MEASUREMENT COMPUTATION news

*product advances from Hewlett-Packard*

JANUARY/FEBRUARY 1987

# Render solid images at interactive speed

The new HP 9000 Model 320/350SRX technical workstations create 3-D computer images at interactive speed. Solid images can be rendered up to 10 to 20 times faster than on other workstations in a similar price range—thanks to innovative graphics architecture, custom VLSI, and hardware and microcode advances.

The Model 320/350SRX provides economical power for CAD applications that require high-performance graphics such as mechanical engineering CAD, molecular modeling, mapping, and high-end architectural and engineering construction.

The Model 320/350SRX gives design engineers using solid modeling an interactive response similar to what is expected today from wire-frame applications. VLSI integrated circuits can compute realistic 3-D images fast enough for you to manipulate them and see the results in less than a second.

*(continued on page 2)*

## IN THIS ISSUE

# Create 3-D computer images

*(continued from page 1)*

### System features

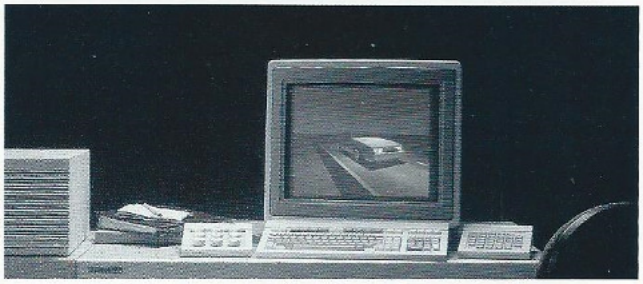
The graphics capabilities of the system include:

- Dimensional capabilities such as fast geometric transformations including: scale, rotate, translate, and perspective, 32-bit IEEE floating point, and six-plane clipping
- Primitives such as polylines and polygons, including: 255-sided, convex, concave, and crossing edges or holes, and B-splines for accurate, fast generation of complex figures
- Fast realistic images via smooth shading, up to eight ambient, directional and positional light sources, and depth cueing
- Price/performance optimization through hardware dithering, double buffering, and strip-Z hidden-surface removal.

### Compatible and easy to upgrade

The Model 320SRX is a bundled workstation system that includes a Model 320 32-bit SPU (MC 68020, 16 MHz), I/O expander, 4M bytes of RAM, high-speed HP-IB, DMA, LAN, HP-UX operating system with graphics library, 1,280 × 1,024-pixel (60-Hz noninterlaced display) monitor, accelerator, and eight planes of frame-buffer memory and four overlay planes.

The Model 350SRX is the latest high-end addition to the workstation line. This system is bundled the same as the 320SRX but includes the Model 350 SPU which is based on the 25 MHz Motorola 68020. It has double the performance of the Model 320 SPU.



Another 16, 24, or 32 planes of graphics memory can be added. With 32 planes of graphics memory, 16 million colors can be displayed simultaneously for shading of complex objects as well as full Z-buffer hidden-surface removal.

The HP 9000 Model 320SRX bundle (HP 98587A) is priced at $45,800. The Model 350SRX bundle (HP 98587B) is priced at $54,900. Eight planes of memory can be added for $4,000. The display controller (HP 98720A) and HP-UX (Option 022) can be added to an existing Model 320 for $12,440.

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

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.

# Software products offer advanced PC integration

Two new software products—HP Resource Sharing and HP Information Access—complete the integration of personal computers into HP's office information system, the Personal Productivity Center.

HP Resource Sharing allows PC users within an organization to share files, disc space, printers, applications, and tape drives. The enhanced HP Information Access simplifies and speeds the gathering of data from different sources across the network.

Building on the recently introduced HP StarLAN network and powerful HP MICRO 3000 computers, HP Resource Sharing and HP Information Access together make HP a leader in incorporating PCs as the primary workstation in an office information network.

### Better use of resources

HP Resource Sharing stores key documents and other data in an MS®-DOS format on a common HP 3000 disc drive. Only one copy is stored to prevent inaccurate or outdated redundant files. Transparent use of disc resources on any networked HP 3000 facilitates concurrent access to centralized files.

Both PC and HP 3000 networked disc files can be backed up easily to tape drives. Once a file is on tape, only subsequent changes are updated to reduce processing time.

Network printers can be shared, broadening access to high-quality, high-volume printing while reducing both the number of system-wide printers and the dependency on dedicated PC printers. Print spooling gives multiple users simultaneous access to system printers while background printing frees a PC for use while a document is being printed.

Software licensing discounts of up to 75% are available for customers with right-to-copy licenses for as few as 10 PC users. Licensed software updates can be electronically distributed and centrally administered using the disc-sharing features of HP Resource Sharing.

### Controlled access to shared data

The new HP Information Access represents a 40% performance improvement over HP Access, an earlier version of the software. It lets you format local and remote HP Image data using simple menu commands without knowing the data base location or structure.

Once data is retrieved, it can be organized, formatted and transparently downloaded into PC applications such as 1-2-3 ® from Lotus®, dBase II™, and R:Base 5000™

A new built-in, menu-driven report writer allows you to create and save ad-hoc and routine reports. The report writer, the increased performance, and high data security reduce the MIS department's involvement in report generation.

HP Information Access also calculates the time required to complete a search and, once initiated, continually tracks what percentage of the search is completed.

Licensed upgrades to support more than 10 PCs are available. HP Information Access (supporting 10 PCs) ranges from $5,900 for the HP MICRO 3000 to $12,500, depending on the processor. HP Resource Sharing (supporting 10 PCs) starts at $4,800 for the HP MICRO 3000 and goes up to $9,500 for larger processors.

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

MS-DOS is a U.S. registered trademark of Microsoft Corp. 1-2-3 and Lotus are registered trademarks of the Lotus Development Corp. R:Base is a trademark of Microrim, Inc. dBase II is a trademark of Ashton-Tate Corp.

# Use scientific calculator for symbolic mathematics

Advanced mathematics capabilities of the HP-28C include vector and matrix math. And you can solve algebra and calculus problems conceptually using symbols or variables.

The HP-28C Scientific Professional Calculator is a new technical calculator capable of doing symbolic mathematics. Algebra and calculus operations can be performed with a few keystrokes. Problems can be solved conceptually and numbers keyed in later.

Designed for scientists, engineers, students, and math and computer specialists, the HP-18C lets you concentrate on the concepts of mathematics rather than on the mechanics. You save time because problems can be formulated right on the calculator—instead of using paper and pencil.

The HP-28C has a four-line by 23-character liquid crystal display and 128K bytes of ROM. A wide range of built-in programmable commands and keyboard operations are available.

Complex numbers, matrices, vectors, lists, algebraic expressions, and other data types can be viewed, edited, and used in calculations as easily as ordinary numbers.

### Symbolic algebra and calculus

Equations can be entered and stored in your own terms with the equation-solver capability. The HP-28C lets you solve math operations without assigning numerical values to variables—and numbers can be substituted at any time.

### Matrices, vectors, and plotting

Thirty commands provide a full range of matrix operations on real or complex-valued matrices and vectors. And the HP-28C can graphically depict any single-valued function and plot statistical data. Once an expression is plotted in the display, you can locate an approximate root, press a key to record the coordinates, and use the equation solver to calculate the root with 12-digit accuracy.

The HP-28C has separate alphabetic and numeric keyboards. When open, the calculator is 7.5 in. × 6.25 in. × 0.5 in. and weighs 8 ounces.

An optional, compact printer communicates with the calculator via an infrared beam. It allows you to record keystrokes, show stored data, or selectively print the display contents for review.

The HP-28C is priced at $235. The infrared printer is $135.

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

# Infrared printer available for new calculators

The new HP 82240A is a thermal printer that communicates with two of Hewlett-Packard's new calculators via an infrared interface. To print from the Business Consultant (HP-18C) or Scientific Professional (HP-28C) calculators, you simply point the calculator at the printer and push PRNT. It works up to 18 inches (46 cm) away and is completely portable.

The infrared printer is powered by four AA alkaline batteries or by an optional ac adapter. The adapter does not recharge the batteries but it will extend their lives considerably.

The HP 82240A prints a 24-character line on 2.25-inch (58-mm) black-printing thermal paper. It gives you a printed record of your calculations when you need it—no matter where you are.

The infrared printer is priced at $135.

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

The portable HP 82240A Infrared Printer communicates via an infrared light beam.

# HP 9000 network upgraded

The Shared Resource Management (SRM) system, a file/peripheral server and local area network for HP 9000 BASIC and Pascal workstations, has been upgraded to revision 3.0. The new SRM server has a selective file backup and restore capability.

The SRM operating system can find all files that were created or changed since the last periodic full backup and copy them to tape, flexible disc, or hard disc. The backup can be scheduled to execute unattended (with the HP 35401 cartridge autochanger) or can execute while the system is on-line. In addition, printer banners are now an option.

Support of the following HP mass storage peripherals has been added: HP 9133H/L, 9134H/L, 9153B, 9122S/D, 7957A, 7958A, 7907A, 7935H, and 35401A. And the HP 7570A DraftPro and HP 7440A ColorPro plotters are now supported.

If you are on the HP 98619A subscription services, software and manuals will be distributed. If you have an installed system not on subscription services, you can receive an upgrade discount.

The HP 50960A SRM Server system is priced at $4,995. Upgrades are available.

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

# Read about HP Precision Architecture software in HP Journal

The December 1986 HP Journal continues a series of engineering design articles on the major hardware and software components of the HP Precision Architecture development program. One article presents the implementation of HP-UX, a real-time extension of AT&T's UNIX System V.2 operating system for the HP 9000 Series 800 Model 840 processor. Another article describes the multilevel implementation of ALLBASE, a new data base management system. ALLBASE presents the same interface and supports the same data representation on both HP-UX and MPE XL operating systems.

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

Components

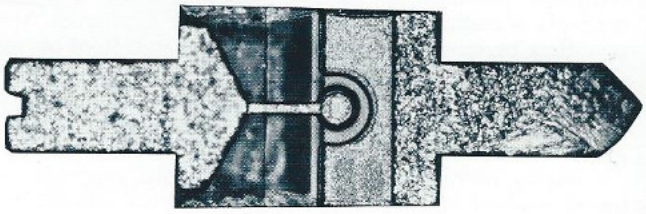
# Fast-switching beam-lead diodes for phased arrays

Two beam-lead PIN diodes, the HPND-4028 and HPND-4038, give you low capacitance, low resistance, and fast switching at microwave frequencies—all with low power consumption. Developed for use in stripline, coplanar waveguide, and microstrip circuits, the diodes are produced using advanced processing techniques to ensure consistent electrical parameters.

Switching speeds are as fast as 2.6 ns for the HPND-4028 and 2.4 ns for the HPND-4038. Similarly, capacitance is only 0.045 pF and 0.065 pF, respectively, at a reverse voltage of 30 volts at 1 MHz. Maximum resistance is 3.0 Ω for the HPND-4028 and 2.0 Ω for the HPND-4038.

In quantities of 1,000 to 2,499, the HPND-4028 is $8.40 and the HPND-4038 is $7.98.

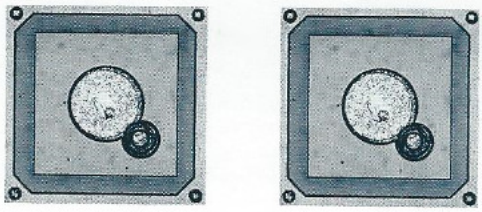
*For more information, check* **H** *on the HP Reply Card.*



The new beam lead PIN diodes have silicon nitride passivation and a polyimide coating for moisture and contamination resistance. Rugged construction and strong beams ensure high assembly yields.

# Increase production rates with offset junction Schottky chips

Because automated wire bonding is simpler when the bonding area is central to the chip, HP introduces offset junction Schottky diode chips, HSMS-0001/-0002/-0003, for analog and digital hybrid applications. The large central bonding area is an easy target for automated wire bonding, allowing increased production rates. Yields are increased because bonding stress on the junction is minimized. Either thermocompression or thermosonic bonding techniques can be used.



A large, centered hard pad and an offset junction are two major innovations of the new Schottky diode family.

Reliability is high with these new chips. Gold metallization for the top contact provides a tarnish-free bond surface. Resistance to moisture and contamination is achieved through nitride passivation. The gold backside allows either epoxy or eutectic die-attach methods.

Three versions are available according to your specific performance requirements. Batch-matched chips, HSMS-0011/-0012/-0013, are available if you need close electrical characteristics between diodes.

In quantities of 1,000 to 4,999, the HSMS-0001/-0002/-0003 range in price from $0.51 to $0.68 each. The prices of the batch-matched chips range from $0.60 to $0.79 each.

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

# New spectrum analyzer offers preselection benefits

The HP 71201A Preselected Microwave Spectrum Analyzer is the latest addition to the HP 70000 modular measurement system. This new spectrum analyzer provides tracking preselection from 2.7 to 22 GHz, low-pass filtering below 2.9 GHz, and a special bypass mode from 0 to 22 GHz. Fully programmable and competitively priced, the HP 71201A makes an excellent choice for automatic test system, lab bench, manufacturing, and communications applications.

### Benefits of preselection

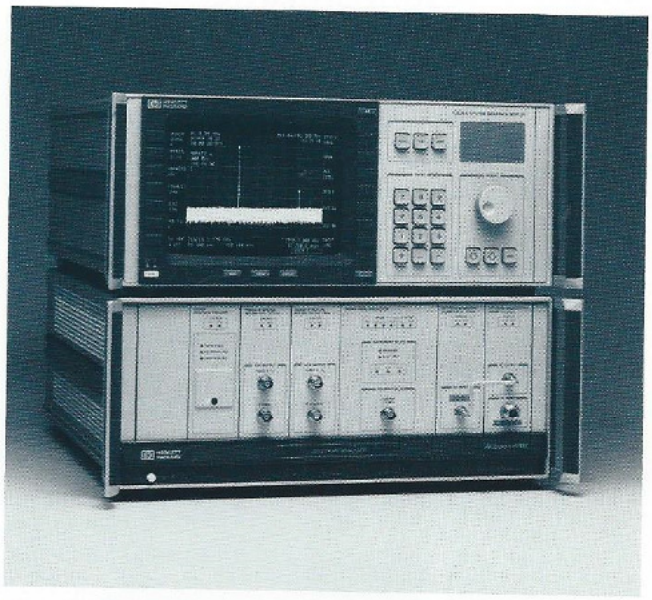
The HP 71201A features the new HP 70600A Preselector Module. If you make measurements in crowded spectra, this preselected system offers a number of benefits. Preselection eliminates the confusing multiple responses that occur with harmonic mixing in spectrum analyzers. The resulting CRT display is easier to interpret and signal identification is much faster. Preselection also helps protect the analyzer from gain compression and increases dynamic range for harmonic measurements.

In addition, once a signal has been identified and "zoomed in on," the preselector can be bypassed, improving the spectrum analyzer's sensitivity. Bypass can be done by remote command or manually. Bypass mode, low-pass filtering, or YIG-tuned filtering can be used without affecting calibration.

The standard HP 71201A spectrum analyzer consists of a mainframe, a display unit, the preselector module, and three spectrum analyzer modules. Included is the new memory-plus controller board, with increased RAM that guarantees a minimum 32K bytes of memory available for downloadable programs. System options are a stand-alone display, a wideband IF module, a tracking generator module, and the precision frequency reference module for increased frequency accuracy.

### Modular system makes upgrading easy

This system shares the benefits of modularity that distinguish the HP 70000 family. Instruments can be upgraded easily and economically by adding or changing a module. Diagnosis and repair or exchange of modules can be accomplished onsite. The HP 70600 Preselector Module can be used with existing HP 71200A microwave spectrum analyzers for preselection to 22 GHz. No hardware additions are required, but the local oscillator firmware must be upgraded to new memory-plus capability. A controller-board upgrade kit is available.



The new HP 71201A modular spectrum analyzer offers full programmability for automatic test system, lab bench, manufacturing, and communications applications.

The HP 71201A Preselected Microwave Spectrum Analyzer is priced at $45,000. The HP 70600A Preselector Module is $9,950 and the HP memory-plus controller-board upgrade kit is $900.

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

# Coaxial and waveguide accessories catalog now available

The latest edition of HP's *Coaxial and Waveguide Measurement Accessories Catalog* is now available. It has product and applications information on more than 400 products operating from dc to 110 GHz. Seventeen product sections include attenuators, detectors, couplers, power sensors, scalar analyzer accessories, noise figure equipment, and 75Ω accessories.

More than 27 pages are devoted to microwave measurement techniques and measurement reference information.

This catalog is useful for design engineers, production test personnel, quality assurance and metrology engineers, and field test engineers.

*For a free copy of the catalog, check* **K** *on the HP Reply Card.*

# Low-cost extended support program for instruments

The new HP Extended Hardware Support program provides two years of return-to-HP hardware service—in addition to the standard one-year warranty currently offered. Available at time of purchase, the program can free you from unplanned expenses in the first few years of ownership. The program is based on HP's low failure rate.

Approximately 500 HP instruments are included in the new support program. Calibration, and certain accessories and options, are not included in the program.

HP Extended Hardware Support generally costs between 2% and 3% of the list price of the instrument. The fee on some products will be as low as 1% but there will be a minimum charge—as well as a maximum.

Regardless of the price of the instrument, the minimum charge is $50 and the maximum charge is $1,000.

*For more information, call your local HP sales representative.*

# New system simplifies high-performance phase noise measurements

The new HP 3048A Phase Noise Measurement System simplifies the difficult task of characterizing the phase noise of sources and devices. Measuring phase noise used to require an experienced engineer, a rack of equipment, and hours of measurement time. The HP 3048A provides high-performance results in minutes with a simple configuration and easy-to-use menu-driven software.

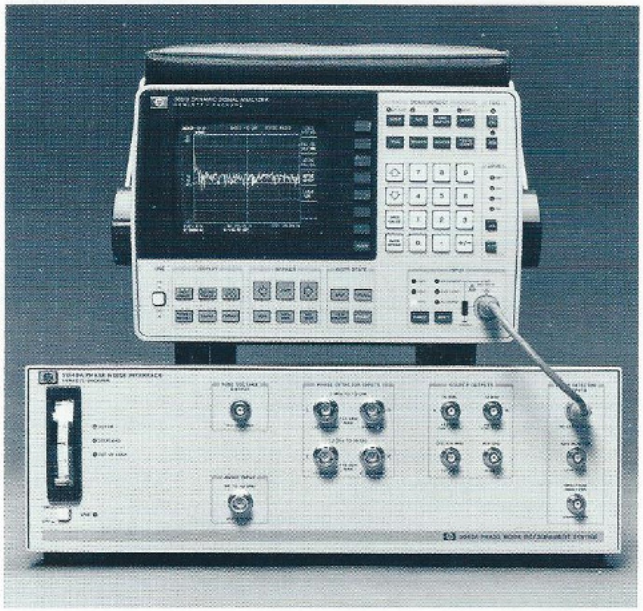
The HP 3048A consists of a phase noise interface, a dynamic signal analyzer, and software. An HP desktop computer is required to use the system.

The HP 3048A's standard frequency range of 5 MHz to 1.6 GHz covers a wide range of RF sources and devices. Option 201 extends measurements to 18 GHz. The specifications include sensitivity for measuring the best frequency standards, amplitude accuracy of ±2 dB for tight test margins, and wide offset range to see SSB phase noise from 0.01 Hz to 40 MHz from the carrier frequency.

Design engineers can evaluate low-noise signal processing circuitry used in radars, guidance systems, satellites, and microwave and RF communication systems. In production applications, the HP 3048A can test synthesizers, crystals, VCOs, YIG oscillators, and subassemblies. Metrologists can test signal generator phase noise specifications.

### Complete phase noise measurements in three steps

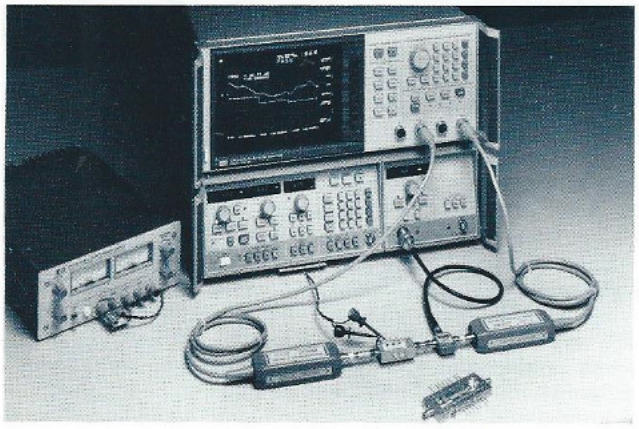
The first step is to define the parameters for the test. Selecting an area for change is done simply by choosing the appropriate special function key. In the second step, you measure the signal. The HP 3048A automatically sets up the instrument, performs the chosen calibration routine, and uses the dynamic signal analyzer to measure the demodulated noise. It applies any corrections and formats the data in the specified form. You can view single-sideband phase noise or spectral density graphs. Or list measured noise at selected offsets, or all spurious signals identified in a given frequency range. Other outputs, such as total noise power, residual RF, and Allan variance, are available. In the final step of analyzing the results, you can choose from a number of computer-aided software analysis tools.



The new HP 3048A is designed for characterizing the phase noise of sources and devices.

The HP 3048A Phase Noise Measurement System includes the HP 11848A Interface, the HP 3561A Dynamic Signal Analyzer, measurement software, and onsite operator training. It is priced at $31,500. Option 201 is $2,200. The HP 98580A Desktop Computer (including accessories for the HP 3048A) is $9,625.

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



Amplifier measurements using a scalar network analyzer and sweep oscillator are described in HP's new application note.

# Application note addresses amplifier measurements

Techniques for measuring amplifier gain, gain compression, SWR, and isolation using a scalar network analyzer are presented in HP Application Note 345-1. The scalar network analyzer/swept frequency source combination allows these measurements to be made quickly and accurately.

To illustrate each measurement, detailed procedures using the HP 8757A Scalar Network Analyzer and the HP 8350B/83592A Sweep Oscillator are described, followed by a discussion of accuracy considerations. Additional insights into the measurement techniques are provided by descriptions of signal detection schemes, test signal leveling vs. ratioing, and gain compression tests using the signal source's power sweep function.

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

# Enhanced ac software offers at-speed transistor characterization to 26.5 GHz

The Transistor Electrical Characterization and Analysis Program (TECAP) with ac analysis allows you to improve the performance of your IC process significantly. The new ac software calculates device characteristics at the operating frequency for maximum circuit simulation accuracy and confidence.

Using TECAP to revise designs eliminates the need for multiple fabrication runs and reduces design cycles. IC designers no longer have to rely on dc model parameters to characterize a high-frequency device. TECAP completely analyzes nonlinear characteristics of active devices with respect to frequency, bias, temperature, and signal power level.

Easy-to-read plots of base resistance vs. bias current and $f_{tau}$ vs. collector current can be generated quickly to determine a device's maximum frequency of operation or optimum switching speed.

### Measurement and extraction capabilities

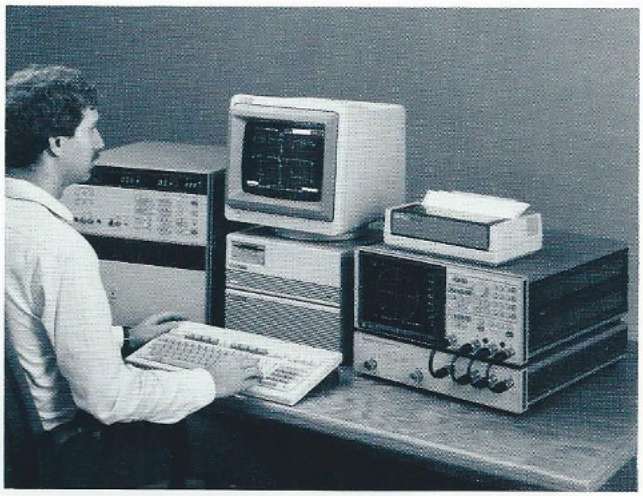
With TECAP, frequency and bias can be varied to measure all s, h, y, and z parameters using HP's advanced network analyzers. Then ac model parameters can be extracted to obtain device resistance, capacitance, and transit time information. The TECAP simulator can directly compare the ac nonlinear SPICE (Simulation Program, Integrated Circuit Emphasis) model equations to the measured device behavior.

### Simulation capability

TECAP provides the nonlinear, high-frequency simulation tools needed to predict high-speed bipolar, gallium arsenide, and MMIC (monolithic microwave integrated circuit) device models in realistic situations. You can extract radio frequency and microwave device model parameters and verify performance immediately with the same system.

Volume discounts are available. You can add ac analysis (HP 94401A) to the standard TECAP software. The complete TECAP dc, CV, and ac software (HP 94445A with Option 001) is $32,500 for the first copy. HP 94401A is $15,000.

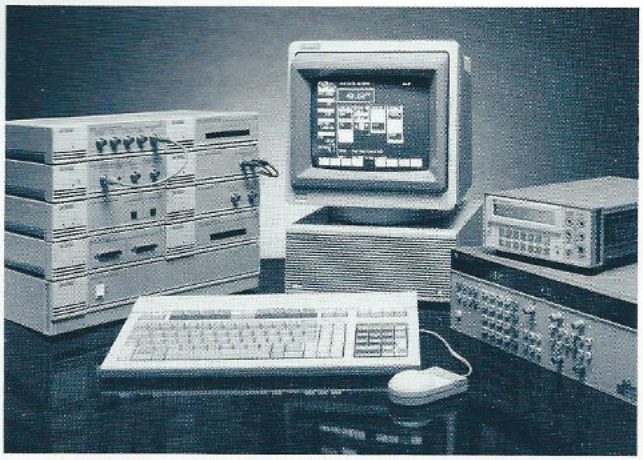
*For more information, check* **N** *on the HP Reply Card.*



Save valuable design time by using HP's enhanced TECAP system to analyze dc, CV, and ac behavior of MOS, bipolar, and GaAs devices.

# Link PC Instruments to HP 9000 Series 200/300 Computers

The HP 9000 Series 200/300 offers an environment that makes it easy to integrate HP-IB instruments with PC Instruments. Now you can integrate all the PC Instruments features that used to be available only on personal computers. HP BASIC, running on the HP 9000 Series 200/300, has powerful statements and programming features.



The HP 98647A provides the HP 9000 Series 200/300 Computers with PC Instruments control capability.

PC Instruments modules are driven by system software that provides high-level, functional programming statements rather than cryptic codes and formats. It is designed to address many instrument configuration details—so you can spend more time developing your applications instead of configuring the instruments. Users of PC Instruments in the personal computer environment spend up to 50% less time developing a test program. With HP BASIC and PC Instruments, your test program can be generated even faster.

### Meet your needs cost-effectively

PC Instruments can be mixed and matched with HP-IB instruments to provide you with cost-effective solutions. This means you can address both HP-IB and PC Instruments from the same HP BASIC program. These flexible instrument combinations can be used to replace custom circuitry or higher-cost, full-function instruments. The combination of HP-IB and PC Instruments, with the Series 200/300 Computer, can provide a cost-effective solution for applications including: temperature measurement, production test, data logging, process monitoring, electronic component evaluation, and research and development. And PC Instruments is compatible with the HP 44458A Data Acquisition Manager for applications involving large amounts of test data.

The HP 98647A PC Instruments Interface and system software is priced at $850. PC Instrument modules range from $700 to $1,500.

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

# Test data lines while they carry traffic

The new HP 4948A In-Service Transmission Impairment Measuring Set (ITIMS) measures the same line-impairing effects as conventional test sets, but does it while the circuit is in service. This increases circuit availability and protects revenue. The HP 4948A is a significant step in testing—for both users and providers of voice-grade data circuits.

The HP 4948A operates with many of the standard CCITT and AT&T modem signals (2,400 to 9,600 bits per second). If the signal type is unknown, the HP 4948A can automatically identify the modem signal before it starts making its measurements.

### Fingerpointing, troubleshooting, and preventive maintenance

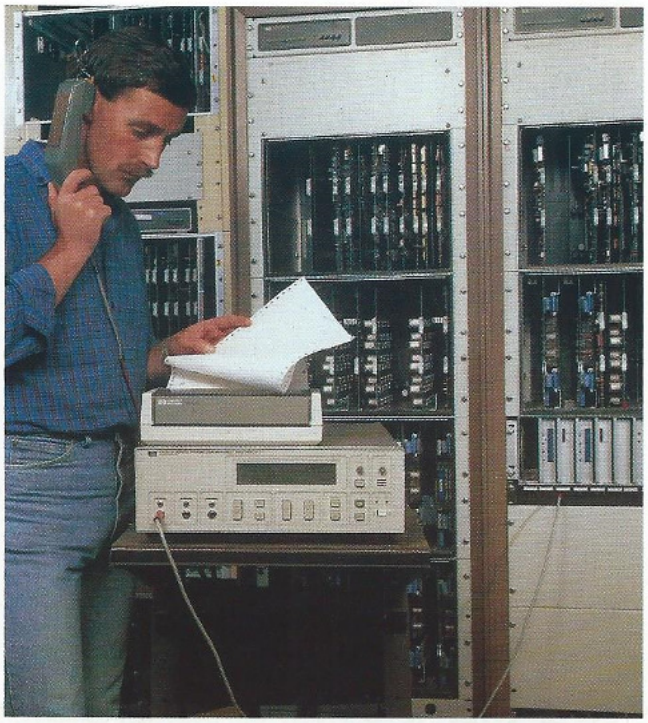
The HP 4948A allows lines to be checked quickly to identify who is responsible for fixing a fault without taking the line down—and without cooperative testing. One test measures all impairments, and intermittent faults can be captured using the long-term monitoring capability. The HP 4948A can be used to implement a preventive maintenance policy. Operational circuits can be routinely tested and problems identified before data errors occur.

### Build a line-monitoring system

The HP 4948A provides an economical means of producing data for network management—even for small systems, or systems using a variety of modem types. It can be integrated into a fully-automatic line-monitoring system controlled by a desktop computer.

The HP 4948A is priced at $12,500.

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



After monitoring a line to trap an intermittent fault, the HP 4948A ITIMS can print the results on a ThinkJet printer.

MEASUREMENT COMPUTATION news
*product advances from Hewlett-Packard*

January/February 1987

**Editor**
**Deborah Geiger**
Hewlett-Packard Company
3200 Hillview Avenue
Palo Alto, California 94304
(415) 857-3456

Address Correction Requested

**Regional Sales Headquarters**

**Eastern Region**
4 Choke Cherry Road
Rockville, Maryland 20850
Ph. (301) 670-4300

**Midwestern Region**
5201 Tollview Drive
Rolling Meadows, Illinois 60008
Ph. (312) 255-9800

**Southern Region**
2000 South Park Place
Atlanta, Georgia 30339
Ph. (404) 955-1500

**Western Region**
5161 Lankershim Boulevard
North Hollywood, California 9160
Ph. (818) 505-5600

00572A