

HP 3000 Computer Family, Series 900

HP 27113A

CIO/HP-IB Channel Card

Installation and Configuration Manual

Card Assembly 27113-60101



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New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update; the edition does not change when an update is incorporated.

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Edition 1JULY 1987

Safety Considerations

GENERAL - This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.



Indicates hazardous voltages.



Indicates earth (ground) terminal.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure or practice that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

CAUTION

STATIC SENSITIVE DEVICES

When any two materials make contact, their surfaces are crushed on the atomic level, and electrons pass back and forth between the objects. In separation, one surface comes away with excess electrons (negatively charged) while the other is electron deficient (positively charged). The level of charge that is developed depends on the type of material. Insulators can easily build up charges in excess of 20,000 volts. A person working at a bench or walking across a floor can build up a charge of many thousands of volts. The amount of static voltage developed depends on the rate of generation of the charge and the capacitance of the body holding the charge. If the discharge happens to go through a semiconductor device and the transient current pulse is not effectively diverted by protection circuitry, the resulting current flow through the device can raise the temperature of internal junctions to their melting points. MOS structures are also susceptible to dielectric damage due to high fields.

The resulting damage can range from complete destruction to latent degradation. Small geometry semiconductor devices are especially susceptible to damage by static discharge.

The CIO/HP-IB card is shipped in a transparent static shielding bag. The card should be kept in this bag at all times until it is installed in the system. Save this bag for storing or transporting the card. When installing the card in the system, do not touch any components. Hold the card by its handles, and avoid contact with non antistatic surfaces.

Safety Considerations (continued)

WARNING

SAFETY EARTH GROUND - The computer on which this product is installed is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety ground must be provided from the main source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and must be secured against any unintended operation.

SERVICING

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by service-trained personnel.

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Introduction

The product designated 27113A Hewlett-Packard Interface Bus (HP-IB) Channel Card implements IEEE Standard 488-1978 and Supplement 488-1978A-1980. As an input/output (I/O) card, it is used with the Hewlett-Packard 3000 family, series 900 computers.

The 27113A can connect up to 14 slow-speed to medium-speed peripheral devices (such as instruments), or up to eight high-speed peripheral devices (such as disc drives).

Standard Product

The standard HP 27113A HP-IB Channel Card has the following parts:

	Part Number
1. HP-IB printed circuit card assembly	27113-60101
2. Four-metre HP-IB cable	27113-63001
3. One Installation & Configuration Manual (this manual)	27113-90001
4. One HP-IB connector backing plate	30070-00043

The descriptors that identify this card are:

1. Product number:	HP 27113A
2. Card assembly number:	27113-60101
3. Date code:	A-2715

The card assembly number and the date code are printed on a sticker attached to the card, as well as on the title page of this manual.

Specifications

Maximum Transfer Rates:

Medium/Slow-Speed: 500 kbytes/second
High-Speed: 980 kbytes/second

(Note: transfer rates are host-computer and software dependent)

Data Settling Time:

Medium/Slow-Speed Operation: May exceed 500 ns (e.g. 2 μ S)
High-Speed Operation: 350 ns minimum

HP-IB Address:

Switch-selectable (set to 30 decimal when acting as the Controller-in-Charge of the HP-IB).

HP-IB Signal Line Terminations:

Without the optional load resistor pack installed (the card configured for medium/slow-speed operation), each of the 16 HP-IB signal lines is terminated with a 2.3 Kohm resistor to Vcc and a 4.7 Kohm resistor to common. With the installation of the load resistor pack for high-speed operation, signal line termination values are changed except for the REN line, which is not affected.

HP-IB Signal Line Drivers:

Each of the 16 HP-IB signal lines is driven with a circuit having the following typical characteristics:

Type:	Tri-state, open collector
Output Voltage, Low State:	< 0.5 V, 48 mA
Output Voltage, High State:	> 2.5 V, -5.2 mA

HP-IB Line Receivers:

Each of the 16 HP-IB signal lines is received with a circuit having the following characteristics:

Type: Schmitt Trigger
 Threshold, Positive Transition: 1.6 V
 Threshold, Negative Transition: 0.9 V for data lines
 1.0 V for control lines

Input Current, Low State: -1.3 mA minimum to -3.2 mA maximum @ 0.5 V
 Input Current, High State: 0.7 mA minimum to 2.5 mA maximum, between 5 V and 5.5 V

Maximum Cable Length

Medium/Slow-Speed Operation: 2 metres (6.56 ft) per device connected or 20 metres total.

High-Speed Operation:

<u>Number of Devices</u>	<u>Maximum Total Cable Length</u>
1	8m (26ft)
2	9m (30ft)
3	10m (33ft)
4	11m (36ft)
5	12m (39ft)
6	13m (43ft)
7	14m (46ft)
8 (maximum)	15m (49ft)

Environmental Limits

Operating Temperatures: 0 to 55 degrees Celsius (32F-131F).

Operating Humidity: 5% to 95% Relative Humidity at 40 degrees Celsius (104F).

Operating Altitude: 4600 metres (15,000 feet) maximum.

(Before operating this unit in any extreme environment, consult your HP Customer Engineer or your nearest HP Sales and Service Office.)

General Information

Physical Characteristics

Size: 172.7 mm (6.73 inches) long
172.0 mm (6.71 inches) wide

Weight: 265 grams (9.275 ounces)

I/O Channel Connector: 80-pin connector, J1

Device Connector: 26-pin connector, J2

Power Requirements

<u>Voltage</u>	<u>Current</u>	<u>Power Usage</u>
+5 V	1.68 A	8.4 Watts

HP-IB Supported Functions

The 27113A card is designed to support the following HP-IB Interface Functions as defined by the IEEE Standard 488-1978. (The HP-IB is Hewlett-Packard's implementation of the IEEE Standard 488-1978.) These functions are fully supported by the HP 27113A unless noted otherwise.

Mnemonic----Controller Functions:

C1 -- System Controller
 C2 -- Send Interface Clear and Take Control
 C3 -- Send Remote Enable
 C4 -- Respond to Service Request
 C5 -- Send Interface Messages, Receive Control, Pass Control, Pass Control to Self, Parallel Poll, Take Control Synchronously

Mnemonic----Controlled Device Functions:

SR1 -- Service Request
 RL2 -- Remote Local
 PP1 -- Parallel Poll
 DC1 -- Device Clear
 DT1 -- Device Trigger

The following utility functions are provided to support the above listed functions:

Mnemonic----Utility Functions

SH1 -- Source Handshake
 AH1 -- Acceptor Handshake
 T1 -- Basic Talker, Serial Poll, Talk Only
 TE1 -- Basic Extended Talker, Serial Poll, Talk Only, Unaddress if My Listener Address and My Secondary Address (requires host software support)
 L1 -- Basic Listener, Listen Only Mode
 LE1 -- Basic Extended Listener, Listener Only Mode, Unaddress if My Secondary Address and Talker Primary Addressed State (requires host software support)

NOTE

There are no site preparation requirements specific to the 27113A HP-IB Channel card. Refer to your computer system manuals for general site preparation procedures.

Introduction

This section provides information for you to install and configure the 27113A HP-IB Channel Card. For reference, you will also need your computer system installation manual.

General Guidelines for HP-IB Configuration

The following general guidelines should be observed when configuring an HP-IB system:

1. Devices or cable segments should not be added to an HP-IB system that is active.

If a device is to be added to an active HP-IB system, the possibility of errors will be minimized if the following procedure is used:

- a. Attach all new cables to the new device to be added. Do not attach any unterminated cables to the existing bus.
 - b. Power on the new device.
 - c. Attach the new device (with power on) and its cable to the existing bus as a unit.
2. On an active HP-IB system, all devices attached should be powered-on to avoid excessive loads caused by powered-down devices.
 3. The selection of Medium/Slow-speed or High-speed operation depends on both the number, and performance characteristics, of the attached devices. Devices that talk at a slower rate may be configured in the same system as high-speed devices, provided all of the requirements for high-speed operation are met. However, bus performance may decrease.
 4. If an HP-IB system is configured for high-speed operation, it is required that the HP-IB System Controller must have the necessary additional high-speed termination resistors. Thus, the high-speed load resistors should NOT be installed in the interface card when it is NOT being used as the System Controller (switch S1(6), "SCTL", in DOWN position). Refer to figure 3-2 for the original factory switch (S1) settings.

CAUTION

Adding termination resistors to more than one card in an HP-IB system may result in permanent damage to any or all cards in the system.

NOTE

A powered-off System Controller will not allow the system to be used (as long as the System Controller is connected), because HP-IB bus drivers cannot drive the powered-down termination resistors.

5. Bus configuration is unimportant as long as the guidelines in the following paragraphs are observed.

Medium/Slow-Speed Configurations

For proper operation of the HP-IB bus at medium/slow operating speeds, observe the following guidelines:

1. Counting the HP-IB Channel Card as a device, up to 15 HP-IB devices may be connected to the bus.
2. The maximum length of cable permitted is two metres (6.56 ft) per connected device, or 20 metres (65.6 ft), whichever is less. For example, when connecting an HP-IB card to the first peripheral device, a cable of up to 4 metres (13.1 ft) is allowed (2 devices X 2 metres/device). The length between adjacent devices is not normally critical as long as the overall limit is not exceeded.
3. At least four out of every five devices should be powered on.
4. The optional load resistor pack **MUST NOT BE INSTALLED**. The 18-pin Dual In-Line Package (DIP) resistor pack is marked 1810-0081. If it is installed in "HI-SPD" storage socket U123 behind connector J2, it must be removed and placed in the socket labeled "NRML-SPD STORAGE" (U106).

Refer to the following paragraph for high-speed operation.

High-Speed Configuration

To achieve the maximum possible data transfer rate within a system, the following guidelines must be followed:

1. Switch S1(7), marked "SLOW", should be set to the high speed position (down or closed). Switch S1(7) determines the delay between data assertion and DAV (data valid) during an HP-IB write from the computer to the device. With the switch in SLOW position (up or open) a delay of approximately 500 nsec is realized. In the high-speed (down) position, the delay is reduced to approximately 350 nsec.
2. All devices expected to talk at high speed must use a settling time of 350 nanoseconds or more.
3. All devices expected to talk at the higher rates should use 48 mA, tri-state drivers.
4. The device capacitance on each HP-IB line, except REN (Remote Enable) and IFC (Interface Clear), should be less than 50 pF per device. In a system configuration, the total device capacitance should be no more than 50 pF for each equivalent resistive load in the system.
5. Interconnecting cable links should be as short as possible, with a maximum of 15 metres total length per system (see table 3-1). There should be AT LEAST one equivalent resistive load per metre (3.28 ft) of cable. With the HP-IB Channel Card as the System Controller, each peripheral device provides a resistive load, and the high-speed resistor pack adds seven equivalent resistive loads.

Table 3-1. Maximum HP-IB Cable Lengths

<u>Number of Peripheral Devices</u>	<u>Maximum Total Cable Length (metres)</u>
1plus 7 resistive loads....	8
2	9
3	10
4	11
5	12
6	13
7	14
8 (maximum)	15

A maximum system would therefore be composed of the HP-IB card as the System Controller (with its high-speed resistor pack installed) and eight HP-IB peripherals.

6. If the HP-IB Channel Card is the HP-IB System Controller (switch S1(6), marked "SCTL", is in the up or open position), the optional load resistor pack **MUST BE INSTALLED** in "HI-SPD" storage packet for high-speed operation. The 18-pin Dual In-Line Package (DIP) resistor pack is marked 1810-0081. Holding the card by its extractor handles, place it on the static-free pouch. Insert the 1810-0081 resistor pack in the U123 socket (labeled "HI-SPD") with pins 1 and 18 on the pack oriented toward the left handle and the S1 switch. See figure 3-1, and make sure the package properly fits into the socket.

If the card is **NOT** the System Controller, the load resistor pack must **NOT** be installed. See page 3-1 item 4 of the paragraph **GENERAL GUIDELINES FOR HP-IB OPERATION**.

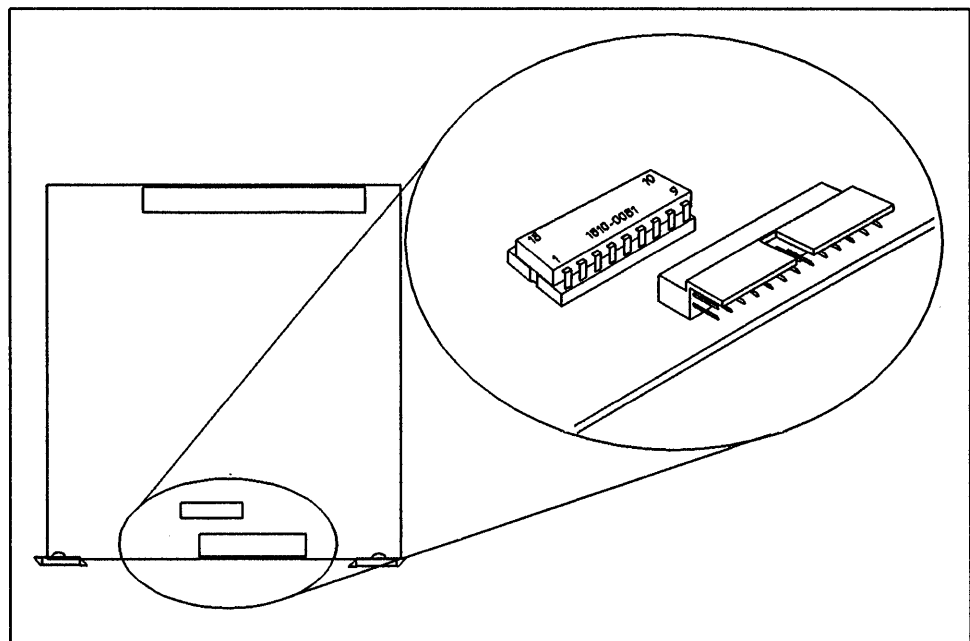


Figure 3-1. Top View of U123 Socket

7. All devices on the cable should be powered-on to avoid excessive loads caused by powered-down devices.

Installation and Configuration

To install and configure the operation of the HP-IB card, follow the sequence of steps below:

CAUTION

Static discharge can destroy components on a card. Handle the card by using its anti-static container or by the extractor levers on the card. Do not touch the electrical traces or set the card on any surface other than its anti-static container.

All I/O cards draw their power from the host computer system. Refer to section 1 for power requirements of the HP-IB card.

1. Set the card switches. Table 3-2 provides a summary of switch positions. Note that UP (open) is logic one, and DOWN (closed) is logic zero.
 - a. Set switch S1(7), marked "SLOW", either up (for medium/slow-speed operation) or down (for high-speed operation). Check that the optional load resistor pack (see the HIGH-SPEED OPERATION paragraph) is installed if high-speed devices are going to be connected to the card AND the card is the HP-IB System Controller.
 - b. Set switch S1(6), marked "SCTL", either up (System Controller ON) or down (System Controller OFF) depending on whether the card is going to operate as the System Controller.
 - c. Set switches S1(1) through S1(5) to the card HP-IB address. Address override is set to 30 decimal when it is acting as controller-in-charge.
 - d. Ensure switch S1(8) is in the down/disabled position.
2. Turn off your computer power following system shutdown procedures compatible with your computer operating system. All HP-IB devices should also be powered-down. Insert the HP-IB card into the desired slot in the I/O channel. Make sure that the components on the card are on the same side as other installed cards. When installing the card, use care not to touch or damage the components or traces on the card or on adjacent cards. Handling the card by its extractor handles, press it firmly into place.
3. Connect the HP-IB Channel Cable 27113-63001 to the 26-pin connector (J2) on the card. Table 3-3 shows the pin signal definitions for connector J2. Connect the other end to the HP-IB device(s).

NOTE

A "grounding grommet" on the interface cable allows the cable shield to be electrically grounded at that point, which helps to reduce electromagnetic interference generated by some systems. Refer to your computer installation manual for additional information.

4. Close the interface card cage door, and tighten the door screws firmly.
 5. The HP-IB Channel Card has onboard intelligence for conducting a card selftest. There is a red LED on the card that comes on for approximately two seconds while performing selftest. If the LED stays on after the computer has been powered up, the board failed selftest. Depending on the power-on sequence and logic of the host computer system, card selftest may be initiated at power-on or system reset, or it may have to be invoked by the user through software. Refer to the appropriate manual for your system for a description of selftest initiation.
-

WARNING

Any attempt to defeat the safety interlock and operate the computer with the I/O card cage door open will cause exposure to hazardous current and energy. Such operation is limited to qualified service personnel.

The product is not designed to comply with mandatory electromagnetic radiation and interference regulations when the I/O card cage door is open.

6. Power-up the computer following procedures compatible with your operating system. To provide an indication that the HP-IB card is working properly:
 - a. Some systems have a Computer Service Panel that has LEDs (light emitting diodes) for each I/O slot. These LEDs indicate when the interface card in the specified slot did not pass selftest. Consult your computer system installation manual for additional information.
 - b. For systems that do not have a Computer Service Panel, system software will provide console messages relating I/O slot status. Consult your system manuals.

Table 3-2. Configuration Switch Functions

Switch	Function	Settings
S1(8)	No Listener Detection	Should be down/disabled
S1(7)	Data Settling Time Selection	Up = Medium/Slow-speed Down = High-speed
S1(6)	System Controller Selection	Up = System Controller Down = Not System Controller
S1(1)-S1(5)	HP-IB Address Selection When not controller-in-charge	S5 = MSB S1 = LSB Up = Logic 1 = Open Down = Logic zero = closed

The original factory switch (S1) settings are as follows:

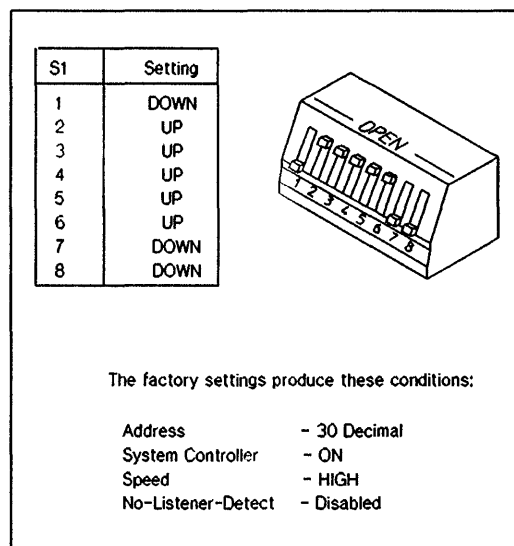


Figure 3-2. Switch Settings

Note that the load resistor pack is installed for high-speed operation when shipped from the factory. Refer to the Medium/Slow Speed Operation paragraph for resistor pack location for medium/slow speed operation.

Table 3-3. Device Connector J2

PIN NO.	SIGNAL MNEMONIC	SIGNAL DEFINITION
A1	SAFETY	Cable outer shield (chassis ground)
A2	SAFETY	Cable outer shield (chassis ground)
A3	ATN	Attention
A4	SRQ	Service Request
A5	IFC	Interface Clear
A6	NDAC	Not Data Accepted
A7	NRFD	Not Ready For Data
A8	DAV	Data Valid
A9	EOI	End Or Identify
A10	DIO4	Data Input/Output, Bit 4
A11	DIO3	Data Input/Output, Bit 3
A12	DIO2	Data Input/Output, Bit 2
A13	DIO1	Data Input/Output, Bit 1
B1	GND	Ground
B2	GND	.
B3	GND	.
B4	GND	.
B5	GND	.
B6	GND	.
B7	GND	.
B8	GND	Ground
B9	REN	Remote Enable
B10	DIO8	Data Input/Output, Bit 8
B11	DIO7	Data Input/Output, Bit 7
B12	DIO6	Data Input/Output, Bit 6
B13	DIO5	Data Input/Output, Bit 5

Reshipment

If the HP-IB card is to be shipped to Hewlett-Packard for any reason, attach a tag identifying the owner and indicating the reason for shipment. Include the part number of the HP-IB card.

Pack the HP-IB card in the original factory packing material, if available. If the original material is not available, good commercial packing material should be used. Reliable commercial packing and shipping companies have the facilities and materials to repack the item. **BE SURE TO OBSERVE ANTI-STATIC PRECAUTIONS.**

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Reader Comment Sheet

Information Networks Group

HP 27113A CIO/HP-IB Channel Card

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