



HEWLETT  PACKARD

INTERFACE BUS

Versatile interconnect system for
instruments and controllers

Standard common approach helps you
combine up to 15 interconnecting devices,
with minimum added engineering

Stimulus, measurement, display, storage,
and processor-related capabilities—
all yours from the growing list of
HP Interface Bus-compatible products

Use the HP Interface Bus
for simple interconnection
of instruments



Use its flexibility and power
to configure multi-device
bench instrument systems which can
operate under program control



Or, get ready solutions with
systems which are fully
integrated and supported by HP



What is the Hewlett-Packard Interface Bus?

The Hewlett-Packard Interface Bus (HP-IB) provides you with a low-cost and versatile way to interconnect instruments digitally—leading to higher-productivity, systems-type solutions.

- it accommodates both high and low speed devices in the same system with equal ease, thus permitting selection of the best system component devices without undue constraints imposed by the interface
- data codes, data rates and data paths may be altered during a test sequence to optimize system performance
- use of ASCII code (preferred but not mandatory) simplifies system programming as well as generation and interpretation of data
- it provides for direct data transfer between devices and allows multiple system component LISTENERS, which reduces message traffic across the interface and speeds overall system performance

Optimized for instrument interfacing applications, the HP-IB standardizes* three of the four primary characteristics associated with complete interface systems: *mechanical* (connectors and cables), *electrical* (driver and receiver circuit parameters), and *functional* (complete repertoire and precise definition of each signal line, exact protocol and timing relationships for message transfer, etc.). On the other hand, device-dependent *operational* characteristics are properly excluded from HP-IB definition—thus retaining maximum flexibility for you to utilize each instrument's particular capabilities to best advantage in your particular application.

Working as a bus, whereby instruments and accessories are interconnected in common via a set of signal lines, the HP-IB allows any one device to transfer data to one or more other devices. Each participating device has one or more of three principle roles which it may perform: TALKER, LISTENER, and/or CONTROLLER. A TALKER can send data on the

bus, and a LISTENER can receive data from the bus. For example, a programmable device can LISTEN to receive its control word and can TALK to send its measurement. A CONTROLLER manages the operation of the bus system primarily by designating which devices are to send and receive data, and it also may command specific actions within other devices.

A minimum HP-IB configuration may consist of one TALKER and one LISTENER (e.g. a measuring instrument and a printer, for semi-automatic data logging). The full flexibility and power of the HP Interface Bus become more apparent, however, when one device which can serve as TALKER/LISTENER/CONTROLLER (e.g. calculator or computer) is interconnected with a variety of other devices which may be either TALKERS or LISTENERS or both (e.g. frequency synthesizers, counters, relay actuators, displays, printers, etc.), depending on application.

All active circuitry is contained within the various devices, and the interconnecting cable is entirely passive.

* The HP Interface Bus is a new standard approach to instrument interconnection:

- It is Hewlett-Packard's implementation of the IEEE Standard 488-1975 "Digital interface for programmable instrumentation".
- Technical Committee 66 of the International Electrotechnical Commission used the HP-IB as a model during their deliberations, and the HP Interface Bus conforms to the draft Recommendation subsequently approved by that Committee for ballot among IEC member nations.
- The HP-IB is a major instrumentation interface within Hewlett-Packard. This not only assures you of maximum interface compatibility among our products; it also signals a commitment on our part to provide the thoughtful and thorough type of program long associated with the Hewlett-Packard name.

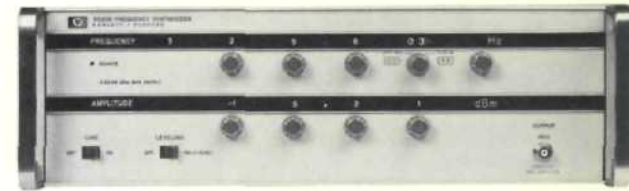
Instruments and accessories for do-it-yourself HP-IB system solutions

This product listing, representing an impressive range of capabilities, was current at time of printing. Additional new HP-IB products will be announced frequently as part of the ongoing Hewlett-Packard program. Please watch for them.

Most principal functions on these instruments are programmable; for specific details, see the data sheet which is available for each individual product.



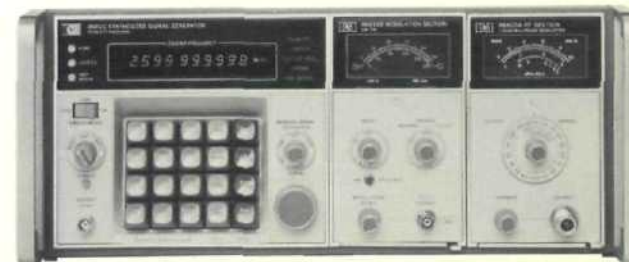
5312A ASCII Interface module for 5300B Measuring System. Counter, multimeter capabilities at low cost



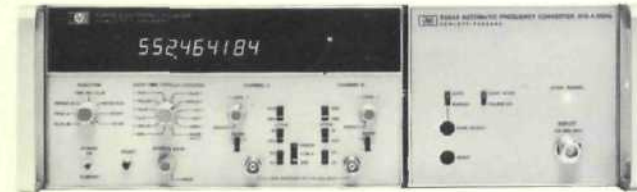
3320B (option 007) Frequency Synthesizer. 0.01 Hz to 13 MHz



3330A, 3330B Automatic Synthesizer/Sweepers. 0.1 Hz to 13 MHz



8660A, 8660C (option 005) Synthesized Signal Generators. 10 kHz to 2.6 GHz



5345A (option 011) Plug-In Electronic Counter. State-of-the-art frequency and time measurements



5340A (option 011) Automatic Frequency Counter. 10 Hz to 18 GHz, high sensitivity



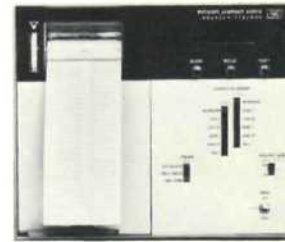
5341A (option 011) Automatic Frequency Counter. 10 Hz to 4.5 GHz, fast measurements



8620A (option E45) Microwave Sweep Oscillator. 3 MHz to 18 GHz (2-18 GHz with one plug-in)



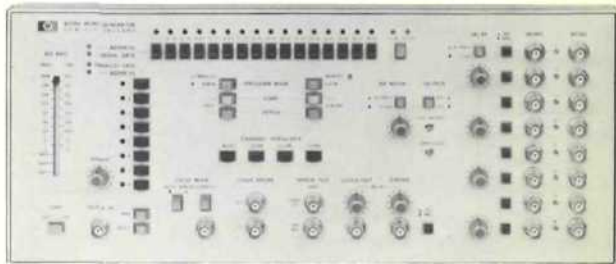
436A (option 022) Digital Power Meter. Power sensors for 100 kHz to 18 GHz, -30 dBm to +35 dBm



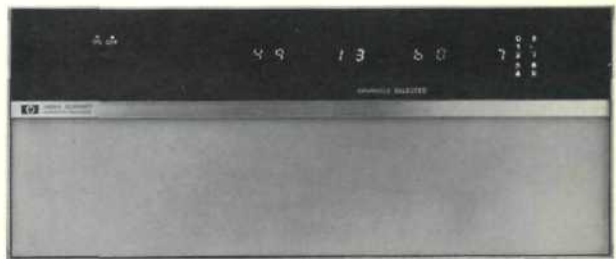
5150A (option 001) Alphanumeric Thermal Printer. 20 columns; optional clock, scanner for HP-IB control



3490A (option 030) Digital Multimeter. ac and dc volts, ohms; also ratio, sample/hold options



8016A (option 001) Word Generator with programmable bit pattern. 0.5 Hz to 50 MHz, 9 x 32 bit memory



3495A 40-Channel Scanner. Low thermal dry-reed relays and/or armature type relays, in groups of 10



59301A ASCII-to-Parallel Converter. Converts ASCII-coded information to parallel BCD or line-per-function information



59303A Digital-to-Analog Converter. Converts any three consecutive ASCII digits to a 0.1% accurate dc voltage, in 25 μsec



59306A Relay Actuator. Provides 6 form "C" relays under front panel or remote control



59304A Numeric Display. Remote or auxiliary display of up to 12 characters



59307A Dual VHF Switches. Two independent single-pole four-position switches; 50Ω, bidirectional, dc to 500 MHz

For HP-IB programmable voltage and current: HP 6128C thru 6145A (option J99) digitally-controlled power sources

A typical application: Graphic logging with HP 680 or HP 7100-series strip chart recorders

For HP-IB programmable microwave switching, dc-18 GHz: HP 8761A/B SPDT switches

For HP-IB programmable attenuation, dc-18 GHz: HP 8494 thru 8496G/H attenuators, 1 or 10 dB steps to max of 110 dB



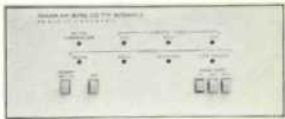
10631A, B & C Cables for HP-IB Interconnection. Male & female connector on both ends; in lengths of approximately 1, 2 and 4 meters (3, 6 and 12 feet)



59308A Timing Generator. Precision pacer-timer; intervals from 1 μsec to more than 1 day; crystal timebase



59309A ASCII Digital Calendar/Clock. Displays and outputs month, day, hour, minute, second; crystal timebase



59400A HP-IB/RS232 TTY Interface. Enables use of teletypewriters, CRT terminals or equivalent RS232C I/O devices as controller



59403A HP-IB/Common Carrier Interface. Permits separating component devices in HP-IB system by up to 900 meters (3000 feet) via dedicated line; optional Modem for additional extension via direct or dial-up telephone line

Do-it-yourself HP-IB system controllers

A separate controller is not required for simple HP-IB configurations (e.g. data logging)—however, HP-IB's full flexibility and power are more obvious when used with HP programmable calculators or computers. They are ideally suited for systems control and data manipulation/storage . . . and have many useful peripheral capabilities such as plotting and page printing.

59405A HP-IB Calculator Interface. For interconnecting an HP 9820A, 9821A or 9830A Calculator with up to 14 other HP-IB devices; uses only one ROM slot, and only one of four I/O slots on calculator

59300-90001 HP-IB User's Guide for 9820A/9821A. Describes how to assemble and program interface systems which use a 9820A or 9821A Calculator with other HP-IB instrumentation. (Guide included in 59405A options 020 or 021 Calculator Interface package, as well as with preassembled calculator-controlled systems at right)

59300-90002 HP-IB User's Guide for 9830A. Similarly describes use of 9830A Calculator as HP-IB controller



9830A BASIC Language Calculator. Powerful capabilities, typewriter-style keyboard, magnetic tape cassette programming and data recording; large memory option

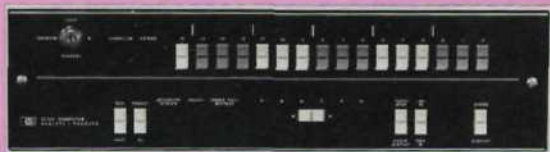


9820A Algebraic Language Calculator. Magnetic card programming and recording; conversational alphanumeric display and printer



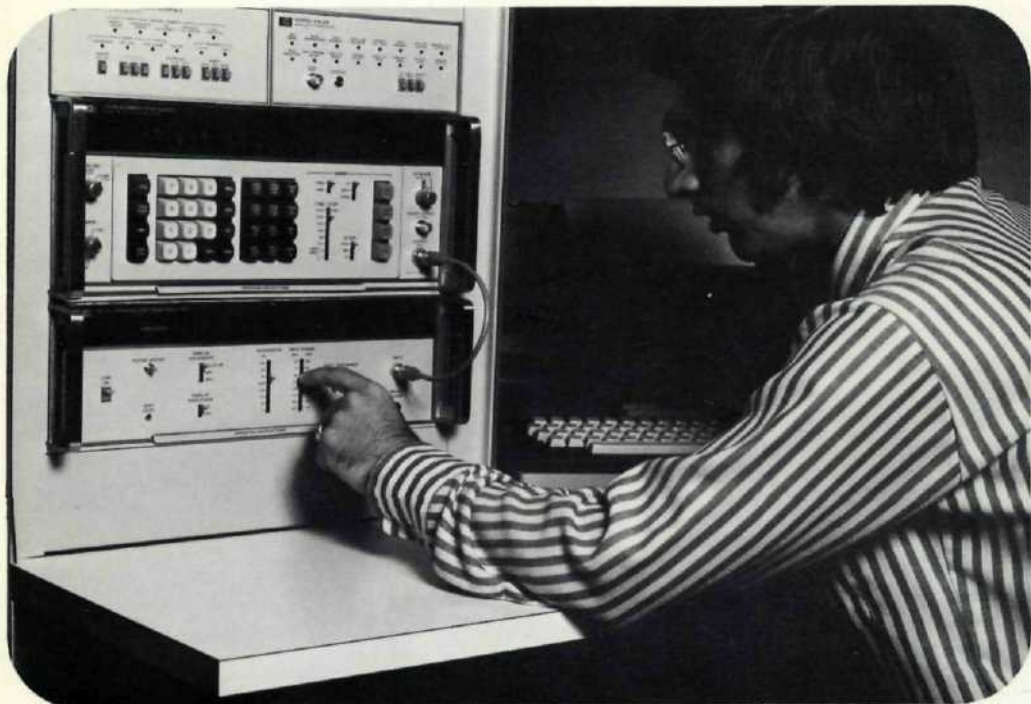
9821A Algebraic Language Calculator. Magnetic tape cassette programming and data recording; alphanumeric display and printer

59310A HP-IB Computer Interface. For interconnecting an HP 21MX or HP 2100 Computer with up to 14 other HP-IB devices; complete Talker, Listener and System Controller functions (plus optional Direct Memory Access). Uses only one I/O slot on computer



21MX Computers. Powerful, user microprogrammable processors with highly reliable semiconductor memory in 4K, 8K, and 16K modules. Fully expandable I/O capability including complete range of peripherals, and memory expansion to 192K with Dynamic Mapping System and Memory Extenders

Preassembled HP-IB system solutions ... fully integrated and supported by Hewlett-Packard



STANDARD HP-IB SYSTEMS

Many applications can be satisfied with standard HP-IB systems. These systems are not only assembled and checked out at the factory—they are fully integrated and documented from a hardware and software point of view, and HP assumes full responsibility for overall specified system performance.

Installation is included, HP's standard "on-site" system warranty applies, and maintenance agreements are also available.

Three families of systems are currently available, with more to come. The following calculator-controlled automatic versions offer maximum flexibility in terms of data manipulation and analysis, and available accessories and peripherals:

DATA ACQUISITION

Model 3050B Automatic Data Acquisition System. acV, dcV, ohms measurements of

up to 40 (or more) points; monitoring, manufacturing, lab applications. Especially suited for remote applications when equipped with HP 59403A HP-IB/Common Carrier Interface.

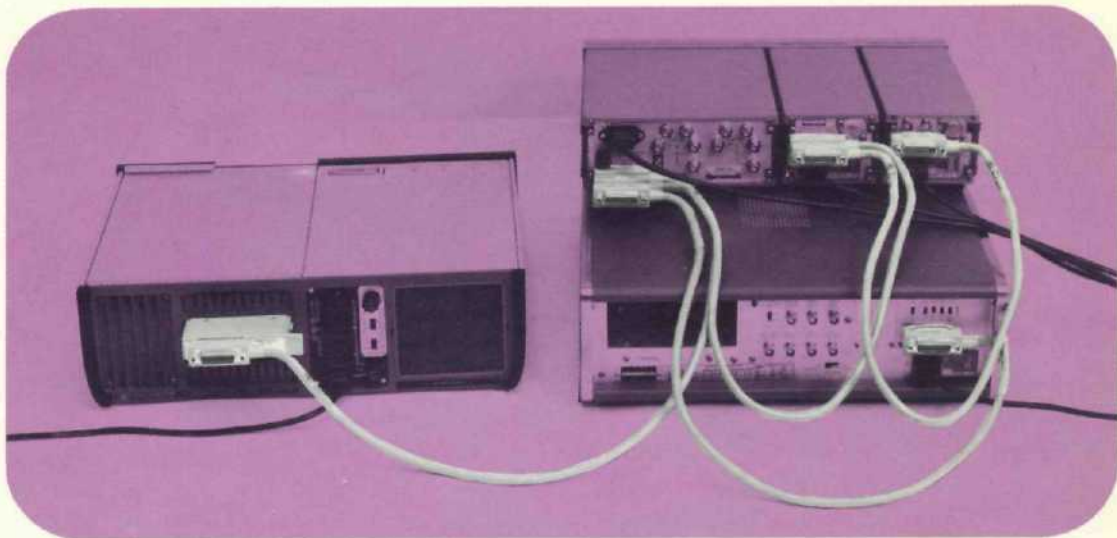
SPECTRUM ANALYSIS

Model 3045A Automatic Spectrum Analyzer. High-accuracy amplitude and frequency measurements, from 10 Hz to 13 MHz

NETWORK ANALYSIS

Model 3042A Automatic Network Analyzer. Complete amplitude and phase characterization, from 50 Hz to 13 MHz

Manual-control systems for spectrum and network analysis are also available—and Hewlett-Packard also has many computer-based (although not necessarily HP-IB) test, measurement and control systems for demanding applications. Please contact us for details.



HP Interface Bus Specification Summary

Interconnected Devices: Up to 15 maximum on one contiguous bus

Interconnection Path: Star or linear bus network up to 20 meters total transmission path length

Active Signal Lines: Sixteen total: 8 data lines, 3 data transfer control lines, and 5 bus management message lines

Message Transfer Scheme: Byte-serial, bit-parallel asynchronous data transfer using interlocked 3-wire handshake technique

Data Rate: One megabyte per second, maximum over limited distances; 250-500 kilobytes per second typical over full transmission path (depends on device)

Address Capability: Primary addresses, 31 TALK and 31 LISTEN; secondary (2-byte) addresses, 961 TALK and 961 LISTEN. Maximum of 1 TALKER and up to 14 LISTENERS at a time

Control Shift: In systems with more than one controller, only one can be active at a time. Currently active controller can pass control to another, but only the designated system controller can assume control over others

Interface Circuits: Driver and Receiver circuits are TTL-compatible

Support Summary

User's Guides which accompany selected HP-IB products (as outlined on inside pages) are also available for separate purchase

Application Notes define specific ways Model 5345A, 5340A, and 5300B Counters can be combined with other HP-IB products to solve many difficult measurement problems. Ask about AN 174 and AN 181-series Notes

Customer Training: Seminars to help HP-IB users get maximum value from their purchase are now being scheduled.

Diagnostic Equipment:

The HP 59401A Bus System Analyzer is useful for diagnosing HP-IB software and hardware problems, and can be used as a design aid for HP-IB-compatible devices.



Warranty: Standard individual product warranty applies to each separate stand-alone HP-IB device—but overall operational responsibility for customer-assembled HP-IB systems rests with the customer. Standard "on-site" system warranty applies, however, to complete HP-IB systems which are preassembled and installed by HP.



For more information, call your local HP Sales Office or East (201) 265-5000 • Midwest (312) 677-0400 • South (404) 434-4000 • West (213) 877-1282. Or write: Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304. In Europe: P.O. Box 349, CH-1217 Meyrin 1, Geneva, Switzerland. In Japan: YHP, 1-59-1, Yoyogi, Shibuya-Ku, Tokyo, 151.