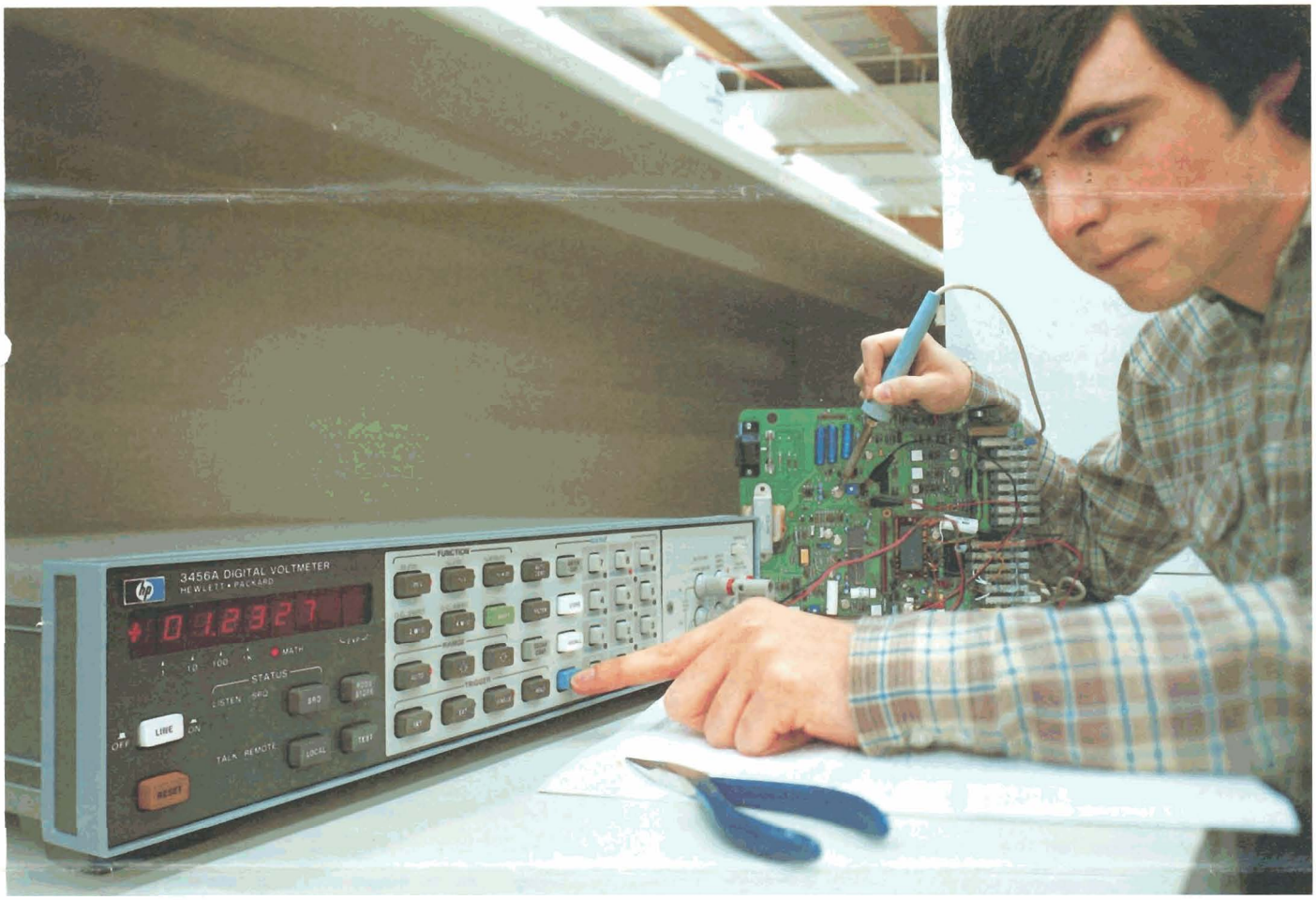
MEASUREMENT COMPUTATION news

product advances from Hewlett-Packard

Computer Museum

JULY/AUGUST 1980



Obtain outstanding precision and speed in your measurements with HP's new DMM

You don't have to compromise measurement accuracy, noise or resolution to get fast DMM readings. Hewlett-Packard's new integrating 3456A 3½ to 6½-Digit Multimeter for bench and system use allows you to choose the best speed, or the best accuracy or resolution for a particular application, simply by pushing a button.

An important key to this flexibility and nearly uncompromising capability is the 3456A's selectable integration time, ranging from 0.01 to 100 power-line cycles. If reading rate counts, an operator can select up to 330 readings per second for high-speed bursts or one reading every 15 minutes for periodic measurements. When accuracy is more important, stretching the integration time increases the accuracy. You can also select resolution of 100 nV at up to 48 readings per second (6½ digits) or 10 μV resolution up to 330 readings per second (3½ or 4½ digits).

This fully-guarded, microprocessor-based DMM also provides a wide repertoire of other features. Its dc voltage capability extends from 0.1 to 1000 V in five ranges and it measures up to 700 V of calculated true-rms on four ranges, over 20 Hz to 250 kHz. In addition, the 3456A offers resistance measurements, mathematical calculations controlled from the front panel (statistics, null, percentage error, dB, limits, scaling), and a built-in memory of up to 1400 bytes.

A technique called Offset Compensated Ohms is incorporated in the 3456A to correct resistance measurements for undesirable thermal offsets generated by bimetallic junc-

(continued on third page)

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

HP's lowest priced synthesized signal generator now available for 0.1 to 990 MHz applications

Full HP-IB programmability under microprocessor control makes the new HP 8656A Signal Generator particularly well-suited for automatic test stations as well as for manual testing in the lab and in the field.

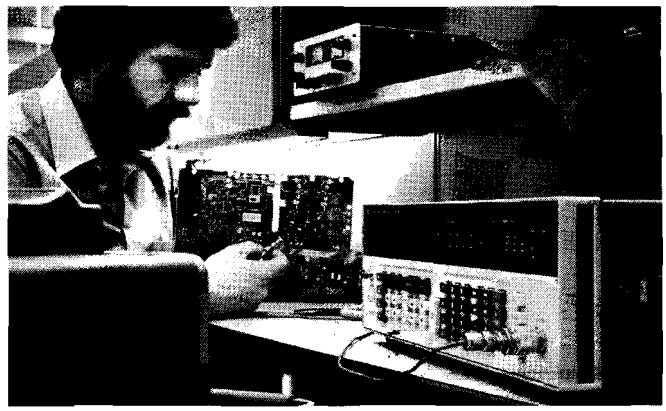
For manual applications, the 8656A has been designed to minimize the time required to set up desired signal conditions of frequency, output level, and modulation. All signal conditions are keyed-in directly in the units desired, such as MHz and dBm. What's more, the microprocessor permits keying in of non-traditional units such as dBμV (dB referenced to a microvolt) useful in broadcast stereo work. For high impedance loads, the output can be calibrated in EMF.

An important advantage to repetitive testing is the 8656A's store/recall mode. It can remember 10 complete, front panel, signal set-ups and recall each at a touch of two keys. In production test, the 10 conditions can be sequenced with a rear panel contact closure to ground, connected to a foot switch.

Output frequency covers a very broad application range from long range navigation (100 kHz) to beyond cellular telephone (990 MHz). Resolution is 100 or 250 Hz while stability results from an internal 2 ppm per year time base. Intended primarily for in-channel receiver tests, the single sideband phase noise is <-122 dBc/Hz at a 20 kHz offset at 225 MHz.

Calibrated output level from +13 to −127 dBm has an absolute accuracy of ±1.5 dB, resolution of 0.1 dB, harmonics <-25 dBc, non-harmonic spurious <-60 dBc, and reverse power protection of 50 W.

AM from 0-99% is available at internal rates of 400 and 1000 Hz. FM ranges up to 99 kHz peak deviation (depending on carrier frequency) at 400 and 1000 Hz rates. For calibrated external AM or FM (at rates up to 25 kHz), two limit lights indicate proper input amplitude of 1 V peak.



HP-IB programming is standard in HP's new 8656A Signal Generator. In that mode, fequency switches in less than two seconds (to be within 100 Hz).

All display values can be incremented with up/down keys and increment sizes are set in the same fashion as other function data by the keyboard. Holding down an up/down key causes continual step "tuning" and replaces the need for knobs.

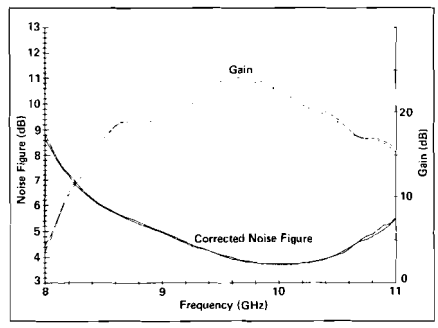
Check **B** *on the HP Reply Card.*

New application note describes how to make accurate repeatable noise figure measurements 10 MHz to 18 GHz

Application Note 64-3, *Accurate and Automatic Noise Figure Measurements*, details how to use the HP 436A Digital Power Meter, under desktop computer control, to measure Y-factor and compute noise figure. This new, high-accuracy technique depends on the implementation of the new HP 346A 10 MHz - 18 GHz Noise Source which reduces measurement uncertainty because of its low SWR.

Demonstration software routines in AN 64-3 include techniques for measuring noise figure and gain of microwave components. Further, the note covers use of the computer to correct second stage noise figure, ambient temperature, and ENR (excess noise ratio) variation vs. frequency.

For a complimentary copy of AN 64-3, check **C** *on the HP Reply Card.*



Corrected noise figure and gain of an X-band Amplifier shows good repeatability.

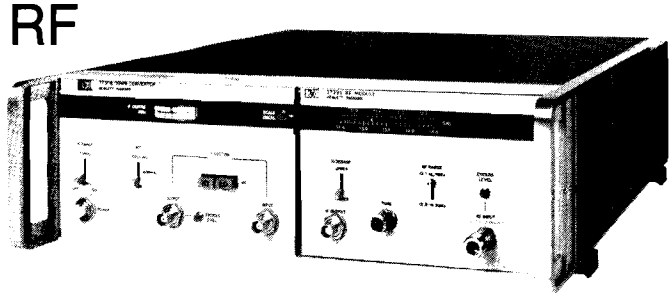
How to select the right RF signal generator

A new, colorful, 8-page Selection Guide for RF Signal Generators and Sources is now available. It describes HP's signal generator capabilities between 10 kHz and 2600 MHz. Specification comparisons are made for nine different generators ranging from the manually-tuned 8654A L-C type to the high-performance 8662A Synthesized Generator.

The application selection chart compares critical parameters required for nine separate measurement applications ranging from L.O. substitution to the stringent out-of-channel radio test procedure. A single-sideband, phase noise comparison chart for five generators appears for the first time, as well as a glossary of terms to round out the user-oriented information in this brochure. Capsule descriptions of each generator are provided.

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

Extend MLA test capability to RF



The new 3730B Down Converter offers extended frequency coverage and many new features to improve measurement accuracy.

The new 3730B Down Converter is a replacement for the now obsolete 3730A model and offers many outstanding new features. It provides RF to IF conversion, permitting an RF interface capability for Microwave Link Analyzers (MLA's). The extended RF range, 1.7 to 14.5 GHz, is accommodated by a series of broadband, plug-in RF Modules.

In addition to extended RF coverage and a much improved residual performance, this latest down converter provides a special tracking AFC and recovered sweep facility which causes the local oscillator in the 3730B to track the incoming swept RF signal. Because of the effective sweep compression of the IF signal, the 3730B allows measurements with conventional MLA's over bandwidths of up to 250 MHz.

Lengthy runs of RF cables between the down converter and the RF test point may generate ripple responses which can mask the true measurement response. To avoid this problem, it is possible to remove the down converter plug-in and mount this directly onto a waveguide test point. The plug-in is then connected to the 3730B mainframe by an umbilical cable. which carries only IF signals.

Other new 3730B features are: upper/lower sideband operation to eliminate difficulties when comparing MLA responses between microwave radio repeater stations; provision for incorporating an RF Input Isolator to improve noise figure, input VSWR, and local oscillator leakage; and interface capability with 70 or 140 MHz IF MLA's.

Check **E** *on the HP Reply Card.*

New "SC" crystal-cut and efficient electronics provide superior quartz oscillator performance

These two new, high-performance oscillators were designed for instruments, communication and navigation equipment, and precision timekeeping systems.

If your equipment requires a compact, rugged precision frequency source with fast warmup, high stability, or low phase noise, consider HP's two new oscillators, the 10811A/B. Both can be built into your equipment to provide the following key specifications:

Output frequency: 10 MHz (10.23 MHz on special order).
Aging Rate: <5 parts in 10^{10}/day
Phase Noise: >160 dBc at 10 kHz offset
Warmup: Within 5 parts in 10^9 of final frequency in 10 minutes.
Time Domain Stability: 5 parts in 10^{12} for a 1-second averaging time.
Power consumption: 2 Watts.

They are plug-compatible with HP's other compact quartz oscillators, the 10544A/B/C. Models 10811A and B differ in 1) the methods of making electrical connections and, 2) model B has provisions for shock mounting.

Check **F** *on the HP Reply Card.*

Have your speed and accuracy too with this new DMM

(continued from first page)

tions. This allows the user to select any kind of metal for the test leads, without worrying about the metal on the resistor leads.

Standard on the 3456A is an isolated HP-IB (IEEE-488) I/O for the systems operation. The front panel indicators on the 3456A display range, function and HP-IB status during remote operation. Also on the front panel is a SRQ (Service Request) button which can be used to flag or interrupt a computer. When combined with the 3456A's program memory and reading storage capability, system programmers and operators need to use only one desktop or minicomputer to control numerous test stations.

Another system feature of the 3456A is its hardware scanner advance capability. As soon as the 3456A's measurement cycle is complete, a TTL signal is available to trigger an HP 3495A Scanner or 3497A Acquisition/Control Unit to advance to their next channel. Up to 330 channels can be scanned per second without computer interaction.

With a 2 PPM stability, the HP 3456A is a true transfer standard with its 100 nV sensitivity and 0.001% accuracy. A statistics function key (STAT) enables the operator to improve the 3456A's sensitivity, resolution and accuracy by averaging.

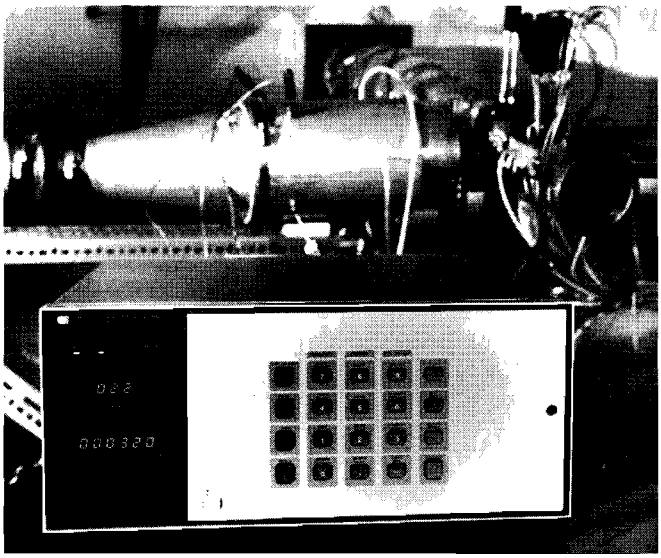
Calibration of the HP 3456A is fast and convenient since all routine adjustments are accessible from a concealed door in the front panel.

Check **B** *on the HP Reply Card.*

DESIGNED FOR HP-IB SYSTEMS HP introduces a low-cost solution to data collection in a variety of applications

If you've been looking for a low-cost solution to data collection problems in applications such as component and production test, environmental monitoring, production process monitoring, and evaluation and quality assurance, consider HP's new 3497A Data Acquisition and Control Unit.

A powerful tool that's easy to use, the 3497A consists of a clock/timer, front-panel keyboard and display. Optional plug-in assemblies enable the user to customize the 3497A for a specific data logging/acquisition application.



Dedicated keys such as "Current Source" or "Voltage Source" can be programmed from the front panel, making it ideal for system configuration and troubleshooting.

Friendly and Powerful Keyboard

The simple front panel keyboard with dedicated keys makes the 3497A easy to understand and operate. Should the operator wish to observe a particular analog channel or digital slot without disturbing running measurement, all that is required is to press a "Viewed Channel" or "Viewed Slot" key. Keyboard control also lets the operator evaluate different 3497A configurations before writing a program. After a program is written, the operator can quickly verify system configuration or troubleshoot.

Standard in the 3497A is a non-volatile quartz reference clock-timer. Complete timing from months to seconds can be programmed from the front panel. It can monitor elapsed time (stopwatch) or interrupt at a pre-set time (alarm clock).

Options for your flexibility

A number of optional, plug-in, multiplexer assemblies are available for scanning inputs. The maximum of 1000 analog channels and 1360 digital lines is available when using HP's 3498A Extenders with the 3497A. An optional, plug-in, 5½-digit integrating DVM assembly provides one μV resolution, 0.0005% best-case accuracy, auto-ranging with maximum reading rates to 300 per second (3½ digits) and memory storage up to 100 readings.

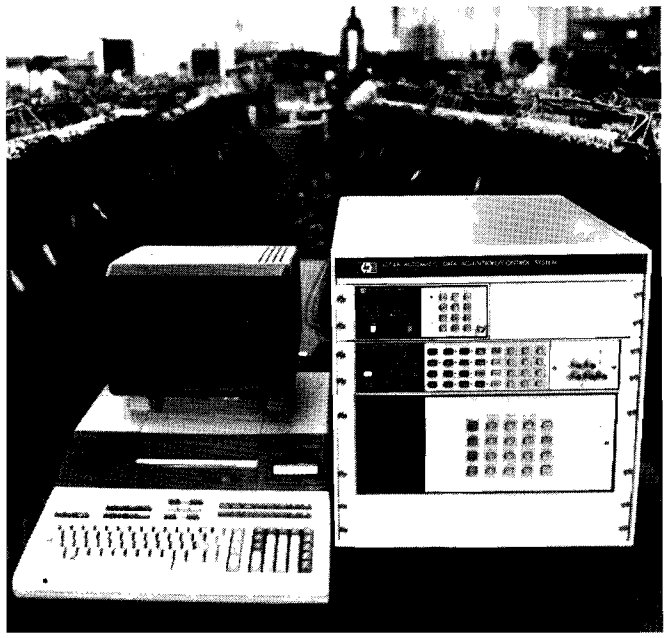
Check **H** *on the HP Reply Card.*

DESIGNED FOR HP-IB SYSTEMS Powerful, new data acquisition system gives you high speed at low cost per channel

A powerful, new data acquisition system with full computation and analysis capabilities now makes available impressive speed and accuracy at an economical rate.

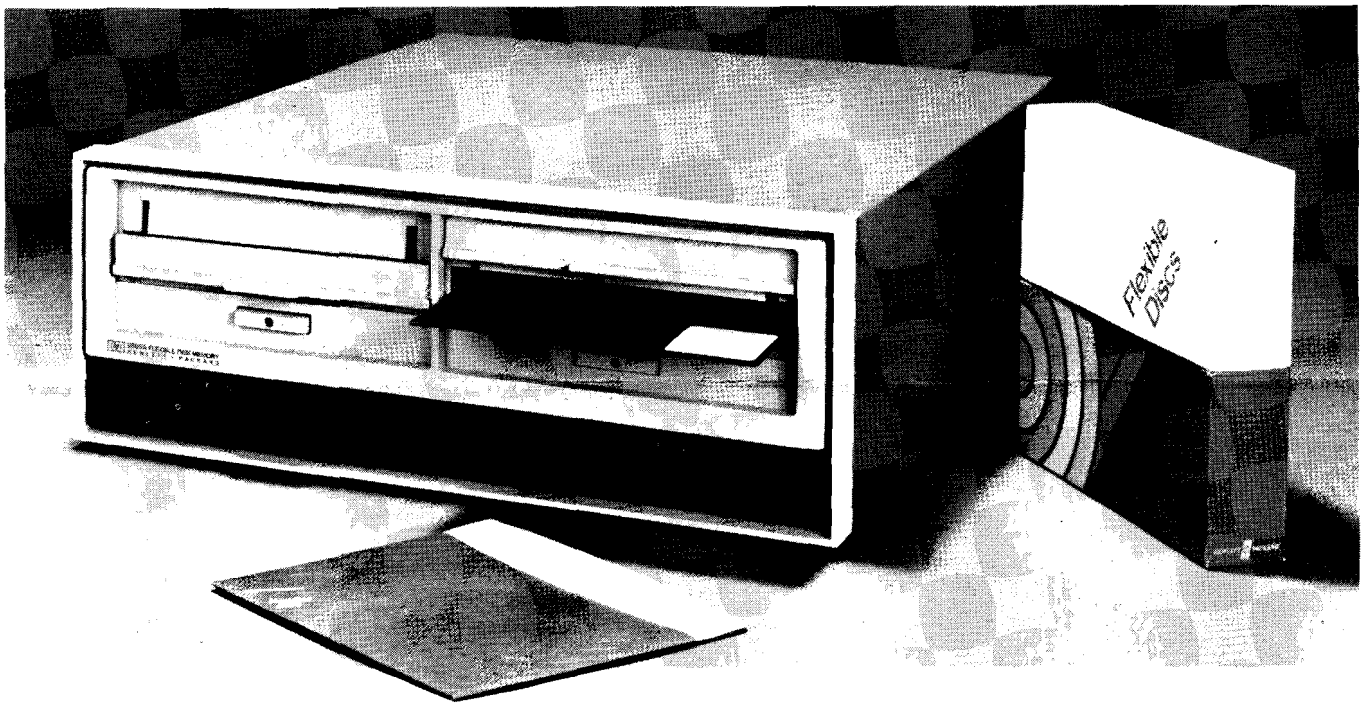
This new HP 3054A system offers a range of features to deal with your needs in process control development, transducer measurements, production testing, research and development, and signal analysis. Consisting of an HP desktop computer, an HP 3497A Data Acquisition/Control Unit, and HP's 3437A and/or 3456A Voltmeters, the 3054A system also accommodates a number of options to further augment its performance and versatility. The 3437A Digital Voltmeter gives this system the flexibility of very fast (5,000 readings per second) measurements, with waveform characterization.

Powerful system software, including instrument driver routines, data analyses and presentation programs, instrument verification routines, and application programs are provided with the 3054A system which uses HP's 85A, 9825T, 9835S or 9845T Desktop Computers. Each of the computers has different capabilities so you can choose the level of performance that your application demands. For example, read/write memory ranges from 32K bytes in the 85A up to 449K bytes in the 9845T



For complete details,check **I** *on the HP Reply Card.*

DESIGNED FOR HP-IB SYSTEMS New, double-density flexible disc memory provides increased personal mass storage



Hewlett-Packard's new, double-density 9895A Flexible Disc Memory offers up to 2.36 million bytes of formatted, mass storage capacity for the HP System 45B Desktop Computer and the HP 1000 Minicomputer series.

The Hewlett-Packard 9895A Flexible Disc Memory provides a convenient way to store and retrieve up to 2.36 million bytes of additional mass storage for your HP 45 Computer and HP 1000 minicomputer series.

The increased storage capacity offered by the 9895A lifts the storage constraints you may have experienced with tape or single flexible disc drives, without the expense of hard discs.

Each of the two drives in the HP 9895A reads double-sided, double-density format on HP-qualified, flexible discs. The drive can store up to 590,000 bytes of formatted data per side, for a total of 1.18 million bytes per disc.

Price/Performance Flexibility

A total storage capacity of up to 4.72 million bytes can be provided through an optional dual-drive slave unit (without controller). This is one of several options designed to provide you price/performance flexibility. A single-drive slave offers an extra 1.18 million bytes of storage, and the dual-drive slave provides an additional 2.36 million bytes. For 1.18 million bytes capacity, the 9895A can also be ordered with one drive installed with controller. You can easily upgrade these options to full 9895A capability at a later date if you choose.

Single-Drive Compatible

The built-in controller enables the 9895A to recognize whether a disc has been recorded on one or two sides. This capability allows it to read single-sided discs written by the HP 9885M or 9885S flexible disc memories, making it convenient for present 9885 owners to convert to the new drive. The 9895A can also write on any 9885 single-sided disc, and the 9885 will be able to read the disc. (A 9885 cannot read 9895 double-sided flexible discs, however.)

The IBM Exchange

Many of today's applications call for both data exchange with IBM mainframes or use of data that has been generated on IBM products. HP designed the 9895A, enabling it through its built-in controller, to conveniently and reliably recognize if a disc is written in IBM 3740 single-density or in HP's double-density format. Software available for HP System 45 also allows the user to easily read and write IBM discs.

Stand-Alone Reliability

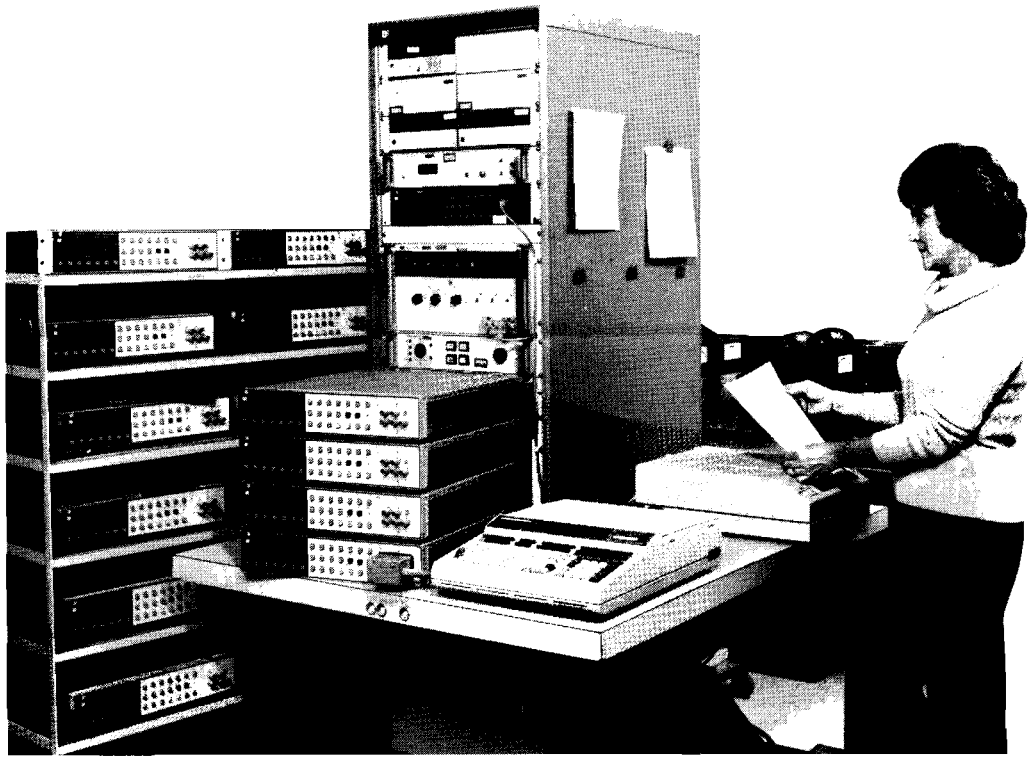
The 9895A is patterned after similar flexible disc drives currently integrated into other HP business and technical computers—the HP 250, HP 300, and HP 3000 Series 30 and 33. The 9895A also has extensive self-test capabilities which are accessible to the host controller. A hardware self-test is initiated and reported at powerup. Read/write tests can be initiated manually by the operator or remotely through HP-IB using the host computer. The 9895A's intelligent controller can detect and mark bad tracks, as well as renumber good tracks sequentially to maintain organization in a logical manner.

Quality Media

You are assured of approved, quality media thanks to Hewlett-Packard's extensive QA testing, selection and control over its flexible discs. These HP qualified discs bring out the most reliable performance in the 9895A disc drive and are among the full line of HP computer supplies readily available for your convenience through local HP sales offices, and distribution centers located both in the U.S. and Europe.

Check **J** *on the HP Reply Card.*

DESIGNED FOR HP-IB SYSTEMS HP's fastest desktop controller now has twice the memory



A 25T Desktop Computer controls the automated testing of digital voltmeters, acquires test data and prints out results on an HP 9876A Printer.

The HP 9825 Desktop Computer is now available with up to 62K bytes of read/write memory, with no loss of the speed on which the 9825 built its reputation.

Two Models

Reducing the physical size of the memory inside the 9825 and devising a hardware block-switching scheme have made possible the introduction of the two new models, the 9825B and the 9825T. Both are completely compatible with programs written for the 9825A or S.

The 9825B has 23K bytes of read/write memory and internally integrated ROMs (read-only memories) for many functions that were previously available only as plug-in options. These internal ROMs are: Strings, Advanced Programming, Plotter, General I/O and Extended I/O.

The 9825T has 62K bytes of read/write memory, all the built-in ROMs contained in the 9825B, and, in addition, a built-in Systems Programming ROM. This internal Systems Programming ROM in the 9825T can be used concurrently with the Matrix ROM. Due to addressing limitations, this is not possible in the 9825A, S, or B.

The Systems Programming ROM is still available as a plug-in option for the 9825B. The Matrix ROM and the 9885 Flexible Disc ROM are available as options for both the B and T models.

In addition to the read/write memory and ROM changes, the 9825B/T includes the improved typewriter keyboard that was introduced on the 9825A/S several months ago. It provides higher reliability and a familiar, typewriter-like feel that makes entry faster and more comfortable.

Easy Upgrade from 9825A/S

An upgrade kit is available to convert any 9825A or 9825S into a 9825T. Local HP sales office personnel can install the kits at either the HP sales office or at customer locations.

The upgrade kit provides 62K bytes of read/write memory, built-in option ROMs, option ROM compatibility and software compatibility. And an upgraded 9825T will operate with all the speed it did when it was a 9825A or S.

HP's Premier Desktop Controller

The 9825 is HP's fastest desktop computer for data acquisition, instrument control and computation. It can perform direct memory access at up to 800K bytes per second, fast read/write at up to 70K bytes per second, and formatted read/write at up to 16K bytes per second.

The 9825 has three I/O slots (expandable to 14) and four ready-made plug-in interface cards are available: HP-IB (IEEE-488), 16-bit parallel, bit-serial (RS-232C) and binary-coded decimal (BCD). An optional real-time clock can also be plugged into one of the I/O slots.

A complete line of peripherals is available to complete any 9825 system—page printers, plotters, flexible disc, magnetic tape cartridge drive, digitizer, paper tape and card readers and a paper tape punch.

The 9825's usefulness grows every year as the number of available HP-IB instruments increases. There are now well over 100 available from Hewlett-Packard and hundreds more from other manufacturers.

Check **K** *on the HP Reply Card.*

HP-85 personal computer gets advanced I/O capability and three I/O ROMs

The combination of I/O ROMs and HP-IB module enable the HP-85 to control a large number of instruments in data acquisition applications.

Hewlett-Packard's HP-85 personal computer for professionals is now even more powerful and versatile. This additional capability is made possible by the HP-IB interface module and three I/O ROM's, all of which can be plugged into the HP-85's ports.

The HP-IB interface module is a complete implementation of the IEEE-488 standard. It enables the HP-85 to communicate with up to 14 instruments plus a variety of peripherals, such as plotters and printers.

ROM's enable the user to get maximum benefits from the peripherals and instruments by providing additional BASIC language commands. The I/O ROM provides statements to configure, control, pass data and check the status of devices in the system. The Plotter/Printer ROM extends the basic graphics commands in the HP-85 while the Matrix ROM allows extensive, one-and two-dimensional array manipulation.

Twelve application pacs in science, engineering and finance make the HP-85 an adaptable tool that the technical or business professional can use immediately to solve problems.

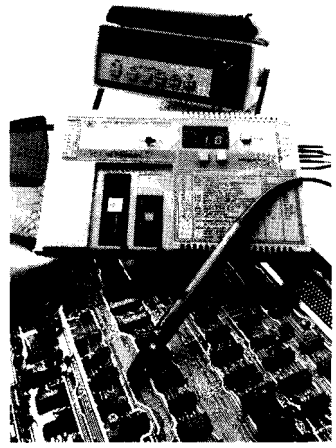
Check **A** *on the HP Reply Card.*

New, easy method permits quick retrofitting for signature analysis

Just plug your product's 6800 microprocessor into HP's new 5001A Microprocessor Exerciser, plug the 5001A cable into the now vacant microprocessor socket, and the major hardware and software part of your retrofit for Signature Analysis (SA) is done. It's that simple and it costs less than providing test stimuli through incircuit emulation techniques.

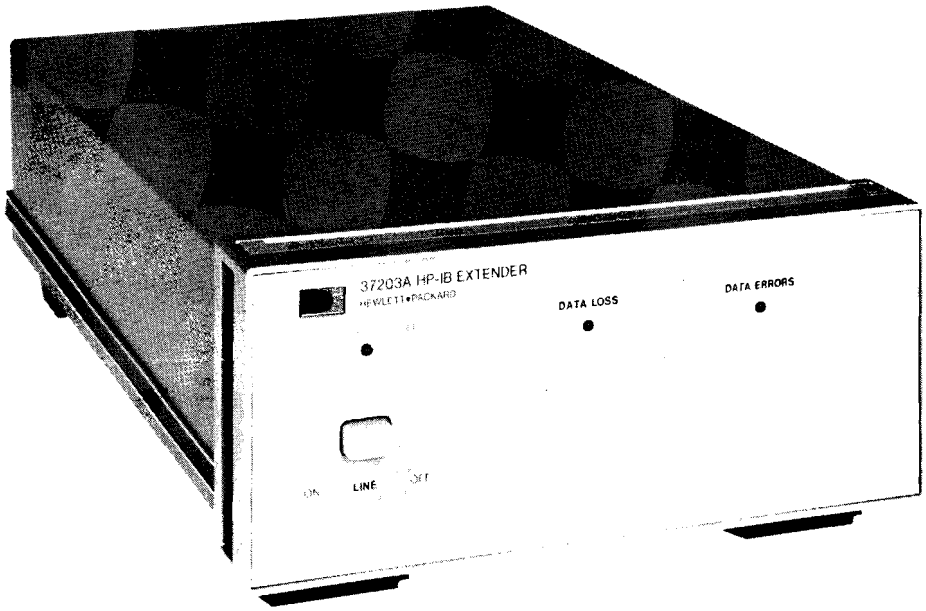
The 5001A Exerciser takes control of your product's buses and runs test stimulus programs from its own ROM while you use an HP 5004A Signature Analyzer to take signatures at designated circuit points for each test stimulus. These signatures help you pinpoint malfunctions right down to the component level. This saves you time and money compared to the hit-or-miss, board exchange, troubleshooting method.

For 5001A/5004A details, check **L** *on the HP Reply Card. For an index to signature analysis publication, check* **M**.



Now you can troubleshoot your microprocessor-based products quickly and economically through Signature Analysis—even if you didn't design it in.

DESIGNED FOR HP-IB SYSTEMS New, fast HP-IB extender operates over coaxial cable or fibre optic link



The new 37203A lets you extend operation of your HP-IB systems up to 1000 metres using coaxial cable or a fibre optic link.

HP's new 37203A HP-IB Extender provides a high-speed, low-cost solution for HP-IB extension up to 1000 metres. Operating in pairs, each 37203A serializes the HP-IB information and transmits it over coaxial cable or a fibre optic link to a remote 37203A which reconverts the serial data to parallel HP-IB format.

The 37203A is fast — providing information transfer at rates up to 50k bytes/second. It is also inexpensive and the basic unit is designed to operate over a single, low-cost coaxial cable. An optional fibre optic interface is also available which allows HP-IB Extenders to operate over a dual fibre optic link up to 1000-metres long.

Integrity of HP-IB extension is assured by isolating the data from electrical interference — the fibre optic link provides complete immunity to electro-magnetic pick-up and even the coaxial cable interface is optically isolated. A further measure of protection is provided by a simple error detection/correction algorithm which automatically identifies and corrects any transmission errors.

The 37203A is easy to use, and no special programming is required. It is transparent to HP-IB operation and suports the full range of HP-IB procedures including Pass Control and a form of Parallel Poll.

Check **N** *on the HP Reply Card.*

HEWLETT-PACKARD AUSTRALIA Pty. Ltd.,
ADELAIDE: 153 Greenhill Rd., **Parkside**, S.A., 5063, Tel. 272 5911.
BRISBANE: 5th Floor, Teachers Union Bldg., 495-499 Boundary St., **Spring Hill**, 4000 Queensland, Tel. 2291544.
CANBERRA; 121 Wollongong St., **Fyshwick**, A.C.T. 2609, Tel. 804244.
MELBOURNE: 31-41 Joseph Street, **Blackburn**, Victoria 3130, Tel. 89 6351, (Mail) P.O. Box 36, **Doncaster East**, Victoria 3109.
PERTH: 141 Stirling Highway, **Nedlands**, W.A., 6009, Tel. 3865455.
SYDNEY: 17-23 Talavera Rd., P.O. Box 308, **North Ryde** N.S.W. 2113, Tel. 887-1611.

HEWLETT-PACKARD NEW ZEALAND LTD.
AUCKLAND: P.O. Box 26-189; 169 Manukau Road, Epsom, **Auckland**, Tel. 687-159.
WELLINGTON: 4-12 Cruickshank St., Kilbirnie, P.O. Box 9443, Courtney Place, **Wellington** 3, Tel. 877-199.

HEWLETT PACKARD

MEASUREMENT COMPUTATION news
product advances from Hewlett-Packard

New product information from