

# HP 1000 Computer Systems



## HP 1000 A-Series Computer Interfaces Technical Data



# Documentation Map for HP 1000 Data Books

I/O ARCHITECTURE	DISTRIBUTED INTELLIGENCE	CENTRALIZED INTELLIGENCE
SERIES	A	E/F
SYSTEMS AND COMPUTERS	HP 1000 Hardware, Software, and Peripherals Ordering Guide	
HARDWARE	HP 1000 A-Series Hardware Technical Data Book	HP 1000 E/F-Series Hardware Technical Data Book
INTERFACES	HP 1000 A-Series Interfaces Summary	HP 1000 E/F-Series Interfaces Summary
SOFTWARE	HP 1000 Computer Systems Software Technical Data Book, Volumes I and II	
COMMUNICATIONS	HP 1000 Data Communications Software Technical Data Book	

## HP 1000 A/L-Series Systems

This booklet provides data on the interfaces that are available for use in HP 1000 A/L-Series Computer Systems in compact tabular summary form. For convenience in locating needed data, the interfaces summary table is

divided into several different headlined subsections. In addition, the interfaces and related accessories can be located by the alphabetical and product number indexes below.

## Alphabetical Index

Product Name	Page
Analog Output Card (12062A)	13
Asynchronous Serial Interface (12005B)	4
Breadboard Interface (12010A)	15
Cable kit with connectors for user-fabricated DS/1000-IV direct connect cable (91714A)	8 & 9
Color Video Interface Card (12065A)	15
Data Link Master Interface (12092A)	6
Data Link Slave Interface (12072A)	6
Digital I/O Card (12063A)	13
Direct Driver Access (manual) (12079A)	9
DS/1000-IV Extension Cable (91712A)	8 & 9
DS/1000-IV Interfaces to HP1000 (12007B, 12044A)	7 & 8
DS/1000-IV Interfaces to HP3000 (12073A, 12082A)	8 & 9
Eight-Channel Multiplexer Card (12040C)	4
Expansion Multiplexer Card (12061A)	13
Extender Card (12011A)	15
Extension cable for 12044A/12087A (9171xA)	8 & 9
High-Level Analog Input Card (12060B)	12
HP-IB Extender Card (37203L)	12
HP-IB Interface (12009A)	11
IBM/Plug Compatible Sys (modem) Interface (12043A)	6
Integral Modem Card (37222A)	5
LAN/1000 Link Interface (12076A)	9
Measurement & Control Cables (1206xAC/BC)	14
Multi-Use 8-Channel Multiplexer (12041A)	5
Pair of connectors for user-fabricated DS/1000-IV extension cable (91713A)	8 & 9
Parallel Interface (12006A)	14
Priority Jumper Card (12012A)	15
Programmable Serial Interface (12042B)	10
PROM Storage Module (12008A)	15
PSIF Development Package (24602A)	11
Termination Assembly (12064A)	14
X.25 Network Interface (12075A)	7

## Product Number Index

Product No. & Name	Page
12005B Asynchronous Serial Interface	4
12006A Parallel Interface	14
12007B DS/1000-IV Modem Interface to HP 1000	7
12008A PROM Storage Module	15
12009A HP-IB Interface	11
12010A Breadboard Interface	15
12011A Extender Card	15
12012A Priority Jumper Card	15
12040C Eight-Channel Multiplexer Card	4
12041A Multi-Use 8-Channel Multiplexer Card	5
12042B Programmable Serial Interface	10
12043A IBM/Plug-Compatible System Interface	6
12044A DS/1000-IV Dir Conn Interface to HP 1000	8
12060B High-Level Analog Input Card	12
12061A Expansion Multiplexer Card	13
12062A Analog Output Card	13
12063A Digital I/O Card	13
1206x AC/BC Measurement and Control Cables	14
12064A Termination Assembly	14
12065A Color Video Output Interface	15
12072A Data Link Slave Interface	6
12073A DS/1000-IV Modem Interface to HP 3000	8
12075A X.25 Network Communications Interface	7
12076A LAN/1000 Link Interface	9
12079A Direct Driver Access (manual)	9
12082A DS/1000-IV Dir Conn Interface to HP 3000	9
12092A Data Link Master Interface	6
24602A PSIF Development Package	11
37203L HP-IB Extender Card	12
37222A Integral Modem Card	5
91712A DS/1000-IV extension cable	8 & 9
91713A Pair of connectors for user-fabricated DS/1000-IV extension cable	8 & 9
91714A Cable kit with connectors for user-fabricated DS/1000-IV cable	8 & 9

Interfaces summary

Table 1. HP 1000 A-Series Interfaces Summary

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)																																		
RECOMMENDED TERMINAL INTERFACES AND ACCESSORIES																																				
<p>12005B</p> <p>-001</p> <p>-002</p> <p>-003</p> <p>-004</p> <p>-005</p>	<p>ASYNCHRONOUS SERIAL INTERFACE. Software support includes RTE-A interface drivers ID.00 and ID.01, and device drivers DD.00 (keyboard-display I/O) and D.20 (mini-cartridge I/O). The interface includes:</p> <ol style="list-style-type: none"> <li>12005-60012 interface.</li> <li>12005-90002 installation and ref manual.</li> <li>5061-5798 15m (49.2 ft) fiber optic cable.</li> </ol> <p>5061-6604 5m (16.4 ft) filtered cable for terminals using 50-pin connector instead of standard cable.</p> <p>5061-6605 5m (16.4 ft) filtered cable for terminals with a 25-pin DB25P male RS-232-C DTE connector, instead of standard cable.</p> <p>12005-60004 5m (16.4 ft) RS-232-C cable for modems using a 25-pin male connector instead of standard cable.</p> <p>12005-60005 5m (16.4 ft) cable for 264x terminals (using hooded connector) instead of standard cable.</p> <p>Adds 5061-5800 fiber-optic interface for terminals using 50-pin connectors.</p> <p>NOTE: If the intended terminal does not include a built-in fiber-optic interface, ONE of Options 001 through 005 MUST be ordered.</p>	<p>EIA COMPLIANCE: The 12005B interface complies with EIA Standards RS-232-C, RS-422, RS-423, and RS-449, as summarized below, and equivalent international standards.</p> <table border="1" data-bbox="812 504 1461 672"> <thead> <tr> <th>EIA Std</th> <th>Driver-Receiver Type</th> <th>Maximum Cable Length</th> <th>Maximum Data Rate</th> </tr> </thead> <tbody> <tr> <td rowspan="2">RS-232-C</td> <td>Single-Ended</td> <td>15.24m (50 ft)</td> <td>20k baud</td> </tr> <tr> <td>Differential</td> <td>12.19m (40 ft)</td> <td>10M baud</td> </tr> <tr> <td rowspan="2">RS-423</td> <td>Single-Ended</td> <td>1219m (4000 ft)</td> <td>100k baud</td> </tr> <tr> <td>Differential</td> <td>1219m (4000 ft)</td> <td>100k baud</td> </tr> <tr> <td rowspan="2">RS-449</td> <td>Single-Ended</td> <td>60.96m (200 ft)</td> <td>1k baud</td> </tr> <tr> <td>or Differential</td> <td></td> <td>2M baud</td> </tr> </tbody> </table> <p>SERIAL DATA TRANSFER FORMAT:</p> <table border="1" data-bbox="812 714 1461 861"> <thead> <tr> <th>Parity</th> <th>8-Bit Character Length</th> <th>7-Bit Character Length</th> </tr> </thead> <tbody> <tr> <td>ON</td> <td>Send 7 + 1 Parity Bit Rec. 7 + 1 Parity Bit</td> <td>Send 7 + 1 Parity Bit Rec. 7 + 1 Parity Bit &amp; strip parity from data</td> </tr> <tr> <td>OFF</td> <td>Send 8 bits Receive 8 bits</td> <td>Send 8 bits Receive 8 bits and strip 8th bit from the data</td> </tr> </tbody> </table> <p>INTERFACE-CLOCKED RATES: 50, 75, 110, 134.5, 150, 300, 600, 900, 1200, 1800, 2400, 3600, 4800, 7200, 9600 and 19200 baud (bits/sec), selected by switches on the interface.</p> <p>EXTERNALLY-CLOCKED RATE: Up to 56k baud as determined by terminal or other serial device interfaced by the 12005B.</p> <p>CHARACTER BUFFERING: Two characters.</p> <p>TELEPRINTER INTERFACE: A 20mA current loop interface that can run at up to 110 baud, (bits/sec) is provided for interfacing to teleprinters via a user-fabricated cable.</p> <p>VIRTUAL CONTROL PANEL SUPPORT: The 12005B interface can be set to support a terminal that will function as the Virtual Control Panel of the A/L-Series Computer.</p> <p>DMA ACCESSIBILITY: The 12005B can directly access memory under control of its I/O master processor regardless of how many other interfaces are also directly accessing memory.</p> <p>TERMINATION OF INDETERMINATE LENGTH TRANSFERS: A special character recognition capability can be set up to terminate DMA transfers automatically when a specified character is encountered. In this way, receipt of a carriage return, for example, can be used to terminate block transfers from terminals regardless of block length.</p> <p>BREAK DETECTION: Hardware break detection.</p> <p>MODEM COMPATIBILITY: The 12005B interface with supporting driver ID.00 and ID.01 is compatible with Bell Type 103 and 212 Data Sets and equivalent modems.</p>	EIA Std	Driver-Receiver Type	Maximum Cable Length	Maximum Data Rate	RS-232-C	Single-Ended	15.24m (50 ft)	20k baud	Differential	12.19m (40 ft)	10M baud	RS-423	Single-Ended	1219m (4000 ft)	100k baud	Differential	1219m (4000 ft)	100k baud	RS-449	Single-Ended	60.96m (200 ft)	1k baud	or Differential		2M baud	Parity	8-Bit Character Length	7-Bit Character Length	ON	Send 7 + 1 Parity Bit Rec. 7 + 1 Parity Bit	Send 7 + 1 Parity Bit Rec. 7 + 1 Parity Bit & strip parity from data	OFF	Send 8 bits Receive 8 bits	Send 8 bits Receive 8 bits and strip 8th bit from the data
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RS-232-C	Single-Ended	15.24m (50 ft)	20k baud																																	
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<p>12040C</p> <p>-002</p> <p>-003</p>	<p>8-CHANNEL ASYNC MULTIPLEXER with RS-232-C connector panel. Software support includes interface driver ID.M00, device driver DD.00, and Minicartridge driver DD.20, which are furnished in the RTE-A and RTE-L/XL operating systems. The interface includes:</p> <ol style="list-style-type: none"> <li>12040-60004 8-channel interface assy.</li> <li>28658-60005 RS-232-C multiplexer panel.</li> <li>12040-90022 interface manual.</li> <li>28658-63005 3m (10 ft.) RS-232 Cable.</li> <li>5001-5278 rack mounting bracket (supports two multiplexer panels).</li> <li>1252-0508 multiplexer cable extender kit for user-fabricated extension cable.</li> <li>12828-60002 3m (10 ft) interface cable.</li> </ol> <p>Deletes connector panel, including items 2, 4, 5, and 6, above, while retaining item 7 for connection to the 37214A Systems Modem.</p> <p>5061-3467 edge connector kit instead of items 2, 4, 5, and 6, above.</p>	<p>CAPACITY: Up to 8 full-duplex comm channels connected via eight 25-pin EIA connectors on RS-232-C MUX Panel.</p> <p>BUFFERING: Two 254-byte transmit buffers and two 254-byte receive buffers for each channel.</p> <p>INTERFACE LEVEL: RS-423-A, RS-232-C and CCITT V.24.</p> <p>PROGRAM-SELECTABLE data rates: 50, 75, 110, 134.5, 150, 300, 1200, 2400, 3600, 4800, 9600, and 19200 bits/second.</p> <p>AGGREGATE THROUGHPUT CAPACITY: 69,000 bits/sec per interface, attainable for short bursts. For continuous throughput, baud rate or number of channels must be reduced to avoid input data loss. No data loss is experienced on output, but the full data rate may not be achieved.</p> <p>COMMUNICATION MODE: Asynchronous, bit-serial.</p> <p>MAXIMUM MULTIPLEXER TO TERMINAL CABLE LENGTH: 91m (300 ft.) from multiplexer card to panel, thence 15.2m (50 ft.) from</p> <p>OTHER PROGRAMMABLE COMMUNICATIONS PARAMETERS: Character length from 5 to 8 bits; start, stop, and parity.</p>																																		

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)															
RECOMMENDED TERMINAL INTERFACES AND ACCESSORIES (CONTINUED)																	
12040C	8-CHANNEL ASYNC MULTIPLEXER, continued	<p>VIRTUAL CONTROL PANEL SUPPORT: Port zero of the 12040C multiplexer can be set to support a terminal that will function as the Virtual Control Panel of the A-Series Computer.</p> <p>MODEM SUPPORT: The 12040C Multiplexer supports modem control when used with the 37214A Systems Modem and appropriate 3721xA Modem or Modem interface cards with 12040C, Opt 002.</p> <p>MULTIPLEXER PANEL MOUNTING: The multiplexer panel may be rack mounted using included hardware bracket (two panels per bracket) or may be used standing on its own rubber feet on a desk, table, or shelf.</p> <p>DEVICE CONNECT CABLES:</p> <ul style="list-style-type: none"> <li>13232A M,N,Y: 4.6m (15 ft) cable to 264x terminal.</li> <li>13222M,N,Y: 5m (16 ft) cable to 262x terminal.</li> <li>13242N,Y: 4.6m (15 ft) cable to 239xA terminal.</li> <li>263xB incl.: 3.6m (12 ft) cable to 263xB terminal.</li> <li>30062B*: 7.6m (25 ft) cable to modem.</li> <li>30062B+001*: 15.2m (50 ft) cable to modem.</li> <li>30062C*: 7.6m (25 ft) extension cable.</li> <li>30062C+001*: 15.2m (50 ft) extension cable.</li> </ul> <p>* 30062x cables are not recommended for use in electrically noisy environments.</p>															
12041A	<p>MULTI-USE 8-CHANNEL MULTIPLEXER for use with 94200B/94202A/94204A/94205A Programmable Controller Interface/1000 (PCIF/1000) software operating under RTE-A. The 12041A interface includes:</p> <ol style="list-style-type: none"> <li>1. 12041-60002 8-Channel interface assy.</li> <li>2. 5180-1968 download monitor EPROM.</li> <li>3. 5001-5278 mounting bracket (supports two multiplexer panels).</li> <li>4. 28658-60005 RS-232-C multiplexer panel.</li> <li>5. 28658-63005 3m (10 ft.) interface cable.</li> <li>6. 1252-0508 multiplexer cable extender kit for user-fabricated extension cable.</li> <li>7. 5061-4901 diagnostic hood.</li> <li>8. 12040-90001 interface reference manual.</li> </ol>	<p>CAPACITY: Up to 8 ports per multiplexer.</p> <p>BUFFERING: Two 254-byte transmit buffers and two 254-byte receive buffers for each channel.</p> <p>INTERFACE LEVEL: RS-232-C and CCITT V.24.</p> <p>PROGRAM-SELECTABLE DATA RATES: 50, 75, 110, 134.5, 150, 300, 1200, 2400, 3600, 4800, 9600, and 19200 bits/second.</p> <p>COMMUNICATION MODE: Asynchronous, bit-serial.</p>															
-003	5061-3467 edge connector kit instead of items 3 through 7, above.																
37222A	<p>INTEGRAL MODEM CARD for terminal communication via direct connection to telephone line and remote modem from A-Series system operating under RTE-A or L-Series system operating under RTE-XL or RTE-L. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 37222-60001 plug-in modem card.</li> <li>2. 37222-60002 telephone line connector module.</li> <li>3. 37222-80001 firmware ROM.</li> <li>4. IAF5-6001 I/O processor chip.</li> </ol> <p>MODEM-TO-TELEPHONE LINE ACCESSORY CABLES</p> <p>15561A 2.1m (7 ft) modem telephone cable with Bell modular telephone jack.</p> <p>15562A 3m (9.8 ft) modem telephone cable w/British Telecom modular telephone jack.</p> <p>15563A 3m (9.8 ft) modem telephone cable with spade terminals.</p>	<p>COMMUNICATION MODES: Full-duplex, asynchronous data on dial-up lines, Bell 212A/103/113 compatible.</p> <table border="0"> <tr> <td>Modes:</td> <td>212A/V.22 mode</td> <td>103/113 mode</td> </tr> <tr> <td>Data Rates:</td> <td>1200 bps</td> <td>300 bps</td> </tr> <tr> <td>Trans Rate Tol:</td> <td>+/-0.01%</td> <td>+/-0.01%</td> </tr> <tr> <td>Rec Rate Tol:</td> <td>+1%/-2.5%</td> <td>+/-4%</td> </tr> <tr> <td>Modulation Type:</td> <td>Four-phase differential phase shift keyed</td> <td>Binary phase coherent frequency shift keyed</td> </tr> </table> <p>CHARACTER LENGTH: 10 bits (1 start bit, 8 data bits, 1 stop bit).</p> <p>TRANSMIT LEVEL: -9 dBm maximum (600 ohm impedance) allowing permissive connection as defined in Part 68 of FCC Rules.</p> <p>V.22 GUARD TONE: 180 Hz, 6 dB below main power level, switchable.</p> <p>V.22 CALLING TONE: Single tone 0.5s on, 4s off, switchable.</p> <p>AUTO-DIAL: 10 +/-1 pps pulse dial rate with 39% make/61% break duty cycle in North America, 33% make/67% break duty cycle in U.K., switch-selectable, 4 second pre-dial delay, and 3 second minimum delay between completion of one call and start of the next.</p> <p>AUTO-REDIAL: 0 to 8 redials, programmable, before failure report, 60 seconds between successive redials, 40 second failed call delay after last digit dialed.</p>	Modes:	212A/V.22 mode	103/113 mode	Data Rates:	1200 bps	300 bps	Trans Rate Tol:	+/-0.01%	+/-0.01%	Rec Rate Tol:	+1%/-2.5%	+/-4%	Modulation Type:	Four-phase differential phase shift keyed	Binary phase coherent frequency shift keyed
Modes:	212A/V.22 mode	103/113 mode															
Data Rates:	1200 bps	300 bps															
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## Interfaces summary

**Table 1. HP 1000 A-Series Interfaces Summary, continued**

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
RECOMMENDED TERMINAL INTERFACES AND ACCESSORIES (CONTINUED)		
37222A	INTEGRAL MODEM CARD, continued	<p>TANDEM DIALING: Pauses may be inserted in the dialing sequence to allow dialing through a PBX.</p> <p>AUTO-ANSWER: Automatic speed detection of the calling modem and configuration of computer port speed with a minimum of one ring cycle ring detect delay.</p> <p>AUTO-DISCONNECT: Auto-answer mode disconnects after 16-18 seconds if no carrier is received. Auto-dial mode disconnects in 40 seconds after last digit dialed if no answer is received. Loss of carrier for 1.2 seconds results in disconnect; drop-outs shorter than 1 second are ignored. Replacement of carrier by voice or tone causes disconnect within 15 seconds after start of false signal, a response that is switchable.</p>
DS/1000-IV DATA LINK MASTER AND SLAVE INTERFACES		
12092A  -001	<p>DATA LINK MASTER INTERFACE for use with 91732A data link software operating under RTE-A. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 5061-4912 interface card.</li> <li>2. 12092-80001 and -80002 ROMs.</li> <li>3. 5061-4914 5m (16.4 ft) interface cable.</li> <li>4. 5061-4916 PSI diagnostic test hood.</li> <li>5. 5955-7632 12092A firmware manual.</li> <li>6. 12042-91001 programmable serial interface manual.</li> </ol> <p>Provides the latest data link ROMs and firmware manual (deletes other parts of interface).</p>	<p>COUNTERPART SLAVE INTERFACE: 12072A in A-Series computer or 12830A in M/E/F-Series computer.</p> <p>INTERNALLY-CLOCKED, SWITCH SELECTABLE DATA RATES: 300, 600, 1200, 1800, 2400, 4800, 9600, and 19200 bits/second. 19200 bits/second rate is supported only in data link configuration, not in multipoint configuration.</p> <p>PHYSICAL INTERFACE: EIA RS-449, RS-232-C, and CCITT V.28, 5V differential voltage level with 120V dc isolation from ground.</p> <p>MESSAGE PROTOCOL: Asynchronous HP Multipoint, similar to IBM Bisync.</p> <p>NUMBER OF DEVICES: Up to 64.</p> <p>MESSAGE BLOCK SIZE: 16 to 2032 characters.</p> <p>CHARACTER BUFFERING: Two 2032 byte input buffers and three 2032 byte output buffers.</p>
12072A  -001	<p>DATA LINK SLAVE INTERFACE. Support for data link communications is included in 91750A network software. The 12072A interface includes:</p> <ol style="list-style-type: none"> <li>1. 5061-4904 interface card.</li> <li>2. 5180-1974 ROM, 1818-1114 RAM, and 1AF5-6001 I/O processing chip.</li> <li>3. 5061-4903 twin 5m (16.4 ft) cable terminated with HP 1000 hood connector and 6-contact male connector.</li> <li>4. 12072-90001 interface manual.</li> </ol> <p>Provides latest firmware update ROM.</p>	<p>COUNTERPART MASTER INTERFACE: 12092A data link master interface in A-Series or 12790A multipoint interface in M/E/F-Series computer, connected via 12790A Option 001 cable and 3074A data link adapter or via 12790A Option 001 cable, modems, telephone line, and 3074M data link adapter.</p> <p>INTERNALLY-CLOCKED, PROGRAMMABLE DATA RATES: 300, 600, 1200, 2400, 4800, 9600, and 19200 bits/sec.</p> <p>EXTERNALLY-CLOCKED DATA RATES: Up to 2400 bits/sec.</p> <p>TRANSMISSION MODE: Bit-serial, asynchronous, half-duplex.</p> <p>ERROR DETECTION: CRC-16 cyclic redundancy error checking of blocks sent and received.</p> <p>ERROR CORRECTION: By retransmission of block with error to attain error-free data transfer.</p>
IBM/PLUG-COMPATIBLE SYSTEM (MODEM) INTERFACE		
12043A  -001	<p>MULTI-USE PROGRAMMABLE SERIAL (MODEM) INTERFACE for use with 91781A RJE/1000-II, 91782A MRJE/1000, or 91784A PMF/1000 software. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 5061-4912 interface card.</li> <li>2. 5180-1966 self-test/download EPROM installed with 1258-0124 jumper plugs as required and appropriate.</li> <li>3. 5061-4914 5.17m (18 ft) RS-232-C interface cable.</li> <li>4. 5061-4916 PSI diagnostic test hood.</li> <li>5. 5955-7630 installation manual.</li> </ol> <p>5061-4923 5.17m (18 ft) RS-449 interface cable instead of 5061-4914 RS-232-C cable.</p>	<p>TRANSMISSION MODE: Full or half-duplex, bit-serial synchronous or asynchronous.</p> <p>DATA BUFFERING: Received data quadruple buffered; transmitted data double buffered.</p> <p>CLASSES OF OPERATION: Transfer only, Search only, Search and Transfer.</p> <p>MODES OF OPERATION: Byte-at-a-Time, Burst (continuous as long as both sides are ready), Continuous (locks out CPU until done). Read and write addresses can independently increment, decrement, or stay fixed.</p> <p>INTERRUPTS: On Match Found, End of Block, or Port Ready (each can be its own interrupt vector).</p>

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)															
DSN/X.25 COMMUNICATIONS INTERFACE																	
<p>12075A</p> <p>-001</p> <p>-002</p>	<p>LAP-B NETWORK INTERFACE. Requires 91751A X.25 comm. software, which also supports higher-level user access via 91750A DS/1000-IV network software. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 5061-4912 interface card.</li> <li>2. 5180-1958/1959 and 5180-1975/1976 ROMs.</li> <li>3. 5061-4914 5m (16.4 ft) RS-232-C modem cable</li> <li>4. 5061-3425 RS-232-C loop-back verifier hood.</li> <li>5. 12042-91001 interface manual.</li> <li>6. 5955-7625 LAP-B firmware reference manual.</li> </ol> <p>Set of latest firmware ROMs (deletes other parts of the interface).</p> <p>5061-3436 5m (16.4 ft) RS-449 modem cable instead of 5061-3424 RS-232-C modem cable.</p>	<p>INTERFACE LEVEL: EIA RS-232-C, EIA RS-449, CCITT X.21 bis.</p> <p>TRANSMISSION MODE: Bit-serial synchronous half-duplex, via half-duplex of full-duplex modems and telephone lines.</p> <p>INTERNALLY-CLOCKED, PROGRAMMABLE DATA RATES: 300, 1200, 2400, 4800, 9600, 19200, 38400, 48000, and 57600 bits/sec.</p> <p>EXTERNALLY-CLOCKED DATA RATES: Up to 57600 bits/sec.</p> <p>MESSAGE BUFFERING: 14k bytes is available for message buffering.</p> <p>ERROR DETECTION: CCITT compatible CRC cyclic redundancy checking of blocks sent and received.</p> <p>ERROR CORRECTION: Interface transmits or requests retransmission of all frames with errors to attain error-free data transfer. Maximum number of retransmissions is user specified.</p> <p>LINE PROTOCOL: The 12075A interface supports the internationally adopted full-duplex Link Access Protocol -- Balanced (LAP-B) to maximize communications efficiency and reliability and provide access to X.25 Packet Switching Networks. The interface handles all LAP-B protocol generation, including CCITT compatible CRC error checking, on-board buffer management and all modem control tasks.</p> <p>COUNTERPART INTERFACES IN REMOTE HP SYSTEMS: 12075A in HP 1000 A/L-Series, 12250A in HP 1000 M/E/F-Series, 30010A in HP 3000 Series III, 30020A in HP 3000 Series 30/33/40/44, 30020B in HP 3000 Series 30/33/40/44/64/68.</p> <p>COMPATIBLE MODEMS: The 12075A interface is compatible with the modems listed below and with the standard RS-232-C compatible modems supplied by Transpac and Telenet at speeds to 19200 bits/sec.</p> <table border="0" data-bbox="812 1081 1429 1207"> <thead> <tr> <th>Switched Telephone Network Modems</th> <th>Private Line Modems</th> <th>Max. Data Rate</th> </tr> </thead> <tbody> <tr> <td>Bell 212A</td> <td></td> <td>1200 bits/sec</td> </tr> <tr> <td></td> <td>Bell 201C</td> <td>2400 bits/sec</td> </tr> <tr> <td></td> <td>Bell 208A</td> <td>4800 bits/sec</td> </tr> <tr> <td></td> <td>Bell 209A</td> <td>9600 bits/sec</td> </tr> </tbody> </table>	Switched Telephone Network Modems	Private Line Modems	Max. Data Rate	Bell 212A		1200 bits/sec		Bell 201C	2400 bits/sec		Bell 208A	4800 bits/sec		Bell 209A	9600 bits/sec
Switched Telephone Network Modems	Private Line Modems	Max. Data Rate															
Bell 212A		1200 bits/sec															
	Bell 201C	2400 bits/sec															
	Bell 208A	4800 bits/sec															
	Bell 209A	9600 bits/sec															
DS/1000-IV POINT-TO-POINT INTERFACES FOR COMMUNICATION WITH HP 1000 SYSTEMS																	
<p>12007B</p> <p>-001</p> <p>-002</p>	<p>DS/1000-IV MODEM INTERFACE TO HP 1000 SYSTEMS. Software support for HP 1000 communications is included in the 91750 DS/1000-IV Network Software. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 5061-4912 interface card.</li> <li>2. 91750-80008 and -80009 ROMs.</li> <li>3. 5061-4914 5m (16.4 ft) RS-232-C modem cable.</li> <li>4. 5061-3425 RS-232-C loop-back verifier hood.</li> <li>5. 12042-91001 interface manual.</li> <li>6. 5955-7626 HDLC firmware manual.</li> </ol> <p>Set of updated firmware ROMs (deletes other parts of the interface).</p> <p>5061-4923 5m (16.4 ft) RS-449 modem cable and 5061-4915 RS-449 loop-back verifier hood instead of 5061-4914 cable and 5061-3425 verifier hood.</p>	<p>INTERFACE LEVEL: EIA RS-232-C and EIA RS-449.</p> <p>TRANSMISSION MODE: Full-duplex, bit-serial synchronous via full-duplex modems and telephone lines.</p> <p>INTERNALLY-CLOCKED, PROGRAMMABLE DATA RATES: 300, 1200, 2400, 4800, 9600, 19200, 57600, and 230000 bits/sec.</p> <p>EXTERNALLY-CLOCKED DATA RATES: Up to 230000 bits/sec.</p> <p>MESSAGE BUFFERING: Seven frames in either direction (14 frames total, with up to 1024 bytes per frame) may be buffered using the 16k byte on-board RAM memory.</p> <p>ERROR DETECTION: CRC-16 cyclic redundancy error checking of blocks sent and received.</p> <p>ERROR CORRECTION: User-specified number of retransmissions to attain error-free data transfer (default is 10).</p> <p>LINE PROTOCOL: The 12007B interface implements a superset of the High Level Data Link Control (HDLC) communications protocol, which is not suitable for general-purpose HDLC communications and should not be used for other than HP 1000-to-HP 1000 communications under DS/1000-IV.</p> <p>COUNTERPART INTERFACES IN REMOTE HP 1000 SYSTEMS: 12007B in HP 1000 A/L-Series, 12794B in HP 1000 M/E/F-Series.</p> <p>COMPATIBLE MODEMS:</p> <table border="0" data-bbox="812 1785 1429 1879"> <thead> <tr> <th>Private Line Modems</th> <th>Max. Data Rate</th> </tr> </thead> <tbody> <tr> <td>Bell 201C</td> <td>2400 bits/sec</td> </tr> <tr> <td>Bell 208A</td> <td>4800 bits/sec</td> </tr> <tr> <td>Bell 209A</td> <td>9600 bits/sec</td> </tr> </tbody> </table>	Private Line Modems	Max. Data Rate	Bell 201C	2400 bits/sec	Bell 208A	4800 bits/sec	Bell 209A	9600 bits/sec							
Private Line Modems	Max. Data Rate																
Bell 201C	2400 bits/sec																
Bell 208A	4800 bits/sec																
Bell 209A	9600 bits/sec																

Interfaces summary

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)												
DS/1000-IV POINT-TO-POINT INTERFACES FOR COMMUNICATION WITH HP 1000 SYSTEMS (CONTINUED)														
12044A	<p>DS/1000-IV DIRECT CONNECT INTERFACE to HP 1000 Systems. Software support for HP 1000 communications is included in the 91750A DS/1000-IV network software. The interface includes:</p> <ol style="list-style-type: none"> <li>5061-4912 interface card.</li> <li>91750-80008 and -80009 firmware ROMs.</li> <li>5061-3422 and -4908 5m (16.4 ft) direct connect cables, one to a male connector, the other to a female connector. Together these two cables provide a complete link between local and remote 12044A and/or 12825A interfaces, although extension cables (listed below) may also be required.</li> <li>Two 5961-3421 loop-back verifier hoods.</li> <li>5955-7626 HDLC firmware manual.</li> <li>12042-91002 installation manual.</li> </ol>	<p>INTERFACE LEVEL: EIA RS-232-C and EIA RS-449.</p> <p>TRANSMISSION MODE: Full-duplex, bit-serial synchronous.</p> <p>USABLE DATA RATES VS DIRECT CONNECT CABLE LENGTH:</p> <table border="1" data-bbox="850 548 1338 617"> <thead> <tr> <th>Data Rate To</th> <th>Cable Length To</th> </tr> </thead> <tbody> <tr> <td>230,000 bits/sec</td> <td>1 km/0.6214 mi/3281 ft</td> </tr> <tr> <td>57,6000 bits/sec</td> <td>2.2 km/1.367 mi/7218 ft</td> </tr> </tbody> </table> <p>MESSAGE BUFFERING: Seven frames in either direction (14 frames total, with up to 1024 bytes per frame) may be buffered using the 16k byte on-board RAM memory.</p> <p>ERROR DETECTION: CRC-16 cyclic redundancy checking of blocks sent and received.</p> <p>ERROR CORRECTION: By retransmission of blocks in error up to user-specified number of retransmissions (default is 10).</p> <p>LINE PROTOCOL: The 12044A interface implements a superset of the High Level Data Link Control (HDLC) communications protocol, which is not suitable for general purpose HDLC communications and should not be used for other than HP 1000-to-HP 1000 communications under DS/1000-IV.</p> <p>COUNTERPART INTERFACES IN REMOTE HP 1000 SYSTEMS: 12044A in remote HP 1000 A/L-Series, 12825A in HP 1000 E/F-Series.</p> <p>DIRECT CONNECT LIMITATIONS: The 12044A interface has optical and transformer isolation for voltages up to 1000V, maximum. This isolation is usable only for intra-building communication. Because its isolation is not designed to survive a lightning strike, the 12044A interface is not recommended or warranted for connections between buildings.</p>	Data Rate To	Cable Length To	230,000 bits/sec	1 km/0.6214 mi/3281 ft	57,6000 bits/sec	2.2 km/1.367 mi/7218 ft						
Data Rate To	Cable Length To													
230,000 bits/sec	1 km/0.6214 mi/3281 ft													
57,6000 bits/sec	2.2 km/1.367 mi/7218 ft													
-001	Set of latest firmware ROMs (deletes other parts of the interface).													
-002	Deletes cables, verifier hoods, and manual from 12044A that will be second interface in a direct connect HP 1000-to-HP 1000 link.													
12044A EXTENSION CABLES														
91712A	75m (255 ft) DS/1000-IV extension cable.													
91713A	Pair of connectors for user-fabricated DS/1000-IV extension cable.													
-001	One pair of edge connectors for 12044A I/F.													
91714A	300m (1020 ft) cable kit with connectors for user-fabricated DS/1000-IV extension cable.													
DS/1000-IV POINT-TO-POINT INTERFACES FOR COMMUNICATION WITH HP 3000 SYSTEMS														
12073A	<p>DS/1000-IV MODEM INTERFACE to HP 3000 Systems. Software support for HP 3000 communications is included in the 91750A DS/1000-IV network software. The interface includes:</p> <ol style="list-style-type: none"> <li>5061-4912 interface card.</li> <li>91750-80016 and -80017 firmware ROMs.</li> <li>5061-4914 5m (16.4 ft) RS-232-C modem cable.</li> <li>5061-4916 diagnostic test hood.</li> <li>12042-91001 interface manual.</li> <li>5955-7627 bisync protocol firmware manual.</li> </ol>	<p>INTERFACE LEVEL: EIA RS-232-C and EIA RS-449.</p> <p>TRANSMISSION MODE: Bit-serial synchronous half-duplex, via half-duplex of full-duplex modems and telephone lines.</p> <p>INTERNALLY-CLOCKED, PROGRAMMABLE DATA RATES: 300, 1200, 2400, 4800, 9600, 19200, and 57600 bits/sec.</p> <p>EXTERNALLY-CLOCKED DATA RATES: Up to 57600 bits/sec.</p> <p>MESSAGE BUFFERING: A maximum of 6432 bytes in each direction (12864 bytes total) may be buffered using the 16k byte on-board RAM memory.</p> <p>ERROR DETECTION: CRC-16 cyclic redundancy error checking of blocks sent and received.</p> <p>ERROR CORRECTION: User-specified number of retransmissions up to 255 to attain error-free data transfer (default is 7).</p> <p>LINE PROTOCOL: The 12073A interface implements an extended subset of the IBM Binary Synchronous Line protocol and is NOT a general-purpose Bisync interface. It should be used only for HP 1000-to-HP 3000 communications links in the HP-DSN environment.</p> <p>COUNTERPART INTERFACES IN REMOTE HP 3000 SYSTEMS: 30010A or 30055A in HP 3000 Series II/III, 30020A in HP 3000 Series 30/33/40/44, 30020B in HP 3000 Series 30/33/40/44/64/68.</p> <p>COMPATIBLE MODEMS:</p> <table border="1" data-bbox="834 1757 1435 1856"> <thead> <tr> <th>Switched Telephone Network Modems</th> <th>Private Line Modems</th> <th>Max. Data Rate</th> </tr> </thead> <tbody> <tr> <td>Bell 201C</td> <td>Bell 201C</td> <td>2400 bits/sec</td> </tr> <tr> <td>Bell 208B</td> <td>Bell 208A</td> <td>4800 bits/sec</td> </tr> <tr> <td></td> <td>Bell 209A</td> <td>9600 bits/sec</td> </tr> </tbody> </table>	Switched Telephone Network Modems	Private Line Modems	Max. Data Rate	Bell 201C	Bell 201C	2400 bits/sec	Bell 208B	Bell 208A	4800 bits/sec		Bell 209A	9600 bits/sec
Switched Telephone Network Modems	Private Line Modems	Max. Data Rate												
Bell 201C	Bell 201C	2400 bits/sec												
Bell 208B	Bell 208A	4800 bits/sec												
	Bell 209A	9600 bits/sec												
-001	Set of latest firmware ROMs (deletes other parts of the interface).													
-002	5061-3436 5m (16 ft) RS-449 modem cable instead of 5061-3424 RS-232-C modem cable.													



Table I. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
DS/1000-IV POINT-TO-POINT INTERFACES FOR COMMUNICATION WITH HP 3000 SYSTEMS (CONTINUED)		
<p>12082A</p> <p>-001</p> <p>91712A</p> <p>91713A</p> <p>-001</p> <p>91714A</p>	<p>DS/1000-IV DIRECT CONNECT INTERFACE to HP 3000 Systems. Software support for HP 3000 communications is included in the 91750A DS/1000-IV network software. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 5061-3434 interface card.</li> <li>2. 91750-80016 and -80017 firmware ROMs.</li> <li>3. 5061-3422 5m (16 ft) cable to a male connector. Extension cables (listed below) may also be required.</li> <li>4. 5061-3460 diagnostic test hood.</li> <li>5. 12041-91002 interface manual.</li> <li>6. 5955-7627 bisync firmware manual.</li> </ol> <p>Set of latest firmware ROMs (deletes other parts of the interface).</p> <p>12082A EXTENSION CABLES</p> <p>75m (255 ft) DS/1000-IV extension cable.</p> <p>Pair of connectors for user-fabricated DS/1000 extension cable.</p> <p>One pair of edge connectors for 12082A I/F.</p> <p>300m (1020 ft) cable kit with connectors for user-fabricated DS/1000-IV extension cable.</p>	<p>INTERFACE LEVEL: EIA RS-422.</p> <p>TRANSMISSION MODE: bit-serial, synchronous, half-duplex.</p> <p>INTERNALLY-CLOCKED, PROGRAMMABLE DATA RATES: 300, 1200, 2400, 4800, 9600, 19200, and 57600 bits/second.</p> <p>MESSAGE BUFFERING: Maximum of 6432 bytes in each direction (12864 bytes total) may be buffered using the 16k byte on-board RAM memory.</p> <p>ERROR DETECTION: CRC-16 cyclic redundancy checking of blocks sent and received.</p> <p>ERROR CORRECTION: By retransmission of blocks in error up to user-specified number of retransmissions (default is 7).</p> <p>LINE PROTOCOL: The 12082A interface implements an extended subset of the IBM Binary Synchronous Line protocol and is NOT a general-purpose Bisync interface. It should be used only for HP 1000-to-HP 3000 communications links in the HP-DSN environment.</p> <p>COUNTERPART INTERFACES AND CABLES IN REMOTE HP 3000 SYSTEMS: HP 30010A interface and 30222F cable for HP 3000 Series II/III, HP 30020B interface and 30221F cable for HP 3000 Series 30/33/40/44/64/68.</p> <p>DIRECT CONNECT LIMITATIONS: The 12082A interface has optical and transformer isolation for voltages up to 1000V, maximum. This isolation is usable only for intra-building communication. Because its isolation is not designed to survive a lightning strike, the 12082A interface is not recommended or warranted for connections between buildings.</p>
LAN/1000 LINK INTERFACE AND DIRECT DRIVER ACCESS DOCUMENTATION		
<p>12076A</p> <p>-001</p> <p>-002</p> <p>-241</p> <p>12079A</p>	<p>LAN/1000 LINK INTERFACE</p> <p>The interface includes:</p> <ol style="list-style-type: none"> <li>1. 12076-60001 A-Series LAN interface card.</li> <li>2. 12076-63001 IEEE 802.3 card connector cable.</li> <li>3. 12076-90001 Installation manual.</li> <li>4. 12076-90002 Node manager user's guide.</li> <li>5. 30241-60101 Medium Attachment Unit.</li> <li>6. 0362-0819 Coaxial cable tap kit.</li> <li>7. 92254A 6 metre FEP AUI.</li> </ol> <p>Replaces items 3, 5, and 6, above, with an Ethernet Rev 1 Card Connector Cable.</p> <p>Set of latest firmware EPROMs (deletes all</p> <p>Deletes items 5 and 6, above.</p> <p>NOTE A: The following software options will be available until the node management interface and driver software are incorporated into the RTE-A operating system.</p> <ul style="list-style-type: none"> <li>-022 Software on CS-80 cartridge tape.</li> <li>-044 Software on microfloppy discs.</li> <li>-051 Software on 1600 bpi mag tape.</li> </ul> <p>NOTE B: The 12076A can use "thin" LAN connection via the 28641A ThinMAU with integral 1 metre AUI cable. Other LAN cables and connection accessories are listed in the current Hewlett-Packard Computer User's Catalog from Direct Marketing Division.</p> <p>LAN/1000 Direct Driver Access Manual (12079-90001).</p>	<p>TRANSMISSION MODE: Baseband digital.</p> <p>ACCESS METHODS: Carrier Sense Multiple Access with Collision Detection (CSMA/CD).</p> <p>IMPEDANCE: 50 ohms.</p> <p>TOPOLOGY: Bus.</p> <p>NETWORK MEDIUM: Digital baseband IEEE 802.3 Type 10 base 5 backbone ("thick") coax.</p> <p>MAXIMUM DISTANCE BETWEEN NODES PER SEGMENT: 500 metres, excluding AUI cables.</p> <p>MINIMUM DISTANCE BETWEEN NODES: 2.5 metres.</p> <p>MAXIMUM NUMBER OF NODES: 100.</p> <p>MAXIMUM AUI LENGTH: 42 metres.</p> <p>PURPOSE: Provides information necessary to interface user's customized network software to the driver that supports the LAN/1000 Link interface.</p>

Interfaces summary

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
PROGRAMMABLE SERIAL INTERFACE AND DEVELOPMENT PACKAGE		
<p>12042B</p> <p>-001</p> <p>-002</p> <p>-003</p>	<p>PROGRAMMABLE SERIAL INTERFACE. This is a user-customizable, microprocessor based interface that sophisticated OEMs or End Users can use as a foundation for their own application oriented communications products. The 24602A Programmable Serial Interface Firmware Development Package (below) provides reference material to guide users in the task of creating their own firmware. The 12042B interface includes:</p> <ol style="list-style-type: none"> <li>1. 5061-4912 interface card.</li> <li>2. 5061-4914 5m (16 ft) RS-232-C cable.</li> <li>3. 5061-4916 diagnostic test hood.</li> <li>4. 5180-1951 self-test EPROM.</li> <li>5. 5955-7628 interface manual.</li> </ol> <p>5061-3436 5m (16.4 ft) RS-449 cable instead of 5061-4914 RS-232-C cable.</p> <p>5061-3440 cabling kit (edge connector only).</p> <p>Delete self-test EPROM and diagnostic hood.</p> <p>SUPPORT POLICY: Because the 12042B interface is a customizable system, the customer must assume responsibility for its support. Consequently, there is no Service Contract applicable to the 12042B.</p> <p>Hewlett-Packard Computer Engineers will accept contracts for HP 1000 Systems containing the 12042B upon verification of the system by the responsible HP field office. However, the 12042B interface itself will not be diagnosed, repaired, or examined at the customer's site. If the 12042B product develops problems, it will be the customer's responsibility to diagnose and replace both its hardware and firmware. The self-test PROM is provided as a tool to be used at the discretion of the customer.</p> <p>Customers must be prepared to develop their own support strategy for the 12042B card. It is suggested that the customer maintain spare cards which can be swapped to isolate trouble if a problem arises in the field. Board repair and exchange programs are available for the 12042B to assist customers in their support. Contact the responsible Hewlett-Packard Field Engineer for further information.</p>	<p>TRANSMISSION MODE: Full or half duplex, bit-serial synchronous or asynchronous.</p> <p>DATA BUFFERING: Received data quadruple buffered, transmitted data double buffered.</p> <p>SYNCHRONOUS FEATURES FOR CHARACTER-ORIENTED PROTOCOL:</p> <ul style="list-style-type: none"> <li>-- One or two sync characters</li> <li>-- Automatic sync character insertion</li> <li>-- Cyclic Redundancy Check (CRC) generation and checking</li> <li>-- Received data overrun detection</li> </ul> <p>SYNCHRONOUS FEATURES FOR BIT-ORIENTED PROTOCOL:</p> <ul style="list-style-type: none"> <li>-- Abort sequence generation and checking</li> <li>-- Automatic Zero insertion and detection</li> <li>-- Automatic Flag insertion between messages</li> <li>-- Address field recognition</li> <li>-- Supports one to eight bits per character</li> <li>-- Cyclic Redundancy Check (CRC) generation and checking</li> <li>-- Valid receive message overrun detection</li> </ul> <p>ASYNCHRONOUS FEATURES:</p> <ul style="list-style-type: none"> <li>-- 5, 6, 7, or 8 bit</li> <li>-- 1, 1-1/2, or 2 stop bits</li> <li>-- Even, odd, or no parity</li> <li>-- X1, X16, X32, or X64 clock mode</li> <li>-- Break generation and detection</li> <li>-- Parity, overrun, and framing error detection</li> </ul> <p>OPTIONAL GENERATION OF A VECTORED INTERRUPT WHEN:</p> <ul style="list-style-type: none"> <li>-- The state of an SIO modem control input changes</li> <li>-- The transmit buffer is empty</li> <li>-- A receive character is available</li> <li>-- A special receive condition occurs for parity error, Rx overrun error, CRC or framing error, or End of Frame</li> </ul> <p>CLASSES OF DMA OPERATION: Transfer only, Search Only, and Search and Transfer.</p> <p>DMA OPERATING MODES: Byte-at-a-time, Burst (continuous as long as both sides are ready), Continuous (locks out CPU until done). Read and write port addresses can independently increment, decrement, or stay fixed.</p> <p>DMA INTERRUPTS: On Match Found, End of Block, or Port Ready (each can be its own interrupt vector).</p> <p>DMA ADDRESS AND BLOCK LENGTH REGISTER LOADING: Registers may be loaded for the next operation without disturbing current operation.</p> <p>DMA OPERATION RESTART: Last operation can be restarted automatically on command.</p> <p>DMA SIGNALLING: DMA can signal when a specified number of bytes have been transferred without disturbing the current system.</p> <p>DMA STATUS: CPU can read the current channel status, Read or Write address registers, or the Length register.</p> <p>COUNTER-TIMER CHANNELS: Four independently programmed channels used for dynamic RAM timing, Zilog chip main system clock, and baud rate generator for each SIO channel. Baud rate limits are: 57.6k bits/sec, asynchronous; 460.8k bits/sec, internally clocked synchronous; and 810k bits/sec externally clocked synchronous.</p> <p>COUNTER-TIMER MODES: Operates in counter or timer mode.</p> <p>COUNTER-TIMER INTERRUPT: On zero count condition (each channel has its own interrupt vector).</p> <p>COUNTER-TIMER RESTART: Counter-timer automatically restarts the last operation in either mode.</p> <p>COUNTER-TIMER OUTPUT: Gives the Z-80 CPU the number of counts to go until a zero count condition.</p> <p>NUMBER OF COMMUNICATIONS INPUT LINES: Six with balanced line receivers and eight with unbalanced receivers.</p> <p>NUMBER OF COMMUNICATIONS OUTPUT LINES: Four that can be driven by balanced or unbalanced line drivers and eight with unbalanced line drivers.</p>

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)								
PROGRAMMABLE SERIAL INTERFACE AND DEVELOPMENT PACKAGE (CONTINUED)										
12042B	PROGRAMMABLE SERIAL INTERFACE, continued	<p>COMPATIBLE MODEMS: The 12042B interface is compatible with the modems listed below and may be useful with other modems that are compatible with both the interface hardware and user-developed firmware. Compatibility with any modem is highly dependent on the firmware implemented on the interface.</p> <table border="0" data-bbox="852 554 1339 642"> <tr> <td style="text-align: center;">Private Line Modems</td> <td style="text-align: center;">Max. Data Rate</td> </tr> <tr> <td>Bell 201C</td> <td>2400 bits/sec</td> </tr> <tr> <td>Bell 208A/B</td> <td>4800 bits/sec</td> </tr> <tr> <td>Bell 209A</td> <td>9600 bits/sec</td> </tr> </table>	Private Line Modems	Max. Data Rate	Bell 201C	2400 bits/sec	Bell 208A/B	4800 bits/sec	Bell 209A	9600 bits/sec
Private Line Modems	Max. Data Rate									
Bell 201C	2400 bits/sec									
Bell 208A/B	4800 bits/sec									
Bell 209A	9600 bits/sec									
24602A  -001	<p>PROGRAMMABLE SERIAL INTERFACE FIRMWARE DEVELOPMENT PACKAGE, consisting of:</p> <ol style="list-style-type: none"> <li>1. 24602-90001 firmware programming manual.</li> <li>2. 24602-60001 DDM accessory cable.</li> <li>3. 24602-80001 developmental debug monitor (DDM) EPROM.</li> <li>4. 12042-91001 installation manual.</li> <li>5. 12826-91001 installation manual.</li> </ol> <p>Deletes 24602-80001 DDM ROM and 24602-60001 DDM accessory cable.</p>	<p>PURPOSE: Support of the development of firmware for the 12042B or 12826B Programmable Serial Interface (PSI) card.</p> <p>DEVELOPMENT DEBUG MONITOR CAPABILITIES:</p> <ol style="list-style-type: none"> <li>1. Loading of cross-assembled firmware program into the RAM memory of the PSI card.</li> <li>2. Display and/or modification of memory locations.</li> <li>3. Display and/or modification of registers.</li> <li>4. Control of program flow by: <ol style="list-style-type: none"> <li>a. Transferring control to firmware entry points.</li> <li>b. Setting and removing break points.</li> <li>c. Single-step simulation with trace.</li> </ol> </li> <li>5. Reading and writing through all I/O ports.</li> <li>6. Creating ("punching") modified code into 264x Mini-cartridge tape.</li> <li>7. Help with information about the command set.</li> </ol> <p>PREREQUISITE FOR DDM USE: The self-test PROM normally provided with the PSI card.</p> <p>HARDWARE REQUIREMENTS FOR USE OF 24602A: HP 1000 computer and 12042B (for A/L-Series) or 12826B (for M/E/F-Series) PSI card, plus either:</p> <ol style="list-style-type: none"> <li>1. A microprogramming workstation, such as the HP 64000, or</li> <li>2. Self Test for the 12042B or 12826B, a cross Assembler program to translate HP Assembly or higher level language code to Z-80 code (contact HP for list of available cross-assemblers), and one or more 264x terminals with Minicartridge support.</li> </ol> <p>USER'S EXPERTISE: User must be able to write, test, and debug Z-80 firmware as well as HP 1000 resident drivers and applications software. This requires substantial expertise in Z-80 and HP 1000 assembly programming, the RTE operating system at the driver and backplane level, and communication protocols.</p>								
IEEE 488-1978 INTERFACES										
12009A  -001	<p>HP-IB INTERFACE for connection of up to 14 HP-IB instruments or other devices to A/L-Series computer via a single I/O channel. Software support includes interface driver ID.37 and device drivers DD.30 and DD.33 for disc memories and DD.12 for printers. These drivers are furnished in the RTE-A, RTE-L, and RTE-XL operating systems. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 12009-60010 interface card.</li> <li>2. 12009-60011 2m (6.5 ft) cable.</li> <li>3. 12009-90001 interface manual.</li> </ol> <p>12009-60008 4m (13 ft) cable instead of 12009-60012 2m (6.5 ft) cable.</p>	<p>CAPACITY: Up to 14 HP-IB bus-connected devices in normal mode, up to 8 devices in high speed mode, but no more than 4 CS-80 discs and no more than 2 797xA/E magnetic tape units or 256xA Printers on a single 12009A interface.</p> <p>APPLICABLE STANDARD: Logic levels, termination, line drivers, and receivers conform to IEEE Standard 488-1978, identical ANSI Standard MC1.1, and IEC Recommendation 625-1.</p> <p>HIGH SPEED MODE DATA RATES: To 940k bytes/sec, maximum.</p> <p>NORMAL MODE DATA RATES: To 500k bytes/sec, maximum.</p> <p>MATCHING REQUIREMENT: All devices connected to the same bus must be compatible with the selected mode. For that reason, separate 12009A interfaces will be required to interface both high speed and normal mode devices to the same A/L-Series computer system.</p> <p>MAXIMUM CABLE LENGTH FOR NORMAL MODE OPERATION: 2m (6.5 ft) per device connected, with a 20m (65 ft) total length. The maximum number of devices is accommodated by connection of some devices using 1m (3.28 ft) cables.</p> <p>MAXIMUM CABLE LENGTH FOR HIGH SPEED OPERATION: Same as for normal mode operation, but maximum total length is 15m (49.2 ft), 10m (32.8 ft) with CS/80 discs. Additional load resistors may be required.</p>								

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Interfaces summary

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)																				
IEEE 488-1978 INTERFACES (CONTINUED)																						
37203L	<p>HP-IB EXTENDER CARD for transparent transmission of HP-IB signals to a remote 37203A/L HP-IB Extender via coaxial cable (std) or Fiber Optic Cable (Option 001) over distances that exceed the 20m (65 ft) maximum total cable length specification of the bus itself. The extender card includes:</p> <ol style="list-style-type: none"> <li>37203-60003 extender card.</li> <li>37203-60012 link cable assembly.</li> <li>37203-60013 coaxial cable adapter.</li> <li>37203-90001 reference manual.</li> </ol>	<p>CAPACITY: The 37203L forms one transmitter/receiver of a half-duplex, bit-serial channel transmitting via coaxial cable (std) or fiber optic cable (Option 001) to a 37203A/L HP-IB Extender at the other end of the extended HP-IB link.</p> <p>CABLE LENGTHS, DATA RATES, AND RESPONSE TIMES:</p> <table border="1"> <thead> <tr> <th colspan="5">Coaxial Cable Lengths</th> </tr> <tr> <th></th> <th>Back-to-Back</th> <th>250m (820ft)</th> <th>500m (1641ft)</th> <th>1000m (3282ft)</th> </tr> </thead> <tbody> <tr> <td>Max. Data Rate(kb/s)</td> <td>50</td> <td>40</td> <td>14.2</td> <td>2.75</td> </tr> <tr> <td>Max. Parallel Poll Response Delay (microseconds)</td> <td>20</td> <td>40</td> <td>75</td> <td>270</td> </tr> </tbody> </table> <p>DRIVER/RECEIVER ISOLATION: Line drivers and receivers float free of ground. Data is transferred to/from drivers and receivers via optical couplers, eliminating interference from ground currents.</p> <p>MODE RESTRICTIONS AND BUS LOADING: The 37203L may not be connected to a 12009A configured in the high speed mode. The number of devices at each end of the bus is limited by normal bus loading rules. The 37203L is one bus load and does not use an address.</p> <p>ERROR CONTROL: Data is transmitted across the link in frames, each including a cyclic redundancy check code that is checked when received. Detection of an error results in rejection of the frame in error and a request for its retransmission.</p> <p>COMPATIBLE COAXIAL CABLE: Belden type 9248 or equivalent coaxial cable with 75 ohm impedance, 6.9dB attenuation per 100 metres at 100MHz, 4.1 ohms resistance per 100 metres.</p> <p>RECOMMENDED COAXIAL CONNECTOR: 75 ohm BNC, Trompeter type UPL 20-41.</p>	Coaxial Cable Lengths						Back-to-Back	250m (820ft)	500m (1641ft)	1000m (3282ft)	Max. Data Rate(kb/s)	50	40	14.2	2.75	Max. Parallel Poll Response Delay (microseconds)	20	40	75	270
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Max. Parallel Poll Response Delay (microseconds)	20	40	75	270																		
-001	Adds capability for transmission via fiber optic cable.	<p>CABLE LENGTHS, DATA RATES, AND RESPONSE TIMES:</p> <table border="1"> <thead> <tr> <th colspan="4">Fiber Optic Cable Lengths</th> </tr> <tr> <th></th> <th>Back-to-Back</th> <th>250m (820ft)</th> <th>1000m (3282ft)</th> </tr> </thead> <tbody> <tr> <td>Max. Data Rate (kb/s)</td> <td>50</td> <td>39</td> <td>25</td> </tr> <tr> <td>Max. Parallel Poll Response Delay (microsec)</td> <td>20</td> <td>25</td> <td>40</td> </tr> </tbody> </table> <p>RECOMMENDED FIBER OPTIC CABLE: HP 39200A (simplex -- two required per system) or HP 39200B (duplex -- one required per system). Cable is ordered by specifying Option 001 of 39200A/B and defining the required length in metres. For a 328 metre length of duplex cable, you would order HP 39200B Option 001, 328 metres long.</p>	Fiber Optic Cable Lengths					Back-to-Back	250m (820ft)	1000m (3282ft)	Max. Data Rate (kb/s)	50	39	25	Max. Parallel Poll Response Delay (microsec)	20	25	40				
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MEASUREMENT AND CONTROL INTERFACES																						
12060B	<p>HIGH LEVEL ANALOG INPUT CARD. Software support by driver ID.50 is furnished in the RTE-A, RTE-L, and RTE-XL operating systems. The interface includes:</p> <ol style="list-style-type: none"> <li>12060-60001 interface card.</li> <li>12060-60101 interface manual.</li> <li>12060-90003 programmer's manual.</li> </ol>	<p>CAPACITY: Eight differential inputs.</p> <p>FULL-SCALE (F-S) INPUT RANGES, RESOLUTION, AND ACCURACY:</p> <table border="1"> <thead> <tr> <th>F-S range</th> <th>+/-10.24V</th> <th>+/-5.12V</th> <th>+/-2.56V</th> <th>+/-1.28V</th> </tr> </thead> <tbody> <tr> <td>Resolution</td> <td>5mV</td> <td>2.5mV</td> <td>1.25mV</td> <td>0.625mV</td> </tr> <tr> <td>Accuracy (rti)#</td> <td>+/-5mV</td> <td>+/-2.5mV</td> <td>+/-1.25mV</td> <td>+/-0.625mV</td> </tr> <tr> <td>Temp Coeff##</td> <td>+/-16.4</td> <td>+/-8.2</td> <td>+/-4.1</td> <td>+/-2.1</td> </tr> </tbody> </table> <p># referred to input ## microvolts per degrees, Centigrade</p> <p>COMMON MODE REJECTION: &gt;70 dB, dc to 100 Hz (all gains), 1k ohm source impedance and 1k ohm source unbalance (&lt;6 mV p-p rti at all gains for 20V p-p common mode input).</p> <p>CROSSTALK: &lt;80 dB, dc to 100Hz (all gains) (&lt;1 mV rti at all gains for 10V adjacent channel input).</p> <p>THROUGHPUT TO MEMORY: 55kHz.</p> <p>PROGRAM TIMING: Program to I/O access delay is 3 millisecc, data from I/O to memory is 18 microsec (55kHz), I/O to program return is 2 millisecc.</p> <p>SAMPLE-AND-HOLD APERTURE TIME: &lt;20 nsec.</p>	F-S range	+/-10.24V	+/-5.12V	+/-2.56V	+/-1.28V	Resolution	5mV	2.5mV	1.25mV	0.625mV	Accuracy (rti)#	+/-5mV	+/-2.5mV	+/-1.25mV	+/-0.625mV	Temp Coeff##	+/-16.4	+/-8.2	+/-4.1	+/-2.1
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-001	Adds edge connector kit and extra connector.																					
-002	Calibration program on 264x Minicartridge.*																					
-041	Calibration program on 1.2M byte flexible disc.*																					
	* The 12060B is calibrated at the factory and may be recalibrated using voltage sources and optional calibration software.																					

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
MEASUREMENT AND CONTROL INTERFACES (CONTINUED)		
12060B	HIGH LEVEL ANALOG INPUT CARD, continued	<p>INPUT OVERLOAD PROTECTION: Up to +/-25V steady state on any input line with respect to ground or another input line or up to +/-42V transient for 500 milliseconds without damage.</p> <p>EFFECTIVE INPUT IMPEDANCE: 5M ohms with power on, 1.2k ohms +/-10% to ground, 2.4k ohms +/-10% to any other channel with power off, source impedance up to 1k ohms, source unbalanced up to 1k ohms, common mode return, up to 10k ohms.</p> <p>EXTERNAL TRIGGER: TTL-compatible handshake, not protected (operates at up to full 55 kHz rate, jumper-selectable pull-up, pull-down, or TTL).</p>
12061A  -001	<p>EXPANSION MULTIPLEXER CARD (12061-60001) for increasing capacity of the 12060B High-Level Analog Input Card, above. Software support for the 12060B includes the 12060B-12061A combination. The interface includes the 12061-6000x jumper kit.</p> <p>Adds edge connector kit and extra connector.</p>	<p>CAPACITY: Adds 32 channels to the capacity of the 12060B to provide a total of 40 differential input channels.</p> <p>ALL OTHER SPECIFICATIONS: 12060B specifications, above, apply without change to the 12060B-12061A combination.</p>
12062A  -001 -020 -041	<p>ANALOG OUTPUT CARD. Software support by driver ID.50 is furnished in the RTE-A, RTE-L, and RTE-XL operating systems. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 12062-60001 interface card.</li> <li>2. 12060-90003 programmer's manual.</li> <li>3. 12062-90001 interface manual.</li> </ol> <p>Adds edge connector kit and extra connector.</p> <p>Calibration program on 264x Minicartridge.*</p> <p>Calibration program on 1.2M byte flexible disc.*</p> <p>* The 12062A is calibrated at the factory and may be recalibrated using voltage sources and optional calibration software.</p>	<p>CAPACITY: Four independent bipolar outputs.</p> <p>VOLTAGE output range: -10.24V to +10.235V at 20 mA.</p> <p>COMPLIANCE: +/-20 mA.</p> <p>RESOLUTION: 12 bits, providing 5 mV resolution.</p> <p>ACCURACY: +/-5 mV at 25 deg C +/-31 microvolts/deg C over entire operating temperature range, rel humidity to 80%.</p> <p>SLEW RATE: 10V per microsecond across resistive load.</p> <p>SETTLING TIME FOR FULL SCALE CHANGE: 5 microsecond typical with resistive load.</p> <p>FULL POWER BANDWIDTH: 20kHz with resistive load.</p> <p>RIPPLE AND OUTPUT NOISE: 2.5 mV, peak-to-peak, maximum, dc to 500kHz, no load.</p> <p>SHORT CIRCUIT AND OVERVOLTAGE PROTECTION: 12062A circuits are protected against short to common or up to +/-15V.</p> <p>PROGRAMMABLE UPDATE TIMING: From 10.85 microsec between updates to 288.61 microsec in 1.085 microsec increments.</p>
12063A  -001	<p>16-INPUT/16-OUTPUT ISOLATED DIGITAL CARD. Software support by driver ID.50 is furnished in the RTE-A, RTE-L, and RTE-XL operating systems. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 12063-60001 interface card.</li> <li>2. 12060-90003 programmer's manual.</li> <li>3. 12063-90001 interface manual.</li> </ol> <p>Adds edge connector kit and extra connector.</p>	<p>CAPACITY: 16 isolated inputs and 16 isolated outputs.</p> <p>INPUT LEVELS: 5 to 42V dc or 6 to 29V rms, user-selectable on removable headers, with the level determined by resistor value.</p> <p>DEBOUNCE TIME: 0 to 246 millisecc, user programmable with 960 microsec resolution.</p> <p>ISOLATION BETWEEN INPUT CHANNELS: 250V dc or 110V ac.</p> <p>INPUT SIGNAL TIMING: 1 millisecc minimum ON state time with or without filter capacitor, 1 millisecc minimum OFF state time without filter capacitor, 53 millisecc minimum OFF state time with filter capacitor.</p> <p>PROGRAM TIMING: Program to I/O access delay is 3 millisecc; data from I/O to memory is determined by debounce delay or input signal timing specification; I/O to program return is 2 millisecc.</p> <p>OUTPUT: 16-relay isolated 1 Form C (SPDT) outputs.</p> <p>CONTACT RATINGS: 1A at 28V dc or at 120V ac, maximum.</p> <p>CONTACT SWITCHING TIME: Approximately 12 millisecc to pull-in or release.</p> <p>CONTACT RESISTANCE: &lt;300 milliohms measured between card edge connector contacts.</p> <p>OUTPUT INSULATION RESISTANCE: 10M ohms at 250V dc.</p> <p>CONTACT LIFETIME: At least 100,000 operations at 1 amp.</p> <p>RELAY ARC SUPPRESSION VOLTAGE LEVELS: User-selectable on removable headers with transient suppressors available from 5V and up.</p>

## Interfaces summary

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
MEASUREMENT AND CONTROL CABLES AND RACK-MOUNTING SCREW TERMINATION ASSEMBLIES		
12060BC	2.4m (8 ft) 8-CHANNEL ANALOG INPUT CABLE	<p>USER APPLICATION: 206xx/C cables are unterminated at the application end to enable the user to fabricate a connector suited to a specific configuration.</p> <p>USER APPLICATION: The 12064A is 19-inch rack mountable, and provides easy screw terminal connections on the application side, and self-stripping contacts on computer side.</p>
12061AC	2.4m (8 ft) 32-CHANNEL ANALOG INPUT CABLE	
12062AC	2.4m (8 ft) 4-CHANNEL ANALOG OUTPUT CABLE	
12063AC	2.4m (8 ft) 32-CHANNEL DIGITAL I/O CABLE	
12064A	68-CIRCUIT TERMINATION ACCESSORY for HP 1000 A-Series Measurement and Control Cards	
MISCELLANEOUS INTERFACES AND PLUG-INS		
12006A	<p>PARALLEL INTERFACE. Software support by driver ID.50 is furnished in the RTE-A, RTE-L, and RTE-XL operating systems. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 12006-60002 interface card.</li> <li>2. 5061-3426 48-pin connector kit.</li> <li>3. 12006-90001 interface manual.</li> </ol>	<p>CAPACITY: Up to 16 input and 16 output bits.</p> <p>PROTOCOL: Transfers either 8 or 16 parallel bits at a time.</p> <p>MAXIMUM RATE: Up to 1.05 million words/sec (2.1M bytes/sec) via Direct Memory Access (DMA).</p> <p>HIGH LOGIC LEVEL CHOICES: TTL (+5V) is standard; removal of six resistor packages converts the interface to +12V level.</p> <p>+5V input levels: High is +2V min to +15V max, 4mA max sink. Low is 0 to +0.8V max, 16 mA max source.</p> <p>+5V output levels: High is +4V min to +6V max, 4 mA max source. Low is 0 to +0.7V max, 270 mA max sink.</p> <p>+12V input levels: High is +2V min to +15V max, 40 micro-amps sink. Low is 0 to 0.8V max, 0.8 mA max source.</p> <p>+12V output levels: High is +8V min to +12.6V max, 1.8 mA max source. Low is 0 to 0.7V, 290 mA max sink.</p> <p>BYTE PACKING: For use with 8-bit devices, such as tape readers, punches, and some line printers, the interface may be programmed to automatically pack/unpack bytes into/from computer words.</p> <p>CLOCKED MODE: The 12006A interface supports a clocked mode in which data transfers to/from external devices are synchronized by a command/flag handshake.</p> <p>DEVICE COMMAND SENSE SELECTION: The 12006A can be set to respond to either high-true or low-true device flag from the interfaced device.</p> <p>TRANSPARENT MODE: The 12006A can also be used to send data to or receive data from one or several devices, such as indicators or switches, that do not provide or use any type of clocking signal. Information is output to the destination device(s) exclusively under program control and input information may be read at any time.</p> <p>CONTROL OUTPUT: Four control bits may be sent to the interfaced device via an output control word for use as control, command, or address bits. For instance, they can be decoded to address any of 16 device registers or actions, or to address any of 16 devices connected to the same 12006A interface.</p> <p>STATUS INPUT: Four status bits can be received from the interfaced device via an input control word.</p> <p>PREREQUISITE TO CONTROL BIT-STATUS BIT COMMUNICATION: The global register must be enabled.</p> <p>DMA ACCESSIBILITY: The 12006A can directly access memory under control of its I/O master processor regardless of how many other interfaces in the system are also directly accessing memory.</p> <p>SELF-CONFIGURED, CHAINED DMA MODE: The 12006A I/O processor supports a self-configuring mode of operation. In this mode, instead of interrupting the central processor after a block transfer, the I/O processor fetches a new set of control words for the next transfer, reconfigures itself, and initiates another block transfer. This process continues as long as additional sets of control words are available.</p>

Table 1. HP 1000 A-Series Interfaces Summary, continued

PRODUCT AND OPT NUMBERS	INTERFACE NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
MISCELLANEOUS INTERFACES AND PLUG-INS (CONTINUED)		
12008A	<p>PROM STORAGE MODULE, which includes the 12008-90001 reference manual. Software support by drivers ID.36, DD.36, and a PFORM utility to assist in programming PROMs used on the PROM Storage Module are furnished in the RTE-A, RTE-L, and RTE-XL operating systems. The 12008A includes:</p> <ol style="list-style-type: none"> <li>1. 12008-60001 PROM storage module.</li> <li>2. 12008-90001 reference manual.</li> </ol>	<p>CAPACITY: 32 sockets for 16k PROMs; 64k bytes, maximum.</p> <p>BLOCK DEFINITION: 2 PROMs/block, 4k bytes minimum.</p> <p>PROM RECOMMENDATIONS: Intel 2716 or equivalent UV-erasable 16k PROMs, which may be programmed using many commercially available PROM burners.</p> <p>TRANSFER CHARACTERISTICS: 2 bytes to 64k bytes may be transferred under either DMA or program control at a maximum rate of 1.7M bytes under DMA control.</p>
12010A	<p>BREADBOARD INTERFACE, which includes:</p> <ol style="list-style-type: none"> <li>1. 12010-60001 interface card.</li> <li>2. 5061-3426 48-pin connector kit.</li> <li>3. 02103-90005 L-Series I/O interfacing guide.</li> </ol>	<p>I/O MASTER: The 12010A Breadboard Interface includes the same I/O processor as other L-Series interfaces.</p> <p>MAXIMUM ACHIEVABLE DMA RATE: 1,050,000 words/sec (2.1k bytes/sec).</p> <p>USER'S CIRCUIT SPACE: An area 133 mm (5.25 in.) by 146 mm (5.75 in.) is organized into ten column pairs of 53 circuit pads each for mounting up to 60 16-pin wire wrap integrated circuit sockets or any other combination of dual in-line integrated circuit sockets with different numbers of pins.</p> <p>MAXIMUM COMPONENT HEIGHT ABOVE CARD SURFACE: 10 mm (0.4 in.) for an interface capable of being installed in any position in an L-Series card cage.</p> <p>MAXIMUM PERMISSIBLE DEPTH BELOW CARD FOR LEADS OR ATTACHING HARDWARE: 5mm (0.2 in.).</p> <p>MAXIMUM POWER DISSIPATION OF USER-ADDED CIRCUITS: 11.7W.</p>
12011A	EXTENDER CARD	<p>PURPOSE: Extension of other interface cards outside of the A600+, A600, A700, A900, or L-Series Computer for servicing.</p>
12012A	PRIORITY JUMPER CARD	<p>PURPOSE: Continuation of processor's hardware priority chain through an otherwise unoccupied card cage slot.</p>
12065A	<p>COLOR VIDEO OUTPUT INTERFACE. Software support includes RTE-A interface driver ID.50 and device handlers and library routines. The interface includes:</p> <ol style="list-style-type: none"> <li>1. 12065-60001 Video Output Interface Card.</li> <li>2. 12065-63001 3m/9.8 ft RGB video output cable with three BNC output connectors.</li> <li>3. 12065-90001 Video Output Reference Manual.</li> <li>4. 12065-90003 Color Video Device Handlers Manual.</li> </ol>	<p>VIDEO OUTPUT: Compatible with RGB RS-343. Three BNC connectors are provided for red, green, and blue.</p> <p>RESOLUTION: 576 x 455 (4:3 aspect ratio) or 512 x 512 (1:1 aspect ratio).</p> <p>MEMORY MAPS: Four planes that can be partitioned as three planes producing 8 colors from a palette of 4096 and one overlay plane or four planes producing 16 colors from a palette of 4096.</p> <p>BLINK CONTROL: On-board blink control of all memory planes is supported.</p> <p>WRITE MODES: Flash fill (blanking the screen, writing vectors, pixels, and characters, then displaying the screen) and Update (single character or vector writes to existing display) are supported.</p> <p>POLYGON AREA FILL: Eight unique styles are available.</p> <p>CHARACTER DISPLAY: On-board ROM stores standard character set with on-board RAM for user-downloadable character sets. Variable size, orientation in 90 degree increments, and on-board character field blinking are supported.</p> <p>MAXIMUM DISTANCE TO MONITOR: 76m/250 ft via RG-59/U (Belden No. 9259) cable, 152m/500 ft via RG-11/U (Belden 9212 cable).</p> <p>MAXIMUM MONITORS PER 12065A INTERFACE: Five.</p> <p>RECOMMENDED MONITOR: The HP 13279B Color Monitor is functionally compatible with the 12065A Color Video Interface and complies with FCC EMI regulations.</p> <p>ACCESSORY DATA COMM: Two, three-wire RS-232-C ports with user-programmable data rate to 9600 baud, provide for interfacing of graphics accessories, such as a joystick, trackball, custom keyboard, keypad, or a mouse.</p>
-001	<p>Adds a 12065-63002 3m/9.8 ft RS-232-C input cable from edge connector to 25-pin RS-232 connector.</p> <p>NOTE: A 12065-67001 loop-back connector is available for self-testing of the 12065A Color Video Interface.</p>	



For more information call the HP Sales Office listed in the  
White Pages. Or write or phone Hewlett-Packard, Data Systems  
Division, 11000 Wolfe Rd., Cupertino, CA 95014, (408) 257-7000.

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