

# hp MEASUREMENT COMPUTATION NEWS

product advances from Hewlett-Packard

MAY/JUNE 1985



## Versatile instrumentation system adds low-cost test and measurement capability to your personal computer

Hewlett-Packard's new personal-computer-based test and measurement system expands the versatility of PCs as workstations for technical professionals. In this modular system, called HP PC Instruments, the instruments act as I/O peripherals for a PC.

### HP and IBM PC compatibility

The HP PC Instruments system is compatible with the HP Touchscreen PC (called HP 150B and HP 150 II outside North America) as well as with the IBM PC, PC/XT, or PC/AT running industry standard MS™-DOS. Your personal computer can communicate with any combination of eight different kinds of instruments via a user interface, the PC Instruments Bus (PCIB). Each PCIB card is capable of supporting up to eight instruments and is plugged into a slot inside the PC. Different numbers of PCIB cards can be used, depending on

the number of slots available in the computer. The HP 150 II has four slots.

### Modular system design

The PC Instruments system consists of eight instrument modules, each with its own power pack and contained in a separate stackable plastic enclosure. The initial product line includes the following modules:

- HP 61010AA Digital I/O
- HP 61011AA Relay Multiplexer
- HP 61012AA Dual Voltage Digital to Analog Converter
- HP 61013AA Digital Multimeter
- HP 61014AA Function Generator
- HP 61015AA Universal Counter
- HP 61016AA Digitizing Oscilloscope
- HP 61017AA Relay Actuator

(continued on page 2)



## For hardware designers: a logic analyzer and a digitizing oscilloscope in one low-cost instrument

Hewlett-Packard's new HP 1631A/D Logic Analyzer is a dedicated benchtop logic analyzer that adds digitizing oscilloscope functions to state analysis, timing analysis, and performance analysis. A general-purpose system integration tool for the digital hardware designer, the HP 1631A/D can trigger on specific analog events, providing information for troubleshooting and characterizing systems.

Its two analog channels provide a 200-megasample-per-second digitizing rate, allowing simultaneous capture and storage of single-shot waveforms with bandwidths up to 50 MHz.

Single-shot time-interval measurements can be made with accuracy up to  $\pm 1.5$  ns. Time and voltage statistics can be obtained through repetitive measurements using X and O cursors.

The HP 1631A has 27 25-MHz state channels and eight 100-MHz timing channels, while the D model has 27 state channels and 16 timing channels, or 35 state and eight timing. The HP 1631A can be configured for 35 state channels, and the D model can be configured for 43 state channels, but no timing channels are available in these configurations.

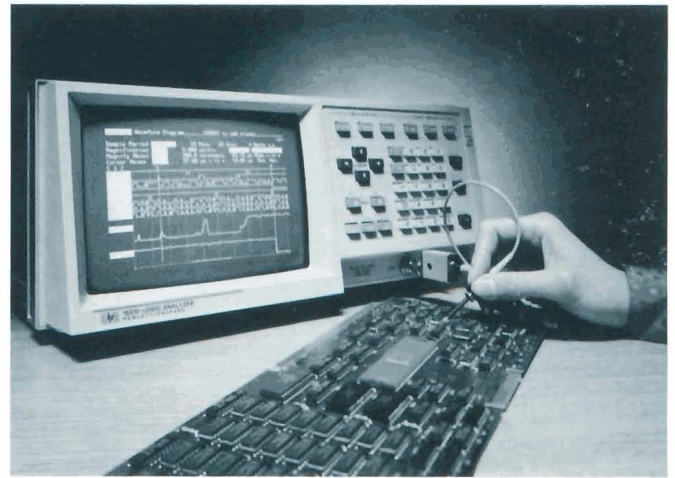
Two high-speed analog-to-digital converters (DACs) form the basis of the HP 1631A/D's internal digitizing oscilloscope. These proprietary custom bipolar integrated circuits are six-bit Gray-code flash converters that can digitize up to 200 megasamples per second.

### Cross-domain analysis

The HP 1631A/D provides measurement, triggering, and data display in the three domains that interest digital

hardware designers: state, timing, and analog. The user can make interactive measurements across the domains—the window provided by one domain can affect the capture and display of data in another domain.

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



For interactive timing and analog measurements, the HP 1631A/D Logic Analyzer can display eight channels of timing patterns simultaneously with two channels of analog oscilloscope waveforms.

## General-Purpose Electronic Instruments and Systems

### PC Instruments

(continued from page 1)

#### System software

PC Instruments software allows you to use the system in both a manual and a programmed mode. In the system's manual mode, the software generates a "soft front panel" on the CRT screen that simulates the control panel of conventional instruments. This graphics interface allows you to operate the PC Instruments through the HP Touchscreen, a mouse for the IBM PC, or the keyboard cursor controls.

In the system's programmed mode, you can create your own applications programs for automating instruments. Typical applications include production and subassembly testing, incoming inspection, data logging, and experimental control.

Also included in system software is the Data Interchange Format (DIF™), an industry-standard interface that connects existing software such as 1-2-3™ from Lotus™, VisiCalc®, and others to HP PC Instruments. This feature allows users to obtain instrument readings, file the data, and then use it with other general-purpose software for reports and presentations.

#### Optional software

Optional PC Instruments Data Acquisition Software eliminates the need to write your own programs for common data acquisition applications. This is a menu-driven program that performs voltage scanning, thermocouple scanning, and

analog recording. It also includes graphics presentation routines that can be used to plot any set of data.

#### HP-IB compatibility

HP also offers hardware and software products to give HP-IB (IEEE 488) capabilities to the HP 150 and the IBM PC. These products allow users to control up to 15 HP-IB instruments per HP-IB interface card. A PC can have HP-IB and PCIB interfaces installed at the same time.

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

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## High-performance systems multimeter offers more functions at a lower cost

Increase your test throughput with the new HP 3457A 3½-to-6½-digit digital multimeter. Outstanding dc-volts measurement accuracy—as good as  $\pm 5$  ppm—and reading rates as high as 1350 readings per second add up to increased test throughput and measurement confidence. The HP 3457A helps you reduce the space needed in your test system by offering measurement functions not typically found in a conventional DMM. In addition, this new DMM offers two optional ten-channel multiplexer plug-in assemblies, so a small system user need not pay a large price to measure more than one input. HP-IB (IEEE 488) is a standard feature.

The seven functions of the HP 3457A let you measure dc volts, ac volts, dc current, ac current, two and four-wire resistance, frequency, and period. It offers selectable integration times from 100 power line cycles (PLC) to 0.0005 PLC, so you can match your measurement speed, resolution, and accuracy to the measurement task. It sets a new standard for reading rate with normal mode rejection—53 readings per second at 6½ digits of resolution and 60 dB of power line noise rejection (60 Hz).

### Built-in math functions

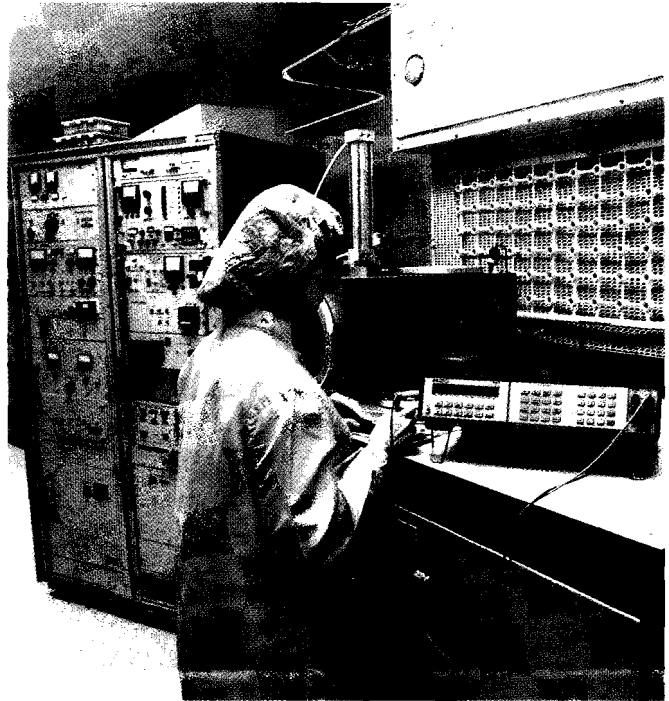
The new HP 3457A Multimeter is not confined to systems applications. The bench user has a full keyboard and LCD display, powerful built-in math functions, and scanning capability without a computer. Statistical functions such as mean and standard deviation are part of the built-in math routines. Others include thermistor linearization, pass-fail limit testing, dB, dBm, scale, null, offset, and digital filters. The rms filter makes it easy to make measurements below 20 Hz for acV and acI.

You can store up to twenty complex measurement setups in nonvolatile memory so that a few simple keystrokes can call up a complex test. The metrology lab user will welcome the quiet 100 PLC measurement integration time, the 7½-digit extended resolution, and the digital filter for precise transfer measurements of dc volts and resistance.

The maximum input voltage measured by the HP 3457A is 300V rms in dcV or acV. The acV bandwidth is 20 Hz to 1 MHz. The maximum input current for the dcI function is 1.5A. For acI, the maximum input current is 1.05A rms. The resistance measurement range is extremely wide—from 30 $\Omega$  to 3 G $\Omega$  full scale. The frequency and period measurement capabilities are unusual because of their range, from 10 Hz to 1.5 MHz, their differential input, and their presence in a systems DMM.

### Two multiplexer options

Either of two plug-in multiplexer assemblies may be used with the HP 3457A. The HP 44491A Armature Relay Multiplexer Assembly has eight two-wire channels and two current/actuator channels. It can switch signals with a maximum amplitude of 250V rms, and it can be configured for four four-wire ohms measurements with simple software commands. The current channels have make-before-break switching to prevent current loop interruption and can carry up to 1.5A. For higher-speed scanning up to 300 channels per second, the HP 44492A Reed Relay Multiplexer Assembly can switch dc and ac voltage and two-wire resistance signals for dcV, acV, ohms, frequency, and period measurements. It can handle amplitudes up to 125V peak.



Outstanding accuracy and resolution, built-in measurement management, systems compatibility, and low price make the new HP 3457A Digital Multimeter a price-performance leader for the lab bench or automatic systems applications.

### Powerful measurement management

The HP 3457A combines its wide variety of analog measurement capabilities with powerful measurement management. You can store up to 1050 readings or entire measurement sequences in the instrument for convenient and fast throughput. The front-panel setup currently in use can be stored in nonvolatile memory for easy reconfiguration.

Statistical functions such as mean and standard deviation are part of the built-in math routines. Others include thermistor linearization, pass-fail limit testing, dB, dBm, scale, null, offset, and digital filters. The rms filter makes it easy to make measurements below 20 Hz for acV and acI. The new multimeter has systems features never before offered in a multimeter. Included are flexible formatting of ASCII, 16-bit and 32-bit binary, and serial data, very fast memory transfers to your computer, and complete programmability via the HP-IB (IEEE 488). Voltmeter Complete output and External Trigger input signals are useful for synchronizing other test instrumentation with the HP 3457A. It also features a set of new easy-to-use program commands that form a core language called HP-ML (HP Multimeter Language). HP-ML ensures that the software you write today will work with tomorrow's DMMs.

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

**HP Computer Museum**  
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## Make indoor and outdoor EMI tests with new spectrum analyzer/EMI receiver system

Add the new HP 85685A RF Preselector (20 Hz to 2 GHz) to an HP 8568B RF or 8566B Microwave Spectrum Analyzer and you get the sensitivity, overload protection, and amplitude accuracy required for commercial and military EMI compliance testing.

Using the HP 8568B (100 Hz to 1.5 GHz) or 8566B (100 Hz to 22 GHz) and simple probes, you can quickly locate sources of problem emissions and evaluate potential fixes. When it's time for final compliance testing, either spectrum analyzer can be combined with the RF Preselector and the HP 85650A Quasi-Peak Adapter to make an EMI receiver system that meets the recommendations of CISPR Publication 16 for indoor and outdoor testing.

With an HP 9000 Model 226 or 236 Desktop Computer and the HP 85864B EMI Measurement Software, you'll easily automate your FCC, VDE, and MIL-STD emission measurements. Choose from a library of tests or design your own. Direct plotter control provides fast hard-copy documentation.

HP also offers measurement accessories to complete your testing setup, including transducer kits for commercial and military tests, an HP-IB controlled antenna tower, a turntable, antennas, preamplifiers, LISNs, and current probes.



This new Spectrum Analyzer EMI Receiver system easily automates FCC, VDE, and MIL-STD emission measurements.

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

## Characterize microwave radio performance during flat-fade and interference conditions

The new HP 3708A Noise and Interference Test Set provides an accurate, easy-to-use method of simulating flat-fade and/or interference conditions on microwave radio links. Designed for operation in the IF section of a digital or analog microwave radio system, the HP 3708A can add calibrated

levels of white noise and/or interference signals to the radio IF carrier, thereby generating an operator-selected carrier-to-noise (C/N) and/or carrier-to-interference (C/I) ratio.

A built-in IF power meter and microprocessor control enable the radio IF carrier power to be sampled continuously at the point of noise and/or interference-signal injection. The noise density or interference-signal level is adjusted automatically to maintain a constant C/N or C/I ratio, even in the presence of receiver carrier-level variations.

### Flexible design for all microwave applications

The HP 3708A is designed primarily for manufacturers and operators of microwave radio systems. It offers improved accuracy and ease of use over traditional simulation methods. Flexibility in design makes the test set suitable for applications in digital radio, analog FM radio, and satellite TDMA.

The HP 3708A test set is equipped with full HP-IB (IEEE 488) interface capability, and this facility has been fully used in the HP 3708S Noise and Interference Measurement System. Designed specifically for manufacturers and operators of digital radio systems, the HP 3708S (an HP 3708A, a bit-error-ratio (BER) tester, and an HP 9000 Series 200 Computer) enables automatic plotting of C/N or C/I versus BER characteristics.



With an HP 3708A test set and an HP 3764A BER tester configured together in an HP 3708S Noise and Interference Measurement System, you can automatically plot C/N or C/I versus BER characteristics for a digital microwave radio system.

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

# Higher precision and productivity in swept-frequency component measurements

Hewlett-Packard's newest scalar network analyzer, the HP 8757A, offers increased measurement performance and new operating features that significantly enhance the productivity of your RF and microwave swept-frequency measurements. Combining the HP 8757A with a wide range of compatible HP signal sources, directional bridges, and detectors results in a fully programmable 10-MHz-to-40-GHz measurement system for both bench and automatic systems.

Productivity-improving features, such as built-in limit lines, reduce test times. Enter test limits directly from the front panel or the HP-IB (IEEE 488), and let the analyzer display your test specifications and indicate out-of-spec areas. Other productivity-enhancing features of the HP 8757A in-

clude fast sweep rates for real-time adjustments, automatic search for selected response levels (such as 3-dB points, 3-dB bandwidth, or maximum and minimum power), and direct SWR readout of cursor values.

### High-performance detectors and sources

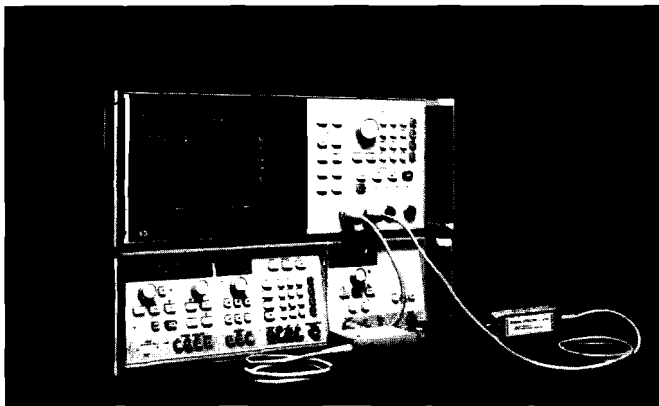
Measure insertion and return loss over a wide 76-dB dynamic range using the existing 11664 Detectors. Thanks to the improved sensitivity of the HP 8757A, you can now make broadband measurements to -60 dBm at fast sweep speeds.

The new HP 85025 Detectors allow the user to choose the measurement mode that best suits the application. Choose the unmodulated RF mode (dc detection) for accurate swept-frequency power measurements. Choose ac detection for measurements in the presence of undesired signals such as broadband noise or electromagnetic interference.

While the HP 8757A will operate with virtually any RF or microwave swept signal source, its capabilities expand significantly when used with the HP 8350B Sweep Oscillator or the HP 8341A/40A Synthesized Sweepers. A "private bus" between the HP 8757A and these sources allows the analyzer to display start, stop, and marker frequencies on the CRT.

### An ideal HP-IB component

Put the full power of the HP 8757A to work in an automatic system. Write your own automatic measurement program using the free HP 8757A Programming Notes to guide you, or use the HP 85015A System Software or the new HP 85016A Transmission Line Test Software and make automatic measurements without programming.



Microwave component testing becomes more efficient with the productivity-enhancing features of the new HP 8757A Scalar Network Analyzer (top instrument). The unit shown has the optional fourth detector input (Option 001). The bottom instrument is the HP 8350B Sweep Oscillator.

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

# Presentation graphics software produces charts of professional quality

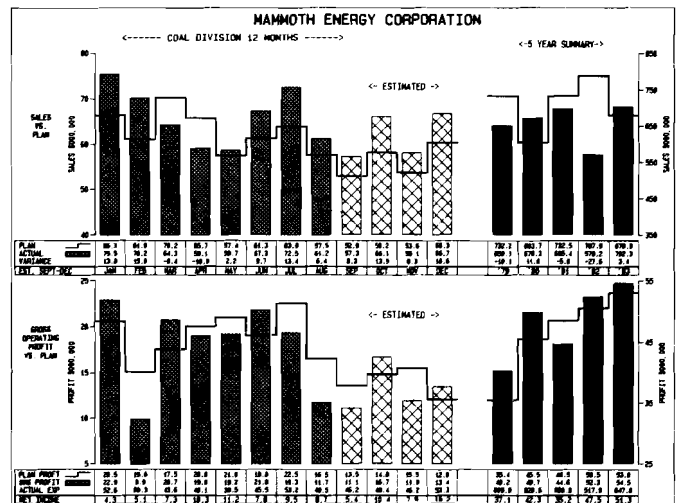
Picture Perfect™ presentation graphics software is now available for the HP 9000 Series 200 computer workstations. Picture Perfect is a data-driven package that can turn out high quality pie charts, vertical or horizontal bar charts, line charts, and combined line and bar charts.

### Operating environment provided

Picture Perfect provides its own Pascal operating environment so no particular language environment or installation is required. It runs on the Models 216, 217, 220, and 236A/C with 512K memory, and supports a wide range of peripherals. It is available on 3½-inch or 5¼-inch flexible discs. Picture Perfect is available worldwide; however, it will work with the keyboard in US mode only.

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

Picture Perfect™ is a trademark of Computer Support Corporation.



Picture Perfect™ presentation graphics software produces high quality charts for users of the HP 9000 Series 200 computer workstations.

# New higher-performance data base management system and performance tuning tools

Image/3000, the data base management system for HP 3000 Computers, now has a solution for users who need greater performance from their data base systems or who have reached the limits on the size of a data base. TurboImage/3000 is a major performance and functionality upgrade of Image/3000 that will be available to MPE V/E users at no cost.

### Larger data bases

The new TurboImage size limitations are all at least 100% greater than the Image/3000 size limitations. You can increase the number of:

- Data items per data base from 255 to 1023
- Data items per data set from 127 to 255
- Data sets per data base from 99 to 199
- Data entries per data set from 8 million to 2 billion
- Data entries per chain from 65K to the maximum length of a data set.

TurboImage uses new buffering techniques to decrease the time it takes to process a transaction. Performance gains will be greatest when multiple users are concurrently accessing a data base using high-read/write-ratio transactions. In addition, TurboImage introduces the ability to place data sets on user-specified disc devices, so you can separate high-volume data sets on different devices to avoid physical access contentions.

### Expanded recovery choices

In addition to the existing rollforward recovery and intrinsic level recovery in Image/3000, TurboImage adds rollback recovery. In the event of a computer malfunction,

rollback recovery can greatly reduce the amount of time it takes to bring TurboImage back up and running.

All current customers running with the newly released MPE V/E operating system will be upgraded to TurboImage at no cost. Your existing Image/3000 application programs are 100% compatible with TurboImage, so no code changes will be required. A fast conversion of data bases from Image/3000 format to TurboImage format will be required, using an HP-supplied conversion utility. TurboImage will replace Image/3000 as part of the fundamental operating software on HP 3000 Computers.

### Data base tools

Data base administrators and application programmers can now get the information they need to fine-tune the design of their TurboImage data bases and application programs. Database Tools is a new package of products designed exclusively for use with TurboImage to help you get the maximum performance from your database systems.

TurboImage Profiler, the major component of Database Tools, produces statistical reports on exactly what activity is taking place in a TurboImage data base and how these activities are using the system resources. With this information, application programs and data bases can be modified to improve efficiency and performance.

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

# Software package allows solution of complex mathematical models

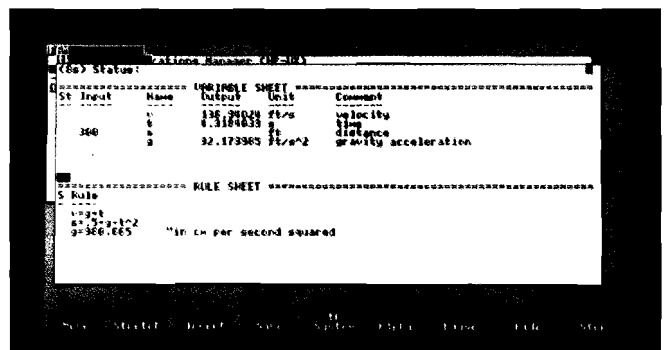
TK!Solver®/HP-UX\*, an equation-solving software package, is now available for use with the HP 9000 Series 200 Computers and Hewlett-Packard's Integral Personal Computer. TK!Solver allows you to solve complex mathematical models that cannot be easily done with programming languages, spreadsheets, or calculators. You define the model with equations written in the usual form and TK!Solver uses direct or iterative techniques to solve the model.

All the tools needed for problem solving are built into the program, including mathematical functions, facilities for converting units of measurement, and the ability to produce graphics and tables.

### Additional software templates

Also available are four TK!SolverPacks, which are templates designed for operation with TK!Solver. These include Mechanical Engineering, Financial Management, Introductory Science, and Building Design and Construction.

TK!Solver can run on the Integral PC or the HP 9000 Series 200 models that have HP-UX\* 2.1 or 2.2 operating systems. Software is distributed on 3½-inch double-sided flexible discs for the Integral PC and HP 9133D disc drive. It is also available on ¼-inch tape.



The variable sheet and the rule sheet are two of the most frequently used features of the TK!Solver software package.

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

TK!Solver® is a registered trademark of Software Arts Products Corporation. \*HP-UX is Hewlett-Packard's implementation of the UNIX operating system. UNIX is a trademark of AT&T Bell Laboratories.



## High-performance graphics system offers flexible configurations

A new high-performance graphics system can be configured with up to three graphics display stations, along with other terminals. The graphics system, which is based on the new HP 98700H Graphics Display Station and the HP 9000 Model 550 Computer, provides an engineering team with a multiuser design center that responds like a single-user workstation. This powerful system, running the HP-UX\* 5.0 operating system, improves productivity at a per-station cost less than comparable graphics systems.

### Display station and controller

The display station includes a 19-inch memory-mapped color monitor that is refreshed at a 60-Hz noninterlaced rate and has a displayable resolution of  $1024 \times 768$  bits. The display controller, also part of the display station, contains the frame buffer for four or eight planes of  $1024 \times 1024$  bits each for the chosen color map of 16 or 256 colors out of a possible 16 million.

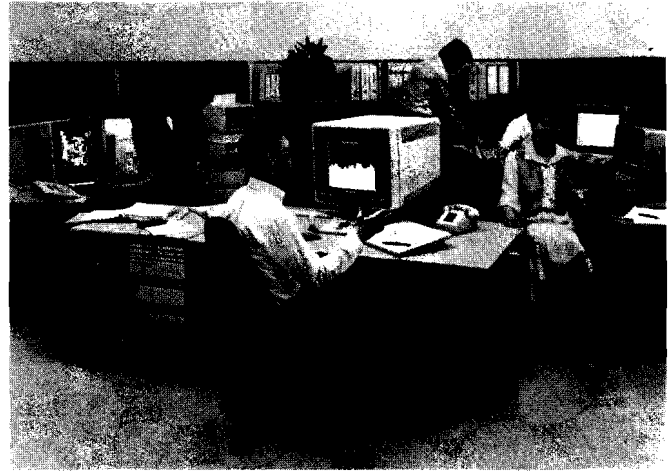
The display controller interface plugs directly into the memory processor bus of the Model 550, allowing the graphics to be memory-mapped into the CPU's address space. This tight coupling provides a 2M-byte/second data transfer rate from the CPU to the controller. The result is fast first-time picture generation, and fast modifications to an existing picture.

### Graphics accelerator

An optional graphics accelerator (HP 98710A) further increases performance by offloading the CPU and implementing the graphics functions in hardware. The graphics accelerator contains both a hardware scan converter and a transform engine. It also has a bit-slice processor with writable control store, three floating-point chips, and a vector generation chip with area-fill support hardware. The accelerator can improve performance tenfold, to 60,000 vectors/second.

### Graphics library

Also being introduced is a new 2-D and 3-D graphics library, which is bundled into the latest release of HP-UX (5.0). This fast, flexible library offers asynchronous input and tracking, raster operation support, support for multiple input and output devices, and device independence.



The HP 98700H graphics system provides a multiuser design center that responds like a single-user workstation.

### Design station network

Design stations can be linked together with an enhanced version of HP LAN/9000, which includes a new LAN card and network services. HP LAN/9000 provides increased performance and reliability, and supports the IEEE 802.3 standard in addition to Ethernet. The new LAN product also allows connections to HP 3000 Computers.

The HP 98700H Display Station consists of the display controller, a 19-inch high-resolution color monitor, an HP-HIL (Human Interface Link) keyboard, the display station buffer (interface), and the required cables.

For more information, check **J** 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.

## New Touchscreen series

(continued from page 8)

### Enhanced instrument control applications

Two new products are now available that give the Touchscreen II significantly enhanced capabilities for instrument control. The Touchscreen PCIB Controller (HP 45862A) includes the PC Instrument Interface. This product includes an accessory card with system software that allows the Touchscreen II to control a new series of low-cost PC Instruments (see cover story).

The other new product, the HP-IB Controller (HP 45861A), includes the new HP-IB Command Library, a set of software

routines that makes the Touchscreen II an instrument controller for a wide variety of HP-IB instruments. This product is fully supported by GW™ BASIC and Pascal.

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

\*Available Summer 1985  
EtherSeries™ is a U.S. trademark of 3Com Corporation



# New features extend capabilities of the Touchscreen PC

An improved ergonomic design and new accessories and peripherals, including system software, provide significantly enhanced capabilities for a new series of the HP 150 PC.

The new series is called Touchscreen II and Touchscreen II MAX in North America and HP 150 II elsewhere. The Touchscreen II is fully compatible with all other HP 150 software, accessories, and peripherals. In addition, it can easily share information with IBM personal computers either through direct connections or through a local area network.

### Improved ergonomic design

The Touchscreen II has a 12-inch display screen that offers one of the highest resolutions available today on a personal computer. The display screen can be tilted, and the controls for power, brightness, and keyboard connection are readily accessible on the front panel.

### System features

The Touchscreen II provides three standard ports: one HP-IB port for peripherals, one RS-232-C/RS-422 communications port, and one RS-232-C port that supports up to 19.2 kilobaud. It also includes the HP Human Interface Loop (HP-HIL), which allows you to daisy-chain up to seven input devices, including the keyboard, a new mouse, a graphics tablet, and a new bar code reader. Four accessory slots allow for expansion. You can easily add accessories such as memory cards and a Centronix interface through a removable top panel.

### Accessories and peripherals

The Touchscreen II is available with the HP 9123D Disc Drive, which accommodates two double-sided 3½-inch flexible discs. Each disc provides 710K bytes of formatted storage capacity. For greater storage and information management needs, the Touchscreen II MAX offers three Winchester disc drive storage options: the HP 9153A 10-Mbyte disc, the HP 9133H 20-Mbyte disc, and the new HP 9133L 40-Mbyte disc.\* Backup for the Winchester drive is provided by the new HP 9142A ¼-inch Tape Drive.\*



The new models of the HP 150 Personal Computer have a high-resolution 12-inch display screen. New accessories and peripherals, including system software, give the 150 greatly enhanced capabilities for instrument control.

### Networking support

Full support of the 3Com Local Area Network is provided for Touchscreen II users. Using 3Com's EtherSeries™/150 Network, you can link HP Touchscreen computers to share information and peripherals. In addition, EtherStart allows the Touchscreen II to be fully supported on the network without a local disc.

*(continued on page 7)*

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