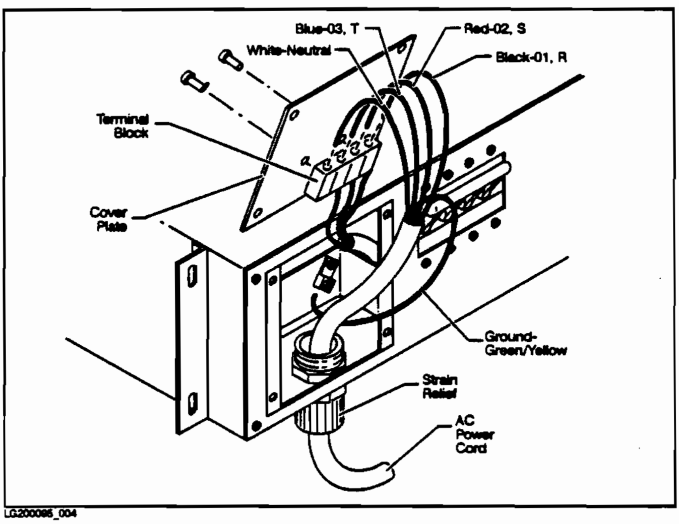


Figure 3-11. Power Cord Installation - ACDC AC Unit

Power Plug Installation

Connect a suitable plug at the power end. Electrical codes specified by each country determine the proper attachment plug, receptacle, and wiring convention. The type of plug should be determined by a qualified electrician familiar with the electrical codes for the site location. The power plug should be supplied by the customer.

WARNING

The plug can only be inserted into a power source (outlet) provided with a protective earth ground. The protective earth terminal on the computer must be connected to the protective conductor of the AC line (mains) power cord before the computer is switched on. The protective action must not be defeated by using a power extension cord that does not have a protective grounding conductor.

STRAPPING TRANSFORMERS FOR INPUT VOLTAGE/FREQUENCY

WARNING

Make sure input power is disconnected before proceeding. Turn off front power switch, and the circuit breaker in the rear.

The procedure for strapping the ferro-resonant transformers varies according to the kind of power system (ITT or ACDC) installed. Confirm the power supply, and strap the transformers accordingly. Refer to Figure 3-12 when connecting new transformers (ACDC power system).

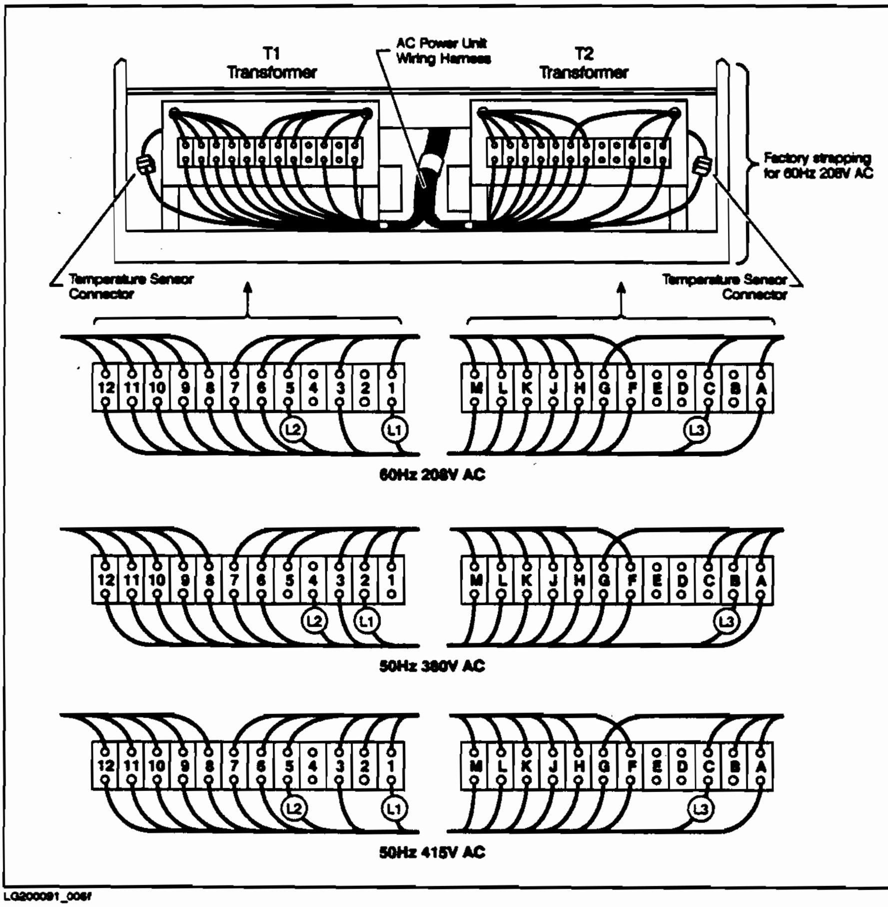


Figure 3-12. ACDC Transformer Connections, 60Hz and 50Hz

TROUBLESHOOTING

SECTION 4

Troubleshooting data presented in this section is designed to assist the user with diagnostic and repair functions affecting the HP 3000 Series 64/68/70. The HP 3000 Series 64/68/70 contains a built-in diagnostic system (DCU) and uses stand-alone diagnostics, refer to section 5, to help the user in troubleshooting the system. Also, included in this section are overtemperature troubleshooting, error codes and messages, machine instruction decode reference table and CBI SYSTOP Flowchart.

TROUBLESHOOTING

CONTRIBUTED SLEUTHSM PROGRAMS

Refer to Diagnostic Manual Set Volume 1 of 2 for a description of Sleuth program commands for troubleshooting.

SleuthSM Programs

The following programs can be used as an aid in troubleshooting:

SERVO EXERCISER (HP 9895A)

```
5000 DEV 0,<CHAN NO.>, <DEV NO.>, 99, 0, <IMB NO.>
5010 FOR A:=0 TO 3
5020 SEEK 0,0,0,0
5030 SEEK 0,76,0,0
5040 NEXT 5010
5050 SEEK 0,0,0,0
5060 FOR A:=0 TO 76
5070 IS 0
5080 DS 0
5090 NEXT 5060
5100 SEEK 0,44,0,0
5110 SEEK 0,0,0,0
5120 FOR A:=0 TO 14
5130 RS 0
5140 NEXT 5120
5150 SEEK 0,0,0,0
5160 RUN
```

FLAG DEFECTIVE TRACKS (HP 7920)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,10,0, <IMB NO.>
5010 DB AA, 6144,0
5015 DB &BB,3,"0"
5020 RC 0
5030 PRINT "CYLINDER # TO BE FLAGGED DEFECTIVE?"
5040 INPUT A
5050 PRINT "HEAD #?"
5060 INPUT B
5070 SEEK 0,A,B,0
5080 IDI 0,AA(0),3,D
5090 PRINT "CONTINUE? (Y/N)"
5100 INPUT &BB(0)
5110 IF &BB(0)= "Y" THEN 5020
```

FORMAT AND VERIFY (HP 7920)

```
5000 DEV 0,6,1,100,0, <IMB NO.>
5010 DB AA,6144,0
5020 RC 0
5030 FOR A:= 0 TO 822
5040 FOR B:= 0 TO 4
5050 SEEK 0,A,B,0
5060 IDI 0,AA(0),3,N
5070 NEXT 5040
5080 NEXT 5030
5090 FOR A:= 0 TO 822
5100 FOR B:= 0 TO 4
5110 SEEK 0,A,B,0
5120 VER 0,48,A,B,0
5130 NEXT 5100
5140 NEXT 5090
```

RANDOM READ/WRITE (HP 7920)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,10,0, <IMB NO.>
5010 DB AA,2000,0
5020 ASSIGN AA(0),( 666 ),%155555,%133333,%066666
5030 DB BB,2000,0
5040 RAND D
5050 LET A:= D MOD 813
5060 LET B:= D MOD 4
5070 LET C:= D MOD 47
5080 SKWD 0,AA(0),7,A,B,C
5090 RS 0
5100 SKRD 0,BB(0),7,A,B,C
5110 GOTO 5040
```

FLAG DEFECTIVE TRACKS (HP 7925)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,10,0, <IMB NO.>
5010 DB AA, 8192,0
5015 DB &BB,3,"0"
5020 RC 0
5030 PRINT "CYLINDER # TO BE FLAGGED DEFECTIVE?"
5040 INPUT A
5050 PRINT "HEAD #?"
5060 INPUT B
5070 SEEK 0,A,B,0
5080 IDI 0,AA(0),3,D
5090 PRINT "CONTINUE? (Y/N)"
5100 INPUT &BB(0)
5110 IF &BB(0)= "Y" THEN 5020
```

FORMAT AND VERIFY (HP 7925)

```
5000 DEV 0,6,1,100,0, <IMB NO.>
5010 DB AA,8192,0
5020 RC 0
5030 FOR A:= 0 TO 822
5040 FOR B:= 0 TO 8
5050 SEEK 0,A,B,0
5060 IDI 0,AA(0),3,N
5070 NEXT 5040
5080 NEXT 5030
5090 FOR A:= 0 TO 822
5100 FOR B:= 0 TO 8
5110 SEEK 0,A,B,0
5120 VER 0,64,A,B,0
5130 NEXT 5100
5140 NEXT 5090
```

RANDOM READ/WRITE (HP 7925)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,10,0, <IMB NO.>
5010 DB AA,2000,0
5020 ASSIGN AA(0),( 666 ),%155555,%133333,%066666
5030 DB BB,2000,0
5040 RAND D
5050 LET A:= D MOD 813
5060 LET B:= D MOD 8
5070 LET C:= D MOD 63
5080 SKWD 0,AA(0),7,A,B,C
5090 RS 0
5100 SKRD 0,BB(0),7,A,B,C
5110 GOTO 5040
```

HP 79XX RANDOM WRITE/READ

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,100,0, <IMB NO.>
5006 GOSUB 888
5010 DB AA, 3072
5011 DB BB, 3072
5020 ASSIGN AA(0),(1024),%155555,%133333,%066666
5025 LET H:= WW(13) MOD 100
5030 LET B:= WW(13)-1-H, F:= WW(14)-1, G:= WW(15)-1
5040 RAND D
5045 LET A:= D MOD E, B:= D MOD F, C:= D MOD G
5050 SKWD O, AA(0),7,A,B,C
5060 RS 0
5070 SKRD 0, BB(0),7,A,B,C
5080 CB AA(0), BB(0),3072
5090 IF INDEX=-1 THEN 5040
5100 PRINT "BUFFER COMPARE ERROR -- TEST ABORTED"
```

WW(13) = First disc track
WW(14) = No. of heads
WW(15) = No. of sectors

SERVO TEST (HP 7920,7925)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,99,0, <IMB NO.>
5010 FOR A:= 0 TO 50
5020 LET B:= 822
5030 RC 0
5040 SEEK 0,B,0,0
5050 NEXT 5010
5060 FOR A:= 0 TO 30
5070 FOR B:= 0 TO 822
5080 LET C:= 823-B
5090 SEEK 0,B,0,0
5100 SEEK 0,C,0,0
5110 NEXT 5070
5120 NEXT 5060
5130 FOR A:= 0 TO 10
5140 RAND C
5150 LET C:= C MOD 821
5160 SEEK 0,C,0,0
5170 RC 0
5180 NEXT 5130
```

MULTIDISC EXERCISER (HP 7920,7925)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,100,0,<IMB NO.>
5010 DEV 1,<CHAN NO.>,<DEV NO.>,100,1
5020 DEV 2,<CHAN NO.>,<DEV NO.>,100,2
5030 DEV 3,<CHAN NO.>,<DEV NO.>,100,3
5040 DB AA,128,1
5050 DB BB,128,0
5060 PRINT "ENTER NO. OF DRIVES TO BE TESTED (4 MAX.)?"
5070 INPUT A
5080 FOR B:= 0 TO 100
5090 RS 0
5100 WDI 0,AA(0)
5110 RDI 0,BB(0)
5120 SCB 0,AA(0),BB(0),1
5130 IF A<1 THEN 5280
5140 RS 1
5150 WDI 1,AA(0)
5160 RDI 1,BB(0)
5170 SCB 1,AA(0),BB(0),1
5180 IF A<2 THEN 5280
5190 RS 2
5200 WDI 2,AA(0)
5210 RDI 2,BB(0)
5220 SCB 2,AA(0),BB(0),1
5230 IF A<3 THEN 5280
5240 RS 3
5250 WDI 3,AA(0)
5260 RDI 3,BB(0)
5270 SCB 3,AA(0),BB(0),1
5280 BUMP
5290 NEXT 5080
```

TEST SPARING FUNCTION (HP 7920,7925)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,100,0, <IMB NO.>
5010 DB AA,6144,0
5020 FOR A:= 0 TO 10
5030 LET A:= 815
5040 SEEK 0,10,0,0
5050 ID 0,AA,3,D,A,0,0
5060 SEEK 0,,A,0,0
5070 ID 0,AA,3,S,10,0,0
5080 SEEK 0,10,0,0
5090 RDI 0,AA(0),7
5100 NEXT 5020
```

DISC VOLUME AND COLD LOAD PROGRAM REWRITE

THIS PROGRAM WILL ALLOW ONE TO REWRITE THE DISC VOLUME NAME AND COLD LOAD PROGRAM. ***CAUTION*** THIS PROGRAM SHOULD BE USED ONLY AS A LAST RESORT AND YOU MUST KNOW THE CORRECT CONTENTS OF CYLINDER ZERO, AND SECTOR ZERO.

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,10,0, <IMB NO.>
5010 DB AA,128,0
5020 DB BB,128,0
5030 RC 0
5040 SKRD 0,AA(0),0
5050 FOR A:= 0 TO 15
5060 LET BB(A):=AA(A)
5070 PRINT "WORD  ";A;" CONTAINS ":AA(A)
5080 PRINT "WISH TO CHANGE (Y/N)?"
5090 INPUT B
5100 IF B="N" THEN 5130
5110 PRINT "ENTER IN OCTAL NEW VALUE?"
5120 INPUT BB(A)
5130 NEXT 5050
5140 PRINT "OK TO WRITE TO DISC (Y/N)?"
5150 INPUT B
5160 IF B="N" THEN 5250
5170 RC 0
5180 SKWD 0,BB(0),0
5190 SKRD 0,AA(0),0
5200 CB AA(0),BB(0),128
5210 IF INDEX= -1 THEN 5260
5220 PRINT "DISC WRITE OK READ ERROR WISH TO RETRY (Y/N)?"
5230 INPUT B
5240 IF B="Y" THEN 5170
5250 PRINT "REQUEST NOT GRANTED"
5260 PRINT "END OF PROGRAM"
5270 END
```

WRITE ENTIRE TAPE WITH "ONES" PATTERN (HP 7970E)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,100,0, <IMB NO.>
5010 DB AA,4000,%177777
5020 WD 0,AA(0)
5030 GOTO 5020
```

WRITE 20 RECORD, BACKSPACE, AND READ (HP 7970E)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,20,0 <IMB NO.>
5010 DB AA,4000,0
5020 DB BB,4000,0
5030 ASSIGN AA(0),(1000),3,5,7,9
5040 FOR A:= 0 TO 19
5050 WD 0,AA(0)
5060 WFM 0
5070 NEXT 5040
5080 REW 0
5090 FOR A:= 0 TO 18
5100 FSF 0
5110 NEXT 5090
5120 RD 0,BB(0)
5130 SCB 0,AA(0),BB(0),3
```

RIPPLE PRINT (HP 2608,2631)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,100,0, <IMB NO.>
5010 RP 0,132
```

PRINT 50 LINES OF "H" (HP 2608,2631)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,100,0, <IMB NO.>
5010 DB &AA,132,"H"
5020 FOR A:=1 UNTIL 50
5030 WD 0,&AA(0),1,132
```

OVERTEMPERATURE CONDITIONS

The Series 64/68A signals an overtemperature failure by lighting the overtemp LED on the SSDP-A.

The Series 64B, 68B/C, 70 signals an overtemperature failure by lighting the overtemp LED or the "H" LED on the SSDP-B.

OVERTEMP LED Lit On SSDP

The system has two sets of overtemperature sensors designed for either "low" (40 degree exhaust C) or "high" (50 degrees exhaust C) overtemperature conditions. When a "low" switch opens, the following happens:

a. Overtemp LED on front display lights.

b. Overtemp message is sent to system console.

c. Console "beeps" every 10 seconds.

When a "high" overtemperature switch opens, the following occurs:

a. Overtemp LED on front display lights.

b. Overtemp message is sent to system console.

c. Console "beeps" once each second.

d. After 1 min., the banner OVERTEMP SHUTDOWN flashes on the screen.

e. After 15 sec., PFW(L) goes active. Ten ms later, all power supplies except the battery charger/backup supply are shut down via their Remote Shutdown lines. At this time, power to the overtemp LED is lost and the LED turns off. On SSDP-B, this is battery backed-up.

f. The system will not restart until the overtemp switches close and power is turned off and back on to the power supplies.

   1. CB2 on HP 32460A, DC power supply.

   2. Main AC Unit switch on HP 32460B, 32468B/C, 32471A A.C. power.

H LED Lit on SSDP-B (ITT B Power System)

The H LED on the SSDP-B implies that an AC Unit failure alarm has occured. There are four types of AC Unit failure alarms:

- o Fan Failure (FANFAIL).
- o Rectifier Failure (RFA).
- o Transformer overtemperature (OT).
- o Power Failure (PFA).

The first three of these will turn on the SSDP-B H LED. The four AC Unit alarms are outputed from J5 of the AC Unit and are delivered to P4 of the PDM PCA. The fan failure alarm, rectifier failure alarm, and overtemperature alarm are OR'ed together on the PDM PCA. If any are active (high true), the PDM will light the H LED. The PDM does not notify the Diagnostic Control Unit (DCU) of the failure, and the operating system may still continue to function. The fourth AC Unit alarm, power failure, causes the PDM to interrupt the DCU and start a power down routine. In this case, the SSDP-B LED will light to indicate a low PON signal.

When the H LED is lit, the possible causes are transformer overtemperature, rectifier failure, or fan failure. To isolate the failure, perform the following troubleshooting procedures:

1. Observe the operation of the system fans. If all system fans are working, and if an Aux I/O bay is not present, rotate P1, P2, and P3 plugs on the AC distribution strip making sure that cable connections are secure. Now if system fans are not working measure the AC unit outputs: J1, J2, and J3 should read 230 VAC +/- 12%. If any output phase is missing, you have located the source of the problem.

2. Check if any of the three AC Unit switches tripped. The three switches correspond to three transformers which are located on the left side of the AC Unit. If a switch trips, the system will still operate; however, one system bay of fans will not work. If any of the relay switches are tripped, replace the AC Unit. (It is more likely that the relay switch tripped as a result of faulty AC Unit hardware than as a result of transformer overtemperature.

3. It is possible that a faulty AC Unit may generate an alarm signal without other indications. Therefore, if steps 1, and 2 do not locate the problem, try replacing the AC Unit.

4. Since the PDM PCA is responsible for lighting the SSDP-B H LED, perhaps its circuitry is faulty. If steps 1, 2, and 3 do not solve the problem, replace the PDM PCA.

5. If steps 1 through 4 do not solve the problem, check the continuity of the AC Unit alarm cable. (AC Unit J5 to PDM PCA J4.) All alarm signals are TTL, with a low (not true) signal measuring less than 0.8 volts, and a high (true) signal measuring greater than 2.0 volts. If an alarm signal falls between these values, the PDM will probably interpret it as true. Also, note that a broken alarm wire will cause the PDM to assume a true failure. The cable pins are listed below.

6. If steps 1 through 5 do not solve the problem, contact an HP 3000 TSE for further technical assistance.

AC UNIT ALARM CABLE PINS

AC UNIT	PDM PCA	
J5-1	J4-12	Rectifier Failure Alarm
J5-3	J4-11	Overtemperature Alarm
J5-4	J4-10	Fan Failure Alarm
J5-2	J4-7	Fan Failure Alarm Return
J5-5	J4-19	Power Failure Alarm
J5-6	J4-15	Power Failure Alarm Return
J5-8	J4-9	Battery Connect
J5-9	J4-5	Battery Connect Return
J5-7	J4-17	Chassis Ground

H LED Lit on SSDP-B (Scott T Power System)

A lit H LED is caused by a fan failure alarm. If the H LED is lit, do the following:

1. Check the system fans. If any of the fans are not turning or turning slower than normal, then:

   a. Check the fan fuses at the rear of the AC Unit.

   b. Perform an orderly shutdown, power down the system, and check the fan power distribution cables for tightness.

   c. Measure system input power to see if an input phase is missing; if so, you've found the problem.

   d. If the problem persists, the fan power generation circuitry in the AC Unit may be faulty; replace the AC Unit.

   e. If steps 1a to 1d don't solve the problem, call the Response Center nearest you.

2. If all fans are turning properly, the alarm signal is false. To find the source of the false signal:

   a. Check the voltage levels of the rectifier failure alarm, overtemperature alarm, and fan failure alarm at plug J5 on the AC Unit. The cable pins are listed above. All alarm signals are TTL with a low (not true) signal measuring less than 0.8 volts and a high (true) signal measuring greater than 2.0 volts. If an alarm signal falls between these values, the PDM will probably interpret it as true. If one of these signals is true, try replacing the AC Unit. If they are all false, go to the next step. (The alarm cable must be properly attached to the AC Unit and the PDM for your measurements to be valid.)

   b. Check the voltage levels of these signals on J4 on the PDM. If any signals are true here and were false at J5 on the AC Unit, the alarm cable is faulty. If all signals are not true here, and the H LED is lit, try replacing the PDM PCA.

   c. If steps 2a and 2b don't solve the problem, call your HP 3000 CEC.

POWER SUPPLY TROUBLESHOOTING

Refer to Section 6 for power supply troubleshooting information.

IMBI LED DEFINITIONS

Table 4-1 lists the IMBI signals and gives a brief description of each. The LEDs are located on the IMBI adjacent to connector J3.

Table 4-1. IMBI LEDs

----- J3 LED Arrangement -----

```
I X R R M   M L W S S   S I C I B
D 1 1 2 1   2     1 2   3 N M M R
```

LABEL	Signal	On if and only if the IMBI is...
ID	IFTL	In the IDLE state.
XI	XFTL	Trying to send unsolicited message (X1,X2 state).
R1	R1FTL	Requesting message from IOB (R1 state).
R2	R2FTL	Checking parity, content of message (R2 state).
M1	M1FTL	Executing an IMB command (M1 or M2 state).
M2	M2FTL	Asserting IMB command handshake lines (M2 state).
L	LFTL	Performing an IMBI register operation (L state).
W	WFTL	Sending response message to CPU (W state).
S1	S1FTL	Sending memory address to IOB (S1 state).
S2	S2FTL	Waiting for completion of data portion of memory operation (S2FTL) with IOB.
S3	S3FTL	Completing IMB memory handshake (S3 state).
IN	INTL	Going to enter X state soon, as there is a valid reason to send an unsolicited message to the CPU.
CM	CSRQMFL	Enabled to recognize and report assertion of IMB CSRQ2L signal (channel program request mask).
IM	IRQMFL	Enabled to recognize and report assertion of IMB IRQL signal (interrupt request mask).
BR	MYBRQFL	Asserting the IMB BRQL signal to gain control of the IMB to send a command (only used if a CPP is installed).

AUXILIARY I/O BAY TROUBLESHOOTING

To isolate an Auxiliary I/O Bay failure, perform the following troubleshooting procedures:

1. Rotate assemblies to isolate failures. With the Auxiliary I/O Bay, there are multiple CBIs, IOBs, IMBIs, and 5-volt power supplies available.

2. FLDs Test Section 5, I/O and IOMAP, recognizes and identifies channels and devices on third IMB.

3. DCU Selftest will report if it sees any PCAs on the CPU backplane which are not required for DCU Selftest to pass. For the second IMB (IMBI) this will include CBI2 and IOB2, for the third IMB, this will be CBI3 and IOB3. The message printed upon completion of DCU Selftest will be "OPTION PCAs RESPONDING", followed by a list of assemblies. Note that this message is not an error message, and should be seen if a second or third IMB is installed.

4. The software diagnostics on DUS are functional on the third IMB.

Refer to Section 6 for additional troubleshooting information on the Auxiliary I/O Bay power supplies.

ERROR CODES/MESSAGES

The following tables describe the major system error codes/messages and corrective action to be taken.

DCU Error Code

Table 4-2 lists the error codes displayed when a DCU selftest function fails. The DCU error code is also displayed on the LEDs of the DCU. The most significant bit is displayed by the top LED.

Table 4-2. DCU Error Code

ERROR CODE		DESCRIPTION	CORRECTIVE ACTION
05	H	Cannot access terminal.	Check REMOTE/LOCAL switch. Check hung terminal. Check Cables. Check parity NONE function. Check FULL duplex position. Check AIBO power switch. Replace DCU.
10		DCU lost	Replace DCU.
21		PSC/PDM selftest failure.	Replace PSC/PDM.
31	H	Bad DCU RAM location.	Replace DCU.
32	H	DCU RAM Address problem.	Replace DCU.
41		Cannot obtain terminal primary status.	Replace or fix terminal.
42		Cannot obtain terminal secondary status.	Replace or fix terminal.
43		Terminal BLOCK MODE on.	Set BLOCK MODE off.
44		Terminal 'Z' strap enabled.	Disable 'Z' function on HP 2642 terminal keyboard I/F PCA.
51		Defective DCU shift string hardware.	Replace DCU.
52		No System Clock.	Fix System Clock, replace: 1) CTLB 2) DCU 3) PSC/PDM
53		Defective DCU shift string or clock burst hardware.	Replace DCU.

H = Hardware error

Table 4-2. DCU Error Code (con't.)

ERROR CODE		DESCRIPTION	CORRECTIVE ACTION
61		Defective DCU power fail clock.	Replace DCU.
71	H	System DC Power Low.	Isolate, replace, and adjust power supplies.
72	H	System DC Power HI.	Isolate, replace, and adjust power supplies.
90-9D	H	DCU ROM sequence error 0-D is ROM number.	Replace DCU or put DCU ROMs in correct socket.
A0-AD	H	DCU ROM checksum error 0-D is ROM number.	Replace DCU or Bad ROM.
B0-BD	H	DCU ROM not accessible 0-D is ROM number.	Replace DCU or install missing ROM.
E0	H	DCU UART Loopback error.	Replace DCU.
E8	H	DCU UART crosscouple ERR.	Replace DCU.
C1		PSC U114 error.	Replace/connect PSC.
C2		PSC U115 error.	Replace/connect PSC.
C3		PSC U134 or U144 error.	Replace/connect PSC.
C4		PSC U135 or U145 error.	Replace/connect PSC.
C6		PDM not connected	Replace/connect PDM.
CA		PSC timer error.	Replace/connect PSC.
CF		PSC multiplexer error.	Replace/connect PSC.
00		Test passed.	
FF		Test hung.	

H = Hardware error

NOTE

Before replacing any hardware as a result of a failure verify DC power operation. Check all voltage outputs. (Refer to Section 6 for a list of voltage outputs).

System Load (MPL) Errors (DCU ROM Date Code < 2403)

These are error messages which can be received on a system load (LO, ST, DU commands); they apply only to DCU ROM date codes less than 2403. Each error is described along with possible clues to the problem:

- INIT/IDENT FAILED (was not able to successfully initialize memory or identify a device for the Loading operation).
- BAD INIT/IDENT DEVICE TYPE (device specified was not a proper MPL device 792x disc, 797x tape or 7933 disc).
- MPL FAILED (could not load system microcode from specified device)

Microcode Program Load (MPL) Error Messages (DCU ROM Date Code < 2403)

These errors messages are printed on DCU console when loading system microcode. Table 4-3 applies only to DCU ROM date codes less than 2403.

Table 4-3. MPL Error Codes (DCU ROM Date Code < 2403)

ERROR CODE	DESCRIPTION	ACTIONS
A001	Message timeout - either the message can not be sent because the receiving module (IOA) is busy, or there is no response from receiving module.	1) Check cables between IOB and IMBI of the cold load device. 2) Run I/O microdiagnostics.
A002	Disc status not ready.	1) Check cold load device connected to proper channel. 2) Check system disc powered up and ready.
A003	The cold load channel can not be brought on line as a controller-in-charge.	1) Check if right channel number is set on the channel. 2).Check if 'SYS CRTL' is set on cold load channel. 3) Run I/O microdiagnostics. Run IOMAP and Loopback test of cold-load device to check if channel is responding.

Table 4-3. MPL Error Codes (DCU ROM Date Code < 2403) (con't.)

ERROR CODE	DESCRIPTION	ACTIONS
A004	WCS/LUT checksum error.	1) Check if correct system firmware is installed on the cold load device 2) Run CPU micro-diagnostics to check WCS/LUT RAMs.
A005	CSRQ timeout after DMA completion.	1) Check switch on channel is set to 'CPP PROCESSOR'. 2) Run DMA exerciser.
A006	Abnormal DMA termination or disc drive is off. WCS did not get loaded correctly from disc, probable cause disc data not there or is garbage. DMA transfer is halted because of memory error or hardware timeout.	1) Run I/O micro-diagnostic. 2) Run DMA exerciser.
A007	No WCS/LUT on tape.	1) Check tape drive unit 0 is selected and on line. 2) Check if proper magnetic tape is mounted on the drive.
A008	Device Specified Jump Response not equal to zero.	1) Run loopback test of the device. 2) Run DMA exerciser.

System Load (MPL) Errors (DCU ROM 2403 and >)

These are error messages which can be received on a system load (LO or ST commands); they apply only to ROM date codes 2403 and greater. Each error is described along with possible clues to the problem:

- o INIT/IDENT FAILED (was not able to successfully complete INITIALIZATION/IDENTIFICATION part of MPL).
- o BAD INIT/IDENT DEVICE TYPE (device specified was not a proper MPL device 7914 disc, 792x disc, 797x tape or 793X disc).
- o MPL FAILED (could not load system microcode from specified device).
- o NO RESPONSE FROM CPU (timeout).
- o UNEXPECTED CPU INTERRUPT (CPU interrupt other than Diag Freeze).
- o MPL ERROR CODE = Annn (system microcode bootstrap loader has detected a problem--error codes follow).

Microcode Program Load (MPL) Error Messages (DCU ROM Date Code 2403 and >)

These error messages are printed on DCU console when loading system microcode. Table 4-4 applies only to DCU ROM date codes 2403 and greater.

Cache Initialization (NCAC or OCAC) Errors (DCU ROM Date Code 2601 and >)

These are error messages which can be received on a system load (LO or ST Command) or auto restart.

- o CACHE RETURNED BAD CACHE TYPE IN CACSTAT (CAC or CACX had bad bit 7 in CACSTAT)
  CACSTAT (7:1) = 0 for 8 Kb CAC and CMA.
  CACSTAT (7:1) = 1 for 128 Kb CACX and CMAX.
- o NO RESPONSE FROM CPU (timeout).
- o UNEXPECTED CPU INTERRUPT (CPU interrupt other than Diag Freeze).
- o CACHE INTITALIZATION FAILED (could not initialize the CACHE).

Table 4-4. MPL Error Codes (DCU ROM Date Code 2403 and >)

ERROR CODE	DESCRIPTION	ACTIONS
A001	Message timeout - either the message cannot be sent because the receiving module (IOA) is busy, or because there is no response from the receiving module.	1. Check the cables between the IOB and IMBI of the cold load channel. 2. Run I/O microdiagnostics.
A002	Disk status not ready.	1. Check if the system disk is powered up and is ready. 2. Check HPIB cables from GIC to the coldload disk. 3. Check the IMB number, channel number, and device number used to specify the coldload device. 4. Check if correct channel number is set on the coldload channel GIC. 5. Check if correct HPIB address is set on the coldload device. 6. Run I/O microdiagnostics. Run IOMAP and DUS device diagnostics on the coldload disk.
A003	The coldload channel cannot be brought on line as a controller-in-charge.	1. Check if correct channel number is set on the coldload channel GIC. 2. Check if 'SYS CTRL' is set on the coldload channel. 3. Run I/O microdiagnostics. Run IOMAP and DUS GIC diagnostics on the coldload channel.
A004	WCS/LUT checksum error.	1. Check to make sure the correct system firmware is installed on the coldload device. 2. Try another copy of the operating system if loading from tape. 3. Clean the heads on the coldload device if loading from tape. 4. Run DUS device diagnostics on the coldload device. 5. Run DMA exerciser. 6. Run FLD's to locate possible hardware error condition.
A005	No WCS/LUT on the tape.	1. Check if the tape drive unit 0 is selected, and on line. 2. Check if the proper magnetic tape is mounted on the drive.

Table 4-4. MPL Error Codes (DCU ROM Date Code 2403 and >) (con't.)

ERROR CODE	DESCRIPTION	ACTIONS
A006	Device Specified Jump Response not equal to zero. The coldload device has detected an error in the data sent to the system Possible errors include parity, drive fault, power-fail, illegal disc address, read requested past end or file, etc. Check the device programming manual for the possible error causes.	1. Check to make sure the correct system firmware is installed on the coldload device. 2. If loading from a tape, verify that the tape is at the load point before attempting to load the system. 3. Check HPIB cables to coldload device. 4. Clean the heads on the coldload device if loading from tape. 5. Run DUS device diagnostics on the coldload device. 6. Run DMA exerciser.
A007	CSRQ timeout after SIOP command. The channel program has not completed within the allowed time limit.	1. Check if the switch on channel is set to 'CPP PROCESSOR'. 2. Run I/O microdiagnostics. 3. Run DMA exerciser.
A008	Channel Program Abort. The channel program used to read from the coldload device has aborted due to an error condition that it encountered.	1. Check if the system coldload device is powered up and online. 2. Check HPIB cables to coldload device. 3. Run I/O microdiagnostics. 4. Run DUS device diagnostics on the coldload device. 5. Run DMA exerciser.
A009	CSB I/O ERROR. An error has been detected on a data transfer across the Central System Bus.	1. Run FLD's to locate possible hardware error condition.

Table 4-4. MPL Error Codes (DCU Date Code 2403 and >) (con't.)

ERROR CODE	DESCRIPTION	ACTIONS
A00A	INVALID MODULE NUMBER. The MPL microcode has detected an attempt to access a module that does not exist.	1. Check the IMB number used to specify the coldload device. 2. Run FLD's to locate possible hardware error condition.
A00B	NON-RESPONDING MODULE. The MPL microcode has detected an attempt to access a module that does not respond.	1. Check the IMB number used to specify the coldload device. 2. Run FLD's to locate possible hardware error condition.
A00C	UNIMPLIMENTED CHANNEL OPCODE. The channel program interpreter has encountered an illegal channel program opcode while executing the channel program used to read from disc or tape.	1. Run FLD memory diagnostics or DUS main memory diagnostics to test main memory banks zero and one. 2. Execute DCU selftest command, ZS, to verify that the DCU ROMs still checksum properly. 3. Run FLD's to locate possible hardware error condition.
A00D	COLDLOAD DEVICE WON'T INDENT. The coldload device won't respond to an IDENT request with a valid identification code.	1. Check if the system coldload device is powered up and ready. 2. Check HPIB cables from GIC to the coldload device. 3. Check the IMB number, channel number, and device number used to specify the coldload device. 4. Check if correct channel number is set on the coldload channel GIC. 5. Check if correct HPIB address is set on the coldload device. 6. Run I/O microdiagnostics. Run IOMAP and DUS device diagnostics on the coldload disk.

Hardware Error Messages (Printed on DCU Console)

The error messages described in Table 4-5 indicate a specific hardware problem as detected by the DCU during normal startup and system operation. These are referred to as DCU hardware halts, caused by CBI or CTLB PCA pulling on the SYSTOP line. Run FLD's to further isolate the problem.

Table 4-5. Hardware Error Messages

Hardware CBI Error (1/2/3/5/7) Catastrophic hardware fault as detected by the indicated CBI. The indicated CBI module is not necessarily the cause of the error.
WCS Parity Error Catastrophic single bit parity error. Generally caused by a faulty WCS PCA which may be encountered when loading system microcode, or during normal system operation.
CPU Timeout CPU has not received a required response from one of the other CSB modules in the allotted time. (64K clocks .)
CAC Error (Series 64/68, only) The cache array controller has detected one or more cache conditions. In most conditions, an active DMA transfer will be allowed to complete (I/O).
CMA Error (Series 64/68, only) Single bit cache memory array parity error.
CACX or CMAX Error (Series 70, only) A cache error has been detected.
Multi Bit Error A catastrophic multi bit parity error has been detected in main memory.
Invalid Address Module (1/2/3/5/7) Detected by receiving CBI. Caused by a module SENDING an illegal memory address.
Invalid Address - CAC (Series 64/68, only) Illegal addressing of CMA as detected by CAC.
Invalid Address - CACX (Series 70, only) Illegal addressing of CMAX as detected by the CACX.
Continuous DCUSTOR Error Series 64/64B/68/68B is generating continuous DCUSTOR interrupt to the DCU. The system is in an abnormal state and the DCU had to disable this interrupt line.
LUT Parity Error The system microcode Lookup Table has a parity error, generally caused by a faulty CIR PCA.
Unexpected Debug This usually results from attempting to run diagnostics without the ED command. A special diagnostic microcode command (DEBUG) has been encountered. The DCU is not prepared to handle this.
Diag Stop Error A hardware failure has forced the microcode to do 'panic stop'.
Mem Breakpoint at xxxx.xxxx/WCS Breakpoint at xxxx.xxxx A memory or WCS breakpoint previously set in maintenance mode has been reached.

CS 80 Error Messages

The following error messages are initial errors on the boot:

"ERROR 30 CS80 ERROR NUMBER 0" Refers to one of four errors:

<<ID ERROR>>
<<REJECT ERROR>>
<<FAULT ERROR>>
<<ACCESS ERROR>>

"ERROR 30 CS 80 ERROR NUMBER 1" <<OFF LINE ERROR>>

"ERROR 30 CS 80 ERROR NUMBER 3"

"ERROR 32 CS 80 ERROR NUMBER EXCEEDS MAX, LDEV,DRT,UNIT" <<RETRY ERROR>>

"ERROR 2 CHANNEL PROGRAM FAILURE - DRT" <<LAUNCH ERROR>>

"ERROR 3 CHANNEL PROGRAM ABORTED - CPVA WORD 0" <<CPVA ERROR>>

System Halt Conditions

System halt conditions are outputted to the DCU Console in the format of "System Halt--<text>". These are microcode halts where the DCU is responsible for printing the halt number and message on the console. (Refer to Table 4-8.)

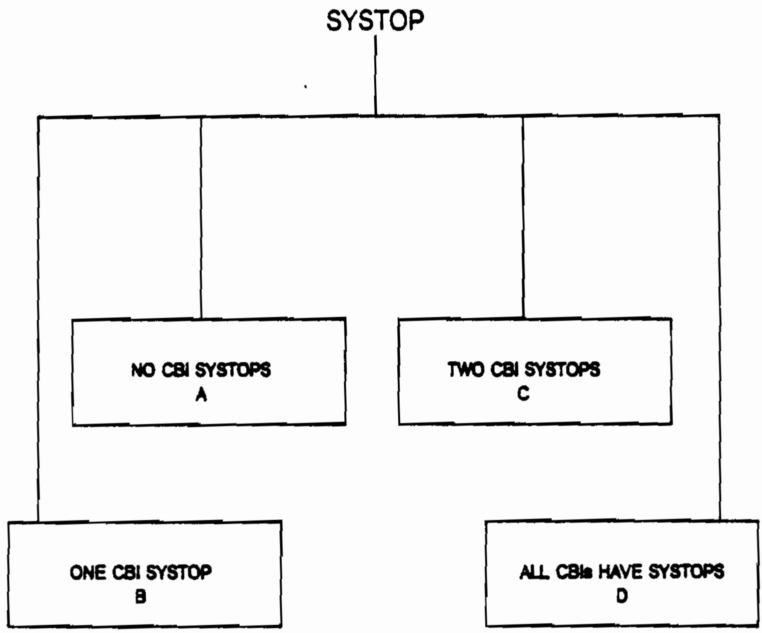
= 635-5400 -

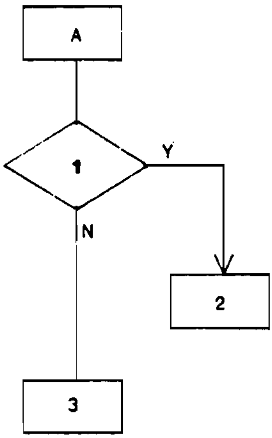
Table 4-6. System Halt Conditions

HALT #	CONDITIONS
0	Unexpected (unknown) interrupt
1	STT violation in segment #1
2	Absent code segment while on ICS
3	Absent segment or trace in segment #1
4	Stack overflow on ICS
5	CST length violation
6	Channel program timeout
7	Bootstrap channel program checksum
8	Bootstrap channel program abort
9	Pseudo-Enable violation (Q1-18) < 0
10	Module send message timeout
11	Invalid module responding
12	Channel not system controller
13	Non-responding IOB Module
14	No channel responding
15	Channel 0 responding
16	Message interrupt w/o IRQ or CSRQ
17	Not able to put it to controller-in-charge
18	Receive message timeout
19	I/O error, parity/timeout
20	WCS checksum error
21	LUT checksum error
22	Bad DCU Command Code

CBI SYSTOP FLOWCHART

The following flowchart summarizes recommended actions for resolving CBI Systop failures.



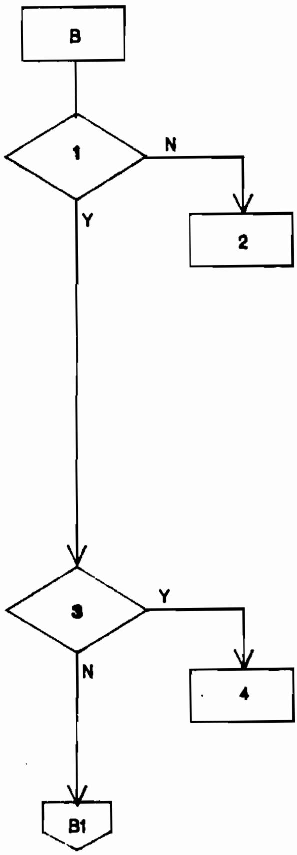


(A) NO CBI SYSTOPS

(1) Any module (SELDEL, SELD01, and SELD02) on CSB recently?

(2) Any module that uses CHK PAR should be suspect. (For PP only.)

(3) Probably not CBI related. Check CPU.



(B) ONE CBI SYSTOP

(1) Are any status bits on CBIs set?

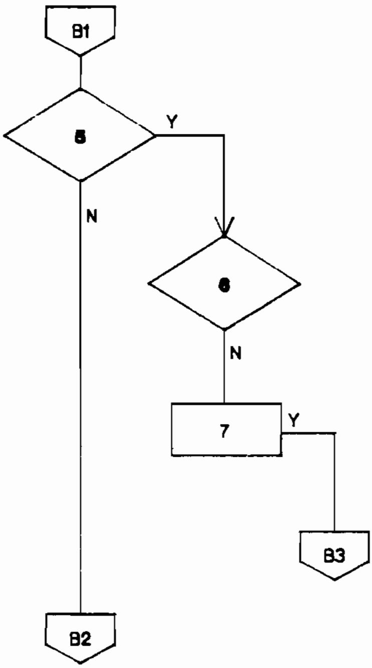
(2) Check SELDEL*, SELD01*, and SELD02* on CBIs to find which moduel was on CSB last. If this tells you nothing, hook up logic analyser.

	SELD3L*	SELD01*	SELD02*
WORD 0	0	0	0
WORD 1	0	0	0
WORD 2	1	0	0
WORD 3	1	1	0

(3) Does any CBI have a SBACKE?

(4) This module sent information to a non-existent module (most likely module 0).

(B1) Go to branch B1.



(B1) ONE CBI SYSTOP (Con't.)

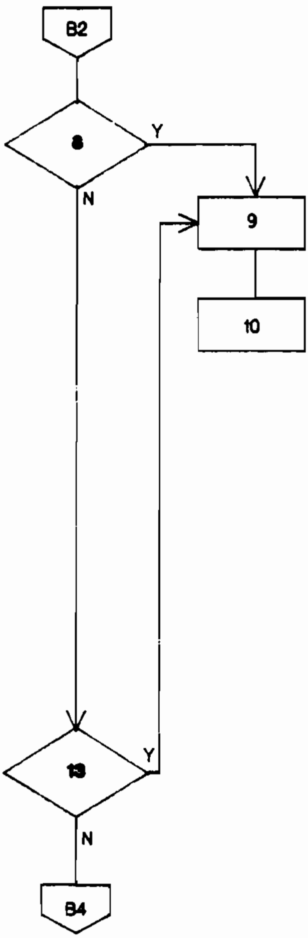
(5) Does any module have a SBEROP?

(6) Is NOACRD set on MCS?

(7) Multibit error should be set. There are two bad RAMS on a MMA.

(B3) Go tro branch B3.

(B2) Go to branch B2.



(B2) ONE CBI SYSTOP (Con't.)

(8) Does any module have SBADPE?

(9) Check other CBI's to find sending module. Check SEL1*, SELDEL*, SELDD1* and SELDD2*.

(10) Check IOB or CAC to determine if the operation is a read or a write.

WRITE:

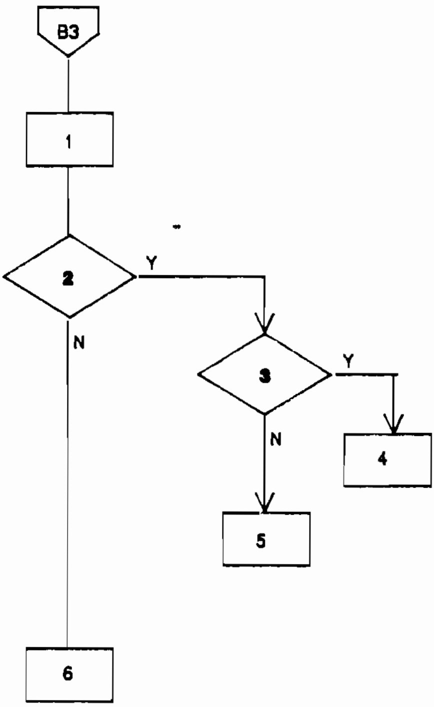
	SEL1*	CONT	SELDEL*	SELDD1*	SELDD2*
ADDRESS	0	1	0	0	0
WORD 0	0	0	0	0	0
WORD 1	1	0	0	0	0
WORD 2	1	0	1	0	0
WORD 3	1	0	1	1	0

READ:

	SEL1*	SELDEL*	SELDD1*	SELDD2*
WORD 0	0	0	0	0
WORD 1	1	0	0	0
WORD 2	1	1	0	0
WORD 3	1	1	1	0

(13) Does a module have a SBCPE or ILOP?

(B4) Go to branch B4.



(B3) ONE CBI SYSTOP (Con't)

(1) The error was caused by an illegal memory address.

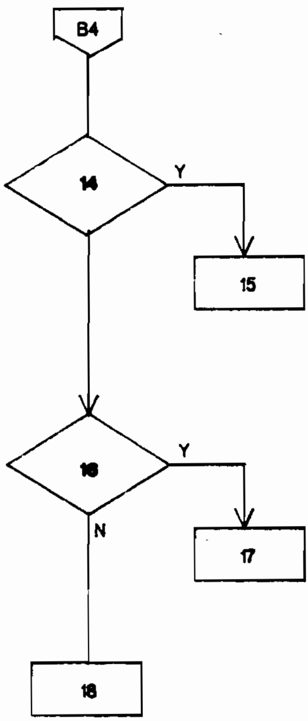
(2) Is SYSTOP on CBI 5 set?

(3) Is WRDCNT on CAC = 0?

(4) Bad address cannot be found. Hookup logic analyser.

(5) CAR has address that was sent to memory.

(6) CBI 1, 2, or 3 should have a SYSTOP. Refer to IOB-IMS to obtain address.



(B4) ONE CBI SYSTOP (Con't.)

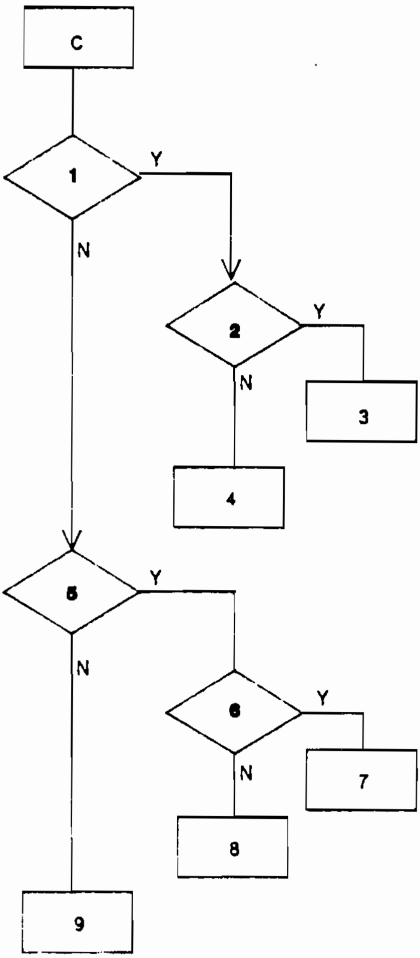
(14) Does any module have a SBNACKE?

(15) Some modules on the CSB did not release the NACK line at the correct time. This is a CBI problem.

(16) Does any module have a SBDPE?

(17) The information coming from the module to the CBI is in error.

(18) No known problem.



(C) TWO CBI SYSTOPS

(1) Does any board have a SBACKE?

(2) Does other board have a SBCPE, SBADPE, SBILOP or SBEROP?

(3) The Module with SBACKE sent bad information.

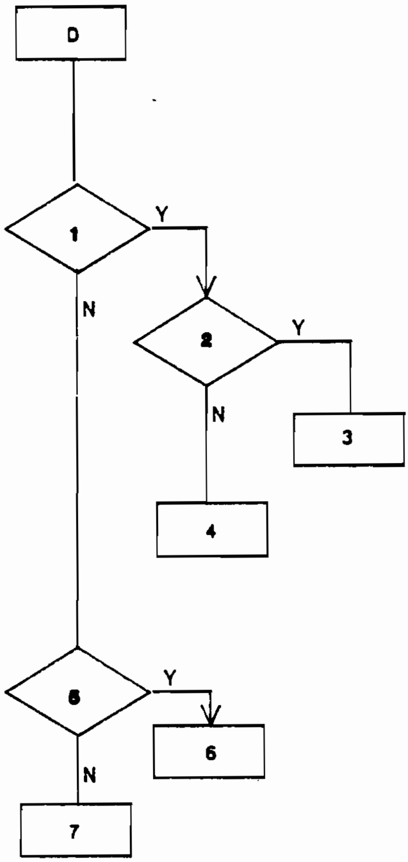
(4) The decision point has not been observed and it is unknown as to how this condition would occur.

(5) Do any boards have a SBNACKE?

(6) Do other boards have a SBCPE, SBADPE or SBILOP?

(7) This module is bad.

(8) & (9) The decision point has not been observed and it is unknown as to how this condition would occur.



(D) ALL CBI's HAVE SYSTOPS

(1) Does any module have a SBNACKE?

(2) This is the sending module. Do all other modules have SBADPE, SBCPE, or SBILOP?

(3) The module with SBNACKE is at fault.

(4) The decision point has not been observed and it is unknown as to how this condition would occur.

(5) Do all modules have a SBACKE?

(6) The transmitting CBI is bad.

(7) The module with SBACKE sent bad information.

DIAGNOSING WCS PARITY ERRORS

This troubleshooting procedure enables you to diagnose a WCS parity error from the shift string dump, and to trace the error to the failing chip. To use this procedure you need a Series 64/68/70 Microcode Manual (Part No. 30140-90045). Information for this procedure was taken from the Shift String Reference Manual (part No. 30140-90052).

The WCS (Writeable Control Store)

The WCS PCA is an 8k by 32 bit static RAM array with no error detection or correction. Two WCS PCAs are installed in each system. WCS0 contains the most significant microcode bits (0-31) and WCS1 contains the least significant bits (32-63). The CSAR address from the VBUS PCA is decoded by both WCS PCAs, and 32 bits from each WCS PCA is sent to the 64 bit Control Store Operand Register (CSOR). The CSOR is also split; the 32 bits (0- (0-31) from WCS0 correspond to CSOR bits 0-31 on the SKSP PCA and the 32 bits (32-63) from WCS1 correspond to CSOR bits 32-63 on the VBUS PCA.

When a word is read into the CSOR, parity bits are generated for the 32 bits on the SKSP PCA and for the 32 bits on the VBUS PCA. The SKSP PCA checks for odd parity on the 64 bit CSOR. An error causes the DCU to freeze the processor clocks and issue the WCS PARITY ERROR message. At this time, the last address sent to the WCS is in the CSAR being incremented. Thus, the CSAR contains the address of the bad data, incremented by one.

Troubleshooting with the Shift String

To find the failing WCS word bit(s), perform the following procedure. Use the WCS Parity Error Work Sheet (Table 4-7) to compute the value of the CSOR.

1. In the VBUS PCA shift string (second row), find the value of CSAR. Subtract one from CSAR and write this value on the line marked CSAR-1 on the work sheet that appears in Table 4-7. This value is the address of the bad data.

2. The upper 32 bits of the CSOR are a combination of hexadecimal and binary fields in the first row of the SKSP PCA shift string. Using the hex-to-binary assist chart at the bottom of the work sheet, write binary values in the blanks provided for each field.

3. Transfer the binary values from the SKSP fields to the blanks provided, so the bits are grouped by four.

4. Convert the binary values to hexadecimal and write the hexadecimal value in the blanks provided.

5. The lower 32 bits of the CSOR are the first 32 bits of the VBUS PCA shift string; these fields are binary. Write the binary values in the blanks provided for each field.

6. Transfer the binary values from the VBUS fields to the blanks provided, so that the bits are grouped by four.

7. Convert the binary numbers to hexadecimal. Write the hexadecimal value in the blanks provided.

8. Look up the expected value of the WCS at the address indicated by CSAR-1 in the Control Store listing provided in the back of the Series 64/68/70 Microcode Manual (P/N 30140

90045). Compare this value to the CSOR value computed above (SKSP contains the upper half of the data word; VBUS contains the lower half).

9. Determine the bad bit(s).

10. Table 4-8 contains a WCS word bit to IC map. The upper half of the data word is on WCS0; the lower half is on WCS1. Locate and replace the defective IC(s).

Using the Down System to Troubleshoot

1. From the maintenance prompt, find the value of CSAR-1:

   ```
   M>LW CSAR-1
   ```

   Enter this value on the line marked CSAR-1 on the work sheet in Table 4-7.

2. The upper 32 bits of the CSOR are the first 32 bits of the SKSP PCA shift string. List these from the maintenance prompt:

   ```
   M>SKSP.0:32,h
   ```

   This will be a hexadecimal value.

3. Write the hexadecimal value in the blank provided on the work sheet in Table 4-7..

4. The lower 32 bits of the CSOR are the first 32 bits of the VBUS PCA shift string. List these from the maintenance prompt:

   ```
   M>VBUS.0:32,h
   ```

   This will be a hexadecimal value.

5. Write the hexadecimal value in the blank provided on the work sheet.

6. To determine the expected value of CSOR, do the following;

7. Perform a system start:

   ```
   M>START
   ```

8. When the question for "Warmstart or Coolstart" appears, press the control key and the B key together to get the maintenance prompt.

9. Print the expected CSOR value with the following command, where xxxx is the address of CSAR-1 found above.

   ```
   M>LW !xxxx
   ```

   The CSOR value will be a hexadecimal value.

10. Write this hexadecimal value in the blank provided on the work sheet.

11. Compare this value to the CSOR value listed above (SKSP contains the upper half of the data word; VBUS contains the lower half.)

12. Determine the bad bit(s).

13. Table 4-8 contains the WCS word bit to IC map. The upper half of the word is on WCS0; the lower half is on WCS1. Locate and replace the defective IC(s).

Table 4-7. WCS Parity Error Work Sheet

```
CSAR-1 = _________
SKSP/WCS0
                     1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
-----------------------------------------------------------------
|_ _ _ _ _ _|_ _ _ _ _ _|_ _ _ _ _ _|_ _|_ _ _|_ _ _ _ _|_ _ _ _|
    SFA1        SFB1        SPSKF1    |< >| < > |   SKFB1 |FCNFB0-3
                                         |     |
                               RFA01-----|     |-----FCNFA0-2

Transfer SKSP bits from above:
                     1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
-----------------------------------------------------------------
|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|

SKSP Hex Value   =_ _ _ _  _ _ _ _

Upper Control Store=_ _ _ _  _ _ _ _

VBUS/WCS1
 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 6 6 6 6
 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3
-----------------------------------------------------------------
|_ _|_ _ _ _ _ _|_ _ _ _ _ _|_ _ _ _ _ _|_ _ _ _|_ _ _ _ _ _|_ _ _|_|

 < >|FCNF1A0-4|STF1A04-7|  STF1B03-7| RF1B  |  SPF1B    | < > |<>
  |                                                          |   |
  |----RF1A23                                  FCNF1B4-6--|   |
                                                    CSPARITY--|

Transfer VBUS bits from above:
 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 6 6 6 6
 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3
-----------------------------------------------------------------
|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|_ _ _ _|

VBUS Hex Value   =_ _ _ _  _ _ _ _

Lower Control Store =_ _ _ _  _ _ _ _
```

Hex to Binary Assist Chart

0= 0000	4= 0100	8= 1000	C= 1100
1= 0001	5= 0101	9= 1001	D= 1101
2= 0010	6= 0110	A= 1010	E= 1110
3= 0011	7= 0111	B= 1011	F= 1111

Table 4-8. WCS Word Bit to IC Map

If SKSP/WCS0 Error and CSAR= 0000 to 0FFF (hex)

Failing bit:

0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1

Corresponding chip:

U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
																				1	1	1	1	1	1	1	1	1	1	1	1
5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	0	0	0	0	1	1	1	1	2	2	2	2
2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8

If SKSP/WCS0 Error and CSAR=1000 to 1FFFF (hex)

Failing bit:

0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1

Corresponding chip:

U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
																				1	1	1	1	1	1	1	1	1	1	1	1
5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	0	0	0	0	1	1	1	1	2	2	2	2
3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9

If VBUS/WCS1 Error and CSAR= 0000 to 0FFF (hex)

Failing bit:

3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	6	6	6	6
2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3

Corresponding chip:

U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
																				1	1	1	1	1	1	1	1	1	1	1	1
5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	0	0	0	0	1	1	1	1	2	2	2	2
2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8

If VBUS/WCS1 Error and CSAR= 1000 to 1FFF (hex)

Failing bit:

3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	6	6	6	6
2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3

Corresponding chip:

U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
																				1	1	1	1	1	1	1	1	1	1	1	1
5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	0	0	0	0	1	1	1	1	2	2	2	2
3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9	3	5	7	9

MEMORY ERROR LOGGING UTILITY

The memory logging utility is used to examine the error history of memory. The utility consists of the following:

- Memory error logging process (MEMLOGP)
- Memory error log analysis program (MEMLOGAN)
- Memory error logging interval update program (MEMTIMER)
- Memory error log file (MEMLOG)

MPE initiates MEMLOGP, the memory error logging process, when the system is initialized if error-correcting memory controllers are installed. Once an hour, MEMLOGP obtains error data from the memory-error logging arrays and writes the data to the two-record file MEMLOG.PUB.SYS. The time period may be adjusted with the MEMTIMER utility program.

Memlogan

MEMLOGAN (MEMLOGAN.PUB.SYS) is the utility that reads and interprets the error information logged and kept in the MEMLOG file. Refer to Table 4-9 for an example of the Memlogan Error Printout Format. Refer to Table 4-10 for a sample output of MEMLOGAN for the Series 6X/70.

To run the program, enter:

```
:FILE OUT;DEV=LP (optional)
:RUN MEMLOGAN.PUB.SYS
```

NOTE

If an additional error is encountered by MEMLOGAN, the program will print the appropriate error information and then terminate.

Table 4-9. MEMLOGAN Format

```
+--------------------------------------------------------------+
|              ADDRESS             |     ERROR TYPE      | ERROR |
|----------------------------------+---------------------+-------|
|     BOARD       |      WORD      | TYPE   BIT   CHIP   | COUNT |
+--------------------------------------------------------------+
```

Values

board	The memory module board on which the error occurred.
word	The word, within the data block, where the error occurred.
type	Type of error detected, as follows:

CHECK	*Check bit error.*
DATA	*Data bit error.*
MULTIPLE BIT ERROR	*Error is more than one bit.*
FORCED D.E.W.	*Forced double-error write. Indicates parity error on data sent to memory.*
MISSING ARRAY BOARD	*Non-responding array board.*

bit — If *type* = CHECK, *bit* is the failing check bit.

If *type* = DATA, *bit* is the failing data bit.

chip — Chip on which error occurred, in format:

U*n*

where the variable *n* is a digit indicating the chip number.

count — The number of logging intervals during which this error was detected at least once. This value does not represent the number of times that an error was actually detected. The reason for this is that the error logging arrays can store only 1 error per location, and the error will be overwritten unless MEMTIMER is activated between errors.

Table 4-10. Series 6X/70 MEMLOGAN Sample Output

```
LOGGING STARTED     -  DATE:  11/ 1/85   TIME:  0:01
FIRST ERROR LOGGED  -  DATE   11/ 1/85   TIME:  0:00
LAST ERROR LOGGED   -  DATE   11/ 1/85   TIME:  0:03
TIMING INTERVAL     -  0:00:01
```

ADDRESS		ERROR TYPE			ERROR
BOARD	WORD	TYPE	BIT	CHIP	COUNT
0	1	DATA	7	U1504	154

Use of Parameters

PARM=0; Causes the current contents of MEMLOG to be printed on the output device. The contents of the file will not be changed. This is the default PARM value.

PARM=1; Causes the current contents of MEMLOG to be printed on the output device after which the file is reset to a no-error state. All previously logged errors are deleted from the log file.

NOTE

> When a system is initialized for the first time or the memory size is changed, MEMLOGAN should be run with PARM=1 as soon as the system is up and running. This will ensure a clean MEMLOG file and that subsequent error counts are valid. Also, use PARM=1 if the power has been down for any reason.

PARM=2; Causes the current contents of MEMLOG to be printed on the output device after which the file is deleted from the system. (This is the only way to remove the MEMLOG file from the system and normally only the system manager would use this PARM value.)

Memtimer

MEMTIMER (MEMTIMER.PUB.SYS) is the utility program which allows the user to modify the interval of time between successive memory log updates. To run the program enter:

:RUN MEMTIMER;PARM=*n*

n = logging interval in seconds.

Default period is 60 minutes. To return logging to the default interval (60 minutes), enter:

:RUN MEMTIMER;PARM=36000

LISTLOG5

LISTLOG5 is a utility program which prints the contents (in sequential order) of any MPE log file record types on the system. The default output is to line printer.

To output to terminal, enter:

```
:FILE LOGLIST=$STDLIST
```

To run LISTLOG5, enter:

```
:RUN LISTLOG5.PUB.SYS

LIST LOG FILE PROGRAM VERSION 00.00 2/20/76
ENTER FIRST AND LAST LOG FILE TO BE ANALYZED
FIRST?2842
LAST?2842        (Note: Do not enter latest File)
ENTER EVENTS TO BE PRINTED
TYPE NO.  EVENT
 0 LOG FAILURE
 1 SYSTEM UP
 2 JOB INITIATION
 3 JOB TERMINATION
 4 PROCESS TERMINATION
 5 FILE CLOSE
 6 SYSTEM SHUTDOWN
 7 POWER FAILURE
 8 SPOOLING LOG RECORD
 9 LINE DISCONNECTION
10 LINE CLOSE
11 I/O ERRORS
12 PRIVATE VOLUMES
13 PRIVATE VOLUMES
14 TAPE LABELS
15 CONSOLE LOG
16 PROGRAM FILE EVENT
17 CALL PROGRESS SIGNALS
18 DCE PROVIDED INFO
46 MAINTENANCE REQUEST
ENTER EVENT NUMBERS SEPARATED BY COMMAS
11
DO YOU WANT TO PURGE LOG FILES?NO
DO YOU WISH TO RUN AGAIN (Y OR N)?NO

 END OF PROGRAM
```

```
:RUN LISTLOG5.PUB.SYS

ENTER FIRST AND LAST LOG FILE TO BE ANALYZED
FIRST?_____ (Enter nnnn from above)
LAST?_____ (If no new logs have been opened after number nnnn,
    LAST will also be nnnn, so just enter <CR>.)

ENTER EVENTS TO BE PRINTED
TYPE NO.          EVENT
  0                 LOG FAILURE
  :                 :

  :                 :
  11                I/O ERRORS
  :                 :
```

ENTER EVENT NUMBERS SEPARATED BY COMMAS. A CARRIAGE RETURN ASSUMES ALL EVENTS WILL BE EVALUATED.

11 (An entry of 11 is shown, since we are only interested in I/O errors.)

The LISTLOG5 output will be directed to the line printer; ensure that the line printer is online.

```
DO YOU WANT TO PURGE LOG FILES? NO
```

(If the previous FREE5 listing indicated the disc was getting low on space - less than 15% free - you may wish to enter YES to purge the log files. Never purge log files without the customer's OK.)

```
DO YOU WISH TO RUN AGAIN (Y OR N?) N

END OF PROGRAM
```

Examine LISTLOG5 printout for Disc and/or Tape errors.

WORKOUT2/WORKSER

WORKOUT2 is an online program that exercises both disc and tape drives. WORKOUT2 can open 64 disc files and 4 tape files. It writes 512 records to disc and/or tape, writes a file mark, and rewinds or resets to the beginning of the disc or tape files. WORKOUT2 then reads records, comparing the read and write buffers and reporting any errors. (WORKOUT2 writes 4095-word records.) If the SORT option is invoked, the program sorts the first and last disc file. WORKOUT2 requires the following parameters: cap=IA,BA;maxdata=%75000.

WORKSER is very similar to WORKOUT2, but is designed for serial devices (cartridge tapes, tapes, and discs used as serial devices). WORKSER is the preferred exerciser for cartridge tapes.

WORKSER can open 64 disc files, and only 1 tape file. It writes 8192-word records until the end of the tape, writes a file mark, and rewinds. The program then reads the tape, comparing read/write buffers and reporting any errors. Run the program just as you would run WORKOUT2, substituting "WORKSER" for "WORKOUT2".

In the example that follows, entries made by the operator are underlined. Pressing the "RETURN" key in response to questions selects the default answer.

To initiate the WORKOUT2 program, enter:

:RUN WORKOUT2[;PARM=]

Three options are available but not mandatory when running WORKOUT2:

;PARM=1

Eliminates comparing data buffers after each READ.

;PARM=2

Causes END OF PASS messages to be displayed at the System Console as well as with $STDLIST.

;PARM=3

Accomplishes both of the above.

NUMBER OF DISC FILES?2 (Default is 0.)

Assuming sufficient space was shown during "RUN FREE5" enter any number from 0-64. WORKOUT2 will attempt to open that number of files. Each work file requires approximately 10,000 sectors.

LDN FOR FILE #1?1 (Default is 0.)

LDN FOR FILE #2?1 (Default is 0.)

The above example assumes that only the system disc is currently online. If more discs are present, specify any appropriate LDEV number from 0-255. When zero is entered, WORKOUT2 spreads its files over all devices in class DISC.

IS A SORT TO BE DONE? NO (Default is NO.)

This question is only asked if the answer to "NUMBER OF DISC FILES?" above was 2 or greater. A "YES" answer causes file #1 to be sorted and written to file #n; where "n" is the last file specified. For example, if you specified 2 disc files above and answered this question with "Y" the program would write to file #1, read back the data, sort it, then write it to file #2. Doing a sort significantly lengthens the program run time.

`NUMBER OF TAPE FILES?` 1 (if a tape unit is available; default is 0.)

Enter a number from 0-4.

`NUMBER OF PASSES?` 1 (Default is 0.)

Any number from 0-32767 may be entered. The default of 0 causes the program to terminate immediately.

```
?TIME/SESSION #/PIN #/LDEV #FOR "WRKTAPE1" ON TAPE(NUM)?

=REPLY PIN#,LDEV#
```

This question and its reply are displayed only if the answer to NUMBER OF TAPE FILES? was greater than 0. Be sure you have mounted a "scratch" tape or one whose contents you do not mind losing.

```
<time>  START
```

WORKOUT2 now attempts to open the files. If all files are successfully opened, no message appears. If any file cannot be opened, a message to that effect appears. Each pass is followed by a message telling how many files were successfully opened.

```
 <time>  END OF PASS 1  FILES: DISC=2, TAPE= 1
TAPE    #RETRYS
 1        7

END OF PROGRAM
```

FREE5

FREE5 details the contiguous free space on each mounted disc volume and the total free space on each disc volume, and the total free space in the system. HP recommends 15% free space on each disc. This utility does not list private volumes. Use VINIT to list private volumes.

```
:FILE FREE5OUT;DEV=LP
:RUN FREE5.PUB.SYS

VOLUME=MH7925U0
LARGEST FREE AREA=26112

          SIZE    COUNT  SPACE  AVERAGE
        >100000   0      0      0
        >10000    1      26112  26112
        >1000     2      8836   4418
        >100      14     3062   218
        >10       100    3118   31
        >1        318    844    2
        TOTAL FREE SPACE=41972

        ****************************

        VOLUME=MH7920U1
        LARGEST FREE AREA=82
          SIZE    COUNT  SPACE  AVERAGE
        >100000   0      0      0
        >10000    0      0      0
        >1000     0      0      0
        >100      0      0      0
        >10       26     985    37
        >1        242    547    2
        TOTAL FREE SPACE=1532

        ****************************

SYSTEM TOTAL FREE SPACE=43504

END OF PROGRAM
```

DIAGNOSTICS

SECTION 5

The HP 3000 Series 64/68/70 diagnostic system is designed to test and perform fault isolation of CPU/Memory boards.

DIAGNOSTICS

Diagnostics

Refer to Diagnostic Manual Set (P/N 30070-60068) for details. The following manuals from that set apply to Series 64/68/70 Computer Systems:

Series 64 DCU SelfTest Diagnostic Manual (P/N 32342-90002)

Diagnostic/Utility System Reference Manual (P/N 30070-90043)

AID Diagnostic Language Manual (P/N 30070-90042)

Sleuth Simulator Diagnostic Language Reference Manual (P/N 30070-90018)

IOMAP Diagnostic Reference Manual (P/N 30070-90041)

Series 64 Fault Locating Diagnostic Manual (P/N 32342-90003)

HP 3000 CS80 Device Diagnostic Manual (P/N 32342-90006)

General I/O Channel Diagnostic Manual (P/N 30070-90039)

Series 64 Memory Diagnostic Manual (P/N 32342-90007)

DMA Exerciser Diagnostic Reference Manual (P/N 32003-90008)

HP 7902/9895 Flexible Disc Diagnostic Manual (P/N 30070-90040)

HP 7974A/7978A Magnetic Tape Drive Diagnostic Manual (P/N 32342-90011)

HP 7970 Magnetic Tape Diagnostic Manual (P/N 30070-90015)

HP 13037C Disc Controller Diagnostic Manual (P/N 30070-90016)

HP 7906/7920/7925 Verifier Manual (P/N 30070-90027)

HP 7976 Magnetic Tape Unit Diagnostic Loader (P/N 30070-90073)

HP 2680A/2688A Page Printer Verifier Diagnostic Manual (P/N 30070-90074)

Online Hewlett-Packard Line Printers Verification Diagnostic Manual (P/N 30209-90007)

NOTE

In Q3, 1991, the two-volume diagnostic manual set for HP 3000 Series 64/68/70 Computer Systems (P/N 32342-60001) was discontinued. The manuals listed above were incorporated into the Diagnostic Manual Set for the HP 3000 HP-IB and MICRO 3000 Computer Systems (P/N 30070-60068). That manual set now includes the diagnostic manuals for all the classic HP 3000 systems. Since the operating instructions for IOMAP and DMAEXR/DMAEXR9 are the same on all classic HP 3000 systems, only one version of each corresponding diagnostic reference manual has been included in the manual set. The part numbers listed above reflect that change.

AVAILABLE DEVICE TESTS

Verify devices on the Series 64/68/70 with the offline and online tests listed in Table 5-1.

Table 5-1. Available Device Tests

HP Device	Standalone	Verifier	Self-Test	Sleuth Sim.	DCU	ON LINE
7911/12	x		x	x		x
7914	x		x	x		x
7920/25		x		x		
7933	x		x	x		x
7936/37	x		x			x
7945A	x		x	x		x
7957/58	x		x			x
7959B	x		x			
7962B	x		x			
7963B	x		x			
C1707A			x			
C2200A/ 02A/ 03A	x		x			
13037C/D	x			x		
2562C						
2563A	x	x	x			
2563B/C						
2564B/C			x			
2565A	x	x	x			
2566A	x	x	x			
2566B/C						
2567B/C			x			
2608A			x	x		
2608S			x			
2617A				x		
2619A				x		
2631B			x	x		
2680A		x	x			x
2687A			x			
2688A		x	x			x
2934A			x			

Table 5-1. Available Device Tests (con't.)

HP Device	Standalone	Verifier	Self-Test	Sleuth Sim.	DCU	ON LINE
7970E	x			x		
7974A	x		x			
7976A	x		x	x		x
7978A	x		x			
7979/80A	x		x			
7980XC	x		x			
9144A/45A	x		x			
35401A	x		x			
C1511A	x		x			
9895A	x		x	x		
262XX			x			
264XA			x			
30XXA			x			
GIC	x				x	
INP	x		x			x
ATP	x		x			x
MEMORY	x				x	
CPU	x		x		x	
DCU			x		x	

DCU SELFTEST

The DCU Selftest verifies the DCU hardware and its ability to communicate with all PCAs accessible to it. It verifies: ROM checksums, RAM memory, UARTS (wrapped and cross-coupled), terminal accessibility, DCU shift-string hardware, power fail clock, and PSC/PDM selftest.

DCU PCA Selftest/LED Functions

When the DCU SELFTEST switch is pressed, a firmware program on the DCU is run to verify DCU operation. (See Figure 5-1.) If a selftest function fails, error codes are displayed. (Refer to Section 4 for DCU error codes.)

CONTROL/INDICATOR	FUNCTION
SELFTEST	When momentarily pressed, activates the DCU selftest process.
SELFTEST DISPLAY	Two-digit (Hex) display indicating results of the DCU selftest.

DCU Selftest Procedure

To execute the DCU Selftest, perform the following steps:

1. Have System Operator perform a system backup.

2. Perform an MPE SHUTDOWN.

3. Set Key Switch to MAINTENANCE ENABLED MODE.

4. Enter CONTROL B from the Console.

5. Perform one of the following:

   Press DCU Selftest switch, Enter ZS, or VS command.

   If the DCU PROM date code is 2601 or > the messages "DCU for HP 3000 Series 64, 68, or 70" and " EQUIPPED WITH 128KB CACHE" OR "EQUIPPED WITH 8KB CACHE" will be displayed on the console.

6. All LEDs on the front of the DCU PCA will all turn on and remain on as long as the selftest is running. When the selftest has successfully completed, all LEDs will go off and DCU SELFTEST COMPLETE' will be displayed on the console.

7. If the selftest is not successfully completed, an error code will be displayed on the DCU LEDs (catastrophic DCU failures), or on both the LEDs and CRT. Refer to Section 4 Troubleshooting for a listing of DCU error codes.

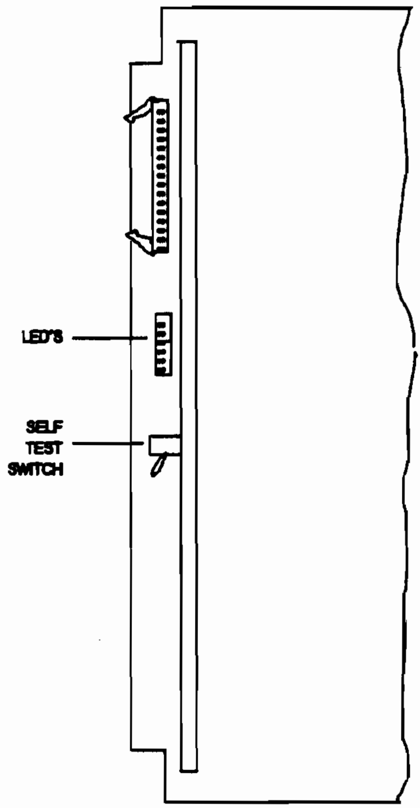


Figure 5-1. DCU Selftest Control & Indicators

DCU OPERATING MODES

Three DCU operating modes are described in the following paragraphs: remote maintenance, control commands, and maintenance commands.

Remote Maintenance

The HP 3000 Series 64/68/70 provides remote diagnostic capability to enable fault isolation procedures from a remote site. A remote operator with an HP 264X, 262X, 2382, 232X, 2397 terminal or HP 150 can run any diagnostic available to the local operator.

The FLDs are physically loaded at the local console, but may be executed using the FL command from the Remote Console.

NOTE

> The term LOCAL refers to the console located at the system site. REMOTE refers to a console connected to the system via a modem (not located at the site).

1. Hardware Required:

   - HP 35141A Modem (Support Link) or HP 35031A (Support Link II)
   - HP 35016A Modem or Bell 103A or 212A or Vadic.
   - HP 262X, 264X, 2382, 232X, 2397 or HP 150.
   - Cable (Remote Console) RS232 Type (varies with Console type).
   - HP 0960-0646 Data Station Adaptor.
   - HP 1251-5870 "T" Connector.

2. Preparation:

   a. Verify that an originate/answer modem (HP 35141A or equivalent) is connected to the local console. Refer to Figure 5-2 for remote hookup and Table 5-2 for modem switch and operating conditions.

   b. Verify that an originate/answer modem (HP 35141A or equivalent) is connected to the remote DCU junction panel.

   c. Local operator places keyswitch in REMOTE position. The local console displays `M>`.

   d. Both operators must ensure their terminals are set for the same Baud rate (either 300 or 1200). Use either the SP command or MPE SPEED command (if MPE is running).

   e. Local operator types `RM` command and the local console displays `REMOTE ENABLED`.

   f. With HP 35016A and similar modems, the remote operator must set the DA/VO Switch on the remote modem to VO.

   g. The remote operator dials the number of the local modem. The local modem answers with a high-pitched tone.

NOTE

Turning the power off on the SPU to replace a PCA will break the remote connection. Also, if MPE is up and the console operator enters BYE, the connection is broken. You will need to restart at this step. The RM command must be re-entered each time remote hookup is attempted.

h. With the HP 35016A and similar modems, the remote operator sets the DA/VO Switch on the remote modem to DA, then places the receiver on the modem.

i. When the connection is complete, verify the following message on console banner: REMOTE ESTABLISHED On the SSDP/SSDP-B the REMOTE indicator light turns on and the modem DTR LED lights.

j. When both consoles are in parallel with each other, they can pass messages from console to console using the TELL command. Without the TELL command any input will be interpreted as a command.

k. All maintenance mode commands are valid except ZS. This will cause the remote connection to disconnect.

l. To disconnect, either operator enters BYE.

Control Commands C>

The CONTROL commands listed in Table 5-3 are used during a maintenance session to perform the following functions: run/halt, cold load, warm start, system dump, status display control, DCU log display, console speed control, and control mode command display. The CONTROL mode is established when the REMOTE/MAINT/CONTROL key switch is positioned to CONTROL and CNTLB is entered on the system console.

Maintenance Commands M>

The maintenance commands listed in Table 5-4 are used during a maintenance session to fault isolate system problems within the CPU/Memory card cage. The maintenance mode is selected when the REMOTE/MAINTENANCE/CONTROL key is turned to MAINTENANCE and CNTLB is entered. The DCU will reply with the >M prompt indicating the system has switched to the maintenance mode.

NOTE

Maintenance Mode Commands can be destructive in nature. Use only with TSE or factory Help.

Table 5-2. Modem Switch Settings and Operation Conditions
For the HP 35016A and Similar Modems

SWITCH AND CONDITIONS	Local Site Initiates	Remote Site Initiates
Modem loopback (DLB/ALB)	Center position	Center position
Selftest	Left position	Left position
High Speed (HS)	Up (1200 baud) Down (300 baud) a. Verify terminal at same baud rate as modem b. Verify if DTR is on	Up (1200 baud) Down (300 baud) a. Verify terminal at same baud rate as modem b. Verify if DTR is on
Line Connect (DA/VO/MA)	VO position a. Remote site ready b. Lift receiver c. Lift exclusion key d. Listen for dial tone e. Dial remote site f. Wait for auto-answer tone g. Lower exclusion key to middle position h. Put receiver aside, but do not hang up	VO position a. Now in auto mode b. When phone rings, do not lift receiver c. Modem automatically answers
Indicator lamps conditions	TXR - intermitted flash RXD - intermitted flash HS - don't care state CTS - on DSR - on RI - off CXR - on	TXR - intermitted flash RXD - intermitted flash HS - don't care state CTS - on DSR - on RI - off CXR - on
Termination condition	Replace phone receiver	Modem connected to CPU: a. All lamps go out b. After 10 or 15 sec., DTR comes on and the RI will flash briefly. Modem not connected to CPU: toggle DA/VO/MA from VO to DA and back to VO

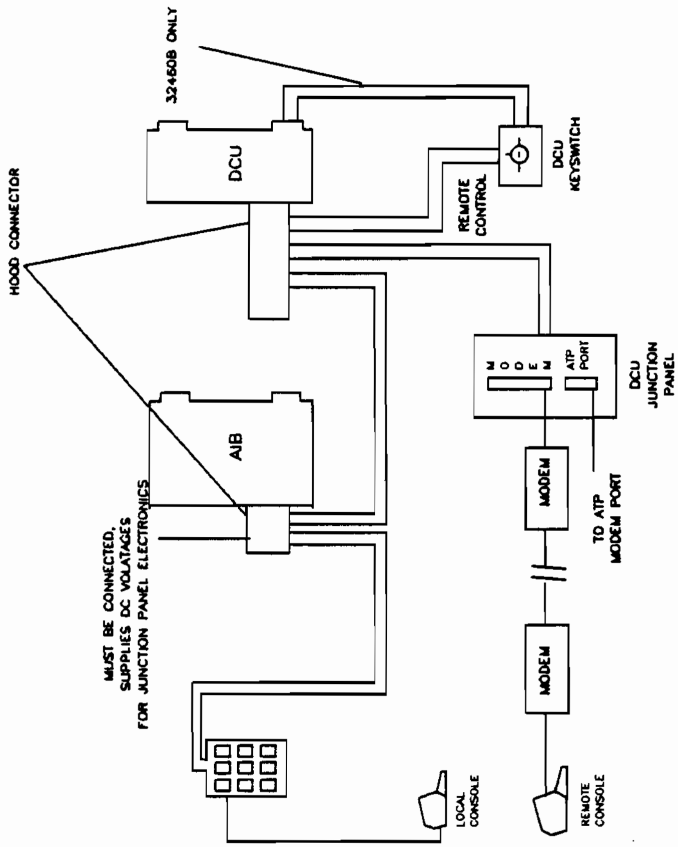


Figure 5-2. Remote Connection

Table 5-3. Control Commands

C> COMMAND	CONTROL COMMAND DESCRIPTION	FORM
AR	AUTO-RESTART system. Valid only after the automatic auto-restart has failed.	AR
DI	DISPLAY. Generates system status display banner on console similar to the following: RUN START 0,3,1 DUMP 0,3,1 LOAD 0,2,1	DI
DU	DUMP. Dumps system from designated dump device. System must first be halted using the HALT command.	DU [:] [=] [< imb > ,] [<channel>], [unit]
EX	EXIT. Exits control mode.	EX
HA	HALT. Macro-halts the system.	HA
HE	HELP. Lists valid control-mode commands.	HE
LD	LOG DUMP. Allows operator to set up the parameters for dumping the DCU log to MPE.	LD<dump interval>[,<min log size>]
LG ST	LOG HARDWARE STATUS. Displays power supply voltage and current measurements.	LG ST (32460A ONLY) For 32460B, it only refers to SSDP-B LEDs.
LG EV	LOG EVENT. Displays event log containing the last 128 events.	LG EV
LO	LOAD. Loads the firmware and software from the indicated (or saved) LOAD device.	LO [:] [=] [< imb >,] [< channel >], [< unit >]
PA	PART/REVISION CODE. Displays the part number and revision level of all 14 ROMS in the DCU.	
RU	RUN. Macro runs system and returns to MPE.	RU
ST	START. Loads the microcode and software from the indicated (or saved) START device.	ST [:] [=] [< imb >,] [< channel >], [< unit >]
SW	SWITCH. Alters contents of 16-bit switch register or a bit of the register.	SW [:] = < switch > SW < n > [:] = < state >

Table 5-4. Maintenance Commands

M> COMMAND	MAINTENANCE COMMAND DESCRIPTION	FORM
	REGISTER DISPLAY COMMAND. Allows any hardware register to be displayed and altered. Individual extended registers for either ALU may be displayed or altered.	< reg. name > [,base >] < reg. name > [:] = < expr >
BA[SE]	BASE. Sets default base for displays (constants, register register names, screen displays) Base = B (binary) 8 = O (octal) 10= D (decimal) 16= H (hex) Numbers can be converted from one base to the default base by entering the number and the base.	BA [[:] = < base >] M > 256D 256D = 100 HEX
BY	REMOTE MAINTENANCE DISABLE/DISCONNECT. Disables remote maintenance mode (disables RM) or will force a disconnect if the remote link is up.	BY
CJ	CLEAR WCS JUMP. Clears the WCS jump by writing the original data back to WCS.	CJ
CK	CLOCK. Allows user to clock a particular board(s) set up by either the LS or SYNC command. Clocks = 1-255 clocks.	CK < clocks >
CL	SELECT LEFT EMULATED CASSETTE FOR TESTING. The default drive can change to left or right units.	CL
CR	SELECT RIGHT EMULATED CASSETTE FOR TESTING.	CR
DC	DCU CONTROL. Sets the DCU control lines DCUSHIFT, DCULOAD, FRZENB, HRDSTP, and DIAHOLD. Not intended for field use.	DC < ctl > ctl = control word

Table 5-4. Maintenance Commands (con't.)

M> COMMAND	MAINTENANCE COMMAND DESCRIPTION	FORM
DM	DISPLAY MEMORY. Lists large blocks of data on the system console. Memory is displayed in both octal and ASCII. Field width is set from 1-8 for table display. Count = Number of words to dump Width = Number of words dumped in a line (default=8) 000000. 0 1 2 . . . 000000:000000 000000 000000. . . 7 8 ASCII 000000 000000	DM (addr) [[count] [width]
DP	DISABLE KERNEL DIAGNOSTIC PRINTING. Disables printing of the kernel diagnostic as it executes.	DP
DS	DUMP STRINGS. Dumps shift strings to the floppy disc and then dumps FIRMWARE and SOFTWARE screens.	DS
ED	EXECUTE DIAGNOSTIC. This causes the DCU to execute the DIAGNOSTIC loaded into the WCS beginning at optional starting address.	ED [< addr >] [, L]
EH	ENABLE HARD STOP ERROR HANDLING. This causes the microcode machine to halt immediately and system clocks to stop 2 clock cycles after error condition is detected	EH
EK	START EXECUTION OF KERNEL DIAGNOSTIC. This begins the execution of diagnostic currently loaded.	EK
EP	ENABLE KERNEL PRINTING. Enables display of diagnostic commands as they are executed.	EP
ES	ENABLE SOFT ERROR HANDLING. This causes the DCU to leave clocks running after the microcode machine stops to allow I/O to complete, decreasing probability that the customer data will be destroyed.	ES

Table 5-4. Maintenance Commands (con't.)

M> COMMAND	MAINTENANCE COMMAND DESCRIPTION	FORM
EX	EXIT COMMAND. Exits from maintenance mode without affecting the system. The vector for the console interrupt handler replaces the maintenance mode interrupt handler vector. The DCU returns to the wait loop and disables MEMORY LOCK.	EX
FL	FAULT LOCATION DIAGNOSTICS. Initiates DCU fault location diagnostics.	FL
HE	HELP FACILITY.	HE
LL	LIST LUT. Lists the indicated word of the Look-up Table.	LL < address >
LM	LIST MEMORY. Lists number of 16-byte blocks starting with the block containing the indicated address. Format is as follows: MEM ADDRESS WORD0 WORD1 WORD2 H00000000 H0000 H0000 H0000 WORD3 WORD4 WORD5 WORD6 H0000 H0000 H0000 H0000 WORD7 SOURCE H0000 H00 ADDRESS: 0-0FFFFFFFF May be entered in any base and may be an expression containing a register name (LM DB+6). A NULL address causes the next 16-byte memory block to be displayed. COUNT: 1-20 May be entered in any valid base.	LM [< addr >, [< count >]], F

Table 5-4. Maintenance Commands (con't.)

M> COMMAND	MAINTENANCE COMMAND DESCRIPTION	FORM
LS	LIST STRING. Lists the shift for the indicated board.	LS < board ID >
LW	LIST WCS. Lists indicated WCS word as follows: WCS ADDRESS WCS. 0:16 WCS. 16:16 H0000 H0000 H0000 WCS. 32:16 WCS. 48:16 H0000 H0000	LW [< addr >]
MB	SET MEMORY BREAKPOINTS. Allows user to set or clear up to four read, write, or read/write memory breakpoints.	MB < addr > [: [@] [< count >]] [,< type >]
MC	CLEAR MEMORY BREAKPOINTS.	MC < addr >
MD	SET MEMORY BREAKPOINT DATA WORD.	MD <16 bits of data 1/0/X.
ML	MODIFY LUT. Allows user to change the indicated word of LUT.	ML [< address >]
MM	MODIFY MEMORY. Modifies any 16-byte of memory in the block of memory containing the indicated address. Uses same display format as list memory. Address 0-OFFFFFFFF NULL causes the next memory block to be displayed for modifications. FLUSH causes input value to be flushed from CACHE to MAIN memory and re-read from memory.	MM [< address >] [, F [lush]]
MS	MODIFY STRING. Modifies any of the register fields in the shift string for the indicated board.	MS < board >
MT	LIST MEMORY BREAKPOINTS TABLES.	MT

Table 5-4. Maintenance Commands (con't.)

M> COMMAND	MAINTENANCE COMMAND DESCRIPTION	FORM
MW	MODIFY WCS. Modifies indicated word of WCS. Uses LIST format. ADDRESS 0-OFFFF NULL causes next WCS word to be displayed for modification.	MW [< addr >]
REGISTER ALT	REGISTER ALTERATION. Alters contents of registers. < REGISTER NAME > [:] = < EXPRESSION > Register name = any register NOTE Screen display will also be updated if data was set using the LIST STRING or MODIFY STRING commands.	M> RA = 03FFC RA = 03FFC
REGISTER DISP	REGISTER DISPLAY. Displays contents of hardware registers M>< REGISTER NAME > [, < BASE >] CR	RAC, H
RL	RESET DCU LOG. Allows operator to clear-out DCU's event log.	RL
RM	REMOTE ENABLE. Connects modem to remote DCU and performs selftests.	RM
RS	Reset all CPU boards.	RS
RX	RESET DCU BUFFERS. Resets DCU internal buffer pointers and buffer status. The user will invoke this command when the following message is displayed: ERROR NO FREE BUFFERS	RX

Table 5-4. Maintenance Commands (con't.)

M> COMMAND	MAINTENANCE COMMAND DESCRIPTION	FORM
SC	SCREEN COMMAND. Displays register contents. M> SC [REEN] , [< TYPE >] TYPE = Firm for firmware display = Soft for software display (default) %%% = XRA for extended reg - A %%% = XRB for extended reg - B NOTE: XRA & XRB allow two additional optional parameters. M> SC XRN, [< ADDR >] [, < COUNT >] ADDR = REG # (0-255) COUNT = # of reg to display (0-256)	SC SC F1 SC XRA 10,000 SC XRB
SP	CONSOLE SPEED. Changes the speed of the console.	DCU SPEED CONTROL (in MAINT mode) SP < inspeed > [,< outspeed >] DCU & MPE SPEED CONTROL (in MPE) : SPEED < inspeed > , < outspeed >
SS	SINGLE STEP. Single steps thru a program at the macro-instruction level. -	SS
SY	Selectively enable syncs to any combination of boards.	SY < board > [. board ID >] . . . [< board ID] [, < crt >] SY SET enables sync SY CLEAR disables
TE	REMOTE COMMUNICATION. Allows remote and local console to talk to each other while in remote diagnostic mode.	TE [11] < message >

Table 5-4. Maintenance Commands (con't.)

M> COMMAND	MAINTENANCE COMMAND DESCRIPTION	FORM
TK	TEXT KERNEL DIAGNOSTIC PROGRAM. Causes the DCU to text the kernel diagnostic file into the DCU's RAM area.	TK [< file >]
TL	TEXT LUT. Reads the data in the indicated file from the emulated cassette unit into the look-up table.	TL [< file >]
TW	TEXT WCS. Reads the data in the indicated file from the emulated cassette unit into WCS.	TW [< file >]
UH	MICRO-HALT. Halts system by setting DIAGFRZ to turn off clocks and reset syncs.	UH
UP	UPDATE. Allows user to control the maintenance screen display when clocking or microstepping, register modification.	UP [DATE] < flag > , < flag > , . . . < flag >
UR	MICRO-RUN. Micro-runs system by sending syncs to all boards. RUN/HALT flip-flop isn't toggled.	UR [UNN]
US	MICROSTEP. Generates clocks to all boards. Updates last board string displayed after each clock depending on state of UPDATE flag. Clocks = 1-255 clocks Null = 1 clock B = Burst Mode, output all clocks at speed Null = Update string display after each clock Repeat by hitting RETURN. To EXIT press any key except ; .	US < clocks >

Table 5-4. Maintenance Commands (con't.)

M> COMMAND	MAINTENANCE COMMAND DESCRIPTION	FORM
VS	TEST ALL STRINGS. Resets and reads back the strings to verify the boards are reset.	VS
WB	SET WCS BREAKPOINTS >. Set or clear up to four read/write WCS breakpoints.	WB < addr > [: [@] < count >]
WC	CLEAR WCS BREAKPOINTS.	WC < addr >
WJ	WCS JUMP. Writes a WCS jump at the indicated WCS address and save it's contents.	WJ < addr > , < target >
WS	WALK STACK. Traces stack markers from 'Q' back to the first marker (delta-Q = 0)	WS [< count >]
WT	DISPLAY WCS BREAKPOINT TABLE.	WT
XA	EXTENDED REGISTER A DISPLAY. Displays 128 Extended Registers from either ALUA or ALUB.	XA XB
ZR	REMOTE DIAGNOSTIC HARDWARE SELFTEST. A self-test capability of the remote hardware.	ZR
ZS	DCU SELFTEST. Performs tests on ROM, RAM, UARTS, terminals, DCU shiftstring hardware, power fail clock, and PSC/PDM selftest.	ZS
ZW	No longer available. Use FLD WCS test.	

FAULT LOCATING DIAGNOSTICS (FLD)

The following section describes the fault locating diagnostics. Refer to diagnostics chart for organizational chart of kernel and hardware diagnostics, DCU selftest and cold load diagnostics. For proper operation on a Series 70, the FLD date code must be B-2610 or greater. (See figure 5-3.)

Kernel and Microdiagnostics

Press the applicable function key to checkout a given PCA. (Refer to Tables 5-5 and 5-6.)

1. Initial Procedure:

   a. Back up system and perform MPE SHUTDOWN.

   b. Set key switch to MAINTENANCE ENABLED position.

   c. Load Floppy Disc.

   d. Type CNTL B, then FL .

      M>FL

Table 5-5. Menu - Fault Locating Diagnostic (FLD)

SERIES 64/68/70 FAULT LOCATING DIAGNOSTICS		
Date Code A-3010 Diagnostic Menu - Press the corresponding soft key.		
F1	KER/MICR	Run Kernel and all Microdiagnostics.
F2	ALL MICR	Run all Microdiagnostics (Sections 1-5).
F3	MEMORY	Run Microdiagnostics (Sections 4-5).
F4	I/O & IOMAP	Run Microdiagnostics (Section 5).
F5	WCS PART I	Addresses 1000H - 1FFFH
F6	WCS PART II	Addresses 0000H - 0FFFH
F8	RESTART	Rerun currently loaded Microdiagnostics.

F7 - not used

Table 5-6. PCA Fault Locating Diagnostics

NOTE

When soft key F1 is pressed, it runs tests included in F1 through F4. When soft key F2 is pressed, it runs tests included in F2 through F4. When soft key F3 is pressed, it runs tests included in F3 and F4. When soft keys F4 through F6 are pressed, they run only their own individual tests. Pressing F8 will rerun the last microdiagnostic loaded.

PCAs	SOFTKEY	DESCRIPTION
*WCS	F5 & F6	Run WCS Test Parts 1 & 2.
WCS	F1	Run Kernel and Micro-FLDs
VBUS	F1	Run Kernel and Micro-FLDs
CIR	F1	Run Kernel and Micro-FLDs
SKSP	F1	Run Kernel and Micro-FLDs
RAL	F1	Run Kernel and Micro-FLDs
CTLA	F1	Run Kernel and Micro-FLDs
CTLB	F1	Run Kernel and Micro-FLDs
CAC/CACX	F2	Run all Microdiagnostics only
CMA/CMAX	F2	Run all Microdiagnostics only
CBI	F2	Run all Microdiagnostics only
IOB	F4	Run Microdiagnostics Section 5
GIC,IMBI, SIB, I/O MAP	F4	Run Microdiagnostics Section 5
MCS	F3	Run Microdiagnostics Sections 4-5
MMC	F3	Run Microdiagnostics Sections 4-5
MMA	F3	Run Microdiagnostics Sections 4-5

* Test WCS assemblies with all other reference boards installed in the test system.

FLDCOPY

The remainder of this section contains the dialog necessary to run FLDCOPY from an HP 2647F or an HP 150 running the HP 3000 S68 DCU to HP 150 Communication Program. In some cases the dialog is the same for both the HP 2647F and the HP 150. There are places where the dialog differs, not only for the terminal type but also if the terminal is the MPE (system) console or LDEV 20 (DCU Console).

Running FLDCOPY to Create A Copy From A Permanent File

When the system is running and it is necessary to make a copy of the FLD diskette from an existing file, use the following procedure:

```
:run fldcopy (RETURN)
```

The following will be displayed:

```
FLDCOPY - ver 13.0

Terminal= XXXXX,  LDEV=nn,  MPE Console LDEV=aa
```

XXXXX is the Terminal type, nn is the LDEV number, aa is the current MPE Console LDEV number.

```
This utility program is intended to make copies of Fault Locating
Diagnostics (binary) to HP92190A flexible disc media by using the
HP2647F or to HP92192A micro flexible disc media by using an HP150
running the HP3000 S68 DCU to HP150 Communication Program.
```

If your terminal is configured as the MPE Console the following dialog will appear on your screen (if not, type go to continue):

```
Successful operation of this utility requires that the MPE Console
be temporarily moved to another appropriately configured terminal.
Please perform the following operations:
  1. Press <Break>                          (to break MPE)
  2. Type 'CONSOLE'  ldev#  <Return>         (to move console to new ldev)
  3. Type 'RESUME'  <Return>                 (to resume FLDCOPY)
  4. Type 'GO'                              (to continue FLDCOPY)
The MPE console will be restored programmatically upon successful
completion of the program.

TYPE 'GO' TO CONTINUE
go

Pressing <CTRL> and <Y> will transfer control to a trap procedure,
which sets terminal echo ON and terminates the program.
```

If the terminal is configured as the MPE Console the following message will appear on the screen:

```
Since you are using the MPE Console, the CTRL-Y trap will also
restore the MPE Console to this terminal.
```

If the terminal is configured as LDEV 20 (the DCU Console), the following message will appear on the screen:

```
Since you are using LDEV 20, the CTRL-Y trap will also re-enable
CTRL-B functions.

The CTRL-Y trap should be used to abort the program whenever pos-
sible.  However, during binary data transfer, CTRL-Y is regarded
as data by the system.  If it is necessary to abort the program
during binary read or write, and CTRL-Y seems to be ignored, do
the following instead:
  1. Press <Break>                  (break to MPE)
  2. type <ESC> ':'               {turn on terminal echo}
  3. type 'ABORT' <Return>            {abort FLDCOPY}
```

Whether or not additional steps are displayed will depend upon the following conditions.

If user LDEV is 20 and MPE Console LDEV is not 20 then the following will be displayed:

```
  4. type 'RUN CBON' <Return>       (enable control B)
```

If user LDEV is 20 and MPE Console LDEV is 20 then the following will be displayed:

```
  4. type 'RUN CBON' <Return>       (enable control B)
  5. type 'CONSOLE 20' <Return>     (move console back to LDEV 20)
```

If user LDEV is not 20 and user LDEV and MPE Console LDEV are equal the following will be displayed:

```
  4. type 'CONSOLE nn' <Return>     (restore MPE Console)
```

```
Do you have a permanent file (saved from previous execution of
this program) you want to copy the discs from? yes

What is the name of the permanent file? s64flds

Do you want the instructions to prepare the TO disc for copying? yes
```

If you are using an HP 2647F terminal then the following will be displayed:

```
To prepare the TO disc for copying with a HP 2647F terminal:
  1. Make sure the disc media is not write protected and then
     insert the disc into the unit and close the door.
  2. Push <COMMAND>

  NOTE: Steps 3-7 require usage of the console soft keys.
        They are pre-programmed and should be pushed in the
        sequence stated.

  3. SHOW VOLUME  (press  <F3>, <F2>, and <Return> )
  4. If volume name is "nonsif" or "nonfmat" then go to step 6.
  5. PURGE VOLUME <volume name>  (press <F8>, <F4>, <F5>, name of
     volume to be purged, and <Return>)
  6. CREATE VOLUME <volume name> ON DISC#1  (press <F8>, <F5>, <F6>,
     type in a volume name, press <F2>, type '1', and <Return> )
  7. VERIFY ENABLE  (press <F1> twice, <F4> twice, and <Return> )
  8. press  <COMMAND>  <Return>
```

```
Press <Return> when disc is ready and inserted.
```

If you are using an HP 150 the following will be displayed:

```
To prepare the TO disc for copying on the HP 150:
  1. Make sure the HP 150 is running the HP 3000 s68 DCU to
     HP 150 Communication Program.
  2. Make sure the micro floppy disc is not write-protected and
     insert the disc into drive B.
  3. Press <Shift> and <User/System> at the same time to display
     the communication program application softkeys.
  4. Press <F6> to access the 'disc' menu keys.
  5. Press <F1> (FORMAT FLOPPY) to format the disc in drive B.
  6. Wait for the format warning message and type 'Y' to continue
     the floppy format process.
  7. Wait for the 'FORMAT DONE!' message.

Press <Return> when disc is ready and inserted.

BEGIN WRITE (approximately 15 minutes; sample display shown below)
3 RECORDS RECORDED, FILE 1
7 RECORDS RECORDED, FILE 2
16 RECORDS RECORDED FILE 3
15 RECORDS RECORDED, FILE 4
14 RECORDS RECORDED, FILE 5
6 RECORDS RECORDED, FILE 6
3 RECORDS RECORDED, FILE 7
89 RECORDS RECORDED, FILE 8
130 RECORDS RECORDED, FILE 9
94 RECORDS RECORDED, FILE 10
79 RECORDS RECORDED, FILE 11
147 RECORDS RECORDED, FILE 12
35 RECORDS RECORDED, FILE 13
141 RECORDS RECORDED, FILE 14

14 FILES COPIED.

WRITE COMPLETED

Do you want to make another copy? no

END OF PROGRAM
:
```

Running FLDCOPY To Create A Copy Of An FLD Diskette

When the system is running and it is necessary to make a copy of the FLD diskette from an existing copy, use the following procedure:

```
:run fldcopy  RETURN
```

The following will be displayed:

```
FLDCOPY - ver 13.0

Terminal= XXXXX,  LDEV=nn,  MPE Console LDEV=aa
```

XXXXX is the Terminal type, nn is the LDEV number, aa is the current MPE Console LDEV number.

```
This utility program is intended to make copies of Fault Locating
Diagnostics (binary) to HP92190A flexible disc media by using the
HP2647F or to HP92192A micro flexible disc media by using an HP150
running the HP3000 S68 DCU to HP150 Communication Program.
```

If your terminal is configured as the MPE Console the following dialog will appear on your screen (if not, type go to continue):

```
Successful operation of this utility requires that the MPE Console
be temporarily moved to another appropriately configured terminal.
Please perform the following operations:
  1.  Press <Break>                   (to break MPE)
  2.  Type 'CONSOLE'  ldev#  <Return>        (to move console to new ldev)
  3.  Type 'RESUME'  <Return>                (to resume FLDCOPY)
  4.  Type 'GO'                            (to continue FLDCOPY)
The MPE console will be restored programmatically upon successful
completion of the program.

TYPE 'GO' TO CONTINUE
go

Pressing <CTRL> and <Y> will transfer control to a trap procedure,
which sets terminal echo ON and terminates the program.
```

If the terminal is configured as the MPE Console the following message will appear on the screen:

```
Since you are using the MPE Console, the CTRL-Y trap will also
restore the MPE Console to this terminal.
```

If the terminal is configured as LDEV 20 (the DCU Console), the following message will appear on the screen:

```
Since you are using LDEV 20, the CTRL-Y trap will also re-enable
CTRL B functions.

The CTRL-Y trap should be used to abort the program whenever pos-
sible.  However, during binary data transfer, CTRL-Y is regarded
as data by the system.  If it is necessary to abort the program
during binary read or write, and CTRL-Y seems to be ignored, do
```

```
the following instead:
  1. Press <Break>                  {break to MPE}
  2. type <ESC> ':'               {turn on terminal echo}
  3. type 'ABORT' <Return>          {abort FLDCOPY}
```

Whether or not additional steps are displayed will depend upon the following conditions.

If user LDEV is 20 and MPE Console LDEV is not 20 then the following will be displayed:

```
  4. type 'RUN CBON' <Return>       {enable control B}
```

If user LDEV is 20 and MPE Console LDEV is 20 then the following will be displayed:

```
  4. type 'RUN CBON' <Return>       {enable control B}
  5. type 'CONSOLE 20' <Return>     {move console back to LDEV 20}
```

If user LDEV is not 20 and user LDEV and MPE Console LDEV are equal then the following will be displayed:

```
  4. type 'CONSOLE nn' <Return>     {restore MPE Console}
```

The following will then be displayed:

```
Do you have a permanent file (saved from previous execution of this
program) you want to copy the discs from? no

Insert the FROM disc and press <Return>.
```

BEGIN READING (approximately 15 minutes; sample display shown below)

```
3 RECORDS READ, FILE 1
7 RECORDS READ, FILE 2
16 RECORDS READ FILE 3
15 RECORDS READ, FILE 4
14 RECORDS READ, FILE 5
6 RECORDS READ, FILE 6
3 RECORDS READ, FILE 7
89 RECORDS READ, FILE 8
130 RECORDS READ, FILE 9
94 RECORDS READ, FILE 10
79 RECORDS READ, FILE 11
147 RECORDS READ, FILE 12
35 RECORDS READ, FILE 13
141 RECORDS READ, FILE 14

14 FILES READ BEFORE EOD FOUND

Remove the FROM disc

Do you want to save the temporary file as permanent? yes

Enter file name:
```

Enter the filename that you choose.

```
Do you want the instructions to prepare the TO disc for copying? no

press <Return> when disc is ready and inserted.
```

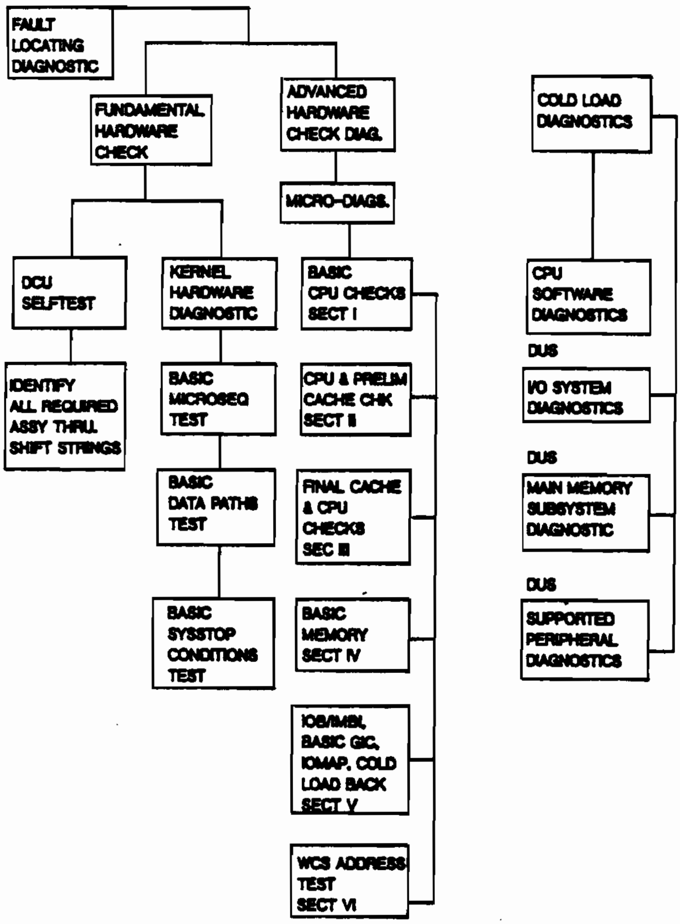


Figure 5-3. Fault Locating Diagnostic Block Diagram

KER/MICR FLD Execution

To excecute the KER/MICRO FLD, perform the following steps:

1. Press the KER/MICR softkey (f1) to run the complete kernel and microdiagnostic set. The following fault-free response is provided to indicate the displays to be observed when the KER/MICRO switch is pressed.

NOTE

CE must return to beginning after repair or replacement of PCAs to ensure problem did not move.

2. Normal Messages

   a. Normal completion is indicated as follows:

   Kernel Diagnostic:
   The following message is displayed:
   END OF KERNEL DIAGNOSTIC

   Microdiagnostics:
   The following message is displayed:
   FAULT LOCATING MICRODIAGNOSTICS COMPLETED - NO ERRORS

   WCS Tests:
   The following message is displayed:
   END OF WCS TEST PART n

   A standard output as seen when "F1" is pressed is listed below:

```
 M>
KERNEL DIAGNOSTIC
REVISION xxx---
TESTING TIME=5 MIN
PAGE ONE COMPLETED
PAGE TWO COMPLETED
PAGE THREE COMPLETED
PAGE FOUR COMPLETED
END OF KERNEL DIAGNOSTIC
SECTION 0001 LOADING
FAULT LOCATING MICRODIAGNOSTIC REV xxx---
SECTION 0001 EXECUTING -- TESTING TIME 00030 SECONDS
 SECTION 0001 COMPLETED, 00192 PASSES
SECTION 0002 LOADING
SECTION 0002 EXECUTING -- TESTING TIME 00060 SECONDS
SECTION 0002 COMPLETED, 0003 PASSES
SECTION 0003 LOADING
SECTION 0003 EXECUTING
SECTION 0003 EXECUTING TESTING TIME 00150 SECONDS
```

```
PLEASE OBSERVE THE CIR DISPLAY - LEDS FOR A MOVING PATTERN
IF PATTERN IS NOT CORRECT, POSSIBLE PROBLEM ASSEMBLIES ARE:
CIR, DISPLAY PANEL, CTLA
NOW OBSERVE DISPLAY FOR A ROTATING RIGHT LOGIC
SECTION 0003 COMPLETED, 00002  PASSES
SECTION 0004 LOADING
SECTION 0004 EXECUTING  --  TESTING TIME 00050 SECONDS
                        --  PER MBYTE OF MEMORY
 00008 BANKS OF MAIN MEMORY FOUND
 SECTION 0005 LOADING
 SECTION 0005 EXECUTING - TESTING TIME 00020 SECONDS
 TIME CONFIGURATION DEPENDENT
 IOA 0001 UNDER TEST
 GENERAL I/O  CHANNEL FOUND ON CURRENT IMB
 -----------------------------------------------------
 CHANNEL 0002  ID=!0000 GENERAL I/O CHANNEL
 DEVICE 0001  ID=!0183   7970 MAGNETIC TAPE
 -----------------------------------------------------
 CHANNEL 0003  ID=!0000 GENERAL I/O CHANNEL
 DEVICE 0001  ID=!0002 13037 DISC CONTROLLER INTERFACE
 -----------------------------------------------------
 CHANNEL 0004  ID=!0000 GENERAL I/O CHANNEL
 -----------------------------------------------------
 TERMINAL CONTROLLERS FOUND ON CURRENT IMB
 -----------------------------------------------------
 CHANNEL 0001  ID=!000F LYNX SYSTEM INTERFACE BOARD
 -----------------------------------------------------
 SECTION 0005 COMPLETED, 00001 PASSES

 FAULT LOCATING MICRODIAGNOSTICS DONE -- NO ERRORS
```

b. Normal completion of a WCS test is as follows:

```
END OF WCS TEST PART n
```

A standard output as seen when "F5" is pressed is listed below:

```
M>
 WCS TEST PART 1 -- TESTING ADDRESSES 1000 TO 1FFF
 END OF WCS TEST PART 1
```

A standard output as seen when "F6" is pressed is listed below:

```
M>
 WCS TEST PART 2 -- TESTING ADDRESSES 0000 TO 0FFF
END OF WCS TEST PART 2
```

3. Fault Messages

a. A fault indication during a kernel Micro-FLD diagnostic is indicated by the following message:

```
KERNEL DIAGNOSTIC FAULT TEST #nnn.n
MICRODIAGNOSTIC FAULT - TEST NUMBER nnnn, PASS COUNT nnnn
```

b. Another fault indication during the Micro-FLD is indicated by the following message:

```
HARDWARE FAILURE STOP TEST NNN.N,PASS COUNT 0000
```

This indicates that the system hardware circuitry detected a hardware fault during the execution of the FLD section and test number.

c. A fault indication during a WCS diagnostic is indicated by the following series of messages:

```
WCS DATA FAULT  ADDRESS = nnnn
EXPECTED DATA = NNNNNNN
ACTUAL DATA = nnnnnnn
```

NOTE

If an error occurs when using the console disk, the diagnostic will halt and an error message (CHECKSUM ERROR) will be displayed. Possible corrective actions are to restart the entire package, fix the terminal, or restart the current test.

TROUBLESHOOTING

DCU commands can be used in Maintenance Mode to provide troubleshooting assistance such as looping, individual section execution, and failing address and register information. Refer to the DCU ERS P/N A-30140-60001-32 for command descriptions.

LOOPING

Sections 1, 2, 4, and 5 can be looped individually by typing the following DCU commands at the M> prompt:

Section 1

M>tw 8 <ret>
M>wj 09B9,100 <ret>
M>ed 100 <ret>

Section 2

M>tw 9 <ret>
M>wj 0F13,00 <ret>
M>ed 00 <ret>

Section 4

M>tw 11 <ret>
M>wj 8AD,00 <ret>
M>ed 00 <ret>

Section 5

M>tw 12 <ret>
M>wj 0F9E,00 <ret>
M>ed 00 <ret>

The looping sections will continue running until an error occurs or until a <cntrl Y> is pressed.

INDIVIDUAL SECTION EXECUTION

Sections 1, 2, 4, 5 WCS 1, and WCS 2 can be selected to run individually. When a section is finished executing, the diagnostics will automatically continue on to the next sequential section. A breakpoint must be set at the end of a section in order to end with only a single pass of the section. A <CNTRL Y> may be pressed as soon as the section "complete" message is displayed before the next section is loaded.

example:

M>tw 9 <ret>
M>wb 0F13 <ret>
M>ed 00 <ret>

will load Section 2, set a breakpoint at the end of the section at control store address 0F13, and begin executing Section 2 at address 0 and stop at address 0F13.

NOTE: Section 5, WCS 1, and WCS 2 run individually by using the FLD softkeys.

To begin execution with a particular section, type the following at the M> prompt:

Section 1 M>tw 8;ed 100 <ret>
2 M>tw 9;ed 00 <ret>
4 M>tw 11;ed 00 <ret>
5 M>tw 12;ed 00 <ret>

The next sequential section will execute following the specified section.

FAILING ADDRESS AND REGISTER INFORMATION

Failing address, expected vs actual data, and register contents can be displayed by typing the following at the M> prompt to display the Firmware Maintenance Display Screen:

M>SC FI <ret>

The failing address is displayed in R3SAVE and the actual vs expected data from a compare is usually displayed in RRGA, SRGA, and UBA respectively. See actual FLD source print out for specific section and test data information. Register contents, flags, and other information are also displayed.

Advanced Hardware Diagnostic Tests (Micro-FLDs)

Separate micro-fault locating diagnostic tests exist for each hardware subsystem. Refer to Series 64/68/70 Diagnostic Manual Set (Volume 1 of 2) for a test-by-test description of kernel diagnostic tests. The following Fault Locating Microdiagnostics (FLM) exist:

- o Section 1 (Basic CPU checks)

  This section begins the CPU verification. The following features are tested: basic skips, jumps, and register reads and stores; shift options; literal operations; flag tests and operations; TOS register operations; scratch pad register operations; counter operations; and basic arithmetic functions.

  Operational hardware required: CPU (WSC and Processor).

- o Section 2 (CPU and preliminary cache checks)

  This section continues verification of the CPU and starts checkout of the Cache/CBIS. CPU features covered are as follows: ALU functions; REGN store/read operations; extended register operations; special functions; shift operations; repeat operations; link operations; multiply, divide, and BCD operations; CPX1/CPX2 tests; jump speeds and priority tests.

  Cache/CBIS features tested are: Status RAM and Tag Set read/write tests; data store read/write tests; store address tests; Tag parity tests; Tag verify tests; invalid address detection and double hit tests; and CSB accessability tests.

  Operational hardware required: CPU, Cache, and CBIS.

- o Section 3 (Final cache and final CPU checks)

  This section completes the verification of the CPU. Features covered include: memory access tests; bounds violation tests; LUT tests; overhead line functions; NIR-CIR tests; split stack flag operations; SR preadjust tests; stack OP pending bit tests; NEXT tests; bankswitch function tests; CPU timer and PERF register tests; DCU/microcode: CPU, Cache, and CBIS.

- o Section 4 (Memory)

  This section verifies main memory and CPU Cache. Cachê tests include: dirty bit tests; read fault tests; invalid block access tests; cache check cycle tests; read/write freeze tests; cache flush tests. Main memory tests are as follows: logging RAM tests; memory address tests; multi-bit error tests; no array card tests; write timeout tests; shutdown tests and error correction tests.

  Operational hardware required: CPU, Cache, and Main memory.

- o Section 5 (IOB/IMBI, GICs, IOMAP and I/O loopback)

  This section verifies all IOA modules found in the I/O system. Preliminary tests are performed on all GICs found on the IMBs. Tests include: IMB module identification; IOB tags, status, and data store read/write tests; cache abort mechanism tests; IOB flush tests; cache lock/unlock tests; advanced terminal processor tests*; cold load device loopback tests**; IMBI register tests; IMBI global handshake, timeout, and busy tests; IMBI read/write memory tests; IMBI parity tests; IMBI message tests; find GIC tests; and IOA memory operations tests.

* The ATP test does fundamental channel checks for ATP/SIB channels.

** Only port 0 of ATP/AIB Channel 1 is checked for proper loopback.

Operation hardware required: CPU, cache, and at least one IOA module.

- WCS Part 1 (Most significant WCS addresses)

  This section performs four tests on WCS addresses 0100H-13FFH. The tests consist of writing, reading back, and comparison of calculated data from each WCS address. The data used is as follows:

  Test 1 - if address is odd then -1, if even then 0
  Test 2 - if address is odd then 0, if even then -1
  Test 3 - address incremented by 1 each 16 bit word
  Test 4 - same as Test 3 using complemented addresses

  Operational hardware required: CPU.

- WCS Part 2 (Least significant WCS addresses)

  This section performs four tests on WCS addresses 0000H-13FFH. The tests consist of writing, reading back, and comparison of calculated data from each WCS address. The data used is as follows:

  Test 1 - if address is odd then -1, if even then 0
  Test 2 - if address is odd then 0, if even then -1
  Test 3 - address incremented by 1 each 16 bit word
  Test 4 - same as Test 3 using complemented addresses

  Operational hardware required: CPU.

- Error Reporting

  When the Fault Locating Diagnostics detect a failure, they will halt the system and the DCU will display that fact at the system console. The DCU console will display the suspected assemblies in order of fault ranking and the test number that failed.

  The error reporting can be communicated to a CE before he/she leaves the office.

DUMP STRING (DS)

The following describes the dump string command.

1. Format a diskette.

   If the system console is an HP 2647F:

   a. Insert diskette at console.

   b. Press console COMMAND key.

   c. SHOW [f3] VOLUME [f2] [RETURN].

   d. If volume name is "nofmt", skip to f.

   e. DISC [f8],PURGE [f4] VOLUME [f5] "Name" [RETURN].

   f. DISC [f8], CREATE [f5], VOLUME [f8] "Name" ON [f2] 1 [RETURN].

   g. Exit command mode (Press COMMAND key).

   h. M>DS (Dump String Command). This will dump 25 files (board shiftstrings only) if DCU date code is 2601 or less, and will dump 31 files if DCU date code is greater than 2601. These files consist of:

      (1). Board shiftstrings (first 25).
      (2). Firmware and Software maintenance screens.
      (3). DCU event log.
      (4). All extended registers.
      (5). Current MPE process stack.

   If the system console is an HP 150 II:

   a. Insert a blank diskette into Drive B. (Make sure that the diskette is not write-protected)

   b. From the main menu, press the disc function key [f8].

   c. Press the FORMAT FLOPPY function key [f1]. The following message will be displayed:

      WARNING! THIS FUNCTION WILL FORMAT THE FLOPPY IN DRIVE B.
      ALL FILES (IF ANY) CURRENTLY STORED ON THE FLOPPY DISC IN
      DRIVE B WILL BE LOST.
      DO YOU WANT TO CONTINUE? (Y/N)

   d. Enter "Y" and press [RETURN]. Wait for the "FORMAT DONE! PRESS <RETURN TO CONTINUE" message to be displayed.

e. In response to the "M>" prompt, enter the following:

M> BA=OCT (RETURN)
M> DS;WS;LG (RETURN) (for MPE V or greater, just enter DS (RETURN))

f. The system will respond with the following header and series of questions. Enter appropriate responses for each line, followed by (RETURN). Be as accurate as possible in supplying this information as it will assist the Customer Engineer (CE) or Technical Support Engineer (TSE) in locating the cause of the system failure.

```
GEMINI BOARD STRING & REGISTER DUMP

 FILE   0    1    2    3    4    5    6    7    8    9
   0        DESC FIRM SOFT CTLA CTLB SKSP RAL0 RAL1 RAL2
  10   RAL3 VBUS CIR  CAC  MCS  MMC  CBI1 CBI2 CBI3 CBI5
  20   CBI7 IOB1 IOB2 IOB3 WCS0 WCS1

 DATE:
 TIME:
 OPERATOR:
 SYSTEM:
 MEMORY SIZE:
 HOW LONG WAS SYSTEM RUNNING ?
 WHAT WAS RUNNING ?
 DESCRIBE WHAT HAPPENED (CNTL-G (RETURN) TO TERMINATE)
```

g. Hold down the CTRL key and enter the letter "G".

h. Press (RETURN). The DCU will automatically load the contents of the shift string registers for each PCA onto the diskette in Drive B. This operation takes approximately ten minutes.

i. When the M> prompt appears, press the main menu key (f8).

j. Press the copy key (f2).

k. Press the COPY SCREEN key (f8). The contents of the screen display will be copied to the diskette.

l. Press the "home" key (this key is located directly below the Insert char' key on the keyboard.

m. Press the Clear Display key.

NOTE

Steps n through q are only required if the DCU date code is 2601 or less.

n. Enter RFLAG=0;XA;XB and press (RETURN).

o. Repeat steps k,l, and m.

p. Enter RFLAG=1;XA;XB and press [RETURN].

q. Repeat steps k,l, and m.

r. Press the main menu function key [f8].

s. Press the REWIND function key [f5]. (This closes the last string dump file and must be done prior to removing the diskette.)

t. Remove, date, and label the String Dump diskette from Drive B. (Write-protect the diskette by sliding the write-protect tab away from the diskette hub.)

2. Determine how many files exist on the floppy disc.

If the system console is an HP 2647F:

a. Ensure floppy disc is inserted.
b. Press COMMAND key.
c. Press [f3] (SHOW) key.
d. Press [f3] (FILES) key.
e. Press [RETURN] key.
f. Count the number of files listed on the screen.

If the system console is an HP 150 II:

a. Ensure floppy disc is inserted.
b. Hold SHIFT key down and press User/System key.
c. Press [f6] (disc) key.
d. Press [f6] (SHOW) key.
e. Count the number of files listed on the screen.

If the DCU PROM date code is 2601 or greater, the number of files listed should be 31.

3. Use FCOPY to copy the floppy data into a permanent disc file.

:FCOPY

>FROM=$CTUL;TO=STRINGS;NEW;FILES=(25 OR 31);SKIPEOF=1

>EXIT

4. If files=31, the last six files may be listed to the printer. To format and print the first 25 files, run STRINGDU.HP32342.SUPPORT.

NOTE

If the DCU ROM date code <2601, the user may dump all 31 files by using the following command:

M>DS;LG;WS;RFLAG=0;XA;XB;RFLAG=1;XA;XB

DIAGNOSTIC/UTILITY SYSTEM (DUS) PROGRAMS

The Diagnostic/Utility System is a series of memory resident programs used to test the computer system. The CE invokes the applicable DUS diagnostic during the fault isolation process. The DUS PN xxxx xxxx is a Cold Loadable Tape.

The following diagnostic programs are installed on DUS:

- o Sleuth Simulator Program
- o IOMAP
- o General I/O Channel Diagnostic-Replaced by GICD88 (DUS 3.06, date code 2804)
- o HP 7902/9895 Flexible Disc Diagnostic-Deleted (DUS 3.08, date code 2905)
- o 7970E Magnetic Tape Diagnostic-Deleted (DUS 3.08, date code 2905)
- o 13037C Disc Controller Diagnostic
- o 7906/7920/7925 Disc Verifier
- o DMA Exerciser Diagnostic-Deleted (DUS 3.08, date code 2905) Replaced by DMAEXER9
- o DMAEXER9 Diagnostic
- o Memory Diagnostic (MDIAG64) - MCS,MMC,MMA
- o CS80DIAG-Deleted (DUS 3.08, date code 2905) Replaced by CS80EXER
- o CS80EXER
- o ATP Diagnostic
- o SADUTIL

Creating Diagnostic/Utility System Media

To create the DUS media, set up file equation for media to be used:

```
:HELLO FIELD.SUPPORT,HP32231 :FILE MTAPE; DEV=TAPE; DEN=1600 (for 7976)
:FILE FLOPPY; DEV=FLOP (for 7902/9895)
:FILE CTAP; DEV=CTAPE (for 9144/35401)
:RUN COPYDUS.HP32231.SUPPORT
```

When media is mounted, Ready and Online, respond to I/O request.

Loading Diagnostic/Utility System (DUS)

To execute DUS, perform the following procedures:

1. Perform an MPE SHUTDOWN to properly log off all current sessions.

2. Ensure that the REMOTE key is in the down position.

3. Insert a Diagnostic/Utility System (DUS) diskette into the Flexible Disc Unit (FDU) or mount a DUS tape on the Magnetic Tape Unit (MTU).

4. Enter LOAD X.Y,Z where X is IMB number of cold load device, Y is channel number of cold load device and Z is device number of Cold Load Device.

5. The welcome message and prompt displayed are:

```
Diagnostic/Utility System (revision XX.XX)
Enter your program name (Type HELP for program information)
:
```

Sleuth Simulator Program

To execute the Sleuth Simulator Program, perform the following procedure:

1. Install a Diagnostic/Utility System diskette or tape.

2. Cold load the DUS programs.

3. When the DUS displays its title message and prompt, enter: AID.

4. AID will respond with a prompt character (>) and line number:

```
>10
```

5. Enter LOAD SLEUTHSM. The Sleuth Simulator is now loaded and you may enter program statements or use available commands:

ENTERING A SLEUTH PROGRAM

Programs are entered at the first available AID line number after the simulator program. The simulator becomes part of the user program entered.

DELETING A SLEUTH PROGRAM

To erase the lines of code generated by entries, the delete command must be used as it erases only specified lines:

```
D 5000/5100
```

To erase both the Sleuth Simulator and user programs, enter the EP command.

IOMAP

STANDARD OPERATING MODE

To execute IOMAP, perform the following procdure:

1. Install a Diagnostic/Utility System diskette or tape.

2. Cold load the DUS programs.

3. When the DUS displays its title message and prompt, enter: IOMAP.

4. IOMAP will respond with:

```
IOMAP     REVISION xx.xx
Enter 'GO' to continue
      'GO,1' to continue with printer output
      'GO 1' for Optional Test Sections
      'GO 1,1' to run Optional Sections with printer output
      ('LC' to list Commands)
>
```

NOTE

Printer output options cannot be used with a HP 2608S. The 7980A and 7980XC have the same ID code (!0181), but IOMAP will only recognize the 7980A. To determine a 7980A from a 7980XC, run the tape drive selftest.

5. Enter GO or GO,1 and the IOMAP program will perform an identify to all devices, display the system I/O configuration table, and return control to the DUS.

Sample I/O Table (with tape unit on line and selected)

```
IOMAP              SYSTEM I/O CONFIGURATION
-------------------------------------------------------------
>Control panel switch settings: Channel=7 Device=1
>System console is device 0 on channel 1
-------------------------------------------------------------
Channel 1   ID=!000F  Advanced Terminal Processor (ATP/SIB) (CODE=3)
   AIB Number 0       Asynchronous Intf Bd (Code=3)
-------------------------------------------------------------
Channel 5  ID=!0       General I/O Channel  (GIC)
    Device 1 ID=!183     7970E Mag Tape Controller        (CODE=2)
         Unit 0           7970E Mag Tap Controller
    Device 7 ID=!2001    2608 Dot Matrix Printer
-------------------------------------------------------------
Channel 7  ID=!0       General I/O Channel  (GIC)
    Device 1 ID=!2       7920/7925 Disc Controller     (CODE=2)
         Unit 0          7920 Disc Drive
    Device 2 ID=!81     9895 Flexible Disc Unit  (Double-sided)
-------------------------------------------------------------
```

```
End of pass n
```

Explanation of '(CODE=)'

1 implies: NO LOOPBACK Capability.
2 implies: NO SELFTEST Capability.
3 implies: LOOPBACK and SelfTest Are Only Available In The Present Diagnostic

"n" indicates the number of passes that have been made to this point.

6. Optional Operating Mode

Three additional test sections are available in the optional:

- o Test Section 2 - Identify
- o Test Section 3 - SelfTest
- o Test Section 4 - HP-IB Loopback

To execute any of these test sections:

a. Enter: TEST SECTION <NO.>

b. The following is displayed:

```
TEST SECTION <NO.> --- <NAME>
```

c. Enter legal channel, IMB#, and device numbers to execute test.

d. Enter 2 to exit test section.

SUPPORTED DEVICES. IOMAP currently recognizes the following devices, but not all may be supported by the current system. For latest information, check the HP device default list during the start-up procedure (for MPE V or greater).

ID CODE	HP DEVICE
!0001	7910 Fixed Disc
!0002	13037C Disc Controller for 7906/7920/7925 Disc Drives
!000F	Advanced Terminal Processor (ATP)
!0080	Flexible Disc Unit (Single Sided)
!0081	7902 Flexible Disc Unit (Double Sided)
!0082	12745 HP-IB Adapter for 13037 Disc Controller
!0100	31207 Writable Control Store
!0101	2893 Card Reader
!0102	9875 Cartridge Tape Controller
!0174	7974 Mag Tape Unit
!0176	7976 Mag Tape Unit
!0178	7978 Mag Tape Unit
!0179	7979 Mag Tape Unit
!0180	7980 Mag Tape Unit (See NOTE on previous page)

ID CODE	HP DEVICE
!0183	7970E Mag Tape Controller
!0190	C1511A DDS Cartridge Tape Drive (DUS 3.09, date code 3009)
!0204	7911 Disc Drive
!0205	7911 Disc with Cartridge Tape
!0208	7912 Disc Drive
!0209	7912 Disc with Cartridge Tape
!020A	7914 Disc Drive
!020B	7914 Disc with Cartridge Tape
!022C	7957B/7961B Tape Drive Unit
!022D	7958B/7962B Tape Drive Unit
!022E	7958B/7963B Tape Drive Unit
!0212	7933/7935 Disc Drive
!0214	7937 Disc Drive
!0215	7936 Disc Drive
!0220	7945A Disc Drive
!022A	7957A Disc Drive
!022B	7958A Disc Drive
!022F	C2200A Disc Drive (DUS 3.08, date code 2930)
!0230	C2203A Disc Drive (DUS 3.08, date code 2930)
!0231	C2202A Disc Drive (DUS 3.08, date code 2930)
!0240	Cartridge Tape Drive
!0250	C1707A CD ROM Drive (DUS 3.08, date code 2930)
!0270	35401A Multicartridge Tape Drive
!0260	9144 Cartridge Tape Drive
!2000	9871 Character Printer
!2001	2608A Dot Matrix Printer
!2002	2631A Serial Printer
!2004	268X Page Printer
!2005	9872 Plotter
!2006	7245 Plotter/Printer
!2009	2631B Serial Printer
!200A	2611/2613/2617/2619A Line Printer
!2080	Integrated Display System (IDS)
!2101	2608S/2563A/2564B/2567B Line Printers
!4000	31281 SDLC-EIA Interface
!4001	BYSINC Interface
!4002	30020A Intelligent Network Processor (INP)
!4003	30020B Intelligent Network Processor (INP)
!4080	ADCC
!6000	31262 GIC as device
!8000	31321 Processor Maint. Panel
!A000	9847 Digitizer

GIC Diagnostic

To execute GIC diagnostics, perform the following procedures:

1. Install a Diagnostic/Utility System diskette or tape.
2. Cold load the DUS programs.
3. When the DUS displays its title message and prompt, enter: GICDIAG.
4. When the prompt is returned, enter GO. Respond to the following:

```
Set 'MODE' switch on GIC under test to 'TEST' (out)
Set 'PROCESSOR' switch on GIC under test to 'CPU' (in)
Set 'DEVICE TYPE' switch on GIC under test to 'A' (in)
Set 'SYS CTRL' switch on GIC under test to 'ON' (in)
Remove cables attached to GIC under test.
Respond  GO
```

5. Enter GO and respond to the following:

```
More than one Megabyte of memory installed in system?(Y/N)
What is channel address and IMB# of GIC under test?
GIC diagnostic pass 0001
Restore switches on GIC under test to original settings.
Replace system cables on GIC
```

GICDIAG was replaced by GICD88 on DUS release 3.06 (date code 2804) and later.

HP 7902A/9895A Flexible Disc Diagnostic

To execute the flexible disc diagnostics, perform the following procedure:

1. Install a Diagnostic/Utility System diskette or tape.
2. Cold load the DUS programs.
3. When the DUS displays its title message and prompt, enter: D7902.
4. After prompt (>) is returned, enter GO. Answer the following:

```
What is the IMB#?
What is the CHANNEL ADDRESS of the controlling GIC (1-15)?
What is the DEVICE ADDRESS OF THE FDU or TAPE (0-7)?
```

The D7902 program has been deleted from DUS release 3.08 (date code 2905) and later.

HP 7970E Magnetic Tape Diagnostic

To execute the magnetic tape diagnostics, perform the following procedure:

1. Turn on the power to necessary devices. Magnetic tape units not to be tested must be turned off.

2. Insert the diagnostic flexible disc or mount the Diag Tape and enable the unit.

3. Select the channel and device number of the Mag Tape and perform the cold load procedure.

4. Select the channel and device number of the console and press the RUN button.

5. The system outputs the following message:

```
DIAGNOSTIC-UTILITY SYSTEM REV=xx.xx
ENTER YOUR PROGRAM NAME
```

   Enter either:

   D7970S13 (for a basic check of the drive)
   D7970S45 (for a random read/write verification)
   D7970S68 (for extended interactive diagnostics)

6. Enter GO in response to the prompt (>).

7. Respond to following instruction messages appropriately.

```
7970E CHANNEL NUMBER?
ENTER THE IMB NUMBER FOR CHANNEL #(as subsequently entered)
? (asked only if multiple IMB system)
7970E DEVICE # ?
MOUNT A TAPE WITH A WRITE RING ON EACH UNIT TO BE TESTED.
SET OTHERS OFFLINE.
```

8. Respond GO.

This diagnostic program has been deleted from DUS release 3.08 (date code 2905) and later.

HP 13037C Disc Controller Diagnostic

To execute disc controller diagnostics, perform the following precedure:

STANDARD OPERATING MODE

1. Install a Diagnostic/Utility System diskette or tape.

2. Cold Load the DUS programs.

3. When the DUS displays its title message and prompt, enter: D13037.

4. Install a scratch cartridge/pack in all units to be tested. If scratch cartridges and packs are not available, save contents to another media and then later restore from this media.

5. To continue execution, enter GO. Respond to message:

```
Enter Channel number to which the 13037 controller is
connected (1-15)
?

Enter IMB number for channel "(enter chan # 0, 1, or 2)"


Enter Device number assigned to the controller by the
HP-IB (0-7)
?
```

When diagnostic identifies test configuration, respond to the next request message:

Enter the number of required passes (-1 = indefinitely) OPTIONAL OPERATING MODE

The optional operating mode allows selection of particular test sections for execution, and permits suppression or enabling of error and non-error printout and pauses.

HP 7906/20/25 Disc Verifier

To execute disc verifier, perform the following procedure:

1. Set up the disc subsystem that is to be tested as follows:

   a. Place the disc drive READ ONLY switch in its OFF position.

   b. Place the disc drive FORMAT switch in its ON position if you intend to format the disc pack/cartridge.

   c. If you intend to use the customer's disk pack/cartridge, make a back-up copy of the entire system using a 0 dump date in the SYSDUMP command.

   d. If you do not intend to use the customer's disc pack/cartridge, insert a scratch pack cartridge either now or when instructed by the program.

2. Install a Diagnostic/Utility System diskette or tape.

3. Cold load the DUS programs.

4. When the DUS displays its title message and prompt, enter: VERIFIER.

5. Answer the following requests:

```
79XX Disc Verifier   Revision xx.xx
Place Scratch Pack/Cartridge in Units to be Tested

Enter IMB#               (enter chan # 0, 1, or 2)
Enter Channel Number     (GIC channel number of 13037
                      controller)
Enter Device Number      (Disc Unit Device # of 13037)
Enter Unit Number        (Number of Unit to be tested)
Enter Error Count (# of errors to display before prog ends)
```

6. Respond to the following requests:

```
Unit Select Switch Test?  (0=N, 1=Y)

Enter Unit # to be Tested

Format Pack?  (0=N, 1=Y)

Verify Pack?  (0=N, 1=Y)

Verify, Long Pass?  (0=N,1=Y)

Enter the number of passes desired.
```

7. The following messages are displayed as each section is executed:

```
Begin Format               (If formatting was requested)
End Format
Begin Verify               (If verifying was requested)
Verify Pass #X             (short or long pass)
End Verify
Begin Main
End Head Test
End Track Switch Test
End W/R Test
```

DMA Exerciser Diagnostic

To execute the DMA Exerciser Diagnostics, perform the following procedure:

1. Back up system.

2. Perform MPE SHUTDOWN.

3. Cold load the Diagnostic/Utility System (DUS).

4. Once the DUS program has output its title message and prompt (:) enter DMAEXR.

5. The response should be:

   ```
   DMAEXR EXERCISER PROGRAM 'DMAEXR', version XX.XX.
   ```

6. A CTRL-Y may be entered at any time to abort the diagnostic.

This program is intended to provide an exhaustive check of the DMA operation. The full check requires three GIC assemblies. A minimum test, however, may be run using two GICs (Control and Device). Follow the configuration instructions, always using valid IMB, Channel and Device numbers.

NOTE

Valid IMB numbers are 0 and 1; where 1 is used for channels on the Series 64/68/70 second I/O Adaptor (HP 30143A).

DMAEXR has been deleted from DUS release 3.08 (date code 2905) and later. It has been replaced by DMAEXR9.

DMAEXR9 Diagnostic

Like DMAEXR, DMAEXR9 is an AID diagnostic tool which runs under the control of the DUS offline operating system. The most significant enhancement to DMAEXR9 is the increased number of GICs which can be operated simultaneously. DMAEXR9 supports concurrent operation of up to 3 Controller GIC-Device GIC pairs (6 GICs), plus up to 3 busy GICS. The configuration portion of the user interface has been modified to be easier to use and understand. The program tests for configuration errors and gives an appropriate message if an error is found.

DMAEXR9 is one of the most effective system-level diagnostics available for HP-IB HP3000s, but only if each IMB is tested with a minimum of 3 GICs. A 2-GIC test is satisfactory for exercising GICs, and might locate a serious system problem if one exists. However, only a test with a minimum of 1 Busy GIC and 1 Controller GIC-Device GIC pair on an IMB can stress the system up to and beyond the level of normal operation. This is the only way to really shake down a system, and smoke out intermittents.

If the system under test has 2 GICs, and you want to run 3-GIC DMAEXR9, then a GIC from a kit can be used as the third GIC. An extra cable is not required, since the Busy GIC needs no HP-IB cable.

DMAEXR9 is a go/no-go test of the computer hardware. There is no time during the diagnostic for extensive word-by-word testing of every step. The tradeoff is that DMAEXR9 does not tell which board(s) to replace. However, a problem can be swiftly narrowed down by logical troubleshooting, with DMAEXR9 passing or failing.

To execute the DMA Exerciser Diagnostics, perform the following procedure:

1. Back up the system.

2. Perform an MPE SHUTDOWN.

3. Cold load the Diagnostic/Utility System (DUS).

4. When the DUS program displays its title message and prompt (:), enter DMAEXR9.

5. The response should be:

   ```
   Enhanced DMA Exerciser Program, DMAEXR-9, version XX.XX
   ```

6. After reading the display of information on the program, enter GO to continue. (A CTRL-Y may be entered at any time to abort the diagnostic.)

7. The program displays the message:

   ```
   DEVICE NUMBERS USED FOR ANY GIC MUST NOT CORRESPOND
   TO DEVICES ACTUALLY ATTACHED TO THAT GIC.
   ```

   The device numbers you enter must not match any devices currently existing on the system. This means that IMB number (always 0) and Channel number MUST exist in the system, but that the device number specified for that channel MUST NOT exist on that channel.

8. Enter responses to these prompts from the program:

```
Number of CONTROLLER - DEVICE GIC pairs available (1-3)?
Enter first CONTROLLER GIC's IMB, channel, device numbers:
Enter first DEVICE GIC's IMB, channel, device numbers:
Enter second CONTROLLER GIC's IMB, channel, device numbers:
Enter second DEVICE GIC's IMB, channel, device numbers:
Enter third CONTROLLER GIC's IMB, channel, device numbers:
Enter third DEVICE GIC's IMB, channel, device numbers:

Number of BUSY GICs available (0-3)?
Enter first BUSY GIC's IMB, channel, device numbers:
Enter second BUSY GIC's IMB, channel, device numbers:
Enter third BUSY GIC's IMB, channel, device numbers:
```

The mag tape (or other DUS cold-load device) will not work on the device GIC, and it is often not desirable to place it on the busy GIC. Therefore, place it on the controller GIC, but at a different device number than the one specified for the controller GIC or the device GIC. Channel 9 is made controller GIC out of convenience, not necessity.

9. Follow the directions given by the program for CHANNEL CONFIGURATION:

```
1. Connect GIC 0/15 to GIC 0/14 by HP-IB.
2. Connect GIC 0/13 to GIC 0/12 by HP-IB.
3. Connect GIC 0/11 to GIC 0/10 by HP-IB.
   Note that each connected CONTROLLER GIC-DEVICE GIC pair can
   have no more than ONE ACTUAL HP-IB DEVICE attached to their HP-IB.
4. Set the 'SYS CTRL' switch to the OUT position on
   GIC 0/14, 0/12, 0/10
```

These steps ensure that the channels entered as controller and device GICs have their HP-IBs tied together. This can mean tying the two HP-IB ports together at the junction panel with an HP-IB cable. This is particularly good for testing the HP-IB cable as part of the system. Alternatively, you can tie the ports at the lower board edge (where an INP would attach) with an HP-IB ribbon cable. You may attach or disconnect HP-IB cables of either type with the power on.

Now is a good time to remove all devices attached to the controller or device GICs (except the mag tape). To allow the busy GIC to operate at the highest speed possible, remove all HP-IB cable hoods (both standard cable and the ribbon cable) right at the edge of the board.

To cause the device GIC to behave as a device, its system controller switch ("SYS CNTL") must be pulled out. (This is the switch hiding behind the HP-IB cable hood.) With this switch pulled out, the device GIC will not be system controller on the HP-IB. More than one system controller on one HP-IB is not allowed, and could damage one or both GICs.

10. Enter the appropriate responses to the prompts for MEMORY CONFIGURATION:

```
Enter the number of MEGABYTES of memory to test:
      or 0 (zero) for partial megabyte question.
Note that 1 bank = 128K bytes, 8 banks = 1 Megabyte.
Enter the number of BANKS of memory to test:
```

DMAEXR9 requires you to specify either the number of megabytes or the number of banks to test. For systems with an even multiple of 1 megabyte of memory, the memory size can be entered as 1, 2, 3, or 4 for 1Mb, 2Mb, 3Mb, or 4Mb configurations.

11. Enter a value for the TRANSFER COUNT:

```
620 transfers will allow one pass through 8 megabytes
Enter the number of TRANSFERS to perform,
      or 0 (zero) for continuous looping.
```

The number of passes that DMAEXR9 will make through memory is determined by the value you enter here, and by the amount of memory available. The first 2 banks of memory are not tested by DMAEXR9 in the same way as it tests the rest of memory, since DUS resides there. If the first 2 bank are suspect, trade addresses between board 0 and another board, then re-run the test. The rule of thumb is ten passes per bank, 80 passes per megabyte. Subtract the 2 banks which are not tested, and you come up with the magic number of 620 passes/8 Mb.

Memory Diagnostic (MDIAG64) - MCS,MMC,MMA

To execute the memory diagnostic, perform the following procedure:

1. Have the System Operator perform system back-up.
2. Perform an orderly MPE SHUTDOWN'.
3. Mount, Load, and ON-Line the DUS tape.
4. Cold load from DUS tape (refer to DUS manual p/n 30070-90043).
5. Once the DUS program has output its title message and prompt (:) enter the following:

   :MDIAG64 RETURN

   The following dialogue will occur:

   HP 3000 Series 64/68/70 Memory Diagnostic (MDIAG64 01.00)

Begin Section 1

If Section 1 does not complete without error, then either MMA0 should be moved to another valid MMA slot and another MMA put in its place (for troubleshooting), or MMA0 should be replaced. Then run this diagnostic again.

The program will output one of the folowing, depending upon the memory configuration:

```
Detected XXX Banks (xxMBYTES) on X 1Mb Board(s)
                    OR
Detected XXX Banks (xxMBYTES) on X 4Mb Board(s)
                    OR
Detected XXX Banks (xxMBYTES) on X 4Mb Board(s) and X 1Mb Board(s)
```

NOTE: WHEN INSTALLING THE MMA'S, MAKE SURE NO 1Mb BOARDS PRECEDE ANY 4 Mb BOARDS.

Do you wish to see the contents of the logging RAM before it is cleared?
May be garbage if not initialized since last power on. (Y/N)

<<enter Y or N>>

NOTE

If Y is entered and this is the first pass through this diagnostic, the logging RAM may contain garbage. To halt the listing of the logging RAMs, enter a CNTRL Y'. The logging will cease and the diagnostic prompt (>) will appear to allow either the GO' to continue or EXIT' command to be entered. If N is entered , the following dialogue will continue:

End Section 1
Type GO' to continue (LC to list commands)
>GO RETURN

6. This will be followed by self explanatory dialogue.

CS80 Device Diagnostic

To execute CS80 device diagnostics, perform the following procedure:

1. Perform an MPE SHUTDOWN.
2. Cold load the Diagnostic/Utility System.
3. Once the DUS program has output the its title message and prompt (:) enter CS80DIAG.
4. The response should be:

```
Program Loaded!!
nnnn>
```

The CS80DIAG program is now loaded and may be run with the RUN command.

(CS80DIAG has been replaced by the CS80EXER program, described next in this section.)

CS80DIAG has been deleted from DUS release 3.08 (date code 2905) and later.

CS80EXER

Offline (DUS) diagnostics for all CS80 devices are provided by the CS80EXER program, which replaces CS80DIAG. CS80EXER is fully backward compatible with CS80DIAG and uses a format similar to CS80UTIL. CS80EXER is distributed with DUS rev 3.02 or later.

NOTE

It is desireable to have a current IOMAP listing in order to specify the proper DRT # when prompted. When prompted for the LDEV number, you may specify *any number*. That is, the number you enter does not have to correspond to the LDEV # associated with MPE. By convention, however, the same numbers are used.

To execute CS80EXER, follow these steps:

1) Perform an MPE SHUTDOWN.

2) Cold load the Diagnostic/Utility System (DUS).

3) Once the DUS program has displayed the title message and prompt (:) enter CS80EXER.

4) The response should be:

```
CS80EXER X.XX.XX (C) Hewlett-Packard Co., 1986

Please wait:  loading message file ...

CS80 Device Configuration

Logical Device? (Enter User Selected "LDEV" Number)
DRT?
List logical devices (Y/N)[N]?
```

After the desired devices are configured, the program prompts for user input with the prompt:

```
CS80EXER>
```

For a list of commands, enter HELP at the CS80EXER> prompt.

Note that the CS80EXER SPARE command uses the algorithm depicted on the next page.

```
                      Attempt to read target sector
                       and store in program buffer
                       /                           \
                 Successful                      Unsuccessful
                     |                               |
                     |                           Continue?
                     |                               |
                     |                               --->NO--->Exit
                     |                               |
                     |                              Yes
                     \                               /
           Attempt spare retaining data (target sector is lost)
                  /                                    \
            Successful                             Unsuccessful
                |                                      |
     If sector was recovered                        Continue?
     then rewrite target sector                        |
                |                                      --->NO--->Exit
               Exit                                    |
                                                      Yes
                                                       |
                                  Attempt spare not retaining data (track is lost)
                                                       |
                                                      Exit
```

NOTE

It is the user's responsibility to ensure that data affected by sparing are backed up and restored (if required), or purged (if not needed).

ATP Diagnostic

NOTE

Tests can be run individually or as group. It is recommended that they be run as a group.

To execute ATP, perform the following procedure:

1. Load Diagnostic/Utility System (DUS) or Diskette.

2. Bring up the Diagnostic/Utility System (DUS).

   `Enter Program Name` is displayed.

3. Respond ATPDIAG to. initiate the Diagnostic. The ATP Diagnostic Program displays its title message and prompts for the Channel # and IMB# of the SIB. Respond accordingly to the questions presented.

4. Four types of message are output by the diagnostic: prompt, help, information and error messages.

5. Before the diagnostics are started you can specify whether the diagnostics should stop after the first error or whether they should continue to test as much of the system as possible.

6. The following is a sample dialogue:

```
 Advanced Terminal Processor Offline Diagnostic V-00.20

 Enter Exit in response to any question to terminate the
 program.


 Enter IMB number to which the SIB is connected (0-2) - 0
 Enter the channel number of the SIB under test: 1
 Print failure messages? NO
 Print success messages? NO
 Output  results to line printer? YES
 Stop on errors? NO
 Loop count-(zero for continuous looping):  1
 Enter SIB tests to be run:
>ALL
 Enter AIB tests to be run:
>ALL
 Enter ports to be tested, separated by commas:
>A0, 1, 2, 3.....11)
```

NOTE

Port 0 cannot be tested since it is connected to the console.

NOTE

It is recommended that you respond with a NO to questions concerning errors and messages, since the results will be summarized at the end of the diagnostic testing.

7. Refer to ATP Diagnostic Manual (P/N 30144-90003) for more detailed information.

SADUTIL

SADUTIL is a stand-alone utility program used to perform disk operations. Refer MPE System Utilities Manual P/N 30000-90044. SADUTIL performs the following functions:

- o When used with RECOVER5 utility, re-creates disc files.
- o Recovers MPE files that have become logically inoperable because of a catastrophic condition (invalid system file directory, or bad code-load information).
- o Requires no special MPE capability.

Note the following enhancements:

- o SADUTIL 3.12 was changed for security enhancements to MPE on DUS release 3.07 (date code 2830).
- o SADUTIL was changed to handle tape tension loss problems on DUS release 3.08 (date code 2830).
- o SADUTIL added support for the C2200A, C2202A, and C2203A disc drives on DUS release 3.08 (date code 2930).

ONLINE DIAGNOSTICS

The following is a description of online diagnostic tests.

HP2563A Line Printer

Restore file PD466A to the HP32340 group of the SUPPORT account. Enter the following system commands:

```
:HELLO FIELD.SUPPORT,HP32340
:RUN PD466A
```

The program will request user inputs for test configuration. Enter the appropriate values for each request:

Enter Model No.

Enter Number of Characters to be used (64/96/128).

For HP 2563A/2608S printers only: printer connected via multi-point terminal system (i.e., Remote) Y/N?

Enter Logical Dev. No.

Select Section Flags.

For looping and Status checks, use SLEUTHSM in offline Diagnostic/Utility System (DUS).

HP2680A/2688A Page Printer Verifier

To execute the page printer verifier, perform the following procedure:

1. Verify proper online operation.
2. Enter the following system commands:

```
:HELLO FIELD.SUPPORT,HP32340
:RUN PD467A
```

3. Perform procedures requested by the verifier.

NOTE

Use the printer selftest function (on top panel keyboard) to run the complete set of printer diagnostics.

4. To run printer selftest, enter the following commands from the printer keyboard:
   a. Press HALT.
   b. Enter 1 ENT.
   c. Press RUN.

CS80UTIL

Online diagnostics for CS80 devices are provided by the CS80UTIL program. CS80UTIL usually resides in the CS80 group of the TELESUP account, and uses a message file called CS80MSG. CS80UTIL will look for CS80MSG in the user logon group, then in CS80.TELESUP, and finally in HP32340.TELESUP. If CS80 does not find a message file, or if the message file it locates is a different version than the program, CS80UTIL will not run.

To execute CS80UTIL, enter the following system commands:

```
:HELLO FIELD.TELESUP,CS80
:RUN CS80UTIL
```

The program header will be displayed, and then the prompt:

```
CS80UTIL>
```

For a list of available commands, enter HELP at the CS80UTIL> prompt.

Note that the CS80UTIL SPARE command uses the algorithm depicted on the next page.

```
                      Attempt to read target sector
                       and store in program buffer
                      /                            \
                 Unsuccessful                   Successful
                    /                               |
                 Continue?                          |
                    |                               |
     Exit<---NO<---                                 |
                    |                     Attempt spare retaining data
                   Yes                      (target sector is lost)
                    |                          |                   \
     Program will allow spare if:              |                    |
                    |                      Successful          Unsuccessful
     1) Non-system volume with                 |                    |
        no user data.                    Rewrite target            Exit
     2) Sector in free space of              sector
        system volume disc.                    |
     3) Sector in file that is                Exit
        in directory.  (Report
        file name)
                    |
  Exit<---Other<---
                    |
     Attempt spare retaining data (target sector is lost)
                    |
                   Exit
```

NOTE

It is the user's responsibility to ensure that files affected by sparing are backed up and restored (if required), or purged (if not needed).

TERMDSM

To execute the TERMDSM, perform the following procedure

1. TERMDSM Options

    a. Run diagnostics.

    b. Abort job(s).

    c. Abort I/O.

    d. Reset one or more ports and associated tables.

    e. Display tables.

    f. Dump one or more ports and associated tables.

    g. Obtain a list of broken ports.

2. Once you have created an MPE session, invoke TERMDSM by the following:

```
RUN TERMSM.PUB.SYS <cr>

Use of TERMDSM requires (OP) capability.  TERMDSM will output
the following message after it has verified (OP) capability:

TERMINAL DIAGNOSTIC--VERSION V.UU.FF
Type HELP for aid
```

HP 7974A/78A Magnetic Tape Diagnostic

To execute the magnetic tape diagnostics, perform the following procedure:

```
:HELLO FIELD.SUPPORT,HP32340 RETURN
:RUN PD471A RETURN
```

The 7974A Tape Diagnostic has no interactive test sections, but the user can select the following test parameters:

- o Enter sections separated by commas
- o Enter steps separated by commas
- o Enter loop count
- o Enter error parameters: error only, error pause, error count
- o Enter logical device number of tape unit under test

If all default parameters have been selected, the diagnostic will respond with a header and welcome message, and if no errors are generated, will output the following message:

```
Section 3 - Indentify (5sec)
End Section 3, ID code of $174 was returned

Section 4 - Loopback (2min)
End Section 4

Section 5 - Poweron Selftest (30secs)
End Section 5

7974A Magnetic Tape Diagnostic Normal Termination
```

HP7976A Magnetic Tape Diagnostic Loader

The HP 7976A Diagnostic Loader may be run in either Auto or Manual mode. To execute the diagnostic loader, perform the following procedure:

```
:HELLO FIELD.SUPPORT,HP32340
:RUN PD470A
or
:RUN PD470A,MANUAL
```

If the Loader is run in Auto mode, minimal user interaction is necessary. In Manual mode the Loader prompts the user for the desired operation:

Routine (RTssrree), Selftest, Loopback, Auto, Exit?

Where:
ss is the section designator in OCTAL
rr is the routine designator in OCTAL
ee is the routine extension field in OCTAL

ADJUSTMENTS

SECTION 6

Adjustment procedures for the power supply are presented in the following section. Part 1 contains adjustments for series 64/68A and Part 2 contains adjustments for series 64,68B/C,70.

SERIES 64/68A/70 Upgrade - PART 1

The following text describes adjustment procedures for power supply 32460A.

VAC TRANSFORMER RESTRAPPING

Check that the system power is strapped for local line power. (Refer to Table 6-1 and Figure 6-1.) If transformer restrapping is required, perform the following mechanical procedure:

WARNING

Primary AC power is exposed when covers are removed. Turn OFF CB1 and CB2, and remove all input power to the system by disconnecting the power cord from the wall receptacle. Failure to comply can result in injury or death!

1. Remove the front panels of the I/O bay.
2. Remove the isolation transformer primary winding end cover plates from each transformer.
3. Restrap the primary windings for local area power as specified in Table 6-1.
4. Ensure that the connectors are tight and no loose strands of wire are protruding from the terminal block.
5. Ensure that resistance between transformer connectors and ground lug measures open (infinite resistance).
6. Reconfigure input VAC rating plates, located below main breaker, to indicate present AC voltage strapping.
7. Remount cover plates of transformer and front panels of I/O bay.

For additional transformer information refer to Figure 6-2 and Figure 6-3.

Table 6-1. Strapping Options (HP 32460A)

VOLTAGE	INPUT	JUMPER	NEUTRAL
120/208	1-5	---	4-8
220/380	1	3-5	7
240/415	1	4-5	8

INPUT TOLERANCE: +6% /-10%

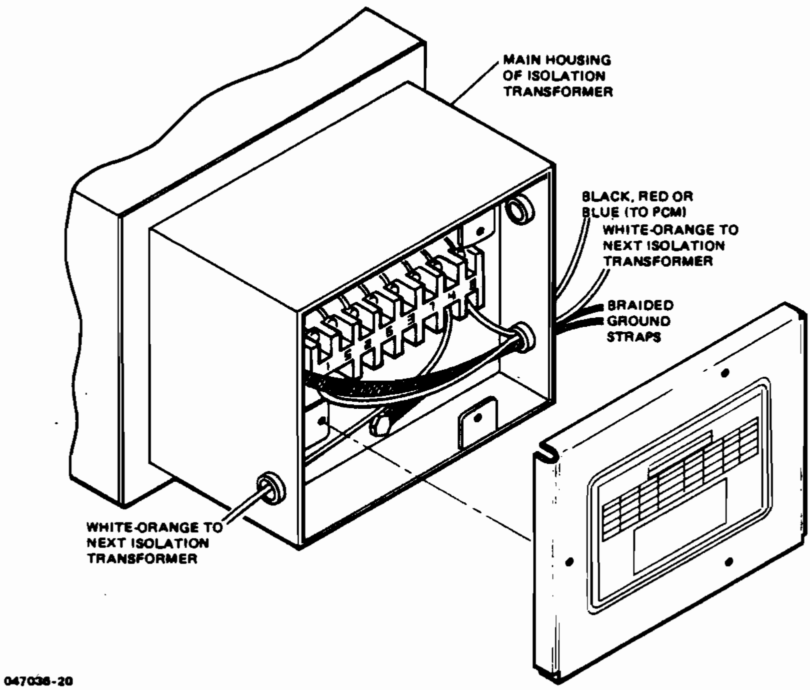
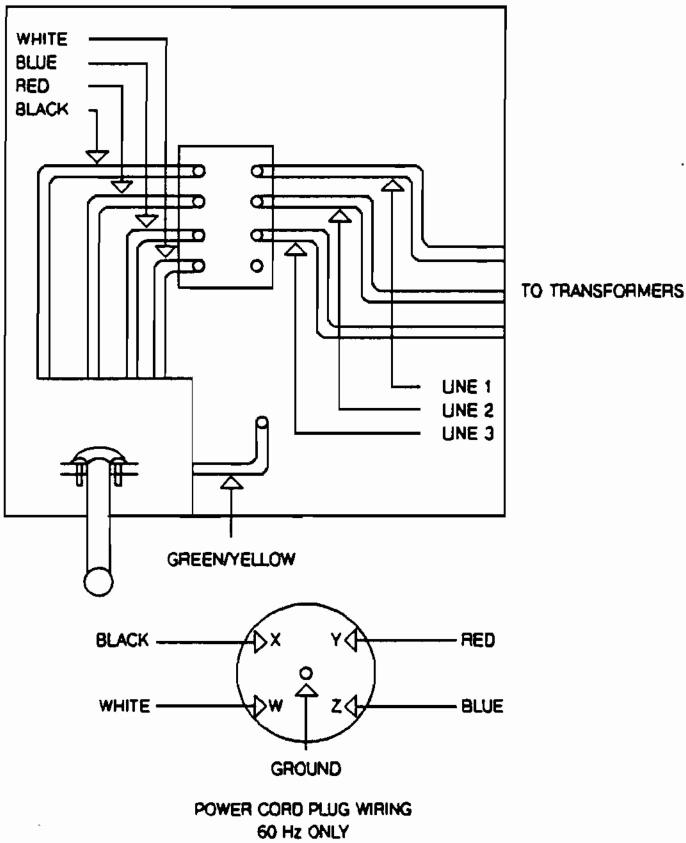


Figure 6-1. Transformer Strapping



WARNING

Hazardous voltages are present when the cover plate is removed. Set branch breaker to OFF. Failure to comply can result in injury or death!

Figure 6-2. Power Line Connection

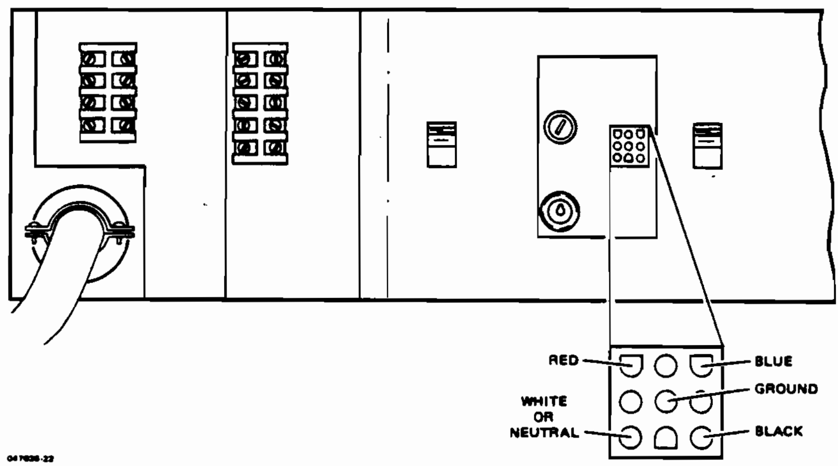


Figure 6-3. Transformer Voltage Test Points (HP 32460A)

ISOLATION AND REPLACEMENT OF A DEFECTIVE PARALLEL POWER SUPPLY

NOTE

The power supplies in the Series 64/68 may require a load to supply voltage.

To isolate a defective parallel power supply, perform the following procedure:

1. Turn off AC power.

2. Disconnect both supplies from their bus bars. A piece of insulating material may be inserted between the bus connections after the screws have been removed.

3. Disconnect BOTH sense leads from both supplies. (See Figure 6-4.)

4. Disconnect the shutdown lead (A1) from both supplies.

5. Measure the voltage output of each supply and replace the defective supply. Connect AC power and current referenced leads to the new supply. DO NOT connect bus bar, sense leads or shutdown leads at this time.

6. Adjust new supply voltages to nominal (rated) value as specified in Table 6-4.

7. Adjust current limit to proper setting as specified in Table 6-4.

8. Turn off AC power and complete connections.

9. Turn on AC and finalize voltage adjustments as outlined in Parallel Power Supply Adjustments procedures.

If problems occur on parallel power supplies, the bus bars on both supplies should be removed, and the sense leads disconnected. The plus sense should be jumped to the plus out and the minus sense to the minus out of the power supply. This will ensure that the good power supply will always come up.

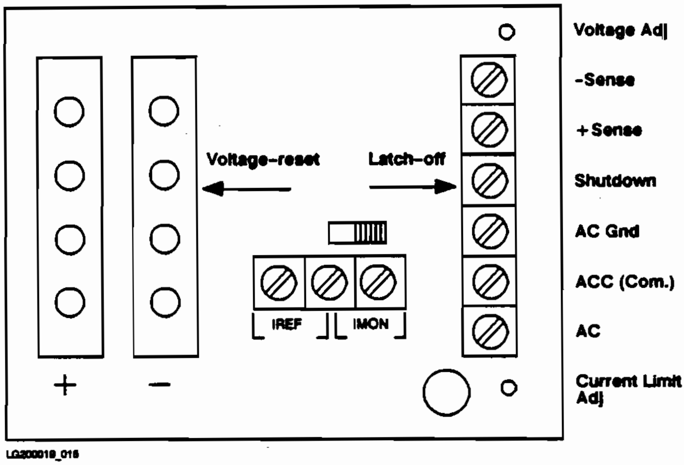


Figure 6-4. Rear View Of Power Supply (HP 32460A)

PSC ADJUSTMENTS

Normally, the PSC should not require adjustment. However, if it is necessary to adjust the PSC, perform the following procedures:

1. Measure the voltage between VREF and ground terminals on the PSC. (See Figure 6-5.) Adjust the VREF ADJ potentiometer to +5.12V. This sets an internal reference voltage on the PSC.

2. Ground ADC CAL. on the PSC. (See Figure 6-5.) The PSC LED display should show two digits. Adjust the ADC ADJ potentiometer so that the LED display toggles between 00 and 01. This adjustment increases the accuracy of the PSC LED display.

PARALLEL POWER SUPPLY ADJUSTMENTS

Following are the procedures for adjusting power supplies 2 and 3, 6 and 7, and (if an auxiliary I/O bay is installed) 8 and 9. If you have a Series 70A with a Power Supply Upgrade for 3 IMBs, an ACDC power supply replaces PS#2 and #3; the procedure for adjusting the ACDC supply is given later in this section.

Adjusting Parallel Power Supplies No. 2 and No. 3

1. Current Limit Pre-Adjustment:

   a. Disable the "DC UV/OV" detection circuitry by installing a jumper from the "UV/OV Disable" terminal on the PSC PCA (located above and to the right of J3) to a ground terminal on the PSC. See Figure 6-5.

   b. Adjust the current limit pots on PS#2 and PS#3 to the fully clockwise position (maximum current).

2. Voltage Adjustment:

   a. Monitor the -5.2 volt sense lines on the CPU backplane with a voltmeter and adjust PS#3 to -5.25 V. (See Figure 6-6 and refer to Table 6-3.)

   NOTE

   Power supplies 2 and 3 are parallel supplies. Therefore, only the more positive supply (the less negative one) will be adjustable.

   If PS#3 is not adjustable, then turn the PS#2 voltage adjust pot clockwise until PS#3 is adjustable to -5.25 V.

   b. Continuing to monitor the -5.2V sense lines, turn the PS#2 voltage adjust pot counter-clockwise to -5.22 V.

3. Current Limit Adjustment:

   a. Place the voltmeter leads across the -5.2V sense lines on PS#2. (See Figure 6-6.)

   b. Adjust the current limit adjustment pot on PS#2 counter-clockwise until -5.2V begins to decay. Backoff the adjustment until -5.2V is steady.

   c. Now adjust the current limit adjustment pot on PS#3 counter-clockwise until -5.2V begins to decay. Backoff the adjustment until -5.2V is steady.

4. Current Limit Check

   a. Measure and record the voltage across the IREF and IMON terminals on PS#2.

   b. Measure and record the voltage across the IREF and IMON terminals on PS#3.

   c. If the IREF/IMON voltage difference between PS#2 and PS#3 is less than 5.00 mv, adjust the current pot on PS#2 until a difference of greater than 5.00 mv is reached.

The voltage and current limit adjustments for PS no. 2 and no. 3 are now complete.

Adjusting Parallel Power Supplies No. 6 and No. 7 (No. 8 and No. 9*)

1. Current Limit Adjustment:

   a. Disable the "DC UV/OV" detection circuitry by installing a jumper from the "UV/OV Disable" terminal on the PSC PCA (located above and to the right of J3) to a ground terminal on the PSC. See Figure 6-5.

   b. Place voltmeter leads across the IREF terminals located on the rear of PS#7. (See Figure 6-4.)

   c. Adjust the current limit adjustment pot to the proper value. (Refer to Table 6-4.)

   d. Place voltmeter leads across the IREF terminals located on the rear of PS#6.

   e. Adjust the current limit adjustment pot to the proper value. (Refer to Table 6-4).

2. Voltage Adjustment:

   a. Place the voltmeter leads on the appropriate sense leads according to which supplies are going to be adjusted.

      For the +5 volt power supplies (no. 6 and no. 7), the sense leads are on J21 connector on the I/O backplane. (See Figure 6-6 and refer to Table 6-3.) Meter leads will remain on the same connection throughout the procedure.

   b. Adjust power supply no. 7 to +4.95 volts. See Figure 6-4 for location of PS voltage adjust pot. Since the most positive supply will determine the bus voltage, if no. 6 is set at a more positive level you will be unable to achieve this; therefore, you may have to adjust no. 6 lower (less positive) than no. 7 and then adjust no. 7.

   c. Adjust power supply no. 6 to +5.00 volts.

   d. Adjust no. 7 to +5.05 volts.

   e. Remove the power supply shutdown disable jumper from the PSC.

The voltage and current limit adjustments for PS no. 6 and no. 7 are now complete.

*Parallel power supplies no. 8 and no. 9, located in auxiliary I/O Bay, are identical to parallel supplies no. 6 and no. 7. (See Figure 6-9.) Repeat above adjustments for parallel power supplies no. 8 and no. 9.

NOTE

Because of the adjustment sensitivity, removing the screwdriver from screw adjustment may cause a slight change in the value. Be sure value is correct.

ADJUSTING POWER SUPPLIES NO. 1, NO. 4 AND NO. 5

1. Current Limit Adjustment:

   a. Disable the "DC UV/OV" detection circuitry by installing a jumper from the "UV/OV Disable" terminal on the PSC PCA (located above and to the right of J3) to a ground terminal on the PSC. See Figure 6-5.

   b. Place the voltmeter leads across the IREF terminals located on the rear of the power supply. (See Figure 6-4.)

   c. Adjust the current limit adjustment pot to the proper value. (Refer to Table 6-4.)

2. Voltage Adjustment:

   a. Place the voltmeter leads on the appropriate sense leads according to which supplies are going to be adjusted. See Figure 6-6 for the location of sense leads and Figure 6-4 for location of voltage adjust pot.

   b. Adjust power supply voltages. (Refer to Table 6-4.)

ADJUSTING ACDC POWER SUPPLY

In Series 70A systems that have had a power supply upgrade for 3 IMBs, a single power supply manufactured by ACDC Electronics takes the place of PS2 and PS3.

1. Current Limit Adjustment: there is no current limit adjustment for this power supply.

2. Voltage Adjustment:

   a. Place test leads on -5.2V sense wires (two lowest wires of upper right board on CPU bay backplane). This is across the red and black twisted pairs of wires.

   b. Adjust potentiometer (below white sense plug on power supply) for a reading of -5.2 Volts (+/- 0.025).

NOTE

With the ACDC power supply, the ground to neutral voltage will be about 53V.

Also, the DCU "LG ST" command and PSC voltmeter function will not return a valid current reading for the ACDC supply. The current values returned for all other system supplies are not affected. Voltage readings for all system supplies (including ACDC) are accurate.

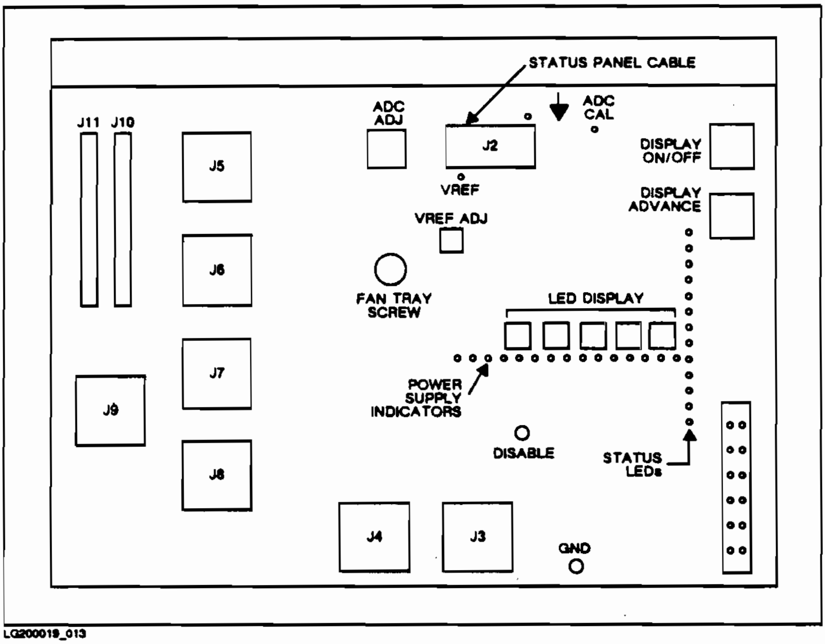


Figure 6-5. Power System Controller (PSC) Layout

Table 6-2. PSC Connections

J1	DCU Signals
J2	SSDP - Power & Indicators
J3	PSC Power
J4	Aux I/O Bay Control
J5	PCM - AC Sense
J6	CPU & I/O Bay Power Supply Voltage Sense & Shutdown
J7	CPU & I/O Bay Power Supply Current Sense
J8	Aux I/O Bay Power Supply Voltage & Current Sense
J9	Current Limit Reference - All Bays
J10	CPU & I/O Bay Test
J11	Aux I/O Bay Test

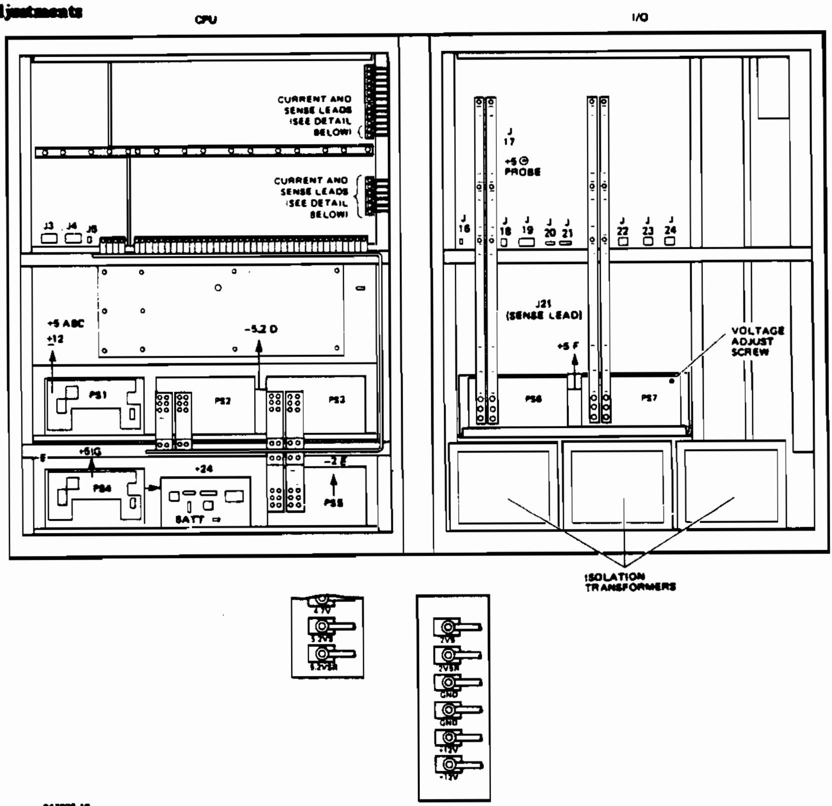


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Figure 6-6. Power Supplies, Sense Leads and Isolation Transformer Location (HP 32460A)

Table 6-3. Voltage Setting/Sense Lead Location

PS1:	+5.05 to 4.98	Memory Backplane (Hole above J4)
	+12.05 to 11.95	I/O Backplane (Test Points): -12V Rht. of J23,
	-12.05 to -11.95	+12V Rht. of J22
PS2:	-5.22	CPU Backplane (Sense & Sense Return Terminals)
PS3:	-5.25	CPU Backplane (Sense & Sense Return Terminals
PS4:	+5.02 to 4.98	Memory Backplane (Hole above J4)
	+28.85 to 28.75	On PS4 (Terminal Screw V1)
PS5:	-2.11 to -2.09	CPU Backplane (Sense & Sense Return Terminals)
PS6:	+5.00	I/O Backplane (J21)
PS7:	+5.05	I/O Backplane (J21)
PS8:	+5.00	Auxiliary I/O Backplane (J21)
PS9:	+5.05	Auxiliary I/O Backplane (J21)

Table 6-4. DC Power Supply Specifications Table

P.S. NO.	NOM.*** VOLT.	OPERATING**** LIMITS UPPER	LOWER	CURRENT LIMIT ADJ. LIMITS LOWER millivolts	UPPER	CONVERSION FACTOR
PS1A	5.00	5.10	4.90	58.75	76.00	1.25mV/Amp .8Amp/mV
PS1B	12.00	12.10	11.90	44.18	49.82	4.75mV/Amp .21Amp/mV
PS1C	-12.00	-12.10	-11.90	44.18	49.82	4.75mV/Amp .21Amp/mV
PS2	-5.22*	- 5.275	- 5.175	ABOVE 65		0.75mV/Amp 1.33Amp/mV
PS2 (Series 70 same)						
PS3	-5.22*	- 5.275	- 5.175	58.00	62.00	0.75mV/Amp 1.33Amp/mV
(w/2 IOAs)	-5.22*	- 5.275	- 5.175	58.00	65.00	0.75mV/Amp 1.33Amp/mV
(w/3 IOAs)	-5.22*	- 5.275	- 5.175	67.00	69.00	0.75mV/Amp 1.33Amp/mV
PS3 (Series 70 same except----->				7.00<Max		
ACDC**	-5.2	-5.225	-5.175	-	-	N/A
PS4A	5.00	5.10	4.90	53.20	58.80	2.35mV/Amp .43Amp/mV
PS4B	28.00	28.90	28.00	34.20	41.80	2.5mV/Amp .4Amp/mV
PS5	-2.1	- 2.12	- 2.08	57.00	67.31	0.56mV/Amp 1.79Amp/mV
PS6	5.05*	5.10	4.80	ABOVE 65		0.75mV/Amp 1.33Amp/mV
PS7	5.05*	5.10	4.80	42.30	47.70	0.75mV/Amp 1.33Amp/mV
PS8	5.05*	5.10	4.80	ABOVE 65		0.75mV/Amp 1.33Amp/mV
PS9	5.05*	5.10	4.80	42.30	47.70	0.75mV/Amp 1.33Amp/mV

*Bus Voltage - not necessarily the supply voltage.
**ACDC PS replaces PS2/PS3 on Series 70A Power Supply Upgrade for 3 IMBs
***Nominal Voltage - rated output of power supply.
****Operating Limits - measured at system backplane.

WARNING

Energy Hazard: 200 amps may be present at power supply output terminals; be extremely cautious not to short them. Shorting these outputs can cause a severe shock resulting in damage to the equipment, permanent injury, or death.

POWER SUPPLY REFERENCE INFORMATION (HP 32460A)

Additional power supply information is contained in Table 6-5 and Figures 6-7 through 6-10.

Table 6-5. Power Supply Applications

POWER SUPPLY NO.	LOCATION
PS1A +5V	MEMORY
PS1B +12V	I/O, DCU, PSC, JUNCTION PANEL
PS1C -12V	I/O, DCU, PSC, JUNCTION PANEL
PS2 -5.22V	CPU, MEMORY, CACHE, DCU, PSC, SSDP
PS3 -5.22V	CPU, MEMORY, CACHE, DCU, PSC, SSDP
PS4A +5V	MEMORY, I/O, DCU, PSC, SSDP
PS4B +28.8V	BATTERY, SSDP
PS5 -2.1V	CPU, MEMORY, CACHE, DCU, PSC
PS6/8 +5.05V	I/O }DCU, IOB, PSC, JUNCTION PANEL, SSDP
PS7/9 +5.05V	I/O }DCU, IOB, PSC, JUNCTION PANEL, SSDP

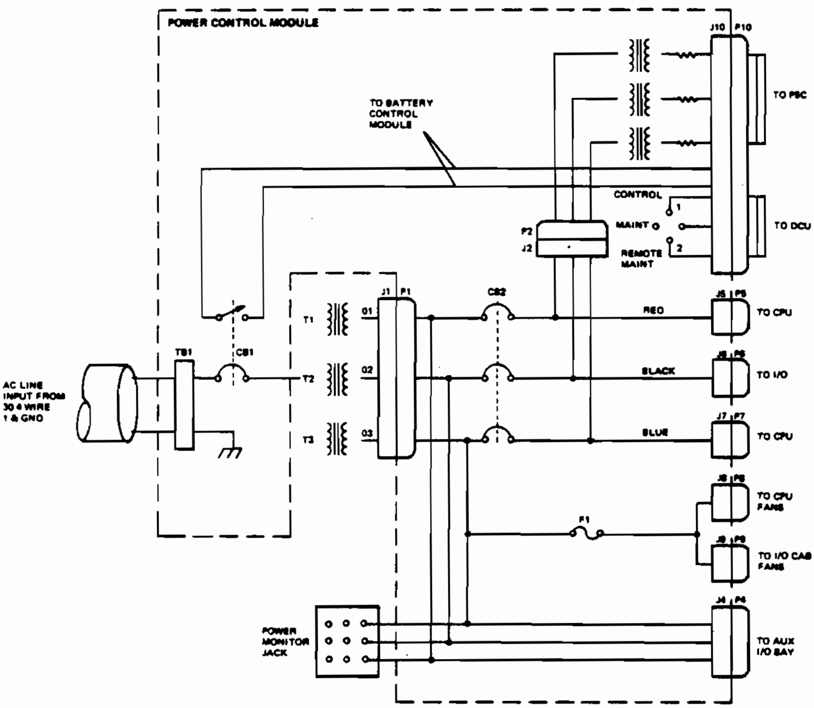
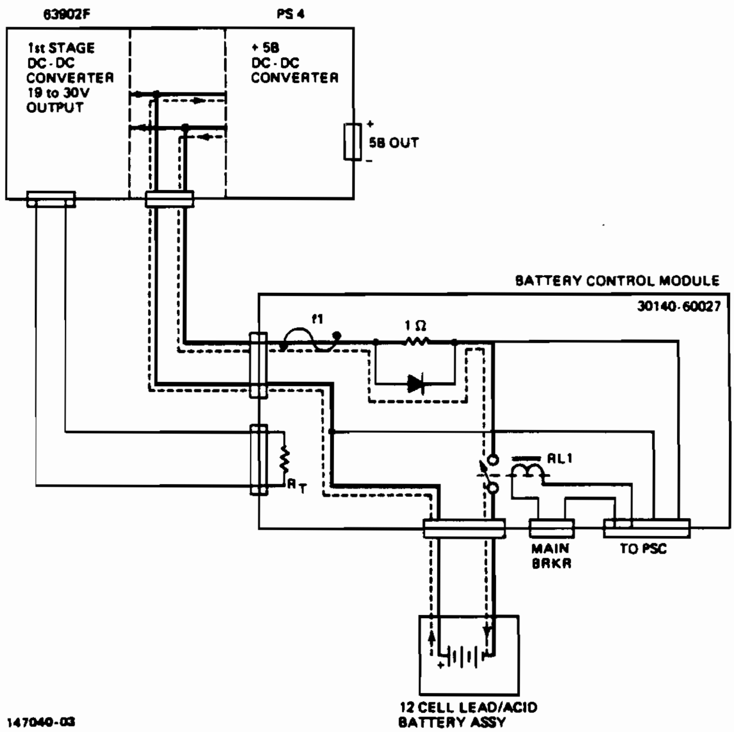


Figure 6-7. AC Distribution (HP 32460A)



Solid line = charge path
Broken line = discharge path

Figure 6-8. Battery Backup System (HP 32460A)

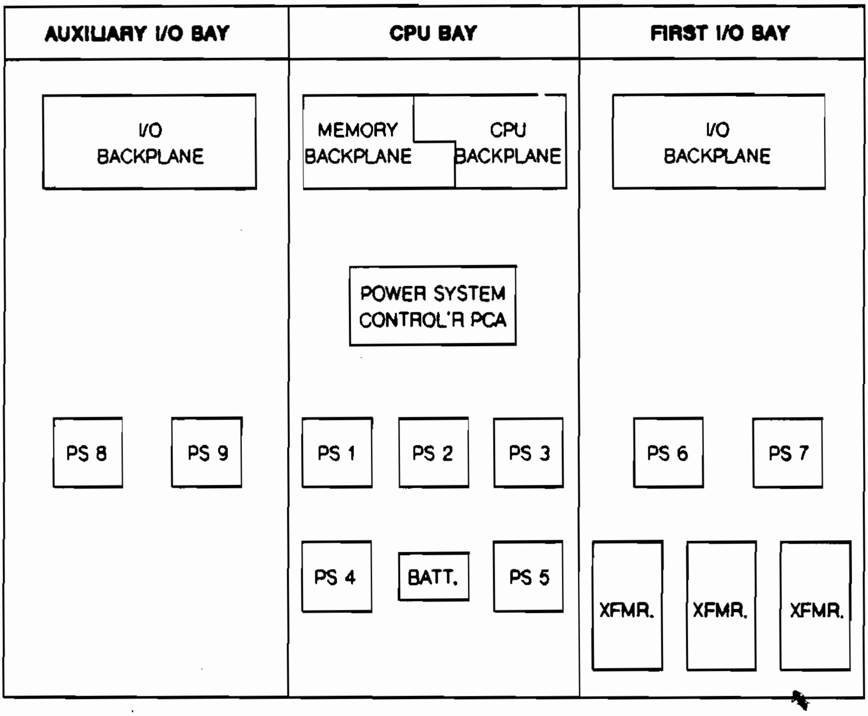


Figure 6-9. Series 64/68A with Auxiliary I/O Bay

Table 6-6. Power Supply Monitor Indicators

LED			LED		
R	Reset		E	Power Supply 5	-2.1V
A	Power Supply 1	+5.0V	F	Power Supply 6/7	+5.0V
B	Power Supply 1	+12V	G	Power Supply 4	BATT
C	Power Supply 1	-12V	H	Power Supply 8/9	+5.0V
D	Power Supply 2/3	-5.2V		(Aux I/O Bay)	

SERIES 64B,68B/C,70 - PART 2

Three types of power systems may be installed in the Series 64B, 68B/C and 70B computers. They are the ITT B 60 Hz, the ITT B 50/60 Hz, the Scott T, and the ACDC. Each power system requires a different AC input voltage. Before installing a replacement AC unit, ensure the new AC unit is the correct one for the site voltage.

AC Strapping on the ITT B

The AC strapping must match local line power. See Figure 6-10 for power line connection information. For ITT B power systems a choice of three pre-strapped AC Units are available. They are:

208VAC/60 Hz	AC Unit PN 0950-1693
380VAC/50 Hz	AC Unit PN 0950-1694
415VAC/50 Hz	AC Unit PN 0950-1695

AC Strapping on the Scott T

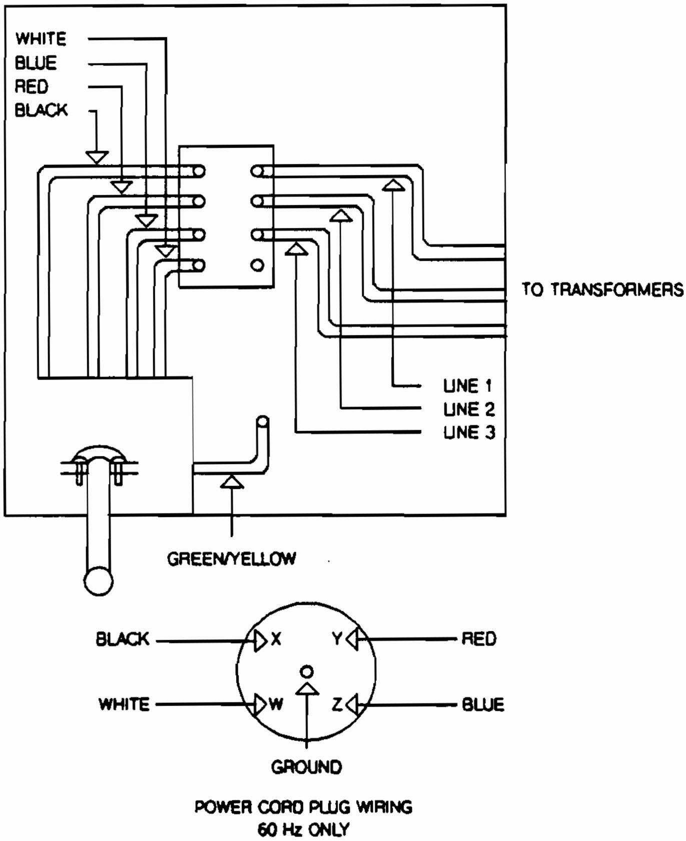
One AC unit exists for the Scott T power system (0950-1796) which can be strapped for use with two sets of AC transformers (60 Hz and 50/60 Hz). The 60 Hz set can only be strapped for 208V/60Hz. The 50/60 Hz set may be strapped for any of the following AC inputs:

208VAC 50/60 Hz
380VAC 50/60 Hz
415VAC 50/60 Hz

Both sets of transformers are shown in figure 6-11. The wires going to the transformers are labeled with either a letter or a number. The labels above the terminal blocks on the transformers correspond to these letters or numbers. Notice that the labels on the 50/60Hz transformers relate to the three possible input voltages. Be sure to use the label that corresponds to the site voltage.

AC Strapping on the ACDC

Refer to Figure 3-12.

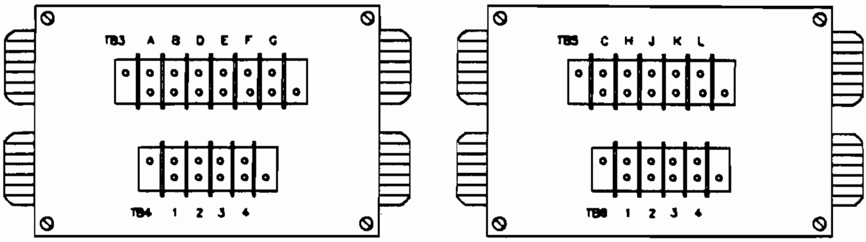


WARNING

Hazardous voltages are present when the cover plate is removed. Set branch breaker to OFF. Failure to comply can result in injury or death!

Figure 6-10. Power Line Connection

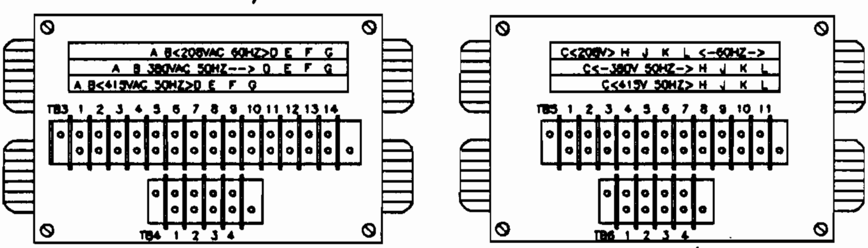
60 Hz Transformer Set



T1
(P/N 9100-4534)

T2
(P/N 9100-4537)

50/60 Hz Transformer Set



T1
50/60 Hz
(P/N 9100-4535)

T2
50/60 Hz
(P/N 9100-4536)

Figure 6-11. Scott T Transformer Sets

SYSTEM STATUS DISPLAY PANEL (SSDP-B)

The following text is a description of the System Status Display Panel (SSDP-B). (See Figure 6-12.)

A-E - DC power module failure.

F - no +5VB is being delivered from module B. However, +28.8V from module B is available.

G - no DCU/PDM communication.

The DCU and PDM PCAs have not communicated for more than ten seconds. Under normal operation the DCU and PDM PCAs perform a handshake every second. During this handshake the DCU checks the system overtemperature signals on the PDM. If an overtemperature condition is detected, the DCU instructs the PDM to shut down the modules. Thus, if the DCU and PDM PCAs cannot communicate, thermal damage may result. If the G LED should turn on, the operating system will continue to function normally. However, eventually, damage may result.

NOTE

During normal system operation, the DCU and PDM need not communicate. However, the PDM must always remain physically connected to the system, it distributes +5VB and +/-12V. This restriction does not apply to the PSC on the HP 32460A.

H - AC unit failure

a. AC Unit rectifier failure. *

b. Fan output power failure (CPU, I/O or AUX I/O BAY) - the system will continue operating until the system overtemperature sensors detect an overtemperature condition.

c. AC Unit Overtemperture - will trip internal breakers located on the left hand side of the AC Unit as observed from the rear. *

* Only a Fan Failure will light the H LED of a Series 70 with a SCOTT T power system.

CAUTION

Warn the customer to pay close attention to the G and H LEDs. If the G or H LED should turn on, the operating system will continue to function normally. However, eventually, damage may result.

CAUTION

If the system is physically moved, a sudden jolt in transit may cause internal AC Unit breakers to trip. This will result in the H LED turning on.

P - no PON signal.

The PDM has detected an AC Unit output to be under voltage (equal to or less than 240V). The AC Unit output should be 300V. An AC undervoltage alarm from the AC Unit will cause the PDM to perform an orderly shutdown and to deactivate the PON signal. This, in turn, will light the P LED on the display panel. No message will appear on the console until the system recovers from the power failure.

R - DCU is in a reset state.

This will occur during an initial powerup sequence and whenever PON signal is inactive. Note that the R LED is not activated during DC power failure.

OVERTEMP - system exhaust temperature equal or greater than 40 degrees centigrade.

The overtemperature LED will light when the overtemperature sensors sense an exhaust temperature equal to or greater than 40 degrees centigrade. This LED will latch on immediately before the orderly shutdown and will remain on until AC power is recycled.

BATTERY - battery charge/discharge level.

The battery LED will flash rapidly when the battery pack is discharging and slowly when the battery pack is charging. Under normal conditions, this LED is off.

REMOTE - remote established.

The remote LED will light once a remote connection has been established.

The right half of the display panel is reserved for a 16-bit CIR and for the CPU macro-run, macro-halt LEDs.

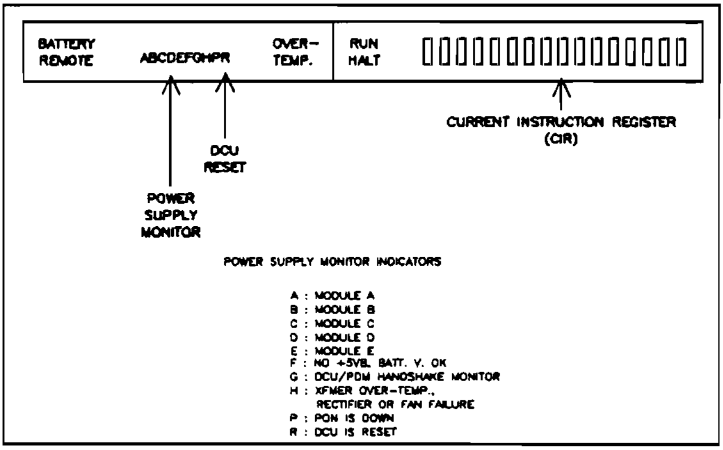


Figure 6-12. System Status Display Panel (SSDP-B)

DC MONITORING - MODULE ALARMS

The HP 32460B, 32468B, 32471A with "B" power system uses six power supplies grouped into four sets to provide DC power. A fifth set, E, exists if an auxiliary I/O bay is installed. Each supply has it own alarms to the PDM. The PDM will logically OR these alarms for all supplies in a given set. The result is that the SSDP-B LED represents the bad module set. This can mean any supply in the set is bad. The status of each power supply in a module set is represented by four LEDs located on the ITT B power modules (see Tables 6-7 and 6-8) or by two LEDs located on the YEW power modules (see Table 6-9). LEDs are configured as follows:

- o ON (This green LED is lighted when the supply is working properly.
- o OV (Overvoltage. This LED is red.) Normally off.
- o UV (Undervoltage. This LED is red.) Normally off.
- o OT (Overtemperature. This LED is red.) Normally off.

Refer to power supply operating limits and applications specified in Tables 6-10 and 6-11.

NOTE

If a supply fails in a parallel pair, the SSDP-B will point to the faulty set. The supply LEDs should point to the faulty supply. However, usually the failed supply will show no LEDs at all while the good supply in the pair will indicate an undervoltage.

Table 6-7. AC Power Module Failure Analysis

RFA	PFA	FA	OT	COMMENTS
1	5	4	3	Pin numbers of J5 on AC Unit (Pin 2=Grnd)
12	19	10	11	Pin numbers of J4 on PDM (Pin 7=Grnd)
1	1	1	1	(1) No power to unit. (2) Overtemperature in the control module.
1	1	1	0	Two rectifier failures.
1	1	0	1	Not possible.
1	1	0	0	Not possible.
1	0	1	1	Ferro overtemperature.
1	0	1	0	(1) Single rectifier failure. (2) Loss of one AC phase.
1	0	0	1	Not possible.
1	0	0	0	Not possible.
0	1	1	1	Not possible.
0	1	1	0	Multiple fault, fan alarm plus loss of line (Momentary).
0	1	0	1	Not possible.
0	1	0	0	Loss of line (Momentary).
0	0	1	0	Fan alarm.
0	0	0	1	Not possible.
0	0	0	0	Unit OK.

RFA	RECTIFIER ALARM	PIN 1 J5 AC UNIT	PIN 12 J4 PDM	0=TTL +0V
OT	OVERTEMP	PIN 3 " "	PIN 11 " "	1=TTL +5V
FA	FAN ALARM	PIN 4 " "	PIN 10 " "	
SG	SIG GROUND	PIN 2 " "	PIN 7 " "	"Not possible"
PFA	POWERFAIL ALARM	PIN 5 " "	PIN 19 " "	is probably a
PFAR	PFA RETURN	PIN 6 " "	PIN 15 " "	bad AC Unit

(When signals RFA, FA or OT are active, they cause the H LED to light on the SSDP-8.)

Table 6-8. Using LEDS to Analyze Failures in Power Supply Modules A-E*

ON	OV	UV	OT	COMMENTS
0	0	0	0	No power (1) Unit not connected (2) Blown input fuse
0	0	0	1	Not possible
0	0	1	0	(1) Unit latched off due to output undervoltage (2) Converter shutdown signal "CS" present
0	0	1	1	Unit latched off due to overtemperature
0	1	0	0	Not possible
0	1	0	1	Not possible
0	1	1	0	(1) Unit latched off due to output overvoltage (2) Connector interlock open
0	1	1	1	Overvoltage occurred during overtemperature timeout Not probable
1	0	0	0	Unit OK (1) Output above undervoltage (2) Output below overvoltage (3) Temperature below limit (4) No "CS" signal present
1	0	0	1	Not possible
1	0	1	0	Not possible
1	0	1	1	Not possible
1	1	X	X	Not possible
1	X	X	X	Not possible

0 = Lamp "OFF" for "ON", "OV", "UV", "OT"

1 = LAmp "ON" for "ON", "OV", "UV", "OT"

X = Don't care

Not possible = Fault of alarm circuitry
*E — located in Aux I/O Bay

The YEW Power Modules are non-exchange assemblies, and any failing module (ITT or YEW) must be discarded at the local office.

The YEW Power Modules have two LEDs, one green and one red. Table 6-9 describes the function of the LEDs.

Table 6-9. LEDs on YEW Power Modules

Green LED	Red LED	Indication
On	Off	Normal operation
On	On	Should never occur
Off	Off	No input power of fault module
Off	On	Faulty module

NOTE

Flashing or blinking green LED indicates the supply has been shut off remotely.

POWER SUPPLY REMOVAL/REPLACEMENT

To remove a power supply, perform the following procedure:

1. Turn off AC power.
2. Remove front and rear panels.
3. Remove all wires connected to supply.
4. Using a 7/16-inch wrench, remove the two front bolts that attach the power supply to the bus bar.
5. Remove two screws from the rear fastening of the supply and slide the supply out from the rear.
6. Install new power supply module; no adjustments are required.

WARNING

Wait at least 15 sec. after removing AC power before connecting or disconnecting high voltage cables to power supplies. Check to see if power module's LEDs are off before removing or connecting cables. Failure to comply can result in injury or death!

POWER SUPPLY OPERATING LIMITS

Additional power supply information is contained in Tables 6-10 and 6-11 and Figures 6-13 through 6-15.

These supplies do not require adjustments.

Table 6-10. Power Supply Operating Limits

Module Set of Supply	Nominal* Voltage	Operational Limits** Lower	Operational Limits** Upper	Voltage Latch Off Under	Voltage Latch Off Over
A	-5.225V	-5.175V	-5.275V	-3.8V	-6.8V
B	+4.95V	+4.90V	+5.40V	+3.5V	+6.6V
B	+28.5V	+28.2V	+28.8V	+15V	+33V
C	-2.10V	-2.08V	-2.12V	-1.2V	-2.8V
C	+12.0V	+11.8V	+12.2V	+9.5V	+14.7V
C	-12.0V	-11.8V	-12.2V	-9.5V	-14.7V
D & E***	+5.10V	+5.05V	+5.15V	+3.6V	+6.6V

* Nominal Voltage - rated output of power supply
** Operating Limits - measured at system backplane
*** E - located in Aux I/O Bay

Table 6-11. Power Supply Applications

MODULE SET	LOCATION	HOW MANY SUPPLIES PER MODULE
A	Memory, CPU, DCU, PDM, SSDP-B	2
B	Memory, DCU, PDM, I/O, SSDP-B	1
C(-2.1V)	Memory, CPU, DCU, PDM	1
C(+-12V)	DCU, PDM, I/O, Junct. Panel	
D, E	Memory,DCU,PDM,I/O,Junct Panel, IOB, SSDP-B	2

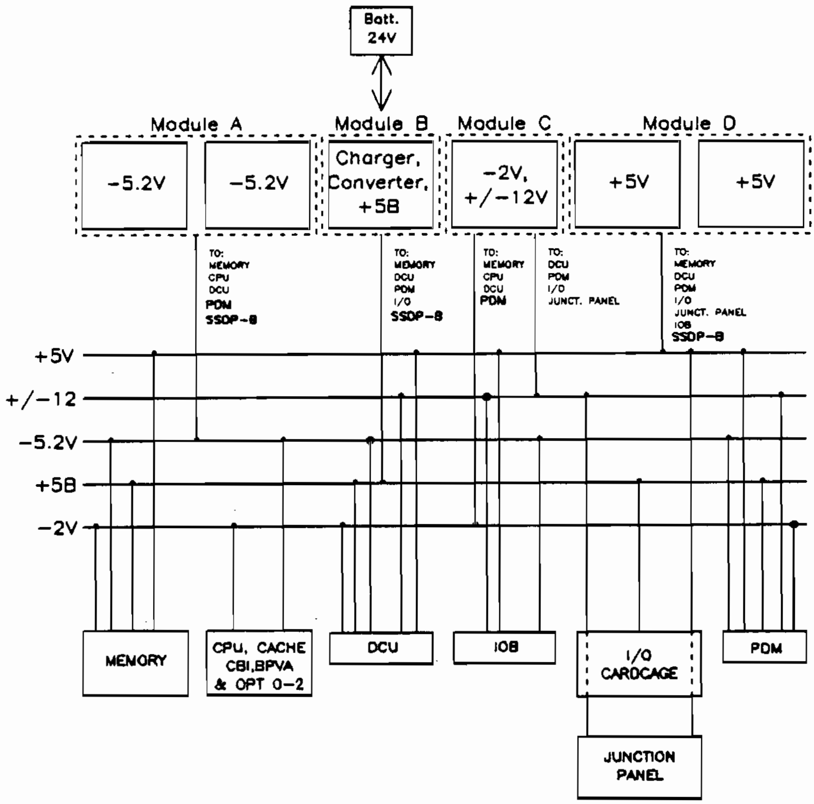


Figure 6-13. DC Power Distribution

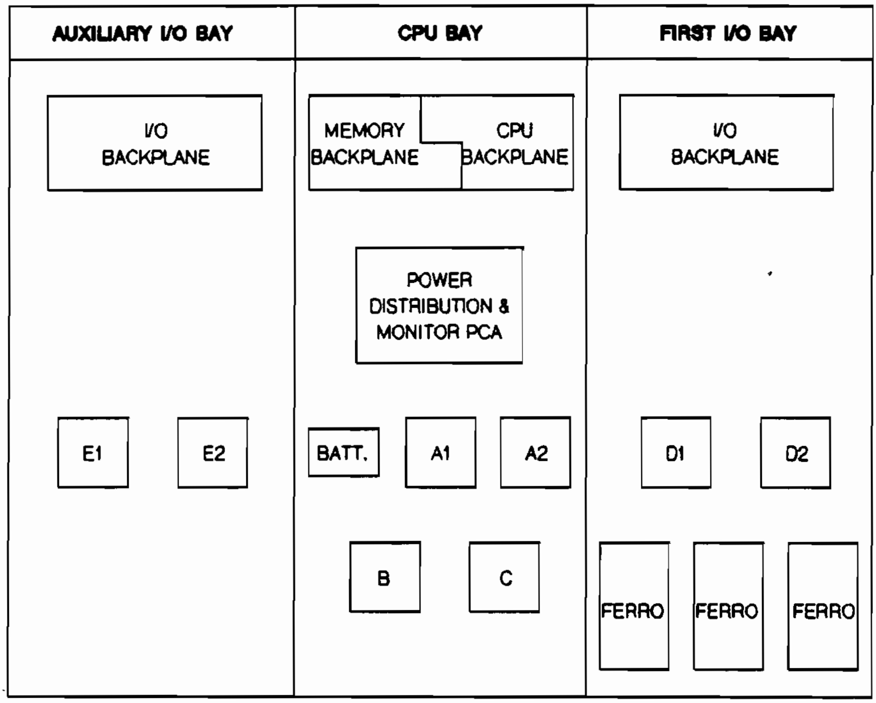


Figure 6-14. Series 68B/C with Auxiliary I/O Bay (ITT B Power System)

Table 6-12. Power Supply Monitor Indicators (SSDP-B)

LED		LED	
A	Module A	G	DCU/PDM Handshake Monitor
B	Module B	H	XFMER Over-Temp; Recifier or Fan Failure
C	Module C	P	PON Is Down
D	Module D	R	DCU Is Reset
E	Module E (Aux I/O Bay)		
F	No +5VB, Batt V Okay		

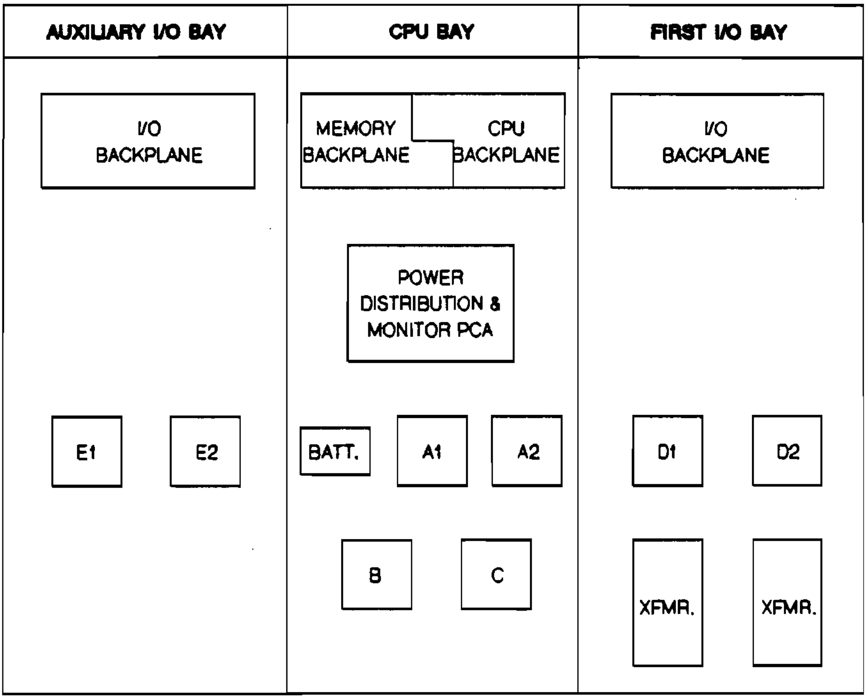


Figure 6-15. Series 64B,68B/C,70 with Auxiliary I/O Bay
(SCOTT T & ACDC Power System)

PERIPHERALS

SECTION 7

This section describes the HP-IB devices supported on the Series 64/68/70.

WARNING

Hazardous voltages exist in the processor and peripheral cabinets when AC power is connected. Do not connect the processor or any peripheral to AC power until all system components have been installed and interconnections have been made. Failure to comply can result in injury or death!

PERIPHERAL DEVICES

Table 7-1 lists supported peripherals. Figure 7-1 shows typical HP-IB cabling.

Table 7-1. HP 3000 64/68/70 Peripheral Devices

Model Number	Channel Type	HP-IB Loads	Internal Cable Length (meters)	IOMAP Identity Code	Remarks
Line Printers					
2562C/2563A/B/C	INP-GIC-ATP	1	1	!2101	HS
2564B/64C/67B/67C	GIC-ATP	1	0	!2101	HS
2565A/66A/66B/66C	GIC	1	0	!2101	HS
2608A opt. 346	GIC	1	0	!2001	NOT HS
2608S	INP-GIC	2	1	!2101	HS, do not mix with 7906/20/25
2609A Interface for 2611/13/17/19	GIC	1	1	!200A	
2610A/14A/18A	GIC				
2611A/17A/19A with opt. 364	GIC				
Page Printers					
2680A opt. 364	GIC	4	1	!2004	HS
2686A (RS-232-C)	ATP				
2686A opt. 200	ATP				
2687A (RS-232-C)	ATP				
2686A/87A/88A	GIC	4	1	!2004	HS*
Serial Printers					
2601A/02A/03A (RS-232-C)	ATP				
2932A/34A (RS-232-C)	ATP				
2631B dot matrix (RS-232-C)	ATP				
2563B/C	ATP				
2564B/C	ATP				
LaserJet Series II	ATP				
LaserJet IID	ATP				
LaserJet III					

Remark Codes:

CS80 = Device selftest/loopback can be initiated using CS80DIAG.
HS = High speed device, attach only to high speed GIC.
HS* = Low speed if connected via HP-IB Extender 337203A opt. 10.
Not HS = Device cannot be attached to high speed GIC.
DG = Device requires a dedicated GIC.
DL = Requires a dedicated line conditioner, HP 35030A or equivalent.
V = Variable load

LG200019_004

Table 7-1. HP 3000 64/68/70 Peripheral Devices (con't)

Model Number	Channel Type	HP-IB Loads	Internal Cable Length (meters)	IOMAP Identity Code	Remarks
Disc Drives					
7911P	GIC	1	1	!0204	HS, CS80
7912P	GIC	1	1	!0208	HS, CS80
7914	GIC	1	1	!020A	HS, CS80
7920M/S	GIC	1	1	!FF03	HS
7925M/S	GIC	1	1	!FF04	HS
13037C Controller for 7920/25	GIC	1	0.75	!0002	HS, No Selftest
7933A/C/H	GIC	1	0	!0212	HS, CS80
7935A/C/H	GIC	1	0	!0212	HS, CS80
7936H/XP	GIC	1	0	!0215	HS, CS80
7937H/XP	GIC	1	0	!0214	HS, CS80
7957A	GIC	1	0	!022A	HS, CS80
7958A	GIC	1	0	!022B	HS, CS80
7958B	GIC	1	0	!022D	HS, CS80
7959B	GIC	1		!022E	HS, CS80
7961B	GIC	1		!022C	HS, CS80
7962B/M	GIC	1		!022E	HS, CS80
7963B/M	GIC	1		!022D	HS, CS80
C1707A	GIC	1	0	!0250	HS
C2200A/02A/03A	GIC	1			HS, CS80
9895A (floppy)	GIC	1			DG, Low Speed
Tape Drives					
7970E (Slave)	N/A	-	-		
7970E (Master)	GIC	1	0	!0183	DG, No Selftest
7974A	GIC	1	1	!0174	HS
7976A opt. 616	GIC	2	2	!0176	HS
7978A/B	GIC	1	0	!0178	HS
7979A	GIC	v		!0179	
7980A/XC	GIC	v		!0180	
9144A/B	GIC	1	0	!0260	HS, CS80
9145A/S		1		!0268	
C1511A	GIC	1			
Integrated Cartridge Tape Unit (ICTU) opt. 100 with ICTU opt. 140 w/o ICTU	GIC	1	0	!0240	DG, CS80
35401 Multicartridge	GIC	1	0	!0270	HS, CS80
Other					
2893A Card Reader	GIC	1	0	!0101	DG, DL
Terminals					Specified by IND
3075A/76A/77A Data Collection Terminals	ATP				
26075A Multiple Sys. Access Selec.	GIC	0			DG
30020B INP	GIC	1	1	!4003	Low Speed
30106A Card Reader	GIC	1	0		DG, Low Speed DG
37203A HP-IB Ext.	GIC	1			DG
37204B HP-IB Ext.	GIC	0	2		DG
GIC used as device	GIC	7	0	!6000	For testing only

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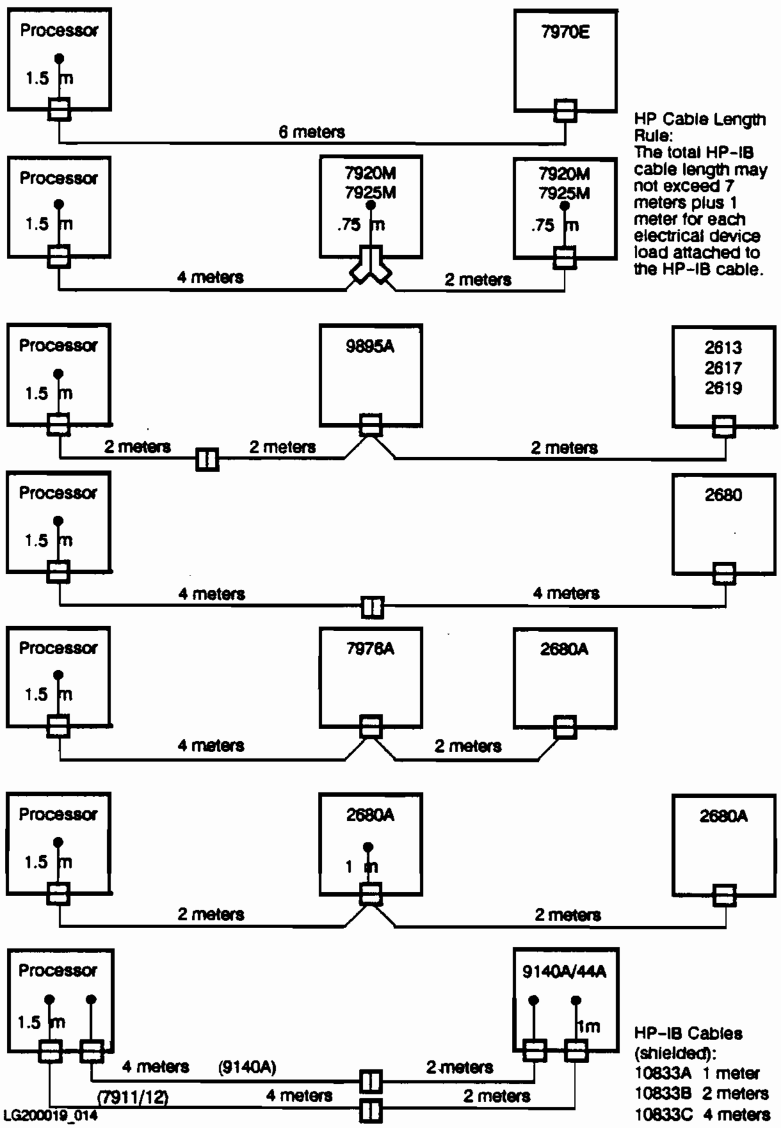


Figure 7-1. Internal HP-IB Cable Configurations

CS80 Status Word Formats

A 20-byte status report is returned with the Request Status command and contains a summary of all transactions since the last report was cleared.

Refer to Table 7-2 for decoding the status bytes. The left column decodes the first 2 bytes (identification field). The next 4 columns decode the 8 bytes of the error reporting field. The last column describes the final 10 bytes of the parameter field.

Notes:

1. The 8-byte error reporting field contains Reject Errors, Fault Errors, Access Errors, and Information Errors. These are shown in Table 7-2 in the CE Service Handbook for 79XX Series Disc Drives, P/N 5957-4227.

2. Use Set Status Mask command to prevent setting hard errors -- insert one's in the bit positions corresponding to errors in the Request Status report. (Fault errors cannot be masked.)

3. Status can also be returned with LISTLOG2.

4. For more information on commands, see CS/80 Instruction Set Programming Manual, P/N 5955-3442.

Table 7-2. Request Status Summary

ERROR REPORTING FIELDS [1]

Identification Errors Field	Reject Errors Field	Fault Errors Field[2]
<VVVVUUUU> <SS SS SS SS>	0 7 8 15 <0 0 2 0 0 5 6 7> <8 9 10 0 12 0 0 0>	16 23 24 <0 17 0 19 0 0 22 0> <24 0 26 27 28 0 30 31>
VVVV = Volume Number UUUU = Unit Number SSSSSSSS = Value of the lowest numbered unit with status pending (all ones if no units have status pending)	2 = **CHANNEL PARITY ERROR** A channel command was received without odd parity. 5 = **ILLEGAL OPCODE** An unrecognizable opcode was received. 6 = **MODULE ADDRESSING** An illegal volume or unit number was specified for this device. 7 = **ADDRESS BOUNDS** The target address has exceeded the bounds for this device. 8 = **PARAMETER BOUNDS** A parameter (other than unit, volume, or target address) is not allowed for this device. 9 = **ILLEGAL PARAMETER** A parameter field was the wrong length for the opcade preceding it. 10 = **MESSAGE SEQUENCE** The message sequence has been violated. (Error suppressed if any reject or fault errors have occurred prior to sequence error.) 12 = **MESSAGE LENGTH** The total length of the execution message differs from the current default value.	17 = **CROSS-UNIT**[3] An error has occurred during a Copy Data operation. 19 = **CONTROLLER FAULT** A hardware fault occurred in the controller. 22 = **UNIT FAULT** A hardware fault has occurred in the unit addressed. 24 = **DIAGNOSTIC RESULT**[3] The hardware failed the diagnostic indicated in the parameter field. 26-28 = **RELEASE REQUIRED** This command cannot be executed until after release is granted to the device. Device requires release for indicated reason. 26 = **OPERATOR REQUEST** Release required for operator request (e.g. load/unload, restore). 27 = **DIAGNOSTIC REQUEST** Release required for diagnostics initiated from control panel (e.g. HIO, self test). 28 = **INTERNAL MAINTENANCE** Release required for internal maintenance (e.g. head alignment, error log). 30 = **POWER FAIL** The power to the unit failed, a diagnostic destroyed configuration, or a pack was loaded. Device should be reconfigured. 31 = **RESTRANSMIT** The preceding transactic should be retried.

Notes:

1. Error bit positions correspond to bit positions in Set Status Mask command. A "1" indicates presence of an error. Unused bit positions must be zeros.
2. All Fault Errors are unmaskable.
3. Error uses parameter field.
4. • Parameter field configuration is dependent on reported errors.
   • Highest priority is given to lowest numbered errors.
   • Masked errors relinquish their priority.

Table 7-2. Request Status Summary (Cont'd)

ERROR REPORTING FIELDS [1]

ACCESS ERRORS FIELD	INFORMATION ERRORS FIELD	PARAMETER FIELD [4]
32 ... 39 40 ... 47 <32 33 34 35 36 37 0 0> <40 41 0 43 44 0 0 0>	48 ... 55 56 ... 63 <48 49 50 51 52 0 0 55> <0 57 58 59 0 61 0 0>	<P1>..........<P10>
32 = ILLEGAL PARALLEL OPERATION The requested operation cannot be executed in parallel with some other operation(s) currently in progress. **33 = UNINITIALIZED MEDIA** The host attempted to access unformatted media, or unusable media has been loaded. **34 = NO SPARES AVAILABLE** Spare Block cannot be executed due to lack of spare media. **35 = NOT READY** The selected unit is not ready for access at this time (e.g. heads or media not yet fully loaded). **36 = WRITE PROTECT** The selected volume is write protected. **37 = NO DATA FOUND** A block accessed during a read has not been written. **40 = UNRECOVERABLE DATA OVERFLOW** The previous transaction generated more than 1 unrecoverable data error. The entire transfer should be considered in error. **41 = UNRECOVERABLE DATA [3]** Unrecoverable data at indicated block(s). **43 = END OF FILE** End of file encountered on file structure device. **44 = END OF VOLUME** The host attempted to access across a volume boundry. * EXCEPTIONS FOR HP 794X.	**48–50 = REQUEST RELEASE [3]** Device requests release for indicated reason. **48 = OPERATOR REQUEST [3]** Release requested for operator request (e.g. load/unload, restore). **49 = DIAGNOSTIC REQUEST [3]** Release request initiated from diagnostic control panel (e.g. HIO, self test). **50 = INTERNAL MAINTENANCE [3]** Release requested for internal maintenance (e.g. head alignment, error log). **51 = MEDIA WEAR** Only one spare track (disc) or one spare block (tape). **52 = LATENCY INDUCED** A latency was induced during the transfer due to slow transfer rate or seek retry. **55 = AUTO SPARING INVOKED** A defective block has been automatically spared by the device. **57 = RECOVERABLE DATA OVERFLOW** The previous transaction generated more than 1 recoverable data error. **58 = MARGINAL DATA [3]** Data was recovered, but with difficulty. **59 = RECOVERABLE DATA [3]** A latency was introduced in order to correct a data error. **61 = MAINTENANCE TRACK OVERFLOW [3]** Error and fault log area is full.	No errors: P1 thru P6 indicate new Target Addr. The address format, which is used any time P1 thru P6 contain addr. information is defined by the Set Return Addressing Command. No Errors: P7 thru P10 contain run-time drive error codes (DERRORS) except after a Spare Block command. The errors are arranged chronologically. P7 contains the most recent of the four errors recorded. P10 contains the oldest of the four recorded. Note: Error codes 40H and CBH will always be followed by a single byte containing fault latch information. After a **Spare Block** command, P1 thru P6 contain the beginning address of the reformatted area. (Disc operation only). After a **Spare Block** command, P7 thru P10 indicate the length in blocks of the reformatted area. The length is a four-byte unsigned binary number. (Disc operation only) Error Bit No. 17 **Cross-unit:** P1 through P6 contain the encoded values of each unit which has experienced an error. A byte of all ones indicates no additonal units. Error Bit No. 24 **Diagnostic Results:** P1 through P6* contain the following information: P1= most suspect component P2= next most suspect component P3=test error (TERROR) associated with P1 P4=test error (TERROR) associated with P2 P5–P6 = not used P7–P10 contain DERROR information (format described above) Error Bit No. 41 **Unrecoverable Data:** P1 through P6 indicate address of bad block. Error Bit No. 48 – No. 50 **Request Release:** P1 through P6 contain the encoded values of each unit requesting release. A byte of all ones indicates no additional units. Error Bit No. 58 **Marginal Data:** P1 through P6 indicate address of the marginal block. Error Bit No. 59 **Recoverable Data:** P1 through P6 indicate address of recoverable block.

HP 9895A FLEXIBLE DISC UNIT

Information for the HP 9895A Flexible Disc Unit is contained in Figures 7-2 and 7-3 and Table 7-3.

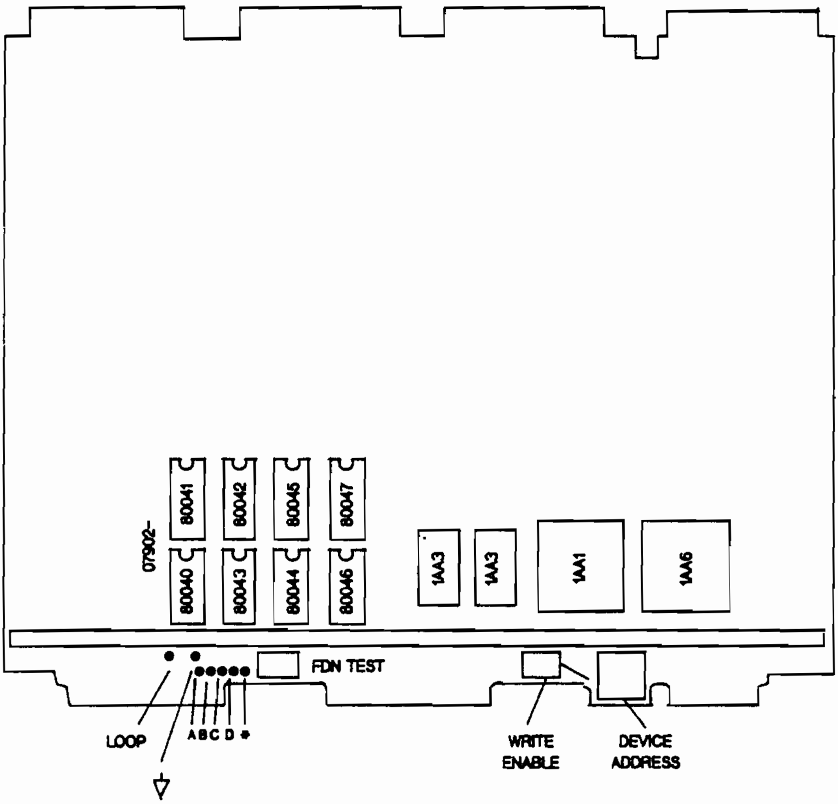


Figure 7-2. HP 9895A FDU Controller

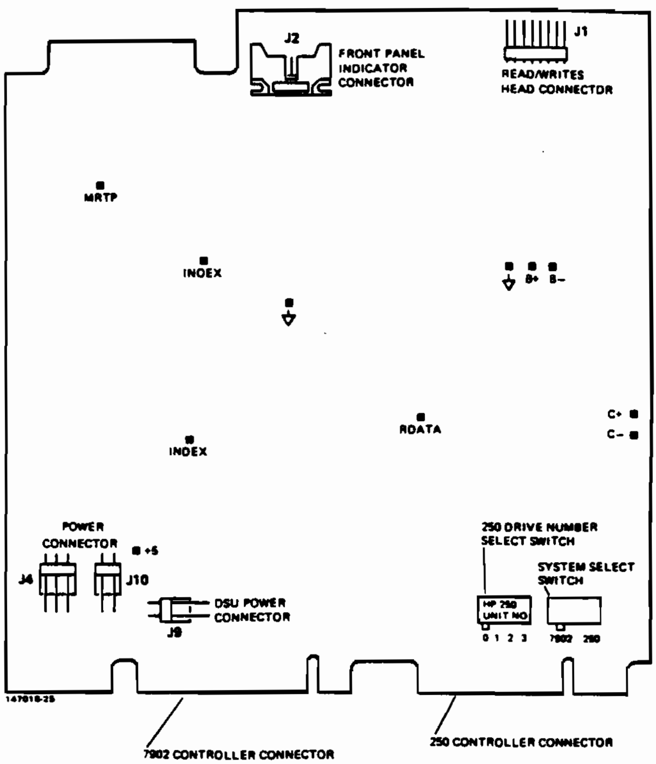


Figure 7-3. HP 9895A Drive Electronics PCA

Table 7-3. HP 9895A Controller Selftests

A	B	C	D	*	Controller Status
0	0	0	1	0	Polling drive
0	0	1	0	0	Transfer byte(s) to HP-IB
0	0	1	1	0	Receive byte(s) from HP-IB
0	1	0	0	0	Status operation
0	1	0	1	0	Head load
0	1	1	0	0	Release drive
0	1	1	1	0	Formatting
1	0	0	0	0	Main loop, DSJ=0 (no error)
1	0	0	1	0	Main loop, DSJ=1 (error)
1	0	1	0	0	Main loop, DSJ=2 (power on)
1	0	1	1	0	Main loop, DSJ=3 (HP-IB parity error)
1	1	0	0	0	Verify operation
1	1	0	1	0	Seeking
1	1	1	0	0	Write to disc
1	1	1	1	0	Read from disc
0	0	0	0	1	No errors
0	0	0	1	1	Left byte (most significant) of ROM checksum of ROM locations F800-FFFF
0	0	1	0	1	Right byte of ROM checksum of locations F800-FFF
0	0	1	1	1	Left byte (most significant) of ROM locations F000-F7FF
0	1	0	0	1	Right byte of ROM checksum of locations F000-F7FF
0	1	0	1	1	Left byte RAM pattern failure
0	1	1	0	1	Right byte RAM pattern failure
0	1	1	1	1	PHI offline test error
1	0	0	0	1	Controller timeout or overrun failure
1	0	0	1	1	Controller data loop test failure
1	0	1	0	1	CRC chip test failure
1	0	1	1	1	Drive select/seek test failure
1	1	0	0	1	Rotational timing test failure
1	1	0	1	1	Write test failure, cannot write
1	1	1	0	1	Write/read test failure, unsuccessful read
1	1	1	1	1	MCC system failure

HP 9895A Status Word Formats

Refer to Table 7-4 for a description of the bit definitions for status words 1-2 and see Figure 7-4 for sector recording formats. Figures 7-5 and 7-6 illustrate system disc HP-IB device select switch and 7920/25 disc cabling.

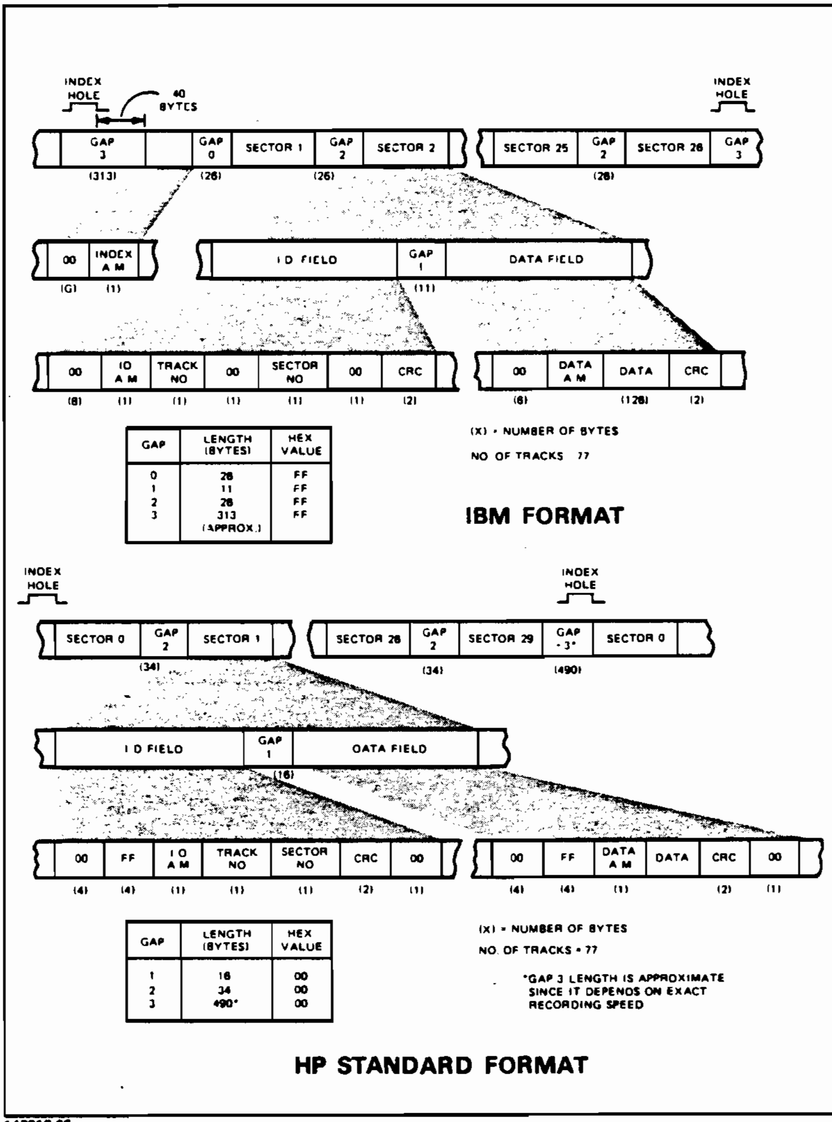
Table 7-4. HP 9895A Status Bit Definitions

Status Word No. 1

```
+------------------------------------------------------------+
|        Word One          |            Word Two             |
|------------------------------------------------------------|
| 0  1  2  3  4  5  6  7   |  8  9  10  11  12  13  14  15   |
|------------------------------------------------------------|
| 0  0  D  (  S1 Field)    |        Unit Number              |
|------------------------------------------------------------|
|        |                                                   |
|        |                                                   |
|        Defective bit                                      |
|                                                            |
|S1 Field: !00 . . . Normal completion                       |
|          !01 . . . Illegal opcode                          |
|          !07 . . . Cylinder compare error                  |
|          !08 . . . Uncorrectable data error                |
|          !09 . . . Sector compare error                    |
|          !0A . . . I/O program error                       |
|          !11 . . . Defective cylinder/sector               |
|          !12 . . . Retryable hardware error                |
|          !13 . . . Status 2 error (see status word 2)      |
|          !1F . . . Seek complete or drive error occurred   |
+------------------------------------------------------------+
```

Status Word No.2

```
+-------------------------------------------------------------+
|        Word One          |            Word Two              |
|-------------------------------------------------------------|
| 0  1  2  3  4  5  6  7   |  8  9  10  11  12  13  14  15    |
|-------------------------------------------------------------|
| X  0  0  (Diskette    )  |  X  X  0   X   X   X   X   X     |
|-------------------------------------------------------------|
|  |Diskette: 00-Empty drive |  |      |   |   |   |   |     |
|  |          02-Never occurs|  |      |   |   |   |  Busy*  |
|  |          04-HP Emt      |  |      |   |   |  Not Ready* |
|  |          10-IBM Emt     |  |      |   |  Seek check     |
|  |                         |  |      |  1st Status         |
|  |                         |  |   Drive Fault              |
|  |                         | Write Protect                 |
|  |                     Attention                           |
| On if bits 11, 13, 14, or 15 are on.                        |
| *Bits 14-15: 00-Ready                                       |
|              01-Never occurs                                |
|              10-No drive connected                          |
|              11-No diskette in drive                        |
+-------------------------------------------------------------+
```



GAP	LENGTH (BYTES)	HEX VALUE
0	26	FF
1	11	FF
2	26	FF
3	313 (APPROX.)	FF

GAP	LENGTH (BYTES)	HEX VALUE
1	16	00
2	34	00
3	490*	00

Figure 7-4. Sector Recording Formats

HP 7906/20/25

Refer to Table 7-5 for a description of the bit definitions for status words 1 and 2 and Table 7-6 for a definition of controller internal names.

Table 7-5. HP 7906/20/25 Status Bit Definitions

```
                      Status Word No.1
 --------------------------------------------------------
 | 0| 1| 2| 3  4  5  6  7| 8  9  10  11| 12  13  14  15 |
 |-------------------------------------------------------|
 | S| P| D| T  S  T  A  T| X  X   X   X|  U   N   I   T |
 |-------------------------------------------------------
 | |  |  |     |              |              |          |
 | |  |  |     |          Not Used     Unit number of  |
 | |  |  |  *Encoded termination statue current drive  |
 | |  |  |                                              |
 | |  |  ---Track is defective if set.                  |
 | |  |                                                 |
 | |  .------Track is protected if set.                 |
 | |                                                    |
 | ---------Track is spare if set.                      |
 +------------------------------------------------------+
```

```
                      Status Word No.2
 ----------------------------------------------------------------
 | 0 | 1   2   3   4   5   6   7 | 8 | 9 |10 |11 |12 |13 |14 |15|
 |---------------------------------------------------------------|
 | E | D   R   T   Y   P   E   X | A | P | F |DF |FS |SC |NR | B|
 ----------------------------------------------------------------|
 | |   Drive Type*_|             |   |   |   |   |   |   |   ||
 | |___ Error Flg*               |   |   |   |   |   |   |   ||
 |                 Attention---------    |   |   |   |   |   ||
 |                                   |   |   |   |   |   |   ||
 |                 Protected-------------    |   |   |   |   ||
 |                                           |   |   |   |   ||
 |                 FORMAT switch (1=dot)-----    |   |   |   ||
 |                                               |   |   |   ||
 |                 Drive Fault-------------------    |   |   ||
 |                                                   |   |   ||
 |                 First Status----------------------    |   ||
 |                                                       |   ||
 |                 Seek Check----------------------------    ||
 |                                                           ||
 |                 Drive Not Ready---------------------------- ||
 |                                                            ||
 |                 Drive Busy-----------------------------------|
 +--------------------------------------------------------------+
```

* Drive type is as follows:

```
   000000 = 7906
   000001 = 7920
   000011 = 7925
```

** Error flag - set if bit 11, 13, 14, or 15 is set.

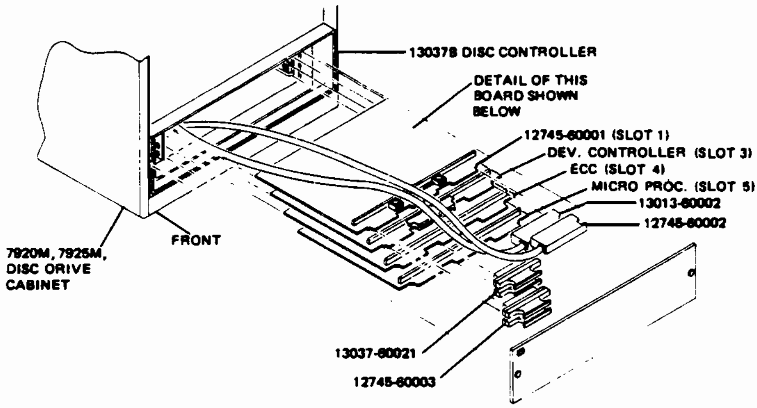
*Table 7-6. Controller Internal Name

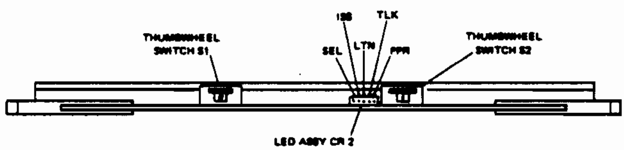
STATUS WORD ONE (hex)	TSTAT (binary)	DEFINITION (controller internal name)
0000	00000	No errors. (NORMAL COMPLETE)
0100	00001	Illegal opcode. (ILLEGAL OPCODE)
0200	00010	Unit available. (UNIT AVAILABLE)
0700	00111	Cylinder compare error. (CYL CMP ERR)
0800	01000	Uncorrectable data error. (UNCOR DATA ERR)
0900	01001	Head-sector compare error.(HD/SEC CMP ERR)
0A00	01010	I/O program error.
0C00	01100	End of cylinder. (END OF CYLINDER)
0E00	01110	Data overrun. (OVERRUN)
0F00	01111	Possible correctable data error.
1000	10000	Illegal access to spare track. (SPR TRK ACCESS)
1100	10001	Defective track. (DEFECTIVE TRK)
1200	10010	Access not ready during data operation. (ACCSS NR DATOP)
1300	10011	Status word two error. (STATUS-2 ERROR)
1600	10110	Attempt to write on protected or defective track. (WRT PTROTEC TRK)
1700	10111	Unit unavailable. (UNIT UNAVAIL)
1F00	11111	Drive attention. (DRIVE ATTENTION)

* Drive type is as follows:

000000 = 7906
000001 = 7920
000011 = 7925

System Disc HP-IB Device Select Switch





12745A DISC HPIB CONTROLLER BOARD

CONTROL/ INDICATOR	FUNCTION
SWITCH S1	Selects CPU number (0 - 7). Number is detected by controller during its polling operation. In a multi-CPU system, no two CPU's can have the same number.
SWITCH S2	Selects HP-IB address (0 - 7).
LED ASSY CR2	Indicates operational state of adapter kit PCA. LED's are coded as follows:
	SEL – SELECT. When LED is lit, it indicates that controller is operating on adapter kit PCA. When controller is idle, LED will be dimly lit.
	ISS – IDENTIFY STANDBY STATE.
	LTN – LISTEN. When LED is lit, it indicates that adapter kit PCA is in Listen mode.
	TLK – TALK. When LED is lit, it indicates that adapter kit PCA is in Talk mode.
	PPR – PARALLEL POLL RESPONSE. When LED is lit, it indicates that adapter kit PCA is ready to respond to a Parallel Poll from the controller of the HP-IB as soon as it is given.

Figure 7-5. System Disc HP-IB Device Select Switch

HP 7920/7925 Master/Slave Disc Cabling

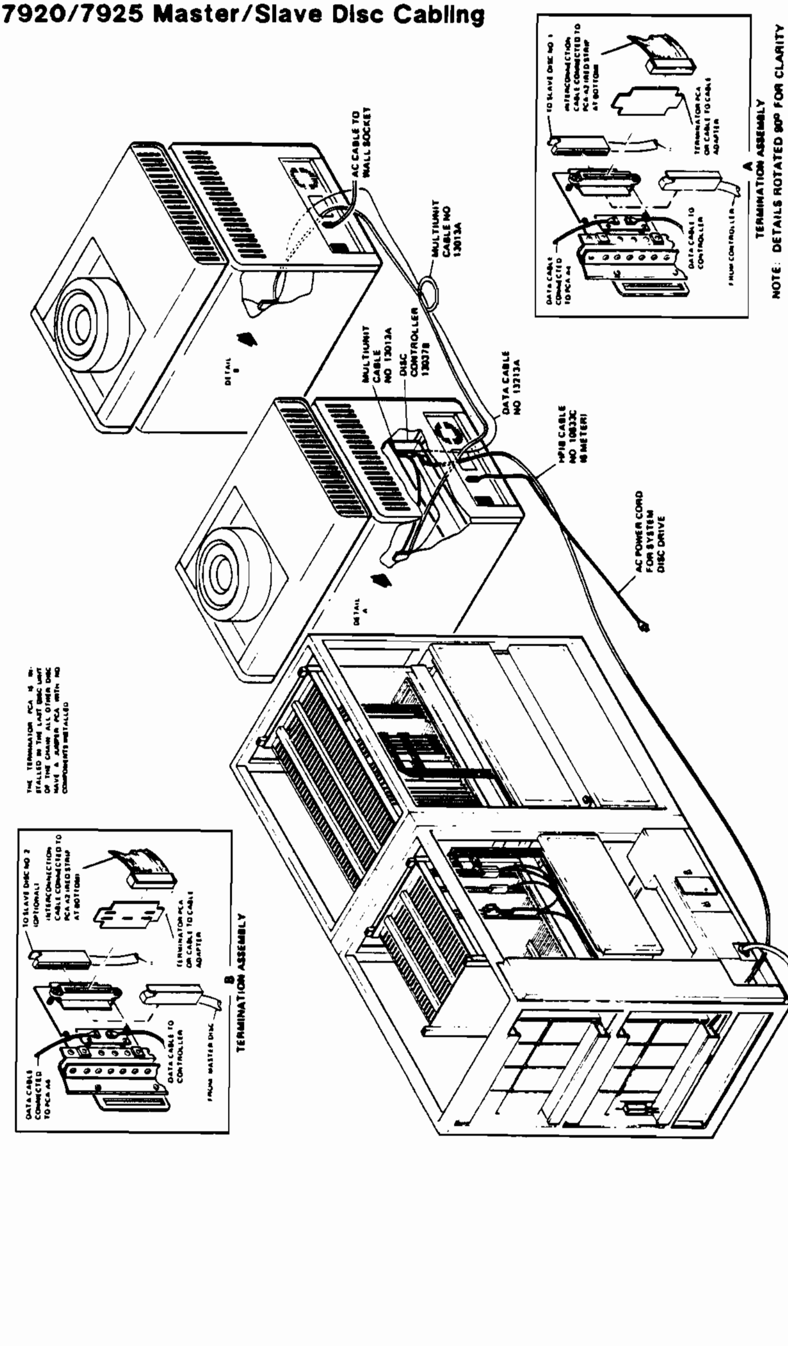


Figure 7-6. 7920/7925 Master/Slave Disc Cabling

HP 7970 MAGNETIC TAPE UNIT

Refer to Table 7-7 for a description of the bit definitions for status words 1-3.

Table 7-7. HP 7970 Status Bit Defintions

Status Word No. 1

Word Bit No.	DIO Line No.	Description
0	8	EOF - End of File of File Mark (FM).
1	7	BOT - Beginning of Tape or Load Point.
2	6	EOT - End of Tape.
3	5	STE - Single Track Error.
4	4	Command Rejected.
5	3	File Protected (No Write Ring).
6	2	MTE - Multiple Track Error.
7	1	Online.

Status Word No. 2

Word Bit No.	DIO Line No.	Description
0	8	Reserved.
1	7	Selected Tape Unit MSB (in channel program).
2	6	Selected Tape Unit LSB (in channel program).
3	5	Data Error (Timing).
4	4	Tape Runaway.
5	3	Rewinding.
6	2	Tape Unit Busy.
7	1	Interface Busy.

Status Word No. 3

Word Bit No.	DIO Line No.	Description
0	8	Reserved.
1	7	Reserved.
2	6	Power has been restored.
3	5	Reserved.
4	4	Tape Unit 3 has been placed ONLINE.
5	3	Tape Unit 2 has been placed ONLINE.
6	2	Tape Unit 1 has been placed ONLINE.
7	1	Tape Unit 0 has been placed ONLINE.

HP 7974/78/80A/80XC MAGNETIC TAPE DRIVE

Refer to Table 7-8 for a description of the bit definitions for status words 1-3. Status word 4 contains two fields; the retry count for the last read or write operation (bits 3-7) and the error detail of a command reject error (bits 0-2). The three bits of command reject detail are decoded as follows:

000 = no further detail
001 = no further detail
010 = device reject; see byte 5
011 = protocol reject; see byte 5
100 = no further detail
101 = prior error reject; see byte 5
110 = no further detail
111 = selftest failure

Table 7-8. HP 7974/78 Status Bit Definitions

Status Word No. 1

Word Bit No.	DIO Line No.	Description
0	8	EOF - End of File detected.
1	7	BOT/LP - Beginning of tape/load point.
2	6	EOT - End of Tape.
3	5	STE - Single Track Error (recovered error).
4	4	Command reject (See byte 4).
5	3	File Project (not write enabled; no write ring).
6	2	Unrecovered error.
7	1	Unit Online.

Status Word No. 2

Word Bit No.	DIO Line No.	Description
0	8	In GCR (6250 CPI Density) mode.
1	7	Unknown density on tape.
2	6	Data Parity Error.
3	5	Data Error (Timing).
4	4	Tape Runaway.
5	3	Door Open.
6	2	Transparent status.
7	1	Immediate report enable.

Status Word No. 3

Word Bit No.	DIO Line No.	Description
0	8	In PE (1600 CPI Density) mode.
1	7	In NRZI (800 CPI Density) mode.
2	6	Power Restored.
3	5	HP-IB Command Parity Error.
4	4	Tape position is unknown (unrecovered).
5	3	Tape drive formatter error.
6	2	Tape drive servo error.
7	1	Tape drive controller error.

The fifth status word contains binary coded information regarding the specific error encountered. The sixth status word is used only for reporting the transparent status of hard and soft errors while in immediate report mode. This byte indicates which command had the error. It contains the number of commands sent and reported since the command in question was issued.

In order to identify hard errors reported to the host while writing or reading a data compressed tape, the 7980XC will set two existing status bits. The "GCR (6250 CPI Density) mode" status bit and the "Unknown density on tape" status bit of status word No. 2 will both be set to indicate that the tape format is data compressed.

HP 7976 MAGNETIC TAPE UNIT

Refer to Table 7-9 for a description of the bit definitions for status words 1-3.

Table 7-9. HP 7976 Status Bit Definitions

Status Word No. 1

Bit 0:	End of file
Bit 1:	Beginning of Tape/Load Point
Bit 2:	End of Tape
Bit 3:	Single track error (not logged for reads)
Bit 4:	Command reject
Bit 5:	File protect (not write enabled, no write ring)
Bit 6:	Multiple track error
Bit 7:	Unit ON-LINE
Bit 8:	GCR (6250 BPI-DENSITY)
Bit 9:	Unit Number (MSB)
Bit 10:	Unit Number (LSB)
Bit 11:	Timing Error
Bit 12:	Tape runaway
Bit 13:	Rewinding
Bit 14:	Unit busy (reported as unit ready)
Bit 15:	Interface busy

Table 7-9. HP 7976 Status Bit Definitions (con't.)

Status Word No. 2 (add to DIT of 7976 in Tables Manual)

```
+------------------------------------------------------------+
|  Bit 0:  Reserved                                          |
|                                                            |
|  Bit 1:  MTU/FCU down, Unit waiting for power              |
|                                                            |
|  Bit 2:  Power restored                                    |
|                                                            |
|  Bit 3:  Parity error                                      |
|                                                            |
|  Bit 4:  Position unrecovered                              |
|                                                            |
|  Bit 5:  Formatter/Controller and Tape Unit                |
|                                                            |
|  Bit 6:  Interface Controller (IFC) (FCU S.SM)             |
|                                                            |
|  Bit 7:  Interface Controller (IFC) (incl. PHI S.M)        |
|                                                            |
|  BIt 8 to 10:  Error Details (binary):                     |
|                                                            |
|          000 = Null Code                                   |
|          001 = Data Parity Error                           |
|          010 = FCU/MTU Reject                              |
|          011 = Protocol Reject                             |
|          100 = Timeout Reject                              |
|          101 = Prior Error Reject                          |
|          110 = ROM Parity Error                            |
|          111 = Self Test Failure Error                     |
+------------------------------------------------------------+
```

Status Word No. 3

```
+----------------------------------------------------------------------+
| The content of the third Status Word depends on the bits from       |
| the first status word.                                               |
|                                                                      |
| -  If Format Failure  is  asserted  the  register will be encoded   |
|    with the return code from the FCU.                                |
|                                                                      |
| -  If MTE is asserted the register will be encoded with the error   |
|    mux. lines.                                                       |
|                                                                      |
| -  If internal failure is asserted, this register will be encoded   |
|    with the actual error condition flagged.                          |
|                                                                      |
| -  If self-test failure is asserted this register will be encoded   |
|    with the type of self test failure condition.                     |
+----------------------------------------------------------------------+
```

HP 9144A/35401A CARTRIDGE TAPE DRIVES

Refer to Table 7-10 for the status values returned by the driver for the HP 9144A/35401A.

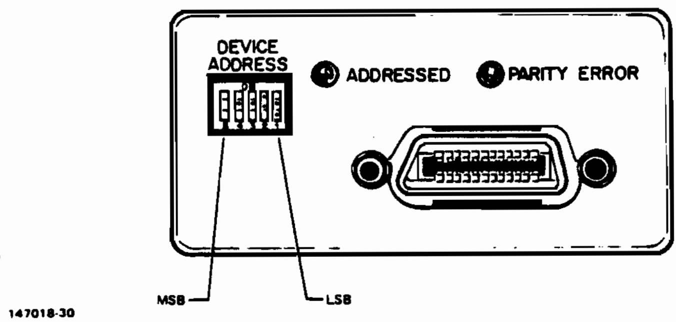
Table 7-10. HP 9144A/35401A I/O Queue Status Word

General Status (13:3)	Qualifying Status (8:5)	Overall Value
0 - Pending	1 - Completion wait	%10
	3 - Not ready wait	%30
1 - Successful	0 - No errors	1
	2 - Retry was necessary	%21
3 - Unusual condition	1 - Status interrogation required	%13*
	3 - Request aborted	%33
	4 - Prior error abort	%43
	6 - Powerfail abort	%63
	%21 - Device powered up	%213*
4 - Irrecoverable error	0 - Invalid request	4
	1 - Track/Sector error	%14
	2 - I/O timed out before complete	%24
	4 - SIO failure	%44
	5 - Unit failure	%54
	6 - Invalid address	%64
	%12 - System error	%124
	%14 - Channel failure	%144
	%15 - Uninitialized media	%154
	%16 - No spares available	%164

* These statuses are used for diagnostic reporting only.

HP 2563A and 2608A/S LINE PRINTER

See Figure 7-7 for layout of HP 2608A HP-IB interface connector and refer to Table 7-11 for a description of the status bit definitions for status words 1 and 2.




```
DEVICE ADDRESS Switches         5  4  3  2  1
   Binary representation       16  8  4  2  1
   Example device address 7     0  0  1  1  1

          1 = on
          0 = off
```

Figure 7-7. 2608A HP-IB Interface Connector and Device Address Switches

Table 7-11. HP 2608A Status Bit Definition

```
+--------------------------------------------------------------+
|       Word One          |           Word Two                 |
----------------------------------------------------------------
| 0  1  2  3  4  5  6  7  |  8  9  10  11  12  13  14  15      |
----------------------------------------------------------------
| |  |  |  |  |  |  |  |     |  |   |   |   |   |   |   |      |
| |  |  |  |  |  |  |  |     |  |   |   |   |   |   |   |      |
| |  |  |  |  |  |  |  |     |  |   |   |   |   |   |  Not     |
| |  |  |  |  |  |  |  |     |  |   |   |   |   |   |  Used    |
| |  |  |  |  |  |  |  |     |  |   |   |   |   |Platen/ribbon|
| |  |  |  |  |  |  |  |     |  |   |   |   | 6/8 Lines per    |
| |  |  |  |  |  |  |  |     |  |   |   |   | Inch             |
| |  |  |  |  |  |  |  |     |  |   |   | Self Test Mode       |
| |  |  |  |  |  |  |  |     |  |   | Paper Error              |
| |  |  |  |  |  |  |  |     |  | Self Test Failure            |
| |  |  |  |  |  |  |  |     | Print Mechanism Failure        |
| |  |  |  |  |  |  |  |  On Line                              |
| |  |  |  |  |  |  |  | Power Restored/                       |
| |  |  |  |  |  |  | Not Used                                  |
| |  |  |  |  |  | 6/8 Lines per Inch                          |
| |  |  |  |  | VFC Initialized                                |
| |  |  |  | VFC Channel 12 (top op form)                      |
| |  |  | VFC Channel 9 (bottom of form)                       |
| | Not Ready                                                  |
|On Line                                                       |
+--------------------------------------------------------------+
```

HP 2611A/2613A/2617A/2619A LINE PRINTERS

Refer to Table 7-12 for a description of the bit definitions for status words 1 and 2, and see Figure 7-8 for line printer installation.

Table 7-12. HP 2611A/13A/2617A/2619A Status Bit Definitions

```
+-------------------------------------------------------------+
|         WORD ONE           |                WORD TWO          |
|---------------------------------------------------------------|
| 0  1  2  3  4  5  6  7  |  8  9  10  11  12  13  14  15      |
|---------------------------------------------------------------|
| |  |  |  |  |  |  |  |  |                                     |
| |  |  |  |  |  |  |  |  |-------------------------------      |
| |  |  |  |  |  |  |  |                 |                       |
| |  |  |  |  |  |  |  |              NOT USED                  |
| |  |  |  |  |  |  |  POWER FAIL                               |
| |  |  |  |  |  |  PAPER OUT/PAPER JAM/GATE OPEN/ETC.          |
| |  |  |  |  |  RESERVED                                        |
| |  |  |  |  PARITY ERROR                                       |
| |  |  |  PROTOCOL ERROR                                       |
| |  |  RESERVED                                                |
| |  I/O BUFFER READY                                           |
| ONLINE                                                        |
+---------------------------------------------------------------+
```

LOGGING CONSIDERATIONS

DMA abort and Channel Program Abort - CPVA (0) is logged. Parity Error - A value of -1 is logged. Protocol Error - Status is logged to denote a unit failure.

[In the case of Channel Program Abort due to a channel hardware timeout, status is checked to determine if this was caused by Parity Error. If so, the parity error value -1 is logged instead of CPVA (0).]

TROUBLESHOOTING PROCEDURE

1. Obtain the following information:

   a. What software is running and how many sessions are in progress?

   b. What other peripherals, whose configuration may contribute to the problem, are attached to the same GIC as the Line Printer in question?

   c. Did the system and/or application run successfully before the problem occurred?

   d. Have any major hardware or software changes been made just prior to or concurrent with the occurance of the problem?

   e. Obtain a copy of the present system I/O configuration.

   f. Obtain a copy of the I/O system error log to see status being returned from the device controller.

   g. Obtain a memory dump if it is suspected that the problem is I/O related.

2. Perform the following ON-LINE tests to eliminate the driver and hardware as a probable cause of the problem:

   a. If a line printer I/O problem is suspected, use the MPE command 'STOPSPOOL 6'. This will allow files to bypass the SPOOLER and be sent directly to the line printer. If this causes the problem to disappear, the problem is probably in the SPOOLER or user file.

   b. Run PD466A to perform the more standard tests such as Ripple Print. PD466A is an ON-LINE supported utility.

3. Perform the following OFF-LINE tests:

   a. Run IOMAP to determine if the device controller can identify the line printer when it does not appear to respond.

   b. Write and run a short SLEUTHSM program that will attempt a line printer access under programatic control, but not under MPE control.

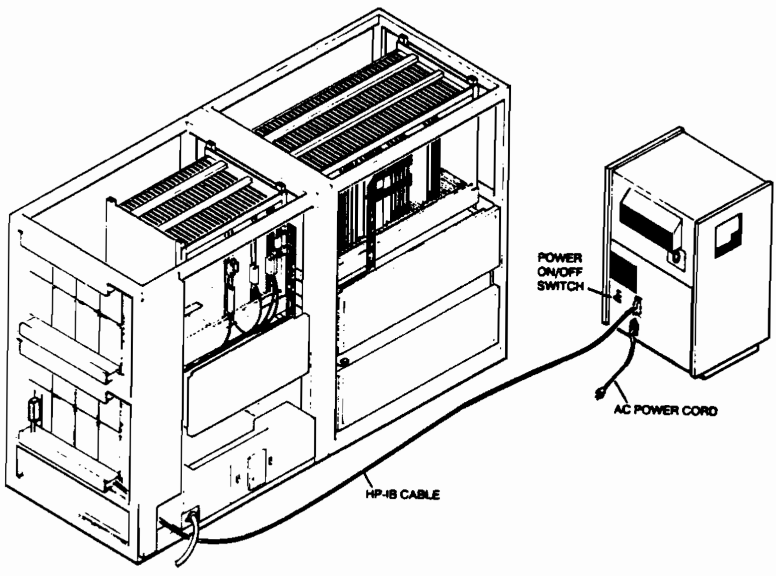


Figure 7-8. HP 2611A/13A/2617A/2619A Printer Installation

HP 2680A/2688A PAGE PRINTER

I/O Status

The HP 2680A status reports contains 16 data words to indicate the the condition of the HP 2680A system. The status report is used to to diagnose HP 2680A system faults. The following is an example of example of an I/O display in response to the OCTAL command.

NOTE

> Words 2 through 15 and bits 1,2,3 and 4 of word 1 are cleared whenever the I/O status block is returned to the host system.

WORD	I/O STATUS	ENV STATUS
0	%004004	%000020
1	%000000	%027511
2	%000000	%000057
3	%000000	%010100
4	%001000	%070101
5	%000000	%000654
6	%000000	%000000
7	%000000	%000102
8	%000000	%021156
9	%000000	%000000
10	%000000	%000675
11	%000000	%004102
12	%000000	%000000
13	%000001	%000000
14	%000000	%000000
15	%000000	%000000

I/O Status Word 0

Word 0 identifies status words containing valid information. Each bit, starting with bit one, indicates the status word (1-15) containing valid information. For example, if bit 4 is set (1), then word four contains valid status data.

```
-----------------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-----------------------------------------------------------------
     |     |  |  |                       |   |   |   |
     |     |  |  |                       |   |   |   |
     -------------------------------------------------
                            |
                            |STATUS WORDS CONTAINING
                             VALID DATA.
```

I/O Status Word 1

```
-----------------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-----------------------------------------------------------------
  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |
  |  |  |  |  |  +---------------------------------------+
  |  |  |  |  |                    |
  |  |  |  |  |                    |
  |  |  |  |  |                RESERVED
  |  |  |  |  |
  |  |  |  |  |---> TRANSMISSION ERROR DETECTED IN PRINTER
  |  |  |  |        (CHANNEL COMMAND ERRONEOUS OR
  |  |  |  |        DATA LENGTH ERROR).
  |  |  |  |
  |  |  |  |------> PARITY ERROR DETECTED IN HPIB.
  |  |  |
  |  |  |
  |  |  |---------> POWER UP COMPLETED SINCE LAST I/O
  |  |              STATUS READ.
  |  |
  |  |------------> MESSAGE BEING DISPLAYED ON HP 2680A PRINTER.
  |
  |---------------> 0=ONLINE, 1=OFFLINE.
```

I/O Status Word 2 - Unused

I/O Status Word 3 - Machine Control System (MCS) Fault Member

```
-----------------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-----------------------------------------------------------------
```

Contains octal word indicating a given machine fault (i.e., paper jam, out-of-paper). The status word is translated to a message and displayed on the printer readout LED display.

I/O Status Word 4

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

BIT	DESCRIPTION
0	No memory available for attempted character set load.
1	No memory available for attempted form load.
2	No memory available for attempted VFC load.
3	An attempt was made to print data without a selected character set.
4	An attempt was made to select an undefined form.
5	An attempt was made to print data without a selected Vertical Form Control (VFC).
6	An attempt was made to print data without a selected Logical Page Table (LPT).
7	An attempt was made to move pen off the logical page.
8	The printer could not process all data before transfer was made to the drum/paper. Data will be lost.
9	Data block contains format error. Invalid function code or record/block size error.
10	Missing multi-copy forms table. An attempt was made to use a multicopy forms table that was not loaded for this job.

I/O Status Word 4 (con't.)

BIT	DESCRIPTION
11	Maximum number of copies per physical page has been exceeded.
12	A command or function code was received without a job in process.
13	No user memory available. User memory is loaded with character sets, VFC's, forms and data. The current data transmitted cannot be processed and will be lost.
14	A VFC is selected by a logical page table entry which has word ten (line spacing on page) less than or equal to zero.
15	A skip was made to a non-existent VFC.

I/O Status Word 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

BIT	DESCRIPTION
0	Logicai page was truncated to fit on the physical page.
1	Page size requested by programmer does not match page length set by operator. The operator-set page length will be used.
2	No character set selected when print record was processed. Record was skipped.
3-15	Unused.

I/O Status Word 6

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

BIT	DESCRIPTION
0	Not enough memory for picture download.
1	Attempt to print more than 64 pictures on a physical page.
2	Attempt to print a picture which is not present.
3-15	Unused.

I/O Status Words 7-11 - Reserved for future use.

NOTE

I/O Status Words 12,13,14, and 15 are double word integers.

I/O Status Word 12

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Contains error record number defined by word 4. Information is reported during a JOB function.

I/O Status Word 13

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Contains error record number defined by word 4. Information is reported during a JOB function.

I/O Status Word 14

```
-------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-------------------------------------------------------
```

Contains sheet number where error occured as defined by word 4. Information is reported during a job function.

I/O Status Word 15

```
-------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-------------------------------------------------------
```

Contains sheet number where error occured as defined by word 4. Information is reported during a job function.

Environmental Status

The environmental status report contains 16 data words indicating current configuration, print job, and printer mode of the HP 2680A page printer. Data is supplied to assist in the interpretation of diagnostic data.

Environmental Status Word 0

```
-------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-------------------------------------------------------
  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |
  ----------------------  ----------------------------
           |                            |
           |                            |
 Number of data blocks      Size of incoming data buffer
 in the incoming data       in 512 word blocks.
 buffer.
```

Environmental Status Word 1.

```
-------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-------------------------------------------------------
```

Number of twenty word buckets available.

Environmental Status Word 2

```
---------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
---------------------------------------------------------
```

Maximum number of buckets used since last job open.

Environmental Status Word 3

```
---------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
---------------------------------------------------------
  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |
  ----------  ----------------  ---------------------
      |              |                   |
      |              |           Number of forms loaded in
      |              |           printer.
      |              |
      |              |---------->Number of VFC's loaded in
      |                          printer.
      |
      |------------------------->Amount of Printer Memory:
                                 00=128K words
                                 01=256K words
```

Environmental Status Word 4

```
---------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
---------------------------------------------------------
---------------------------------------------------------
  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |
  ----------  ----------------  ---------------------
      |              |                   |
      |              |           Character sets loaded in
      |              |           printer.
      |              |
      |              |---------->Number of active logical
      |                          pages.
      |
      |------------------------->HPIB address (dev 0-7).
```

Environmental Status Word 5

```
-----------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-----------------------------------------------------------
```

Number of character set dot/bit image (words+3)/4 plus the number of proportional spacing (words used plus 3)/4.

Environmental Status Word 6

```
-----------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-----------------------------------------------------------
```

Number of form dots per bit (words + 3)/4 plus the number of form triplet (words plus 3)/4.

Environmental Status Word 7

```
-----------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-----------------------------------------------------------
```

Number of VFC words loaded.

Environmental Status Word 8

```
-----------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-----------------------------------------------------------
  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |
  ----------------------  ----------------------------
           |                              |
           |                              |
 Page length in the         Page width in direction of laser
 direction of of paper      scan, in 0.1 inch increments.
 motion, in 0.25"
 increments.
```

Environmental Status Word 9

```
-----------------------------------------------------------
| 0   1   2   3   4   5   6   7   8   9   10   11   12   13   14   15 |
-----------------------------------------------------------
  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
  ----------------------------------------    |    |    |
                      |                       |    |    |
                      |                       |    |    |
                                              |    |    |
               NOT USED                       |    |    |
                                              |    |    |
                                              |    |    |
 End of job encountered while printer         |    |    |
 was in the silent running mode.      <-------     |    |
                                                   |    |
                                                   |    |
 Form not printed on page as form started          |    |
 before the quarter inch margin on the top         |    |
 or bottom of page.  Error was caused either <--|       |
 by programmer error, or operator used the              |
 registration switches to locate the form off           |
 the page.                                              |
                                                        |
                                                        |
                                                        |
 Data truncated from top or bottom of page.             |
 Programming error occurred or operator moved           |
 the print of the page with the registration    <----|
 switches.
```

Environmental Status Word 10

```
-----------------------------------------------------------
| 0   1   2   3   4   5   6   7   8   9   10   11   12   13   14   15 |
-----------------------------------------------------------
```

Number of USER AREA words actually loaded, plus 3 divided by 4.

Environmental Status Word 11

```
-----------------------------------------------------------
| 0   1   2   3   4   5   6   7   8   9   10   11   12   13   14   15 |
-----------------------------------------------------------
```

Date code of DCS firmware currently installed.

Environmental Status Word 12

```
-------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-------------------------------------------------------
```

Number of non blank characters clipped (not printed) on this job.

Environmental Status Word 13

```
-------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-------------------------------------------------------
```

Reserved.

Environmental Status Word 14 and 15

```
-------------------------------------------------------
| 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 |
-------------------------------------------------------
```

Number of physical pages printed since last job open (signed double integer). Indicates total number of physical pages printed for this job since the environmental status block read function.

HP 26075A MULTIPLE SYSTEM ACCESS SELECTOR

The HP 26075A is an HP-IB switchbox designed to switch an HP 2680A or 7976A between up to three HP 3000 CPUs.

1. Maximum Configuration

   There are four standard HP-IB connections in total, with a maximum of three CPUs to one peripheral. Only one peripheral can be connected to a switch.

```
+-----------+       +-----------+    +-----------+
|           |       |           |    |           |
|  CPU #1   |       |  CPU #2   |    |  CPU #3   |
|           |       |           |    |           |
+-----+-----+       +-----+-----+    +----+------+
      | Dedicated         |Ded. GIC       | Dedicated
      | GIC         +-----+-----+         |  GIC
      |             |           |         |
      +-------------+  SWITCH   +---------+
                    |           |
                    +-----+-----+
                          |           Note: Connection to each SPU
                          |                 requires a dedicated GIC
                +---------+------+          (No other devices can be
                |               |           attached to the GIC).
                |   PERIPHERAL  |
                |               |
                +---------------+
```

The HP 26075A is equivalent to less than 0.5 meter of standard HP-IB cable and represents no loads for HP-IB I/F.

Supported devices include the HP 2680A page printer and the HP 7976A magnetic tape driver.

2. Cable Loading

In this example there are two possible cable lengths (depending on the system selected by the HP 26075A) available for calculating the number of loads needed to compensate the installed cable. The calculation made uses the system which presents the greatest amount of cable when selected. Thus, when the alternate system is selected the number of loads will exceed the meters of cable installed, which meets the requirement that "loads" should exceed the meters of installed cable. Since system A has more cable, the meters of cable equals 10, and the load required for system A to the output peripheral (HP 7976A) also equals 10.

```
         SYSTEM A                    SYSTEM B
+-------------------------+     +------------------------+
|        CPU A GIC        |     |       CPU B GIC        |
|   7 "LOADS" (Internal)  |     |  7 "LOADS" (Internal)  |
| (No internal cabling)   |     | (No internal cabling)  |
+--------+----------------+     +-------+----------------+
         |                              |
         |                              |
         |                              |
         +------+   +-------------------+
                |   |
  4 Meters of   |   |  2 Meters of Cable
     Cable      |   |
             +-+---+------------+
             | |   |            |  HP 26075A Multiple System
             | ++  ++  ++   ++  |           Access Selector
             | ||  ||  ||   ||  |
             | ++  ++  ++   ++  |  Presents 1/2 meter of cable
             | A   B   C    |   |
             +--------------+---+
                            |
                            | 4 Meters of Cable
                            |
                            |
          +-----------------+-------------+
          |                               |
          |       OUTPUT PERIPHERAL       |
          |                               |
          | 1 1/2 Meter of Internal cable |
          |       1 Internal "LOAD"       |
          |       2 Installed "LOADS"     |
          +-------------------------------+
                  (HP 7976A)
```

```
SYSTEM A CABLE LENGTH
---------------------

4      Meters from GIC to HP 26075A
 1/2   Meters HP 26075A Internal
4      Meters from HP 26075A to peripheral
1 1/2  Meters peripheral internal
-------------------------------------
10 Meters Total Installed Cable


SYSTEM A "LOADS"
----------------

7 GIC Design Loads
1 HP 7976A Design Load
--------------------
8 Total Design "LOADS"
```

In order for the system "LOADS" to match the meters of cable, two installable loads need to be installed in the peripheral device.

NOTE

No more than a total of 15 "LOADS" should be installed on any bus. Also when it is not possible to match the number of "LOADS" to meters of cable, it is preferable to have the number of "LOADS" exceed the number of meters of cable.

NOTES

```
+---------------------------------------------------------------------+
|                                                                     |
| 1.  When  switching the HP 26075A access selector, make certain there |
|     is no activity(data transfer processes) on the bus; otherwise   |
|     data loss may result.                                           |
|                                                                     |
| 2.  The HP 26075A acess selector is not supported on any bus        |
|     configuration to which a disc drive is connected.               |
|                                                                     |
| 3.  The devices on the bus being switched from and to must be       |
|     properly halted and "Down (LDEV#)" before switching the         |
|     peripheral to another system.                                   |
|                                                                     |
+---------------------------------------------------------------------+
```

HP 37203A HP-IB EXTENDERS

The HP 37203A HP-IB Extender allows HP 3000 systems to be connected to remote or distributed printing stations. Option 010 provides powerfail recovery and is required for HP 3000 support. Ordering the HP 37203A HB-Extender with only Option 010 means that coaxial cables are supplied and printers can be placed up to 250 meters from the HP 3000. With Options 010 and 001 (Fiber Optic Cable), printers can be placed up to 1000 meters away. See Figure 7-9 for the maximum supported configuration.

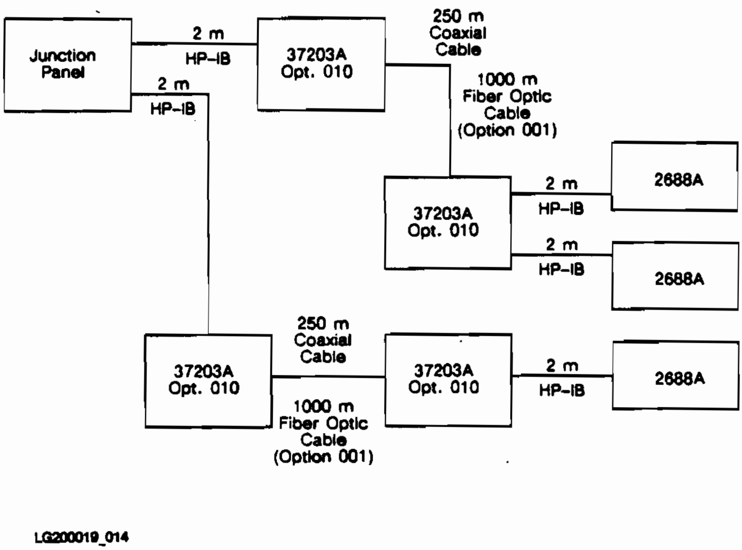


Figure 7-9. HP 37203A Maximum Supported Configuration

Option 010 (Powerfail Recovery)

The HP-IB Extender with only Option 010 (Powerfail Recovery) specified means that coaxial cable is supplied. This configuration increases the number of 2688A page printers on the Series 6X/70, and increases to 250 meters the distance that the 2688A can be located from the processor. A dedicated GIC is required for the HP-IB Extender and this GIC is considered to be a low-speed GIC. (When configured directly via HP-IB, the HP 2688A is a high-speed GIC.)

The number of HP 2688s supported on HP 3000 systems is as follows:

	Without HP-IB Extender	With at Least 1 HP-IB Extender
Series 39/4X/5X	2	3
Series 6X/70	4	5

Up to two HP-IB Extender pairs can be connected to a system, each pair requiring a dedicated GIC. No more than two HP 2688s can be connected to extender pairs and there can be no more than two HP 2688s connected to the extender pairs attached to the system (see Figure 7-9). The HP 2688 is the only device supported on the HP-IB extenders and may be used with the HP 2688A only on systems running Q-Delta-2 or any subsequent release of MPE.

Option 010 and 001 (Fiber Optic Cable)

The HP 37203A HP-IB Extender with Options 001 and 010 uses the same packaging and electronics as the HP 37203A with Option 010, but provides connections with fiber optic cable rather than coaxial cable. This allows greater protection against electrical disturbance, allowing a greater cabling distance (up to 1000 meters) between the extender pairs.

The following printers may be combined on a single extender chain:

HP2563A/B	300	lpm dot matrix impact
HP2564A/B	600	lpm dot matrix impact
HP2565A	600	lpm dot matrix impact
HP2566A/B	900	lpm dot matrix impact
HP2567B	1200	lpm dot matrix impact
HP2680A	45	ppm non-impact
HP2688A	12	ppm non-impact

A maximum of four printers is supported per extender chain, of which two of the printers may be non-impact (HP 2680A or HP 2688A). Thus there is a maximum of four line printers (HP256X) per extender chain, and a maximum of two page printers (HP268X). Only for combinations of CIPER printers (HP256X) can there be two sets of extenders per GIC.

The number of printers supported per system is the same with or without extenders -- except for the HP2688A. Five HP2688A printers are supported on the Series 6X/70 when using an extender, as opposed to the normal maximum of four.

As with the coaxial cable version of the HP-IB Extender, there is a maximum of two GICs with extenders per system, and extenders must be on a dedicated low-speed GIC.

REPLACEABLE PARTS

SECTION 8

The Replaceable Parts Catalog provides illustrations and parts lists to assist the user in locating replaceable assemblies of the HP 3000 Series 64/68/70 computer system. The primary purpose of the catalog is to provide part number data for the Customer Engineer when parts replacement is required.

HOW TO USE THE PARTS CATALOG

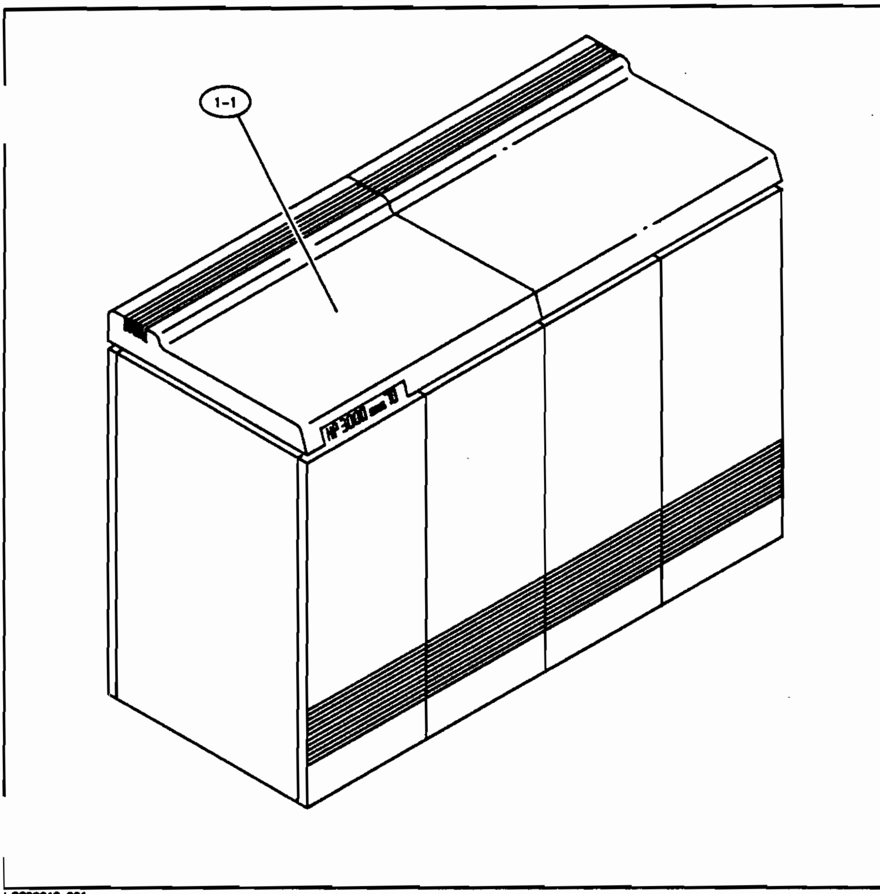
The parts catalog is organized in the order of significant major assemblies, followed by subassemblies, and associated parts.

To find information for a given part:

1. Locate the assembly in one of the figures that follow. When you find the part desired, note the circled index number that refers to it. For example, index number 3-1 refers to the Memory Backplane.

2. Look in Table 8-1 under the index number to find information about the part. You'll find the name, part number, and quantity used of any replaceable part listed.

3. If you already know the name of the part, consult Table 8-2. This table contains the same information as Table 8-1 but is arranged in alphabetical order by part name.



LG200019_001

Figure 8-1. HP 3000 Series 64/68/70 Computer

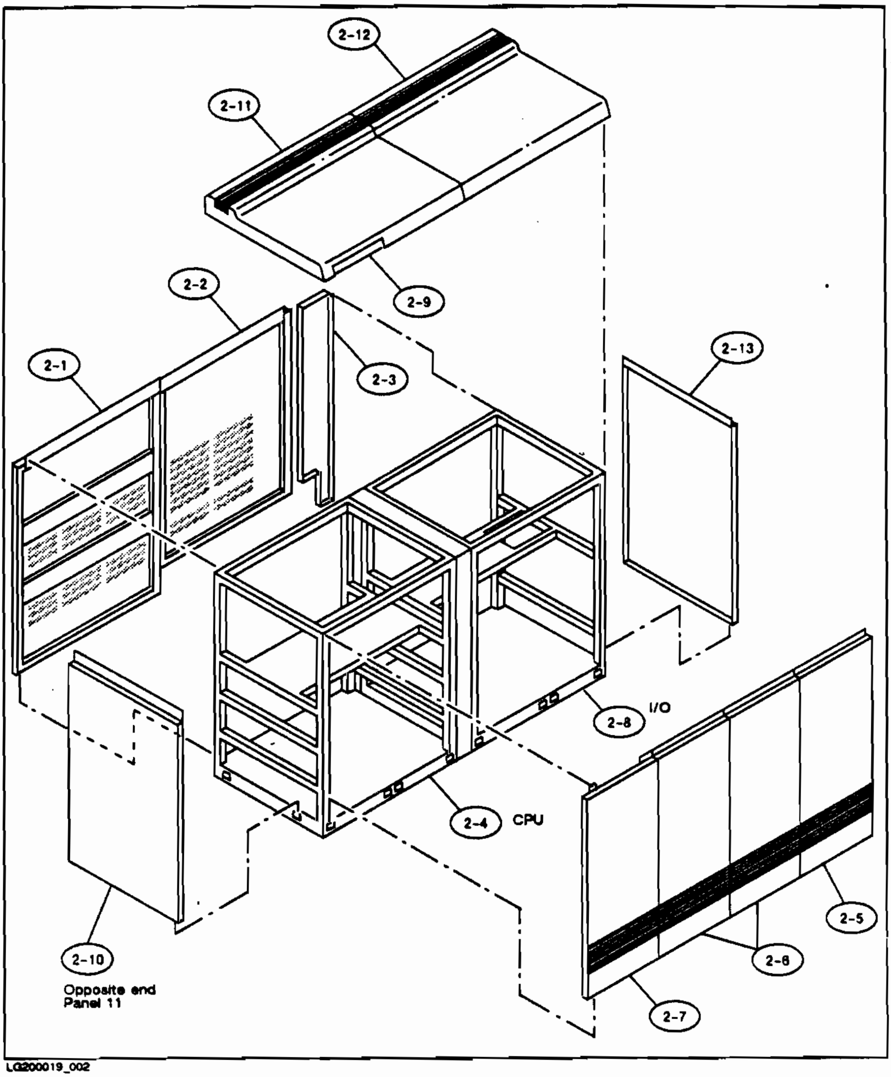


Figure 8-2. HP 3000 Series 64/68/70 Exploded View

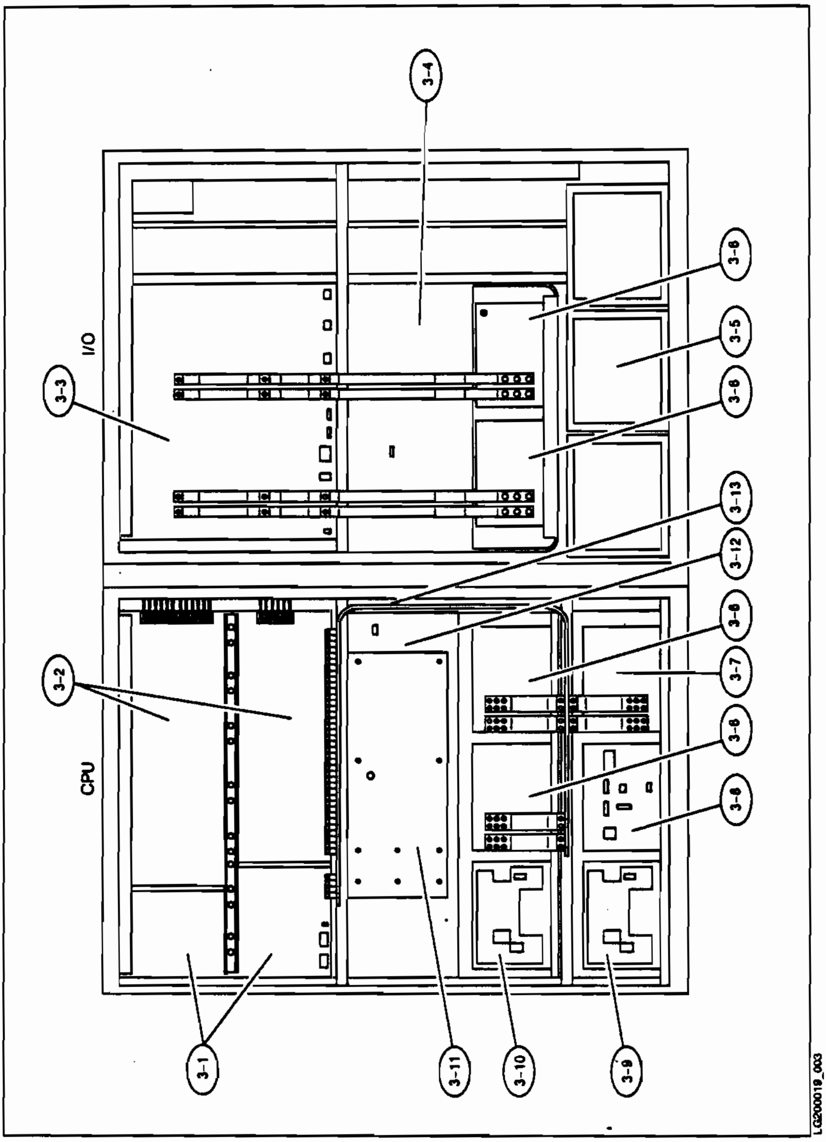
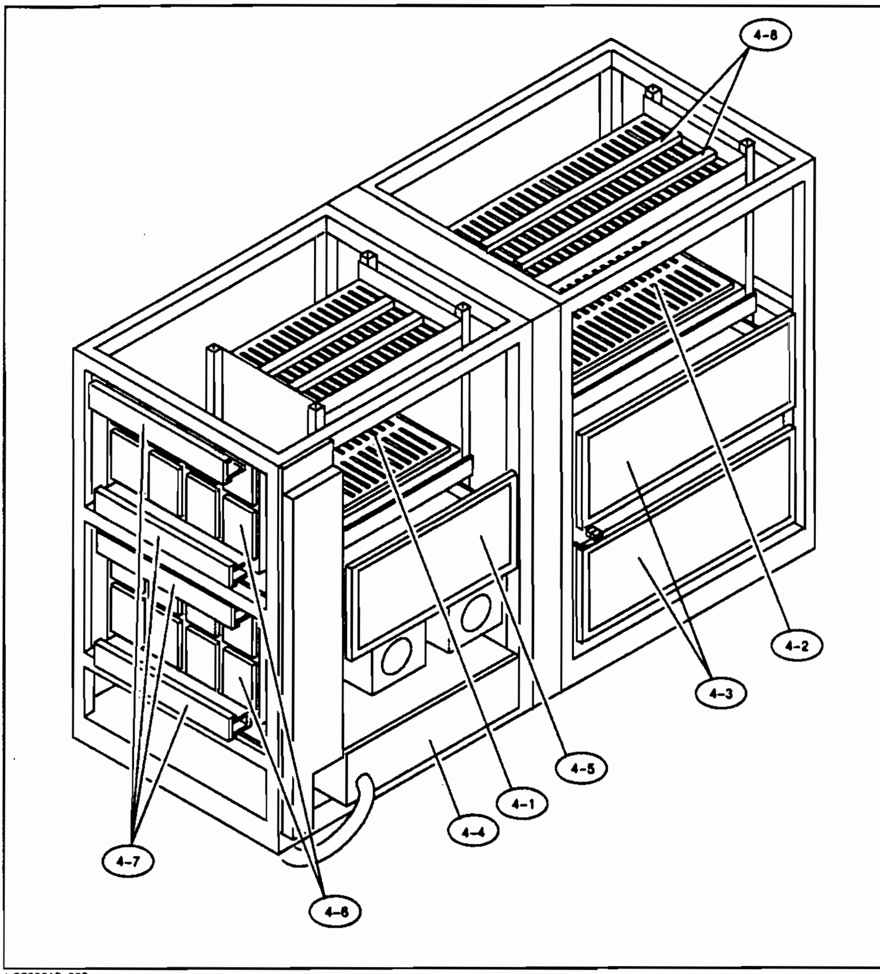


Figure 8-3. Series 64A/68A/70A Front View
(For Series 68B/68C/70B, see Figures 8-6 and 8-6a.)



LG200019_009

NOTE: 3rd IOA (Aux. I/O Bay) uses same part numbers as 2nd IOA.

Figure 8-4. Rear View of Series 64/68/70

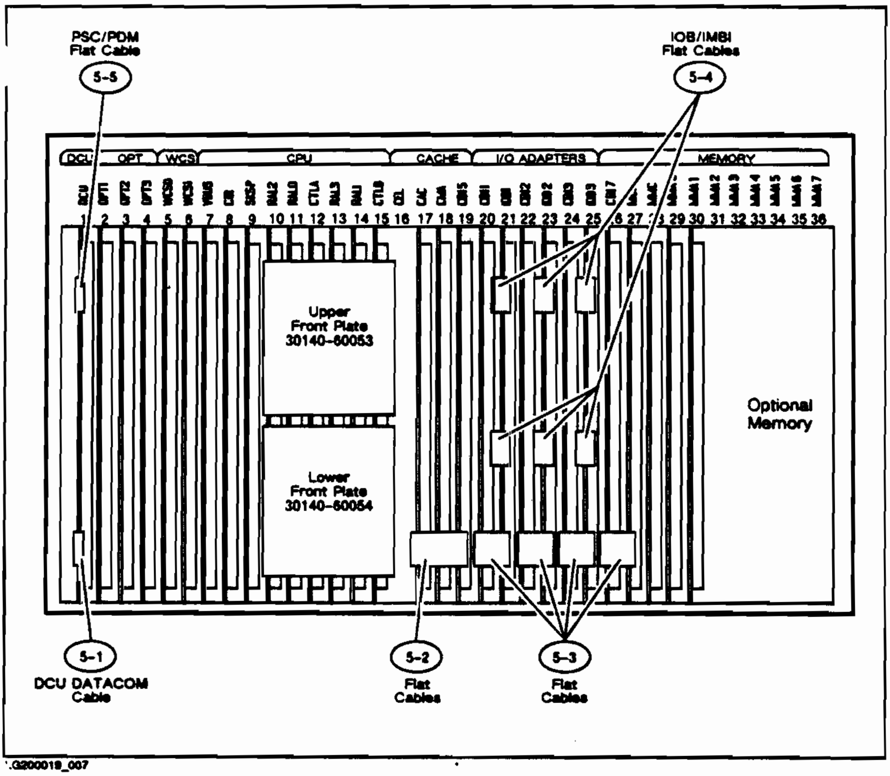
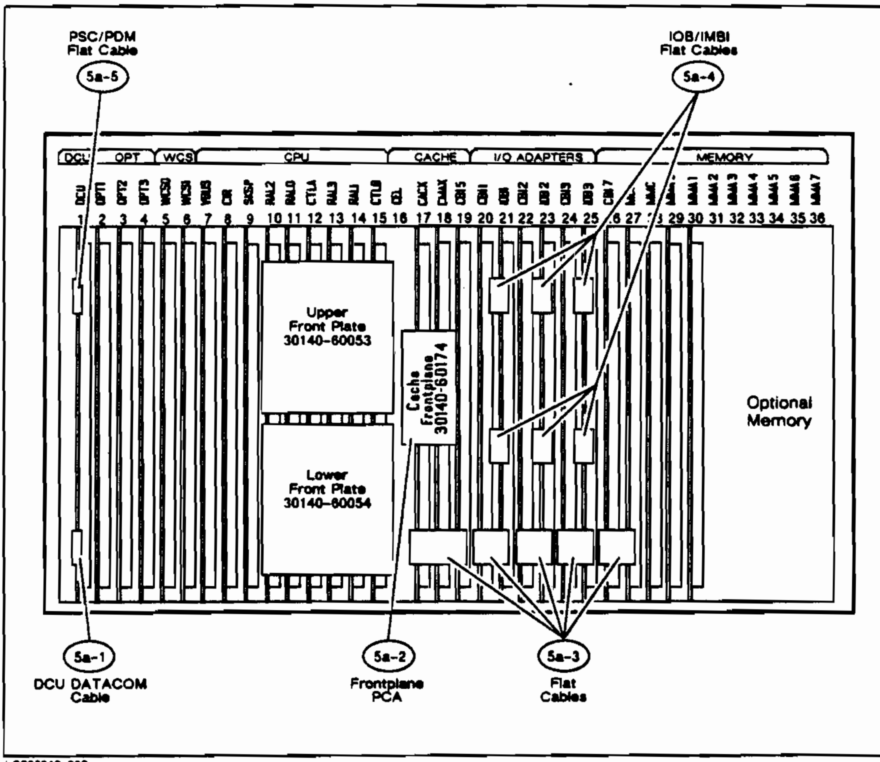
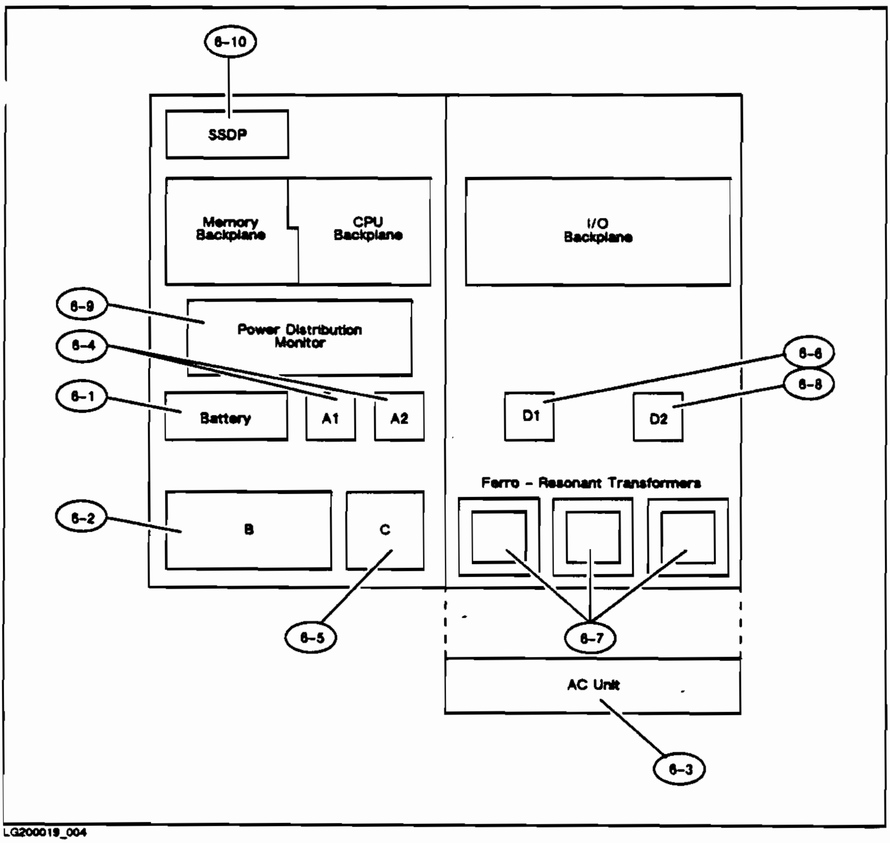


Figure 8-5. CPU Card Cage and Cabling Series 64/68



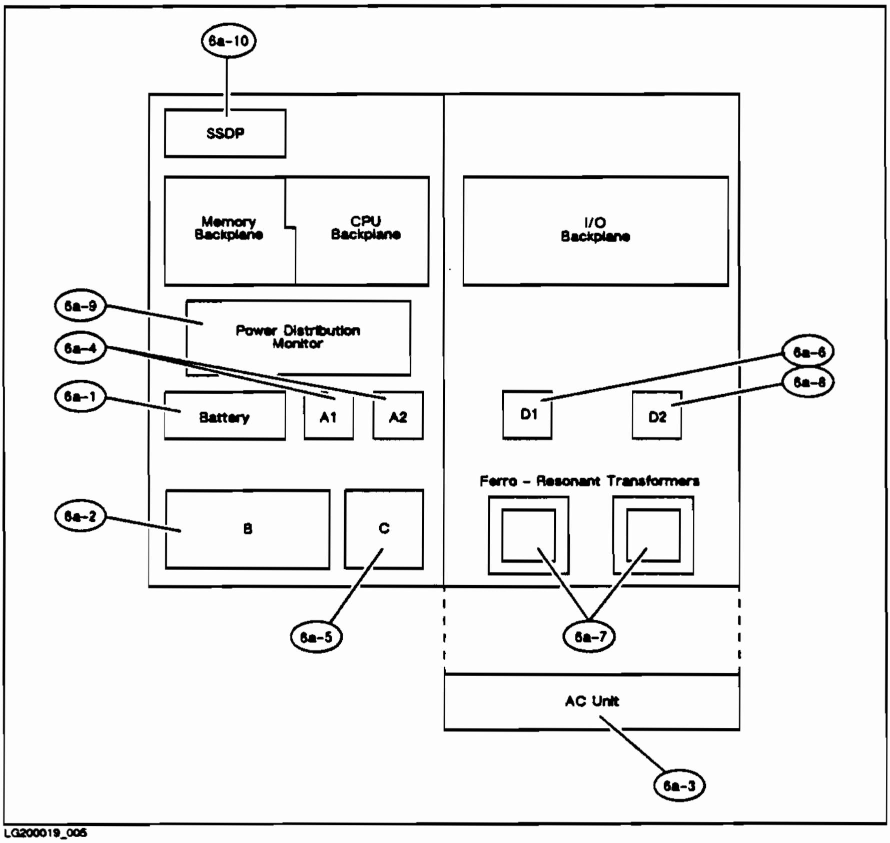
LG200019_008

Figure 8-5a CPU Card Cage and Cabling Series 70



NOTE: 3rd IOA (Aux. I/O Bay) uses same part numbers as 2nd IOA.

Figure 8-6. Series 68B/68C/70B Front View (ITT B Power System)



NOTE: 3rd IOA (Aux. I/O Bay) uses same part numbers as 2nd IOA.

Figure 8-6a Series 68B/68C/70B Front View (SCOTT T Power System)

REPLACEABLE PARTS SORTED BY INDEX NUMBER

Table 8-1. Replaceable Parts By Index Number

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
1-1	Series 6X/70 Main Frame	30140A	1
2-1	Panel Right Rear	30140-00146	1
-2	Panel Left Rear	30140-00147	1
-3	Panel Rear Cable Exit	30140-00052	1
-4	CPU Bay	REF	1
	Fan-T BAX 6" DIA	3160-0362	2
	Lg CPU Cooling Fan	30140-60037	4
-5	Panel Front Right	30140-00153	1
-6	Panel Front Center	30140-00155	2
-7	Panel Front Left	30140-00154	1
-8	I/O Bay	REF	1
	Fan-T BAX 6" DIA	3160-0362	7
-9	System Display Panel Assy	30140-60070	1
	FCA PSC/SSDP	30140-60051	1
	FCA CIR/SSDP	30140-60052	1
-10	Panel Left Side	30140-00068	1
-11	Cover Top I/O Bay	30140-40011	1
-12	Cover Top CPU Bay	30140-40010	1
-13	Panel Right Side	30140-00068	1
3-1	Memory Back Plane	30140-60020	1
-2	CPU Back Plane	30140-60018	1
-3	I/O Back Plane	30140-60021	1
-4	I/O Plenum	Ref	1
-5	Isolation XMFR 1 Phase	9100-4117	3
-6	Power Supply(PS 2,3,6,7)	62971M	4
	ACDC PS (replaces PS2 & PS3 in PS Upgrade)	0950-1823	1
-7	Power Supply (PS5)	62970M	1
-8	Battery Module PCA	30140-60027	1
	24V Battery 5AH	1420-0286	1
-9	Power Supply (PS4)	63902F	1
	Power Dist PCA	30140-60025	1
-10	Power Supply (PS1)	63901F	1
	Power Dist PCA	30140-60024	1
3-11	PSC	30140-60017	1
-12	Diode - 35V/60A	1901-0727	1
-13	U-Bus (laminated, power)	0360-2051	1
4-1	I/O Card Cage - 24 Slot	7101-0583	1
	GIC PCA	31262-60001	2
	INP PCA	30020-60009	1
	Translator	26069-60001	1
	ATP-SIB	30144-60001	1
	ATP-AIB	30145-60001	1

Table 8-1. Replaceable Parts By Index Number (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
4-2	CPU Card Cage - 32 Slot	7101-0582	1
	DCU PCA	30140-60001	1
	RALU (0) PCA	30140-60002	1
	RALU (1,2,3) PCA	30140-60002	3
	CIR PCA	30140-60003	1
	VBUS PCA	30140-60004	1
	SKSP PCA	30140-60005	1
	WCS PCA	30140-60026	2
	CTLA PCA	30140-60007	1
	CLTB PCA	30140-60008	1
	CAC PCA	30140-60009	1
	CACX PCA	30140-60172***	1
	CMA PCA	30140-60010	1
	CMAX PCA	30140-60173***	1
	CBI PCA	30140-60011	3
	MMC PCA	30140-60012	1
	MCS PCA	30140-60013	1
	MMA PCA	30140-60014	1-8
	IOB PCA	30140-60015	1
	IMBI PCA	30140-60016	1
	CPU BACK PLANE	30140-60018	1
	CPU FRONT PLANE PCAs:		
	1. top	30140-60053	1
	2. bottom	30140-60054	1
4-3	Air Filter 9X29 (CPU)	3150-0389	2
-4	Power Control Module	30140-60023**	1
	Cable AC Power Cord (Internal)	30140-60042	1
	Cable AC Power Cord (External)	8120-3753	1
	Circuit Bkr 20A 3P,new	3105-0163**	1
	Circuit Bkr 20A 3P,old	3105-0137**	1
	Circuit Bkr 50A 3P	3105-0138**	1
	Fuse (Fan)	2110-0010**	1
	Key Switch, Rem/Maint	1390-0482	1
	Key	1535-4228	1

** Series 64A/68A only
*** Series 70 only

Table 8-1. Replaceable Parts by Index Number (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
4-5	Air Filter -I/O Plenum	3150-0390	1
-6	ATP Junction Panel	30140-00022	2
	Direct Conn Mother Bd	30145-60003	1
	RS232 Modem Mother Bd	30145-60002	1
	RS232C Mini Board	30147-60001	1
	RS422 Mini Board	30148-60001	1
	Modem Mini Board	30146-60011	1
	Internal Data Cables	REF	1
-7	Wiring Duct - Junct. Pnl	30140-00098	4
-8	Thermal Switch-122F(50C)	3103-0103	4
	Thermal Switch-104F(40C)	3103-0104	4
5,5a-1	Cable DCU/Data Comm	30140-60048**	1
-2	Cable Flat CAC/CMA/CBI	30140-60029	1
-3	Cable Flat		
	CBI/IOB-MCS-CAMX	30140-60028	2
-4	Cable Flat IOB1/IMBI1	30140-60082	2
	Cable SSDP/PSC	30140-60051	1
	Cable SSDP/CIR	30140-60052	1
	Cable GIC/HPIB JNT PLN	5061-2503	
	Cable Flat DCU/PSC	30140-60050	1
	Cable Flat AIB/SIB	REF	
	with 3 connectors	30000-93053	1
	with 6 connectors	30000-93056	1
	with 9 connectors	30094-60002	1
-5	External Data Cables	REF	
	Cable RS-232 Console	02640-60131	1
	to Junction Panel		
	HP-IB Disc/Magtape(2m)	10833B	2
	Cable-modem jumper	30140-60081	1
5a	Cache Front Plane	30140-60174***	1

** Series 64A/68A only
*** Series 70 only

NOTE

The remainder of Table 8-1 lists parts for the Series 64B, 68B/C, and 70 (ITT B and Scott T Power Systems).

Table 8-1. Replaceable Parts By Index Number (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
6,6a-1	Battery Module	30140-60103	1
	P.S. Shelf Top CPU	30140-00104	1
-1	Plate Battery Mtg.	30140-00106	1
-2	Fuse 10A 600V Fast-Blo	2110-0575	1
	Fuse 1A 250V Fast-Blo	2110-0001	1
	Fuse 30A 32V	3150572-ITT	1
	Fuse 20A 32V	2110-0649	2
	Boxer Fan-Module A,C,D	3120032-ITT	5
	Boxer Fan-Module B	3120041-ITT	1
	Batt Ch. (Module B)	0950-1657	1
Note 1	P.S. YEW Batt (Module B)	0950-1945	1
	Cable I/O, +5B,+/-12V Dist.	30140-60113	1
	" " +5B, Aux. In	30140-60115	1
	" " Mod. B, +5B	30140-60122	1
	" " Mod,Set B,Control/Mon.	30140-60125	1
	" " Zero Volt/PDM	30140-60126	1
-3	Cable High Voltage, CPU	30140-60111	1
	" " High Voltage, I/O	30140-60112	1
	" " A.C. Unit,Control/Mon.	30140-60127	1
	" " Mod,Set A,Control/Mon.	30140-60128	1
	" " High Voltage Aux. I/O	30140-60129	1
	AC Unit (ITT B)	REF	
	208VAC 60HZ	0950-1693	1
	380VAC 50HZ	0950-1694	1
	415VAC 50HZ	0950-1695	1
	AC Unit (SCOTT T)	0950-1796	1

Notes:

1. Power Modules may be mixed unless they are used in parallel, such as the +5V and -5.2V modules.

2. Transformers and AC power units must be manufactured by the same vendor; do not intermix ITT components with ACDC components.

3. The ACDC upgrade kit is shipped with one AC unit and two transformers (kit weight=270 lbs.). HP recommends that 2 CEs install the kit due to the weight of the transformers.

Table 8-1. Replaceable Parts By Index Number (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
Note 2	AC Unit (ACDC)	0950-1950	1
	Boxer Fan-AC Unit	3120032-ITT	2
	Fuse 3A 250V Slo-Blo	2110-0029	3
	Fuse 1A 250V Slo-Blo	2110-0007	1
	Cover A.C. Unit	30140-00107	1
	Plenum Bottom I/O	30140-00108	1
	Plenum Bottom CPU	30140-00109	1
	Plate Ass'y - DCU, Key Sw.	30140-00110	1
	Plate Terminal Block Mtg.	30140-00111	1
	Cover Terminal Block	30140-00112	1
6,6a-4	P.S. -5.2V (Module A)	0950-1655	2
Note 1	P.S. YEW -5.2V (Module A)	0950-1948	1
-5	P.S. -2, +/- 12V (Mod. C)	0950-1656	1
Note 1	P.S. YEW +/-12 -2V (Mod. C)	0950-1947	1
	" " Mod. Set C, +/-12V	30140-60114	1
	" " Mod,Set C,Control/Mon.	30140-60123	1
	" " CPU/+5 Distribution	30140-60124	1
-6,8	P.S. Mod. Set D, 5V (Module E In Aux Bay)	0950-1654	2
Note 1	P.S. YEW 5V (Mod. D)	0950-1949	1
	" " Mod,Set D,Control/Mon.	30140-60116	2
	" " Zero Volt, Interbay	30140-60117	1
-7	Xfrmr ITT B, 50/60Hz	9100-4308	1
	Xfrmr SCOTT T, 60Hz, T1	9100-4534	1
	Xfrmr SCOTT T, 50/60Hz, T1	9100-4535	1
	Xfrmr SCOTT T, 60Hz, T2	9100-4537	1
	Xfrmr SCOTT T, 50/60Hz, T2	9100-4536	1
Note 2	Xfrmr (ACDC) 60Hz, T1	0950-1941	1
Note 2	Xfrmr (ACDC) 60Hz, T2	0950-1942	1
Note 2	Xfrmr (ACDC) 50Hz, T1	0950-1944	1
Note 2	Xfrmr (ACDC) 50Hz, T2	0950-1943	1

Notes:

1. Power Modules may be mixed unless they are used in parallel, such as the +5V and -5.2V modules.

2. Transformers and AC power units must be manufactured by the same vendor; do not intermix ITT components with ACDC components.

3. The ACDC upgrade kit is shipped with one AC unit and two transformers (kit weight=270 lbs.). HP recommends that 2 CEs install the kit due to the weight of the transformers.

Table 8-1. Replaceable Parts By Index Number (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
	Slide Chassis	7200-1727	1
	Cable DCU/DATA Comm	30140-60100	1
-7	Cover Ferro Transformer	30140-00113	1
	Support Junction Panel	30140-00114	1
	Duct - Cable CPU	30140-00115	1
	Duct - Cable I/O	30140-00116	1
	Shelf P.S. Bottom CPU	30140-00117	1
	Shelf P.S. I/O	30140-00118	1
-9	PDM	30140-60091	1
	" " PDM, CPU, I/O, Mem.	30140-60118	1
	" " Diode, -4.7V	30140-60119	1
	" " Diode, -5.2V	30140-60120	1
	" " CPU/SSDP-B	30140-60121	1
	Fuse .5A 250V Fast-Blo	2110-0012	5
-10	System Status Display B PCA	30140-60092	1
-10	System Display B Assembly	30140-60095	1
-10	Fuse .5A 250V Fast-Blo	2110-0012	5
Note 3	ACFE Upgrade Kit ITT B, 60Hz	30140-60208	1
Note 3	ACFE Upgrade Kit ITT B, 50Hz	30140-60207	1
Note 3	ACFE Upgrade Kit Scott-T 60Hz	30140-60206	1
Note 3	ACFE Upgrade Kit Scott-T 50Hz	30140-60205	1
N/A	Transformer Brackets (incls front,rear brackets, and bolts)	30140-60204	1

Notes:

1. Power Modules may be mixed unless they are used in parallel, such as the +5V and -5.2V modules.

2. Transformers and AC power units must be manufactured by the same vendor; do not intermix ITT components with ACDC components.

3. The ACDC upgrade kit is shipped with one AC unit and two transformers (kit weight=270 lbs.). HP recommends that 2 CEs install the kit due to the weight of the transformers.

REPLACEABLE PARTS SORTED ALPHABETICALLY

Table 8-2. Replaceable Parts Sorted Alphabetically

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
3-8	24V Battery 5AH	1420-0286	1
Note 2	AC Unit (ACDC)	0950-1950	1
6,6a-3	AC Unit (ITT B)	REF	1
	208VAC 60Hz	0950-1693*	1
	380VAC 50Hz	0950-1694*	1
	415VAC 50Hz	0950-1695*	1
-3	AC Unit (SCOTT T)	0950-1796*	1
	AC Unit-Boxer Fan	3120032-ITT*	2
Note 3	ACFE Upgrade Kit ITT B, 60Hz	30140-60208	1
Note 3	ACFE Upgrade Kit ITT B, 50Hz	30140-60207	1
Note 3	ACFE Upgrade Kit Scott-T 60Hz	30140-60206	1
Note 3	ACFE Upgrade Kit Scott-T 50Hz	30140-60205	1
4-6	ATP Junction Panel	30140-00022	2
4-1	ATP-AIB	30145-60001	1
-1	ATP-SIB	30144-60001	1
4-5	Air Filter -I/O Plennum	3150-0390	1
4-3	Air Filter 9X29 (CPU)	3150-0389	2
6,6a-2	Batt Ch.	0950-1657*	1
-1	Battery Module	30140-60103*	1
3-8	Battery Module PCA	30140-60027**	1
6,6a-1	Boxer Fan-Modules A,C,D	3120032-ITT*	5
	Boxer Fan-Module B	3120041-ITT*	1
	Boxer Fan-AC Unit	3120032-ITT*	2

* Series 64B, 68B/C, 70 only (ITT B and Scott T Power Systems)
** Series 64A/68A only
*** Series 70 only

Notes:

1. Power Modules may be mixed unless they are used in parallel, such as the +5V and -5.2V modules.

2. Transformers and AC power units must be manufactured by the same vendor; do not intermix ITT components with ACDC components.

3. The ACDC upgrade kit is shipped with one AC unit and two transformers (kit weight=270 lbs.). HP recommends that 2 CEs install the kit due to the weight of the transformers.

Table 8-2. Replaceable Parts Sorted Alphabetically (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
4-2	CAC PCA	30140-60009	1
-2	CACX PCA	30140-60172***	1
-2	CBI PCA	30140-60011	3
-2	CIR PCA	30140-60003	1
-2	CLTB PCA	30140-60008	1
-2	CMA PCA	30140-60010	1
-2	CMAX PCA	30140-60173***	1
-2	CPU Back Plane	30140-60018	1
2-4	CPU Bay	Ref	1
4-2	CPU Card Cage - 32 Slot	7101-0582	1
-2	CPU FRONT PLANE PCAs:		
	1. top	30140-60053	1
	2. bottom	30140-60054	1
	CTLA PCA	30140-60007	
-2	Cable AC Power Cord ext.	8120-3753	1
4-4	Cable AC Power Cord Int.	30140-60042	1
5-1	Cable DCU/Data Comm	30140-60048**	1
5-4	Cable Flat AIB/SIB	REF	
	with 3 connectors	30000-93053	1
	with 6 connectors	30000-93056	1
	with 9 connectors	30094-60002	1
5-2	Cable Flat CAC/CMA/CBI	30140-60029	1
5-3	Cable Flat CBI/IOB-MCS	30140-60028	2
5-4	Cable Flat IOB1/IMBI1	30140-60082	2
5-5	Cable Flat DCU/PSC	30140-60050	1
5-4	Cable GIC/HPIB JNTN PNL-2M	5061-2503	
5-5	Cable HP-IB Disc/Mag -2M	10833B	2
-5	Cable - Modem Jumper	30140-60081	1
-5	Cable RS-232 Console/Junc	02640-60131	1
5-4	Cable SSDP/CIR	30140-60052	1
-4	Cable SSDP/PSC	30140-60051	1
	Cables (Ser.64B,68B/C,70B)	Ref	
	(B & Scott T Pwr Systems)	Ref	

* Series 64B, 68B/C, 70 only (ITT B and Scott T Power Systems)
** Series 64A/68A only
*** Series 70 only

Table 8-2. Replaceable Parts Sorted Alphabetically (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
6,6a-1	Cable High Voltage, CPU	30140-60111*	1
	" " High Voltage, I/O	30140-60112*	1
	" " I/O, +5B,+/-12V Dist.	30140-60113*	1
-5	" " Mod. Set C, +/-12V	30140-60114*	1
	" " +5B, Aux. In	30140-60115*	1
-5	" " Mod,Set D,Control/Mon.	30140-60116*	1
	" " Zero Volt, Interbay	30140-60117*	1
-9	" " PDM, CPU, I/O, Mem.	30140-60118*	1
	" " Diode, -4.7V	30140-60119*	1
	" " Diode, -5.2V	30140-60120*	1
	" " CPU/SSDP-B	30140-60121*	1
-2	" " Mod. B, +5B	30140-60122*	1
-5	" " Mod,Set C,Control/Mon.	30140-60123*	1
	" " CPU/+5 Distribution	30140-60124*	1
	" " DCU/DATA Comm	30140-60100*	1
-2	" " Mod,Set B,Control/Mon.	30140-60125*	1
	" " Zero Volt/PDM	30140-60126*	1
-3	" " A.C. Unit,Control/Mon.	30140-60127*	1
-4	" " Mod,Set A,Control/Mon.	30140-60128*	1
	" " High Voltage Aux. I/O	30140-60129*	1
5a	Cache Front Plane	30140-60174***	1
4-4	Circuit Bkr 20A 3P (old)	3105-0137**	1
-4	Circuit Bkr 20A 3P (new)	3105-0163**	1
-4	Circuit Bkr 50A 3P	3105-0138**	1
6,6a-3	Cover A.C. Unit	30140-00107*	1
	Cover Terminal Block	30140-00112*	1
-7	Cover Ferro Transformer	30140-00113*	1
1-12	Cover Top CPU Bay	30140-40010	1
1-11	Cover Top I/O Bay	30140-40011	1
3-12	Diode - 35V/60V	1901-0727	1
4-2	DCU PCA	30140-60001	1
4-6	Direct Connect Mother BD	30145-60003	1
6,6a-7	Duct - Cable CPU	30140-00115*	1
	Duct - Cable I/O	30140-00116*	1
5-5	External Data Cables	REF	

* Series 64B, 68B/C, 70 only (ITT B and Scott T Power Systems)
** Series 64A/68A only
*** Series 70 only

Table 8-2. Replaceable Parts Sorted Alphabetically (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
1-9	FCA PSC/SSDP	30140-60051	1
-9	FCA CIR/SSDP	30140-60052	1
1-4	Fan, Lg CPU Cooling	30140-60037	4
1-4	Fan-T BAX 6" DIA(I/O BAY)	3160-0362	2
1-8	Fan-T BAX 6" DIA(CPU BAY)	3160-0362	7
6,6a-3	Fuse 3A 250V Slo-Blo	2110-0029*	3
	Fuse 1A 250V Slo-Blo	2110-0007*	1
-4,1,5	Fuse .5A 250V Fast-Blo	2110-0012*	5
-2	Fuse 10A 600V Fast-Blo	2110-0575*	1
	Fuse 1A 250V Fast-Blo	2110-0001*	1
	Fuse 30A 32V	3150572-ITT*	1
	Fuse 20A 32V	2110-0649*	2
4-4	Fuse (Fan)	2110-0010**	1
4-1	GIC PCA	31262-60001	2
3-3	I/O Back Plane	30140-60021	1
2-8	I/O Bay	Ref	1
4-1	I/O Card Cage - 24 Slot	7101-0583	1
3-4	I/O Plenum	REF	1
4-2	IMBI PCA	30140-60016	1
4-1	INP PCA	30020-60009	1
4-2	IOB PCA	30140-60015	1
4-6	Internal Data Cables	REF	
3-5	Isolation XMFR 1 Phase	9100-4117	3
4-4	Key	1535-4228	1
-4	Key Switch, Remote/Maint	1390-0482	1
4-2	MCS PCA	30140-60013	1
-2	MMA PCA	30140-60014	1-8
-2	MMC PCA	30140-60012	1

* Series 64B, 68B/C, 70 only (ITT B and Scott T Power Systems)
** Series 64A/68A only
*** Series 70 only

Table 8-2. Replaceable Parts Sorted Alphabetically (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
3-1	Memory Back Plane	30140-60020	1
4-6	Modem Mini Board	30146-60011	1
2-6	Panel Front Center	30140-00155	2
2-7	Panel Front Left	30140-00154	1
2-5	Panel Front Right	30140-00153	1
2-2	Panel Left Rear	30140-00147	1
2-13	Panel Left Side	30140-00068	1
2-3	Panel Rear Cable Exit	30140-00052	1
2-1	Panel Right Rear	30140-00146	1
2-10	Panel Right Side	30140-00068	1
6,6a-9	PDM	30140-60091*	1
	Plate Ass'y - DCU, Key Sw.	30140-00110*	1
-1	Plate Battery Mtg.	30140-00106*	1
	Plate Terminal Block Mtg.	30140-00111*	1
-3	Plenum Bottom CPU	30140-00109*	1
	Plenum Bottom I/O	30140-00108*	1
4-4	Power Control Module (PCM)	30140-60023**	1
3-9	Power Dist PCA	30140-60025**	1
3-10	Power Dist PCA	30140-60024**	1
6,6a-6,8	Power Supply 5V (Mod D)	0950-1654*	2
-4	Power Supply -5.2V (Mod A)	0950-1655*	2
-5	Power Supply -2,+/-12V	0950-1656*	1
-1	Power Supply Shelf Top CPU	30140-00104*	1
3-6	Power Supply (PS2,3,6,7)	62971M	4
	ACDC PS (replaces PS2 & PS3 in PS Upgrade)	0950-1823**	1
3-7	Power Supply (PS5)	62970M**	1
3-9	Power Supply (PS4)	63902F	1
3-10	Power Supply (PS1)	63901F	1
Note 1	P.S. YEW -5.2V (Mod.A)	0950-1948	1
	P.S. YEW Batt (Mod. B)	0950-1945	
Note 1	P.S. YEW +/-12 -2V (Mod.C)	0950-1947	1
Note 1	P.S. YEW 5V (Mod. D)	0950-1949	1

* Series 64B, 68B/C, 70 only (ITT B and Scott T Power Systems)
** Series 64A/68A only
*** Series 70 only

Notes:

1. Power Modules may be mixed unless they are used in parallel, such as the +5V and -5.2V modules.
2. Transformers and AC power units must be manufactured by the same vendor; do not intermix ITT components with ACDC components.
3. The ACDC upgrade kit is shipped with one AC unit and two transformers (kit weight=270 lbs.). HP recommends that 2 CEs install the kit due to the weight of the transformers.

Table 8-2. Replaceable Parts Sorted Alphabetically (Cont'd)

FIGURE/ INDEX #	DESCRIPTION	HP PART #	QTY
3-11	PSC	30140-60017**	1
4-2	RALU (0) PCA	30140-60002	1
-2	RALU (1,2,3) PCA	30140-60002	3
4-6	RS232 Modem Mother Bd	30145-60002	1
-6	RS2332C Mini Board	30148-60001	1
-6	RS422 Mini Board	30147-60001	1
1-1	Series 6X/70 Main Frame	30140A	1
6,6a-1	Shelf P.S. Bottom CPU	30140-00117*	1
	Shelf P.S. I/O	30140-00118*	1
4-2	SKSP PCA	30140-60005	1
6,6a-1	Slide Chassis	7200-1727*	1
	Support Junction Panel	30140-00114*	1
-10	System Status Disp.B PCA	30140-60092*	1
	System Display B Assembly	30140-60095*	1
7-10	System Display Panel Assy	30140-60070**	1
4-8	Thermal Switch, 122F (50C)	3103-0103	4
-8	Thermal Switch, 104F (40C)	3103-0104	4
N/A	Transformer Brackets (incls front,rear brackets, and bolts)	30140-60204	1
4-1	Translator	26069-60001	1
3-13	U-Bus (laminated, power)	0360-2051	1
4-2	VBUS PCA	30140-60004	1
4-7	Wiring Duct - Junct Pnl	30140-00098	4
4-2	WCS PCA	30140-60026	2
Note 2	Xfrmr (ACDC) 60Hz, T1	0950-1941	1
Note 2	Xfrmr (ACDC) 60Hz, T2	0950-1942	1
Note 2	Xfrmr (ACDC) 50Hz, T1	0950-1944	1
Note 2	Xfrmr (ACDC) 50Hz, T2	0950-1943	1
6,6a-7	Xfrmr (ITT B),50/60Hz	9100-4308*	1
	Xfrmr (SCOTT T),60Hz,T1	9100-4534*	1
	Xfrmr (SCOTT T),50/60Hz,T1	9100-4535*	1
	Xfrmr (SCOTT T),60Hz,T2	9100-4537*	1
	Xfrmr (SCOTT T),50/60Hz,T2	9100-4536*	1

* Series 64B, 68B/C, 70 only (ITT B and Scott T Power Systems)
** Series 64A/68A only
*** Series 70 only

Notes:

1. Power Modules may be mixed unless they are used in parallel, such as the +5V and -5.2V modules.
2. Transformers and AC power units must be manufactured by the same vendor; do not intermix ITT components with ACDC components.
3. The ACDC upgrade kit is shipped with one AC unit and two transformers (kit weight=270 lbs.). HP recommends that 2 CEs install the kit due to the weight of the transformers.

DIAGRAMS

SECTION

9

The diagrams contained in this section have been prepared from factory drawings to assist the CE in troubleshooting the system. The Series 64/68/70 Block Diagrams and Assembly Drawings Manual (Part No. 30140-90004) contains detailed diagrams for additional reference.

PCA LAYOUT

Figures 9-1 through 9-8 show the location of major components (switches, chips and connectors) on various PCAs.

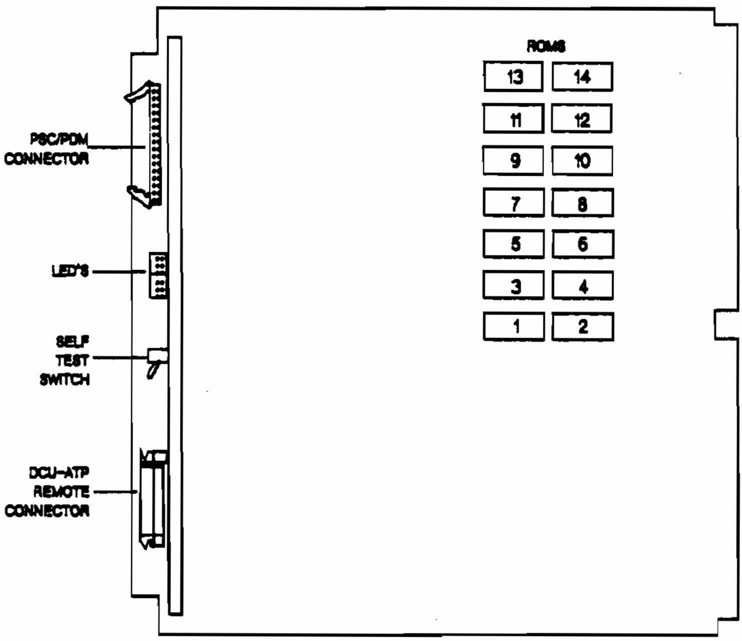


Figure 9-1. DCU Layout

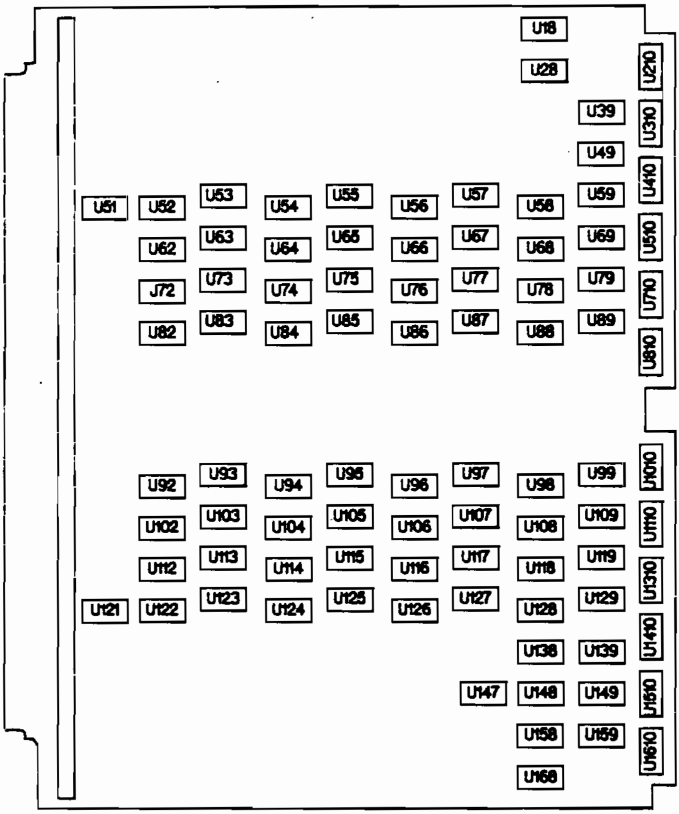


Figure 9-2. WCS Layout

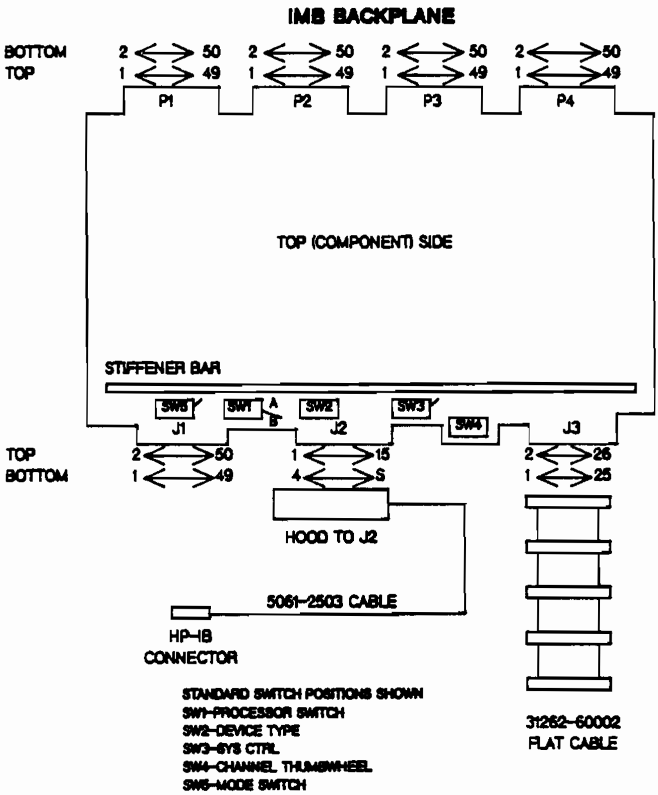


Figure 9-3. GIC Layout

NOTE: Observe that switch 1 is OUT, contrary to the convention of switches being set IN.

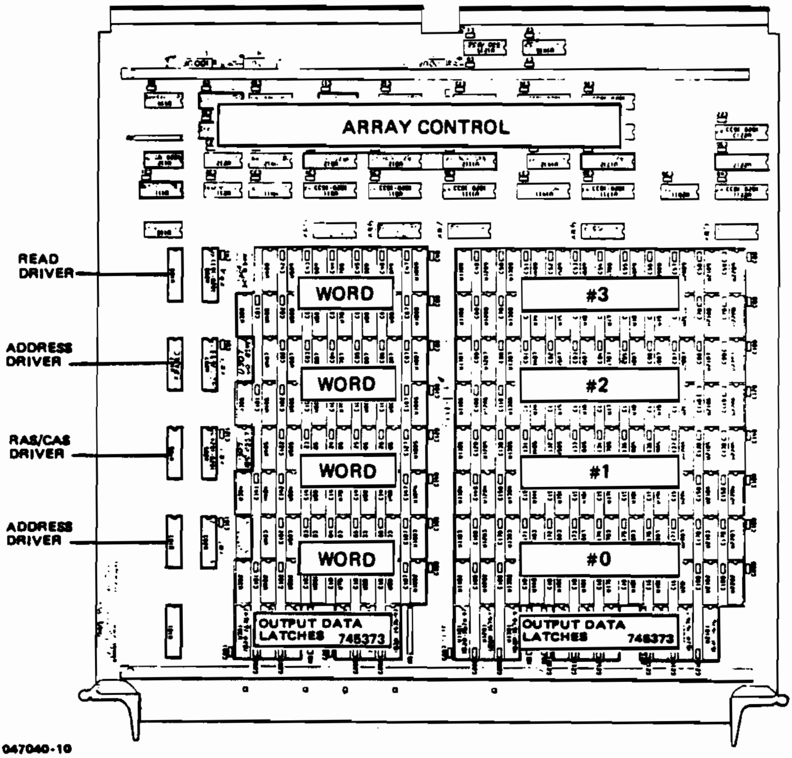


Figure 9-4. Memory Array Layout

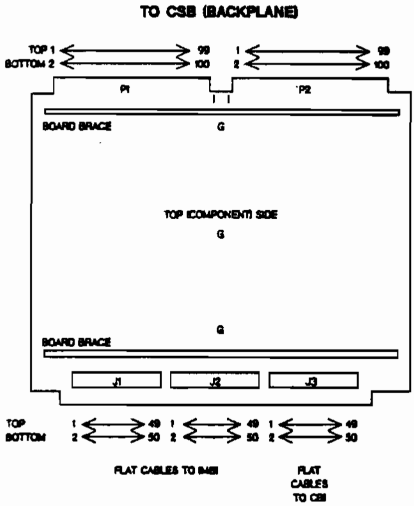


Figure 9-5. IOB PCA Layout

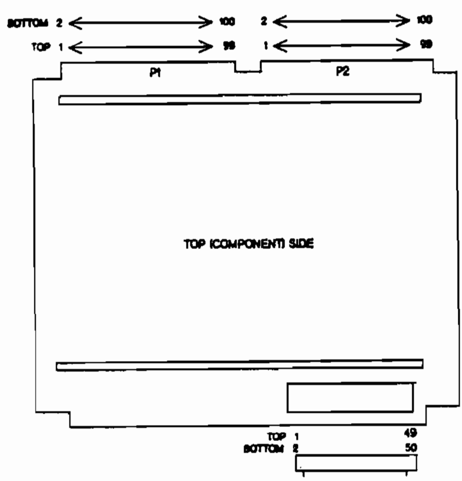
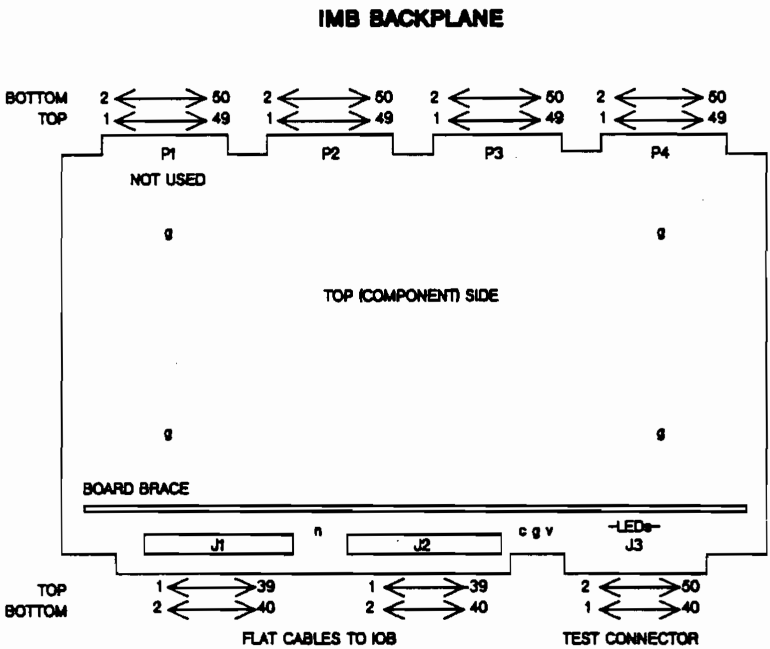


Figure 9-6. CBI PCA Layout



Test Points

c = Clock: High during first half of state time (rising edge triggers state changes). 50% duty cycle, Schottky TTL signal.

g = Common: binding posts connected to board logic common.

n = -5.2 volt test point between J1, J2.

v = +5.0 volt test point by J3, primarily for probe power.

Figure 9-7. IMBI Layout

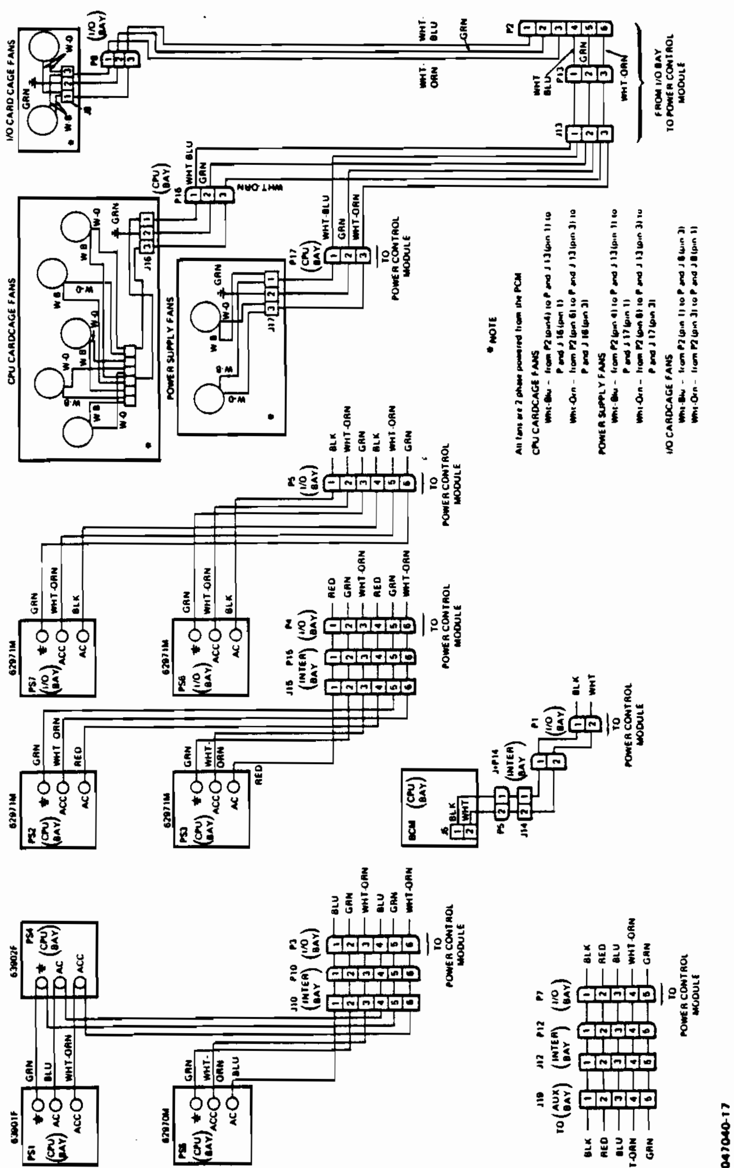


Figure 9-8. AC Wiring (32460A)

POWER SYSTEM CONTROL WIRING LIST (HP 32460A)

CP1 and CP2 are interbay connector panels.

Terminal A1 on power supplies is SHUTDOWN.

```
                                              P6 to
J5(PSC) P5(PSC)               CP1 JH  CP1 JP  J6 PCM
Pin #   Pin #                 Pin #   Pin#    Pin #
+---+   +---+                 +---+   +---+   +---+
| 1 |   | 1 |         +-------| 1 |---| 1 |---| 1 |-BRN
|---|   |---|         |       |---|   |---|   |---|
| 2 |---| 2 |---+BLK  | +-----| 2 |---| 2 |---| 2 |-RED
|---|   |---|   |     | |     |---|   |---|   |---|
| 3 |---| 3 |-----BRN-+ | +---| 3 |---| 3 |---| 3 |-ORN
|---|   |---|   |       | |   |---|   |---|   |---|
| 4 |   | 4 |   +-------------| 4 |---| 4 |---| 4 |-BLK
|---|   |---|           | |   |---|   |---|   |---|
| 5 |   | 5 |       +---------| 5 |---| 5 |---| 5 |-GRN
|---|   |---|       |   | |   |---|   |---|   |---|
| 6 |---| 6 |---RED-----+ | +-| 6 |---| 6 |---| 6 |-YEL
|---|   |---|       |     | | |---|   |---|   |---|
| 7 |---| 7 |---YEL-------- + | 7 |   | 7 |   | 7 |
|---|   |---|       |     |   |---|   |---|   |---|
| 8 |---| 8 |---GRN-+     |   | 8 |   | 8 |   | 8 |
|---|   |---|             |   |---    |---|   |---|
| 9 |---| 9 |---ORN-------+   | 9 |   | 9 |   | 9 |
+---+   +---+                 +---+   +---+   +---+


J3(PSC) P3(PSC)
Pin #   Pin #
+---+   +---+
| 1 |   | 1 |
|---|   |---|
| 2 |   | 2 |
|---|   |---|
| 3 |   | 3 |
|---|   |---|
| 4 |   | 4 |
|---|   |---|
| 5 |---| 5 |----BRN-------to PS1 (pin 13)
|---|   |---|
| 6 |   | 6 |
|---|   |---|
| 7 |   | 7 |
|---|   |---|
| 8 |---| 8 |----WHT-RED---to PS2 -5.2 Volts
|---|   |---|
| 9 |   | 9 |
+---+   +---+
```

```
J6(PSC) P6(PSC)
Pin #   Pin#
+---+   +---+
| 1 |   | 1 |
|---|   |---|
| 2 |---| 2 |----WHT-BLU to PS1 (pin 16)
|---|   |---|
| 3 |---| 3 |----WHT-YEL to PS1 (pin 20)
|---|   |---|
| 4 |---| 4 |----RED to PS1 -5 Volt terminal
|---|   |---|
| 5 |---| 5 |----YEL to PS5 -5 Volt terminal
|---|   |---|
| 6 |---| 6 |----BLU to PS1 (pin 12)
|---|   |---|
| 7 |---| 7 |----WHT-RED to P9 (pin 5)
|---|   |---|
| 8 |---| 8 |----VIO to BCM (pin 1)
|---|   |---|
| 9 |---| 9 |----WHT-GRY to PS4 (pin 20)
|---|   |---|
|10 |---|10 |----GRY to PS4 (pin 12)
|---|   |---|
|11 |---|11 |----WHT-VIO to BCM (pin 3)
|---|   |---|
|12 |---|12 |----WHT-BLK-BRN to PS2 A1 terminal
|---|   |---|
|13 |---|13 |----WHT-BLK-RED to PS3 A1 terminal
|---|   |---|
|14 |---|14 |----GRN to BCM (pin 2)
|---|   |---|
|15 |---|15 |----WHT to PS1 (pin 19)
|---|   |---|
|16 |---|16 |
|---|   |---|
|17 |---|17 |
|---|   |---|
|18 |---|18 |----ORN to P9 (pin 6)
|---|   |---|
|19 |---|19 |----WHT-BLK to PS5 A1 terminal
|---|   |---|
|20 |---|20 |----WHT-BLK-BLU to P9 (pin 7)
+---+   +---+
```

```
J7(PSC) P7(PSC)
Pin #   Pin #
+---+   +---+
| 1 |---| 1 |--VIO-----+      +--to PS1 (pin 5)
|---|   |---|          |------|
| 2 |---| 2 |--WHT-VIO-+      +--to PS1 (pin 6)
|---|   |---|
| 3 |---| 3 |--WHT-BLK-ORN--+    +---to PS1 (pin 9)
|---|   |---|               |----|
| 4 |---| 4 |--WHT-BLK-YEL--+    +---to PS1 (pin 10)
|---|   |---|
| 5 |---| 5 |---YEL-----+    +----to PS3 +SHUNT
|---|   |---|           |----|
| 6 |---| 6 |--WHT-YEL--+    +----to PS3 -SHUNT
|---|   |---|
| 7 |---| 7 |---RED-----+    +----to PS2 +SHUNT
|---|   |---|           |----|
| 8 |---| 8 |--WHT-RED--+    +----to PS2 -SHUNT
|---|   |---|
| 9 |---| 9 |--ORN------+  +----to CP.2  P and J9 (pin 1)
|---|   |---|           |--|
|10 |---|10 |--WHT-ORN--+  +----to CP.2  P and J9 (pin 2)
|---|   |---|
|11 |---|11 |--GRN------+  +----to PS5 +SHUNT
|---|   |---|           |--|
|12 |---|12 |--WHT-GRN--+  +----to PS5 -SHUNT
|---|   |---|
|13 |---|13 |--BRN------+  +----to PS 4 (pin 5)
|---|   |---|           |--|
|14 |---|14 |--WHT-BRN--+  +----to PS 4 (pin 6)
|---|   |---|

|15 |---|15 |--BLK------+  +----to CP.2 P and J9 (pin 3)
|---|   |---|           |--|
|16 |---|16 |--WHT-BLK--+  +----to CP.2 P and J9 (pin 4)
|---|   |---|
|17 |---|17 |
|---|   |---|
|18 |---|18 |
|---|   |---|
|19 |---|19 |--GRY------+  +----to PS1 (pin 1)
|---|   |---|           |--|
|20 |---|20 |--WHT-GRY--+  +----to PS1 (pin 2)
+---+   +---+
```

```
J9(PSC) P9
Pin #   Pin #
+---+   +---+
| 1 |---| 1 |--WHT-BLK-BRN-----to PS1 (pin 3)
|---|   |---|
| 2 |---| 2 |--WHT-BLK-RED-----to PS1 (pin 7)
|---|   |---|
| 3 |---| 3 |--WHT-BLK-GRN-----to PS1 (pin 11)
|---|   |---|
| 4 |---| 4 |--WHT-BLK-VIO-----to PS2 VREF
|---|   |---|
| 5 |---| 5 |--WHT-BLK-GRY-----to PS3 VREF
|---|   |---|
| 6 |---| 6 |--WHT-RED-VIO-----to.PS5 VREF
|---|   |---|
| 7 |---| 7 |
|---|   |---|
| 8 |---| 8 |
|---|   |---|
| 9 |---| 9 |
|---|   |---|
|10 |---|10 |
|---|   |---|
|11 |---|11 |
|---|   |---|
|12 |---|12 |
|---|   |---|
|13 |---|13 |
|---|   |---|
|14 |---|14 |
|---|   |---|
|15 |---|15 |
|---|   |---|
|16 |---|16 |
|---|   |---|
|17 |---|17 |--WHT-BRN-ORN-----to  PS4 (pin 2)
|---|   |---|
|18 |---|18 |--WHT-BRN-RED-----to  PS4 (pin 1)
|---|   |---|
|19 |---|19 |
|---|   |---|
|20 |---|20 |
+---+   +---+
```

```
     CP2
J9       P9
Pin #    Pin #
+---+    +---+
| 1 |---| 1 |---ORN--from P7 (pin 9) to PS6 +SHUNT
|---|    |---|
| 2 |---| 2 |--WHT-ORN---from P7 (pin 10) to PS6 -SHUNT
|---|    |---|
| 3 |---| 3 |---BLK--from P7 (pin 15) to PS7 +SHUNT
|---|    |---|
| 4 |---| 4 |---WHT-BLK--from P7 (pin 16) to PS7 -SHUNT
|---|    |---|
| 5 |---| 5 |---WHT-RED--from P6 (pin 7) to PS7 +5Volts
|---|    |---|
| 6 |---| 6 |---ORN---from P6 (pin 18) to PS7 A1
|---|    |---|
| 7 |---| 7 |---WHT-BLK-BLU--from P6 (pin 20) to PS6 A1
|---|    |---|
| 8 |---| 8 |---BLU---from P9 (pin 10) to PS7 VREF
|---|    |---|
| 9 |---| 9 |---YEL---from P9 (pin 9) to PS6 VREF
+---+    +---+
```

CPU/IO BACKPLANE WIRING LIST (HP 32460A)

The following pages provide wiring lists for the CPU and I/O backplane (32460A).

```
J3 (PSC)
Pin #
+---+
| 1 |-----WHT-BLU-----to - 12 Volts (CPU Backplane)
|---|
| 2 |-----WHT-BLK-----to GND (CPU Backplane)
|---|
| 3 |-----GRY---------to J3 (pin 12)
|---|
| 4 |-----BLU---------to +12 Volts (CPU Backplane)
|---|
| 5 |
|---|
| 6 |-----RED---------to +5 Volts (CPU Backplane)
|---|
| 7 |
|---|
| 8 |
|---|
| 9 |
+---+
```

```
J3 (BCM)                          J3 (PS4)
Pin #                             Pin #
+---+                             +---+
| 1 |----WHT-ORN---+    +------| 1 |
|---|              |    |      |---|
| 2 |----ORN-------+----+------| 2 |
|---|              |    |      |---|
| 3 |----WHT-BRN---+    +----  | 3 |
|---|                          +---+
| 4 |----ORN---to PS4 + 28.8 Volts
|---|
| 5 |
|---|
| 6 |----BRN---to PS4 - 28.8 Volts
|---|
| 7 |----ORN---to PS4 + 28.8 Volts
|---|
| 8 |
|---|
| 9 |----BRN---to PS4 - 28.8 Volts
+---+
```

```
J1 (PS4)
Pin #
+---+
| 1 |----GRY---to J5 (pin 2)
|---|
| 2 |----GRY---to CP3 J21 (pin 1)
|---|
| 3 |----GRY---to J3(Memory Backplane) pin 8
|---|
| 4 |----GRY---to J3(Memory Backplane) pin 10
|---|
| 5 |----GRY---to J3(Memory Backplane) pin 11
|---|
| 6 |
|---|
| 7 |
|---|
| 8 |----WHT-GRY--to J3(Memory Backplane) pin 5
|---|
| 9 |
|---|
|10 |----WHT-GRY----to J3(Memory Backplane) pin 2
|---|
|11 |----WHT-GRY----to J3(Memory Backplane) pin 3
|---|
|12 |----WHT-GRY----to J3(Memory Backplane) pin 4
|---|
|13 |----WHT-GRY----to J5(Memory Backplane) pin 1
|---|
|14 |
|---|
|15 |
+---+
```

```
J3 (Memory Backplane)
Pin #
+---+
| 1 |
|---|
| 2 |----WHT-GRY---to PS4 J1 (pin 10)
|---|
| 3 |----WHT-GRY---to PS4 J1 (pin 11)
|---|
| 4 |----WHT-GRY---to PS4 J1 (pin 12)
|---|
| 5 |----WHT-GRY---to J19 (I/O Backplane) pin 1
|---|
| 6 |----WHT-GRY---to J19 (I/O Backplane) pin 4
|---|
| 7 |
|---|
| 8 |----GRY---to PS4 J1 (pin 3)
|---|
| 9 |----WHT-GRY---to J19 (I/O Backplane) pin 3
|---|
|10 |----GRY---to PS4 J1 (pin 4)
|---|
|11 |----GRY---to PS4 J1 (pin 5)
|---|
|12 |----GRY---to J3 (PSC) pin 3
|---|
|13 |----GRY---to J19 (I/O Backplane) pin 2
|---|
|14 |----GRY---to J19 (I/O Backplane) pin 3
|---|
|15 |----GRY---to J19 (I/O Backplane) pin 6
+---+


J5 (Memory Backplane)
+---+
| 1 |----WHT-GRY-+    +---PS4 J1 (pin 13)
|---|            |---|
| 2 |----GRY-----+    +---PS4 J1 (pin 1)
+---+
```

```
J4 (Memory Backplane)
Pin #
+---+
| 1 |----GRY----to CPU Backplane +5VB
|---|
| 2 |----RED---+
|---|          |
| 3 |----RED---+
|---|          |
| 4 |----RED---+----to PS1 +5V
|---|          |
| 5 |----RED---+
|---|          |
| 6 |----RED---+
|---|
| 7 |----BLK---+   +----to PS1 J3 (pin 2)
|---|          |   |
| 8 |          +---+
|---|          |   |
| 9 |----RED---+   +----to PS1 J3 (pin 1)
|---|
|10 |----BLK---+
|---|          |
|11 |----BLK---+
|---|          |
|12 |----BLK---+----to PS1 -5V
|---|          |
|13 |----BLK---+
|---|          |
|14 |          |
|---|          |
|15 |----BLK---+
+---+
```

```
CP3 J21 to Auxiliary Bay
Pin #
+---+
| 1 |----GRY---to PS4 J1 (pin 2)
|---|
| 2 |----WHT-GRY---to PS4 J1 (pin 8)
|---|
| 3 |
|---|
| 4 |----BLU---to PS1 J1 (pin 2)
|---|
| 5 |----WHT-BLU-GRY---to PS1 J1 (pin 14)
|---|
| 6 |
|---|
| 7 |----WHT-BLK---to PS1 J1 (pin 8)
|---|
| 8 |----WHT-BLK---to PS1 J1 (pin 8)
|---|
| 9 |
|---|
|10 |
|---|
|11 |
|---|
|12 |
+---+
```

```
J1 (PS1)
Pin #
+---+
| 1 |----BLU----to CPU Backplane +12V
|---|
| 2 |----BLU----to CP3 J21 (pin 4)
|---|
| 3 |----BLU----to J19 I/O Backplane (pin 13)
|---|
| 4 |----BLU----to J20 I/O Backplane (pin 1)
|---|
| 5 |----WHT-BLK---to CPU Backplane GND
|---|
| 6 |----WHT-BLK---to CPU Backplane GND
|---|
| 7 |----WHT-BLK---to CP3 J21 (pin 7)
|---|
| 8 |----WHT-BLK---To CP3 J21 (pin 8)
|---|
| 9 |----BLK----to P20 I/O Backplane (pin 2)
|---|
|10 |----WHT-BLK---to P20 I/O Backplane (pin 3)
|---|
|11 |----WHT-BLK---to J19 I/O Backplane (pin 9)
|---|
|12 |----Wht-BLK---to J19 I/O Backplane (pin 11)
|---|
|13 |----WHT-BLU-GRY---to CPU Backpane -12V
|---|
|14 |----WHT-BLU-GRY---to CP3 J21 (pin 5)
|---|
|15 |----WHt-BLU-GRY---to  J18 I/O Backplane (pin 15)
+---+
```

```
J19 (I/O Backplane)
Pin #
+---+
| 1 |----WHT-GRY---to J3(Memory Backplane) pin 5
|---|
| 2 |----GRY---to J3(Memory Backplane) pin 13
|---|
| 3 |----GRY---to J3(Memory Backplane) pin 14
|---|
| 4 |----WHT-GRY---to J3(Memory Backplane) pin 6
|---|
| 5 |----WHT-GRY---to J3(Memory Backplane) pin 9
|---|
| 6 |----GRY---to J3(Memory Backplane) pin 15
|---|
| 7 |
|---|
| 8 |
|---|
| 9 |----WHT-BLU---to PS1 J1 (pin 11)
|---|
|10 |
|---|
|11 |----WHT-BLK---to PS1 J1 (pin 12)
|---|
|12 |
|---|
|13 |----BLU---to PS1 J1 (pin 3)
|---|
|14 |
|---|
|15 |----WHT-BLU-GRY---to PS1 J1 (pin 15)
+---+


J20 (I/O Backplane)
Pin #
+---+
| 1 |----BLU-----+  +---to PS1 J1 (pin 4)
|---|            |  |
| 2 |----BLK-----+--+---to PS1 J1 (pin 9)
|---|            |  |
| 3 |----WHT-BLU-+  +---to PS1 J1 (pin 10)
+---+
```

```
J23 (Between Card Cages)
Pin #
+---+
| 1 |----WHT-ORN---to Overtemperature Switch (high)
|---|
| 2 |----BLK---to Overtemperature Switch (high)
|   |----BLK---to Overtemperature Switch (low)
|---|
| 3 |----BRN---to Overtemperature Switch (low)
+---+
```

```
P23 (Between Card Cages)
Pin #
+---+
| 1 |----WHT-ORN---to P25 (CPU Bay) pin 1
|---|
| 2 |----BLK---to P25 (CPU Bay) pin 2
|---|
| 3 |----WHT-BRN---to P25 (CPU Bay) pin 3
+---+
```

```
J6 (PSC)
Pin #
+---+
|15 |
|---|
|16 |----WHT-BRN---to J21 (located in Cable Channel) pin 2
|---|
|17 |----WHT-ORN---to J21 (located in Cable Channel) pin 1
|---|
|18 |
+---+
```

```
J18 (I/O Backplane)
Pin #
+---+
| 1 |----RED---to CPU Backplane +5V
|---|
| 2 |----RED---to CPU Backplane +5V
|---|
| 3 |----RED---to CPU Backplane +5V
|---|
| 4 |----BLK---to CPU Backplane +5V
|---|
| 5 |----BLK---to CPU Backplane +5V
|---|
| 6 |----BLK---to CPU Backplane +5V
+---+
```

```
J23 (Between Card Cages)
Pin #
+---+
| 1 |----WHT-ORN---to Overtemperature Switch (high)
|---|
| 2 |----BLK---to Overtemperature Switch (high)
|   |----BLK---to Overtemperature Switch (low)
|---|
| 3 |----BRN---to Overtemperature Switch (low)
+---+


P23 (Between Card Cages)
Pin #
+---+
| 1 |----WHT-ORN---to P25 (CPU Bay) pin 1
|---|
| 2 |----BLK---to P25 (CPU Bay) pin 2
|---|
| 3 |----WHT-BRN---to P25 (CPU Bay) pin 3
+---+


J6 (PSC)
Pin #
+---+
|15 |
|---|
|16 |----WHT-BRN---to J21 (located in Cable Channel) pin 2
|---|
|17 |----WHT-ORN---to J21 (located in Cable Channel) pin 1
|---|
|18 |
+---+


J18 (I/O Backplane)
Pin #
+---+
| 1 |----RED---to CPU Backplane +5V
|---|
| 2 |----RED---to CPU Backplane +5V
|---|
| 3 |----RED---to CPU Backplane +5V
|---|
| 4 |----BLK---to CPU Backplane +5V
|---|
| 5 |----BLK---to CPU Backplane +5V
|---|
| 6 |----BLK---to CPU Backplane +5V
+---+
```

PDM CONNECTOR PIN ALLOCATION (HP 32460B, 32468B/C, 32471)

The followings pages indicate pin allocation for each connector. Abbreviations to be used are as follows:

A,B,C,D,E,	:	MODULES A,B,C,D,E
IO	:	CURRENT OUTPUT
M+	:	UP MARGIN
M-	:	DOWN MARGIN
MA	:	MODULE ALARM
CS	:	CONVERTER SHUTDOWN
RFA	:	RECTIFIER FAILURE ALARM
CH	:	CHARGER
SG	:	SYSTEM GROUND

J1 PIN ALLOCATION

1- SG
2- SG
3- A00
4- A01
5- A02
6- A03
7- A04
8- SG
9- A05
10-A06
11-A07
12-A08
13-A09
14-SG
15-A10
16-A11
17-A12
18-A13
19-A14
20-SG
21-A15
22-D0
23-D1
24-D2
25-D3
26-SG
27-D4
28-D5
29-D6
30-D7
31-MREQ
32-SG
33-IOREQ
34-RD
35-WR
36-RESET
37-SG
38-NMI
39-TMRINT
40-ROMDISAB
41-PSCENAB
42-SG
43-DBUSENAB
44-PON
45-PFW
46-CPUR/H
47-SG
48-
49-SG
50-SG

J2 PIN ALLOCATION

1- R LED
2- A LED
3- B LED
4- OVERTEMPERATURE LED
5- C LED
6- D LED
7- E LED
8- F LED
9- G LED
10-H LED
11-P LED
12-
13-
14-CPU R/H
15-REMOTE
16-BATTERY LED

J3 PIN ALLOCATION

1- CH CS
2- BC
3- SG
4- SG
5- CH A
6- CH IO
7- BATTERY CURRENT MONITOR
8- -/+5VBB SOURCE
9- -/+5VBB SOURCE
10-SG
11-SG
12-SG
13-BC RETURN
14-KEYING PLUG
15-SG
16-B CS
17-B MA
18-B+5 IO
19-BATTERY VOLTAGE MONITOR
20-

J4 PIN ALLOCATION

1- LOW OVERTEMP SWITCH
2- HIGH OVERTEMP SWITCH
3-
4-
5- BC (RTN)
6- SG
7- SG
8- KEYING PLUG
9- BC
10-FAN FAIL
11-RECTIFIER OVERTEMPERATURE
12-RFA
13-
14-SG
15-SG
16-
17-CHASSIS GROUND
18-SG
19-PFA
20-

J5 PIN ALLOCATION

1- +5V
2- -5.2 V
3- +5VB
4- SG

J6 PIN ALLOCATION

1 -E1 CS
2 -E1 MA
3 -SG
4 -E2 CS
5 -E2 MA
6 -
7 -E3 CS
8 -E3 MA
9 -
10-E2 +5 IO
11-E1 +5 IO
12-E3 +5 IO
13-E +5 M+
14-E +5 M-
15-SG
16-SG
17-KEYING PLUG
18-
19-SG
20-SG

J7 PIN ALLOCATION

1 -CICS
2 -C1MA
3 -SG
4 -C2CS
5 -C2MA
6 -SG
7 -KEYING PLUG
8 -C1 -2 IO
9 -C2 -2 IO
10-C2 +12 IO
11-C1 -12 IO
12-C1 +12 IO
13-C -2 M+
14-C -2 M-
15-C +12 M+
16-C2 -12 IO
17-C +12 M-
18-C -12 M+
19-C -12 M-
20-SG

J9 PIN ALLOCATION

1 -D1 CS
2 -D1 MA
3 -SG
4 -D2 CS
5 -D2 MA
6 -SG
7 -D3 CS
8 -D3 MA
9 -KEYING PLUG
10-D2 +5 IO
11-D1 +5 IO
12-D3 +5 IO
13-D +5 M+M+
14-D +5 M-
15-SG
16-SG
17-SG
18-SG
19-SG
20-

J8 PIN ALLOCATION

1 -A1 CS
2 -A1 MA
3 -KEYING PLUG
4 -A2 CS
5 -A2 MA
6 -SG
7 -A3 CS
8 -A3 MA
9 -
10-A2 -5.2 IO
11-A1 -5.2 IO
12-A3 -5.2 IO
13-A -5.2 M+
14-A -5.2 M-
15-SG
16-SG
17-SG
18-SG
19-SG
20-

J12 PIN ALLOCATION

1 - +12S
2 - SG
3 - SG
4 - -12S

J13 PIN ALLOCATION

1,2,3,4,5,6 +5VB

J14 PIN ALLOCATION

1,2,3	+ 5VB
4,7	+12
6,9	-12
8	+5V (E IO,AUX IO)

J15 PIN ALLOCATION

1 - SG
2 - SG
3 - SG

J16 PIN ALLOCATION

1 - +12V
2 - -12V
3 - +5V
4 - -5.2V
5 - -2V

J17 PIN ALLOCATION

1,4,7,10	+12V
2,5,8,11,	SG
3,6,9,12	-12V

J18 PIN ALLOCATION

1,2,3	+5VB
4,7	+12
6,9	-12
8	+5 (E IO,AUX I/O)
5	SG

REFERENCE

SECTION 10

This section contains reference data to aid in troubleshooting the Series 64/68/70.

ASCII Code Chart

Table 10-1. ASCII Code Table

How To Use This Table

- The table is sorted by character code, each code being represented by its decimal, octal, and hexadecimal equivalent.
- Each row of the table gives the ASCII and EBCDIC meaning of the character code, the ASCII/EBCDIC conversion code, and the Hollerith representation (punched card code) for the ASCII character.

Example 1: Suppose you want to determine the ASCII code for the $ character. Scan down the ASCII graphic column until you locate $, then look left on that row to find the character code — 36 (decimal), 044 (octal), and 24 (hex). This is the code used by an ASCII device (terminal, printer, computer, etc.) to represent the $ character. Its Hollerith punched card code is 11-3-8.

Example 2: The character code 5B (hex) is the EBCDIC code for what character? Also, when 5B is converted to ASCII (for example by FCOPY with the EBCDICIN option), what is the octal character code? First, locate 5B in the hex character code column and move right on that row to the EBCDIC graphic which is $. The next column to the right gives the conversion to ASCII, 044. As a check, find 044 (octal) in the character code column, look right to the ASCII graphic column and note that $ converted to EBCDIC is 133 (octal) which equals 5B (hex).

Character Code			ASCII			EBCDIC	
Decimal	Octal	Hex	Control/ Graphic	To EBCDIC (Octal)	Hollerith	Control/ Graphic	To ASCII (Octal)
0	000	00	NUL	000	12 0 1 8 9	NUL	000
1	001	01	SOH	001	12 1 9	SOH	001
2	002	02	STX	002	12 2 9	STX	002
3	003	03	ETX	003	12 3 9	ETX	003
4	004	04	EOT	067	7 9	PF	234
5	005	05	ENQ	055	0 5 8 9	HT	011
6	006	06	ACK	056	0 6 8 9	LC	206
7	007	07	BEL	057	0 7 8 9	DEL	177
8	010	08	BS	026	11 6 9		227
9	011	09	HT	005	12 5 9		215
10	012	0A	LF	045	0 5 9	SMM	216
11	013	0B	VT	013	12 3 8 9	VT	013
12	014	0C	FF	014	12 4 8 9	FF	014
13	015	0D	CR	015	12 5 8 9	CR	015
14	016	0E	SO	016	12 6 8 9	SO	016
15	017	0F	SI	017	12 7 8 9	SI	017

Table 10-1. ASCII Code Table (con't.)

Character Code			ASCII			EBCDIC	
Decimal	Octal	Hex	Control/ Graphic	To EBCDIC (Octal)	Hollerith	Control/ Graphic	To ASCII (Octal)
16	020	10	DLE	020	12 11 1 8 9	DLE	020
17	021	11	DC1	021	11 1 9	DC1	021
18	022	12	DC2	022	11 2 9	DC2	022
19	023	13	DC3	023	11 3 9	TM	023
20	024	14	DC4	074	4 8 9	RES	235
21	025	15	NAK	075	5 8 9	NL	205
22	026	16	SYN	062	2 9	BS	010
23	027	17	ETB	046	0 6 9	IL	207
24	030	18	CAN	030	11 8 9	CAN	030
25	031	19	EM	031	11 1 8 9	EM	031
26	032	1A	SUB	077	7 8 9	CC	222
27	033	1B	ESC	047	0 7 9	CU1	217
28	034	1C	FS	034	11 4 8 9	IFS	034
29	035	1D	GS	035	11 5 8 9	IGS	035
30	036	1E	RS	036	11 6 8 9	IRS	036
31	037	1F	US	037	11 7 8 9	IUS	037
32	040	20	SP space	100	Blank	DS	200
33	041	21	!	117	12 7 8	SOS	201
34	042	22	"	177	7 8	FS	202
35	043	23	#	173	3 8		203
36	044	24	$	133	11 3 8	BYP	204
37	045	25	%	154	0 4 8	LF	012
38	046	26	&	120	12	ETB	027
39	047	27	' apost.	175	5 8	ESC	033
40	050	28	(	115	12 5 8		210
41	051	29	)	135	11 5 8		211
42	052	2A	*	134	11 4 8	SM	212
43	053	2B	+	116	12 8 8	CU2	213
44	054	2C	, comma	153	0 3 8		214
45	055	2D	- hyphen	140	11	ENQ	005
46	056	2E	. period	113	12 3 6	ACK	006
47	057	2F	/	141	0 1	BEL	007
48	060	30	0	360	0		220
49	061	31	1	361	1		221
50	062	32	2	362	2	SYN	026
51	063	33	3	363	3		223
52	064	34	4	364	4	PN	224
53	065	35	5	365	5	RS	225
54	066	36	6	366	6	UC	226
55	067	37	7	367	7	EOT	004
56	070	38	8	370	8		230
57	071	39	9	371	9		231
58	072	3A	:	172	2 8		232
59	073	3B	;	136	11 8 8	CU3	233
60	074	3C	<	114	12 4 8	DC4	024
61	075	3D	=	176	6 8	NAK	025
62	076	3E	>	156	0 6 8		236
63	077	3F	?	157	0 7 8	SUB	032

Table 10-1. ASCII Code Table (con't.)

Character Code			ASCII			EBCDIC	
Decimal	Octal	Hex	Control/ Graphic	To EBCDIC (Octal)	Hollerith	Control/ Graphic	To ASCII (Octal)
64	100	40	@	174	4 8	SP	040
65	101	41	A	301	12 1		240
66	102	42	B	302	12 2		241
67	103	43	C	303	12 3		242
68	104	44	D	304	12 4		243
69	105	45	E	305	12 5		244
70	106	46	F	306	12 6		245
71	107	47	G	307	12 7		246
72	110	48	H	310	12 8		247
73	111	49	I	311	12 9		250
74	112	4A	J	321	11 1	¢	133
75	113	4B	K	322	11 2	. period	056
76	114	4C	L	323	11 3	<	074
77	115	4D	M	324	11 4	(	050
78	116	4E	N	325	11 5	+	053
79	117	4F	O	326	11 6	|	041
80	120	50	P	327	11 7	&	046
81	121	51	Q	330	11 8		251
82	122	52	R	331	11 9		252
83	123	53	S	342	0 2		253
84	124	54	T	343	0 3		254
85	125	55	U	344	0 4		255
86	126	56	V	345	0 5		256
87	127	57	W	346	0 6		257
88	130	58	X	347	0 7		260
89	131	59	Y	350	0 8		261
90	132	5A	Z	351	0 9	!	135
91	133	5B	[	112	12 2 8	$	044
92	134	5C	\	340	0 2 8	*	052
93	135	5D	]	132	11 2 8	)	051
94	136	5E	^	137	11 7 8	;	073
95	137	5F	_ unlin	155	0 5 8	¬	136
96	140	60	' grave	171	1 8	- hyphen	055
97	141	61	a	201	12 0 1	/	057
98	142	62	b	202	12 0 2		262
99	143	63	c	203	12 0 3		263
100	144	64	d	204	12 0 4		264
101	145	65	e	205	12 0 5		265
102	146	66	f	206	12 0 6		266
103	147	67	g	207	12 0 7		267
104	150	68	h	210	12 0 8		270
105	151	69	i	211	12 0 9		271
106	152	6A	j	221	12 11 1		174
107	153	6B	k	222	12 11 2	, comma	054
108	154	6C	l	223	12 11 3	%	045
109	155	6D	m	224	12 11 4	_ unlin	137
110	156	6E	n	225	12 11 5	>	076
111	157	6F	o	226	12 11 6	?	077

Table 10-1. ASCII Code Table (con't.)

Character Code			ASCII			EBCDIC	
Decimal	Octal	Hex	Control/ Graphic	To EBCDIC (Octal)	Hollerith	Control/ Graphic	To ASCII (Octal)
112	160	70	p	227	12 11 7		272
113	161	71	q	230	12 11 8		273
114	162	72	r	231	12 11 9		274
115	163	73	s	242	11 0 2		275
116	164	74	t	243	11 0 3		276
117	165	75	u	244	11 0 4		277
118	166	76	v	245	11 0 5		300
119	167	77	w	246	11 0 6		301
120	170	78	x	247	11 0 7		302
121	171	79	y	250	11 0 8		140
122	172	7A	z	251	11 0 9	:	072
123	173	7B	{	300	12 0	#	043
124	174	7C	|	152	12 11	@	100
125	175	7D	}	320	11 0	' apos	047
126	176	7E	~	241	11 0 1	=	075
127	177	7F	DEL	007	12 7 9	"	042
128	200	80		040	11 0 1 8 9		303
129	201	81		041	0 1 9	a	141
130	202	82		042	0 2 9	b	142
131	203	83		043	0 3 9	c	143
132	204	84		044	0 4 9	d	144
133	205	85		025	11 5 9	e	145
134	206	86		006	12 6 9	f	146
135	207	87		027	11 7 9	g	147
136	210	88		050	0 8 9	h	150
137	211	89		051	0 1 8 9	i	151
138	212	8A		052	0 2 8 9		304
139	213	8B		053	0 3 8 9		305
140	214	8C		054	0 4 8 9		306
141	215	8D		011	12 1 8 9		307
142	216	8E		012	12 2 8 9		310
143	217	8F		033	11 3 8 9		311
144	220	90		060	12 11 0 1 8 9		312
145	221	91		061	1 9	j	152
146	222	92		032	11 2 8 9	k	153
147	223	93		063	3 9	l	154
148	224	94		064	4 9	m	155
149	225	95		065	5 9	n	156
150	226	96		066	6 9	o	157
151	227	97		010	12 8 9	p	160
152	230	98		070	8 9	q	161
153	231	99		071	1 8 9	r	162
154	232	9A		072	2 8 9		313
155	233	9B		073	3 8 9		314
156	234	9C		004	12 4 9		315
157	235	9D		024	11 4 9		316
158	236	9E		076	6 8 9		317
159	237	9F		341	11 0 1 9		320

Table 10-1. ASCII Code Table (con't.)

Character Code			ASCII			EBCDIC	
Decimal	Octal	Hex	Control/ Graphic	To EBCDIC (Octal)	Hollerith	Control/ Graphic	To ASCII (Octal)
160	240	A0		101	12 0 1 9		321
161	241	A1		102	12 0 2 9	~	176
162	242	A2		103	12 0 3 9	s	163
163	243	A3		104	12 0 4 9	t	164
164	244	A4		105	12 0 5 9	u	165
165	245	A5		106	12 0 6 9	v	166
166	246	A6		107	12 0 7 9	w	167
167	247	A7		110	12 0 8 9	x	170
168	250	A8		111	12 1 8	y	171
169	251	A9		121	12 11 1 9	z	172
170	252	AA		122	12 11 2 9		322
171	253	AB		123	12 11 3 9		323
172	254	AC		124	12 11 4 9		324
173	255	AD		125	12 11 5 9		325
174	256	AE		126	12 11 6 9		326
175	257	AF		127	12 11 7 9		327
176	260	B0		130	12 11 8 9		330
177	261	B1		131	11 1 8		331
178	262	B2		142	11 0 2 9		332
179	263	B3		143	11 0 3 9		333
180	264	B4		144	11 0 4 9		334
181	265	B5		145	11 0 5 9		335
182	266	B6		146	11 0 6 9		336
183	267	B7		147	11 0 7 9		337
184	270	B8		150	11 0 8 9		340
185	271	B9		151	0 1 8		341
186	272	BA		160	12 11 0		342
187	273	BB		161	12 11 0 1 9		343
188	274	BC		162	12 11 0 2 9		344
189	275	BD		163	12 11 0 3 9		345
190	276	BE		164	12 11 0 4 9		346
191	277	BF		165	12 11 0 5 9		347
192	300	C0		166	12 11 0 6 9	{	173
193	301	C1		167	12 11 0 7 9	A	101
194	302	C2		170	12 11 0 8 9	B	102
195	303	C3		200	12 0 1 8	C	103
196	304	C4		212	12 0 2 8	D	104
197	305	C5		213	12 0 3 8	E	105
198	306	C6		214	12 0 4 8	F	106
199	307	C7		215	12 0 5 8	G	107
200	310	C8		216	12 0 6 8	H	110
201	311	C9		217	12 0 7 8	I	111
202	312	CA		220	12 11 1 8		350
203	313	CB		232	12 11 2 8		351
204	314	CC		233	12 11 3 8		352
205	315	CD		234	12 11 4 8		353
206	316	CE		235	12 11 5 8		354
207	317	CF		236	12 11 6 8		355

Table 10-1. ASCII Code Table (con't.)

Character Code			ASCII			EBCDIC	
Decimal	Octal	Hex	Control/ Graphic	To EBCDIC (Octal)	Hollerith	Control/ Graphic	To ASCII (Octal)
208	320	D0		237	12 11 7 8	}	175
209	321	D1		240	11 0 1 8	J	112
210	322	D2		252	11 0 2 8	K	113
211	323	D3		253	11 0 3 8	L	114
212	324	D4		254	11 0 4 8	M	115
213	325	D5		255	11 0 5 8	N	116
214	326	D6		256	11 0 6 8	O	117
215	327	D7		257	11 0 7 8	P	120
216	330	D8		260	12 11 0 1 8	Q	121
217	331	D9		261	12 11 0 1	R	122
218	332	DA		262	12 11 0 2		356
219	333	DB		263	12 11 0 3		357
220	334	DC		264	12 11 0 4		360
221	335	DD		265	12 11 0 5		361
222	336	DE		266	12 11 0 6		362
223	337	DF		267	12 11 0 7		363
224	340	E0		270	12 11 0 8	\	134
225	341	E1		271	12 11 0 9		237
226	342	E2		272	12 11 0 2 8	S	123
227	343	E3		273	12 11 0 3 8	T	124
228	344	E4		274	12 11 0 4 8	U	125
229	345	E5		275	12 11 0 5 8	V	126
230	346	E6		276	12 11 0 6 8	W	127
231	347	E7		277	12 11 0 7 8	X	130
232	350	E8		312	12 0 2 8 9	Y	131
233	351	E9		313	12 0 3 8 9	Z	132
234	352	EA		314	12 0 4 6 9		364
235	353	EB		315	12 0 5 8 9		365
236	354	EC		316	12 0 6 8 9		366
237	355	ED		317	12 0 7 8 9		367
238	356	EE		332	12 11 2 8 9		370
239	357	EF		333	12 11 3 8 9		371
240	360	F0		334	12 11 4 8 9	0	060
241	361	F1		335	12 11 5 8 9	1	061
242	362	F2		336	12 11 6 8 9	2	062
243	363	F3		337	12 11 7 8 9	3	063
244	364	F4		352	11 0 2 8 9	4	064
245	365	F5		353	11 0 3 8 9	5	065
246	366	F6		354	11 0 4 8 9	6	066
247	367	F7		355	11 0 5 8 9	7	067
248	370	F8		356	11 0 6 8 9	8	070
249	371	F9		357	11 0 7 8 9	9	071
250	372	FA		372	12 11 0 2 8 9		372
251	373	FB		373	12 11 0 3 8 9		373
252	374	FC		374	12 11 0 4 8 9		374
253	375	FD		375	12 11 0 5 8 9		375
254	376	FE		376	12 11 0 6 8 9		376
255	377	FF		377	12 11 0 7 8 9		377

SERVICE NOTES/IOSM'S

SECTION 11

NOTES

NOTES

HEWLETT PACKARD

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