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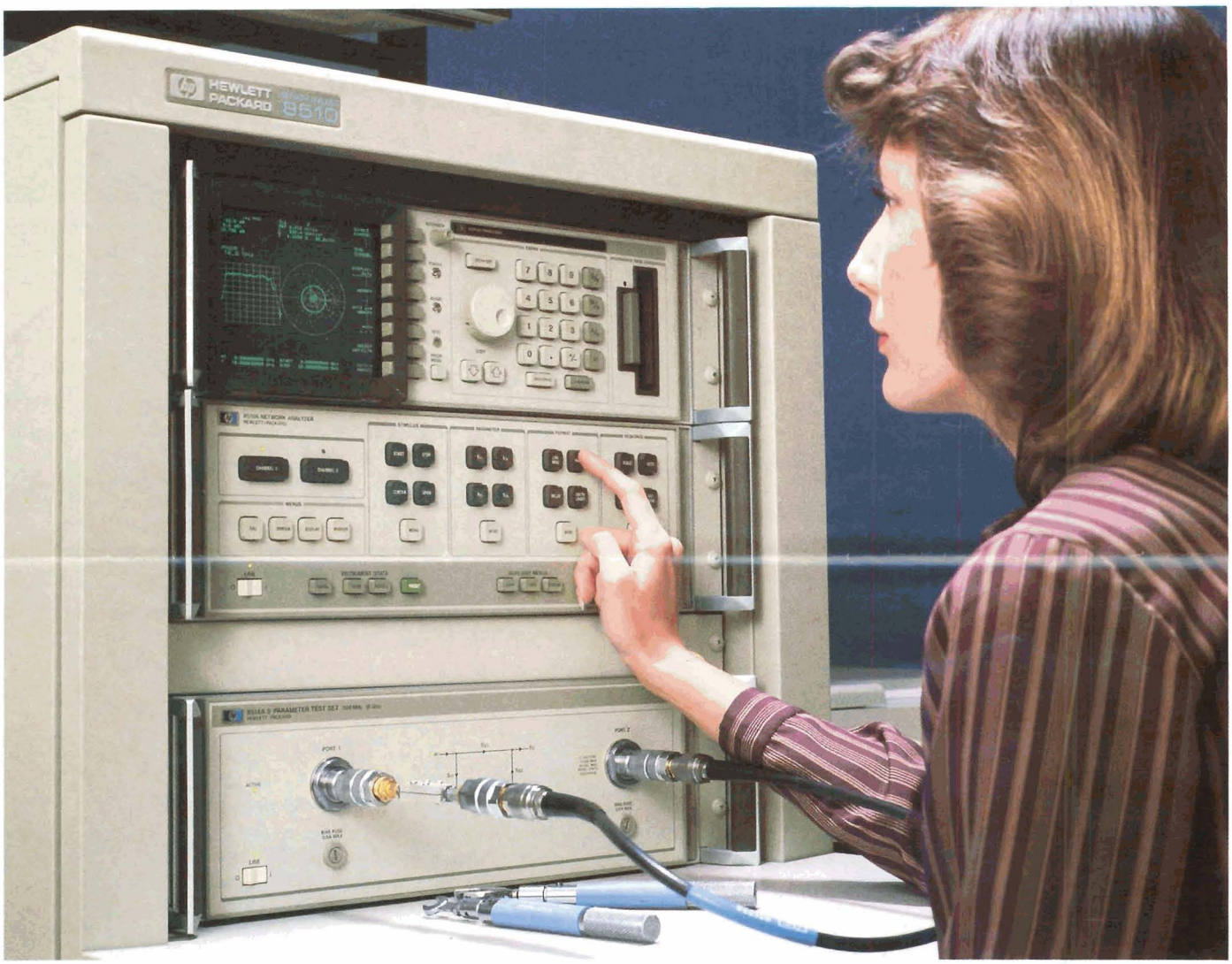
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MEASUREMENT COMPUTATION news

product advances from Hewlett-Packard

NOVEMBER/DECEMBER 1984




# Make real-time, error-corrected measurements quickly with new network analyzer

Hewlett-Packard's new HP 8510A Network Analyzer offers impressive performance and capability for microwave test and measurement needs. With a single connection, you can completely characterize the behavior of a linear network over the frequency range of 45 MHz to 26.5 GHz. Combining advanced microwave hardware with an internal high-speed computer, the HP 8510 system provides a solution for network measurement problems with remarkable accuracy, speed, and flexibility.

### Flexible system configuration

The HP 8510 system includes the HP 8510A Network Analyzer and a choice of four broadband test sets, which measure either reflection/transmission or all four s-parameters to 18 GHz or 26.5 GHz. Also available is a stand-alone, four-channel frequency converter to which the user can connect signal separators for custom configured test setups. The system source can be either the HP 8340A or HP 8341A Synthesized Sweeper or one of the HP 8350 Series Sweep Oscillators.

Included in the purchase price of the HP 8510A are two enrollments in HP's three-day user course. This lab-intensive course trains operators to become proficient more quickly and easily than when self-taught.

*(continued on page 2)*

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# Two new synthesized signal generators offer expanded features for ATE systems

Two new synthesized signal generators, the HP 8642A (100 kHz to 1,057.5 MHz) and the HP 8642B (100 kHz to 2,115 MHz), have expanded ATE system features to help you achieve higher productivity. HP has designed these new generators for increased up time, an important factor in productivity, by combining designed-in quality, a two-year calibration interval, and typically two-hour on-site repair and calibration. The modular design of these generators lets you easily locate and replace faulty modules when necessary. You can transfer a module's calibration data to the instruments' main memory with a simple front-panel key sequence.

### Reduced measurement error

The HP 8642A/B generators improve the typical measurement margin in stringent out-of-channel RF receiver tests such as adjacent channel selectivity and spurious signal rejection. Both generators provide single-sideband phase noise of less than −139 dB, relative to the carrier (dBc), at a 20-kHz offset from a 1-GHz carrier. Spurious signal levels are less than −100 dBc. These improved levels are accomplished by using high-Q SAW-resonator oscillators.

Both generators offer output power from +20 dBm to −140 dBm in 0.1-dB steps. Accuracy is ±1 dB down to −127 dBm. Their high output power lets you make a variety of high-level measurements, often without external amplifiers. Leakage of less than 0.5 μV helps you make low-level measurements with confidence.

### Modulation capabilities and programmability

The HP 8642A/B generators offer AM, FM, phase, and pulse modulation over their full frequency ranges. A special selectable low-frequency output section provides improved FM peak deviation at lower carrier frequencies (less than 132 MHz). Simultaneous modulation allows you to modulate with two separate sources.



The new HP 8642A/B signal generators feature 14 internal modules, each of which can be replaced easily when faults are discovered. Faulty modules can be isolated quickly using the instruments' internal diagnostic hardware and software.

To simplify receiver audio flatness tests when testing FM mobile radios, these generators feature a built-in 750-ms preemphasis capability.

An easy-to-use front panel labeled with all the HP-IB (IEEE 488) programming codes saves you time when developing ATE system software. An innovative *HELP* feature uses the back-lit alphanumeric LCD display to show special function codes and associated operation descriptions.

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

# New network analyzer

*(continued from page 1)*

### Real-time, error-corrected measurements

In less than one second, the HP 8510 system can display reflection or transmission measurements that have been vector error corrected for systematic errors at 401 frequency points. System speed is even faster with fewer frequency points. This means that you can see the real-time effects of adjustments on a network under test while measuring with extreme precision. Accuracy-enhancement techniques can produce 50 dB effective directivity and 40 dB effective source and load match, giving you a high level of confidence in your measurement results.

### High accuracy in broadband measurements

In a single test setup, you can measure both the magnitude and phase response of the reflection or transmission characteristics of a device under test from 45 MHz to 26.5 GHz. When you couple the accuracy enhancement of vector error correction with the HP 8510A's precision IF processing and detection system, you can achieve dynamic accuracies of ±0.05 dB and ±0.3 degree at a level of 50 dB below the measurement reference. Resolutions of 0.001 dB, 0.01°, and 0.01 ns are provided, with commensurate stability. Dynamic range is 80 to 100 dB, depending on the frequency range and test set used.

### Frequency/time-domain transforms

The HP 8510 system has the optional capability of transforming measurement data from the frequency domain to the time domain. Viewing measurements in the time domain lets you see inside a network to identify individual discontinuities or signal paths as a function of time or distances. Mathematically simulated step or impulse stimuli and a variety of operating modes provide more flexibility in viewing measurement results.

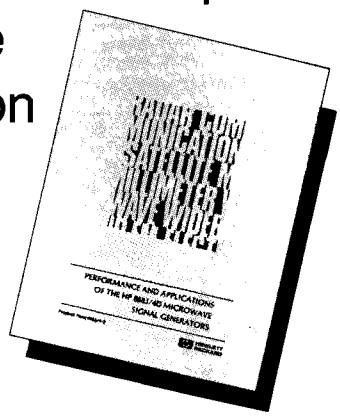
Individual responses can also be isolated within settable gates, letting you virtually ignore all responses outside the gates. You can then transform the response back into the frequency domain to view the response of the device alone, ignoring the effects of the cables, connectors, and fixtures. Like the frequency-domain measurements, time-domain results can also be seen in real time, computed from the error-corrected s-parameter measurements. Because the HP 8510A is a dual-channel instrument, you can view the response of a network in both domains simultaneously.

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



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# New product note expands performance information on cavity-tuned signal generators



Hewlett-Packard's new product note PN 8683/4-2 provides supplemental performance information about HP cavity-tuned signal generators. This publication expands the information provided in operators' manuals and data sheets and shows typical parameter curves for using the instruments in room temperature (whereas data sheet specifications cover 0° to 55°C).

Titled "Performance and Applications of the HP 8683/4D Microwave Signal Generators," this product note covers the special considerations needed when using passively doubled signals and shows the effects of optional postamplifiers that provide 10-mW output levels. Applications are also described in which the doublers provide doubled FM deviations.

*For a copy of this product note, check* **C** *on the HP Reply Card.*

# Application note details microwave switching from SPDT to matrix test

Most microwave automatic test systems use some type of signal switching interface unit to connect stimulus and measuring equipment to the units under test. Because of the special nature of the test situations, these interfaces must often be custom designed. For those who design such interfaces, Hewlett-Packard's new application note offers some helpful design and testing suggestions.

AN-332, "Microwave Switching, from SPDT to Matrix Test," begins by reviewing the edge-line principle of transmission line design used in the HP 8761 and HP 33311 families of SPDT switches. Signal transfer switching is discussed for serial and parallel configurations.

Also covered are switching matrices, including the simple single-channel-access and the more complex full-access configurations. Special emphasis is placed on the crossbar, or intersection, type of configuration.

The note addresses several methods for automatic testing of signal path deterioration. One novel configuration places a power meter sensor inside the interface panel and routes a 50-MHz, 1-mW reference signal into the internal sensor. You can then establish NBS traceability right at the interface panel.

*For your free copy of this new application note, check* **D** *on the HP Reply Card.*



# Switching matrix provides improved semiconductor testing on up to 48 pins

Hewlett-Packard's new HP 4085M Switching Matrix is a dedicated subsystem created for use with the HP 4145A Semiconductor Parameter Analyzer. Designed to minimize noise and current leakage, this new switching matrix allows high-sensitivity measurements of 1 pA and 1 mV on up to 48 pins of a device under test (DUT) in wafer or packaged form. The HP 4085M subsystem consists of the switching matrix and its controller, which is a remote-control module that contains power-sourcing and logic-control circuitry.

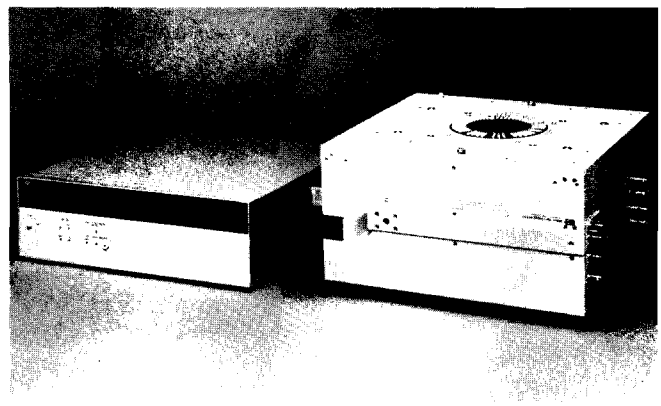
The switching matrix has eight input ports that are matrixed to 48 output pins. Under program control, any of these input ports can be switched to any DUT pin. When the switching matrix is mounted on a wafer prober, it also provides RFI shielding and a minimum interconnecting distance to the probe card.

### Software and adapters

The software included with the HP 4085M uses high-level commands for executing port-to-pin interconnections and diagnostics. You can also view the status of the interconnections on a system controller such as the HP 9000 Model 216S Computer.

The following test-fixture adapters are also included with the HP 4085M:

- HP 16078A Adapter for use with the HP 4145A Semiconductor Parameter Analyzer



The HP 4085M Switching Matrix (at right) and its controller form a dedicated subsystem for use with the HP 4145A Semiconductor Parameter Analyzer.

- HP 16066A Test-Fixture Adapter to accommodate fixtures for packaged devices or circuits
- HP 16075A Relay Test Adapter for diagnostics.

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



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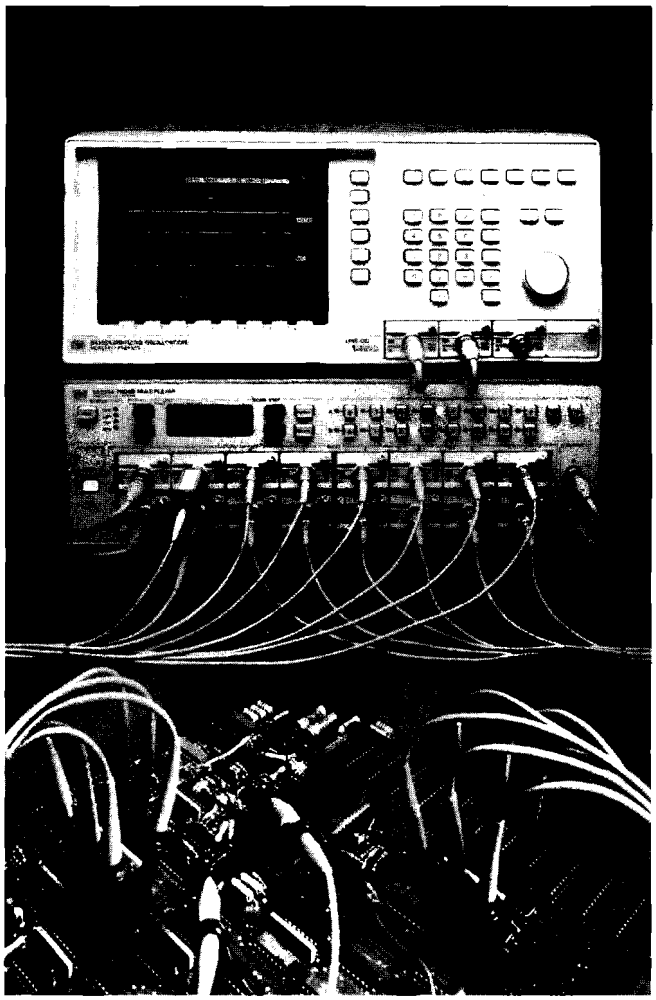
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# Fully programmable digitizing oscilloscope has digital architecture

With a 1-GHz bandwidth and 100-ps time-base accuracy, Hewlett-Packard's new HP 54100A/D Digitizing Oscilloscope solves measurement problems in designing and testing high-speed logic circuits. Combining a 68000-based digital architecture with a crystal-controlled time base, the fully programmable HP 54100A/D is designed for engineers working with fast TTL, ECL, CMOS, and other high-speed logic families. However, its excellent price and performance value make the HP 54100A/D an attractive choice for a variety of general-purpose oscilloscope applications.

At the press of a front-panel button, the HP 54100A/D automatically measures frequency, period, pulse width, transition times, peak-to-peak amplitude, top and base voltage levels, preshoot, and overshoot. Other features include the following:

- Digital storage
- Infinite persistence displays
- Pretrigger viewing
- Clutter-free, easy-to-use front panel
- A choice of removable pods for configurable inputs
- Setup aids to simplify time-domain measurements for digital design.



With the HP 54100A/D's configurable pod positions, you can connect as many as 16 [illegible] with the HP 54300A/D.

### Configurable inputs and probes

Unlike most oscilloscopes, the HP 54100A/D's inputs are configured via removable pods that you can select to suit your application. The HP 54100A model has three configurable inputs: two vertical channels and one trigger input. The HP 54100D provides an additional trigger input. There are currently three probe pods that you can install in any of the front-panel inputs. Attached to the HP 54001A 1-GHz pod is a 10-kΩ 2-pF mini-probe, which provides accurate displays of fast logic signals so you can see fast transitions with a minimum of distortion. This pod is also useful for probing densely packed, high-speed logic circuits. When this pod is used with the HP 54100A/D, the system bandwidth is 700 MHz.

The HP 54002A 50Ω pod should be used when signal fidelity in transmission line systems is important. For high-resistance circuits, the HP 54003A 1-MΩ pod is appropriate.

### Probe multiplexer increases versatility

A companion product to the HP 54100A/D, the HP 54300A Dual Eight-to-One Probe Multiplexer provides a versatile probing system for both automatic and manual applications. With this multiplexer, you can connect up to 16 probes to a circuit and select two at a time to test. This feature lets you make measurements with the confidence that all conditions are identical, eliminating the need to shut off power, connect or disconnect probes, or otherwise disturb the test points.

### Persistence modes

The HP 54100A/D's digital variable persistence mode lets you see the most recently captured representation of the signal. By increasing the persistence, you can retain waveform information on the screen for as long as you wish.

The oscilloscope's infinite persistence mode helps you perform worst-case analysis by providing a cumulative display of minimum and maximum values, as well as jitter. In this mode, the oscilloscope retains all waveform information on screen, easily capturing transient events or errors that occur at a low repetition rate.

### Simple programming for computer analysis

For computer analysis and comparison of measurement data, you can connect an HP Series 200 Computer to the HP 54100A/D. Thanks to the oscilloscope's English-like mnemonics, uncomplicated syntax, and command hierarchy, you can simplify software development, allowing you to program complex measurement sequences easily.

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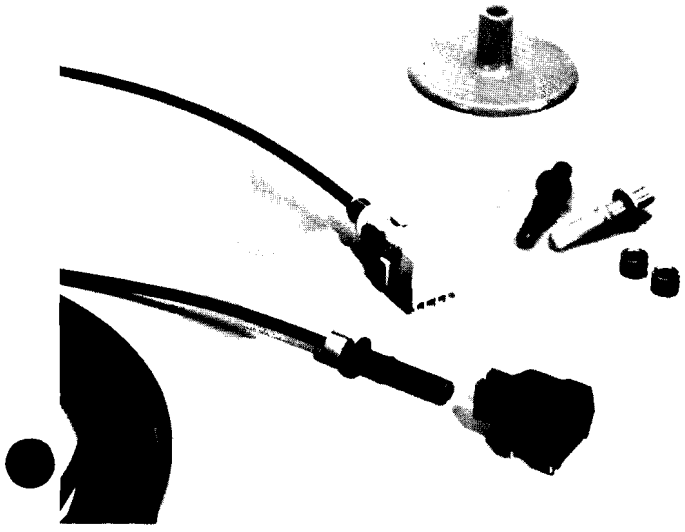
# Fiber optic design flexibility and sensitivity provided by new snap-in link components

Hewlett-Packard's new HFBR-2503 Snap-In Fiber Optic Link Receiver has a sensitivity of −39 dBm, giving it the flexibility to be used in a variety of designs, including sensor applications such as gap sensors and photointerruptors. The corresponding transmitter is the CMOS-compatible HFBR-1512, which has an LED drive current as low as 2 mA. It can be driven from many CMOS logic gates. Other applications for these and other HP snap-in fiber optic components include battery-operated equipment, computer-to-peripheral links, medical equipment, and a wide range of industrial instrumentation.

When used together, these two plastic snap-in components, the HFBR-2503 and the HFBR-1512, can achieve an 8-m link at 40 kbaud. Link length can be increased to 60 m at equivalent data rates by increasing the LED drive current to 60 mA.

HP also offers a new low-attenuation, plastic-fiber cable, which features flame retardance, complying with UL VW-1 regulations. This new cable meets many building fire code requirements, saving on installation costs by replacing traditional wire cable and conduit.

The new HFBR-4505/4515 Bulkhead Feedthroughs are compatible with the HFBR-2503 and HFBR-1512, as well as with other HP snap-in components. These snap-in feedthroughs are color coded to match transmitters and receivers. They can be used either as in-line splices or as panel feedthroughs for plastic fiber cable.



Among HP's newest snap-in fiber optic components are the HFBR-2503 Receiver and the HFBR-1512 Transmitter. The HFBR-2503's sensitivity helps achieve greater link distances with plastic fiber technology.

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

# Hermetic dot-matrix color displays new from HP

Hermetic dot-matrix displays are now available from Hewlett-Packard in high-efficiency red (HER) and yellow. The HDSP-078X/079X/088X Series Displays conform to requirements for U.S. military applications, specifically TXV/TXVB test programs, MIL-D-87157, quality level A.

These hexadecimal and numeric displays feature 4×7-dot matrix characters and measure 7.4 mm (0.29 in) high. Categorized for luminous intensity, this new display series offers either low-power or high-brightness options for the HER displays.

An on-board IC contains data memory, decoder, and display driver functions for greater design flexibility. The performance of these displays is guaranteed over a wide temperature range.

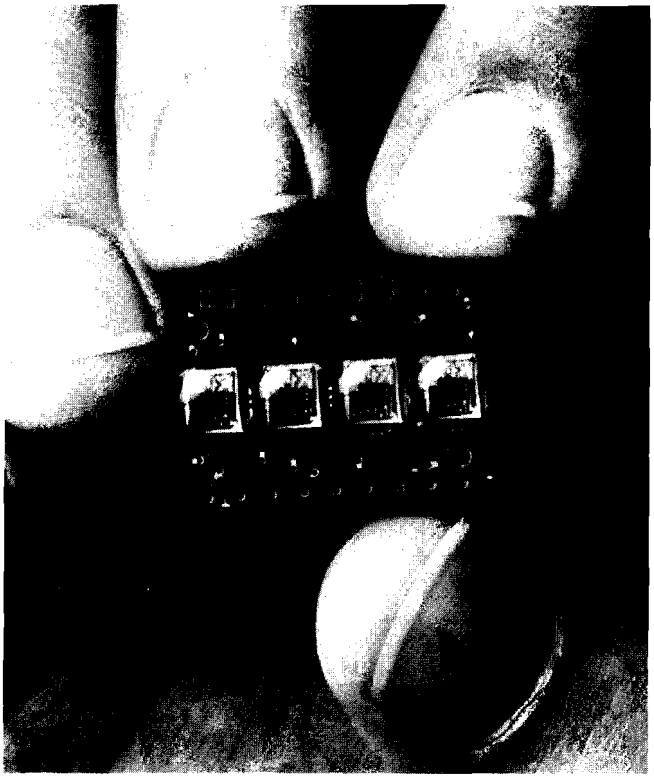


This new hermetic display, available in high-efficiency red and yellow, conforms to requirements for U.S. military applications.

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These intelligent alphanumeric displays from Hewlett-Packard are pin-for-pin compatible with the Litronix DL-2416 displays.

# Intelligent alphanumeric display is suitable for industrial and commercial use

New from Hewlett-Packard is the HPDL-2416 Display, an intelligent alphanumeric display that is pin-for-pin compatible with the Litronix (Siemens) DL-2416 displays. This 4.1 mm (0.16 in) red GaAsP display has four characters and a sixteen-segment character font. Its on-board CMOS IC contains memory, ASCII decoder, multiplexing circuitry, and drivers and ensures low power consumption.

The HPDL-2416 offers several feature advantages. It has a wide operating temperature range, going from −20°C to +70°C. Large built-in protective diodes provide excellent ESD provide excellent ESD protection, and the IC has a fast access time of 160 ns. The HPDL-2416 is fully TTL-compatible and can be wave soldered for faster assembly. It is especially well suited for industrial and commercial applications requiring an attractive, easy-to-use alphanumeric display.

Typical applications for this new display include portable data-entry devices, medical equipment, process-control equipment, industrial instrumentation, and computer peripheral devices.

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



# New disc drives offer small desktop packaging

The new HP 7941A and HP 7945A Disc Drives complement Hewlett-Packard's family of Command Set 80 Winchester disc drives (The HP 7908/11/12/14/33). At the same time, the 24M-byte HP 7941A and the 55M-byte HP 7945A offer new features to help meet your mass-storage needs. Both disc drives are designed for entry-level, multiuser systems.

Key features include the following:

- Reduced size. Both drives are housed in the same small stand-alone desktop cabinet—one-tenth the size of HP's other Command Set 80 disc drives.
- Quiet operation. With less than 50 dBA sound pressure levels, both drives are well suited to the office environment.
- Customer installable.
- Good performance. Both have an average seek time of 30 ms.

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

# PC software support available for HP plotters

Hewlett-Packard plotters are well supported by a variety of software programs for non-HP as well as HP personal computers. The HP 7470 and HP 7475 plotters are supported with many programs on both Apple and IBM personal computers. The HP 7550A plotter, introduced just this year, is already supported with many of the same programs. The IBM PC software includes business programs, design graphics, project management, mapping, and customized graphs.

Among the more well-known programs supporting HP plotters are the following:

- Decisionnel Grafique by ADE Marketing in France
- GraphPlan by Vector International in France, Belgium, and UK
- Presentation Graphics by Ide-data in Sweden and France
- Open Access by Software Products International in Italy, Germany, UK, and Spain
- Chart-Master by Decision Resources in Germany, UK, and Sweden
- AutoCad by AutoDesk in Germany, UK, France, Sweden, and Switzerland
- 1-2-3 and Symphony by Lotus Development in the UK
- ESS Plot by ESS Consultants in the UK
- SuperCalc$^3$ by Sorcim in the UK

*For more information, contact your local HP sales office.*



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# Rugged line printers offer high speeds, versatility

Two new line printers from Hewlett-Packard, the HP 2565A and the HP 2566A, match the quality and flexibility of other dot-matrix printers, yet offer speeds up to 900 lines per minute.

The HP 2566A prints at a maximum speed of 900 lines per minute (lpm), and the HP 2565A prints at 600 lpm. These printers are designed for medium-to-high volume print loads in such application areas as EDP, manufacturing, and engineering. Their heavy-duty modular design increases reliability and serviceability. Both printers offer multipart forms handling and high-speed graphics capabilities.

### Matrix-printer features at band-printer speeds

The HP 2565A/66A printers offer capabilities and features not typically found in line printers that operate at similar speeds. The standard character set in both printers is 8-bit Roman8, which supports USASCII in addition to eleven European languages at standard 10 cpi (characters per inch), compressed 16.7 cpi, and double high/double wide characters. Up to 14 optional character sets can be installed at one time. You can choose any of these character sets either from the front panel or using program control. You can also mix compatible character sets on the same line of print.

Both printers offer optional low-resolution bar code character printing in Code 3 of 9, Interleaved 2 of 5, Industrial 2 of 5, UPC, A&E, and EAN 8 and 13 codes. You can vary the bar code size programmatically from ⅜ inch to 3 inches, include optional headers above or below the bar code, and intermix text and bar codes in the same line.

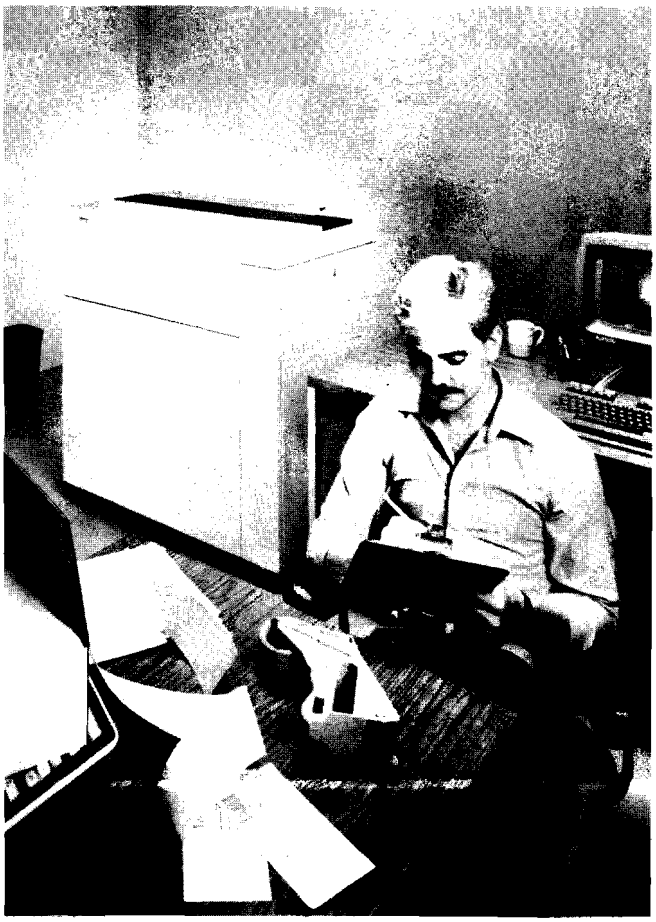
Optional OCR-A and OCR-B character sets are also available. OCR letters and numbers look like conventional characters but are printed to a specification that can be read by an optical reader.

### Simplified paper loading and forms handling

The print mechanism raises to give you easy access to the paper path. Horizontal positioning of four paper tractors is motor-driven to simplify further the paper loading and alignment. You can also make fine adjustments to the vertical and horizontal positioning of the form while printing.

Using the printer's simplified control panel, you can choose primary and character sets and control page length and spacing. In addition, a standard programmable 16-channel VFC (Vertical Format Control) reduces operator intervention by allowing VFC commands to be downloaded at the beginning of a print job to change the format of the print data.

Both the HP 2565A and the HP 2566A can link to HP 3000 and HP 1000 Computer Systems through the HP-IB (IEEE 488). Other optional interfaces include RS-232-C, RS-422A, the Centronics Parallel Interface, and the HP 2608A Plug-Compatible Parallel Differential I/O for the HP 1000 M, E, and F systems.



The HP 2565A/66A heavy-duty dot-matrix printers offer speeds of either 600 or 900 lines per minute. Bar-code capabilities make them well suited to manufacturing applications.

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

# New HP 150 enhancements

*(continued from page 8)*

tation and enhancements of the Personal Applications Manager (PAM), the system software that interfaces with the operating system. Also included are the MemoMaker and Personal Card File application software for word processing and simple data management.

New documentation for the HP 150 computers features easy-to-read copy and helpful illustrations to get you started quickly. Three levels of manuals are offered so that you can easily find the answers you need. For the new user, the documentation includes an introductory guide with easy-to-learn steps. If you are an experienced user, you can look up detailed information in the task-oriented user's guides. Also included is a compact quick reference guide.

The new version of PAM enables it to run faster and take up less RAM space. PAM's file manager now supports subdirectories to simplify organizing your files. A new application called Easy Config lets you configure the enhanced HP 150 quickly for printers, plotters, disc drives, and host computers. Easy Config presents a pictorial menu from which you select the device you wish to use.

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# New HP 150 enhancements add networking and increased storage capabilities

Hewlett-Packard's new enhanced HP 150 offers increased data communications capabilities, a new double-sided flexible disc drive, and innovative features designed for ease of use. Like the current model HP 150, this new version features the MS™-DOS operating system, powered by the Intel 8088 16-bit microprocessor.

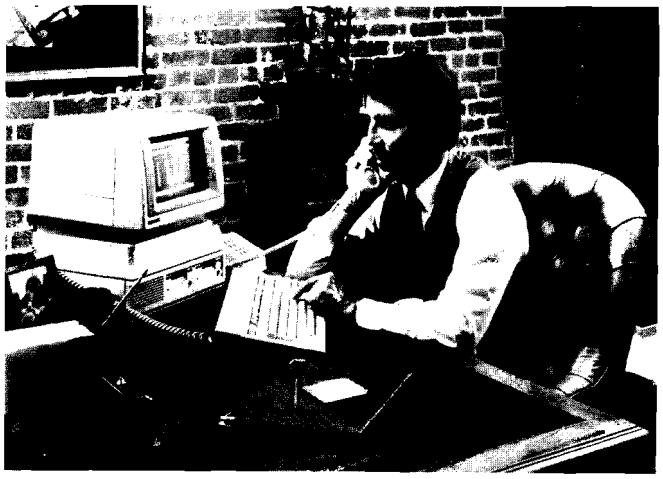
### Networking support

Support of the 3Com Local Area Network is now available for HP 150 users. Using 3Com's EtherSeries™/150 Network, you can link HP 150 computers with IBM PCs and compatible computers*, communicate with them via electronic mail**, and share large-capacity fixed discs and printers. The EtherSeries/150 Network supported by HP is expandable, linking from two to a hundred personal computers and accepting up to 1,000 feet of cabling. Other available software lets you exchange data with remote computers and information services and exchange files between your HP 150 computer and an IBM PC, a DEC computer, or the HP 110 Portable Computer. Upgrade packages are available for current HP 150 users.

### Higher-capacity disc drives

The new HP 150 Personal Computers use double-sided disc drives that let you store more information on each disc, work with fewer discs, and boot, load, and run applications more quickly.

Packaged with your choice of two different disc drives, the enhanced HP 150 may be ordered with the HP 9122D Disc Drive by specifying Part Number 45650BU. This drive accommodates two double-sided 3½-inch flexible discs, each of which provides 710 kbytes of formatted storage capacity. For greater storage and information management needs, Part No. 45660BU combines the HP 150 with the HP 9133D Disc Drive. This drive has a Winchester disc with 14.8 Mbytes of formatted capacity and one double-sided, 3½-inch flexible disc. Backup for the Winchester drive can be handled by the HP 9144A ¼-inch tape drive in just eight minutes. You can also purchase the enhanced HP 150 separately for use as a terminal by specifying Part Number 45610BU.



The new enhanced version of the HP 150 Personal Computer is packaged with your choice of disc drives: either the dual double-sided 3½-inch flexible disc drive or a drive combining a Winchester disc and one flexible disc.

### New features make computing easier

The new enhanced HP 150 systems make computing easy to learn and easy to use. Standard with each system is the Instant Productivity Pack, which contains all new documen-

*(continued on page 7)*

*Hewlett-Packard does not support IBM PCs and other EtherSeries-compatible computers on non-U S -configured networks.

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