(hp) MEASUREMENT COMPUTATION news
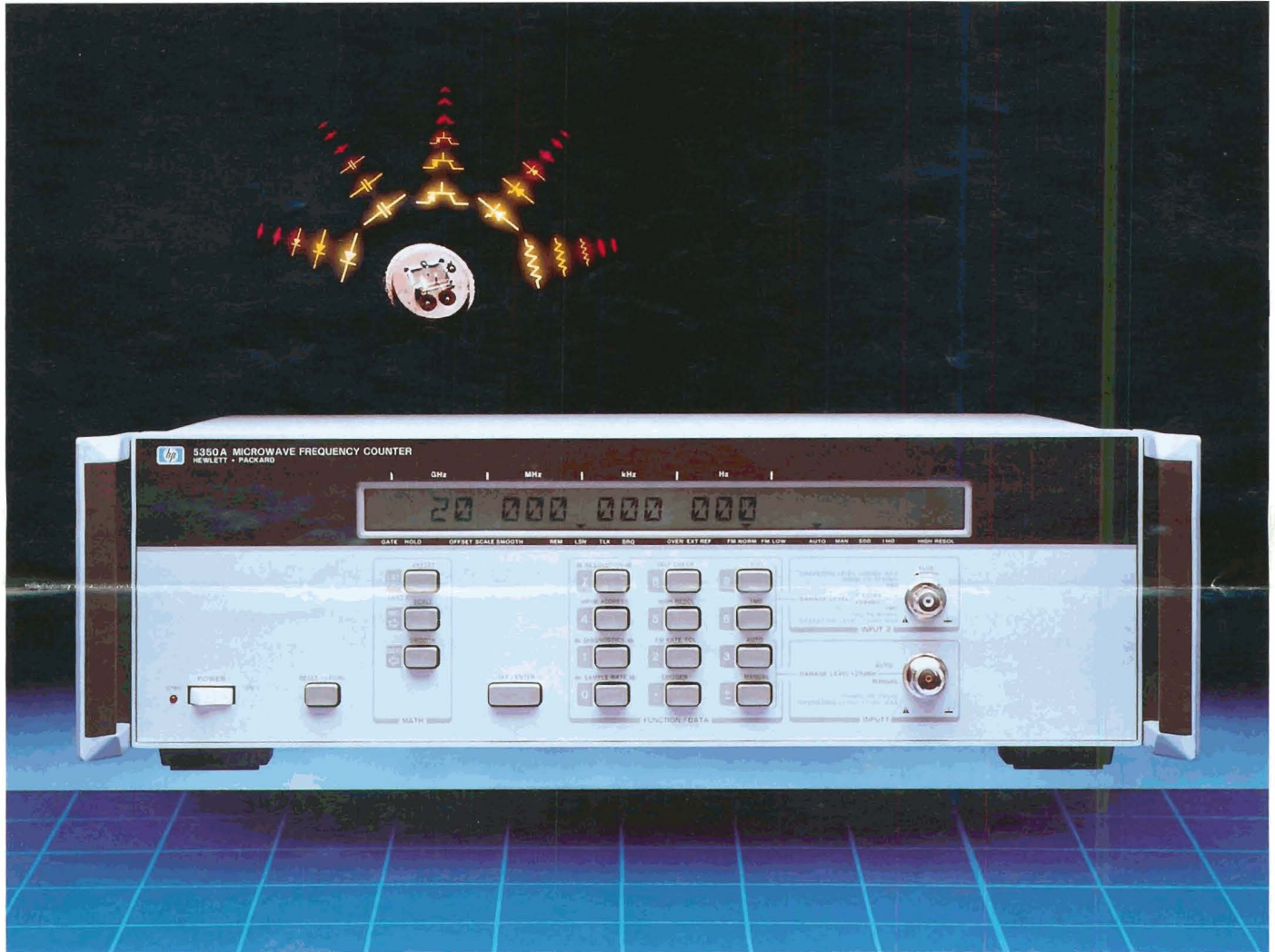
product advances *from Hewlett-Packard*

New GaAs sampler technology in microwave counters reduces part count, increases reliability and performance

Inside the small brass module highlighted above are several key microwave elements that were separate components in previous frequency counters. Now, thanks to Hewlett-Packard's proprietary gallium arsenide sampling IC, these components have been integrated into a single hybrid circuit. This advance is a key technological innovation featured in HP's two newest microwave frequency counters, the HP 5350A and the HP 5351A.

Performance and sensitivity

The HP 5350A and HP 5351A measure up to 20 GHz and 26.5 GHz, respectively, with resolutions to 1 Hz. A single-synthesizer design and newly devised measurement algorithm allow the counters to output >80 measurements per second via the HP-IB (IEEE 488) and to tolerate FM deviations as high as 20 MHz on the incoming signal. The HP-IB is standard on both instruments.

High sensitivity lets you use these counters when very low signal levels are present. The sensitivity is rated at -25 dBm from 500 Hz to 12.4 GHz, -20 dBm from 12.4 GHz to 20 GHz, and -15 dBm from 20 GHz to 26.5 GHz. Low RFI/EMI is made even lower by a *SLEEP* mode, which powers down internal operations when the instrument is not in use. The result is an extremely quiet test environment suitable for applications such as receiver testing.

Modular spectrum analyzers cover frequencies from 100 Hz to 325 GHz

Hewlett-Packard's new HP 71000 Modular Spectrum Analyzers let you select a system with just the capability you need for your signal analysis measurements. As your needs grow, your modular system can be expanded easily to match new requirements. This new spectrum analyzer family consists of 11 components: a system mainframe, seven spectrum analyzer modules and an RF tracking generator module that fit into the mainframe, a display module, and a large-screen, stand-alone display unit. These components can be assembled in many different configurations to suit a wide variety of applications.

### Choose small or large, factory or custom systems

A small system configuration for many RF, microwave, or millimeter measurements consists of four modules (RF section, IF section, local oscillator-controller, and display) in a system mainframe. This single-mainframe system can be expanded easily by using the large-screen display unit in place of the display module. You can then add another IF section for a wider selection of resolution bandwidths or an RF tracking generator module for stimulus-response measurements.

The system can include more than one spectrum analyzer in several mainframes. Measurement data from all the analyzers can be shown on a central display in another location.

You can order a custom HP 71000 system and have it assembled and checked by HP or choose one of the three standard systems: HP 71100A RF, HP 71200A Microwave, and HP 71300A Millimeter Spectrum Analyzers. Their respective frequency ranges are from 100 Hz to 2.9 GHz, 50 kHz to 22 GHz (26.5 GHz is optional), and up to 325 GHz, depending on the external mixer used. Each system consists of four modules (local oscillator, RF section, IF section, and display) in a single mainframe.

On-site repair

If a failure occurs, the faulty module(s) can be replaced on site quickly with minimum downtime. You can either stock
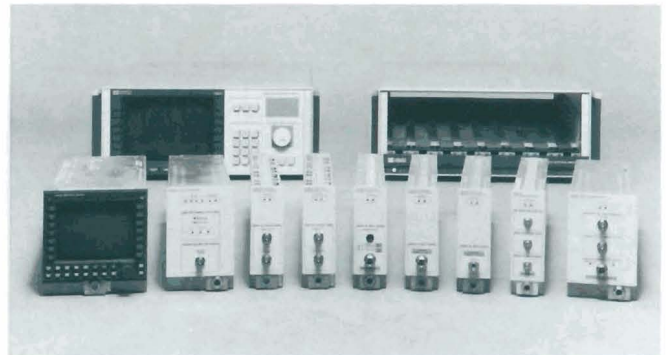
The HP 71000 Modular Spectrum Analyzer family includes 11 components that can be configured for a wide variety of signal analysis applications. Both custom and factory-configured systems are available.

backup modules for this purpose or, in some locations, take advantage of HP's on-site service. Diagnostic routines help locate the malfunctioning module, and no adjustment or recalibration is required after the module is replaced.

Automatic measurements

The HP 71000 analyzers are designed for automatic test applications. More than 50 built-in data processing and signal functions, such as fast Fourier transform (FFT), simplify the programming of automatic measurements. Because programs can be downloaded, you can transfer a finished measurement program from a desktop computer to the analyzer, where it can be executed without an external computer.

For more information, check **B** *on the HP Reply Card.*

New GaAs sampler technology

Ease-of-use and security features

Special keyboard commands can be used to convert measurements into other useful information. A *SMOOTH* feature uses a running weighted-average technique to maintain full resolution while working with unstable sources, enhancing readability when measuring noisy signals. An *OFFSET* feature subtracts or adds successive measurements from a specific value and displays only deviations. It simplifies null and other measurements when exact frequency is important.

Automatic amplitude discrimination detects the largest signal. The input circuitry is protected by an overload warning and an optional signal limiter.

You can avoid accidental loss of data from a change in a measurement setup by using *KEYBOARD LOCKOUT*. For security purposes, you can use *DISPLAY LOCKOUT* to clear the display and conceal your test results.

Reliability and serviceability

With fewer parts, you can expect greater reliability, easier servicing, and lower prices for these new HP counters. With an average temperature rise of only 2 degrees inside the in-

strument and in selected components, an eight-year MTBF is projected.

These counters require only minimal calibration adjustments. Standard with both the HP 5350A and HP 5351A is a temperature-compensated crystal oscillator. For longer calibration intervals, you can specify an optional oven oscillator that increases the required calibration interval to one year or choose a higher-performance oven oscillator that will extend the interval to five years. If you prefer an external time base, you can specify an external reference input that accepts input signals at 1 MHz, 2 MHz, 5 MHz, or 10 MHz.

Should repairs be necessary, faults can be identified at the board level by using the more than 30 built-in diagnostic tests. For fault isolation at the component level, you can use the built-in signature analysis stimulus. Diagnostic tests are accessible from the front panel or via the HP-IB.

For more information, check **A** *on the HP Reply Card.*

Versatile dynamic signal analyzer integrates testing, modeling, and analysis capabilities

Hewlett-Packard's new HP 3562A Dynamic Signal Analyzer can replace several instruments previously required for applications in electronics, mechanical vibration analysis, and control system design. This high-performance, dual-channel analyzer operates at frequencies ranging from dc to 100 kHz.

Electronic analysis

Key capabilities for electronics applications include 801-line frequency resolution, 80-dB dynamic range, and frequency response accuracy of ±0.1 dB and ±0.5 degree. The HP 3562A offers a choice of three analysis techniques for frequency response measurements: linear-resolution fast Fourier transform (FFT), logarithmic resolution, and true swept sine wave.

These capabilities make the HP 3562A especially useful for spectrum analysis and network testing, modeling, and analysis applications. It also provides waveform recording capabilities for data storage and subsequent analysis.

Mechanical vibration analysis

The HP 3562A offers excellent capabilities for a range of vibration analysis and other mechanical applications, whether dealing with machinery, motors, or structures. You can use it to identify and locate vibrations in machines and structures, diagnose faults in rotating machinery, predict behavior of airframe structures under varying loads, and reduce noise generated by new engines.

For mechanical applications, the HP 3562A features logarithmic resolution analysis that matches the true response of proportional bandwidth systems, burst random noise and burst sine wave chirp signals that reduce leakage and save measurement time, and direct-to-disc storage of sampled data that allows later detailed analysis.

Servo control system development

When developing new servo control systems, you may choose to replace the collection of design equipment formerly required with a single instrument: the HP 3562A. This analyzer offers a variety of capabilities for such applications, including true differential inputs for in-circuit testing without amplifiers, simple math operations for computing open-loop responses from closed-loop measurements, an advanced curve fitting algorithm for extracting and tabulating up to 40 poles and 40 zeros from a measured source, and frequency response synthesis for modeling network magnitude and phase.

Third-party software available

Software that extends the HP 3562A's capabilities for specialized applications has been developed by third-party software suppliers. Available third-party software for use with
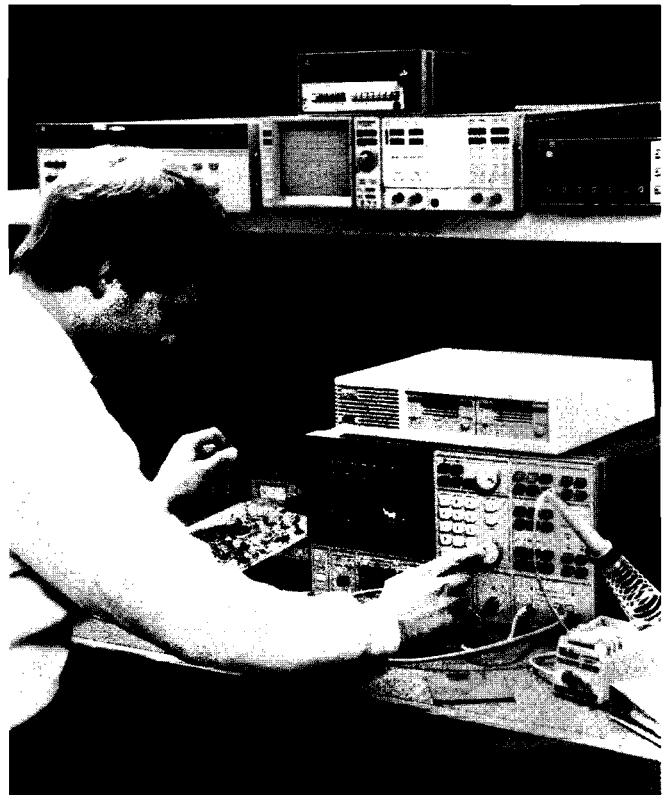
Four built-in processors help the HP 3562A function as a measurement and design station. Auto-ranging and main processor control capabilities enable the HP 3562A to conduct and document many tests without the aid of an external controller.

the HP 9000 Series 200 Computers includes the following:
- Structural modal analysis: extracts parameters from HP 3562A measurements and combines them with geometric models to provide vibration mode shapes and tables
- Acoustic intensity: determines the patterns of sound radiation from complex structures
- Rotating machinery maintenance: provides a system for periodic monitoring and analysis of rotating machinery.

Contact your HP sales office for a catalog of software suppliers.

*For more information, check **C** on the HP Reply Card.*

New brochure helps you select the right HP counter

A new four-color, 14-page brochure describes Hewlett-Packard's complete line of electronic counters. More than 21 products are included to help you select the best solution for your particular measurement problems. An easy-to-use selection guide simplifies the process.

Enclosed in the brochure is a prepaid business reply card that you can use to order data sheets and other information about the products described.
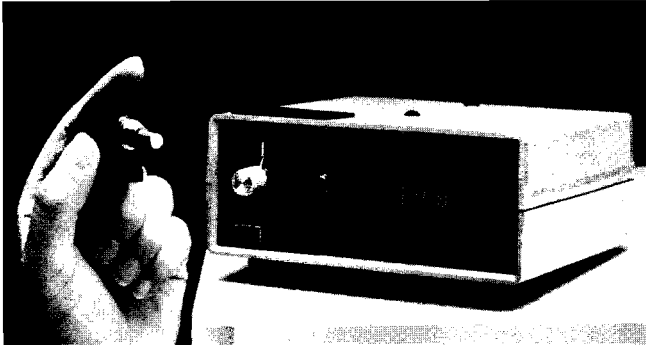
*For your free copy of this brochure, check **D** on the HP Reply Card.*

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

New potentiometer produces incremental digital output from manual input

The new HEDS-7500 Digital Potentiometer marks Hewlett-Packard's entry into a new sector of the optical technology market. Unlike most potentiometers, which require analog-to-digital conversion circuitry for digital output, the HEDS-7500

converts manual rotary inputs directly into incremental digital outputs.

Because of this potentiometer's two-channel quadrature output, you can count position movement both up and down. Since there is no deadband region, you can count infinitely in either direction. Standard resolution is 256 pulses per revolution. A slotted code wheel rotates between an LED source and a photodiode detector to provide digital pulses without contact between components, increasing the product's lifespan and reliability. The integrated photodiode and detector contribute to stability in temperatures ranging from $-20°C$ to $+85°C$.

Other key features include the following:
- Single 5V power supply
- TTL-compatible digital output
- Small size—only 28 mm diameter
- Excellent linearity for high precision
- Configured for standard front-panel mounting

For more information, check E on the HP Reply Card.

HP's new digital potentiometer can be used as a knob on the front panel of an instrument with a digital display to indicate the position of the knob. The HEDS-7500 converts manual rotary input directly into digital pulses for use with microprocessors or other digital circuitry.

New system represents significant advance in X.25 certification testing

An increasingly cost-effective method of interconnecting computers within a country or around the world is the use of X.25 Packet Switching Networks (PSNs). Enhanced capabilities in this area are provided by Hewlett-Packard's new 18150JA X.25 Certification Testing and Analysis System, which expands the capabilities of the HP 4955A Protocol Analyzer. This easy-to-use system gives X.25 users a more effective means of certification testing and network troubleshooting than was previously available.

The 18150JA consists of X.25 link-level and packet-level certification and link-level emulation. It is designed to adhere to the U.S. National Bureau of Standards X.25 verification procedure for FS 1041/FIPS100, which is rapidly gaining acceptance as an international standard. Implementation of this procedure in the 18150JA represents a significant advance in state-of-the-art X.25 certification tools.

Whether you are developing a PSN or equipment that connects to one, you can benefit from the HP 4955A/18150JA combination. With more than 700 tests at your disposal, you can quickly isolate link-level and packet-level problems and ensure that your PSN conforms to CCITT X.25 specifications. When developing X.25 equipment (terminals, hosts, network nodes), you can cut product development time by using the 18150JA instead of connecting to a live PSN.

M.F. Smith and Associates, Inc. of Bernardsville, New Jersey, wrote the link-level and packet-level certification tests. The fully documented tests are written in HP 4955A BASIC for easy customization.

The X.25 link-level emulator allows you to concentrate on X.25 packet-level testing by handling the details of level two

The new 18150JA X.25 Certification Testing and Analysis System uses the HP 4955A Protocol Analyzer for certification testing and network troubleshooting. It is state of the art and helps you ensure conformance to all codes of network certification equipment tests.

automatically. You can emulate the link level of the X.25 network or subscriber using enhancements to the *SIMULATE* menu of the HP 4955A.

For more information, check F on the HP Reply Card.

Statistical multiplexer capabilities added to HP's X.25 cluster controller

A new version of the HP 2334A X.25 Cluster Controller expands its capabilities so that it can also be used as a statistical multiplexer (stat mux). Called the HP 2334A MULTIMUX, this enhanced instrument is an excellent choice for connecting a remote group of workstations (terminals, PCs, printers, or plotters) to a central computer. The HP 2334A MULTIMUX can be used over analog leased lines, on X.25 Packet Switching Network (PSN) or dial-up lines, or on digital leased lines (DDS from AT&T).

Stat mux configuration support

As shown in Figure 1, the configuration differs when you use the HP 2334A MULTIMUX as a stat mux, rather than as a cluster controller. The new stat mux configuration supports most HP workstations and most HP 3000 application subsystems.*

The HP 2334A MULTIMUX is supported on the HP 1000 Computers (A-Series or E/F-Series) in the stat mux configuration by using either the HP 12040B or HP 12792B Interface Cards. Character-mode applications are fully supported on most HP terminals and personal computers.

Other new features

A new four-port modem control interface card allows remote workstations to be connected to the HP 2334A via asynchronous modems. Also available are features such as switching from one computer to another from the same workstation, computer port contention, a PBX/data switch, and an X.25 node switch connection. Other enhanced features make the HP 2334A MULTIMUX more flexible and easier to use:

- Remote configuration
- Automatic host dial-up
- Auto-parity
- User-definable profile
- Password on test port
- Indexed subaddressing
- New power supply with automatic power fail reset.

Cluster controller support

The HP 2334A MULTIMUX in its cluster controller configuration has the same level of support as the original HP 2334A. With the HP 3000 computer, it supports limited VPlus/3000, DSNLink/AdvanceLink, and character-mode applications. The HP 1000 is supported with character-mode applications.
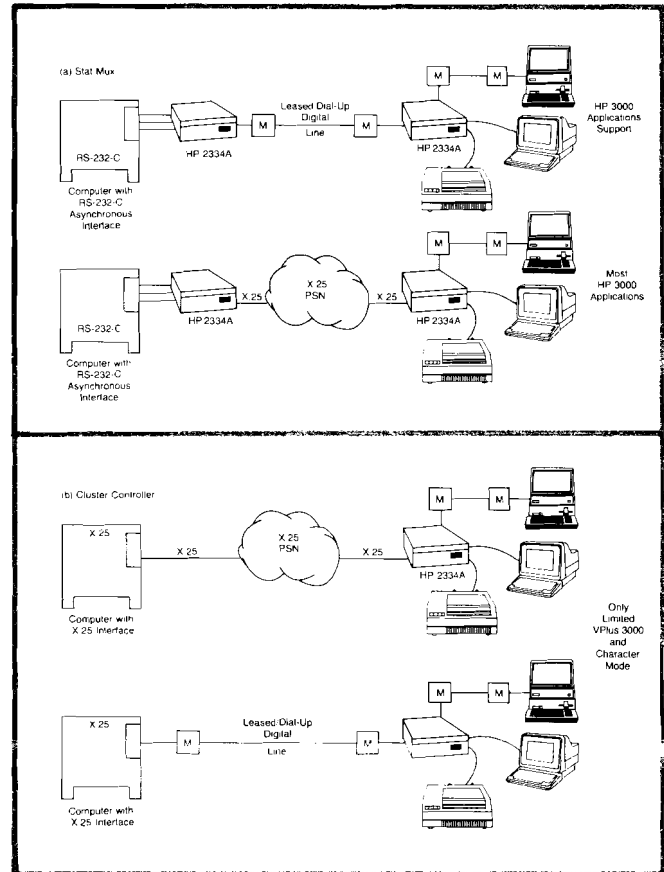

Fig. 1 ... HP 2334A MULTIMUX as ... a stat mux ...

*For more information, check **G** on the HP Reply Card.*

*Materials Management/3000, Production Management/3000, VisiCalc®, Rapid, ToolSet, Slate, TDP, and IDS/IFS programs are not yet supported. Results of current tests on these programs will be announced soon. Check with your local HP sales office for results.

# New ROMs expand mass storage selection

Two new low-cost, high-performance mass storage ROMs are now available from Structured Software Systems, Inc. (SSS). In conjunction with Hewlett-Packard, SSS developed one ROM for the HP 9845B/C Desktop Computer and one for the HP 9825T Computer. These MSROMs allow the computers to use HP's newest disc drives, including the double-sided 3½-inch flexible disc drive family (see separate article in this issue).

The HP 9845 MSROM operates with all of HP's CS 80, SS 80, and Amigo mass storage protocols. The following disc drives can now be used with both the HP 9845B/C and the HP 9825T: HP 9121/22 3½-Inch Flexible Disc Drives, HP 82901 5¼-Inch Flexible Disc Drive, HP 9895 8-Inch Flexible Disc Drive, HP 9133D Winchester/3½-Inch Flexible Disc Combination Drive, HP 9134D Winchester Disc Drive, HP 9133A/B/XV Winches-

ter/3½-Inch Flexible Disc Combination Drive, HP 9134A/B/XV Winchester Disc Drive, HP 9135A Winchester/5¼-Inch Flexible Disc Combination Drive, HP 7908/11/12/14 Winchester Disc Drive with optional tape, HP 7941/42/45/46 Winchester Disc and Disc/Tape Combination Drive, and HP 9144A ¼-Inch Cartridge Tape Drive. An HP 9825T upgrade kit is available from HP for current HP 9825A/B/S owners.

All sales, service, and operating support is supplied by Structured Software Systems, Inc. In North America, contact Frank Key, President, Structured Software Systems, Inc., Box 1072, Irick Road, Mt. Holly, NJ 08060, phone (609) 267-1616. In other parts of the world, contact the SSS representative nearest you. Structured Software Systems, Inc. has international representatives in the U.K., West Germany, Australia, France, Venezuela, Taiwan, and South Africa.

Double-sided disc drives reduce storage costs
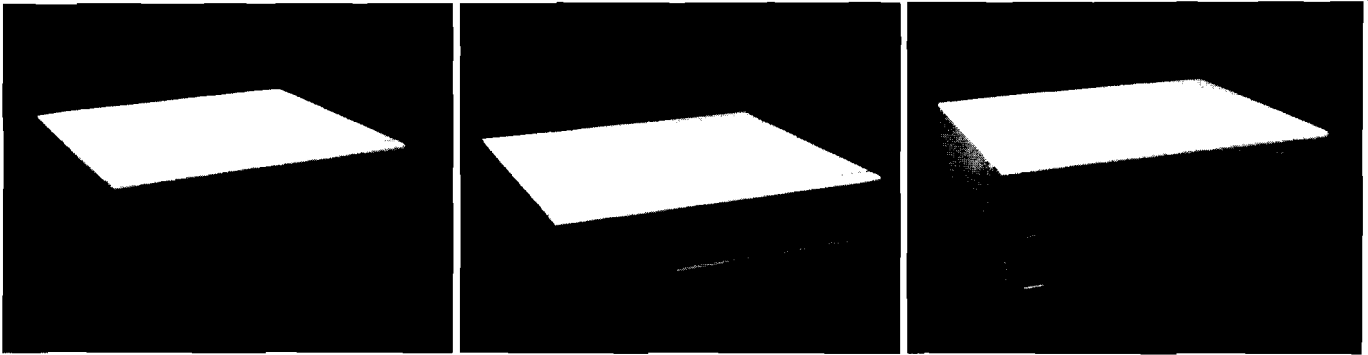
Hewlett-Packard's new 3½-inch mass storage products provide increased storage capacity, excellent reliability, and data compatibility among HP's handheld, portable, and personal computer families. Designed especially for the new enhanced HP 150 Computer (called the Touchscreen and Touchscreen MAX in North America), these disc drives boast a typical formatted capacity of 710 kbytes on each disc, resulting from their ability to read and write on both sides. This capability offers you a lower cost per byte of storage than single-sided disc drives. You can carry the equivalent of a filing cabinet full of data on a few small discs that fit in a shirt pocket.

Choose the right drive for your needs

The HP 9122D Dual Disc Drive provides two double-sided 3½-inch flexible discs, each with 710 kbytes of storage. This drive is well-suited to word-processing, spreadsheet, and graphics applications. There is also a single-drive version, the HP 9122S.

You can have fast access to large amounts of data easily with the new HP 9133D Disc Drive, which combines one 3½-inch flexible disc with a Winchester disc that provides 14.8 Mbytes of formatted capacity. The Winchester disc also offers high-speed transfer rates for the HP 150 (Touchscreen) plus the convenience of loading all your applications on one disc. The flexible disc can then be used for selective file backup, loading new software into the Winchester, and easy data exchange with other HP computers.

If you already have a flexible-disc-based HP 150 system, an excellent add-on device is the new HP 9134D Disc Drive, a stand-alone version of the Winchester disc drive.

Compatibility with single-sided media

These new double-sided disc drives can also read or write information in single-sided format. Using the appropriate command, you simply format the discs in either single-sided or double-sided format. Once a disc is formatted, the drive understands how you want to read and write the data.

Double-sided media can be used in HP's single-sided drives, but it is less expensive to use single-sided media for this purpose. Nonautoshutter single-sided drives shipped before March 1, 1983, cannot use the double-sided media.

No sacrifice of reliability

The excellent quality of the 3½-inch flexible disc has made it possible to increase disc capacity without sacrificing high reliability. Because of features such as the hard media jacket, autoshutter, and HP's exclusive media wear monitor, HP has found the 3½-inch disc to be several times more reliable than 5¼-inch discs.

*For more information, check **H** on the HP Reply Card.*

Enhanced RJE capability now available on HP 1000 A-Series computers

The new RJE/1000-II now provides protocol emulation of IBM 2780/3780 workstations for HP 1000 A-Series Computers. A dramatic improvement over the existing RJE product (HP 91780), this package works with the RTE-A operating system of the A-Series computers and the RTE-6/VM operating system of the E/F-Series computers.

With this package, you can transfer files, access data bases, and submit jobs for remote processing on IBM mainframes or on other mainframe computers that emulate the IBM 2780/3780 protocol, such as DEC computers.

Supporting dial-up or leased lines up to 19.2 kbps, RJE/1000-II achieves line efficiency of more than 90% and uses less than 2% of CPU capacity . Compared with the existing RJE product, this package offers a fourfold improvement in line speed and reduces CPU overhead dramatically.

RJE/1000-II uses the HP 12043A Data Communications Link for A-Series computers and HP 12260A for E/F-Series computers. These are the same links, including the PSI bisynchronous interface board and cable, as those used by HP's MRJE and PMF datacommunications products.

Currently supported are the JES2, JES3, and HASPII job entry subsystems. The Network Configuration Checkout Program run by HP's Network Marketing Center will be used to maintain a record of successful system configurations and to expand the supported job entry systems.

*For more information, check **I** on the HP Reply Card.*

Prices cut and field reliability documented for digital multimeter

The HP 3478A Digital Multimeter now has field reliability figures indicating an MTBF of more than 50,000 hours (25 operational years). This proven relability combined with worldwide reductions in price make the HP 3478A an even better value for ATE systems.

Providing five functions and 3½ to 5½ digits of selectable resolution, the HP 3478A measures DCV and DCI, true rms ACV and ACI, and two-wire or four-wire ohms. It features easy programming using the HP-IB (IEEE 488), external trigger and scanner synchronization signals, and extensive service-request capabilities.

Calibration can be automated via the HP-IB. You do not need to remove the covers or make any manual adjustments during calibration.

For more information, check J on the HP Reply Card.

Logic and Processor-Based Circuit Analysis

New software tools allow troubleshooting in C and Pascal

The first four of a series of software debugging tools for Hewlett-Packard's HP 64000 Logic Development System are now available for use in designs based on Intel 8086/8088 and Motorola 68000/68010 microprocessors. Software analysis for these microprocessor families can now be performed directly in the C and Pascal high-level programming languages.
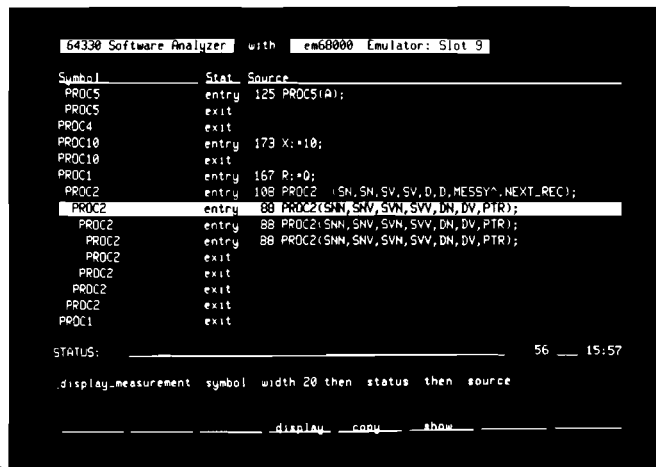
The HP 6433XA High-Level Software Analyzers meet the measurement needs of programmers who write code in high-level languages. These analyzers significantly increase software engineering productivity by freeing the user from cumbersome and time-consuming references to source, linker, and assembly listings. A software designer can now have a dynamic view of program and data flow, as well as the interactions between the two.

Each of these high-level analyzers operates with a corresponding emulator and an HP 64302A Emulation Bus Analyzer. The close tie to the emulator lets you control the target system and load its memory.

These new analyzers offer both global and local measurements. Module execution can be traced to verify program flow; nesting levels and the calling procedures are indicated on the trace display. Source code statements and variable values can be traced to highlight problem areas quickly. Data flow can be traced to check parameter values that are passed to and from blocks of code. Global data structures at block entry and exit points can also be viewed. Because the analyzers are directly connected to the emulators, control over program execution is rapid and straightforward, and program data is readily displayed and modified.

For more information, check K on the HP Reply Card.

A "trace modules" measurement with the any of the HP 6433XA High-Level Software Analyzers lists entry and exit points for each module, together with the associated source line statement for each.
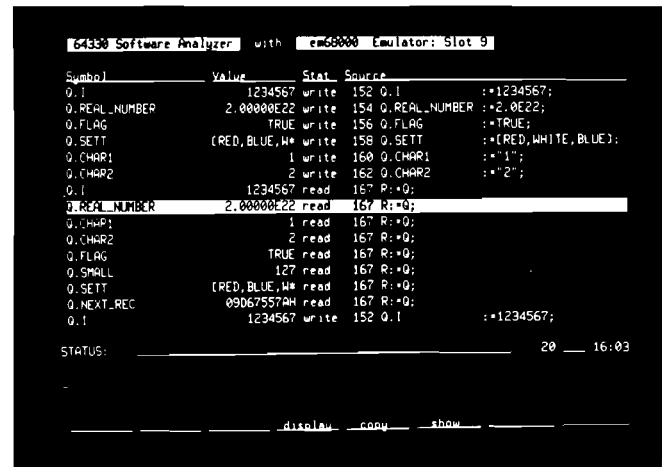
A "trace variables" measurement with HP's high-level software analyzer lists the variable (Q), variable symbol (integer, real number, etc.), the value of the variable, the read/write status, and the source line statement for each variable.

Logic development system supports larger design teams with addition of host computer

A new line of software development tools and high-speed network links lets you integrate HP 9000 Series 200 and Series 500 Computers with the HP 64000 Logic Development System. The tight coupling of the computer with the development system supports larger design teams and broader program coordination than is possible using either the computer or the HP 64000 system independently. Also available are similar software design tools and a high-speed link for the DEC VAX® series computers.

System designers can now access utilities and application programs available on HP-UX* or VMS® operating systems. Using software tools such as the Source Code Control System, the "make" utility, and UUCP (a program for networking UNIX systems), the computer/development system offers extensive support for efficient project management and programming. Comparable CMS and MMS utilities on the VMS system provide the same support when the HP 64000 system is used with a DEC VAX® 11/730/750/780 computer.

High-speed links and compatible software

This new computer/development system communicates across a high-speed link that connects the computer to the system bus for the HP 64000 system cluster. Links are currently available for HP 9000 Series 500 Computers with the HP-UX operating system and DEC VAX 11/730/750/780 computers with the VMS operating system.

System software generates code on the host computer that is compatible with the HP 64000 subsystems. Pascal and C compilers are available for seven microprocessor families: 8085, 8086, 6800, 6809, 68000, Z80, and Z8000. Cross-assemblers are offered for these processors and seven additional microprocessor families. These software tools are offered on the media appropriate to the host computer.

Flexible modular system

The HP 64000's modular structure lets you begin with the software and hardware modules that meet your current needs and then add modules as your needs change. Each system
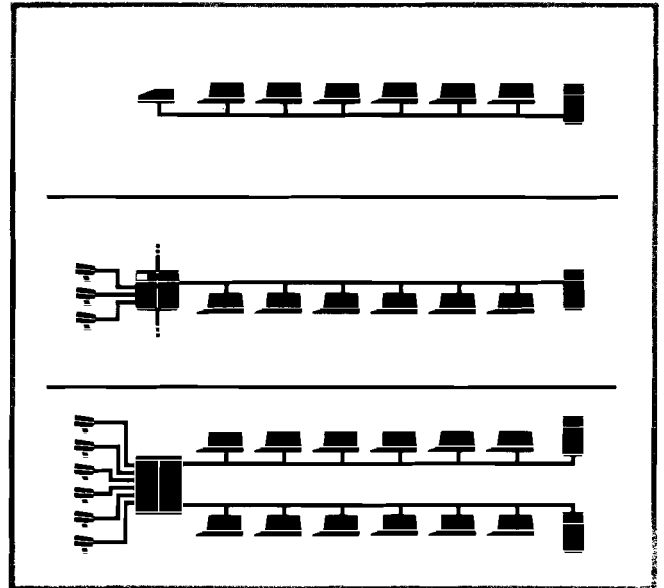
The addition of a host computer to the HP 64000 Logic Development System lets you cluster development stations, hard discs, and printers to serve large software design teams. A system can be reconfigured at any time to meet changing needs.

may be configured as a single stand-alone benchtop system, as a host computer combined with several HP 64000 clusters and computer terminals, or any combination in between.

*For more information, check **L** on the HP Reply Card.*

*HP-UX is Hewlett-Packard's implementation of the UNIX operating system. UNIX is a trademark of AT&T Bell Laboratories.

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