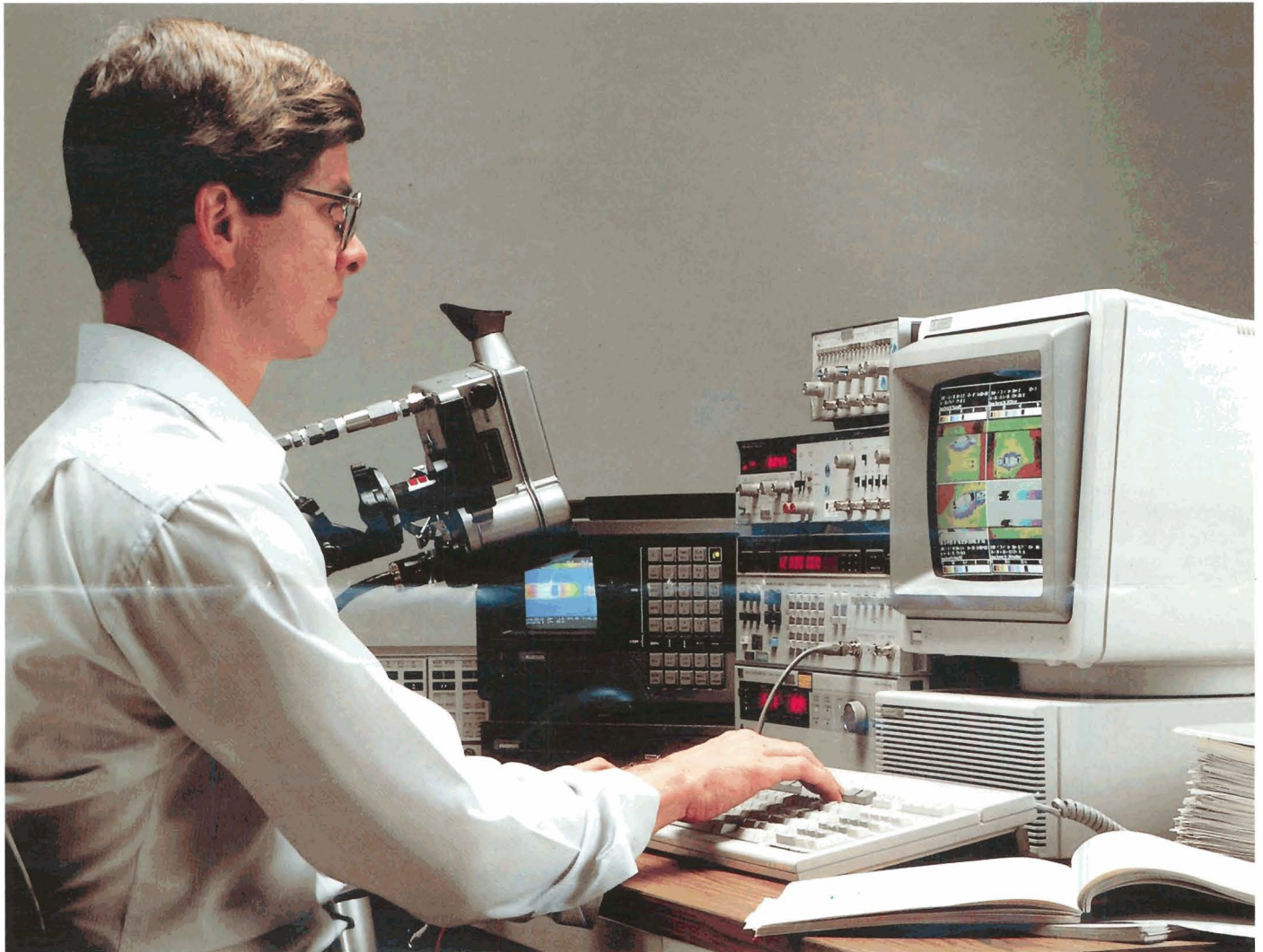




MEASUREMENT COMPUTATION **news**

product advances from Hewlett-Packard

SEPTEMBER/OCTOBER 1985



New modular workstations let you design your own computer

The new HP 9000 Series 300 Computers are modular technical workstations that can be configured to meet your changing business needs while protecting the investment you've made in other HP products. The Series 300 lets you choose system processing units, display options, system operating languages, applications software, peripherals, and instruments. All are compatible.

Two system processing units

The Model 310 is based on the 10-MHz Motorola 68010 CPU. It includes built-in 512K-byte or 1M-byte RAM, HP-IB (IEEE 488), RS-232-C/V.24 and HP-HIL (HP Human Interface Loop) interfaces, four accessory slots for additional memory

or I/O interfaces, audio output, and video output for the 12-inch monochrome display. It also features a battery-backed real-time clock. The four-slot accessory card cage accepts all HP 9000 Series 200 RAM and I/O cards. That means you can upgrade to Series 300 computational performance and still preserve the investments you may already have in Series 200 equipment.

The Model 320, with the Motorola 68020 processor, is the foundation for a high-performance system for data-intensive applications. This 32-bit CPU operates at 16.6 MHz with a 16K-byte cache and a Motorola 68881 floating-point math coprocessor.

(continued on page 8)

Vector film recorder can produce 35-mm color slides, instant slides, and prints

You can make very high-resolution 35-mm color slides for business and technical presentations with the new HP 7510 Film Recorder. The new recorder also produces instant slides and $3\frac{1}{2} \times 4\frac{1}{2}$ -inch instant positive prints.

The HP 7510 accepts direct vector input from a computer. It requires less computer memory and, for typical business plots, operates faster than raster recorders in the same price range. The HP 7510 also provides higher addressable resolution, with 16,000 points per frame and infinite resolution between points, much higher than the human eye can perceive. As a result, output quality is enhanced by the absence of raster "jaggies," the unwanted jagged lines that a raster device often produces.

Operation and ease of use

The new film recorder operates similarly to a pen plotter. Instead of writing with a plotter pen, however, the HP 7510 uses a thin electron beam to "write" onto a phosphor CRT screen. A wheel containing red, green, and blue filters allows any of four artist-designed palettes to be recorded on the film. You can also define your own colors from a nearly unlimited color range. The HP 7510 is easy to use. Camera operation, including film advance, is automatic.

Two standard interfaces, RS-232-C and HP-IB (IEEE 488), provide flexibility in configuring computer hardware and software. The RS-232-C interface is used for all transmission and control functions.

The new film recorder is compatible with a wide variety of computers. An easy-to-read liquid crystal display shows recording status and setup conditions.

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



The HP 7510 Film Recorder has very wide color range capabilities, built-in polygon fill, and built-in film-compensation curves.

Impedance/gain-phase analyzer improves device quality

The HP 4194A Impedance/Gain-Phase Analyzer improves the quality and reduces the evaluation and development time of electronic materials, discrete components, ICs, and circuits.

The new analyzer makes both impedance and transmission measurements, displays results on a color CRT, and performs parameter analysis of devices. The frequency range is 100 Hz to 40 MHz for impedance measurements and 10 Hz to 100

MHz for gain-phase measurements. The HP 4194A has a 7.5-inch (19-cm) color display for presenting measurement data, making it the first HP instrument with a color CRT.

Lab and quality assurance applications

Designed for lab and quality assurance applications of component manufacturers and communications and consumer equipment manufacturers, the HP 4194A features an Auto Sequence Program (ASP) that makes it easy to automate the measurement and analysis functions without using a separate computer.

The ASP commands are similar to BASIC, and the analyzer's editor allows users to convert manual key operations to programs easily. The HP 4194A is flexible and expandable because ASP allows users to enhance and create their own functions to automate measurement and analysis.

Nearly all of the HP 4194A functions can be controlled remotely by a computer with an HP-IB (IEEE 488) interface.

The analyzer has an option for either 50 Ω or 75 Ω input impedance for gain-phase measurements. Ten test fixtures and cables are available as accessories for making impedance measurements on many different devices.



The HP 4194A Impedance/Gain-Phase Analyzer tests materials, components, ICs and circuits to 40 MHz for impedance measurements and 100 MHz for gain-phase measurements.

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

Digital signal generator offers performance and versatility for digital design and test environments

Hewlett-Packard's new HP 8175A Digital Signal Generator simulates a wide range of digital signals for component, board, and module design and test. It combines high data rates with programmable pattern durations and interactive, intelligent cycling capabilities. In parallel mode, 24-bit data patterns can be generated with rates up to 50 megabits per second. A serial mode provides two channels, each with speeds up to 100 megabits per second.

Memory and pattern duration flexibility

Programmable pattern duration and virtual memory expansion allow the HP 8175A to supply the large volume of test patterns necessary for many test applications.

Virtual memory expansion is achieved by sequencing and/or repeating arbitrary memory segments at full speed in any order desired up to 255 times. This extends the number of ways to use the existing memory of 1,024 bits for parallel patterns or 8,192 bits serial, and allows long data strings to be generated quickly and easily.

Programmable pattern durations avoid wasting memory in applications requiring short bursts of data followed by long, steady-state conditions. They are also useful for asynchronous timing, often impossible with a data source that delivers patterns at a periodic rate. The HP 8175A provides programmable durations for individual patterns in a wide dynamic range from 20 nanoseconds to 9.99 seconds.

Interactive data cycling

Simulation of digital circuit behavior typically requires the ability to react to the response of the device under test. The HP 8175A can be controlled by an 8-bit programmable trigger word from the device, which regulates the data cycling of the generator, allowing branching to other data sequences. Eight output flags can be used to acknowledge trigger conditions.

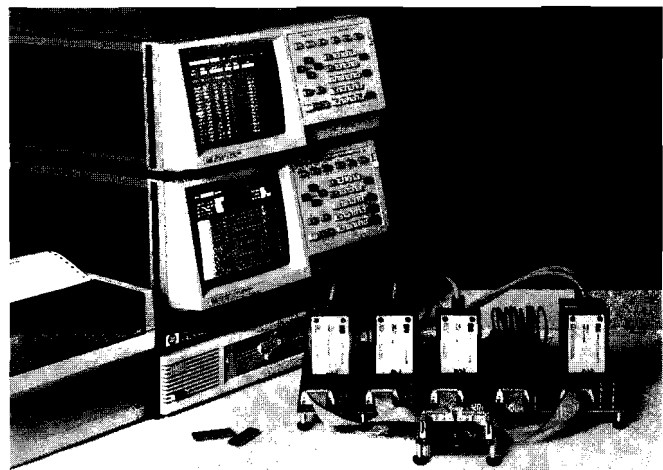
ECL fixed or TTL/CMOS pods (programmable high level 2.4 to 9.9V) are available. A fine-timing option provides 100-ps

resolution on four channels for very tight adjustment of timing edges.

Operational convenience is ensured by a large CRT and menu-driven softkey control. Data patterns can be displayed and edited graphically. All functions are programmable via the HP-IB (IEEE 488).

Configured with an HP 1630 A/D/G and/or an HP 1631 A/D Logic Analyzer, the HP 8175A forms part of a stimulus-response test system. The digital signal generator provides stimulus to the device under test and the logic analyzer measures the response.

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



The HP 8175A Digital Signal Generator (bottom) and an HP 1630A D/G or HP 1631A D Logic Analyzer form a stimulus response test system for digital circuit testing.

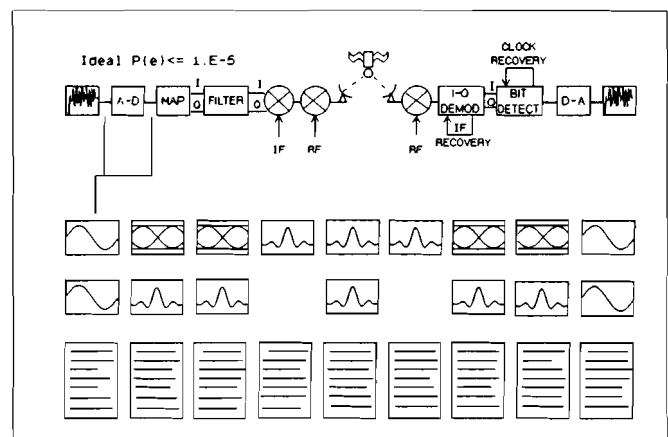
RF and Microwave Measurement

A new teaching tool for digital radio communications

I-Q Tutor, a new interactive training program that operates on HP 9000 Model 216 or 236 Desktop Computers, models a modern digital communications system signal chain from analog channel through modulation, transmission, demodulation, and back to baseband.

In the phase or vector domain, the I-Q concept is introduced (*in-phase* and *quadrature*), and both I and Q are not only plotted, but the plot can be rotated to see the phase domain or to see the eye diagrams (I vs time or Q vs time). In both domains, the data can be sampled to show the constellation diagram in the phase plot or the sampling points in time.

Intended for technical personnel new to digital communications and to expand insights for senior engineers and engineering managers, I-Q Tutor comes with a training manual containing program operating information, a brief tutorial, and several concept-expanding lab exercises.



I-Q Tutor system overview screen. The system block diagram is displayed along with time-domain and frequency-domain waveforms.

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

HP Computer Museum
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2-to-18-GHz synthesized generator has improved amplitude range and resolution

For signal simulation applications in the 2-to-18-GHz range, the HP 8673E Synthesized Signal Generator now offers AM, FM, and pulse modulated signals from +8 to -120 dBm with 0.1-dB amplitude resolution and a digital display.

This latest member of the HP 8673 family is intended for middle-range price/performance applications, where ultimate modulation performance is not needed. Amplitude modulation provides depths up to 75% at rates up to 10 kHz, more



The HP 8633E Synthesized Signal Generator provides economical signal simulation for 2-to-18 GHz applications

than enough for most applications. The locked-FM mode features up to 3-MHz peak deviation, dependent on modulation index limits. In the unlocked-FM mode, 10-MHz peak deviations are available at rates as low as 50 Hz. The internal pulse modulator has >70-dB on/off ratio, <50-ns rise and fall times, and <100-ns pulse width capability.

All HP 8673 family generators allow keyboard entry of frequency with 1-kHz, 2-kHz or 3-kHz resolution, although an analog dial can be used if preferred. Step sweep is available in start-stop, span, and ΔF modes, with five markers.

The spectral integrity of HP generators always receives careful design attention. HP 8673E carrier single-sideband phase noise at 10 GHz is below -60 dBc/Hz at a 1-kHz offset. Harmonic spurious signals are below -40 dBc, and nonharmonic, below -60 dBc.

The HP 8673E is a direct descendant of the HP 8673B, which has an MTBF (Mean Time Between Failures) greater than 7500 hours, an important requirement for ATE system configuration. All functions are HP-IB programmable. And since HP 8673E programming is identical to that for the A,B,C, and D models, any previously prepared software will run unmodified.

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

Microwave counter makes automated measurements to 40 GHz

GaAs (gallium arsenide) technology is combined with the latest concepts in microwave-instrument design in a new 10-Hz-to-40-GHz microwave frequency counter from Hewlett-Packard, the HP 5352A.

The HP 5352A offers the same feature set as the HP 5350A (10 Hz to 18 GHz) and HP 5351A (10 Hz to 26.5 GHz) Microwave Counters. This family of instruments provides high-speed data transfer, optional low-aging-rate oscillators, and a single input connector for frequency measurements from 500 MHz to the upper limit of each product. A low-frequency BNC-type input measures from 10 Hz to 525 MHz with resolution to 0.001 Hz.

The HP 5352A derives its high-frequency performance from a GaAs sampler, which is used as a down-converter. The counter measures to 40 GHz with 1-Hz resolution in one second. Its single-synthesizer design and a newly devised measurement algorithm allow output of more than 80 measurements per second over the HP-IB (IEEE-488). HP-IB is standard. FM peak-to-peak deviation on the incoming signal can be as high as 12 MHz.

Sensitivity in a 25°C laboratory environment is rated at -25 dBm from 500 MHz to 26.5 GHz, linearly decreasing to -15 dBm from 26.5 to 40 GHz.

Low RFI/EMI radiation, a design criterion, is made even lower by *SLEEP* mode, which powers down internal operations when the instrument is not in use.

Extended calibration

Extending the calibration interval of a counter is a major factor in lowering its cost of ownership. In the HP 5352A, a

temperature-compensated crystal oscillator is standard. An optional oven oscillator increases the calibration interval required for maintaining kHz accuracy to one year. A higher-performance oven oscillator extends the calibration interval to five years. An external reference input can also be used.

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



VCO characterization and measurement to 40 GHz are simplified with the HP 5352A Microwave Frequency Counter

Logic development system offers fourteen new emulators

Fourteen new emulation subsystems significantly expand the processor support capabilities of the HP 64000 Logic Development System.

The newly released emulation subsystems and their target microprocessors are:

HP 64286SA	Fairchild	F9450
HP 64243AA/AB	Motorola	68000
HP 64244AA	Motorola	68008
HP 64245AA/AB	Motorola	68010
HP 64285S	TI	TMS32010
HP 64253S	Zilog	Z80
HP 64220S	Intel	8086/8087
HP 64220S Opt 001	Intel	80C86
HP 64221S	Intel	8088/8087
HP 64221S Opt 001	Intel	80C88
HP 64206S	Hitachi	6301/6303 V Series
HP 64294S	NEC	70116
HP 64295S	NEC	70108
HP 64195S	Motorola	146805E2

The HP 64000 now supports more than 40 microprocessors. All HP emulators aid hardware and software designers by providing target-system control and a nonintrusive view of system activity at stated operating speeds.

HP emulators are compatible with an extensive set of processor-specific development tools: assembler/linkers, C compilers, Pascal compilers, and user-friendly interfaces for software analysis, software performance analysis, and timing analysis. User-definable products are also available that access the HP 64000 system capabilities for projects based on microprocessors not supported by dedicated emulators.



The HP 64000 Logic Development System now offers emulators for more than 40 microprocessors from Intel, Motorola, Zilog, Fairchild, TI, National, NEC, and Hitachi.

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

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

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

Bus preprocessor solves problems in microprocessor-based system design

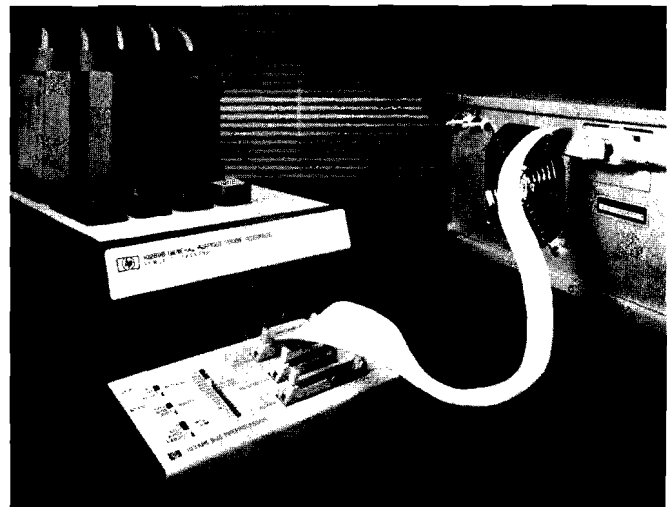
The HP 10342B Bus Preprocessor adds RS-232C/V.24, RS-449, and HP-IB analysis to the HP 1630A/D/G and HP 1631A/D Logic Analyzers. With this capability, a digital design engineer can solve interaction problems between a microprocessor and an interface bus or among system components (e.g., a computer and a terminal).

The HP 10342B includes an inverse assembler, provided on a 3½-inch disc. The inverse assembler converts data and status into easy-to-read language rather than coded symbols.

In the HP-IB mode, the HP 10342B monitors and displays the states of the five status lines and the eight data lines. The three handshake lines can be viewed using the timing analysis capabilities of the logic analyzer.

For RS-232C/V.24 and RS-449, the HP 10342B monitors and displays five handshake lines, four of which are synchronous with the serial controller. The fifth is the carrier detect line and is asynchronous; it is sampled each time a character is sent to the analyzer.

In the RS-232C/V.24 and RS-449 modes, the HP 10342B analyzes asynchronous and synchronous data. For asynchronous data, baud rates are available from 50 to 19.2 kbits per second. The data code is selectable: six-bit Transcode, seven-bit or eight-bit ASCII, or eight-bit EBCDIC. Parity is also selectable. For synchronous data, rates to 72 kbits per second with bit or character orientation are provided.



The HP 10342B is a printed circuit board that is inserted in the HP 10269B General-Purpose Probe Interface, which connects to HP logic analyzers.

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

Modular workstations

(continued from page 1)

The Model 320 computer features the same four accessory slots as the Model 310. However, two slots are used for a 1M-byte RAM card and a card with HP-IB, RS-232-C/V.24, HP-HIL, audio, and a monitor interface.

Display options

The Series 300 offers six display options. Four of the options are bit-mapped monitors and display boards. You can choose color or monochrome, medium-resolution or high-resolution, and 12-inch, 17-inch, or 19-inch sizes.

Some Series 200 software takes advantage of the separate alpha and graphics planes of the Series 200. An optional Series 200 display compatibility card lets you use that software on the Series 300. In most cases, the programs you've written for Series 200 hardware will run on the Series 300.

Another display option provides high-performance graphics capabilities by adding the HP 98700H Graphics Display Station. This display station includes a 19-inch color display, a display controller, an HP-HIL keyboard, and an optional graphics accelerator.

Operating systems and peripherals

You also have your choice of operating systems. HP BASIC 4.0 and Pascal 3.1 are ideal for instrument control applications such as automated measurement, analysis, and test functions. HP-UX is HP's enhanced version of the UNIX™ System V operating system. It is a powerful, flexible system to help software designers create and modify software. C, Pascal, and Fortran 77 compilers are available for the HP-UX system.

With the three standard interfaces—HP-IB, HP-HIL, and RS-232-C/V.24, you have access to all HP peripherals, instruments, and input devices. These HP products are compatible with all configurations of the Series 300.

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

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HP Journal describes next-generation HP computers

HP's next generation of computers is now under development. The code name given to this development project is Spectrum, because the new computer line will include a spectrum of models ranging from desktop workstations to systems larger than any present HP products, all based on the same architecture. In an article in the August 1985 *Hewlett-Packard Journal*, Joel S. Birnbaum and William S. Worley, Jr. introduce the basic principles of the new architecture and tell what HP hopes to accomplish with it. Their article describes the new architecture's definition at HP Laboratories, a process that involved analyzing billions of instruction executions to determine the optimal instruction set for the new machines. Although the new architecture fits loosely within the class known as reduced instruction set computers, or RISCs, it also takes full advantage of VLSI (very large-scale integration) and new software technology. It does not, however, depend on any particular circuit technology, so instead of being rendered obsolete by the inevitable development of new circuit technologies in the future, new technologies can produce further performance gains. The first computers of the new generation will extend the high end of the present HP 3000 business computer and HP 1000 real-time computer lines. For HP customers, migration to the new models is expected to be simple. Existing HP 3000 software will run unmodified at about present speeds, or can be recompiled or further modified to improve performance. HP 1000 software will transport to the new machines using specially developed utilities and emulation capabilities.

Reprints of the article, *Beyond RISC: High-Precision Architecture*, in English only, are available free of charge.

For a free copy, check **P** on the HP Reply Card.

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