MEASUREMENT COMPUTATION news

product advances from Hewlett-Packard

MARCH/APRIL 1987

New vector signal generator and analyzer serve test needs for complex and wideband modulation

The HP 8780A Vector Signal Generator (10 to 3000 MHz) and the HP 8980A Vector Analyzer (dc to 350 MHz) are versatile off-the-shelf alternatives to specialized user-configured instrumentation for generating and analyzing RF and microwave signals with complex and wideband modulations, including digital formats and vector modulation.

Modern communications and defense electronics systems are continually pushed to carry more information in smaller bandwidths or find out more about potential threats in a shorter time with increased cost-effectiveness. One important system technology helping to do this is quadrature signal

(continued on page 2)

IMPORTANT NOTICE! *As of the **May/June** issue, **Measurement/Computation News** will be replaced by two new publications: **Test and Measurement News** for our instrument customers and **Update** for our computer customers. Based on existing profile information, you will receive one of these two publications. Each will feature new products and services, application notes, upgrades, and more. Hewlett-Packard's goal is to give you **news you can use**.*

Vector signal generator and analyzer

(continued from page 1)

processing, using both the amplitude and phase—or the in-phase (I) and quadrature (Q) parts—of the received signal.

Vector signal generator

The new vector signal generator has all the conveniences and performance of standard generators, but can also accept TTL/ECL digital data streams and produce formats such as BPSK, QPSK, and up to 64QAM directly. It can provide pulsed and burst signal formats, too. Its I and Q channel vector analog inputs accept dc-to-350-MHz modulating signals. For standard FM, rates to 12 MHz and deviations to 200 MHz p-p are possible.

The generator's output range is +10 to −100 dBm, and phase noise is less than −107 dBc/Hz at a 1-kHz offset from a 1-GHz carrier. Thus it is ideally suited for modern digital microwave radio work with sophisticated carriers. With user-configured up-converters, the VHF/UHF carrier can be easily placed into user frequency bands.

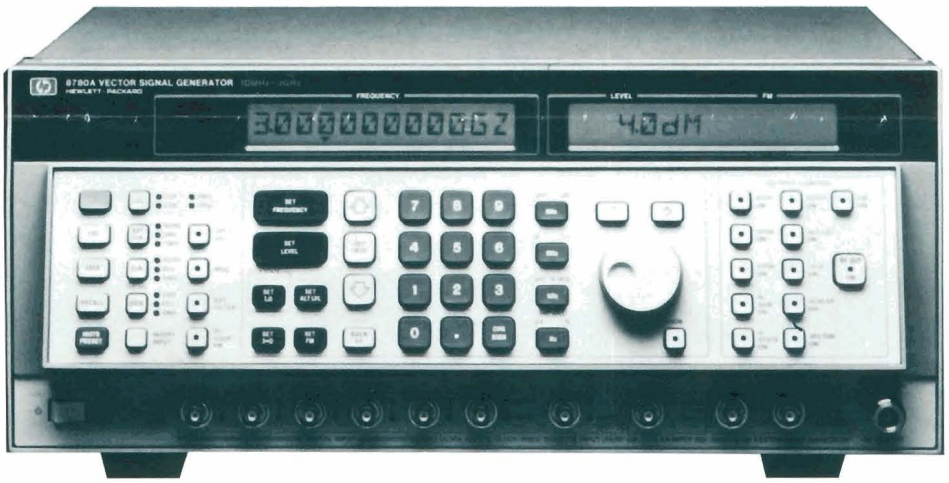
Dual-channel vector analyzer

The vector analyzer is a dual-channel, matched-input, X-Y sampling oscilloscope, used for measuring and displaying demodulated in-phase and quadrature signal components (sometimes referred to as baseband) from dc to 350 MHz. The general-purpose instrument features a wideband vector mode for wideband X-versus-Y measurements, a clocked time-sampled (constellation) mode for phase diagrams, and a versatile time display for digital modulation "eye" diagrams. In operation, a user-configured quadrature demodulator furnishes the I and Q channel baseband input signals.

Both inputs are matched from dc to 350 MHz. Sensitivities range from 5 mV/div to 1 V/div. Input impedances are 50Ω and 75Ω, and high-impedance probes are available. For convenience, controls such as the gain settings are ganged together. The time base ranges from 0.5 ns/div to 2 ms/div and is accurate within ±3%.

Five markers offer user convenience and confidence: time, magnitude, phase angle, I-magnitude and Q-magnitude. While markers are preferred for bench and quick-look measurements, the very best measuring accuracy comes from the precision digital voltage measurements made by the analyzer on the I and Q channels. These are displayed as digital annotations on-screen and are available for computer analysis over the HP-IB (IEEE 488/IEC 625).

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



The HP 8780A Vector Generator features digital BPSK, QPSK, and up to 64 QAM modulation directly.

New application note on low-phase-noise signal generators

The stringent performance requirements of modern radar and communications systems demand high spectral purity in high-frequency signals. The HP 8662A and 8663A Synthesized Signal Generators meet the need for spectral purity by combining the low close-in phase noise of a frequency synthesizer with the low spurious and low noise floor typically found only in cavity-tuned generators.

Application Note 283-3 explains what phase noise is and how the HP 8662A and 8663A minimize it. Other chapters discuss phase noise implications in RF and microwave phase measurements, receiver testing, and local oscillator substitution. Fast frequency switching capability is also covered.

For a free copy of the application note, check **B** *on the HP Reply Card.*

Telecom/datacom test and measurement products summarized in new brochure

A new full-color, 32-page brochure outlines more than 70 telecommunications/datacommunications test and measurement products.

Using an illustration of a typical network, the *Telecommunications/Datacommunications Test and Measurement* brochure shows how many of the 70 products can be used.

Other sections feature product offerings in the areas of: protocol analysis, analog and digital circuits, digital switching and multiplexing, analog transmission (FDM), digital transmission (TDM), microwave radio and satellite, fiber optics, and cellular radio.

For a free copy of the brochure, check **C** *on the HP Reply Card.*

System speeds and simplifies noise figure measurements to 18 GHz

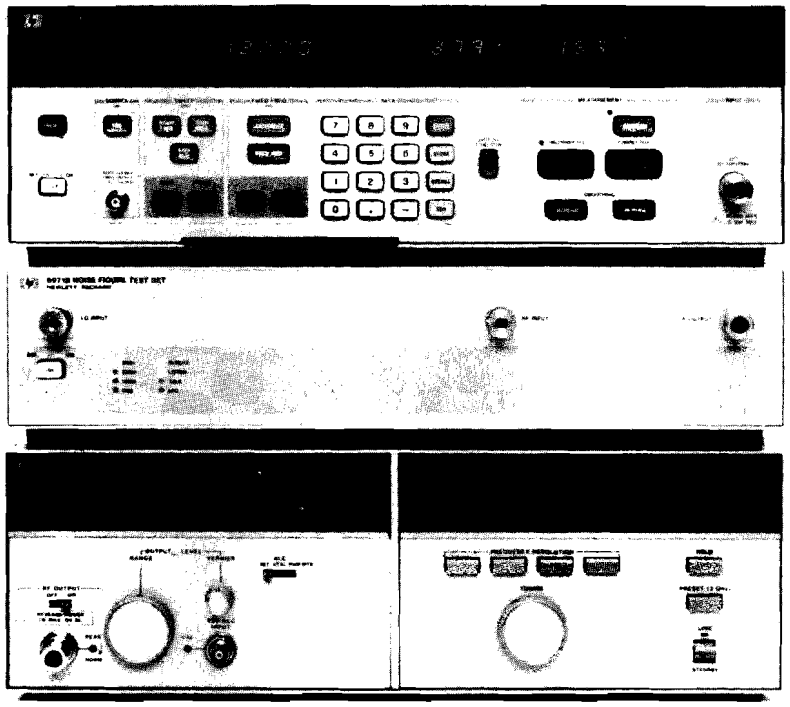
The new HP 8970T Microwave Noise Figure Measurement System makes fast, accurate noise figure measurements from 10 MHz to 18 GHz for component design and test engineers and system engineers. The system measures noise figure from 0 to 30 dB and gain from −20 to +40 dB. Instrument accuracy is ±0.25 dB.

The system consists of three instruments. The HP 8971B Noise Figure Test Set is a switching, single-sideband down-converter. The HP 8970B Noise Figure Meter automatically measures, corrects, and processes noise figure and gain. The HP 8671B Synthesized CW Generator serves as the microwave local oscillator. A tracking preselection YIG filter for the microwave bands eliminates errors caused by previously recommended double-sideband down-conversion.

Overall system control is built into the HP 8970B Noise Figure Meter, which communicates over a special system interface bus. No external computer is needed. However, for control or links to other systems, the HP-IB (IEEE 488/IEC 625) is built-in.

For customers who already have local oscillators or an older HP 8970A, the HP 8970S system allows for a configure-it-yourself selection of individual instruments. (Only synthesized sources can serve as LO). Older HP 8970A models require a modification update procedure by HP to provide the extra frequency range, the HP 8971B control, and the extended memory and bus capability.

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



The new HP 8970T covers the frequency range from 10 MHz to 18 GHz. It calibrates the system, measures gain and noise figure from a single connection, and operates without the need for an external computer.

New seminar on high-frequency component characterization

Hewlett-Packard is offering a new seminar on the latest methods of characterizing circuits, devices, and components. If you are involved in high-frequency design or testing, *Vector Measurements of High-Frequency Networks* is an excellent way to learn new techniques to optimize the performance of your measurement systems.

The seminar includes a review of the typical network analyzer measurements used to obtain device characteristics such as loss, gain, reflection coefficient, return loss, SWR, impedance, phase, group delay distortion, and s-parameters. Methods to analyze and improve the accuracy of these measurements will be discussed and demonstrated. In addition, you will learn how time domain analysis can provide invaluable insight into the measured device. The seminar concludes with a discussion of how to apply these techniques to various measurement applications.

This one-day seminar is offered free of charge.

For more information about the Vector Measurements seminar schedule, contact your local HP sales office.

HP Computer Museum
www.hpmuseum.net

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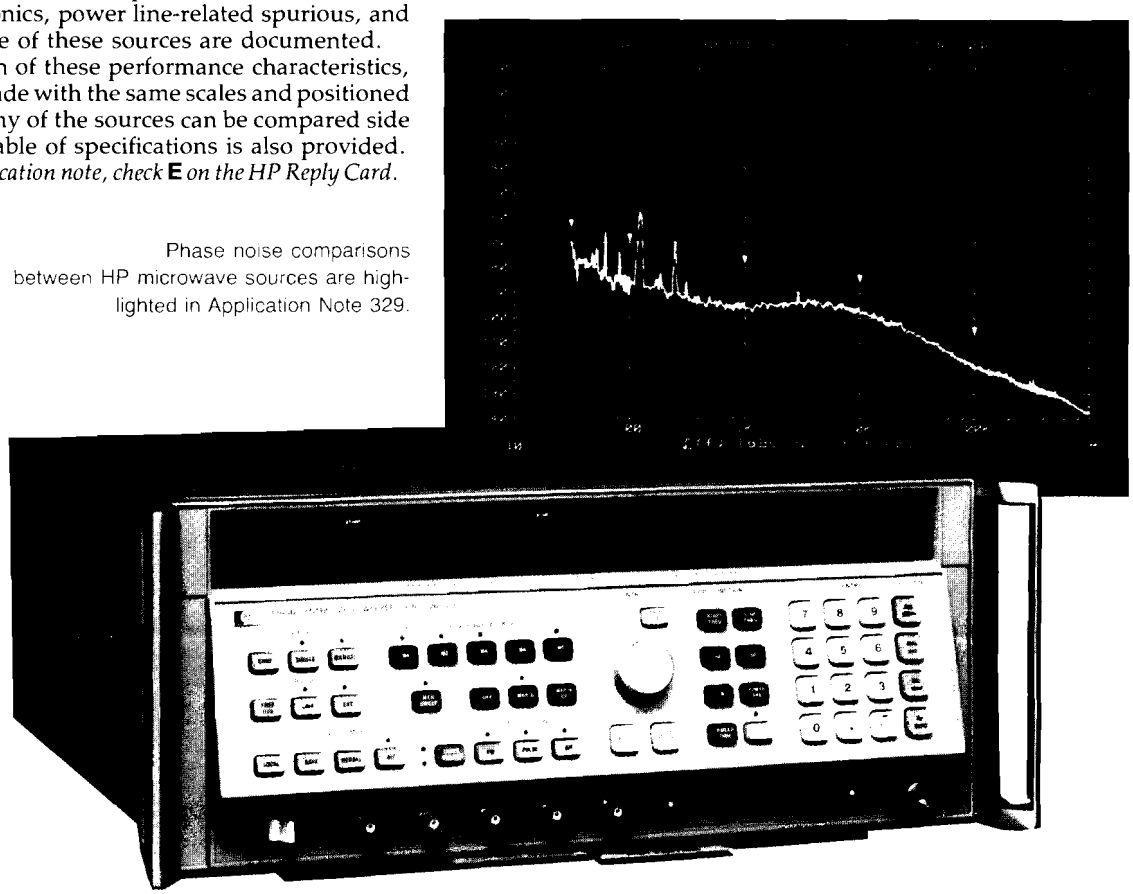
Spectral purity characteristics of HP microwave signal sources compared

A new application note compares the spectral purity characteristics of all HP's microwave source products, including sweep oscillators, signal generators, synthesized signal generators, and synthesized sweepers. Characteristics such as phase noise, harmonics, power line-related spurious, and AM noise performance of these sources are documented.

For easy comparison of these performance characteristics, plots of the data are made with the same scales and positioned on the pages so that any of the sources can be compared side by side. A complete table of specifications is also provided. *For a free copy of the application note, check* **E** *on the HP Reply Card.*

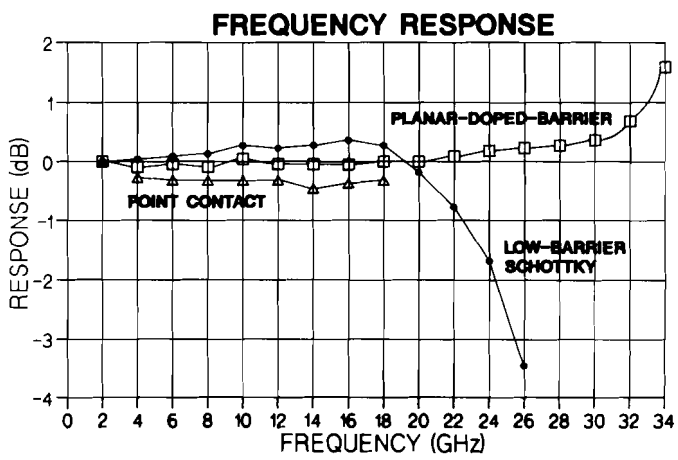


Phase noise comparisons between HP microwave sources are highlighted in Application Note 329.

Three video detectors feature exceptional flatness to 33 GHz

A new molecular beam epitaxy process produces diodes with a planar-doped barrier that features exceptionally low junction capacitance. This results in much higher performance than that of low-barrier Schottky diodes.

HP is introducing three new detector products using these devices. The HP 8473D Detector (10 MHz to 33 GHz) has ±0.4 dB flatness to 26.5 GHz and ±1.25 dB to 33 GHz. SWR is less than 1.4 at 26.5 GHz. The HP 33330D OEM Detector is intended for OEM applications in systems and instrumentation. It covers the same ranges as the HP 8473D but has different connector configurations and wider environmental performance. The HP K422C Waveguide Detector (18.0 to 26.5 GHz) has flatness of ±0.4 dB and SWR less than 1.4. Waveguide is WR-42 and flange is UG-595/U.



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

New HP 9000-to-IBM data communications products

A new family of software and hardware products allows the HP 9000 Series 300 engineering workstations and Series 800 computers to communicate with IBM mainframe computers. The products permit HP-equipped CAE/CAD/CAM organizations to access mainframe engineering data bases, peripheral hardware, and electronic-mail systems by way of IBM SNA networks.

The HP-UX SNA Link for the HP 9000 is a new communications multiplexer that emulates an IBM 3274 cluster controller. The HP-UX SNA 3270 is a new software interface that emulates an IBM 3278 display station or an IBM 3287 printer and has transparent file transfer capabilities.

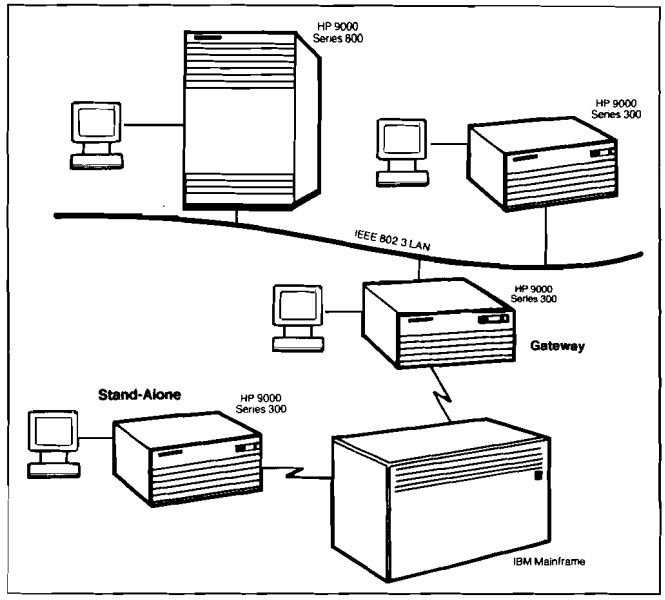
Using the new products, HP 9000 computers with HP-UX can emulate IBM display stations, achieving fully interactive access and file-transfer capability. Connections can be made with a single unit or with a local area network (LAN).

The SNA Link can support up to 32 sessions on HP workstations and terminals. It has a synchronous RS-232-C interface, and connects to an IBM communications controller through modems and a telephone line. The SNA Link is available in three versions:

- An entry-level SNA Link supports a single workstation with two simultaneous sessions.
- A single-system version of the SNA Link supports multiple users and 32 active sessions.
- The HP-UX Gateway/SNA Link for the HP 9000 serves multiple users on multiple systems on a standard IEEE 802.3 LAN and supports up to 50 active sessions.

The SNA 3270 emulator provides an interface between the SNA Link on one side, and one or more user stations on the other. It runs on HP-UX and also is available in three versions:

- SNA Link 3270 runs on an HP 9000 Series 300 workstation. It works with the entry-level and multiuser SNA Links.
- Gateway/SNA 3270 runs on an HP 9000 Series 300 workstation, which must be equipped with a Gateway/SNA Link for the HP 9000 or be in a network with a Gateway-equipped Series 300.
- Gateway/SNA 3270 runs on an HP 9000 Series 800 computer networked with a Gateway-equipped Series 300 workstation.



HP's gateway products allow HP computers and workstations to communicate with IBM mainframes.

In a significant advance in gateway design, the communications chores are distributed among workstations on the network. This allows the gateway-equipped computer to be used simultaneously for engineering applications, instead of being a dedicated gateway processor.

For more information, call your local HP sales office.

HP-UX is HP's version of AT&T's UNIX System V operating system. UNIX is a registered trademark of AT&T in the U.S.A. and other countries.

Fiber optic test instruments featured in HP Journal

If you're interested in versatile, precise instruments for testing fiber optic receivers, transmitters, and components, you can read about HP's new family of fiber optic test instruments in the February 1987 HP Journal. The family is designed to meet the needs of test applications in the wavelength windows at 850, 1300, and 1550 nanometers.

The family includes an optical average power meter that works with either of two optical heads, depending on the wavelength. The optical heads have individual calibration data stored in ROM and a high-precision optical interface. Two models of variable optical attenuator cover the three wavelength windows; one model is distinguished by its usability in both single-mode and multimode applications. Three models of optical source provide highly stable optical power for testing components and receivers. An optical switch provides flexibility in building test setups. Because test instruments have to be connected and disconnected hundreds of times during their lifetimes, the new family is equipped with a special connector designed for high stability, repeatability, and lifetime.

For a free copy of the February issue (English only), check **G** *on the HP Reply Card. To have your name added to the mailing list for the HP Journal, check* **H**. *If you currently receive Measurement and Computation News, please attach your mailing label to the reply card.*

Surface mount diodes and LED lamps expand choices for automated manufacturing

Two more series of surface mount components are now available from HP. New Schottky barrier diodes and subminiature LED lamps help you save on printed circuit board space and on the total cost of your design.

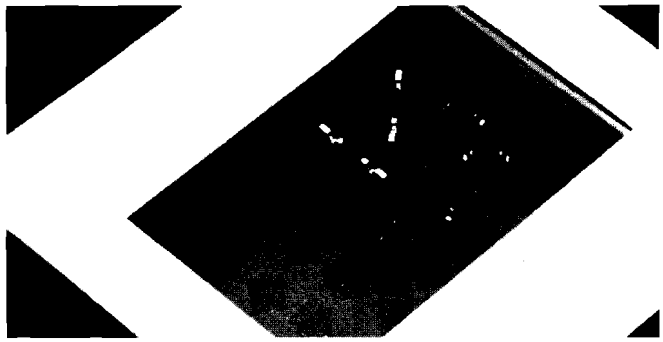
Schottky barrier diodes offer you a choice

Designed for both analog and digital applications that require SOT-23 surface mount packaging, HP's HSMS-28XX series offers a range of specifications in both single and dual configurations.

You get diodes that have picosecond switching speeds, nitride passivation for moisture and contamination resistance, turn-on voltages as low as 0.34V at 1 mA, and breakdown voltages as high as 70V.

LED lamps in two lead configurations

Choose from two lead configurations in surface mount lamps, either yoke lead or gull wing. For backlighting switches, membrane panels, appliques and others, yoke leads give added lead strength. The leads are mounted through holes in the printed circuit board to give mechanical strain relief and good solder pads. Gull wing leads are designed for mounting on top of the printed circuit board without using through-holes.



Save on printed circuit board space and on design costs with HP's new surface mount components.

Either individual subminiature lamps or arrays are available in the gull wing version. Both yoke and gull lead lamps are compatible with vapor phase reflow solder processes.

You get reliability and a wide viewing angle, plus a choice of colors and versions: red, high-efficiency red, yellow, green, integrated resistor, and low-current.

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

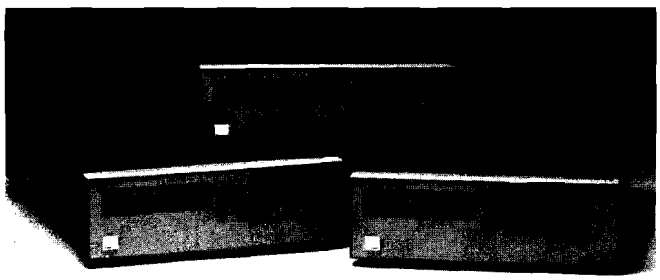
General Purpose Electronic Instruments and Systems

Multiple-output system dc power supplies offer state-of-the-art performance

HP extends its family of controllable system power supplies with the addition of new multiple-output units to meet your ATE and programmable power supply needs today and well into the future.

These HP-IB programmable series-regulated power supplies integrate the functions of several unit power supplies and programmers, a scanner, current monitor shunts, and a DVM into one mechanical package. This yields substantial savings and many advanced functions over alternatives that use a submodule approach.

Most functions can also be implemented from the front panel. Other operating capabilities include the ability to sink as well as source current for fast discharging of capacitive loads and for consistent up-and-down programming times. For programming ease, ten STO/RCL registers store preset output values, reducing the number of commands needed for fast repetitive programming.



New programmable two, three, and four-output supplies expand HP's system power supply family to eleven members.

Models and output ratings

Each model has a combination of two, three, or four independent 40- and 80-watt isolated outputs for a total of 160 watts in a 5¼-inch-high-full-rack-width package. Each output can supply full power at either of two separate output-voltage ranges.

- HP 6621A—Two 80-watt outputs, each 0-20 volts at 0-4 amperes or 0-10 volts at 0-7 amperes.
- HP 6622A—Two 80-watt outputs, each 0-50 volts at 0-2 amperes or 0-20 volts at 0-4 amperes.
- HP 6623A—One 80-watt and two 40-watt outputs. First output, 80 watts, 0-20 volts at 0-4 amperes or 0-10 volts at 0-7 amperes. Second output, 40 watts, 0-20 volts at 0-2 amperes or 0-7 volts at 0-5 amperes. Third output, 40 watts, 0-50 volts at 0-0.8 ampere or 0-20 volts at 0-2 amperes.
- HP 6624A—Four 40-watt outputs. First and second outputs, 0-20 volts at 0-2 amperes or 0-7 volts at 0-5 amperes. Third and fourth outputs, 0-50 volts at 0-0.8 ampere or 0-20 volts at 0-2 amperes.

Parallel or series operation for increased voltage or current is possible with appropriate connections. Application in the Air Force MATE program is made possible by ordering Option 700, which enables programming in CIIL.

For more information, check **J** *on the HP reply card.*

Reduce production cost and improve quality with new capacitance meter

The new HP 4278A is a high-speed capacitance meter (C-meter) that measures capacitance, conductance, dissipation factor, quality factor, and equivalent series resistance at 1 kHz and 1 MHz. Designed for production test and incoming inspection of single-layer and multilayer ceramic and film capacitors, the HP 4278A can test chip or leaded components.

Reduce production cost with high speed

The HP 4278A reduces test time and increases throughput by performing fast measurements in just seven to 21 milliseconds. It also has an interface (Option 201) with a component handler for fast and automatic testing.

A binning function allows quick and easy sorting of tested capacitors. And the HP 4278A has an HP-IB interface (Option 101) for high-speed data logging.

Increase device quality with accurate measurements

The new C-meter's accuracy is 0.05% for capacitance and 0.0002 for dissipation factor measurements. It has a calibration function to reference its specifications to your standard and can eliminate errors caused by cables and fixtures.

The test signal can vary from 100 mV rms to 1V rms in 100-mV rms steps. The binning function also allows you to perform statistical analysis to improve the device manufacturing process and quality.

A built-in self-test function, service accessories, and the HP service center can help minimize production-line downtime if the HP 4278A fails.

Easy operation

The HP 4278A has a dot-matrix LCD display that shows measurement values, softkeys for instrument control, comparator limits for sorting, and self-test results for easy operation. Also, a memory card stores and recalls control settings and sorting limits for simplified measurement setup. One- and two-meter test leads are available for connecting the HP 4278A's measurement port to an automatic component handler. Several test fixtures are also available to measure different devices manually, such as chip capacitors.

The new HP 4278A high-capacitance meter reduces test time and increases throughput by performing fast measurements in just seven to 21 milliseconds.

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

Design verification system

(continued from page 8)

mediate execution. Of course, HP's 74200 proprietary design workstations can be easily linked, too. Provisions are also made to convert any other format.

Verification requires performance

The system's test vector resources of 1 to 16K vectors by 8 to 256 channels allow real-time truth table verification at speeds up to 50 MHz. Dual-level comparison and glitch detection identify any level violation within a programmable time window. To make sure that the IC operates correctly in its normal environment, the performance limits of the IC must be measured. By sweeping the sampling point on the IC outputs, waveforms can be reconstructed with a resolution of 100 ps, to measure ac characteristics such as setup or hold times and propagation delays. Dc measurements (e.g., leakage current) are also readily available. A test head concentrates all measurement resources at the device's pins, allowing ac and dc parametric and functional measurements without recabling.

Easy operation for immediate results

Using the system software, the IC designer can start testing without being a tester expert. Measurement results are quickly obtained by pressing softkeys that execute preinstalled test routines. Combining several routines allows "What if...?" decisions to be made, ideal for debugging and failure analysis. An error map identifies failed bits, while a shmoo plot maps the parameters under which the IC operates correctly (e.g., propagation delay versus supply voltage.) These measurements are easily included in a BASIC test program.

Modularity gives wide choice

The HP 81810S is modular in vector memory depth, channel count, and timing performance. Dc capability and device power supplies are optional, and there is a choice of HP workstations. This lets the user tailor the configuration to the needs and ensures a growth path.

Trade-in links the installed base

The new HP 81810S expands the measurement capabilities of its predecessor, the HP 81800S, which is used worldwide in hundreds of IC design verification and test installations. A trade-in program allows these existing users to migrate to the new performance level cost-effectively.

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

Design verification system cuts ASIC development time

Hewlett-Packard's new HP 81810S IC Design Verification System gives an IC designer a dedicated tool to diagnose chip faults at the prototype stage. This avoids the risk of committing a faulty chip to production, thereby saving additional mask costs and shortening the development cycle. Short time-to-market, in turn, can provide the competitive edge for manufacturers of application specific ICs (ASICs). IC users, confronted with the design of ASICs rather than breadboards, will also benefit from the new ASIC verifier.

The HP 81810S was designed with several years of experience and customer feedback gained with its predecessor, the HP 81800S. The new features reflect the demanding needs of IC design verification: a link to CAE simulators, high measurement performance, easy operation without being a test expert, and modular price/performance.

Linking design to test

Verifying what CAE simulation predicted assumes having the simulator data available in the tester. The system's CAE link software downloads industry standard formats such as HILO-3 and FACTOR into the system's hardware for im-

(continued on page 7)

With the new HP 81810S Design Verification System, you can diagnose chip faults at the prototype stage.

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