NEW INSTRUMENTATION

Hewlett-Packard / WESCON / 1966

Hewlett-Packard WESCON...

...a chance to learn more about new measuring techniques at **HP SEMINARS,** Hollywood Park, second level, 10 and 11 a.m., 2, 3, and 4 p.m., Aug. 23-26

New and improved measurement techniques will be discussed and demonstrated in a unique series of seminar sessions to be presented by Hewlett-Packard at Hollywood Park during the four days of WESCON.

You're invited

HP engineers will present these technical sessions, each lasting approximately 20 minutes, with full opportunity for questions and answers and individual discussions (30 minutes).

10 a.m. 1. How to get the most from your spectrum analyzer: common problems; practical solutions.

2. Error reduction by automating production tests with programmable scopes.

11 a.m. 1. Scattering parameters: powerful new tool to solve microwave design problems.

2. Improve quality, save time, reduce costs: how to choose and use data acquisition systems.

2 p.m. 1. Calibrated Sweep Delay for Sampling Scope permits accurate waveform analysis on signals well into the microwave region.

2. Phase noise and short term stability; definition and measurement.

3 p.m. 1. How to measure microwave coax systems accurately to 18 GHz.

2. Faster circuit analysis from 1-1000 MHz with direct, broad-band measurements of magnitude and phase.

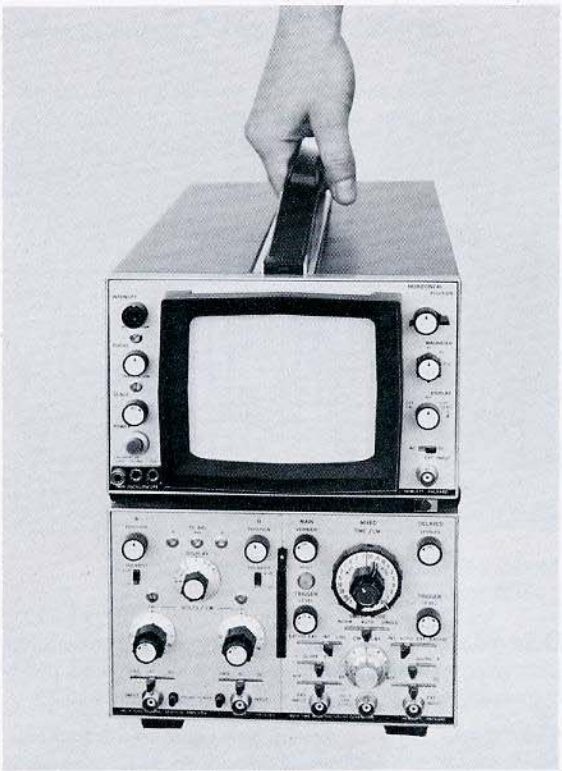
4 p.m. 1. Digitally measuring microwave frequencies through 40 GHz.

2. Bringing standards lab dc voltage and resistance measurements to bench and production use with easy transfer techniques.

HP Seminars on New Measurement Techniques—WESCON 1966—Hollywood Park

Daily, second level in comfortable classrooms... just enter the main Wescon gate, take the stairs. Use the handy card here as a reminder of seminar time. And of course, visit the Hewlett-Packard exhibit on the main floor, where you'll see new instruments in operation.

Get high performance, big picture in this New Solid-State Plug-in Scope —in a 30-pound Package!



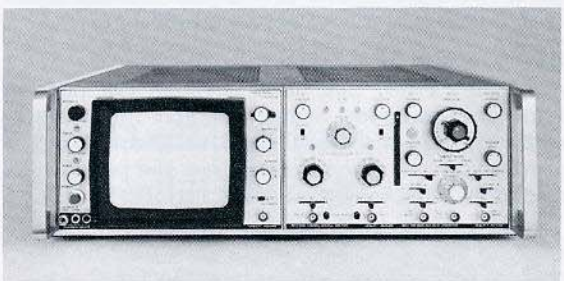
New HP 180A Oscilloscope

This all new 100% solid-state high-frequency scope gives you big 8 x 10 cm picture, plug-in versatility, step-ahead electrical performance, and rugged design in a 30-lb. package that goes anywhere—field, laboratory or production line.

CRT display area, 30% larger than existing high-frequency scopes, makes accurate measurements easier. FET vertical amplifiers have exceptionally low drift, quick 15-second warmup. Amplifier bandwidth is 50 MHz, sensitivity 5 mv/cm. Time base plug-ins trigger to 90 MHz, sweeps available to 5 nsec. 19-inch rack model mounts in 5¼ inch high space.

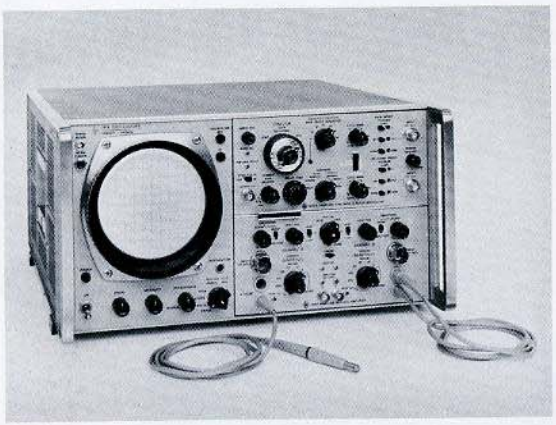
100% solid-state design except for CRT means light weight, low 95 watt power requirement (no fan required). Operates with confidence −28° to +65° C, at 95% relative humidity, and to 15,000 feet.

Get the big picture! Available now, Model 180A Oscilloscope is $825: rack version Model 180AR, $900. Model 1801A Dual-Channel 50 MHz Amplifier plug-in, $650. Model 1820A Time Base with sweeps to 5 nsec/cm, $475. Model 1821A Time Base and Delay Generator, $800.



Model 1118A Testmobile for 180A folds up for easy carrying, $95. Rack mount Model 180AR requires only 5¼" vertical space.

Now Measure to 12.4 GHz with Delayed Sweep Capability



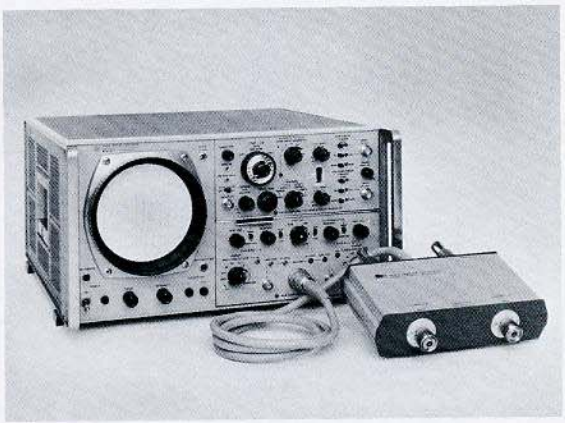
Model 141A Oscilloscope with Models 1410A and 1425A

Just plug these new sampling vertical amplifiers and time bases into your 140A General-Purpose Scope ($575) or 141A Variable Persistence Storage Scope ($1275) for the highest frequency scope measurements available today.

1 GHz vertical amplifier, 350 psec rise time, 1 mv/cm sensitivity, versatile probes and 50-ohm inputs —all in one unit. Model 1410A, $1600.

Bandwidth to 12.4 GHz with the Model 1411A Amplifier ($700) and these samplers (all offering 1 mv/cm sensitivity; remote samplers for measurements right in the signal line; feed-through inputs prevent disturbing signal under test and permit high resolution TDR measurements):

- **28 psec rise time sampler** with clean pulse response; Model 1430A, $3000.
- **12.4 GHz sampler** with low vswr and flat bandwidth; Model 1431A, $3000.
- **4 GHz (90 psec) sampler;** Model 1432A, $1000.



Model 140A Oscilloscope with Models 1411A, 1430A and 1425A

Delayed sweep sampling time base ideal for detailed jitter-free examination of complex signals and pulse trains, triggering to 1 GHz. Model 1425A, $1600.

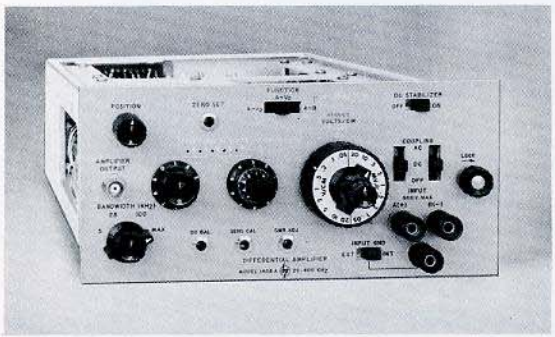
Countdown for triggering on signals to 18 GHz: Model 1104A Countdown Supply ($200) used with Model 1106A Tunnel Diode Mount ($550).

20 psec rise time pulser provides clean 200 mv step for Time Domain Reflectometry work and fast circuit testing: Model 1105A Pulse Generator Supply ($200) used with 1106A Tunnel Diode Mount ($550).

Electronically-controlled scope camera

Shutter speeds 1/30 sec-4 sec, remote operation, sync contacts to trigger external equipment; all controls external, color-coded; interchangeable rotatable back, automatic UV light, f1.9 lens. Model 197A, $475 (without UV light, $425).

New High-Performance Plug-ins for 140A, 141A Scopes!



Model 1406A

Measure signals with 0.4% accuracy by using **no-drift amplifier having calibrated offset,** see and measure small ac signals on large dc signals. Bandwidth to 400 kHz, sensitivity to 50 μv/cm. Model 1406A, $850.

Measure small differential signals even in the presence of common mode interference by using **no-drift differential amplifier having uncalibrated differential offset.** Bandwidth to 400 kHz, sensitivity to 50 μv/cm, 80 db CMR. Model 1407A, $675.

Low-cost time base only $225. Sweep speeds 200 nsec/cm to 5 sec/cm. Model 1422A.

Accessories for Time Domain Reflectometry: *Measure reactive discontinuities quickly, directly* by using Model 874A Calibrated Susceptance ($250) with Model 1415A Time Domain Reflectometer Plug-in ($1050). *Eliminate reflections caused by frequencies beyond bandwidth of interest,* 10452A-10456A Rise Time Converters, $75 each. *Convert 50-ohm TDR output to 75-ohm systems;* 10457A Adapter 50-ohm GR to 75-ohm Type N, $35; 10458A to Type F (CATV), $25.

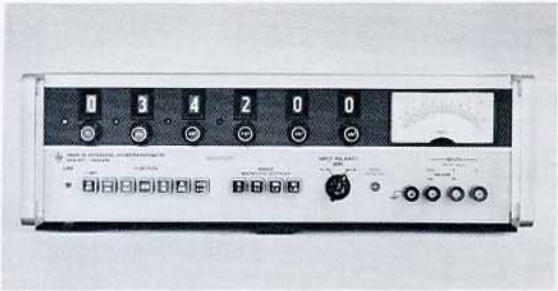
Programmable scope speeds production tests

Programmable 25 MHz, 5 mv/cm oscilloscope increases production output by reducing test time, simplifying test procedures, minimizing operator errors and fatigue, and shortening training time. All major scope functions are programmable. Calibrated vertical positioning over ±25 cm dynamic range and a no-drift amplifier allow signals to be accurately offset and magnified. Model 155A Programmable Oscilloscope, $2450; Model 1550A Programmer (18 programs), $600.

TV waveform scope, all solid-state instrument for VIT, video set-up

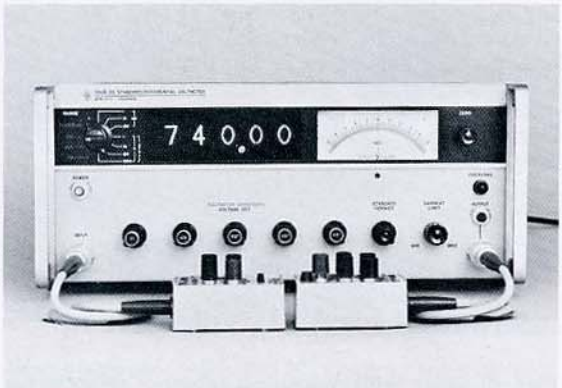
Flat amplifier with 5-position response selector for accurate signal measurement, 20 kv CRT for easy viewing of sine-squared T/2 pulse, positive digital field select, discrete selection of lines 16-21 for rapid location of VIT signals, free-run sweep for video level measurement and set-up. Model 191A, $1295.

New High-Accuracy DC Differential Voltmeter/Ratio Meter!



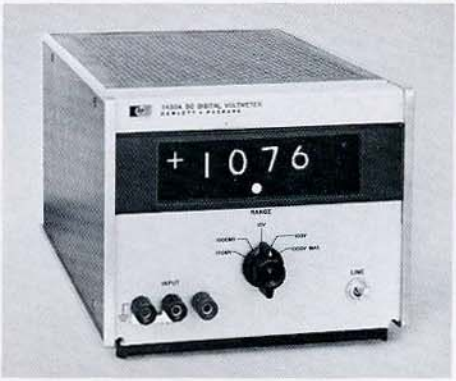
Six-digit models (1.1-1100 v) with 0.2 ppm resolution; accuracy 0.002% of setting +0.0002% of full scale; 4 ppm/°C temperature coefficient; four ranges of 0.002% ratio measurement. 3420A, ac line operated, $1175; 3420B, battery/line operated, $1300.

New DC Calibrator with Differential Voltmeter, Amplifier Capabilities!



Accuracy 0.002% of setting +0.0004% of full scale; resolution 1 μv on 1 v range with 6-digit discrete stepping; 1, 10, 100, 1000 v ranges; differential voltmeter has 0.005% accuracy. Model 740B, $2350.

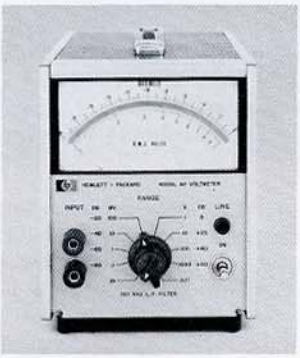
New Low-Cost 3-Digit DVM with 4th Overranging Digit!



Floating measurements, 0.1% accuracy, with 100 μv resolution, 100 mv-1000 v full scale, with 4th digit for 60% overranging. Amplifier output, autopolarity, flicker-free display storage for increased versatility, ease of use. Ratio capability, optional for additional $80. Model 3430A, only $595!

New AC Voltmeter 1 μv Resolution, 20 Hz-4 MHz!

General-purpose ac voltmeter (100 μv-300 v full scale), linear meter reading to 10 μv with 0.5% of reading +0.5% of full scale accuracy. Model 400F, $275; Model 400FL, with linear 12 db log scale, $285. Use either model as 80 db low-noise amplifier.

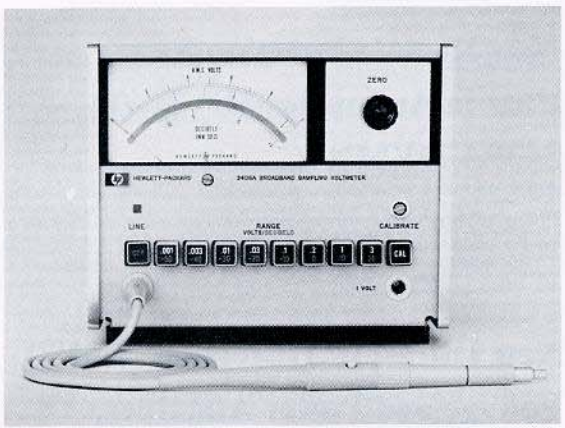


Special version for acoustical sonar applications — Model 400GL, 100 μv-1 kv full scale with 20 db linear meter; fast responding, wide-range scale readings 20 Hz-4 MHz, ±0.2 db accuracy in 20 db attenuator steps. Model 400GL, $290.

New Low-Cost, High-Performance Multi-Function Meter!

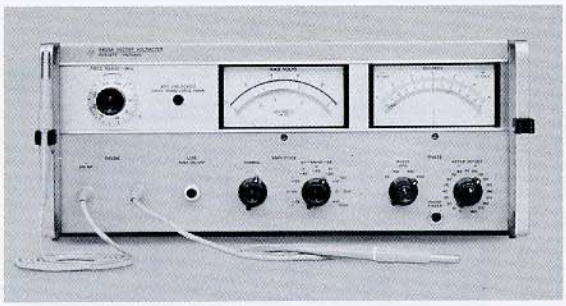
Measure ac, dc, ohms; 10 MΩ floating input, solid-state, battery operation. Measure dc 100 mv-1 kv full scale; ac 10 mv-300 v full scale, 10 Hz-1 MHz; resistance 10Ω to 10 MΩ center scale; Model 427A, with battery, only $195 (ac optional, add $35).

New Sampling RF Voltmeter, 1 mv-3 v, 10 kHz-1 GHz!



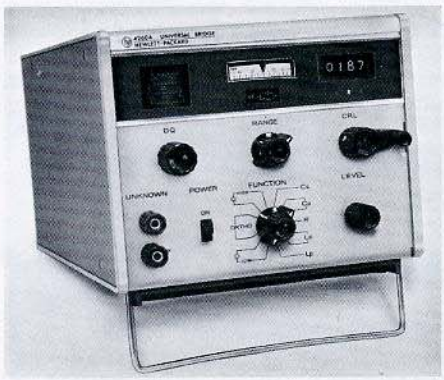
First rf voltmeter to offer 50 μv readings with 20 μv resolution, ±5% measurements at 700 MHz (usable to 2 GHz), linear scale all ranges, recorder and sample hold outputs, probe with pushbutton measurement retention. Model 3406A, $650.

New 1-1000 MHz Dual-Channel Vector Voltmeter!



Significant time-savings in rf circuit design, including: amplifier gain/phase, transistor parameters, cable characteristics. Accurately measure voltage in either channel with simultaneous display of phase angle between channels! Large voltage range 100 μv-1 v full scale, <10 μv noise; automatically tunes to signal over octave bandwidths; phase angle range ±180° with controls for easy 0.1° resolution; sampled rf outputs available for use with low-frequency scope, wave analyzer, also voltage and phase reading outputs for recorder. Model 8405A, $2500.

New Fast, Accurate Universal Impedance Bridge!



Easy measurements of C, R, L, D, Q with new universal impedance bridge; digital readout, automatic decimal point, indicator lights show up-scale or down-scale unbalance; simplified controls for production testing, general use; balance achieved with single control; false or "sliding" nulls eliminated. Model 4260A, $550 (f.o.b. Palo Alto, Calif.).

Direct-Reading Impedance, Phase Angle Measurements to 108 MHz!

Fast, direct-reading measurements of impedance, 10 Ω to 100 KΩ and phase angle, 0 to 360°, from 500 kHz to 108 MHz in 5 bands. Continuous tuning without balancing or data interpretation. Probe measurements for fast lab, inspection, production line applications; self-calibration check; analog outputs for recording. Model 4815A, $2650.

New Sweeper Offset Plug-in for 3300A Function Generator!

The dual-output 3300A Function Generator, offering square, sine and triangular outputs, two simultaneous, is made more versatile with a plug-in that provides one decade of sweeping over 0.01 Hz to 100 kHz; ±16 v dc offset; in addition, provides offset square and sawtooth waveforms. Both amplitude and offset are variable. Model 3304A, $210; 3300A, $570.

New DVM with 1 ppm Resolution —6 Full Digits, plus 7th for 20% Overranging to 1200 v!

0.005%-of-reading accuracy, or 0.0005% of full scale, repeatable to better than 2 ppm; high CMR (160 db), 0.002%/24 hr. stability, remotely programmable, recorder outputs, 10 MΩ input impedance. Model HO4-3460A, $4250.

New Adjustable Resistance Standards!

Unique construction provides stability not available before and an adjustable feature (±25 ppm) with ±0.15 ppm resolution, available with NBS certificate of calibration to ±6 ppm, typical drift <3 ppm per year. Four models, each housed in 3" x 4½" can; 100 Ω, 1 KΩ, 10 KΩ, 100 KΩ, 11100 Series, priced at $75 each.

New Remote Function Range Plug-in Automates HP 3440A, 3439A DVM's!

Permits remote programming of function (ac or dc) and range (10-1000 v full scale), ideal for automatic testing, etc. Model 3446A Plug-in, $575.

New Ultra-low Distortion (0.01%) Voltage and Power Amplifier, DC to 1 MHz!

Fixed gain 10, 100, 1000; variable gain over each decade; gain accuracy 0.01%, dynamic range up to 100 v rms and up to 50 ma; Model 463A, $590.

New Low-Cost, High-Performance Electronic Counter!

Measure frequency to 50 MHz (ac or dc coupling) with this new 6-digit counter. Use the same plug-ins as with the hp 5245L Counter to measure frequency to 12.4 GHz, time interval from 1 μsec to 10^6 sec, dc voltages to 1000 v. Dual FET input amplifier for superior input characteristics. Model 5246L, $1800.

New X-Band Counter Converter—12.4 GHz!

New rapidly tuned heterodyne converter extends the range of the popular 50 MHz 5245L and new 5246L Plug-in Counters to cover 3-12.4 GHz; 100 mv input sensitivity; also use as a highly sensitive 1-200 MHz prescaler; retains accuracy of 5245L; 1 Hz resolution in 4 sec, 10 Hz in 0.4 sec. Model 5255A, $1650.

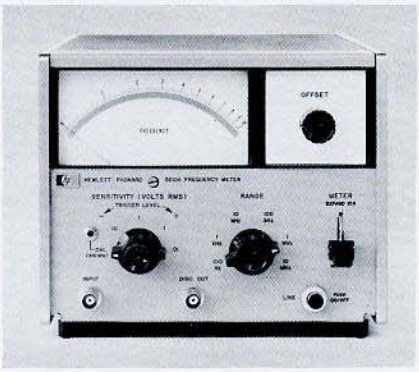
Atomic Frequency Time Standard Completely Portable!

Solid-state cesium beam primary frequency and time standard, $2x10^{-11}$ frequency accuracy. (In the June, 1966 HP Flying Clock experiment, drift was <1 μsec during a 30-day trip around the world.) UT_2 or atomic time scale, plus frequency divider and digital clock and battery-operated power supply with standby reserve. Model E20-5060A, $22,000.

New Accurate Frequency Source for Calibration, 10 Hz-10 MHz!

Features expanded scale output monitor for greater resolution, in per cent ($\pm$0.1 db accuracy with $\pm$0.25% for HO1-652A); 90 db attenuator. 652A, $725.

Measure to 10 MHz with New Wide-Range Frequency Meter, FM Discriminator

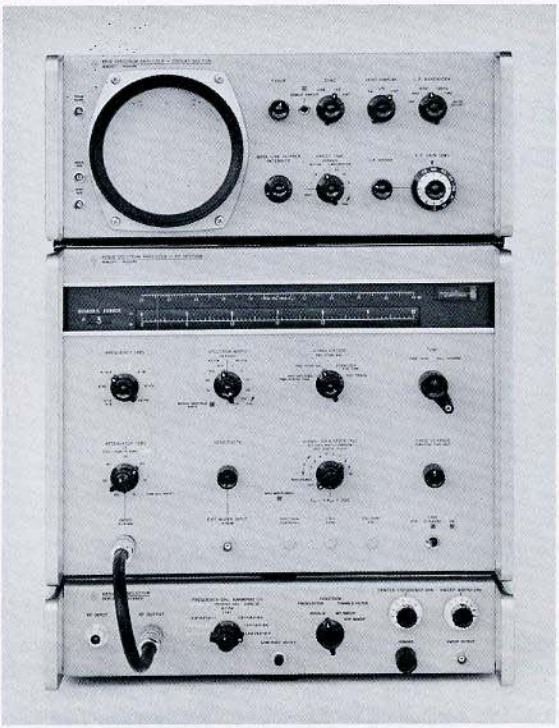


Measure frequency directly to 10 MHz; accuracy: meter, 1% of reading (0.2% to 0.3% of range with calibrated offset option), recorder output linearity, 0.025% to 0.2%, depending on frequency. FM discriminator: linearity, 0.025% to 0.1%; 3 db bandwidth greater than 1 MHz; residual FM noise -120 db; input impedance 1 Meg/30 pf, constant with attenuator setting; 0.01% calibrator; internal plug-in filters for convenient FM measurements; calibrated offset optional. Model 5210A, $575.

Fast, Fully Automatic Digital Frequency Measurement through X-Band with New Automatic Frequency Divider!

Use with electronic counters to get direct readout with no ambiguity, offset or arithmetic processing, 300 MHz through 12.4 GHz; sensitivity 100 mv. Model 5260A, $3250.

New YIG-Tuned Preselector for 8551B/851B Spectrum Analyzer

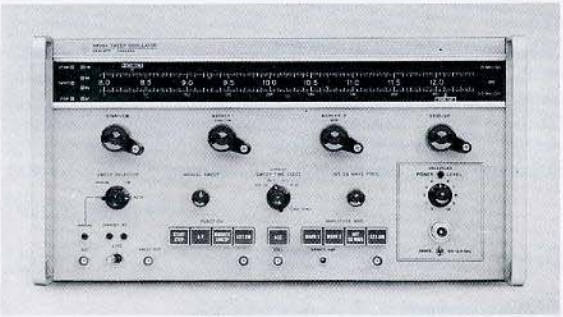


Effects from multiple signals, such as intermodulations, are virtually eliminated with new 8441A **Preselector** for 8551B/851B Spectrum Analyzer. Multiple responses from harmonic mixing are also reduced. Preselector has 1.8 to 12.4 GHz range, tracks automatically with 8551B scan. Model 8441A, $2950.

Basic 8551B/851B Analyzer covers 10.1 MHz to 40 GHz; has calibrated spectrum width 100 kHz to 2 GHz, 60 db calibrated display dynamic range, flat response, calibrated resolution, wide image separation. Model 8551B RF Section, $7100; Model 851B Display Section, $2400. New **Up Converter** extends lower frequency of 8551B/851B down to 10 kHz; high sensitivity, ideal for RFI measurements. Model K15-8551B, $1625.

Combine 851B Display Section with K10-8551B **Converter Section** and your swept local oscillator (such as hp 8690 Sweeper) for high-sensitivity, uncluttered displays in frequency range of your L.O. Model K10-8551B, $1600.

New Easy-to-Use Microwave Sweep Oscillators with Interchangeable RF Units!

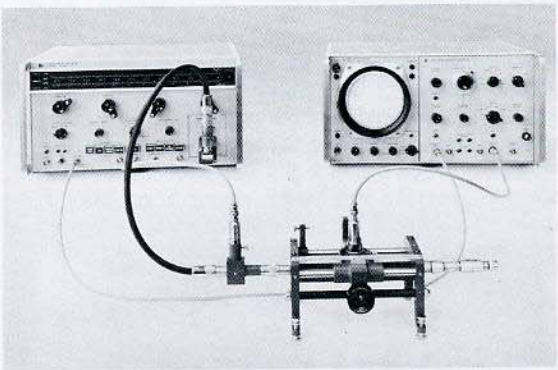


Integral-sweeper performance with plug-in sweeper economy, convenient, compact size with clear, logical operating controls. Full-length snap-in frequency dial tells you—at a glance—both sweep mode and sweep coverage; frequency accuracy and linearity better than 1% for all operating conditions, including Start-Stop sweep, Marker sweep, Calibrated Δ F sweep; sweep speeds for scope displays or x-y recording (with Manual Sweep for simple set-up); choose PIN diode- or grid-modulated rf units; cover 1 to 40 GHz in octave- or waveguide-frequency bands. 8690A main unit, $1550; rf units from $1575.

New 250-Times Improvement in Frequency Stability from Microwave Signal Generators!

New synchronizer, used with improved signal generators, provides 2×10^{-7}/10 minutes stability, 10 kHz-455 MHz. Unique sampling phase-lock permits stabilization at any frequency; high spectral purity; frequency- or phase-modulation capability. Signal generators provide low-distortion AM, constant power with frequency change. Model 8708A Synchronizer, $1800; 606B HF Signal Generator, $1550; 608F VHF Signal Generator, $1600.

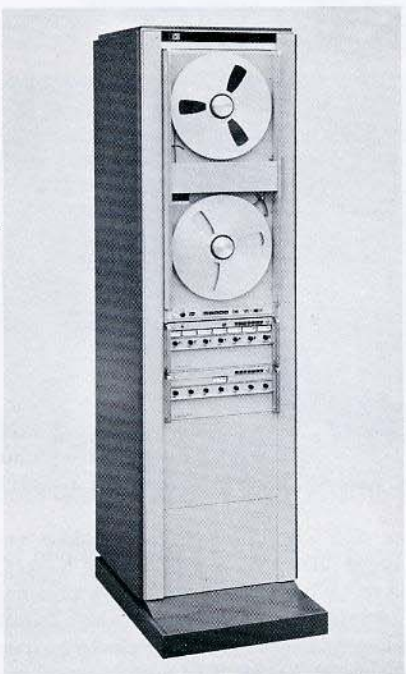
Instruments for New Precision in Coax—to 18 GHz!



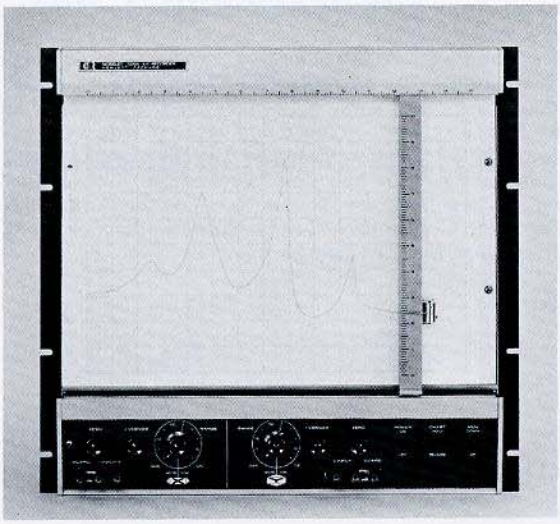
Availability of new precision connectors means systems designers can use coax to 18 GHz, and Hewlett-Packard introduces a broad array of test instruments for accurate measurements in coax. These include a new, high-performance slotted line assembly, a swept-frequency slotted line system, coaxial thermistor mounts and crystal detectors, fixed and sliding loads and coax attenuators. Connectors on the new instruments can be either the Amphenol Precision Connector—7 mm—or new precision high-frequency Type N fittings.

New Value Standard for Magnetic Recording Systems— 300 kHz Direct, 20 kHz FM

Outstanding signal-to-noise ratio, low flutter and wow, straightforward operation and exceptional reliability are major features of these high-performance, moderate-cost magnetic tape recording systems. Transports for 7 or 14 tracks with either 10½" or 15" maximum reel size are free from need for adjustment and maintenance. Pushbutton speed and mode selection, dependable equalizer switching. Interchangeable Direct and FM amplifiers have integral front-panel metering and test points. Model 3955-Series, complete systems prices from $10,000.

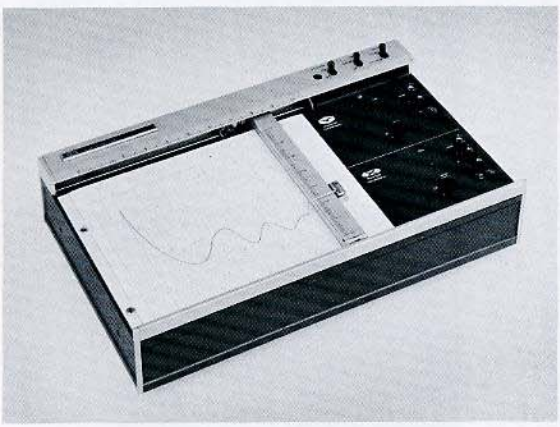


New Low-Cost 11"x17" X-Y Recorder!



Utility solid-state recorder offering high performance, 5 fixed calibrated ranges 1 mv/in-10 v/in, guarded and floating; independent servo systems, zener reference, accepts external time base. 7005A, $1195.

New Economical Single-Channel X-Y Recorder!



General-purpose 8½" x 11" systems readout recorder, input range 100 mv/in on x- and y-axes; y-axis calibrated to 1 v full scale; x and y low terminal common and isolated from ground, 1 MΩ input impedance, maintenance-free Autogrip electric paper holddown. Model H10-7035A, $845.

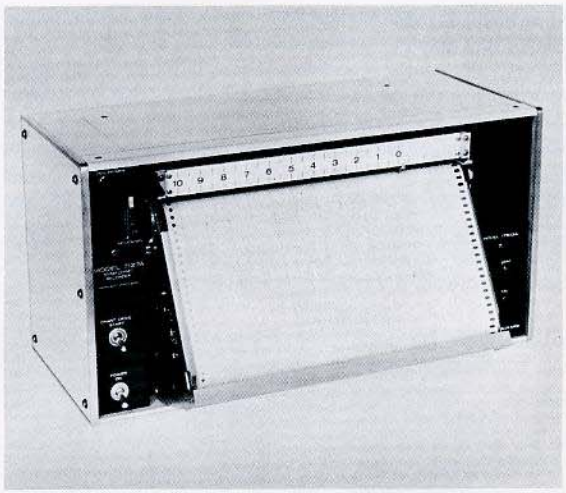
Monitoring Strip-Chart Recorders, Virtually Maintenance-Free!

Modular construction, all elements easily replaced; potentiometric, 1 MΩ inputs, disposable capillary pen tip or optional electric writing; solid-state with zener reference, differential and floating inputs; high reliability multi-contact flat mandrel linear potentiometers; specify sensitivity range 1 mv-100 v fs; speed 0.5"/hr-10"/min. 5700 Series, 6" or 11" recorders, 1-pen, 2-pen versions, from $825.

External Time Base for HP/Moseley X-Y Recorders!

Connects input terminals of either axis, provides ±5% accuracy, ±0.5% linearity, sweep speeds 0.5-50 sec/in; sweep, hold, reset positions. Model 17108A, $175.

New 10" Strip-Chart Recorder With Plug-in Versatility!



Solid-state one-pen main frame with multi-speed strip-chart transport and servo-activated pen, four instantly selected chart speeds; five currently available input modules, for multiple span, temperature input, 1 mv single span and the 17504A described on the next page. Model 7127A, $850.

New Strip-Chart Input Module Has Range Card Versatility

A single range input module, 17504A, accepts plug-in range cards with a single full-scale span from 5 mv to 100 v. High common mode rejection, 1 MΩ input impedance, and floating inputs up to 500 v. Model 17504A (for 7100B, 7101B, 7127A, 7128A Recorders), $200.

New Strip-Chart Filters for Maximum Noise Rejection

Reject noise and line frequency signals introduced with recorder input signal. For use with front or rear input terminals on 10-inch recorders (7100B, 7101B, 7127A, 7128A). 17106A and 17107A Filters, $35 each.

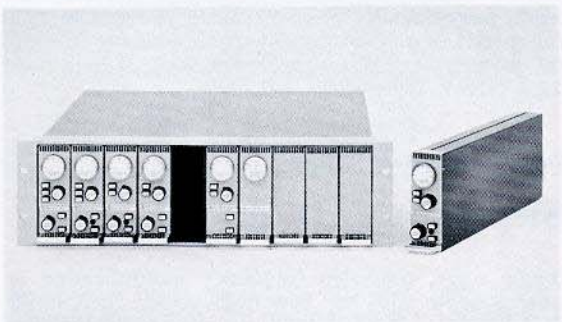
Inkless Strip-Chart Recorder Writing!

New electric writing system, using new hp-developed electro-sensitive paper, optional on many strip-chart recorders; fast, no ink refilling, clogging, drying; neither temperature- nor pressure-sensitive. Economical, and the ideal answer for unattended recording applications.

Solid-State Two-Channel Oscillographic Recorder!

Seven available interchangeable plug-in preamps, ideal for low-level recording from thermocouples, strain gages, comparison records. Only 8½" high, rack mount. Simple operation. Model 7702A, $1675 plus preamps.

High-Performance Signal-Conditioning Instrumentation



Full floating and guarding in a new series of signal conditioners to provide dc excitation and conditioning for strain-gage transducers, potentiometric transducers, other variable-resistance devices. Ideal for data acquisition systems with guarded DVM's and data amplifiers, contributing to maximum system accuracy, minimum common-mode noise problems. Compact modular construction. Power supply, excitation coupler, resistance bridge, monitor function selector, 2480 Series.

New Voltage-to-Frequency Converter Excels in Low-Level Applications!

Uses differential circuits for low input drift, high CMR; 10 mv, 100 mv, 1 v input ranges produce 100 kHz full-scale output, 150% overranging all ranges; reliable all-silicon circuitry, self-contained power supply, small modular package. Model 2212A, $900.

New Flexible, Compact Differential Data Amplifier!

This wideband data amplifier offers low drift, low noise, high CMR, fast settling and overload recovery, exceptional reliability, 50 kHz bandwidth, selectable gain X1-X1000, 1 watt output; compact package with self-contained power supply...10 fit in standard rack space 5¼" high. Model 2470A, $585.

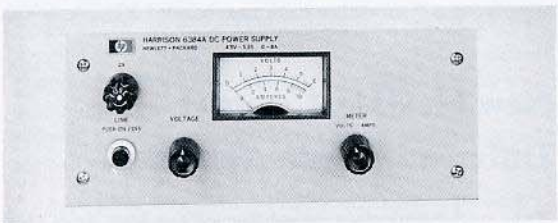
Increased Power Supply Resolution, Accuracy with Magnified Meter Ranges!

New four-position meter range switch sets full scale voltmeter, ammeter values at 100% or 10% of the nominal output range on 25 low- and medium-power Hewlett-Packard power supplies. No increase in cost. Meter and associated circuitry are foolproof—no danger of burnout for any dc output combined with any meter range. Highly regulated power supplies, low ripple, fast recovery, constant voltage-constant current models, each model for bench and rack use.

New Series of Constant-Current Bench Power Supplies!

For very small direct currents with resolution to 100 nanoamps, high-speed programming, high output impedance over wide frequency range, adjustable voltage limits, low drift; compact half-rack width, 3½" high. Special terminals permit voltmeter monitoring of output without degrading constant current through load. All-silicon CCB Series, $425 each.

New Low-Voltage Supplies for Integrated and Micromodular Circuits!



Extremely fast 10 μsec internal overvoltage "crowbar" protection included, low output capacity to minimize load circuit transients, current ratings 8-120 amps. Five all-silicon supplies in the ICS Series, priced from $220.

Compact, Constant-Voltage Power Supplies in Modular Package!

New series of unmetered constant-voltage supply modules adjustable over a narrow range; fully serviceable, no external heat syncs required; all internal wiring on printed wiring board, no wires or cables. Three package sizes with maximum power capability of 12, 25 or 50 watts for systems applications. Priced from $94.

New Microwave Mixer and Detector Diodes to above 8 GHz

The new HPA 2600 Metal-silicon Schottky Barrier Diode is optimized for use as an rf mixer and detector to above 8 GHz. Typical noise figure is 6.5 db at 8 GHz and pulse burnout is typically 10 ergs.

New Fast SPST Microwave Switch

The new HPA 3540 single-pole-single-throw Stripline Microwave Switch is five times faster (10 nsec switching speed) than previously available switches of similar geometry and offers broad bandwidth (dc to over 12.4 GHz). Unit price: 1-9, $175.

New High-Power Step Recovery Diode

Single stage, times-ten frequency multiplication is now possible with the new high power HPA 0300 Step Recovery Diode. Typical output power is greater than 2 W at 2 GHz when driven with 15 W at 200 MHz. Unit price: 1-9, $55; 10-99, $45.

Data subject to change without notice.

Prices f.o.b. factory.

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