HP 3000 Computer Systems

SERIES 64/68 CE HANDBOOK

HEWLETT PACKARD
19447 PRUNERIDGE AVENUE, CUPERTINO, CA 95014

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LIST OF EFFECTIVE PAGES

The List of Effective Pages gives the date of the current edition, and lists the dates of all changed pages. Unchanged pages are listed as "ORIGINAL". Within the manual, any page changed since the last edition is indicated by printing the date the changes were made on the bottom of the page. Changes are marked with a vertical bar in the margin. If an update is incorporated when an edition is reprinted, these bars and dates remain. No information is incorporated into a reprinting unless it appears as a prior update.

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PRINTING HISTORY

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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.

The information which refers specifically to the 32460A and 32460B/32468B is cited; all other information applies to 32460A, 32460B/32468B.

Reference Documents

The documents listed below represent the full complement of hardware manuals supporting the HP 3000 Series 64/68. 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

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

List of Abbreviations

The following table lists abbreviations used in this manual.

ABBREVIATION	DESCRIPTION
AIB	Asynchronous Interface Board
ALU	Arithmetic Logic Unit (CPU)
ATP	Advanced Terminal Processor
BCM	Battery Control Module
CAB	Cache Address Bus
CAC	Cache Address Controller
CAM	Content Addressable Memory
CBI	Common Bus Interface
CDB	Cache Data Bus
CIB	Common Interface Bus
CIR	Current Instruction Register (CPU)
CMA	Cache Memory Array
CPU	Central Processor Unit
CSAR	Control Store Address Register
CSOR	Control Store Output Register
CSB	Central System Bus
CSD	CPU Software Diagnostic
CTLA	Control A (CPU)
CTLB	Control B (CPU)

ABBREVIATION	DESCRIPTION (CON'T.)
DCU	Diagnostic Control Unit
DMA	Direct Memory Access
DRT	Device Reference Table
ECL	Emitter-Coupled Logic
FCA	Flat Cable Assembly
FLD	Fault Locating Diagnostics
GIC	General I/O Channel
HP-IB	Hewlett Packard Interface Bus
ICB	Intra-Cache Bus
IMB	Inter-Module Bus
IMBI	Inter-Module Bus Interface
INP	Intelligent Network Processor
IOA	Input/Output Adapter
IOB	Input/Output Buffer
KHD	Kernel Hardware Diagnostic
LED	Light Emitting Diode
MCS	Memory Correction and Storage
MMA	Main Memory Array
MMC	Main Memory Control
MPL	MicroProgram Load
MPE	Multi-Programming Executive
MUX	Multiplexer
PCA	Printed Circuit Assembly
PCM	Power Control Module
PDB	Processor Data Bus
PDM	Power Distribution and Monitor
PFT	Power Fail Tester
PFW	Power Fail
PON	Power-ON
PSC	Power System Controller
RALU	Register/Arithmetic Logic Unit
SIB	System Interface Board
SKSP	Skip Special (CPU)
SSDP	System Status and Display Panel for 32460A
SSDP-B	System Status and Display Panel for 32460B
SPU	System Processor Unit
VBUS	V-bus (CPU)
WCS	Writeable Control Store

PRODUCT INFORMATION

SECTION I

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

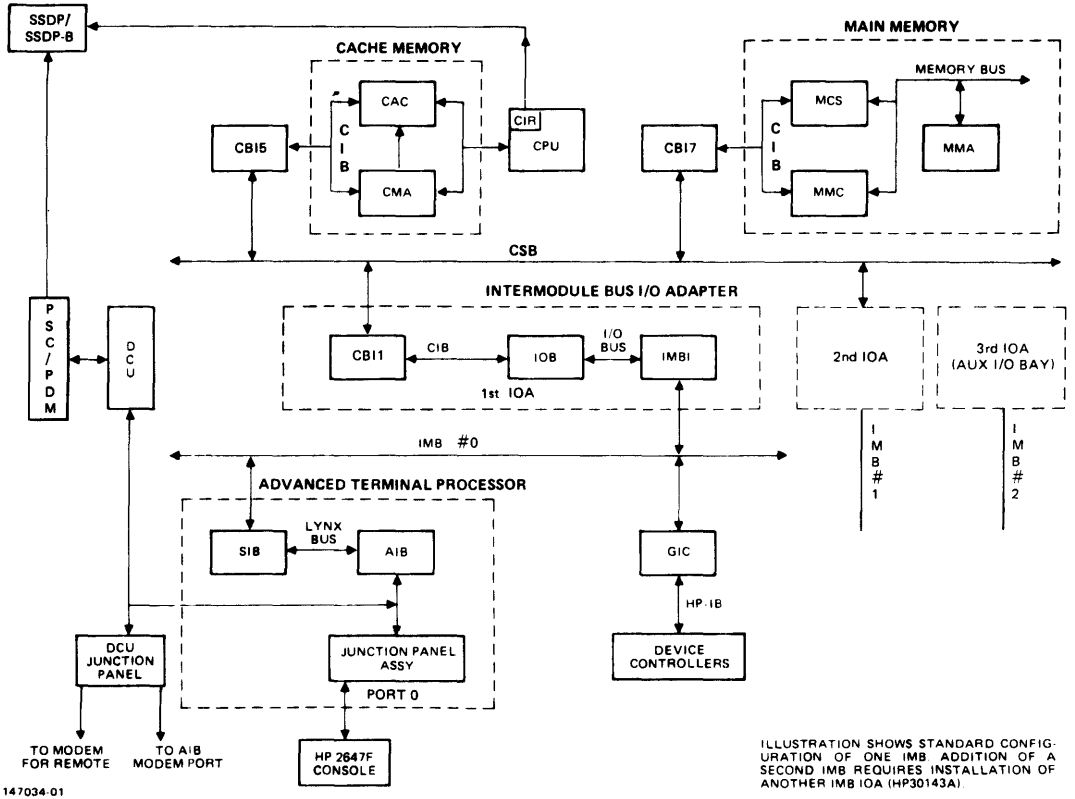


Figure 1-1. HP 3000 Series 64/68 Functional Block Diagram

SERIES 64/68 SYSTEM SPECIFICATIONS

The following is a listing of general specifications for the HP 3000 Series 64/68 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
Maximum Memory per System	8MB
Battery Backup Time	15 minutes minimum

Input/Output Structure

Common asynchronous bus structure with individual data channels.

	Series 64	Series 68
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 1-2 and 1-3.) The following panel functions pertain to the HP 32460A, 32460B and 32468B, 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).

OVER-TEMP (HP 32460A):
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):
Same function as HP 32460A except the overtemperature LED on SSDP is battery backed-up.

POWER SUPPLY MONITOR LED DISPLAY (HP 32460A):
Each power supply is monitored by a corresponding LED. Supplies 1-9 have a corresponding A-H display. (See Figure 1-2 for further detail.) The R on the panel correlates with DCU RESET.

POWER SUPPLY MONITOR LED DISPLAY (HP 32460B/32468B):
Each power supply is monitored by a corresponding LED. (See Figure 1-3 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
P: PON is down.
R: DCU is at reset, initial powerup reset, AC low with PON set LOW.

SERIES 64/68 (32460A)

SSDP

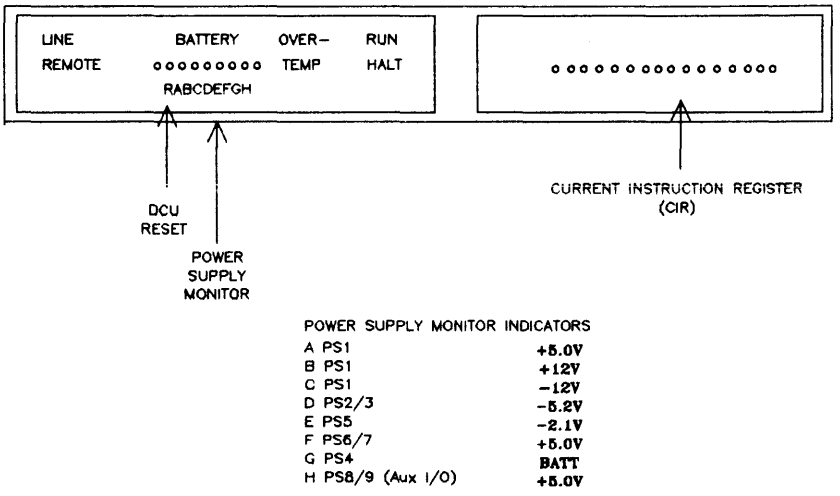


Figure 1-2. System Status and Display Panel (HP 32460A)

Note: Refer to page 6-17 (Fig. 6-9) for power system layout

SERIES 64/68 (32460B/32468B)

SSDP

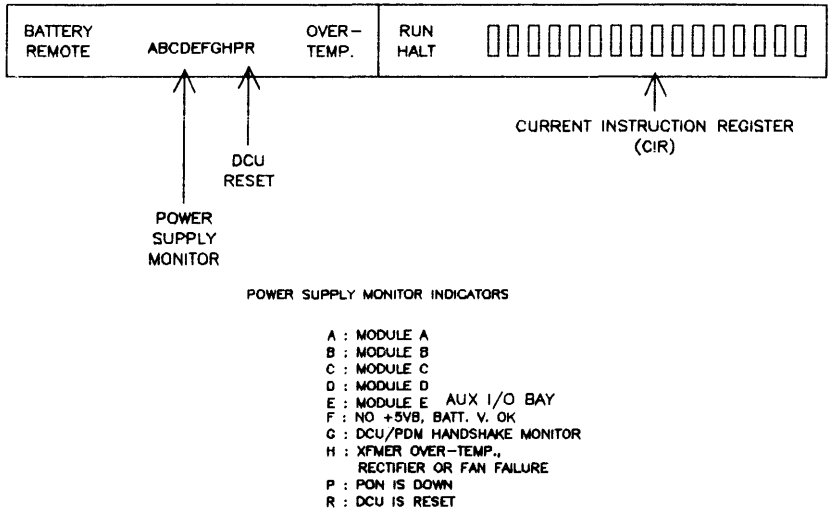


Figure 1-3. System Status and Display Panel (HP 32460B/32468B)

Note: Refer to page 6-28 (Fig. 6-13) for power system layout.

POWER SUPPLY SYSTEM

The Series 64/68 (HP 32460A) consists of a Power Control Module with the following panel controls: main circuit breaker, remote maintenance key-switch and power supply breaker.

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

Power Control Module for 32460A

The Power Control Module (PCM) is located at the lower rear of the I/O Bay. (See Figure 1-4.) The PCM is used to protect the HP 3000 Series 64/68 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 1-5 for PCM cable connectors. Auxiliary I/O Bay AC power is also discussed. 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.

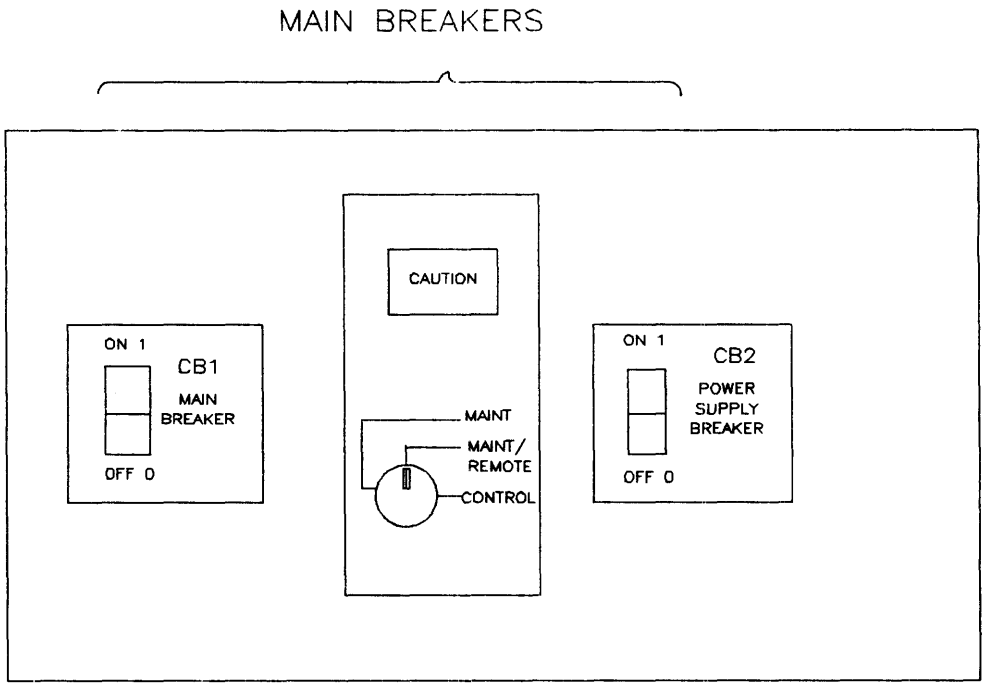


Figure 1-4. Power Control Module (32460A)

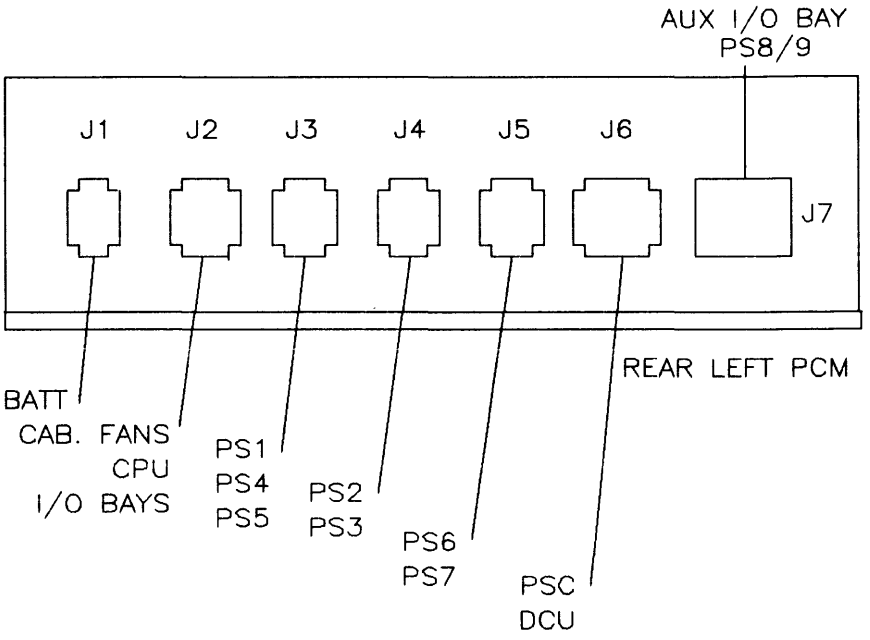


Figure 1-5. PCM Cable Connections (HP 32460A)

A.C. Unit for HP 32460B/32468B

The A.C. Unit is located at the lower rear of the I/O Bay. The A.C. unit sends live voltage to the three ferro-resonant transformers and then distributes the outputs. The output voltage powers the fans (240 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 1-6 for AC Unit panel layout.) A.C. panel functions are defined as follows:

INPUT PROGRAM PLUG:
AC voltage configuration is determined by a choice of three plugs: 208 VAC/60 HZ, 380 VAC/50 HZ, 415 VAC/50 HZ. If you change the plug, ensure the AC input power is turned off. See Section VIII for part numbers.

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

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

FUSES:

F1 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 240VAC 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 VI, Adjustments, for specifications on modules E1 and E2.

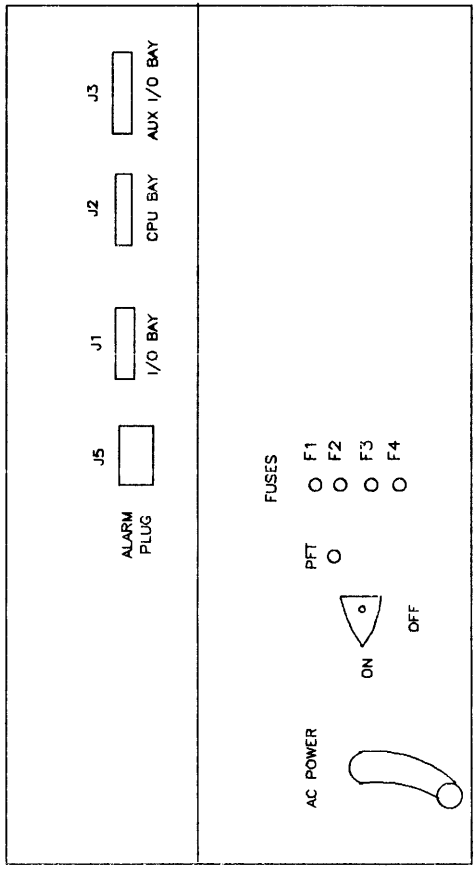


Figure 1-6. A.C. Unit (32460B/32468B)

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, 47.5 - 52.5 HZ
	60 HZ Nom, 57.0 - 63.0 HZ
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%)
AC Input Voltage (HP 32460B/ 32468B):	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) (ph to ph):	208V Nom, 177V to 231V (+10%,-15%)
	380V Nom, 323V to 418V (+10%,-15%)
	415V Nom, 353V to 451V (+10%,-15%)

Current (full load):	24A/Phase (USA)
	13A/Phase (EUR)
	12A/Phase (UK)
Circuit Breaker Rating (HP 32460A):	20 Amperes (Internal)
Surge Current (HP 32460A):	208V line, 200A peak, 1 cycle
	380V line, *
	415V line, *
Surge Current (HP 32460B/32468B):	208V line, 500A 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 (HP 32460A):

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 (32460B/32468B):

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.

PREVENTATIVE MAINTENANCE (PM)

Preventative 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. Preventative Maintenance Procedures

PREVENTATIVE 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.
Replace Memory Array Chips as needed.	Replace with stressed 64K RAM, HP P/N 1818-3006.
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.	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 III

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 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.

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 and listed in Table 3-1.

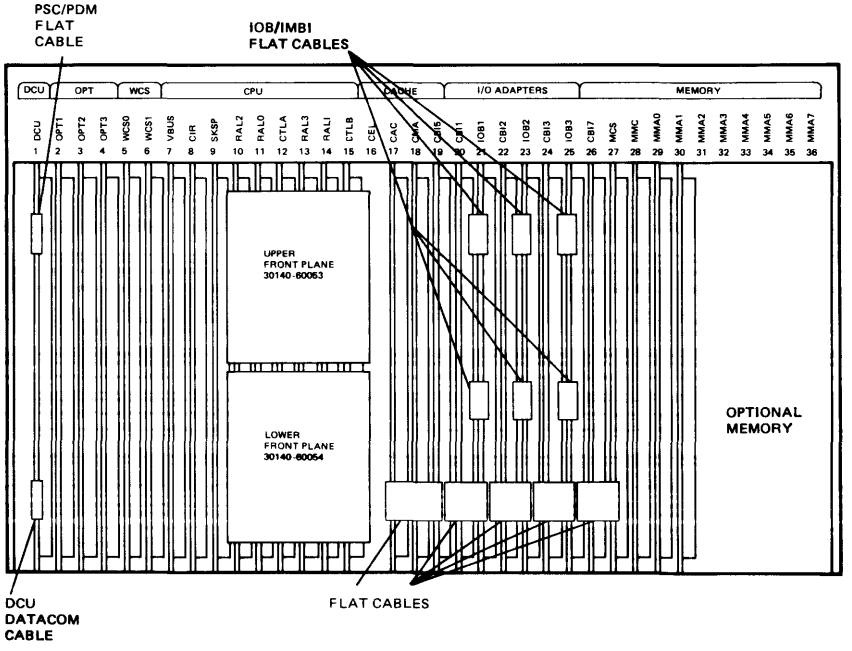


Figure 3-1. CPU Cage and Cabling Assignment

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 Address Controller
CMA	18	Cache Memory Assembly
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

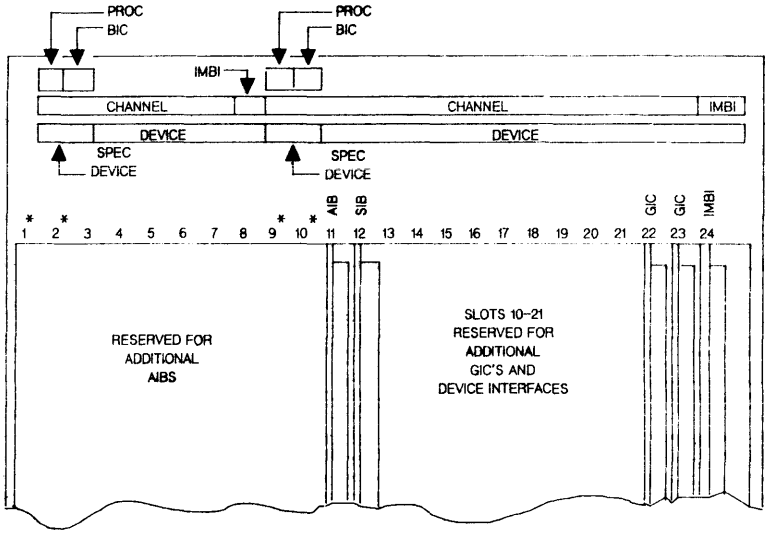
I/O Card Cage Configuration

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 IV for IMBI PCA LED definitions.)

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

IMB No. 1 (Logical IMB 0)			
SLOT	ASSEMBLIES	CHANNEL No.	"TO" DEVICE
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)			
SLOT	ASSEMBLIES	CHANNEL No.	"TO" DEVICE
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)			
SLOT	ASSEMBLIES	CHANNEL No.	"TO" DEVICE
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 ten 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 USAGE BUT MAY BE USED BY OTHER DEVICE INTERFACES.

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

CAUTION

A GIC PCA or SIB PCA must be installed within every ten physical slots; 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.

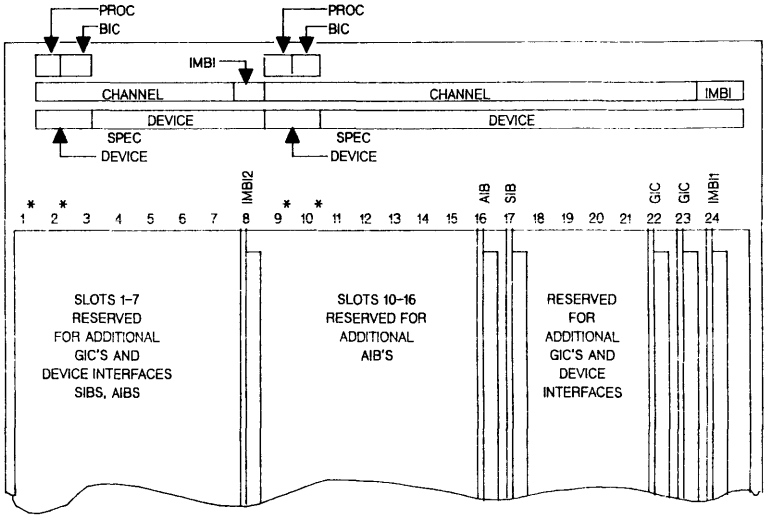


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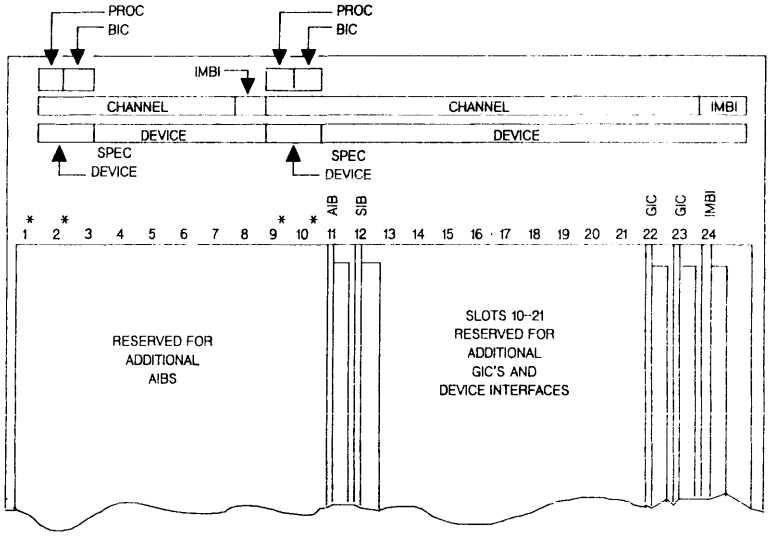
Figure 3-3. I/O Card Cage Assignment for First and Second IMBs

CAUTION

A GIC PCA or SIB PCA must be installed within every ten physical slots; 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 USAGE BUT MAY BE USED BY OTHER DEVICE INTERFACES.

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

CAUTION

A GIC PCA or SIB PCA must be installed within every ten physical slots; 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.

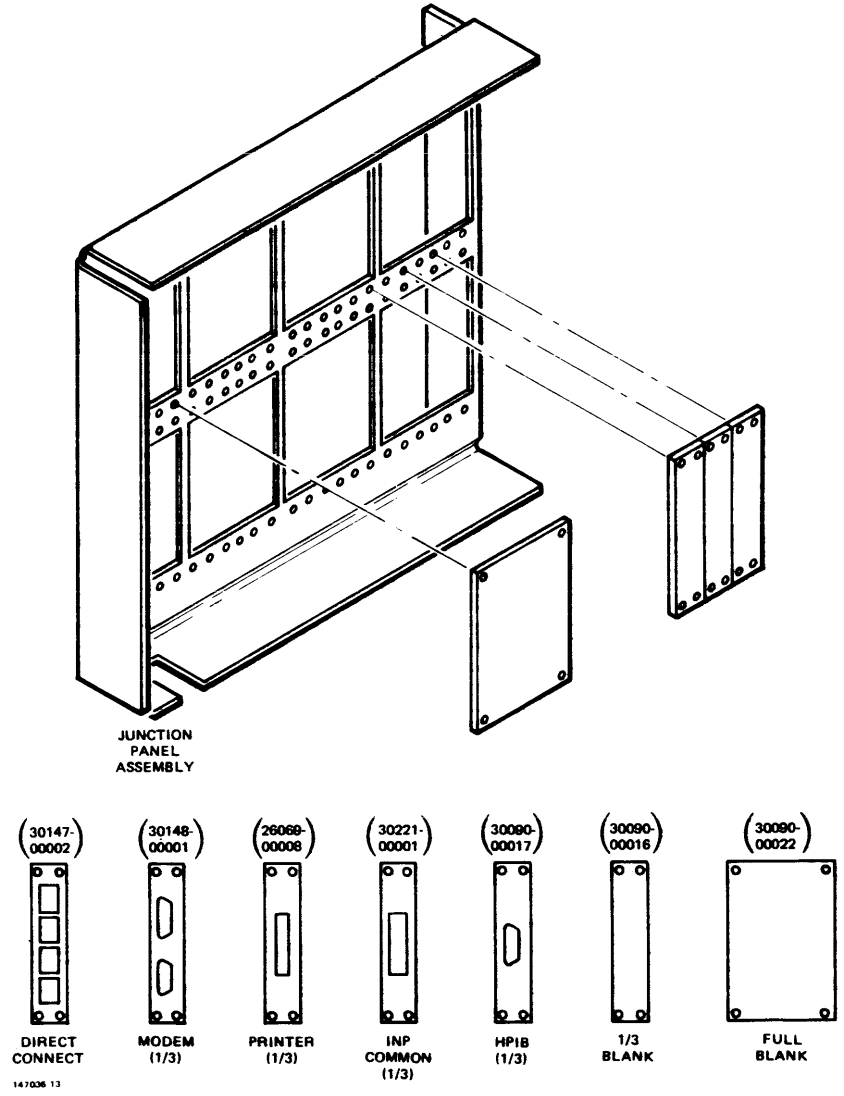


Figure 3-5. Junction Panel Assembly and Mounting Panels

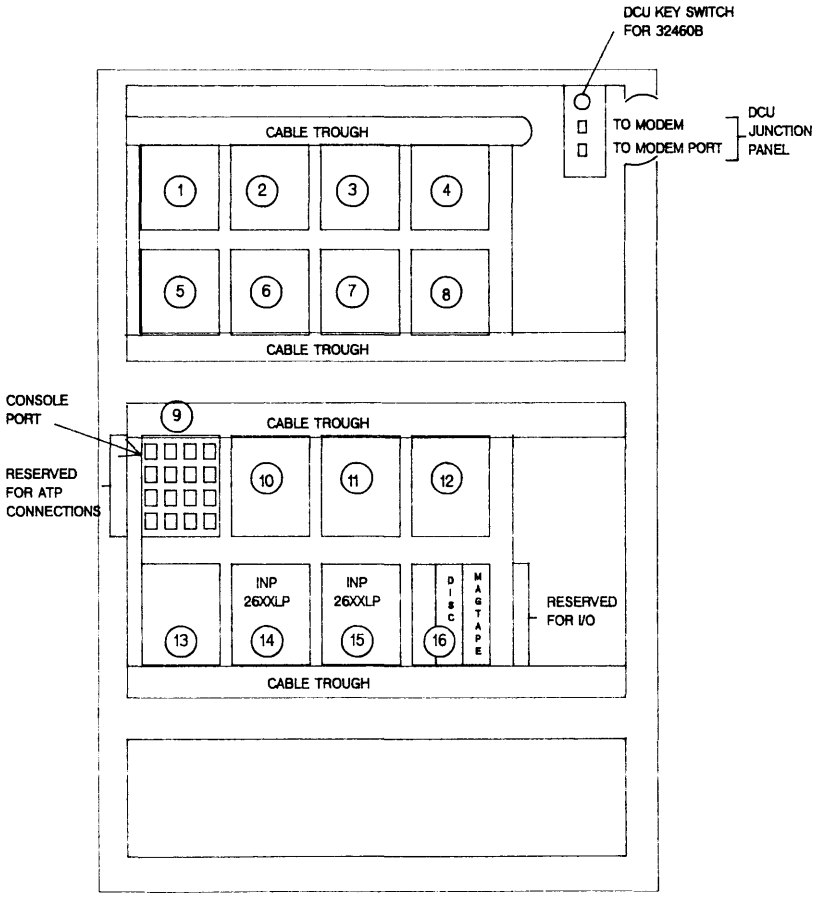


Figure 3-6. Junction Panel Layout

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

Peripherals	Peripheral Speed	HP-IB Electrical Deviced Loads
7911/12/14 Intregrated Cartridge Tape Unit	Low	1 (Dedicated GIC)
7911/12/14 Disc	High	1
7920M/25M/33H/35H	High	1
7970E	Low	1 (Dedicated GIC)
7974A	High	Shipped w/1(Variable from 1 to 3
7976A	High	Shipped w/2(Variable from 1 to 4
7978A	High	1
2563A	Low	1
2611A/13A/17A/19A	Low	1
2608A	Low	1
2608S	High	Shipped w/2(Variable from 1 to 7)
2680A/88A	High	Shipped w/4(Variable from 1 to 8)
9895A	Low	1
30106A	Low	1 (Dedicated GIC)
INP	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 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	9,13
Max High Speed GICs	4	6	1,2
Max GICs	10	15	3
Max INPs	16	24	7,14
Discs:			
7920/7925M	16	16	4
7920/7925S	14	14	
7933H/7935H	16	24	4
7914	8	8	4
7911/7912	1	1	4
7906M	0	0	4
7906S	0	0	4
Max Disc Drives	16	24	
Tapes:			
7970E-M	2	2	5
7970E-S	6	6	
7974A/7976A	2	2	4
7978A	4		
Max 1/2" Mag Tape Drives	8	8	
Max integrated Tape Cart.	1	1	5,8
Printers:			
2563A	4		
2611A/13A/17A/19A	4	4	
2608A	4	4	6
2608S	4	4	10
Max Line Printers	8	8	
Page Printers:			
2680	2	2	4
2688	2	2	4
Max Page Printers	2	2	
Serial Connected Printers:			
2687 (RS-232/422) ADCC			11,12
2687 (RS-232/422) ATP	4	4	11,12
2631B	16	16	12
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 are allowed per IMB on the Series 64/68.
3. Up to five GICs per IMB on the Series 64/68.
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. The integrated Tape Cartridge is only supported on the Series 39/42 for systems with less than 130 Mbytes of disc storge.
9. Third IMB requires Auxiliary I/O Bay.
10. Must be on a high-speed GIC, but cannot be on the same GIC as a 792x disc.
11. The HP 2687 cannot be a "System" printer.
12. These maximums are not additive.
13. Only two IMBs are supported on a 1 or 2 I/O Bay Series 68 with MPE-V/P.
14. Maximum of 16 INPs on a 1 or 2 I/O Bay Series 68 with MPE-V/P.

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
9895	No	No	Yes	Yes
7906M/S	No	Yes	Yes*	Yes*
7920/25M	Yes	Yes	Yes	Yes
7920/25S	No	Yes	Yes	Yes
7911/12	S/35 & 4x only	Yes	Yes	No
7914	Yes	Yes	Yes	No
7933	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
	J5 CPU CMA	CPU 18	J5 CPU CB15	CPU 19
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 17
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) (32460B)	J5 CPU DCU	CPU 1	*J3 I/O AIB	I/O 11
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 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 9, PORT 0	
8120-3446(HP-IB)	7920/7925 DISC		JUNC PNL 13, SUB 2	
8120-3446(HP-IB)	7970E MASTER MAGTAPE		JUNC PNL 13, SUB 3	

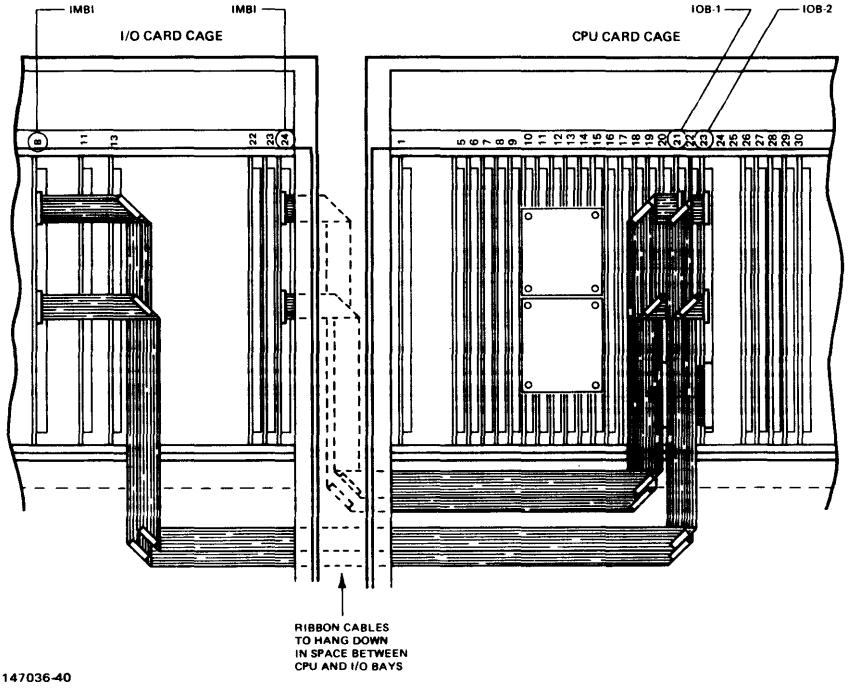


Figure 3-7. IOB Cable Connection, First and Second IOA

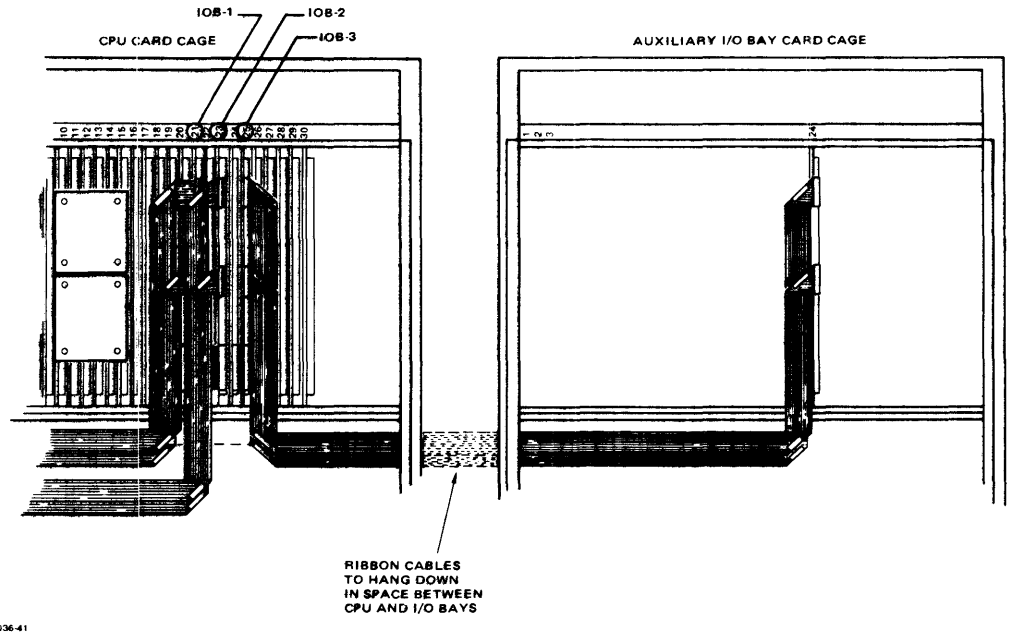


Figure 3-8. IOB Cable Connection, Third IOA

POWER SYSTEM MONITOR BOARD CONFIGURATION

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

The Series 64/68B 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	Indicates ac 3 phase reading.
DC OV	Indicates PS voltage is high.
DC UV	Indicates 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.

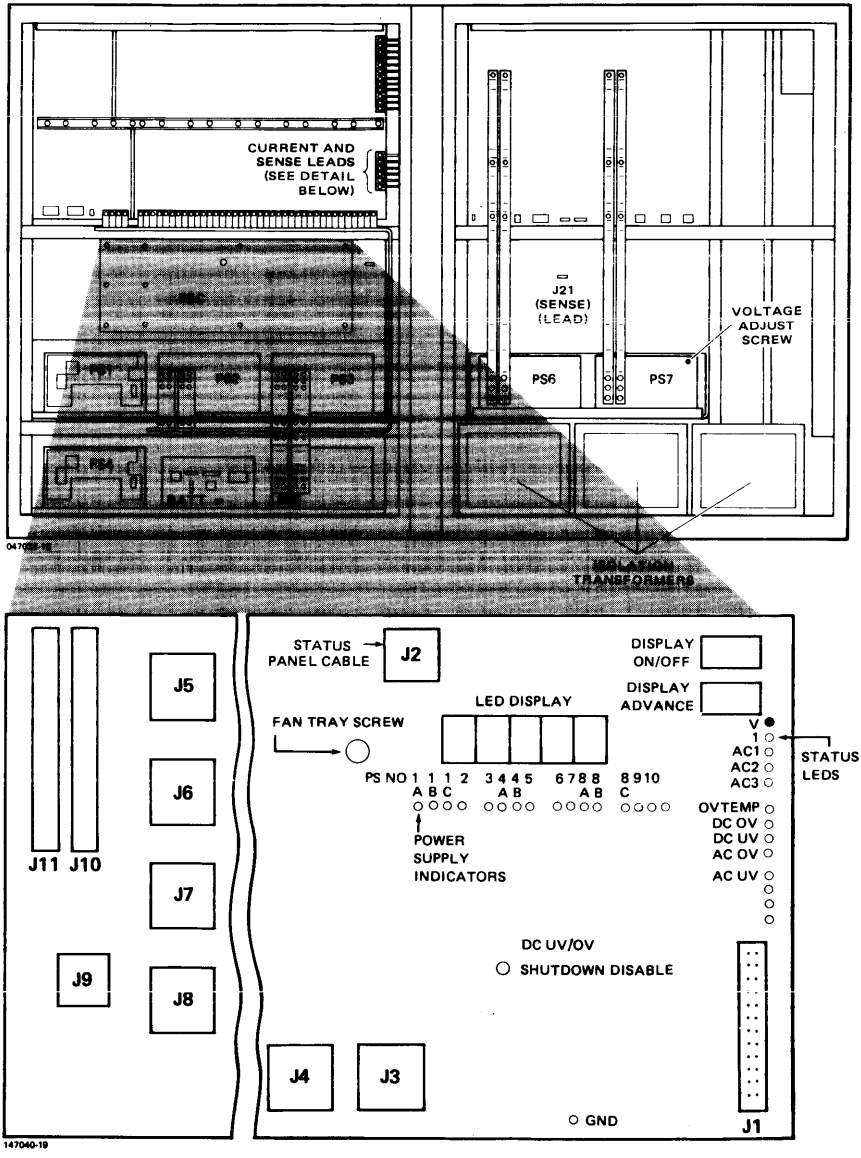


Figure 3-9. Power Supply Control Layout (HP 32460A)

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)

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 (HP 32460B/32468B)

Connectors	Description
J1	DCU Signals
J2	SSDP - Power & Indicators
J3	Module B and charger
J4	A.C. Unit
J5	Sends power to SSDP Enable switch
J6	Module E
J7	Module C
J8	Module A
J9	Module D
J10	Production test interface
J11	Production test interface
J12	+12B and -12B
J13	+12S and -12S
J14	+5B
J15	+12, -12, and +5B output
J16	COMMON (GROUND)
J17	+5, -5.2V, -2V input
J18	+12V and -12V input
J19	+12V, -12V, +5B output and AUX I/O voltage monitor input

POWER SUPPLY CONFIGURATION

Refer to Section VI for power supply configuration.

DRT CALCULATION

Since the Series 64/68 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.

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

CHANNEL NAME	PERIPHERAL	CHANNEL #	DEVICE #	PCA SLOT	DRT #
AIB			(BD#)		
SIB		1			8
GIC	7920M0M	3	1	22	25
	7925M CTLR				
GIC	7970E/7976	2	1	23	17
(TAPE)					

I/O SOFTWARE CONFIGURATION

The I/O software configuration in Table 3-10 indicates the I/O drivers required to support an I/O device.

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	

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

DEVICE	PART NO.	DRIVER NAME	TYPE	SUB TYPE	RECORD WIDTH
2608A		HIOLPRT0	32	4	66/68
2608S		HIOCIPR0	32	9,13[6]	66
2611A/13A/17A /19A		HIOLPRT2	32	2	
2631A		HIOLPRT1	32	5	
2631B[3]		HIOASLP0	32	14-hard-wired 15-full duplex modem	
2680A		HIOPPRT0	8	0	66
Card Reader (2893A)		HIOCDRD0	8	0	40
Nine Channel Magnetic Tape Unit					
7970E		HIOTAPE0	24	0[4],8	128
7976A		HIOTAPE1	24	15[5],9	128
Intregrated Cartridge Tape Unit		HIOCTAP0	3	0	
Disc Drive					
9895/7902		HIOFLOP0	2	0	128
7906		HIOMDSC1		10	
7906(removable platter)					
7906(fixed platter)				11	
7906(both pletter)				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	
DSN/RJE	30130E				
Intelligent Network work Processor Line with modem Nonswitched (private line with modem)	32020B	IOINP0	17	0	N/A
				1	
DSN/DS	32190A				

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

DEVICE	PART NO.	DRIVER NAME	TYPE	SUB TYPE	RECORD WIDTH
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]These terminals should be configured with SUBTYPE = 1 when hardwired: ASR37, Memorex 1240.
[2]Not supported on Series 44 via the DSN/ADCC.
[3]Configured as remote printer on DSN/ADCC.
[4]Available via the HP-IB Interface Module.
[5]For automatic allocation, use subtype 8.
[6]Subtype 9 is for feature access, 13 is for transparent access

TROUBLESHOOTING

SECTION IV

Troubleshooting data presented in this section is designed to assist the user with diagnostic and repair functions affecting the HP 3000 Series 64/68. The HP 3000 Series 64/68 contains a built-in diagnostic system (DCU) and uses stand-alone diagnostics, Section V, 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 CBI SYSTOP Flowchart.

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
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 "CONTINE? (YES/NO)"
5100 INPUT &BB
5110 IF &BB= "YES" 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
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 "CONTINE? (YES/NO)"
5100 INPUT &BB
5110 IF &BB= "YES" 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 0
5045 LET A:= D MOD E, B:= D MOD F, C:= D MOD G
5050 SKWD 0, 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
```

, <IMB NO.> MULTIDISC EXERCISER (HP 7920,7925)

```
5000 DEV 0,<CHAN NO.>,<DEV NO.>,100,0
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 PROGRAN 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 B 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 64/68B 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, A.C. power.

H LED Lit on SSDP

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 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

POWER SUPPLY TROUBLESHOOTING

Refer to Section VI for power supply troubleshooting.

IMBI LED DEFINITIONS

Table 4-3 lists the IMBI signals and gives a brief description of each. The LEDs are located on the IMBI adjacent to connector J3.

Table 4-3. 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 VI 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 4-4 lists the error codes displayed when a DCU selftest function fails.

Table 4-4. 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.
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 4-4. 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/PDM U114 error.	Replace/connect PSC/PDM.
C2	PSC/PDM U115 error.	Replace/connect PSC/PDM.
C3	PSC/PDM U134 or U144 error.	Replace/connect PSC/PDM.
C4	PSC/PDM U135 or U145 error.	Replace/connect PSC/PDM.
CA	PSC/PDM timer error.	Replace/connect PSC/PDM.
CE	PSC/PDM multiplexer error.	Replace/connect PSC/PDM.
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 VI 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 4-5 applies only to DCU ROM date codes less than 2403.

Table 4-5. 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 4-5. 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:

- INIT/IDENT FAILED (was not able to successfully complete INITIALIZATION/IDENTIFICATION part of MPL).
- BAD INIT/IDENT DEVICE TYPE (device specified was not a proper MPL device 7914 disc, 792x disc, 797x tape or 793X disc).
- MPL FAILED (could not load system microcode from specified device).
- DCU RECEIVED NO RESPONSE FROM CPU (timeout).
- 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 4-6 applies only to DCU ROM date codes 2403 and greater.

Table 4-6. 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 4-6. 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 4-6. 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 4-7 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 4-7. Hardware Error Messages

Hardware CBI Error (1/2/3/5/7)
Catastrophic hardware fault as detected by the indicated CBI. The receiving 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.

CPU Timeout
CPU has not received a required response from one of the other CSB modules in the allotted time. (64K clocks).

CAC Error
The cache array controller has detected one or more cache conditions. In most conditions, I/O will be allowed to complete (see DCU Hardstops).

CMA Error
Single bit cache memory array parity error.

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 (ie; I/O, CBI) SENDING an illegal memory address.

Invalid Address - CAC
Illegal addressing of CMA as detected by the CAC.

Continuous DCUSTOR Error
Series 64/64B/68/68B is generating continuous DCUSTOR interrupt to the DCU. The system is an abnormal state and the DCU had to disable this interrupt line.

LUT Parity Error
The system ucode Lookup Table has a parity error. Generally, this is 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.

Stand-Alone CPU Diagnostic Error Messages

The following is a description of stand-alone CPU error messages:

1. Halt 1's are unexpected internal interrupts. CIR=%030361.
2. Halt 2's are unexpected external interrupts. CIR=%030362.
3. Halt %12's are error halts. CIR=%030372.
4. Halt %13's are halted at step #. CIR=%030373.

   (DB+5 contains current step #)

   (XReg contains current step #)
5. Halt %15 is halted after complete cycle. CIR=%030375.
6. Halt %16 modifies section select register. CIR=%300376.
7. Halt %17 restores switch register. CIR=%300377.
8. A BR* is used to indicate errors in user mode. CIR=%14000.

NOTE

CIR is the Current Instruction Register. If an error is detected, the program should not be continued. Unexpected interrupts are irrecoverable. If an unexpected interrupt occurs, the address in the code when it occurred can be determined from the stack marker and the CST table.

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" <<UNIT'ERROR>>

"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

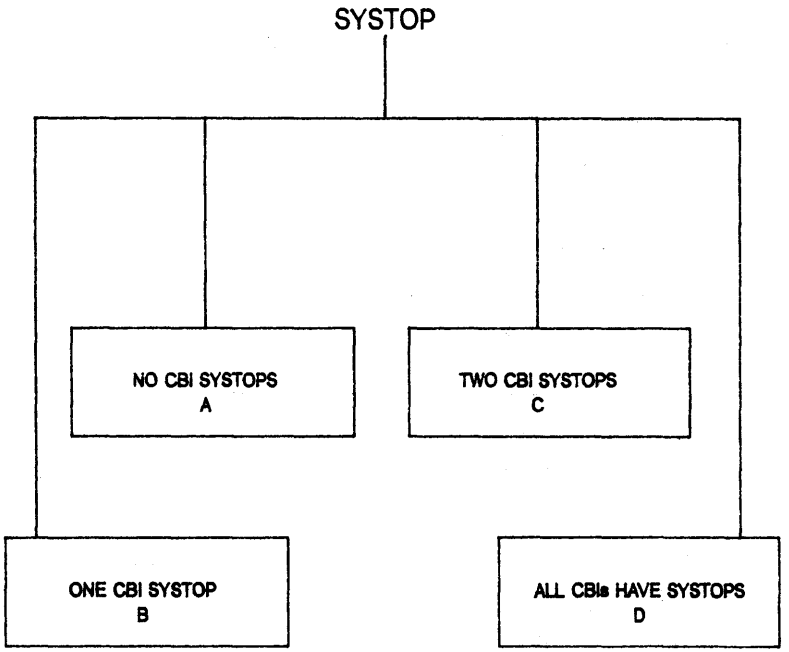
System halt conditions are outputted to the DCU Console in the format of "System Halt--<text>" These are microcode halts where the DCU is responsible for printing the halt number and message on the console. (Refer to Table 4-8.)

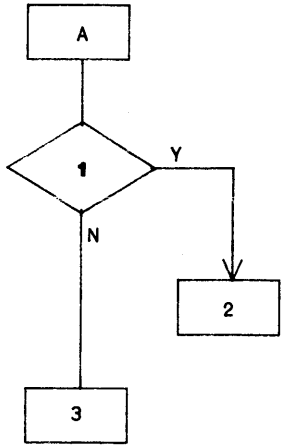
Table 4-8. System Halt Conditions

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	Code segment violation in segment #1
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.



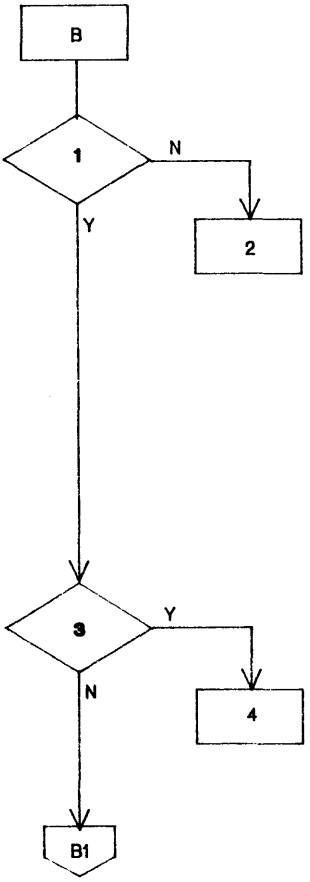


(A) NO CBI SYSTOPS

(1) Any module (SELDEL, SELD01, 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?

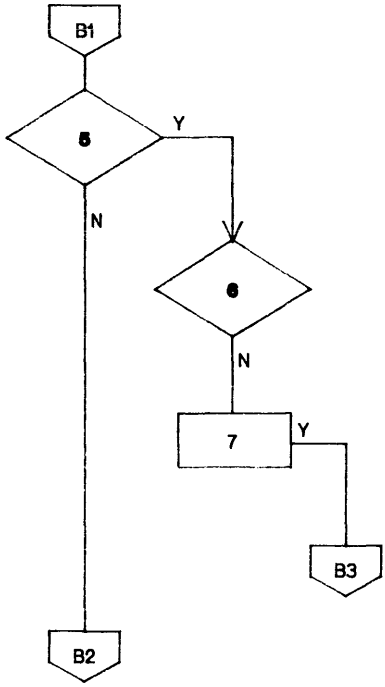
(2) Check SELDEL*, SELD01*, and SELD02* on CBIs to find which moduel was on CSB last. If this tells you nothing, hook up logic analyser.

	S E L D 3 L *	S E L D 0 1 *	S E L D 0 2 *
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.)

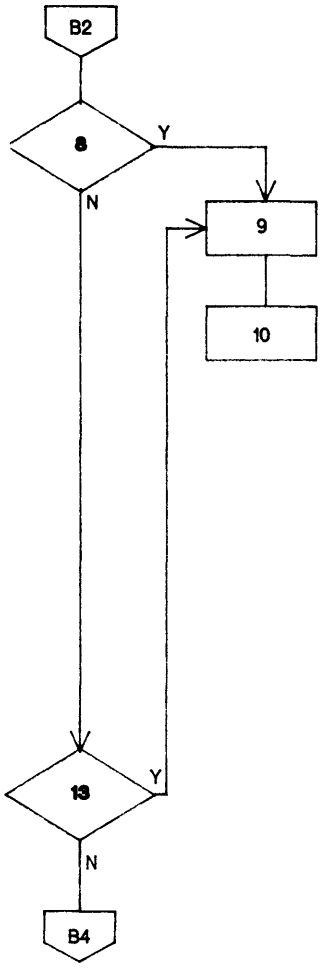
(5) Does any module have a SBEROP?

(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:

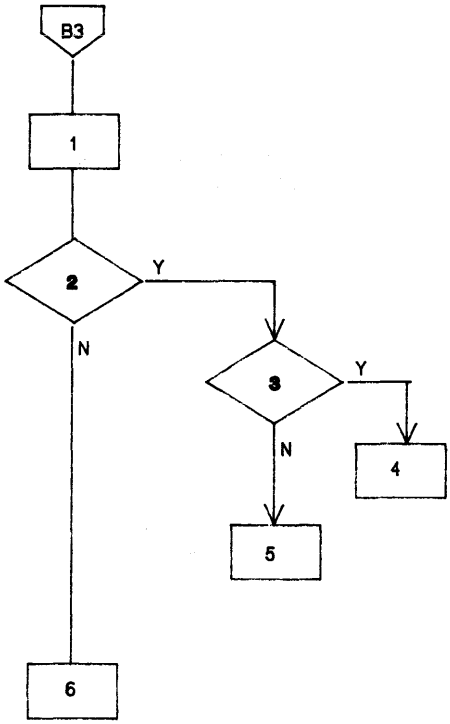
	SEL1*	CNTL*	SELDEL*	SELDD1*	SELDD2*
ADDRESS	0	1	0	0	0
WORD 0	0	0	0	0	0
WORD 1	1	0	0	0	0
WORD 2	1	0	1	0	0
WORD 3	1	0	1	1	0

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.

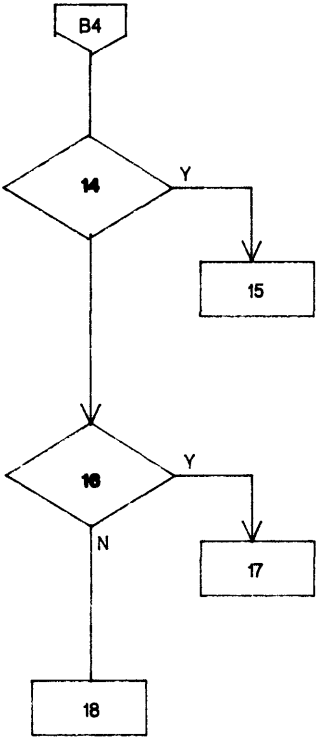
(2) Is SYSTOP on CBI 5 set?

(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.)

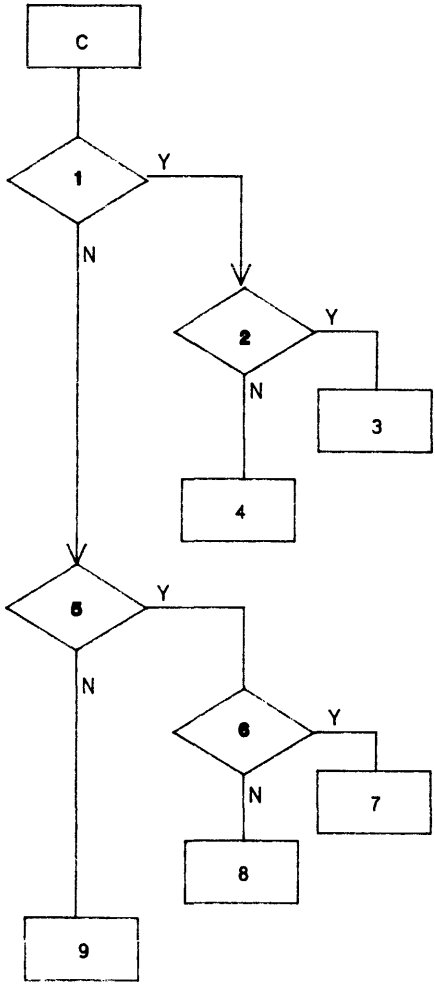
(14) Does any module have a SBNACKE?

(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.

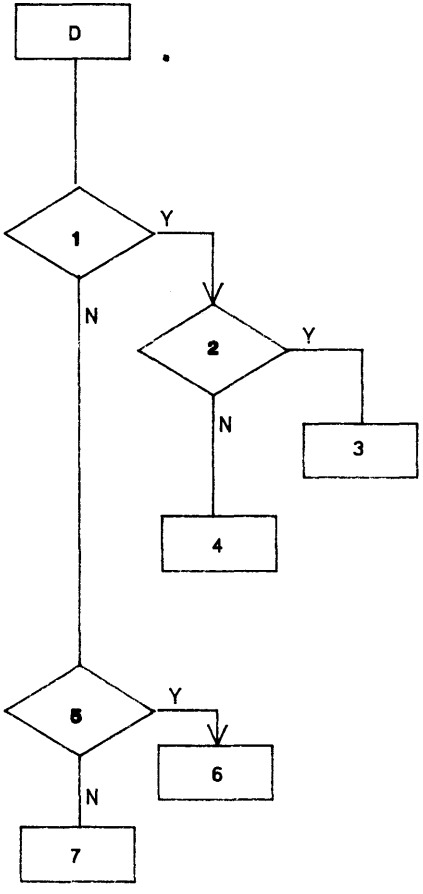
(4) The decision point has not been observed and it is unknown as to how this condition would occur.

(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 transmiting CBI is bad.

(7) The module with SBACKE sent bad information.

DIAGNOSTICS

SECTION V

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

Refer to Diagnostic Manual Set (P/N 32342-60001) for details. The Set contains the following diagnostics:

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)

Series 64/68 IOMAP Diagnostic Reference Manual (P/N 32342-90010)

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 Stand-Alone Diagnostic Utility Program (P/N 32342-90004)

Series 64 Stand-Alone CPU Diagnostic Reference Manual (P/N 32342-90005)

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

Series 64/64B DMA Exerciser Diagnostic Reference Manual (P/N 32342-90008)

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

HP 7974A Magnetic (P/N 32342-90011)

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

HP 13037B 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)

AVAILABLE DEVICE TESTS

The HP 3000 Series 64/68 Computer System is verified by using the available OFFLINE and ONLINE device tests in Table 5-1.

Table 5-1. Available Device Tests

DEVICE	OFFLINE				ONLINE
	Stand-alone	Selftest	Sleuth Sim.	DCU	
7933	x	x	x		x
7920/25			x		x
7911/12	x	x	x		x
7914	x	x	x		x
13037 C/D	x		x		
2563A		x			x
2608A		x	x		x
2608S		x			x
2617A			x		x
2619A			x		x
2631B		x	x		
2680A		x			x
2687A		x			
2688A		x			x
7970E	x		x		
7974A		x	x		x
7976A		x	x		x
7978A		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 IV 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:
   - o Press the DCU Selftest switch.
   - o Enter ZS command. (Wait for DCU Test Complete.)
   - o Enter VS command.
6. 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 the following message will be displayed on the console:

   DCU SELFTEST COMPLETE

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 IV Troubleshooting for a listing of DCU error codes.

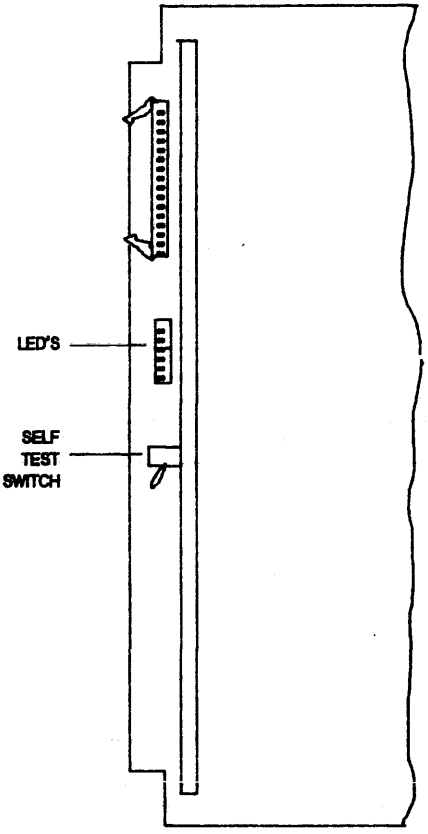


Figure 5-1. DCU Selftest Control & Indicators

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 provides remote diagnostic capability to enable fault isolation procedures from a remote site. A remote operator with an HP 264X, 262X, or 2382 terminal 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 Series 64/68 site. REMOTE refers to a console connected to the Series 64/68 via a modem (not located at the site).

1. Hardware Required:

   - o HP 35141A Modem
   - o HP 35016A Modem or Bell 103A or 212A or Vadic.
   - o HP 2624A, 2642, 2645A, 2648A, 2622, 2623, 2626, 2644 2647, 2382.
   - o Cable (Remote Console) RS232 Type (varies with Console type).
   - o HP 0960-0646 Data Station Adaptor.
   - o 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. The remote operator sets the DA/VO Switch on his modem to VO, then 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.

g. The remote operator sets the DA/VO Switch on his modem to DA, then places the receiver on the modem.

h. 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.

i. 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.

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

k. 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 Condtions

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

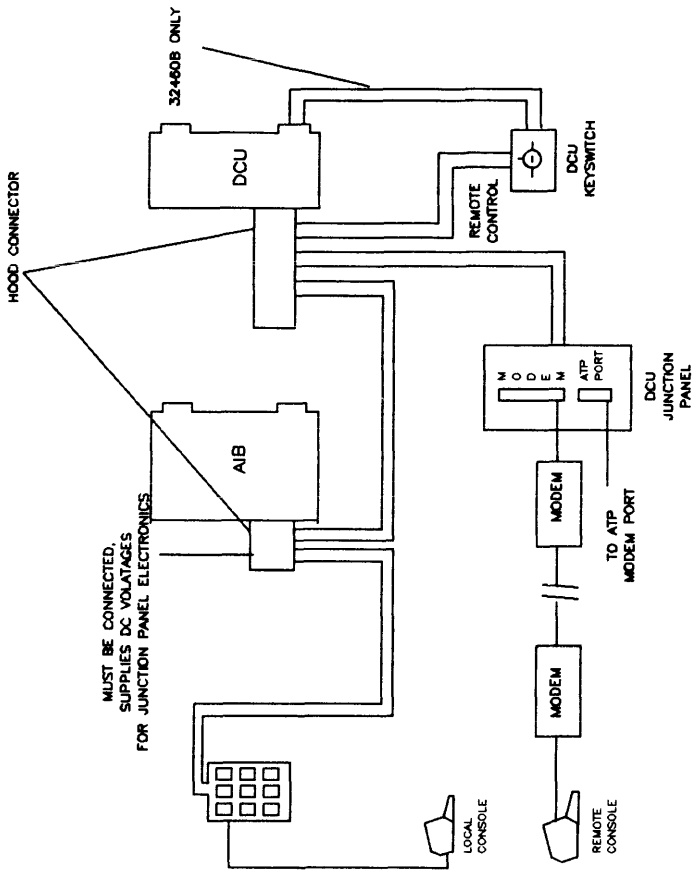

32460B ONLY
DCU
DCU KEYSWITCH
REMOTE CONTROL
HOOD CONNECTOR
MODEM
ATP PORT
DCU JUNCTION PANEL
AIB
MODEM
TO ATP MODEM PORT
MUST BE CONNECTED. SUPPLIES DC VOLTAGES FOR JUNCTION PANEL ELECTRONICS
LOCAL CONSOLE
REMOTE CONSOLE

Table 5-3. Control Commands

C> 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	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	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	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	No longer available.	
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	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	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	DESCRIPTION	FORM
SC	SCREEN COMMAND. Displays register contents. M> SC [REEN] , [< TYPE >] TYPE = Firm for firmware display = Soft for software display %%% = 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)	
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	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	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. (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)

HP 3000 Series 64/68 FAULT LOCATING DIAGNOSTICS	
Diagnostic Menu - Press the corresponding softkey	
f1 - KER/MICR	Run Kernel and all microdiagnostics
f2 - ALL MICR	Run all microdiagnostics (Section 1-5).
f3 - MEMORY	Run Microdiagnostics (Section 4-5).
f4 - I/O & IOMAP	Run Microdiagnostics (Section 5).
f5 - WCS PART I	Addresses 0100H - 13FFH
f6 - WCS PART II	Addresses 0000H - 12FFH
f8 - RESTART	Rerun currently loaded Microdiagnostic

f7 - not used

Table 5-6. PCA Fault Locating Diagnostics

PCA	SOFTKEY	DESCRIPTION
WCS *	f5 & f6	Run WCS tests Part 1 & 2
WCS	f1	Run Kernel and Microdiagnostics
VBUS	f1	Run Kernel and Microdiagnostics
CIR	f1	Run Kernel and Microdiagnostics
SKSP	f1	Run Kernel and Microdiagnostics
RAL	f1	Run Kernel and Microdiagnostics
CTLA	f1	Run Kernel and Microdiagnostics
CTLB	f1	Run Kernel and Microdiagnostics
CAC	f2	Run all Microdiagnostics only
CMA	f2	Run all Microdiagnostics only
CBI	f2	Run all Microdiagnostics only
IOB	f4	Run Microdiag Section 5
IMBI	f4	Run Microdiag Section 5
GIC	f4	Run Microdiag Section 5
ATP (port 0)	f4	Run Microdiag Section 5
Loopback on Peripheral HP-IB I/F PCA	f4	Run Microdiag Section 5
MCS	f3	Run Microdiag Sections 4-5
MMC	f3	Run Microdiag Sections 4-5
MMA	f3	Run Microdiag Sections 4-5

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

2. FLDCOPY

To write a new FLD floppy disc run FLDCOPY.HP32342.Support and follow the program instructions. When the program asks for a permanent disc file, enter "S64FLDS".

—no quotes

Log on to

: Hello Field.Support, HP32342

: RUN FLDCOPY

? Answer questions

Copy? yes

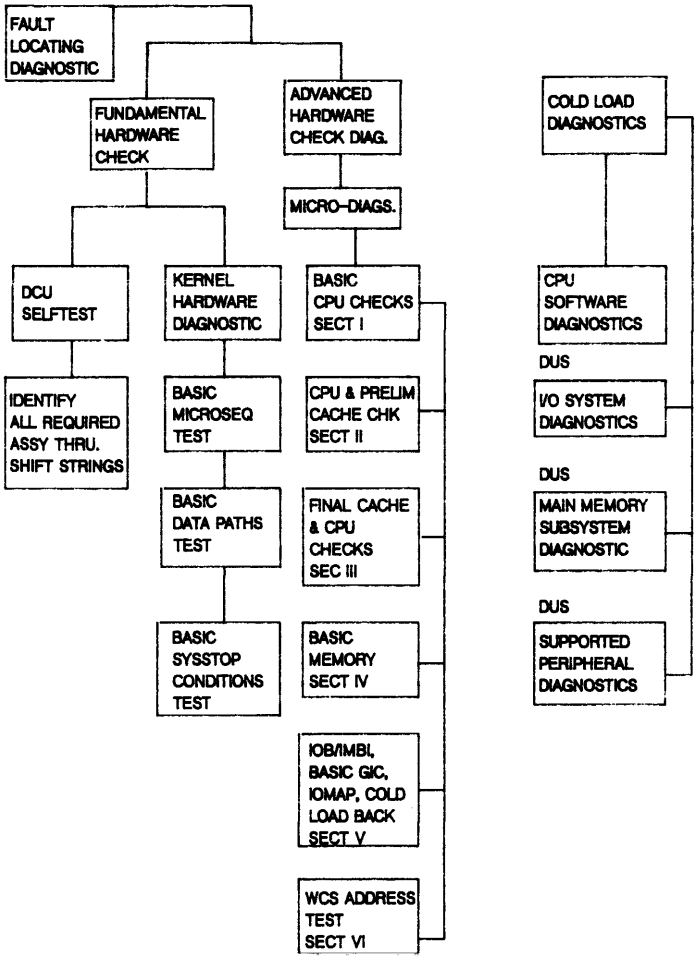


Figure 5-3. Fault Locating Diagnostic Block Diagram

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 of the Fault Locating Diagnostic is indicated by the following message:

```
FAULT LOCATING MICRODIAGNOSTIC COMPLETED
NO ERRORS
```

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.

Advanced Hardware Diagnostic Tests (Micro-FLDs)

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

- 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).

- Section 2 (CPU and preliminary cache checks)

  This section continues verification of the CPU and starts checkout of the Cache/CBI5. 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/CBI5 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 CBI5.

- 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 CBI5.

- Section 4 (Memory)

  This section verifies main memory and CPU Cache. Cache 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.

- 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.

o 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.

o 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.

o 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 section describes the dump string command.

1. Format a diskette.
   a. Insert diskette at console.
   b. Press console COMMAND key.
   c. SHOW (f3) VOLUME (f2) <return>.
   d. If volume name is "nofmt", skip to 6.
   e. DISC (f8), PURGE (f4) VOLUME (f5) "Name" <return>.
   f. DISC (f8), CREATE (f5), VOLUME (f6) "Name" ON (f2) 1 <return>.
   g. Exit command mode (Press COMMAND key).
   h. M>DS (Dump String Command).
2. Use FCOPY to copy the floppy data into a permanent disc file.

   :FCOPY

   >FROM=$CTUL;TO=STRINGS;NEW;FILES=25;SKIPEOF=1

   >EXIT
3. :RUN STRINGDU.HP32342.SUPPORT

   FILE? STRINGS

OFFLINE DIAGNOSTIC

The following pages provide a description of offline diagnostics.

Stand-Alone Diagnostic Utility Program (SDUP64)

This diagnostic builds a stand-alone CPU diagnostic tape and enables CPU diagnostics to be loaded from a magnetic tape unit.

1. Recommended procedure for building a SER64LNK-CPU Stand-alone tape follows:

```
:HELLO FIELD.SUPPORT, HP32342
:STREAMS 10
:STREAM SER64LNK
#J1
PLEASE MOUNT STAND/ALONE CPU DIAGNOSTIC TAPE
```

2. A tape request is issued on the system console with the name of the tape file SDUP. The operator must mount the tape and reply to the request.

3. Alternate procedure for building SDUP64 tape.

```
:HELLO FIELD.SUPPORT, HP32342
:RUN SDUP64
3000 DIAGNOSTIC UTILITY PROGRAM (SDUP) D617A.00.01
DO YOU WANT INSTRUCTIONS?
ANSWER 'YES' OR 'NO'
NO

PROGRAM NAME?
PD602A

PROGRAM NAME?
PD602A1

PROGRAM NAME?
PD602A2

PROGRAM NAME?
PD602A3

PROGRAM NAME?
PD602A4

PROGRAM NAME?

MOUNT TAPE ON UNIT

TAPE REQUEST HAS BEEN ISSUED
OPERATOR MUST NOW REPLY TO REQUEST
```

```
01 PD602A
02 PD602A1
03 PD602A2
04 PD602A3
05 PD602A4
END OF PROGRAM
```

Stand-Alone CPU Diagnostic

The CPU diagnostic is used to test the CPU system for normal operation. This a GO/NO GO TEST.

To execute the stand-alone CPU diagnostics, perform the following procedure:

1. Mount the SER64LNK configured tape or tape used to build SDUP64.

2. On system console, enter LO.

   ```
   M> LO
   ```

   You must type a separate LO condition for every section to run unless you are using a tape made from using stream job.

3. The diagnostic will load the system microcode and perform a cold load sequence.

4. SDUP64 will begin execution of the five diagnostic sections.

   a. Test Section 1 - half of instruction set.

   b. Test Section 2 - rest of instruction set except for the I/O instructions and interrupt system.

   c. Test Section 3 - interrupt system.

   d. Test Section 4 - bounds checking capability.

   e. Test Section 5 - extensive MOVE WHILE instructions.

5. Each section is loaded and executed without operator interaction.

6. After section 5 is loaded, the tape will rewind ready to load section 1.

7. Operation will continue until a failure occurs and system halts or operator intervenes (depressing CNTLB).

8. If an error is detected, the program should not be continued. Unexpected interrupts are irrecoverable. (Refer to Section IV Troubleshooting for listing of error messages/codes.) If an unexpected interrupt occurs, the address in the code when it occurred can be determined from the stack marker and the CST table.

9. Run FLD to locate hardware problem.

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
- o Memory Diagnostic (MDIAG64)
- o Magnetic Tape Diagnostic (7970E)
- o Disc Controller Diagnostic (13037)
- o Disc Verifier (79xx) (Not CS-80)
- o CS-80 Diagnostics
- o AID
- o Sadutil/64/68
- o ATP Diagnostic
- o DMA EXR
- o 9895 Diagnostic (D7902)

Creating Diagnostic/Utility System Media

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

```
:FILE MTAPE; DEV=TAPE; DEN=1600 (for 7976)
:FILE FLOPPY; DEV=FLOP (for 7902/9895)
:FILE CTAP; DEV=CTAPE (FOR ICT-CS\80 option)
:RUN COPYDUS.HP32231.SUPPORT
```

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

DUS LAB

:File Mtape; DEV=Tape; DEN=1600

:RUN COPYDUS.HP32231.SUPPORT

:Reply TLA = REPLY

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 at this time.

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)
-----------------------------------------------------------------
Channel 7  ID=!0        General I/O Channel
   Device 7 ID=!2004    2680 Page Printer
-----------------------------------------------------------------
```

```
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.

ID CODE	HP DEVICE
!0001	7910 Fixed Disc
!0002	13037 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
!0183	7970E Mag Tape Controller
!0204	7911 Disc Drive

ID CODE	HP DEVICE
!0205	7911 Disc with Cartridge Tape
!0208	7912 Disc Drive
!0209	7914 Disc with Cartiridge Tape
!020A	7914 Disc Drive
!0210	7931 Disc Drive
!0212	7933/7935 Disc Drive
!0240	Cartridge 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 Line Printer
!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
```

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)?
```

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.

HP 13037B 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 dics verifier, 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: VERIFIER.

4. 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)
```

5. 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.
```

6. 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 CTRLY 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 second I/O Adaptor (HP 30143A).

Memory Diagnostic (MDIAG64) - MCS,MMC,MMA

To execute the memory diagnostics, perform the following procedure:

1. Perform system back-up.
2. Perform an MPE SHUTDOWN.
3. Cold load the Diagnostic/Utility System (DUS).
4. Once the DUS program has output its title message and prompt (:) enter MDIAG64.
5. The response should be:

```
HP 3000 Series 64 Memory Diagnostic (MDIAG64 XX.XX)
Begin Section 1

If Section 1 does not complete without error, then MMA0
should be exchanged with MMA1 before attempting to run
this diagnostic.

Detected XXXX Kbytes of memory on X MMAs

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)   <<answer Y or N>>

End of Section 1
Type 'GO' to continue (LC to list commands)
>GO <CR>
```

6. This will be followed by self explanatory dialog.

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

ATP

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 dialog:

```
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 consol

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:

- When used with RECOVER2 utility, re-creates disc files.
- Recovers MPE files that have become logically inoperable because of a catastrophic condition (invalid system file directory, or bad code-load information).
- Requires no special MPE capability.

ONLINE DIAGNOSTICS

The following is a description of online diagnostic tests.

HP 2563A 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).

HP 2680A/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.

ATPDSM

To execute the ATPDSM, perform the following procedure:

1. ATPDSM 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 ATPDSM by the following:

```
RUN ATPDSM.PUB.SYS <cr>

Use of ATPDSM requires (OP) capability.  ATPDSM 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 erros 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 VI

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.

SERIES 64/68A - 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	2	6-8	8
240/415	1	4-5	8

INPUT TOLERANCE: +6% /-10%

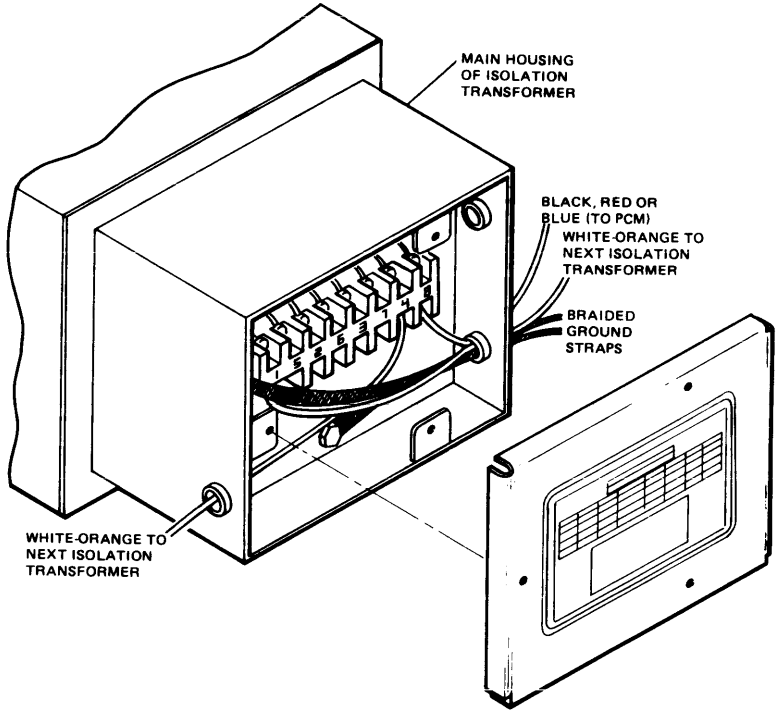


Figure 6-1. Transformer Strapping

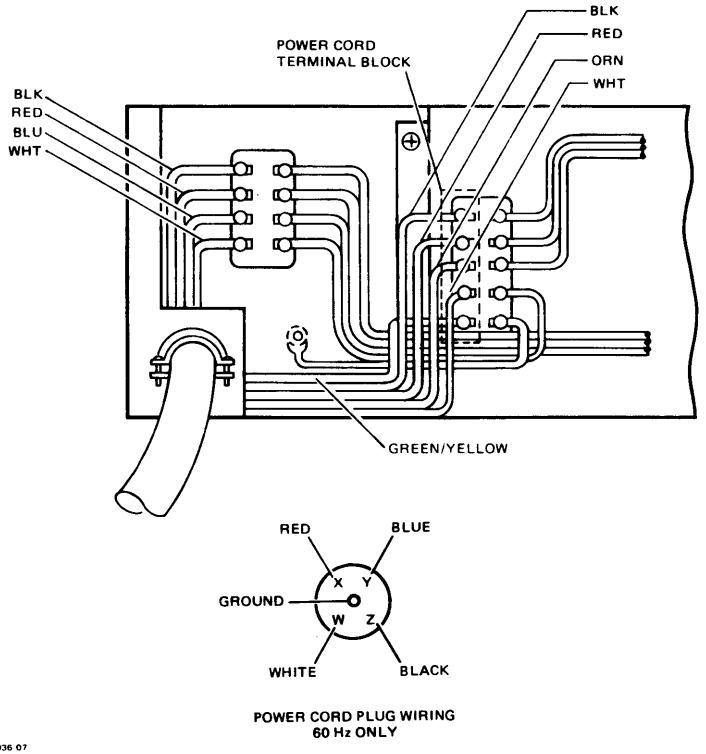


Figure 6-2. Power Line Connection for HP 32460A (208V/60HZ)

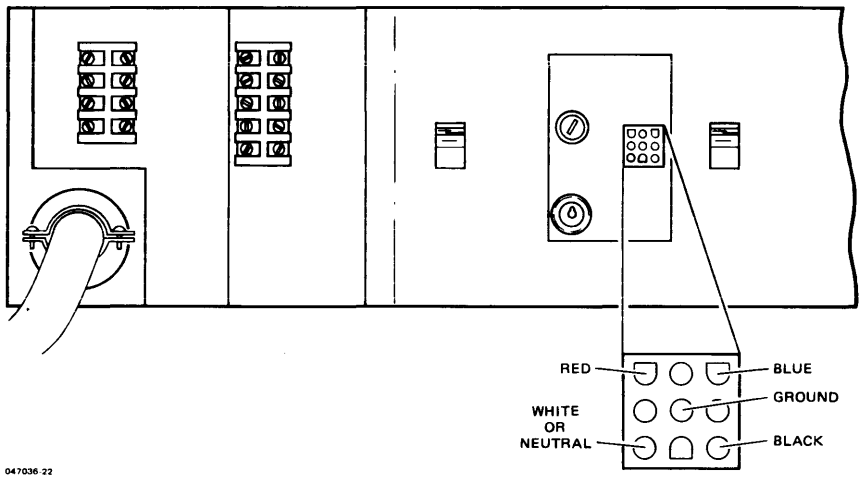


Figure 6-3. Transformer Voltage Test Points (HP 32460A)

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:

2. To isolate a failed supply from a good supply requires that both supplies be disconnected from their bus bars. A piece of insulating material may be inserted between the bus connections after the screws have been removed.

1. Turn off AC power.

3. Disconnect both supplies from their bus bars.

4. Disconnect BOTH sense leads from both supplies. (See Figure 6-4.)

5. Disconnect the shutdown lead (A1) from both supplies.

6. 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.

7. Adjust new supply voltages to nominal (rated) value as specified in Table 6-3.

8. Adjust current limit to proper setting as specified in Table 6-3.

9. Turn off AC power and complete connections.

10. 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.

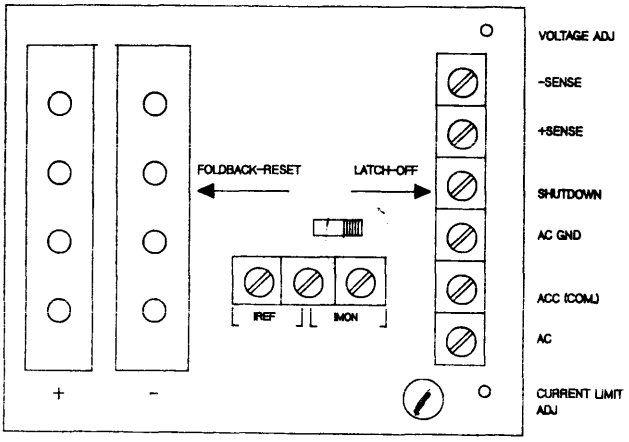


Figure 6-4. Rear View Of Power Supply (HP 32460A)

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 terminls 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

The following procedures describe the adjustment of parallel power supplies no. 2 and no. 3, no. 6 and no.7, and no. 8 and no. 9 (if an auxiliary I/O bay is installed).

Adjusting Parallel Power Supplies No. 2 and No. 3

1. Current Limit Adjustment:

   a. Place the voltmeter leads across the IREF terminals located on the rear of power supply no. 2. (See Figure 6-4.)

   b. Adjust the current limit adjustment pot to the proper value. (Refer to Table 6-3).

   c. Place the voltmeter leads across the IREF terminals located on the rear of power supply no. 3.

   d. Adjust the current limit adjustment pot to the proper value. (Refer to Table 6-3.)

2. Voltage Adjustment:

   a. Place the voltmeter leads on the appropriate sense leads according to which supplies are going to be adjusted.

      For the -5.22 volt power supplies (no. 2 and no. 3), the sense leads are located on the upper right side of the CPU backplane. (See Figure 6-6 and refer to Table 6-2.) Meter leads will remain on the same connection throughout the procedure.

   b. Disable the DC UV/OV detection circuitry by installing a jumper from the UV/OV DISABLE terminal on the PSC to a GROUND terminal on the PSC. (Refer to Figure 6-5)

   c. Adjust power supply no. 2 to -5.30 volts. See Figure 6-4 for location of power supply voltage adjustment pot. Since the most positive supply will determine the bus voltage, if no. 3 is set at a more positive level you will be unable to achieve this; therefore, you may have to adjust no. 3 higher (more negative) than no. 2 and then adjust no. 2.

   d. Adjust power supply no. 3 to -5.25 volts.

   e. Adjust no. 2 to -5.22 volts

   f. Remove the PS shutdown disable jumper from the PSC.

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. Place the voltmeter leads across the IREF terminals located on the rear of power supply no. 6. (See Figure 6-4.)

   b. Adjust the current limit adjustment pot to the proper value. (Refer to Table 6-3.)

   c. Place the voltmeter leads across the IREF terminals located on the rear of power supply no. 7.

   d. Adjust the current limit adjustment pot to the proper value. (Refer to Table 6-3).

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 6-2.) Meter leads will remain on the same connection throughout the procedure.

   b. Disable PON by installing a jumper from the UV/OV DISABLE terminal on the PSC to a GROUND terminal on the PSC. (Refer to Figure 6-5.)

   c. 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.

   d. Adjust power supply no. 6 to +5.00 volts.

   e. Adjust no. 7 to +5.05 volts.

   f. 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. Place the voltmeter leads across the IREF terminals located on the rear of the power supply. (See Figure 6-4.)

    b. Adjust the current limit adjustment pot to the proper value. (Refer to Table 6-3.)

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. Disable PON by installing a jumper from the UV/OV DISABLE terminal on the PSC to a GROUND terminal on the PSC. (Refer to Figure 6-5).

    c. Adjust power supply voltages. (Refer to Table 6-3.)

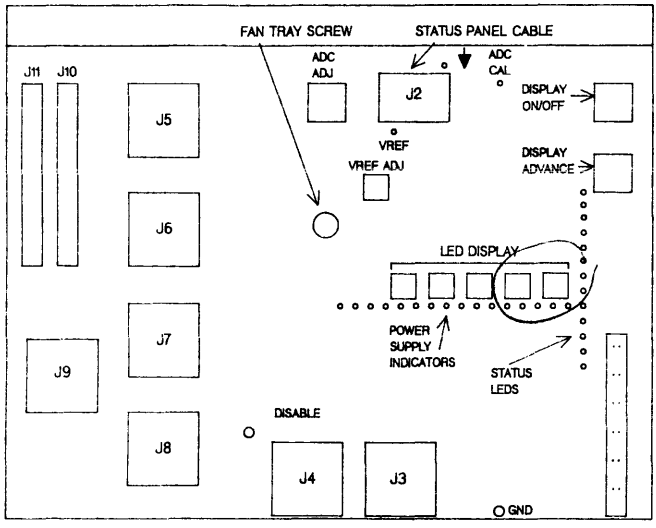


Figure 6-5. Power System Controller (PSC) Layout

Table 6-2. 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)

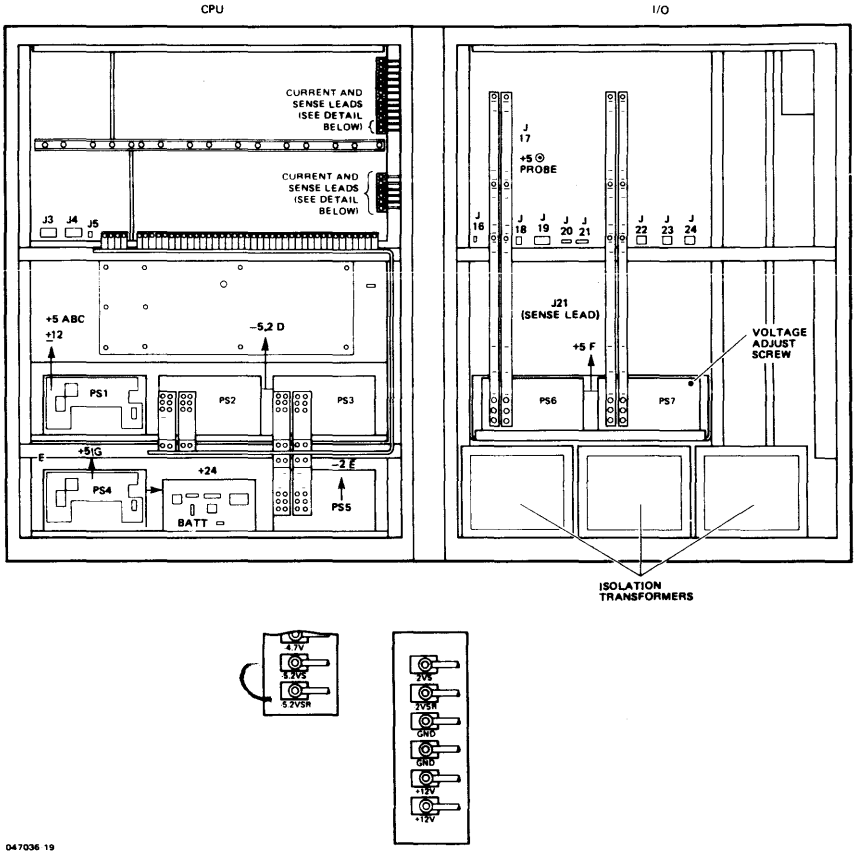


Figure 6-6. Power Supplies, Sense Leads and Isolation Transformer Location (HP 32460A)

Table 6-3. DC Power Supply Specifications Table
(Refer to Table 6-2 for voltage settings.)

P.S. NO.	NOM.** VOLT.	OPERATING *** LIMITS UPPER	OPERATING *** LIMITS LOWER	CURRENT LIMIT ADJ. LIMITS LOWER (millivolts)	CURRENT LIMIT ADJ. LIMITS UPPER (millivolts)	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
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
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	- 2.06	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.
**Nominal Voltage - rated output of power supply.
***Operating Limits - measured at system backplane.

WARNING

Energy Hazard: 200 amps may be available at power supply output terminals. Be extremely cautious not to short these outputs. Shorting these outputs can present a severe shock hazard resulting in permanent injury or death and damage the equipment.

POWER SUPPLY REFERENCE INFORMATION (HP 32460A)

Additional power supply information is contained in Table 6-4 and Figures 6-7 through 6-9.

Table 6-4. 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

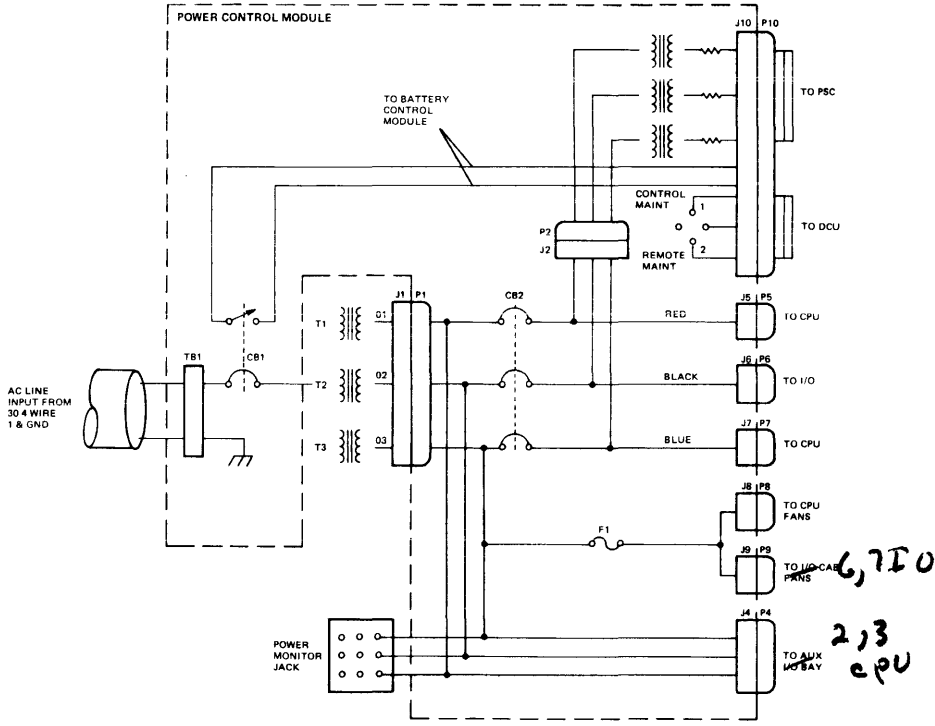
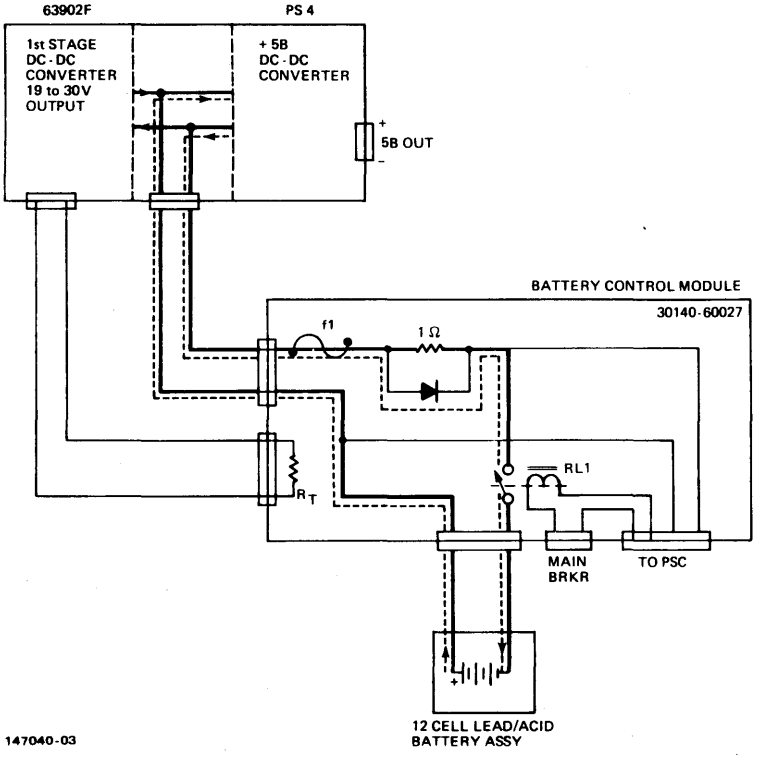


Figure 6-7. AC Distribution (HP 32460A)



Solid line = charge path
Broken line = discharge path

Figure 6-8. Battery Backup System (HP 32460A)

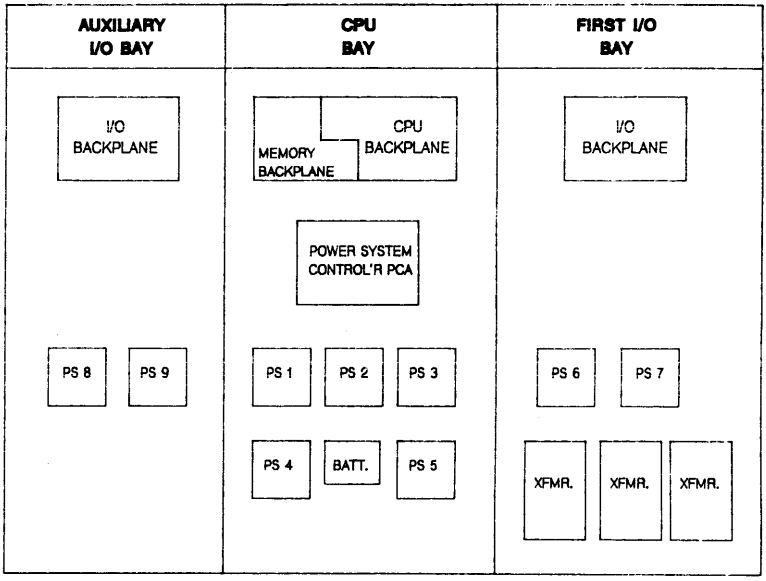


Figure 6-9. Auxiliary I/O Bay Series 68A (HP 30464) Front View

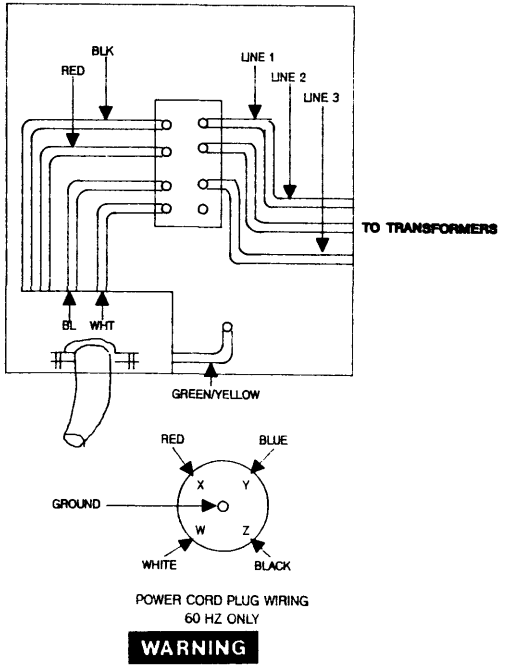
SERIES 64/68B - PART 2

AC STRAPPING

The AC strapping must match local line power. A choice of three AC Units is available with preselected strapping, 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

For power line connection information, see Figure 6-10.



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 (HP 32460B/32468B)

SYSTEM STATUS PANEL DISPLAY (SSDP-B)

The following text is a description of the System Status Panel Display (SSPD-B). (See Figure 6-11.)

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 physcially 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.

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 phsically 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.

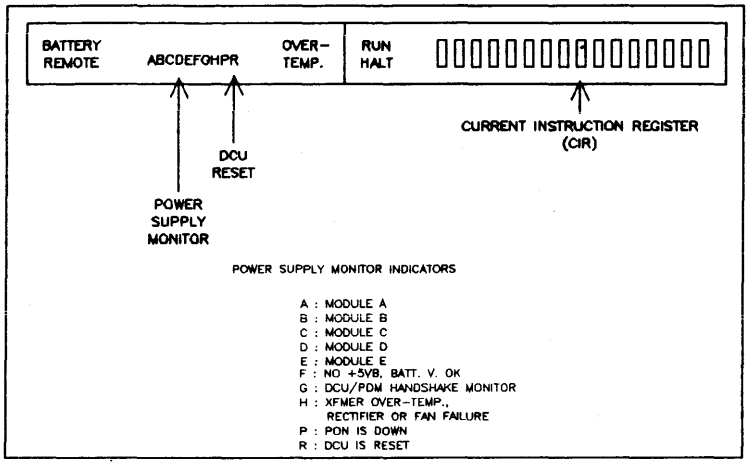


Figure 6-11. System Status Panel Display (SSPD-B)

DC MONITORING - MODULE ALARMS

The HP 32460B 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 each supply. (Refer to Tables 6-5 and 6-6.) 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 6-7 and 6-8.

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 6-5. Power Supply Module A LED Failure Analysis

RFA	PFA	FA	OT	COMMENTS
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.

0 = Collector Low
1 = Collector High

Table 6-6. Power Supply Module B,C,D,E* LED Failure Analysis

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

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 6-7 and 6-8 and Figures 6-12 through 6-14.

These supplies do not require adjustments.

Table 6-7. Power Supply Operating Limits

Module Set of Supply	Nominal* Voltage	Operational Limits** Lower	Upper	Voltage Latch Off Under	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 6-8. 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

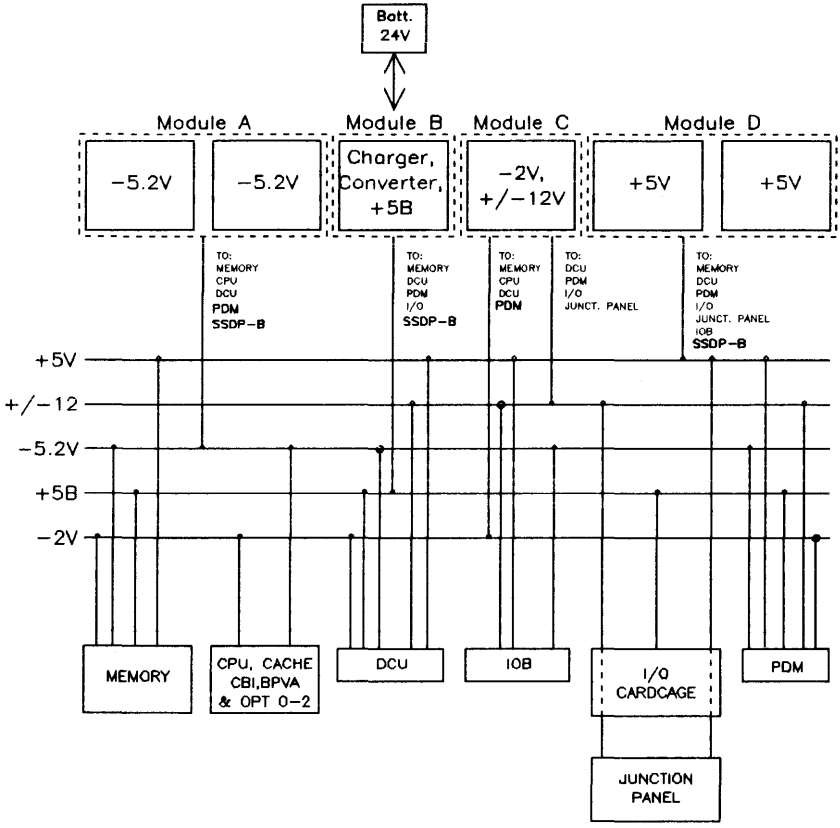


Figure 6-12. DC Power Distribution (32460B/32468B)

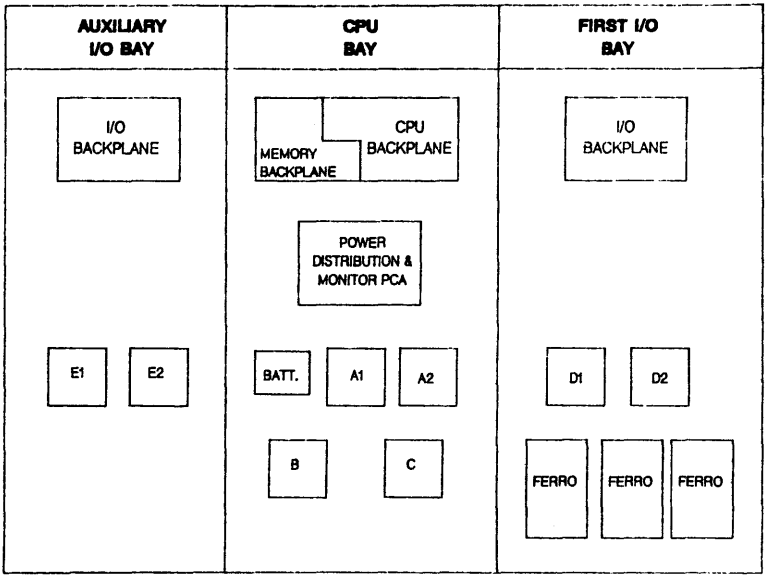


Figure 6-13. Auxiliary I/O Bay Series 68B (HP 30464B) Front View

PERIPHERALS

SECTION VII

This section describes the HP-IB devices supported on the Series 64/68.

PERIPHERAL DEVICES

Tables 7-1 and 7-2 list supported peripherals for HP 3000 Series 64/68. Figure 7-1 illustrates typical HP-IB cabling schemes.

Table 7-1. Supported HP-IB Devices

Device	HP-IB Loads	Intrn'l Cable Length, Meters	Identity Code	Remarks
DISC DRIVES				
13037C Controller for 7920/25	1	0.75	#0002	HS, No Selftest
7933H/35H	1	0	#0212	HS, CS80
7912P	1	1	#0208	HS, CS80
7911P	1	1	#0204	HS, CS80
7914	1	1	#020A	HS, CS80
Flexible Disc Unit	1	Note 1	#0080	(single sided media)
Flexible Disc Unit	1	Note 1	#0081	(double sided media)
TAPE DRIVES				
7970E	1	0	#0183	DG, No selftest
7974A	1	1	#0174	HS
7976A	2	1	#0176	HS
7978A	1	1	#0178	HS
Integrated Cartridge Tape Unit	1	0	#0240	DG, CS80
PRINTERS				
26069A Line Prntr Interface for 2611/13/17/19	1	Note 1	#200A	
2563A	1	0	#200A	
2608A	1	1	#2001	NOT HS
2608S	1	1	#2101	HS, DO NOT MIX WITH 7906/20/25
2680A	4	1	#2004	HS
2688A	4	1	#2004	HS
OTHER				
30020B INP	1	Note 1	#4003	
2893A Card Reader	1	0	#0101	DG, DL
31262 GIC acting as a device	7	0	#6000	for testing only

Table 7-1. Supported HP-IB Devices (Con't.)

Remark Codes: CS80 -- CS80 device selftest/loopback can be initiated using the D.U.S. program CS80DIAG. HS -- High speed device, attach to high speed GIC only 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. Note 1 -- Housed in SPU card cage, no internal cable length in PCA, but remember to count HP-IB flat cable length of 1 meter.

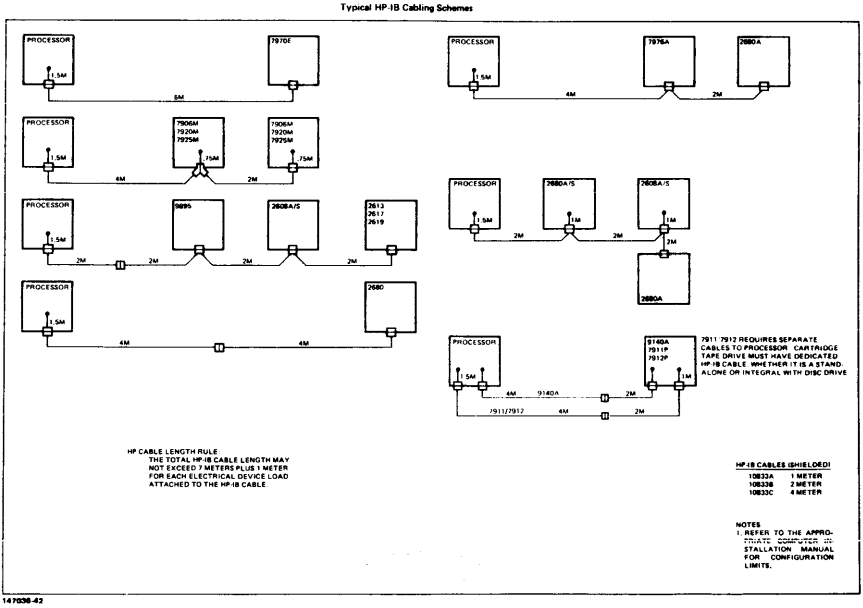


Figure 7-1. Internal HP-IB Cable Configurations

Table 7-2. HP 3000/64/68 Peripheral Devices

Device	HP Model No.	Channel Type
Terminals	As specified by Information Networking Division.	ATP
Data Collection Terminals	3075A 3076A 3077A	ATP ATP ATP
Line Printers	2563A 2608A opt. 346 2608S 2617A with 2619A opt. 364 2611A 2613A	INP-GIC-ATP GIC INP-GIC GIC GIC GIC GIC
Page Printer	2680A opt. 364 2687A (RS-232-C) 2688A	GIC ATP GIC
Dot Matrix Printer	2631B (RS-232-C)	ATP
Mag Tapes	7970E opt. 425 7970E opt. 421 7974A 7976A opt. 616 7978A	GIC N/A GIC GIC GIC
Floppy Drives	9895A opt. 333	GIC
Disc Drives	7933H/35H 7920M/S 7925M/S 7911/7912/7914	GIC GIC GIC GIC
Integrated Cartridge Tape Unit (ICTU)	opt. 001 with ICTU opt. 140 without ICTU	GIC
Card Reader	30106A opt. 333	GIC
Multiple System Access Selector	26075A	GIC
INP	30020B	GIC

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!

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.

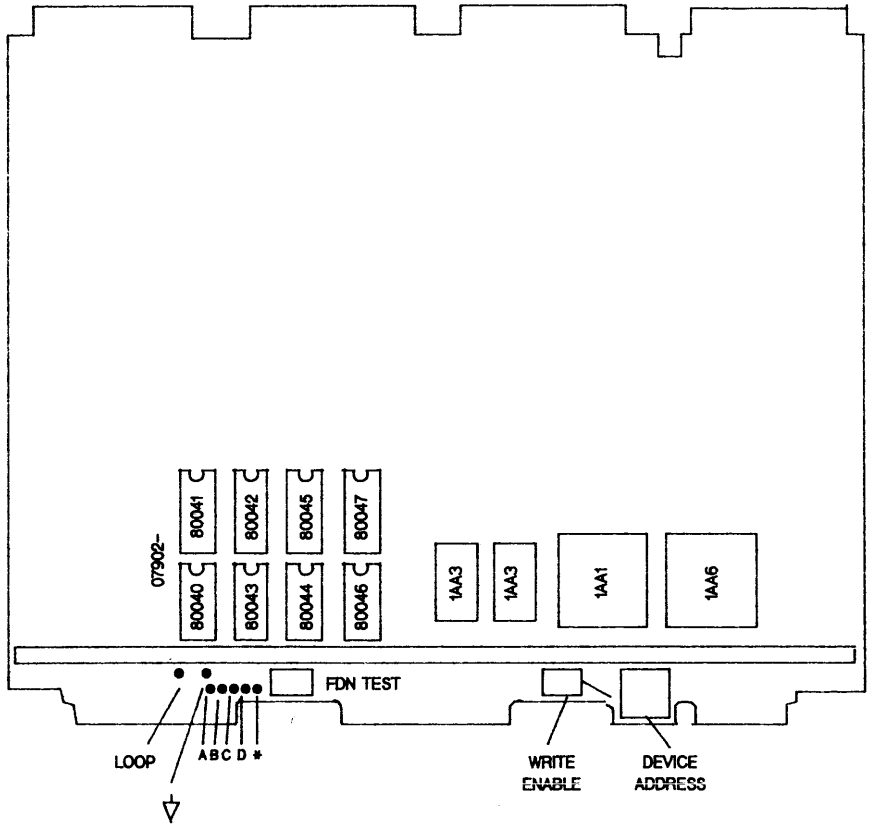


Figure 7-2. HP 9895A FDU Controller

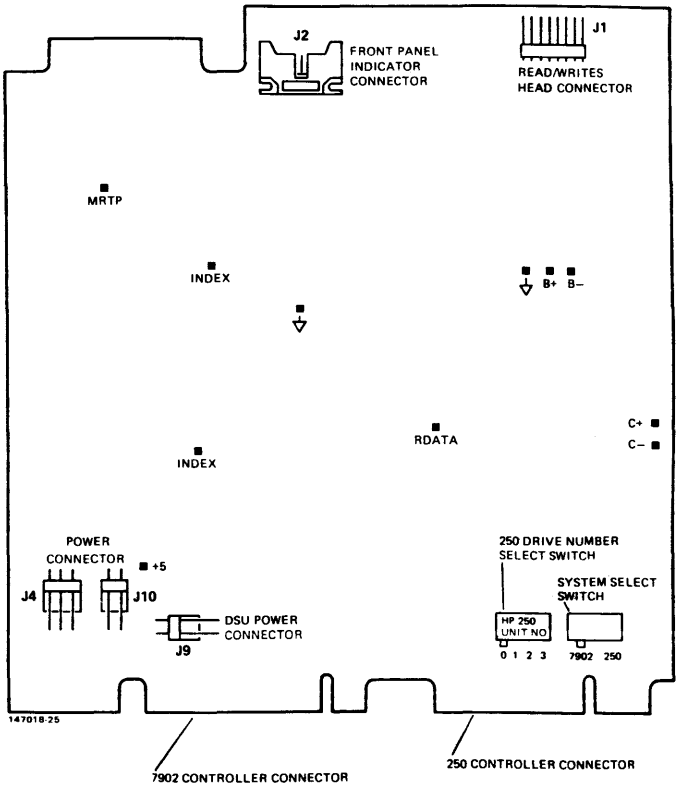


Figure 7-3. HP 9895A Drive Electronics PCA

Table 7-3. HP 9895A Controller Selftests

LED Pattern					Controller Status
A	B	C	D	*	
-	-	-	-	-	
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
- 04-HP Emt
- 10-IBM Emt

Bit 15: Busy*
Bit 14: Not Ready*
Bit 13: Seek check
Bit 12: 1st Status
Bit 11: Drive Fault
Bit 8: Write Protect
Bit 7: 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

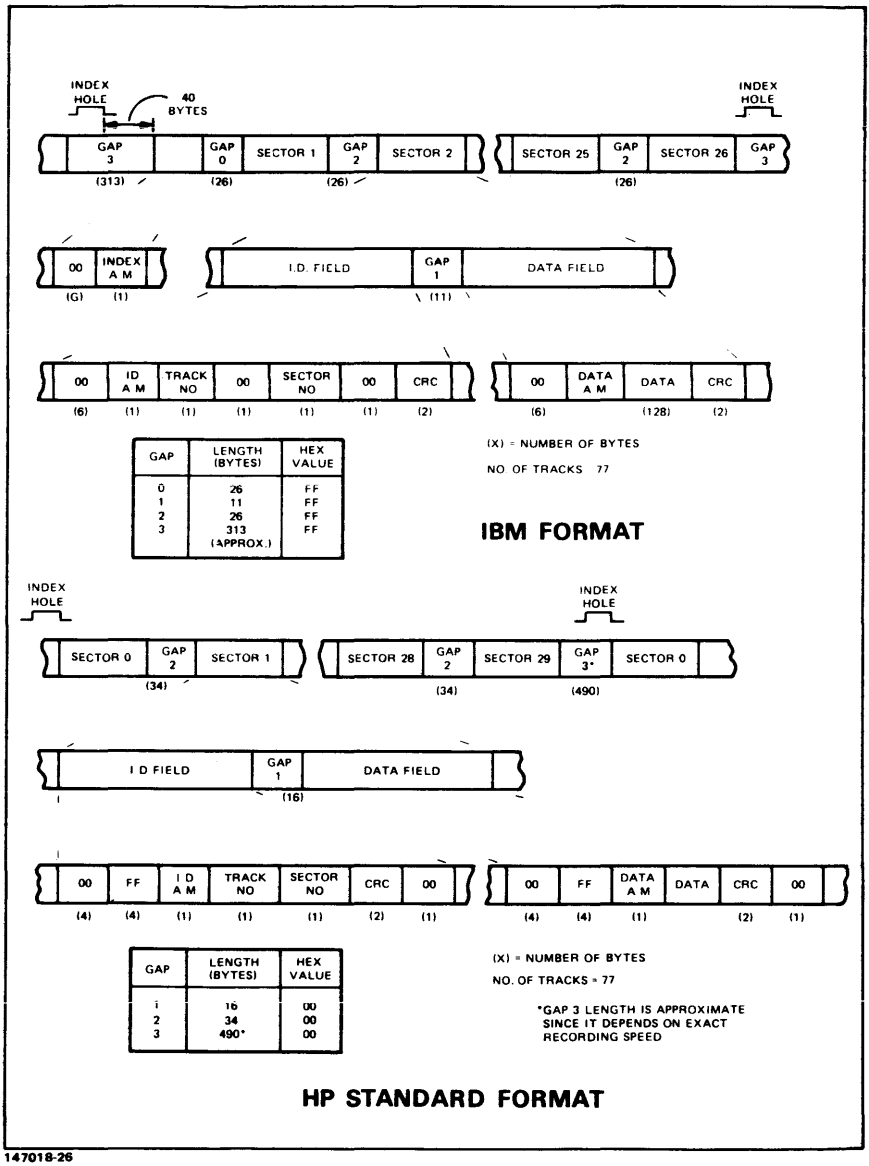


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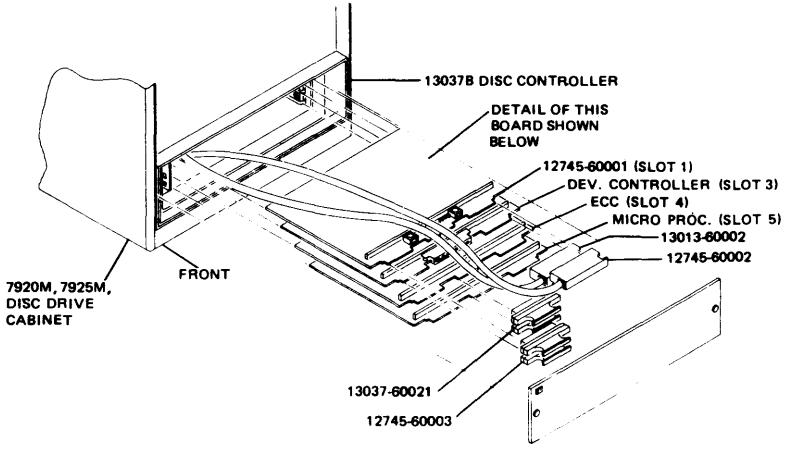
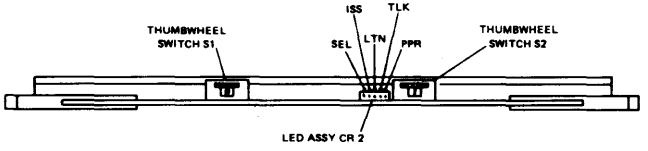
Figure 7-4. Sector Recording Formats





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.

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Figure 7-5. System Disc HP-IB Device Select Switch

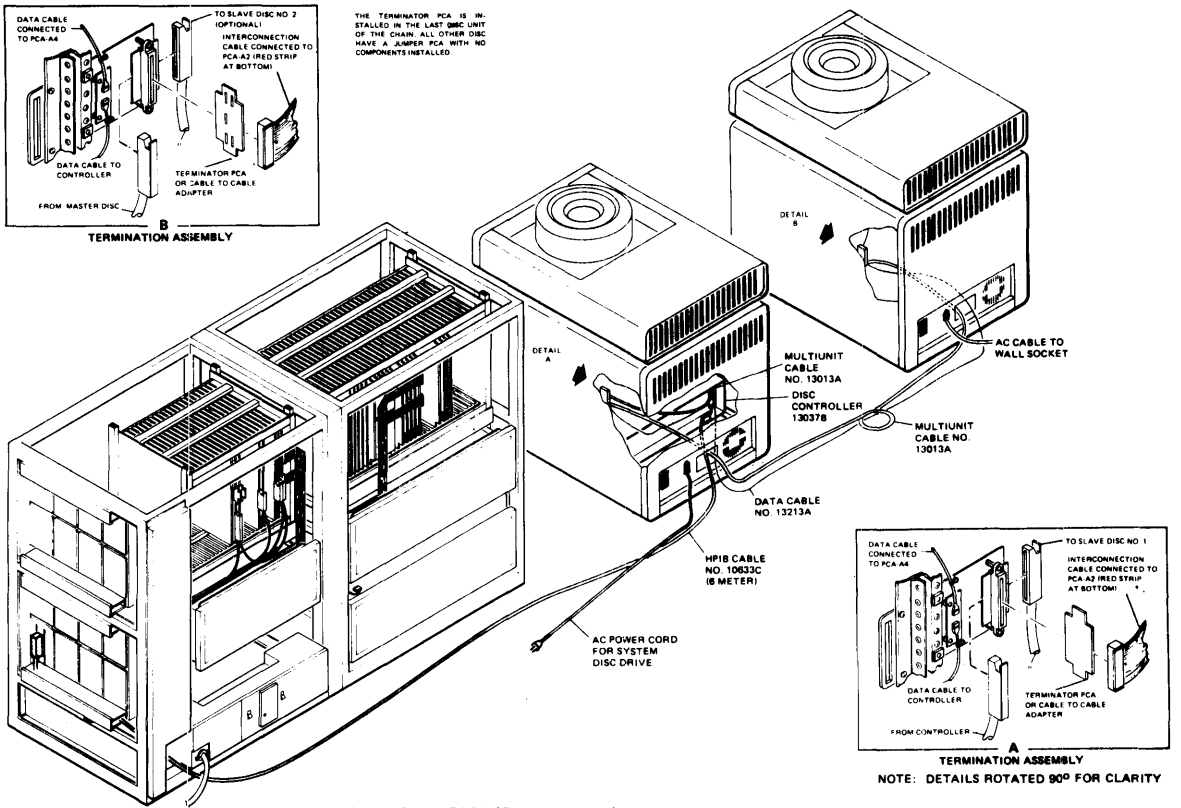


Figure 7-6. 7920/7925 Master/Slave Disc Cabling

HP 7906/20/25

Refer to Table 7-5 for a description of the bit defintions 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 current drive

*Encoded termination status

---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

HP 7911/12/14/33/35 STATUS FORMAT

The following text contains a summary of the status format:

IDENTIFICATION FIELD

Unit = nnnn Volume = nnnn

No Units Require Service
OR
Unit nnnn Requires Service

REJECT ERRORS FIELD

Channel Parity Error
Illegal Opcode
Illegal Volume or Unit number
Address Bounds Error
Parameter Bounds Error
Illegal Parameter
Message Sequence Error
Message Length Error

FAULT ERRORS FIELD

Cross Unit Error during Copy Data
  Unit which had errors are:
  Unit = nnnn
  Unit = nnnn
Controller Fault
Unit Fault
Hardware Failed Diagnostic
  Part number= nnnn failed
  Test Error number= nnnn returned
  Drive Error number= nnnn returned
Release Required for Operator Maintenance
  before command can be executed
Release Required for Diagnostics Maintenance
  before command can be executed
Release Required for Internal Maintenance
  before command can be executed
Power Failed or Drive just Powered On
Auto Release has been completed / Retransmit command

ACCESS ERRORS FIELD

Illegal Parallel Operation
Uninitialized Media
No more spares available
drive is not ready
Volume is Write Protected

No Data Found
Unrecoverable Data Overflow
Unrecoverable Data, Address of bad data follows:
    Block Address = nnnn
      OR
    Vector Address
     cyl = nnnn

     head = nnnn
     sect = nnnn
End of File encountered
End of Volume encountered

INFORMATION ERRORS FIELD

Operator is Requesting Release
Release Requested for a Diagnostic Result
Release Requested for Internal Maintenance
Media Wear
Latency Induced for Data Overun
Auto Sparing Invoked by the Unit
Recoverable Data Overflow
Marginal Data encountered, data was
    recovered but with much
    difficulty. Address of marginal
    data is:
    Block Address = nnnn
      OR
    Vector Address
     cyl = nnnn
     head = nnnn
     sect = nnnn
Recoverable Data -- but a latency
  was induced in order to recover
  the data. Address of the recovered
  block is:
    Block Address = nnnn
      OR
    Vector Address
     cyl = nnnn
     head = nnnn
     sect = nnnn
Maintenance Track Overflow

New Target Address is:
Block Address = nnnn
  OR
Vector Address
 cyl = nnnn
 head = nnnn
 sect = nnnn

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 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.

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)

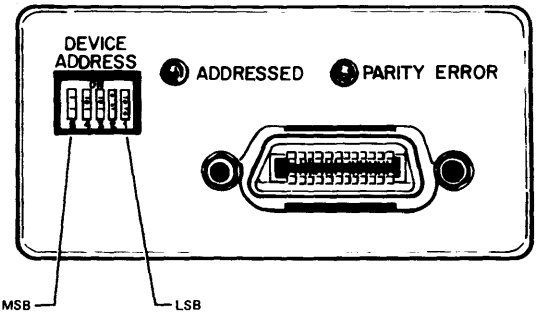
```
Bit 0:  Reserved

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 2563A and 2608A/S LINE PRINTER

See Figure 7-7 for layout of HP 2608A HP-IB interface connector and refer to Table 7-10 for a desciption 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

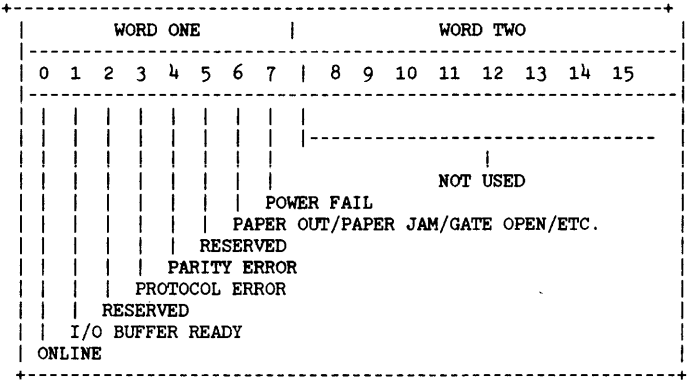
Table 7-10. HP 2608A Status Bit Definition

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 7-11 for a description of the bit definitions for status words 1 and 2, and see Figure 7-8 for line printer installation.

Table 7-11. HP 2611A/13A/2617A/2619A Status Bit Definitions



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.

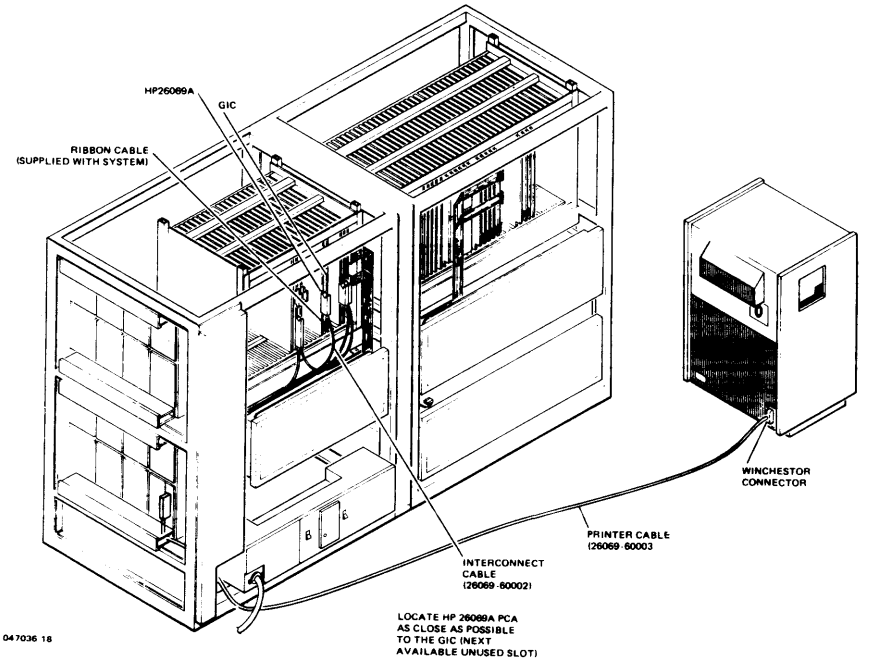


Figure 7-8. HP 2611A/13A/2617A/2619A Printer Installation

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.

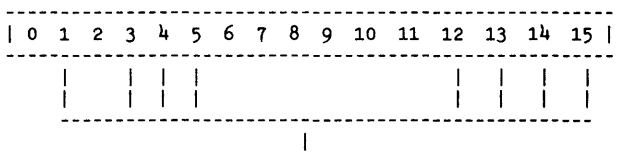
NOTE

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.

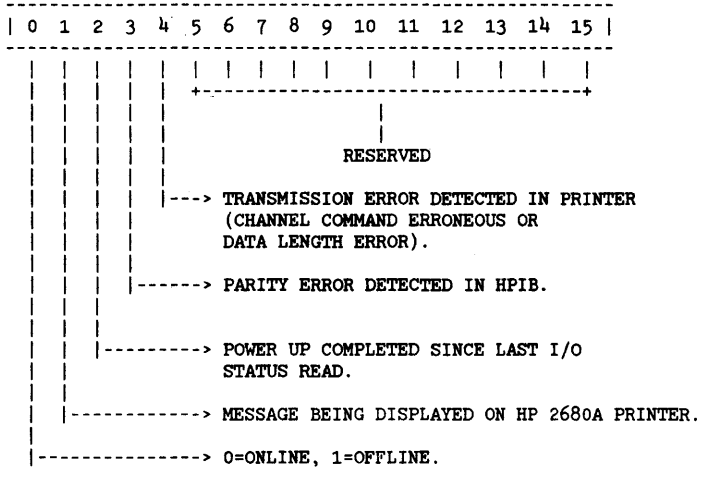
WORD	I/O STATUS	ENV STATUS
0	%004004	%000020
1	%000000	%027511
2	%000000	%000057
3	%000000	%010100
4	%001000	%070101
5	%000000	%000654
6	%000000	%000000
7	%000000	%000102
8	%000000	%021156
9	%000000	%000000
10	%000000	%000675
11	%000000	%004102
12	%000000	%000000
13	%000001	%000000
14	%000000	%000000
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.

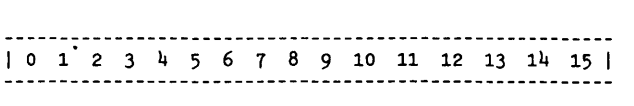


I/O Status Word 1



I/O Status Word 2 - Unused

I/O Status Word 3 - Machine Control System (MCS) Fault Member



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	Logical 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 |

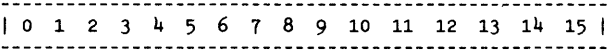
Contains error record number defined by word 4. Information is reported during a JOB function.

I/O Status Word 13

| 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 |

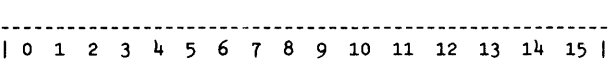
Contains error record number defined by word 4. Information is reported during a JOB function.

I/O Status Word 14



Contains sheet number where error occured as defined by word 4. Information is reported during a job function.

I/O Status Word 15

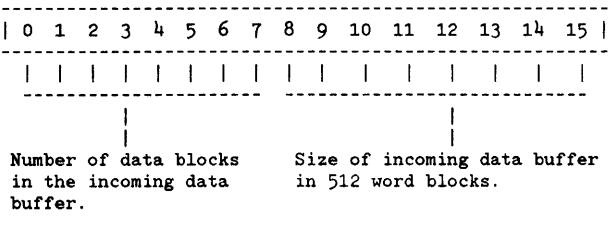


Contains sheet number where error occured as defined by word 4. Information is reported during a job function.

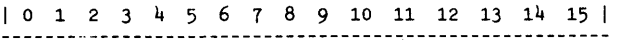
Environmental Status

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

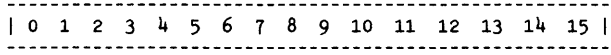


Environmental Status Word 1



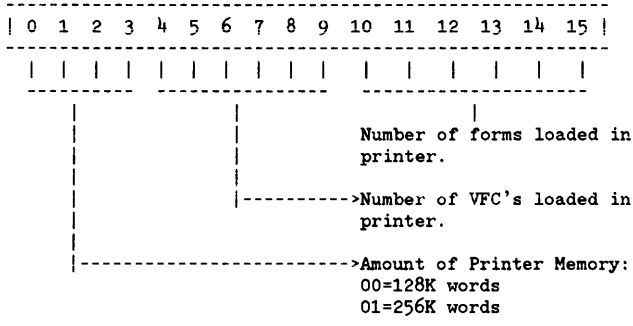
Number of twenty word buckets available.

Environmental Status Word 2

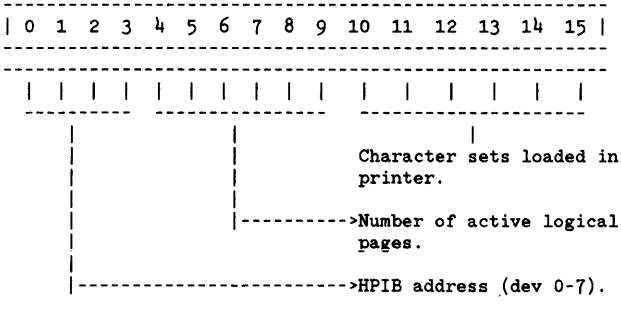


Maximum number of buckets used since last job open.

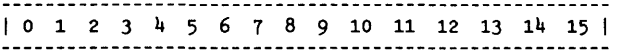
Environmental Status Word 3



Environmental Status Word 4

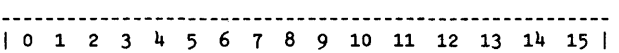


Environmental Status Word 5



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

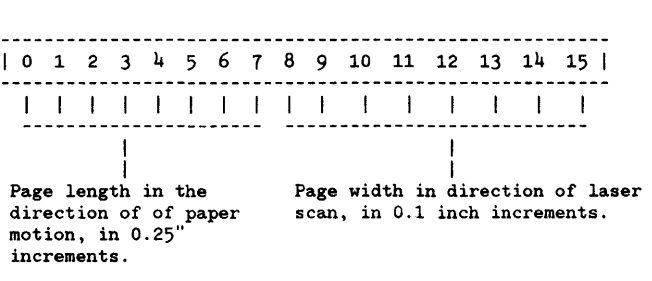


Number of form dots per bit (words + 3)/4 plus the number of form triplet (words plus 3)/4.

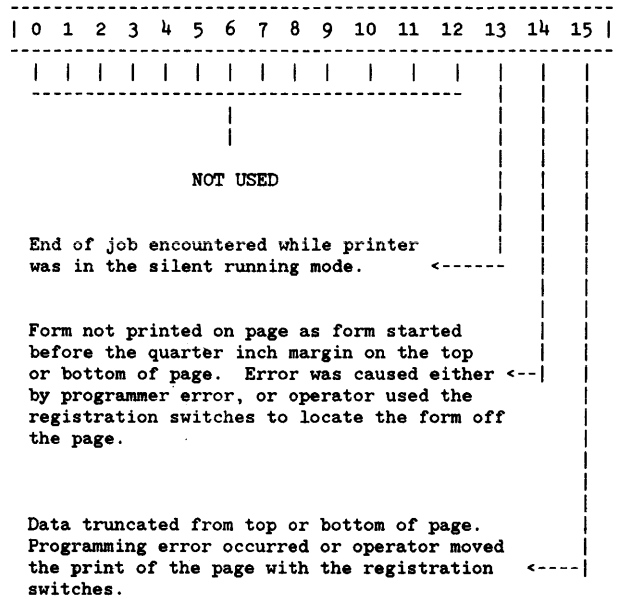
Environmental Status Word 7

Number of VFC words loaded.

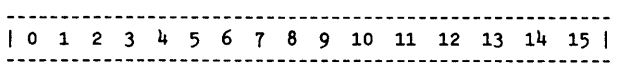
Environmental Status Word 8



Environmental Status Word 9

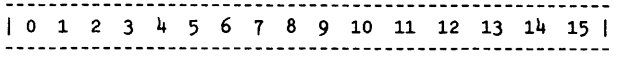


Environmental Status Word 10



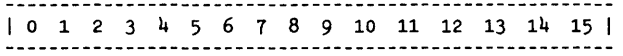
Number of USER AREA words actually loaded, plus 3 divided by 4.

Environmental Status Word 11



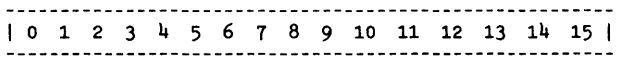
Date code of DCS firmware currently installed.

Environmental Status Word 12



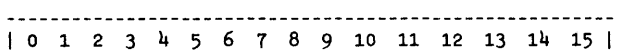
Number of non blank characters clipped (not printed) on this job.

Environmental Status Word 13



Reserved.

Environmental Status Word 14 and 15



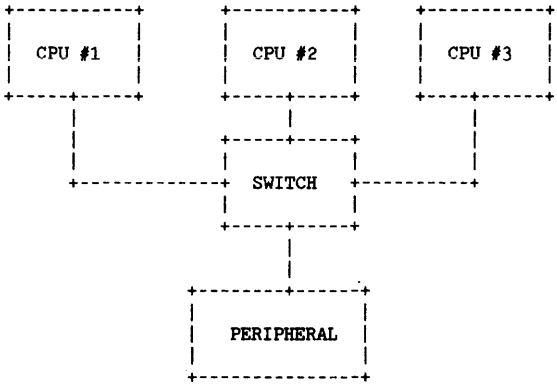
Number of physical pages printed since last job open (signed double integer). Indicates total number of physical pages printed for this job since the environmental status block read function.

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

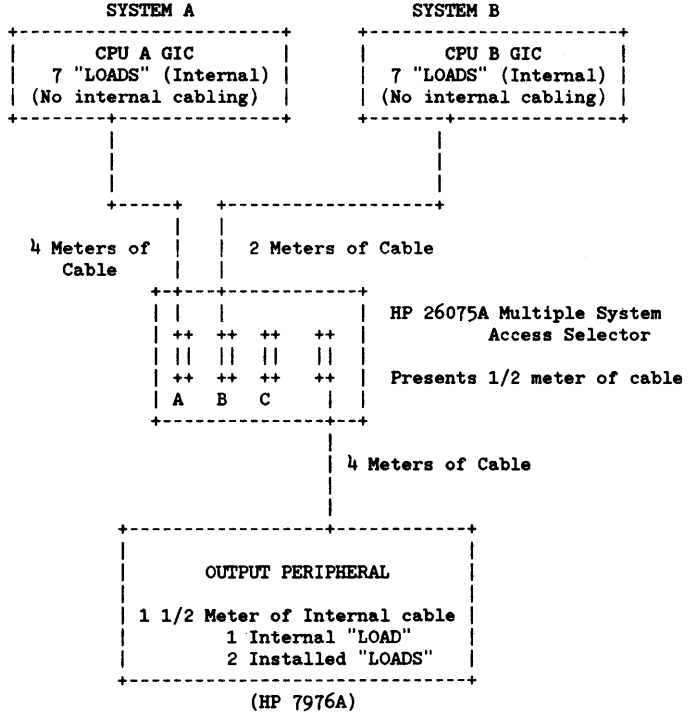
   There are four standard HP-IB connections in total, with a maximum of three CPUs to one peripheral.



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.

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 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 before switching the peripheral to another system.

REPLACEABLE PARTS

SECTION VIII

The Replaceable Parts Catalog provides illustrations and parts lists to assist the user in locating replaceable assemblies of the HP 3000 Series 64/68 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. When the part number is unknown, use the illustrations to locate the major assembly or subassembly. Then refer to the associated parts list for the indexed part number corresponding to the index number on the illustration. The parts list contains the description, part number, and quantity per unit.

Procedure

To find the part number of an assembly, perform the following steps:

1. Locate assembly to be replaced on Figures 8-1 through 8-6.

2. Note index number (1-1). The index number identifies the figure number and assembly location.

3. Refer to the parts catalog (Tables 8-1 through 8-4) for index number, and locate the desired part data.

4. The parts catalog is also sorted alphabetically.

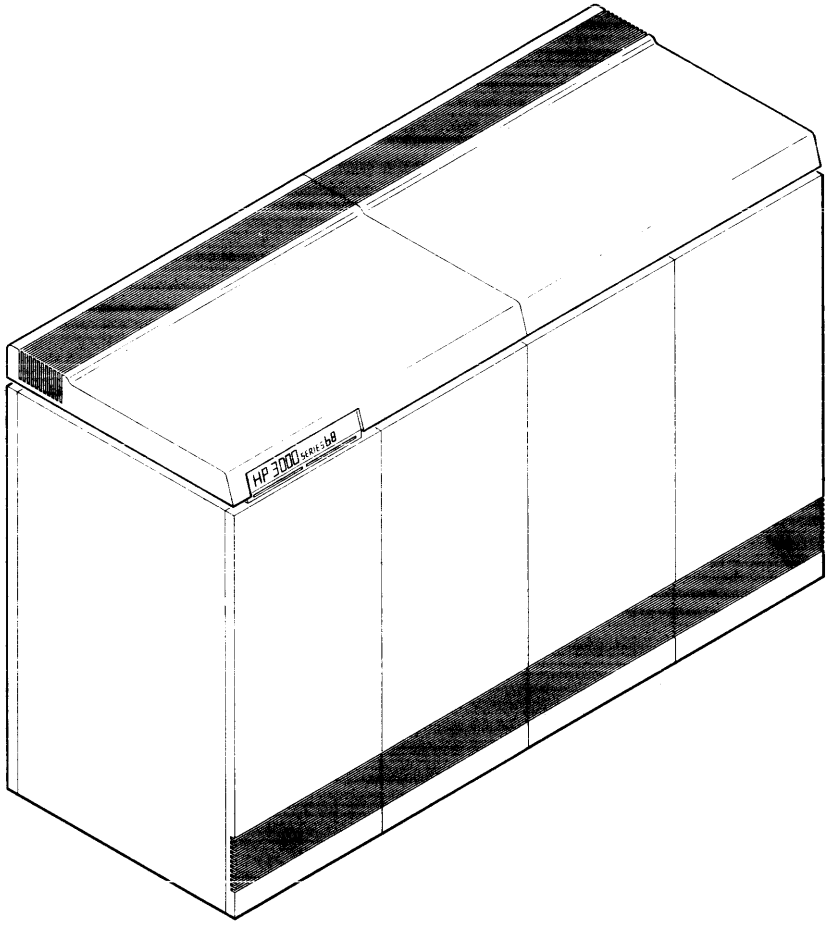


Figure 8-1. HP 3000 Series 64/68 Computer

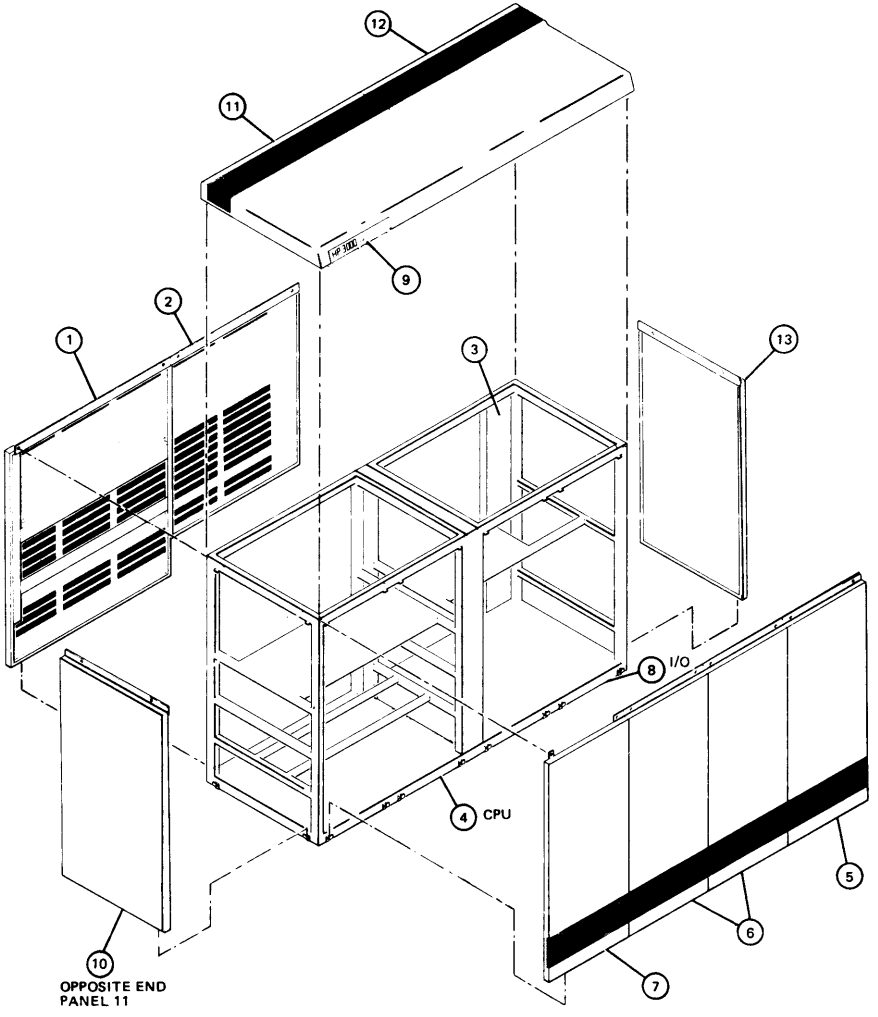


Figure 8-2. HP 3000 Series 64/68 Exploded View

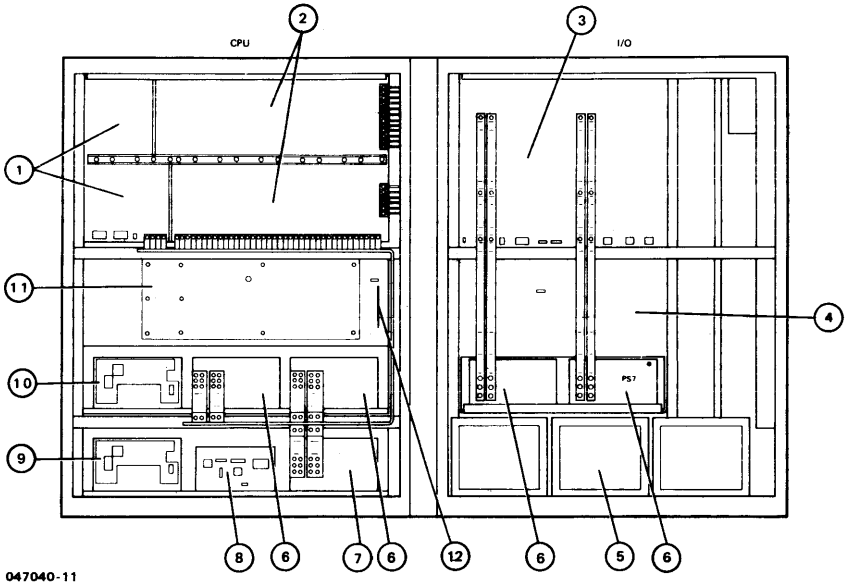
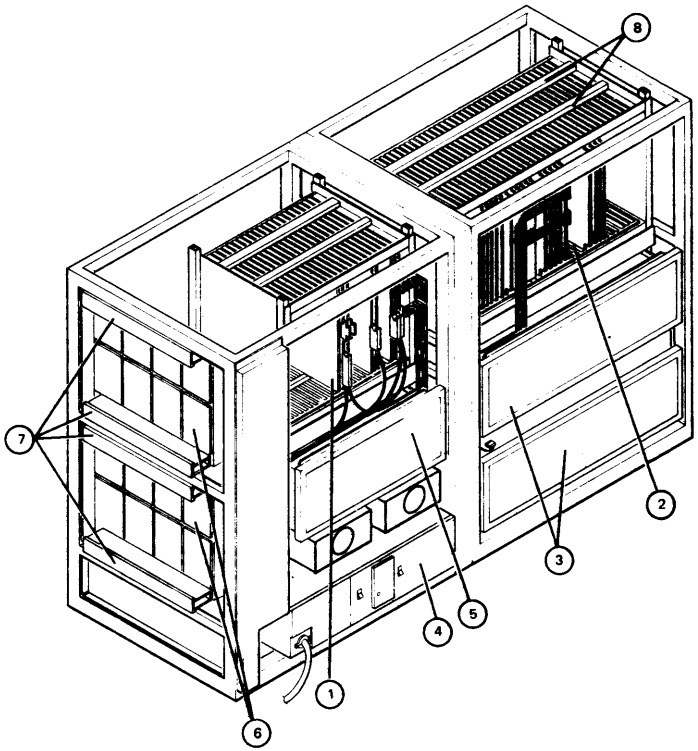


Figure 8-3. CPU and I/O Card Cages Series 64/68 (HP 32460A)
Rear View



NOTE: 3rd IOA (Aux. I/O Bay) uses same part numbers as 2nd IOA.

Figure 8-4. Rear View of Series 64/68 (HP 32460A)

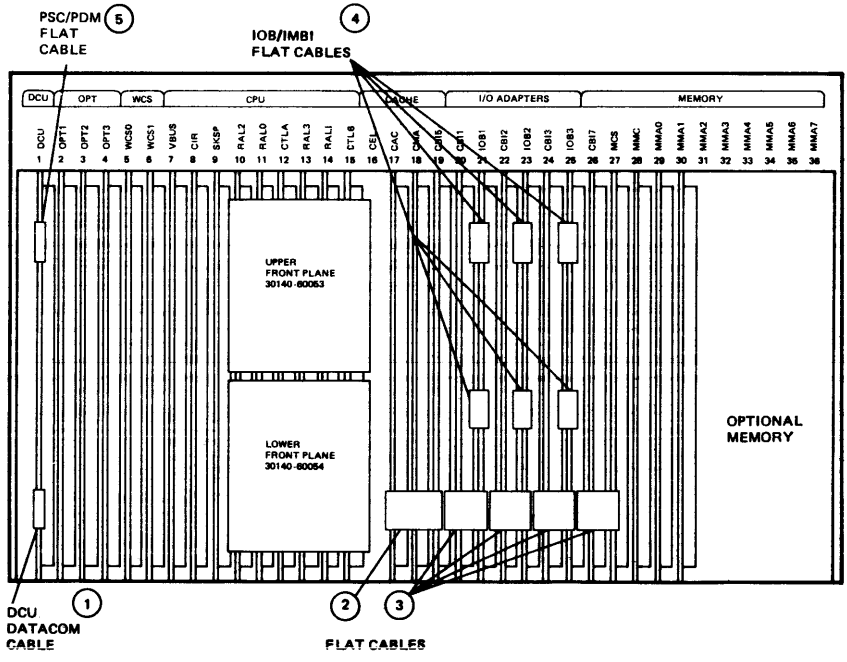
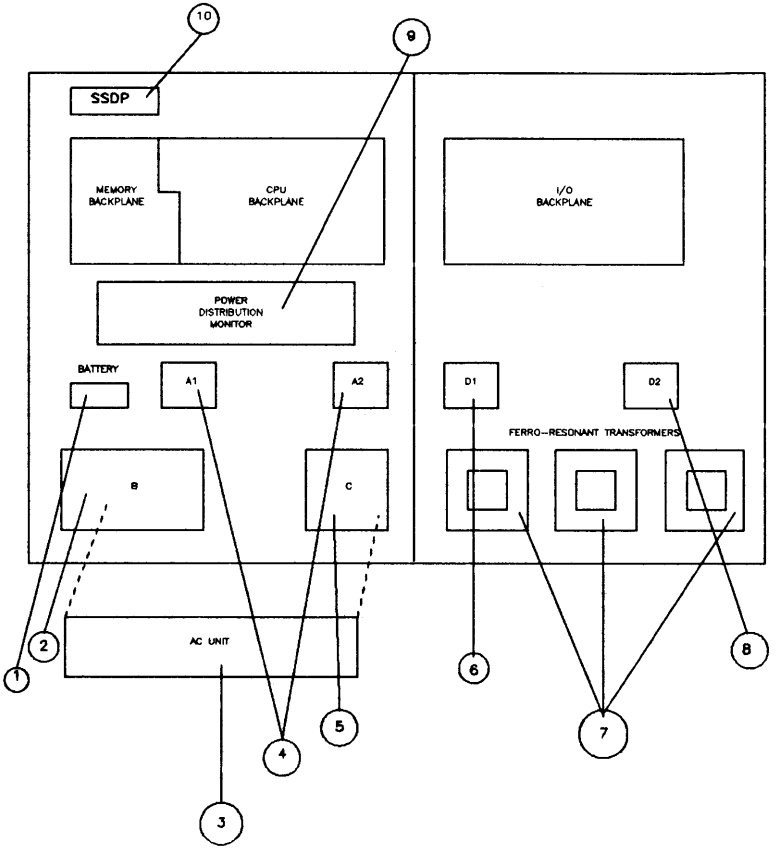


Figure 8-5. CPU Card Cage and Cabling Series 64/68



NOTE: 3rd IOA (Aux. I/O Bay) uses same part numbers as 2nd IOA.

Figure 8-6. Front View of Series 64/68 (HP 32460B/32468B)

REPLACEABLE PARTS CATALOG SORTED BY INDEX NUMBER

Table 8-1. Replaceable Parts By Index Number

INDEX NO	DESCRIPTION	HP PART NO	QTY
1-1	HP 3000/64/68 Main Frame	30140A	1
2-1	Panel Right Rear	30140-00047	1
-2	Panel Left Rear	30140-00050	1
-3	Panel Rear Cable Exit	30140-00052	1
-4	I/O Bay	REF	1
	Fan-T BAX 6.0"	3160-0362	2
-5	Panel Front Right	30140-00036	1
-6	Panel Front Center	30140-00042	2
-7	Panel Front Left	30140-00039	1
-8	CPU 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	30140-00045	1
-11	Cover Top I/O Bay	4040-1792	1
-12	Cover Top CPU Bay	4040-1791	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,	62971-69001**	4
-7	Power Supply (PS5)	62970-69001**	1
-8	Battery Module PCA	30140-60027**	1
	24V Battery 5AH	1420-0286	1
-9	Power Supply (PS4)	63902-69001**	1
	Power Dist PCA	30140-60025**	1
-10	Power Supply (PS1)	63901-69001**	1
	Power Dist PCA	30140-60024**	1
-12	Diode - 35V/60A	1901-0727	1
4-1	I/O Card Cage - 24 Slot	7101-0583	1
	GIC PCA	31262-60001	2
	INP PCA	30020-60009	1
	2619A Printer IMB Intf	26069-60001	1
	ATP-SIB	30144-60001	1
	ATP-AIB	30145-60001	1

** HP 32460A ONLY

Table 8-1. Replaceable Parts By Index Number (Con't.)

INDEX NO	DESCRIPTION	HP PART NO	QTY
4-2	CPU Card Cage - 32 Slot	7101-0582	1
	DCU PCA *	30140-60001	1
	RALU PCA	30140-60002	4
	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
	CMA PCA	30140-60010	1
	CBI PCA	30140-60011	3
	MMC PCA	30140-60012	1
	MCS PCA	30140-60013	1
	MMA PCA	30140-60014	1-8
	RAM CHIP-STRESSED	1818-3006	
	IOB PCA	30140-60015	1
	IMBI PCA	30140-60016	1
	PSC	30140-60017**	1
	CPU BACK PLANE PCA	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	3105-0163**	1
	Circuit Bkr 50A 3P	3105-0138**	1
	Fuse (Fan)	2110-0010**	1
	Key Switch, Rem/Maint with Key	1390-0482 1535-4228	1 1

Table 8-1. Replaceable Parts by Index Number (Con't.)

INDEX NO	DESCRIPTION	HP PART NO	QTY
4-5	Air Filter -I/O Plenum	3150-0390	1
-6	ATP Junction Panel	30140-00022	2
	Direct Conn Mother Bd	30144-60003	1
	RS232 Modem Mother Bd	30145-60002	1
	RS232C Mini Board	30148-60001	1
	RS422 Mini Board	30147-60001	1
	Modem Mini Board	30146-60001	1
	Internal Data Cables	REF	1
-7	Wiring Duct - Junct. Pnl	30140-00098	4
-8	Thermal Switch-122F(50C)	3103-0088	4
	Thermal Switch-104F(40C)	3103-0089	4
5-1	Cable DCU/Data Comm	30140-60048**	1
-2	Cable Flat CAC/CMA/CBI	30140-60029	1
-3	Cable Flat CBI/IOB-MCS	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	30140-60021	1
-5	External Data Cables	REF	
	Cable RS-232 Console	02640-60131	1
	to Junction Panel		
	HP-IB Disc/Magtape(2m)	8120-3446	1
	Cable-modem jumper	30140-60081	1

** HP 32460A ONLY

REPLACEABLE PARTS FOR SERIES 64/68 (HP 32460B/32468B) ONLY

Table 8-2. Replaceable Parts For Series 64B/68B

INDEX NO	DESCRIPTION	HP PART NO	QTY
6-1	Battery Module	30140-60103	1
	P.S. Shelf Top CPU	30140-00104	1
6-1	Plate Battery Mtg.	30140-00106	1
6-2	Fuse 10A 600V Fast-Blo	2110-0575	1
6-2	Fuse 1A 250V Fast-Blo	2110-0001	1
6-2	Fuse 30A 32V	3150572-ITT	1
6-2	Fuse 20A 32V	2110-0649	2
	Boxer Fan-Module A,C,D	3120032-ITT	5
	Boxer Fan-Module B	3120041-ITT	1
6-2	Batt Ch.	0950-1657	1
6-3	AC Unit		
	208VAC 60HZ	0950-1693	1
	380VAC 50HZ	0950-1694	1
	415VAC 50HZ	0950-1695	1
6-3	Fuse 3A 250V Slo-Blo	2110-0029	3
6-3	Fuse 1A 250V Slo-Blo	2110-0007	1
6-3	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
6-7	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
6-9	PDM	30140-60091	1
6-10	System Status Display B PCA	30140-60092	1
6-10	System Display B Assembly	30140-60095	1
6-10,5	Fuse .5A 250V Fast-Blo	2110-0012	5

Table 8-2. Replaceable Parts For Series 64B/68B (Con't.)

INDEX NO	DESCRIPTION	HP PART NO	QTY
6-2	" " I/O, +5B,+/-12V Dist.	30140-60113	1
6-2	" " +5B, Aux. In	30140-60115	1
6-2	" " Mod. B, +5B	30140-60122	1
6-2	" " Mod,Set B,Control/Mon.	30140-60125	1
	" " Zero Volt/PDM	30140-60126	1
6-3	Cable High Voltage, CPU	30140-60111	1
6-3	" " High Voltage, I/O	30140-60112	1
6-3	" " A.C. Unit,Control/Mon.	30140-60127	1
	" " Mod,Set A,Control/Mon.	30140-60128	1
	" " High Voltage Aux. I/O	30140-60129	1
6-3	Strapping Block 208 VAC	1251-8334	1
6-3	Strapping Block 380 VAC	1251-8333	1
6-3	Strapping Block 415 VAC	1251-8335	1
6-5	" " Mod. Set C, +/-12V	30140-60114	1
6-5	" " Mod,Set C,Control/Mon.	30140-60123	1
	" " CPU/+5 Distribution	30140-60124	1
6-6,8	" " Mod,Set D,Control/Mon.	30140-60116	1
	" " Zero Volt, Interbay	30140-60117	1
6-7	Ferro Resonant Transformer	9100-4308	1
	Slide Chassis	7200-1727	1
	Cable DCU/DATA Comm	30140-60100	1
6-9	" " 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

REPLACEABLE PARTS CATALOG SORTED ALPHABETICALLY (HP 32460B/32468B) ONLY

Table 8-3. Replaceable Parts Sorted Alphabetically 64B/68B

INDEX NO	DESCRIPTION	HP PART NO	QTY
6-3	AC Unit	0950-1653	1
6-2	Batt Ch.	0950-1657	1
6-1	Battery Module	30140-60103	1
	Boxer Fan-Modules A,C,D	3120032-ITT	5
	Boxer Fan-Module B	3120041-ITT	1
	Cable High Voltage, CPU	30140-60111	1
	" " High Voltage, I/O	30140-60112	1
	" " I/O, +5B,+/-12V Dist.	30140-60113	1
6-5	" " Mod. Set C, +/-12V	30140-60114	1
	" " +5B, Aux. In	30140-60115	1
6-5	" " Mod,Set D,Control/Mon.	30140-60116	1
	" " Zero Volt, Interbay	30140-60117	1
6-9	" " 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
6-2	" " Mod. B, +5B	30140-60122	1
6-5	" " Mod,Set C,Control/Mon.	30140-60123	1
	" " CPU/+5 Distribution	30140-60124	1
	" " DCU/DATA Comm	30140-60100	1
6-2	" " Mod,Set B,Control/Mon.	30140-60125	1
	" " Zero Volt/PDM	30140-60126	1
6-3	" " A.C. Unit,Control/Mon.	30140-60127	1
6-4	" " Mod,Set A,Control/Mon.	30140-60128	1
	" " High Voltage Aux. I/O	30140-60129	1

Table 8-3. Replaceable Parts Sorted Alphabetically 64B/68B (Con't.)

INDEX NO	DESCRIPTION	HP PART NO	QTY
6-3	Cover A.C. Unit	30140-00107	1
	Cover Terminal Block	30140-00112	1
6-7	Cover Ferro Transformer	30140-00113	1
	Duct - Cable CPU	30140-00115	1
	Duct - Cable I/O	30140-00116	1
6-7	Ferro Resonant Transformer	9100-4308	1
6-3	Fuse 3A 250V Slo-Blo	2110-0029	3
6-3	Fuse 1A 250V Slo-Blo	2110-0007	1
6-4,1,5	Fuse .5A 250V Fast-Blo	2110-0012	5
6-2	Fuse 10A 600V Fast-Blo	2110-0575	1
6-2	Fuse 1A 250V Fast-Blo	2110-0001	1
6-2	Fuse 30A 32V	3150572-ITT	1
6-2	Fuse 20A 32V	2110-0649	2
6-2	P.S 5V	0950-1654	1
6-4	P.S. -5.2V	0950-1655	1
6-5	P.S. -2,+/-12V	0950-1656	1
	P.S. Shelf Top CPU	30140-00104	1
	Plate Ass'y - DCU, Key Sw.	30140-00110	1
	Plate Battery Mtg.	30140-00106	1
	Plate Terminal Block Mtg.	30140-00111	1
	Plenum Bottom CPU	30140-00109	1
	Shelf P.S. Bottom CPU	30140-00117	1
	Shelf P.S. I/O	30140-00118	1
	Slide Chassis	7200-1727	1
	Support Junction Panel	30140-00114	1

REPLACEABLE PARTS CATALOG SORTED ALPHABETICALLY

Table 8-4. Replaceable Parts Sorted Alphabetically

INDEX NO	DESCRIPTION	HP PART NO	QTY
3-8	24V Battery 5AH	1420-0286	1
4-1	2619A Printer IMB Intf	26069-60001	1
4-6	ATP Junction Panel	30140-00022	2
4-1	ATP-AIB	30145-60001	1
4-1	ATP-SIB	30144-60001	1
4-5	Air Filter -I/O Plennum	3150-0390	1
4-3	Air Filter 9X29	3150-0389	2
3-8	Battery Module	30140-60027**	1
4-2	CAC PCA	30140-60009	1
4-2	CBI PCA	30140-60011	3
4-2	CIR PCA	30140-60003	1
4-2	CLTB PCA	30140-60008	1
4-2	CMA PCA	30140-60010	1
4-2	CPU BACK PLANE PCA	30140-60018	1
4-2	CPU Back Plane	30140-60018	1
1-8	CPU Bay	Ref	1
4-2	CPU Card Cage - 32 Slot	7101-0582	1
4-2	CPU FRONT PLANE PCAs:		
	1. top	30140-60053	1
	2. bottom	30140-60054	1
	CTLA PCA	30140-60007	
4-2	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
5-2	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	1
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	8120-3446	2
5-5	Cable - Modem Jumper	30140-60081	1
5-5	Cable RS-232 Console/Junc	02640-60131	1
5-4	Cable SSDP/CIR	30140-60052	1
5-4	Cable SSDP/PSC	30140-60051	1
4-4	Circuit Bkr 20A 3P	3105-0137**	1
4-4	Circuit Bkr 40A 3P	3105-0138**	1
1-12	Cover Top CPU Bay	4040-1791	1
1-11	Cover Top I/O Bay	4040-1792	1
3-11	Diode - 35V/60V	1901-0727	1
4-2	DCU PCA	30140-60001	1
4-6	Direct Connect Mother BD	30145-60003	1
5-5	External Data Cables	REF	

** HP 32460A ONLY

Table 8-4. Replaceable Parts Sorted Alphabetically (Con't.)

INDEX NO	DESCRIPTION	HP PART NO	QTY
1-9	FCA PSC/SSDP	30140-60051	1
1-9	FCA CIR/SSDP	30140-60052	1
1-4	Fan-T BAX 6" DIA(I/O BAY)	3160-0362	2
1-8	Fan-T BAX 6.0"(CPU BAY)	3160-0362	7
4-4	Fuse (Fan)	2110-0010**	1
4-1	GIC PCA	31262-60001	2
1-1	HP 3000/64 Main Frame	30140A	1
3-3	I/O Back Plane	30140-60021	1
1-4	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
4-4	Key Switch, Remote/Maint	1390-0482	1
4-2	MCS PCA	30140-60013	1
4-2	MMA PCA	30140-60014	1-8
4-2	MMC PCA	30140-60012	1
3-1	Memory Back Plane	30140-60020	1
4-6	Modem Mini Board	30146-60001	1
3-11	PSC	30140-60017**	1
2-6	Panel Front Center	30140-0042	2
2-7	Panel Front Left	30140-0039	1
2-5	Panel Front Right	30140-0036	1
2-2	Panel Left Rear	30140-00050	1
2-13	Panel Left Side	30140-00045	1
2-3	Panel Rear Cable Exit	30140-00052	1
2-1	Panel Right Rear	30140-00047	
2-10	Panel Right Side	30140-00068	1

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Table 8-4. Replaceable Parts Sorted Alphabetically (con't.)

INDEX NO	DESCRIPTION	HP PART NO	QTY
3-9	Power Dist PCA	30140-60025**	1
3-10	Power Dist PCA	30140-60024**	1
3-6	Power Supply (PS2,3,6,7)	62971-69001**	4
3-7	Power Supply (PS5)	62970-69001**	1
3-9	Power Supply (PS4)	63902-69001**	1
3-10	Power Supply (PS1)	63901-69001**	1
5-2	RALU PCA	30140-60002	4
5-2	RAM Chip - Stressed	1818-3006	
5-6	RS232 Modem Mother Bd	30145-60002	1
5-6	RS2332C Mini Board	30148-60001	1
5-6	RS422 Mini Board	30147-60001	1
5-2	SKSP PCA	30140-60005	1
5-9	System Display Panel Assy	30140-60070**	1
5-2	VBUS PCA	30140-60004	1
5-8	Wiring Duct - Junct Pnl	30140-00098	4
5-2	WCS PCA	30140-60026	2
6-9	PDM	30140-60091	1

** HP 32460A ONLY

DIAGRAMS

SECTION IX

The diagrams contained in this section have been prepared from factory drawings to assist the CE in troubleshooting the system. The Series 64/68 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.

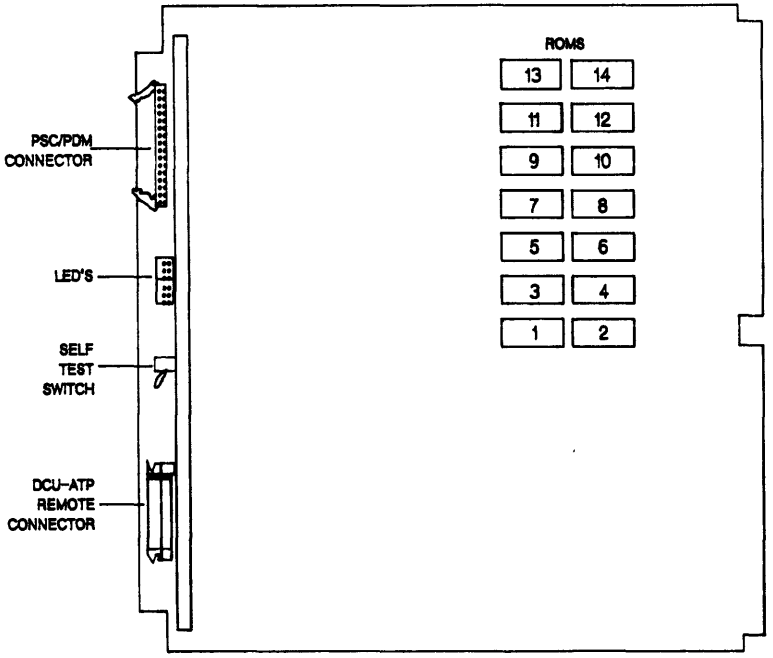


Figure 9-1. DCU Layout

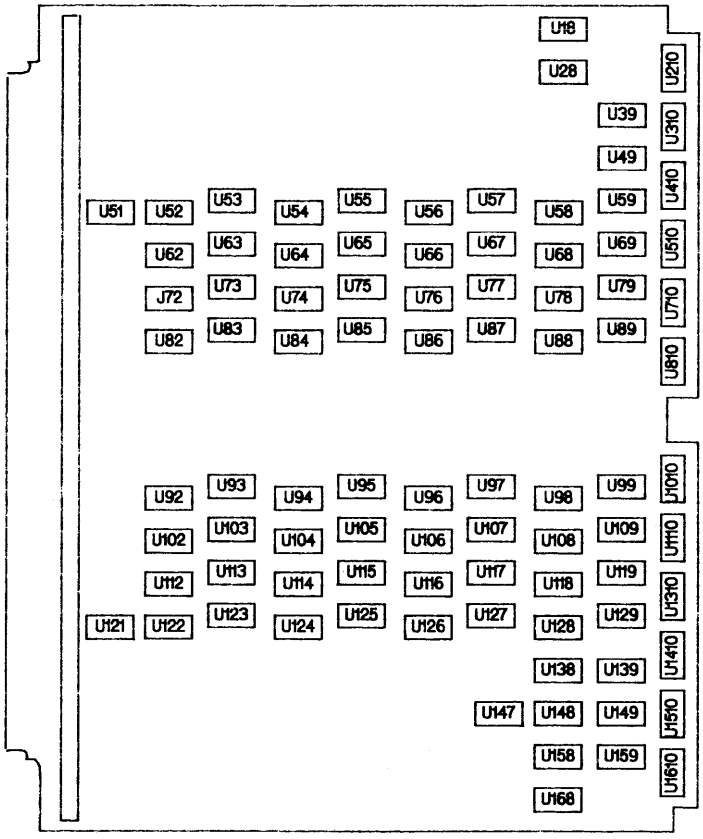


Figure 9-2. WCS Layout

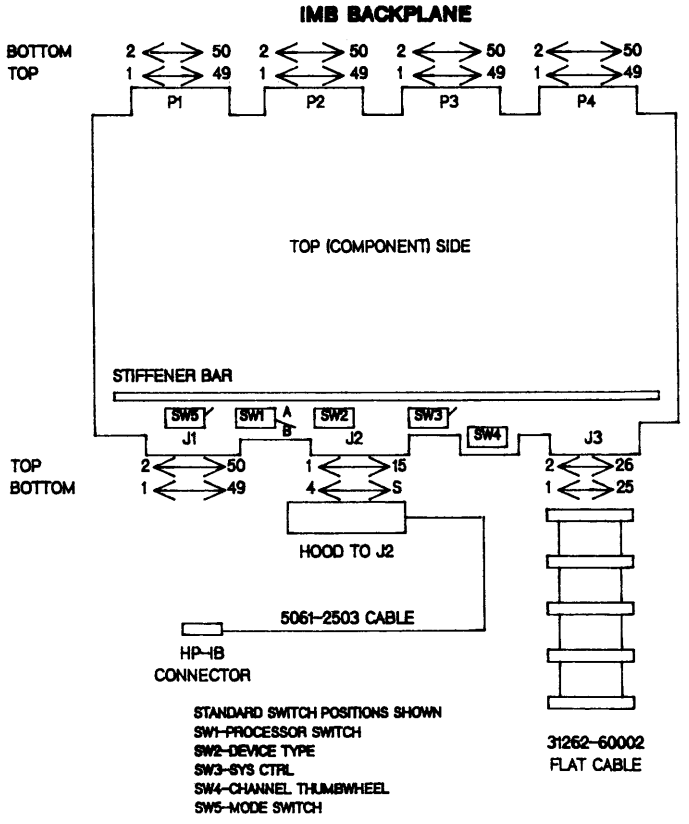


Figure 9-3. GIC Layout

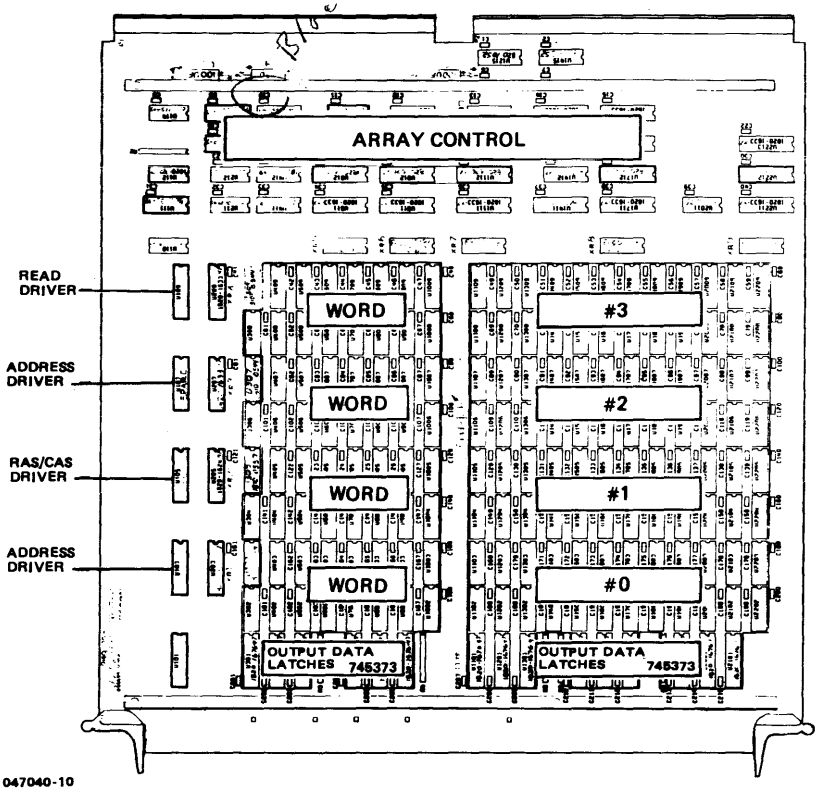


Figure 9-4. Memory Array Layout

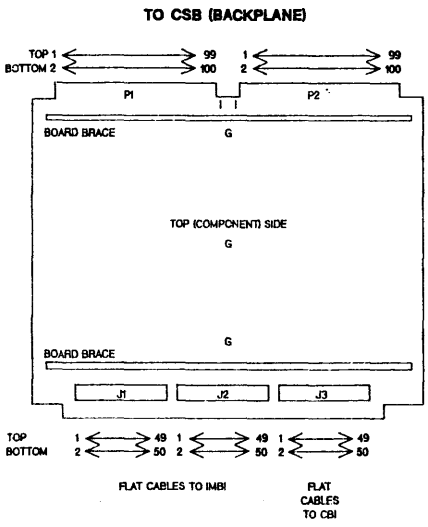


Figure 9-5. IOB PCA Layout

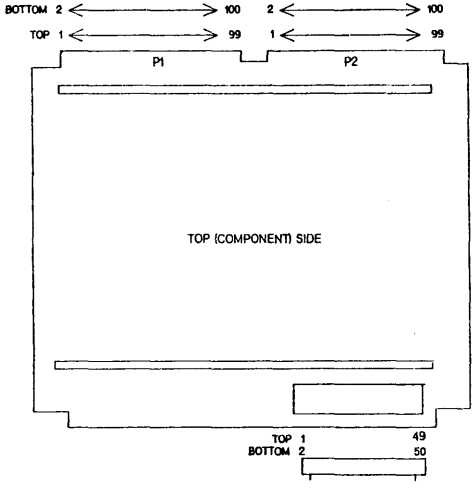
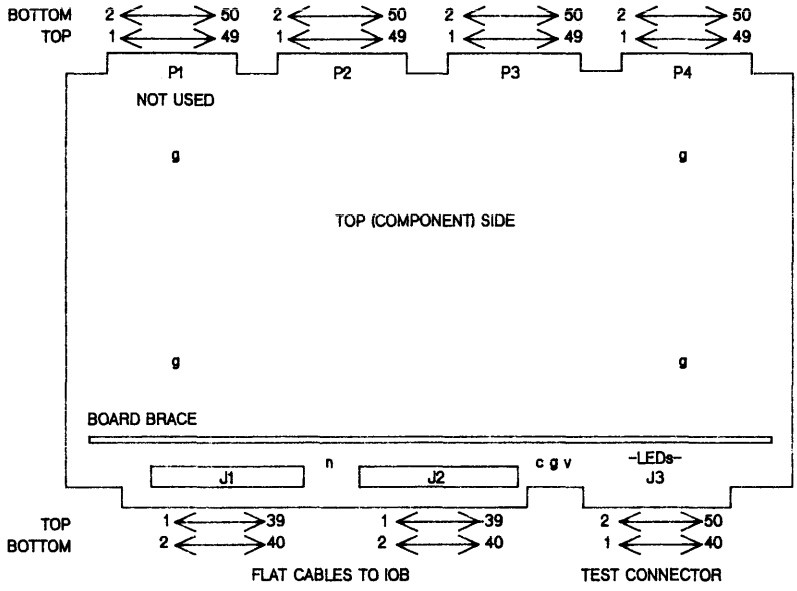


Figure 9-6. CBI PCA Layout

IMB BACKPLANE



Test Points

c = Clock: High during first half of state time (rising edge triggers state changes). 50% duty c ycle, 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

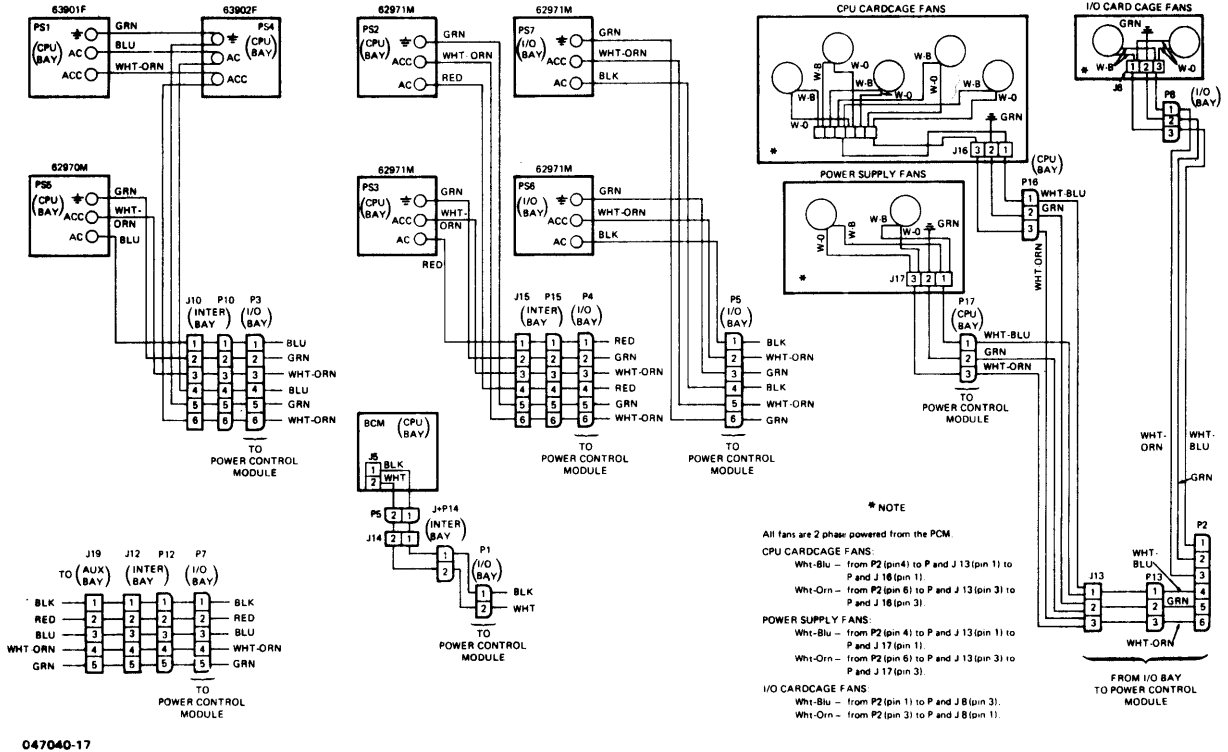
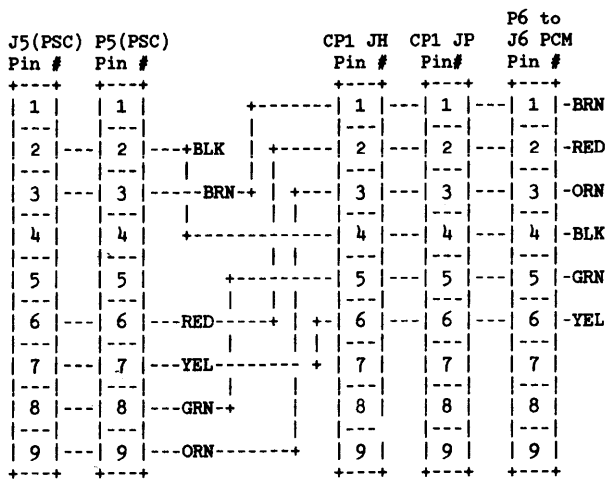


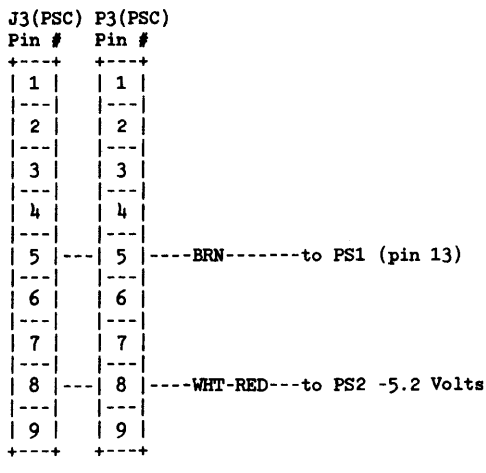
Figure 9-8 . AC Wiring (32460A)

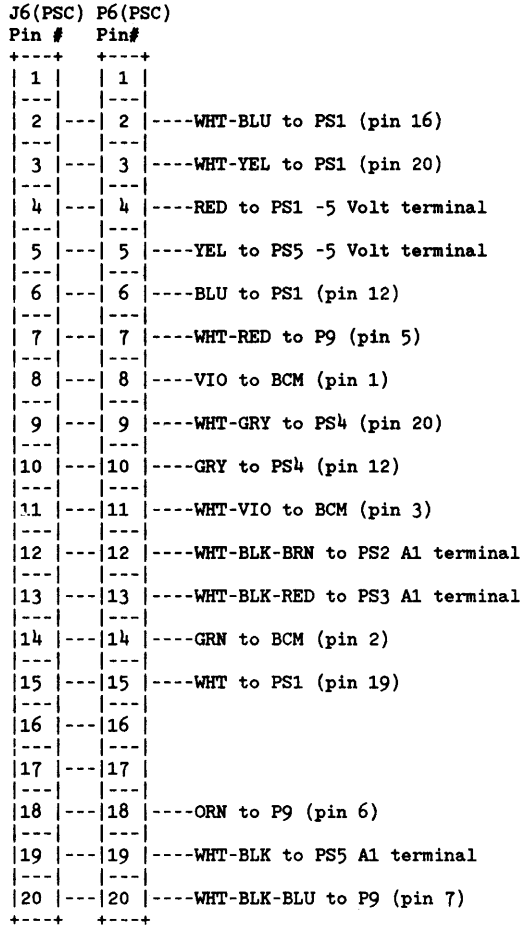
POWER SYSTEM CONTROL WIRING LIST (HP 32460A)

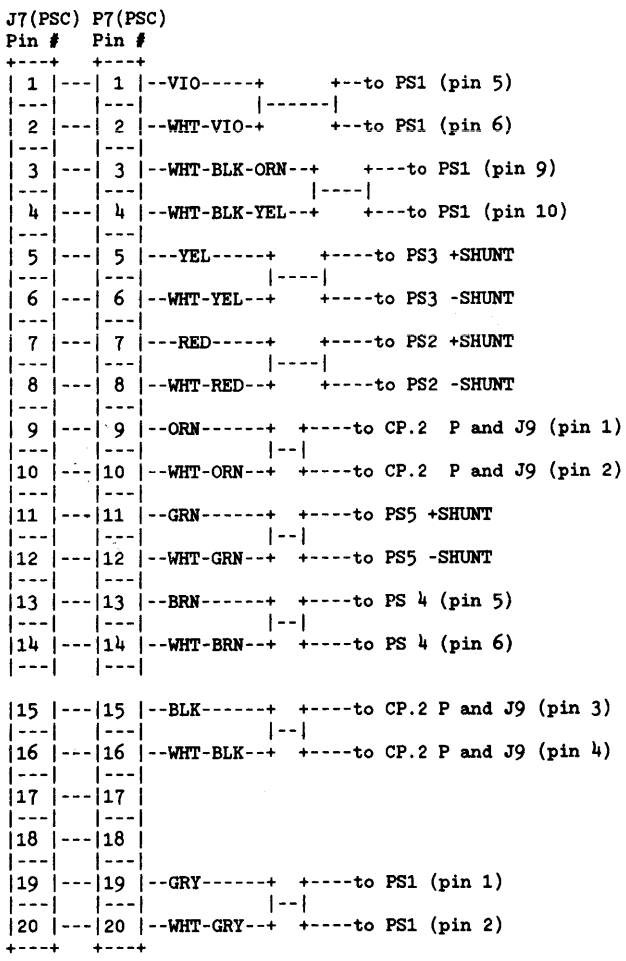
CP1 and CP2 are interbay connector panels.

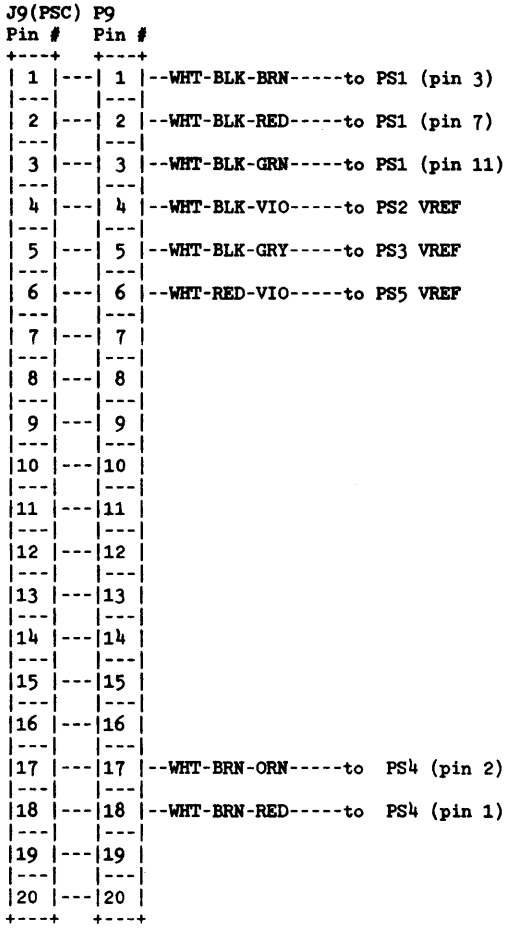
Terminal A1 on power supplies is SHUTDOWN.

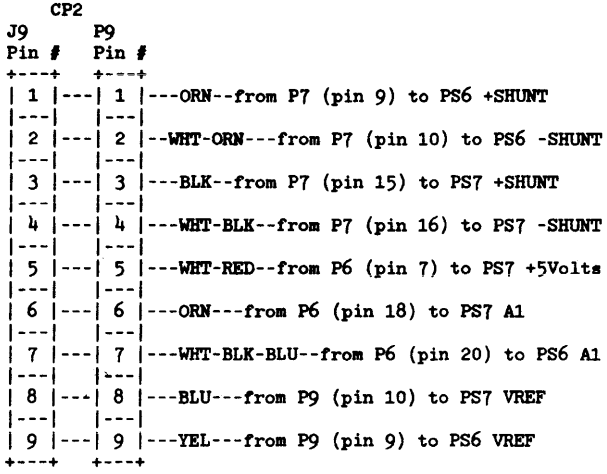





J6(PSC) Pin #
P6(PSC) Pin#
1 1
2 2 ----WHT-BLU to PS1 (pin 16)
3 3 ----WHT-YEL to PS1 (pin 20)
4 4 ----RED to PS1 -5 Volt terminal
5 5 ----YEL to PS5 -5 Volt terminal
6 6 ----BLU to PS1 (pin 12)
7 7 ----WHT-RED to P9 (pin 5)
8 8 ----VIO to BCM (pin 1)
9 9 ----WHT-GRY to PS4 (pin 20)
10 10 ----GRY to 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)

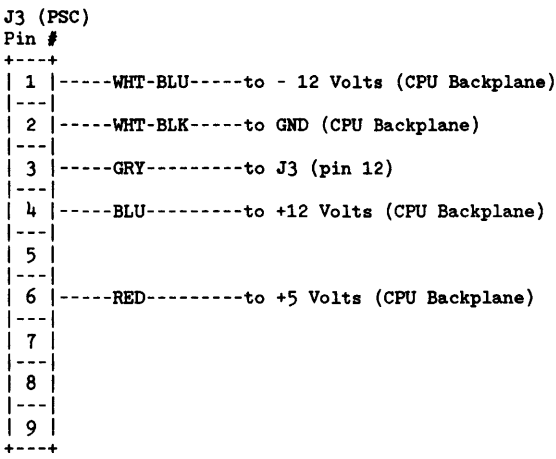

J7(PSC) P7(PSC)
Pin # Pin #
1 1 --VIO-----+ +--to PS1 (pin 5)
2 2 --WHT-VIO-+ +--to PS1 (pin 6)
3 3 --WHT-BLK-ORN--+ +---to PS1 (pin 9)
4 4 --WHT-BLK-YEL--+ +---to PS1 (pin 10)
5 5 ---YEL-----+ +----to PS3 +SHUNT
6 6 --WHT-YEL--+ +----to PS3 -SHUNT
7 7 ---RED-----+ +----to PS2 +SHUNT
8 8 --WHT-RED--+ +----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)

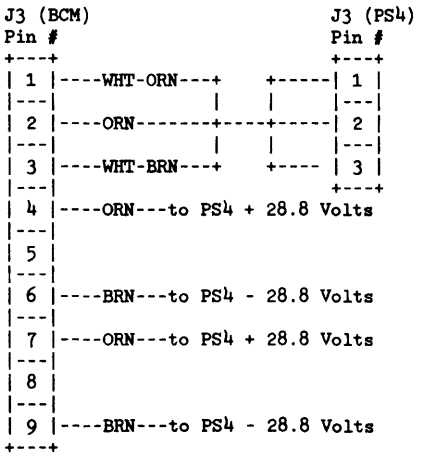

J9(PSC) P9
Pin # Pin #
1 1 --WHT-BLK-BRN-----to PS1 (pin 3)
2 2 --WHT-BLK-RED-----to PS1 (pin 7)
3 3 --WHT-BLK-GRN-----to PS1 (pin 11)
4 4 --WHT-BLK-VIO-----to PS2 VREF
5 5 --WHT-BLK-GRY-----to PS3 VREF
6 6 --WHT-RED-VIO-----to PS5 VREF
7 7
8 8
9 9
10 10
11 11
12 12
13 13
14 14
15 15
16 16
17 17 --WHT-BRN-ORN-----to PS4 (pin 2)
18 18 --WHT-BRN-RED-----to PS4 (pin 1)
19 19
20 20

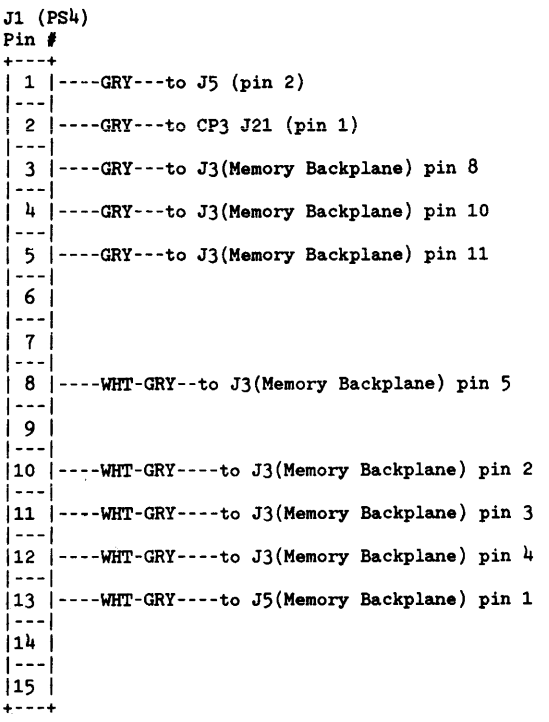

CP2
J9 Pin #
P9 Pin #
1 1 ---ORN--from P7 (pin 9) to PS6 +SHUNT
2 2 --WHT-ORN---from P7 (pin 10) to PS6 -SHUNT
3 3 ---BLK--from P7 (pin 15) to PS7 +SHUNT
4 4 ---WHT-BLK--from P7 (pin 16) to PS7 -SHUNT
5 5 ---WHT-RED--from P6 (pin 7) to PS7 +5Volts
6 6 ---ORN---from P6 (pin 18) to PS7 A1
7 7 ---WHT-BLK-BLU--from 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

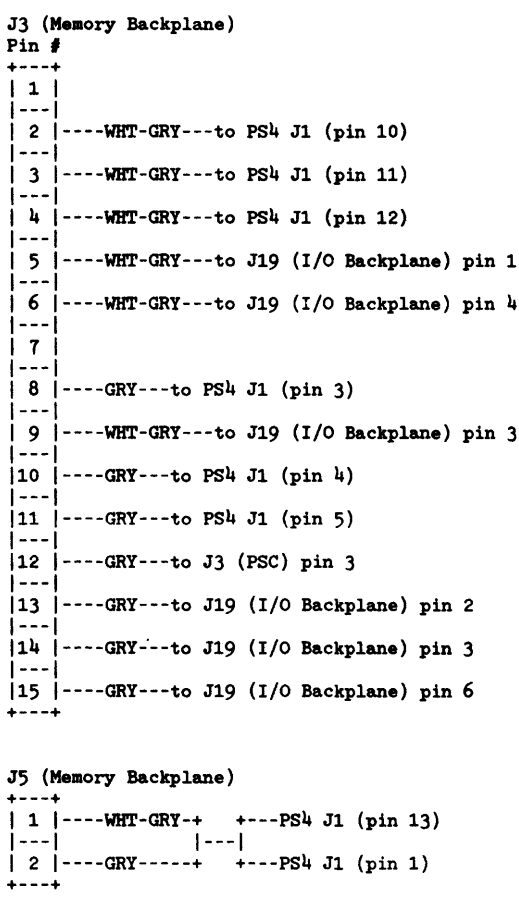
CPU/IO BACKPLANE WIRING LIST (HP 32460A)

The following pages provide wiring lists for the CPU and I/O backplane (32460A).

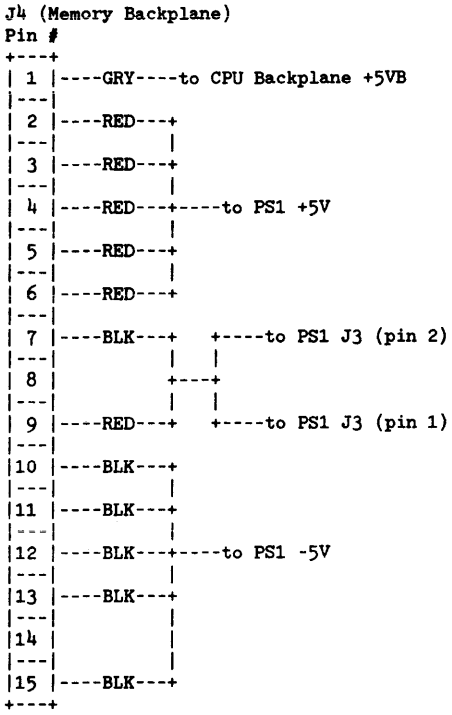


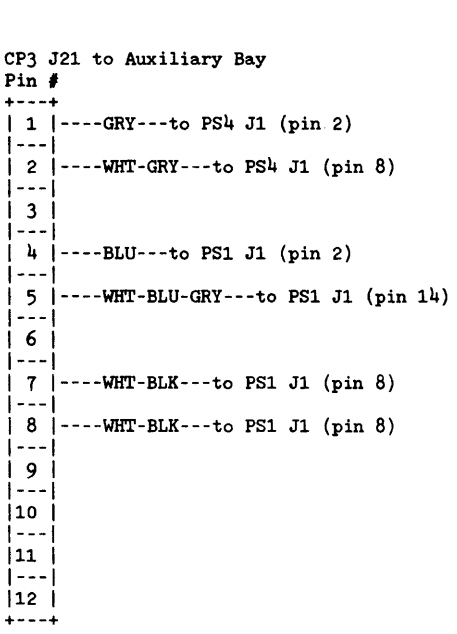



J1 (PS4)
Pin #
1 ----GRY---to J5 (pin 2)
2 ----GRY---to CP3 J21 (pin 1)
3 ----GRY---to J3(Memory Backplane) pin 8
4 ----GRY---to J3(Memory Backplane) pin 10
5 ----GRY---to J3(Memory Backplane) pin 11
6
7
8 ----WHT-GRY--to J3(Memory Backplane) pin 5
9
10 ----WHT-GRY----to J3(Memory Backplane) pin 2
11 ----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

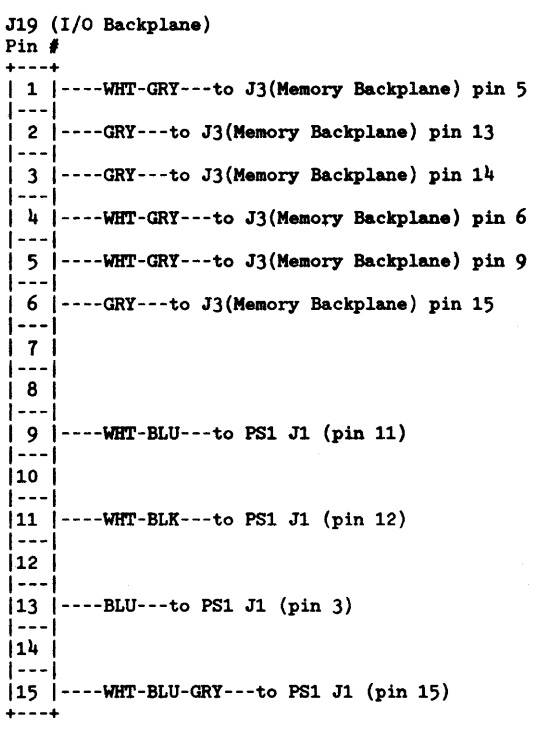

J3 (Memory Backplane)
Pin #
1
2 ----WHT-GRY---to PS4 J1 (pin 10)
3 ----WHT-GRY---to PS4 J1 (pin 11)
4 ----WHT-GRY---to PS4 J1 (pin 12)
5 ----WHT-GRY---to J19 (I/O Backplane) pin 1
6 ----WHT-GRY---to J19 (I/O Backplane) pin 4
7
8 ----GRY---to PS4 J1 (pin 3)
9 ----WHT-GRY---to J19 (I/O Backplane) pin 3
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

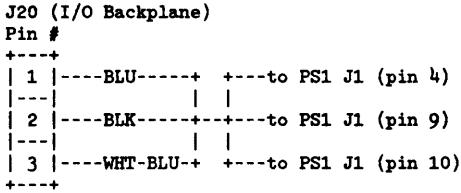
J5 (Memory Backplane)
1 ----WHT-GRY-+ +---PS4 J1 (pin 13)
2 ----GRY-----+ +---PS4 J1 (pin 1)


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

PDM CONNECTOR PIN ALLOCATION (HP 32460B/32468B)

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	31-MREQ
2- SG	32-SG
3- A00	33-IOREQ
4- A01	34-RD
5- A02	35-WR
6- A03	36-RESET
7- A04	37-SG
8- SG	38-NMI
9- A05	39-TMRINT
10-A06	40-ROMDISAB
11-A07	41-PSCENAB
12-A08	42-SG
13-A09	43-DBUSENAB
14-SG	44-PON
15-A10	45-PRW
16-A11	46-COUR/H
17-A12	47-SG
18-A13	48-
19-A14	49-SG
20-SG	50-SG
21-A15	
22-D0	
23-D1	
24-D2	
25-D3	
26-SG	
27-D4	
28-D5	
29-D6	
30-D7	

J2 PIN ALLOCATION

1- R LED
2- A LED
3- OVERTEMPERATURE LED
4- C LED
4- D LED
5- E LED
6- F LED
7- G LED
8- H 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-+5 IO
19-BATTERY VOLTAGE MONITOR
20-

J4 PIN ALLOCATION

1- LOW OVERTEMPERATURE SWITCH
2- HIGH OVERTEMPERATURE SWITCH
3- RFA
4- ROT
5- FAN FAIL
6- PFA
7- BC SWITCH
8- BC SWITCH
9- SG

J5 PIN ALLOCATION

1- +5V
2- -5.2 V
3- +5VB
4- SG

J6 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+
14-D +5 M-
15-SG
16-SG
17-SG
18-SG
19-SG
20-

J10 PIN ALLOCATION

1 -A1 SHUTDOWN ACTUATOR
2 -A1 SHUTDOWN ACTUATOR
3 -A1 SHUTDOWN ACTUATOR
4 -B SHUTDOWN ACTUATOR
5 -C1 SHUTDOWN ACTUATOR
6 -C2 SHUTDOWN ACTUATOR
7 -CH SHUTDOWN ACTUATOR
8 -
9- DI SHUTDOWN ACTUATOR
10-D2 SHUTDOWN ACTUATOR
11-D3 SHUTDOWN ACTUATOR
12-PROTECTED +5VBB
13-E1 SHUTDOWN ACTUATOR
14-E2 SHUTDOWN ACTUATOR
15-E3 SHUTDOWN ACTUATOR
16-

J11 PIN ALLOCATION

1 -SG
2 -SG
3 -
4 -D1 +5 IO
5 -D2 +5 IO
6 -D3 +5 IO
7 -D +5V M+
8 -D +5V M-
9 -
10-A1 -5.2 IO
11-A2 -5.2 IO
12-A3 -5.2 IO
13-A +5.2 M+
14-A -5.2 M-
15-B -12V
16-C -2V
17-B +5V
18-A -5V
19-C +12V
20-C -12V
21-E +5V
22-B +12V
23-D +5V
24-SG
25-SG
26-SG
27-CH IO
28-B +5 IO
29-BATTERY CURRENT
30-C1 -2
31-C1 +12 IO
32-C1 -12 IO
33-C2 -2 IO
34-C2 +12 IO
35-C2 -12 IO
36-
37-C -2 M+
38-C -2 M-
39-C +12 M+
40-C -12 M-
41-C -12 M+
42-C -12 M-
43-
44-E1 +5V IO
45-E2 +5V IO
46-E3 +5VIO
47-E +5V M+
48-E +5V M-
49-
50- BATTERY VOLTAGE SENSE

J12 PIN ALLOCATION

1 - -12B
2 - SG
3- +12B

J13 PIN ALLOCATION

1 - +12S
2 - SG
3 - SG
4 - -12S

J14 PIN ALLOCATION

1,2,3,4,5,6 +5VB

J15 PIN ALLOCATION

1,2,3	+ 5VB
4,7	+12
6,9	-12
8	+5V (E IO,AUX IO)

J16 PIN ALLOCATION

1 - SG
2 - SG
3 - SG

J17 PIN ALLOCATION

1 - +12B
2 - -12B
3 - +5V
4 - -5.2V
5 - -2V

J18 PIN ALLOCATION

1,4,7,10	+12V
2,5,8,11,	SG
3,6,9,12	-12V

J19 PIN ALLOCATION

1,2,3	+5VB
4,7	+12
6,9	-12
8	+5 (E IO,AUX I/O)
5	SG

This section contains reference data to aid in troubleshooting the Series 64/68.

ASCII Code Chart

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.

The following examples describe several ways of using the table:

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 (dec), 044 (oct), 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 (oct) in the character code column, look right to the ASCII graphic column and note that $ converted to EBCDIC is 133 (oct) which equals 5B (hex).

Table 10-1. ASCII Code Table

CHAR CODE			ASCII			EBCDIC	
Dec	Oct	Hex	Cntl/ Gph	to EBCDIC (Oct)	Hollerith	Cntl/ Gph	to ASCII (Oct)
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	12-4-5-9	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
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	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

CHAR CODE			ASCII			EBCDIC	
Dec	Oct	Hex	Cntl/ Gph	to EBCDIC (Oct)	Hollerith	Cntl/ Gph	to ASCII (Oct)
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	11-6-8	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
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	.	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

Table 10-1. ASCII Code Table (con't.)

CHAR CODE			ASCII			EBCDIC	
Dec	Oct	Hex	Cntl/ Gph	to EBCDIC (Oct)	Hollerith	Cntl/ Gph	to ASCII (Oct)
38	046	26	&	120	12	ETB	027
39	047	27	'	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	12-6-8	CU2	213
44	054	2C	,	153	0-3-8		214
45	055	2D	-	140	11	ENQ	005
46	056	2E	.	113	12-3-8	ACK	006
47	057	2F	/	141	0-1	BEL	007
96	140	60	`	171	1-8	-	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	.	054
108	154	6C	l	223	12-11-3	%	045
109	155	6D	m	224	12-11-4	_	137
110	156	6E	n	225	12-11-5	>	076
111	157	6F	o	226	12-11-6	?	077
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	'	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
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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
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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
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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
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

CHAR CODE			ASCII			EBCDIC	
Dec	Oct	Hex	Cntl/ Gph	to EBCDIC (Oct)	Hollerith	Cntl/ Gph	to ASCII (Oct)
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		155	0-5-8	¬	136
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
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		354
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	12-0-4-8-9		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
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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
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30140-90006 April 1984

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