NEW ELECTRONICS FOR MEASUREMENT·ANALYSIS·COMPUTATION

AUTUMN 1969

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1969 Autumn Catalog Supplement

Recent additions to instrumentation in the fields of measurement, computation and analysis are previewed in the following pages. From HP's new 250 MHz Real Time Oscilloscope to a new Network Analyzer capable of easily making complex measurements, you are assured of maximum performance, reliability and accuracy. Because of their newness, most of these products are not included in your 1969 Hewlett-Packard Catalog.

If after reviewing the new products you desire more detailed information, please check and mail the attached Data Request Card. Retaining this booklet as a supplement to your 1969 Catalog will provide you with an up-to-date reference of the latest in HP's complete line of instrumentation. All prices are in U.S. dollars, F.O.B. Factory. Prices and specifications are subject to change without notice.

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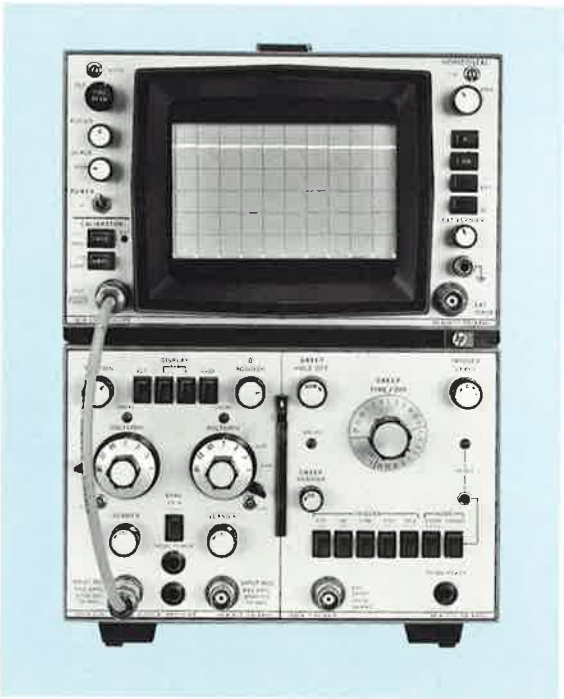
Real-time measurements to 250 MHz



Now with major innovations in CRT design, amplifier and time base circuits, the new **183A** Scope lets you make real-time measurements to 250 MHz on a 6 x 10 cm CRT and with 10 mV/div deflection factor. The HP-designed distributed deflection plate CRT has a vertical deflection factor of 3 V/cm which allows solid-state plug-ins to give you 6 cm of vertical display. CRT driving potentials of 20 kV obtain the fast writing rate (4 cm/ns) required for high-frequency real-time displays. The 183A mainframe itself operates to >500 MHz allowing you to extend your future real-time measurements. And, all your present 1800 series plug-ins can be used in the new 183A mainframe giving you full measurement flexibility.

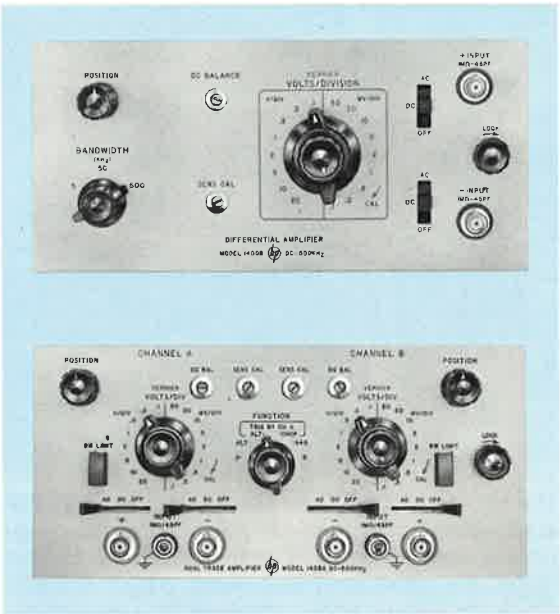
The new **1830A** 250 MHz dual channel plug-in provides deflection factors from 10 mV/div to 1 V/div and you can select ALTERNATE, CHOPPED, A+B, or (with channel B inverted) A-B modes of operation. Capacitive effects, which decrease pulse risetime and induce phase shift in CW amplitude measurements at RF and higher frequencies, are minimized by the 50-ohm input impedance. Or, if you need higher input impedance, the new 1:1 Model **1120A** Active Probe has 100k ohms input impedance shunted by <3 pF, and it has bandwidth of dc to 500 MHz. Probe power can be supplied by the plug-ins or by a separate **1122A** Probe Power Supply.

Model **1840A** Time Base has sweep times from 10 ns/div to 0.1 s/div and, with the 183A Mainframe ×10 magnifier, you can sweep to 1 ns/div. You have rock-steady triggering on 50 mV or greater externally-supplied signals that have frequencies up to and beyond 500 MHz. On internally-derived signals (from the 1830A), the sweep triggers on signals dc to > 250 MHz that produce 1 cm or more deflection. Variable trigger hold-off locks in complex waveforms. In addition, all trigger functions are convenient, easy-to-operate push-button controls.

Model **195A** Oscilloscope Camera was developed to capitalize on the fast writing speed of the 183A. The f/1.3 lens, with a 1:0.5 reduction ratio, coupled with ASA 10,000 film and the 183A Pulsed Flood Gun, provide 4 cm/ns writing speed. Prices: 183A; $1750; 183B (rack-mount): $1825; 1830A: $850; 1840A: $550; 1120A: $350; 195A: $975.

New storage mainframe and plug-ins for 140 series

Besides the advantages of a standard plug-in oscilloscope with variable persistence (from 0.25 to greater than 1 minute) the new **141B** mainframe also has the capability for storing traces for up to 8 hours. Stored traces have the same contrast as conventional CRT's and, with Z-axis modulation, you can store variations in trace intensities. The exclusive HP variable persistence allows you to adjust CRT persistence to match signal characteristics. Plug-in versatility gives you choice of real-time bandwidths to 20 MHz, sensitivity to 10 μV/div, sampling to 12.4 GHz, TDR, and spectrum analysis.



Two new easy-to-operate vertical amplifier plug-ins, the **1400B** Single Channel and **1408A** Dual Channel, give you a sensitive 100 μV/div deflection factor with 100 dB CMRR. These 500 kHz bandwidth plug-ins have very low drift, typically less than 50 μV/hr, and a low noise of less than 25 μV, tangentially measured at full bandwidth. Bandwidth limit switches (5, 50, and 500 kHz in the 1400B and 50 and 500 kHz in the 1408A) improve resolution of low-level signals by eliminating the noise in the unused portion of the bandwidth. With the high degree of stability of these amplifiers, ac-coupling as a means of eliminating drift is not necessary. Prices: 141B, $1500; 1400B, $275; 1408A, $575.

New Raster Displays with optional high line rates

Now you can have a precision 525-line raster display with optional rasters from 675 to 1029 lines. CRT spot size is compatible with the number of lines. The HP Models **6946A** and **6947A** are monochrome displays employing circuit concepts and techniques new to the industry.

The field rate for the higher line rates is 60 Hz.

Option:	001	002	003	004	005
Lines:	675	729	875	945	1029

A complete kit on Raster Displays is yours for the asking. It includes:

Comparison Chart illustrating unity interlace, linearity, resolution, stability, staircase display and adjustable aspect ratio.

Technical Data Sheets on 14" and 17" Raster Displays with optional line rates from 525 to 1029.

Reprint of Article on "Precision Raster Displays," an in-depth discussion of state-of-the-art circuitry in Hewlett-Packard Displays.

Models 6946A, 6947A: $1050. Options 001-005: $200.

Easy-to-use general-purpose scope camera

The HP Model **198A** is an economical, battery powered camera for general-purpose oscilloscope photography. A novel focusing arrangement eliminates the need for focus plates or wasted film. Graticule illumination is obtained by a pair of mirrors that are interlocked with the focusing system to reflect twin curtains of light on the CRT. The camera is focused when the curtains of light just meet (giving continuous graticule illumination). Shutter speeds are 1/60 s thru 1 s plus B position with aperture settings of f/3.5 thru f/22. Model 198A mounts directly on any HP 5-inch round or rectangular CRT bezel and is priced at $350.

Complete device characterization from 100 kHz to 110 MHz

Now you can accurately make swept-frequency amplitude and phase angle measurements of transmission and reflection coefficients from 100 kHz to 110 MHz. With the new **8407A** Network Analyzer System and its Phase-Magnitude Display, you can display amplitude and phase simultaneously.

Optional accessories let you tailor the system to your needs. With plug-ins and the Transmission Kit, you can measure the complex gain of amplifiers, transistors and IC's to 90 dB, and loss of filters, attenuators, and other passive components to 100 dB.

With the Reflection-Transmission Kit, you easily make complex reflection measurements of return loss, VSWR, complex impedance or reflection coefficient as well as transmission measurements.

The Passive Voltage and Current Probe Kit allows quick and easy testing of devices in the breadboard stage.

The Model **8412A** Display, with its simultaneous CRT presentation of both phase and amplitude versus frequency, features an 80 dB range with 0.05 dB resolution and a phase range of ±180 degrees with 0.2 degree resolution.

If you prefer a polar display of data, the Model **8414A** provides a CRT presentation of complex impedance and reflection coefficients with convenient Smith Chart overlays.

As signal sources for the 8407A System, either the HP 8601A Generator/Sweeper or 8690B/8698B Sweeper is available. They feature accurately calibrated sweep widths, frequency accuracy, linearity and calibrated output. Prices: 8407A Network Analyzer Mainframe, $2950. 8412A Phase-Magnitude Display, $1575. 8414A Polar Display, $1250. 11651A Transmission Kit, $80. 11652A Reflection-Transmission Kit, $300. 11654A Passive Probe Kit, $225.

New microwave power meter has internal calibration

Confidence in system measurement accuracy is provided by the new **437A** Thermocouple Power Meter with its exclusive internal calibrator. The front panel calibrator switch automatically compensates for changes in thermocouple sensitivity (from temperature variations, aging or overload) by matching instrument gain to mount sensitivity. Zero setting is also automatic.

With its companion **8485A** Thermocouple Mount, the 437A can measure power over a 55 dB range (10 full scale ranges from 3 μW to 100 mW) between 10 MHz and 18 GHz. This wide range in a single mount combines sensitivity for low-level measurements with protection against high-power burn-out.

Low noise and drift make accurate measurements possible even on the most sensitive range.

Microcircuit construction of the thermocouple and high frequency matching network allows close control of dimensions resulting in a SWR<1.35 from 20 MHz to 18 GHz, thereby reducing mismatch errors.

Each 8485A mount is individually calibrated on HP's Automatic Network Analyzer for: (1) Effective efficiency, (2) Calibration factor and (3) Magnitude and phase of the reflection coefficient. Prices: 437A, $625; 8485A, $300.

High resolution, direct readout of low frequencies with a new plug-in

Fast, direct readout of low frequencies is made possible for the 5245/6/8 Counter series by the new **5268A** Plug-In. By multiplying the incoming frequency (CW or pulse train) by 10, 100 or 1000, the Plug-In improves the counter's resolution for a given gate time in proportion to the multiplication factor. Or, for the same resolution as before, gate time can be decreased by as much as 1000 times. The speed plus accuracy combination of reciprocal taking counters is thereby achieved with the 5245/6/8 series. The Model 5268A Frequency Multiplier Plug-In accepts frequencies down to 5 Hz and it costs $650.

Programmable preset counters for control systems and industry

For physical event measurements and automatic control system work, HP offers the versatile new **5330A/B** Counters. A variable (preset) time base for normalized measurements allows direct reading of results in useful engineering units. Front panel switches allow the counting time to be preset as desired.

For additional versatility, a preset zero offset (Preset-Reset) option is offered for both models. This option resets the Counter to a switch-selected number other than zero, a real convenience when taking readings from an external transducer that may not represent zero frequency with zero units.

The Model 5330B has additional capability with its preset limits. Front panel switches let you preset high and low limits; the Counter issues control signals whenever the limits are exceeded. All functions are externally programmable. Prices: 5330A, $1200; 5330B, $1550; Preset-Reset Option, $100.

Programming Keyboard extends computing counter power

With the availability of the new **5375A** Keyboard, the extraordinary speed and resolution of the 5360A Computing Counter can now be put to use in an even wider variety of measurements—many not previously possible. The Keyboard programs the Counter to display, in real time, solutions to equations whose variables are the measurement values from the Counter. It can calculate standard deviation, maximum values and detect limits.

The Keyboard has a LEARN mode, in which the Counter can be taught a fixed program that automatically repeats with a new set of data each time the Counter measures. There is also a manual mode which lets you use the Counter's arithmetic power to add, subtract, multiply, divide, square root, etc.

Main and sub-programs have 16 instructions each and a REPEAT LOOP function makes the Keyboard particularly useful in statistical analysis.

The Keyboard greatly extends the Computing Counter's ability to normalize to engineering units; easily entered data are harmonic numbers, offsets, scale factors and heterodyne converter mixing frequencies.

An AUXILIARY connector at the rear for system installations allows the program to be controlled by external equipment. The 5375A Keyboard for the 5360A Computing Counter costs $1350.

Measure time interval with 100 ps resolution down to and through zero

With the HP **5379A** Plug-In you can convert the 5360A Computing Counter to a time-interval meter of 100 ps resolution and 1 ns accuracy. A new trigger arming technique provides new versatility to time-interval measurement—you can even measure "negative" time intervals (the time difference between stop and start pulses), a particularly useful feature in phase measurements near 0°.

The unit's high accuracy, resolution and repetition rate (up to 1000 measurements per second) greatly increase the information obtained when measuring cable delay, radar and laser ranging, phase difference, pulse width, and rise time. Unlike other time interval units, the 5379A may be armed by an input signal of either polarity. Programming by means of the Counter's accessory keyboard permits direct readout of velocity and rotational speed from time-interval measurements. The 5379A for only $750 gives you more of the capability for new kinds of measurements you can make with the 5360A Computing Counter.

Continuous recording of sound levels and accurate measurement of peak levels

New laws limit employee exposure to excessive noise. To establish compliance you may need acoustic noise levels measured accurately, automatically, continuously and unattended. Use the HP Model **80511P** Level Recorder, a combination of an 8052P Precision Sound Level Meter and a 680 Strip Chart Recorder (modified). Detection modes (SLOW, FAST, MAX and PEAK) and weighting networks (A, B and C) are selectable. The built-in log converter provides a linear scale for meter and recorder.

The averaging "SLOW" and "FAST" time constants match the dynamic requirements of IEC 179, and USA S1.4-1961. Sound levels over the range from 30 dB to 140 dB are measured with overall accuracy of ±1 dB.

The Strip Chart Recorder uses electrosensitive paper, so the unit is suitable for unattended operation, rarely needing attention.

A wide range of chart speeds (eight inches/minute to one inch/hour) makes this combination suitable for short and long-term evaluations to determine daily noise exposures and also to measure peak sound levels. A complete measuring set installed in a combining case, including a microphone, tentatively priced at $1995.

Extend real-time audio analysis to 36 channels

A valuable addition to your **8054A** Real-Time Audio Spectrum Analyzer, the HP **8060A** Real-Time Analyzer Module increases the number of channels by 50% to 36, extending the low-frequency range down to 3.15 Hz. The 8054A/8060A combination provides a continuous flicker-free display of 25 spectra (36 channels/spectra) per second on the CRT of the Real-Time Audio Spectrum Analyzer.

A single cable connects the Module to the 8054A, which automatically displays the 12 additional channels. Or, on manual or remote command, the analyzer's digital readout can display the levels of any channel. The front panel controls of the 8054A (RANGE SELECTION, DISPLAY MODE, and SCANNING) perform the same functions for the Module. The only panel control on the Module is the manual selection of band levels for the first twelve channels.

In addition to the CRT and digital displays, analog outputs are available for X-Y recording or external oscilloscope displays. Ideal for computerized systems or high-speed data acquisition systems, digital output (BCD positive 8-4-2-1) of band levels and channel identification is provided. All functions (RANGE, DISPLAY MODE, and SCANNING) can be remotely selected by contact closure to ground. This complete programmability and versatility of output signals make the 8054A/8060A compatible with any analog or digital sound or vibration system.

Many of the standard ⅓ octave filters may be replaced with octave filters or A, B, C, and D weighting networks or a linear network. Prices: Model 8060A (3.15 Hz to 40 Hz) is $4,050. Model 8054A (50 Hz to 10 kHz) is $8,950.

Accurate sound level calibration at four sound pressure levels

Perform accurate field calibration of sound measuring equipment at the level you're working at—the new **15117A** Sound Level Calibrator has four sound pressure levels: 94, 104, 114, and 124 dB accurate within ±0.3 dB referred to 2×10^{-4} μbar. This compact, battery powered, precision acoustic source for calibrating HP condenser microphones and acoustic instrumentation uses a 1 kHz drive frequency so the instrumentation under test gives the same reading for A, B, C, D, and linear weightings.

The stabilized 1 kHz electrical signal is available for calibration of sound measuring instrumentation without the use of a microphone. This electrical output provides 1 volt rms (120 dB above 1 μV) into an open circuit or 500 mV (114 dB) into 600 ohms. Model 15117A, $285.

A quiet and fast printer for 9100 calculators

Now you can have a printed record of your 9100 Calculator output. The HP **9120A** Printer quietly and rapidly prints the contents of any combination of X, Y, and Z Calculator display registers or lists the contents of the Calculator program memory upon manual or programmed command. Quiet operation is obtained by use of electrosensitive printing. The printer mounts on top of the 9100 Calculator offering easy access while occupying minimum space. Model 9120A Printer is priced at $975.

Boost RF signal levels with the latest HP tuned amplifier

High power and low noise characterize the new HP **230B** Tuned RF Amplifier. Like its predecessor, this one covers 10 MHz to 500 MHz in six frequency bands with up to 30 dB of gain and a maximum power output of 4.5 watts, ideal for increasing signal generator output. In addition, lower noise figures, typically 6 to 9 dB, make it suitable for low signal level (preamplifier) applications.

The high-power, wide-range amplification, low noise performance is obtained by a three-stage, grounded-grid amplifier using a regulated power supply. Output level is monitored by a broad-band, rms-calibrated, peak-responding voltmeter.

Other features include a maximum-level-limiting circuit to reduce amplifier gain when the output reaches a 30-volt level. The amplifier is thereby protected from damage, either from accidental input overload or from improper output termination.

The size (WHD) is 19 x 7 3/16 x 18 1/16 inches. The weight is 35 lbs and price is $1350.

DC Logarithmic Amplifier has 1/4 dB accuracy and 110 dB dynamic range

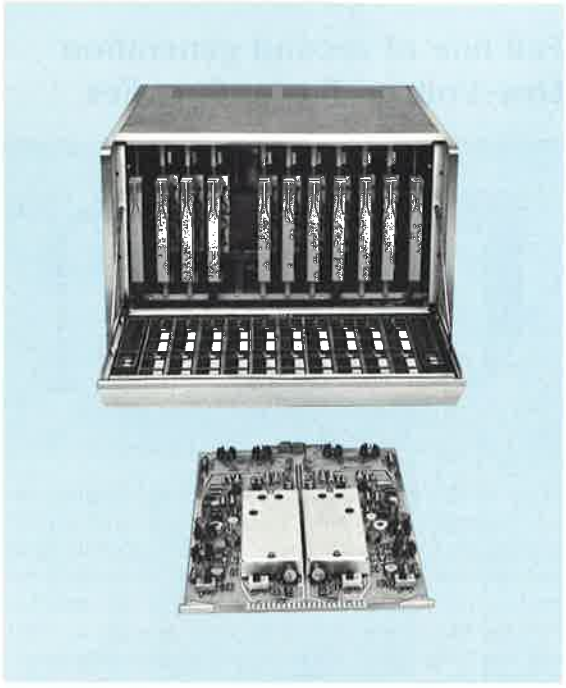
Make high resolution recordings or displays of dc signals that have wide voltage variations (up to 316,000 to 1) by converting them to logarithmic output.

A new dc logarithmic amplifier, the HP Model **7563A,** provides positive dc output voltages logarithmically related to either positive or negative dc input voltages over a 110 dB range, with accuracy as good as ¼ dB. Calibrated scale factor is 10 mV out per dB in, adjustable down to and including 1 mV/dB.

The Amplifier operates directly with all HP X-Y and strip-chart recorders and with most other recorders and oscilloscopes. With but a single range, the Model 7563A delivers midscale (1 mV–10 V) accuracy of ¼ dB over an 80 dB span. Input voltage range is 316 μV to 100 V, either positive or negative. A front panel meter calibrated in both dB and mV gives an instantaneous visual indication of operating levels and also serves as a single-scale, wide-range (110 dB) voltmeter.

Input impedance is 100k ohms shunted by less than 100 pF. Output impedance is less than 5 ohms. Price: 7563A, $695.

Low-cost, high-performance data amplifier for high-speed data acquisition systems



High-speed data acquisition systems can now be equipped with wideband, differential-output, amplifiers at a cost of less than $400 per channel. This capability is obtained with the new HP **2471A** System Data Amplifier and the price includes 20-channel combining case, power supply, and provision for switching gain and bandwidth.

The new Data Amplifier has two independent amplifier channels mounted on a single circuit board, each channel capable of providing up to ±10V, 50 mA full-scale output. Four selectable calibrated gains range from 1 to 1000 in decade-multiple steps. Bandwidths are selected by plug-in jumpers, with a choice of full bandwidth (greater than 50 kHz) or 10 Hz, 100 Hz, 1 kHz, and 10 kHz controlled bandwidths with 12 dB-per-octave rolloff.

Extensive use of integrated circuits and simplified packaging has reduced cost without sacrificing performance. In fact, from common-mode rejection (> 120 dB, dc to 60 Hz) through drift (1μV/°C), gain accuracy (.02% rdg), linearity (.01% rdg), wide-band noise (5μV rms), and input impedance (10 megohms), the HP 2471A delivers performance equal to that offered by amplifiers costing considerably more. For further details, please check the reply card. Tentative Prices: 2471A (2 amplifier channels), $600; 12670A Combining Case (holds 10 2471A Amplifiers), $1275.

Companion amplifier extends ac calibrator to 1100 V rms

You can get up to 1100 volts from your HP 745A AC Calibrator by adding the **746A** Amplifier. A ten-fold increase in output voltage is obtained over the frequency range of 10 Hz to 110 kHz. The 6-place voltage dials on the AC Calibrator still control the output (within ±0.04% of setting from 50 Hz to 20 kHz) and the benefits of the AC Calibrator—stability, usability, speed, direct per cent error read-out, ease of calibration, programmability, and purity of signals—are retained.

Even at 1100V, the output of the amplifier can be shorted without damage, but, to protect the operator, OUTPUT ON button must be pressed to restore the voltage. Many additional safety features, such as plastic covers with appropriate high-voltage notations and probe access holes, are used to protect personnel.

A separate 1100V output cable provides the amplifier with automatic sensing at the load (while reminding the operator of the safeguards required). At 1000V and 100 kHz the amplifier can provide 63 mA to a 100 pF load. Model 746A: $2,000.

Ideal Constant-Current DC Sources — three models now available

Unlike many so-called "constant current" sources, the new **CCB** Series has a high impedance, non-capacitive output. This means no stored energy to discharge in response to programming or load changes, which would delay response.

A patented guard circuit allows the output voltage to be externally monitored without degrading regulation. Further, the new CCB Series permits you to preset current and voltage levels before connecting your load. Three models, that can be remotely programmed (resistance or voltage) with accuracy of 1% or better, are now available.

Other operating features include: transient recovery time less than 200μsec for output recovery to within 1% following a full load change; programming speed less than 1 msec from zero to 99% of programmed current output; resolution 0.02% of the range switch setting, and rms ripple less than 80 ppm of range.

OUTPUT CURRENT	VOLTAGE LIMIT	MODEL	PRICE
0–500mA	0–50Vdc	6177B	$425
0–250mA	0–100Vdc	6181B	$425
0–100mA	0–300Vdc	6186B	$475

Full line of second generation Low-Voltage Power Supplies

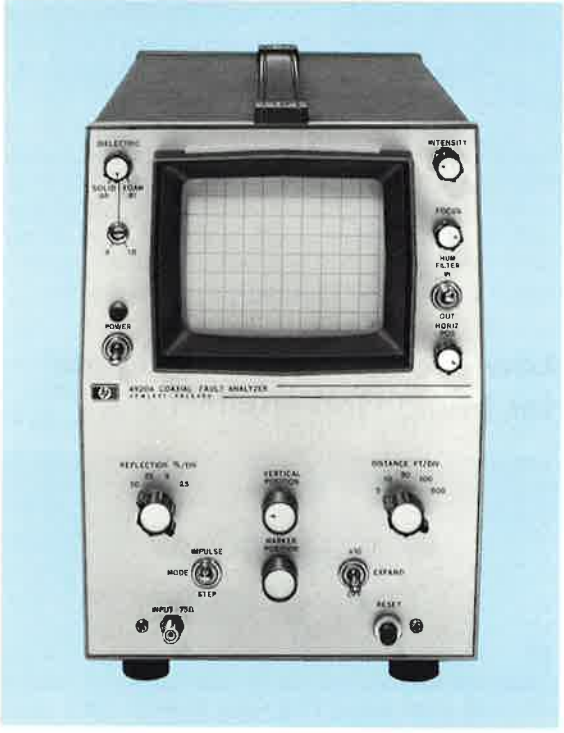
Long established as preferred system supplies for component aging, production testing, and special applications, the **LVR** Series power supplies now include overvoltage crowbars in all 12 models for protection of delicate loads. Other advantages include low ripple (peak-to-peak as well as rms) and well-regulated constant-voltage/constant-current dc output.

Where loads are critical and expensive, the extra protection a crowbar provides against inadvertent knob-turning is invaluable. On all internal crowbars in this series, the trip voltage is set by a screwdriver adjustment on the front panel.

Pertinent specifications are: triggering margins settable at 1V plus 7% of operating level; voltage ripple and noise less than 1 mV rms or 10 mV peak-to-peak (DC to 20 MHz); current ripple 8 mA rms or less depending on output rating; voltage regulation 0.01%; resolution, 0.25% or better; remote programming.

DC OUTPUT VOLTS	DC OUTPUT AMPS	MODEL	PRICE
0–10	0–20	6256B	$450
0–10	0–50	6259B	$650
0–10	0–100	6260B	$825
0–20	0–50	6261B	$775
0–20	0–10	6263B	$435
0–20	0–20	6264B	$525
0–40	0–3	6265B	$350
0–40	0–5	6266B	$435
0–40	0–10	6267B	$525
0–40	0–30	6268B	$695
0–40	0–50	6269B	$875
0–60	0–3	6271B	$435

Portable analyzer easily locates and measures TV cable faults



Location and measurement of faults on 75-ohm coaxial systems operating to 300 MHz is easy with the new **4920A** portable Coaxial Fault Analyzer. Using time domain reflectometry, the Model 4920A reads directly in feet with a maximum range of 5000 feet. A times 10 magnification provides excellent distance resolution and measurement accuracy on closely spaced faults.

Incident energy (output) can be either a step signal with 1.3 ns rise time and effective BW of dc to 320 MHz or an impulse function with a spectrum of 50 to 320 MHz. Other features include a relay-protected input, built-in hum filter and selection of calibration for various cable dielectric factors. The Fault Analyzer measures only 8 x 11 x 18 inches and weighs 23 lbs. Price: $1825.

Automatic Digital Capacitance Bridge

Incoming inspection, quality assurance, component evaluation and characterization of active circuits in terms of input/output capacitance—these are a few of the tasks the Automatic Capacitance Bridge performs.

Model **4270A** has ranges from 10 pF to 1μF with five-digit resolution and it measures at four decade frequencies, 1 kHz to 1 MHz. Accuracy is 0.1% at 1 kHz, 0.2% at other frequencies. Measurements may be made biased, low side grounded, or floating and if an automated system is required, the Automatic Bridge provides BCD output and complete programmability.

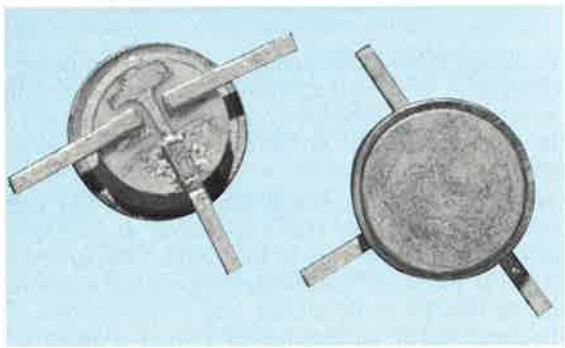
Besides capacitance, the Automatic Bridge also measures the loss component either as parallel conductance or as dissipation factor. Conductance is measured down to 0.1 nanomhos.

Range and balance modes provide manual, remote, or automatic operation. Once automatically ranged and balanced, the operator may switch to HOLD for capacitance classification, or TRACK for drift and stability measurements. In HOLD, balancing is performed on the most significant digit; in TRACK, on the least significant digit. Price: $4825.

500 MHz double-balanced mixer now in miniature package

The HP **10514C** 500 MHz Mixer which occupies less than .15 square inch on a printed circuit board combines miniaturization with low conversion loss and good isolation between local oscillator and input. Like other members of the 10514 Mixer family, conversion loss is less than 9 dB at only 5 mW of local oscillator power and balance is such that local oscillator power is more than 20 dB down at the input port throughout a frequency range of 10 MHz to 500 MHz. The Mixer is type tested to MIL-E-16400F Class 1, MIL-E-5400K Class 2 and MIL-T-2/200 Class 1—extremely rugged and reliable. It weighs only 0.06 oz. and its leads are spaced the same as a flat-pack integrated circuit. Prices: $80.00 (1 to 9) and $65.00 (10 to 24).

Silicon Transistor has guaranteed $f_{max} > 6.0$ GHz



For critical oscillator and amplifier applications to 6 GHz, HP offers hermetically sealed stripline NPN transistors in two configurations. The common-emitter version **(35806E)** as a linear amplifier typically provides 20 mW output with 5 dB NF at 2 GHz. In a common-base version **(35806B),** this high performance transistor is ideal as an oscillator; 20 mW output at 4 GHz is typical.

Complete parameter characterization assures uniform performance with optimum operation in production circuits. Prices: $100 (1 to 9), $89 (10 to 24).

Solid-State Modulators cover greater than octave bands (1-18 GHz)

For your microwave absorptive modulator needs look to the **33000** series; each covers more than an octave bandwidth.

Whether it's the **33000C/D** (1–4 GHz), **33008C/D** (4–8 GHz), or the **33001C/D** (8–18 GHz), port impedance match is excellent at all attenuations permitting pulse and amplitude modulation of load-sensitive microwave sources without frequency pulling.

High on-off ratios and rapid switching speed (modulation bandwidth) are achieved throughout the MIL-E-5400K, Class 2 temperature range (—54 to +95C). Attenuation is current controlled, typically repeatable within 5% at a given control current, frequency, and temperature. Small quantity prices are $365 to $575 depending on model.

Low-Cost Solid-State Switches for broadband applications

You can now get exceptionally wide frequency coverage (.1 to 18 GHz), high performance and long life—all at a surprisingly low cost—with the **33100** series of SPST switches. Use these low-cost control elements to gate VHF, UHF, and microwave signals. They can pulse-modulate carriers at power levels to 2 watts and have a dynamic range suitable for closed-loop power leveling or AGC systems.

The series consists of two families: the **33102A, 33103A** and **33104A** switches optimized for high isolation, and the **33122A, 33123A** and **33124A** switches optimized for fast switching speed. These small, lightweight switches use PIN diodes in shunt with an ac-coupled transmission line. The three members of each family differ only in on-off ratio. Small quantity prices range from $125 to $175 (tentative).

Versatility in correlation measurements in one easy-to-use instrument

- Obtain your system transfer function without disturbing its normal operation.
- Recover those signals buried in noise.
- Identify and characterize noise sources.

These and other previously very difficult problems are analyzed at a glance with the new HP Correlator.

The Model **3721A** can display 100 values of correlation function, recovered signal, or probability density function (PDF) and is continuously calibrated, even during the averaging process. Frequency range is from dc to 250 kHz with time scale selectable from 1 μsec to 1 s per mm using the internal clock. Maximum amplitude sensitivity of 5 μV^2/cm in correlation modes and 50 μV/cm for signal recovery justifies the claim of high sensitivity. Digital averaging with selectable time constants up to 10^7 seconds gives unique capability in low-frequency applications plus the ability to follow signal changes. The versatility of the Correlator is enhanced by its ability to give a quick CRT indication of the computed function's final value. Model 3721A is easily interfaced with a computer to extend its analyzing capability to such things as calculating the spectrum through Fourier transformation of the correlation function.

Besides application in the more conventional electronic disciplines, the Correlator is useful in acoustics, medicine, radio astronomy, process control, and vibration analysis. Model 3721A, $8350.

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6 ___ 746A AC Calibrator Amplifier
7 ___ 437A/8485A Thermocouple Power Meter and Mount
8 ___ 2471A System Data Amplifier
9 ___ 3721A Correlator
10 ___ 4270A Automatic Capacitance Bridge
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