A-Series Computer Systems

CE Handbook

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Manual Part No. 5955-8896
E0892

Printed in U.S.A. August 1992
Fourth Edition

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Printing History

The Printing History below identifies the edition of this manual and any updates that are included. Periodically, update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this printing history page. Also, the update may contain write-in instructions.

Each reprinting of this manual will incorporate all past updates; however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with its user-inserted update information. New editions of this manual will contain new information, as well as all updates.

First Edition . . . . . Jan 1984 . . . . . .
Second Edition . . . . . Jul 1985 . . . . . .
Third Edition . . . . . Jan 1987 . . . . . .
Fourth Edition . . . . . Aug 1992 . . . . . .

Preface

The purpose of this handbook is to provide the Hewlett-Packard Customer Engineer with a reference for on-site service of the A-Series Computer Systems. This handbook contains information for installation, configuration, performance verification and calibration, and troubleshooting of the system.

Changes since the last edition:

In an effort to keep the size of this document to one volume, obsolete information was deleted. If you still have a need for this information, retain the pages from the previous edition of your CE Handbook. The following has been deleted for this edition:

- AUTO file listing, revisions prior to rev. 5000
- Loading diagnostics from mini-cartridge tape
- Primary System configuration and loading the Primary System, revisions prior to rev. 5000
- Diagnostic media information for 5 1/4-inch and 8-inch floppies, SIF format, and 264x mini-cartridge tape

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Chapter 1
Product Information

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Product Information

Board Computers, Box Computers, and System Processor Units

Product Number Summary by Processor Family

Table 1-1 contains a listing of HP product numbers by processor family number. This list includes current and discontinued products. The date shown in parentheses after the processor family number indicates the year in which the product first shipped. Discontinued products are indicated with an asterisk (*) after the product number (for example, 2484A*).

Table 1-1. HP Product Number Summary by Processor Family [1]

Processor (CPU) Family	Level of Integration	Hewlett-Packard Product Number				
		Computer on a Card(s)	6-slot Card Cage (Cooler Package)	16-slot Card cage [2] (Micro/1000 Package)	20-slot Card Cage (20-slot Box Package)	20-slot Card Cage (Cabinet Package)
A400 (1986)	Board Computer [3]	12100A				
	Box Computer [4]		2424A (Micro 14)	2434A (Micro 24)	2134A (Model 24)	
	System Processor Unit [5] (SPU)			2484A*/B (Micro 24)		
A600+ (1982)	Board Computer [6]	2106AK*/BK*/CK/DK				
	Box Computer [4]		2426E*/F*/G/H (Micro 16)	2436A*/E*/G/H (Micro 26)	2156A*/B*/C/D (Model 26)	
	System Processor Unit [5] (SPU)			2486A*/B/C (Micro 26)		2196A*/B*/C*/D*/G/H (Model 26)
A700* (1982)	Board Computer [6]	2107AK*				
	Box Computer [7]			2437A*/B* (Micro 27)	2137A*/B* (Model 27)	
	System Processor Unit [5] (SPU)			2487A*/B* (Micro 27)	2197E* (Model 27)	2197A*/B*C*/D* (Model 27)
A900 (1982)	Box Computer [8]			2439A*/B (Micro 29)	2139A*/B (Model 29)	
	System Processor Unit [5] (SPU)			2489A*/B (Micro 29)		2199A*/B*/C*/D*/E (Model 29)
A990 (1991)	Board Computer [9]	12990C [10]				
	Box Computer [4]			2939A (Micro 99)	2959A (Model 99)	
	System Processor Unit [5] (SPU)			2989A (Micro 99)		2999A (Model 99)

See notes next page

Table 1-1 notes:

* Discontinued product; shown for reference only.

1. Data applies to currently available products only (except A700 processor family of products).

2. Includes one dedicated slot each for battery backup and 25 kHz power accessory cards. Two adjacent slots, in addition to the dedicated battery backup slot, are consumed if this accessory is used.

3. Board Computer: Single card computer includes processor and memory plus breakout panel containing four serial I/O ports.

4. Box Computer: Board Computer (same processor family) in a box card cage with dc power supply.

5. System Processor Unit: Box Computer (same processor family) plus HP-IB card (to system disk), RTE-A with VC+ and diagnostics.

6. Board Computer: CPU card and memory controller card (with memory).

7. Box Computer: Upper and lower CPU cards, memory controller card (without memory), and floating point processor card. All cards in a box card cage with dc power supply.

8. Box Computer: Floating point processor includes sequencer, data path, and cache control cards plus memory controller card (without memory). All cards in a box card cage with dc power supply.

9. Board Computer: Single card CPU includes writable control store, two level cache, floating point processor, and memory controller (without memory).

10. Upgrade Board: From A400, A600+, A700, or A900 processor configuration to equivalent A990 processor configuration. Plug compatible with these other processor family cards.

Backplane Slot Requirements by Processor Family

Table 1-2 contains a listing, by processor family number, of the number of backplane slots required for each of the most common cards used with each processor family.

NOTE

The sum total of all system and/or accessory cards listed per package type in table 1-2 cannot always be accommodated by the package type indicated. This limitation becomes more severe when considering I/O card slot requirements. Therefore, consult the *HP 1000 A-Series Computer Systems . . . Ordering Guide* (part no. 5952-1745D or prior edition part no.) when configuring a computer or system.

Table 1-2. Backplane Slot Requirements by Processor Family (Sheet 1 of 2) [1]

Processor (CPU) Family	Level of integration	Package Type	Total Number of Slots per Package	Number of Backplane Slots Required For:									
				Mandatory Cards			System Cards		Accessory Cards				
				Processor	Memory Controller	Minimum Memory	HP-IB Disk I/F	System Console I/F	Battery Backup	25 kHz Power Supply	Writable Control Store	PROM Stg. Module	Max. Memory Array [2]
A400	Board	Card	0	1	(Note 3)	(Note 3)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Box	Cooler	6	1	(Note 3)	(Note 3)	n/a	n/a	n/s	n/s	n/s	1	4
	Box	Micro/1000	16	1	(Note 3)	(Note 3)	n/a	n/a	3 [4,7]	1 [7]	n/s	1	4
	Box	20-slot box	20	1	(Note 3)	(Note 3)	n/a	n/a	(Note 5)	(Note 5)	n/s	1	4
	System	Micro/1000	16	1	(Note 3)	(Note 3)	1	1	3 [4,7]	1 [7]	n/s	1	4
A600+	Board	Card	0	1	1	(Note 6)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Box	Cooler [8]	6	1	1	(Note 6)	n/a	n/a	n/s	n/s	n/s	1	4
	Box	Micro/1000	16	1	1	(Note 6)	n/a	n/a	3 [4,7]	1 [7]	n/s	1	4
	Box	20-slot box	20	1	1	(Note 6)	n/a	n/a	(Note 5)	(Note 5)	n/s	1	4
	System	Micro/1000	16	1	1	(Note 6)	1	1	3 [4,7]	1 [7]	n/s	1	4
	System	Cabinet	20	1	1	(Note 6)	1	1	(Note 5)	(Note 5)	n/s	1	4

Notes:
n/a = not applicable; n/s = not supported.

1. Data applies to currently available products only (except A700 processor family) and excludes I/O requirements.
2. Maximum number of memory array slots are shown *after* accounting for the number of mandatory cards and dedicated slots/slot sequence requirements. Consideration has *not* been given to slot and power requirements for accessory and system cards (shown in this table) or I/O cards.
3. Processor card includes memory controller with minimum (base) memory; see table 1-3.
4. Battery backup requires one slot but extends into the two adjacent slots above in Micro/1000 packages.
5. Battery backup and 25 kHz power are housed in main dc power supply in 20-slot boxes and cabinets.
6. Memory controller card contains minimum (base) memory; see table 1-3.
7. Requires dedicated slot.
8. The sum total of all mandatory and accessory cards shown for this package type cannot be accommodated due to insufficient slot capacity.

Table 1-2. Backplane Slot Requirements by Processor Family (Sheet 2 of 2) [1]

Processor (CPU) Family	Level of Integration	Package Type	Total Number of Slots per Package	Number of Backlane Slots Required For:									
				Mandatory Cards			System Cards		Accessory Cards				
				Processor	Memory Controller	Minimum Memory	HP-IB Disk I/F	System Console I/F	Battery Back-up	25 kHz Power Supply	Writable Control Store	PROM Stg. Module	Max. Memory Array [2]
A700*	Box	Micro/1000	16	3	1	1	n/a	n/a	3 [4,7]	1 [7]	1	1	3
	Box	20-slot box	20	3	1	1	n/a	n/a	(Note 5)	(Note 5)	1	1	4
	System	Micro/1000	16	3	1	1	1	1	3 [4,7]	1 [7]	1	1	3
	System	20-slot box	20	3	1	1	1	1	(Note 5)	(Note 5)	1	1	4
	System	Cabinet	20	3	1	1	1	1	(Note 5)	(Note 5)	1	1	4
A900	Box	Micro/1000	16	3 [7]	1 [7]	1	n/a	n/a	3 [4,7]	1 [7]	1	1	2
	Box	20-slot box	20	3 [7]	1 [7]	1	n/a	n/a	(Note 5)	(Note 5)	1	1	8
	System	Micro/1000	16	3 [7]	1 [7]	1	1	1	3 [4,7]	1 [7]	1	1	2
	System	Cabinet	20	3 [7]	1 [7]	1	1	1	(Note 5)	(Note 5)	1	1	8
A990	Board	Upgrade Card	0	1	(Note 9)	1	n/a	n/a	n/a	n/a	(Note 10)	n/a	n/a
	Box	Micro/1000	16	1	(Note 9)	1	n/a	n/a	3 [4,7]	1 [7]	(Note 10)	1	4
	Box	20-slot box	20	1	(Note 9)	1	n/a	n/a	(Note 5)	(Note 5)	(Note 10)	1	4
	System	Micro/1000	16	1	(Note 9)	1	1	1	3 [4,7]	1 [7]	(Note 10)	1	4
	System	Cabinet	20	1	(Note 9)	1	1	1	(Note 5)	(Note 5)	(Note 10)	1	4

Notes:

* Discontinued product; shown for reference only. n/a = not applicable.

1. Data applies to currently available products only (except A700 processor family) and excludes I/O requirements.
2. Maximum number of memory array slots are shown *after* accounting for the number of mandatory card and dedicated slots/slot sequence requirements. Consideration has *not* been given to slot and power requirements for accessory and system cards (shown in this table) or I/O cards.
4. Battery backup requires one slot but extends into two adjacent slots above in Micro/1000 packages.
5. Battery backup and 25 kHz power are housed in main dc power supply in 20-slot boxes and cabinets.
7. Requires dedicated slot.
9. Processor card includes memory controller without minimum (base) memory.
10. Processor card includes writable control store.

Maximum Main Memory by Processor Family

Table 1-3 contains a listing of maximum main memory capacity by processor family number. The data has been taken from the most recent *HP 1000 A-Series Computer Systems . . . .Ordering Guide* (part no. 5952-1745D or prior edition part no.) in which the product number appears. Discontinued products are indicated with an asterisk (*) after the processor family number (for example, A700*).

NOTE

Maximum main memory values in table 1-3 are shown without regard for the slot and power requirements for system and accessory cards (shown in table 1-2), and I/O cards , consult the *HP 1000 A-Series Computer Systems . . . Ordering Guide*. (part no. 5952-1745D or prior edition part no.) when configurating a computer or system for maximum main memory.

Table 1-3. Maximum Main Memory by Processor Family [1]

Processor (CPU) Family	Card Cage Size	Maximum Available Memory Array Slots [2]	Size of Base Memory . . . + . . . Maximum Size of Memory Array Cards . . . = . . . Maximum Main Memory Capacity [2]										
			ECC		Parity		ECC			Parity			
			256 kbit RAMs (MB)	1 Mbit RAMs (MB)	64 kbit RAMs (MB)	1 Mbit RAMs (MB)	64 kbit RAMs (MB)	256 kbit RAMs (MB)	1 Mbit RAMs (MB)	64 kbit RAMs (MB)	1 Mbit RAMs (MB)	ECC (MB)	Parity (MB)
A400	6-slot 16-slot 20-slot	4			0.5					1 [6]	8 [3]	– –	32 [4]
A600+	6-slot 16-slot 20-slot	4		1 [5]	0.5			2 [5,6,7]		1 [6,7]	8 [3,7]	8	32 [4]
A700*	16-slot 20-slot	3 [8] 4					0.5 [6] 0.5 [6]	2 [6] 2 [6]		1 [6] 1 [6]	8 [3] 8 [3]	6 8	24 32
A900	16-slot 20-slot	2 [9] 4					0.75 [10] 0.75 [10]	3 [10] 3	8 8			16 32 [4]	– –
A990	16-slot 20-slot	4 [11] 4					0.75 0.75	3 [10] 3	8 8			32 [4] 32 [4]	– –

See notes next page

Table 1-3 notes:

* Discontinued product; shown for reference only.

1. Data applies to currently available products only (except A700 processor family of products).

2. Maximum values are shown *without* regard for system, I/O, and accessory card slot and power requirements.

3. HP 12103K/L/M array cards must be installed on a 512k-multiple boundary.

4. 32 MB is maximum *addressable* memory.

5. HP 12110A*/B controller card (with 0.5 KB*/1 MB ECC memory) is required to support ECC array cards in the A600+ processor family.

6. Each of the array cards listed below, must be added to the backplane in a sequence that will satisfy the equation:

   [Size of the existing, installed controller and/or array card(s)]
   divided by
   [Size of the array card to be added]
   equals a whole integer.

   Applicable cards: HP 12103A*/B*/C/D, 12104A*, and 12111A*/B/C.

7. A 64 kbit and 1 Mbit parity card(s) can be mixed with a 256 kbit ECC card(s) in the A600+ processor family. The 256 kbit card(s), however, must be installed between the CPU card and 64 kbit card(s).

8. Maximum of three memory slots are available since the controller and array cards must be installed adjacent to one another in the right-hand half of the 16-slot card cage.

9. Maximum of two memory slots are available since array cards must be installed in the right-hand half of the 16-slot card cage, adjacent to the controller card. The four-card processor set (which includes the controller card) requires four dedicated slots (in the right-hand half of the card cage).

10. A 3 MB array card(s) must be installed closer to the controller card than a 0.75 MB card.

11. For an A990 that has been upgraded from an A900 in a 16-slot box, the maximum available memory array slots is 2. Therefore, the maximum main memory is 16 MB.

Processing Speed by Processor Family

Table 1-4 contains a listing of selected indicators of processing speed by processor family number.

Table 1-4. Processing Speed by Processor Family[1]

Processor (CPU) Family	Fastest Base Set Inst. Speed (MIPs)	Floating Pt. Speed (B1D Whet.) (kwips)	I/O Bandwidth (MB/sec) Out	In	Memory Cycle Time (nsec)
A400	1	122	4.27	4.27	454
A600+	1	113	4.27	4.27	454
A700*	1	340	4.0	4.0	500
A900	3	821	2.5	3.7	181[2]
A990	7	1,500	2.7	4.0	122[3]

Notes:
* Discontinued product; shown for reference only.
1. Data applies to current active products only.
2. Average effective value at 88% cache hit rate.
3. Average effective value assuming 80% hit rate in the level 1 cache and a 97% hit rate in the level 2 cache.

Maximum Electrical Requirements and Availability by Product Number

Table 1-5 contains a listing of the following items by HP product number:

1. Size of base memory (MB), when included with product.
2. Whether an HP-IB card is included with product.
3. Ac current (A) and power (Watts) required from exterior line source.
4. Output current (A) and power (Watts) available from: (a) main dc power supply, and (b) 25 KHz power supply.

Table 1-5. Maximum Electrical Requirements and Availability by HP Product Number (Sheet 1 of 7)

Hewlett-Packard Product Number	Product Includes:			Input Required From:			Output Available From:							
	Base Memory		HP-IB Interface	Exterior Ac Line			Main Dc Power Supply [1]					25 KHz Power Supply		
				Oper. Current		Maximum Power (W) [2]								
	ECC (MB)	Parity (MB)		@115V (A)	@230V (A)		@+5V (A)	@+5V(M) (A) [3]	@+12V (A)	@−12V (A)	Total (W)	(W)	(A)	@ (Vrms)
12100A	– –	0.5	No	n/a	n/a	n/a	4.2 [4]	1.5 [4]	0.07 [4]	0.09 [4]	32 [4]	n/a	n/a	n/a
12990C	– –	– –	No	n/a	n/a	n/a	6.3 [4]	1.2 [4]	n/a	n/a	40 [4]	n/a	n/a	n/a
2106BK*	–	0.1	No	n/a	n/a	n/a	9.6 [4]	1.1 [4]	– –	– –	53.5 [4]	n/a	n/a	n/a
2106CK	–	0.5	No	n/a	n/a	n/a	9.6 [4]	1.1 [4]	– –	– –	53.5 [4]	n/a	n/a	n/a
2106DK	1.0	–	No	n/a	n/a	n/a	9.7 [4]	1.3 [4]	– –	– –	55.0 [4]	n/a	n/a	n/a
2107AK*	–	0.1	No	n/a	n/a	n/a	17.2 [4]	1.3 [4]	– –	– –	92.5 [4]	n/a	n/a	n/a
2134A	– –	0.5	No	6.0	3.0	700	55.8 [5]	8.3 [5]	5.5	3.4	(Note 6)	50	1.5	39
2136C*	– –	0.1	Yes	n/s	n/s	300	12.6	4.8	2.5	1.4	175	– –	– –	– –

Notes:

* Discontinued product; shown for reference only. n/a = not applicable. n/s = not specified.

1. Values are listed under this category *after* subtracting processor and base memory/HP-IB card consumption (when included with product). Values flagged with notes 5, 9, 10, 11, and 12 are exceptions.
2. Maximum power required for any combination of HP interfaces and other HP plug-ins which can be accommodated by the product number indicated. Power factor (PF) is typically 0.75 with a range of 0.7 to 0.8. Use a PF of 0.7 to 0.72 to estimate ac input requirements in Volt-Amps (VA) from Watts (W) to ensure sufficient total input power (that is, VA=W/PF). To estimate ventilation or air conditioning requirements in BTU per hour, multiply W by 3.419. To determine heat dissipation requirements in kilogram-calories per hour, multiply W by 0.8598.
3. +5V(M) is voltage available to processor, memory controller, and memory array cards.
4. Requirement from external power supply.
5. Combined current consumption at +5.1 V and +5 V(M), *including* processor and base memory/HP-IB cards, when included with product, is limited to 70 W.
6. Main power supply provides enough current for any combination of HP interfaces and other HP plug-ins which can be accommodated by the product number indicated.

Table 1-5. Maximum Electrical Requirements and Availability by HP Product Number (Sheet 2 of 7)

Hewlett-Packard Product Number	Product Includes:			Input Required From:			Output Available From:							
	Base Memory		HP-IB Interface	Exterior Ac Line			Main Dc Power Supply [1]					25 KHz Power Supply		
				Oper. Current		Maximum Power (W) [2]								
	ECC (MB)	Parity (MB)		@115V (A)	@230V (A)		@+5V (A)	@+5V(M) (A) [3]	@+12V (A)	@−12V (A)	Total (W)	(W)	(A)	@ (Vrms)
2136D*	–	0.1	No	n/s	n/s	300	13.5	4.8	3.7	1.4	175	––	––	––
2137A*	–	0.1	No	n/s	n/s	700	42.8 [5,7]	5.6 [5,7]	5.6	3.5	n/s	50 [7]	1.5 [7]	39 [7]
2137B*	–	––	No	n/s	n/s	700	39.9 [5]	9.6 [5,7]	5.6	3.5	(Note 6)	50	1.5	39
2139A*	0.8	––	No	n/s	n/s	800	41.8	7.0	5.5	3.5	n/s	n/s	n/s	n/s
2139B	–	––	No	n/s	n/s	800	42.8 [5]	9.0 [5]	5.5	3.5	(Note 6)	50	1.5	39
2156B*	–	0.1	No	n/s	n/s	700	50.4	5.9	5.6	3.5	n/s	50	2.5	27
2156C	–	0.5	No	n/s	n/s	700	50.4	8.7	5.6	3.5	(Note 6)	50	2.5	27
2156D	1.0	––	No	n/s	n/s	700	50.3	8.5	5.6	3.5	(Note 6)	50	2.5	27
2186C*	–	0.5	Yes	n/s	n/s	n/s	12.6	4.8	2.5	1.4	175	––	––	––

Notes:

* Discontinued product; shown for reference only. n/a = not applicable. n/s = not specified.

1. Values are listed under this category *after* subtracting processor and base memory/HP-IB card consumption (when included with product). Values flagged with notes 5, 9, 10, 11, and 12 are exceptions.
2. Maximum power required for any combination of HP interfaces and other HP plug-ins which can be accommodated by the product number indicated. Power factor (PF) is typically 0.75 with a range of 0.7 to 0.8. Use a PF of 0.7 to 0.72 to estimate ac input requirements in Volt-Amps (VA) from Watts (W) to ensure sufficient total input power (that is, VA=W/PF). To estimate ventilation or air conditioning requirements in BTU per hour, multiply W by 3.419. To determine heat dissipation requirements in kilogram-calories per hour, multiply W by 0.8598.
3. +5V(M) is voltage available to processor, memory controller, and memory array cards.
5. Combined current consumption at +5.1 V and +5 V(M), *including* processor and base memory/HP-IB cards, when included with product, is limited to 70 W.
6. Main power supply provides enough current for any combination of HP interfaces and other HP plug-ins which can be accommodated by the product indicated.
7. Values apply only to computers or SPUs having a serial number prefix of 2648 or greater.

Table 1-5. Maximum Electrical Requirements and Availability by HP Product Number (Sheet 3 of 7)

Hewlett-Packard Product Number	Product Includes:			Input Required From:			Output Available From:							
	Base Memory		HP-IB Interface	Exterior Ac Line			Main Dc Power Supply [1]					25 KHz Power Supply		
				Oper. Current		Maximum Power (W) [2]								
	ECC (MB)	Parity (MB)		@115V (A)	@230V (A)		@+5V (A)	@+5V(M) (A) [3]	@+12V (A)	@−12V (A)	Total (W)	(W)	(A)	@ (Vrms)
2186D*	−−	0.5	No	n/s	n/s	n/s	13.5	4.8	3.7	1.4	175	−−	−−	−−
2196C*	−−	0.5	Yes	16 [8]	n/s	n/s	46.3	5.8	5.3	3.4	n/s	n/s	n/s	n/s
2196D*	−−	0.5	Yes	16 [8]	n/s	n/s	46.3	5.8	5.3	3.4	n/s	n/s	n/s	n/s
2196G	−−	0.5	Yes	16 [8]	n/s	n/s	47.9	8.8	5.5	3.5	(Note 6)	50	2.5	27
2196H	1.0	−−	Yes	16 [8]	n/s	n/s	47.8	8.6	5.5	3.5	(Note 6)	50	2.5	27
2197C*	−−	0.5	Yes	16 [8]	n/s	n/s	35.1	5.5	5.3	3.4	n/s	50 [7]	1.5 [7]	39 [7]
2197D*	−−	0.5	Yes	16 [8]	n/s	n/s	35.1	5.5	5.3	3.4	n/s	50 [7]	1.5 [7]	39 [7]

Notes:

* Discontinued product; shown for reference only. n/a = not applicable. n/s = not specified.

1. Values are listed under this category *after* subtracting processor and base memory/HP-IB card consumption (when included with product). Values flagged with notes 5, 9, 10, 11, and 12 are exceptions.
2. Maximum power required for any combination of HP interfaces and other plug-ins which can be accommodated by the product number indicated. Power factor (PF) is typically 0.75 with a range of 0.7 to 0.8. Use a PF of 0.7 to 0.72 to estimate ac input requirements in Volt-Amps (VA) from Watts (W) to ensure sufficient total input power (that is, VA=W/PF). To estimate ventilation or air conditioning requirements in BTU per hour, multiply W by 3.419. To determine heat dissipation requirements in kilogram-calories per hour, multiply W by 0.8598.
3. +5V(M) is voltage available to processor, memory controller, and memory array cards.
6. Main power supply provides enough current for any combination of HP interfaces and other HP plug-ins which can be accommodated by the product indicated.
7. Values apply only to computers or SPUs having a serial number prefix of 2648 or greater.
8. Current required per phase. HP 2196A*/C*/G/H and 2197C*/E*, with tall cabinet, require split phase; HP 2196B*/D* and 2197B*/D* require single phase.

Table 1-5. Maximum Electrical Requirements and Availability by HP Product Number (Sheet 4 of 7)

Hewlett-Packard Product Number	Product Includes:			Input Required From:			Output Available From:							
	Base Memory		HP-IB Interface	Exterior Ac Line			Main Dc Power Supply [1]					25 KHz Power Supply		
				Oper. Current		Maximum Power (W) [2]								
	ECC (MB)	Parity (MB)		@115V (A)	@230V (A)		@+5V (A)	@+5V(M) (A) [3]	@+12V (A)	@−12V (A)	Total (W)	(W)	(A)	@ (Vrms)
2197E	−−	−−	Yes	16 [8]	n/s	n/s	37.8 [5]	9.6 [5]	5.5	3.5	(Note 6)	50	1.5	39 [7]
2199C*	0.8	−−	Yes	16 [8]	n/s	n/s	38.1 [5]	7.0 [5]	5.2	3.4	n/s	50	1.5	39 [7]
2199D*	0.8	−−	Yes	16 [8]	n/s	n/s	38.1	7.0	5.2	3.4	n/s	50	1.5	39 [7]
2199E	−−	−−	Yes	16 [8]	n/s	700	40.7	9.0	5.4	3.5	n/s	50	1.5	39 [7]
2424A	−−	0.5	No	2.5	1.3	216	17.3	−−	2.03	1.01	119.0 [9]	−−	−−	−−
2426E*	−−	0.5	No	2.5	1.3	216	12.2	−−	2.1	1.1	83.9 [10]	−−	−−	−−
2426F*	1.0	−−	No	2.5	1.3	216	11.9	−−	2.1	1.1	82.4 [10]	−−	−−	−−

Notes:

* Discontinued product; shown for reference only. n/a = not applicable. n/s = not specified.

1. Values are listed under this category *after* subtracting processor and base memory/HP-IB card consumption (when included with product). Values flagged with notes 5, 9, 10, 11, and 12 are exceptions.
2. Maximum power required for any combination of HP interfaces and other plug-ins which can be accommodated by the product number indicated. Power factor (PF) is typically 0.75 with a range of 0.7 to 0.8. Use a PF of 0.7 to 0.72 to estimate ac input requirements in Volt-Amps (VA) from Watts (W) to ensure sufficient total input power (that is, VA=W/PF). To estimate ventilation or air conditioning requirements in BTU per hour, multiply W by 3.419. To determine heat dissipation requirements in kilogram-calories per hour, multiply W by 0.8598.
3. +5V(M) is voltage available to processor, memory controller, and memory array cards.
5. Combined current consumption at +5.1 V and +5 V(M), *including* processor and base memory/HP-IB cards, when included with product, is limited to 70 W.
6. Main power supply provides enough current for any combination of HP interfaces and other HP plug-ins which can be accommodated by the product indicated.
7. Values apply only to computers or SPUs having a serial number prefix of 2648 or greater.
8. Current required per phase. HP 2197C*/*E, and 2199A*/C*/E, with tall cabinet, require split phase; HP 2197B*/D* and 2199B*/D* require single phase.
9. Total main dc power supply consumption, *including* processor and base memory card(s), when included with product, is limited to 151 W.
10. Total main dc power supply consumption, *including* processor and base memory cards, when included with product, is limited to 157 W.

Table 1-5. Maximum Electrical Requirements and Availability by HP Product Number (Sheet 5 of 7)

Hewlett-Packard Product Number	Product Includes:			Input Required From:			Output Available From:							
	Base Memory		HP-IB Interface	Exterior Ac Line			Main Dc Power Supply [1]					25 KHz Power Supply		
				Oper. Current		Maximum Power (W) [2]								
	ECC (MB)	Parity (MB)		@115V (A)	@230V (A)		@+5V (A)	@+5V(M) (A) [3]	@+12V (A)	@−12V (A)	Total (W)	(W)	(A)	@ (Vrms)
2426G	−−	0.5	No	2.5	1.3	216	12.3	−−	2.1	1.1	83.9 [9]	−−	−−	−−
2426H	1.0	−−	No	2.5	1.3	216	11.9	−−	2.1	1.1	82.4 [9]	−−	−−	−−
2434A	−−	0.5	No	6.0	3.0	500	38.8	5.4	6.93	2.91	268.0 [11]	30 [13]	1.5 [13]	19.5 [13]
2436A*	−−	0.1	No	6.0	3.0	500	33.4	5.9	7.0	3.0	246.5 [11]	30 [13]	1.5 [13]	19.5 [13]
2436E*	−−	0.5	No	6.0	3.0	500	33.4	5.8	7.0	3.0	246.0 [11]	30 [13]	1.5 [13]	19.5 [13]
2436G	−−	0.5	No	6.0	3.0	500	33.4	5.8	6.7	3.0	246.0 [11]	30 [13]	1.5 [13]	19.5 [13]
2436H	1.0	−−	No	6.0	3.0	500	33.4	5.7	6.7	3.0	245.5 [11]	30 [13]	1.5 [13]	19.5 [13]
2437A*	−−	0.1	No	6.0	3.0	500	25.9	5.6	7.0	3.0	207.5 [11]	30 [13]	1.5 [13]	19.5 [13]

Notes:

* Discontinued product; shown for reference only. n/a = not applicable. n/s = not specified.

1. Values are listed under this category *after* subtracting processor and base memory/HP-IB card consumption (when included with product). Values flagged with notes 5, 9, 10, 11, and 12 are exceptions.
2. Maximum power required for any combination of HP interfaces and other plug-ins which can be accommodated by the product number indicated. Power factor (PF) is typically 0.75 with a range of 0.7 to 0.8. Use a PF of 0.7 to 0.72 to estimate ac input requirements in Volt-Amps (VA) from Watts (W) to ensure sufficient total input power (that is, VA=W/PF). To estimate ventilation or air conditioning requirements in BTU per hour, multiply W by 3.419. To determine heat dissipation requirements in kilogram-calories per hour, multiply W by 0.8598.

3. +5V(M) is voltage available to processor, memory controller, and memory array cards.

9. Total main dc power supply consumption, *including* processor and base memory card(s), when included with product, is limited to 151 W.

11. Total main dc power supply consumption, *including* processor and base memory/HP-IB card(s), when included with product, is limited to 300 W.

13. Applicable only if HP 12159A card is installed. Value is split phase (measured from phase to common).

Table 1-5. Maximum Electrical Requirements and Availability by HP Product Number (Sheet 6 of 7)

Hewlett-Packard Product Number	Product Includes:			Input Required From:			Output Available From:							
	Base Memory		HP-IB Interface	Exterior Ac Line			Main Dc Power Supply [1]					25 KHz Power Supply		
				Oper. Current		Maximum Power (W) [2]								
	ECC (MB)	Parity (MB)		@115V (A)	@230V (A)		@+5V (A)	@+5V(M) (A) [3]	@+12V (A)	@−12V (A)	Total (W)	(W)	(A)	@ (Vrms)
2437B*	−−	−−	No	6.0	3.0	500	23.0 [12]	6.7 [12]	7.0	3.0	198.5 [11]	30 [13]	1.5 [13]	19.5 [13]
2439A*	0.8	−−	No	6.0	3.0	500	27.9 [12]	3.0 [12]	7.0	3.0	222.5 [11]	30 [13]	1.5 [13]	19.5 [13]
2439B	−−	−−	No	6.0	3.0	500	27.9 [12]	3.0 [12]	7.0	3.0	222.5 [11]	30 [13]	1.5 [13]	19.5 [13]
2484A*	−−	0.5	Yes	6.0	3.0	500	36.7 [12]	5.4 [12]	6.83	2.91	256.3 [11]	30 [13]	1.5 [13]	19.5 [13]
2484B	−−	0.5	Yes	6.0	3.0	500	36.7 [12]	5.4 [12]	6.83	2.91	256.3 [11]	30 [13]	1.5 [13]	19.5 [13]
2486A*	−−	0.5	Yes	6.0	3.0	500	29.7	5.8	6.7	2.9	222.7 [11]	30 [13]	1.5 [13]	19.5 [13]
2486B	−−	0.5	Yes	6.0	3.0	500	31.3	5.8	6.6	3.0	234.3 [11]	30 [13]	1.5 [13]	19.5 [13]
2486C	1.0	−−	Yes	6.0	3.0	500	31.2	5.6	6.6	3.0	232.8 [11]	30 [13]	1.5 [13]	19.5 [13]

Notes:

* Discontinued product; shown for reference only. n/a = not applicable. n/s = not specified.

1. Values are listed under this category *after* subtracting processor and base memory/HP-IB card consumption (when included with product). Values flagged with notes 5, 9, 10, 11, and 12 are exceptions.
2. Maximum power required for any combination of HP interfaces and other plug-ins which can be accommodated by the product number indicated. Power factor (PF) is typically 0.75 with a range of 0.7 to 0.8. Use a PF of 0.7 to 0.72 to estimate ac input requirements in Volt-Amps (VA) from Watts (W) to ensure sufficient total input power (that is, VA=W/PF). To estimate ventilation or air conditioning requirements in BTU per hour, multiply W by 3.419. To determine heat dissipation requirements in kilogram-calories per hour, multiply W by 0.8598.

3. +5V(M) is voltage available to processor, memory controller, and memory array cards.

11. Total main dc power supply consumption, *including* processor and base memory/HP-IB card(s), when included with product, is limited to 300 W.
12. Combined current consumption at +5.1 V and +5 V(M) *including* processor and base memory/HP-IB cards, when included with product, is limited to 50 W.
13. Applicable only if HP 12159A card is installed. Value is split phase (measured from phase to common).

Table 1-5. Maximum Electrical Requirements and Availability by HP Product Number (Sheet 7 of 7)

Hewlett-Packard Product Number	Product Includes:			Input Required From:			Output Available From:							
	Base Memory		HP-IB Interface	Exterior Ac Line			Main Dc Power Supply [1]					25 KHz Power Supply		
				Oper. Current		Maximum Power (W) [2]								
	ECC (MB)	Parity (MB)		@115V (A)	@230V (A)		@+5V (A)	@+5V(M) (A) [3]	@+12V (A)	@−12V (A)	Total (W)	(W)	(A)	@ (Vrms)
2487A*	−−	0.5	Yes	6.0	3.0	500	22.0	5.6	6.7	2.9	184.2 [11]	30 [13]	1.5 [13]	19.5 [13]
2487B*	−−	−−	Yes	6.0	3.0	500	20.9	6.7	6.9	3.0	186.8 [11]	30 [13]	1.5 [13]	19.5 [13]
2489A*	0.8	−−	Yes	6.0	3.0	500	23.1	1.0	6.7	2.9	165.7 [11]	30 [13]	1.5 [13]	19.5 [13]
2489B	−−	−−	Yes	6.0	3.0	500	25.8	3.0	6.9	3.0	210.8 [11]	30 [13]	1.5 [13]	19.5 [13]
2939A	−−	−−	No	6.0	3.0	500	36.7	5.7	7.0	3.0	260 [11]	30 [13]	1.5 [13]	19.5 [13]
2959A	−−	−−	No	6.0	3.0	800	59.3	7.3	5.4	3.4	(Note 6)	50	1.5	19.5
2989A	−−	−−	Yes	6.0	3.0	500	34.6	5.7	6.9	3.0	248.3 [11]	30 [13]	1.5 [13]	19.5 [13]
2999A	−−	−−	Yes	6.0	3.0	700	57.2	7.3	5.3	3.4	(Note 6)	50	1.5	19.5

Notes:

* Discontinued product; shown for reference only. n/a = not applicable. n/s = not specified.

1. Values are listed under this category *after* subtracting processor and base memory/HP-IB card consumption (when included with product). Values flagged with notes 5, 9, 10, 11, and 12 are exceptions.
2. Maximum power required for any combination of HP interfaces and other plug-ins which can be accommodated by the product number indicated. Power factor (PF) is typically 0.75 with a range of 0.7 to 0.8. Use a PF of 0.7 to 0.72 to estimate ac input requirements in Volt-Amps (VA) from Watts (W) to ensure sufficient total input power (that is, VA=W/PF). To estimate ventilation or air conditioning requirements in BTU per hour, multiply W by 3.419. To determine heat dissipation requirements in kilogram-calories per hour, multiply W by 0.8598.
3. +5V(M) is voltage available to processor, memory controller, and memory array cards.
6. Main power supply provides enough current for any combination of HP interfaces and other HP plug-ins which can be accommodated by the product indicated.
11. Total main dc power supply consumption, *including* processor and base memory/HP-IB card(s), when included with product, is limited to 300 W.
13. Applicable only if HP 12159A card is installed. Value is split phase (measured from phase to common).

Product – Option List by Number

Below is a list of product and option numbers and product descriptions covering board and box computers and systems. This list includes currently available and discontinued products. The option list is *not* all-inclusive. The date shown in parentheses after the product name indicates when the product first appeared in the *HP 1000 A-Series Computer Systems Hardware, Software, Peripherals, and Support Ordering Guide* (part no. 5952-1745D or prior edition part no.). The descriptions have been taken from the *most recen*t Ordering Guide in which the product/option number appeared. Descriptions generally are not available prior to 6/83. Discontinued products are indicated with an asterisk (*) after the date (for example, 11/87*).

1**2100A A400 BOARD COMPUTER** (11/86): Single card computer with CPU and 512 KB parity memory. Four serial I/O ports are available from breakout panel connected to card.

12990C A400/A600+/A700/A900-TO-A990 UPGRADE KIT (11/90): A990 single card CPU, frontplane connectors for 1 to 4 memory array cards, and RTE-A upgrade tape.

022 CS/80 cartridge tape media.
044 Microdiskette media.
061 1600 cpi reel-to-reel tape media.
100 "A" software copy license upgrade.
200 Replace 1 to 4 frontplane memory card connectors with 5 to 8.
400 Return credit for A400 processor.
600 Return credit for A600+ processor with parity mem controller.
605 Return credit for A600+ processor with ECC mem controller.
700 Return credit for A700 processor.
900 Return credit for A900 processor.
905 A900 to A990 upgrade incentive.

2106AK A600+ BOARD COMPUTER (Before 6/83*): CPU card and memory controller card with 128 KB parity memory.

2106BK A600+ BOARD COMPUTER (6/83 or before*): CPU card and memory controller card with 128 KB parity memory.

014 Delete standard 128 KB memory controller card.

2106CK A600+ BOARD COMPUTER (11/87): CPU card and memory controller card with 512 KB parity memory.

2106DK A600+ BOARD COMPUTER (11/87): CPU card and memory controller card with 1 MB ECC memory.

2107AK A700 BOARD COMPUTER (6/83 or before*): CPU card and memory controller card with 128 KB parity memory.

001 Add floating point processor with scientific/vector instruction sets.

014 Delete standard 128 KB memory controller card.

2134A A400 (MODEL 24) 20-SLOT BOX COMPUTER (11/87): Single card computer with CPU and 512 KB parity memory. Four serial I/O ports are available from breakout panel connected to the card. Includes box with power supply.

010 Discount for upgrade from E/F-Series systems.

015 230 V ac/50 Hz power.

2136A/C A600 (MODEL 6) 8-SLOT BOX COMPUTER (Before 6/83*): CPU card, memory controller card with 128 KB parity memory, dual mini-flexible disk drive, async serial interface card, and HP-IB interface card.

2136B/D A600 (MODEL 6+) 8-SLOT BOX COMPUTER (6/83 or before*): CPU card, memory controller card with 128 KB parity memory, and RTE-A.

2137A A700 (MODEL 27) 20-SLOT BOX COMPUTER (6/83 or before*): 128 KB parity memory and floating point processor.

014 Delete standard 128 KB memory.

015 230 V ac/50 Hz power.

2137B A700 (MODEL 27) 20-SLOT BOX COMPUTER (11/87*): Upper and lower CPU cards, memory controller card (without memory), floating point processor card, and box with power supply.

015 230 V ac/50 Hz power.

2139A A900 (MODEL 29) 20-SLOT BOX COMPUTER (6/83 or before*): 768 KB ECC memory, cache memory, and floating point processor cards.

014 Delete standard 768 KB memory card.

015 230 V ac/50 Hz power.

2139B A900 (MODEL 29) 20-SLOT BOX COMPUTER (11/87): Sequencer card, data path card, cache control card, memory controller card (without memory), and box with power supply.

0CM Discount for upgrade from A400 computer or system.

0C1 Discount for upgrade from A600+ computer or system.

0C2 Discount for upgrade from A700 computer or system.

010 Discount for upgrade from E/F series system.

015 230 V ac/50 Hz power.

2156A A600+ (MODEL 26) 20-SLOT BOX COMPUTER (Before 6/83*)

2156B A600+ (MODEL 26) 20-SLOT BOX COMPUTER (6/83 or before*): CPU card and memory controller card with 128 KB parity memory.

014 Delete standard memory controller.
015 230 V ac/50 Hz power.

2156C A600 (MODEL 26) 20-SLOT BOX COMPUTER (11/87): CPU card, memory controller card with 512 KB parity memory, and box with power supply.

015 230 V ac/50 Hz power.

2156D A600+ (MODEL 26) 20-SLOT BOX COMPUTER (11/87): CPU card, memory controller card with 1 MB ECC memory, and box with power supply .

015 230 V ac/50 Hz power.

2186A A600 (MODEL 6+) 8-SLOT SPU (Before 6/83*): CPU card, memory controller card with 128 KB parity memory, dual mini-flexible disk drive, async serial interface card, HP-IB interface card, and RTE-A.

2186B A600 (MODEL 6+) 8-SLOT SPU (Before 6/83*): CPU card, memory controller card with 128 KB parity memory, async serial interface card, HP-IB interface card, and RTE-A.

2186C A600 (MODEL 6+) 8-SLOT SPU (6/83 or before*): CPU card, memory controller card with 512 KB parity memory, dual mini-flexible disk drive, async serial interface card, HP-IB interface card, and RTE-A.

012 Substitute 128 KB memory controller card for 512 KB card.

2186D A600 (MODEL 6+) 8-SLOT SPU (6/83 or before*): CPU card, memory controller card with 512 KB parity memory, and RTE-A.

012 Substitute 128 KB memory controller card for 512 KB card.

2196A A600+ (MODEL 26) SPU – TALL CABINET (Before 6/83*): Memory controller card with 128 KB parity memory, async serial interface card, HP-IB interface card (to system disk), and RTE-A.

2196B A600+ (MODEL 26) SPU – SHORT CABINET (Before 6/83*): Memory controller card with 128 KB parity memory, async serial interface card, HP-IB interface card (to system disk), and RTE-A.

2196C A600+ (MODEL 26) SPU – TALL CABINET (6/83 or before*): CPU card, memory controller card with 512 KB parity memory, async serial interface card, HP-IB interface card, (to system disk) and RTE-A.

005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
008 Delete HP 12005B Async Serial Interface Card.
010 Discount for upgrade from M-Series systems.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
051 Upper door trim replacement (allows front-to-rear ventilation.
053 Lower door (with ventilation louvers instead of cutout).
061 1600 cpi reel-to-reel tape media.
070 Delete cabinet from SPU; add support rails and HP-IB card.

2196D A600+ (MODEL 26) 20-SLOT SPU – SHORT CABINET (6/83 or before*): CPU card, memory controller card with 512 KB parity memory, async serial interface card, HP-IB interface card (to system disk), and RTE-A.

005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
008 Delete HP 12005B Async Serial Interface Card.
010 Upgrade from M-Series systems.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
061 1600 cpi reel-to-reel tape media.

2196G A600+ (MODEL 26) 20-SLOT SPU – SHORT OR TALL CABINET (11/87): CPU card, memory controller card with 512 KB parity memory, HP-IB interface card (to system disk), box with power supply, and RTE-A with VC+ and diagnostics.

010 Discount for upgrade from E/F-Series systems.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
061 1600 cpi reel-to-reel tape media.

2196H A600+ (MODEL 26) 20-SLOT SPU – SHORT OR TALL CABINET (11/87):, CPU card, memory controller card with 1 MB ECC memory, HP-IB interface card (to system disk), box with power supply and RTE-A with VC+ and diagnostics.

010 Discount for upgrade from E/F-Series systems.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
061 1600 cpi reel-to-reel tape media.

2197A A700 (MODEL 27) 20-SLOT SPU – TALL CABINET (Before 6/83*).

2197B A700 (MODEL 27) 20-SLOT SPU – TALL CABINET (Before 6/83*).

2197C A700 (MODEL 27) 20-SLOT SPU – TALL CABINET (6/83 or before*): memory controller card with 512 KB parity memory, floating point processor card, async serial interface card, HP-IB interface card (to system disk), and RTE-A with VC+.

005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
008 Delete HP 12005B Async Serial Interface card.
010 Discount for upgrade from M-Series systems.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
051 Upper door trim replacement (allows front-to-rear ventilation).
053 Lower door (with ventilation louvers instead of cutout).
061 1600 cpi reel-to-reel tape media.
070 Delete cabinet from SPU; add support rails and HP-IB card.

2197D A700 (MODEL 27) 20-SLOT SPU – SHORT CABINET (6/83 or before*): Memory controller card with 512 KB parity memory, floating point processor card, async serial interface card, HP-IB interface card (to system disk) and, RTE-A with VC+.

005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
008 Delete HP 12005B Async Serial Interface Card.
010 Discount for upgrade from M-Series systems.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
061 1600 cpi reel-to-reel tape media.

2197E A700 (MODEL 27) 20-SLOT SPU (11/87*): Upper and lower CPU cards, memory controller card (without memory), floating point processor card, HP-IB card (to system disk), box with power supply, and RTE-A with VC+ and diagnostics.

010 Discount for upgrade from from E/F-Series systems.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
061 1600 cpi reel-to-reel tape media.

2199A A900 (MODEL 29) 20-SLOT SPU (Before 6/83*)

2199B A900 (MODEL 29) 20-SLOT SPU (Before 6/83*).

2199C A900 (MODEL 29) 20-SLOT SPU – TALL CABINET (6/83 or before*): Memory controller card with 768 KB ECC memory, cache memory card, floating point processor card, async serial interface card, HP-IB interface card (to system disk), and RTE-A with VC+.

005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
008 Delete HP 12005B Async Serial Interface Card.
010 Discount for upgrade from M/E/F-Series systems.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
051 Upper door trim replacement (allows front-to-rear ventilation).
053 Lower door (with ventilation louvers instead of cutout).
061 1600 cpi reel-to-reel tape media.
070 Delete cabinet from SPU; adds support rails, and HP-IB card.
100 Discount for upgrade from E/F-Series systems.
101 Add 0.75 MB memory on CS/80 cartridge tape media.
102 Add 2.25 MB memory on CS/80 cartridge tape media.
103 Same as option 101 except ads Basic/1000C instead of Pascal/1000.
104 Add 2.25 MB memory on CS/80 catridge tape.
111 Add 0.75 MB memory on 1600 cpi reel-to-reel tape media.
112 Add 2.25 MB memory on 1600 cpi reel-to-reel tape media.
113 Add 0.75 MB memory on 1600 cpi reel-to-reel tape media.
114 Add 2.25 MB memory on 1600 cpi reel-to-reel tape media.

2199D A900 (MODEL 29) 20-SLOT SPU – SHORT CABINET (6/83 or before*): Memory controller card with 768 KB ECC memory, cache memory card, floating point processor card, async serial interface card, HP-IB interface card (to system disk), and RTE-A with VC+.

005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
008 Delete HP 12005B Async Serial Interface Card.
010 Discount for upgrade from M/E/F-Series systems.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
061 1600 cpi reel-to-reel tape media.
100 Discount for upgrade from E/F Series systems.
101 Add 0.75 MB memory on CS/80 cartridge tape media.
102 Add 2.25 MB memory on CS/80 cartridge tape media.
103 Same as option 101 except add Basic/1000C instead of Pascal.
104 Add 2.25 MB memory on CS/80 cartridge tape media.
111 Add 0.75 MB memory on 1600 cpi reel-to-reel tape media.
112 Add 2.25 MB memory on 1600 cpi reel-to-reel tape media.

113 Add 0.75 MB memory on 1600 cpi reel-to-reel tape media.
114 Add 2.25 MB memory on 1600 cpi reel-to-reel tape media).

2199E A900 (MODEL 29) 20-SLOT SPU – SHORT OR TALL CABINET (11/87): Sequencer card, data path card, cache control card, memory controller card (without memory), HP-IB interface card (to system disk), box with power supply, and RTE-A with VC+ and diagnostics.

0CM Discount for upgrade from A400 computer or system.
0C1 Discount for upgrade from A600+ computer or system.
0C2 Discount for upgrade from A700 computer or system.
010 Discount for upgrade from E/F series system.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
061 1600 cpi reel-to-reel tape media.

2424A A400 (MICRO 14) 6-SLOT BOX COMPUTER (11/86): Single card computer with CPU and 512 KB parity memory. Four serial I/O ports are available from breakout panel connected to card. Includes box with power supply

010 Discount for upgrade from E/F-Series systems..
015 230 V ac/50 Hz power.

2426E A600+ (MICRO 16) 6-SLOT BOX COMPUTER (4/86*): CPU card, memory controller card with 512 KB parity memory, and box with power supply.

015 230 V ac/50 Hz power..

2426F A600+ (MICRO 16) 6-SLOT BOX COMPUTER (4/86*): CPU card, memory controller card with 1 MB ECC memory.

015 230 V ac/50 Hz power, and box with power supply.

2426G A600+ (MICRO 16) 6-SLOT BOX COMPUTER (11/87): CPU card, memory controller card with 512 KB parity memory, and box with power supply.

015 230 V ac/50 Hz power.

2426H A600+ (MICRO 16) 6-SLOT BOX COMPUTER (11/87): CPU card, memory controller card with 1 MB ECC memory, and box with power supply .

015 230 V ac/50 Hz power.

2434A A400 (MICRO 24) 16-SLOT BOX COMPUTER (11/86): Single card computer with CPU and 512 KB parity memory. Four serial I/O ports are available from breakout panel connected to the card. Includes box with power supply.

010 Discount for upgrade from E/F-Series systems.

015 230 V ac/50 Hz power.
151 Preparation kit for HP 12122A Integrated Disks.

2436A A600+ (MICRO 26) 16-SLOT BOX COMPUTER (6/83 or before*): CPU card and memory controller card with 128 KB parity memory.
014 Delete standard 128 KB memory controller card.
111 Add integrated 14.5 MB fixed and 270 KB microflexible disk drives and interfaces.

2436E A600+ (MICRO 26) 16-SLOT BOX COMPUTER (6/85*): CPU card and memory controller card with 512 KB parity memory.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
151 Preparation kit for HP 12120A/12121A Integrated Disks.

2436G A600+ (MICRO 26) 16-SLOT BOX COMPUTER (11/87): CPU card, memory controller card with 512 KB parity memory, and box with power supply.
015 230 V ac/50 Hz power.
151 Preparation kit for HP 12122A Integrated Disks.

2436H A600+ (MICRO 26) 16-SLOT BOX COMPUTER (11/87): CPU card, memory controller card with 1 MB ECC memory, and box with power supply .
015 230 V ac/50 Hz power.
151 Preparation kit for HP 12122A Integrated Disks.

2437A A700 (MICRO 27) 16-SLOT BOX COMPUTER (6/83 or before*): Memory controller card with 128 KB parity memory.
001 Add floating point processor card.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
151 Preparation kit for HP 12120A/12121A Integrated Disks.

2437B A700 (MICRO 27) 16-SLOT BOX COMPUTER (11/87*): Upper and lower processor cards, memory controller card (without memory), floating point processor card, and box with power supply.
015 230 V ac/50 Hz power.
151 Preparation kit for HP 12122A Integrated Disks.

2439A A900 (MICRO 29) 16-SLOT BOX COMPUTER (6/83 or before*): Memory controller card with 768 KB ECC memory.

014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
151 Preparation kit for HP 12120A/12121A Integrated Disks.

2439B A900 (MICRO 29) 16-SLOT BOX COMPUTER (11/87): Sequencer card, data path card, cache control card, memory controller card (without memory), and box with power supply.

0CM Discount for upgrade from A400 computer or system.
0C1 Discount for upgrade from A600+ computer or system.
0C2 Discount for upgrade from A700 computer or system.
010 Discount for upgrade from E/F-Series system.
015 230 V ac/50 Hz power.
151 Preparation kit for HP 12122A Integrated Disks.

2456A A600+ (MICRO 16 PLUS) 6-SLOT BOX COMPUTER BUNDLE (4/86*): CPU card, memory controller card with 512 KB parity memory, eight-channel MUX card, and HP-IB interface card.

001 Substitute 1 MB ECC memory for 512 KB parity memory.
002 Add 40 MB Winchester disk.
003 Add 55 MB Winchester disk.
004 Add 65 MB cartridge tape subsystem.
015 230 V ac/50 Hz power.

2459A A900 (MICRO 29 PLUS) 16-SLOT SPU BUNDLE (4/86*): 1.5 MB ECC memory card, eight-channel MUX card, 40 MB Winchester disk, 65 MB cartridge tape subsystem, and RTE-A with VC+.

001 Substitute 55 MB Winchester disk for 40 MB disk.
002 Substitute 132.1 MB Winchester disk for 40 MB disk.
003 Substitute 3 MB ECC memory on 1 card for 1.5 MB on 2 cards.
004 Add HP 12007B Modem Interface to another HP 1000 system.
005 Add HP 12044A Direct Connect Interface to HP 1000 system.
006 Add HP 12076A LAN/1000 Link Interface and HP 91790R Right-To-Copy NS/1000 software.
015 230 V ac/50 Hz power.
115 Add HP 7945A 55.5 MB CS/80 Fixed Disk (operates from option 015).
215 Add HP 7914CT, opt. 140 132.1 MB CS/80 Stand-Alone Disk (operates from option 015).

2484A A400 (MICRO 24) 16-SLOT SPU (Before 11/86*): Single card computer with CPU and 512 KB parity memory. Four serial I/O ports available from breakout panel connected to card. Also includes HP-IB card (to system disk) and RTE-A

015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.

044 Microdiskette disk media.
061 1600 cpi reel-to-reel tape media.
150 Preparation kit for HP 12120A Integrated Disks.
151 Preparation kit for HP 12121A Integrated Disks.

2484B A400 (MICRO 24) 16-SLOT SPU (11/87) Single card computer with CPU and 512 KB parity memory. Four serial I/O ports available from breakout panel connected to card. Also includes HP-IB card (to system disk), RTE-A with VC+ and diagnostics, and box with power supply.

015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.
061 1600 cpi reel-to-reel tape media.
151 Preparation kit for HP 12122A Integrated Disk.

2486A A600+ (MICRO 26) SPU (6/83 or before*): Memory controller card with 512 KB parity memory, async serial I/O card, HP-IB interface card (to system disk), and RTE-A.

005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.
061 1600 cpi reel-to-reel tape media.
101 Add HP 12103C 512 KB Parity Memory Array Card, VC+, Basic/1000C, Image 1000, and Graphics 1000-II DGL on CS/80 cartridge tape media.
102 Option 101 with FORTRAN 77 and Symbolic Debug/1000.
103 Option 101 with Pascal 1000 in place of Basic/1000C.
121 Option 101 with software on 270 KB microdiskette media.
122 Option 121 with FORTRAN 77 and Symbolic Debug/1000.
123 Option 121 with Pascal 1000 in place of Basic/1000C.
131 Option 121 with software on 1600 cpi reel-to-reel tape media.
132 Option 122 with software on 1600 cpi reel-to-reel tape media.
133 Option 123 with software on 1600 cpi reel-to-reel tape media.
150 Preparation kit for HP 12120A Integrated Disks.
151 Preparation kit for HP 12121A Integrated Disks.

2486B A600+ (MICRO 26) 16-SLOT SPU (11/87): CPU card, memory controller card with 512 KB parity memory, HP-IB interface card (to system disk), box with power supply, and RTE-A with VC+ and diagnostics.

015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.

061 1600 cpi reel-to-reel tape media.
151 Preparation kit for HP 12122A Integrated Disks.

2486C A600+ (MICRO 26) 16-SLOT ECC SPU (11/87): CPU card, memory controller card with 1 MB ECC memory, HP-IB interface card (to system disk), box with power supply, and RTE-A with VC+ and diagnostics.

015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.
061 1600 cpi reel-to-reel tape media.
151 Preparation kit for HP 12122A Integrated Disks.

2487A A700 (MICRO 27) 16-SLOT SPU (6/83 or before*): Memory controller card with 512 KB parity memory, async serial interface card, HP-IB interface card (to system disk), box with power supply, and RTE-A .

001 Add floating point processor card.
005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
008 Delete HP 12005B Async serial Interface Card.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.
061 1600 cpi reel-to-reel tape media.
101 Add HP 12103C 512 KB Parity Memory Array Card, VC+, Basic/1000C, Image 1000, and Graphics 1000-II DGL software on CS/80 cartridge tape media.
102 Option 101 with FORTRAN 77 and Symbolic Debug/1000.
103 Option 101 with Pascal 1000 in place of Basic/1000C.
121 Option 101 with software on 270 KB microdiskette media
122 Option 121 plus FORTRAN 77 and Symbolic Debug/1000.
123 Option 121 with Pascal 1000 in place of Basic/1000C.
131 Option 121 with software on 1600 cpi reel-to-reel tape media.
132 Option 122 with software on 1600 cpi reel-to-reel tape media.
133 Option 123 with software on 1600 cpi reel-to-reel tape media.
150 Preparation kit for HP 12120A Integrated Disks.
151 Preparation kit for HP 12121A Integrated Disks.

2487B A700 (MICRO 27) 16-SLOT SPU (11/87*): Upper and lower CPU cards, memory controller card (without memory), floating point processor card, HP-IB card (to system disk), box with power supply, and RTE-A with VC+ and diagnostics.

015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.

061 1600 cpi reel-to-reel tape media.
151 Preparation kit for HP 12122A Integrated Disks.

2489A A900 (MICRO 29) 16-SLOT SPU (6/83 or before*): Memory controller card with 768 KB ECC memory, async serial interface card, HP-IB interface card (to system disk), box with power supply, and RTE-A.

005 Add 15 m (49 ft) fiber optic terminal cable.
006 Add 5 m (16.4 ft) wire terminal cable.
008 Delete HP 12005B Async serial Interface card.
014 Delete standard memory controller card.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.
061 1600 cpi reel-to-reel tape media.
101 Add HP 12103C 512 KB Parity Memory Array Card, VC+, Basic/1000C, Image 1000, and Graphics 1000-II DGL software on CS/80 cartridge tape media.
102 Option 101 with FORTRAN 77 and Symbolic Debug/1000.
103 Option 101 with Pascal 1000 in place of Basic/1000C.
121 Option 101 with software on 270 KB microdiskette media.
122 Option 121 with FORTRAN 77 and Symbolic Debug/1000.
123 Option 121 with Pascal 1000 in place of Basic/1000C.
131 Option 121 with software on 1600 cpi reel-to-reel tape media.
132 Option 122 with software on 1600 cpi reel-to-reel tape media.
133 Option 123 with software on 1600 cpi reel-to-reel tape media.
150 Preparation kit for HP 12120A Integrated Disks.
151 Preparation kit for HP 12121A Integrated Disks.

2489B A900 (MICRO 29) 16-SLOT SPU (11/87): Sequencer card, data path card, cache control card, memory controller card (without memory), HP-IB card (to system disk), box with power supply, and RTE-A with VC+ with diagnostics.

0CM Discount for upgrade from A400 computer or system.
0C1 Discount for upgrade from A600+ computer or system.
0C2 Discount for upgrade from A700 computer or system.
010 Discount for upgrade from E/F series system.
015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.
061 1600 cpi reel-to-reel tape media.
151 Preparation kit for HP 12122A Integrated Disks.

2939A A990 (MICRO 99) 16-SLOT BOX COMPUTER (11/90): Single card computer with CPU, writable control store, floating point processor, two-level cache, and memory controller (without memory). Also includes box with power supply.

015 230 V ac/50 Hz power.
151 Preparation kit for HP 12122A Integrated Disk.

2959A A990 (MODEL 99) 20-SLOT BOX COMPUTER (11/90): Single card computer with CPU, writable control store, floating point processor, two-level cache, and memory controller (without memory). Also includes box with power supply.

015 230 V ac/50 Hz power.

2989A A990 (MICRO 99) 16-SLOT SPU (11/90): Single card computer with CPU, writable control store, floating point processor, two-level cache, and memory controller (without memory). Also includes HP-IB card (to system disk), box with power supply, and RTE-A with VC+ and diagnostics.

015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
044 Microdiskette media.
061 1600 cpi reel-to-reel tape media.
151 Preparation kit for HP 12122A Integrated Disks.

2999A A990 (MODEL 99) 20-SLOT SPU (11/90): Single card computer with CPU, writable control store, floating point processor, two-level cache, and memory controller (without memory) . Also includes HP-IB card (to system disk), box with power supply, and RTE-A with VC+ and diagnostics.

015 230 V ac/50 Hz power.
022 CS/80 cartridge tape media.
061 1600 cpi reel-to-reel tape media.

Peripheral Devices

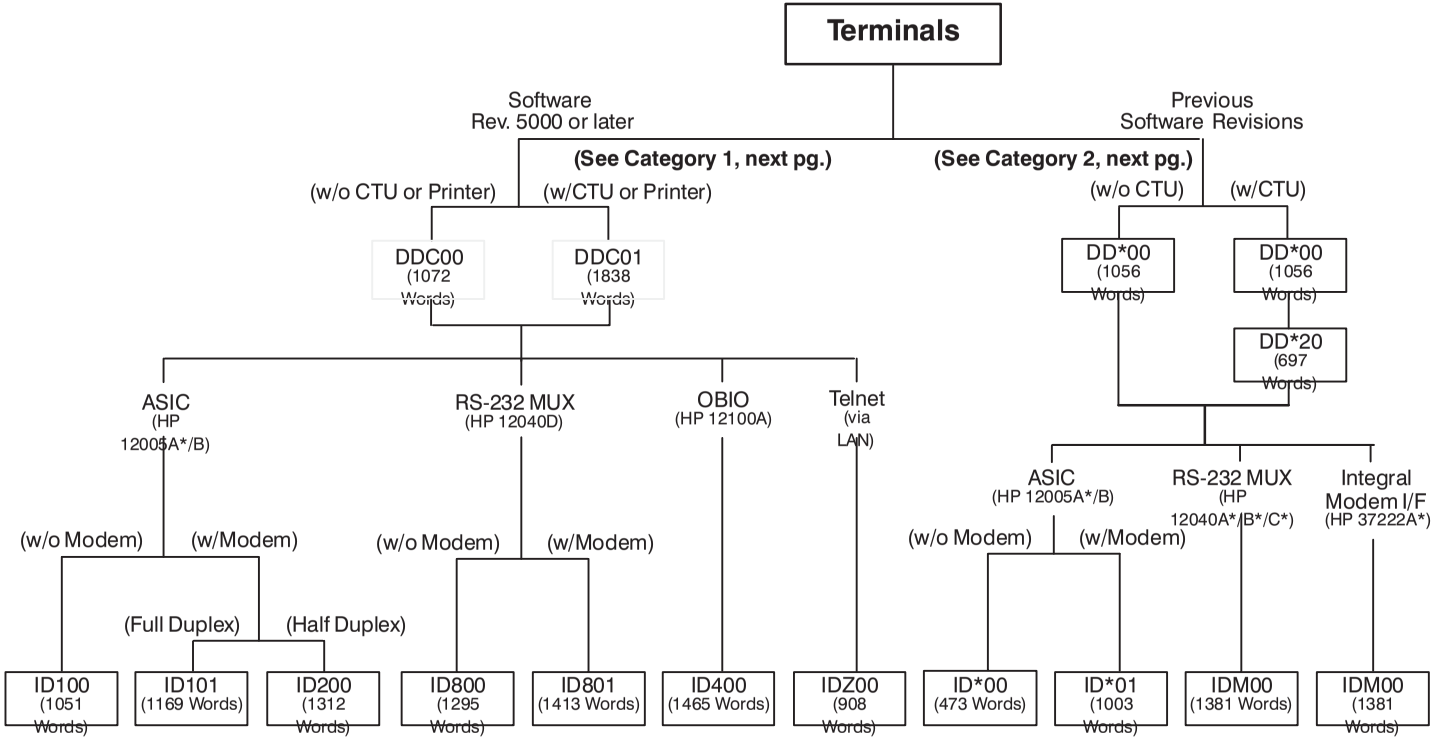
Tables 1-6 through 1-11 list all supported peripherals on the A-Series. The peripherals are grouped into the tables as follows:

Table 1-6	Terminals
Table 1-7	Printers
Table 1-8	Disk Drives
Table 1-9	Tape Drives
Table 1-10	Graphics Devices
Table 1-11	Miscellaneous Devices

Each table contains a diagram that separates the devices into categories based on the device and interface drivers for those peripheral devices. The peripheral devices are then listed by product number according to the category they fall into.

Driver sizes shown in the tables are for rev. 5000 or later. Driver sizes may vary from revision to revision.

Table 1-6. Terminals by Driver Type



See notes, next page.

Table 1-6. Terminals by Driver Type (continued)

Category 1 Terminals

HP Product Number	Device Driver DDC00 or DDC01
2622A*	Display Terminal
2623A*^	Graphics Terminal
2624A*/B*	Display Terminal
2625A*^	Dual System Terminal
2626A*	Display Station
2627A*^	Color Graphics Terminal
2628A*^	Word Processing Terminal
2642A*	Display Terminal w/CTU
2645A*#	Display Station
2647A*#	Intelligent Graphics Terminal
2648A*#	Graphics Terminal
2649A*	OEM Terminal
3081A*	Rugged Industrial Terminal
3082B*	Rugged Industrial Terminal
45850/1A*	HP150 II Touchscreen Terminal
700/92	Replacement Terminal for 2392A

Category 2 Terminals

HP Product Number	Device Driver DD*00
2382A*	Office Display Terminal
2392A*	Display Terminal
2393A^*	Monochrome Graphics Terminal
2397A^*	Color Graphics Terminal
2621A*/B*/P*	Display Terminal
2645A*#	Display Station
2647A*#	Intelligent Graphics Terminal
2648A*#	Graphics Terminal
2649A*	OEM Terminal
3081A*	Rugged Industrial Terminal
3082B*	Rugged Industrial Terminal
45610B*	Touchscreen Terminal
45850/1A*	HP150 II Touchscreen Terminal
700/92	Replacement Terminal for 2392A
72425A*	Vectra Model 25 PC**
72435A*	Vectra Model 35 PC**
72445A*	Vectra Model 45 PC**

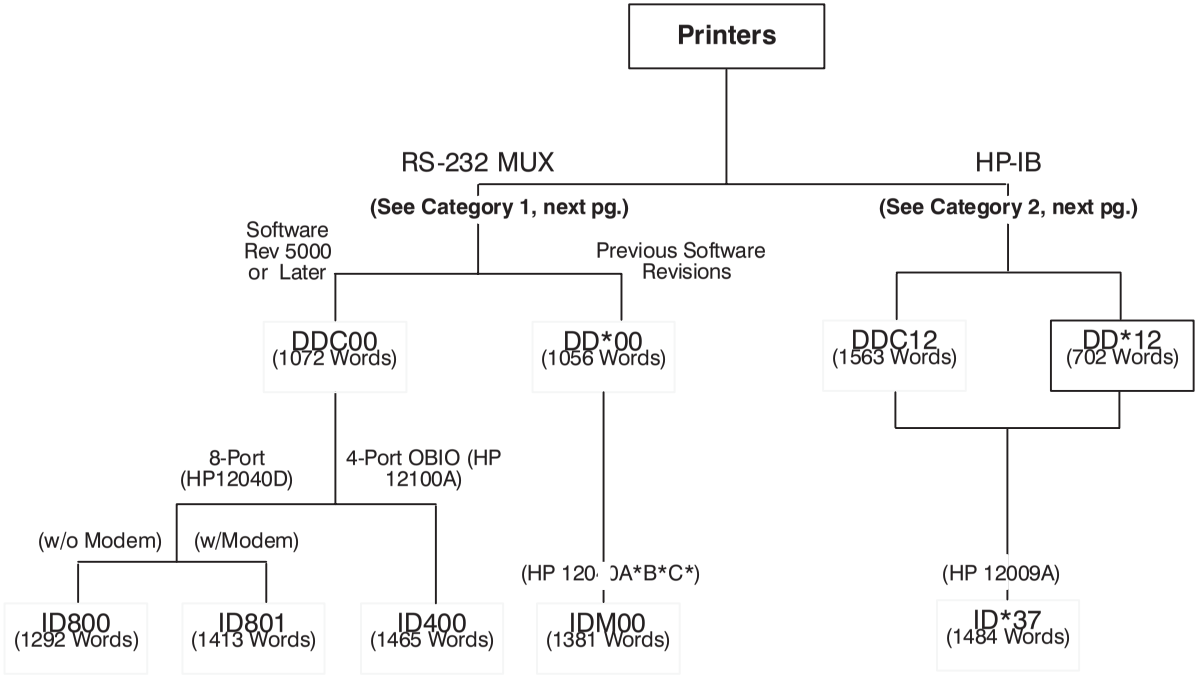
* Discontinued product; shown for reference only.

\# Cartridge tape units in HP 2645A, HP 2647A, and HP 2648A Terminals require Device Driver DD*20 w/DD*00 or DDC01.

^ Supported by device handlers in the HP 92861A Graphics/1000II Device-Independent Graphics Library, version 2.0.

** HP 724xxA Vectra PCs require: (1) monochrome or color monitor connected via appropriate adapter card, (2) serial-parallel, or dual serial dual serial interface, (3) disk operating system, and (4) AdvanceLink 2392 software or equivanlent to function as an HP 1000 A-Series terminal.

Table 1-7. Printers by Driver Type



See notes, next page.

Table 1-7. Printers by Driver Type (continued)

Category 1 Printers

HP Product Number	Device Driver DD*00
2225D ^	150 cps Thinkjet Printer
2227A ^	192 cps Quietjet Plus Printer
2228A ^	192 cps Quietjet Printer
2235B/D ^	240/480 cps RuggedWriter 480 Printer
2276A*	DeskJet Printer
2277A*	Deskjet Plus Printer

HP Product Number	Device Driver DDC00
2562C* ^	420 lpm Line Printer
2563A*/B*/C+049 ^	420 lpm Line Printer
2564A*/B*/C+049 ^	840 lpm Line Printer
2565A+049* ^	600 lpm Line Printer
2566A*/B*/C+049 ^	1200 lpm Line Printer
2631A*/B*	Printer
2680A	45 ppm Laser Printer
2684A/D ^	LaserJet/2000 Printer
2686A* ^	8 ppm Laserjet Printer
2686A+300* ^	8 ppm Laserjet Plus Printer
2687A*	12 ppm Laser Printer, Desktop
2688A*	12 ppm Laser Printer
2932A* ^	200 cps General-Purpose Printer
2933A*	Factory Data Printer
2934A ^	67/100/200 cps Business Printer
33049A	8 ppm Laser Jet Series III Printer
33440A* ^	8 ppm LaserJet Series II Printer
3630A+001 ^	PaintJet Printer

Category 2 Printers

HP Product Number	Device Driver DDC12
2562C* ^	420 lpm Line Printer
2563A*/B*/C+214 ^	420 lpm Line Printer
2564A*/B*/C+214 ^	840 lpm Line Printer
2565A+214* ^	600 lpm Line Printer
2566A*/B*/C+214 ^	1200 lpm Line Printer
2608S+214*	Line Printer

HP Product Number	Device Driver DD*12
2235B/D ^	240/480 cps RuggedWriter 480 Printer
2631A*/B*	Printer
2932A* ^	200 cps General-Purpose Printer
2933A*	Factory Data Printer
2934A ^	67/100/200 cps Business Printer

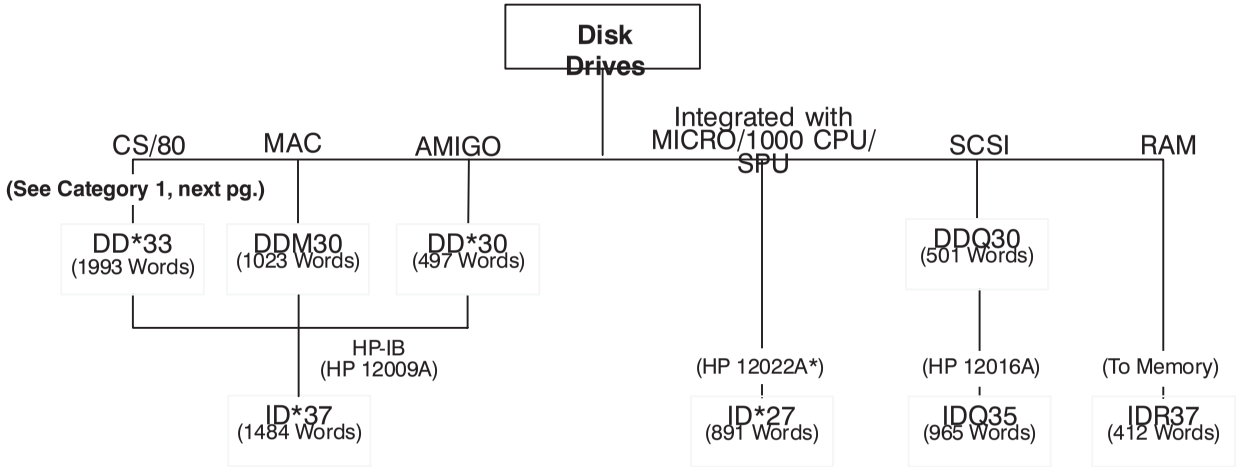
HP Product Number	(See Note A below)
2671A*	Thermal Printer
2671G*	120 cps Graphics (thermal) Printer
2673A*/G*	120 cps Intelligent Graphics Printer

* Discontinued product; shown for reference only.

^ Supported by device handlers in the HP 92861A Graphics/1000II Device-Independent Graphics Library, version 2.0.

Note A: HP 2671A*, HP 2671G*, and HP 2673A*/G* Printers are supported only by HP-IB interface driver ID*37 so all output to those printers must transfer character strings at the interface level.

Table 1-8. Disk Drives by Driver Type (Sheet 1 of 2)



See notes, next page.

Table 1-8. Disk Drives by Driver Type (Sheet 1 of 2, continued)

Category 1 Disk Drives

HP Product Number	Device Driver DD*33
12122A*	20 MB Fixed Disk w/630 KB Microflexible Disk – for integration into Micro/1000 CPU/SPU
C2200A	335 MB Fixed Disk
C2202A	670 MB Fixed Disk w/cache
C2203A	670 MB Fixed Disk w/ two cache
7907A*	20 MB Fixed/20 MB Removable Disk
7908P/R*	16 MB Fixed Disk w/Cartridge Tape Drive
7911P/R*	28 MB Fixed Disk w/Cartridge Tape Drive
7912P/R*	65 MB Fixed Disk w/Cartridge Tape Drive
7914CT*	131 MB Fixed Disk w/Cartridge Tape Drive
7914P/R*	131 MB Fixed Disk w/Cartridge Tape Drive
7914ST*	131 MB Fixed Disk w/1600 cpi Mag. Tape Unit**
7914TD*	131 MB Fixed Disk w/1600 cpi Mag. Tape Unit
7933H*/XP*	404 MB Fixed Disk
7935H/XP	404 MB Removable Disk
7936H*/XP*	307 MB Fixed Disk
7937H*/XP*	571 MB Fixed Disk
7941A*	24 MB Fixed Disk
7942A*	24 MB Fixed Disk w/Cartridge Tape Drive
7945A*	55 MB Fixed Disk
7946A*	55 MB Fixed Disk w/Cartridge Tape Drive

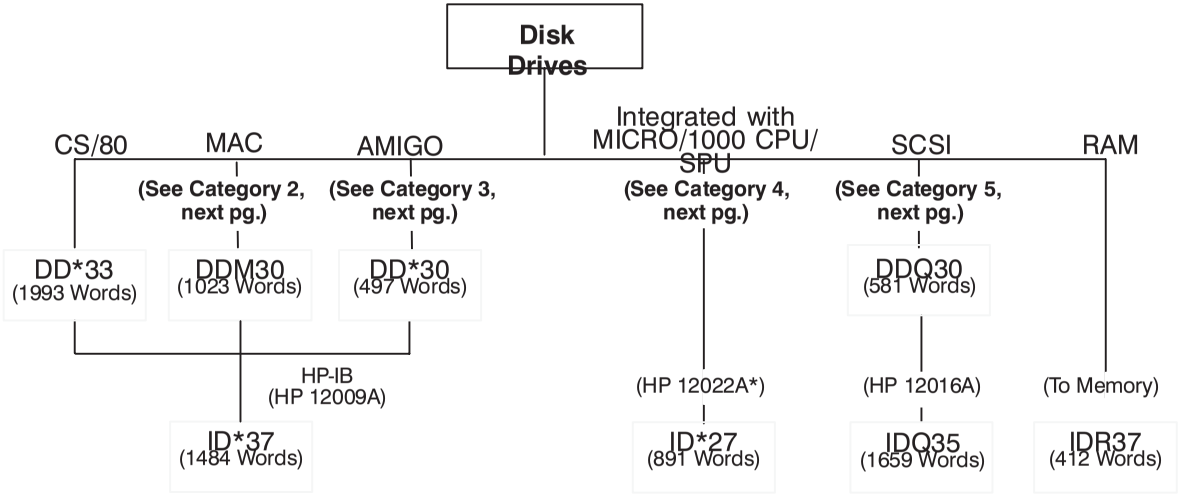
Category 1 Disk Drives (continued)

HP Product Number	Device Driver DD*33
7957A*	81 MB Fixed Disk
7957B*	81 MB Winchester Disk
7958A*	130 MB Fixed Disk
7958B*	152 MB Winchester Disk
7959B*	304 MB Winchester Disk
7962B*	152 MB Winchester Disk
7963B*	304 MB Winchester Disk
9122C*	(Dual 1.42 MB) Flexible Disk
9122D*/S*	Dual 630 KB Microflexible Disks
9133D*	15 MB Fixed Disk w/630 KB Microflexible Disk
9133H*	20 MB Fixed Disk w/630 KB Microflexible Disk
9133L*	40 MB Fixed Disk w/630 KB Microflexible Disk
9134D*	15 MB Fixed Disk
9134H*	20 MB Fixed Disk
9134L*	40 MB Fixed Disk
9153B*	20 MB Fixed Disk w/630 KB Microflexible Disk
9153C*	20/40 MB Winchester Disk
9154B*	20 MB Fixed Disk
9262B*	152 MB Removable Disk
9263B*	304 MB Removable Disk7946A*

* Discontinued product; shown for reference only.

** The 1600 cpi magnetic tape unit in the HP 7914ST product requires a separate HP 12009A HP-IB interface.

Table 1-8. Disk Drives by Driver Type (Sheet 2 of 2)



See notes, next page.

Table 1-8. Disk Drives by Driver Type (Sheet 2 of 2, continued)

Category 2 Disk Drives

HP Product Number	Device Driver DDM30
7906M+102*	19 MB MAC Master Cartridge Disk
7920M+102*	50 MB MAC Master Disk
7925M+102*	120 MB MAC Master Disk

Category 3 Disk Drives

HP Product Number	Device Driver DD*30
9121A*	Dual 270 KB Microflexible Disks
9133A*	4.6 MB Fixed Disk w/270 KB Microflexible Disk
9133B*	9.2 MB Fixed Disk w/270 KB Microflexible Disk
9133V+004*	4.5 MB Fixed Disk w/270 KB Microflexible Disk
9133XV+010*	9.6 MB Fixed Disk w/270 KB Microflexible Disk
9134A*	4.6 MB Fixed Disk
9134B*	9.2 MB Fixed Disk
9134XV+010*	9.6 MB Fixed Disk
9895A*	Dual 1.2 MB Flexible Disks

* Discontinued product; shown for reference only.

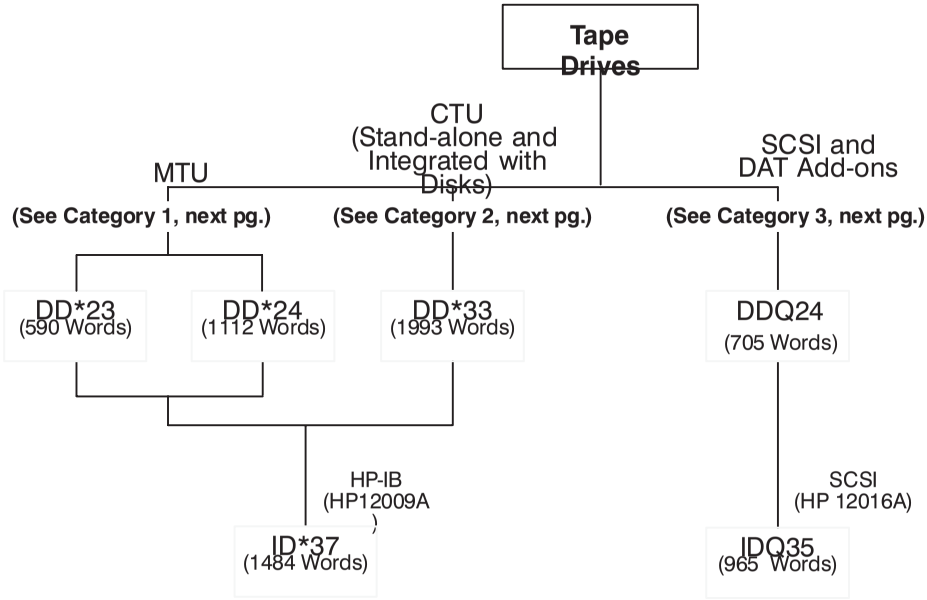
Category 4 Disk Drives

HP Product Number	No Device Driver
12120A*	20 MB Fixed Disk w/630 KB Microflexible Disk Disk for integration in Micro/1000 CPU/SPU
12121A*	20 MB Fixed Disk for integration into Micro/1000 CPU/SPU
263xA/E/248xA	Opt. 110* 10 MB Fixed Disk w/270 KB Micro-flexible for integration in Micro/1000 CPU/SPU
263xA/E/248xA	Opt. 111* 15 MB Fixed Disk w/270 KB Micro-flexible for integration in Micro/1000 CPU/SPU

Category 5 Disk Drives

HP Product Number	Divice Driver DDQ30
C1701A	650 MB Rewritable Optical Disk
C2212A	Mass Storage System w/330 MB Fixed Disk
C2213A	Mass Storage System w/660 MB Fixed Disk
C2212A/ – 2213A+001	Add 332 MB Hard Disk
C2213A+002	Add 664 MB Hard Disk
C2212A/ – 2213A+005	Add 650 Rewritable Optical Disk

Table 1-9. Tape Drives by Driver Type



See notes, next page.

Table 1-9. Tape Drives by Driver Type (continued)

Category 1 Tape Drives

HP Product Number	Device Driver DD*23
7970E+626/636*1	600 cpi Magnetic Tape Unit
7971A+140/144*1	600 cpi Magnetic Tape Unit

HP Product Number	Device Driver DD*24
C1511A*	1.3 GB DDS HP-IB Tape Drive
7914ST*	131 MB Fixed Disk w/1600 cpi Magnetic Tape Unit**
7974A*	1600 cpi Magnetic Tape Unit
7978A*	6250/1600 cpi Magnetic Tape Unit
7978B*	6250/1600 cpi Magnetic Tape Unit
7979A	1600 cpi Autoloading Magnetic Tape Unit
7980A	6250/1600 cpi Autoloading Magnetic Tape Unit
7980XC	6250/1600 cpi Autoloading Magnetic Tape Unit with data compression

Category 2 Tape Drives

HP Product Number	Device Driver DD*33
35401A+100*	Autochanger Cartridge Tape Subsystem
7908P/R*	16 MB Fixed Disk w/Cartridge Tape Drive
7911P/R*	28 MB Fixed Disk w/Cartridge Tape Drive
7912P/R*	65 MB Fixed Disk w/Cartridge Tape Drive
7914CT*	131 MB Fixed Disk w/Cartridge Tape Drive
7914P/R*	131 MB Fixed Disk w/Cartridge Tape Drive
7942A*	24 MB Fixed Disk w/Cartridge Tape Drive
7946A*	55 MB Fixed Disk w/Cartridge Tape Drive
9144A	67 MB Cartridge Tape Subsystem
9145A	134 MB Cartridge Tape Subsystem

Category 3 Tape Drives

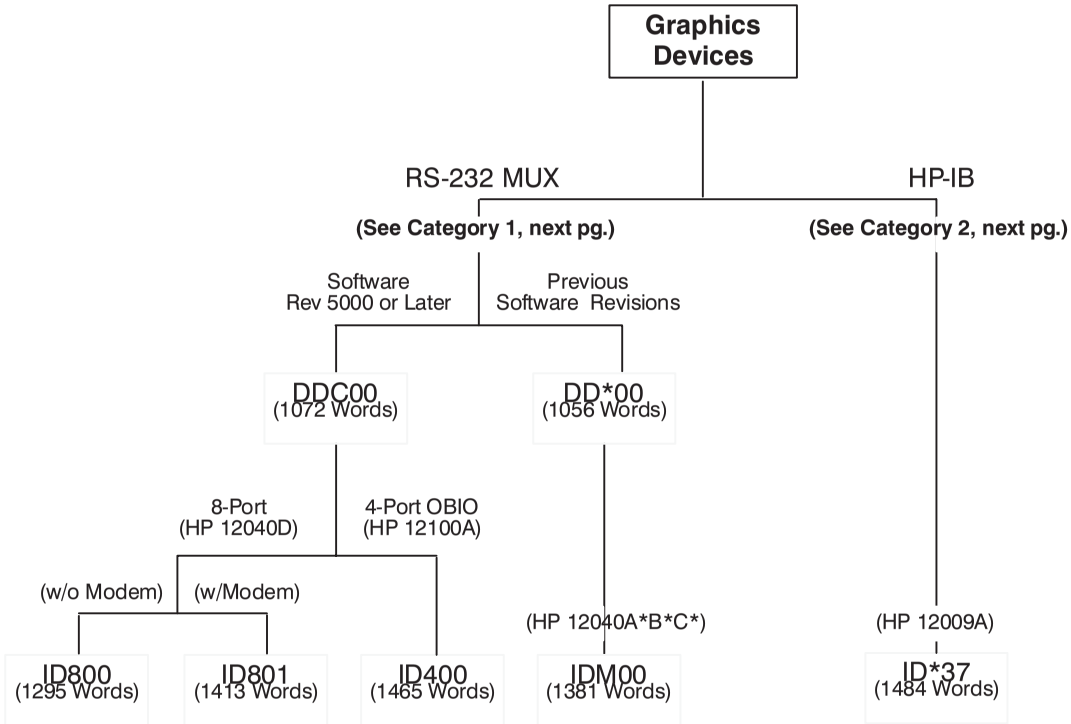
HP Product Number	Device Driver DDQ24
C1512A*	1.3 GB DDS SCSI Tape Drive
C2212A	Mass Storage System w/330 MB Fixed Disk ^
C2213A	Mass Storage System w/660 MB Fixed Disk ^
C2212A+003	Add 1.3 GB Digital Audio Tape
C2213A+003	Add 1.3 GB Digital Audio Tape

* Discontinued product; shown for referrence only.

^ Requires DDQ30 Device Driver

** The 1600 cpi magnetic tape unit in the HP 7914ST product requires a separate HP 12009A HP-IB interface and uses Device Driver DD*24.

Table 1-10. Graphics Devices by Driver Type



See notes, next page.

Table 1-10. Graphics Devices by Driver Type (continued)

Category 1 Graphics Devices

HP Product Number	Device Driver DD*00 (See NoteA below)
7440A+001 ^	Eight−pen Colorpro Plotter, A-size
7470A+001* ^	Two-pen Plotter, A-size

HP Product Number	Device Driver DDC00 (See Note B below)
7475A+001 ^	Six-pen Plotter, A/B-size
7510A* ^	Color Film Recorder, 35mm
7550A*/B ^	Eight-pen Auto Sheet Feed Plotter, A/B-size
7570A/B ^	Eight-pen Draftpro Plotter, C/D-size
7580A*/B*+060* ^	Eight-pen Drafting Plotter, A-D size
7585A*/B*+060* ^	Eight-pen Drafting Plotter, A-E size
7586A*/B*+060* ^	Eight−pen Drafting Plotter, A−E size
7595A*/B ^	DraftMaster I Plotter, single sheet feed
7596A*/B ^	Draftmaster II Plotter, sgl. sheet or roll feed
7599A ^	Draftmaster MX Multiuser sgl. sht. or roll feed

Category 2 Graphics Devices

HP Product Number	(See Notes A and B below)
7225B* ^	Plotter with 17501A HP-IB Interface
7440A+002* ^	Eight−pen Colorpro Plotter, A-size
7475A+002 ^	Six-pen Plotter, A/B-size
7510A*	Color Film Recorder, 35mm
7550A*/B ^	Eight-pen Auto Sheet Feed Plotter, A/B-size
7570A/B ^	Draftpro Plotter w/17570A HP-IB I/F, C/D-size
7580A*/B*+060* ^	Eight-pen Drafting Plotter, A-D size
7585A*/B*+060* ^	Eight-pen Drafting Plotter, A-E size
7586B+060* ^	Eight−pen Drafting Plotter, A−E size
7595A*/B ^	DraftMaster I Plotter, single sheet feed
7596A*/B ^	Draftmaster II Plotter, sgl. sheet or roll feed
7599A ^	Draftmaster MX Multiuser sgl. sht. or roll feed
9111A* ^	Graphics Tablet
9872A*/B*/S* ^	Graphics Plotter
9872C*/T* ^	Graphics Plotter

* Discontinued product; shown for reference only.

^ Supported by device handlers in the HP 92861A Graphics/1000II Device-Independent Graphics Library, version 2.0..

Note A: Device handlers for graphics devices are provided in the HP 92861A Version 2.0 Graphics/1000-II Device-Independent Graphics Library.

Note B: HP-IB connected plotters and other graphics devices are supported by HP-IB interface driver ID*37 and device handlers in the HP 92861A Version 2.0 Graphics/1000-II Device-Independent Graphics Library which is required for operation.

Table 1-11. Miscellaneous Devices by Driver Type

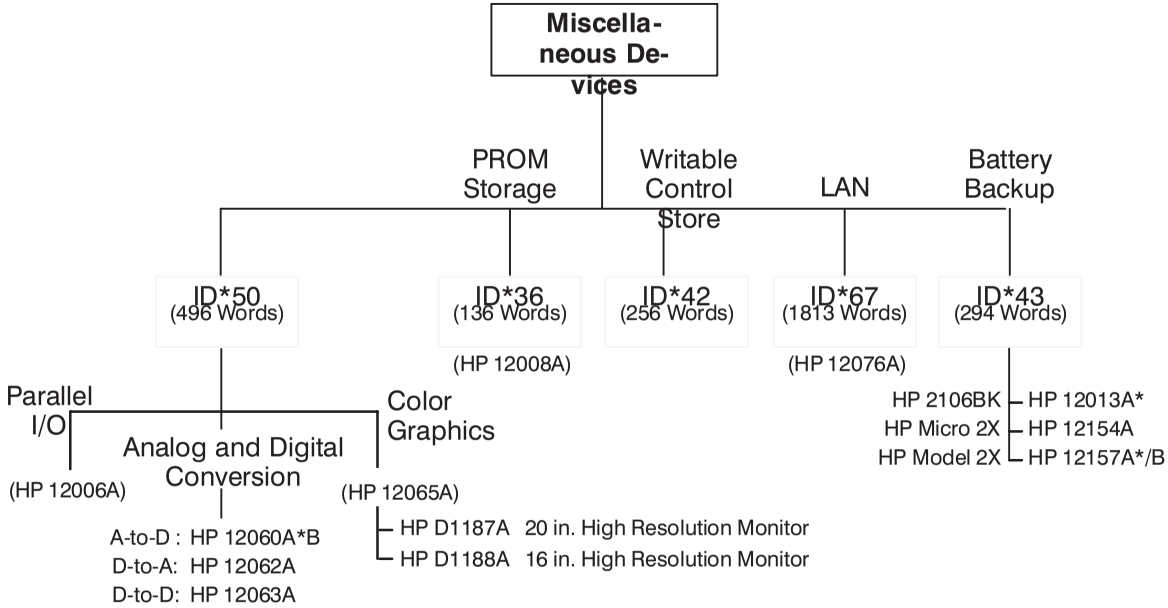


Table of Contents

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Environmental/Installation/PM

Switch Settings

A400/A600+/A900/A990 CPU; A700* Frontplane Lower Byte

The following are the switch settings for the A400 Board U1601 switches, the A600/A600+ and A990 CPU switches, the lower 8 switches on the A700 frontplane, and the A900 Data Path switches.

Boot Sel Switches (see notes on following page)

S1	S2	S3	S4	S5	S6	S7	S8	
C	C	C	C	z	y	x	M	Loop on self-test Test 2 regardless of error.
C	C	O	C	z	y	x	M	Loop on self-test Test 2 and stop on error.
C	O	O	C	z	y	x	M	Run VCP routine, for diagnostic purposes only, on completion of the microcoded self-test.
O	C	C	C	z	y	x	M	If memory lost (not sustained), run VCP; otherwise, restart program (JMP 4B). (See Note 2, 3, and 4.)
O	O	C	O	z	y	x	M	If memory lost (not sustained), speed sense and run VCP; otherwise, restart program (JMP 4B). (See Notes 2, 3, 4, and 6.)
O	C	O	C	z	y	x	M	If memory lost, boot from PROM PCA, otherwise, restart program (JMP 4B). (Note 3 and 4) (PROM sc=22; equivalent loader command is %brm)
O	O	C	C	z	y	x	M	If memory lost, boot from program from HDLC; otherwise restart prog (JMP 4B). (Note 3) (HDLC sc=24; equivalent loader command is %bds)
O	O	O	C	z	y	x	M	If memory lost, boot program from first file on disk (JMP 4B) via HP-IB or SCSI; otherwise restart program (JMP4B). SCSI sc=27, addr=6. HP-IB sc =27, addr=2. Equivalent loader cmd is %bdc.
O	C	C	O	z	y	x	M	If memory lost, boot program from first file on disk (HP 12022A), otherwise, restart program (JMP 4B) (Note 3) (12022 sc=32, addr is 0; equivalent loader command is %bdi)
C	C	C	O	z	y	x	M	If memory lost, execute bootstring from time-of-day clock RAM on A990 card, otherwise, restart program (JMP 4B). (Note 8)

where: O = Open (up);
C = Closed (down)
x = Don't care; MUST be set in DOWN position for A990.
y = C, system console uses ENQ-ACK handshake.
y = O, system console does not use ENQ-ACK handshake.
z = C, Normal Mode, BREAK Enabled on VCP console.
z = O, BREAK disabled. (VCP console won't halt CPU).
M = C, Disable Auto-restart, battery backup not installed.
M = O, Enable Auto-restart, battery backup installed.

NOTES:

* Discontinued product; shown for reference only

1. All settings except speed sense option are true for the following VCP ROMs:

   A600/A600+ = 12102-80003/4 = 5180-4253/54 = 5180-4263/64
   A700 = 12152-80039/40/41/42 = 12152-80043/44/45/46
   = 12152-80058/59/60/61
   A900 [1] = 12203-80007/8 = 12203-80009/10 = 12203-80012/13
   A900 [2] = 5180-4253/4 = 5180-4263/4

   [1] old cache control card (12203-60002)
   [2] new cache control card (12203-60011) for I/O Extender support

   Previous VCP ROMs had S5 = don't care and S4 = closed for BREAK enabled, open for BREAK disabled. Auto-boot from 12022A is not possible with earlier (prior to 4001) VCP ROMs.

2. Speed sense allows VCP to execute at any supported baud rate on the A400 on-board I/O or the 8-channel rev 'D' MUX (software rev 4010 or higher). The speed sense option can only be used with VCP rev 4020 or higher. Refer to the VCP firmware history for each CPU in Chapter 8 for ROM part numbers.

   Speed sense and autoboot cannot be selected together

3. When a loader finishes an auto-boot, it starts execution of the loaded program at location 02.

4. If the auto-restart feature is disabled (switch S8 closed), the program cannot restart and the boot loader (or VCP routine) will execute.

5. Do not use any switch combination that is not shown above.

6. Use this switch configuration for normal computer operation.

7. The VCP command RS can be used to read all switch settings, except S7 and S8, as follows:

   Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
   Boot Sel. Switch: S6 S5 S4 S3 S2 S1
   where: 0 = switch closed; 1 = switch open

8. This switch setting is only available on the A990.

A400 On-Board I/O Switch (U1001)

The on-board I/O is capable of communicating with RS-232, RS-422, or RS-423 protocol. Each of the four on-board I/O ports is capable of independent configuration selecting one of these standards. Modem control is supported on Ports B and C in either V.28 or RS-232 protocol.

All four ports communicate to the peripherals through the edge connector J2 via a 2-meter cable. At the end of the cable there are four 25-pin connectors on a breakout panel. Each of these connectors will support all three electrical standards, however, RS-422/423 requires an RS-449 connector. An adaptor cable with an RS-449 connector must be fabricated by the customer. Refer to the Installation and Service Manual for your computer for information on the adaptor cable.

The U1001 switches on the A400 board configure the ports for RS-232 or RS-422/RS-423 (switches S1 through S4), configure modem control for V.28 or RS-232 (switches S5 and S6), and determine if Port A will be the VCP interface (switch S7). Note that if modem control is desired, switches S2 and/or S3 (port B and C, respectively) must be configured as RS-232 in addition to setting switches S5 and S6 for V.28 or RS-232.

The select code of the four on-board I/O ports is 77 octal and cannot be changed.

A400 U1001 Switch Settings

Switch	I/O Port Controlled	Definition
S1	A	Open = RS-422/RS-423; Closed = RS-232.
S2	B	Open = RS-422/RS-423; Closed = RS-232.
S3	C	Open = RS-422/RS-423; Closed = RS-232.
S4	D	Open = RS-422/RS-423; Closed = RS-232.
S5	C	Open = V.28; Closed = RS-232. You must also set switch S3 for RS-232 when using Port C for Modem control.
S6	B	Open = V.28; Closed = RS-232. You must also set switch S2 for RS-232 when using Port B for Modem control.
S7†	A	Open = does not operate as VCP; Closed = does operate as VCP.
† Note that only Port A can be used as the VCP interface.		

A400 On-Board I/O Cable Switches

There are two switches on the breakout panel of the A400 on-board I/O cable. One switch configures port B and the other switch configures port C. They should be set as follows (note that the two ports are independently configurable):

DCE position – when connecting a *terminal* to the port.

DTE position – when connecting a *modem* to the port.

These switches reverse the transmit and receive lines. Refer to the Installation and Service Manual for your computer for more information.

A700* Frontplane Upper Byte Switch Settings

The following are the switch settings for the upper eight switches on the A700* frontplane:

A700* Front Plane Upper Switch Settings

Switch Setting	Meaning
C C C C C x x x	Normal mode, go to VCP pretest.
O x x x x x x x	Loop on Lower Processor selftest.
C O x x x x x x	Loop on Upper Processor selftest.
C C O x x x x x	Loop on Memory Controller selftest.
C C C O x x x x	Loop on Floating Point self-test (if installed)
C C C C O x x x	Enable diagnostic window. This setting is used for microcode debugging only. It reduces effective CPU speed by 70%.

where: O = Open
C = Closed
x = don't care

A900 Sequencer Switch Settings

The sequencer card switches are set to match the size of the base set PROMs installed on the sequencer card. The card currently has 2k PROMs and switches U204S1−S5 are all closed.

* Discontinued product; shown for reference only.

A700* Floating Point Processor

The following switch settings are for the 12156-60001 floating point processor:

Switch	Meaning
1 − 3	User ROM 2k Address (open = 1, closed = ∅)
4	User ROM enable − Closed to enable
5†	Jump table overlay enable − Closed to enable
6†	Fixed ROM (FPP/VIS/SIS) enable − Closed to enable
7 − 8	Don't care

The factory switch setting for the card is as follows:

S1−8 = O O O O C C O O

where O = Open, C = Closed

A700* Writable Control Store

The switch pack on the 12153-60001 Writable Control Store Card is used to set the select code of the card as follows:

Switches							
S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**
O	x	<		select code			>

where: O = Open (up) = logic 1
C = Closed (down) = logic ∅
X = don't care

* Discontinued product; shown for reference only.

† These switches must be closed to enable use of the hardware floating point processor with the Floating Point/VIS/SIS firmware

A700* PROM Control Store

The 12155-60001 PROM Control Store card can be physically configured for 1k through 8k of PROM storage, installed in addressable banks of 1k each. At installation, each 1k bank must be address-mapped as a 1k logical module within the computer control store address scheme, using the eight PROM bank address switches located on the PCS card.

NOTE

All empty PROM banks must have switch 5 in the OFF position, which disables that bank. A loaded PROM bank can also be disabled by placing switch 5 in the OFF position.

A700* PROM Control Store Card Configuration Switch Settings

Logical Module Number	Logical Module Address Blocks			PROM Bank Map Switch †				
	Decimal	Octal	Hex	5	4	3	2	1
0	0-1023	0-1777	0-3FF	ON	Ø	Ø	Ø	Ø
1	1024-2047	2000-3777	400-7FF	ON	Ø	Ø	Ø	1
2	2048-3071	4000-3777	800-BFF	ON	Ø	Ø	1	Ø
3	3072-4095	6000-7777	C00-FFF	ON	Ø	Ø	1	1
4	4096-5119	10000-11777	1000-13FF	ON	Ø	1	Ø	Ø
5	5120-6143	12000-13777	1400-17FF	ON	Ø	1	Ø	1
6	6144-7167	14000-15777	1800-1BFF	ON	Ø	1	1	Ø
7	7168-8191	16000-17777	1C00-1FFF	ON	Ø	1	1	1
8	8192-9215	20000-21777	2000-23FF	ON	1	Ø	Ø	Ø
9	9216-10239	22000-23777	2400-27FF	ON	1	Ø	Ø	1
10	10240-11263	24000-25777	2800-2BFF	ON	1	Ø	1	Ø
11	11264-12287	26000-27777	2C00-2FFF	ON	1	Ø	1	1
12	12288-13311	30000-31777	3000-33FF	ON	1	1	Ø	Ø
13	13312-14335	32000-33777	3400-37FF	ON	1	1	Ø	1
14	14336-15359	34000-35777	3800-3BFF	ON	1	1	1	Ø
15	15360-16383	36000-37777	3C00-3FFF	ON	1	1	1	1

† On = 0 = closed
Off = 1 = open

* Discontinued product; shown for reference only.

A900 Control Store

The following are the switch settings for the 12205-60001 Control Store card:

U1 Switches							
S1	S2	S3	S4	S5	S6	S7	S8
x	x	<		select code			>

where: Open (up) = logic 1
Closed (down) = logic Ø
X = don't care

If you have installed PROMs on the CS card, it is necessary to select a bank address for the PROMs. The PROM bank address is set by switches U0201S1-S8 on the CS card, and the address must be appropriate for the microprogram addresses in the PROMs.

PCS Address Select for 2k PROMs

Module Number	Control Store Addresses			U0201 Switch†			
	Decimal	Octal	Hex	S4	S5	S6	S8
0	0-2047	000000-003777	0-7FF	Ø	Ø	Ø	Ø
1	2048-4095	004000-007777	800-FFF	Ø	Ø	Ø	1
2	4096-6143	010000-013777	1000-17FF	Ø	Ø	1	Ø
3	6144-8191	014000-017777	1800-1FFF	Ø	Ø	1	1
4	8192-10239	020000-023777	2000-27FF	Ø	1	Ø	Ø
5	10240-12287	024000-027777	2800-2FFF	Ø	1	Ø	1
6	12288-14335	030000-033777	3000-37FF	Ø	1	1	Ø
7	14336-16383	034000-037777	3800-3FFF	Ø	1	1	1
8	16384-18431	040000-043777	4000-47FF	1	Ø	Ø	Ø
9	18432-20479	044000-047777	4800-4FFF	1	Ø	Ø	1
10	20480-22527	050000-053777	5000-57FF	1	Ø	1	Ø
11	22528-24575	054000-057777	5800-5FFF	1	Ø	1	1
12	24576-26623	060000-063777	6000-67FF	1	1	Ø	Ø
13	26624–28671	064000-067777	6800-6FFF	1	1	Ø	1
14	28672-30719	070000-073777	7000-77FF	1	1	1	Ø
15	30720-32767	074000-077777	7800-7FFF	1	1	1	1

†1 = open (up)

Ø = closed (down)

Notes: Switches U0201S1-S2 must be open; and switches U0201S3 and S7 must be closed.

Switch U0201S9 must be closed to enable the PCS, and open to disable the PCS.

Switch U0201S10 may be set to either position (don't care)

A400 Micro 14 (6-Slot) Factory Switch Settings

HP 2424A

Card	Switch Settings		
A400 Board 12100-60001	U1601 U1001	= =	OOCOCCCC all closed
HP-IB Interface 12009-60020 † •	U16S1-8 U1	= =	all closed OCCOCOOO
SCSI Interface 12016-60101 † •	SW1 SW2	= =	OCCOCOOO CCCCCOOO

where: O = Open (up)
C = Closed (down)

† This interface not included with Micro 14 product.

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB.

A400 Micro/1000 (16-Slot) Factory Switch Settings

HP 2484B

Card	Switch Settings		
A400 Board 12100-60001	U1601 U1601 U1001	= = =	OOCOCCCM OCCOCCCM ‡ all closed
Disk Drive Interface 12022-60008 *† (optional)	U1 U1605	= =	CCCOOCOC CCCOCCCO (10 Mb) CCCOCCOC (15 Mb) CCCOOCCO (20 Mb)
HP-IB Interface 12009-60020 •	U16S1-8 U1	= =	all closed (down) OCCOCOOO
SCSI Interface 12016-60101 † •	SW1 SW2	= =	OCCOCOOO CCCCCOOO

where: M = C if battery backup not installed;
O if battery backup installed.
O = Open (up)
C = Closed (down)

† This interface not included with Micro 24 product.

‡ With optional internal disk

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB card.

* Discontinued product; replaced by 12009-60020 HPIB card.

A600+ Model 6* (8-Slot) Factory Switch Settings

HP 2186B*

Card	Switch Settings
Memory Controller HP 12102A*/B	S1 = NORM ‡
Processor HP 12101A or HP 12105A	U1 = OCCCCCM
Minifloppy Drive Controller HP 12021A	S2 = CCCCOCOC
HP-IB Interface 12009-60020 •	U1651-8 = all closed (down) U1 = OCCOCOOO
SCSI Interface 12016-60101 † •	SW1 = OCCOCOOO SW2 = CCCCCOOO
Async Serial IF 12005-60012	U21 = OOOOCCCX U1 = CCCOCCCC
Battery Backup HP 12013A	S1 = ON

where: M = C if battery backup not installed;
O if battery backup installed.
O = Open (up)
C = Closed (down)
X = Don't Care

† This interface not included with Model 6 product.

‡ Memory Controller switch set to BATT if Battery Backup option is installed, NORM if not installed.

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB card.

A600+ Micro 16 (6-Slot) Factory Switch Settings

HP 2426E*/F*

Card	Switch Settings	
Processor HP 12105A	U1 switches	= OCCCCCCC
Memory Controller HP 12102 or 12110	S1	= NORM‡
Async Serial IF 12005-60012 †	U21 switches U1 switches	= OOOOCCCX = CCCOCCCC
HP-IB Interface 12009-60020 † •	U16S1-8 U1	= all closed (down) = OCCOCOOO
SCSI Interface 12016-60101 † •	SW1 SW2	= OCCOCOOO = CCCCCOOO
MUX Card HP 12040B*/C/D	U1 switches	= COCOCCOO

where: O = Open (up)
C = Closed (down)
X = Don't Care

† This interface not included with Micro 16 product.

‡ Battery Backup not available on Micro 16 product.

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB card.

* Discontinued product; shown for reference only.

A600+ Micro/1000 (16-Slot) Factory Switch Settings

HP 2486C

Card	Switch Settings	
Mem Controller HP 12102A*/B or 12110A*/B	S1	= NORM ‡
Processor HP 12105A	U1	= OCCCCCCM
	U1	= OCCOCCCM **
Disk Drive Interface 12022-60008* † (optional)	U1	= CCCOOCOC
	U1605	= CCCOCCCO (10 Mb) CCCOCCOC (15 Mb) CCCOOCCO (20 Mb)
HP-IB Interface 12009-60020 •	U16S1-8	= all closed (down)
	U1	= OCCOCOOO
SCSI Interface 12016-60101 † •	SW1	= OCCOCOOO
	SW2	= CCCCCOOO
Async Serial IF 12005-60012 †	U21	= OOOOCCCX
	U1	= CCCOCCCC
MUX Card HP 1240B*/C/D	U1	= COCOCCOO

where: M = C if battery backup not installed;
O if battery backup installed.
O = Open (up)
C = Closed (down)
X = Don't Care

** With optional internal disk

† This interface not included with Micro 26 product.

‡ Mem Controller switch set to BAT if Battery Backup is installed, NORM if not.

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB card.

A600+ Model 26 (20-Slot) Factory Switch Settings

HP 2196D*

Card	Switch Settings	
Mem Controller HP 12102A*/B or HP 12110A*/B	S1	= BAT
Processor 12105A	U1	= OCCCCCCM
HP-IB Interface 12009-60020 •	U16S1-8	= all closed (down)
	U1	= OCCOCOOO
Async Serial IF 12005-60012	U21	= OOOOCCCX
	U1	= CCCOCCCC
SCSI Interface 12016-60101 † •	SW1	= OCCOCOOO
	SW2	= CCCCCOOO

where: M = C if battery backup not installed;
O if battery backup installed.
O = Open (up)
C = Closed (down)
X = Don't Care

† This interface not included with Model 26 product.

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB card.

* Discontinued product; shown for reference only.

A700* Micro/1000 (16-Slot) Factory Switch Settings

HP 2487B*

Card	Switch Settings
Frontplane 12160-60001	Boot Sel & M = OCCCCCCM Boot Sel & M = OCCOCCCM ‡ SLFTST = all closed
Disk Drive Interface 12022-60008*† (optional)	U1 = CCCOOCOC U1605 = CCCOCCCO (10 Mb) CCCOCCOC (15 Mb) CCCOOCCO (20 Mb)
HP-IB Interface 12009-60020•	U16S1-8 = all closed (down) U1 = OCCOCOOO
SCSI Interface 12016-60101†•	SW1 = OCCOCOOO SW2 = CCCCCOOO
Async Serial IF 12005-60012†	U21 = OOOOCCCX U1 = CCCOCCCC
MUX Card HP 12040B*/C/D	U1 = COCOCCOO

where: M = C if battery backup not installed;
O if battery backup installed.

O = Open (up)
C = Closed (down)

† This interface not included with Micro 27 product.
‡ With optional internal disk.

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP–IB card.

A700* Model 27 (20-Slot) Factory Switch Settings

HP 2197C*/D*

Card	Switch Settings
Frontplane 12156-60002	Boot Sel & M = OCCCCCCM SLFTST = all closed
Floating Point 12156-60001	OOOUJF = OOOOCC
HP-IB Interface 12009-60020•	U16S1-8 = all closed (down) U1 = OCCOCOOO
SCSI Interface 12016-60101†•	SW1 = OCCOCOOO SW2 = CCCCCOOO
Async Serial IF 12005-60012	U21 = OOOOCCCX U1 = CCCOCCCC

where: M = C if battery backup not installed;
O if battery backup installed.

O = Open (up)
C = Closed (down)
X = Don't Care

† This interface not included with Model 27 product.

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB card.

* Discontinued product; shown for reference only.

A900 Micro/1000 (16-Slot) Factory Switch Settings

HP 2489B

Card	Switch Settings
Data Path 12202-60001	Boot Sel & M = OCCOCCCM ‡ Boot Sel & M = OCCCCCCM
Sequencer 12201-60001	U0204S1-5 = CCCCC
Disk Drive Interface 12022-60008 (optional)	U1 = CCCOOCOC U1605 = CCCOCCCO (10 Mb) = CCCOCCOC (15 Mb) = CCCOOCCO (20 Mb)
HP-IB Interface 12009-60020 •	U16S1-8 = all closed (down) U1 = OCCOCOOO
SCSI Interface 12016-60101† •	SW1 = OCCOCOOO SW2 = CCCCCOOO
Async Serial IF 12005-60012†	U21 = OOOOCCCX U1 = CCCOCCCC
MUX Card HP 12040B*/C/D	U1 = COCOCCOO

where: M = C if battery backup not installed;
O if battery backup installed.

O = Open (up)
C = Closed (down)
X = Don't Care

† This interface not included with Micro 29 product.
‡ With optional interface disk

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB card.

* Discontinued product; shown for reference only

A900 Model 29 (20-Slot) Factory Switch Settings

HP 2199E

Card	Switch Settings
Data Path 12202-60001	Boot Sel & M = OCCCCCCM
Sequencer 12201-60001	U0204S1-5 = CCCCC
HP-IB Interface 12009-60020 •	U16S1-8 = all closed (down) U1 = OCCOCOOO
SCSI Interface 12016-60101† •	SW1 = OCCOCOOO SW2 = CCCCCOOO
Async Serial IF 12005-60012†	U21 = OOOOCCCX U1 = CCCOCCCC

where: M = C if battery backup not installed;
O if battery backup installed.

O = Open (up)
C = Closed (down)
X = Don't Care

† This interface not included with Model 29 product.

• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP–IB card.

A990 Factory Switch Settings (16- and 20-Slot)

HP 29x9A

Card		Switch Settings
Processor	12990-60202 or 12990-60102‡	SW2 = OOOCZYCM
HP-IB Interface	12009-60020 •	U16S1-8= All closed U1 = OCCOCOOO
SCSI Interface	12016-60101† •	SW1 = OCCOCOOO SW2 = CCCCCOOO
Async Serial Interface	12005-60012 †	U21 = OOOOCCCX U1 = CCCOCCCC
Multiplexer	HP 12040B*/C/D †	U1 = COCOCCOO

where: O = Open (up).
C = Closed (down).

M = C if battery backup not installed.
= O if battery backup installed.

Y = C when system console uses ENQ-ACK handshaking (normal mode).
= O when system console does not use ENQ-ACK handshaking.

Z = C normal mode, break enabled.
= O break enabled (but not halts).

† This interface not included with Micro 99 or Model 99 product.

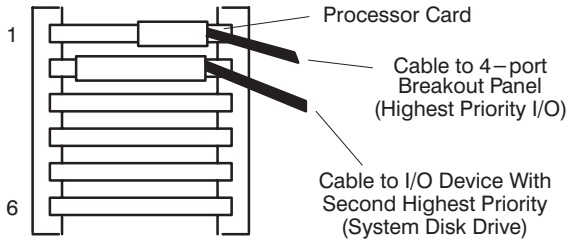
• No two cards can have same sc when used in same system; boot sc is shown for both SCSI and HP-IB card.

‡ Standard processor card (and upgrade processor card from A400, A600+, and A700) part no. is 12990-60202. Upgrade, from A900, processor card part no. is 12990-60102.

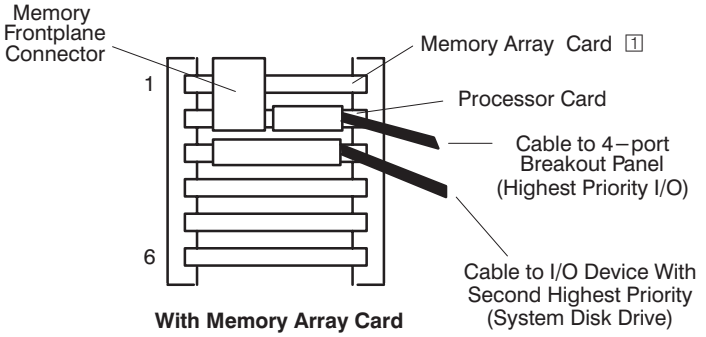
* Discontinued product: shown for reference only.

Typical Card Placement and Cabling

A400 6-Slot Computer Cards and Priority Diagram



Without Memory Array Card

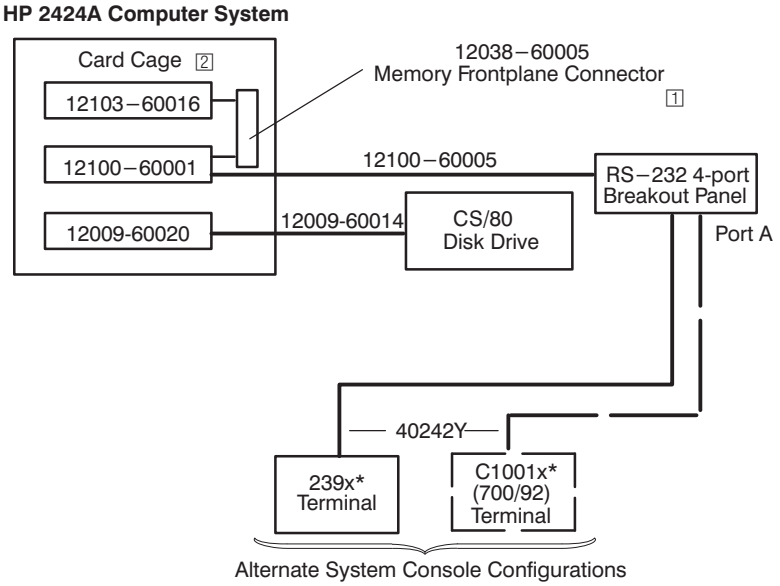


With Memory Array Card

Notes:

1 Up to four memory array cards are supported.

A400 6-Slot Computer Cabling Diagram (With External CS/80 Disk)



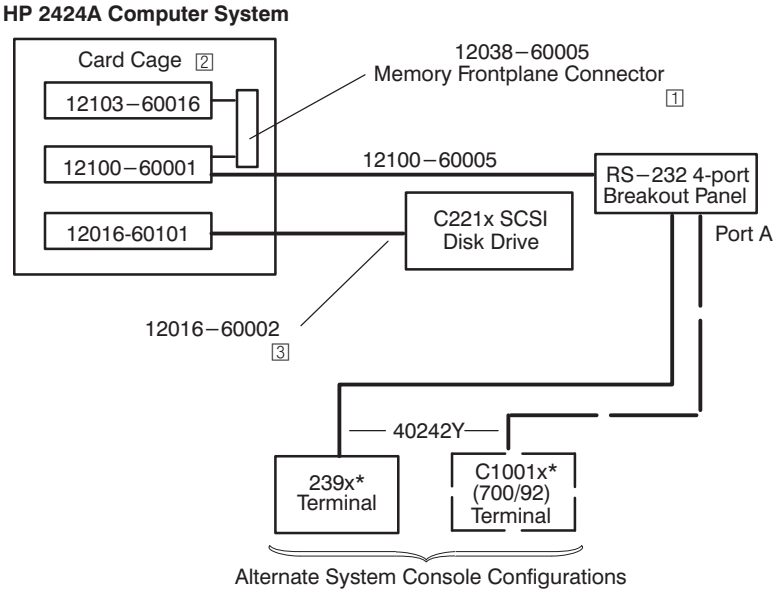
Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

2 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...Computer Cards and Priority Diagram" for this information.

A400 6-Slot Computer Cabling Diagram (With External SCSI Disk)



Notes:

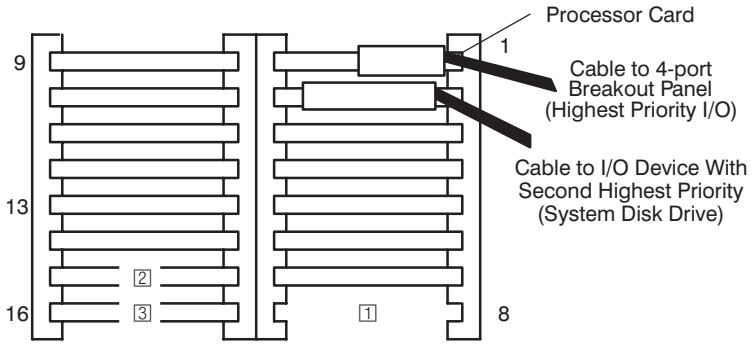
* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

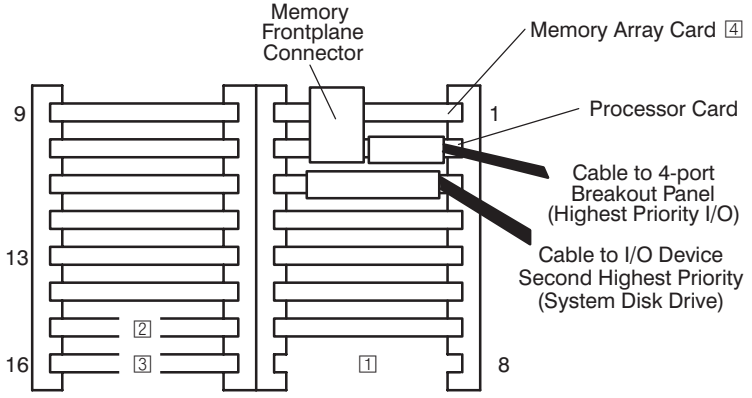
2 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...Computer Cards and Priority Diagram" for this information.

3 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A400 16-Slot System Cards and Priority Diagram



Without Memory Array Card



With Memory Array Card

Notes:

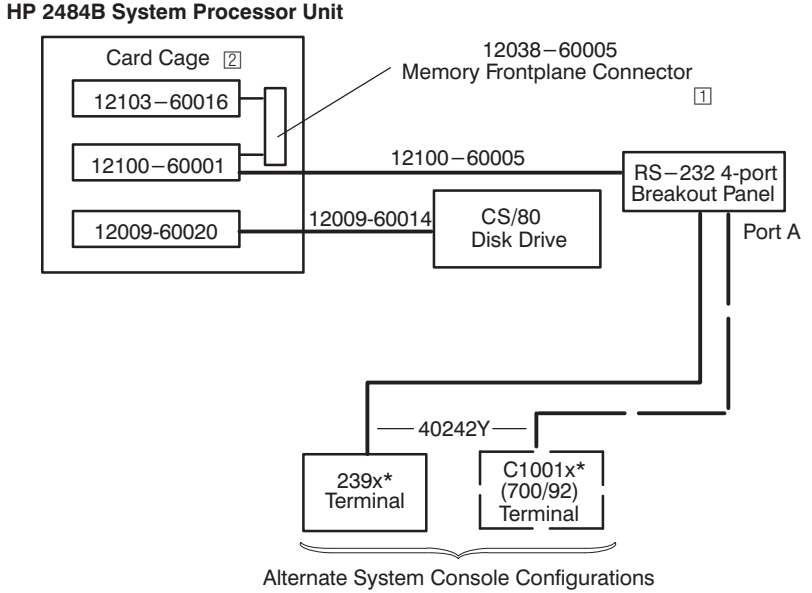
1 Slot 8 is reserved for the optional HP 12159A 25 kHz Power Module. If not installed, this slot must remain unoccupied.

2 Slot 15 is the lowest priority I/O card if optional HP 12154A Battery Backup Card is not installed. If the battery backup card is installed, see note 3.

3 Slot 16 is reserved for the HP 12154A Battery Backup Card which, when used, extends into the space occupied by slots 14 and 15. This makes slot 13 the lowest priority I/O card slot. If the battery backup card is not installed, a voltage jumper card (part no. 02430-60009) must be installed in slot 16.

4 Up to four memory array cards are supported.

A400 16-Slot System Cabling Diagram (With External CS/80 Disk)



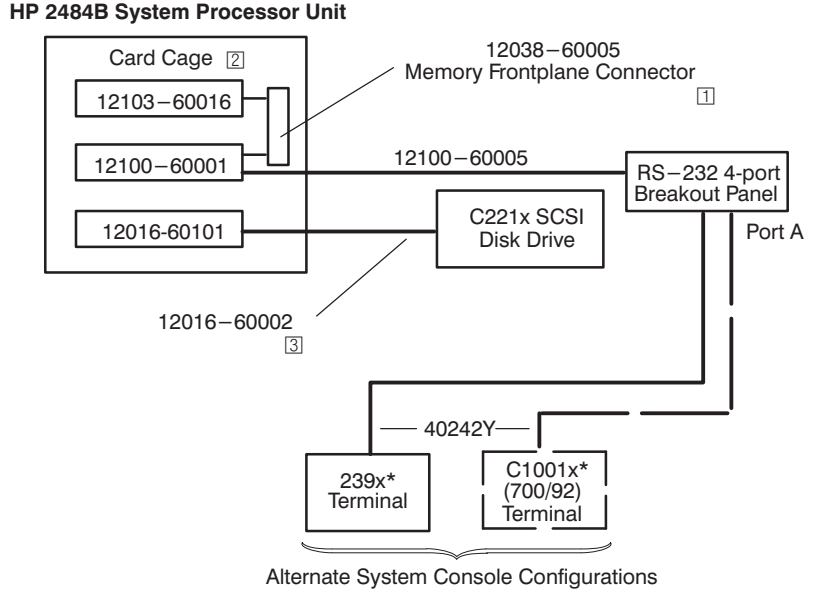
Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

2 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A400 16-Slot System Cabling Diagram (With External SCSI Disk)



Notes:

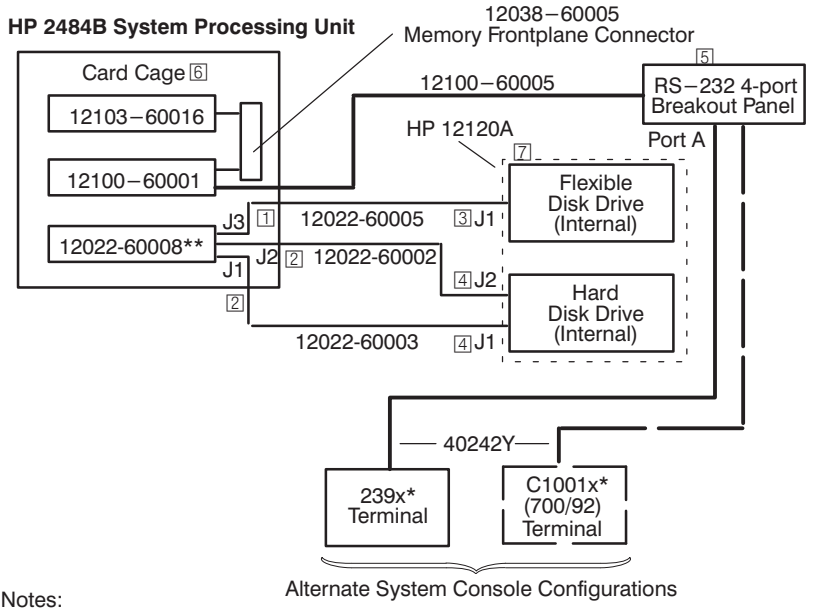
* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

2 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

3 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A400 16-Slot System Cabling Diagram (With Internal Disk - HP 12022A** Interface)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

** Replaced by HP 12009A interface (HP 12122A disk subsystem); see next page.

1 The flexible disk drive ribbon cable must be connected to the HP 12022A Card (part no. 12022-60008) so that its red stripe is on the right side as you face the rear of the computer.

2 The hard disk drive ribbon cable must be connected to the HP 12022A Card (part no. 12022-60008) so that its red stripe is on the right side as you face the rear of the computer.

3 The flexible disk drive ribbon cable must be connected to the HP 12120A Disk Drive so that its red stripe is on the right as you face the front of the computer

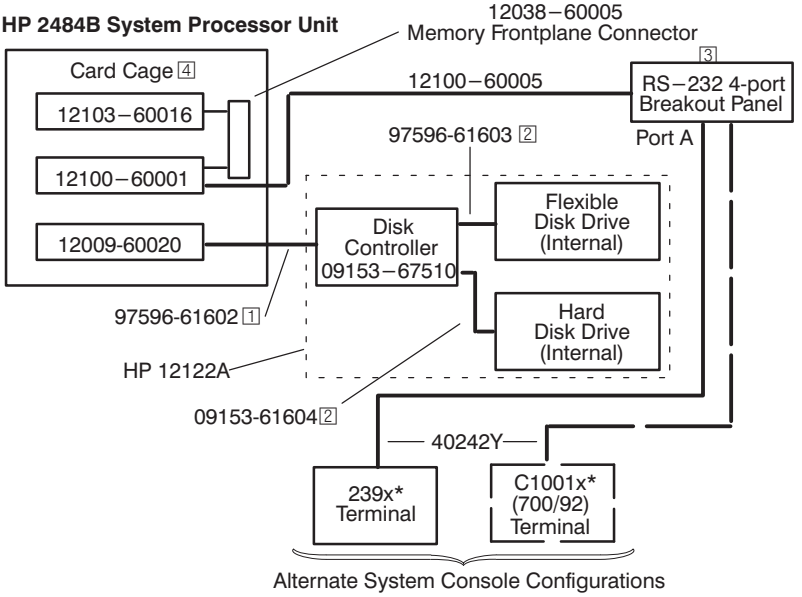
4 The hard disk drive ribbon cables must be connected to the HP 121220A Disk Drive so that its red stripe is on the left as you face the front of the computer

5 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

6 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

7 HP 12120A is a 20 MB hard disk drive (with flexible disk drive included). A 15 MB and 10 MB hard disk drive device (both with flexible disk drive included) also existed as HP 2484A*, opt. 111 and opt 110 respectively

A400 16-Slot System Cabling Diagram (With Internal Disk - HP 12009A Interface)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

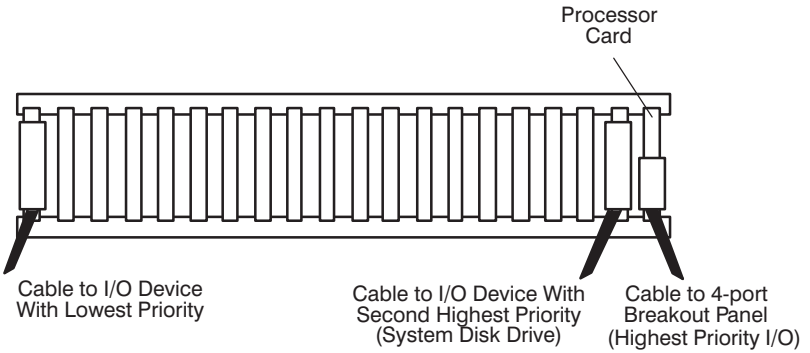
1 The HB-IB ribbon cable must be connected to the HP 12009A Card (part no. 12009-60020) so that its red stripe is on the right side as you face the rear of the computer.

2 When connecting the ribbon cable to the connector on the disk controller card, make sure that you line up the triangle on the side of the connector

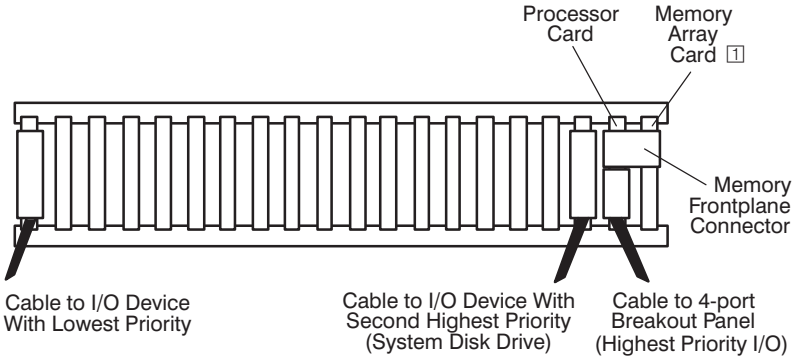
3 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A400 20-Slot System Cards and Priority Diagram



Without Memory Array Card

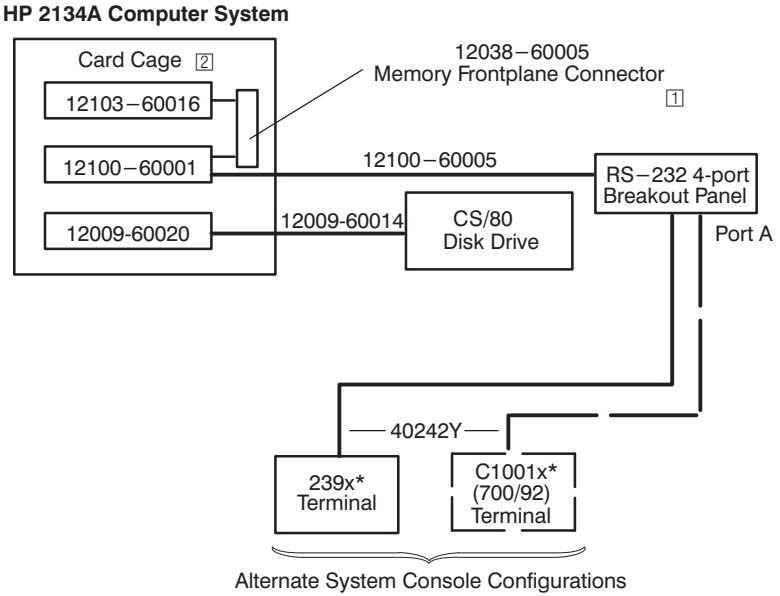


With Memory Array Card

Notes:

1 Up to four memory array cards are supported.

A400 20-Slot System Cabling Diagram (With External CS/80 Disk)



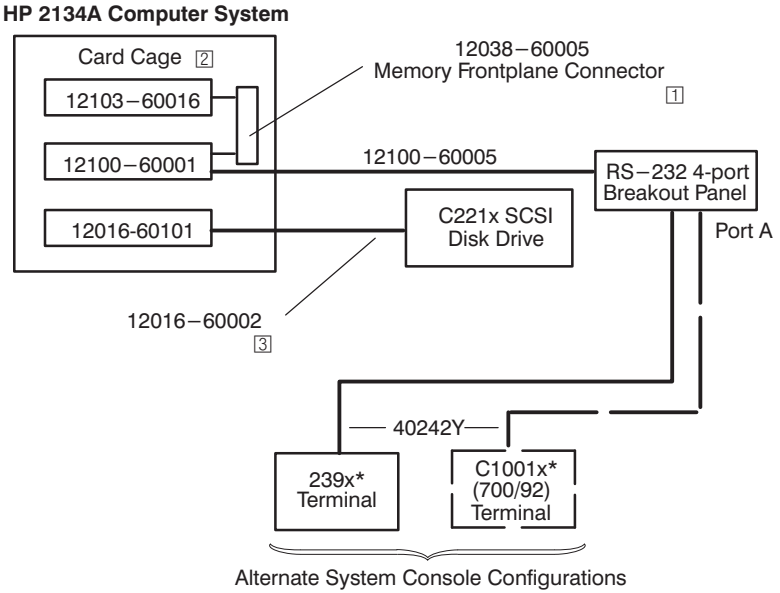
Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

2 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A400 20-Slot System Cabling Diagram (With External SCSI Disk)



Notes:

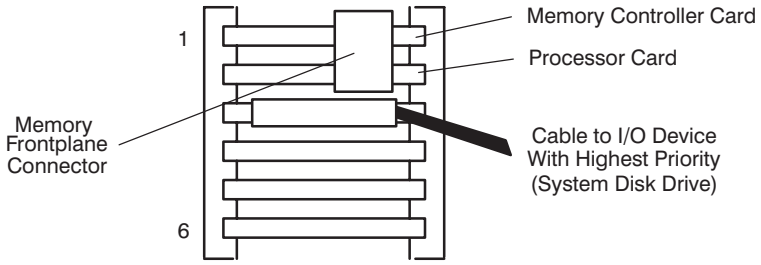
* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

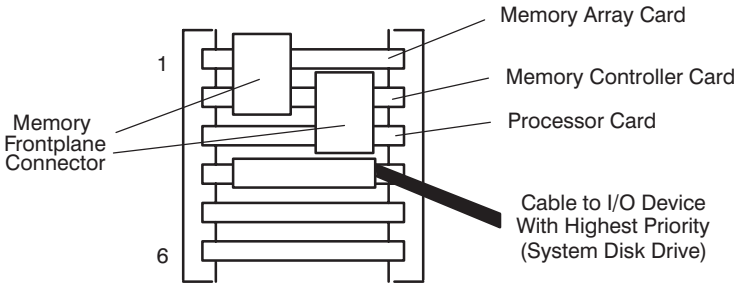
2 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

3 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A600+ 6-Slot Computer Cards and Priority Diagram

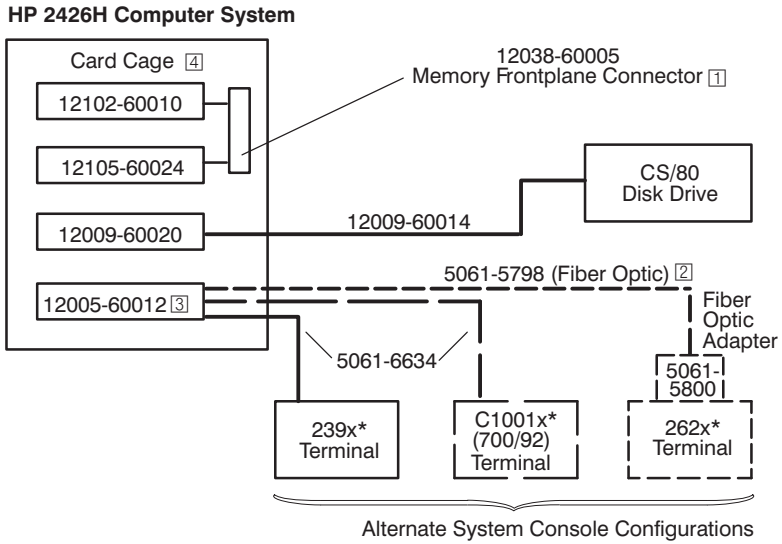


Without Memory Array Card



With Memory Array Card

A600+ 6-Slot Computer Cabling Diagram (With External CS/80 Disk)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

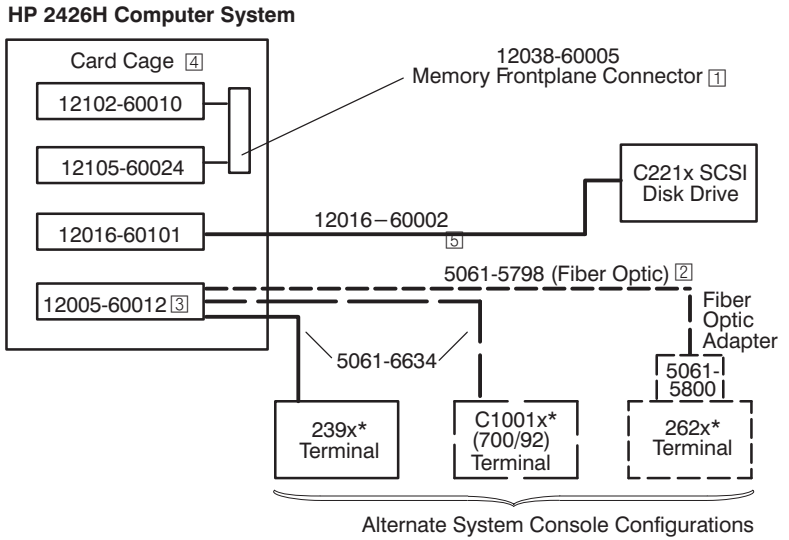
1 Memory array cards must be located directly above the memory controller card. A second 12038−60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connector must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 If HP 12040 MUX card is installed in lieu of 12005-60012 ASIC card, refer to MUX manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...Computer Cards and Priority Diagram" for this information.

A600+ 6-Slot Computer Cabling Diagram (With External SCSI Disk)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 Memory array cards must be located directly above the memory controller card. A second 12038−60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connector must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

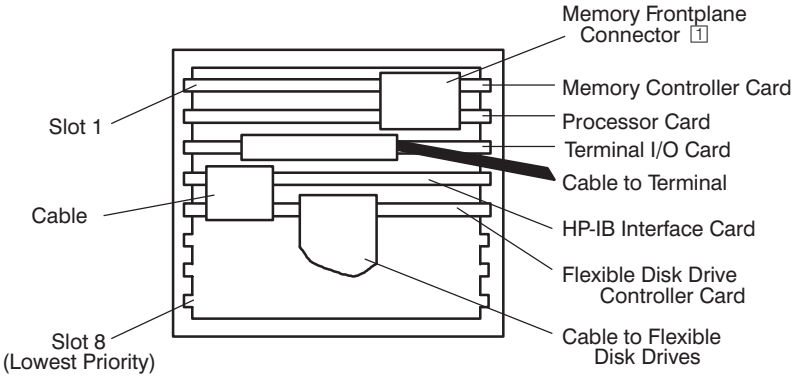
3 If HP 12040 MUX card is installed in lieu of 12005-60012 ASIC card, refer to MUX manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...Computer Cards and Priority Diagram" for this information.

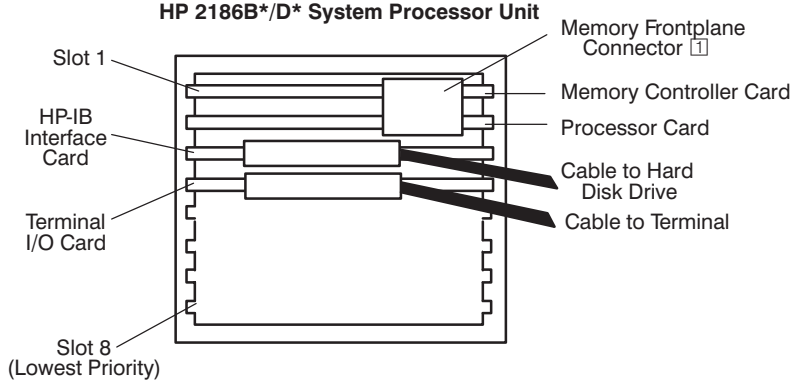
5 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A600+ Model 6* (8-Slot) System Cards and Priority Diagram

HP 2186A*/C* System Processor Unit



HP 2186B*/D* System Processor Unit

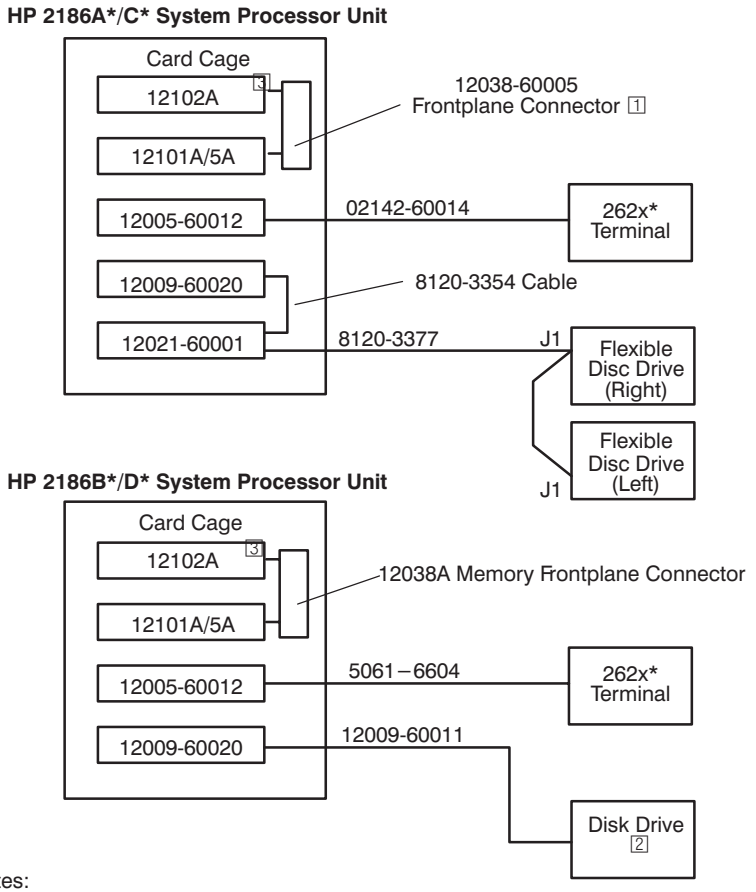


Notes:

* Discontinued product; shown for referrence only

1 See the "A600+ 20-slot System Cards and Priority Diagram" (With Memory Array Card) for an additional memory array card configuration.

A600+ Model 6* (8-Slot) System Cabling Diagram



Notes:

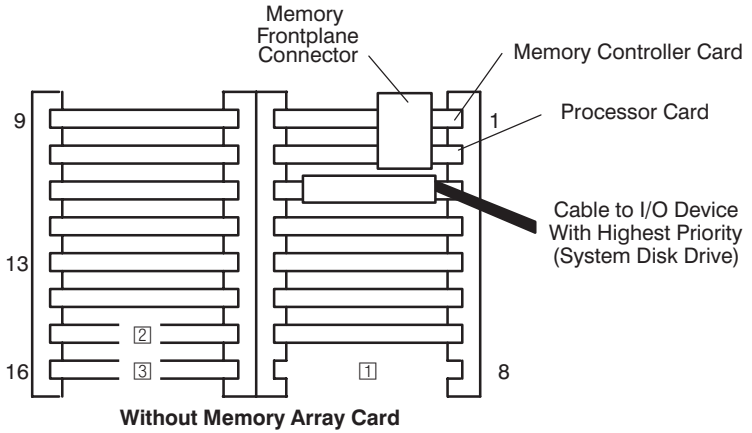
* Portions or all of this product line are discontinued; shown for referrence only

1 Memory array cards must be located directly above the memory controller card. A second 12038−60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connectore must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

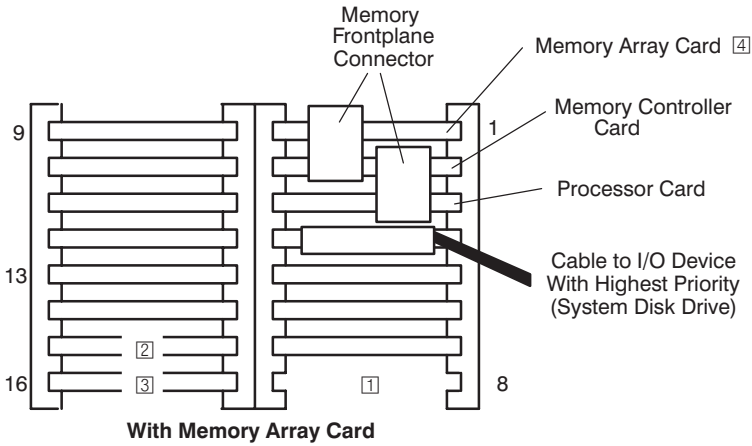
2 If you have a hard disk (for example, HP 7908) as the system disk, it is recommended that the HP-IB interface card be placed above all other I/O cards. (For the HP 2186A/C SPU, the HP 12021 card should always be the lowest card in the card cage.

3 This diagram may not indicate the proper priority placement of cards in the card cage; see preceding "...System Cards and Priority Diagram" for this information.

A600+ 16-Slot System Cards and Priority Diagram



Without Memory Array Card



With Memory Array Card

Notes:

1 Slot 8 is reserved for the optional HP 12159A 25 kHz Power Module. If not installed, this slot must remain unoccupied.

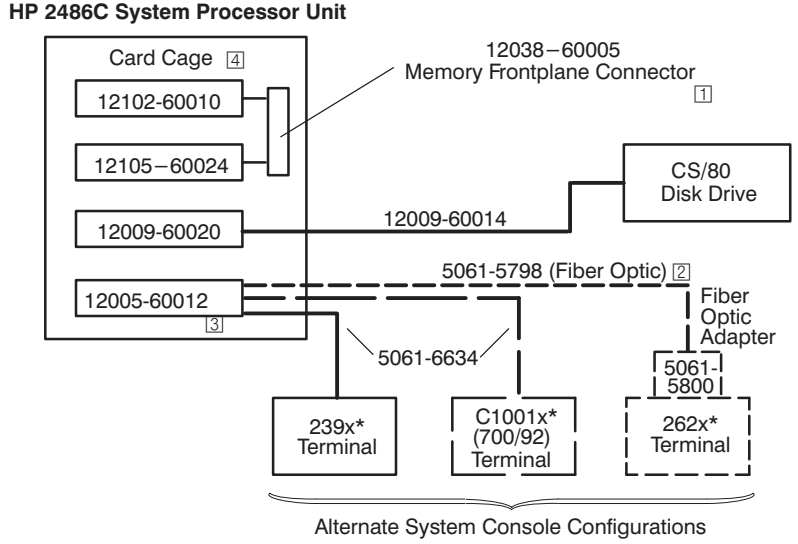
2 Slot 15 is the lowest priority I/O card if optional HP 12154A Battery Backup Card is not installed. If the battery backup card is installed, see note 3.

3 Slot 16 is reserved for the HP 12154A Battery Backup Card which, when used, extends into the space occupied by slots 14 and 15. This makes slot 13 the lowest priority I/O card slot. If the battery backup card is not installed, a voltage jumper card (part no. 02430-60009) must be installed in slot 16.

4 Up to four memory array cards are supported.

L8500-45A

A600+ 16-Slot System Cabling Diagram (With External CS/80 Disk Drive)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

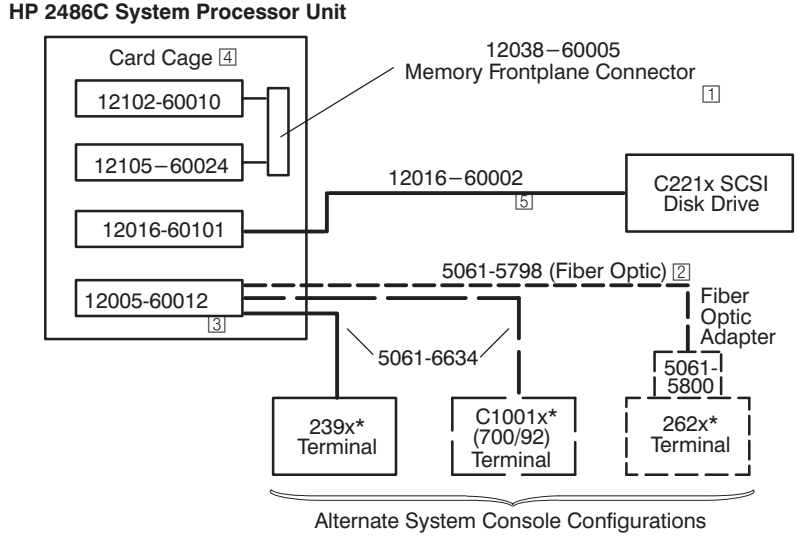
1 Memory array cards must be located directly above the memory controller card. A second 12038−60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connector must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A600+ 16-Slot System Cabling Diagram (With External SCSI Disk Drive)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 Memory array cards must be located directly above the memory controller card. A second 12038−60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connectore must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

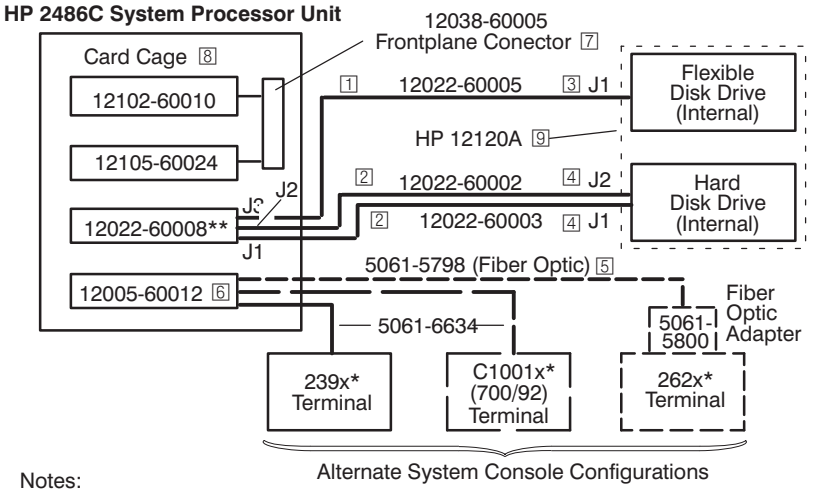
2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

5 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A600+ 16-Slot System Cabling Diagram (With Internal Disk - HP 12022A** Interface)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

** Replaced by HP 12009A Interface (HP 12122A disk subsystem); see next page.

1 The flexible disk drive ribbon cable must be connected to the HP 12022A Card (part no. 12022-60008) so that its red stripe is on the right side as you face the rear of the computer.

2 The hard disk drive ribbon cable must be connected to the HP 12022A Card (part no. 12022-60008) so that its red stripe is on the right side as you face the rear of the computer.

3 The flexible disk drive ribbon cable must be connected to the HP 12120A Disk Drive so that its red stripe is on the right as you face the front of the computer

4 The hard disk drive ribbon cables must be connected to the HP 12120A Disk Drive so that its red stripe is on the left as you face the front of the computer

5 Connect gray connectors to gray transmitters. Connect blue connectors to blue receivers.

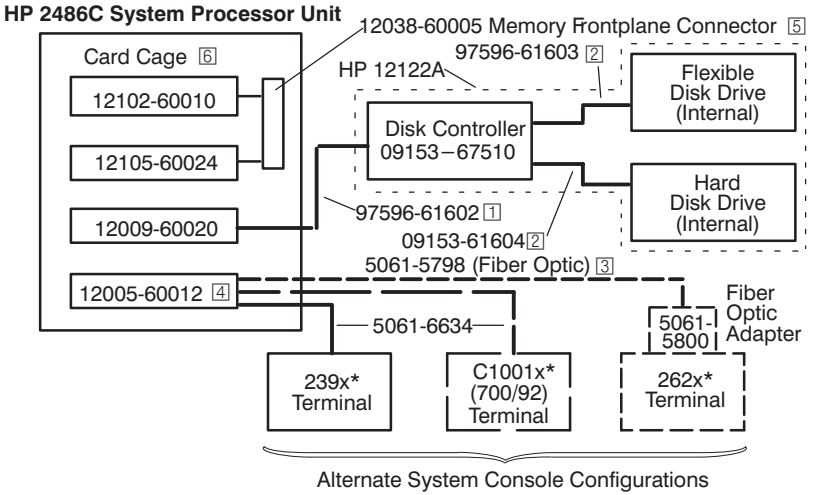
6 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

7 Memory array cards must be located directly above the memory controller card. A second 12038−60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connectore must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

8 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

9 HP 12120A is a 20 MB hard disk drive (with flexible disk drive included). A 15 MB and 10 MB hard disk drive device (both with flexible disk drive included) also existed as HP 2486A*, opt. 111 and opt. 110 respectively

A600+ 16-Slot System Cabling Diagram (With Internal Disk - HP 12009A Interface)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 The HB-IB ribbon cable must be connected to the HP 12009A Card (part no. 12009-60020) so that its red stripe is on the right side as you face the rear of the computer.

2 When connecting the ribbon cable to the connector on the disk controller card, make sure that you line up the triangle on the side of the connector

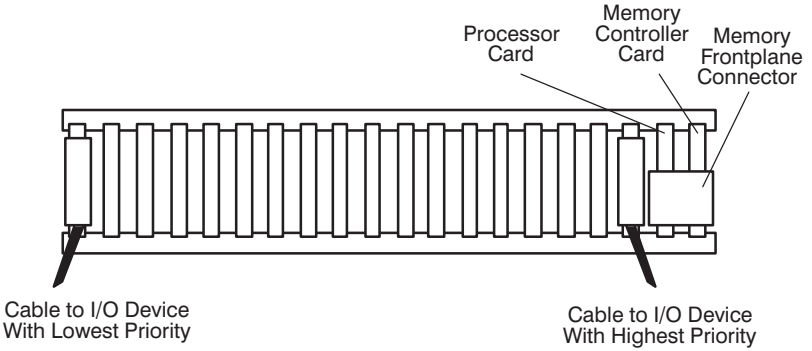
3 Connect gray connectors to gray transmitters. Connect blue connectors to blue receivers.

4 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

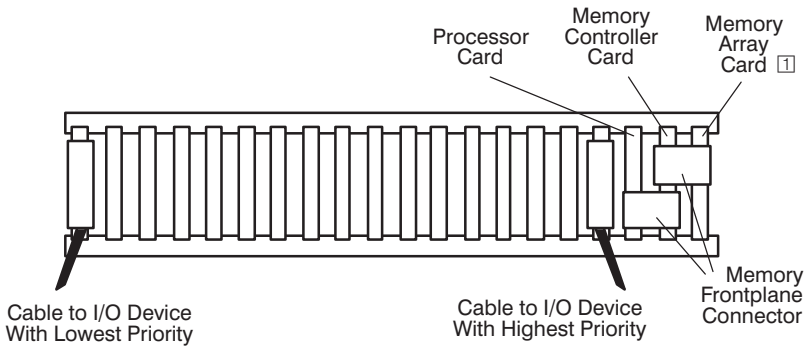
5 Memory array cards must be located directly above the memory controller card. A second 12038−60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connectore must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

6 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A600+ 20-Slot System Cards and Priority Diagram



Without Memory Array Card



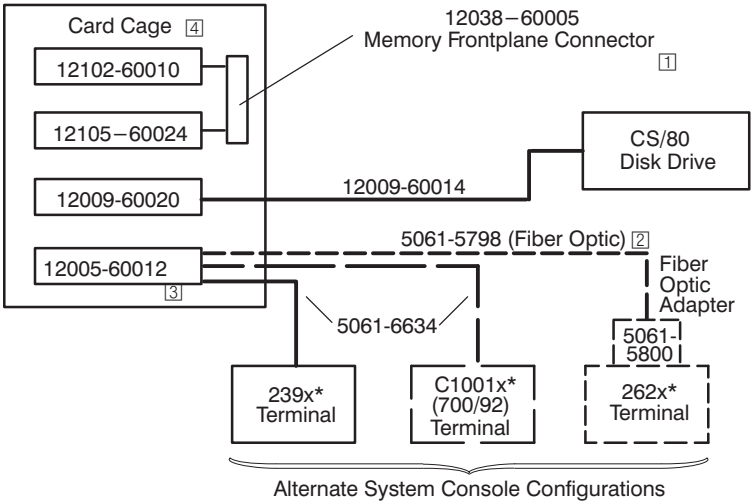
With Memory Array Card

Notes:

1 Up to four memory array cards are supported.

A600+ 20-Slot System Cabling Diagram (With External CS/80 Disk Drive)

HP 2196G/H System Processor Unit



Notes:

* Portions or all of this product line are discontinued; shown for reference only.

1 Memory array cards must be located directly to the right of the memory controller card. A second 12038-60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connector must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

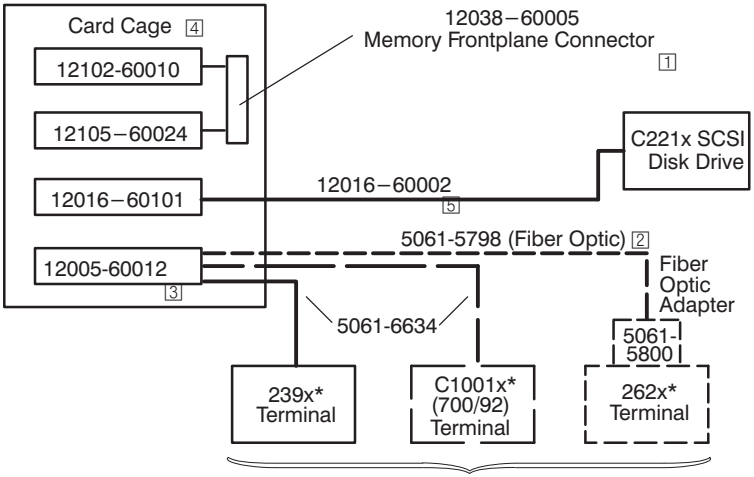
2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A600+ 20-Slot System Cabling Diagram (With External SCSI Disk Drive)

HP 2196G/H System Processor Unit



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 Memory array cards must be located directly to the right of the memory controller card. A second 12038-60005 frontplane connector must be used to connect the first memory array card to the memory controller card. As additional memory array cards are added, the appropriate frontplane connector must be used. HP 12038-60006 through -60008 connect two through four memory array cards respectively.

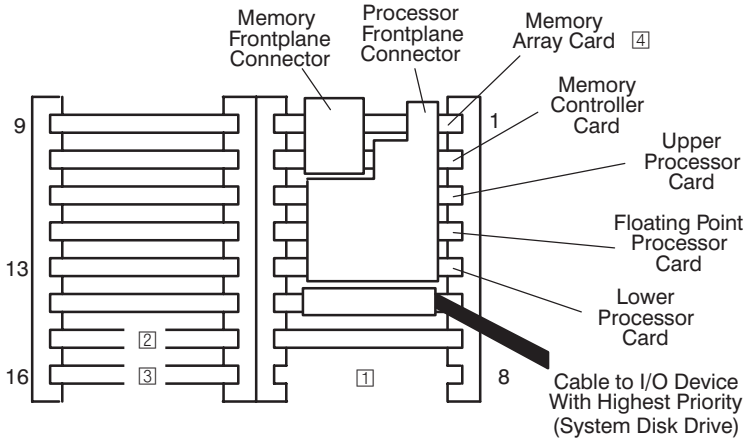
2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

5 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A700* 16-Slot System Cards and Priority Diagram



Notes:

* Discontinued product; shown for reference only.

1 Slot 8 is reserved for the optional HP 12159A 25 kHz Power Module. If not installed, this slot must remain unoccupied.

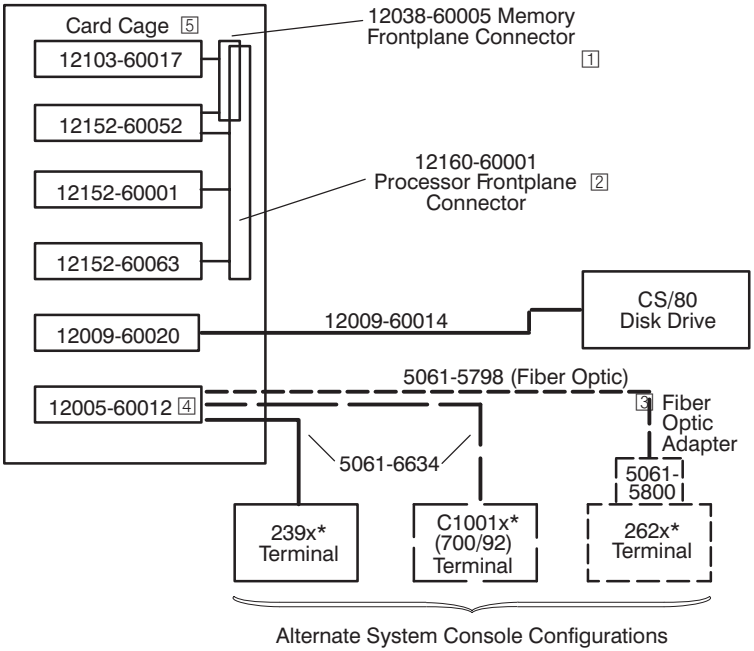
2 Slot 15 is the lowest priority I/O card if optional HP 12154A Battery Backup Card is not installed. If the battery backup card is installed, see note 3.

3 Slot 16 is reserved for the HP 12154A Battery Backup Card which, when used, extends into the space occupied by slots 14 and 15. This makes slot 13 the lowest priority I/O card slot. If the battery backup card is not installed, a voltage jumper card (part no. 02430-60009) must be installed in slot 16.

4 Up to four memory array cards are supported.

A700* 16-Slot System Cabling Diagram (With External CS/80 Disk Drive)

HP 2487B* System Processor Unit



Notes:

* Portions or all of this product line are discontinued; shown for reference only

[1] As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

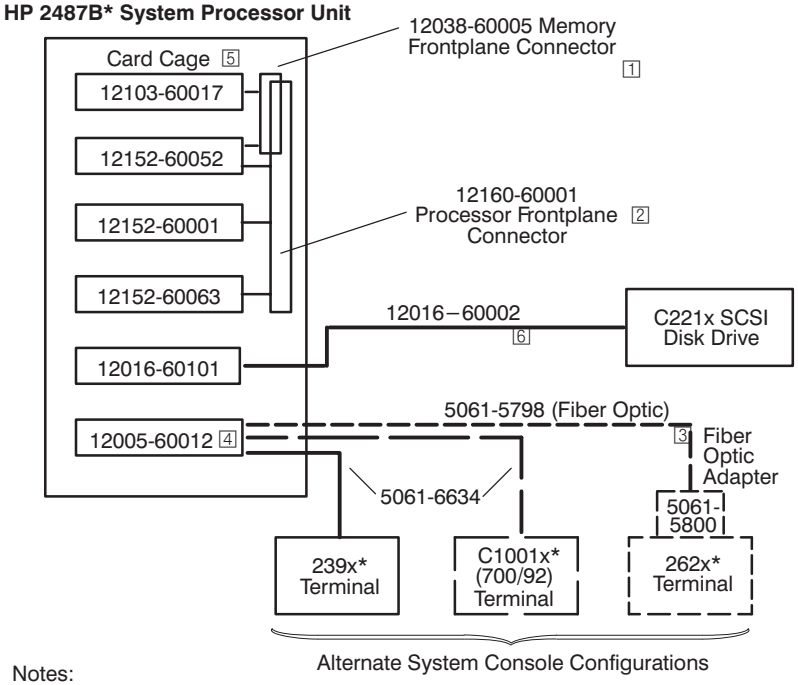
[2] If optional floating point card (part no. 12156-60001) is installed between the upper and lower processor, the 12156-60002 frontplane must be used.

[3] Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

[4] When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

[5] This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A700* 16-Slot System Cabling Diagram (With External SCSI Disk Drive)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

2 If optional floating point card (part no. 12156-60001) is installed between the upper and lower processor, the 12156-60002 frontplane must be used.

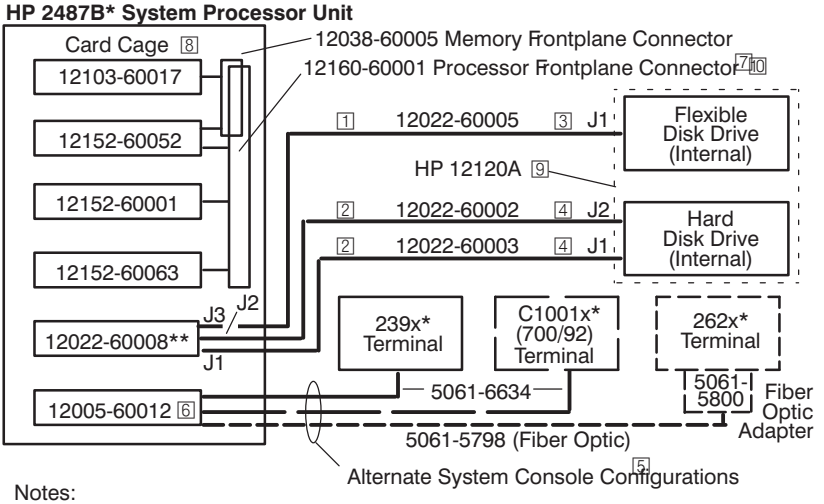
3 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

4 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

5 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

6 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A700* 16-Slot System Cabling Diagram (With Internal Disk – HP 12022A** Interface)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

** Replaced by HP 12009A Interface (HP 12122A disk subsystem); see next page.

1 The flexible disk drive ribbon cable must be connected to the HP 12022A Card (part no. 12022-60008) so that its red stripe is on the right side as you face the rear of the computer.

2 The hard disk drive ribbon cable must be connected to the HP 12022A Card (part no. 12022-60008) so that its red stripe is on the right side as you face the rear of the computer.

3 The flexible disk drive ribbon cable must be connected to the HP 12120A Disk Drive so that its red stripe is on the right as you face the front of the computer

4 The hard disk drive ribbon cables must be connected to the HP 12120A Disk Drive so that its red stripe is on the left as you face the front of the computer

5 Connect gray connectors to gray transmitters. Connect blue connectors to blue receivers.

6 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

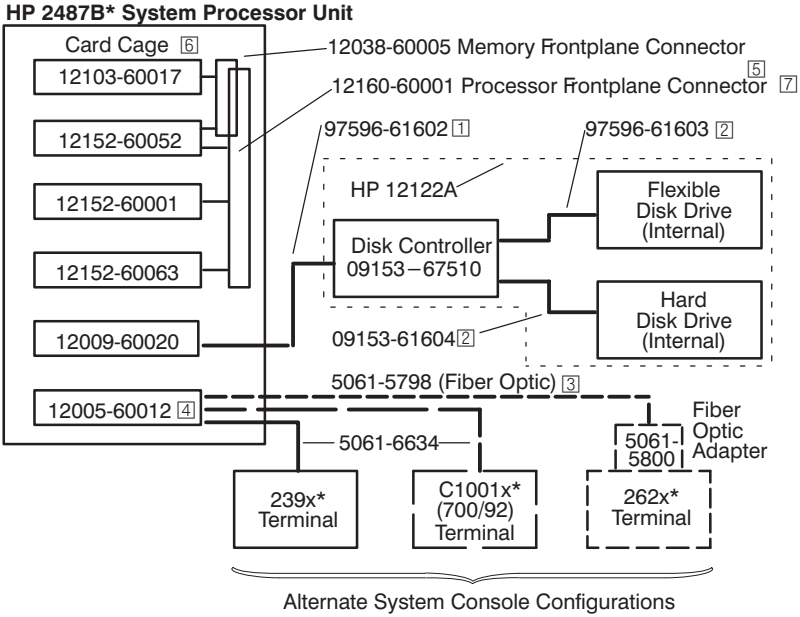
7 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

8 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

9 HP 12120A is a 20 MB hard disk drive (with flexible disk drive included). A 15 MB and 10 MB hard disk drive device (both with flexible disk drive included) also existed as HP 2487A*, opt. 111 and opt. 110 respectively

10 If optional floating point card (part no. 12156-60001) is installed between the upper and lower processor, the 12156-60002 front-plane must be used.

A700* 16-Slot System Cabling Diagram (With Internal Disk – HP 12009A Interface)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 The HB-IB ribbon cable must be connected to the HP 12009A Card (part no. 12009-60020) so that its red stripe is on the right side as you face the rear of the computer.

2 When connecting the ribbon cable to the connector on the disk controller card, make sure that you line up the triangle on the side of the connector.

3 Connect gray connectors to gray transmitters. Connect blue connectors to blue receivers.

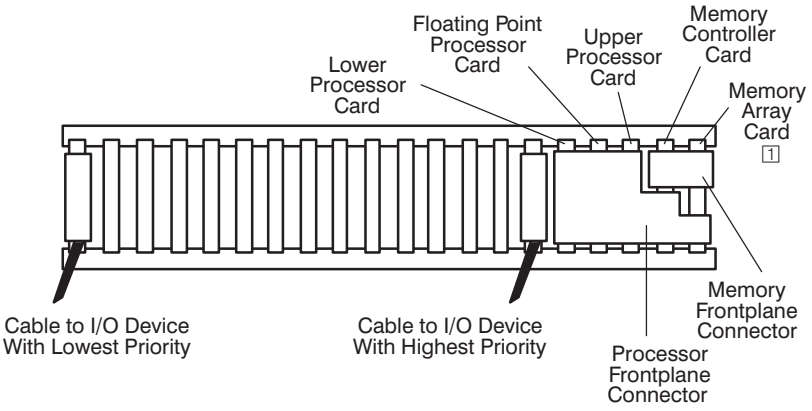
4 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

5 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

6 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

7 If optional floating point card (part no. 12156-60001) is installed between the upper and lower processor, the 12156-60002 front-plane must be used.

A700* 20-Slot System Cards and Priority Diagram

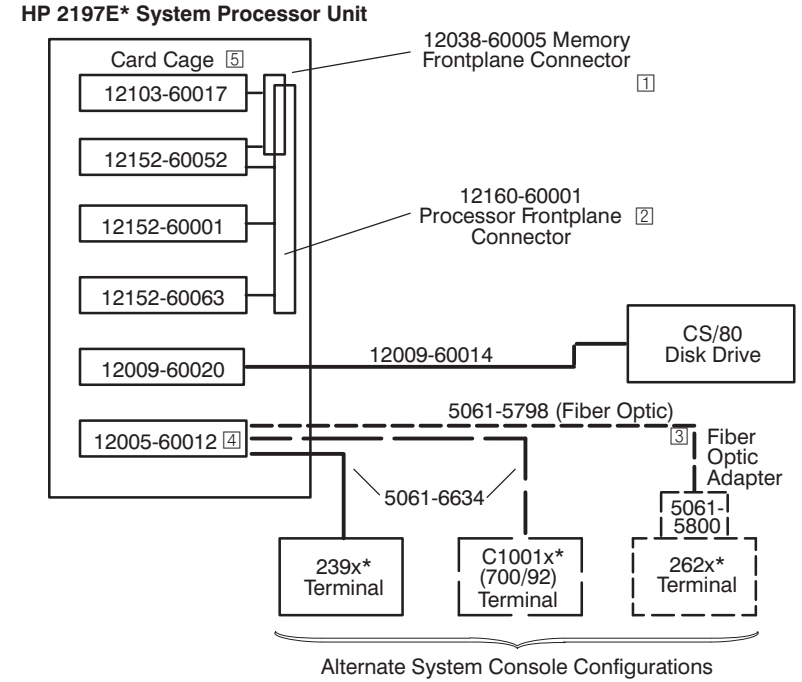


Notes:

* Discontinued product; shown for reference only.

1 Up to four memory array cards are supported.

A700* 20-Slot System Cabling Diagram (With External CS/80 Disk)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

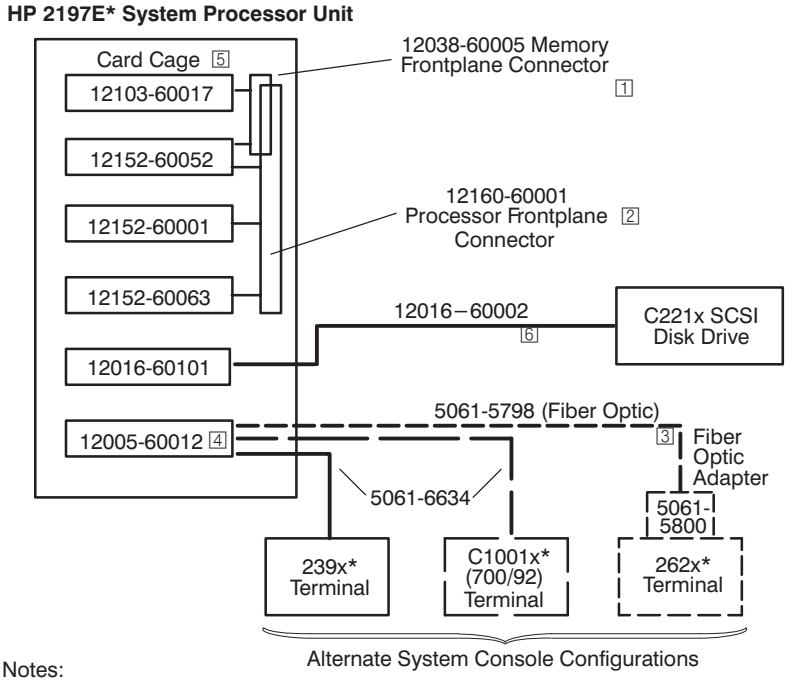
2 If optional floating point card (part no. 12156-60001) is installed between the upper and lower processor, the 12156-60002 frontplane must be used.

3 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

4 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

5 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A700* 20-Slot System Cabling Diagram (With External SCSI Disk)



Notes:

* Portions or all of this product line are discontinued; shown for reference only.

1 As additional memory is added, larger frontplane connectors are required. HP 12038-60005 through -60008 connect one through four memory cards respectively.

2 If optional floating point card (part no. 12156-60001) is installed between the upper and lower processor, the 12156-60002 frontplane must be used.

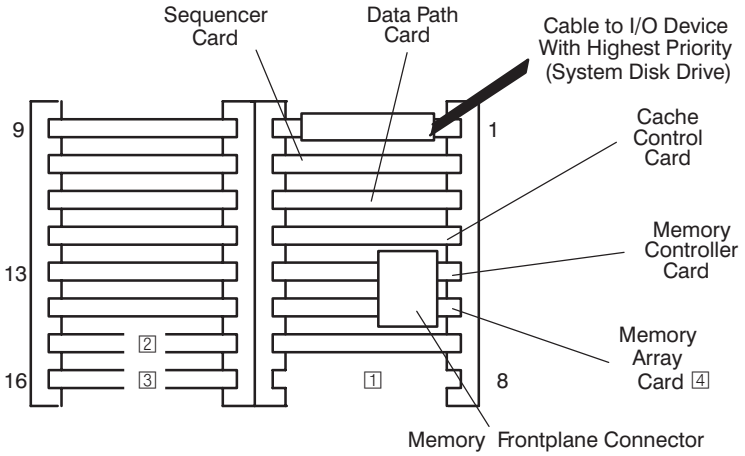
3 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

4 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

5 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

6 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A900 16-Slot System Cards and Priority Diagram



Notes:

1 Slot 8 is reserved for the optional HP 12159A 25 kHz Power Module. If not installed, this slot must remain unoccupied.

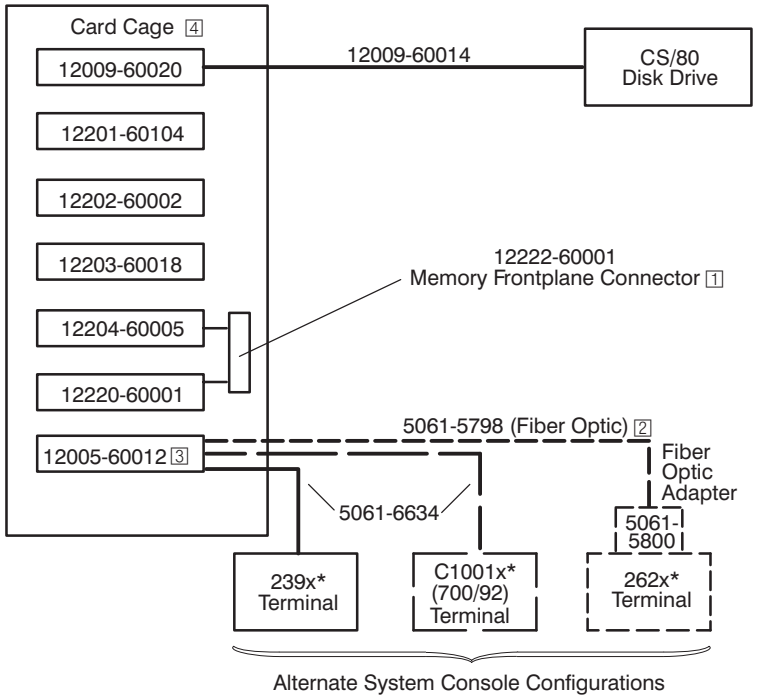
2 Slot 15 is the lowest priority I/O card if optional HP 12154A Battery Backup Card is not installed. If the battery backup card is installed, see note 3.

3 Slot 16 is reserved for the HP 12154A Battery Backup Card which, when used, extends into the space occupied by slots 14 and 15. This makes slot 13 the lowest priority I/O card slot. If the battery backup card is not installed, a voltage jumper card (part no. 02430-60009) must be installed in slot 16.

4 One or two memory array cards are supported.

A900 16-Slot System Cabling Diagram (With External CS/80 Disk)

HP 2489B System Processor Unit



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 If a second memory array card is added, use memory frontplane connector part no. 12222-60002.

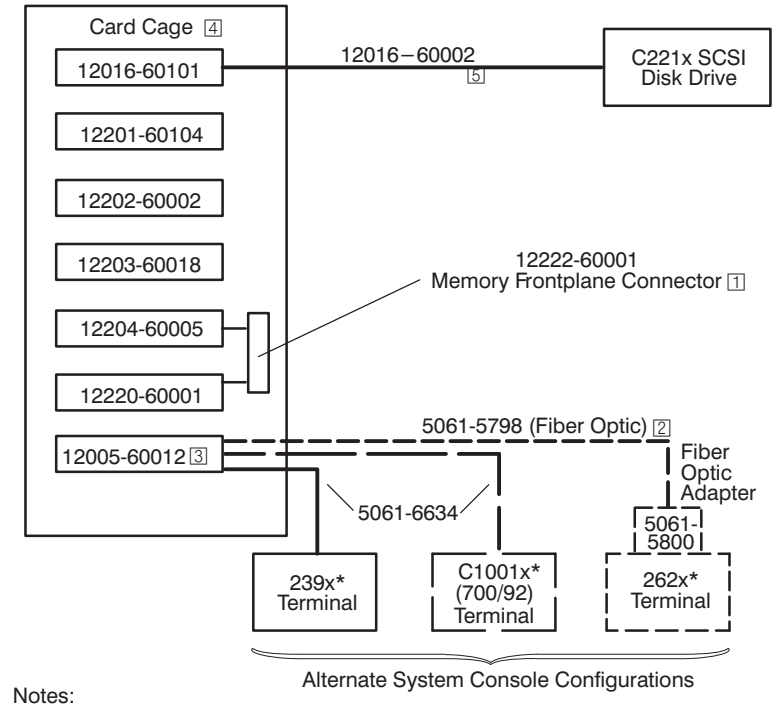
2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 If HP 12040 MUX card is installed in lieu of 12005-60012 ASIC card, refer to MUX manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A900 16-Slot System Cabling Diagram (With External SCSI Disk)

HP 2489B System Processor Unit



Notes:

* Portions or all of this product line are discontinued; shown for reference only

[1] If a second memory array card is added, use memory frontplane connector part no. 12222-60002.

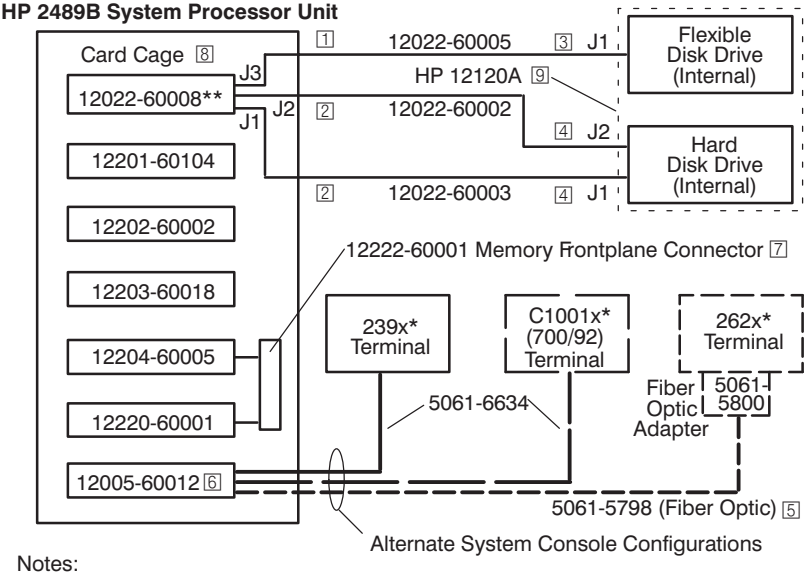
[2] Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

[3] If HP 12040 MUX card is installed in lieu of 12005-60012 ASIC card, refer to MUX manual (part no. 12040−90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at port 0 for the system console. Rev D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

[4] This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

[5] Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A900 16-Slot System Cabling Diagram (With Internal Disk - HP 12022A** Interface)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

** Replaced by HP 12009A Interface (HP 12122A disk subsystem); see next page.

1 The flexible disk drive ribbon cable must be connected to the HP 12022A Card (part no. 12022-60008) so that its red stripe is on the right side as you face the rear of the computer.

2 The hard disk drive ribbon cable must be connected to the HP 12022A Card (part no. 12022-60008) so that its red stripe is on the right side as you face the rear of the computer.

3 The flexible disk drive ribbon cable must be connected to the HP 12120A Disk Drive so that its red stripe is on the right as you face the front of the computer

4 The hard disk drive ribbon cables must be connected to the HP 12120A Disk Drive so that its red stripe is on the left as you face the front of the computer

5 Connect gray connectors to gray transmitters. Connect blue connectors to blue receivers.

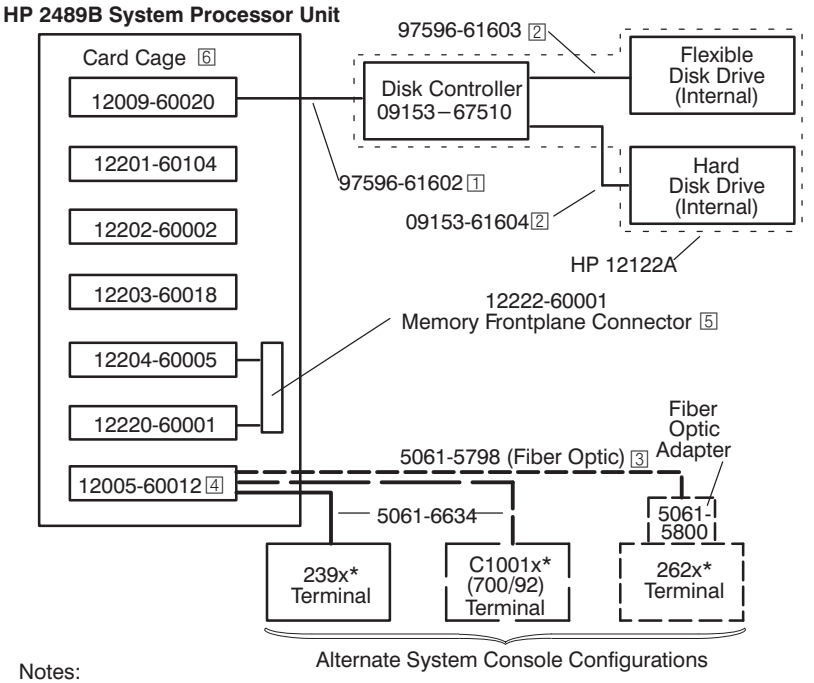
6 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

7 If a second memory array card is added, use memory frontplane connector part no. 12222-60002.

8 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

9 HP 12120A is a 20 MB hard disk drive (with flexible disk drive included). A 15 MB and 10 MB hard disk drive device (both with flexible disk drive included) also existed as HP 2489A*, opt. 111 and opt. 110 respectively

A900 16-Slot System Cabling Diagram (With Internal Disk - HP 12009A Interface)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 The HB-IB ribbon cable must be connected to the HP 12009A Card (part no. 12009-60020) so that its red stripe is on the right side as you face the rear of the computer.

2 When connecting the ribbon cable to the connector on the disk controller card, make sure that you line up the triangle on the side of the connector

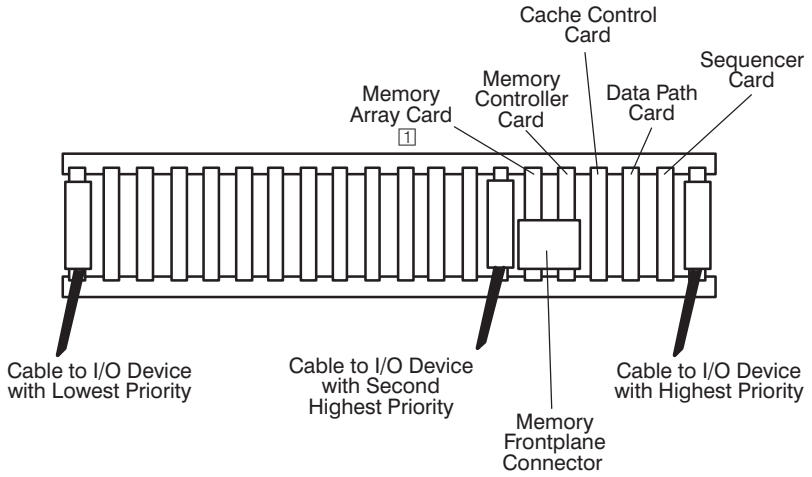
3 Connect gray connectors to gray transmitters. Connect blue connectors to blue receivers.

4 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

5 If a second memory array card is added, use memory frontplane connector part no. 12222-60002.

6 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A900 20-Slot System Cards and Priority Diagram

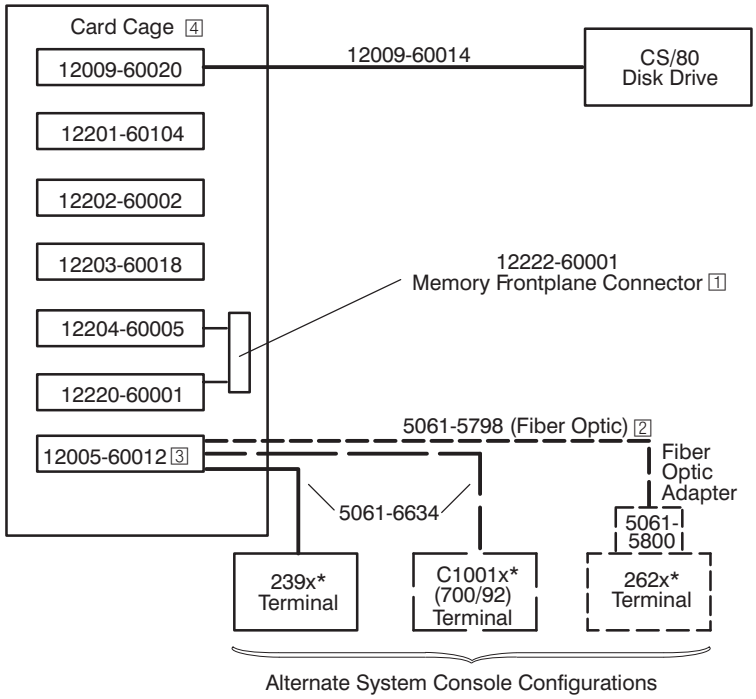


Notes:

1 Up to four memory array cards are supported.

A900 20-Slot System Cabling Diagram (With External CS/80 Disk)

HP 2199E System Processor Unit



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12222-60001 through -60004 connect one through four memory cards respectively.

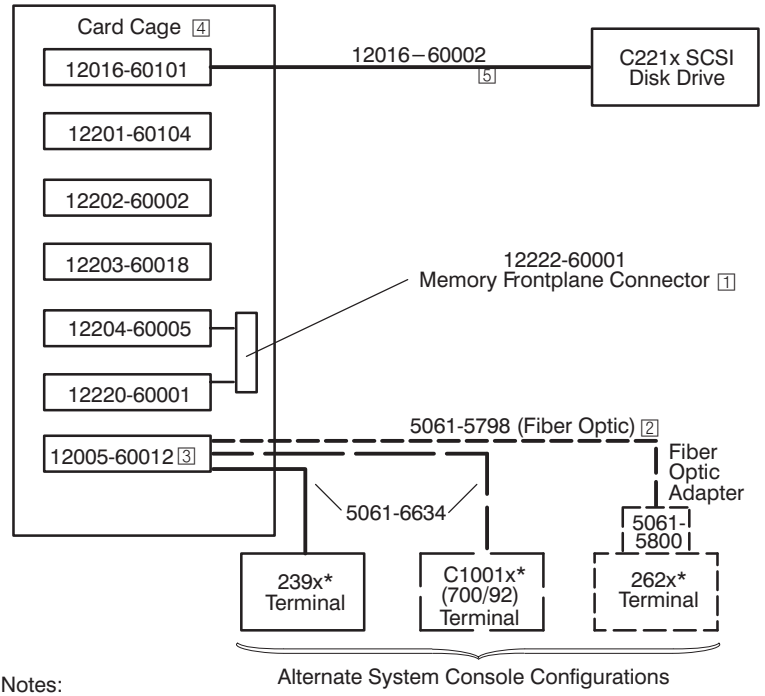
2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 If HP 12040 MUX card is installed in lieu of 12005-60012 ASIC card, refer to MUX manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A900 20-Slot System Cabling Diagram (With External SCSI Disk)

HP 2199E System Processor Unit



Notes:

* Portions or all of this product line are discontinued; shown for reference only

1 As additional memory is added, larger frontplane connectors are required. HP 12222-60001 through -60004 connect one through four memory cards respectively.

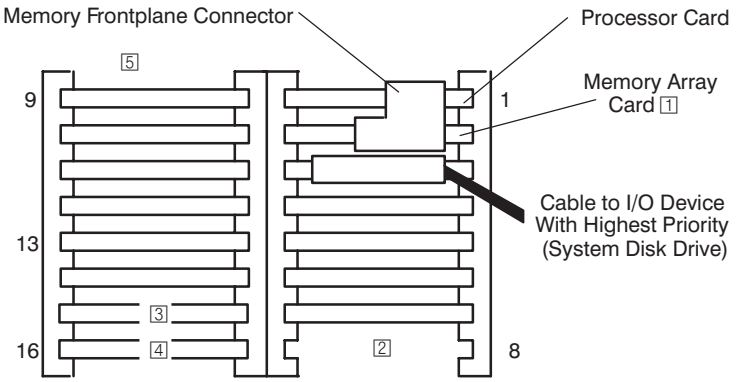
2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 If HP 12040 MUX card is installed in lieu of 12005-60012 ASIC card, refer to MUX manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at port 0 for the system console. Rev D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

5 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

A990 16-Slot Upgrade from A400, A600+, or A700* - System Cards and Priority Diagram



For *internal* disk drive cabling information, refer to the applicable processor and disk configuration cabling diagram *preceding* this page.

For *external* disk drive cabling information, refer to the applicable A990 disk configuration cabling diagram *following* this page.

Notes:

* Discontinued product; shown for reference only.

1 Up to four memory array cards are supported.

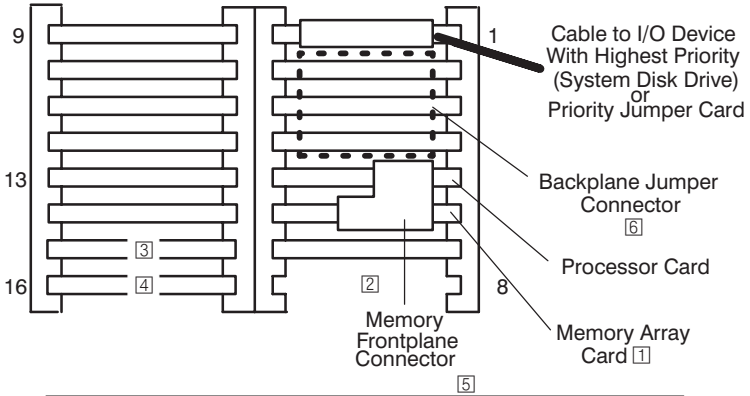
2 Slot 8 is reserved for the optional HP 12159A 25 kHz Power Module. If not installed, this slot must remain unoccupied.

3 Slot 15 is the lowest priority I/O card if optional HP 12154A Battery Backup Card is not installed. If battery backup card is installed, see note 4.

4 Slot 16 is reserved for the HP 12154A Battery Backup Card which, when used, extends into the space occupied by slots 14 and 15. This makes slot 13 the lowest priority I/O card slot. If the battery backup card is not installed, a voltage jumper card (part no. 02430-60009) must be installed in slot 16.

5 As additional memory is added, larger frontplane connectors are required. HP 12230-60001 through -60004 connect one through four memory cards respectively.

A990 16-Slot Upgrade from A900 - System Cards and Priority Diagram



For *internal* disk drive cabling information, refer to the applicable A900 processor disk configuration cabling diagram *preceding* this page.

For *external* disk drive cabling information, refer to the applicable A990 disk configuration cabling diagram *following* this page.

Notes:

1 One or two memory array cards are supported.

2 Slot 8 is reserved for the optional HP 12159A 25 kHz Power Module. If not installed, this slot must remain unoccupied.

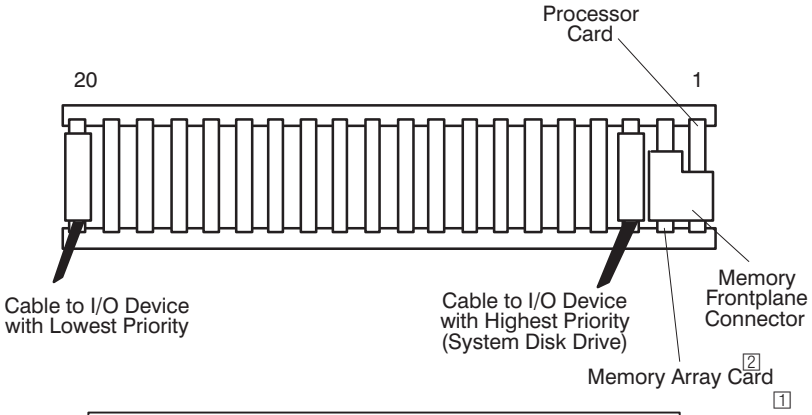
3 Slot 15 is the lowest priority I/O card if optional HP 12154A Battery Backup Card is not installed. If battery backup card is installed, see note 4.

4 Slot 16 is reserved for the HP 12154A Battery Backup Card which, when used, extends into the space occupied by slots 14 and 15. This makes slot 13 the lowest priority I/O card slot. If the battery backup card is not installed, a voltage jumper card (part no. 02430-60009) must be installed in slot 16

5 Frontplane connector part no. 12230-60001 connects one memory array card. If a second memory array card is added, use memory frontplane connector part no. 12230-60002.

6 Backplane jumper connector (part no. 12990-60020) plugs into slots 3 and 4 and covers slot 2.

A990 20-Slot Upgrade from A400, A600+, or A700* - System Cards and Priority Diagram



For disk drive cabling information, refer to the applicable A990 disk configuration cabling diagram following this page.

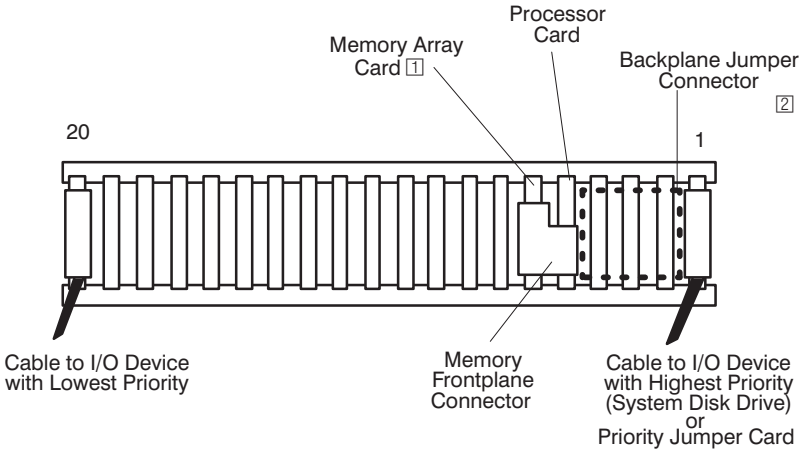
Note:

* Portions or all of this product line are discontinued; shown for reference only

1 Up to four memory array cards are supported.

2 As additional memory is added, larger frontplane connectors are required. HP 12230-60001 through -60004 connect one through four memory cards respectively.

A990 20-Slot Upgrade from A900 - System Cards and Priority Diagram



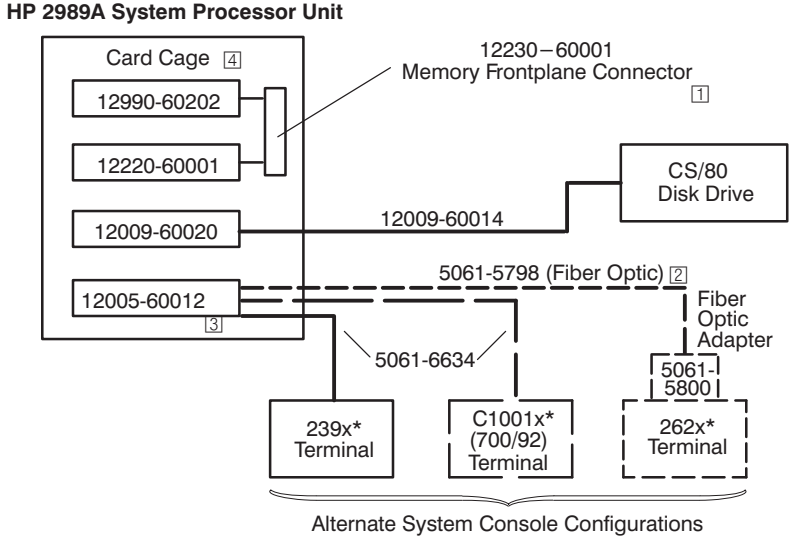
For disk drive cabling information, refer to the applicable A990 disk configuration cabling diagram following this page.

Note:

Up to four memory array cards are supported.

[1] Backplane jumper connector (part no. 12990−60020) plugs into slots 3 and 4
[2] and covers slot 2.

A990 16-Slot System Cabling Diagram (With External CS/80 Disk)



Notes:

* Portions or all of this product line are discontinued; shown for reference only

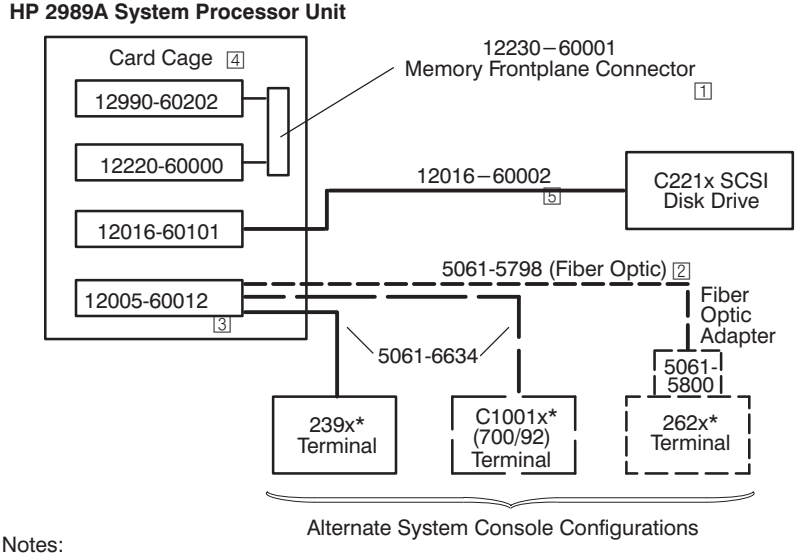
1 As additional memory is added, larger frontplane connectors are required. HP 12230-60001 through -60004 connect one through four memory cards respectively.

2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A990 16-Slot System Cabling Diagram (With External SCSI Disk)



Notes:

* Portions or all of this product line are discontinued; shown for reference only.

1 As additional memory is added, larger frontplane connectors are required. HP 12230-60001 through -60004 connect one through four memory cards respectively.

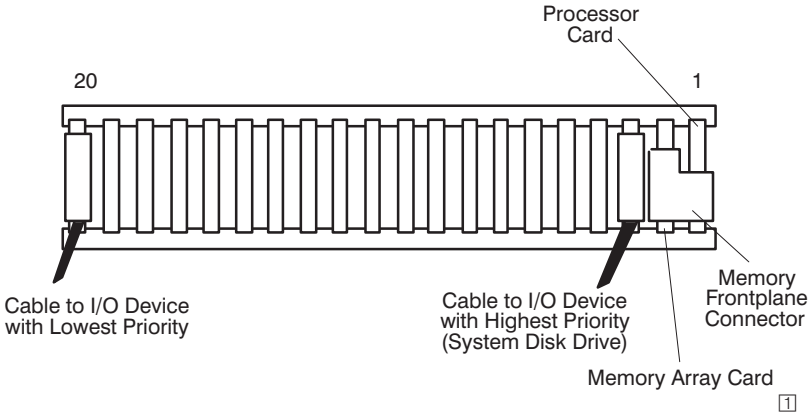
2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

5 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

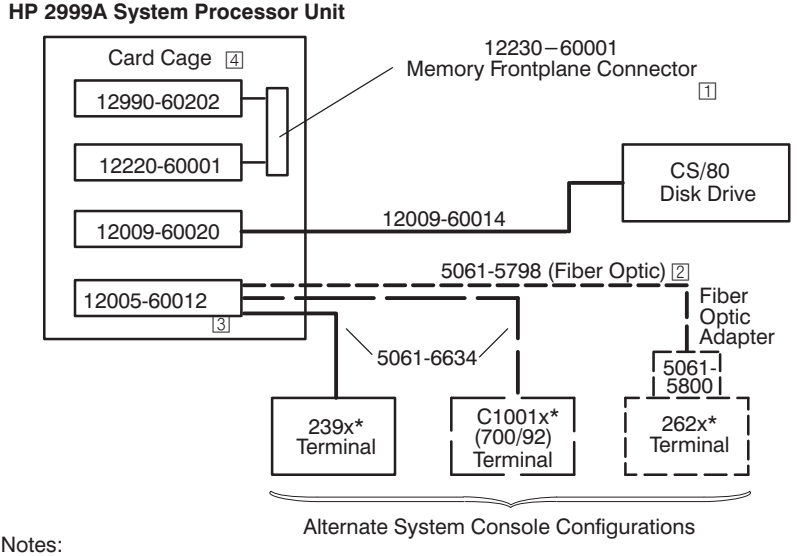
A990 20-Slot System Cards and Priority Diagram



Note:

Up to four memory array cards are supported.
1

A990 20-Slot System Cabling Diagram (With External CS/80 Disk)



Notes:

* Portions or all of this product line are discontinued; shown for reference only.

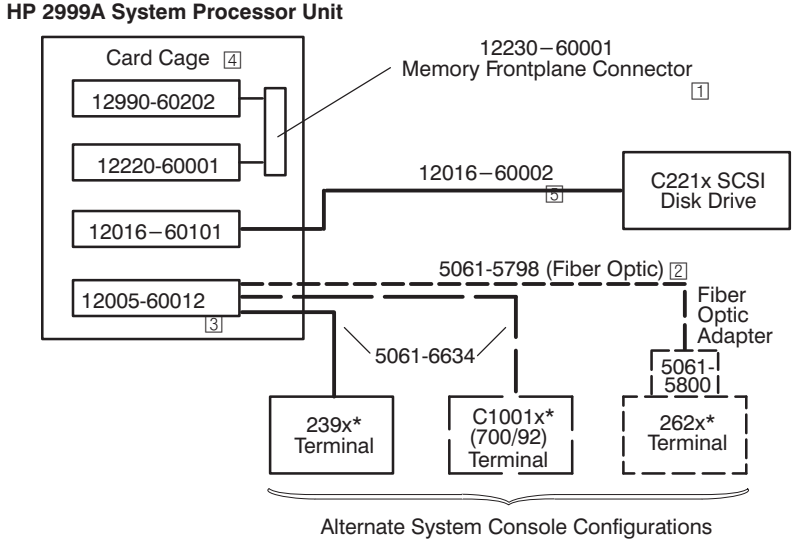
1 As additional memory is added, larger frontplane connectors are required. HP 12230-60001 through -60004 connect one through four memory cards respectively.

2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

A990 20-Slot System Cabling Diagram (With External SCSI Disk)



Notes:

* Portions or all of this product line are discontinued; shown for reference only.

1 As additional memory is added, larger frontplane connectors are required. HP 12230-60001 through -60004 connect one through four memory cards respectively.

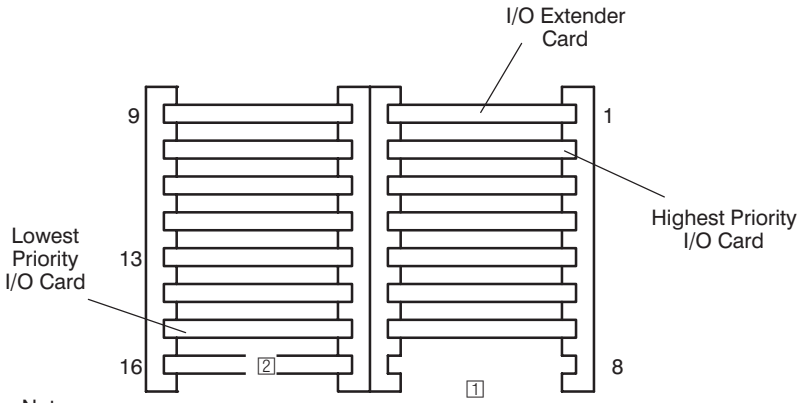
2 Connect gray connectors to gray transmitters; connect blue connectors to blue receivers.

3 When installing the optional HP 12040 MUX card, refer to the card manual (part no. 12040-90123) for cabling information. Note that rev. B or C of the HP 12040 MUX sets a baud rate of 9600 at Port 0 for the system console. Rev. D of the MUX senses and sets the baud rate to match that of the terminal. To configure the MUX ports, follow the directions in the Welcome file (rev. 4010 or later of RTE-A).

4 This diagram may not indicate the proper priority placement of cards in the card cage; see applicable "...System Cards and Priority Diagram" for this information.

5 Cable part no. 12016-60002 is for single-ended SCSI devices. Single-ended and differential devices cannot be connected to the same SCSI interface card (i.e. SCSI bus). Use cable part no. 12016-60003 for differential devices.

I/O Extender Micro/1000 Box (HP 12025A)

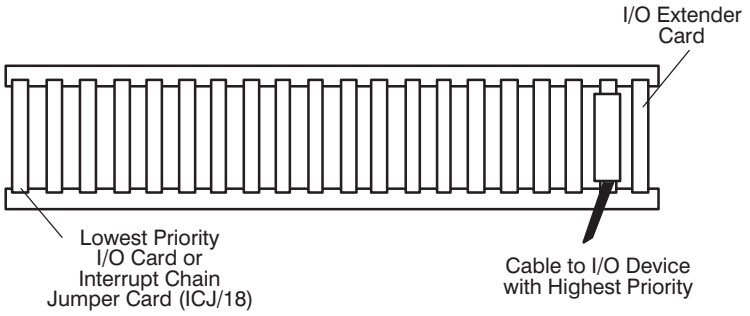


Notes:

1 Slot 8 is reserved for the optional HP 12159A 25 kHz Power Module. If not installed, this slot must remain unoccupied.

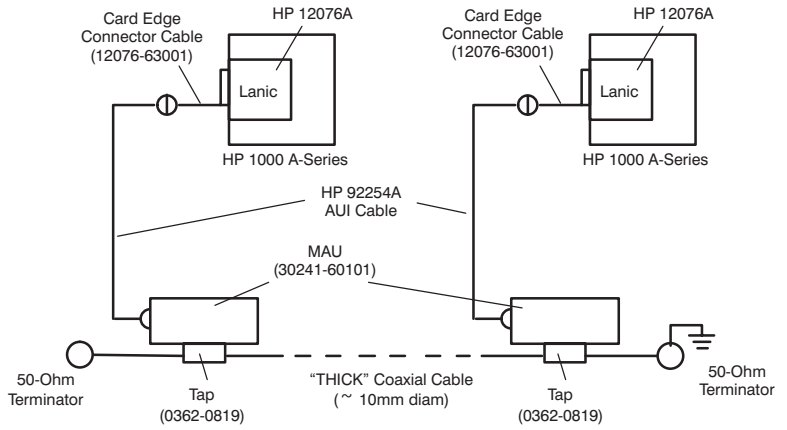
2 Slot 16 is reserved for the Interrupt Chain Jumper Card).

I/O Extender 20-Slot Box (HP 12025B)

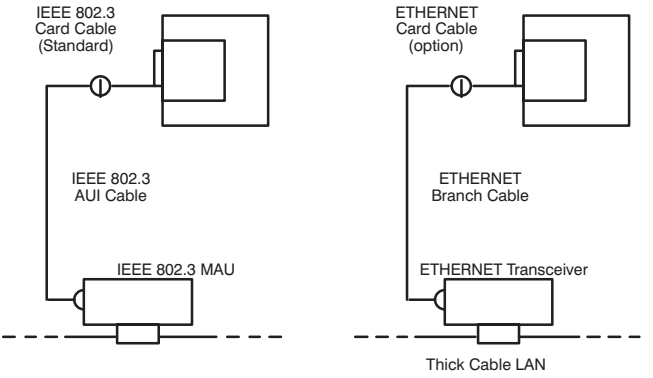


LAN/1000 Interface Controller Cabling

Refer to the *HP 12076A LAN/1000 Link Local Area Network Interface Controller (LANIC) Installation Manual* (part no. 12076-90001) for detailed information.



Typical IEEE 802.3 Type 10 Base 5 LAN Using the LAN/1000 Interface Controller



Examples of Thick Cable LAN Compatibility

Memory Configurations

The following rule should be followed when installing memory arrays in an A400, A600+, or A700* System. The only exception to this rule is HP 12103K/L/M arrays (2, 4, and 8 Mbyte arrays respectively).

Arrange memory array cards such that the size of memory (including the A400 on-board memory or A600+ memory controller) installed in the backplane beneath any array card satisfies the following equation:

$$\frac{\text{Memory Size Now in Backplane}}{\text{Size of Array Card to be Added}} = \text{An Integer}$$

General rule is to place the largest array closest to the controller and install the remaining arrays in decreasing size order. The A400 and A600+ are special cases because you must consider the memory that is already included on the board or memory controller card.

For A900/A990 systems, the general rule is to install the largest memory card closest to the CPU.

Refer to power requirement/availability information to ensure on-line power requirements and battery backup capabilities are met.

Memory Rules

1. The A400 and A600 can never use ECC memory array cards.
2. In the A600+, an ECC controller must be installed if ECC memory is installed. (A600+ can only use the HP 12111 ECC array cards, not the HP 12104* ECC array cards.)
3. In the A700*, the HP 12111 ECC array cards can be mixed with the HP 12104* ECC array cards and the HP 12103 parity array cards.
4. In the A600+, the HP 12111 ECC array cards can be mixed with the HP 12103 parity array cards provided that the memory controller is an ECC memory controller.
5. A900 and A990 memory array cards cannot be used in an A400, A600+, or A700* system and vice versa.
6. The 16-slot A900 supports only 2 memory arrays.
7. The 16-slot A990 Upgrade from an A900 supports only 2 memory arrays.
8. HP 12154A battery backup card for 16-slot (Micro/1000) SPU or computer supports a maximum of four memory arrays.
9. HP 12157A*/B battery backup system for 20-slot SPU or computer supports a maximum of four memory arrays.

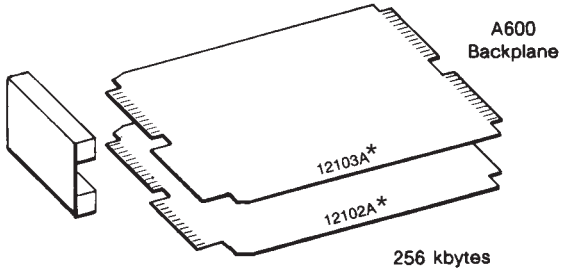
* Discontinued product; shown for reference only.

Memory Products

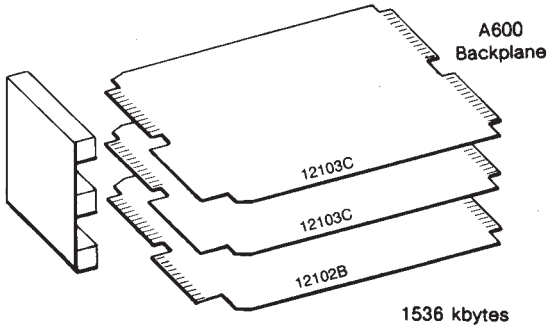
Product	Size (bytes)	Part No.	400	600	600+	700	900	990
A600/600+ parity mem controller	128K	12102-60001*	NO	OK	OK	NO	NO	NO
A600/600+ parity mem controller	512K	12102-60010	NO	OK	OK	NO	NO	NO
A600+ ECC mem controller	512K	12110-60001*	NO	NO	OK	NO	NO	NO
A600+ ECC mem controller	1M	12110-60004	NO	NO	OK	NO	NO	NO
A700* mem controller	0	12152-60003*	NO	NO	NO	OK	NO	NO
A900 ECC mem controller	0	12204-60003	NO	NO	NO	NO	OK	NO
A600(+)/700 par mem array	128K	12103-60015	NO	OK	OK	OK	NO	NO
A700* parity mem array	256K	12103-60002*	NO	NO	NO	OK	NO	NO
A400/600(+)/700 par mem array	512K	12103-60016	OK	OK	OK	OK	NO	NO
A400/600(+)/700 par mem array	1M	12103-60004	OK	OK	OK	OK	NO	NO
A400/600(+)/700 par mem array	2M	12103−66001	OK	OK	OK	OK	NO	NO
A400/600(+)/700 par mem array	4M	12103−66002	OK	OK	OK	OK	NO	NO
A400/600(+)/700 par mem array	8M	12103−66003	OK	OK	OK	OK	NO	NO
A700* ECC mem array	512K	12104-60001*	NO	NO	NO	OK	NO	NO
A600+/700 ECC mem array	512K	12111-60001	NO	NO	OK	OK	NO	NO
A600+/700 ECC mem array	1M	12111-60002*	NO	NO	OK	OK	NO	NO
A600+/700 ECC mem array	2M	12111-60003*	NO	NO	OK	OK	NO	NO
A900/990 ECC mem array	768K	12220-60001	NO	NO	NO	NO	OK	OK
A900/990 ECC mem array	3M	12221-60001	NO	NO	NO	NO	OK	OK
A900/990 ECC mem array	8M	12221-66001	NO	NO	NO	NO	OK	OK

* Discontinued product; shown for referrence only..

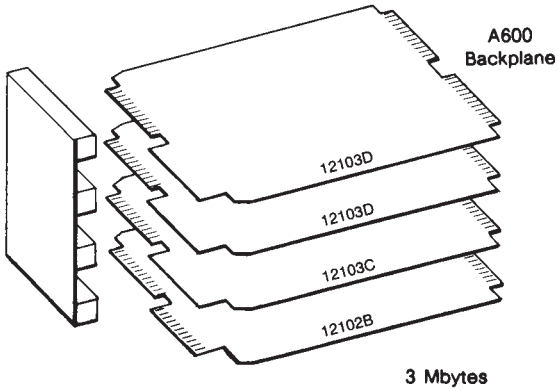
2-Connector
Frontplane
(12038A)



3-Connector
Frontplane
(12038B)



4-Connector
Frontplane
(12038C)



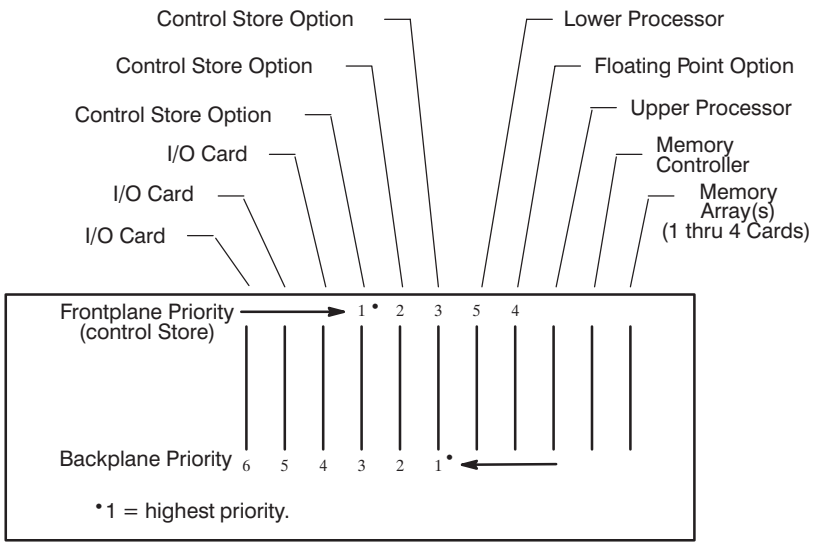
* Discontinued product; shown for reference only.

A900 Control Store Placement

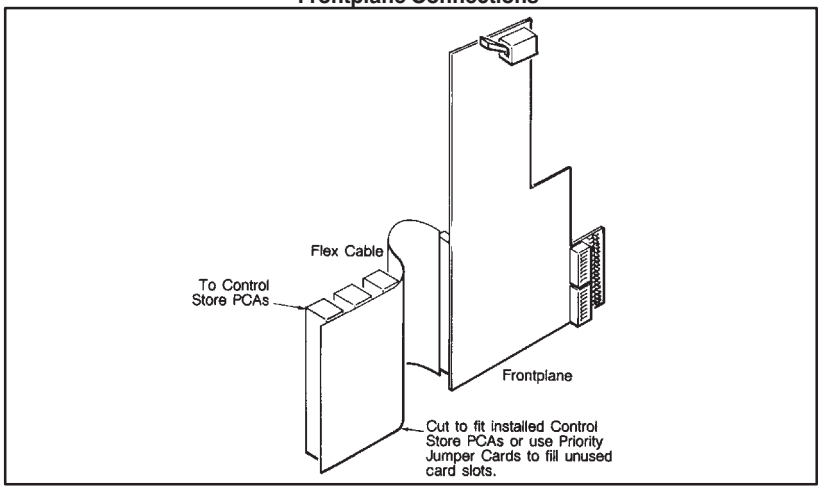
Install the Control Store Card in the highest I/O priority slot (slot 1) of the computer card cage (next to the Sequencer Card).

A700* WCS/PCS Placement

Card Cage Positioning and Priority



Frontplane Connections



* Discontinued product; shown for reference only.

A400 Control Memory Map

Note that user microprogramming on the A400 computer is **not** supported by HP.

Control Memory Module Allocation	Module No.	Address		Software Entry Point
		Hex	Decimal	
HP Base Set	0k	0-3FF	00000-01023	YES †
	1k	400-7FF	01024-02047	YES †
	2k	800-BFF	02048-03071	YES †
Reserved for User	3k	C00-FFF	03072-04095	YES ‡
Reserved for User	4k	1000-13FF	04096-05119	YES ‡
	5k	1400-17FF	05120-06143	YES ‡
Reserved for User	6k	1800-1BFF	06144-07167	NO
	7k	1C00-1FFF	07168-08191	NO
Reserved for User	8k	2000-23FF	08192-09215	YES ‡
	9k	2400-27FF	09216-10239	NO
Reserved for User	10k	2800-2BFF	10240-11263	YES ‡
	11k	2C00-2FFF	11264-12287	NO
Reserved for User	12k	3000-33FF	12288-13311	YES
	13k	3400-37FF	13312-14335	YES
Reserved for User	14k	3800-3BFF	14336-15359	NO
	15k	3C00-3FFF	15360-16383	NO

† HP use only

‡ May be used for HP future firmware package

A600 Control Memory Map

Control Memory Module Allocation	Module No.	Address		Software Entry Point
		Hex	Decimal	
HP Base Set	0k	0-3FF	00000-01023	YES †

† HP use only

A600+ Control Memory Map

Control Memory Module Allocation	Module No.	Address		Software Entry Point
		Hex	Decimal	
HP Base Set	0k	0-3FF	00000-01023	YES †
	1k	400-7FF	01024-02047	YES †
HP Reserved	2k	800-BFF	02048-03071	YES †
	3k	C00-FFF	03072-04095	YES †

† HP use only

A700* Control Memory Map

Control Memory Module Allocation	Module No.	Address		Software Entry Point
		Hex	Decimal	
HP Base Set	0k	0-3FF	00000-01023	YES †
	1k	400-7FF	01024-02047	YES †
HP Reserved	2k	800-BFF	02048-03071	YES †
	3k	C00-FFF	03072-04095	YES †
SIS, VIS, FPP	4k	1000-13FF	04096-05119	YES †
	5k	1400-17FF	05120-06143	YES †
HP Reserved	6k	1800-1BFF	06144-07167	NO
	7k	1C00-1FFF	07168-08191	NO
HP Reserved/User	8k	2000-23FF	08192-09215	YES ‡
	9k	2400-27FF	09216-10239	NO
HP Reserved/User	10k	2800-2BFF	10240-11263	YES ‡
	11k	2C00-2FFF	11264-12287	NO
Reserved for User	12k	3000-33FF	12288-13311	YES
	13k	3400-37FF	13312-14335	YES
Reserved for User	14k	3800-3BFF	14336-15359	NO
	15k	3C00-3FFF	15360-16383	NO

† HP use only

‡ May be used for HP future firmware package

* Discontinued product; shown for reference only.

A900 Control Memory Map

Control Memory Module Allocation	Module No.	Address		Software Entry Point
		Hex	Decimal	
HP Base Set	0k	0-3FF	00000-01023	YES †
	1k	400-7FF	01024-02047	YES †
HP Base Set	2k	800-BFF	02048-03071	YES †
	3k	C00-FFF	03072-04095	YES †
SIS, VIS, FPP	4k	1000-13FF	04096-05119	YES †
	5k	1400-17FF	05120-06143	YES †
HP Reserved	6k	1800-1BFF	06144-07167	NO
	7k	1C00-1FFF	07168-08191	NO
HP Reserved/User	8k	2000-23FF	08192-09215	YES ‡
	9k	2400-27FF	09216-10239	NO
HP Reserved/User	10k	2800-2BFF	10240-11263	YES ‡
	11k	2C00-2FFF	11264-12287	NO
Reserved for User	12k	3000-33FF	12288-13311	YES
	13k	3400-37FF	13312-14335	YES
Reserved for User	14k	3800-3BFF	14336-15359	NO
	15k	3C00-3FFF	15360-16383	NO

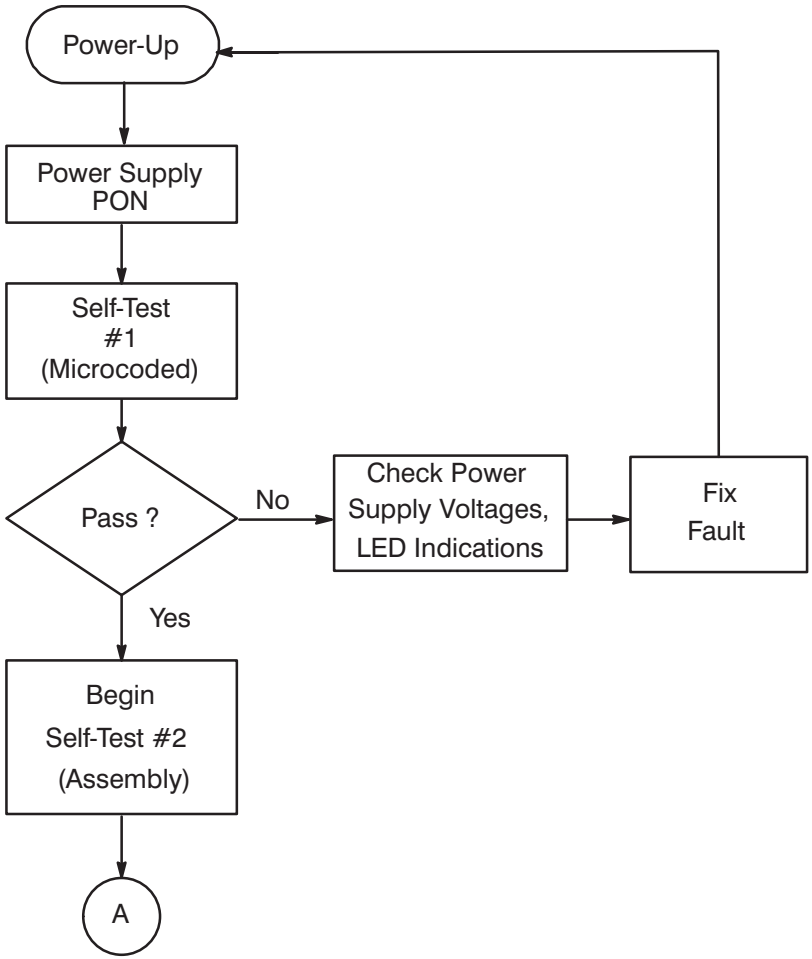
† HP use only

‡ May be used for HP future firmware package

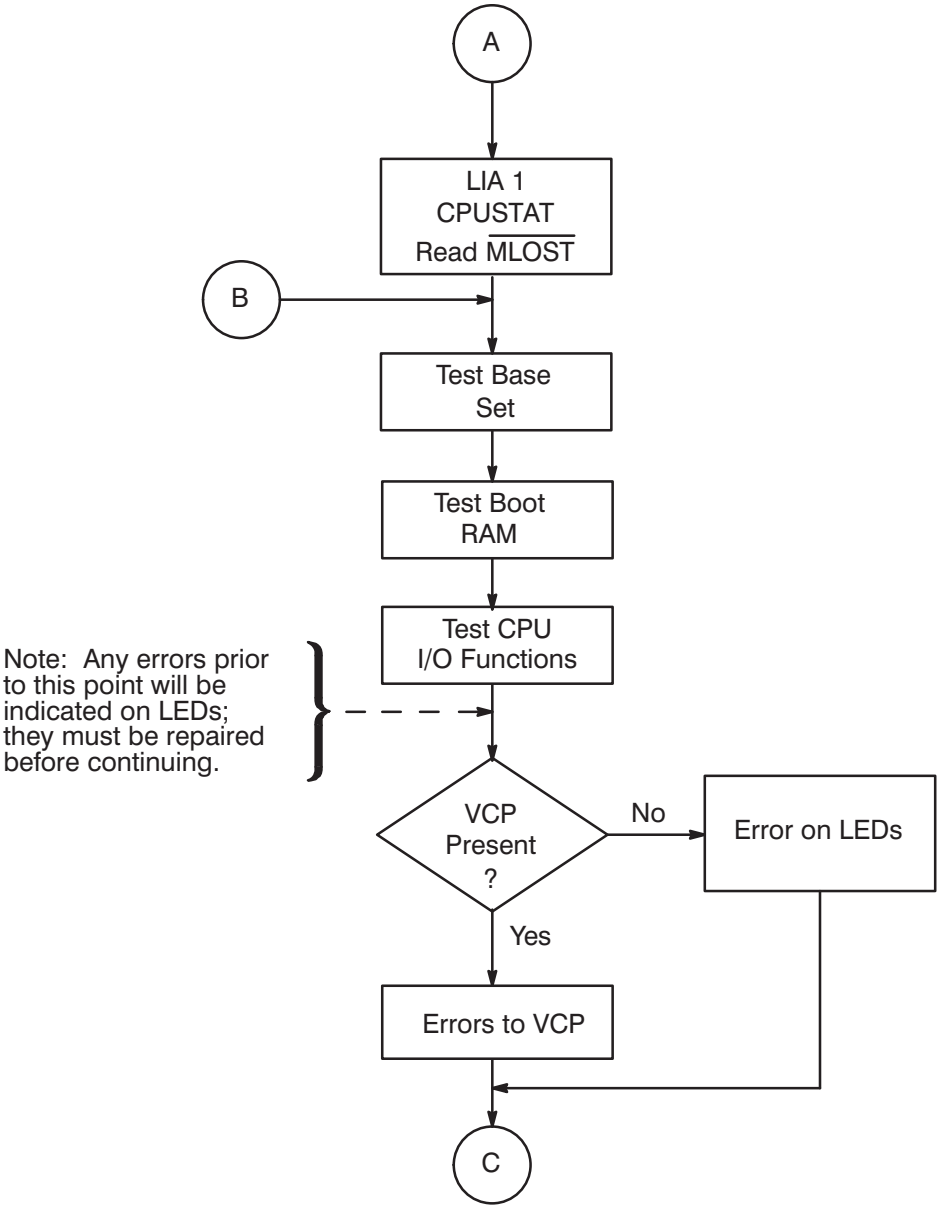
A990 Control Memory Map

Control Memory Module Allocation	Module No.	Address Hex	Software Entry Point
HP Instruction Set	0k 1k 2k 3k 4k 5k	0-17FF	Yes
Boot Memory (VCP)	6k 7k	1800 - 1FFF	No
HP Reserved/User	8k 9k 10k 11k 12k 13k 14k 15k	2000 - 3FFF	No
HP Reserved	16k 17k 18k 19k 20k 21k 22k 23k	4000 - 5FFF	No
Reserved for User	24k 25k 26k 27k 28k 29k 30k 31k	6000 – 7FFF	Yes

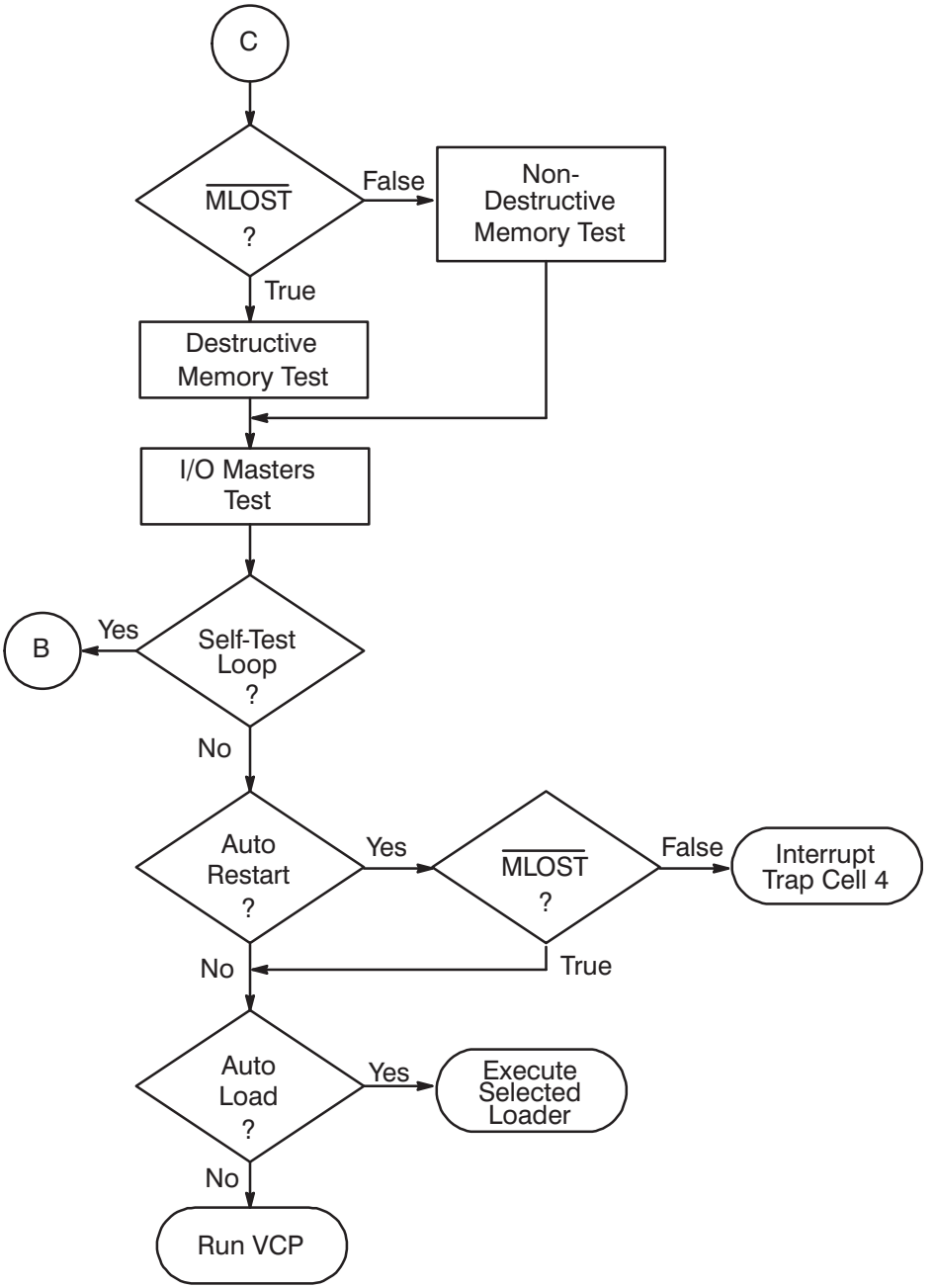
A-Series Power-Up Sequence



A-Series Power-Up Sequence (Continued)



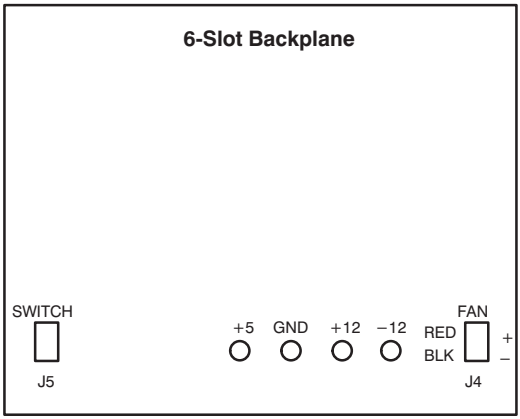
A-Series Power-Up Sequence (Continued)



Power Supply

6-Slot Box (Cooler) Power Supply Test Points

The following voltages should be present at the power supply test points on the backplane of the 6-slot box. The front cover must be removed to access the test points. Refer to the *Micro 14/16 Computer Installation and Service Manual,* part no. 02420-90001, for a detailed description on troubleshooting the power supply.



The following voltage ranges are produced depending on the load to the power supply:

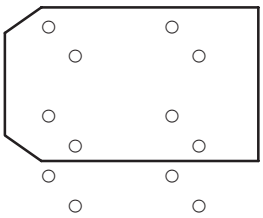
Nominal	With Cards Installed Fan Connected	No Cards Installed, Fan Disconnectted
+5V	5.00 - 5.20 V	4.59 - 5.61 V
+12V	11.64 - 12.72 V	10.92 - 13.20 V
−12V	−11.52 - −12.72 V	−10.92 - −13.44 V

20-Slot Box Power Supply Test Points

The following voltages should be present at the power supply test point connector on the back of the 20-slot box. See Test Point Location diagram below. Note that for testing the battery, the white lead is positive (+) and the black lead is negative (−).

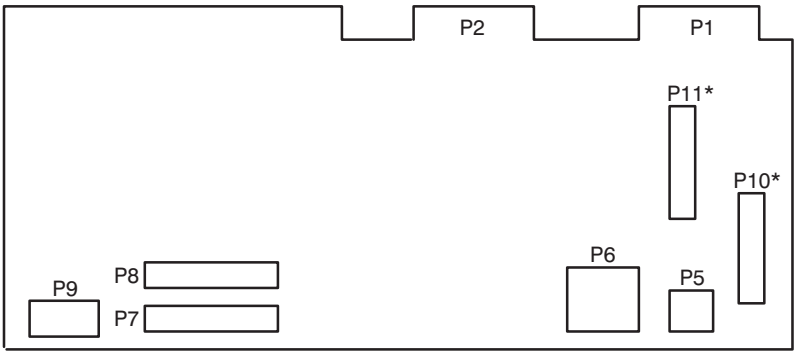
Test Point	Nominal Voltage
+5	+5.0 to +5.2V
+12	+11.64 to +12.72V
−12	−11.28 to −12.72V
+5M	+4.98 to +5.202V (Sustained when battery backup option is installed and enabled and power is removed.)
PON+ (Power On)	+2.4 to +5.0V
PFW− (Power Fail Warning)	+2.4 to +5.0V (Drops as soon as power fail is detected.)
MLT− (Memory Lost)	+2.4 to 5.0V if memory can be (or was) sustained. 0V if memory cannot be (or was not) sustained. MLT− is always 0V if battery option is not installed.
ϕ1, ϕ2 (25 kHz installed)	19.5 Vrms +1.95, −2.3 Vrms (at 0 to .02 Amps) 19.5 Vrms $\pm$1.6 Vrms (at .02 to 1.5 Amps)

Test Point Location



† Positive external battery: white lead
‡ Negative external battery: black lead

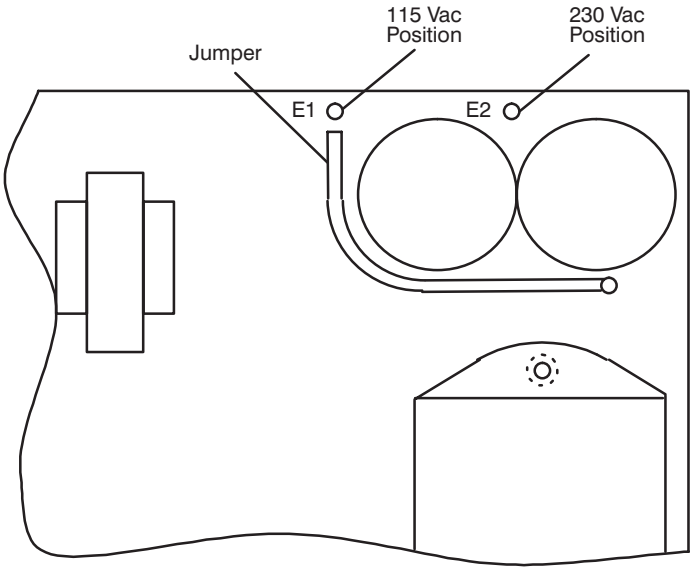
20-Slot Box Power Supply Connections



Front of Power Supply
(Toward Fan Panel and Front Panel)

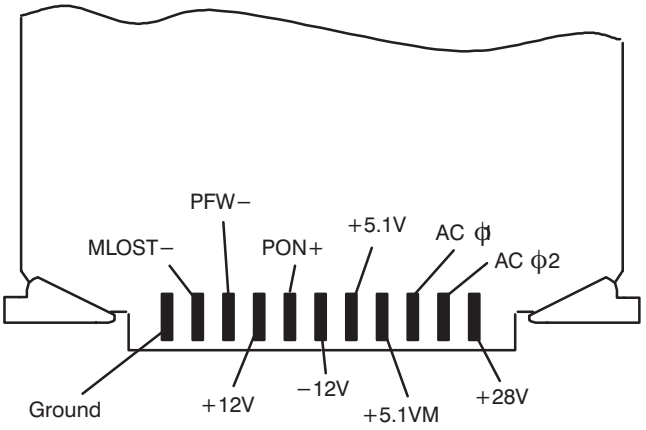
Connector	Description
P1	DC Output Connectors
P2	DC Output Connectors
P5	Battery Switch Connector
P6	Test Points and External Battery Connector
P7	230 Vac Line Configuration Connector
P8	115 Vac Line Configuration Connector
P9	AC Line Input Connector
P10*	Battery Backup Connector
P11*	25 kHz Sine Wave Connector
* Discontinued connector; shown for reference only.	

Model 6 115/230 Vac Strapping



Micro/1000 Power Supply Test Points

Test points are on Voltage Jumper Card or optional Battery Backup Card.

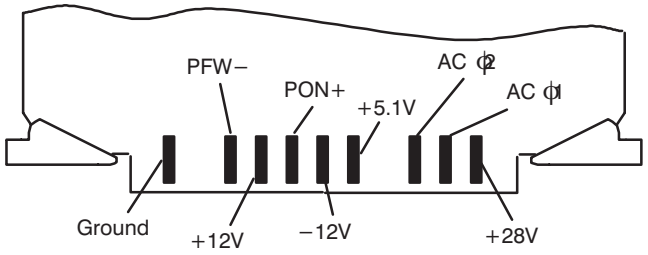


Voltage Point	Voltage Range †			
MLOST−	2.4	-	5.2	
PFW−	2.4	-	5.2	
+12V	11.6	-	12.7	
PON+	2.4	-	5.2	
−12V	−11.2	-	−12.7	
+5.1V	4.99	-	5.2	
+5.1VM	4.99	-	5.2	
AC ϕ1	17.9	-	21.1	(Vrms) ‡
AC ϕ2	17.9	-	21.1	(Vrms) ‡
+28V	22.4	-	33.6	

† Under normal load conditions.
‡ Phase to common at 0.02 to 1.5 A

I/O Extender (12025A) Power Supply Test Points

Test points are on the ICJ/12 Card.



Voltage Point	Voltage Range †			
PFW−	4.9	-	5.2	
+12V	11.6	-	12.7	
PON+	4.9	-	5.2	
−12V	−11.2	-	−12.7	
+5.1V	4.99	-	5.2	
AC ϕ1	17.9	-	21.1	(Vrms) ‡
AC ϕ2	17.9	-	21.1	(Vrms) ‡
+28V	22.4		33.6	

† ‡ Under normal load conditions.
Phase to common at 0.02 to 1.5 A

I/O Extender (12025B) Power Supply Voltages

Test Connector Pin Number	Voltage Point	Nominal Voltage	
1	+5	5.1V	+/− 0.10V
2	+12	12.0V	+0.72V/−0.36V
3	−12	−12.0V	+/− 0.72V
4	+5M	Not Valid	
5	PON+	5.1V	+/− 0.10V
6	PFW−	5.1V	+/− 0.10V
7	MLT−	Not Valid	
8	ϕ1	27.0 Vrms	+/− 2.16V
9	ϕ2	27.0 Vrms	+/− 2.16V
12	Common		

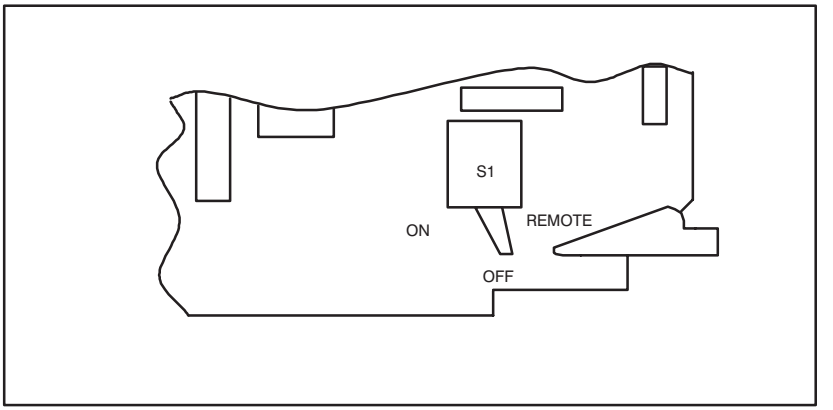
Battery Backup

CAUTION

Set the battery backup switch to DISABLE (OFF) before installing the battery backup card or module in the computer or system. Damage may occur to either the battery backup card or module or memory card. Once installed, set the switch to the desired position. See the following figures and the section titled "Switches and Connectors for 8-, 16-, and 20-Slot Card Cages" for location of this switch.

8-Slot Card Cages* (Model 6)

Battery backup is contained on the optional HP 12013A* card which is installed in the dedicated battery backup slot on the computer or system backplane. The battery backup switch is located on the battery backup card as shown below.



Model 6 Battery Backup Card Switch

Set the switches and connectors (when applicable) as indicated under the following section titled "Switches and Connectors for 8-, 16-, and 20-Slot Card Cages)" depending on whether battery backup is or is not installed.

* Discontinued product; shown for reference only.

CAUTION

Do not set the battery backup card on a conductive surface or on top of another PCA.

16-Slot Card Cages

Battery backup is contained on the optional HP 12154A card which is installed in the dedicated battery backup slot on the computer or system backplane.

CAUTION

Do not set the battery backup card on a conductive surface or on top of another PCA.

Set the switches and connectors (when applicable) as indicated under the following section titled “Switches and Connectors for 8-, 16-, and 20-Slot Card Cages)” depending on whether battery backup is or is not installed.

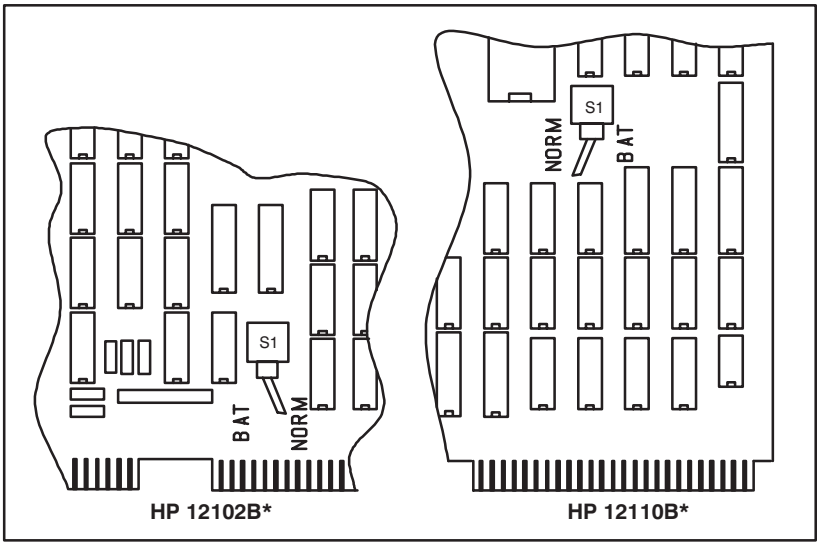
20-Slot Card Cages

Battery backup consists of the optional HP 12157B Battery Backup Module which is installed in the main dc power supply.

Set the switches and connectors (when applicable) as indicated under the following section titled “Switches and Connectors for 8-, 16-, and 20-Slot Card Cages)” depending on whether battery backup is or is not installed.

A600+ Processor

An additional backup switch, S1, must be set on the A600+ computer or system. This switch is located on the 12102A*/B or 12110A*/B Memory Controller card as indicated below.



A600+ Memory Controller Cards

Switches and Connectors for 8-, 16- and 20-Slot Card Cages

Set the switches and connectors (when applicable) as indicated in the following figure depending on whether battery backup is or is not installed.

Note that the batteries on the battery backup card or battery backup module are partially discharged before shipping. When fully discharged, they must be charged for 14 hours (16-slot box) or 24 hours (20-slot box) in order to sustain memory for one hour (full charge).

Corrosion may form on the batteries when they are fully discharged. This corrosion can be removed with a dampened cloth in a mild solution of baking soda and water.

* Discontinued product; shown for reference only.

Battery Backup Switches and Connectors for 8-, 16-, and 20-Slot Card Cages[1]

Switch or Connector	Battery Backup (BB)	Processor Family				
		A400	**A600/A600+**	**A700***	**A900**	**A990**
Battery Backup Switch	Installed	Enable	Enable	Enable	Enable	Enable
	Not Installed	Disable [3]	Disable [3]	Disable [3]	Disable [3]	Disable [3]
(Location)		B.B. card of 8-slot cage; front panel of 16-slot cage; back panel of 20-slot cage				
Strapping Connector [2]	Installed	To B.B. On	To B.B. On	To B.B. On	To B.B. On	To B.B. On
	Not Installed	To B.B. Off	To B.B. Off	To B.B. Off	To B.B. Off	To B.B. Off
(Location)		..... From lower supply in power supply				
Memory Lost (M) Switch S8 [1]	Installed	Open (up) [4]	Open (up) [4]	Open (up) [4]	Open (up) [4]	Open (up) [4]
	Not Installed	Closed (dn) [5]	Closed (dn) [5]	Closed (dn) [5]	Closed (dn) [5]	Closed (dn) [5]
(Location)		Processor Card	Processor Card	Front Plane	Data Path Card	Processor Card
Backup Switch S1	Installed	N/A	Bat	N/A	N/A	N/A
	Not Installed		Norm			
(Location)			Mem. Ctr. Card			

Notes:

* Discontinued product; shown for reference only. N/A = Not Applicable.

1. Battery backup is not supported on 6-slot card cages; set switch S8 closed for any CPU in 6-slot box.
2. Old model 20-slot boxes which contain the discontinued Boschert power supply do not have a strapping connector. When these units were supplied without battery backup, a jumper board was factory-inserted into the empty battery module slot in the Boschert power supply. This jumper board must be removed if battery backup is to be installed.
3. Set switch to disable if: (1) power is turned off and memory backup is not required (avoids draining the battery), or (2) memory or battery backup cards are to be inserted or withdrawn from the backplane. Note that batteries are still charged in the disable position when power is on.
4. Set switch open if: (1) battery backup is installed, enabled, and (2) auto-restart is desired.
5. Set switch closed if: (1) battery backup is not installed, or (2) auto-restart is not desired.

Preventive Maintenance

General

Periodic maintenance schedules should be set up according to the quality of the environment in which the system is operating. A system in a clean and air-conditioned atmosphere requires much less care than one which is located in an atmosphere with an unusual amount of dust, smoke, moisture, or other foreign matter. Consult the service manual for the optional disk drive and peripherals for the procedures required for a preventive maintenance schedule.

NOTE

When operating in a dusty or humid environment, the flexible disk drives will accumulate dust and dirt on heads and other moving surfaces such as the spindle and head positioner. Cleaning should be increased to match the rate of dirt accumulation. Avoid using high-velocity vacuum cleaners which may bend or distort head mechanisms. For specific information refer to disk drive service manuals.

On all computers perform the following steps as necessary:

1. Clean cabinet exterior and interior.
2. Check fans for proper operation.

Model 6 Procedures

On the Model 6, the ventilating fan filters for the optional disk drive cabinet should be cleaned monthly to ensure that the equipment remains free of dust. The ventilation fans in the equipment base have sealed bearings and require no lubrication.

Periodically check the batteries on the optional battery backup card for corrosion which may form on the batteries when they are fully discharged. This corrosion can be removed with a cloth dampened in a mild solution of baking soda and water.

Micro 14/16 Procedures (6-Slot Box – Cooler)

1. Clean the Box interior and exterior with a damp cloth.

2. Check fans for proper operation. Remove front cover and filter. While observing the fan spin, set the Power switch to off. The fan should continue to spin for at least 12 seconds. If the fan spins for less than 12 seconds, replace the fan.

3. Remove the box air filter from the inside of the front cover and vacuum its intake surface or wash it in mild detergent and warm water.

Micro 24/26/27*/29/99 Procedures (16-Slot Box – Micro/1000 package)

1. Clean the Box interior and exterior with a damp cloth.

2. Check fans for proper operation. While observing the fan spin, set the Power switch to off. The fan should continue to spin for at least 22 seconds. If a fan spins for less than 22 seconds, replace it.

3. Remove the front cover of the box by grasping it at both sides and pulling it away from the box. Remove the air filter by sliding it out of the box. Vacuum the filter's intake surface or wash it in mild detergent and warm water.

4. Filters for the ventilating fans in the optional disk drive cabinet should be cleaded monthly to ensure that the equipment remains free of dust. These fans have sealed bearings and require no lubrication.

5. Periodically check the batteries on the optional battery backup card for corrosion which may form on the batteries when they are fully discharged. This corrosion can be removed with a cloth dampened in a mild solution of baking soda and water.

Model 24/26/27*/29/99 Procedures (20-Slot Box)

On Models 24, 26, 27, 29, and 99, the ventilating fans in the computer have sealed bearings and require no lubrication.

The air filter in the computer should be cleaned monthly to ensure that the computer remains free of dust. Clean the air filter in a solution of warm water and mild soap. Thoroughly dry the filter before reinstalling it into the computer.

NOTE

Cleaning the air filter is the customer's responsibility. However, if you are at the customer's site, you should check the air filter and clean it if necessary.

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* Discontinued product; shown for reference only.

Table of Contents

Chapter 3
Configuration

3

Configuration

Operating Information

Virtual Control Panel (VCP) Characters

Character Entry	Response (octal)	Meaning
A †	xxxxxx	A-Register contents
B †	xxxxxx	B-Register contents
E †	x	E-Register contents
G †	x000xx	Global Reg (GR) bit 15=0 if enabled
I †	x	Interrupt system status
M †	0xxxxx	Memory address (pointer for T and Ln cmd)
O †	x	O-Register contents
P †	0xxxxx	Program execution address
Q †	xxxxxx	C and Q-Register contents (C=bit 15)
RS	xxxxxx	Switch register contents
T	0xxxxx xxxxxx	Memory contents pointed to by M
V	xxxxxx	Violation register (memory protect)
X †	xxxxxx	X-Register contents
Y †	xxxxxx	Y-Register contents
Z †	0xxxxx	Z-Register contents
RC	0000xx	Central Interrupt Register contents
RD ‡	xxxxxx xxxxxx	Data for I/O diagnose modes 1 and 2
RF ‡	xxxxxx	I/O flags; Flags 20-24, 30
RI ‡	xxxxxx	Interrupt mask register
RP	xxxxxx xxxxxx	Parity violation register contents
RW †	xxxxxx	Working map set (WMAP)
R20 ‡	xxxxxx	DMA Self-configuration register
R21 ‡	xxxxxx	DMA Control register
R22 ‡	xxxxxx	DMA Address register
R23 ‡	xxxxxx	DMA Count register
R24–26 ‡	xxxxxx	I/O Scratch register
R30 ‡	xxxxxx	I/O Card Data Register
R31/R32 ‡	xxxxxx	Optional I/O Card register

† Registers that are maintained in the VCP save area of boot RAM.
‡ Applies only to the card whose select code equals the GR.

VCP Commands

Command	Meaning
%B	Load and go (boot). Execute a specified loader routine and start program execution at completion of load.
%C	Clear memory. Set all memory to zero and perform a preset.
%E	Execute. Start execution of program at location P=2 (A-Reg → all 1's and B-Reg→ 0).
%F	Fill memory. Set all memory locations to value in A-Register and perform a preset. (VCP rev. 4023 or later)
%L	Load. Similar to %B but do not start execution.
%M	Memory test. Execute destructive extended memory test. Tests addressing logic. The test will optionally loop on error. Returns amount of memory found. If an error is found, the error type, error address, and the data written and read are displayed.
%P	Preset. Generate a control reset (CRS) signal to all interface PCAs.
%R	Run. Set all registers to the appropriate value in the save area and start execution at address specified by the P-Register.
%S	Parity error set. Places a parity error in addressable memory to test the parity interrupt handler and to verify proper functioning of the parity error interrupt logic. this command cannot be used on the A900.
%T	Test. Initiate the self-test and return to VCP (memory is sustained but I/O is reset).
%W	Write. Write from memory to a selected device.
D	Decrement. Decrement memory pointer and display contents of the M- or T-Registers.
Ln	List. List n blocks of eight memory locations starting with the location pointed to by the M-Register
Sn	Show. List boot memory. (VCP rev. 4023 or later)
N	Next. Same as D except increment the pointer
RMxx	List the 32 map registers in the DMS map set specified by xx.
RMxxPyy	Show the value of register yy in map set xx. If a number is input after the command, the register is changed tp the new value.
?	Output HELP screen.

Loader Commands

Loader Command Format

%BdvffbusctextSS	BOOT String
%Ldvffbusc	LOAD String
%Wdvffbusc	WRITE String

where:

dv – device type as follows;

DC	disk (cartridge or flexible) via HP-IB or SCSI (SCSI boot supported with VCP rev 4021 or later)
DI	HP 12022A Integral Disk/Controller (VCP rev 4001 or later)
CT	cartridge tape (HP 264x)
RM	PROM Card
DS	DS computer network link
MT	SCSI DAT tape or HP-IB magnetic tape (MT added at VCP rev 4001; SCSI DAT support added at 4021)

ff – file number (octal 0 to 77777 only)

b – (BOOT/LOAD) HP-IB or SCSI bus address
(WRITE) 4K word memory block number when writing to CTUs. For HP 12022A*, 0 is fixed disk, 3 is diskette.

u – unit number (0 to 7);

for HP 7906/9134*	#	➔ head number.
for CS/80	0	➔ disk drive.
	1	➔ tape device.
for HP 9144/45*	0	➔ stand-alone tape drive.
for CTUs	0	➔ left CTU.
	1	➔ right CTU.
for HP 9121*	0	➔ left drive.
	1	➔ right drive.

sc – Select code of the interface card to be used.

text – File name or ASCII string passed to the program after it is loaded.

SS – Load but do not execute; return to VCP.

* Discontinued product; shown for reference only

Note that spaces cannot be used in the command entry; also leading zeroes in the numeric value are optional. The following is acceptable:

%Bdv	where the default values are as follows:

DC	002027 (for HP-IB) 006027 (for SCSI)	RM	000022
		DS	000024
DI	000032	MT	004027
CT	000020		

%Bdvtext	Device parameters defaulted; text cannot be a number
%Bdvffbusc	No text passed.
%Bdvffbusctext	Text passed.

Firmware Revision Level

VCP Revision Level

The revision level of the VCP firmware installed in a system is shown in the B-Register at power-up. The A-Register contains the number of I/O masters installed in the system. The revision level can also be obtained with the VCP command %T.

Control Store Firmware Revision Level

The following procedure can be used, through the VCP, to find the revision level of the control store firmware (base set, floating point) installed in a system.

A-Reg → 0 B-Reg → XX

where XX is the 1K block of control store to be accessed, for example:

0-1K XX → 0
1-2k XX → 1
:
5-6K XX → 5

Execute the following:

Instruction:	Opcode:
FWID	105301
HLT 77B	102077

A-Register upper byte − Firmware revision level.
A-Register lower byte − package # (1 = Base Set, 2 = FPP).

All 1's will be returned if the firmware addressed is not installed.

The B-Register is ignored for the A600 (Base Set only).

Primary System

RTE-A Primary System Configuration, Rev. 5000 and 5010

LU	Select Code	HP-IB Addr.	HP Device
HP-IB #1			
15	27	36B	HP-IB Controller LU
16,17	"	0	HP 7908* CS/80 disk
18	"	0	HP 7907* CS/80 disk, fixed
19	"	0	HP 7941* CS/80 disk
20	"	0	HP 7911* CS/80 disk
21	"	0	HP 7945* CS/80 disk
22	"	0	HP 7912* CS/80 disk
23	"	0	HP 7914* CS/80 disk
24	"	0	CS/80 compatible cartridge tape cache
25,26	"	0	HP 7933* CS/80 disk
29–31	"	0	HP 7907* CS/80 disk, removable
32,33	"	6	HP 7902/9121* 3.5 in. flexible disk drives
50–52	"	2	HP 12122A or 9153B* hard disk
53	"	2	HP 12122A or 9153B* sgl-side flex disk drive
54	"	2	HP 12122A or 9153B* dbl-side flex disk drive
7	"	3	HP 7974*/7978A* streaming mag tape drive
8	"	4	HP 7970 mag tape drive
9	"	1	HP 9144 CS/80 cartridge tape drive
HP-IB #2			
40	26	36	HP-IB Controller LU
41-43	"	7	HP 9133*/3H* 5.25 in. fixed disk
44-47	"	0	HP 9134* CS/80 disk
12	"	1	HP 9144* CS/80 cartridge tape drive
34,35	"	2	HP 7902*/9122* 3.5 in. flexible disk drives
61	"	7	HP 9133H* 3.5 in. flexible disk drive
85	"	3	HP 2563/66A/2608 line printer
6	"	6	HP 2932A* line printer
Micro/1000 Integrated Disks			
55,62	32		HP 248x Computer with 15 MB hard disk
59,60	"		HP 248x Computer with 20 MB hard disk
39	"		HP 248x Computer with sgl-side flex disk
63	"		HP 248x Computer with dbl-side flex disk
Network Links			
79,80	24		DS/1000 Read and Write Ports
81,82	"		DS/1000 LU mapping

* Discontinued product; shown for referrence only

LU	Select Code	HP-IB Addr.	HP Device
HP 12122A LUs			
50−52	27	2	Hard disks, unit 0
53	〃	2	SS flexible, unit 1
54	〃	2	DS flexible, unit 1
ASIC #1			
1	20		HP 26xx* default system console
ASIC #2			
100	40		HP 26xx* terminal
HP 12100A, A400 OBIO			
110	77		A400 On-Board I/O Port A Terminal
111	〃		A400 On-Board I/O Port B Terminal
112	〃		A400 On-Board I/O Port C Terminal
113	〃		A400 On-Board I/O Port D Terminal
HP 12040D			
120-127	30		8-channel MUX, ports 0 - 7 respectively
HP 12040B*/C			
130-137	23		8-channel MUX, ports 0 - 7 respectively

* Discontinued product; shown for referrence only

RTE-A Primary System Configuration, Rev. 5020

At Rev. 5020, the only change to the Primary System LU Configuration was that LUs 50 and 51 were merged into just LU 51.

Therefore, for the Rev. 5020 configuration, refer to the previous table (Rev. 5000/5010), but note that the disk LUs for the HP 12122A/9153B are 51, 52 instead of 50, 51, 52.

RTE-A Primary System Configuration, Rev. 5270

At Rev. 5270 (5.27) there was a major change in the Primary configuration due to the addition of SCSI boot support and the creation of a SCSI Primary.

Select Code	LU	ADDR	SCSI	HP-IB
25b	22–2	2	– –	SCSI MO Disk
	344	5	– –	SCSI DAT Tape
	20–21	6	– –	SCSI Hard Disk
26b	26–27/28*	0	HP-IB Disk	– –
	29	0	HP-IB Floppy Disk	
	54	0	HP-IB Cartridge	– –
	39	1	9144/45 Cartridge	– –
	37	3	7974/78 Tape	– –
	38	4	7970 Tape	– –
	36	7	2392A Printer	– –
	25	36b	HP-IB Controller	– –
27b	16–17/18*	0	– –	HP-IB Disk
	19	0	– –	HP-IB Floppy Disk
	24	0	– –	HP-IB Cartridge
	9	1	– –	9144/45 Cartridge
	12–13	2	SCSI MO Disk	– –
	7	3	– –	7974/78 Tape
	8	4	– –	7970 Tape
	14	5	SCSI DAT Tape	– –
	10–11	6	SCSI Hard Disk	– –
	6	7	– –	2392A Printer
	15	36b	– –	HP-IB Controller
24b	41–42	0	HP-IB Disk	(same)
	46–47	2	9153 Fixed Disk	
	48	2	9153 Sgl-Side Flex Disk	
	49	2	9153 Dbl-Side Flex Disk	
	85	3	2563/66 A/26085 Printer	
	45	36	HP-IB Controller	

* You may use either LU 17 or 18, but not both. You may also use either LU 27 or 28.

Select Code	LU	ADDR	Device
The following devices have same configuration for both HP-IB and SCSI systems.			
20b	**ASIC #1** 1		HP 26xx Default System Console
77b	**12100A A400 OBIO** 110 111 112 113		 A400 On-Board I/O Port A Terminal A400 On-Board I/O Port B Terminal A400 On-Board I/O Port C Terminal A400 On-Board I/O Port D Terminal
30b	**12040D MUX** 120 – 127		HP 12040 Rev. D 8-Channel MUX, Ports 0 – 7, respectively
23b	**12040B/C MUX** 130 – 137		HP 12040 Rev. B or C, 8-Channel MUX, Ports 0 – 7, respectively

Primary Software Installation Procedures

This section is intended to briefly describe the boot process and to list the bootstrings for several different media. Refer to the *RTE-A Primary System Software Installation Manual* (part no. 92077-90038), for more information.

CS/80 Cartridge or Magnetic Tape, Rev. 5000 and 5010

Primary System installation is identical with software revisions 5000 and 5010 unless specifically indicated otherwise.

The Primary System, when supplied on CS/80 cartridge or 1600 bpi magnetic tape, consists of two tapes. One tape contains the Primary in ASAVE format. The second contains the bootable subsystem ARSTR needed to restore the Primary tape.

Note: After the Rev. 5000 release, CS/80 tape part no. 24999-13641 was created for Primary installation to the HP 12122A disk subsystem. It is an ASAVE version of LUs 50 and 51. This tape was distributed only on internal subscription services. (At Rev. 5012, an extra tape was shipped with the Primary (to customers) for the installation of LUs 50 and 51.)

Proceed with the following steps to install the Primary System:

1. Boot ARSTR† from the VCP prompt, with one of the following commands:

   CS/80 tape:

%bdc441027	(for the HP 9144/45* tape drive
%bdc440127	(for other C S/80 tape drives)

   Magnetic tape:

%bmt23027	(for the HP 7974*/78*/79 /80‡ tape drive)
%bmt24027	(for the HP 7970* magnetic tape drive

* Discontinued product; shown for reference only.

† Only revision 2536 or later of the ARSTR utility can be used to restore the primary system to a 20 MB integrated hard disk in a Micro/1000 system.

‡ In order to boot from the HP 7979, the tape drive must have the model ID configured as 7974. Refer to the HP 7979 CE Handbook for information about configuring the HP 7979.

2. After ARSTR is booted, the prompt "ARSTR:" is displayed. Remove the ARSTR tape and insert the tape labeled RTE-A Primary/Master or Primary/Diags/Master. The Primary can now be restored from the tape using one of the following commands:

   CS/80 tape:

ARSTR: ta,9	(for the HP 9144/45 tape drive)
ARSTR: ta,24	(for other C S/80 tape drives)

   Magnetic tape:

ARSTR: ta,7	(for the HP 7974*/78*/79/80 magnetic tape drive)
ARSTR: ta,8	(for the HP 7970* magnetic tape drive)

3. Copy the software to the hard disk with one of the following commands:

   CS/80 hard disk:

   ```
   ARSTR: re,1:16,2:17|rw
   ```

   This command restores files 1 and 2 to disk volume L Us 16 and 17 respectively and rewinds the tape.

   Micro/1000 hard disk (20 MB):

   ```
   ARSTR: re,3:59,4:60|rw
   ```

   This command restores files 3 and 4 to disk volume L Us 59 and 60 respectively and rewinds the tape.

4. Boot the Primary System from the hard disk with one of the following commands:

   CS/80 hard disk:

   ```
   VCP> %bdc27
   ```

   HP 12122A disk subsystem:

   ```
   VCP> %bdc
   ```

   Micro/1000 hard disk (except HP 12122A):

   ```
   VCP> %bdi32
   ```

CS/80 Cartridge or Magnetic Tape, Rev. 5012

The Primary System, when supplied on either CS/80 or 1600 bpi media, consists of the following three tapes.

- The Primary, in ASAVE format, to be restored to LUs 16/17 for HP 79xx* disks or LUs 50/51 for the HP 12122A disk subsystem.
- The Primary, in ASAVE format, to be restored to LUs 59/60 for the Micro/1000 disk subsystem with HP 12022A* controller interface.
- The bootable ARSTR needed to restore the Primary tape.

Proceed with the following steps to install the Primary System:

1. Boot ARSTR with one of the following commands:

   CS/80 tape:

   VCP> %bdc451027 (for HP 9144/45 tape drives)

   VCP> %bdc450127 (for other C S/80 tape drives)

   Magnetic tape:

   VCP> %bmt23027 (for the HP 7974*/78*/79 ‡/80 tape drive)

   VCP> %bmt24027 (for the 7970* magnetic tape drive)

2. After ARSTR is booted, the prompt "ARSTR:" is displayed. Remove the tape and insert one of the tapes labeled RTE-A Primary (or Primary/Diag if the system came with diagnostics) depending on the LU number to be restored. Use the following guide.

Tape Label No.	Restores LUs	For the following Disks
Primary #1	16 and 17	HP 7907*/08*/11*/12*/14*/33*/41*/45*
Primary #1	50 and 51	HP 9153 or Micro/1000 with HP 12122A integrated disk subsystem
Primary #2	59 and 60	Micro/1000 with integrated disk using HP 12022A* interface

* Portions or all of this product line are discontinued; shown for reference only.

‡ In order to boot from the HP 7979, the tape drive must have the model ID configured as 7974. Refer to the HP 7979 CE Handbook for information about configuring the HP 7979.

3. The Primary can now be restored from tape using one of the following commands:

   CS/80 hard disk:

ARSTR: ta,9	(for the HP 9144/45 tape drive)
ARSTR: ta,24	(for other C S/80 tape drives)

   Magnetic tape:

ARSTR: ta,7	(for the HP 7974*/78*/79/80 magnetic tape drive)
ARSTR: ta,8	(for the HP 7970* magnetic tape drive)

4. Copy the software to the hard disk with one of the following commands:

   HP 79xx* hard disks:

   ```
   ARSTR: re,1:16,2:17|rw
   ```
   This command restores files 1 and 2 to disk volume L Us 16 and 17 respectively and rewinds the tape.

   HP 9153 hard disk or Micro/1000 with HP 12122A integrated disk:

   ```
   ARSTR: re,3:50,4:51|rw
   ```
   This command restores files 3 and 4 to disk volume L Us 50 and 51 respectively and rewinds the tape.

   Micro/1000 integrated disk (20 MB) using HP 12022A* controller:

   ```
   ARSTR: re,1:59,2:60|rw
   ```
   This command restores file 1 and 2 to disk volume L Us 59 and 60 respectively and rewinds the tape.

5. Boot the Primary System from the hard disk with one of the following commands:

   HP 79xx* hard disks:

   ```
   VCP> %bdc27
   ```

   HP 9153 hard disk or Micro/1000 with HP 12122A integrated disk:

   ```
   VCP> %bdc2027
   ```

   Micro/1000 integrated disk (20 MB) using HP 12022A* controller:

   ```
   VCP> %bdi32
   ```

* Portions or all of this product line discontinued; shown for reference only.

CS/80 Cartridge or Magnetic Tape, Rev. 5020

The Primary System, when supplied on either CS/80 or 1600 bpi media, consists of the following four tapes.

- The Primary, in ASAVE format, to be restored to LUs 16 and 17 for HP 79xx* disks or LU 51 for the HP 12122A disk subsystem.
- The Primary, in ASAVE format, to be restored to LU 59 for the Micro/1000 disk subsystem with HP 12022A* controller interface.
- The bootable ARSTR needed to restore the Primary tape.
- RTE-A relocatables for the system gen and program linking.

Proceed with the following steps to install the Primary System:

1. Boot ARSTR with one of the following commands:

   CS/80 tape:

VCP> %bdc451027	(for HP 9144/45 tape drives)
VCP> %bdc450127	(for other C S/80 tape drives)

   Magnetic tape:

VCP> %bmt23027	(for the HP 7974*/78*/79 /‡80 tape drive)
VCP> %bmt24027	(for the 7970* magnetic tape drive)

2. After ARSTR is booted, the prompt "ARSTR:" is displayed. Remove the tape and insert one of the tapes labeled RTE-A Primary (or Primary/Diag if the system came with diagnostics) depending on the LU number to be restored. Use the following guide.

Tape Label No.	Restores LUs	For the following Disks
Primary #1	16 and 17	HP 7907*/08*/11*/12*/14*/33* /41*/45*
Primary #1	51	HP 9153 or Micro/1000 with HP 12122A integrated disk subsystem
Primary #2	59	Micro/1000 with integrated disk using HP 12022A* interface

* Portions or all of this product line are discontinued; shown for reference only.

‡ In order to boot from the HP 7979, the tape drive must have the model ID configured as 7974. Refer to the HP 7979 CE Handbook for information about configuring the HP 7979.

3. The Primary can now be restored from tape using one of the following commands:

   CS/80 hard disk:

ARSTR: ta,9	(for the HP 9144/45 tape drive)
ARSTR: ta,24	(for other C S/80 tape drives)

   Magnetic tape:

ARSTR: ta,7	(for the HP 7974*/78*/79/80 magnetic tape drive)
ARSTR: ta,8	(for the HP 7970* magnetic tape drive)

4. Copy the software to the hard disk with one of the following commands:

   HP 79xx* hard disks:

   ```
   ARSTR: re,1:16,2:17|rw
   ```
   This command restores files 1 and 2 to disk volume L Us 16 and 17 respectively and rewinds the tape.

   HP 9153 hard disk or Micro/1000 with HP 12122A integrated disk:

   ```
   ARSTR: re,3:51|rw
   ```
   This command restores file 3 to disk volume L U 51 and rewinds the tape.

   Micro/1000 integrated disk (20 MB) using HP 12022A* controller:

   ```
   ARSTR: re,1:59|rw
   ```
   This command restores file 1 to disk volume L U 59 and rewinds the tape.

5. Boot the Primary System from the hard disk with one of the following commands:

   HP 79xx* hard disks:

   ```
   VCP> %bdc27
   ```

   HP 9153 hard disk or Micro/1000 with HP 12122A integrated disk:

   ```
   VCP> %bdc2027
   ```

   Micro/1000 integrated disk (20 MB) using HP 12022A* controller:

   ```
   VCP> %bdi32
   ```

* Portions or all of this product line discontinued; shown for reference only.

CS/80 Cartridge, Magnetic, or DAT Tape, Rev. 5270

The Primary System, when supplied on CS/80, 1600 bpi Magnetic, or SCSI DAT Tape media, consists of the following three tapes.

- The primary, in ASAVE format.
- The bootable ARSTR needed to restore the primary tape.
- RTE-A relocatables for the system gen and program linking.

Proceed with the following steps to install the Primary System:

1. Boot ARSTR with one of the following commands:

   To copy from HP-IB tape to HP-IB disk (HP-IB card = sc 27):

VCP> %bdc401027	(for the HP 9144*/45* tape drive)
VCP> %bdc400127	(for other CS/80 tape drives)
VCP> %bmt23027	(for the HP 7974*/78*/79‡/80 tape drive)
VCP> %bmt24027	(for the HP 7970* tape drive)

   To copy from SCSI tape to SCSI disk (SCSI card = sc 27):

VCP> %bmt25027	(for the SCSI DAT tape drive)

   To copy from HP-IB tape to SCSI disk (HP-IB card = sc 26 and SCSI card = sc 25):

VCP> %bdc401026	(for the HP 9144*/45* tape drive)
VCP> %bdc400126	(for other CS/80 tape drives)
VCP> %bmt23026	(for the HP 7974*/78*/79/80 tape drive)
VCP> %bmt24026	(for the HP 7970* tape drive)

   To copy from SCSI tape to HP-IB disk (SCSI card = sc 25 and HP-IB card = sc 26):

VCP> %bmt25025	(for the SCSI DAT tape drive)

* Portions or all of this product line are discontinued; shown for reference only.

‡ In order to boot from the HP 7979, the tape drive must have the model ID configured as 7974. Refer to the HP 7979 CE Handbook for information about configuring the HP 7979.

2. After ARSTR is booted, the prompt "ARSTR:" is displayed. Remove the tape and insert the ASAVE tape. The primary can now be restored from tape using one of the following commands:

   To copy from HP-IB tape to HP-IB disk (HP-IB card = sc 27):

   ```
   ARSTR: ta,9|re,1:16|rw      (from 9144/45 tape drive to CS/80 disk)
   ARSTR: ta,24|re,1:16|rw     (from other CS/80 tape drives to CS/80 disk)
   ARSTR: ta,7|re,1:16|rw      (from 7974/78 tape drive to CS/80 disk)
   ARSTR: ta,8|re,1:16|rw      (from 7970 tape drive to CS/80 disk)
   ```

   To copy from SCSI tape to SCSI disk (SCSI card = sc 27):

   ```
   ARSTR: ta,14|re,2:10|rw     (from SCSI DAT tape to SCSI hard disk)
   ARSTR: ta,14|re,2:12|rw     (from SCSI DAT tape to SCSI MO disk)
   ```

   To copy from HP-IB tape to SCSI disk (HP-IB card = sc 26 and SCSI card = sc 25):

   ```
   ARSTR: ta,39|re,2:20|rw     (from 9144/45 tape drive to SCSI hard disk)
   ARSTR: ta,54|re,2:20|rw     (from other CS/80 tape drives to SCSI disk)
   ARSTR: ta,37|re,2:20|rw     (from 7974/78 tape drive to SCSI hard disk)
   ARSTR: ta,38|re,2:20|rw     (from 7970 tape drive to SCSI hard disk)
   ARSTR: ta,39|re,2:22|rw     (from 9144/45 tape drive to SCSI MO disk)
   ARSTR: ta,54|re,2:22|rw     (from other CS/80 tapes to SCSI MO disk)
   ARSTR: ta,37|re,2:22|rw     (from 7974/78 tape drive to SCSI MO disk)
   ARSTR: ta,38|re,2:22|rw     (from 7970 tape drive to SCSI MO disk)
   ```

   To copy from SCSI tape to HP-IB disk (SCSI card = sc 25 and HP-IB card = sc 26):

   ```
   ARSTR: ta,44|re,1:26|rw     (from SCSI DAT tape drive to CS/80 disk)
   ```

3. Boot from the hard disk with one of the following commands:

   ```
   VCP> %bdc27          (for CS/80 disk)
   VCP> %bdc2027        (for SCSI MO disk)
   VCP> %bdc6027        (for SCSI hard disk)
   ```

3.5-inch Diskettes

Installing the RTE-A Primary System from diskettes consists of booting the primary, initializing the hard disk, and then copying the remainder of the primary to the hard disk. Due to the number of steps and commands required, refer to the *Primary Installation Manua*l (part no. 92077-90038) for installation procedures.

Sample RTE-A Boot Command File, Rev. 5020 (5.2)

As the system is brought into memory, the following messages appear on the screen. Note that you are prompted to enter the current date and time.

```
*   SOURCE: 92077–17293  REV.5020 <901205.1442>
*   JCR
*   FHP,MCN – size up the swap file (2048 blocks)
* Primary system boot up command file (boot.cmd) for primary system
ec
* Define system and snap files
sy,primary.sys
sn,primary.snp
*
* Note: No FMGR cartridges are mounted.  If needed, mount cartridge
        16 for CS–80 systems (MC,16) or mount cartridge 60 for micro–
        1000 systems (MC,60) to mount the appropriate FMGR cartridge.
*
* Define initially RP'ed programs
rp,drtr,d.rtr
rp,derr,d.err
*
rp,ci,cm
rp,cix
*
* RP the powerfail routine and DDC00/DDC01 modem handler
rp,autor
*
* Configure the system console
rp,ci,ci.s
*

* Note: the following line is used for the primary system only.
*       Remove it when you generate your system with a system
        console gen"d in.
*
* Map VCP terminal to LU1
rp,lucfg,prihp
*
* Use Welcome1.cmd
st,,1
end
*
* End RP phase
* Define swap file
* sw,swap.swp::system::2048
*
end
```

Sample RTE-A Welcome File, Rev. 5020 (5.2)

Note that the following example involves an HP 12040D, 8-port MUX card with ports 0 through 7 and device driver DDC00 enabled. LU 1 is an Async port. This example will be different for a different system configuration.

```
* /SYSTEM/WELCOME1.CMD:
* This file is designed to be edited according to your system
* configuration.  See RTE-A System Generation and Installation
* Manual concerning the functions of the WELCOME file.  This
* reflects the terminals configured in the primary system
* (using #ANS), and should be modified according to your system
* configuration.
*
* remove the initializing program which dynamically configures
* LU 1 to the VCP port
of PRIHP id
*
* Update /system/snap.snp for LINK program.  Note that if
*   SNAP::0 exists, LINK will search there first.  Be sure you
*   do not have a SNAP on your FMGR cartridges.
*
co /system/snp.snp /system/snp.snp d
*
wd /programs
set log = off
* The following lines give the typical enabling sequences for
* standard terminals.  If you desire to connect up a RS–232
* printer, enable it according to the RTE–A Driver Reference
* Manual.
*
* If you are using VC+, be sure to RP PROMT in your boot.cmd
* file, and do not perform the “rp ci ciNNN” and “cn LU 20b
* ciNNN” commands.  The VC+ primary program (“cn LU 20b promt”)
* is performed automatically upon first init to the interface
* driver and is not necessary.
*
* Remove the “*”s before the lines which pertain to your system
* using EDIT (see RTE–A EDIT/1000 User’s Guide).  Do not remove
* the comment if the particular card is not physically in your
* system.
*
*
* Section 1: ENABLE ASIC (12005B) card (LU 100, select code 21b)
*
* echo ‘Enabling LU 100, ASIC‘
* rp ci ci100
* cn 100 20b ci100
*
*
* Section 2: ENABLE A400/OBIO 4–MUX (12100A) card (LUs 110 –
* 113)
* note: If you want to perform speed sensing, use only the
* command “CN <lu> 34b 2” (a dummy entry to the card) instead
* of the “CN <lu> 30b 13xB” command.
*
* Echo ‘Enabling LU 110, OBIO 4–MUX port A‘
* cn 110 30b 130b
* cn 110 34b 2
```

```
* rp ci ci100
* cn 110 20b ci110
        .
        .
* Echo ‘Enabling LU 113, OBIO 4–MUX port D‘
* cn 113 30b 133b
* cn 113 34b 2
* rp ci ci113
* cn 113 20b ci113
*
*
* Section 3: ENABLE DDC00 compatable 8–MUX (12040D) card (LUs
* 120 – 127 Select Code 30b)
* note: If you want to perform speed sensing, use only the
* command “CN <lu> 34B 2” (a dummy entry to the card) instead
* of the “CN <lu> 30b 13xB” command.
*
*
echo ‘Enabling LU 120, REV.D 8–MUX port 0‘
cn 120 30b 130b
cn 120 34b 2
rp ci ci120
cn 120 20b ci120
        .
        .
*
echo ‘Enabling LU 127, REV.D 8–MUX port 7‘
cn 127 30b 137b
cn 127 34b 2
rp ci ci127
cn 127 20b ci127
*
*
* Enable CI.RUN as primary program on LU 1
*
echo ‘Enabling system console LU 1
set log = on
rp ci ci.01
cn 1 20b ci.01
co “mess.txt::system 1
rp link
ws link 32
*
* Set the time: tm <mon> <day> <year> <hr>:<min>:<sec>: <am/pm>
*
set log = off
ex
```

Hard Disk Drive Configuration

When using internal jumpers or switches to configure any HP 9133 or HP 9153 hard disk drive, strap the drive for 256-byte sector size and single-volume operation. Refer to the appropriate disk drive manual for instructions on internal strapping.

Interface Configuration

HP 12005A*/B Async Serial Interface

Switch Configuration

U1 Switches

S1	S2	S3	S4	S5	S6	S7	S8	
O	X	< – Select Code – >						HP 12005 will not operate as the VCP interface.
C	X	< – Select Code – >						HP 12005 will operate as the VCP interface. A BREAK character will HALT the computer and enter this code. NOTE: The VCP Interface Select Code must be set for 20B. Early revisions of VCP ROMs allow disabling VCP Break by setting bit 4 on the CPU. Later revisions (4001 and later) use bit 5 for this purpose.

U21 Switches

S1	S2	S3	S4	S5	S6	S7	S8	
< baud rate >				S	P	X	X	S7/S8 switch setting for 12005-60001
< baud rate >				S	P	O	C	S7/S8 switch setting for 12005-60007†
< baud rate >				S	P	O	C	S7/S8 switch setting for 12005-60010†
< baud rate >				S	P	●	X	S7/S8 switch setting for 12005-60011/12‡

where:

O = Open (up) = 1
C = Closed (down) = Ø
X = don't care

S = O; Two stop bits
S = C; One stop bit

P = O; Even parity
P = C; Odd parity

* Discontinued product; shown for reference only.

● S7 is used to select 19.2k baud (see next page).

‡ HP 12005B includes fiber optics.

† When switch S7 is Closed (down) and switch S8 is Open (up), a 16 X baud rate (set by switches S1–S4) signal will be available on pin 23. This signal is necessary for the HP 25590 Diagnostic Interface Unit, DIU (part of the HP 2250 Measurement and Control Product). When switch S7 is Open (up) and switch S8 is Closed (down), normal baud rate operation is regained. The other two possible switch settings for S7 and S8 (i.e., both Open or both Closed) must not be used. If used, these settings will result in self-test errors and/or diagnostic errors.

Baud Rate	S1	S2	S3	S4	S7▪
ext clk	C	C	C	C	C
50	C	C	C	O	C
75	O	C	C	C	C
110	O	C	C	O	C
134.5	C	O	C	C	C
150	C	O	C	O	C
300	O	O	C	C	C
600	O	O	C	O	C
900	C	C	O	C	C
1200	C	C	O	O	C
1800	O	C	O	C	C
2400	O	C	O	O	C
3600	C	O	O	C	C
4800	C	O	O	O	C
7200	O	O	O	C	C
9600	O	O	O	O	C
19200	O	O	O	O	O

▪ For 12005-60011/12

HP 12006A Parallel Interface

Switch Configuration

U1 Switches

S1	S2	S3 S4 S5 S6 S7 S8	
O	Y	< – Select Code – >	HP 12006 will not operate as the VCP interface.
C	Y	< – Select Code – >	HP 12006 will operate as the VCP interface if a suitable VCP ROM is used (currently non-HP supplied).

where:

O = Open (up) = 1
C = Closed (down) = ∅

Y = O; Active high Device Command (for diagnostic)
Y = C; Active low Device Command

Note:

Cable (shielded, twisted pair) is grounded at CPU end only

Programmable Serial Interface (PSI)

Switch Configuration

HP 12007A*/B, HP 12042A*/B, HP 12043A/44A/73A/75A/82A/92A

The PSI Interface is the PCA that is used with specific ROMs to create the various data communications interfaces. The PSI PCA is available in two basic versions, a Modem PSI card or a Direct Connect PSI card. The following tables show the many data communications interfaces, the required ROMs, and specific strapping requirements.

PSI Part Numbers

	Modem	Direct Connect (DC)
PCA (new part) PCA (exchange part)	5061-4940 5061-4941	5061-4938 5061-4939
Cable	5061-4914	5061-3422 (male) 5061-4908 (female)

Product Descriptions and ROM Locations

Description	HP Product	PSI Version	ROMs	Location
HDLC,†1000 to 1000 Link	12007A*/B	Modem	5180-7233**	U24
	12044A	DC	5180−7233**	U93
Bisync,‡1000 to 3000 Link	12073A	Modem	91750-80016 91750-80017	U24 U44
	12082A	DC	91750-80016 91750-80017	U93 U73
X.25 1000 to Packet Network	12075A	Modem	5180-7260	U24
OEM Version	12042A*/B	Modem	5180-1951	U24
MRJE, 1000 to IBM	12043A	Modem	5180-1966	U24
Data Link Master Multipoint	12092A	Modem	5180-1966	U24

† HDLC = High level Data Link Control, uses full duplex protocol.
‡ Bisync = Binary Synchronous communication, uses half duplex protocol.
** Or newer part number 5181-6113

* Discontinued product; shown for reference only.

U1 Switches† on PSI (All Products)

S1 = O PSI will not operate as the VCP Interface.

C PSI will operate as the VCP Interface. A remote BREAK command (via DS/NS software) will halt the computer and enter the VCP mode if the PSI is used as the VCP interface. The select code must be 24B.

S2 = O If card cage door is closed and the spring clip on the hood connector will contact the cage door with a metal to metal connection. (This is true for Model 6 systems and L-Series systems.)

C If the spring clip on the hood connector is not touching card cage ground. (This is true for all 20-slot boxes and Micro/1000 systems.)

S3
S4
S5
S6
S7
S8

} Select code

U15 Switches† S6, S7, S8 on PSI (Baud Rate) for Bisync and HDLC

S6	S7	S8	Clock Rate (bps)
O	O	O	300
C	O	O	1.2k
O	C	O	2.4k
C	C	O	4.8k
O	O	C	9.6k
C	O	C	19.2k
O	C	C	57.6k
C	C	C	230.0k

HP 12007A*/B, HP 12044A (HDLC)

S1 = X
S2 = C 128 Byte information field (recommended for Modems)
O 1024 Byte information field (recommended for Direct Connects)
Both ends of link must have S2 in same position.
S3 = X
S4 = X
S5 = X
S6
S7
S8

} Refer to U15 Switches (Baud Rate).

* Discontinued product, shown for reference only

† O = open (UP) = logic 1, C = closed (down) = logic 0, X = don't care

HP 12042A*/B (OEM Version)

S1 → S8 Depends on OEM ROM code.

HP 12043A (MRJE)

S1 → S8 = X The PSI is programmatically configured by software requirements.

HP 12073A, HP 12082A (Bisync)

S1 = X
S2 = C External clock
O No external clock
S3 = C Ring detect
O Auto answer, Direct Connect
S4 = C Modem, 20 second time-out
O Direct Connect, requires internal clock, no time-out.
S5 = X
S6, **S7**, **S8** } Refer to U15 Switches (Baud Rate), 57.6k bps maximum.

HP 12075A (X.25)

S1 = O Always open to use bps selected by S5 thru S8
S2 = X
S3 = X
S4 = X

U15 Switches† (Baud Rate) for X.25 only

S8	S7	S6	S5	Clock Rate (bps)
O	O	O	O	300
O	O	O	C	1.2k
O	O	C	O	2.4k
O	O	C	C	4.8k
O	C	O	O	9.6k
O	C	O	C	19.2k
O	C	C	O	38.4k
O	C	C	C	48.0k
C	O	O	O	57.6k

† O = open (off, up), C = closed (on, down), X = don't care

* Discontinued product; shown for reference only.

Firmware Installation

A set of jumpers on the interface card provides the option of using different ROM parts in the future. The set consists of a 14-pin socket that houses seven removable jumpers (XW1A through XW1G), and two hard-wired jumpers on the interface card itself. XW1A through XW1G should be configured as described in the following tables. Hard-wired jumpers W5 (not installed) and W6 (installed) are factory configured.

ROM Category	HP Part No.†	Part Type
A	1818-0762	TI 2532
B	1818-0498	TI 2516 Intel 2716
C	1818-0850 1818-1633 (No HP P/N) 1818-1747 1818-3384	Intel 2732 Intel 2732A Intel 2332 Intel 2764 Intel 2764A

† HP Part No. refers to the unprogrammed part; typically a separate sticker is applied with the firmware part no. (i.e., the contents of the programmed ROM).

ROM Category			Modem and Direct Connect							Direct Connect Only			
Modem	U24	U44	XW1A through XW1G							XW2D through XW2A			
Direct Connect	U93	U203	A	B	C	D	E	F	G	D	C	B	A
	C						x			dc	dc	dc	dc
	C	C					x			x		dc	dc
	A	A				x	x	x	x	x		dc	dc
	C	A			x		x	x		x		dc	dc
	B	A			x		x	x	x	x		dc	dc
	B	B			x	x	x	x	x	x		dc	dc
	A	C	x				x		x	x		dc	dc
	C	B	x			x	x	x		x		dc	dc
	A	B	x		x	x	x	x	x	x		dc	dc
	B	C	x		x		x		x	x		dc	dc

where: x = a required jumper in place
dc = don't care

PSI Test Hoods

Direct-Connect	Modem	Purpose
5061-3421 5061-3460	5061-3425 5061-4916 5061-3453 5061-4915 5061-3441	loopback verifier diagnostic hood diagnostic hood RS-449 loopback RS-449 loopback

Both the loopback verifier and the diagnostic hood will perform a loopback function, but the diagnostic hood allows checking all the signal lines to the edge connector. The 1000-3000 link cannot loopback since it is defined as half-duplex. Therefore, the diagnostic hood is shipped for BISYNC while the loopback hood is shipped for HDLC or X.25.

HP 12008A PROM Storage Module

Switch Configuration

U1 Switches								
S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	
X	X	< – Select Code – >						The Select Code is the only configuration required.

where:

O = Open (up) = logic 1
C = Closed (down) = logic Ø
X = don't care

Refer to *HP 12008A PROM Storage Module Interface Reference Manual* (part no. 12008-90001), for information about ROMs suitable for this card as well as programming information.

HP 12009A HP-IB Interface

Switch Configuration

U1 Switches

S1	S2	S3	S4	S5	S6	S7	S8	
C	Y	< –	Select Code				– >	HP 12009 will not operate as the bus controller–in-charge.
O	Y	< –	Select Code				– >	HP 12009 will operate as the bus controller-in-charge.†

where:

O = Open (up) = logic 1
C = Closed (down) = logic Ø

Y = O; the delay between the assertion of data on the bus and the assertion of DAV is 500 ns.

Y = C; the delay between the assertion of data on the bus and the assertion of DAV is 350 ns (satisfies IEEE Standard 488-1978 for fast settling time required for high speed operation).

U16 Switches‡

S1	S2	S3	S4	S5	S6	S7	S8	
C	C	C	<	HP-IB adrs			>	Determines the HP-IB address to which the PHI chip will respond.
O	C	C	<	HP-IB adrs			>	Puts PHI chip online.
C	O	C	<	HP-IB adrs			>	Puts PHI chip into “TALK ALWAYS” mode.
C	C	O	<	HP-IB adrs			>	Puts PHI chip into “LISTEN ALWAYS” mode.

where:

O = Open (up) = logic 1
C = Closed (down) = logic Ø

Note that diagnostics will not pass unless jumper W1 is installed

† When U1S1 is open, U16S1-S8 should all be closed for typical applications.

‡ U144 or later. U16S1-S3 should be open in special applications only

HP-IB Cable Length Restrictions

Standard/Low-Speed Operation (Switch U1S2 Open)

1. All devices on the bus must be the same speed.

2. The total length of the cable permitted to be used with one interface card must be less than or equal to two times the number of devices connected together. The HP-IB card is considered *one* device.

3. The total maximum cable length must not exceed 20 meters.

High-Speed Operation (Switch U1S2 Closed)

1. All devices expected to talk at higher rates must use a settling time of 350 ns or less.

2. All devices expected to operate at higher rates should use 48 mA tri-state drivers.

3. The device capacitance on each lead (except REN and IFC) should be less than 50 pF per device.

4. Interconnecting cable links should be as short as possible with a maximum of 15 meters total length per system.

5. Normally, the optional load resistor pack must be installed for high-speed operation. It is installed at the factory at location U79, a storage socket, and should be installed in U119 when in use. Pin one of the resistor pack goes in the receptacle just above the "U" of "U119" silk-screened on the board.

Number of External Devices	Maximum Total Cable Length (meters)
1	9
2	10
3	11
4	12
5	13
6	14
7 (max, see below)	15

6. Normally, no more than eight high-speed devices are allowed in the system (the HP-IB card counts as one device). A normal maximum system is composed of the HP-IB card with its high-speed resistor pack and up to 7 peripherals.

HP-IB Loading/Cabling Guide

HP 12009 (Instrument or Computer) 1 or 8 loads (1 standard + 7 loads in optional pack = 8 loads).

There are two simple rules to follow when configuring controllers to control peripheral devices and resulting cable layout and length restrictions.

Rule 1 − Loading

For mass storage devices, a controller can support a maximum of four HP-IB loads. For best performance, it is recommended that one interface card not have both disck and mag tapes connected to it. However, if this is the case you need to change your answer file and regen the system.

Rule 2 − Cable Lengths

The cable length (in meters) cannot exceed the total HP-IB loads associated with the computer speed controller (internal and external HP-IB loads). For example, if the controller is "preloaded" to 8 HP-IB loads and only one disk drive is connected to it with an HP-IB load of 1, then the maximum cable length is 9 meters (8 internal + 1 external). All internal device cable lengths must be included in the total cable length computation. The best "rule of thumb" is to measure HP-IB cable lengths from controller PCA edge connector to device PCA edge connector. A summary of known internal HP-IB cable lengths is included in this section. For standard speed operation, 2 meters of cable per device is allowed.

Another point to remember is to add up all pieces of cable, especially if a complex "T" cabling arrangement is used.

Site Preparation Flexibility

The only way to alter the layout of an HP 1000 system when HP-IB cabling restrictions develop is to, when possible, increase the number of HP-IB loads per device. The HP 2608S* printer can have loads adjusted on the interface within the printer (8 loads maximum). The HP 7974*/78* tape drives also have adjustable load resistors.

* Discontinued product; shown for reference only.

HP 1000 Series HP-IB Summary Chart

HP Device	# Loads	Internal Cable
59310B*	1	0M
12821A*	7	0M
12009	1 or 8	0M
7933*/35*	1	0M
792XM*	1	0.75M
7906M*	1	0.75M
7906H*	2	0.75M
7970E*	1	0M
7974*	1-6	1M
7978*	1-7	0M
7908*	1	0M
7911*/12*Disk	1	1.0M
7911*/12*Tape	1	0.5M
2608*	1	0M
293x*	1	0M
256x*	1 to 8	0M
9895*	1	0M
Plotters*	1	0M
2608S*	1 to 8	0M
12009-60007*		2M
10833A		1M
10833B		2M
10833C		4M
10833D		0.5M

Special Conditions:

HP 12009A can support an HP 2631B* and two HP 2608Ss*.

Device Equivalent Loads

There must be one equivalent load for each meter of cable. Optional resister packs for the HP12009 provide seven additional loads for a total of eight loads for the card.

* Portions or all of this product line are discontinued; shown for reference only.

m =	meters of cable	
load =	device load equivalents	(Refer to the appropriate peripheral Installation/Service Manual for individual device loads.)
Case 1.	m − load = N <= 0	As long as N remains less than or equal to 0, the optional load resistor packs are not required.
Case 2.	m − load = N > 0 and less than 8 devices.	Install the optional load resistor packs in the sockets provided. See Note.
Case 3.	m − load = N > 0 and more than 8 devices.	The optional resistors provided with the card will not meet the system requirements. The following formulas must be used to determine the correct values of the load resistors to be used.

$$R12/14 = \frac{2.3k\ ohms}{N} \qquad R11/13 = \frac{4.7k\ ohms}{N}$$

If power applied to the HP-IB Interface card is lost while the optional load resistors are being used, the HP-IB bus will be pulled down to ground. This is also true for devices connected to the bus. All devices (e.g., disks) on the bus should be powered on for high speed operation. Half of the devices plus the farthest device should be powered on for standard/low speed operation.

NOTE:

Part No.	Location	Value
1810-0272	R12,R14	330 ohms
1810-0270	R11,R13	680 ohms
1810-0018	U119	Resistor package

Pin 1 is identified by a dot, a round depression in the resistor pack, or by pin numbers printed on the package. The HP 12009 identifies pin 1 in conjunction with the part reference (i.e., 1R12 = R12 pin 1).

The 12009-60020 card has changed the four SIP resistor sets to a single DIP package (part no. 1810-0018). You must move the package from the shipping (storage) socket U79 to the load position socket U119 where the resistor acts as an additional seven loads (for a total preload of eight).

HP 12016A SCSI Interface

Switch Configuration

SW1 Switches

S1	S2	S3	S4	S5	S6	S7	S8
O	C	< – Select Code – >					

S2 = C enables SCSI TERMPWR (terminal power)

SW2 Switches

S1	S2	S3	S4	S5	S6	S7	S8
C	C	C	C	C	O	O	O

S1 - S5 = C (reserved)
S6 - S8 = 0 determines address (7 shown and recommended)

where:

O = Open (up) = logic 1
C = Closed (down) = logic Ø

HP 12021A* Mini-Disk Controller

The following are the switch settings for the Model 6* Mini-Disk Controller:

Switch

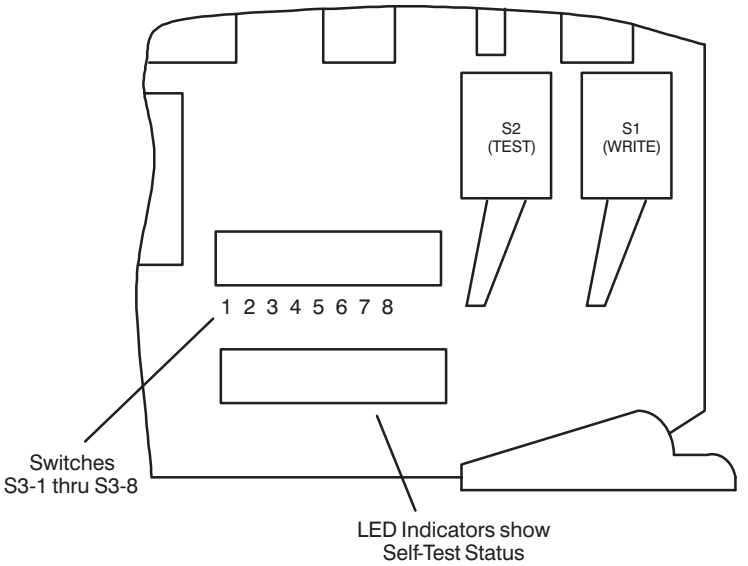
S1	S2	S3	S4	S5	S6	S7	S8	
O	C	X	X	Y	<HP-IB adrs>			Loop on Controller self-test only.
C	O	X	X	Y	<HP-IB adrs>			Loop on self-test.

where:

O = Open (up) = logic 1
C = Closed (down) = logic Ø
X = don't care

Y = C; sets HP-IB timing to Slow (500 ns between DATA & DAV).
Y = O; sets HP-IB timing to Fast (350 ns between DATA & DAV).

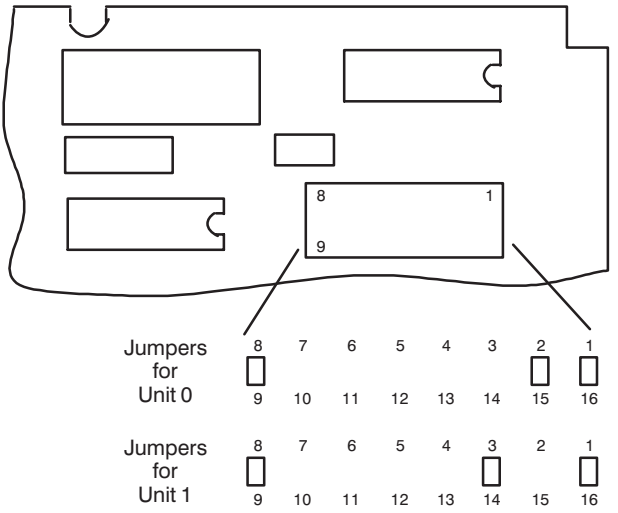
* Discontinued product; shown for reference only.



Note: 1. Switch S3-5 in up position enables compatibility with high-speed HP-IB operation.

2. Switches S3-6 through S3-8 set HP-IB address (up position equals "1").

Unit jumpers for the flexible mini-disk drives (found on the electronics PCA for each drive) are as follows.



HP 12022A* Integral Disk Controller

U1 Switches

S1	S2	S3	S4	S5	S6	S7	S8
X	X	<	– Select Code –				>

U1605 Switches

S1	S2	S3	S4	S5	S6	S7	S8	Disk Drive Type*
C	C	C	C	C	C	C	O	10 Mbyte fixed, address Ø.
C	C	C	O	C	C	C	O	With flexible disk drive, address 3. (Micro 2x SPU option 110)
C	C	C	C	C	C	O	C	15 Mbyte Fixed, Address Ø.
C	C	C	O	C	C	O	C	With flexible disk drive, address 3. (Micro 2x SPU option 111)
C	C	C	C	O	C	C	O	20 Mbyte Fixed, Address Ø. (Micro 2x SPU Opt. 151)
C	C	C	O	O	C	C	O	With flex. disk drive, address 3.(Micro 2x SPU Opt. 150)

Note: The switch settings for flexible disk drives are valid for both single-sided and double-sided 3-1/2 inchmicrodiskettes.

where: O = Open (up) = logic 1
C = Closed (down) = logic Ø
X = don't care

To configure a 15 MB disk to look like a 10 MB disk, strap the HP 12022A* card for 10 MB, then format the disk with the FORMF bootable system microdiskette supplied with a 10 MB system. Use LU 36 when formatting the disk as a 10 MB disk.

The following jumpers should be inserted on the HP 12022A* card as indicated. They are used for factory tests and they apply for all integrated hard disk sizes.

W1, 2, 4, 6, 7 = IN
W3, 5 = OUT
J6 = all OUT
J5 = all OUT except pin 23 tied to pin 24

Seagate has put a green sticker on the outside of the drive designating which drive it is.

10 MB = ST−412
15 MB = ST-419
20 MB = ST-225

* Discontinued product; shown for reference only.

HP 12025A/B I/O Extender

I/O Extender Switches

The I/O extender has two switches, either on the front of the box (HP 12025A) or the rear of the box (HP 12025B). The switches are:

a. BATTERY or BACKUP. This two-position switch has no function when the extender box is used for the extender and may be set to either position. (When the +5VM voltage is activated the box is used for computers.)

b. LINE. When this switch is set to the ON position, it applies AC line power to the extender power supply and fans. When this switch is set to OFF, it removes AC power from the power supply and fans.

I/O Extender Software Considerations

Previously, RTE-A only supported 24 select codes. This limitation was based on the fact that there were 24 available map sets in the A-Series and each map set was used for a unique select code. With the additional select codes needed by the I/O Extender, changes were made to the operating system to dynamically allocate and deallocate map sets.

One word has been added to the Interface Table (IFT) to store mapping information for a particular I/O channel. Therefore, a change was made to the IFT definition in the generation.

```
AL:LO       Look to a map set
AL:DY       Dynamically allocate map set

Example:  IFT,%ID*50::RELOC,SC:26B,AL:DY
```

For more information refer to the *RTE-A System Generation and Installation Manual* (part no. 92077-90034).

I/O Extender Restrictions

1. I/O Extenders are supported only in A600+, A700*, A900, and A990 16- and 20-slot card cages.

2. The EXT card goes in the first slot of the extender box.

3. The I/O Control (IOC) card goes in the CPU backplane. The slot location is dependent upon its priority.

4. If the Interrupt Chain Jumper (ICJ) card is used, the card goes in the first slot after the last card in the extender box.

5. You need to allocate additional space in the answer file for the I/O extender.

6. To use more than 24 I/O cards, you need Rev. 2440 software. However, the extender is compatible back to Rev. 2340 software.

7. The I/O extender will not support battery backup in the I/O extender box. The 12151-80004 battery backup jumper card must be installed in the power supply of the HP 12025B 20-slot box.

I/O Extender Firmware Requirements

If an A900 computer with serial prefix less than 2500 is used with the I/O extender, the following is needed:

1. A 12203-60011 or newer cache control card. (Older cards will cause a self-test machine check error.)

2. The following PROM part numbers (or higher) for the 12201 Sequencer Card.

PROM Part No.	Designation	ROM
12201-80084	U0803	0
12201-80085	U0802	1
12201-80086	U0801	2
12201-80087	U1103	3
12201-80088	U1102	4
12201-80089	U1101	5

* Discontinued product; shown for reference only.

If an A700* computer with serial prefix less than 2500 is used with the I/O Extender, the following PROMS for the 12152 Lower Processor Card are needed.

PROM Part No.	Reference Designation
12152-80053	U91
12152-80054	U101
12152-80055	U111
12152-80056	U121

Rack Mounting Instructions

The I/O Extenders can be installed:

1. In place of an HP 791xR* Disk. In an A-Series system that does not use an HP 791xR* CS/80 Disk, an HP 12025B I/O Extender can be installed in the HP 219xC* cabinet space normally occupied by the HP 791xR* Disk. This requires the replacement of the standard disk computer door, which is cut out for access to the disk, with an HP 219xC*/D* Option 053 door, which has louvers instead of the cut out for the disk. A set of 12679 Support Rails is also required.

NOTE

Because it does not use front-to-rear ventilation, the HP 12025A I/O Extender cannot be installed in the HP 791xR* Disk mounting space in HP 219xC* + 053 SPU cabinets.

---

2. In the upper compartment of the HP 219xC* cabinet. One or two HP 12025A or 12025B I/O Extenders can be installed in the upper compartment of the HP 219xC* (29431G) SPU Cabinet, provided that:

    a. Only HP 12025A or only HP 12025B I/O Extenders are installed in the upper compartment. A HP 12025A I/O Extender cannot be installed in the same compartment with a HP 12025B because they differ with respect to direction of ventilation air flow. One set of 12679 Support Rails is required for each I/O extender.

* Discontinued product; shown for reference only.

b. The upper front door of the cabinet is deleted for installation of HP 12025B I/O Extenders (but not for HP 12025A I/O Extenders) by ordering HP 219xC* Option 051. This permits the front-to-rear air flow required for self-ventilation of the HP 12025B I/O Extenders. For details of trim installation, see the *HP 40027A Door Trim Kit Installation Manual* (part no. 40027-90002).

c. All unoccupied vertical front mounting space is covered by filler panels.

Floor Mounting Instructions

The HP 40025A Vertical Floor Mount must be used for vertical floor mounting of an HP 12025A I/O Extender box. Install the HP 12025A box in a HP 40025A by following the instructions provided with the HP 40025A.

HP 12040B*/C/D 8-Channel Asynchronous Multiplexer

The MUX select code and VCP enabling are controlled by the settings of switch U1.

Switch U1								
S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	
C	X	< – Select Code – >						Port 0 is enabled as VCP.
O	X	< – Select Code – >						Port 0 is disabled as VCP.

where: O = Open (up) = logic 1
C = Closed (down) = logic Ø
X = Don"t care

Note that the BOOT SEL switches for each processor can be set to enable VCP to do speed sensing and enable ENQ/ACK on Rev. D of the HP 12040 MUX. Refer to Chapter 2 for the CPU switch settings.

* Discontinued product; shown for reference only.

HP 12040B*/C/D Jumper Positions vs. Manufacturer's Part No.

Manufacturer's Part Number	Install Jumper	Size (bytes)
TI 2532	W2, W5	4K
MOT MCM68A332	W2, W5	4K
Intel 2732, 2332	W4, W7†	4K
MK36000, AMI 54264	W3, W5	8K
MOT MCM68A364, MCM68764	W3, W5	8K
Intel 2764	W4, W7†	8K
MK2764	W4, W6	8K
MBM 2764	W4, W7	8K

† Jumper W7 continuously enables the EPROM and is used in normal operation. Jumper W6 selectively enables the EPROM and may be used instead of Jumper W7 for custom applications.

HP 12065A Color Video Output Interface

Switch Configuration

The switch settings for the HP 12065A card are as follows:

Switch SW1 Positions

SW1 contains eight positions, numbered 1 through 8; position 1 (SW1-1) is the most significant bit (bit 7). Positions SW1-3 through SW1-8 (bits 5 through 0) establish the video card's select code. Set these switches to the select code that you have chosen for the video card.

Positions SW1-1 and SW1-2 (bits 7 and 6) select the video pattern that is displayed at the end of self-test. These switches are read by the firmware when the card has finished testing its onboard electronics, and the appropriate test pattern is displayed. Self-test modes can be reconfigured in software. The mode definitions are as follows:

* Discontinued product; shown for reference only.

Mode	Description
0 0	Displays the Graphics/1000-II 15 default colors in vertical bands and the default highlight mode. The first six colors are black, white, red, green, yellow, and blue.
0 1	Displays 15 vertical bands in increasing levels of gray. Because the gray scale represents a uniform ramp of intensity data, this mode is useful for testing the video signal without the monitor, such as with an oscilloscope. Alternatively, a monitor can be properly tested and adjusted for proper color tracking; there should be gradual steps in the gray scale without color hues in the vertical bands.
1 0	Displays a grid pattern for adjusting monitor convergence, and horizontal and vertical linearity. Convergence refers to the quality of the blue, green, and red electron beams converging to the same point.
1 1	Repeats self-test continuously. This is useful for the diagnosis of intermittent hardware problems. Note that changing the switches during continuous self-test will automatically reconfigure the self-test mode to the new switch setting selected.

Switch SW2 Positions

The second switch, SW2, configures the monitor drive signal and display format.

	Switches
	1 2 3 4
bits	3 2 1 0

There are 16 possible configurations. These are shown with their respective parameter values in the table following. On power-up and self-test, the configuration indicated by the display switch positions is implemented.

Display Parameters

The monitor drive signal and display format are configured by hardware switch SW2, or in software using the Write Card Configuration video card request. There are 16 possible configurations which are shown by the display codes below. As shown by the range of horizontal sweep frequencies available, the video output card will operate with most monitors.

Display Code	Resolution (h: horizontal) (v: vertical)	Horizontal Sweep Frequency	Vertical Scan Frequency
0000	576h x 455v	29.4 kHz	60.0 Hz
0001	512h x 512v	31.5 kHz	57.5 Hz
0010	576h x 455v	28.1 kHz	57.4 Hz
0011	512h x 512v	30.8 kHz	56.1 Hz
0100	576h x 455v	27.0 kHz	55.1 Hz
0101	512h x 512v	29.4 kHz	53.6 Hz
0110	576h x 455v	25.9 kHz	52.9 Hz
0111	512h x 512v	28.1 kHz	51.4 Hz
1000	576h x 455v	25.0 kHz	50.9 Hz
1001	512h x 512v	27.0 kHz	49.3 Hz
1010	576h x 455v	24.0 kHz	49.1 Hz
1011	512h x 512v	25.9 kHz	47.3 Hz
1100	576h x 455v	23.2 kHz	47.4 Hz
1101	512h x 512v	25.0 kHz	45.5 Hz
1110	576h x 455v	22.4 kHz	45.7 Hz
1111	512h x 512v	24.0 kHz	43.9 Hz

HP 12076A LAN/1000 Interface Controller Card Switch Configuration

Switch U1

S1	S2	S3	S4	S5	S6	S7	S8	
O	X	< –	Select Code	– >				VCP and FCL (Forced Cold Load) are disabled
C	X	< –	Select Code	– >				VCP is enabled

where: O = Open (up) = logic 1
C = Closed (down) = logic Ø
X = don't care

HP 12100A A400 On-Board I/O Interface

Refer to the A400 On-Board I/O Switch (U1001) section in Chapter 2 for information.

HP 12153A Writable Control Store for A700*

The switch on the 12153-60001 Writable Control Store Card is used to set the select code of the card.

Switch							
S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**
O	X	< – Select Code – >					

where: O = Open (up) = logic 1
C = Closed (down) = logic Ø
X = don't care

HP 12155A PROM Control Store for A700*

Refer to the A700* PROM Control Store section in Chapter 2 for information on this card.

HP 12205A Control Store for A900

Refer to the A900 Control Store section in Chapter 2 for information on this card.

* Discontinued product; shown for reference only.

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Troubleshooting

LED Indications

A400/A600+ Self-Test

Self-test consists of two test programs (Test 1 and Test 2) that automatically execute each time the computer is powered up. The tests provide a quick, convenient check of basic computer operation. Self-test can also be executed on the A600+ by pressing the RESET switch on the processor board. If there is a failure during the self-test, the computer may or may not operate depending on what part of the self-test failed. Successful completion of the self-test is followed immediately by execution of a bootstrap loader or the Virtual Control Panel (VCP) program. These functions are selected by setting the processor BOOT SEL switches.

Test 1. Test 1 is a microprogram stored in the base set PROMs of each processor and executes immediately upon power-up. This test will execute in all configurations in which +5V power is present, including the case when the A600+ processor board or the A400 board is the only assembly plugged into the backplane. All of the LEDs are turned on when power is initially applied to the computer or (for the A600+ only) when the RESET switch is pressed. Test 1 then begins execution. Test 1 is different for each processor. The following is a description of Test 1 for each processor:

> **A400** – Test 1 checks the basic functioning of the VLSI chip (that is, the CPU) and does a checksum of the VCP code in PROMs. If Test 1 fails, the processor loops on an instruction in location 04 of main memory.

A600+ – Test 1 checks the CPU, the backplane data paths, the control store sequencer, and the interrupt vector logic. If Test 1 fails, the processor loops on microcode that writes a galloping one through the CPU and backplane data paths, simplifying data path troubleshooting.

Failure is indicated by all the LEDs remaining on. If Test 1 completes successfully, it extinguishes the rightmost LED. Upon successful completion, Test 2 begins execution. Test 1 execution time is negligible. The following table shows the LED failure indicators for Test 1 and the first phase of Test 2.

Test 1/Test 2 Failure Indicators

Failure Pattern †	Meaning
11111111	Microcode self-test failed. Short or power supply fault if PON is low. Processor fault if PON high. (Backplane or processor data bus problem.)
11111110	Microcode self-test passed but first memory fetch failed. First check frontplane cabling and memory controller, then check processor.
11111100	Basic instruction test failed. Check processor.
11111000	Boot memory access failed. Check memory controller and VCP/Loader/Self-Test PROMs.
11110000	Time Base Generator (TBG) tick or interrupt failed. Check processor.
10111111	No VCP found.

† 1 = lit LED; 0 = unlit LED

Test 2. Test 2 is an assembly language program stored in VCP PROM (located on the memory controller card for the A600+) and executes upon successful completion of Test 1. Test 2 can also be initiated by an operator command (%T) from the Virtual Control Panel (VCP). It has a maximum execution time of ten seconds. Test 2 consists of two phases.

The first phase checks the computer's basic instruction set, several internal flags, and Boot RAM. Boot RAM addressing is tested by writing the address of each location into that location and reading it back. Then the complement of each address is written and read back. Finally, zeroes are written and read back. When the entire 1k of Boot

RAM is tested successfully, each location of Boot RAM contains zeroes.

The second phase tests main memory, the I/O Master of each interface to ensure that data transfer, flag, interrupt, and direct memory access (DMA) functions are processed correctly, and checks the computer configuration. Phase 2 tests main memory by writing all ones to each memory location, and reading back the data. Then all zeroes are written and read back. (Main memory is cleared.)

The LED indication on successful completion of Test 2 depends on the computer action selected by the Start-Up (BOOT SEL) switches. (The first two switch settings are used for troubleshooting. The remaining switch settings are used for configuring the processor.) If Test 2 detects a failure, it stops executing and the processor LEDs indicate a failure code. If there is a VCP console and the failure does not hinder VCP operation, the VCP program is entered and the failure code is displayed on the VCP console.

If Test 2 detects a failure during phase 1, it stops execution so that booting of the system does not occur. The processor LEDs indicate the type of failure. If the basic instruction test, or the Time Base Generator (TBG) tick and the interrupt flag test fails, the processor is probably faulty.

If Test 2 detects a failure during phase 2, VCP can still run if the VCP interface is functioning properly and if a VCP console is installed. The failure will cause the LEDs to flash once. The VCP console then displays PTEST ERROR xxxxxx xxxxxx. The first word is the main error code and the second word is the flashing subcode. The following table shows the LED failure indications for memory and I/O errors. The octal number to the left of the LED codes are displayed in the PTEST ERROR fields. The number in the left field specifies the primary category of error: main memory error, I/O interface error, or interrupt error. The number in the right field identifies the specific error. For example, error code 000300 000203 indicates that an I/O error (300) has occurred and that the error was caused by duplicate select codes (203). An error code of 000340 000200 indicates a memory error (340) in the first 32 KWord block of memory.

At revision 4020 of VCP, a new parity error message was added. A memory test failure will result in the following message display:

PAR ERR xxxxxx zzzzzz

where xxxxxx is the octal page number where the failure occurred and zzzzzz is the octal word address within the page. (Don't forget to convert the page number to decimal and KWords to Kbytes to identify the failure location.)

Test 2 Error Codes

Octal Code	LED Display †	Definition
340 2xx	11100000 10xxxxxx	Main memory failure. The right field indicates the 32 KWord block of memory that is bad. If xxxxxx is zero, the memory controller could be bad.
300 2xx	11000000 10yyyyyy	I/O interface failure. The right field displays the interface select code or the error code. If yyyyyy is greater than 17B, yyyyyy is the failing select code. If yyyyyy is less than 20B, an interface error is indicated.
The values for yyyyyy are listed below.		
200	10000000	No I/O cards.
201	10000001	More than one interface has VCP Enabled (switch U1S1 closed).
202	10000010	Priority chain broken or duplicate VCP select code.
203	10000011	Duplicate select code. The duplicate select code is contained in the B-Register.
204	10000100	An I/O card has a select code less than 20B or broken priority chain.
205	10000101	Terminal not connected for VCP. Check the cable, and VCP Enable (switch U1S1) or the VCP interface.
206	10000110	Unexpected time base generator interrupt.
207	10000111	Unexpected memory protect interrupt.
210	10001000	Unexpected unimplemented instruction trap (UIT) interrupt.
211	10001001	Invalid sc for A400 on-board I/O.
212	10001010	Invalid ID Number for A400 on-board I/O.
213	10001011	Speed sensing failure on A400 on-board I/O or HP 12040D 8-channel MUX.

† 1 = lit LED; 0 = unlit LED

Self-Test Pass Indicators

LED Display †	Definition
00000111	VCP program is running.
00000001	A boot loader is running.
00000000	User software is running.
10000000	Loader error. Probably a checksum error; change media on loading device.
00001111	Running Basic Control Module (BCM) Program.
00010000	Running Diagnostic Design Language (DDL) program.

† 1 = lit LED; 0 = unlit LED

A700* Self-Test

Self-Test consists of two test programs (Test 1 and Test 2) that automatically execute each time the computer is powered up. The tests provide a quick, convenient check of basic computer operation. Self-test can also be executed by pressing the RESET switch on the frontplane. If either self-test program fails, the computer will not operate. Successful completion of the self-test is followed immediately by execution of a bootstrap loader, the Virtual Control Panel (VCP) program, or a program sustained in memory by an optional battery pack. These functions are selected by setting the frontplane switches.

Test 1 is a microprogram stored in the base set PROMs on the lower processor card and executed immediately upon power up. It checks logic and registers on the processor cards and checks the VCP/Loader/Test 2 PROMs on the memory controller card. If the floating point processor card is installed, it is also checked by Test 1. On successful completion, Test 2 is started. If Test 1 detects a failure of a processor card or the memory controller, it stops executing and the frontplane LEDs indicate a failure code. If a floating point processor error is detected, it is indicated by the LEDs and the test stops executing. Test 1 execution time is negligible. Each processor card test and the memory controller test can be looped for troubleshooting by setting the frontplane switches.

* Discontinued product; shown for reference only.

Test 2 is part of the VCP program stored in PROM on the memory controller card and executes automatically upon successful completion of Test 1. Test 2 checks the computer's basic instruction set, several internal flags, and all the memory. If memory is sustained by the optional battery pack, Test 2 checks it in a non-destructive manner by reading each memory location and making a parity check on the data. If a parity error occurs, the location is read again. Soft errors (defined as a parity error only on the first of two reads of a memory location) are reported to the VCP (if present). If memory is not sustained, Test 2 writes all ones to each memory location, and reads back the data. Test 2 then writes all zeros and reads back the data. (The memory is cleared.) Test 2 also checks the I/O Master logic on each interface card to ensure that data transfer, flag, interrupt, and direct memory access (DMA) functions are processed correctly. If Test 2 detects a failure, it stops executing and the frontplane LEDs indicate a failure code. If a VCP is in the system and the failure does not hinder VCP operation, the VCP program is entered and the failure code is displayed on the VCP. The LED indication on successful completion of Test 2 depends on the computer action selected by the Start-Up (BOOT SEL) switches on the frontplane. Test 2 has a maximum execution time of five seconds.

Test 1. Test 1 sequentially tests the lower processor, upper processor, memory controller, and the floating point processor cards. The results of Test 1 are displayed on the LEDs on the frontplane. On power-up, all of the frontplane LEDs are turned on. The LEDs are then turned off, beginning with the high-order LED, to indicate the progress of Test 1. Test 1 accepts troubleshooting options specified by the frontplane switches. The switches should be set open only when troubleshooting hardware faults or when debugging microcode.

The following table shows the Test 1 switch options.

Test 1 Switch Options

Switch Setting †	Meaning
CCCCCxxx xxxxxxxx	Normal mode, go to Test 2.
Oxxxxxxx xxxxxxxx	Loop on Lower Processor Test.
COxxxxxx xxxxxxxx	Loop on Lower Processor and Upper Processor Tests.
CCOxxxxx xxxxxxxx	Loop on Lower Processor, Upper Processor, and Memory Controller Tests.
CCCOxxxx xxxxxxxx	Loop on Lower Processor, Upper Processor, Memory Controller, and Floating Point Tests.
CCCCOxxx xxxxxxxx	Enable Diagnostic window (microcode debug utility).

† C = Closed = logic 0
O = Open = logic 1
x = don't care

Only one switch should be set open at any time. If a switch is set open, the test specified by the switch and all of the previous tests will be executed. For example, if SLFTST switch 3 is set open, the Lower Processor test, the Upper Processor test, and the Memory Controller test will be executed. If no faults occur, these tests will continue to execute in a loop. If a failure is detected in any of the tests, the micromachine enters a one-instruction loop and sets the appropriate LEDs on. The following table shows the error codes that are displayed.

Test 1 Failure Indicators

Failure Pattern †	Meaning
11111111 11111111	A700* Lower processor card failed.
01111111 11111111	A700* Upper Processor card failed.
00111111 11111111	A700* Memory Controller or VCP PROMs failed.
00011111 11111111	A700* CPU passed and no Floating Point card installed, or Floating Point card failed.
00011111 11111110	A700* Floating Point card failed.

† 1 = lit LED; 0 = unlit LED * Discontinued product; shown for reference only

NOTE

The frontplane Diagnostic Window (DW) switch must be closed during normal operation. This switch is used to enable the Diagnostic Window. If the Diagnostic Window is enabled, various registers useful in debugging microcode are enabled on the CPU internal data bus after the execution of each instruction. Enabling this feature increases the execution time of each instruction by approximately two microseconds.

LEDs 15, 14, 13, and 0 will be set off if the computer passes all Test 1 tests. LED 12 will be set off if the Floating Point board is installed and if it passes the Floating Point test.

Test 2. Test 2 begins execution when Test 1 has completed successfully. Test 2 can also be initiated by an operator command (%T) from the Virtual Control Panel (VCP). If Test 2 detects a failure during phase 1, it stops execution so that booting or restarting of the system will not occur. The frontplane LEDs indicate the type of failure. Phase 1 of Test 2 retests the Upper and Lower Processor boards and the Memory Controller board.

The following table shows the LED failure indicators for the first phase of Test 2. If the basic instruction test fails, the Lower Processor board is probably faulty. If the Time Base Generator (TBG) tick and interrupt flag test fails, the Upper Processor board is probably faulty.

Test 2 Failure Indicators

Failure Pattern†	Meaning
000x1111 11111110	Microcode test passed but first memory fetch failed. First check memory controller, then check upper processor and floating point processor.
000x1111 11111100	Basic instruction test failed. Check lower processor, then upper processor.
000x1111 11111000	Boot memory access failed. Check memory controller and VCP/Loader/ Self-test PROMs.
000x1111 11110000	Time Base Generator (TBG) tick or interrupt flags failed. Check lower processor, then upper processor.

† 1 = lit LED; 0 = unlit LED

The second phase of Test 2 tests main memory, the I/O master of all installed I/O boards, and the computer configuration. Any failure after this point will still allow the VCP to run if the VCP interface is functioning properly and if a VCP terminal is installed. The failure will cause the LEDs to flash once. The VCP then displays PTEST ERROR xxxxxx xxxxxx. The first word is the main error code and the second word is the flashing subcode. The following table shows the LED failure indicators for memory and I/O errors. The octal numbers to the left of the LED codes are displayed in the PTEST ERROR fields. The number in the left field specifies the primary category of error − main memory error, I/O interface error, or interrupt error. The number in the right field identifies the specific error. For example, error code 000300 000203 indicates that an I/O error (300) has occurred and that the error was caused by duplicate select codes (203). An error code of 000340 000200 indicates a memory error (340) in the first 32 KWord block of memory.

At revision 4020 of VCP, a new parity error message was added. A memory test failure will result in the following message display:

PAR ERR xxxxxx zzzzzz

where xxxxxx is the octal page number where the failure occurred and zzzzzz is the octal word address within the page. (Don't forget to convert the page number to decimal and KWords to Kbytes to identify the failure location.)

If no VCP is present, any error that occurs during Test 1 or Test 2 must be corrected before the computer can be booted up.

Test 2 Error Codes

Octal Code	LED Display †	Definition
340 2xx	11100000 10xxxxxx	Main memory failure. The right field indicates the 32 KWord block of memory that is bad. If xxxxxx is zero, the memory controller could be bad.
300 2xx	11000000 10yyyyyy	I/O interface failure. The right field displays the interface select code or the error code. If yyyyyy is greater than 17B, yyyyyy is the failing select code. If yyyyyy is less than 20B, an interface error is indicated.
The values for yyyyyy are listed below.		
200	10000000	No I/O cards.
201	10000001	More than one interface has VCP Enabled (switch U1S1 closed).
202	10000010	Priority chain broken or duplicate VCP select code.
203	10000011	Duplicate select code. The duplicate select code is contained in the B-Register.
204	10000100	An I/O card has a select code less than 20B or broken priority chain.
205	10000101	Check the cable and VCP Break Enable (Switch U1S1) or the VCP interface.
206	10000110	Unexpected time base generator interrupt.
207	10000111	Unexpected memory protect interrupt.
210	10001000	Unexpected unimplemented instruction trap (UIT) interrupt.
213	10001011	Speed sense failed on 12040D card. Check ENQ/ACK enabled on terminal.

† 1 = lit LED; 0 = unlit LED

Self-Test Pass Indicators

LED Display †	Definition
00000111	VCP program is running.
00000001	A boot loader is running.
00000000	User software is running.
10000000	Loader error. Probably a checksum error; change media on loading device.
00001111	Running Basic Control Module (BCM) program.
00010000	Running Diagnostic Design Language (DDL) program.

† 1 = lit LED; 0 = unlit LED

A900 Self-Test

The self-test consists of two test programs (Test 1 and Test 2) that automatically execute each time the computer is powered up and which provide a quick, convenient check of basic computer operation. (Also, the self-test can be executed by pressing the Reset switch on the sequencer card.) Test 1 tests the processor at the level of individual circuits, and Test 2 tests the processor at a functional level. (For example, Test 1 tests the hardware associated with an LIA instruction to ensure that it works correctly, and Test 2 executes an LIA instruction and checks the result.) If either test program fails, the computer may not operate. Successful completion of the self-test is followed immediately by execution of either a bootstrap loader, the Virtual Control Panel program, or a program sustained in memory by an optional battery card, as preselected by the user.

Test 1. Test 1 is a microprogram stored in PROM on the sequencer card. It executes immediately upon power up and makes checks for all four processor cards, including a check of the microcode PROMs on the sequencer card and the VCP/Test 2 PROMs on the cache control card. On successful completion, Test 2 is started. If Test 1 detects a failure it stops executing and the LEDs on the sequencer card indicate an error code. (Test 1 error codes are listed in the following table.) Test 1 execution time is negligible.

Test 2. Test 2 is part of the VCP program stored in PROM on the cache control card and executes upon successful completion of Test 1. Test 2 can also be initiated by an operator command (%T) from the Virtual Control Panel (VCP). It has a maximum execution time of ten seconds. Test 2 consists of two phases.

The first phase checks the computer's basic instruction set, several internal flags, and Boot RAM. Boot RAM addressing is tested by writing the address of each location into that location and reading it back. Then the complement of each address is written and read back. Finally, zeroes are written and read back. When the entire 1k of Boot RAM is tested successfully, each location of Boot RAM contains zeroes.

The second phase tests main memory, the I/O Master of each interface card, and the computer configuration. The I/O Master of each interface is checked to ensure that data transfer, flag, interrupt, and direct memory access (DMA) functions are processed correctly. If main memory was sustained by the optional battery pack, phase 2 tests main memory in a non-destructive manner by reading each memory location, thus making a parity check on the data. If a parity error does occur, the location is reported to the VCP console (if present). If memory was not sustained, phase 2 writes all ones to each memory location, and reads back the data; and then writes all zeroes and reads back. (Main memory is cleared.)

The LED indication on successful completion of Test 2 depends on the computer action selected by the Start-Up (BOOT SEL) switches on the data path card. If Test 2 detects a failure, it stops executing and the sequencer card LEDs indicate a failure code. If there is a VCP console and the failure does not hinder VCP operation, the VCP program is entered and the failure code is displayed on the VCP console as a PTEST ERROR.

If Test 2 detects a failure during phase 1, it stops execution so that booting of the system does not occur. The processor LEDs indicate the type of failure.

If Test 2 detects a failure during phase 2, VCP can still run if the VCP interface is functioning properly and if a VCP console is installed. The failure will cause the LEDs to flash the error code once. The VCP console then displays PTEST ERROR xxxxxxxx xxxxxxxx. The first word is the main error code and the second word is the subcode (the main error code and the subcode are displayed alternately on the LEDs). The octal number to the left of the LED codes are displayed in the PTEST ERROR fields. The number in the left field specifies the primary category of error: main memory error, I/O interface error, or interrupt error. The number in the right field identifies the specific error. For example, error code 000300 000203 indicates that an I/O error (300) has occurred and that the error was caused by duplicate select codes (203). An error code of 000340 000201 indicates a memory error (340) in the first 32k block of memory. Table 2-2 also shows the LED displays that indicate the self-test passed.

At revision 4020 of VCP, a new parity error message was added. A memory test failure will result in the following message display:

PAR ERR xxxxxx zzzzzz

where xxxxxx is the octal page number where the failure occurred and zzzzzz is the octal word address within the page. (Don't forget to convert the page number to decimal and KWords to Kbytes to identify the failure location.)

Execute the self-test by turning on the computer power. Troubles detected by the self-test are indicated by the sequencer card LEDs (A900) or processor card LEDs (A990) as listed in the following tables. The last table shows the LED displays that indicate that the self-test passed.

Test 1 Error Codes

Error* Code	Meaning
Note: LEDs 2, 3, 4, and 5 represent the sequencer, data path, cache control, and memory controller cards, respectively. A fully bright LED indicates the card primarily suspected of failure; a half-bright LED indicates the secondary suspect.	
111111111	Unknown. Self-test did not begin execution. Check sequencer, cache control, memory controller, data path cards.
110000000	Sequencer card failure.
110h00000	Sequencer card failure.
1100h0000	Sequencer card or memory controller card failure.
101000000	Data path card failure.
1h1000000	Data path card or sequencer card failure
1010h0000	Data path card or memory controller card failure.
100100000	Cache control card failure.
1h0100000	Cache control card or sequencer card failure.
10h100000	Cache control card or data path card failure.
100010000	Memory controller card failure.
1h0010000	Memory controller card or sequencer card failure.
100h10000	Memory controller card or cache control card failure.
10001h000	Memory controller card or first memory array card failure.
100000100	Failure of floating point chip U0807, U0905, or U1106 on data path card.

Test 1 Error Codes (Continued)

Error* Code	Meaning
10h000100	Failure of floating point chips (see above) or data path.
11000000b	Control store Bank Zero failure. Check PROMs U0801, U0802, U0803, U1101, U1102, and U1103 on sequencer card.
1100000bb	Control store Bank One failure. Check PROMs U0701, U0702, U0703, U1001, U1002, and U1003 on sequencer card.
110000bbb	Control store Bank Two failure. Check PROMs U0601, U0602, U0603, U0901, U0902, and U0903 on sequencer card
The following error codes are not self-test codes but are detected by microcode and displayed on the LEDs.	
100000010	Fatal microcode error during the execution of software. Not necessarily a hardware failure.
100000001	Fatal hardware error during execution of software. Cycle the LINE switch; the self-test will execute and identify the failed card.
* 1 = lit LED 0 = unlit LED h = half-bright LED b = blinking	

Test 2 Error Codes

Octal Code	LED* Display	Definition
376	011111110	First instruction fetch of Test 2 failed. Check sequencer, cache control, memory controller, data path cards.
374	011111100	Basic instruction test failed. Check sequencer, data path, cache control, memory controller cards.
370	011111000	Boot memory access failed. Check cache control, memory controller, sequencer, data path cards.

Test 2 LED Indications (Continued)

Octal Code	LED Display †	Definition
360	011110000	TBG tick or interrupt flags failed. Check memory controller, sequencer, data path, cache control cards.
340 2xx	011100000 010xxxxxx	Main memory failure. The right field indicates the 32 KWord block of memory that is bad. If xxxxxx is zero, the memory controller card or memory frontplane could be bad.
300 2xx	011000000 010yyyyyy	I/O interface failure. The right field displays the interface select code or the error code. If yyyyyy is greater than 17B, yyyyyy is the failing select code. If yyyyyy is less than 20B, an interface error is indicated.
The values for yyyyyy are listed below.		
200	010000000	No I/O Cards.
201	010000001	More than one interface has Break Enable.
202	010000010	Priority chain broken, or two terminals set for VCP.
203	010000011	Duplicate select code. The duplicate select code is contained in the B-Register.
204	010000100	An I/O card has a select code less than 20B.
205	010000101	Terminal not connected for VCP. Check the cable, select code, and Break Enable for the VCP interface.
206	010000110	Unexpected time base generator interrupt.
207	010001000	Unexpected memory protect interrupt.
210	010001000	Unexpected unimplemented instruction trap (UIT) interrupt.
213	010001011	Speed sense failed on HP 12040D. Check ENQ/ACK enabled on terninal.

† 1 = lit LED; 0 = unlit LED

Self-Test Pass Indicators

LED* Display	Definition
00000111	VCP program is running.
00000001	A boot loader is running.
00000000	User software is running.
10000000	Loader error. Probably a checksum error; change media on loading device.
00001111	Running Basic Control Module (BCM) Program.
00010000	Running Diagnostic Design Language (DDL) program.
*1 = lit LED; 0 = unlit LED	

A990 Self-Test

The A990 self-test consists of two test programs (Test 1 and Test 2) that automatically execute each time you turn on the computer. You also can initiate these tests by pressing Reset Switch SW1 on the A990 CPU card. Test 1 (microcoded self-test) tests the processor at the circuit level. Test 2 (VCP pretest) tests the processor at the functional level.

Successful completion of the tests is followed by execution of either a bootstrap loader, the Virtual Control Panel (VCP) program, or a program sustained in memory by optional battery backup. (Refer to the *A990 Computer Reference Manual,* part number 02959-90001, for information on bootstrap loaders and the VCP.) Which of these occurs depends on how the BOOT SELECT switches are configured.

Test 1. Test 1 is stored as a microprogram in the firmware EPROM on the A990 CPU card. It executes immediately on power-up and checks all of the hardware on the card. On successful completion of Test 1, Test 2 is started. If Test 1 detects a failure, it stops executing and the LEDs on the CPU card display an error code.

The bank of four LEDs on the bottom of the CPU card displays a code that indicates which field replaceable unit failed. When Test 1 is finished, all four LEDs are extinguished. The bank of eight LEDs on the top of the CPU card is not used by Test 1 to indicate defective field replaceable units. Any pattern that is displayed on the bank of eight LEDs during Test 1 should be ignored.

Test 1 Error Codes

Error Code *		Meaning
Bank of 4 LEDs	**Bank of 8 LEDs**	
1111	11111111	Initial power-on condition. All LEDs are turned on when PON signal is low. Incorrect indication may be caused by microcode load or execution problem, an A990 board failure, EPROM failure, or power system failure.
0001	XXXXXXXX	Failure caused by bad EPROM or bad A990 board.
0010	XXXXXXXX	Base set fatal error (also known as machine check error) has occurred after VCP was started. See LED indications next page for fatal base set error codes.
0011	XXXXXXXX	Failure caused by bad jumper board.
0100	XXXXXXXX	Failure caused by bad memory frontplane connector.
0101	XXXXXXXX	Failure caused by bad memory array card.
0110	XXXXXXXX	Failure caused by bad time-of-day clock chip or bad A990 board.
0111	XXXXXXXX	Failure caused by bad A990 board (possibly caused by a bad processor ASIC chip).
1000	XXXXXXXX	Failure caused by bad A990 board (possibly caused by a bad cache ASIC chip).
1001	XXXXXXXX	Failure caused by bad A990 board.
1010	XXXXXXXX	Failure caused by bad A990 board.
1011	XXXXXXXX	Failure caused by bad A990 board.
1100	XXXXXXXX	Failure caused by bad A990 board.
1101	XXXXXXXX	Failure caused by bad A990 board.
1110	XXXXXXXX	Failure caused by bad A990 board.
1111	0000XXXX	Failure caused by bad EPROM or A990 board (board failure possibly caused by a bad processor ASIC chip).

* 1 = lit LED; 0 = unlit LED; X = don't care

Test 1 Error Codes (Continued)

Error Code *		Meaning
Bank of 4 LEDs	**Bank of 8 LEDs**	
The following LED indications are caused by fatal base set errors after the VCP program has started:		
0010	00000001	Control store parity error. May have been caused by bad hardware.
	00000010	Microcode stack overflow or underflow. May have been caused by an error in the base set microcode.
	00000100	Zap counter interrupt. May have been caused by an error in the base set microcode.
	00001000	Two consecutive micro-interrupts. May have been caused by bad hardware.
	00010000	A micro-interrupt occurred, but the micro-interrupt register didn't have a known error pattern. May have been caused by bad hardware.
* 1 = lit LED; 0 = unlit LED		

Test 2. Test 2 is part of the VCP program also stored in the firmware EPROM on the A990 CPU card. It begins execution upon successful completion of Test 1. Test 2 can also be initiated by an operator command (%T) from VCP. Test 2 executes in two phases, and may take as long as 20 seconds to run, depending on the amount of memory installed.

The first phase of Test 2 checks the computer's basic instruction set, several internal flags, and the Boot RAM. When the entire Boot RAM has been successfully tested, each location of Boot RAM contains zeros.

The second phase of Test 2 tests main memory, the I/O Master of each interface card, and the computer configuration. The I/O Master of each interface card is checked to ensure that data transfer, flag, interrupt, and Direct Memory Access (DMA) functions are correctly processed. If battery backup sustained main memory, phase two of Test 2 tests main memory in a non- destructive manner. If main memory is not sustained by battery backup, a destructive memory test is performed and main memory is effectively cleared (memory contains all zeros). On successful completion of Test 2, the LEDs will be lit with a specific pattern. This pattern depends on the startup configuration as selected by the BOOT SELECT switches (SW2).

If Test 2 detects a failure, the error code is displayed on the upper 8 LEDs (the lower 4 LEDs are all off). If a failure is detected during *phase one* of Test 2, test execution stops and the LEDs indicate the type of failure by displaying a 1-byte static error code (see table next page). If a failure is detected during *phase two* of Test 2, the VCP can still run if the VCP interface is functioning properly and a VCP console is installed. The failure causes the LEDs to flash the error code (in binary format) as well as display the error code in octal format in the message "Pretest Error xxx.xxx.xxx.xxx" on the VCP console.

Each error message for *phase two* of Test 2 consists of four bytes of information. The information is displayed on the LEDs using the scheme described in the figure on the next page. The first byte of the error code is the main error code (memory error, I/O interface error, or interrupt error) and the second byte is the subcode. Some of the error codes give additional information in bytes 3 and 4. For example, error code 300 203 000 022 indicates that an I/O error (300) has occurred and that the error was caused by duplicate select codes (203) and the duplicate select code was 22 (000 022). An error code of 340 201 000 000 indicates a memory error (340 201) in the first 32k block of memory (000 000).

Self-Test Pass Indications

Octal Code	LED Display	Definition
007⇆005	000001*1	VCP program is running; VCP console connected and waiting for user input.
002⇆000	000000*0	VCP program is running; VCP console is not connected, that is, VCP is waiting for the VCP console to respond to the first ENQ-ACK handshake.
001	00000001	A boot loader is running.
000	00000000	User software is running.
200	10000000	Loader error. Probably a checksum error; change media on loading device.
020	00010000	Running Diagnostic Design Language (DDL) Program.
1 = lit LED; 0 = unlit LED; * = flashing LED		

Test 2 (phase 1) Error Codes

Error Code *		Meaning
Bank of 4 LEDs	**Bank of 8 LEDs**	
0000	11111110	Microcoded self-test (Test 1) passed but first memory fetch failed. Bad A990 board.
	11111100	Basic instruction test failed. Bad A990 board.
	11111000	Boot memory access failed. Bad EPROM or A990 board.
	11110000	TBG test failed. Bad A990 board.
* 1 = lit LED; 0 = unlit LED; X = don't care		

Sample Display of Test 2 (phase 2) Error Code

Revision 4022 and later of VCP uses the following scheme to display the four-byte long error code on the 8 LEDs. Preceding each byte of information a "travelling" LED pattern is displayed to indicate which byte of information is going to be displayed. For example, the following LED sequence is displayed for the error code 302 201 023 021. See NO TAG for a definition of all the error codes.

Octal Code	LED Display	
302	○○○○○○○● ●●○○○○●○	*One* travelling LED is displayed, then *First* byte of error message is displayed
201	○○○○○○●● ●○○○○○○●	*Two* travelling LEDs are displayed, then *Second* byte of error message is displayed
023	○○○○○●●● ○○○●○○●●	*Three* travelling LEDs are displayed, then *Third* byte of error message is displayed
021	○○○○●●●● ○○○●○○○●	*Four* travelling LEDs are displayed, then *Fourth* byte of error message is displayed

Test 2 (phase 2) Error Codes

Octal Code *				Definition
Byte				
1	2	3	4	
360	360	xxx	xxx	TBG test failed. 3rd and 4th bytes (xxx xxx) indicate address in VCP where error was detected.
340	– – – – – –		– – –	When LEDs are in this static pattern, memory test is running; this is not an error condition.
340	200	000	000	No memory found or missing frontplane connector.
340	2nn	xxx	xxx	Main memory failed. nn = 01b to 12b depending on where in VCP code the error was detected. 3rd and 4th bytes indicate 32-KB blk of failed memory.
341	000	377	377	ECC memory detected in A400/A600; ECC memory is not supported in an A400/A600. (This error should never occur on an A990.)
300	200	000	000	No I/O cards in the card cage.
300	201	0yy	0xx	More than one card has VCP enabled; yy and xx are the select codes of the enabled cards.
300	202	0yy	0xx	Broken I/O chain; yy is the number of I/O cards found by polling; xx is the number found by priority scan; the break will usually be found at slot xx+1.
300	203	000	0xx	Duplicate select codes; more than one card has the select code xx.
300	204	000	0xx	An I/O card at select code xx has a select code of less than 20b.
300	205	000	000	No I/O card has been enabled as VCP interface.
300	206	000	000	Unexpected TBG interrupt.
300	207	000	000	Unexpected Memory Protect interrupt.
300	210	000	000	Unexpected UIT interrupt.
300	211	000	000	Invalid ID number or select code for A400 OBIO. (This error should never occur on an A990.)
300	213	000	000	VCP Speed Sense failed.
300	220	xxx	xxx	I/O card at sc 20 thru 77 failed self-test. xxx xxx is the address in VCP where error was detected.
	.			
	.			
300	277	xxx	xxx	

* Error codes for phase 2 of Test 2 are displayed on upper 8 LEDs as 4 bytes of information using scheme illustrated in previous figure.

NOTE

If any HP 1000 fails the self-test only when it is cabled to an A-Series I/O extender, make sure that the extender is powered on, and verify that the A900 Cache card has part number 12203-60011 or higher, and U803 on the Sequencer card has part number 12201-80084 or higher.

A400/A600+/A700* Memory Array Cards

The green LED on the A-Series memory arrays (HP 12103A*/B*/C/D and K/L/M) will be extinguished when a parity error occurs on the board. The A400 board (HP 12100A), the A600+ memory controller (HP 12102A*/B), A600+ ECC memory controller (HP 12110A/B), and the A600+/A700 ECC memory arrays (HP 12111A*/B*/C*) also contain a parity LED.

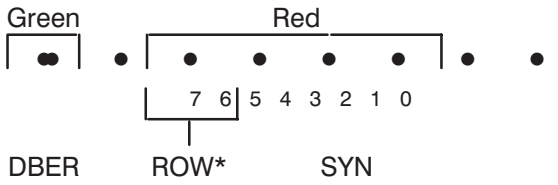
A parity error indication (LED off) can be cleared by cycling the power switch, by pressing the Reset switch on the processor card or frontplane, or by entering the %T or %P command from VCP. Frequently recurring parity errors can be eliminated by replacing the memory card with the extinguished LED.

* Discontinued product; shown for reference only.

A600+/A700* Error Correcting Memory Card

The following LEDs are present on the HP 12104A* memory array and the HP 12110A*/B* A600+ memory controller. The green LED will be extinguished when a double bit error occurs on the array (double bit errors are not corrected). The red LEDs indicate the location of the last single-bit error on the array (single bit errors are corrected).

ECC LED Display



* On the HP 12110, LED 7 indicates Row 1 failure and LED 6 indicates Row 0 failure.

Error Syndrome Code	Bit in Error	Error Syndrome Code	Bit in Error	Error Syndrome Code	Bit in Error
64	DB 0	34	DB 8	76	CB 0
62	DB 1	32	DB 9	75	CB 1
61	DB 2	26	DB 10	73	CB 2
54	DB 3	25	DB 11	67	CB 3
52	DB 4	23	DB 12	57	CB 4
51	DB 5	16	DB 13	37	CB 5
45	DB 6	15	DB 14	00	no error
43	DB 7	13	DB 15		

where: DB is a Data Bit
CB is a Check Bit

A700* WCS Card

The green LED on the HP 12153A Writable Control Store card is lit when the WCS card is ON, which means the card has been enabled for control store operation through the system software.

* Discontinued product; shown for reference only.

A900/A990 Memory Array Card

The green LED is extinguished on HP 12220A*, 12221A, and 12221B memory array cards when a multibit, uncorrectable error has occurred. Multiple bit errors cause the computer to execute a jump to memory location 05.

A900 CS Card

The LED labeled RAM on the HP 12205A Control Store card is lit when the WCS bank is enabled; the LED labeled PROM is lit when the PCS bank is enabled.

I/O Extender IOC Card (12025-66001)

The red LED is lit under the following conditions:

a. DC power in the CPU box is not within regulation.

b. DC power in the extender is not within regulation.

c. Processor is being manually reset.

d. Extender is powered down.

e. IOC to EXT cabling is damaged or is not connected.

The green LED is lit only when both the IOC and EXT are properly powered up and the interconnecting cable is properly connected.

I/O Extender EXT Card (12025-60002)

The red LED is lit under the following conditions:

a. DC power in the CPU box is not within regulation.

b. DC power in the extender is not within regulation.

c. Processor is being manually reset.

d. IOC to EXT cabling is damaged or is not connected.

e. Processor is powered down.

The green LED is lit whenever the red LED is off. This indicates that the extender box is in an operating state.

* Discontinued product; shown for reference only.

PSI Cards

If a self-test failure is detected by the firmware, the indication on the LEDs is as follows:

Condition	LEDs	Notes
PRESET	all on	all on as long as PRESET is true
self-test	0 = off 1,2,3 = on	true during the self-test for about 3.5 seconds. Anything else = error.
end self-test	all on	all on for 10ms
protocol start	varies	for HDLC, all off
		for BISYNC, 0,1,2 = on = on/off depending on internal switch for int/ext clock
		for X.25, all off
		for Multipoint A-Series, all off
		for MRJE and other download firmware, all on
protocol active	varies	for HDLC, LED 0 = on, logical connect has occurred; LED 1 = on, DMA transfer is active; LED 2 and 3 = off always.
		for BISYNC, no change from above.
		for X.25, LEDs 0 and 1 are the same as HDLC; LED 2 = on, msg frame timeout recovery is active; LED 3 toggles with each msg frame received.
		for Multipoint A-Series, LEDs 0 and 1 are the same as HDLC.
		for MRJE and other download firmware, the downloaded firmware will control the LEDs.

HP 12021A* Model 5 and 6 Internal Disk Controller LED Indications

0 = LED off
1 = LED on
f = LED flashing
? = LED may be in any of the above states

Self-Test Initialization

Green LED	Red LEDs T	I	A	B	C	D	E	F	Symptoms
0	0	0	0	0	0	0	0	0	No +5V or GND
?	?	?	1	1	1	1	1	1	A problem with the EPROMs A problem with the Z80A chip (U22) No 4 MHz clock signal No reset pulse at U15

EPROM Errors

Green LED	Red LEDs T	I	A	B	C	D	E	F	Symptoms
0	0	0	0	0	0	0	1	0	U73 ROM 1 HP-IB communication
0	0	0	0	0	0	0	1	1	U63 ROM 2 HP-IB communication
0	0	0	0	0	0	1	0	0	U43 ROM 3 Self-test
0	0	0	0	0	0	1	0	1	U93 RAM chip, lower bytes
0	0	0	0	0	0	1	1	0	U83 RAM chip, upper bytes
0	0	0	0	0	0	1	1	1	U12 GPIB chip

* Discontinued product; shown for reference only.

Non-Fatal Errors

Green LED	Red LEDs T	I	A	B	C	D	E	F	Symptoms
0	0	0	0	0	1	0	0	0	LED register test
0	0	0	0	0	1	0	0	1	LED register test
0	0	0	0	0	1	0	1	0	Select register test
0	0	0	0	0	1	0	1	1	Select register test
0	0	0	0	0	1	1	0	0	Controller register test
0	0	0	0	0	1	1	0	1	Controller chip test
0	0	0	0	0	1	1	1	0	Controller register test
0	0	0	0	0	1	1	1	1	Controller chip test
0	0	0	0	1	0	0	0	0	Index pulse test
0	0	0	0	1	0	0	0	1	Spin one-shot test
0	0	0	0	1	0	0	1	0	Index pulse test
0	0	0	0	1	0	0	1	1	Spin one-shot test
0	0	0	0	1	0	1	0	0	Controller chip direction
0	0	0	0	1	0	1	0	1	Controller chip direction

Drive Power Up Errors

Green LED	Red LEDs T	I	A	B	C	D	E	F	Drive	Symptoms
0	?	?	0	1	0	1	1	0	3	Track 0 not set, spin set
0	1	f	0	1	0	1	1	1	3	Disc spins too slow
0	1	f	0	1	1	0	0	0	3	Disc spins too fast
0	1	?	0	1	1	0	0	1	3	Track 0 on after step in
0	1	?	0	1	1	0	1	0	3	Disc pulled out during test
0	?	?	0	1	1	0	1	1	2	Track 0 not set, spin set
0	1	f	0	1	1	1	0	0	2	Disc spins too slow
0	1	f	0	1	1	1	0	1	2	Disc spins too fast
0	1	?	0	1	1	1	1	0	2	Track 0 on after step in
0	1	?	0	1	1	1	1	1		Disc pulled out during test
0	?	?	1	0	0	0	0	0	1	Track 0 not set, spin set
0	1	f	1	0	0	0	0	1	1	Disc spins too slow
0	1	f	1	0	0	0	1	0	1	Disc spins too fast
0	1	?	1	0	0	0	1	1	1	Track 0 on after step in
0	1	?	1	0	0	1	0	0	1	Disc pulled out during test
0	?	?	1	0	0	1	0	1	0	Track 0 not set, spin set
0	1	f	1	0	0	1	1	0	0	Disc spins too slow
0	1	f	1	0	0	1	1	1	0	Disc spins too fast
0	1	?	1	0	1	0	0	0	0	Track 0 on after step in
0	1	?	1	0	1	0	0	1	0	Disc pulled out during test
0	?	?	1	0	1	0	1	0	ALL	No drives attached

Read Self-Test Errors

Green LED	T	I	Red LEDs A	B	C	D	E	F	Symptoms
0	?	?	1	0	1	0	1	1	No disc/no index pulse/door open
0	0	f	1	0	1	1	0	0	Track 0 not set
0	?	f	1	0	1	1	0	1	Retry exhausted on seek to track
0	?	f	1	0	1	1	1	0	Read sector failed, record not found
0	?	f	1	0	1	1	1	1	Read failed, data error
0	?	f	1	1	0	0	0	0	Read failed, lost data byte
0	?	f	1	1	0	0	0	1	No drives attached

Read/Write Self-Test Errors

Green LED	T	I	Red LEDs A	B	C	D	E	F	Symptoms
0	1	f	1	1	0	0	1	0	Disc is write protected
0	?	?	1	1	0	0	1	1	No disc/not spinning/door open
0	0	f	1	1	0	1	0	0	Track 0 not set
0	?	f	1	1	0	1	0	1	Retry exhausted on seek to track
0	?	f	1	1	0	1	1	0	Lost data during format
0	?	f	1	1	0	1	1	1	Lost data during read operation
0	?	f	1	1	1	0	0	0	Record not found after read
0	?	f	1	1	1	0	0	1	CRC data error after read
0	?	f	1	1	1	0	1	0	Buffer miscompare after read

After Self-Test

(Operation controlled by host computer)

1	0	0	0	0	0	1	Self-Test Passed
1	0	0	0	0	1	0	Seek
1	0	0	0	1	1	0	Read
1	0	0	0	1	1	1	Write
1	0	0	1	0	0	0	Request status
1	0	0	1	0	0	1	Request address
1	0	0	1	0	1	0	Format
1	1	1	0	0	0	0	Verify

HP 12076A LAN/1000 Interface Controller Card LED Display

The green LED is on when power is available to the Medium Attachment Unit (MAU) or the transceiver. If the green LED is off, check the on-board fuse for a possible blown fuse. If the fuse is blown, check the node cabling and/or the MAU for a short circuit. (Note that pin 13 on the 15-pin D connector or pin L on the 48-pin hood connector is the +12 V line.) If an electrical short is isolated to the LANIC card, the card must be replaced.

Upon power-up the red LED should light indicating the self-test is in progress, and after approximately 5 seconds, turn off. If the red LED never turns on after power is applied, or if the light turns on and stays on continuously, then self-test failed indicating a faulty card.

HP 12016A SCSI Card Tests

Self-Test

When you turn computer power on, reset the computer, or execute the %P or %T commands from the VCP prompt, the SCSI (Small Computer System Interface) microprocessor executes a self−test on:

1. The firmware in PROM.
2. The SCSI card's on-board memory.
3. The ability of the SCSI protocol interface chip to communicate with the SCSI card microprocessor.

The self-test does *not* test the SCSI card-to-device cable or the ability of the card to communicate with the computer. (The computer processor's self-test checks for backplane communication between the SCSI card and computer.)

Four LEDs, located on the SCSI card, display card status and report errors (if any) that result from the self-test. The following table shows the possible self-test LED patterns and their definitions. A frozen LED pattern (pattern does not change and some LEDs are in a steady "on" condition) denotes a self-test failure. When the card passes the self-test, all of the LEDs briefly turn off and then LED #1 begins to blink. This indicates a normally functioning SCSI card.

SCSI LED Self-Test Status

LED #1	LED #2	LED #3	LED #4	STATUS
OFF	ON	ON	ON	Card PROM checksum error
OFF	ON	ON	OFF	RAM test failed
OFF	ON	OFF	ON	Reserved
OFF	ON	OFF	OFF	DMA test failed
OFF	OFF	ON	ON	Timer test failed
OFF	OFF	ON	OFF	SCSI chip test failed
OFF	OFF	OFF	ON	Reserved
OFF	OFF	OFF	OFF	Passed test †
BLINK	OFF	OFF	OFF	Normal operation ‡

† The all-LEDs–off condition only exists briefly; LED #1 reverts to continuous blinking which indicates a normal functioning SCSI card.

‡ The rate at which LED #1 blinks indicates the activity of the card; a rate as low as several seconds between blinks is normal.

Verification Program

The SCSI online verification program, VSCSI, is an RTE-A application program which verifies that the SCSI card is functioning correctly. VSCSI provides two user interfaces, interactive and non-interactive.

You can get help on the verification program, at the CI prompt, without specifying any other parameters, simply by entering:

```
CI> vscsi
```

Interactive Interface

An interactive interface permits you to enter commands that run specific verification tests, one at a time. You can also specify the number of times to run each test. The test results are displayed on the screen after you run each test. After a test runs, the command prompt, vscsi, reappears on the screen and you can run another test or exit from the program. To call the interactive verification program, enter the following run string at the CI prompt:

```
CI> vscsi [scsilu] [nontest param1 [nontest param2 [...]]]
```

where:

vscsi: calls the verification program.

scsilu: is the Logical Unit (LU) number of (one of) the SCSI device(s) associated with the SCSI card you are testing. This parameter is optional. That is, you can still invoke the verification program, in the interactive mode, without specifying an LU number if you specify one or more of the following nontest parameters. If you specify one or more test commands (listed on the next page), you will invoke the non-interactive mode as described in the next subsection of this chapter.

nontest param: is one of the following four optional parameters:

−HP	Indicates a non-HP terminal.
−V	Specifies verbose mode.
−I	Ignores errors and continues test.
−L <logfile>	Produces log file to record test results.

After entering one or more of the optional nontest parameters, the command prompt, vscsi, will appear on the screen. You can now execute any of the following commands:

? or ?? or HELP	Any of these three commands displays a list of all valid commands with brief descriptions of each.
LU [scsilu]	Defines the card to be tested where scsi is defined above.
FORMAT	Formats the disk associated with the current SCSI LU.
DISPLAY or DI	Displays a list of the LUs associated with the SCSI card including the address, the device's vendor and model, and current status of the LUs.
UP <lu>	Notifies the system that an LU is available. <lu> is any valid SCSI LU number.
VERBOSE or VE [on/off]	Turns verbose mode on or off. [on/off]

LOOP [n] or REPEAT [n]	Defines how many times to execute the following eight *test* commands.

Test Commands

SELFTEST or SE	Issues a hard reset command to the SCSI card to force it to execute the SCSI self-test.
FMP	Issues FMP calls to the SCSI LU to check the overall functioning of the card, disk, and cables.
ID or REVCODE	Displays the ID and revision code of the SCSI card.
DEVFLAG or DE	Checks device flag operation.
TERMPWR or TE	Displays the status of the TERMPOWER status bit.
TIMESTAMP and or TS	Displays the SCSI card's firmware timestamp address.
RAMTEST or RAM	Tests SCSI card RAM.
LOOPBACK	Loops the test data back from the output of the SCSI card to the input.

EXIT or QUIT or ABORT — Exits the interactive verification program.

For a detailed description of the interactive test parameters, commands, and error/information messages, refer to the *HP 12016A SCSI Host Bus Adapter Card Installation and Reference Manual*, part no. 12016-90001.

Non-Interactive Interface

A non-interactive interface allows you to specify both the tests you want to execute and the number of times to execute the tests in the VSCSI run string. You can run all tests or just selected tests. As VSCSI runs, the tests results appear on screen and the programs terminates back to the CI prompt. Unless you tell the program to ignore errors, it will terminate on the first failure leaving an error message on the screen. (For a detailed explanation of error messages, refer to the *HP 12016A SCSI Host Bus Adapter Card Installation and Reference Manual*, part no. 12016-90001.)

You can invoke the non-interactive verification program from a CI command file or enter the following run string at the CI prompt:

CI> vscsi <scsilu> [param1 [param2 [...]]]

where:

vscsi: calls the verification program.

scsilu: is the Logical Unit (LU) number of (one of) the SCSI device(s) associated with the SCSI card you are testing.

param: is one of the following optional parameters or test commands. (Omitting all test commands from the run string invokes the interactive mode as described in the above subsection of this chapter.)

−HP	Indicates non-HP terminal.
−V	Specifies verbose mode.
−I	Ignores errors and continues test.
−L <logfile>	Produces log file to record test results.
−LOOP [n]	Defines how many times to execute any of the following 10 parameters.

For a detailed description of the non-interactive test parameters, commands, and error/information messages, refer to the *HP 12016A SCSI Host Bus Adapter Card Installation and Reference Manual*, part no. 12016-90001.

VCP Loader Errors

The following are the error codes in response to errors in the loader commands %B and %L.

LDER ERR 0	Unrecognizable load/bootstring.
LDER ERR 2	Select code less than 20B.
LDER ERR 3	No card with that select code.
LDER ERR 4	Product ID not found in EPROM (A990 only).

Cartridge Tape Loader Errors

Test Commands

−SELFTEST or −SE	Issues a hard reset command to the SCSI card to force it to execute the SCSI self-test.
−FMP	Issues FMP calls to the SCSI LU to check the overall functioning of the card, disk, and cables.
−ID	Displays the ID and revision code of the card.
−DEVFLAG or −DE	Checks device flag operation.
−TERMPWR or −TE	Displays the status of the TERMPOWER status bit.
−TIMESTAMP or −TS	Displays the SCSI card's firmware timestamp and address.
−RAMTEST or −RAM	Tests SCSI card RAM.
−LOOPBACK	Loops the test data back from the output of the SCSI card to the input.
−DISPLAY or −DI	Displays a list of LUs associated with the SCSI card.
−ALL	Runs all of the verification program tests except the self-test and loopback test.

LDER ERR 110 File Forward Error; status in B-Register.
LDER ERR 111 Checksum Error.
LDER ERR 112 No data before EOF.
LDER ERR 113 Bad length word.
LDER ERR 120 Write Error; status in B-Register.

PROM Card Loader Errors

LDER ERR 211 End of Program.
LDER ERR 212 Bad Format.
LDER ERR 213 System larger than 32k; must start on card boundary.
LDER ERR 214 Write not allowed to ROM.
LDER ERR 215 Timeout reading data.

DS/1000 Loader Errors

(TO = Timeout)

LDER ERR 310 TO after CLC 0; is SC a DS Card?
LDER ERR 311 Checksum Error; is P file absolute binary?
LDER ERR 312 TO after download request.
LDER ERR 313 TO after file number.
LDER ERR 314 Bad Transfer (cntrl request); status in B-Register.
LDER ERR 315 TO after buffer request.
LDER ERR 316 TO after count echo.
LDER ERR 317 TO waiting for data.
LDER ERR 320 TO after VCP mode request DS write.
LDER ERR 321 Remote node will not accept data; status in B-Register.
LDER ERR 325 Record out of sequence. (Ensure central file is a memory image file.)

Disk Loader Errors

(TO = Timeout)

LDER ERR 411 TO reading disc type or error in initialization process; check HP-IB adrs, card, cable; or, for SCSI check condition after inquiry command.
LDER ERR 412 TO reading status; is device a disc?
LDER ERR 413 Status error; status in B-Register.
LDER ERR 414 TO during file mask.
LDER ERR 415 TO during seek.
LDER ERR 416 TO during read/write command.
LDER ERR 417 TO during DMA of data.
LDER ERR 418 Parity error during DMA transfer.
LDER ERR 420 Parity error during DMA transfer.
LDER ERR 421 TO during FIFO flush.
LDER ERR 422 TO during DSJ command.
LDER ERR 423 Bad DSJ return; returned value in B-Register.
LDER ERR 460 Disc not identifiable; disc ID in B-Register.

Magnetic Tape Loader Errors

(TO = Timeout)

LDER ERR 510 TO during initialization/read ID. For DAT tape, check condition after inquiry command.
LDER ERR 511 TO when issuing end/select unit.
LDER ERR 512 Mag tape off-line.
LDER ERR 513 No write ring. For DAT tape, check condition after read/write, parity error/TO during DMA transfer.
LDER ERR 514 TO during End command.
LDER ERR 515 TO waiting for rewind completion.
LDER ERR 517 TO waiting for DMA transfer.
LDER ERR 520 Parity error during DMA transfer.
LDER ERR 521 TO doing a PHI flush.
LDER ERR 522 TO waiting for DSJ.†
LDER ERR 523 Bad DSJ response.†
LDER ERR 525 TO waiting for Mag Tape Not Busy.
LDER ERR 530 TO after issuing a command.
LDER ERR 531 Parallel Poll time-out after issuing a command.
LDER ERR 535 Bad status after read/write command.
LDER ERR 550 No data transfer (read only).
LDER ERR 560 Not mag tape ID. For DAT tape, check condition after rewind command.

† DSJ = Device Specified Jump

HP 12022A Disk Interface Loader Error

(TO = Timeout)

LDER ERR 610 TO after Sector Drive Head (SDH) for read/write.
LDER ERR 611 TO after cylinder high.
LDER ERR 612 TO after cylinder low.
LDER ERR 613 TO after sector.
LDER ERR 614 TO after sector count.
LDER ERR 615 TO after read/write command.
LDER ERR 616 TO after DMA read/write transfer.
LDER ERR 617 Parity error during transfer.
LDER ERR 620 Fixed disc not ready.
LDER ERR 630 TO after request status register.
LDER ERR 631 TO after read status register.
LDER ERR 632 TO after waiting for not busy.
LDER ERR 633 TO after request error register.
LDER ERR 634 TO after read error register.
LDER ERR 635 Status error: A-Register = status register ‡
B-Register = error register ‡
LDER ERR 650 TO after SDH register for restore.
LDER ERR 651 TO after restore.
LDER ERR 660 Disc not defined.

‡ Refer to the HP 12022A Disk Interface/Controller Diagnostic in chapter 5 for descriptions of the status register and error register.

Other

LDER ERR 1024/1025

Possible meanings:

1. Booting from CS/80 disc that has just been push button restored from a CTD tape or booting diagnostics directly from the tape. The CTD tape may not have been certified/ formatted before data was stored to it.
2. Booting from a CTD tape in ASAVE format.
3. Booting from the CS/80 disc was not successful. Bootex may be corrupted.
4. Faulty tape control board in the CS/80 disc.
5. Incorrect VCP file number in the runstring.

The B-Register will give the following status:

0 = Ready for data; normal mode. Should not get 0 with this loader error.

1 = Status word should be read from drive. Indicates an error, or a new media could have been inserted.

2 = Power up has occurred; no activity in the disc has occurred yet.

3 = Parity error on command.

Halt Error Codes

When a halt is executed, the VCP is invoked. It displays the message:

Pxxxxxx Axxxxxx Bxxxxxx Mxxxxxx T1020zz

where:

P, A, B, M, T are registers.

xxxxxx are the contents of the registers.

zz is the halt number, meaning:

00 The generated system has not been initialized by the BOOTEX program. Also displays the following message:

INITIALIZE SYSTEM BY RUNNING BOOTEX/BUILD

01 The system has not been initialized by the BOOTEX program. Can't mount disk; can't open boot command file; illegal use of shared partition for SHEMA. BOOTEX will usually try to print an error message prior to HLT 1.

02 A privileged routine has executed location 2. This can occur if data is executed or a link is set to 0. Problem with snap or system file (can't open, read/write error).

03 A group II or III error has occurred when no program was executing. The A register will usually indicate either a 046520 (memory protect) or 052511 (unimplemented instruction) error. This can be determined by converting the A register into two ASCII characters as follows:

046520 = MP = Memory Protect
052511 = UI = Unimplemented Instruction

Note: Older revision A900 memory controllers and almost any intermittent problem on the A900 can cause this symptom. In the A600, the processor is most likely to be the problem.

04 A CPU power failure has occurred and the power fail driver was not included in the system.

05 A CPU parity error has occurred in the system or system common areas of memory.

11 - 17 (octal)
An interrupt has occurred from one of the select codes 11B to 17B.

23 Possible corrupt system. Try restoring the operating system.

Diagnostic Control System Error Indications

When DCS first runs, a confidence check is made of the host CPU and I/O. The error is usually shown on the console CRT, but for systems without a console, or where the error prevents using the display, the LEDs can be used to determine the error code.

Primary and Secondary LED Error Codes

The Primary and Secondary LED error codes will alternate if an error is encountered.

P = Primary LED error code (bit 6 = 0). Displays for 2 seconds then becomes Secondary LED error code.

S = Secondary LED error code (bit 6 = 1). Displays for 2 seconds then becomes Primary LED error code.

0 = LED off

1 = LED on

X = Variable LED state; must be collectively converted to octal/ decimal, including bit 6.

Examples:

S 0 1 0 1 0 1 1 0 = Select Code = octal 26
S 0 1 0 1 0 0 1 0 = Error Number = octal 22/decimal 18
S 0 0 0 1 1 0 1 0 = primary number = octal 32 = EIG
S 0 1 0 0 1 0 0 1 = subtest number = octal 11/decimal 9

	bit								
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**(lower 8 bits on A700)**
P	0	0	0	0	1	0	0	0	= Pretest CPU Base page
S	0	1	0	0	0	0	0	0	= 0
P	0	0	0	0	1	0	0	1	= Pretest Memory
S	0	1	0	0	0	0	0	0	= 0
P	0	0	0	0	1	0	1	0	= Pretest CPU Current page
S	0	1	0	0	0	0	0	0	= 0
P	0	0	0	0	1	0	1	1	= Pretest CPU Shift Rotate
S	0	1	0	0	0	0	0	0	= 0
P	0	0	0	0	1	1	0	0	= Pretest I/O Master
S	0	1	X	X	X	X	X	X	= Select Code (octal)
P	0	0	0	0	1	1	0	1	= Pretest Illegal Interrupt
S	0	1	X	X	X	X	X	X	= Select Code (octal)
P	0	0	0	0	1	1	1	0	= BCM Configuration
P	0	0	0	0	1	1	1	1	= BCM Execution or Error (flashes with 0 for active loading)
S	0	1	0	X	X	X	X	X	= Error Number (decimal) (See Appendix B, HP 1000 A/L-Series Computer Diagnostic Operating and Troubleshooting Manual, part no. 24612-90001.)
P	0	0	0	1	0	0	0	0	= DDL Input Mode
P	0	0	0	1	0	0	0	1	= DDL Run Mode
P	0	0	X	X	X	X	X	X	= Primary code of executing Kernal/ Interface program (see section below)
P	0	0	0	1	0	0	1	0	= DDL Error
S	0	1	0	X	X	X	X	X	= Error number in DDL (see DDL manual)
P	0	0	0	1	0	0	1	1	= DDL User
S	0	1	1	1	1	1	1	1	= 177
P	0	0	0	1	0	1	0	0	= DDL I/O Routine A
P	0	0	0	1	0	1	0	1	= DDL I/O Routine B
P	0	0	0	1	0	1	1	0	= DDL I/O Routine C
P	0	0	0	1	0	1	1	1	= DDL I/O Routine D

Diagnostic Program Error LED Indications

	bit 7	6	5	4	3	2	1	0	(lower 8 bits on A700)
P	0	0	0	1	1	0	0	0	= CPU Base Set
S	0	1	X	X	X	X	X	X	= test that failed (decimal)
P	0	0	0	1	1	0	0	1	= MAD Memory Array
S	0	1	X	X	X	X	X	X	= failed card number (memory card with parity LED not lit)
P	0	0	0	1	1	0	1	0	= EIG Extended Instructions
S	0	1	X	X	X	X	X	X	= subtest that failed
P	0	0	0	1	1	0	1	1	= FPD Floating Point
S	0	1	X	X	X	X	X	X	= subtest that failed
P	0	0	0	1	1	1	0	0	= LIS Language Instructions
S	0	1	X	X	X	X	X	X	= subtest that failed
P	0	0	0	1	1	1	0	1	= SIS Language Instructions
S	0	1	X	X	X	X	X	X	= subtest that failed
P	0	0	0	1	1	1	1	0	= MCD Memory Controller
S	0	1	X	X	X	X	X	X	= subtest that failed (decimal for A-Series, octal for XL)
P	0	0	1	0	0	0	0	0	= SFD System Functions
S	0	1	X	X	X	X	X	X	= subtest that failed
P	0	0	1	0	0	0	0	1	= IOM I/O Master
S	0	1	X	X	X	X	X	X	= select code
P	0	0	1	0	0	0	1	0	= Interface Diagnostics
S	0	1	X	X	X	X	X	X	= select code
P	0	0	1	0	1	0	0	0	= CDSBI CDS Basic Instruction
S	0	1	X	X	X	X	X	X	= subtest that failed (decimal)
P	0	0	1	0	1	0	0	1	= CDSPC CDS Procedure Call
S	0	1	X	X	X	X	X	X	= subtest that failed (decimal)
P	0	0	1	0	1	0	1	0	= A990D, A990 Instruction Diagnostic
S	0	1	X	X	X	X	X	X	= subtest that failed

0-17 (octal)	data error
40	XLD, XST failed
41	XST with MPT on failed
42	Map enable failed
43	DMA error

Diagnostic Driver Errors

Driver Name (As Linked) Errors – where dnam is one of the following:

DCDVR when loading from disc
CTDVR when loading from CTU

dnam ERROR 0 = DEVICE UNDEFINED
A request to a driver was made for a non-existent device. Example: if during reset, the driver reported a configuration error and corrective action was not taken before access was attempted through that driver. Using an HP-IB address for a nonexistent disc.

dnam ERROR 1 = FILE ALREADY OPEN
A driver file was left open (no call for release), and another call was made to open a file to that driver. If necessary, enter RESET command.

dnam ERROR 2 = FILE 0 NOT ALLOWED
Access to file is not allowed because it is usually BCM, and is not in any specific format.

dnam ERROR 3 = FILE NOT OPENED
An attempt to release a driver was made, and there was no file open to that driver.

dnam ERROR 4 = COMMAND (EOF/FF)
A driver request of a device was made and the device returned an error. Usually this is a request to the cartridge tape when there is no tape in the drive.

dnam ERROR 5 = WRITE (PROTECTED)
A write request to a device returned an error. This is usually a request to the cartridge tape or flexible disc when it is write protected.

dnam ERROR 6 = TIMED OUT
During a transfer of data or command, the time allowed for correct operation was exceeded and the operation aborted. Usually disc related.

dnam ERROR 7 = BAD DSJ
The last request of an HP-IB device has been aborted because of an error. This can be any type of operation, command or data. DSJ (Device Specified Jump is a single byte status check for HP-IB devices only) is abnormal indicating a device error.

dnam ERROR 8 = USER ABORTED
The driver requested another data media, and the operator struck a key other than the RETURN key.

dnam ERROR 9 = READ/WRITE CONFLICT
A driver was requested for read or write, and a transfer was requested for the opposite.

dnam ERROR 10 =STATUS
A device reported an error status condition.

dnam ERROR 11 =DMA PARITY
During a DMA transfer out of memory, a parity error occurred.

RTE Device Driver Posted Status

Posted Status Bits

Device Driver		7	6	5	4	3	2	1	0
Terminals	DDC00	EOF	BR	EOM	LD	OF	PF	TO	E
Terminals	DD.00	D	–	D	–	–	–	–	E
Line Printers	DD.12	–	–	EOM	–	–	–	–	E
CTUs	DD.20	EOF	DB	EOM	BOM	SE	WP	OFF	E
Mag Tapes	DD.23	EOF	DB	EOM	BOM	SE	WP	OFF	E
ICD Discs	DD.30	–	–	–	EOM	SE	–	–	E
CS/80	DD.33	WP	UND	EOV	UNM	FLT	NR	CE	E

BOM – Beginning of Medium; tape currently positioned at Load Point

BR – Break character detected on received data line.

CE – Channel Errors; CS/80 set for any reject error or DMA length error.

D – End of Transmission, set by a CNTRL D from keyboard.

DB – Device Busy; performing a function that prevents other operations from starting.

E – Error; set by system if driver sets any error code. For DDC00: Set to 1 if any DVT16 error bits are set and bits 6, 5, 3, 2, and 1 are cleared on each read request.

EOF – End of File (set by CTU drivers only).

EOM – End of Medium; printer out of paper; tape is currently positioned at the end-of-tape; a request made for more sectors than are available.

EOV – End of Volume; CS/80.

FLT – Fault.

LD – Line down, valid for modem lines after first connect. Also indicates speed sensing failure for ID400/800/801.

NR – Not Ready.

OF – Overflow error, the application is losing data.

OFF – Off Line; tape not installed.

PF – Parity or Framing error, there was a bit error in the data.

SE – Soft Error; recovered from read/write error.

TO – Time-out by the device driver.

UND – Unrecoverable data; CS/80 set for unrecoverable or marginal errors.

UNM – Uninitialized Medium.

WP – Write Protected; no write ring; record tab set to protect; CS/80 write protected volume.

ASCII/BYTES Table

Byte Position				Byte Position			
CHAR	**Left**	**Right**	**Dec**	**CHAR**	**Left**	**Right**	**Dec**
NUL	000000	000000	0	CAN	014000	000030	24
SOH	000400	000001	1	EM	014400	000031	25
STX	001000	000002	2	SUB	015000	000032	26
ETX	001400	000003	3	ESC	015400	000033	27
EOT	002000	000004	4	FS	016000	000034	28
ENQ	002400	000005	5	GS	016400	000035	29
ACK	003000	000006	6	RS	017000	000036	30
BEL	003400	000007	7	US	017400	000037	31
BS	004000	000010	8	SPACE	020000	000040	32
HT	004400	000011	9	!	020400	000041	33
LF	005000	000012	10	”	021000	000042	34
VT	005400	000013	11	=	021400	000043	35
FF	006000	000014	12	$	022000	000044	36
CR	006400	000015	13	%	022400	000045	37
SO	007000	000016	14	&	023000	000046	38
SI	007400	000017	15	‘	023400	000047	39
DLE	010000	000020	16	(	024000	000050	40
DC1	010400	000021	17	)	024400	000051	41
DC2	011000	000022	18	*	025000	000052	42
DC3	011400	000023	19	+	025400	000053	43
DC4	012000	000024	20	,	026000	000054	44
NAK	012400	000025	21	–	026400	000055	45
SYN	013000	000026	22	.	027000	000056	46
ETB	013400	000027	23	/	027400	000057	47

ASCII/BYTES Table (Cont.)

Byte Position				Byte Position			
CHAR	Left	Right	Dec	CHAR	Left	Right	Dec
0	030000	000060	48	X	054000	000130	88
1	030400	000061	49	Y	054400	000131	89
2	031000	000062	50	Z	055000	000132	90
3	031400	000063	51	[	055400	000133	91
4	032000	000064	52	\	056000	000134	92
5	032400	000065	53	]	056400	000135	93
6	033000	000066	54	^	057000	000136	94
7	033400	000067	55		057400	000137	95
8	034000	000070	56	`	060000	000140	96
9	034400	000071	57	a	060400	000141	97
:	035000	000072	58	b	061000	000142	98
;	035400	000073	59	c	061400	000143	99
<	036000	000074	60	d	062000	000144	100
=	036400	000075	61	e	062400	000145	101
>	037000	000076	62	f	063000	000146	102
?	037400	000077	63	g	063400	000147	103
@	040000	000100	64	h	064000	000150	104
A	040400	000101	65	i	064400	000151	105
B	041000	000102	66	j	065000	000152	106
C	041400	000103	67	k	065400	000153	107
D	042000	000104	68	l	066000	000154	108
E	042400	000105	69	m	066400	000155	109
F	043000	000106	70	n	067000	000156	110
G	043400	000107	71	o	067400	000157	111
H	044000	000110	72	p	070000	000160	112
I	044400	000111	73	q	070400	000161	113
J	045000	000112	74	r	071000	000162	114
K	045400	000113	75	s	071400	000163	115
L	046000	000114	76	t	072000	000164	116
M	046400	000115	77	u	072400	000165	117
N	047000	000116	78	v	073000	000166	118
O	047400	000117	79	w	073400	000167	119
P	050000	000120	80	x	074000	000170	120
Q	050400	000121	81	y	074400	000171	121
R	051000	000122	82	z	075000	000172	122
S	051400	000123	83	{	075400	000173	123
T	052000	000124	84	|	076000	000174	124
U	052400	000125	85	}	076400	000175	125
V	053000	000126	86	~	077000	000176	126
W	053400	000127	87	DEL	077400	000177	127

Utilities

The following utility programs are available on RTE-A and are run from the CI (Command Interpreter) system prompt.

ASAVE and ARSTR

Purpose: Save or restore one disk LU, a group of disk LUs, or an entire disk unit to a tape.

Operation: ASAVE [command [|command ...]]
ARSTR [command [|command ...]]

where:

command is one of the following (or its first two letters). Default = interactive mode.

EXIT|END|ABORT
Terminate ASAVE.

HELP|?|??
On-line help.

LH [fileNum]
List header record for file specified by fileNum or closest file to it on current tape.

Default = next save file. If save file for disk LU crosses tapes, it has same fileNum.

LL [fileDescriptor|lu]
Open list file or LU for log information (in addition to terminal); close previous one.

Default = If no file descriptor|lu is specified, then any open list file or device is closed.

RE fileNum:lu [fileNum:lu ...][VE]
(ARSTR only) Restore a file from tape to disk.

Default fileNum = 1 for first disk lu specified, 2 for second disk lu specified, and so forth.

Default lu = lu used during ASAVE.

Options:

VE Verify

SAVE, lu1 [,lu2 ,...] [,UN] [,AP] [,VE] [,NL] [,NC]
Save a disk to tape. Options:
UN Save entire disk unit containing lu1.
AP Append files to current ASAVE tape.
VE Verify.
NL Do not lock disk LUs during save operation. NC Do not checksum the data records on the tape.

TAPE [lu]
Specify tape LU. Default = display tape LU.

TITLE [text]
(ASAVE only) Specify title (<=40 characters) for save operation. Default = no title.

UE [ON|OFF]
Specify user error-handling mode (initially on). Default = display current mode.

CSYS

Purpose: Copy Type 1 (memory image) file from a CS/80 disk to a cartridge tape, in a memory-based system. CSYS runs only with the HP 7908/11/12/14 disk drives and CTD drive.

NOTE − CSYS does not acknowledge the system BReak command; once invoked, it continues to completion or until aborted by an error.

Operation: CSYS [,system file namr][,tape lu][,file no],[SA]

where:

system file namr
Name of type 1 file on disk.

tape lu
LU of the CTD to be copied.

file no
Specifies the file number that the VCP will use to boot **the system from the tape.**

SA
Adds ASAVE file header so bootable ARSTR can be on same tape as backup.

COPYL

Purpose: Copy one disk LU to another, ignoring file structure.

Note: Disk LUs must be same type and size.

Operation: COPYL [sourceLu destinationLu]

where:

sourceLu
LU of disk to be copied.

destinationLu
LU of disk to receive data.

Default = interactive mode.

EDIT/1000

Purpose: Edit an ASCII file.

Operation: EDIT [file [commandList]]

where:

file
File descriptor of file to be edited.

commandList
List of EDIT commands, separated by vertical bars (|). The commands H and ? display information about EDIT commands.

ERTSH

Purpose: Used with FORMA to find, verify and spare faulty disk sectors (on a Micro/1000 system).

Note: For successful operation, at least 256 KB of system memory, for a memory-based system, is required.

Operation: ERTSH [;command;...]

where:

command is any of the following (command parameters are separated by blanks or commas; default = interactive mode):

BP [word] ... [word]
Define or display the user definable test data pattern (1 to 6 words long). Default = Display the test data patterns and specify those that are currently in use.

CY [low cylinder] [high cylinder]
Define a subrange of disk cylinders for error rate test. Default = all cylinders within the current test LU.

EX or /E
Exit ERTSH after performing necessary cleanup. ERTSH will not respond to a BREAK command during the cleanup process.

HD [low head] [high head]
Define a subrange of disk heads for error rate test. Default = all disk heads within the current test LU.

LL [lu]
Display the current extra log device or set up an extra log device. Setting the LU to zero terminates the use of the extra log device.

LU [lu]
Select the disk LU for testing. The LU does not have to be mounted to the file system. Default = display all disk LUs which can be tested and the currently selected LU.

P# [number]
Define the number of passes (0 to 32767) over the disk range for an error rate test. Zero indicates an infinite

number of passes. Default = display the current pass count.

RO [SQ/RN]
Execute a read-only error rate test over the specified disk range. The sequential (SQ) access test covers the entire disk range in a uniform manner. The random (RN) access test accesses random disk locations.

SC [low sector] [high sector]
Define a subrange of disk sectors for an error rate test. Default = all disk sectors.

SS [HD/AL]
Spare all defective sectors found during a test pass. AL causes all sectors with defects to be spared, while HD spares only those sectors which contain defects that cannot be corrected.

TH [,pattern number] ... [pattern number]
Select one or more of the 19 defined test data patterns for the write-then-read error rate test. If no parameters are specified, then the test data patterns are displayed in addition to the current pattern choices.

WR [SQ/RN]
Execute a write-then-read error rate test over the specified disk range. The LU cannot be mounted to the file system when this test is executed. The sequential (SQ) access test covers the entire disk range in a uniform manner. The random (RN) access test accesses random disk locations.

?? [,command mnemonic]
Display specific help information for the command mnemonic. Default = display all commands.

FC

Purpose: Back up and restore files from FMGR file addressing space to magnetic tape.

Note: FC cannot back up and/or restore CI directories.

Operation: FC [command]

where:

command is one of the following (default = interactive mode):

? List commands and their syntax.

LL Set list device or file.

TITLE
Set title for tape header file.

CF Set namr for tape comment file.

ECHO
Turn ON or OFF echoing of commands to list device.

SCRATCH
Specify disk cartridge for internal scratch files.

COPY
Copy files as specified by parameters.

DEFAULT
Set default source, destination, and options for subsequent COPY commands.

GROUP, COPY EG, AG
Group multiple copy commands into a single operation.

DL Compile directory list of FC tape.

CL List FMP cartridge list, or cartridges included on tape.

LC List comment file from FC tape.

LH List header file from FC tape.

TR Transfer to or from FC command file.

EX Exit FC. If a group COPY is active, it will be completed first.

AB Abort FC, including any active group COPY.

* Comment.

FORMA

Purpose: Provides initialize and spare functions for Micro/1000 systems with internal disks using the HP 12022A* interface card.

Note: For successful operation, at least 256 KB of system memory, for a memory−based system, is required.

Operation: FORMA [command]

where:

command is one of the following (default = interactive mode):

IM lu spareAction

where:

lu Disk LU.

spareAction
p for save the primary;
s for save the primary and secondary
n for save neither.

Note: If you are using a new or replacement disk drive when initializing media that was *not* previously initialized using FORMA, always choose “n”. (If you choose “p” or “s”, the operation will take 16 hours.)

SS diskLu r s/b ccc h ss/bbbbb [p] [o/u]

where:

diskLu Disk LU (1 to 63).

r Retain data (answer y or n).

s/b Logical (sector) or physical (byte) addressing.

ccc Cylinder number of the defect.

h Head number.

* Discontinued product; shown for reference only.

ss/bbbbb
Logical sector or physical byte count since index.

p Primary spare.

o/u Override old spare or unspare.

FORMC

Purpose: Verify integrity of CS/80 disk and tape drives, spare a disk block, or format a disk volume or tape. May also be used with stand alone HP 9153B*/C, integrated HP 9153B* ("Nighthawk") Winchester disk drives, and Micro/1000 Internal Disk Drives using the HP 12122A interface card.

Operation: FORMC [logLu] [command]

where:

logLu LU of log device; default = 1, user terminal

command is one of the following, or its first two letters (default = interactive mode):

? List FORMC commands.

END|EXIT|/EXIT
End FORMC.

ABORT|/ABORT
Abort FORMC.

VERIFY mediaLu [start number]
Verify integrity of CS/80 disk or tape.

mediaLu
LU of CS/80 disk or tape to be verified.

start
Number of disk track or tape block at which verify is to begin. Default = entire disk or tape.

* Discontinued product; shown for reference only.

number
Decimal number of disk tracks or tape blocks to be verified.

SPARE mediaLu track
Spare blocks on specified track.

mediaLu
LU of CS/80 disk or CTD (cache tracks) to be spared.

track
Number of logical RTE (not physical) track containing blocks to be spared.

FORMAT mediaLu [interleave]
Format specified disk or tape.

mediaLu
LU of CS/80 disk or tape to be formatted. Note that entire disk is formatted; it is not possible to format single LUs.

interleave
Disk sector interleave factor. Decimal number between 1 and 32 (Default = 1).

FORMF

Purpose: Verify integrity of and format a flexible disk.

Operation: FORMF [logLu [command lu [interleave]]]

where:

logLu
LU of log device.

command
VE (verify disk integrity) or FO (format disk).

lu LU of disk.

interleave
disk sector interleave factor.

Exit FORMF with EX, EN, or /E; abort it with AB or /A.

FORMT

Purpose: Format a flexible disk, initialize a hard disk, spare a track on a hard disk, verify data on a disk LU, or reformat a hard disk. Will not run online. System must be memory–based with one ID segment generated.

Operation: FORMT [logLu] [command diskLu [pram]]

where:

logLu
LU of device from which FORMT queries are answered. Default is user terminal.

command is one of the following:

FO	Format flexible disk.
IN	Initialize hard disk.
SP	Spare track on hard disk.
VE	Verify data on disk LU (read-only verify).
RE	Reformat hard disk.

diskLu
LU of disk.

pram
For command = FO, pram = sector fill number; for command = SP, pram = track to spare; for other commands, pram is empty.

FOWN

Purpose: Displays owners of and disk space used by files specified.

Operation: FOWN [mask]

where:

mask
File mask. Default = all CI files.

FPACK

Purpose: Rearrange files on file system volume, increasing largest free space on volume. See also MPACK.

Operation: FPACK lu

where:

lu LU of volume to be packed.

FPUT

Purpose: Install bootable systems and diagnostics in space reserved by IN command.

Operation: FPUT file lu [offset]

where:

file File descriptor of file to be installed.

lu LU of disk volume where file is to be installed.

offset
Bootable file number.

FREES

Purpose: Report total free space and size of largest free space on CI file system volume.

Operation: FREES [lu]

where:

lu LU of CI file system volume. Default = all CI volumes.

FSCON

Purpose: Convert FMGR cartridge to CI (hierarchical) structure.

Operation: FSCON lu

where:

lu LU of FMGR cartridge to be converted.

FST

Purpose: Back up and restore files from the disk to magnetic or CS/80 cartridge tape. Supports streaming.

Operation: FST [command | command | ... | command]

where:

command is one of the following (default = interactive mode):

? or HE
List commands and their syntax.

/ Display command stack (10 lines).

BA Select files to back up.

DF Specify a non-default directory file.

DL Display the mounted tape's directory file.

EX Exit FST.

GO Begin executing backup/restore.

LC List the mounted tape's comment file.

LH List the mounted tape's header.

LI List the files selected for backup/restore.

LL Set log device or file for FST activities.

LN List the non-selected files (restore only).

MT Set the magnetic tape LU.

NE Advance the tape to another append.

PO Position the tape to a specific append.

PR Rewind the tape to a previous append.

RE Select files to restore.

RU Run an external program.

SC Select the tape's comment file (backup only).

SD Set the tape density (HP 7974/78 only).

SE Lock the tape LU and check the tape status.

SH Display the DF, MT, TI, SC, LL, and option settings.

TI Specify a title for the tape (backup only).

TR Begin executing a transfer file.

UN Unselect files.

* Comment.

FST Options:

FST> option [option]...[option] [ON/OFF] ...

where:

option is one of the following (specify ON or OFF for each group of options, the default is ON):

A Append this backup to the data already on the tape.

B Only show errors and status messages.

C Clear the disk file's backup bits.

D Replace duplicate files.

K Keep tape on-line when backup/restore is complete.

L Lock any disk LUs used.

O Restore files to their original main size.

P Purge the disk files after backing up the files.

Q Report messages only to the log device/file.

U Replace duplicate file if file has been updated.

V Verify the files during the backup/restore.

W Backup all the blocks reserved for the file.

Y Write over the tape without asking.

FVERI

Purpose: Verify that data within a hierarchical file system volume is consistent.

Operation: FVERI [lu|mask] [options]

where:

lu LU of volume to be verified. Default = all volumes.

mask
mask describing a set of files to be verified.

options
one or more of the following:

+B verify bit map only, illegal if mask is also specified.

+L,file|lu
list file or device for errors.

?? On-line help.

INSTL

Purpose: Initialize boot extension (BOOTEX) file for disk LU.

Operation: INSTL [snap] [system] bootDest lu [bootSource],[NC]

where:

snap
Snapshot file of target system. Default = same as host system.

system
System file of target system. Default = same as host system.

bootDest
File to contain new boot extension, or number which is an offset into reserved space on LU.

lu Disk LU (on target system) containing target system and snap file.

NC
No Console option. BOOTEX will not send message to console.

bootSource
Name of boot extension file on host system. Default is bootDest, if it is a file.

LIF

Purpose: Interchanges files between an HP 1000 system and other HP computer systems. Translates files from the RTE FMP format to a standard Logical Interchange Format (LIF) and vice versa.

Operation: LIF [command]

where:

command is one of the following (default = interactive mode):

CO Copy files from one medium to another.

DL Directory list.

EX Exit.

HE Help.

IN Initialize the LIF medium.

LI List files on the list device.

LL Logical list, specifies the list device.

MC Mount cartridge.

PK Pack cartridge (LIF medium).

PU Purge files from LIF medium.

RN Rename LIF file.

ST Store files to and from LIF medium.

SV Severity level.

TR Transfer to a LIF command file.

LINDX

Purpose: Index library files for faster searching.

Operation: LINDX inputFile outputFile

where:

inputFile
File to be indexed.

outputFile
Indexed library (different from inputFile).

MERGE

Purpose: Combine two or more input files into a single output file.

Operation: MERGE [mergeList] [file|lu]

where:

mergeList
File containing names of files to be merged.

file|lu
Out**put file name or LU.**

METER

Purpose: Displays information about system and user processes. Meter updates the information approximately once every five seconds.

Operation: METER

When the cursor is at the bottom of the list, you can enter one of the following single key commands:

I Sort in increasing order

D Sort in decreasing order

H Sort by histogram order

L Sort by LU (Session number)

N Sort by name

O Sort by owner

P Sort by priority

S Sort by state

T Sort by total CPU

A Display all processes

U Display only user processes (non-system)

? Display a help screen

E Exit

space
Exit

Uppercase or lowercase does not make any difference to METER except for the commands H, L, P, and S. For these commands there can be both a primary and a secondary sort key. Indicate primary sort keys by typing an uppercase character. Indicate secondary sort keys by lowercase.

Use the BR command, not the OF command, to stop execution of METER.

MPACK

Purpose: Consolidate free space on disk by moving files. The LU to be packed must be inactive.

Operation: MPACK lu [option]

where:

lu
LU of volume to be packed.

option
+P = Pack disk LU

?
List options and their syntax.

OLDRE

Purpose: Change extended relocatable record formats to non-extendable formats.

Operation: OLDRE namr

where:

namr
Name of type 5 file. Begins with %.

PBV (PushButton Verify)

Purpose: Verifies that the data copied in a CS/80 PushButton Save or a CS/80 PushButton Restore operation is correct.

Operation: PBV sourceLu destinationLu

where:

sourceLu
If verifying a save operation, LU must be a CS/80 disk. If verifying a restore operation, LU must be a CS/80 CTD.

destinationLu
If verifying a save operation, LU must be a CS/80 CTD. If verifying a restore operation, LU must be a CS/80 disk.

Refer to the RTE-A Utilities Manual (part no. 92077-90004) for additional information.

PRINT

Purpose: Print one or more files to a printer or a file.

Operation: PRINT [file] [lu],[option1 [option2 [...]]]

PRINT options can be placed anywhere in the runstring provided a plus sign precedes each option. PRINT understands file masks. PRINT options are as follows:

Options:

+A:filename
Directs output to the specified filename and appends to the current file if it exists.

+B:banner
Prints a large letter, user-defined banner.

+C:ON/OFF
Sets the carriage control option on or off.

+F:#
Advances paper the specified number of pages after all files are printed.

+I:#
Indents each line by the specified number of spaces.

+M:#
Merge consecutive files with the specified number of blank lines between them.

+N
Produces a numbered listing for each file in the runstring.

+O:filename
Directs output to the specified filename and overwrites the current file if it exists.

+P[:OK]
Purges printed files that have been sent to the line printer. PRINT prompts you before purging the files unless you qualify the command with the word OK.

+Q Suppresses file mask verification. If this option is not used, PRINT shows all files that match the runstring and asks if it is OK to print them.

+X:#
Prints all files contained in the runstring a specified number of times.

+W:workingdir
Prints the files that follow relative to the given working directory.

+? Returns an explanation of available options.

RINFO (Reset Multiuser Accounting Information)

Purpose: Resets the multiuser accounting information to zero for cumulative connect time and cumulative CPU usage. Only the superuser can run this utility.

Operation: RINFO [UserMask1 [UserMask2 [...]]]

where:

UserMask
is the name or file mask for the user(s) whose accounting information is to be reset. Defaults to the current user.

SAM (System Available Memory Reporting)

Purpose: Prints out information concerning the status of System Available Memory (SAM).

Operation: SAM [AL]

where:

AL complete listing of all SAM blocks

SINFO (Show Multiuser Accounting Information)

Purpose: Displays the multiuser accounting information found in the user configuration file for the user(s) specified. The information shown is last logoff time, cumulative connect time, and cumulative CPU usage.

Operation: SINFO [UserMask1 [UserMask2 [...]]]

where:

UserMask
: is the name or file mask for the users whose accounting information is to be displayed. Defaults to the current user.

SPORT (Serial Port Analyzer)

Purpose: Troubleshooting serial ports. Displays the status of serial ports driven by DDC00. Verifies that a port was set up in the desired manner.

Operation SPORT [port_lu [,display_lu [,waitflag]]]

where:

port_lu
: Serial port LU for which current status is requested.

display_lu
: LU to which the output is directed.

waitflag
: Non-zero value to force a wait for a busy port. Permits

SPORT to “hang” on the port until current request completes.

TF

Purpose: Back up and restore files to magnetic or CS/80 cartridge tape.

Operation: TF [command]

where:

command is one of the following (default = interactive mode):

? List commands and their syntax.

COPY
Copy files as specified by parameters.

TITLE
Set title for tape header file.

DEFAULT
Set default source, destination, and options for subsequent COPY commands.

GROUP, EG, AG
Group multiple COPY commands into a single operation.

LL Set list device or file for LH or DL.

LH List header file from TF tape.

DL Compile directory list of TF tape.

TR Transfer to or return from TF command file.

EX Exit TF.

* Comment.

WH

Purpose: Display system status information.

Operation: WH [option]

where:

option is one of the following:

AC Active programs.

AL Active and dormant programs.

CL Class number.

PA Partition status.

SE All sessions (VC+ only).

SH Shareable EMA areas.

ST System status.

US All user programs.

none
All programs in current session.

??|HE
On-line help.

BOOTEX Boot Extension

Purpose

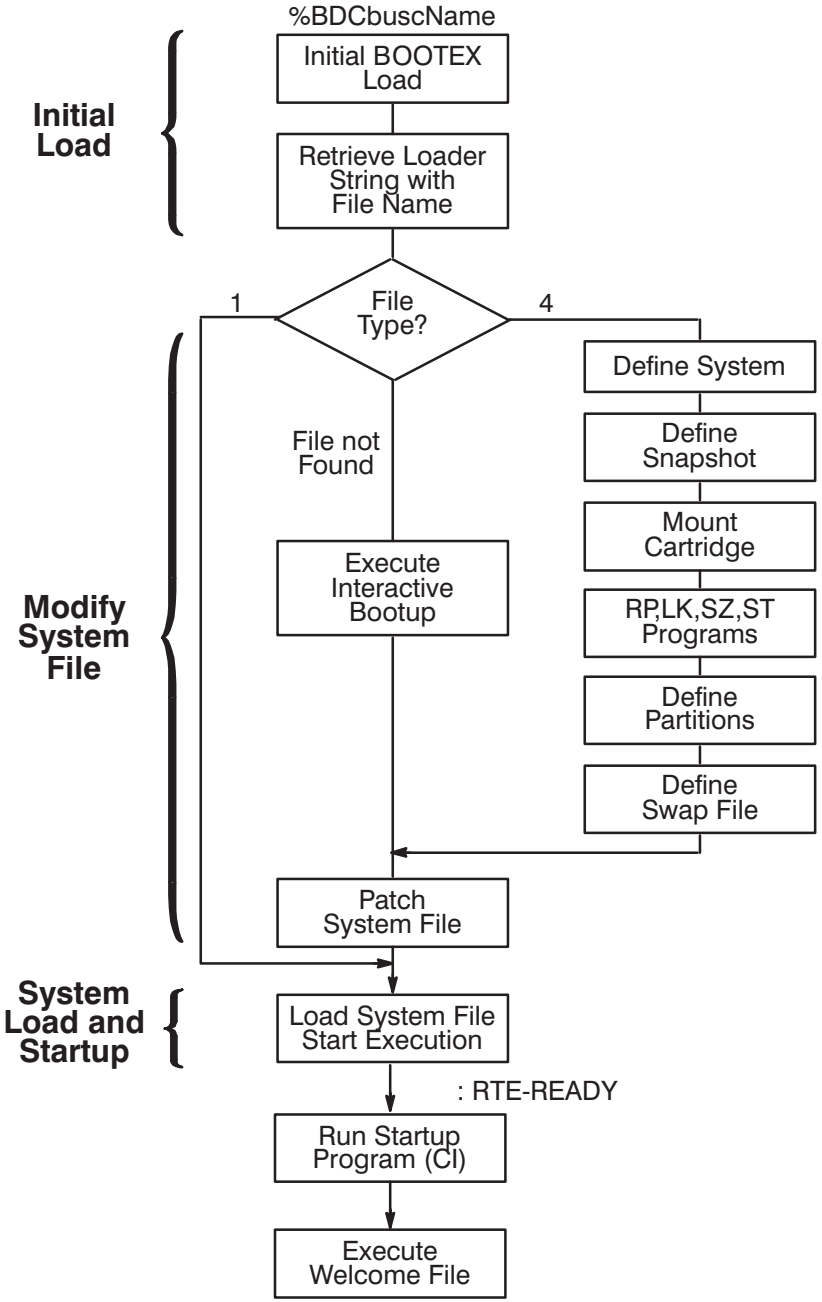
The boot process consists of three phases: initial boot extension load, modification of system file, and loading of the system file and system start-up.

Initial Load – In the initial load, the boot ROM loader brings into memory the boot extension, BOOTEX. BOOTEX resides on the disk starting at cyclinder 0, sector 0. BOOTEX is a file that contains a boot program. The boot loader passes a string to BOOTEX which contains the name of a file. The file can either be a BOOTEX command file (Type 4) or an actual system file to be booted into memory (Type 1).

If the file is a type 4, BOOTEX assumes it is a boot command file. The command file contains the names of the system to be booted and its associated snapshot file, the names of any type 6 program files to be restored, and the reserved partition definitions for the system. BOOTEX restores each program file, then modifies the system file by setting up the memory descriptors and creating ID segments for those programs to be RP'd, and sets up the swap file and the swap area descriptors.

System Load and Start-up – The modified system file is now loaded into memory and, if a program has been specified as the start-up program, it begins to execute.

BOOTEX Flowchart



Operation

BOOTEX can be run either interactively or from a command file. The name of the BOOTEX command file is specified in the boot string (i.e., %BDCbuscNAME). The BOOTEX command file must be on the disk LU from which you are booting (same LU where BOOTEX is found). If the file is not found, or the file is a Type 0 file for the terminal, BOOTEX goes into interactive mode. In most cases, BOOTEX can be rescheduled for interactive execution with the BOOTEX string %BDCffbuscxx (where xx are don't cares).

Boot Program Commands

BOOTEX performs several functions: system and snapshot file initialization, cartridge mounting, memory specification, reserved partition definition, program RP, swap file initialization, set up of timeslice and priority swapping boundaries.

ECHO Command

Echoes all commands to the terminal. This command is usually found in the BOOTEX command file and not necessary for interactive mode.

EC

System/Snap Commands

The first phase of BOOTEX is system and snapshot file initialization. The following two commands must be entered prior to all other commands and must be found on the boot cartridge.

SY,filename
- where filename is the name of the system file.

SN,filename
- where filename is the name of the snapshot file.

Mounting Cartridges

BOOTEX will mount any cartridges you would like to have in the cartridge directory upon system start-up. This command should be entered before the command to relink or RP is given. The cartridge that contains the files to be relinked and/or RP'ed should be mounted first.

MC,+/−lu

Scratch LU

A scratch disk LU may be specified for VMA backing store scratch files.

SC,+/−lu

SC,0 removes scratch cartridge definition.

Bad Pages

You may specify bad pages with the BP command. All bad pages must be specified prior to defining partitions. Bad pages are identified in increasing order. NOTE: Bad pages cannot be specified in the system or system common area. If a bad page exists in either of these areas, the physical memory must be repaired, replaced, or reordered.

BP,page number − identify a bad page of memory by its page number.

or

BP,pnum1,pnum2 − identify a block of bad pages in the range from pnum1 to pnum2.

Memory Commands

The system memory size and System Available Memory (SAM) can be specified with the following commands:

MS,num
sets the memory size used by RTE to "num" pages. "Num" must be less than or equal to the actual number of pages of physical memory installed.

SA,num
sets the number of words of System Available Memory (SAM).

Restore Program Commands: RP, ST, SZ, and PR

Program files can be relinked and optionally have ID segments set up (RP'ed) during this phase. Program size and priority can also be changed as well as specifying a start-up program where RMPAR parameters can be passed.

RP,namr[,newname]
Relink the file if necessary and construct an ID segment. The program can be given a new name if desired.

ST,[p1,...,p5]
Indicate that the program given in the previous RP is to be the start-up program. If more than one ST is issued, the last program will be the actual start-up program.

SZ,nn
Size in pages of the program given in the previous RP or LK command. VMA/EMA programs cannot be sized at boot time.

PR,nn
Change the priority of the program given in the previous RP or LK command. The range is from 0 to 32767.

EN Ends this phase.

Reserved Partition Assignment

Optional reserved partitions can be defined in either two ways: by assigning programs or by simply giving the partition size. A program is assigned a reserved partition in the following manner:

AS,prog1[,prog2[...]] Up to 20 programs can be assigned the same partition with all commands for that partition being grouped together.

Commands are accepted until the area for Memory Descriptors is filled or memory is filled.

Reserved Partition Definition

Reserved partitions without assigning programs are defined as follows:

RV,k	where ‘k’ is the number of pages to allocate for the partition.

Swap File Definition

The swap file command allows you to specify a file to which programs will be swapped. If BOOTEX finds the file in the command, the existing file will be used, ignoring the file size parameter. If the file does not exist, the file will be created. The file size will be set to 32k times the number of ID segments.

SW,namr	Initialize the given file as the system swap file.

Timeslicing, Swapping, Security Code, Session Accounting

Commands to set up the timeslicing quantum, the priority swap boundary and the system security code can be entered at this point in the boot process.

QU,timeslice,pri	Set the timeslice quantum to the given value. Set the priority boundary where timeslicing is to begin.
BG,boundary	Set the background priority limit.
SS,newcode	Change the system security code from the value in the system file to the newcode.

For systems with VC+ only:

AC[,ON/OFF]	Turns session accounting on or off. Default = ON. (Note that the session accounting must be enabled for METER to function properly.)

END Command

The command input to BOOTEX is terminated with the END command.

Sample BOOTEX Command File

```
*   SOURCE: 92077–17293  REV.5020 <901205.1442>
*   JCR
*   FHP,MCN – size up the swap file (2048 blocks)
* Primary system boot up command file (boot.cmd) for primary system
ec
* Define system and snap files
sy,primary.sys
sn.primary.snp
*
* Note: No FMGR cartridges are mounted.  If needed, mount cartridge
        16 for CS–80 systems (MC,16) or mount cartridge 60 for micro–
        1000 systems (MC,60) to mount the appropriate FMGR cartridge.
*
* Define initially RP'ed programs
rp,drtr,d.rtr
rp,derr,d.err
*
rp,ci,cm
rp,cix
*
* RP the powerfail routine and DDC00/DDC01 modem handler
rp,autor
*
* Configure the system console
rp,ci,ci.s
*

* Note: the following line is used for the primary system only.
*       Remove it when you generate your system with a system
        console gen"d in.
*
* Map VCP terminal to LU1
rp,lucfg,prihp
*
* Use Welcome1.cmd
st,,1
end
*
* End RP phase
* Define swap file
* sw,swap.swp::system::2048
*
end
```

Table of Contents

Chapter 5
Diagnostics

5

Diagnostics

Diagnostic Control System

Diagnostic Welcome Message

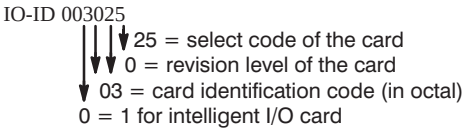
The following is an example of the configuration and status message returned to the terminal. This message should be checked against the I/O cards and amount of memory physically installed in the computer.

```
HP 1000 A990                8192K BYTES MEMORY

IO-ID 000020
IO-ID 003025
IO-ID 004027

BASIC CONTROL MODULE (5270)
SYSTEM MODULES LOADED
```

Interface card octal identification codes are defined as shown below, and are determined through Diagnose Mode 1 of the I/O Master circuits on each installed I/O interface card (refer to any HP 1000 A-Series Computer Reference Manual).



These identification codes are automatically obtained in the diagnostic welcome message when loading the HP 24612A diagnostics.

The identification code for a particular interface card can be obtained in VCP diagnose mode 1 using the following commands (user input is underlined):

VCP> G −−xx xx xxxxsc

or

VCP> RDyyyysc xxxxxx

where sc is the select code (in octal) and yyyy is the ID code. In diagnose mode 2, xxxxxx represents the following data (in A/B register):

Bits 0 - 5: Current global register value
6: Global register enabled/disabled
7: 1 = gobal register: select code of interface
8: Flag bit
9: Control bit
10: Always zero
11: 1 = receiving interrupt priority
12: 1 = break feature enabled
13 - 15: Always zero

Interface Card Octal Identification Codes

	Interface Card	ID Code (octal)
HP 12005A*	ASIC Card, standard	0000sc
HP 12005B	ASIC Card, fiber optics	0001sc
HP 12006A	Parallel Interface Card	0010sc
HP 12007A*/B	HDLC (Modem) Card	1020sc ‡
HP 12008A	PROM I/O Card	0030sc
HP 12009A	HP-IB Interface Card	0040sc
HP 12010A	Breadboard Card	0050sc
HP 12011A	Extender Card	†
HP 12012A	Priority Jumper Card	†
HP 12013A*	Battery Backup Card for model 6	†
HP 12016A	SCSI Host Bus Adapter Card	1150sc
HP 12021A*	Model 5/6 Floppy Controller	†
HP 12022A*	Micro/1000 Disc Interface Card	0230sc
HP 12040A*	Multiplexer Card	1060sc
HP 12040B*	Multiplexer Card	1060sc
HP 12040C	Multiplexer Card	1060sc
HP 12040D	Multiplexer Card	1060sc
HP 12041A*/B	Multi-Use 8-Channel MUX Card	0060sc
HP 12043A	MRJE Modem	0020sc
HP 12060A*	High Level Analog Input Card	0400sc
HP 12060B	High Level Analog Input Card	0400sc
HP 12061A	Multiplexer Expansion Card	†
HP 12062A	Digital-to-Analog Card	0440sc
HP 12063A	16 IN/16 OUT Isolated Digital Card	1410sc
HP 12065A	Color Video Interface Card	0250sc
HP 12072A	Factory Data Link Card	1430sc
HP 12076A	LAN Interface Card	1260sc
HP 12092A	Data Link Master	0020sc
HP 12100A	A400 On-Board 4-Channel MUX	1777sc
HP 12153A	Writable Control Store (A700)	0600sc
HP 12155A	PROM Control Store (A700)	0030sc
HP 12205A	Control Store Interface Card (A900)	0610sc
HP 37203L*	HP-IB Extender	†
HP 37222A	Modem Card	0220sc

where: sc select code.
* Discontinued product; shown for reference only
† Has no I/O master or ID number
‡ Additional PSI interfaces with ID code = 1020sc:

HP 12042A	PSI Card (Modem) OEM use
HP 12042B	PSI Card (Direct Connect) OEM use
HP 12044A	1k DS Direct Connect
HP 12073A	3k DS Modem
HP 12075A	X.25 Modem
HP 12082A	3k DS Direct Connect

VCP AUTO Execution – Complete Test Series

1. Initiate the VCP mode of computer operation. Press the BREAK key to enter VCP mode.
2. Insert disk/tape media in drive, or ensure that the hard disk diagnostic file is accessible.
3. Enter one of the following commands at the terminal, depending on the media or interface indicated:

   - %BDCfbuscAUTO<cr> (HP-IB tape, disk, or Micro/1000 internal subsystem; or SCSI disk)
   - %BDIfbuscAUTO<cr> (Micro/1000 internal subsystem with HP 12022A* Interface)
   - %BMTfbuscAUTO<cr> (HP-IB magnetic tape or SCSI Digital Audio Tape (DAT))
   - %BDS000024AUTO<cr> (DS/1000)

   where:

   f = file number. Use 0 for: (1) HP-IB or SCSI disk, (2) CS/80cartridge tape (when using bootable tape 24998-13328 boot file 0 to read index on tape, then boot again specifying file in index), (3) SCSI DAT, or (4) disk dedicated as diagnostic media.
   Use 1 for magnetic tape 24998-13540 to boot file 1 for index, then boot again specifying file in index.
   Use 2 for: (1) magnetic tape, or (2) CS/80 primary diagnostic cartridge tape.
   Use 6 for disk restored from primary tape.

   NOTE: The above applies to rev. 4010, or later, of the diagnostics. For revision 2440 and 2540, BOOTEX requires two files; therefore, use f=2 for CS/80 primary diagnostic tape or disk restored from primary tape.

   b = HP-IB and SCSI bus address or Micro/1000 internal subsystem drive address (use 3 for microdiskette or 0 for hard disk).

   u = unit number. Use 0 for CS/80 disk drive that includes cartridge tape drive. Use 1 for cartridge tape drive. For the HP 7906, unit number is the head number. Use 0 for the HP 7907 fixed disk and 1 for the removable disk. For Micro/1000 internal subsystem, unit number always equals 0.

   sc = Select code of the interface.

* Discontinued product; shown for reference only.

4. The Diagnostic Control System (DCS) will load and execute, and the terminal will return the configuration and status information.

5. All kernel and interface diagnostic programs in the AUTO file are then loaded and executed under the control of the DCS, with the following type of information returned to the terminal as each diagnostic executes:

```
BASIC INSTRUCTION DIAGNOSTIC
PASS COMPLETE
DIAGNOSTIC COMPLETE
```

   Refer to Kernel and Interface Diagnostic Reference Manuals (part nos. 24612-90017 and 24612-90011, respectively) for additional operating and error information.

NOTE

A test failure will cause the series to stop and return an error message to the terminal. To proceed to the next diagnostic in the series, enter BYE<cr> following the DDL> prompt.

---

6. The AUTO program will select the appropriate diagnostics from the AUTO file. As each selected diagnostic program executes successfully, a pass message similar to that shown above, or an error message if a failure occurs, will return to the terminal display.

   To obtain detailed error information, enter RUN E<cr>.

NOTE

Diagnostics for I/O cards not installed in the system will not be loaded when using AUTO file.

---

7. When all diagnostic programs complete successfully, control will return to the Basic Control Module (BCM) mode, with the BCM> prompt displayed.

```
END OF AUTO
BCM>
```

   Individual kernel and interface diagnostics can be run singly or looped any number of times.

VCP AUTO Execution – Single Test Execution

VCP AUTO Execution, Single Test Mode for HP-IB Cartridge Tape (CS/80) and disk, magnetic tape, Micro/1000 Disk Interface, and SCSI disk and Digital Audio Tape (DAT).

1. Initiate the VCP mode of computer operation. Press the BREAK key to enter VCP mode.
2. Insert disk/tape media in drive, or ensure that hard disk diagnostic file is accessible.
3. Enter the following command at the terminal:
   %BxxfbuscAUTO,name,RU<cr>

   where:

   xx = DC for HP-IB tape, disk or Micro/1000 internal subsytem; or SCSI disk. DI for Micro/1000 internal subsystem with HP12022A* Interface. MT for HP-IB magnetic tape or SCSI DAT.

   f = file number. Use 0 for: (1) HP-IB or SCSI disk, (2) CS/80cartridge tape (when using bootable tape 24998-13328 boot file 0 to read index on tape, then boot again specifying file in index), (3) SCSI DAT, or (4) disk dedicated as diagnostic media.
   Use 1 for magnetic tape 24998-13540 to boot file 1 for index, then boot again specifying file in index.
   Use 2 for: (1) magnetic tape, or (2) CS/80 primary diagnostic cartridge tape.
   Use 6 for disk restored from primary tape.

   NOTE: The above applies to rev. 4010, or later, of the diagnostics. For revision 2440 and 2540, BOOTEX requires two files; therefore, use f=2 for CS/80 primary diagnostic tape or disk restored from primary tape.

   b = HP-IB and SCSI bus address or Micro/1000 internal subsystem drive address (use 3 for microdiskette or 0 for hard disk).

   u = unit number. Use 0 for CS/80 disk drive that includes cartridge tape drive. Use 1 for cartridge tape drive. For the HP 7906, unit number is the head number. Use 0 for the HP 7907 fixed disk and 1 for the removable disk. For Micro/1000 internal subsystem, unit number always equals 0.

   sc = Select code of the interface.

   name =
   Mnemonic of diagnostic to be run. See AUTO file listing.

* Discontinued product; shown for reference only.

4. The following runstrings are also available:

   a. %BxxfbuscAUTO,DDL<cr>

      Load and configure the DCS only; stop in the DDL mode.

   b. %BxxfbuscAUTO,name<cr>

      Load DCS and diagnostic; stop in the DDL mode.

   c. %BxxfbuscAUTO,name,RU<cr>

      Load DCS and diagnostic; run the diagnostic one time.

   d. %BxxfbuscAUTO,name,RU L nn<cr>
      (for Kernel diagnostics only)

      Load DCS and diagnostic; run and loop diagnostic nn times. Default is 10 passes.

   e. %BxxfbuscAUTO,name,RU T<cr>
      (for Kernel diagnostics only)

      Load DCS and diagnostic; display list of tests within diagnostic "name".

   f. %BxxfbuscAUTO,name,RU T a b [x][@sc]<cr>
      (for Kernel diagnostics only)

      Load DCS and diagnostic; run test "a" within diagnostic "b" times; continue on error if "x" is −1; stop on error if "x" is 0 at select code "sc".

      x is optional; default is 0; @sc is for the I/O Master (IOM) diagnostic only.

   g. %BxxfbuscAUTO,name,RU T a b @m @n<cr>
      (for Memory Array diagnostic only)

      Load Diagnostic Control System (DCS) and diagnostic; run test "a" within diagnostic "b" times; test "m" pages (octal) of memory starting at page number "n".

5. The Basic Control Module (BCM) will load and execute the DCS and diagnostic, and return the configuration and status information.

6. If the mini/micro-diskette is used, the following message will be returned to the terminal:

```
LOAD MINI DISC NO. XXX PRESS RETURN
```

   Insert requested disk and press <cr>.

7. During execution, the diagnostic will return the following type of information:

```
XX XXXXX XXXXXX      < diagnostic name.
SSSS PASSED          < diagnostic test pass/fail status.
PASS COMPLETE
DDL>
```

NOTE

A test failure will cause the diagnostic to stop and return an error message, followed by the DDL> prompt. To return to the BCM mode, enter BYE<cr> following the DDL> prompt.

---

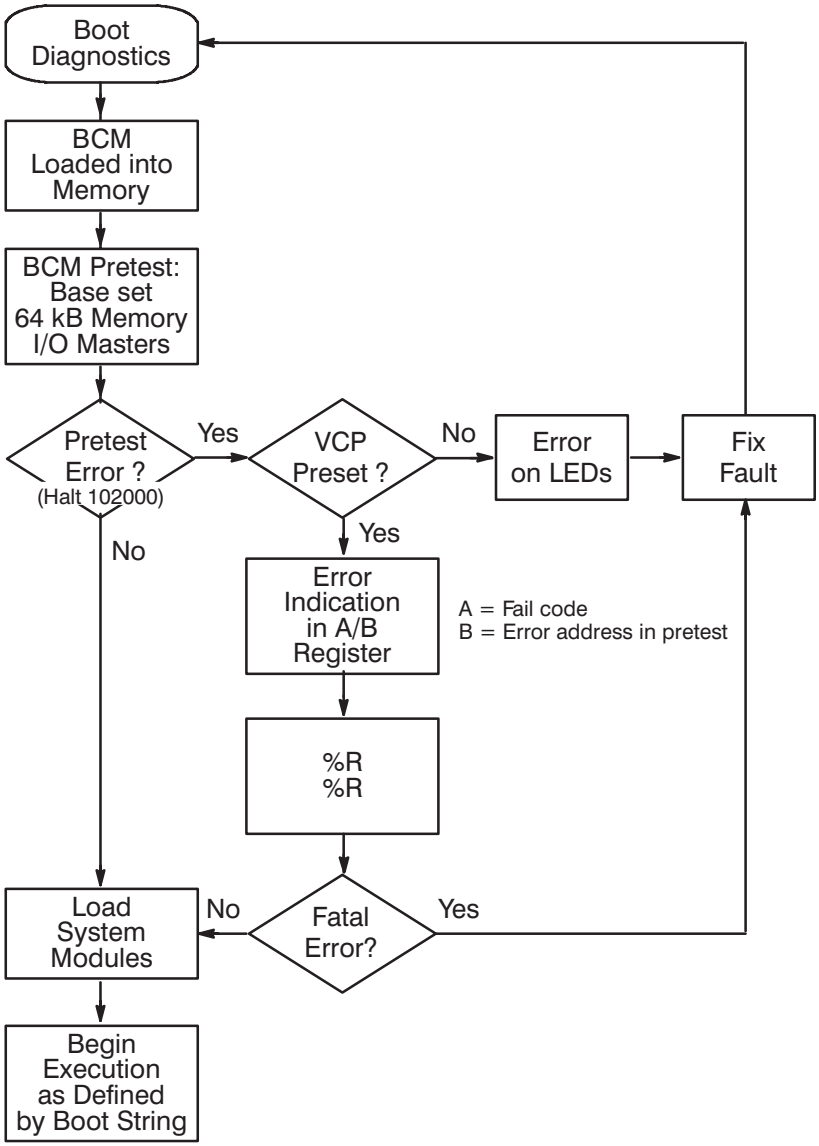
8. To run an additional single test within the same diagnostic, refer to the runstring options above and begin runstring at RU. For example:

```
DDL> RU T a b [x] [@sc]<cr>
```

9. To return to the BCM mode and run a different diagnostic, first enter DDL> BYE<cr> followed by a BCM> CLEAR<cr>. The terminal will return the BCM> prompt. Refer to the runstring options above and begin the runstring at AUTO. For example:

```
BCM> AUTO,name<cr>
```

A-Series Diagnostic BOOT/LOAD Sequence



Operator Command Options

AUTO

Causes the Basic Control Module (BCM) to load and execute a selected configuration of the DCS and/or diagnostic programs.

BCM> *AUTO,LOOP<cr>*	Starts AUTO program, loads system diagnostics, loads and executes each of the diagnostics in the AUTO file. After a complete pass, the AUTO program restarts a pass of the diagnostics.
BCM> *AUTO<cr>*	Starts AUTO program, returns to BCM upon one complete diagnostic pass.
BCM> *AUTO,BCM<cr>*	Primarily used at bootup; returns directly to BCM.
BCM> *AUTO,DDL<cr>*	Will load and execute the Diagnostic Design Language (DDL) program.
BCM> *AUTO,name<cr>*	Loads the named diagnostic. If a DDL diagnostic, executes the DDL module.
BCM> *AUTO,name,string<cr>*	Loads the named diagnostic and processes the runstring.
BCM> *AUTO,−diag<cr>*	Sets skip flag on the diagnostic; not executed during complete pass/loop. (Only skips one diagnostic.)
BCM> *AUTO,+diag<cr>*	Resets skip flag on the diagnostic.

SHOW

Used to display information about the DCS. Information is sent to the terminal or a device file. Format is:

BCM> *SHOW,xxxx,dv:fn*

where xxxx is:

BCM> *SHOW,AUTO<cr>*	Displays the auto file contents.
BCM> *SHOW,ASSIGN<cr>*	Displays a list of reference numbers, DVRs, SCs currently assigned.
BCM> *SHOW,NAME<cr>*	Displays the names of programs in memory.
BCM> *SHOW,LOG<cr>*	Displays the current log DVRF.
BCM> *SHOW<cr>*	Displays common area, base page area, program names, and memory available.

dv:fn Device reference number and file number to which data will be output (default is console).

ASSIGN

Used to assign reference numbers to drivers as they are loaded and made part of the Diagnostic Control System (DCS). All drivers, except the primary load device, must be loaded and linked before they are assigned. This is done for setting up a log device. For example:

1. The AUTO program loads the driver by name. i.e.,

   BCM> *AUTO,CTDVR<cr>*

2. The SHOW,ASSIGN will display current driver assignments.

3. The ASSIGN command is used to configure the driver.

   BCM> *ASSIGN,drn, dvr name, SC, unit #[,HP−IB addr]*

   BCM> *ASSIGN,2,CTDVR,22,1* (defines dvr ref #2 to the CTDVR, SC 22B, left CTU)

LOG

Assigns the Diagnostic Control System (DCS) log device to an existing DVRF assignment. All returned terminal information is echoed to the log device. Note that the log device cannot be placed under test.

BCM> *LOG,dv:fn<cr>*

The following example illustrates how to set up a log device. In this example, the HP 2631B is connected to an HP-IB Interface at select code 25B.

NOTE: The line printer driver, LPDVR, only supports the HP 2631B printer. Newer printers are not supported by LPDVR.

BCM>*SHOW,ASSIGN* (shows the device drivers that are currently assigned)

DVRF 1 = DCDVR 27 0 02
PRAMS xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx

(where: DVRF 1 is the device reference number.
DCDVR is the device reference name.
27 is the select code.
0 is the unit number.
02 is the HP-IB address.)

BCM> *AUTO,LPDVR* (loads the line printer driver, LPDVR)

BCM> *ASSIGN,2,LPDVR,25,0,6*

(assigns the line printer driver to:
device reference number = 2,
select code = 25,
unit number = 0,
HP-IB address = 6 (2631B in primary))

BCM> *SHOW,ASSIGN*
DVRF 1 = DCDVR 27 0 02
PRAMS xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx
DVRF 2 = LPDVR 25 0 06
PRAMS xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx

BCM> *LOG,2* (sets up log device to driver reference number 2; the line printer has HP-IB address 6)

BCM> *FREEZE* (saves all device driver assignments and log assignments in memory)

FREEZE

Freezes the current memory state of the Diagnostic Control System (DCS) to include all new Device Reference Number (DVRF) log assignments, and program additions.

BCM> *FREEZE*

RESET

Used to clear all device drivers and to reset the computer; current memory and program information is displayed.

BCM> *RESET*

COPY

Duplicates files from one media to another. Copies the entire file to the end of the file mark, and writes a file mark to the new device.

BCM> *COPY, dv:fn, dv:fn<cr>*

CLEAR

Clears all unfrozen programs and DVRF assignments from memory. It should usually be executed upon completion of a diagnostic execution.

EXIT

Terminates BCM.

Diagnostic Design Language (DDL)

The HP Diagnostic Design Language consists of statements for writing diagnostic programs and commands for controlling program execution. The language is intended to provide the operator with the ability to communicate with all A/L-Series interface cards and peripherals in a high-level interpretive language while providing the flexibility of maintaining control of the flip-flops, registers, and hardware features.

All HP 24612A diagnostics are written using DDL. Valid DDL commands are listed in Table DDL-1. Table DDL-2, on the following page, lists valid DDL statements and Table DDL-3 shows DDL statements with specific select code parameters that have special defined functions.

CPU interrupts are handled in order of priority as shown below with the highest priority at the top of the list:

Interrupt	Type	Select Code (octal)
Parity Error	1	5
Unimplemented Instruction	1	10
Memory Protect	2	7
Slave Request (VCP)	2	17
Power Fail	2	4
Time Base Generator	3	6
Interface (I/O)	3	20-77

For Additional information on DDL refer to the *Diagnostic Design Language Operating and Programming Manual* (part no. 24612-90015). To load and execute DDL from BCM, refer to the Operator Command Options section. Note that only uppercase letters are used following the DDL> prompt.

Table DDL-1. Valid DDL Operator Commands

Command	Command Meaning
BREAK	Suspend Current Program Execution
BYE	Exit DDL (returns to BCM or AUTO)
COMMENTS	Show Comments in Statement File
DELETE	Delete Statement File
DUMP	Save Statement File in Binary
EDIT	Edit Statement Line
LIST	List Statement File
LOAD	Load Statement File
MAP	Map Function
PROGRAM	Print Program Statements
RENUMBER	Renumber Current Statement File
RUN	Execute Current DDL Program
SAVE	Save Statement File
SIZE	Show Statement File Size
UNDEFINED	Show Undefined Statement List

Table DDL-2. Valid DDL Operator Statements

Statement	Statement Meaning
ASC	ASCII Character String
BUF	Buffer Definition
CFS	Check for Stop
CLC	Clear Control
CLCC	Clear Control and Clear Flag
CLF	Clear Flag
CPBF	Compare Buffers
DVRQ	Device Request
DVIO	Device Input/Output
DLY	Delay
FMT	Format
GOSB/RTN	Go To Subroutine/Return
GOTO	Go To
GTSC	Get I/O Card Select Code
HOOD	Check if Hood is Installed
IPB	Initialize Buffer Pattern
INTP/READ	Input/Read
INT	Interrupt Pointer
IOA,B,C,D	Create I/O Subroutine
IOCA,B,C,D	Clear I/O Subroutine
IORA,B,C,D	Execute I/O Subroutine
LET	Let Assignment
LETC	Let and Check for Overflow
LIA	Load Input Into A-Register
LIAC	Load Input Into A-Register and Clear Flag
MAP	Mapping
OTA	Output A-Register
OTAC	Output A-Register and Clear Flag
PRGM	Program Identification Statement
PRNT/WRIT	Print/Write
REM	Program Remark/Comment
SFC	Skip if Flag is Clear
SFS	Skip if Flag is Set
SKIF	Skip If
STC	Set I/O Control
STCC	Set Control and Clear Flag
STF	Set Flag
STOP	Stop Program Execution
WAIT	Wait
WFI	Wait for Interrupt
YES?	Input a Yes or No Response

Table DDL-3. DDL Special Statement Function Summary

Statement	S. Code	Statement Meaning
CLC	0	Asserts the CPU Control Reset Signal
CLF	0	Disables Type 3 Interrupts
LIA	0	Read Interrupt Mask
OTA	0	Write Interrupt Mask
SFC	0	Skip if Type 3 Interrupts Disabled
SFS	0	Skip if Type 3 Interrupts Enabled
STF	0	Enable Type 3 Interrupts
LIA	1	Read Processor Status Register
OTA	1	Write To Processor LEDs
CLC	2	Enable Boot ROM (L/XL)
CLF	2	Enable Global Register
LIA	2	Read Global Register
OTA	2	Write Global Register/Diagnose Mode
SFC	2	Skip if Global Register Enabled
SFS	2	Skip if Global Register Disabled
STC	2	Disable Boot ROM/Enable Slave Logic
STF	2	Disable Global Register
CLC	3	VCP: Execute 3 instructions and Break
LIA	3	VCP: Read P Save Register
LIAC	3	VCP: Read VCP Starting Address
OTA	3	VCP: Write P Save Register in I/O
OTAC	3	VCP: Write VCP Starting Address
CLC	4	Disable Type 2 and Type 3 Interrupts
LIA	4	Read Central Interrupt Register (CIR)
OTA	4	Write Central Interrupt Register
SFC	4	Skip if Power is Going Down (PFW)
SFS	4	Skip if Power is Going Up
STC	4	Enable Type 2 and Type 3 Interrupts
CLC	5	Disable Parity Interrupt
CLF	5	Clear Parity Sense to Odd (L/XL)
LIA	5	Read Parity Register (lower bits)
LIAC	5	Read Parity Register (upper bits)
SFC	5	Skip if Odd Parity Sense
SFS	5	Skip if Even Parity Sense
STC	5	Enable Parity Interrupt
STF	5	Set Parity Sense to Even (L/XL)
CLC	6	Turn Off Time Base Generator (TBG)
CLF	6	Clear TBG Flag
SFC	6	Skip if TBG Flag is Clear
SFS	6	Skip if TBG Flag is Set
STC	6	Turn On TBG
STF	6	Set the TBG Flag

Table DDL-3. DDL Special Statement Function Summary (cont.)

Statement	S. Code	Statement Meaning
LIAC	7	Read the Violation Register
OTA	7	Write Memory Protect Fence (L/XL)
OTAC	7	Write Violation Register
STC	7	Turn On Memory Protect
CLC	20#	Disable DMA self-configuration
CLF	20#	Clear Flags 20 and 21
LIA	20#	Read DMA configuration address
OTA	20#	Write DMA configuration address
SFC	20#	Skip if Flag 20 is Clear
SFS	20#	Skip if Flag 20 is Set
STC	20#	Enable DMA self-configuration
STF	20#	Set Flag 20
CLC	21#	Disable DMA transfers
CLF	21#	Clear Flag 21
LIA	21#	Read DMA control word
OTA	21#	Write DMA control word
SFC	21#	Skip if Flag 21 is Clear
SFS	21#	Skip if Flag 21 is Set
STC	21#	Enable DMA Transfers
STF	21#	Set Flag 21
CLC	22#	Force DMA reconfiguration
CLF	22#	Clear Flag 22
LIA	22#	Read DMA Address
OTA	22#	Write DMA Address
SFS	22#	Skip if Flag 22 is Set
STF	22#	Set Flag 22
CLC	23#	Terminate DMA operation
CLF	23#	Clear Flags 20-22
LIA	23#	Read DMA Count Register
OTA	23#	Write DMA Count Register
SFC	23#	Skip if All Flags 20-22 are Clear
SFS	23#	Skip if Any Flags 20-22 are Set
LIA	24#	Read Scratch Register 1
OTA	24#	Write Scratch Register 1
SFS	24#	Skip if DMA Enabled
SFC	24#	Skip if DMA Disabled
LIA	25#	Read Scratch Register 2
OTA	25#	Write Scratch Register 2
LIA	26#	Read Scratch Register 3
OTA	26#	Write Scratch Register 3

Requires Global Register Enabled

Table DDL-3. DDL Special Statement Function Summary (cont.)

Statement	S. Code	Statement Meaning
CLC	30#	Clear Control 30
CLF	30#	Clear Flag 30
LIA	30#	Read Data Register
OTA	30#	Write Data Register
SFC	30#	Skip if Flag 30 is Clear
SFS	30#	Skip if Flag 30 is Set
STC	30#	Set Control 30 and issue DVCMD
STF	30#	Set Flag 30
LIA	31#	Read Control Word
OTA	31#	Write Control Word
LIA	32-77#	Read Card Status Register
OTA	32-77#	Card Reset
CLC	s.c.	Clear Control 30 flip-flop
CLF	s.c.	Clear Flag 30 flip-flop
LIA	s.c.	Read Device Data Register
OTA	s.c.	Write Device Data Register
SFC	s.c.	Skip if Flag 30 is Clear
SFS	s.c.	Skip if Flag 30 is Set
STC	s.c.	Set Control 30 and issue DVCMD
STF	s.c.	Set Flag 30 flip-flop

Requires Global Register Enabled

HP 24612A Diagnostic Media Allocation

The following table is available with all HP 24612A media options. This is an example of the AUTO file structure. Both relocatable (%), and memory image (!) or ($) files are provided so that custom diagnostic media can be created. The file type column indicates:

0 = System module loaded on the first execution of AUTO
1 = Utility program loaded only when necessary
2 = Driver routine
3 = Kernel diagnostic
4 = Interface diagnostic

Diagnostic programs are accessed by file name only through the AUTO program of the Basic Control Module (BCM) in the Diagnostic Control System (DCS). The AUTO program accesses diagnostics by BCM file number. If a custom diagnostic media is to be generated using a new user-written Diagnostic Design Language (DDL) diagnostic, the BCM file system numbering becomes important. You can create an AUTO file that can act as a media directory to associate diagnostics with actual file location. But this special operating system that uses the AUTO program to access files (much like FMGR or CI in RTE) uses file sizes of 32 blocks each. Thus, if you are using RTE to create new diagnostic media and create new files on the media, you must ensure that all files are in 32 block increments so that the AUTO file can access the programs when BCM is in control. Because of this need to coordinate RTE and BCM files, additional information is included in this listing of the AUTO file.

The CARTRIDGE TAPE.FILE column indicates which CTU tape (HP 264X or HP-85) contains which files. The ".file" number indicates the file number on a particular tape, but BCM actually uses the file number that is in parentheses.

The next column indicates how big each file is in terms of RTE blocks (1 RTE block = 256 bytes), and how big each file must be made when the diagnostic media is being created when using an RTE Operating System. Diagnostic files must be on the media in even multiples of the 32 block per file requirement of BCM. The BCM file number is indicated in parentheses.

The PROM column is useful only for users who develop their own diagnostic PROMs.

The DS column lists the P-file number as well as the BCM number. This sequential file numbering list also applies to magnetic tape.

The #AUTO file can be listed to indicate revision level, file number, size, and media allocation for CTUs. After the BCM prompt, enter SHOW,AUTO to list the #AUTO file.

BCM AUTO File Allocation, rev. 5000, 5010, and 5020

	Name	Type	Cartridge tape.file		Disk RTE blk	.BCM blk		PROM BD.RMS		DS P-file	
	BCMDR	#	0.2	(2)	64	1.64	(0-1)	1.4	(0-3)	0	(0)
	#AUTO	#	0.3	(3)	25	1.32	(2)	1.2	(4-5)	1	(1)
	%MAPS	0	0.4	(4)	4	1.32	(3)	1.1	(6)	2	(2)
	%MSGS	0	0.5	(5)	16	1.32	(4)	1.1	(7)	3	(3)
	%DDL	0	0.6	(6)	96	1.96	(5-7)	1.6	(8-13)	4	(4)
	%DEBUG	1	0.7	(7)	29	1.32	(8)			5	(5)
DCS	%LPDVR	2	0.8	(8)	4	1.32	(9)			6	(6)
	%CTDVR	2	0.9	(9)	10	1.32	(10)	1.1	(14)	7	(7)
	%DCDVR	2	0.10	(10)	17	1.32	(11)	1.1	(15)	10	(8)
	%DSDVR	2	0.11	(11)	6	1.32	(12)			11	(9)
	%RMDVR	2	0.12	(12)	3	1.32	(13)			12	(10)
	%MTDVR	2	0.13	(13)	13	1.32	(14)			13	(11)
	%DIDVR	2	0.14	(14)	11	1.32	(15)			14	(12)
	%CPU	3	1.2	(18)	47	1.64	(16-17)			15	(13)
	!CPU	3	1.3	(19)	16	1.32	(18)			16	(14)
	%MAD	3	1.4	(20)	17	1.32	(19)			17	(15)
	%MADMG	3	1.5	(21)	16	1.32	(20)			20	(16)
	!MAD	3	1.6	(22)	50	1.64	(21-22)			21	(17)
Kernel	!MCDXL	3	1.7	(23)	45	1.64	(23-24)			22	(18)
	%MCD	3	1.8	(24)	34	1.64	(25-26)			23	(19)
	!MCD	3	1.9	(25)	28	1.32	(27)			24	(20)
	%SFD	3	1.10	(26)	26	1.32	(28)			25	(21)
	!SFD	3	1.11	(27)	32	1.32	(29)			26	(22)
	%IOM	3	1.12	(28)	30	1.32	(30)			27	(23)
	!IOM	3	1.13	(29)	25	1.32	(31)			30	(24)
	%EIG	3	2.2	(34)	56	2.64	(32-33)			31	(25)
	!EIG	3	2.3	(35)	31	2.32	(34)			32	(26)
	%FPD	3	2.4	(36)	58	2.64	(35-36)			33	(27)
Kernel	!FPD	3	2.5	(37)	28	2.32	(37)			34	(28)
	%LIS	3	2.6	(38)	49	2.64	(38-39)			35	(29)
	!LIS	3	2.7	(39)	32	2.32	(40)			36	(30)
	%SIS	3	2.8	(40)	29	2.32	(41)			37	(31)
	!SIS	3	2.9	(41)	24	2.32	(42)			40	(32)
	%CDSBI	3	3.1	(50)	51	2.64	(43-44)			41	(33)
Kernel	!CDSBI	3	3.2	(51)	26	2.32	(45)			42	(34)
	%CDSPC	3	3.3	(52)	27	2.32	(46)			43	(35)
	!CDSPC	3	3.4	(53)	26	2.32	(47)			44	(36)
	!ASIC	4	4.2	(66)	36	2.64	(48-49)			45	(37)
	!HPIB	4	4.3	(67)	47	2.64	(50-51)			46	(38)
	!PIC	4	4.4	(68)	27	2.32	(52)			47	(39)
Intf.	!PROM	4	4.5	(69)	16	2.32	(53)			50	(40)
	!WCS	4	4.6	(70)	14	2.32	(54)			51	(41)
	!CSIC	4	4.7	(71)	24	2.32	(55)			52	(42)
	!PSI	4	4.7	(72)	75	2.96	(56-58)			53	(43)
	!MUX	4	4.8	(73)	22	2.32	(59)			54	(44)
	!FDL	4	4.9	(74)	40	2.64	(60-61)			55	(45)
	!DID	4	4.2	(75)	59	2.64	(62-63)			56	(46)
	!AOUTD	4	5.2	(82)	32	3.64	(64-65)			57	(47)
Intf.	!AIMXD	4	5.3	(83)	56	3.64	(66-67)			60	(48)
	!DIGIO	4	5.4	(84)	38	3.64	(68-69)			61	(49)
	%OBIO	4	5.5	(85)	14	3.32	(70)			62	(50)
	!OBIO	4	5.6	(86)	75	3.96	(71-73)			63	(51)
	!BCM	#	5.7		54	3.64	(74-75)				
	!CTDVR	#	5.8		5	3.32	(76)				
	!DCDVR	#	5.9		9	3.32	(77)				
Syst.	!DSDVR	#	5.10		3	3.32	(78)				
	!RMDVR	#	5.11		2	3.32	(79)				
	!MTDVR	#	5.12		6	3.32	(80)				
	!DIDVR	#	5.13		6	3.32	(81)				
	%PFCON	#	5.14		11	3.32	(82)				
	A24612	#	5.15		27	3.32	(83)				

not in AUTO file

BCM AUTO File Allocation, rev. 5270

At RTE-A revision 5270, the columns for the mini-cartridge tape file numbers and the PROM file numbers were removed from the #AUTO file. Also, file number allocations were added for DAT and Magnetic Tape.

	Name	Type	Disk Block (BCM File)	DS P-file (BCM file)	DAT/Mag Tape File
DCS	Driver	*	64 (0−1)	0 (0)	(0)
	#AUTO	*	32 (2)	1 (1)	(1)
	%MAPS	0	32 (3)	2 (2)	(2)
	%MSGS	0	32 (4)	3 (3)	(3)
	%DDL	0	96 (5−7)	4 (4)	(4)
	%DEBUG	1	32 (8)	5 (5)	(5)
	%LPDVR	2	32 (9)	6 (6)	(6)
	%DCDVR	2	32 (10)	7 (7)	(7)
	%DSDVR	2	32 (11)	10 (8)	(8)
	%MTDVR	2	32 (12)	11 (9)	(9)
	%SCDVR	2	32 (13)	12 (10)	(10)
	%STDVR	2	32 (14)	13 (11)	(11)
Kernel	%CPU	3	64 (15−16)	14 (12)	(12)
	!CPU	3	32 (17)	15 (13)	(13)
	%MAD	3	32 (18)	16 (14)	(14)
	%MADMG	3	32 (19)	17 (15)	(15)
	!MAD	3	64 (20−21)	20 (16)	(16)
	!MCDXL	3	64 (22−23)	21 (17)	(17)
	%MCD	3	64 (24−25)	22 (18)	(18)
	!MCD	3	32 (26)	23 (19)	(19)
	%SFD	3	32 (27)	24 (20)	(20)
	!SFD	3	32 (28)	25 (21)	(21)
	%EIG	3	64 (29−30)	26 (22)	(22)
	!EIG	3	32 (31)	27 (23)	(23)
	%IOM	3	32 (32)	30 (24)	(24)
	!IOM	3	32 (33)	31 (25)	(25)
	%FPD	3	64 (34−35)	32 (26)	(26)
	!FPD	3	32 (36)	33 (27)	(27)
	%LIS	3	64 (37−38)	34 (28)	(28)
	!LIS	3	32 (39)	35 (29)	(29)
	%SIS	3	32 (40)	36 (30)	(30)
	!SIS	3	32 (41)	37 (31)	(31)
	%CDSBI	3	64 (42−43)	40 (32)	(32)
	!CDSBI	3	32 (44)	41 (33)	(33)
	%CDSPC	3	32 (45)	42 (34)	(34)
	!CDSPC	3	32 (46)	43 (35)	(35)
	%A990D	3	32 (47)	44 (36)	(36)
	!A990D	3	32 (48)	45 (37)	(37)

Notes: 1. All numbers in parenthesis are BCM files. 2. * = not in AUTO file

BCM AUTO File Allocation, rev. 5270 (cont.)

	Name	Type	Disk Block (BCM File)	DS P-file (BCM file)	DAT/Mag Tape File
Interface	!SCSI	4	96 (49)	46 (38)	(38)
	!ASIC	4	64 (52–53)	47 (39)	(39)
	!HPIB	4	64 (54–55)	50 (40)	(40)
	!PIC	4	32 (56)	51 (41)	(41)
	!PROM	4	32 (57)	52 (42)	(42)
	!WCS	4	32 (58)	53 (43)	(43)
	!MUX	4	32 (59)	54 (44)	(44)
	!PSI	4	96 (60–62)	55 (45)	(45)
	!CSIC	4	32 (63)	56 (46)	(46)
	!FDL	4	64 (64–65)	57 (47)	(47)
	!DID	4	64 (66–67)	60 (48)	(48)
	!AOUTD	4	64 (68–69)	61 (49)	(49)
	!AIMXD	4	64 (70–71)	62 (50)	(50)
	!DIGIO	4	64 (72–73)	63 (51)	(51)
	%OBIO	4	32 (74)	64 (52)	(52)
	!OBIO	4	96 (75–77)	65 (53)	(53)
System	!BCM	*	64		
	!DCDVR	*	32		
	!DSDVR	*	32		
	!MTDVR	*	32		
	!SCDVR	*	32		
	!STDVR	*	32		
	%PFCON	*	32		

Notes: 1. All numbers in parenthesis are BCM files. 2. * = not in AUTO file

HP 24612A Diagnostic Media Options

Option 044, 3.5-Inch Floppies

Part Number	Label	Revision
24612 -13409 -13410 -13411 -13412	A-SERIES DIAGNOSTICS#0 #1 #2 A/1000 MICRO-FLOPPY#0	2440 thru 5020
24612 -13409 -13410 -13411	A-SERIES DIAGNOSTICS#0 #1 #2	5270

Note that the 24612-13409 is the first diskette inserted into an HP 9121D/S or 9133X microflexible disk drive. The 24612-13412 is the first diskette used if the drive is in a Micro/1000 product using the HP 12022A interface/controller. The 24612-13410 and 24612-13411 are used in either drive.

Option 022, CS/80 Cartridge Tape

24612 -13311	A-SERIES DIAGNOSTICS	2440 thru 5270

Option 051, 1600 bpi Magnetic Tape

24612 -13501	A-SERIES DIAGNOSTICS	2440 thru 5270

Option AAH, SCSI DAT Tape

24612-13326	A-SERIES DIAGNOSTICS	5270

CS/80 Super Tape, RTE-A + HP 24612A + HP 24398B

To boot diagnostics, first boot file 1 (CINFO file) to list the name and file number of the bootable files on the tape. Then, boot from the tape again using the file number given in CINFO for the file that you want to boot. To boot file 1 use one of the following bootstrings:

VCP> %BDC127 for CS/80 tape

VCP> %BDC1027 for HP 9144 tape

24998 -13328	24612A/24398B Diagnostics, IARSTR, IVSCSI, FORMF	5000 thru 5270

1600 bpi Super Tape, RTE-A + HP 24612A + HP 24398B

To boot diagnostics, first boot file 1 (TINFO file) to list the name and file number of the bootable files on the tape. Then, boot from the tape again using the file number given in TINFO for the file that you want to boot. To boot file 1 use one of the following bootstrings:

VCP> %BMT14027 for HP 7970 Mag tape drive

VCP> %BMT13027 for HP 7974/7978 Mag tape drive

24998 -13540	24612A/24398B Diagnostics, IARSTR, IVSCSI, FORMF	5000 thru 5270

SCSI DAT Tape, RTE-A + HP 24612A + HP 24398B

To boot diagnostics, first boot file 1 (TINFO file) to list the name and file number of the bootable files on the tape. Then, boot from the tape again using the file number given in TINFO for the file that you want to boot. To boot file 1 use the following bootstring:

VCP> %BMT15027

24998 -13614	24612A/24398B Diagnostics, IARSTR, IVSCSI, FORMF	5270

HP 24612A KERNEL Diagnostics

KERNEL Diagnostic Summary[1]

Basic Instruction Diagnostic (CPU)
Memory Array Diagnostic (MAD/MADMG)
Memory Controller Diagnostic XL (MCDXL)
Memory Controller Diagnostic (MCD)
System Function Diagnostic (SFD)
I/O Master Diagnostic (IOM)
Expanded Instruction Diagnostic (EIG)
Floating Point Diagnostic (FPD)
Language Instruction Set (LIS)
Scientific Instruction Set (SIS)
Code and Data Separation Basic Instruction Diagnostic (CDSBI)
Code and Data Separation Procedural Call Diagnostic (CDSPC)
A990 Instructions Diagnostic (A990D)

Note:

For all KERNEL diagnostics, two additional run options are available:

RU,T allows independent selection of diagnostic subsections.

RU,E will give error reporting details. If no errors were found while running the diagnostic, typing "RU,E" will, in some cases, produce an error itself.

RU,L allows looping nn number of times.

Basic Instruction Diagnostic (CPU)

Number	Description	
1	(ASG.T)	ALTER SKIP GRO.
2	(MRG.O)	MEM. REF. & OV
3	(IN*.T)	INA/INB TEST
4	(MRG.T)	MEM. REF. GRO.
5	(MRG.I)	MRG IND. TST
6	(SRG.T)	SHIFT ROTATE
7	(EAU.T)	EXTENDED ARITH.
8	(JL*.T)	JLA/JLB TEST
9	(ASG.E)	EXTENDED ASG
−1	(EXIT)	EXIT RUN T MODE

[1] In addition to the HP 24612A Kernel Diagnostics, the Vector Instruction Set (VIS) Diagnostic is available to test the A700 and A900 VIS instruction sets. It

is an online diagnostic available with RTE-A. Refer to the Vector Instruction Set (VIS) Diagnostic section at the end of this chapter.

Card Replacement Order

If any instruction failed during the CPU diagnostic tests, replace the computer cards in the following sequence, repeating the diagnostic between the replacement of each card, until the fault is eliminated. If you are testing an A400 or A990 board, the board must be swapped if an error occurs.

A600/A600+	A700*	A900
1. Processor	1. Lower Processor	1. Data Path
2. Memory Controller	2. Upper Processor	2. Sequencer
3. Memory Array	3. Memory Controller	3. Cache Control
4. Frontplane	4. Memory Array	4. Memory Controller
	5. Floating Point	5. Memory Array
	6. Frontplane	

Memory Array Diagnostic (MAD) A400/A600/A700*; (MADMG) A900/A990

Number		Description
1	(MADDT)	Memory Address Test
2	(MPATT)	Memory Pattern Test
3	(MWCPT)	Worst Case Pattern
4	(MADPT)	Address Parity Test
5	(MSBPT)	Soccer Ball Pattern
6	(MPEIT)	Parity Error Interrupt

Tests 7-9 require ECA memory

7	(ECCBP)	ECA CB Pattern Test
8	(ECADP)	CB Address Parity
9	(ECSBP)	CB Soccer Ball Test
−1	(EXIT)	To Exit

Card Replacement Order

An error message following a MAD execution failure defines the memory area that failed. Using this information, proper memory card replacement is completed by determining which card carries the physical page of memory that failed.

In addition, the parity LED located on the failed memory array PCA (including A600/A600+ controller and the A400 board) will also be in the off state.

* Discontinued product; shown for reference only.

Execution Times

The following table indicates the approximate memory array diagnostic execution times for the configuration indicated.

A400/600+/700	A900	A990
512 Kb ≈ 3 min.	1.5 Mb ≈ 4 min.	1.5 Mb ≈ 2.25 min.
2 Mb ≈ 16 min.	8 Mb ≈ 28 min.	8 Mb ≈ 15.5 min.
8 Mb ≈ 71 min.	32 Mb ≈ 120 min.	32 Mb ≈ 66.66 min.
32 Mb ≈ 270 min.		

Memory Controller Diagnostic (MCDXL*)

L/XL Memory Controller

Number	Description
1	Cross Load/Cross Store Functional
2	Cross Load/Cross Store RAM
3	Map Enable
4	DMA/Map Enable

Card Replacement Order

The card replacement order for an error during execution on the XL memory controller diagnostic is as follows:

XL Processor

1. Memory Controller
2. I/O card w/ matching SC
3. Memory Array
4. Processor

* Discontinued product; shown for reference only.

Memory Controller Diagnostic (MCD)

A400/A600/A600+/A700*/A900/A990 Memory Controller

Number		Description
1	(INSTR)	Data 1 Instruction Check
2	(MVWB1)	XMOVE (0&1) w/int
3	(MRSTR)	Map RAM Storage Check
4	(MPACC)	Mapped Access Check
5	(MWPCT)	Memory Write Protect
6	(INSTP)	Data 2 Instruction Check
7	(MVWB2)	XMOVE (0,1,&2) w/int
8	(MRPCT)	MPT Read Check
9	(SBECT)	Single Bit Error (ECA)†
10	(DBECT)	Double Bit Error (ECA)†
−1	(EXIT)	To Exit

Card Replacement Order

The following provides the card replacement order for an error during execution of Tests 1 through 8 of the MCD on the A600+/A700*/A900. If you are testing an A400 or A990 board, the board must be swapped if an error occurs.

A600/A600+	A700*	A900
1. Memory Controller	1. Memory Controller	1. Cache Control
2. Memory Array	2. Memory Array	2. Memory Controller
3. Processor	3. Upper Processor	3. Sequencer
		4. Data Path
		5. Memory Array

The following provides the card replacement order for an error during execution of Test 9 and 10 of the MCD with the A700* only:

A700* Processor

1. Error Correcting Array
2. Memory Controller
3. Upper Processor

* Discontinued product; shown for reference only.

† A700 only

System Function Diagnostic (SFD)

These tests run on all A-Series computers except that Test 7 (BDPTY) is not run on the A900 or A990 processor.

Number		Description
1	(PIOFT)	Processor I/O Function
2	(TBTST)	Check all TBG Functions
3	(MPTST)	Memory Protect Test
4	(UITST)	Unimplemented Instruction
5	(MLIIT)	Multi-Level Indirect
6	(OSULT)	Operating System Utilities
7	(BDPTY)	Instruction with Bad Parity
8	(PWRFL)	Power Fail Interrupt
–1	(EXIT)	To Exit

Card Replacement Order

Card replacement order for errors in Tests 1 through 7 are as follows (if you are testing an A400 or A990 board, the board must be swapped if an error occurs):

A600/A600+	A700*	A900
1. Processor	1. Lower Processor	1. Memory Controller
2. Memory Controller	2. Upper Processor	2. Cache Control
	3. Memory Controller	3. Sequencer

Card replacement order for Test 8 is as follows (if you are testing an A400 or A990 board, the board must be swapped if an error occurs):

A600/A600+	A700*	A900
1. Battery Backup	1. Battery Backup	1. Batt/Pwr Supply
2. Memory Controller	2. Memory Controller	2. Sequencer
3. Processor	3. Lower Processor	3. Data Path
	4. Upper Processor	4. Cache Control
		5. Memory Controller
		6. Memory Arrays

The Power Fail test requires cycling power twice since the first power cycle will fail.

* Discontinued product; shown for reference only.

I/O Master Diagnostic (IOM)

Number		Description
1	(PCTST)	Priority Chain Test
2	(GRTST)	Global Register Test
3	(REGFL)	Register and Flag Test
4	(INTST)	Interrupt System Test
5	(DFTST)	I/O Flag 20, 21, 22, & 23
6	(DCITS)	DMA Control and Interrupt
7	(D4WCT)	4-Word Self Configuration
8	(DXFRT)	DMA XFER with Self Config
9	(DMPTS)	DMA Into MPT Area
10	(DTHMT)	DMA XFER Into HI Memory
11	(DPRTY)	DMA Parity Test
12	(IIMPT)	Bad I/O Instruction w/MPT On
13	(ALLIN)	All I/O Chips Interrupt
14	(MULTI)	Multi DMA Transfer
−1	(EXIT)	To Exit

Card Replacement Order

When error messages are received, the card replacement order should be as follows (if an error occurs at select code 77 when testing the A400 I/O, the A400 board must be replaced):

A600/A600+

1. I/O Card (SC)†
2. Processor
3. Memory Controller

A700*

1. I/O Card (SC)†
2. Upper Processor
3. Lower Processor
4. Memory Controller

A900

1. I/O Card (SC)†
2. Cache Control
3. Memory Controller
4. Sequencer
5. Data Path

A990

1. I/O Card (SC)†
2. Processor

* Discontinued product; shown for reference only

† SC is the select code of the card under test indicated by the error message.

Expanded Instruction Diagnostic (EIG)

Number		Description
1	(LBT)	Load Byte
2	(SBT)	Store Byte
3	(CBT)	Compare Bytes
4	(SFB)	Scan for Byte
5	(MBT)	Move Bytes
6	(CMW)	Compare Words
7	(MVW)	Move Words
8	(TBS)	Test Bits
9	(SBS)	Set Bits
10	(CBS)	Clear Bits
11	(C†‡)	Copy † to ‡
12	(C‡†)	Copy‡ to †
13	(X†‡)	Exchange † and ‡
14	(IS‡)	Increment Skip‡
15	(AD‡)	Add to ‡
16	(L†‡)	LD † indexed by ‡
17	(S†‡)	ST † indexed by ‡
18	(JPY)	JMP LD/Indexed Y
19	(LDX)	Load/Store X
20	(LDI)	LA ‡/LD ‡ Indirect
−1	(EXI)	Exit Run T Mode

where: † = A or B register
‡ = X or Y register

Card Replacement Order

For a failure in tests 1 through 5 on the A600+/A700*, or for the error message “TBG INTERP. DIDN’T OCCUR” on the A600+/A700*/A900, the card replacement order is as follows (if you are testing an A400 or A990 board, the board must be swapped):

A600/A600+	A700*	A900
1. Processor	1. Upper Processor	1. Memory Controller
2. Memory Controller	2. Lower Processor	2. Sequencer
3. Memory Array	3. Memory Controller	3. Data Path
	4. Memory Array	4. Cache Control
	5. Floating Point	5. Memory Array

For a failure in tests 6 through 20 on the A600+/A700*, or for any test failed on the A900, the card replacement order is as follows. (If you are testing an A400 or A990 board, the board must be swapped.)

* Discontinued product; shown for reference only.

A600/A600+	A700*	A900
1. Processor	1. Lower Processor	1. Data Path
2. Memory Controller	2. Upper Processor	2. Sequencer
3. Memory Array	3. Memory Controller	3. Cache Control
	4. Memory Array	4. Memory Controller
	5. Floating Point	5. Memory Array

Floating Point Diagnostic (FPD)

Number	Description
1	(.FIXS) S. FLT->S. INT
2	(.FLTS) S. INT->S. FLT
3	(.FADD) S. FP ADD
4	(.FSUB) S. FP SUB
5	(.FMPY) S. FP MPY
6	(.FDIV) S. FP DIV
7	(.FIXD) S. FLT->D. INT
8	(.FLTD) D. INT->S. FLT
9	(.TADD) D. FP ADD
10	(.TSUB) D. FP SUB
11	(.TMPY) D. FP MPY
12	(.TDIV) D. FP DIV
13	(.TFXS) D. FLT->S. INT
14	(.TFTS) S. INT->D. FLT
15	(.TFXD) D. FLT->D. INT
16	(.TFTD) D. INT->D. FLT
−1	(.EXIT) Exit Run T Mode

Card Replacement Order

Card replacement order for an FPD error on the A600+/A900, or A700* without HFP installed is as follows (if an error occurs on an A400 or A990 board, the board must be swapped:

A600/A600+	A700*	A900
1. Processor	1. Lower Processor	1. Data Path
2. Memory Controller	2. Upper Processor	2. Sequencer
3. Memory Array	3. Memory Controller	3. Cache Control
4. Frontplane	4. Memory Array	4. Memory Controller
	5. Frontplane	5. Memory Array

* Discontinued product; shown for reference only.

Card replacement order for an FPD error on the A700* with HFP installed is as follows:

A700*

1. Floating Point
2. Frontplane
3. Lower Processor
4. Upper Processor
5. Memory Controller
6. Memory Array

Language Instruction Diagnostic (LIS)

Number		Description
1	(.DAD)	Double Int. Add
2	(.DSB)	Double Int. Subtract
3	(DSBR)	D.I. Subtract Reverse
4	(.DIN)	D.I. Increment
5	(.DDE)	D.I. Decrement
6	(.DIS)	D.I. Increment Skip
7	(.DDS)	D.I. Decrement Skip
8	(.DNG)	D.I. Negative
9	(.DCO)	D.I. Compare
10	(.CPM)	D.I. Compare
11	(.FCM)	..FCM S.F.P.
12	(DFER)	.DFER
13	(CFER)	.CFER
14	(ZFER)	.ZFER
15	(XFER)	.XFER
16	(ENTP)	.ENTP-PASS PARMS
17	(ENTR)	.ENTR-PASS PARMS
18	(ENTN)	.ENTN-PASS PARMS
19	(ENTC)	.ENTC-PASS PARMS
20	(SETP)	.SETP-SET A TBL
21	(.DMP)	Double Int. Multiply
22	(.DDI)	Double Int. Divide
23	(DDIR)	D.I. Divide Reverse
24	(PACK)	Pack Floating Point Instruction
25	(.BLE)	S.->D. Floating
26	(.NGL)	D.->S. Floating
27	(.TCM)	..TCM - D.F.P.
28	(PWR2)	.PWR2 - Y=X*2 ^ N
29	(FLUN)	Unpack Floating Point Inst.
−1	(EXIT)	Exit Run T Mode

* Discontinued product; shown for reference only.

Card Replacement Order

The following provides a card replacement order when an instruction in tests 1 through 23 have failed on the A700* without HFP, for a failure of Tests 1 through 20 for A700* with HFP, or for any failure on the A600+/A900 (if an error occurs on the A400 or A990 board, then the board must be replaced):

A600/A600+	A700*	A900
1. Processor	1. Lower Processor	1. Data Path
2. Memory Controller	2. Upper Processor	2. Sequencer
3. Memory Array	3. Memory Controller	3. Cache Control
4. Frontplane	4. Memory Array	4. Memory Controller
	5. Frontplane	5. Memory Array

If tests 21 through 29 fail on the A700* with HFP installed, the card replacement order is as follows:

A700*
1. Floating Point Card
2. Frontplane
3. Lower Processor
4. Upper Processor
5. Memory Controller
6. Memory Array

If the LIS diagnostic returns the message “TBG INTERP. DIDN’T OCCUR”, use the following card replacement order:

A600/A600+	A700*	A900
1. Processor	1. Upper Processor	1. Memory Controller
2. Memory Controller	2. Lower Processor	2. Sequencer
3. Memory Array	3. Memory Controller	3. Data Path
	4. Memory Array	4. Cache Control
	5. Floating Point	5. Memory Array

* Discontinued product; shown for reference only.

Scientific Instruction Set (SIS)

NOTE: This diagnostic is supported only on the A700* with floating point card, the A900, and A990.

Number		Description
1	(COS)	Cosine
2	(SIN)	Sine
3	(TAN)	Tangent
4	(ALOG)	Natural Log
5	(ATAN)	Arctangent
6	(ALOGT)	Common Log
7	(SQRT)	Square Root
8	(EXP)	E to the Power of X
9	(TANH)	Hyperbolic Tangent
10	(DPOLY)	Polynomial Eva.
11	(/CMRT)	Range Reduction
12	(/ATLG)	(1−X)/(1+X)
13	(.FPWR)	32-Bit Expont.
14	(.TPWR)	64-Bit Expont.
−1	(EXIT)	Exit Run T Mode

Card Replacement Order

Card replacement order for errors detected by the SIS diagnostic is as follows: (If an error occurs on the A990 board, the board must be replaced):

A700*	A900
1. Floating Point	1. Data Path
2. Frontplane	2. Sequencer
3. Lower Processor	3. Cache Control
4. Upper Processor	4. Memory Controller
5. Memory Controller	5. Memory Array
6. Memory Array	

* Discontinued product; shown for reference only.

CDS Basic Instruction Diagnostic (CDSBI)

Number	Description
1	(MRG1) CP† /LD† /ST†
2	(CACQ) CACQ & CCQB
3	(CBCQ) CBCQ & CCQA
4	(MRGD) MRG Direct
5	(MRGI|) MRG Indirect
6	(.CAZ) .CAZ & .CZB
7	(.CBZ) .CBZ & .CZA
8	(CIQA) Copy IQ to A
9	(CIQB) Copy IQ to B
10	(SDSP) Store Display
11	(XJCQ) X Jump Load Q
12	(ADQA) Add CQ to A
13	(ADQB) Add CQ to B
−1	(EXIT) Exit Run T Mode

where † = A or B register

If any test has failed, the card replacement order is as follows (if you are testing the A400 or A990 board, replace it):

A600/A600+	A700*	A900
1. Processor	1. Upper Processor	1. Cache Card
2. Memory Controller	2. Lower Processor	2. Memory Controller
	3. Memory Controller	3. Sequencer
		4. Data Path

Note: Running this diagnostic revision levels before rev 5020 with new A900 base set chips (part no. 12201-80103 through 80120) causes CDS test to fail with the following error message displayed:

```
CDS NOT SUPPORTED − F/W PK = 4 RV = 19
```

Use revision 5020 (or later) diagnostic or ignore this error for revisions prior to 5020.

* Discontinued product; shown for reference only.

CDS Procedural Call Diagnostic (CDSPC)

Number		Description
1	(.EXIT)	Exit no Skip
2	(EXIT1)	Exit and Skip1
3	(EXIT2)	Exit and Skip2
4	(PCALI)	Internal PCALL
5	(PCALR)	.ENTR Compatible
6	(PCALN)	.ENTN Compatible
7	(PCALX)	External PCALL
8	(PCALV)	Variable PCALL
−1	(EXIT)	Exit Run T Mode

If any test has failed, the card replacement order is as follows (if you are testing the A400 or A990 board, replace it):

A600/A600+	A700*	A900
1. Processor	1. Upper Processor	1. Cache Card
2. Memory Controller	2. Lower Processor	2. Memory Controller
	3. Memory Controller	3. Sequencer
		4. Data Path

* Discontinued product; shown for reference only.

A990 Instructions Diagnostic (A990D)

A990D provides six separate tests for verifying the operation of microcoded instructions that are available only on the A990 processor. A990D does not run on any other processor.

Number		Description
1	(TLXMP)	Load and Store Extended Map Registers
2	(TLXMR)	Load and Store Mapping Registers
3	(TWCS)	Write and Read Control Store
4	(TWTM)	Write and Read Timer Registers
5	(TFWID)	Firmware ID for A990
6	(TWTC)	Write and Read Time-of-Day Clock

Card Replacement Order:

The replacement order for an error during execution of Test 6 is:

1. Time-of-day clock chip
2. A990 processor board

For any other A990 instruction failure, replace the A990 board.

HP 24612A Interface Diagnostics

General Information

The following section provides a description and special operating instructions for each of the following interface card diagnostic programs:

- HP 12005A*/B Asynchronous Serial Interface (ASIC)
- HP 12006A Parallel Interface (PIC)
- HP 12007A/B Programmable Serial Interface (PSI)
- HP 12008A PROM Storage Module (PROM)
- HP 12009A HP-IB Interface (HPIB)
- HP 12016A Small Computer System Interface (SCSI)
- HP 12022A* Disk Interface/Controller (DID)
- HP 12040A* – /B*/C/D 8-Channel Asynchronous Multiplexer (MUX)
- HP 12044A Programmable Serial Interface (PSI)
- HP 12060A*/B – /12061A High Level Analog Input / 31-Ch. MUX (AIMXD)
- HP 12062A 4-Channel Analog Output Card (AOUTD)
- HP 12063A Isolated Digital I/O Card (DIGIO)
- HP 12072A Data Link (FDL)
- HP 12100A A400 On-Board I/O (OBIO)
- HP 12153A Writable Control Store (WCS)
- HP 12205A Control Store Card (CSIC)

The interface diagnostics operate under control of the Diagnostic Design Language (DDL) Interpreter module which is a part of the Diagnostic Control System (DCS).

Error codes and additional operating information specific to a particular interface card diagnostic are provided in the *HP 1000 A-Series Computer Interface Diagnostic Reference Manual* (part no. 24612-90011).

The diagnostic operating procedures assume a VCP terminal is connected and enabled. To execute diagnostics without a terminal, refer to the *Diagnostic Operating and Troubleshooting Manual* (part no. 24612-90013). Refer to Chapter 10, Reference, for specific diagnostic manual part numbers.

* Discontinued product; shown for reference only.

Diagnostic Test Hoods

Test Hood for 12005 ASIC	24397-60005
Fiber Optic Test Cable for 12005B	5061-7933
Test Hood for 12006 PIC	24397-60004
Test Hood for 12007 PSI (all modem)	5061-4916
Test Hood for 12016 SCSI	12016-60007
Test Hood for 12040 MUX expansion	5061-4901
Loaded Test Hood 12040 MUX	ET30170-6001**
Test Hood for 12044 PSI (all D.C.)	5061-3460
Test Hood for 12060* Hi level analog	12060-60003
Test Hood for 12061 MUX	12061-60002
Test Hood for 12062 D-to-A converter	12062-60002
Test Hood for 12063 16 IN / 16 OUT	12063-60002
Test Hood for 12072 Factory data link	5061-4909
Test Hood for 12100 (A400) Cable	12100-60004

General Diagnostic Operation

Load and execute the Diagnostic Control System (DCS). Upon loading the desired interface diagnostic, the DDL prompt will be displayed.

Type "RUN<cr>" following DDL> to start the diagnostic program.

NOTE

Typing "RUN !<cr>" will cause the diagnostic to execute on the highest priority interface card in a noninteractive mode. If failures are detected, the diagnostic terminates and prints the error message. If the diagnostic completes normally, it will automatically execute the next highest priority interface. When all diagnostic interface types have been tested the diagnostic terminates and returns with the DDL prompt.

* Discontinued product; shown for reference only.

** Test hood ET30170-6001, part of the field diagnostic kit 12040-67805, can be used in place of the non-loaded test hood (5061-4901). It provides resistive and capacitive loading to simulate an external device on each of its eight I/O ports. ROM part number 5181-6125 is part of the diagnostic kit and is required for the MUX card when this test hood is used.

HP 12005A*/B Async Serial Interface (ASIC)

After typing “RUN<cr>”, the following messages will be displayed:

12005A/B ASYNCHRONOUS SERIAL INTERFACE DIAGNOSTIC	
12005A INPUT SELECT CODE:	If a 12005A interface card is to be tested, enter the octal select code (ie: 22<cr> or −1 to skip the request for 12005A and continue to the 12005B).
12005B INPUT SELECT CODE:	Enter the octal select code (ie: 22<cr>).
HOOD INSTALLED?	Enter a “YES” or “NO”. On the interface card with the test hood(s) installed (part no. 24397-60005), set the U21 switches to the following: 12005A Switch U21 #1 2 3 4 5 6 7 8 Setting 1 1 1 1 1 1 1 0 12005B Switch U21 #1 2 3 4 5 6 7 8 Setting 1 1 1 1 1 1 0 1 1 = open = up; 0 = closed = down Attach the 12005A/B Test Hood prior to executing the diagnostic.For the 12005B also connect the fiber optic loopback cable.
HOOD INSTALLED	Indicates if the test hood is installed.
BAUD RATE TEST BAUD RATE UNDER TEST = XXXX	The baud rate under test will be displayed for each baud rate tested.
EXTERNAL CLOCK SOURCE TEST	
BAUD RATE TEST COMPLETE	Indicates termination of the baud rate test.
OPTICAL LINK PASSED	Indicates the 12005B was tested with the fiber optic loopback connector.
HOOD TESTS NOT EXECUTED	Indicates the test hoods are not installed.
12005A PASS COMPLETE	Marks successful completion of the 12005A/B Interface Diagnostic.
INPUT SELECT CODE:	To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode. To discontinue program execution, enter a zero (0). Return the 12005A/B U21 switches to the original switch configuration.

* Discontinued product; shown for reference only.

Terminal to Interface Communication Test

DDL> RU A<cr>	Schedules the terminal to interface test.

1500 PRGM A TERMINAL-12005A/B INTERFACE COMMUNICATION TEST
INPUT SELECT CODE: Type in the select code of the terminal to be tested.

On the terminal under test, the following will be displayed:

TERMINAL TO 12005A/B INTERFACE COMMUNICATION TEST
TYPE TWENTY CHARACTERS ON THE KEYBOARD NOW
Enter twenty (20) characters.

ASIC TERMINAL TEST COMPLETE
nn CHARACTERS RECEIVED This message will be displayed upon
PASS COMPLETE receiving the last character or after
INPUT SELECT CODE: a <cr> is entered.

TEST FAILURE Indicates no characters were entered within 2 minutes of running the diagnostic.

Special Character Recognition Test

DDL> RU B<cr> Schedules the special character recognition test.

1700 PRGM B SPECIAL CHR. TEST
INPUT SELECT CODE: Type in the select code of the 12005A/B Interface to be tested.

The following will be displayed on the terminal connected to the 12005A/B under test:

SPECIAL CHARACTER RECOGNITION
ASCII CHAR.(OCT) T1 T2 T3 Note that this test may fail if a non-standard special character ROM is installed on the 12005 card.

004	X		
010	X		
015	X		X
022	X		
036		X	
177	X		
204	X		
210	X		
215	X		X
222	X		
236		X	
377	X		

PASS COMPLETE
INPUT SELECT CODE:

The previously displayed message shows what special characters are recognized by the card in its three special character type modes. With a standard card, type 1 characters are EOT (4 octal or 204 octal), BACKSPACE (10 or 210), CARRIAGE RETURN (15 or 215), DC2 (22 or 222), and RUBOUT (177 or 377). The type 2 special character is the RECORD SEPARATOR (36 or 236), and the type 3 special character is the CARRIAGE RETURN (15 or 215). Note the special characters are recognized once with the most significant bit clear and once with the most significant bit set (difference is 200 octal).

The execution time with the test hood is about 90 seconds.

The execution time without the test hood is about 30 seconds.

HP 12006A Parallel Interface (PIC)

After typing "RUN<cr>", the following messages will be displayed;

12006A PARALLEL INTERFACE DIAGNOSTIC	
INPUT SELECT CODE:	Enter the octal select code (ie: 24<cr>).
HOOD INSTALLED?	Enter a "YES" or "NO". (Hood part no. is 24397-60004.) The following message will be displayed:
DEVICE COMMAND SENSE SWITCH – ACTIVE HIGH	This indicates that the switch U1S2 setting must be in the active high (up) setting for the correct operation of the diagnostic.
PASS COMPLETE INPUT SELECT CODE:	Indicates successful completion of the 12006A Interface Diagnostic. To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode. To discontinue program execution, enter a zero (0). Return the 12006A switches to their original switch configuration.

The execution time with the test hood is about 10 seconds.

The execution time without the test hood is about 5 seconds.

Programmable Serial Interface (PSI) Diagnostics

After typing “RUN<cr>”, the following messages will be displayed:

5061-4940(4941),-4938(4939) PROG. SERIAL I’FACE DIAGNOSTIC INPUT SELECT CODE:	Enter the octal select code
SELF TEST PASSED PASS COMPLETE INPUT SELECT CODE	Indicates successful completion of the PSI Diagnostic, when the diagnostic test hood is not installed. Hood part numbers: Modem card: 5061-4916, 5061-3453 Direct connect: 5061-3460
DIAGNOSTIC TEST HOOD SENSED SELF-TEST PASSED PASS COMPLETE INPUT SELECT CODE	Indicates successful completion of the PSI Diagnostic, when the diagnostic test hood is installed.
	To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode.
	Looping will continue until an error occurs or the “BREAK” key is pressed. Typing a “%E” will return control to the beginning of the diagnostic.
	To discontinue program execution, enter a zero (0).

Note: When testing a PSI card with ROM part no. 5180-1951 (self-test ROM),
STATUS = 0830; when testing with LAP-B/X.25 ROM,
STATUS = 8000; when testing with HP 12042 Data Link,
STATUS =BADC (except with 5.1 (or later) rev code).

HP 12008A PROM Storage Module (PROM)

After typing “RUN<cr>”, the following messages will be displayed;

12008A PROM CARD DIAGNOSTIC INPUT SELECT CODE:	Enter the octal select code (ie: 24<cr>)
PASS COMPLETE INPUT SELECT CODE:	Indicates successful completion of the 12008A Diagnostic.
	To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode.
	To discontinue program execution, enter a zero (0).
	Return the 12006A switches to their original switch configuration.

PROM Data Access Program (Optional)

At least two PROMs must be installed in the HP 12008A card.

DDL> RU A<cr> — Schedules the diagnostic for Data Access.

650 PRGM A PROM ACCESS PROGRAM
INPUT SELECT CODE: — Enter the select code of the PROM card under test.

INPUT STARTING (,ENDING) ADDRESS IN OCTAL — Enter the information requested (i.e., 300, 303<cr>). If the PROM address is not in octal, is not positive, or is not within the PROM memory boundaries, the following message will be given:

YOU HAVE PASSED THE LIMITS OF THE PROM DATA
INPUT STARTING (,ENDING) ADDRESS IN OCTAL — The PROM data will be displayed.

ADDRESS	DATA
(300)	002074
(301)	102077
(302)	030202
(303)	113406

WOULD YOU LIKE TO CONTINUE? — Enter a "YES" or a "NO" followed by a <cr>.

The execution time is about 90 seconds.

HP 12009A HP-IB Interface (HPIB)

Install jumper W1 on the board and type "RUN<cr>". The following messages will be displayed:

12009A HP-IB INTERFACE DIAGNOSTIC
INPUT SELECT CODE: — Enter the octal select code (i.e., 27<cr>).

ADDR n IDENTIFIES WITH xxxx OCTAL — Indicates that an HP-IB device responds to the HP-IB Identify Command where 'n' is the device address and xxxx is the octal identification code of the HP-IB device.

DISK CONTROLLER LOOPBACK TEST ON HP-IB ADDR n — Indicates that the diagnostic identifies a disk drive.

NO HP-IB DISKS FOUND — Indicates that the program does not identify a disk drive.

CARD NOT SYSTEM CONTROLLER
ON-LINE TEST NOT EXECUTED — Indicates that the interface is not configured as the controller-in-charge (U1S1).

PASS COMPLETE
INPUT SELECT CODE: — Indicates successful completion of the 12009A Interface Diagnostic.

Card-to-Card Test

If there are two or more 12009A HP-IB cards installed, the optional card-to-card test may be executed.

Cable together all 12009A cards that are to execute this test. No HP-IB device with address equal to 0 should be connected to the HP-IB cards under test. Set the U16 Switches on the cards to execute the card-to-card test to the following:

12009A U16 Switch Setting

S1	S2	S3	S4	S5	S6	S7	S8
O	C	C	C	C	C	C	O

where: O = Open (up)
C = Closed (down)

Set the U16 switches on the cards not being tested to all down (closed).

Set the Data Settling Time (U1S2) to the High Speed setting (closed = down).

The following message is displayed if the card-to-card test is executed:

CARD-CARD TEST: SELECT CODES sc1 AND sc2
Return all HP-IB Interfaces to their original switch configuration.

PHI Chip Access Program (Optional)

DDL> RU A<cr> — Schedules the PHI Chip access program.

SELECT CODE? — Type in the select code of the HP-IB Interface to be tested.

R/W/S TO REGISTER? — To read a register, enter Rn<cr>. To write a register, enter Wn<cr>. To stop the program, enter S<cr>.

REGISTER n = num OCTAL
R/W/S TO REGISTER? — If a read was requested, this message will be displayed. 'num' is the octal representation of the 10-bit register.

DATA? –1 TO END ENTRY : — If a write was requested, the message will be displayed. Enter the data (i.e., 0372<cr>).

HP-IB Register No.	Function
0	HP-IB FIFOs
1	PHI Chip Status
2	PHI Chip Interrupt Sense
3	PHI Chip Interrupt Mask
4	Parallel Poll Mask
5	Parallel Poll Sense
6	HP-IB Control
7	HP-IB Address

The execution time is about 45 seconds.

HP 12016A SCSI Interface (SCSI)

The SCSI loopback test panel, part number 12016-60007, is required to execute the SCSI interface diagnostic loopback tests.

The SCSI diagnostic provides five tests:

SCSI card self-test
TERMPWR check
Firmware timestamp display
RAM
Loopback

Single SCSI Card Automatic Mode Execution

To initiate automatic execution of the SCSI interface diagnostic for one SCSI card, enter:

DDL> RUN	When you enter *RUN* at the DDL prompt, a message stating the program name and revision number appears, followed by a prompt for the select code of the SCSI card you want to test:
INPUT SELECT CODE	Enter the octal select code of the card. Do not use the at sign (@) before the code number; the test expects an octal number. The tests affect the selected card only. After you select a SCSI card, a prompt asks you if the loopback test panel has been installed:
HOOD INSTALLED?	Hood refers to the loopback test panel. If you have attached the loopback panel and answer *yes*, the loopback test is included in the test sequence. Otherwise, only the firmware timestamp, TERMPWR check, self-test and RAM tests are executed (unless you have set the Z variable to a nonzero integer, which disables the RAM test). When the tests have executed, the prompt
INPUT SELECT CODE	appears again. If an error occurs, the error message prints before the select code prompt appears. To run the diagnostic again, enter the select code of the desired SCSI interface card. You can run the diagnostic on the same card or on a different card, or exit the program. To exit the diagnostic program and return to the DDL prompt, enter *0* (zero) at the INPUT SELECT CODE prompt. If you press the <RETURN> key at the INPUT SELECT CODE prompt without entering a select code value, the program loops (repeats the tests) continuously on the last selected SCSI card. After every successful pass, the following message prints:
PASS n	where *n* is the pass number. Looping continues until an error occurs or you press the <BREAK> key. After you press the <BREAK> key, enter the %E command, which sends you to the BCM> prompt. From there, you can enter the DDL command at the prompt to return to the SCSI diagnostic program.

The following is an example SCSI DDL session, in automatic single card test mode, where *xx* is the octal select code of a SCSI card (0 returns you to the DDL prompt).

```
DDL> RUN <RET>
12016A SCSI INTERFACE DIAGNOSTIC – REV.5270
INPUT SELECT CODE  xx <RET>
HOOD INSTALLED?  YES <RET>
SELF–TEST PASSED.
TERMPWR ENABLED.
FIRMWARE TIMESTAMP:  900130.0004
EXECUTING RAM TEST.  PLEASE WAIT.
RAM TEST PASSED.
LOOPBACK TEST PASSED.
PASS COMPLETE
INPUT SELECT CODE  xx <RET>
. .
. .
. .
INPUT SELECT CODE  0
DDL>
```

Multiple SCSI Card Automatic Mode Execution

To initiate automatic execution of the SCSI interface diagnostic for multiple SCSI cards (in the same computer card cage), enter:

`DDL> RUN !`

The RUN ! command tests the SCSI cards in the order of their priority. The multiple card diagnostic mode does not run the loopback test (the loopback panel connects to one card at a time). Multiple card automatic mode executes the self-test, TERMPWR check, firmware timestamp test, and the RAM test unless you have set the Z variable to a nonzero integer, which disables the RAM test.

When you enter RUN ! at the DDL prompt, a message stating the program name and revision number appears, followed by the select code of the card being tested, the test results, then the select code of the next card, until all cards have been tested. The diagnostic tests the highest priority SCSI card first. If the diagnostic detects a failure, it prints an error message, terminates the program and returns to the DDL prompt. If no errors occur, the program proceeds to the next highest priority SCSI card and reports the results.

The following is an example SCSI DDL session, in automatic multiple card test mode, where xx and yy are the octal select codes of SCSI cards.

```
DDL> RUN ! <RET>
12016A SCSI INTERFACE DIAGNOSTIC – REV.5270
SELECT CODE xx UNDER TEST
SELF–TEST PASSED.
TERMPWR ENABLED.
FIRMWARE TIMESTAMP:  900130.0004
EXECUTING RAM TEST.  PLEASE WAIT.
RAM TEST PASSED.
PASS COMPLETE
```

```
SELECT CODE yy UNDER TEST
SELFTEST PASSED.
TERMPWR ENABLED.
. .
. .
. .
PASS COMPLETE
DDL>
```

Interactive Mode Diagnostic Operation

The SCSI diagnostic program's interactive mode runs one of five tests on a specified SCSI card and enables you to download Z180 code from a specified file on a specified device. You can execute a test multiple times. You initiate interactive mode by entering

DDL> RUN T — with or without runstring command parameters. If you enter *RUN T* without parameters, the diagnostic displays a list of tests you can run and commands you can execute, followed by a test selection prompt:

```
 1 – SELF–TEST
 2 – TERMPWR ENABLED CHECK
 3 – FIRMWARE TIMESTAMP DISPLAY
 4 – RAM TEST
 5 – LOOPBACK TEST
10 – DEFINE DOWNLOAD DEVICE:FILE
11 – DOWNLOAD Z180 CODE
–1 – EXIT DIAGNOSTIC
```

ENTER TEST NUMBER: You can either enter a test number or exit to the DDL prompt (−1) from the ENTER TEST NUMBER: prompt. If you enter a test number, the prompt INPUT SELECT CODE appears, enabling you to choose the SCSI card on which to run the test. Enter the octal select code of the card (do not use the @ sign before the code number; the test expects an octal number).

Options 10 (DEFINE DOWNLOAD DEVICE:FILE) and 11 (DOWNLOAD Z180 CODE) are used in conjunction with one another. Together, they enable you to download Z180 code from a specified file on a specified load device. To do this, first select option 10. Selecting option 10 brings up the prompt

ENTER DEVICE NUMBER: Enter the number of the load device from which you want to download the Z180 code (for example, a CS/80 cartridge or a tape drive). The prompt

ENTER FILE NUMBER: appears. Enter the number of the file that contains the Z180 code you want to download. The SCSI device and the file containing the Z180 code on that device are now specified. Next, select option 11. This automatically downloads the Z180 code to the SCSI card.

Note that the DEFINE DOWNLOAD DEVICE:FILE option assumes that device numbers have been assigned to the SCSI devices. The DOWNLOAD Z180 CODE option assumes that you have defined a device and named a file using option 10.

You can also download Z180 code to a SCSI card by using the RUN T command runstring twice. To do this, enter the 10 option in the first RUN T command runstring, execute it, then enter the 11 option in the next RUN T command runstring.

SCSI Card Self-Test

Running this test causes the SCSI diagnostic to issue an OTA 32B instruction to the specified SCSI card, which forces the card to execute its power-on self-test.

LED 1	LED 2	LED 3	LED 4	Status
OFF	ON	ON	ON	Card PROM Checksum Error
OFF	ON	ON	OFF	RAM Test Failed
OFF	ON	OFF	ON	Reserved
OFF	ON	OFF	OFF	DMA Test Failed
OFF	OFF	ON	ON	Timer Test Failed
OFF	OFF	ON	OFF	SCSI Chip Test Failed
OFF	OFF	OFF	ON	Reserved
OFF	OFF	OFF	OFF	Passed Test *
BLINK	OFF	OFF	OFF	Normal Operation **

* The all-LEDs-off condition that indicates successful self-test completion only exists briefly; after this, LED number one blinks continuously, which indicates a normally functioning SCSI Card.

** The rate at which LED number one blinks indicates the activity level of the card. Faster blinking indicates an idle card. Slower blinking indicates a heavier load on the card. A rate as low as several seconds between blinks is normal.

TERMPWR Check

This test reports the status of the SCSI card's bus termination power. TERMPWR status indicates whether or not TERMPWR is present. It does not indicate the TERMPWR source, which can be the SCSI card or a SCSI device.

If the SCSI card or a SCSI device is providing TERMPWR, the message "TERMPWR ENABLED" appears.

If neither a device nor the SCSI card (Switch SW1−2 is open) is providing TERMPWR, the message "TERMPWR DISABLED" appears.

Firmware Timestamp Display

This test sends a “peek” script (a command that reads data without moving the data from its current location) to the SCSI card. The peek script requests the card to transmit the firmware timestamp (the contents of memory location 0x40 through 0x4F) to the HP 1000 computer’s CPU. If the CPU receives the firmware timestamp, a message appears in the following form:

```
FIRMWARE TIMESTAMP:  yymmdd.aabb
```

where *yy* is the year, *mm* is the month, and *dd* is the day of the firmware release; *aa* is the major revision code, and *bb* is the minor revision code. A period separates the date and revision code fields.

If the peek script request fails, one of the following three error messages appears, depending on the failure:

```
DEVFLAG NOT SET
RESPONSE FIFO EMPTY
```

or

```
RESPONSE TYPE INCORRECT
```

The DEVFLAG NOT SET error indicates a hardware failure. Replace the SCSI card.

The RESPONSE FIFO EMPTY error indicates that the diagnostic program received the correct device flag after sending the command to retrieve the timestamp, but the SCSI card status word (LIA 32B) indicated that the response FIFO was empty. The diagnostic program expects the response FIFO to contain the firmware timestamp response, which means that the response FIFO should not be empty. Run the SCSI card self-test to verify that this is a hardware failure. If this condition persists, replace the SCSI card.

The RESPONSE TYPE INCORRECT error indicates that the response to the firmware timestamp request did not contain the expected response type, which is five (5). Verify that the proper drivers and firmware are installed, then run this test again. If this error persists, replace the SCSI card.

RAM Test

The RAM test detects stuck-at-0 and stuck-at-1 conditions (that is, a bit always reports a 0 or a 1) in the address range 32 KByte to 512 KByte. The address range 0KB through 32KB is not tested, because these memory locations contain the on-board firmware code and the downloaded RAM test code itself.

You cannot execute the RAM test if the SCSI card's firmware timestamp is 900711.0003 or earlier (July 11, 1990, major revision 00, minor revision 03). In order to execute the RAM test, the firmware revision must be major revision 00, minor revision 04, or greater.

If the RAM test fails, the following two messages appear:

```
RAM FAILURE AT ADDR: xxxxx; BIT y.
SUSPECT DRAM AT POSITION zzzz.
```

where *xxxxx* is the hexadecimal address where the failure was detected, *y* is the bit position, and *zzzz* is the DRAM IC that is associated with the address/bit position that failed. The DRAM IC designation will be U124, U114, U123 or U113.

You can bypass RAM test execution when running the diagnostic program by setting the variable Z to any nonzero integer at the DDL prompt, before executing any tests. For example, entering

```
DDL> Z=1
```

disables the RAM test. If you disable the RAM test, then attempt to run the RAM test later, a message appears that indicates that the RAM test has been disabled. When you run the diagnostic program, the message

```
RAM TEST NOT EXECUTED
```

appears with the results of the other diagnostic tests.

To enable the RAM test, set Z=0 at the DDL prompt.

Loopback Test

If the loopback test detects a stuck-at-1 failure (that is, a zero was written on the line, but a one was read back), the DDL program prints a message in the following form:

```
LOOPBACK ERROR:  DATAx –> yyy BITS ALWAYS HI (0V).
LOOPBACK ERROR:  yyy –> DATAx BITS ALWAYS HI (0V).
```

where *DATAx* is the name of the data signal associated with the failure, and *yyy* is the name of the control line associated with the failure.

If the loopback test returns a stuck-at-0 failure (that is, a one was written on the line, but a zero was read back), the DDL program prints a message in the following form:

```
LOOPBACK ERROR:  DATAx –> yyy BITS NOT ASSERTED.
LOOPBACK ERROR:  yyy –> DATAx BITS NOT ASSERTED.
```

where *DATAx* identifies the data signal associated with the failure, and *yyy* identifies the control line associated with the failure.

If bits in addition to the bit being tested assert during the stuck-at-0 test (multiple bit error), the diagnostic program prints a message in the following form:

```
LOOPBACK ERROR:  DATAx –> yyy CAUSE MULTIPLE BIT ERRORS.
LOOPBACK ERROR:  yyy –> DATAx CAUSE MULTIPLE BIT ERRORS.
```

Again, *DATAx* identifies the data signal, and *yyy* identifies the control line.

Stuck-at-1 bits do not cause multiple bit errors, because they are already reported as stuck in an “on” condition.

NOTE

Without at least one peripheral device attached, the DID program will abort with an error following testing of the card logic, and at the start of the card-to-peripheral testing.

After typing "RUN<cr>", the following messages will be displayed:

DISK INTERFACE CARD DIAGNOSTIC INPUT SELECT CODE:	Enter the octal select code (i.e., 32<cr>)
PASS COMPLETE INPUT SELECT CODE:	Indicates successful completion of the 12022A Interface diagnostic. The diagnostic compares all disk combinations with the disk units in the system configuration switch register. If it finds a mismatch, it outputs the mismatch to the terminal. To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode. To discontinue program execution, enter a zero (0).

NOTE

The diagnostic only tests that there are disks present where the configuration switch indicates there are; it does not ascertain that the disk type is correct. For example, if there is a 15 Mbyte disk connected as drive 0 and the system configuration switch is set to indicate a 10 Mbyte disk, the diagnostic will not flag this as a misconfiguration.

* Discontinued product; shown for reference only.

Interactive Diagnostic Operation

The interactive mode consists of 17 individual tests. The runstring for interactive mode is:

RU T [test] [select code] [track] [sector offset]

where:

test = 1 through 17.

select code = select code in octal of the card under test.

track = 0 through maximum track for the desired disk.

sector offset = the offset within the defined track.

RU T alone will list the tests and their respective test number after prompting you for the select code.

Track and sector offset are used only for tests 10, 14, and 15. If set when using other tests, they are ignored. Test 11 (Restore) requires that the SDH register be set prior to executing this test. Each test prompts you for necessary data for that test.

The following is a list of the 17 interactive tests:

1	Set SDH Register
2	Set Cylinder High Register
3	Set Cylinder Low Register
4	Set Sector Number Register
5	Set Sector Count Register
6	Set Write Precomp Register
7	Read All Registers
8	Read Status Register
9	Read System Configuration
10	Seek to Track
11	Restore to Track 0
12	Reset Card
13	Test New Card
14	Read Sector
15	Write Sector
16	Dump Input Buffer
17	Compare I/O Buffers
−1	EXIT

Register Definitions

Status Register (A-Register)
The status register is a read only register that contains the status of the last command executed on the drive specified in the SDH register. Status remains valid until another command is issued to the selected drive.

7	6	5	4	3	2	1	0
Busy	Drive Ready	Write Fault	Seek Done	Data Req.	Data Error Corr.	Write Prot.	Error

Busy
Indicates that the card is busy executing a command. Whenever Busy is set, no other status bits are valid.

Drive Ready
Indicates the status of the ready line of the selected drive. No command can be executed until this bit is set.

Write Fault
Indicates the state of the write fault line on the selected drive. No command can be executed while this bit is set. This is a fatal drive error.

Seek Done
Indicates the state of the seek complete line for the selected drive.

Data Request
When set, this bit indicates that the board is ready to send or accept data for a read or write.

Data Error Corrected
Indicates that a successful data error correction has occurred on the data read from the hard disk. This is not applicable to floppies.

Write Protect
Indicates the state of the selected flexible disk drive write protect.

Error
Indicates that the error register has one or more errors which should be read by the host.

Error Register (B-Register)
The error register is a read only register which contains error information when the low order byte of the status register is set.

7	6	5	4	3	2	1	0
Bad Block	ECC/ CRC Error	Self- test Error	ID Not Found	Not Used	Abort Comnd	TR00 Error	DAM Not Found

Bad Block
This bit indicates that a bad block mark has been found in the specified ID field. If the command is a write, no writing will be done. If the command is a read, no read will be done. If the flaw is in the ID field, the bad block will not be detected.

ECC/CRC Error
This bit indicates that an ECC or CRC error was encountered in a data field during a read command, and was not correctable.

Self-Test Error
This bit indicates a failure occurred during self-test. The error register will be set to a value between 41 and 45 (octal) as follows:

Error Number	Error Description
41	Floppy controller failure
42	Winchester controller failure
43	Sector buffer failure
44	Error detection failure
45	Control Processor failure

ID Not Found
This bit indicates that an ID field containing a specified head, cylinder, sector number or sector size was not found after retries.

Abort Command
This bit indicates that a valid command has been received that cannot be executed based on status information from the drive, such as drive not ready, seek complete not asserted, or write fault. Status and/or Error register will show the cause.

TR00 Error
This bit indicates that the controller was unable to find track zero on a restore. The controller sends up to 1023 step pulses on the hard disk and 255 step pulses on the microdiskette before setting this bit if TR00 is not detected.

DAM Not Found
This bit will be set on a read command if, after successfully identifying the ID field, the Data Address Mark was not detected within 16 bytes of the ID field.

SDH Register
The SDH register contains the sector size, drive select, head select, and ECC/CRC select bits. This is a read/write register which is organized as follows:

7	6	5	4	3	2	1	0
ECC/ CRC	Sector Size		Drive Select		Head/Drive Select		

ECC/CRC
0 − CRC on
1 − ECC on

Sector Size
0 − 256 bytes
1 − 512 bytes
2 − 1024 bytes
3 − 128 bytes

Drive Select
0 − hard disk drive 1
1 − hard disk drive 2
2 − reserved
3 − flexible disk drive select

Head Select for Hard Disk
0 − head 0
1 − head 1
2 − head 2
3 − head 3
4 − head 4
5 − head 5
6 − head 6
7 − head 7

Head/Drive Select for Flexible Disks
0 − flexible disk drive 0, head select 0
1 − flexible disk drive 0, head select 1
2 − flexible disk drive 1, head select 0
3 − flexible disk drive 1, head select 1

HP 12040A*/B*/C/D 8-Channel Asynchronous Multiplexer Diagnostic (MUX)

Note: Use loopback tool kit (part no. 12040-67805) or MUX diagnostic hood (part no. 5061-4901) for a more conclusive test of the input and output drivers.

After typing "RUN<cr>", the following messages will be displayed:

12040 EIGHT CHANNEL MUX DIAGNOSTIC INPUT SELECT CODE:	Enter the octal select code.
REV A-C FIRMWARE INSTALLED or REV D FIRMWARE INSTALLED FIRMWARE REV CODE IS xx	One of these messages will be displayed depending on the revision of your MUX card.
MUX TEST PASSED PASS COMPLETE INPUT SELECT CODE:	Indicates successful completion of the 12040 Interface diagnostic.
	To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode.
	Looping will continue until an error occurs or the "BREAK" key is pressed. Typing a "%E" will return control to the beginning of the diagnostic.
	To discontinue program execution, enter a zero (0).

Common Errors, Rev. B and C

NO RESPONSE FROM MUX	Indicates that the diagnostic program cannot communicate with the MUX board.
MUX TEST NUMBER #N FAILED or MUX LOOPING IN TEST NUMBER #N	Indicates failure of at least one of the components on the MUX interface.
	#N indicates the test that failed as follows:

#N	Test Failed
1	Z-80A CPU
2	EPROM
3	RAM
4	Z-80A DMA
5	Z-80A CTC
6	Z-80A SIO Port 7
7	Z-80A SIO Port 6
8	Z-80A SIO Port 5
9	Z-80A SIO Port 4
10	Z-80A SIO Port 3
11	Z-80Z SIO Port 2
12	Z-80A SIO Port 1
13	Z-80A SIO Port 0
14	MUX-to-host latch circuitry

* Discontinued product; shown for reference only.

CARD IS NOT RESPONDING TO SELF TEST
Indicates that the diagnostic program did not receive a response from the MUX card that the self-test ran.

FLAG 30 TIMEOUT WHILE READING A STATUS WORD
or
TIMEOUT WHILE WAITING FOR STATUS WORD
or
INVALID STATUS WORD RETURNED : <returned status word>
Indicates a communication problem with the firmware. Check firmware or the MUX card.

HP 12060A*/B High Level Analog Input / HP 12061A 31-Channel Expansion Multiplexer

After typing "RUN<cr>", the following messages will be displayed:

12060A 12 BIT ADC DIAGNOSTIC
INPUT SELECT CODE: Input the octal select code.

Control/status register test:
CHECKING CONTROL/STATUS REGISTER FUNCTIONALITY
CONTROL/STATUS REGISTER TEST PASSED

Programmed I/O tests:
CHECKING PROGRAMMED I/O INTERRUPT FLAG
PROGRAMMED I/O TEST PASSED

DMA tests:
CHECKING SELF CONF. DMA INTERRUPT AND FLAG
CHECKING REGULAR DMA INTERRUPT AND FLAG
DMA TESTS
PASSED Indicates successful completion of the above tests.

HOOD INSTALLED? Answer "YES<cr>" or "NO<cr>". Test hood part no. is 12060-60003

HOOD TESTS NOT EXECUTED Indicates the test hoods are not attached

Offset test: Continues with the following tests if the
Results of test for 5V reference: test hoods are attached.
Results of gain of 1 test:
Results of auto-scan test:
Results of gain test:
External trigger test:

THERE APPEARS TO BE NO 12061 WITH THIS 12060
The diagnostic ends here if a 12061A card is not installed. Test hood part no. is 12061-60002.

* Discontinued product; shown for reference only.

THERE APPEARS TO BE A 12061 WITH THIS 12060
CONTINUING WITH 12061 TESTS
Results of tests for 9V references: The diagnostic continues here if
Results of gain of 1 test: a HP 12061A card is installed.

PASS COMPLETE
INPUT SELECT CODE:

Indicates successful completion of the diagnostic.

To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode.

Looping will continue until an error occurs or the “BREAK” key is pressed. Typing “%E” will return control to the beginning of the diagnostic.

To discontinue program execution, enter a zero (0).

HP 12062A 4-Channel Analog Output Card Diagnostic (AOUTD)

After typing “RUN<cr>”, the following messages will be displayed:

12062A ANALOG OUTPUT CARD DIAGNOSTICS
INPUT SELECT CODE:

Enter the octal select code. Test hood part no. is 12062-60002.

CHECKING CONTROL REGISTER 31 OPERATION
CONTROL REGISTER OK-CHECKING FLAGS

PASS COMPLETE
INPUT SELECT CODE:

Indicates successful completion of the 12062A Diagnostic.

To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode.

Looping will continue until an error occurs or the “BREAK” key is pressed. Typing “%E” will return control to the beginning of the diagnostic.

To discontinue program execution, enter a zero (0).

Interactive Diagnostics

Type “RUN I<cr>” to display the following information:

USER INTERACTION TEST
ENTER: RU C FOR ANALOG OUTPUT CALIBRATION
ENTER: RU A FOR ANALOG AND DIGITAL OUTPUTS

Analog Output Calibration

After typing “RU C<cr>”, the following messages will be displayed:

HOOD INSTALLED?	If “NO” is the answer the diagnostic will not proceed with the calibration.
ENTER CARD SELECT CODE IN OCTAL	Enter the octal select code.
TWEAK GAIN POTS SO ALL CHS READ –10240 MV HIT <cr> TO ADJUST GAINS FOR ALL CHS	
TWEAK GAIN POTS SO ALL CHS READ +10235 MV HIT <cr> TO ADJUST GAINS FOR ALL CHS	
END CALIBRATION PROGRAM	Indicates successful completion of the Analog Output Calibration.

Analog and Digital Output Program

After typing “RU A<cr>”, the following messages will be displayed:

HOOD INSTALLED?	If “NO” is the answer, the diagnostic will not proceed.
INPUT CARD SELECT CODE IN OCTAL	Enter the octal select code.
ENTER THE DESIRED CHANNEL (0, 1, 2, 3)	
ENTER OUTPUT VALUE IN MV (–10240 TO 10235)	
ENTER DESIRED DIGITAL OUTPUTS (1=HIGH, 0=LOW)	
DO YOU WANT ANOTHER OUTPUT	If the answer “YES” is entered, the program will begin again asking for the select code. Any other answer will display the following message:
END ANALOG OUTPUT PROGRAM	Indicates successful completion.

HP 12063A Isolated Digital I/O Card Diagnostic (DIGIO)

After typing “RUN<cr>”, the following messages will be displayed:

12063A ISOLATED DIGITAL I/O DIAGNOSTIC INPUT SELECT CODE:	Enter the octal select code.
TESTING RELAY REGISTER TESTING MASK REGISTER TESTING PRESCALE REGISTER TESTING SENSE REGISTER TESTING SENSE OVERRIDE REGISTER	These messages are displayed as each section passes its test.
HOOD INSTALLED?	Enter “YES<cr>” or “NO<cr> ”. Test hood part no. is 12063-60002.
HOOD TEST NOT EXECUTED	Diagnostic test hood is not installed.
	The test hood is installed and the following tests are executed. Each message is displayed as each section passes its test.
TESTING RELAYS AND OPTOCOUPLERS TESTING INTERRUPT MASK FUNCTION TESTING INTERRUPT POSITIVE SENSE FUNCTION TESTING INTERRUPT NEGATIVE SENSE FUNCTION TESTING INTERRUPT STORAGE AND SENSE OVERRIDE	
CARD PASSES ALL TESTS PASS COMPLETE	Indicates successful completion of the 12063A Interface diagnostic.
	To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode.
	Looping will continue until an error occurs or until the “BREAK” key is pressed. Typing “%E” will return control to the beginning of the diagnostic.
	To discontinue program execution, enter a zero (0).

Optional Diagnostics

There are five optional diagnostic programs to help in troubleshooting the HP 12063A.

To get a list of the optional programs, enter "RU I<cr>".

To run any of the programs, enter "RU p<cr>" where p is the program letter.

Program W	This program allows an octal word to be written to any register. (For a complete description of registers, refer to the *HP 12063A Operating and Service Manual,* part no. 12063-90001.)
Program R	This program allows you to read octal data from any register.
Program T	This program will display a timing profile for any relay transition state for a specified number of readings.
Program X	This program allows you to set the maximum allowable operate time for the relays during the hood tests.
Program C	This program allows you to reset the HP 12063A.

HP 12072A Data Link Diagnostic (FDL)

After typing "RUN<cr>", the following messages will be displayed:

```
12072A DATA LINK DIAG – REV 2213. Test hood part no. is 5061-4909

                        FDL DIAGNOSTICS
LOOP MODE:  DISABLE, MESSAGE PRINTING:  ENABLE
FDL:                    Enter "??<cr>" or "<cr>" to obtain a list
                                of available commands and diagnostic
                                tests.

FDL DIAGNOSTICS AVAILABLE COMMANDS

??   LIST THIS HELP MESSAGE
EX   TERMINATE THIS FDL DIAGNOSTIC
LD   DISABLE LOOPING MODE
LE   ENABLE LOOPING MODE
PD   DISABLE MESSAGE PRINTING
PE   ENABLE MESSAGE PRINTING
RF   RUN ALL FIELD DIAGNOSTICS
SC   SET SELECT CODE
```

AVAILABLE FIELD DIAGNOSTICS

1. RESET & SELF–TEST
2. NOOP TEST
3. ENABLE CARD TEST
4. ABORT INPUT TEST
5. ABORT OUTPUT TEST
6. DUMP INPUT TEST
7. STATUS REQUEST TEST
8. HOST TO PCA DATA TRANSFER TEST (PRI CH)
9. DATA LOOP BACK TEST (PRI CH)
10. HOST TO PCA DATA TRANSFER TEST (SEC CH)

LOOP MODE: DISABLE, MESSAGE PRINTING ENABLE
FDL: Enter the command or test number.

STARTING SELECT CODE: If this is the first test you are running, it will prompt you for the select code. Otherwise it will display the select code you have already chosen. To change the select code, enter the SC command when you have the FDL prompt.

NUMBER OF FDL BOARD(S): Enter the number of data link boards you want tested.

TEST xx SC xx PASS = xx ERR CT = XX

PASS COMPLETE
LOOP MODE: DISABLE, MESSAGE PRINTING ENABLE
FDL: Indicates successful completion of the diagnostic.

To run another test, enter the appropriate commands and test number.

To discontinue program execution, enter EX.

Error Messages

The error messages will be one of the following:

TEST xx ERROR = yyyyy

TEST xx ERROR = yyyyy iijj

where xx and yyyyy are decimal values and iijj is a hexadecimal value.

A complete list of error messages and their meanings are listed on the following pages.

HP 12072A Diagnostic Error Messages

Error Number	Meaning
101	Failed to receive a response from the card for a reset-and-self-test command.
102	Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received.
201	Failed to receive a response from the card for the no-op cmd.
202	Failed to receive the correct solicited status for the no-op cmd. Field iijj shows the status received. The status should be 8000.
301	Failed to receive a response from the card for the enable-card command.
302	Failed to receive the correct solicited status for the enable-card command. Field iijj shows the status received.
401	Failed to receive a response from the card for the abort-input command.
402	Failed to receive the correct solicited status for the abort-input command. Field iijj shows the status received.
501	Failed to receive a response from the card for the abort-output command.
502	Failed to receive the correct solicited status for the abort-output command. Field iijj shows the status received.
601	Failed to receive a response from the card for the dump-input command.
602	Failed to receive the correct solicited status for the dump-input command. Field iijj shows the status received.
701	Failed to receive a response from the card when requesting the buffer size status.
702	The buffer size returned was zero. Field iijj shows the actual status received. jj shoudl be nonzero.
703	Failed to receive a response from the card when requesting the message sent count status.
704	Message sent count is nonzero. Field iijj shows the status received. jj should be zero.

HP 12072A Diagnostic Error Messages (Cont.)

Error Number	Meaning
705	Failed to receive a response from the card when requesting the message receive count.
706	Message receive count is nonzero. Field iijj shows the status received. jj should be zero.
707	Failed to receive a response from the card when requesting the send retry count.
708	The send retry count is nonzero. Field iijj shows the status received. jj should be zero.
709	Failed to receive a response from the card when requesting the receive retry count.
710	The receive retry count is nonzero. Field iijj shows the status received. jj should be zero.
801	Failed to receive a response from the card for the reset-and-self-test command.
802	Failed to receive the correct solicited status to the reset-and-self-test command. Field iijj shows the status received.
803	Failed to receive a response from the card for the write cmd.
804	Failed to receive the correct solicited status for the write cmd. Field iijj shows the status received. jj should be nonzero.
805	Data transfer from host to card failed when using the host DMA
806	Failed to receive a response from the card for the end-of-data-transfer command.
807	Failed to receive the correct solicited status for the end-of data-transfer command. Field iijj shows the status received.
808	Failed to receive a response from the card for the write cmd.
809	Failed to receive the correct solicited status for the write cmd. Field iijj shows the status received. jj should be nonzero.
810	Failed to receive a response from the card for the start-of data-transfer command.
811	Failed to receive the correct solicited status for the start-of data-transfer command. Field iijj shows the status received.

HP 12072A Diagnostic Error Messages (Cont.)

Error Number	Meaning
812	Programmed I/O failed. No response from the card was received to send a data word.
813	Failed to receive a response from the card for the write cmd.
814	Failed to receive the correct solicited status to the write cmd. Field iijj shows the status received. jj should be nonzero.
815	Failed to receive a response from the card for the start-of data-transfer command.
816	Failed to receive the correct solicited status for the start-of data-transfer command. Field iijj shows the status received.
817	Programmed I/O failed. No response from the card was received to send the next data word.
818	Failed to receive a response from the card for the end-of data-transfer command.
819	Failed to receive the correct solicited status for the end-of data-transfer command. Field iijj shows the status received.
820	Failed to receive a response from the card for the write cmd.
821	Failed to receive the correct solicited status for the write cmd. Field iijj shows the status received. jj should be zero.
822	Failed to receive a response from the card for the reset-and-self-test command.
823	Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received.
901	Failed to receive a response from the card for the reset-and-self-test command.
902	Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received.
903	Failed to receive a response from the card for the enable diagnostics mode command.
904	Failed to receive the correct solicited status for the diagnostics mode command. Field iijj shows the status received.
905	Failed to receive a response from the card for the write cmd.
906	Failed to receive the correct solicited status for the write cmd. Field iijj shows the status received.

HP 12072A Diagnostic Error Messages (Cont.)

Error Number	Meaning
907	DMA failed when transferring data from the host to the card.
908	Failed to receive a response from the card for the end-of-data-transfer command.
909	Failed to receive the correct solicited status for the end-of data-transfer command. Field iijj shows the status received.
910	Failed to receive the unsolicited read status from the card.
911	Failed to receive a response from the card for the unsolicited status acknowledge command.
912	Failed to receive the correct solicited status for the unsolicited status acknowledge command. Field iijj shows status received.
913	Failed to receive the correct unsolicited status. Field iijj shows the status received.
914	Failed to receive a response from the card for the read cmd.
915	Failed to receive the correct solicited status for the read command. Field iijj shows the status received.
916	DMA failed for the data transfer from the card to the host.
917	Failed to receive a response from the card for the end-of-data-transfer command.
918	Failed to receive the correct solicited status for the end-of data-transfer command. Field iijj shows the status received.
919	The loop-back data is not the same as the sent data.
920	Failed to receive a response from the card for the reset-and self-test command.
921	Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received.
1001	Failed to receive a response from the card for the reset-and-self-test command.
1002	Failed to receive the correct solicited status to the reset-and-self-test command. Field iijj shows the status received.
1003	Failed to receive a response from the card for the write cmd.
1004	Failed to receive the correct solicited status for the write cmd. Field iijj shows the status received. jj should be nonzero.

HP 12072A Diagnostic Error Messages (Cont.)

Error Number	Meaning
1005	Data transfer from host to card failed when using host DMA
1006	Failed to receive a response from the card for the end-of-data-transfer command.
1007	Failed to receive the correct solicited status for the end-of-data transfer command. Field iijj shows the status received.
1020	Failed to receive a response from the card for the write cmd.
1021	Failed to receive the correct solicited status for the write cmd. Field iijj shows the status received. jj should be zero.
1022	Failed to receive a response from the card for the reset-and-self-test command.
1023	Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received.

HP 12100A A400 On-Board I/O (OBIO)

After typing "RUN<cr>", the following messages will be displayed:

INPUT SELECT CODE: Enter 77 (octal) for OBIO.

HOOD INSTALLED? Enter "yes<cr>" or "no<cr>". Test hood part no. is 12100-60004.

FIRMWARE REVCODE IS : xx REGISTER TEST This message is displayed if you answered "yes" to the previous question.

REGISTER TEST PASSED
CPU TO MCU COMMUNICATION TEST
Indicates successful completion of the register test.

CPU TO MCU COMMUNICATION TEST PASSED
Indicates successful completion of the CPU to MCU test.

LOOPBACK HOOD TEST

Indicates that the Loopback Hood Test has started if a “yes” was entered to the loopback hood installed question.

Note: To test ports B and C, install the RS-422 side of the loopback hood. Set the switch on the breakout panel to DCE for the port being tested, then run the test. **RS-422 can only be tested with DCE.** Reinstall the loopback hood with the RS-232 side.

LOOPBACK HOOD INSTALLED ON PORT A?

Answer “yes” to have the port tested or “no” to go to the next port. You will then be prompted for Ports B, C, and D in the same manner. Note that all four ports must be configured before any tests are run.

THE RS 422 STANDARD APPEARS TO BE INSTALLED ON PORT C
(RI AND CTS ASSERTED WHEN RTS ASSERTED)

or

THE RS 232 STANDARD APPEARS TO BE INSTALLED ON PORT B
(CD AND DSR ASSERTED WHEN RTS ASSERTED)

This message is displayed if Port B and/or Port C have been selected for testing.

It is possible to test all four ports in a single pass if you have four test hoods available. If you have only one test hood, you must move the hood and repeat the test for each port to be tested.

ARE YOU IN LOOPING MODE?

This message is displayed when all of the ports with loopback hoods have been tested. If you answer “yes”, there will be no further prompts concerning loopback hood tests. The test continues to loop on the ports selected. Normally you would not do this if you have previously chosen the looping mode.

If you answer “no”, the following message will be displayed:

DO YOU WANT TO TEST MORE PORTS?

If you enter “yes”, then you are prompted to select ports to be tested by again entering “yes” to the appropriate prompt.

LOOPBACK HOOD INSTALLED ON PORT A? LOOPBACK HOOD INSTALLED ON PORT B? LOOPBACK HOOD INSTALLED ON PORT C? LOOPBACK HOOD INSTALLED ON PORT D?	Use this sequence to re-execute the test with the same ports testing the other communication standard, or to test additional ports when using a single hood..
DO YOU WANT TO TEST MORE PORTS?	Terminates the looping test sequence if you answer “no”.
PASS COMPLETE INPUT SELECT CODE	Indicates termination of the first pass if you answered “no” to previous question. To run the diagnostic again, reenter the select code 77 for another complete pass, or enter a <cr> to put the diagnostic in the loop mode. Looping will continue until an error occurs or the “BREAK” key is pressed. Typing a “%E” will return control to the beginning of the diagnostic. To discontinue program execution, enter a zero (0).

The execution time with all the test hoods is about 60 seconds. The execution time without a test hood is about 30 seconds.

HP 12153A Writable Control Store (WCS)

NOTE

Always execute the IOM diagnostic before running WCS to ensure proper operation of I/O Master functions.

The Writable Control Store (WCS) diagnostic provides a test of both the I/O backplane interface and the micro-instruction frontplane interface on the WCS card. The diagnostic also checks the address counter, map RAM, and data RAMs on the card.

Testing begins with the lowest priority WCS card (adjacent to processor card) installed in the computer system, and tests each WCS card in turn from the lowest to the highest priority.

Type “RUN<cr>” to begin the diagnostic.

HP 12205A Control Store Card (CSIC)

After typing “RUN<cr>”, the following messages will be displayed:

12205A CONTROL STORE CARD DIAGNOSTIC INPUT SELECT CODE:	Enter the octal select code
PASS COMPLETE INPUT SELECT CODE:	Indicates successful completion of the 12205A Diagnostic.
	To run the diagnostic again, reenter the select code for another complete pass, or enter a <cr> to put the diagnostic in the loop mode.
	To discontinue program execution, enter a zero (0).

Under the single test diagnostic operation, enter the following runstring:

RU T x y z

where:

x = test number
y = loop number
z = select code of control store card

The CSIC diagnostic contains five separate tests.

Test #	Test Description
1	Turn Control Store Card On
2	Turn Control Store Card Off
3	Read/Write Test
4	Frontplane Test
5	Download and Execute Microcode

HP 24398B Diagnostic Media Options

Option 044, 3.5-Inch Floppies

Rev. 5000 thru 5020

Part Number	Label	Program	File #
24398-13414	MCFLPY PRPHL D1	EXRTP (EXER & TAPE)	0
24398-13415	MCFLPY PRPHL D2	OPER MTVER	0 2
24398-13416	MCFLPY PRPHL D3	MACICD	0
24398-13417	MCFLPY PRPHL D4	MTEXR	0
24398-13418	MCFLPY PRPHL D5	TESTM	0

Rev. 5270

Part Number	Label	Program	File #
24398-13414	MCFLPY PRPHL D1	EXRTP (EXER & TAPE)	0
24398-13415	MCFLPY PRPHL D2	MTVER	0
24398-13416	MCFLPY PRPHL D3	OPER	0
24398-13417	MCFLPY PRPHL D4	MTEXR	0
24398-13418	MCFLPY PRPHL D5	TESTM	0

Option 022, CS/80 Cartridge Tape

Rev. 5000

Part Number	Description	Program	File #
24398-13318	24398B Diagnostics only	CINFDS EXRTP OPER MTVER MACICD MTEXR TESTM LANMEM	0 2 6 10 12 17 22 24
24998-13328	ARSTR, PBV, FORMF DIAGS Bootable Files	CINFO 24612A EXRTP OPER MTVER MACICD MTEXR TESTM LANMEM !ARSTR !PBV FORMF FRMER	0 2 15 21 23 25 31 34 36 44 53 56 61

Rev. 5010, 5012, 5020

Part Number	Description	Program	File #
24398-13318	24398B Diagnostics only	CINFDS EXRTP OPER MTVER MACICD MTEXR TESTM LANMEM	0 2 6 10 12 17 22 24
24998-13328	ARSTR, PBV, FORMF DIAGS Bootable Files	CINFO 24612A EXRTP OPER MTVER MACICD MTEXR TESTM LANMEM !ARSTR !PBV FORMF FRMER	0 2 15 21 23 25 32 35 37 45 54 57 62

Rev. 5270

Part Number	Description	Program	File #
24398-13318	24398B Diagnostics only	CINFDS EXRTP OPER MTVER MTEXR TESTM LANMEM	0 2 6 10 12 15 17
24998-13328	ARSTR, VSCSI, FORMF DIAGS Bootable Files	CINFO 24612A EXRTP OPER MTVER MTEXR TESTM LANMEM !ARSTR !VSCSI FORMF	0 2 15 21 23 25 30 32 40 47 54

Option 051, 1600 bpi Magnetic Tape

Rev. 5000

Part Number	Description	Program	File #
24398-13501	24398B Diagnostics only	TINFDS EXRTP OPER MTVER MACICD MTEXR TESTM LANMEM	1 2 3 4 5 6 7 10
24998-13540	ARSTR, PBV, FORMF DIAGS Bootable Files	TINFO !ARSTR FORMF FRMER !PBV 24612A EXRTP OPER MTVER MACICD MTEXR TESTM LANMEM	1 2 3 4 5 6 103 104 105 106 107 110 111

Rev. 5010, 5012, 5020

Part Number	Description	Program	File #
24398-13501	24398B Diagnostics only	TINFDS EXRTP OPER MTVER MACICD MTEXR TESTM LANMEM	1 2 3 4 5 6 7 10
24998-13540	ARSTR, PBV, FORMF DIAGS Bootable Files	TINFO !ARSTR EXRTP OPER MTVER MACICD MTEXR TESTM LANMEM A24612 FORMF FRMER !PBV	1 2 3 4 5 6 7 10 11 13 110 111 112

Rev. 5270

Part Number	Description	Program	File #
24398-13501	24398B Diagnostics only	TINFDS EXRTP OPER MTVER MTEXR TESTM LANMEM	1 2 3 4 5 6 7
24998-13540	ARSTR, VSCSI, FORMF DIAGS Bootable Files	TINFO !ARSTR EXRTP OPER MTVER MTEXR TESTM LANMEM 24612A !VSCSI FORMF	1 2 3 4 5 6 7 10 12 107 110

Option AAH, SCSI DAT Tape

Rev. 5270

Part Number	Description	Program	File #
24398-13621	24398B Diagnostics only	TINFDS EXRTP OPER MTVER MTEXR TESTM LANMEM	1 2 3 4 5 6 7
24998-13614	ARSTR, VSCSI, FORMF DIAGS Bootable Files	TINFO !ARSTR EXRTP OPER MTVER MTEXR TESTM LANMEM 24612A !VSCSI FORMF	1 2 3 4 5 6 7 10 12 107 110

Loading Diagnostics from 3.5-Inch Floppies

To load the HP 24398B diagnostics from floppies, insert the floppy that has the diagnostic program you want to run and enter the following bootstring:

VCP> %B*xxfbusc*

where: *xx* = DC for CS/80 disks
DI for Micro/1000 integrated disk w/ 12022 controller:
f = file number of diagnostic program
b = HP-IB bus address; b=3 for integrated disk w/ 12022.
u = unit
sc = select code

Refer to the Primary System Configuration tables in Chapter 3 to determine the values of *b*, *u*, and *sc* to use for the device from which you are booting. Note that these only apply to the Primary System; your system configuration may differ.

Loading Diagnostics from CS/80 Cartridge Tapes

The HP 24612A/24398B diagnostics are available with the Primary System on the following CS/80 cartridge tapes:

24998-13327 (Primary/Diags/Master)
24998-13328 (ARSTR, VSCSI, FORMF, DIAGS Bootable Files)

The diagnostics listed on tape number 24998-13327 are the same as those on tape number 24998-13328. The 24998-13327 version must first be restored to disk using ARSTR, before they can be accessed.

The diagnostics on the 24998-13328 tape are bootable from the cartridge tape drive. The contents of the CS/80 tape 24998-13328 are listed in a file called CINFO. CINFO is a bootable system whose only purpose is to print a file that lists the name and sequence number of bootable files on the tape.

There is one copy of CINFO. It can be read by entering one of the following bootstrings:

VCP> %bdc1027	(for the HP 9144/45 tape drive)
VCP> %bdc127	(for other CS/80 tape drives)

Then press the break key and re-enter the bootstring using the file number of the diagnostic you want to run.

NOTE

The file sequences of these diagnostics, shipped with the Primary System, are not the same as those for the HP 24398B and HP 24612A standalone products. When using the diagnostic manuals, use the file numbers in the CINFO file on the 24998-13328 tape instead of those listed in the manuals. These numbers must be in the bootstring in order to select the diagnostic you wish to run. Also note that file numbers may change from one revision to another; thus, read your actual tape to get the file numbers.

Loading Diagnostics from 1600 bpi Magnetic Tape

The HP 24612A/24398B diagnostics are supplied with the Primary System on the following 1600 bpi magnetic tapes:

24998-13539 (Primary/Diags/Master)
24998-13540 (ARSTR, VSCSI, FORMF, DIAGS Bootable Files)

The diagnostics contained on tape number 24998-13539 are the same as those on tape number 24998-13540. The 24998-13539 version must first be restored to disk using ARSTR, before they can be accessed.

The diagnostics on the 24998-13540 tape are bootable from the magnetic tape drive. The contents of the mag tape 24998-13540 are listed in a file called TINFO. TINFO is a bootable system whose only purpose is to print a file that lists the name and sequence number of bootable files on the tape.

There is one copy of TINFO. It can be read by entering one of the following bootstrings:

VCP> %bmt13027 (for the HP 7974/78/79/80 tape drive)

VCP> %bmt14027 (for the HP 7970† mag tape drive)

Then press the break key and re-enter the bootstring using the file number of the diagnostic you want to run.

NOTE

The file sequences of these diagnostics, shipped with the Primary System, are not the same as those for the HP 24398B and HP 24612A standalone products. When using the diagnostic manuals, use the file numbers in the TINFO file on the 24998-13540 tape instead of those listed in the manuals. These numbers must be in the bootstring in order to select the diagnostic you wish to run. Also note that file numbers may change from one revision to another; thus, read your actual tape to get the file numbers.

† When booting the HP 24612A diagnostics on rev 2540 and 4010 tapes from an HP 7970E* using an A900 with a rev 13 (or later) base set, the diagnostic will fail with the message:

MTDVR #1 ERROR 6
DVR ERROR 24

This is due to BCM timing out when searching for diagnostic files after rewinding since larger (ARSTR) files are stored at the beginning of the tape. To avoid this, use a rev 5.0 (or later) tape.

Loading Diagnostics from SCSI DAT

The HP 24612A/24398B diagnostics are supplied with the Primary System on the following SCSI DAT tapes:

24998-13613 (Primary/Diags/Master)
24998-13614 (ARSTR, VSCSI, FORMF, DIAGS Bootable Files)

The diagnostics contained on tape number 24998-13613 are the same as those on tape number 24998-13614. The 24998-13613 version must first be restored to disk using ARSTR, before they can be accessed.

The diagnostics on the 24998-13614 tape are bootable from the SCSI DAT tape drive. The contents of tape 24998-13614 are listed in a file called TINFO. TINFO is a bootable system whose only purpose is to print a file that lists the name and sequence number of bootable files on the tape.

There is one copy of TINFO. It can be read by entering the following bootstring:

```
VCP> %bmt15027
```

Then press the break key and re-enter the bootstring using the file number of the diagnostic you want to run.

NOTE

The file sequences of these diagnostics, shipped with the Primary System, are not the same as those for the HP 24398B and HP 24612A standalone products. When using the diagnostic manuals, use the file numbers in the TINFO file on the 24998-13614 tape instead of those listed in the manuals. These numbers must be in the bootstring in order to select the diagnostic you wish to run. Also note that file numbers may change from one revision to another; thus, read your actual tape to get the file numbers.

HP 24398B Peripheral Diagnostics

CS/80 Disk Diagnostics

For operating instructions and error messages refer to the CS/80 Exerciser Manual (part no. 5955-3462).

To load the diagnostics, insert the media containing the diagnostic and enter the appropriate bootstring.

Hit any key to get the RTE prompt, then type the following:

RTE:RU,name,1,1

where:

name = EXER
TAPE
OPER

Notes:

1. EXER and TAPE are contained in the file named EXRTP.
2. OPER is contained in the file named OPER.
3. 1,1 is required by all CS/80 diagnostic programs before rev. 2540.

   CS/80 EXTERNAL EXERCISER

   Input drive LU?

Rev. 2540 or before

HP-IB Address	SC 27	SC 25
0	LU 10	LU 20
1	LU 11	LU 21
2	LU 12	LU 22
3	LU 13	LU 23
4	LU 14	LU 24
5	LU 15	LU 25
6	LU 16	LU 26
7	LU 17	LU 27

Rev. 4010

HP-IB Address	SC 27
0	LU 10
1	LU 11
2	LU 12
3	LU 13
4	LU 14
5	LU 15
6	LU 16
7	LU 17

Input DRIVE ADDRESS?
[HP-IB address of CS/80 drive]

Input the test name

RTE:RU,EXER

The following commands are available when running under the EXER program:

CE MODE† – enables CE capabilities at rev 5.0 (and later)
CANCEL – cancels the previous command
CHANNEL – HP-IB channel test
CICLEAR – channel independent clear utility
CLEAR LOGS – clear internal logs
DIAG – internal diagnostic test
ERRSUM – print error summary data
ERT LOG – print ERROR RATE TEST log
EXIT – either stops program or re-prompts for test name
EXIT – is allowed as an input for all input prompts
FAULT LOG – print drive fault log
INIT MEDIA – initializes the selected devices media
HELP – prints this file over
PRESET – preset drive utility
REQSTAT – request status message
REV – print revision data
RF SECTOR – read full sector utility
RO ERT – read only error rate test
RUN LOG – print run-time data error log
SDCLEAR – selected device clear
SENSE – print sensor data
SPARE – spare block utility
TABLES – print internal table data
UNIT – set unit utility
WTR ERT – write then read ERT

RTE:RU,TAPE

The following commands are available when running under the TAPE program:

Note: When testing an HP 9144A Tape Subsystem, run the UNIT utility to set the unit to 0. When testing HP 791x* Integrated Cartridge Tape drive Subsystems, set the unit to 1.

CANCEL – cancels the previous command
CERT – certify tape
CICLEAR – channel independent clear utility
CLEAR LOGS – clear internal logs
ERT LOG – print ERROR RATE TEST summary data
HELP – prints this file over

* Discontinued product; shown for reference only.

† Commands involving writing to a disk require CE capabilities at rev 5.0 (and later).

INIT MEDIA – format media utility
PRESET – preset drive utility
RO ERT – read only error rate test
REQSTAT – request status
RUN LOG – print run-time data error log
SDCLEAR – selected device clear
SPARE – spare block utility
TABLES – print internal table data
UNIT – set unit utility
UNLOAD – unload tape utility
USE LOG – print TAPE use log
WRITE FM – write end of file mark on tape
WTR ERT – write then read ERT

RTE:RU,OPER

The following commands are available when running under the OPER program:

HELP – prints this list over
EXEC – executes the command steps
EDIT – allows the editing of program steps
LIST – allows the listing of program steps
STOP – stops this program
NEW – restarts the program from step 1
EXIT – exits this program; EXIT is allowed for all input

Allowable Program Steps:

LCRD – Locate and read
LCWR – Locate and write
CMPR – Write, Read and compare
COMP – Complementary commands
RQST – Request status
CLR – Channel Independent Clear
LOOP – Loop the following program steps until the end of the program or the first ENDLP command is encountered
ENDLP – Described above
INSK – Incremental seek
NULL – Nulls a program step

CS/80 Error Information

For unsuccessful data transmissions, the system will return the following error messages.

I/O −RQ LUxx

An illegal I/O request was received for one of the following reasons:

1. Negative track or sector value was specified.
2. Odd valued sector number was specified.
3. Sector or track number was specified that was greater than the maximum allowed value.
4. Attempt was made to write more sectors than are available on the disk.

I/O −NR LUxx,D

LUxx not ready due to one of the following reasons:

1. No disk.
2. Drive not connected.
3. Tape not inserted.

I/O −TE LUxx

Disk transmission error.

I/O −WP LUxx

Device write protected.

I/O −FA LUxx

Drive fault.

I/O −TO LUxx

Drive or device not connected or on-line.

RTE-A DD*33 Error Decoding

If an error occurs from the CS/80 disk device driver, DD*33, the following error messages will be output to the terminal:

LU xx ty ST = XXXXXX

PARM = AAAAAA BBBBBB CCCCCC

DDDDDD EEEEEE

where:

xx is the LU number.

ty is the two-letter type of error as shown below and explained on the following pages:

RE = Reject Errors = Class 1
FA = Fault Errors = Class 2
TE = Access Errors = Class 3
IN = Information Errors = Class 4
WN = Driver Retry (CS/80 timeout)

XXXXXX is an octal field format representation for the error class. This octal number can be looked up directly on the following pages for specific details concerning error.

PARM is the five word parameter field in DECIMAL representation.

Interpretation of PARM for all errors, unless noted otherwise in the class error field definition, is as follows:

1. Convert decimal values in each field to a hexadecimal value. Arrange (for convenience) the new values as shown here:

   AAAAAA = H1H2 BBBBBB = H3H4

   CCCCCC = H5H6 DDDDDD = H7H8

   EEEEEE = H9H0

   Conversion notes: 16E3 = 4,096; 16E2 = 256;
   decimal-to-hex: 10=A 11=B 12=C 13=D 14=E 15=F

2. H1 through H0 are the hex CS/80 parameters P1-P0 respectively.

3. P1-P6 (H1-H6) together form the new target block address on the disk drive. This information can be usually disregarded except when noted differently in specified error field description.

4. P7-P10 (H7-H10) are the four most recent DERRs from the CS/80 disk drive. For 793x drives these numbers individually must be converted to decimal in order to look up in DMDs handbook.

Class of Errors

RE – Reject Errors Field

The reject errors field format is:

< x x 1 x x 2 3 4 5 6 7 x 8 x x x >

where:

1 – Channel Parity Errors (20000B)
A channel command was received without odd parity.

2 – Illegal Opcode (2000B)
Unrecognizable opcode was received.

3 – Module Addressing (1000B)
Illegal unit or volume was received.

4 – Address Bounds (400B)
The target address exceeded the bounds for this device.

5 – Parameter Bounds (200B)
A parameter other than unit, volume, or address is out of bounds for this device.

6 – Illegal Parameter (100B)
A parameter field has the wrong length for the opcode preceding it.

7 – Message Sequence Error (40B)
The message sequence has been violated. (This error will be suppressed if any reject or fault errors have occurred prior to sequence error.)

8 – Message Length Error (10B)
The total length of the execution message is different from the current default values based on the present command.

Note: Reject errors are not drive related. These errors are command line, interface, and software caused.

FA – Fault Errors Field

The fault errors field format is:

< x 1 x 2 x x 3 x 4 x 5 6 7 x 8 9 >

where:

1 – Cross Unit Error (40000B)
Error occurred during a copy data operation. Parameters P1-P6 contain the encoded values of each unit which experienced an error. A byte of all ones indicates no additional units.

2 – Controller Fault (10000B)
Hardware controller fault has occurred.

3 – Unit Fault (1000B)
Hardware unit fault has occurred.

4 – Diagnostic Result (200B)
Hardware failed a diagnostic test, indicated in the parameter field as follows:

P1-P2 contain the most and next-most suspect component,
P3-P4 contain the TERROR associated with P1-P2, respectively,
P5-P6 are not used,
P7-P10 contain DERROR information as usual.

5 – Release for Operator Request (40B)
Release is required by the drive to service an operator request; i.e., load or unload. Programs should grant or deny this request.

6 – Release Required for Diagnostic (20B)
Release is required for diagnostics initiated from the front panel.

7 – Release Required for Internal Maintenance (10B)
Release is required so that the drive can update logs or perform head alignment. If release is not granted, error information may be lost.

8 – Power-Fail (2B)
Power to the drive failed, a diagnostic destroyed drive state, or a pack was loaded.

9 – Release Completed (1B)
The drive has returned from automatic release; the preceding transaction should be retried.

TE – Access Errors Field

The access errors field format is:

< 1 2 3 4 5 6 x x 7 8 x 9 10 x x x >

where:

1 – Illegal Parallel Operation (100000B)
The operation requested cannot be executed in parallel with other operations in progress.

2 – Uninitialized Medium (40000B)
The medium is unformatted or unusable in this device.

3 – No Spares Available (20000B)
The spare block command cannot be executed due to lack of spare media.

4 – Not Ready (10000B)
The selected unit is not ready for access at this time.

5 – Write Protect (4000B)
The selected volume is write protected.

6 – No Data Found (2000B)
A block accessed during a read has not been written.

7 – Unrecoverable Data Overflow (200B)
The last transaction had more than one unrecoverable data error.

8 – Unrecoverable Data Error (100B)
The controller was unable to read data at block address in the parameter field (P1-P6). The data cannot be totally recovered, although reading with maximum retries will get the controller's best guess.

9 – End of File (20B)
An end of file mark was encountered during the read.

10 – End of Volume (10B)
The last access attempted to access past the end of the volume. The parameter field (P1-P6) contains the block address of the last block on the volume.

IN – Information Errors Field

The information errors field format is:

< 1 2 3 4 5 x x 6 x 7 8 9 x 10 x x >

where:

1 – Release for Operator Request (100000B)
The controller requests release to allow operator request (i.e. load/unload, save/restore.) Parameters P1-P6 contain encoded values of each unit requesting release, where a byte of all ones indicates no additional units.

2 – Release for Diagnostic Request (40000B)
Release for diagnostic generated by front panel or self-test. Parameter field same as in (1) above.

3 – Release for Internal Maintenance (20000B)
Request release to update error logs or perform maintenance. Parameter field same as in (1) above.

4 – One Spare Left (10000B)
There is only one spare block left on this media volume.

5 – Data Overrun/Latency Induced (4000B)
During a transfer, a latency occurred when the system could not accept data as fast as the device could send due to slow transfer rate or seek retry.

6 – Auto Sparing Invoked (400B)
A defective block was automatically spared by the device.

7 – Recoverable Data Overflow (100B)
The last transaction had more than one recoverable data error.

8 – Marginal Data (40B)
The last request generated an error which was recovered with difficulty. Parameters P1-P6 indicate the block address of the marginal data block.

9 – Recoverable Data Error (20B)
The last request generated an error which was recovered by retry or error correction. No data was lost. Parameters P1-P6 indicate the block address of recoverable data.

10 – Maintenance Track Overflow (4B)
The error and fault logs on the device are full.

WN – Warning – driver retry (rev 5.0 or later). Status, parameters, and error fields are not valid.

Disk Drive – Block Address Conversion

When the disk drive data block address is known, and the cylinder, head, and sector of the data is desired, perform the following:

Calculate the following using drive specific information:

a. Divisor1 = (# Sectors/Track) x (# Data Heads)
b. Divisor2 = (# Sectors/Track)

$$\frac{\text{Data Block Address}}{\text{Divisor1}} = \text{Cylinder with Remainder1}$$

$$\frac{\text{Remainder1}}{\text{Divisor2}} = \text{Head with Remainder2}$$

Remainder2 = Sector

HP 7970E* HP-IB Verifier

For operating instructions and error messages refer to the HP 7970E* Verifier Manual (part no. 07970-90980).

The HP-IB address of the magnetic tape drive must be set to 4 and select code of the HP-IB interface must be set to 27 (for diagnostic revisions 2540 through 5020).

To load the diagnostic, insert the media containing the diagnostic and enter the appropriate boot string given in the Diagnostic Media Options and Boot Commands section.

The diagnostic will automatically run one complete pass using the defaults. Therefore, you must have the tape (with write ring) loaded and on-line.

After one complete pass, the system will return the following:

PASS 1 COMPLETE

To run the diagnostic, hit any key to get the RTE: prompt, then type the following:

RTE: RU,MTVER,1110B,[msge/hlt],[tests1],[tests2],[#passes]

* Discontinued product; shown for reference only.

where:

msge/hlt = 1 – Suppress information messages; halt after error messages.

2 – Print error and information messages; suppress error halts.

3 – Print error and information messages; permit error halts (default condition).

4 – Suppress error and information messages; suppress error halts.

tests1 = Selected test desired to be run as shown on following page. Default tests are 32777B.

tests2 = Selected test desired to be run as shown on following page. Default test is 20000B.

#passes = Number of passes to execute, −1 to repeat indefinitely. Default is 1 pass.

Common test selections, error information, and directive messages are shown on the following pages.

Test/Bit Selection

	Tests 1																Tests 2		
Bit No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	15	14	13
Test No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16	17	18

Test/Octal Selection

	Test No.	Octal No.	Test Description
Tests1	1	–	Not Used
	2	40000B	Power On Test
	3†	20000B	Identify Test
	4†	10000B	Loopback Test
	5	4000B	Manual Test
	6†	2000B	Write Gap Test
	7†	–	Not Used
	8†	400B	Write Test
	9†	200B	Backspace/Forward Space Record Test
	10†	100B	Backspace/Forward Space File Test
	11†	40B	Read/Write Test
	12†	–	Not Used
	13†	10B	Rewind and Busy Test
	14†	4B	BOT Checks
	15†	2B	Tape Runaway Test
	16†	–	Not Used
Tests2	17	–	Not Used
	18	–	Not Used
	19†	20000B	Rewind at End of Pass

† Default test selections.

Common Test Selections

RU,MTVER,1110B,3,32777B,20000B
Execute all tests that do not require operator intervention, with message and error halts enabled.

RU,MTVER,1110B,3,77777B,20000B
Execute all tests (including manual tests) with message and error halts enabled.

RU,MTVER,1110B,3,31763B,0,−1
Execute all tests (except those with manual intervention and those containing rewind) with message and error halts enabled.

Error, Information and Directive Messages

The following is a list of Verifier Error, Information, and Directive Messages. Numbers followed by a "B" are octal numbers; all other numbers are decimal numbers. A number sign (#) indicates the position of a number supplied at run-time.

Message No.	Description
E01	DSJ is # should be #
E04	Status is #B #B #B should be #B #B #B
E05	Poll response is #B should be #B
E07	Byte # is #B should be #B
E08	EOF not found where expected
E09	EOF found where not expected
E10	Read # bytes, expected #
E11	Byte counter = #, expected #
I12	Turn power Off and On
E13	No poll response
E14	Poll response not cleared
E17	Identify is #B, should be #B
I18	Mount tape without write ring, press LOAD and ON-LINE
I22	Mount tape with write ring, press LOAD and ON-LINE
E23	Unit still on-line
I24	Put unit on-line
I25	EOT
E28	GAP command failed to move tape
E29	WRITE PROTECT status not set
E30	Tape runaway fail
E33	HP-IB time-out
I34	# Retries

Status Registers

Status Register 1
DIO Lines 1 = On-line 2 = Multiple Track Error (MTE) 3 = File Protected (Not Write Enabled; No Write Ring) 4 = Command Rejected 5 = Single Track Error (STE) 6 = End-of-Tape (EOT) 7 = Load Point (LP)/Beginning-of-Tape (BOT) 8 = End-of-File (EOF)
Status Register 2
DIO Lines 1 = Interface Busy 2 = Tape Unit Busy 3 = Rewinding 4 = Tape Runaway 5 = Data Timing Error (DTE) 6 = Selected Tape Unit LSB 7 = Selected Tape Unit MSB 8 = Reserved
Status Register 3
DIO Lines 1 = Tape Unit 0 has been placed on-line 2 = Tape Unit 1 has been placed on-line 3 = Tape Unit 2 has been placed on-line 4 = Tape Unit 3 has been placed on-line 5 = Command Parity Error 6 = Power has been restored 7 = Reserved 8 = Reserved

ICD/MAC Disk* Diagnostics

For operating instructions and error messages refer to the *ICD/MAC Disk Diagnostic Reference Manua*l (part no. 5955-4355). Use select code 25 or 27.

NOTE

ICD disks are not supported on the A-Series Computers but may be tested using MACICD. MACICD is no longer supplied with the 24398B diagnostic product rev. 5270 and later.

To load the diagnostics, insert the media containing the diagnostic and enter the appropriate bootstring.

FORM

The FORM program is an off-line, physical disk formatting utility for MAC disk drives. However, this tool requires careful use, because it is capable of erasing all LU and spare track designations.

To best use this utility, you should have a track map table and a working knowledge of track sparing and disk formatting. The track map table is found on the first page of the generation map for the system.

FORM will report any non-zero status conditions that occur due to soft errors (such as seek retries), as well as hard errors.

SP	Spare a Track
VE	Verify Tracks
RE	Reformat Tracks
MD	Mark a Track Defective
EX,EN or /E	FORM will restart and prompt TASK

* Discontinued product; shown for reference only.

DIAG

DIAG is an interactive, stand alone disk diagnostic that tests the disk through physical references to the disk and references to other control sections of the drive.

DIAG runs on A-Series systems with physical addressing. Therefore, no device specific LUs are needed.

DIAG should only be run after the completion of the system installation and after running self-test. If self-test fails, follow the troubleshooting procedure outlined in the appropriate manual. Once self-test is passed, run the verification test supplied with the system. If the system does not boot up, fails verification test, or encounters abnormal conditions, use this diagnostic. The diagnostic returns information which can be used to isolate a fault at the module level.

DIAG requires two scratch tracks for testing. Data will be destroyed on these tracks with the preamble left intact.

ERT

ERT, the Error Rate Program, is designed to run on A-Series Systems with MAC disk drives*. It should be used when the error rate of a particular disk drive and/or media is suspected to be particularly high.

As generated, no other system activity is possible. The ERT program has complete access to the system disk and data will be overwritten and lost from the physical unit/cylinder/head combinations used by the test.

Program execution is interactive and requires a certain amount of configuration.

DISCZ

DISCZ provides the capability to string up, and loop on, any combination of the discrete disc commands that are available. This provides a capability to locate suspected problems.

* Discontinued product; shown for reference only.

Operator Control Commands

?? – Help
??,xx – where xx is any command
LL,lu – change list device
CU – change unit number
LU,lu – change disk LU
LE – lock EQT of disk LU
UE – unlock EQT
SW – set display window
IB – initialize buffer
DB – display data buffer
MW – modify word
/E – exit program
CO – send comment to list device

Disk Commands

DJ – get DSJ status
ST – get status byte
SK – seek to physical address SK, cyl, head, sector
SM – set file mask
RC – recalibrate
RA – request address
AR – address record
ID – get HP-IB ID bytes
EN – end command
RD – read data
RF – read full sector
RO – read with offset
RW – read without verify
VF – verify sectors
WD – write data
WF – write full sector
IN – initialize

Program Control Commands

EP – erase program
LP – list program
SP – start program
GO – go to; allows looping within the program
N= – loop counter
nn – add line to program

HP 7974*, 7978*, 7980 Magnetic Tape Drive Exerciser

For operating instructions and error messages refer to the 7974 Exerciser Manual (part no. 24398-90007).

To run the diagnostic, insert the media containing the diagostic and enter the appropriate boot string given in the Diagnostic Media Options and Boot Commands section.

The memory based Exerciser software expects the tape drive under test to be at select code 27, HP-IB address 3, lu 7.

The Exerciser will begin execution, asking for the LU of the tape drive to be tested. The Exerciser then verifies the drive tape and displays the following warning and main menu:

NOTE

Some of these options are destructive to tape contents and require a SCRATCH tape.

```
 1   Test All
 2   Clear
 3   Identify
 4   Loopback
 5   Power-on Self-Test
 6   Status
 7   Internal Device Error Logs
20   Selectable Self-Tests
30   Selectable Tape Movement Commands
40   Selectable Tape Write Commands
45   Selectable Tape Read Commands
50   Service Utilities

 0   Exit the Exerciser

Enter the desired option number:
```

Select one of the options by number, press return, the Exerciser will proceed to execute that option. Within the option, there may be another menu to select particular functions.

* Discontinued product; shown for reference only.

Note that you can always select 0 to exit. Enter 0 in any option menu to return to the main menu. Enter 0 in the main menu to exit the Exerciser.

Error messages displayed will, in some cases, list a possible offending Field Replaceable Unit (FRU). If the option finds more than one offending FRU, the candidates will be listed in order, with the most probable offender first.

Status Registers

Status Register 1
DIO Lines 8 = End-of-File (EOF) Detected 7 = At Load Point 6 = Beyond the End-of-Tape (EOT) 5 = Error Correction or Retries Have Occurred 4 = Command Rejected – See Byte 4 3 = Loaded Tape is Write Protected 2 = Unrecoverable Data or Format Error – See Byte 5 1 = On-Line
Status Register 2
DIO Lines 8 = Reserved 7 = Unknown Density on Tape 6 = Data Parity Error 5 = Data Error (Timing) 4 = Tape Runaway 3 = Reserved 2 = Reserved 1 = Immediate Response Mode
Status Register 3
DIO Lines 8 = In PE (1600 BPI) Mode 7 = In NRZI (800 BPI) Mode 6 = Power Has Been Restored 5 = HP-IB Command Parity Error 4 = Tape Position is Unknown (Unrecovered) 3 = Tape Drive Formatter Error – See Byte 5 2 = Tape Drive Servo Error – See Byte 5 1 = Tape Drive Controller Error – See Byte 5

Status Registers (Cont.)

Status Register 4
DIO Lines 1 – 5 = Retry Count 6 – 8 = Command Rejected Error Detail 0 = No Further Detail 1 = No Further Detail 2 = Device Reject – See Byte 5 3 = Protocol Reject – See Byte 5 4 = No Further Detail 5 = Prior Error Reject – See Byte 5 6 = No Further Detail 7 = Self Test Failure
Status Register 5
This byte contains binary coded information regarding the specific error encountered.
Status Register 6
This byte is used only with transparent status messages of soft and hard errors in immediate response mode. It contains the number of commands pending at the time of the error.

Systems Modem Diagnostic

Use software revision 5010 or later. For operating instructions and error messages refer to the *Systems Modem On-Line Diagnostic Manual* (part no. 24398-90004).

To run the diagnostics, insert the media containing the diagnostic and enter the appropriate boot string given in the Diagnostic Media Options and Boot Commands section.

Before execution of the diagnostic, it is necessary to initialize the port. The 'CN' program is used for this purpose. Enter the following command from the RTE prompt.

RTE: RU,CN,P1,P2,P3

where:

P1 − modem LU (must be 10−17)

P2 − 30B

P3 − port configuration word (refer to IDM00 Control Request section, Function code 30B of the RTE-A Driver Reference Manual, part no. 92077-90011).

Bits 15-14	number of bits/char (binary code): 00 = 5 bits/char 10 = 6 bits/char 01 = 7 bits/char 11 = 8 bits/char
Bit 13	Set to 1 (specifies modem port).
Bit 12	Baud rate generator used for MUX: 1 for gen. #1 or 0 for gen. #0 Refer to the 12040 MUX Installation Manual for cable connections.
Bits 11-10	Number of stop bits 00 = reserved 10 = 1.5 bits 01 = 1 stop bit 11 = 2 stop bits
Bits 9-8	Select Parity 00 = none 10 = none 01 = odd 11 = even
Bit 7	ENQ/ACK handshake: 1 − enable 0 − disable
Bits 6-3	Baud rate; 300 or 1200 for 12040 06B = 300 07B = 1200B
Bits 2-0	Port number, must be 0-6 in binary

After initializing the port, execute TESTM in the following manner:

RTE: RU,TESTM, loglu, locsc, loccp, #test,iopt,remno,locno

where:

loglu − log Device (Default = Terminal)

locsc − Local Modem Select Code (MUX Card) (end with B for octal)

loccp − Local Modem Card Cage Port (Default = 0)

#test – Number of tests (Default = 1)

iopt – Run Option (Default = 0)
0 – for test 1 high speed local analog loop, and test 2 for low speed local analog loop.

1 – for test 1 high speed local analog loop, and test 2 for low speed local analog loop, and test 3 remote digital loop.

remno – Remote Telephone Number*

locno – Local Telephone Number*

* Add the prefix 'P' for pulsed telephones and 'T' for Touch-Tone.

Example:

RTE: RU,CN,10,30B,17227B
RTE: RU,TESTM,1,22B,2,1,0 test option 0 (local analog loop) with MUX select code = 22B, port 2, and test executed once.

or

RTE: RU,TESTM,1,22B,2,1,1,T9962178,T3360

test option 1 (local and remote loopback with MUX select code 22B, port 2, execute test once, local phone no. 3360, and remote phone number 996-2178.

Commands used for HP 37214 "Queensferry" modem card cage:

@: Take control

K: Release

H: High speed

L: Low speed

E: Enable auto answer

Y: Disable

T: Tone dialing

P: Pulse dialing

*: 2 second delay

U*: Analog loopback

V*: Digital loopback

W: Disable loopback

Vector Instruction Set (VIS) Diagnostic

This is an online diagnostic for VIS firmware (A900/A990 processor and A700* processor with the floating point card). It is supplied with RTE-A software in %VISOA. To load the diagnostic, LINK the relocatable, making sure to search $VLBA1.LIB (vector library). The run string is:

VISOD, <output lu>,<number of passes>,<EMA test>

The default will output to the terminal, run one pass, but will not execute EMA/VMA tests. To execute EMA/VMA tests, any non-zero value as the third parameter will work.

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Adjustments

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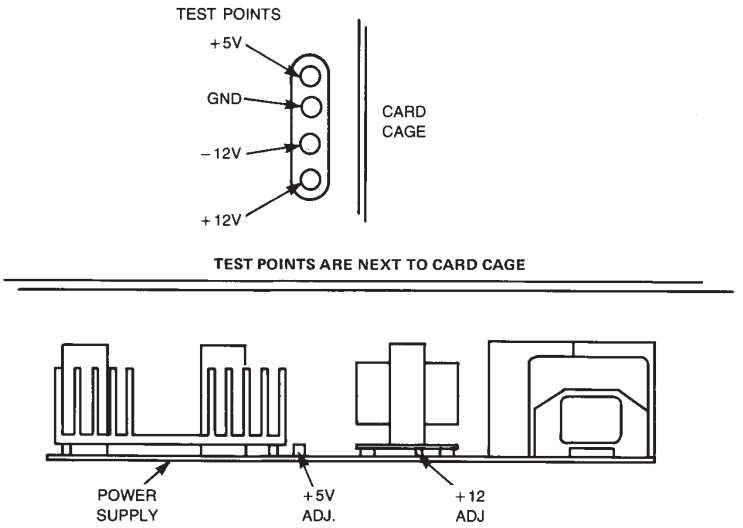
Adjustments

Model 6 Power Supply Adjustments



Voltage	Range
+5V	5.05 - 5.25
+12V	11.4 - 12.6
–12V	–11.4 - –12.8

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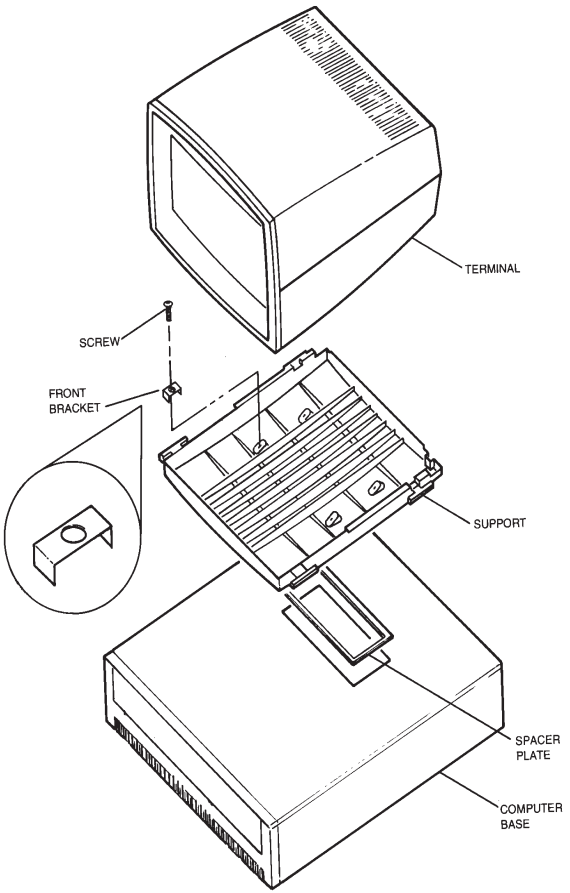
Chapter 7
Peripherals

7

Peripherals

Peripheral Installation

A600 Model 6 Terminal Installation



L8300-04

Peripheral Configuration

2392A Terminal Configuration

On the 2392A, set the baud rate as described in Table 7-1 (baud rate is dependent on the interface used). Display the terminal configuration screen labels and ensure that the rest of the configuration appears as follows:

TERMINAL CONFIGURATION

Datacomm/Ext Dev	*PORT1/PORT2*		Keyboard	*USASCII*	
Terminal Id	*2392A*		Language	*ENGLISH*	
Local Echo	*OFF*	Caps Lock *OFF*	Start Col	*01*	Bell *OFF*
XmitFunction	*NO*	SPOW(B) *NO*	InhEolWrp(C)	*NO*	Line/Page(D) *LINE*
InhHndShk (G)	*NO*	Inh DC2(H) *NO*	EscXfer(N)	*NO*	
FldSeparator	*U/S*	BlkTermntr *R/S*	ReturnDef	*C/R*	

DATACOMM CONFIGURATION

Baud Rate *9600*	Parity/DataBits *NONE/8*		
Asterisk *OFF*	Chk Parity *NO*	SR(CH) *LO*	EnqAck *YES*
RecvPace *NONE*			CS(CB)Xmit *NO*
XmitPace *U/S*			

2393/97A and 150-I/150-II Terminal Configuration

On these terminals, select the system defaults for both Datacomm and Terminal Configurations. Select HP 1000 PT.PT. Set the baud rate as described in Table 7-1 (baud rate is dependent on the interface used).

Table 7-1. Baud Rate Selection for Serial Interfaces

Serial Interface Used	Baud Rate
12005A/B	Selected by U21 switch on 12005 card.
12040B/C	9600
12040D or 12100A A400 on-board I/O	VCP speed senses and operates at the baud rate selected by the terminal if speed sense is enabled using the CPU Boot Sel switches. Default: 9600

2621A Terminal Configuration

On the 2621A, set the baud rate as described in Table 7-1 (baud rate is dependent on the interface used). Display the configuration screen labels (refer to the terminal owner's manual) and make sure the rest of the configuration appears as follows:

Baud Rate	Parity	Duplex	Straps	Handshake	Hz	Start Col	Return
9600	*NONE*	*FULL*	*bcgHxz*	*Etx*	*60*	*1*	*cr*

NOTE

Make sure the remote function label appears with an asterisk (*); the BLOCK MODE and AUTO LF function labels appear without an asterisk. For some installations the Hz should be 50 instead of 60.

It may be desirable to have CAPS LK function label appear with an asterisk, but this is not required for most HP software.

2622/23/25/26/28A Terminal Configuration

On the 2622A, set the baud rate as described in Table 7-1 (baud rate is dependent on the interface used). Display the terminal configuration screen labels and ensure that the rest of the configuration appears as follows:

Language *USASCII* FrameRate *60*
Return Def *c/r*

Local Echo *OFF* Caps Lock *OFF* Start Col *01* ASCII 8 Bits *NO*
Xmit Fnctn(A) *NO* SPOW(B) *NO* InhEolWrp(C) *NO* Line/Page(D) *Line*
InhHndShk (G) *NO* Inh DC2(H) *NO*
FldSeparator *u/s* BlkTermntr *r/s*

BaudRate *9600* Parity *NONE* EnqAck *YES*
Chk Parity *NO* SR(CH) *LO*

RecvPace *NONE*
XmitPace *NONE* CS(CB)Xmit *YES*

NOTE

For typical installations, the 2622/23 terminals can all be set to default configuration for terminal and datacomm, then the baud rate is selected as described in Table 7-1.

2624A Terminal Configuration

On the 2624A, set the baud rate as described in Table 7-1 (baud rate is dependent on the interface used). Display the terminal configuration screen labels and ensure that the rest of the configuration appears as follows:

TERMINAL CONFIGURATION

Bell	*OFF*	Click	*OFF*	FrameRate	*60*	Tab=Space	*NO*
Language	*USASCII*			Datacomm/Printer	*Port1/Port2*		
Return Def	*c/r*					PrinterNulls	*0*

Local Echo	*OFF*	Caps Lock	*OFF*	Start Col	*01*	ASCII 8 Bits	*NO*
Xmit Fnctn(A)	*NO*	SPOW(B)	*NO*	InhEolWrp(C)	*NO*	Line/Page(D)	*LINE*
InhHndShk (G)	*NO*	Inh DC2(H)	*NO*	Auto Term(J)	*NO*	ClearTerm(K)	*NO*
InhSlfTst (L)	*NO*			Esc Xfer(N)	*NO*	InhDcTst(W)	*NO*
FldSeparator	*u/s*	BlkTermntr	*r/s*	FormsBufSize(256x)			*0*

ESC) @	A	B	C	Alt Set
USASCII		LINE DRAWING		B

FORMAT MODE

Decimal Type *US*	Implied Dec Digits *2*	Transmit *All Fields*

DATACOMM CONFIGURATION

(use full duplex hardwired Port 1)

BaudRate	*9600*	Parity	*NONE*	DataBits	*8*	BufSize *128*	Clk *INT*
Asterisk	*OFF*			StopBits	*1*	EnqAck *YES*	
TR(CD)	*HI*	Chk Parity	*NO*	SR(CH)	*LO*	StrNulDel *YES*	
RecvPace	*NONE*			SRRXmit	*NO*	RR(CF)Recv *NO*	
XmitPace	*NONE*			SrrInvert	*NO*	CS(CB)Xmit *NO*	

NOTE

For typical installations, the 2622/23/24/26/27 terminals can all be set to default configuration for terminal and datacomm, then the baud rate is selected as described in Table 7-1.

293x Printer Configuration

On the 293x Printers, select the configuration below based on the interface being used:

Serial Interface:

***** DATA SETTINGS *****

BAUD RATE	DATA BITS	PARITY	PARITY CHECK	STRIP NULL
2400	*8*	*none*	*off*	*off*

***** CONTROL SETTINGS *****

XON/XOFF	ENQ/ACK	BINARY ENQ/ACK	DTR/CD	(S)RTS/SCA	CTS/CB	RS/CH
on	*off*	*off*	*High*	*Low*	*Ignore*	*Low*

HP-IB Interface:

SECONDARY COMMANDS	LISTEN ALWAYS	SERVICE REQUEST	ADDRESS
on	*off*	*off*	*6*

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Chapter 8
Replacement Parts

8

Replacement Parts

Replaceable Parts/Exchange Assemblies

Processors

A400

Part Number	Exchange Number	Description
12100-60001	12100-69001	A400 CPU/512k Mem/OBIO
12100-60005	– –	OBIO cable with breakout panel
12103-60016	12103-69016	Memory Array 512kB
12103-60004	12103-69004	Memory Array 1MB
12103-66001	12103-69101	Memory Array 2MB
12103-66002	12103-69102	Memory Array 4MB
12103-66003	12103-69103	Memory Array 8MB
12038-60005	– –	2-Connector Memory Frontplane
12038-60002	– –	3-Connector Memory Frontplane
12038-60003	– –	4-Connector Memory Frontplane

A600/A600+

Part Number	Exchange Number	Description
12101-60047	12101-69047*	A600 Processor
12105-60024	12105-69024*	A600+ Processor
12102-60009	12102-69009*	Memory Controller 128kB
12102-60010	12102-69010*	Memory Controller 512kB
12103-60015	12103-69015	Memory Array 128kB
12103-60016	12103-69016	Memory Array 512kB
12103-60004	12103-69004	Memory Array 1MB
12103-66001	12103-69101	Memory Array 2MB
12103-66002	12103-69102	Memory Array 4MB
12103-66003	12103-69103	Memory Array 8MB
12110-60003	12110-69003*	ECC Memory Controller 512kB
12110-60004	12110-69004*	ECC Memory Controller 1MB
12111-60001	12111-69001	ECC Memory Array 512kB
12111-60002	12111-69002	ECC Memory Array 1MB
12111-60003	12111-69003	ECC Memory Array 2MB
12038-60005	– –	2-Connector Memory Frontplane
12038-60002	– –	3-Connector Memory Frontplane
12038-60003	– –	4-Connector Memory Frontplane
12038-60004	– –	5-Connector Memory Frontplane

* All exchange assemblies include firmware.

A700

Part Number	Exchange Number	Description
12152-60001	12152-69001	Upper Processor
12152-60063	12152-69063*	Lower Processor
12152-60052	12152-69052*	Memory Controller
12153-60001	12153-69101	Writable Control Store
12155-60001	– –	PROM Control Store Board
12156-60037	12156-69037*	Floating Point PCA
5061-3480	– –	WCS/PCS Flex Frontpl. Conn.
12155-80002-5	– –	PCS Test PROMs
12103-60015	12103-69015	Memory Array 128kB
12103-60017	12103-69002	Memory Array 256kB
12103-60016	12103-69016	Memory Array 512kB
12103-60004	12103-69004	Memory Array 1MB
12103-66001	12103-69101	Memory Array 2MB
12103-66002	12103-69102	Memory Array 4MB
12103-66003	12103-69103	Memory Array 8 MB
12104-60001	12104-69001	ECC Memory Card 512kB
12111-60001	12111-69001	ECC Memory Array 512kB
12111-60002	12111-69002	ECC Memory Array 1MB
12111-60003	12111-69003	ECC MEmory Array 2MB
12160-60001	– –	2-Conn. Processor Frontplane
12156-60002	– –	3-Conn. Processor Frontplane
12038-60005	– –	2-Conn. Memory Frontplane
12038-60002	– –	3-Conn. Memory Frontplane
12038-60003	– –	4-Conn. Memory Frontplane
12038-60004	– –	5-Conn. Memory Frontplane

* These exchange assemblies include firmware.

A900

Part Number	Exchange Number	Description
12201-60104	12201-69104	Sequencer PCA**
12202-60002	12202-69002	Data Path PCA**
12203-60018	12203-69018	Cache Control PCA*
12204-60005	12204-69005	Memory Controller PCA
12205-60001	12205-69001	Control Store
12220-60001	12220-69001	Memory Array 768k bytes
12221-60001	12221-69001	ECC Memory Array 3M bytes
12221-66001	12221-69101	ECC Memory Array 8M bytes
12222-60001	– –	2-Connector Memory Frontplane
12222-60002	– –	3-Connector Memory Frontplane
12222-60003	– –	4-Connector Memory Frontplane
12222-60004	– –	5-Connector Memory Frontplane
12222-60005	– –	6-Connector Memory Frontplane
12222-60006	– –	7-Connector Memory Frontplane
12222-60007	– –	8-Connector Memory Frontplane
12205-60002	– –	Control Store Frontplane

* The newer cache control board (part no. 12203-60011 or 12203-60017) is needed for I/O Extender support.

** These exchange assemblies include firmware.

A990

Part Number	Exchange Number	Description
12990-60102	12990-69102	A990 CPU Card (pin and socket)
12990-60202	12990-69202	A990 CPU Card (edge connector)
1826-2068	– –	Time-of-Day Clock Chip
12990-80106	– –	Firmware EPROM Chip
12990-60020	– –	Jumper board for A900 upgrades
12220-60001	– –	768 KByte ECC Memory Card
12221-60001	– –	3 MByte ECC Memory Card
12221-66001	– –	8 MByte ECC Memory Card
12230-60001	– –	Connector to 1 Memory Card
12230-60002	– –	Connector to 2 Memory Cards
12230-60003	– –	Connector to 3 Memory Cards
12230-60004	– –	Connector to 4 Memory Cards

Box-Specific Parts Lists

Model 6 (10-Slot Box)

Part Number	Exchange Number	Description
12013-60001	12013-69001	Battery Backup Card
12021-60001	12021-69001*	Minifloppy Controller
09130-60600	09130-69600	Flexible Disc Drive
09130-66501	– –	Drive Electronics Board
– –	– –	200W Power Supply**
02142-60001	– –	8-slot system backplane
02142-60002	– –	Power Distribution board
02142-60005	– –	Power Control Assembly
02142-60012	– –	Disc Drive Power Cable
02142-60014	– –	ASIC to 262X terminal cable
3160-0294	– –	Pedestal Box Fan
8120-3354	– –	Cntrlr. to HP-IB IF Cable (short)
8120-3377	– –	Cntrlr. to disc drive ribbon cable
8120-3396	– –	Cntrlr. to HP-IB IF Cable (long)

* These exchange assemblies do not include firmware.

** Refer to Power Supply History.

Micro 14/16 (6-Slot Box)

Part Number	Exchange Number	Description
– –	– –	160W Power Supply*
02420-60001	– –	Backplane, 6-slot
02420-40001	– –	Front Cover (incl. captive screws)
3150-0511	– –	Air Filter
02420-00008	– –	Rear door (incl. captive screw)
3160-0493	– –	Fan assembly (includes cable)
2110-0010	– –	fuse, 5A 250V normal blow
2110-0565	– –	fuse holder cap

* Refer to Power Supply History.

Micro/1000 (16-Slot Box)

Part Number	Exchange Number	Description
02430-60022	– –	A4/6/700 Chassis with Power Supply
02430-60023	– –	A900 Chassis with Power Supply
– –	– –	300W Power Supply*
02430-60015	– –	A400/ A600/A700 Backplane
02430-60004	– –	A900 Backplane
1902-0939	– –	Backplane diode – 5 volt
1902-0941	– –	Backplane diode – 12 volt
02430-60009	– –	Voltage Jumper Card
02430-40001	– –	Front Cover (blank)
02430-40002	– –	Front Cover (single flexible disc drive)
3150-0459	– –	Air Filter
02430-60026	– –	PDU and Fan Assembly
3160-0420	– –	Fan
02430-00015	– –	Shroud
02430-00030	– –	Rear Left Panel
02430-00029	– –	Rear Right Panel
12154-60005	12154-69005	Battery Backup Card
12154-60002	– –	Battery Backup Cable
1420-0321	– –	Battery Pack
12159-60001	– –	25 kHz Power Module
2110-0001	– –	Fuse
12022A INTEGRATED DISC SUBSYSTEM-SPECIFIC PARTS		
0950-1639	09121-69521	3.5” Single-Sided Floppy Drive
09114-67511	09114-69511	3.5” Double-Sided Floppy Drive
09133-67102	09133-69102	10 MB Hard Disc Drive Assy, ST 412
09133-67101	09133-69101	10 MB Hard Disc Logic PCA, ST 412
09133-67104	09133-69104	15 MB Hard Disc Drive Assy, ST 419
09133-67105	09133-69105	15 MB Hard Disc Logic PCA, ST 419
09133-67206	09133-69206	20 MB Hard Disc Module, ST 225 (includes logic PCA)
12022-60008	12022-69008	Disc Drive Interface PCA
12022-60002	– –	Cable, All Hard Discs, Control
12022-60003	– –	Cable, All Hard Discs, Data
12022-60004	– –	Cable, All Hard Discs, Power
12022-60005	– –	Cable, All Flexible Discs, Control/Data
12022-60006	– –	Cable, Single-Sided Floppy, Power
12022-60010	– –	Cable, Double-Sided Floppy, Power
12122A INTEGRATED DISC SUBSYSTEM-SPECIFIC PARTS		
45816-67111	45816-69111	3.5 Winchester Disk 20 MB
09123-67101	09123-69101	3.5 Flexible Disk Drive
09153-67530	09153-69530	Controller PCA
97596-61602	– –	Ribbon Cable – HPIB to 9153 Cntrlr.
97596-61603	– –	Cable – Controller to Flexible Disk
97596-66501	– –	Power Cable to 9153 Controller
97596-04701	– –	Mounting Tray
09153-61604	– –	Cable – Controller to Hard Disk

*Refer to Power Supply History.

Model 26/27/29/99 (20-Slot Box)

Part Number	Part Number	Description
– –	– –	440W Power Supply*
12151-60024	– –	A4/6/700 Chassis with Power Supply
12210-60009	– –	A900 Chassis with Power Supply
12151-60002	– –	A400/600/700 Backplane
12210-60002	– –	A900 Backplane
1902-0939	– –	Backplane diode – 5 volt
1902-0941	– –	Backplane diode – 12 volt
29429-60006	– –	Power Distribution Unit
0950-1687 **	– –	Battery Backup Module
0950-0877 **	– –	25 kHz Module
4208-0405	– –	Filter
12151-60026	– –	Chassis
12210-00020	– –	Battery Support
12210-00009	– –	Front Deflector
5061-6642	– –	Fan Panel
12210-00022	– –	Rear Shield
12151-60009	– –	Fan Cable
12151-60006	– –	AC Filter Cable
12151-60007	– –	AC Power Cable
9135-0312	– –	Line Filter
3160-0315	– –	Fan
3160-0092	– –	Fan Guard
12151-60008	– –	Test Point Cable
5061-6652	– –	Rear Panel
3101-0402	– –	AC Power Switch
1251-4470	– –	Power Receptacle
12151-60010	– –	Battery Backup Cable
1420-0304	– –	Battery Pack
12151-60015	– –	Cable Retainer Hardware Kit

* Refer to Power Supply History.

** For Boschert power supply only, the new YEW power supply (0950-1849) has battery backup built in.

I/O Extender (12025A/B)

Part Number	Exchange Number	Description
02430-60022	– –	14-slot box without power supply
12151-60024	– –	20-slot box with power supply
12025-66001	12025-69101	I/O Control Card
12025-60002	12025-69002	Extender Control Card
12025-80003	– –	Interrupt Jumper Card for 14-slot box
12025-80004	– –	Interrupt Jumper Card for 20-slot box
12025-60007	– –	CPU-to-extender connecting cable

Note: The 12025A uses the A4/6/700 version of the 14-slot box and the 12025B uses the A4/6/700 version of the 20-slot box. Use the 14- and 20-slot box parts lists given previously in this chapter for box-related part numbers.

I/O Interface Exchange Assemblies

Product Number	Exchange Number	Description
12005A	12005-69010	Async Serial IF
12005B	12005-69012	Async Serial IF (fiber optics)
12006A	12006-69003	Parallel IF
12007B	5061-4941	HDLC Modem IF (CCITT Compatible) (PSI-Modem)
12008A	12008-69002	PROM Storage Module
12009A	12009-69020	HP-IB IF
12011A	12011-60001	Extender Board for I/O Cards
12012A	12012-60001	Priority Jumper Card
12022A	12022-69008	Integral Disc Interface
12040A/D	12040-69014	8-Channel Async MUX
12041A/B	12040-69014	8-Channel Async MUX
12042B	5061-4941	Programmable Serial Interface (PSI-Modem)
12043A	5061-4941	MRJE (PSI-Modem)
12044A	5061-3463	HDLC Direct Connect IF (PSI DIRCON)
12060A	12060-69001	Hi-Level Analog Input IF
12061A	12061-69001	32-Channel Expansion Mux
12062A	12062-69001	4-Channel Analog Output IF
12063A	12063-69001	16-IN/16-OUT Isolated Dig IF
12065A	12065-69001	Video Out
12072A	5061-4911	Data Link Slave Interface
12073A	5061-4941	Bisync Modem Interface (PSI-Modem)
12075A	5061-4941	X.25 (PSI-Modem)
12076A	12076-69001	LAN/1000 Interface
12082A	5061-3463	Bisync Direct Connect Interface (PSI-DIRCON)
12092A	5061-4941	Data Link Master (PSI-Modem)
18651B	18651-69032	Loop Control Card
37222A	37222-69101	Integral Modem

HP-IB Cables

Product/Part Number	Description
12009-60014	2-meter HP-IB Cable
10833A	1-meter HP-IB Cable
10833B	2-meter HP-IB Cable
10833C	4-meter HP-IB Cable
10833D	.5-meter HP-IB Cable

Power Supply History

Watts	Products	New Part No.	Exchange Part No.	Reason for change
160W	Micro14/16 6-slot box	0950-1792	0957-0023	Original
		0950-1822	0957-0024	Add remote AC select switch conn.
200W	Model 5,6 10-slot box	0950-0848	0950-0849	Original
		0950-0848	0950-0874	C19 could explode
		0950-0885	0957-0001	PON intermittent
300W	Micro/1000	0950-1646	0957-0004	Original
		0950-1788	0950-1806	Change to YEW.
420W	20-slot box	0950-0873	0950-0875	Original
440W*	20-slot box	0950-0893	0957-0002	25 kHz accessory
		0950-1648	0957-0002	Mechanical modif.
		0950-1671	0957-0012	need better mount
		0950-1849	0957-0028	Change to YEW.
		0950-1962	0957-0041	Screw-on bracket.
		0950-2039	0957-0047	Battery discharge.
		0950-2100	0957-0051	Fused on/off switch.

* For 440W power supply, battery jumper card is 12151-80004 and the battery backup card is 0950-1687 for the 0950-1671 power supply or before. The YEW power supply has battery backup and 25kHz built in to the supply.

12040 Multiplexer Replaceable Parts (current)

HP Part No.	Description
28658-60005	Plastic J-box
28658-63005	Cable from MUX to J-box, BRG-0 = port 0
1252-0508	Connector kit for do-it-yourself cables to new J-box
5001-5278	Mounting bracket for the plastic J-box
2110-0679	5v Fusible Link
2110-0665	±12v Fusible Link

12040 MUX Assembly Revisions History

Old Assembly	New Assembly	Old Exchange	New Exchange	Service Note
12040A:				
5061-3427	– –	5061-4906	12040-69014	N/A
12040B:				
5061-3427	12040-60003	5061-4906	12040-69003	12040B-06
12040-60003	(no change)	12040-69003	12040-69013	12040B-09
12040-60003	(no change)	12040-69013	12040-69023	12040B-11
12040-60003	12040-60014	12040-69023	12040-69014	N/A
12040C:				
12040-60003	12040-60004	12040-69023	12040-69004	12040C-01
12040-60004	12040-60014	12040-69004	12040-69014	12040C-02
12040D:				
12040-60014	12040-60114	12040-69014	(no change)	12040D-01

12040 MUX Accessories History

12040A:

Connection panel was a separate product, 12828A, consisting of:

12828-60001	MUX panel
12828-60002	Card-to-panel cable
12828-60004	Connector kit
12828-00004	Rack mount bracket

The 12828-60002 cable hood was wired for:

BRGØ = Port Ø
BRG1 = Ports 1 -7

12040B:

Same as the 12040A except the cable changed from 12828-60002 to 12040-60002. The 12040-60002 cable hood was wired for:

BRGØ = Port 7
BRG1 = Ports Ø -6

12040C/D:

The 12828A connection panel was replaced by the 28658-60005 connection panel which is not a separate product, but a component of the 12040C. The 28658-60005 consists of:

28658-60005	Mux panel
28658-63005	Interface-to-panel cable
8120-4510	17 twisted pair 24AWG cable, 3m
1251-6077	80-pin card edge connector
1252-0369	50-pin shielded connector

The 28658-63005 cable differs from the 12040-60002 cable in two ways: the 28658-63005 panel-end connector is 50 pins versus 36 pins in the 12040-60002; and the 12-volt supplies are not brought out to the connector panel, which results in a change to the RS-232 port connector wiring. Also, the baud rate generators are rewired to the original version:

BRGØ = Port Ø
BRG1 = Ports 1 -7

Note: +/− 12V is no longer available on the new 28658 box. Customers needing this voltage as a reference or control voltage only, may fabricate their own cable and bring out the voltages as needed. These voltages are not designed to provide external power for devices connected to the MUX. (Power consumption for the MUX would not be predictable.)

12076A LAN/1000 Replaceable Parts

HP Part No.	Description
12076-63001	IEEE 802.3 based LANIC Card Edge Connector Cable (Stub Cable), 1 meter
92254A	IEEE 802.3 based AUI Cable, 6 meters, with D-connector on each end
30241-60101	IEEE 802.3 based Medium Attachment Unit (MAU) assembly
0362-0819	Coaxial Cable Tap Kit
2110-0520	125 volt, 5A fuse

Power Cord and Cordset Replaceable Parts

A power cord only has a plug on one end; the other end is stripped. A cord set has a plug on both ends.

Part No.	System	Cabinet	Phase	Plug Type
8120-4280*	2196C 2197C 2199C	29431G (tall)	split phase	NEMA L14-20P
8120-4308**			–	CEE 22 (male and female ends)
8120-2517*	2196D 2197D 2199D	29429A (short)	single phase	NEMA 5-20P
8120-4308**			–	CEE 22 (male and female ends)

*Power Cord
**Cordset

A-Series Firmware History

A400 Base Set Firmware

12100-80010 (U1212)* 12100-80011 (U1312)* 12100-80012 (U1412)* 12100-80013 (U1512)*	**Revision 4000** Original Release * These parts are bundled in with the 12100-60001 A400 board.
12100-80015 (U1212)* 12100-80016 (U1312)* 12100-80017 (U1412)* 12100-80018 (U1512)*	**Revision 4000**
12100-80019 (U1212) 12100-80020 (U1312) 12100-80021 (U1412) 12100-80022 (U1512)	**Revision 4000** See S/N 12100A-04
12100-80023 (U1212)* 12100-80024 (U1312)* 12100-80025 (U1412)* 12100-80026 (U1512)*	**Revision 4000** * The supplier changed from Signetics to Cypress (see S/N 12100A-09)

A400 OBIO Firmware

12100-80002 (U304)* 12100-80002 (U504)* 12100-80002 (U704)* 12100-80002 (U804)*	**Revision 4000** Original Release (Note: SPORT reports 4.06) * These parts are bundled in with the 12100-60001 A400 board.

A400 VCP Firmware

5180-4271 (U908) 5180-4272 (U1108)	**Revision 4020** Original Release Required for D-MUX console
5180-4286 (U908) 5180-4287 (U1108)	**Revision 4020** Same as 5180-4271/72, but plastic ROMs
5181-8604 (U908) 5181-8605 (U1108)	**Revision 4021** SCSI boot capability. Included in upgrade kit 5181-8607

5181-8657	(U908)
5181-8658	(U1108)

Revision 4021
Vendor change.
Included in upgrade kit 5181-8607

A600 Minifloppy Controller

PROM 1	U73	5180-0136
PROM 2	U63	5180-0137
PROM 3	U43	5180-0144
CPU	U22	1820-2298
Cntlr	U105	1820-2456
GPIB	U12	1820-2549

A600 Base Set Firmware

12101-60001	
12101-80002	(U0706)
12101-80003	(U0806)
12101-80004	(U1006)
12101-80005	(U0506)
12101-80006	(U0606)
12101-80007	(U1106)
12101-80008	(U0906)
12101-80009	(U0305)
12101-80010	(U0505)
12101-80011	(U0605)*
12101-80012	(U0705)*
12101-80013	(U0805)*
12101-80014	(U1005)*

Revision 4000
Original Release

* These parts are bundled in with the 12101-60001 processor board. The 12101-60002 assembly no longer includes these PROMs.

12101-60001	
12101-80002	(U0706)
12101-80003	(U0806)
12101-80021	(U1006)*
12101-80005	(U0506)
12101-80006	(U0606)
12101-80007	(U1106)
12101-80008	(U0906)
12101-80009	(U0305)
12101-80010	(U0505)
12101-80011	(U0605)#
12101-80012	(U0705)#
12101-80013	(U0805)#
12101-80014	(U1005)#

Revision 4000

* Changed to fix bug. .FDIV with E-Register set returns incorrect results. (See S/N 12101A-01)

\# These parts are bundled in with the 12101-60001 processor board. The 12101-60002 assembly no longer includes these PROMs.

12101-60002	
12101-80024	(U0706)*
12101-80025	(U0806)*
12101-80027	(U1006)*
12101-80022	(U0506)*
12101-80023	(U0606)*
12101-80028	(U1106)*
12101-80026	(U0906)*
12101-80029	(U0305)*
12101-80030	(U0505)*
12101-80031	(U0605)*
12101-80032	(U0705)*
12101-80033	(U0805)*
12101-80013	(U1005)*

Revision 401

* Update 12101-60001 to 12101-60002 by removing four socketed mapping PROMs (12101-80001, 80012, 80013, and 80014). Firmware adds Data2 map instruction. (See S/N 2106AD-02)

REQUIRED TO RUN RTE-A

12101-60002	
12101-80024	(U0706)
12101-80025	(U0806)
12101-80027	(U1006)
12101-80022	(U0506)
12101-80023	(U0606)
12101-80028	(U1106)
12101-80026	(U0906)
12101-80034	(U0305)*
12101-80035	(U0505)*
12101-80031	(U0605)
12101-80032	(U0705)
12101-80033	(U0805)
12101-80013	(U1005)

Revision 401

* Changed to fix bug. .PWR2 causes Unimplemented Instruction Trap Interrupt (See S/N 2106AK-01)

12101-60002	
12101-80037	(U0706)*
12101-80025	(U0806)
12101-80027	(U1006)
12101-80022	(U0506)
12101-80036	(U0606)*
12101-80028	(U1106)
12101-80026	(U0906)
12101-80034	(U0305)
12101-80035	(U0505)
12101-80031	(U0605)
12101-80032	(U0705)
12101-80033	(U0805)
12101-80013	(U1005)

Revision 401

* Changed to fix bug. Power-Fail routine is not executed at power-fail. (See S/N 2106AK-01)

12101-60002	
12101-80040	(U0706)*
12101-80041	(U0806)*
12101-80043	(U1006)*
12101-80038	(U0506)*
12101-80039	(U0606)*
12101-80044	(U1106)*
12101-80042	(U0906)*
12101-80034	(U0305)
12101-80035	(U0505)
12101-80031	(U0605)
12101-80032	(U0705)
12101-80033	(U0805)
12101-80013	(U1005)

Revision 1001

* .FDV produces incorrect results for certain operands. (See S/N 2106AK-04)

This firmware is included in Upgrade Kits 12101-60045 and 12101-60046.

A600+ Base Set Firmware

12105-80002	(U0405)
12105-80003	(U0505)
12105-80004	(U0605)
12105-80005	(U0705)
12105-80006	(U0805)
12105-80007	(U0905)
12105-80008	(U1005)
12105-80009	(U0308)
12105-80010	(U0808)

Revision 3
Original Release

12105-80024	(U0405)*
12105-80025	(U0505)*
12105-80026	(U0605)*
12105-80027	(U0705)*
12105-80028	(U0805)*
12105-80029	(U0905)*
12105-80030	(U1005)*
12105-80009	(U0308)
12105-80010	(U0808)

Revision 4

* Changed to fix bugs. .EXIT0, .EXIT1, and EXIT2 changed to always read the CST from the code map. The JLA, JLB, and JLY instructions were altered to execute one machine cycle faster (227 ns).

A600/A600+ VCP Firmware

5180-0173	(U606)
5180-0174	(U706)

Revision 4
Original Release

5180-0189	(U606)*
5180-0190	(U706)*

Revision 6

* Changed to fix bugs. Two power-fails in quick succession may result in an incorrect auto-restart. Booting remotely over FDL causes system to hang. Erroneous parity error message if memory is lost. Also several inconveniences are fixed and enhancements added. (See S/N 12102A-01)

12102-80003	(U606)*
12102-80004	(U706)*

Revision 4001

* Changed to run with VC+. Also adds boot loaders for 1600 bpi Map Tape, 3.5" Microfloppy, and 10 MB Mini-Winchester disc. VCP size is 8K and resides in EPROM. Included in 12107A A600+ Upgrade Kit. (See S/N 2106AK-3)

5180-4253	(U606)*
5180-4254	(U706)*

Revision 4004

* Changed to fix bug. If system disc and CPU are powered up simultaneously the CPU will not auto boot. (See S/N 2106AK-6A)

5180-4263	(U606)*
5180-4264	(U706)*

Revision 4011

* Fixed Break Disable processing on the 12040B/C MUX.

5180-4271	(U606)*
5180-4272	(U706)*

Kit P/N
5180-4274

Revision 4020

* A400 release, new I/O table in VCP power-up message. Supports new serial I/O drivers introduced with RTE-A rev. 4.1.
  Required for D-MUX console.

5180-4286	(U606)
5180-4287	(U706)

Revision 4020
Same as 5180-4271/72, but plastic ROMs

5181-8604 (U606) 5181-8605 (U706)	**Revision 4021** SCSI boot capability. Included in upgrade kit 5181-8607
5181-8657 (U606)* 5181-8658 (U706)*	**Revision 4021** * Due to a vendor change included in upgrade kit 5181-8607. (See S/N 2139B-15)

A700 Base Set Firmware

12152-80011 (U91) 12152-80012 (U101) 12152-80013 (U111) 12152-80014 (U121)	Original Release
12152-80031 (U91)* 12152-80032 (U101)* 12152-80033 (U111)* 12152-80034 (U121)*	* Changed to fix bug. DDS will skip incorrectly.
12152-80035 (U91)* 12152-80036 (U101)* 12152-80037 (U111)* 12152-80038 (U121)*	* Add Code and Data Separation Instructions. Also several bugs were fixed. .LWD1 and .LWD2 are not privileged instructions. Any instruction in the A/B-Registers which causes an MP violation freezes the computer. (See S/N 2107AK-01) This firmware is included in Upgrade Kit 12152-60043. REQUIRED TO RUN VC+
12152-80053 (U91)* 12152-80054 (U101)* 12152-80055 (U111)* 12152-80056 (U121)*	**Revision 2500** (currently supported Base Set) * Changed to be compatible with the I/O Extender.

A700 Floating Point History

12156-80005	(U106)
12156-80006	(U105)
12156-80007	(U103)
12156-80008	(U102)

12156-80013	(U106)
12156-80014	(U105)
12156-80015	(U103)
12156-80016	(U102)

12156-80017	(U106)
12156-80018	(U105)
12156-80019	(U103)
12156-80020	(U102)

12156-80025	(U106)
12156-80026	(U105)
12156-80027	(U103)
12156-80028	(U102)

12156-80029	(U106)
12156-80030	(U105)
12156-80031	(U103)
12156-80032	(U102)

12156-80033	(U106)
12156-80034	(U105)
12156-80035	(U103)
12156-80036	(U102)

Currently supported FP firmware

(See S/N 2107AK-01)

A700 VCP Firmware History

5180-0173	(U15)
5180-0174	(U35)

Revision 4

Original Release

5180-0189	(U15)*
5180-0190	(U35)*

Revision 6

* Changed to fix bugs. Two power-fails in quick succession may result in an incorrect auto-restart. Booting remotely over FDL causes system to hang. Erroneous parity error message if memory is lost. Also several inconveniences are fixed and enhancements added.
(See S/N 12102A-01)

12152-80039	(U15)*
12152-80040	(U35)*
12152-80041	(U55)*
12152-80042	(U65)*

Revision 4001

* Changed to run with VC+. Also adds boot loaders for 1600 bpi Map Tape, 3.5" Microfloppy, and 10 MB Mini-Winchester disc. (See S/N 2107AK-01)

12152-80043	(U15)*
12152-80044	(U35)*
12152-80045	(U55)*
12152-80046	(U65)*

Revision 4004

* Changed to fix bug. If system disc and CPU are powered up simultaneously, the CPU will not auto boot. (See S/N 2107AK-2A)

Included in Upgrade Kit 12152-60043.

12152-80058	(U15)*
12152-80059	(U35)*
12152-80060	(U55)*
12152-80061	(U65)*

Revision 4011

* Fixed Break Disable processing on the 12040B/C MUX.

12152-80065	(U15)*
12152-80066	(U35)*
12152-80067	(U55)*
12152-80068	(U65)*

Revision 4020

* A400 release, new I/O table in VCP power-up message. Supports new serial I/O drivers introduced with RTE-A Rev. 4.1.

Included in Upgrade Kit 12152-64004.
Required for D−MUX console.

12152-80069	(U15)*
12152-80070	(U35)*
12152-80071	(U55)*
12152-80072	(U65)*

Revision 4021

* SCSI boot support. (See S/N 2139B-13)

Included in Upgrade Kit 12152-64005.

A900 Firmware History

12201-80003	(U0803)
12201-80004	(U0802)
12201-80005	(U0801)
12201-80006	(U1103)
12201-80007	(U1102)
12201-80008	(U1101)
12201-80009	(U0703)
12201-80010	(U0702)
12201-80011	(U0701)
12201-80012	(U1003)
12201-80013	(U1002)
12201-80014	(U1001)
12201-80015	(U0603)
12201-80016	(U0602)
12201-80017	(U0601)
12201-80018	(U0903)
12201-80019	(U0902)
12201-80020	(U0901)
12201-80021	(U1407)
12201-80022	(U1607)

Original Release

12201-80024	(U0803)*
12201-80025	(U0802)*
12201-80026	(U0801)*
12201-80027	(U1103)*
12201-80028	(U1102)*
12201-80029	(U1101)*
12201-80030	(U0703)*
12201-80031	(U0702)*
12201-80032	(U0701)*
12201-80033	(U1003)*
12201-80034	(U1002)*
12201-80035	(U1001)*
12201-80036	(U0603)*
12201-80037	(U0602)*
12201-80038	(U0601)*
12201-80039	(U0903)*
12201-80040	(U0902)*
12201-80041	(U0901)*
12201-80042	(U1407)*
12201-80043	(U1607)*

* Rewrite firmware to execute Code and Data Separation Instructions. Firmware change must be accompanied by a new Cache Control Board: 12203-60004.

This firmware is included in the 12203A Opt 001 Retrofit Kit.

REQUIRED TO RUN RTE-A AND VC+

12201-80024	(U0803)
12201-80044	(U0802)*
12201-80026	(U0801)
12201-80027	(U1103)
12201-80028	(U1102)
12201-80029	(U1101)
12201-80030	(U0703)
12201-80031	(U0702)
12201-80032	(U0701)
12201-80033	(U1003)
12201-80034	(U1002)
12201-80035	(U1001)
12201-80036	(U0603)
12201-80037	(U0602)
12201-80038	(U0601)
12201-80039	(U0903)
12201-80040	(U0902)
12201-80041	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

* Computer does not Power-Fail Auto-restart. When power is restored, the computer comes up in VCP mode. (See S/N 2139A-01)

12201-80045	(U0803)*
12201-80046	(U0802)*
12201-80047	(U0801)*
12201-80048	(U1103)*
12201-80049	(U1102)*
12201-80050	(U1101)*
12201-80030	(U0703)
12201-80031	(U0702)
12201-80032	(U0701)
12201-80033	(U1003)
12201-80034	(U1002)
12201-80035	(U1001)
12201-80036	(U0603)
12201-80037	(U0602)
12201-80038	(U0601)
12201-80039	(U0903)
12201-80040	(U0902)
12201-80041	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

* If negative indicies for EMA arrays are used, incorrect addresses are generated. This may appear as a Memory Protect error. (See S/N 2139A-2)

12201-80052	(U0803)*
12201-80053	(U0802)*
12201-80054	(U0801)*
12201-80055	(U1103)*
12201-80056	(U1102)*
12201-80057	(U1101)*
12201-80030	(U0703)
12201-80031	(U0702)
12201-80032	(U0701)
12201-80033	(U1003)
12201-80034	(U1002)
12201-80035	(U1001)
12201-80036	(U0603)
12201-80037	(U0602)
12201-80038	(U0601)
12201-80039	(U0903)
12201-80040	(U0902)
12201-80041	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

* Changed to fix bug. Computers with battery backup will not auto-restart. Also, a compare byte instruction (CBT) incorrectly clears the X-Register.
(See S/N 2139A-2)

12201-80060	(U0803)*
12201-80053	(U0802)
12201-80054	(U0801)
12201-80055	(U1103)
12201-80061	(U1102)*
12201-80062	(U1101)*
12201-80030	(U0703)
12201-80031	(U0702)
12201-80032	(U0701)
12201-80033	(U1003)
12201-80034	(U1002)
12201-80035	(U1001)
12201-80036	(U0603)
12201-80037	(U0602)
12201-80038	(U0601)
12201-80039	(U0903)
12201-80040	(U0902)
12201-80041	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

Revision 11

* A900 TBG runs too slow. The TBG loses approximately 24 seconds per day due to a firmware bug.
(See S/N 2139A-4)

This firmware included in Upgrade Kit 12201-60051.

12201-80060	(U0803)
12201-80053	(U0802)
12201-80054	(U0801)
12201-80055	(U1103)
12201-80061	(U1102)
12201-80062	(U1101)
12201-80063	(U0703)*
12201-80064	(U0702)*
12201-80065	(U0701)*
12201-80066	(U1003)*
12201-80067	(U1002)*
12201-80068	(U1001)*
12201-80036	(U0603)
12201-80037	(U0602)
12201-80038	(U0601)
12201-80039	(U0903)
12201-80040	(U0902)
12201-80041	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

* Changed to fix bug. Erroneous results returned when .FPWR is followed by .FAD in MACRO code. This code is generated by the FORTRAN compiler in the expression: B=2*A**3
(See S/N 2139A-6)

This firmware included in Upgrade Kit 12201-60069.

12201-80060	(U0803)
12201-80053	(U0802)
12201-80054	(U0801)
12201-80055	(U1103)
12201-80061	(U1102)
12201-80062	(U1101)
12201-80063	(U0703)
12201-80064	(U0702)
12201-80065	(U0701)
12201-80066	(U1003)
12201-80067	(U1002)
12201-80068	(U1001)
12201-80070	(U0603)*
12201-80071	(U0602)*
12201-80072	(U0601)*
12201-80073	(U0903)*
12201-80074	(U0902)*
12201-80075	(U0901)*
12201-80042	(U1407)
12201-80043	(U1607)

* Changed to fix bug. When using the .NGL instruction in MACRO to convert double precision floating point to single precision floating point, incorrect results were obtained if the instruction immediately following .NGL used address 000000 or 000001 to reference the A- or B-Registers.
(See S/N 2139A-B)

12201-80076	(U0803)*
12201-80077	(U0802)*
12201-80078	(U0801)*
12201-80079	(U1103)*
12201-80080	(U1102)*
12201-80081	(U1101)*
12201-80063	(U0703)
12201-80064	(U0702)
12201-80065	(U0701)
12201-80066	(U1003)
12201-80067	(U1002)
12201-80068	(U1001)
12201-80070	(U0603)
12201-80071	(U0602)
12201-80072	(U0601)
12201-80073	(U0903)
12201-80074	(U0902)
12201-80075	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

* Changed to fix bug. Interim bank that contains SQRT fix but not I/O Extender changes. When taking the square root of floating point numbers that had all 1's in the mantissa and exponent combinations 4*16**n, an incorrect result was obtained.

12201-80084	(U0803)*
12201-80085	(U0802)*
12201-80086	(U0801)*
12201-80087	(U1103)*
12201-80088	(U1102)*
12201-80089	(U1101)*
12201-80063	(U0703)
12201-80064	(U0702)
12201-80065	(U0701)
12201-80066	(U1003)
12201-80067	(U1002)
12201-80068	(U1001)
12201-80070	(U0603)
12201-80071	(U0602)
12201-80072	(U0601)
12201-80073	(U0903)
12201-80074	(U0902)
12201-80075	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

* Changed to fix bug. This revision contains both the SQRT fix and changes for the I/O Extender. (See S/N 2139A-9)

This firmware included in Upgrade Kit 12201-60083.

12201-80090	(U0803)*
12201-80091	(U0802)*
12201-80092	(U0801)*
12201-80093	(U1103)*
12201-80094	(U1102)*
12201-80095	(U1101)*
12201-80063	(U0703)
12201-80064	(U0702)
12201-80065	(U0701)
12201-80066	(U1003)
12201-80067	(U1002)
12201-80068	(U1001)
12201-80070	(U0603)
12201-80071	(U0602)
12201-80072	(U0601)
12201-80073	(U0903)
12201-80074	(U0902)
12201-80075	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

* Changed to fix bug. Fixed break disable problem (needed in conjunction with rev. 4011 of VCP).

See S/N 2139A-19.

This firmware is included in Upgrade Kit 12201-60090.

12201-80096	(U0803)*
12201-80097	(U0802)*
12201-80098	(U0801)*
12201-80099	(U1103)*
12201-80100	(U1102)*
12201-80101	(U1101)*
12201-80063	(U0703)
12201-80064	(U0702)
12201-80065	(U0701)
12201-80066	(U1003)
12201-80067	(U1002)
12201-80068	(U1001)
12201-80070	(U0603)
12201-80071	(U0602)
12201-80072	(U0601)
12201-80073	(U0903)
12201-80074	(U0902)
12201-80075	(U0901)
12201-80042	(U1407)
12201-80043	(U1607)

* Changed to fix Machine Check bug.

See S/N 2139A-23.

This firmware is included in Upgrade Kit 12201-60097.

12201-80103	(U0803)*
12201-80104	(U0802)*
12201-80105	(U0801)*
12201-80106	(U1103)*
12201-80107	(U1102)*
12201-80108	(U1101)*
12201-80109	(U0703)*
12201-80110	(U0702)*
12201-80111	(U0701)*
12201-80112	(U1003)*
12201-80113	(U1002)*
12201-80114	(U1001)*
12201-80115	(U0603)*
12201-80116	(U0602)*
12201-80117	(U0601)*
12201-80118	(U0903)*
12201-80119	(U0902)*
12201-80120	(U0901)*
12201-80042	(U1407)
12201-80043	(U1607)

* Changed to fix:

- self-test error after 50 or more power cycles (duplicated only with 50 Hz power).
- base relativity problem with VIS instructions.
- cross map move bytes (MBxx) instructions now work for all cases.
- self-test diagnoses incorrectly with first 1Mb bank in the 8Mb memory board; reports a single-bit error.

See S/N 2139A-30.

This firmware is included in Upgrade Kit 12201-60103.

A900 VCP Firmware History

NOTE

The old cache board, part no. 12203-60004, must have the old ROMs (prefix 12203-) and the new cache board must have the new ROMs (prefix 5180- or 5181-).

12203-80002 (U0908) 12203-80003 (U1208)	Original Release
12203-80005 (U0908)* 12203-80006 (U1208)*	**Revision 4001** * REQUIRED TO RUN RTE-A AND VC+ Included in the 12203A Opt. 001 Retrofit Kit.
12203-80007 (U0908)* 12203-80008 (U1208)*	**Revision 4001** * Add boot loaders for 1600 bpi Map Tape, 3.5" Microfloppy, and 10 MB Mini-Winchester disc. VCP is now in 8k EPROMs. (See S/N 2139A-3)
12203-80009 (U0908)* 12203-80010 (U1208)* or 5180-4253** (U0908)* 5180-4254** (U1208)*	**Revision 4004** * Change to fix bug. If system disc and CPU are powered up simultaneously, the CPU will not auto boot. (See S/N 2139A-2) ** These are new VCP ROMs used in the new A900 Cache board, part no. 12203-60011. The new board was needed for I/O Extender compatibility, and also includes field improvements. This set of ROMs is identical to those in the A600+. (See S/N 2139A-10)

12203-80012 (U0908)* 12203-80013 (U1208)* or 5180-4263** (U0908)* 5180-4264** (U1208)*	**Revision 4011** * Fixed Break Disable processing on the 12040B/C MUX. ** These ROMs are used in newer A900 Cache board, part no. 12203-60011/17/18.
12203-80015 (U0908)* 12203-80016 (U1208)* (Kit P/N 12203-64001) or 5180-4271** (U0908)* 5180-4272** (U1208)* (Kit P/N 5180-4274)	**Revision 4020** * A400 release, new I/O table in VCP power-up message. Supports new serial I/O drivers introduced with RTE-A rev. 4.1. ** These ROMs are used in newer A900 Cache board, part no. 12203-60011/17/18. Required for D-MUX console.
5180-4286 (U0908)* 5180-4287 (U1208)*	**Revision 4020** * Same as 5180-4271/72, but plastic ROMs
5181-8604 (U0908)* 5181-8605 (U1208)*	**Revision 4021** * SCSI boot capability. These ROMs are used in newer A900 Cache board, part no. 12203-60011/17/18. Included in upgrade kit 5181-8607.
5181-8657 (U0908)* 5181-8658 (U1208)*	**Revision 4021** * Due to a vendor change. These ROMs are used in newer A900 Cache board, part no. 12203-60011/17/18. Included in upgrade kit 5181-8607. (See S/N 2139B-15)

A990 Firmware History

The A990 firmware has a different structure than previous A-Series CPUs. It is composed of one EPROM that contains several pieces of code: VCP, baseset, self-test, and the configuration file for the memory/IO controller chip.

Each firmware program in the EPROM is called a product, and has a unique product ID number. The EPROM contains a directory with an entry for each product. The entry contains (among other things) the product ID and the revision number of the product. The directory also contains an entry for the entire EPROM. The entire EPROM is designated as product 0. The revision of product 0 is the revision of the entire EPROM.

This structure allows each product in the EPROM to have its own revision number. When a change is made to VCP, for example, the revision number of the VCP product must be incremented. Also, the revision number of the entire EPROM must be incremented. By looking at the revision numbers of the products in the EPROM, you can determine which products have changed in a new EPROM. You can use the HP 24612A Diagnostic "A990D" Test 5 to list the firmware revision of the A990 EPROM.

	Rev 8	**Rev 9**	
	12990-80106	**12990-80111**	
Product # (in octal)	Revision # (in octal)	Revision # (in octal)	Description
000	010	011	Entire EPROM
001	023	024	VCP
002	002	002	STST0 (Self-test module 0)
005	001	001	XILINX (memory/IO)
003	003	003	STSTC (Self-test module C)
011	002	002	STSTD (Self-test module D)
012	003	003	STSTE (Self-test module E)
013	004	004	STSTF (Self-test module F)
014	002	002	STSTG (Self-test module G)
015	004	005	STSTH (Self-test module H)
210	001	002	Baseset microcode

PSI Firmware History

12007B 1000-1000 Modem Interface
12044A 1000-1000 Direct Connect Interface

91750-80008/80009	Original HDLC firmware.
91750-80008/80021	Refer to SN 12007B-04, 12044A-07. Fixes for: 1) Intermittent timeouts 2) A-Series remote boot fails at less than 9600 baud 3) Re-transmission if CRC error occurs in last frame
5180-7233	The two 4k byte EPROMs were replaced with one 8k EPROM. Refer to SN 12007B-05, 12044A-08. Fixes for: 1) Duplicate frames 2) Deadlock and loss of communication
5181-6113 (current)	Refer to SN 12007B-09 and 12044A-10. ROM from vendor changed.

12042B OEM P.S.I

5180-1951	Self-test code only.

12043A MRJE (download)

5180-1966	Original
5180-7290	Refer to SN 12043A-05.

12072A Data Link Slave firmware

5180-1957	Original Data Link Slave firmware.
5180-1965	Refer to SN 12072A-01

5180-1974 (current)	No service note written.

12073A 1000-3000 Modem Interface
12082A 1000-3000 Direct Connect Interface

91750-80010/80011	Original BISYNC firmware.
91750-80012/80013	Refer to SN 12073A-1, 12082A-1. Fix for intermittent link failures.
91750-80016/80017	Refer to SN 12073A-2, 12082A-2. Auto re-enable capability added.
5180-7263/7264 (current)	Minor enhancement.

12075A X.25 (LAP-B) Modem Interface

5180-1975/1976	Original LAP-B firmware.
5180-7220/7221	Refer to SN 12075A-03. Data loss fix.
5180-7232	Lost frames fix and the two 4k byte EPROMs were replaced with one 8k EPROM. Refer to SN 12075A-05.
5180-7260 (current)	Refer to SN 12075A-07. Enhanced loss of communication handling.

12092A Multipoint Master Modem Interface

12092-80001/80002	Original Data Link/Multipoint Master firmware.
12092-80003/80004	Refer to SN 12092A-02.
12092-80005/80006 (current)	

12016A SCSI Firmware History

12016-80003	Original firmware (PC board part number 12016-60001).

12016-80005	PC board upgraded for reliability (new PC board P/N: 12016-60101).
12016-80009	Refer to SN 12016A-03. Added SCSI boot.

12040A/B/C MUX Firmware History

ROM Part no.	Changes
12040-80001	Original “A” version.
12040-80002	“A” version. Fixed port lockup due to powering down terminal.
5180-1970	“B” version of the product (12040B). Changes are: – round-robin buffer handling – no echo for control characters handled correctly – split baud rate groups added – character count reset fixed – cancel-all logic for parity fixed – ENQ/ACK handshake counter fixed – QTD modem box capability added – XON/XOFF added.
5180-7227	“almost-a-C” version.(Not a warranty upgrade) Changes are: – ENQ/ACK timer changed to 10 seconds – control request can force XON – ports using parity now handle terminal power-downs – BREAK on odd parity ports no longer hangs port – KATAKANA (or character with hi-bit on) no longer hangs port if = is terminator.
5180-7228	“C” version (12040C, not a warranty upgrade) The only change was to set both BRG-0 and BRG-1 to 9600 baud to simplify use of the MUX as a console.

12040D MUX Firmware History

5180-7245	Original “D” version. Changes are: – Improved performance. – Auto speed sense. – Expanded baud rate grouping. – Increased type-ahead buffer. – Mirrors HP 3000 terminal IF protocol.
5180-7262	“D” mux, revision 4.11. Changes are: Fix for port lockup caused by transparent read and zero length buffer received, that is, two carriage returns in a row.
5180-7268	“D” mux, revision 5.02. Changes are: – Data loss using TELNET fixed. – Unsolicited interrupt after aborted write request fixed. – Data loss on timeout with RD bit set in CN34B request fixed. – Fix for driver–defined error 29. – Support of QTD modem card cage.
5180-7289	“D” mux, revision 5.19. Fixes for the following symptoms: port hangs, illegal interrupts, and driver-defined errors 25, 28, and 29.
5180-7300	“D” mux, revision 5.20. Current as of September ’90. Fixes for driver-defined error 29 when configured to “Return Data on timeout”. This feature enabled by setting bit 9 in CN34B. Refer to SN 12040D-08A.

12076A LAN/1000 Interface Controller Card Firmware

U56	12076-81004	EPROM
U58	12076-81005	EPROM
U291	12076-81006	NOVRAM

12041B 8-Channel MUX OEM Version

5180-1968	Self-test/Download/Debug Monitor ROM.

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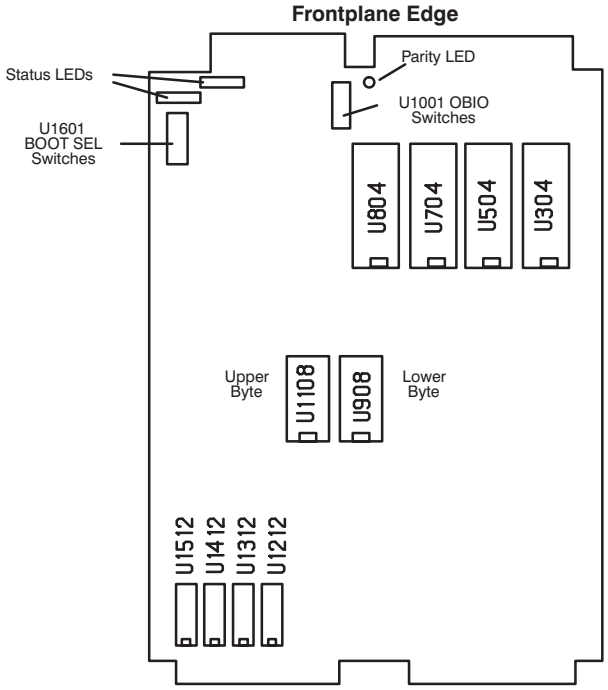
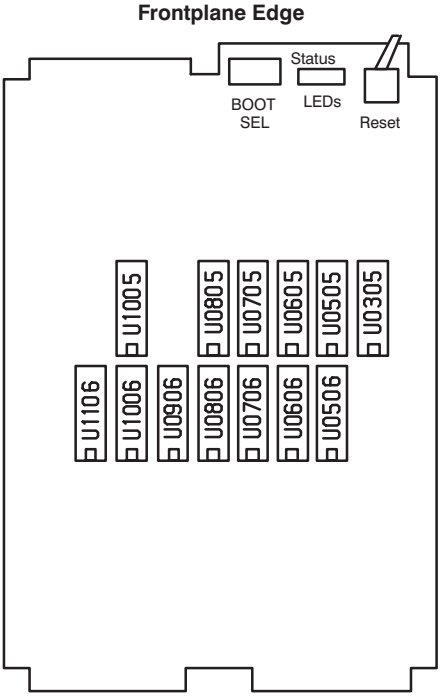
Diagrams

Refer to Firmware History for ROM part numbers.

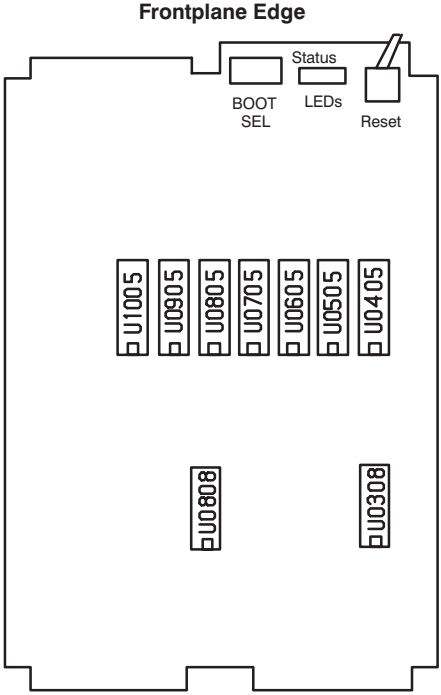
A400 Board (12100-60001)



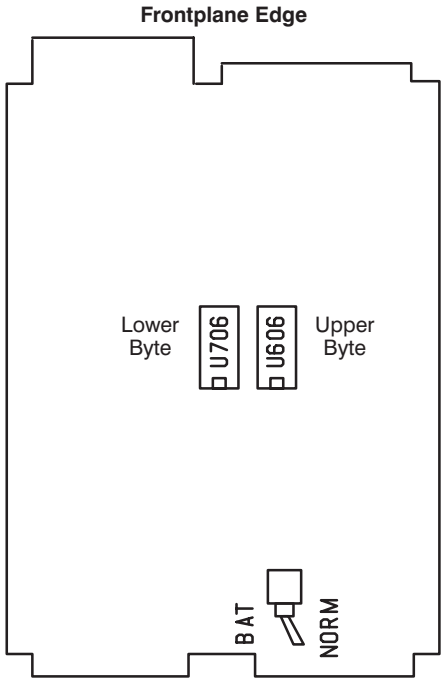
A600 Processor (12101-60001)



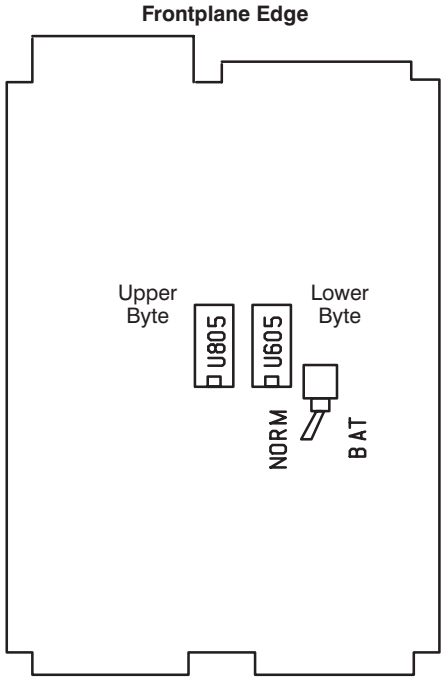
A600+ Processor (12105-60001)



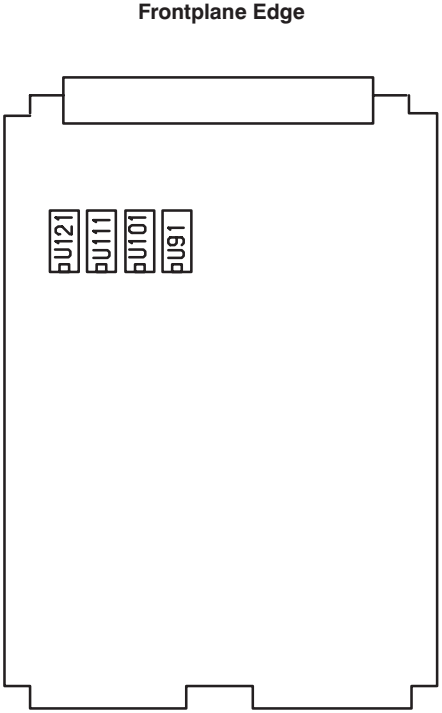
A600/A600+ Parity Memory Controller (12102-60001/60002)



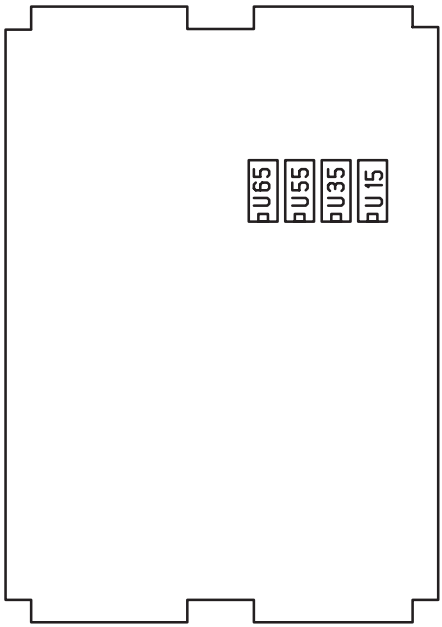
A600+ ECC Memory Controller (12110-60001/60002)



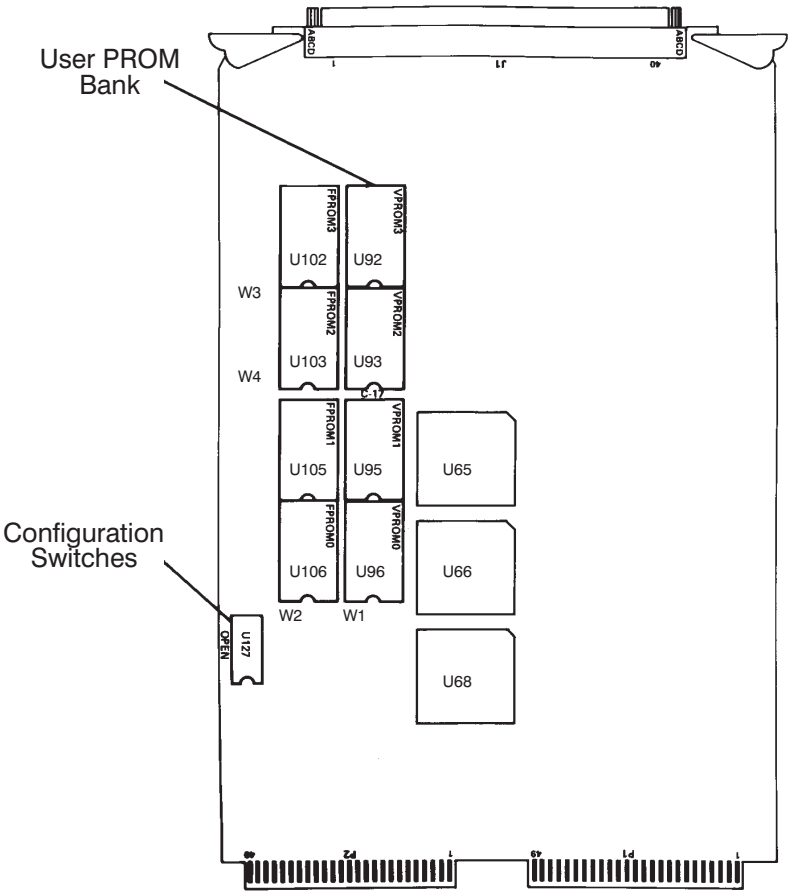
A700 Lower Processor (12152-60002)



A700 Memory Controller (12152-60003)



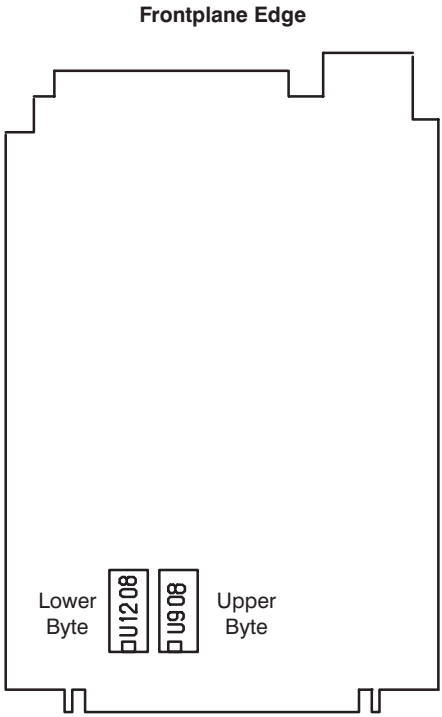
A700 Floating Point Processor (12156-60001)



Floating Point Chips

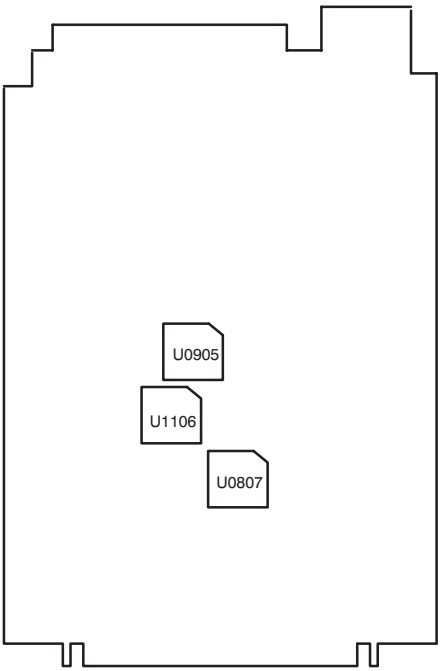
1AE7-6200	U65 (Add/Subtract)
1AH4-6200	U66 (Multiply)
1AH7-6201	U68 (Divide)

A900 Cache Control (12203-60004)



A900 Data Path (12202-60001)

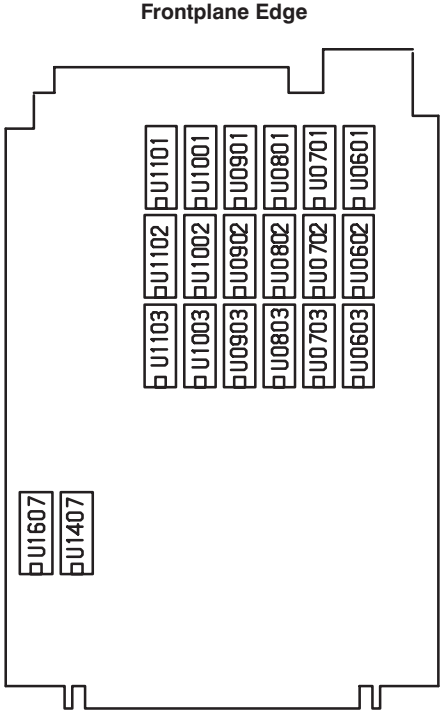
Frontplane Edge



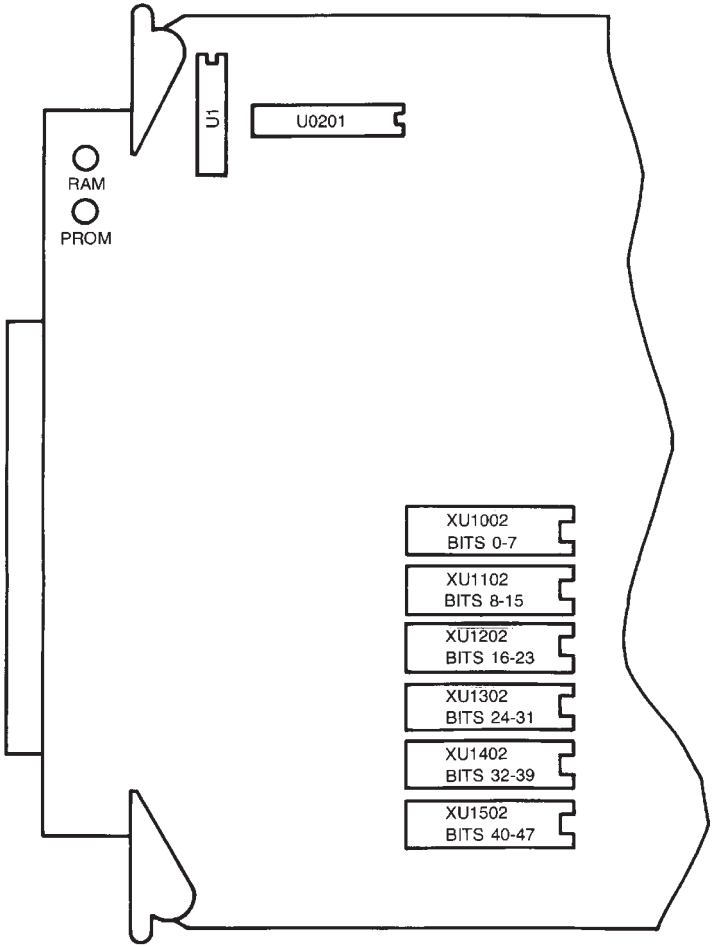
Floating Point Chips

1TT4-0501	U0807	(Multiply)
1TT5-0501	U0905	(Add/ Subtract)
1TT6-0501	U1106	(Divide)

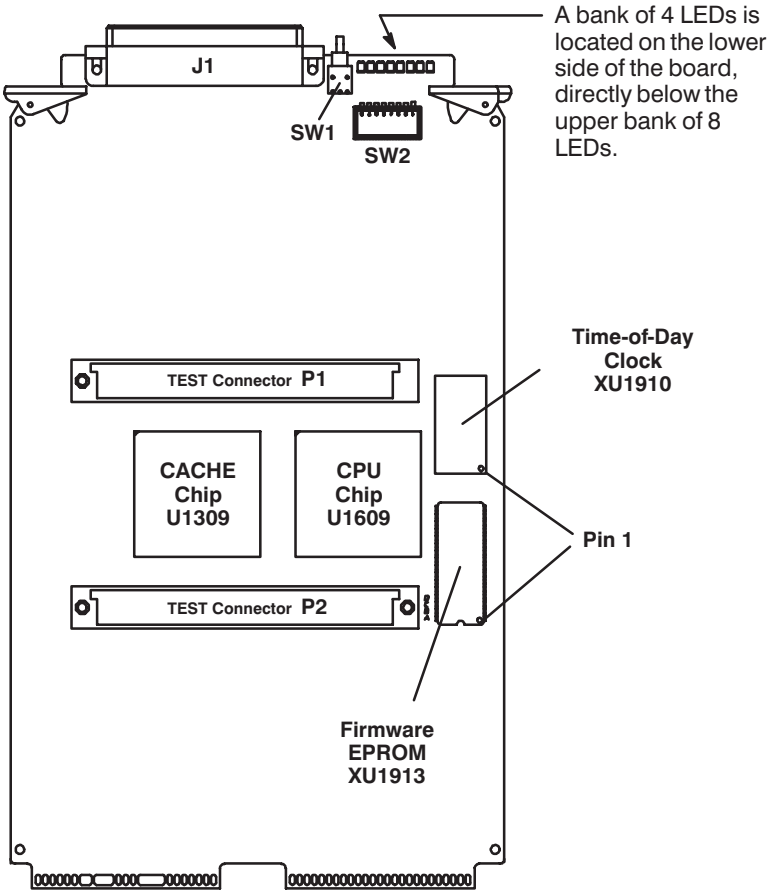
A900 Sequencer (12201-60001)



A900 Control Store (12205-60001)



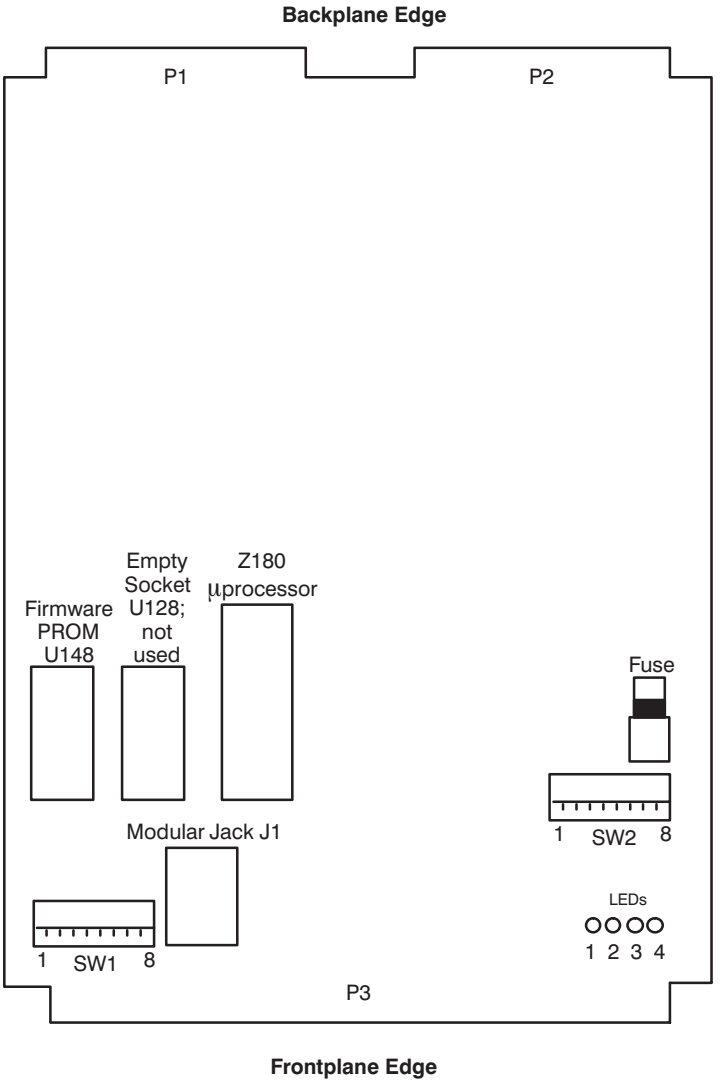
A990 Board (12990-60102 or -60202*)



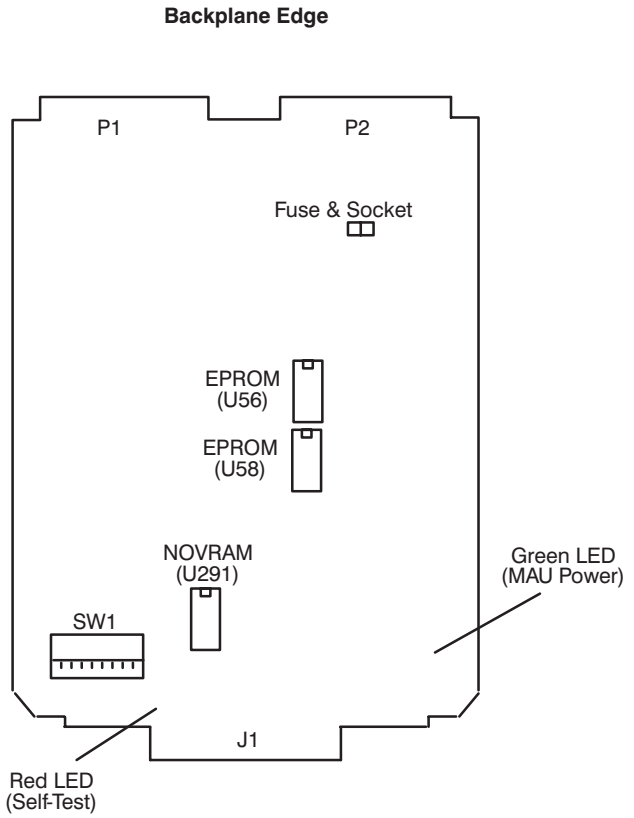
U1910 1826-2068
U1913 12990-80106

* Note that this is a diagram of the edge-connector version of the A990 CPU card (12990-60202); the pin-and-socket version (12990-60102) has a different backplane connector but an identical parts layout.

SCSI Interface Card (12016-60101)



LAN/1000 Interface Controller (12076-60001)



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Reference

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Reference

A-Series Reference Manuals

Hardware Manuals

HP 1000 A400 Computer Reference	02424-90001
HP 1000 A400 Computer Installation and Service	02134-90001
HP 1000 A400 Engineering Reference Document	02424-90003
HP 1000 A600/A600+ Computer Reference	02156-90001
HP 1000 A600 Computer Installation and Service	02156-90002
HP 1000 A600/A600+ Engineering Ref. Document	02156-90003
HP 1000 A600 Model 6 Installation and Service	02136-90001
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HP 1000 A700 User Control Store Inst. and Service	02137-90003
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HP 92045A Microprogramming Reference	92045-90001
HP 1000 A900 Computer Reference	02139-90001
HP 1000 A900 Computer Installation and Service	02139-90002
HP 1000 A900 Engineering Reference Document	02139-90003
HP 1000 A990 Computer Reference	02959-90001
HP 1000 A990 Upgrade Installation and Service	12990-90011
HP 1000 A990 20-Slot Installation and Service	02959-90002
HP 1000 A990 16-Slot Installation and Service	02939-90001
HP 92049A Microprogramming Reference	92049-90001
HP 1000 Model 26/27/29 Installation and Service	02196-90002
HP Micro 14/16 Computer Installation and Service	02420-90001
HP Micro/1000 System/Computer Inst. and Service	02430-90001
HP 12025A/B Input/Output Extender Support	12025-90001
HP 1000 A-Series I/O Interfacing Guide	02103-90055

Software Manuals

Getting Started with RTE-A	92077-90039
RTE-A User's Manual	92077-90002
RTE-A Utilities	92077-90004
RTE-A Programmer's Reference	92077-90007
RTE-A LINK	92077-90035
RTE-A Driver Reference	92077-90011
RTE-A System Design	92077-90013
RTE-A Driver Designer's	92077-90019
RTE-A System Generation and Installation Guide	92077-90034
RTE-A Quick Reference Guide	92077-90020
RTE-A Index and Glossary	92077-90036
RTE-A and RTE-6/VM Relocatable Libraries	92077-90037
RTE-A Primary System Installation	92077-90038
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HP 12005A Asynchronous Serial IF Reference	12005-90001
HP 12005B Asynchronous Serial IF Reference	12005-90002
HP 12006A Parallel Interface Reference	12006-90001
HP 12007A HDLC MODEM Interface Reference	12007-90001
HP 12008A PROM Storage Module Reference	12008-90001
HP 12009A HP-IB Interface Reference	12009-90001
HP 12016A SCSI Host Bus Adapter Inst. and Reference	12016-90001
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HP 12041B Downloadable MUX Reference	12041-90001
HP 12042A Programmable Serial IF Reference	12042-90001
HP 12044A HDLC Direct Connect IF Reference	12044-90001
HP 12060A Analog to Digital IF Reference	12060-90001
HP 12062A Digital to Analog IF Reference	12062-90001
HP 12063A Isolated Digital IF Reference	12063-90001
HP 12065A Color Video Output IF Reference	12065-90001
HP 12072A Data Link Slave IF Reference	12072-90001
HP 12076A LAN/1000 Link Installation Manual	12076-90001
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Diagnostic Operating and Troubleshooting	24612-90013
Diagnostic Design Language Prog Reference	24612-90015
Kernel Diagnostics Reference	24612-90017
Introduction to HP 1000 A-Series Diagnostics	24612-90010
Interface Diagnostic Reference	24612-90011*
HP 7970E HP-IB 1000 A/L-Series Verifier	07970-90908
7970E and Systems Modem Diag Reference	24398-90008**
CS/80 External Exerciser	5955-3462
ICD/MAC Disc Diagnostic Reference	5955-4355
7974/7978 Tape Drive A-Series Exerciser	5958-9137†

* This manual contains the contents of the following manuals that have been discontinued:

HDLC Interface Diagnostic Reference	24600-90001
Data Link Slave Interface Diagnostic Reference	24600-90002
Analog to Digital Interface Diagnostic Reference	24601-90001
Digital to Analog Interface Diagnostic Reference	24601-90002
Isolated Digital Interface Diagnostic Reference	24601-90003
MUX Interface Diagnostic Reference	12040-90003
Interface Diagnostics Reference	24612-90004

** This manual contains the contents of the following manuals that have been discontinued:

System Modem Diagnostic Reference	24398-90004
Micro-Flexible Disc Diagnostic	24398-90005
Loading Your 24398B Diagnostic from Mag Tape	24398-90006

† This manual was previously Part No. 24398-90007.