hp MEASUREMENT COMPUTATION news

product advances *from Hewlett·Packard*

Compact protocol analyzer tests datacom networks at the office, the factory, or remote sites

To help meet the increasing demand for versatile, sophisticated data communications test equipment, Hewlett-Packard continues to expand its family of protocol analyzers.

The newest member of this family is the HP 4951A Protocol Analyzer, a comprehensive analyzer that simulates network components such as terminals or modems, monitors data transmission, performs bit-error rate tests, and allows remote testing. This easy-to-use instrument boasts softkey-driven menus, including an autoconfigure selection feature, which automatically determines the line protocol, data code, speed, and error-check algorithm.

Small enough to fit under an airplane seat, the HP 4951A is an ideal instrument for use at remote test sites. Since it is compatible with the HP 4955A Protocol Analyzer, you can remotely transfer data back to your central site using the HP 4955A or another HP 4951A to receive the data. You can also store setups, programs, and data on tape to be downloaded to the HP 4955A for future analysis. You can add another 256K bytes of storage with an optional mass storage unit. Boasting the same trapping capability as the HP 4955A, the HP 4951A has 63 triggers for extensive data analysis in either real-time or postprocessing mode. It also features a non-volatile memory, which automatically retains all monitor and simulation programs, setups, and captured data.

Compact protocol analyzer

In addition to protocol analysis, the HP 4951A also performs the following digital tests:
- Bit-error rate
- Block-error rate
- Errored seconds
- Percent error-free seconds.

In its nonintrusive monitoring mode, the HP 4951A can be programmed to examine data to determine network characteristics or overall network performance. As an intrusive simulator, it can bring terminals on-line with complete interactive testing capability without shutting down the network.

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

Logic development system expands support for Intel processors with three new emulators

Development support tools for a new generation of Intel microprocessors are now available with three new emulators for the HP 64000 Logic Development System: the HP 64264S 8051/8031/8751 Emulator, the HP 64224S 80186 Emulator, and the HP 64225S 80188 Emulator.

For designers and engineers who use Intel processors in developing microprocessor-based products, the HP 64000 system now offers support for more than a dozen Intel chips. Emulators, interfaces, and software development tools provide measurement power and design versatility to help you produce better products in less time.

The 8051 emulator directly monitors the microcomputer's internal bus. Displays show all the 8051 activity, including data memory, all four I/O ports, accumulator, and special function registers. The HP 64264S also supports emulation for the 8031 and 8751 processors.

Both the 80186 and 80188 microprocessors are in 68-contact, leadless chip packages. The HP 64224S and the HP 64225S emulators fully support all of the functions with real-time, nonintrusive emulation. The emulators make it possible to access, display, and modify all three timers, both DMA channels, the peripheral chip-select logic, the interrupt controller, and the wait-state generator.

These new emulators are the most recent additions to the broad selection of design aids and development tools available with the modular HP 64000 Logic Development System. Comparable support sets are also offered for other microprocessors from Intel and other major manufacturers. The HP 64000 system supports microprocessor product design at any level of complexity or any design phase.

This new emulator for the Intel 8051 microprocessor directly monitors the microcomputer's internal bus and displays information about the emulator's activity.

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

Logic analyzer data sheet focuses on the digital design cycle

A new data sheet for HP 1630 Series Logic Analyzers is now available from Hewlett-Packard. This full-color, 26-page booklet features the new HP 1630G Logic Analyzer and the HP 1630A/D models.

Titled "The indispensable tool for digital design and test," the booklet details the use of timing and state analysis and describes many applications using performance analysis. The data sheet discusses how to use histograms to find software bottlenecks and inefficiencies and how to optimize system performance. Also included are screen displays that illustrate specific features and models and diagrams that illustrate digital design concepts and methodology.

In this data sheet you will find information on the use of

a logic analyzer throughout the design cycle of digital products. From the time when you have dynamic circuit activity until your system is tested and debugged, a logic analyzer allows you to observe bus, control line, and status signals. As you integrate software and hardware, you can look at simple or complex program activity in real time. To meet system throughput requirements, you can use performance analysis to look at overall system activity.

The HP 1630 series data sheet also covers automatic data acquisition using a logic analyzer under computer control.

*For your free copy of this new logic analyzer data sheet, check **C** on the HP Reply Card.*

New software simplifies EMI measurements

Hewlett-Packard's new HP 85864A EMI Measurement Software makes emissions testing with spectrum analyzers for military and commercial applications easier than ever before. The software is a general-purpose BASIC program for HP 9000 Model 226 and Model 236 Desktop Computers and HP 8568A/B and 8566A/B Spectrum Analyzers.

This easy-to-use software requires no programming knowledge and only a basic familiarity with spectrum analyzer operation. The program's friendly menu structure leads you through conducted and radiated emissions tests from initial setup to final hard-copy plots of test results.

Standard and custom tests

The standard test library supplied with the HP 85864A includes common VDE, FCC, and MIL-STD EMI tests. After a test is loaded from the menu, you simply press two keys on the computer to execute the measurement.

Commercial (CISPR) tests can be made by adding an HP 85650A Quasi-Peak Adapter to the system. A speaker built into the HP 85650A lets you tune in and listen to a signal of interest to determine whether it is an emission from the device under test or an ambient signal.

A customized test can be designed easily by entering test equipment parameters, transducer factors, and test limits into the test setup tables. These can be loaded from their respective program libraries or entered directly from the computer keyboard. The custom test can be stored in the test library and recalled, used, modified, and stored again as your measurement needs change.

Store and plot measurement data

Test and measurement results can be stored on flexible discs for easy recordkeeping and retrieval, letting you view, analyze, or make hard-copy plots of desired data.

Measurement data is processed and displayed in a log-frequency format on the spectrum analyzer's CRT. Up to four
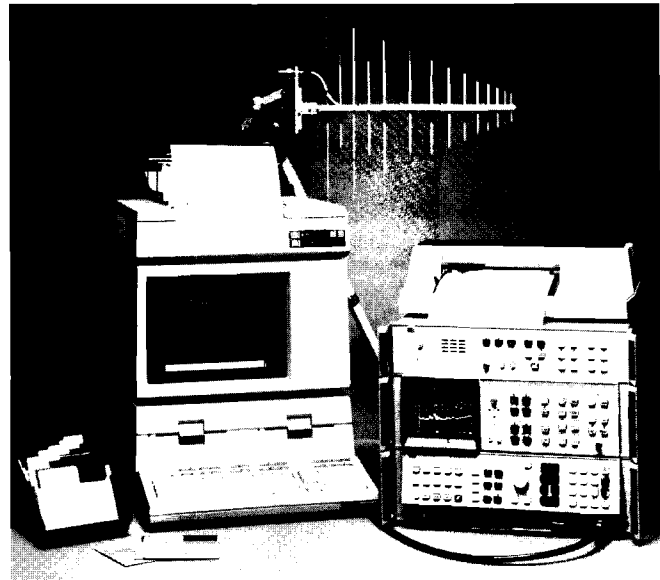
The new HP 85864A EMI Measurement Software program leads you through an EMI measurement from the setup to a final hard-copy plot of the test results. You do not need BASIC programming knowledge to use this soft....

plots can be made on one sheet of paper for easy test comparison.

The HP 85864A comes on two 5¼-inch flexible discs. Also included are a library disc, a desktop disc file, an operation manual, and a box of 10 blank discs.

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

New HP course teaches effective data acquisition and control

Businesses today are discovering that data acquisition and control automation is the key to remaining competitive and profitable. With Hewlett-Packard's new course—HP 50015A Data Acquisition and Control Fundamentals—you can now learn how to use this automation effectively.

This new course is a three-day, hands-on introduction to the basic principles and concepts of data acquisition and control. These concepts are taught using the HP 3497A Data Acquisition/Control Unit with an HP 9000 Series 200 Model 26 Computer as the controller.

After an overview of system types, you will learn the techniques needed to measure physical phenomena such as temperature and pressure. You will also learn the grounding and guarding techniques needed for good signal transmission,

analog and digital input/output signal processing, the on-off control modes, and PID (proportional-integral-derivative) algorithm basics.

Carefully prepared lectures and hands-on lab exercises will enable you to gain a thorough understanding of how to set up and use a computer-controlled data acquisition system. All lab exercises are designed to be performed easily, and only a basic knowledge of electronic theory is needed.

HP 50015A is subject to local availability. Check with your local sales office for course schedule.

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

10-MHz to 20-GHz synthesized sweeper offers precision in a swept source

The HP 8341A combines the versatility of a sweeper with the high performance of a synthesizer to satisfy your microwave source applications from 10 MHz to 20 GHz.

More and more swept source applications require that a sweeper not only be very broadband but also have significantly improved frequency accuracy and stability in an easy-to-use instrument. Hewlett-Packard now provides this capability with its new HP 8341A Synthesized Sweeper, which covers the 10-MHz to 20-GHz frequency range.

For use as a sweeper

The HP 8341A provides all the functions of a broadband microwave sweeper. It possesses a highly accurate broadband analog sweep with a sweep width range of 100 Hz to 19.99 GHz. Sweep widths of less than 5 MHz are phase locked, providing synthesizer-class frequency accuracy and signal purity in a continuous narrowband sweep. For sweep widths greater than 5 MHz, the start frequency is phase locked. A built-in microprocessor aids in providing a variety of useful features, including nine save/recall registers (capable of storing and retrieving nine complete front-panel setups), five independent markers and associated marker functions, and a friendly, informative front panel. The HP 8341A provides + 10 dBm of output power and can analog sweep its output power over at least a 20-dB range, facilitating rapid testing of active devices.

For use as a synthesizer

The HP 8341A is also a very high-performance synthesizer, featuring 1 Hz to 3 Hz frequency resolution (depending on the frequency band) and excellent single sideband phase noise. With the optional 90-dB attenuator, which provides calibrated output power to − 110 dBm, and the optional pulse modulation capability, the HP 8341A is well suited for state-of-the-art EW and signal simulation applications.

For microwave network analysis

The combination of a versatile analog sweeper and a powerful precision synthesizer in one source makes the HP 8341A ideal for network analysis. Broadband and narrowband device characterization can be done easily with the HP 8756A Scalar Network Analyzer. The HP 8341A is also the recommended choice as the source for the new HP 8510 Vector Network Analyzer for applications to 20 GHz.

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

Tune in to HP's *Wavelength* for microwave information
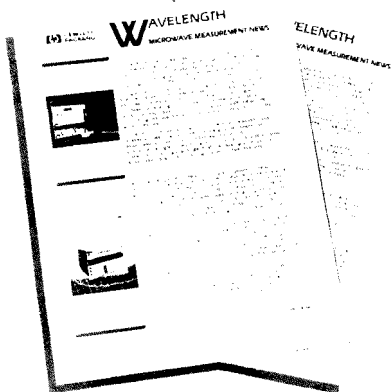
If you work with RF and microwave frequencies, you may wish to receive Hewlett-Packard's free newsletter, *Wavelength*, which is published four times a year. Reaching a worldwide audience of engineers and test personnel, *Wavelength* reviews new RF and microwave hardware and application notes as they become available. In addition, it often contains technical briefs of general interest to its readers.

Your local HP instrument sales office mails *Wavelength* and sometimes encloses other recent publications such as one-page flyers, short data sheets describing new measurement accessories, or reprints of technical articles. Since the mailing is done locally, the cover letter may include information about current HP events of interest, such as technical symposiums and seminars.

To place your name on the Wavelength *mailing list, contact the Instrument Department of your local HP sales office.*

High-speed CMOS-compatible optocoupler features low input current for reduced power consumption

The HCPL-2200 Logic-Gate Optocoupler provides high speed and a wide V_{cc} capability and is sensitive enough to be driven by most CMOS circuitry. Operating at a typical speed of 5 Mbaud, the HCPL-2200 accepts a forward current as low as 1.6 mA, contributing to low power consumption.

This optocoupler has a typical supply current of 4.5 mA in logic low and 2.7 mA in logic high when V_{cc} is 5.5V. These values are believed to be half those of other high-speed optocouplers currently on the market.

This lower supply current means that you can use less expensive power supplies and lower operating temperatures. Improved power-supply ripple rejection also eliminates the need for special power-supply bypassing precautions.

Because of its wide, 4.5-volt-to-20-volt V_{cc} range, the HCPL-2200 can be designed into circuits using either 12-volt or 15-volt supplies. As a result, it is suited for applications ranging from industrial control to computer-related products.

An internal shield provides common-mode rejection (CMR) of typically 10,000 $V/\mu s$ at 25°C, raising immunity to data errors. Directly compatible with data buses, the HCPL-2200 offers a three-state output. Thus, in TTL applications, a pull-up resistor is not required.

The ac and dc performance of the HCPL-2200 is guaranteed from 0°C to +85°C, and it is recognized under the component program of Underwriters Laboratory, Inc. (File Number E55361).

The HCPL-2200 is compatible with LSTTL logic, making it suitable for providing isolation of high-speed logic systems and interfacing a computer to a peripheral or a microprocessor to another microprocessor. Other applications include ground-loop elimination, pulse-transformer replacement, isolated-bus drivers, and line receivers.
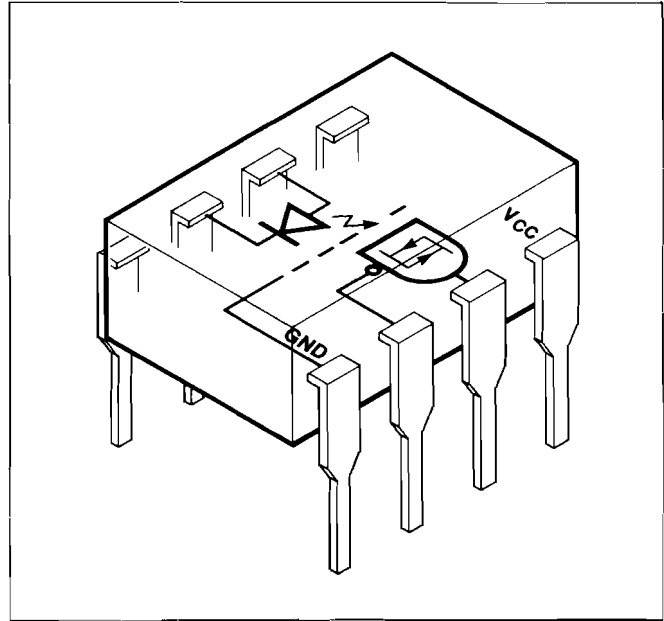
Sensitive enough to be driven by most CMOS circuitry, the HCPL-2200 Logic-Gate Optocoupler offers high speed and a wide range of V_{cc} capability.

*For more information, check **G** on the HP Reply Card.*
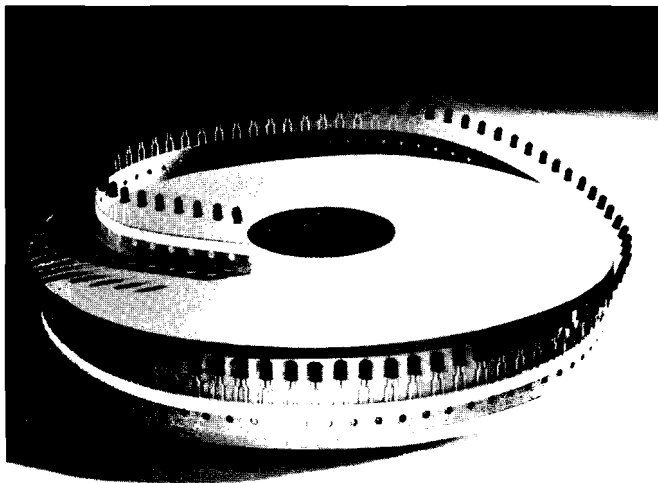
Two new tape and reel options for T-1 and T-1 3/4 LED lamps let you select either 5 mm or 2.54 mm spacing for use with automatic insertion equipment.

Tape and reel LED lamps now available for use with automatic insertion equipment

Two new tape and reel options let you use any of Hewlett-Packard's T-1 and T-1 3/4 LED lamps with radial lead automatic insertion equipment. Tape and reel lamps give you the advantages of automated manufacturing in large-volume applications and ease of handling in applications such as incoming inspection. Option 001 offers formed leads with 5 mm spacing, and Option 002 provides straight lead devices with 2.54 mm spacing.

Both new options are available from your local authorized HP components distributor.

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

New plotter features automatic cut-sheet paper feed for unattended plot reproduction

Hewlett-Packard's HP 7550A Graphics Plotter, which the company believes to be the first plotter available with automatic cut-sheet paper feed, features 31.5 ips plot speed and 6g acceleration. Designed for applications in business, engineering, science, and manufacturing, this 11 × 17-inch plotter offers speed, high quality, ease of use, and reduction of paper handling.

The new HP 7550A Graphics Plotter can be slaved to equipment such as this UV/visible spectrophotometer to produce hardcopy output of measurements. Featuring *REPLOT* firmware and automatic cut-sheet media feed, the HP 7550A is designed for unattended, automatic plotter applications.

With the HP 7550A you can supplement an overhead-slide presentation with full-color handouts for all participants using the *REPLOT* function, which generates up to 99 paper copies of the original plot without rerunning the program. Copies can be generated with almost no operator attendance. The plotter automatically loads sheets of paper in response to either front-panel or program commands and will feed up to 150 sheets without reloading.

Fastest B-size copies

The HP 7550A is believed to be the fastest B-size pen plotter on the market. It has a pen speed of more than 31 inches per second. Its acceleration rate of 6g, believed to be the best for all current 11 × 17-inch plotters, can cut plotting time in half. (Pen acceleration up to 2g is typically available on most plotters.) The HP 7550A forms eight to ten characters per second, the equivalent of drawing a full page of 10-point single-spaced type in only four minutes.

Other features

Other important features include the liquid-crystal display and the front-panel function keys that replace the hard-switch settings used on older plotters. The liquid-crystal display reports plotter status and can be used for program messages. Combining the display with the function keys enables you to choose functions such as plot rotation, replotting, and alignment to preprinted or pregridded paper and to respond to program selections.

Additional features include 20 international character sets in two fonts, including Japanese Katakana and most European languages, user-definable character-set capability, polygon definition and area-fill commands, an arc and circle generator, a line-pattern generator, point digitizing, a built-in self-test, and block mode I/O error checking and recovery for RS-232-C. The HP 7550A has a large 12K-byte I/O buffer.

The HP 7550A features both the HP-IB (IEEE 488) and RS-232-C/CCITT V.24 interfaces. Using only one serial computer port, the plotter can be connected either directly to a computer or in series between a terminal and a computer.

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

Interface subsystem simplifies automation of programmable controllers

PCIF/1000 is a new Hewlett-Packard software product linking Allen-Bradley programmable controllers (PCs) to HP 1000 A-Series Computers. Designed to save time in developing application programs, PCIF/1000 is an industrial automation tool for integrating machine-control equipment and a supervisory HP 1000 Computer into a complete automation system. It allows PC data and programs to be read from and downloaded to the programmable controller from the computer. Allen-Bradley PCs can be accessed via a link to the Allen-Bradley Data Highway.

PCIF/1000 provides transparent access to programmable controllers from the application program. You can communi-

cate with any supported PC through standard functions without knowing its specific protocol. PCIF/1000 executes on the HP 1000 A-Series Computer with the RTE-A operating system. Its modular software can be configured by the user, and protocol-dependent modules may be added at any time without changing application programs.

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

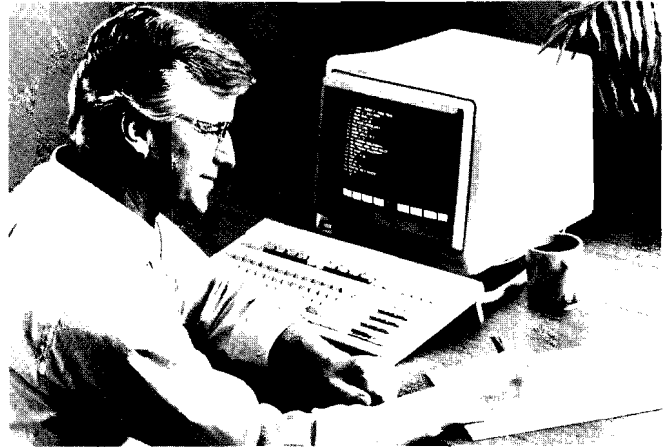# Compact new terminal features innovative design at a low price

The new HP 2392A Display Terminal supercedes the widely used HP 2622A Block Mode Data Entry Terminal with a compact, ergonomically improved design. This terminal is priced competitively with other full-capability block mode terminals. VLSI circuit technology and a reduced component count make possible the lower price and improved reliability.

The HP 2392A's 12-inch diagonal display unit uses about one cubic foot of desk space. It incorporates an integrated tilt-and-swivel mechanism to adjust its viewing angle to your preference. The detachable, low-profile keyboard can be placed either flat on a desk or angled toward you.

Characters are formed by a 9 × 14-dot cell and displayed in green on the screen. With smooth scrolling, you can read through as many as four pages of text without pause (up to eight pages as an option).

The HP 2392A terminal is designed for data entry, program development, and data inquiry applications on the HP 3000 Business Computer, HP 1000 Real-Time Computer, and HP 9000 Engineering Workstation. ANSI-standard compatibility is available at no extra cost.

A combined RS-232-C/RS-422 port offers flexible data communications with HP and non-HP host systems. An optional


Quiet, easy to use, and ergonomically designed, the HP 2392A Display Terminal offers compactness, reliability, and low price for a variety of applications requiring block mode data entry.

second port lets you connect the terminal directly to a printer.

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

Compact 1/4" cartridge tape drive offers convenient, low-cost backup for small to midrange computer systems

Hewlett-Packard's new HP 9144A Quarter-Inch Cartridge Tape Subsystem offers a convenient, low-cost alternative to multiple discs as a backup for small computer systems. With the HP 9144A you can provide backup for HP fixed discs with capacities of 15M to 132M bytes by using one or two of either the 16M-byte or 67M-byte cartridges. Continuing HP's
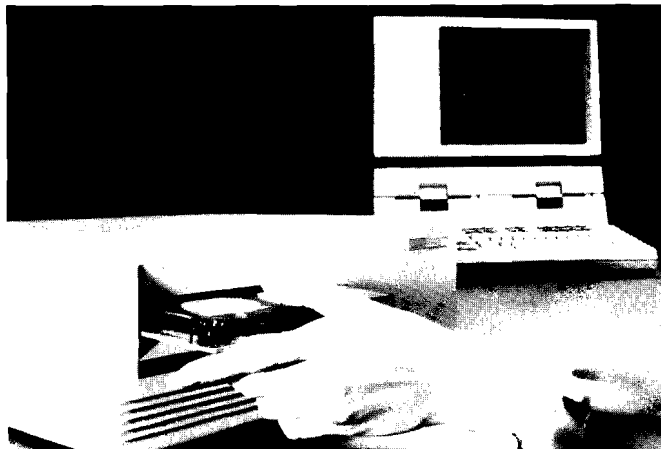
With the HP 9144A Quarter-Inch Tape Cartridge Subsystem, you can make a backup copy of Webster's Unabridged Dictionary using just one 67M-byte cartridge.

development of compact computer products, the HP 9144A occupies about as much surface area as an in-basket.

Automatically protects valuable data

The HP 9144A protects your data in three ways:
- Read-after-write capability provides automatic data verification during the write process. Any media problems are detected immediately during writing, not later when you are trying to read the data back.
- Data reliability is ensured during the read process by exclusive-OR error correction, which uses data redundancy for automatic error detection and correction. This means that if data later becomes defective and you attempt to read it back, the drive has the capability of reconstructing the original data under many circumstances.
- Another contribution to data integrity is the built-in media monitor which indicates the need for replacement before a worn-out tape begins to affect data reliability.

16-track recording for high density

The cartridge tape drive can store up to 67M bytes of data on one 4 × 6-inch tape cartridge using a density of 10,000 bpi and an innovative 16-track recording format. By comparison, a 10½-inch 2400-foot reel of half-inch tape recorded at 1600 cpi has a capacity of about 40M bytes. The block-oriented format allows individual files or records to be addressed in a fashion similar to discs. Using a directory at the beginning of the tape, the drive quickly moves to the desired block, rather than having to read through each file as do most tape formats. Search speed is 90 ips and read/write speed in 60 ips.

The HP 9144A is currently supported on the HP 9000 Series 200 (BASIC and Pascal) and HP 1000 Computers. Support on the HP 9000 HP-UX system will be available soon. Support is also planned for the HP 150 and the HP 3000 Computers.

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

Handheld computer packs computational power and expandability into pocket size

Hewlett-Packard's HP-71B Handheld Computer, designed especially for technical professionals, is a versatile, easy-to-use tool for numeric computation and calculation. It features enhanced BASIC language and a specially designed calculation mode, plus a variety of options and application packages.

To perform repetitive calculations, you can either write programs in BASIC language or use available application packages. For one-time calculations, the *CALC* mode lets the HP-71B function as an advanced calculator. Variables assigned a value in the BASIC mode can share their value in the *CALC* mode and vice-versa. The *CALC* mode can execute algebraic subexpressions as they are entered, perform automatic parenthesis matching, and provide user-defined function support.

Other key features

The HP-71B's large continuous memory—a standard 17.5K bytes of RAM and 64K bytes of ROM—allows you to store more data, create larger software programs, and store a larger number of programs than most handheld computers. Designed for versatility and customization, the HP-71B features built-in slots for an optional magnetic card reader and for the HP-IL (Hewlett-Packard Interface Loop). Four plug-in slots let you expand memory by either 16K bytes of RAM (for a total of 33.5K bytes) or by 256K bytes of ROM (for a total of 320K bytes), or some combination of both.

As portable as a notepad, the HP-71B weighs 12 ounces and measures 3⅞ in × 7½ in × ½ in. It has a block QWERTY keyboard with typing aids for easy program entry. The keyboard includes a 10-digit number pad and is completely redefinable. Overlays are available for custom keys.

The HP-71B's 8 × 132-element, one-line dot matrix LCD display has a large font and features extensive status annunciators. Twenty-two characters of a 96-character line are displayed at one time.

You can customize the software written for the HP-71B by using programming aids such as programmable key defini-
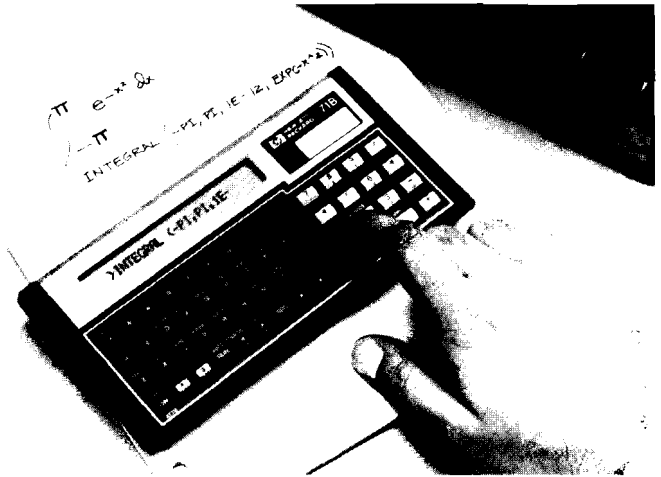
You can perform advanced calculations such as statistical analysis and trigonometric functions quickly and easily with the HP-71B Handheld Computer.

tion, key files, language extension files, window command, and autostart. You can extend the BASIC language with additional keywords, override BASIC with Assembly/Forth, or override the entire operating system.

A variety of peripheral devices can be used with the HP-71B. Using the HP-IL module, you can interface it with either a 24-character strip printer or a full-page printer, including HP's new Thinkjet printer. A plotter, a video interface, a digital-tape memory, or any of several scientific instruments can also be used with the HP-71B. The use of other HP interfaces, such as the HP-IB (IEEE 488), RS-232-C, and general-purpose I/O (GP-IO), can further expand the range of available peripheral devices.

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