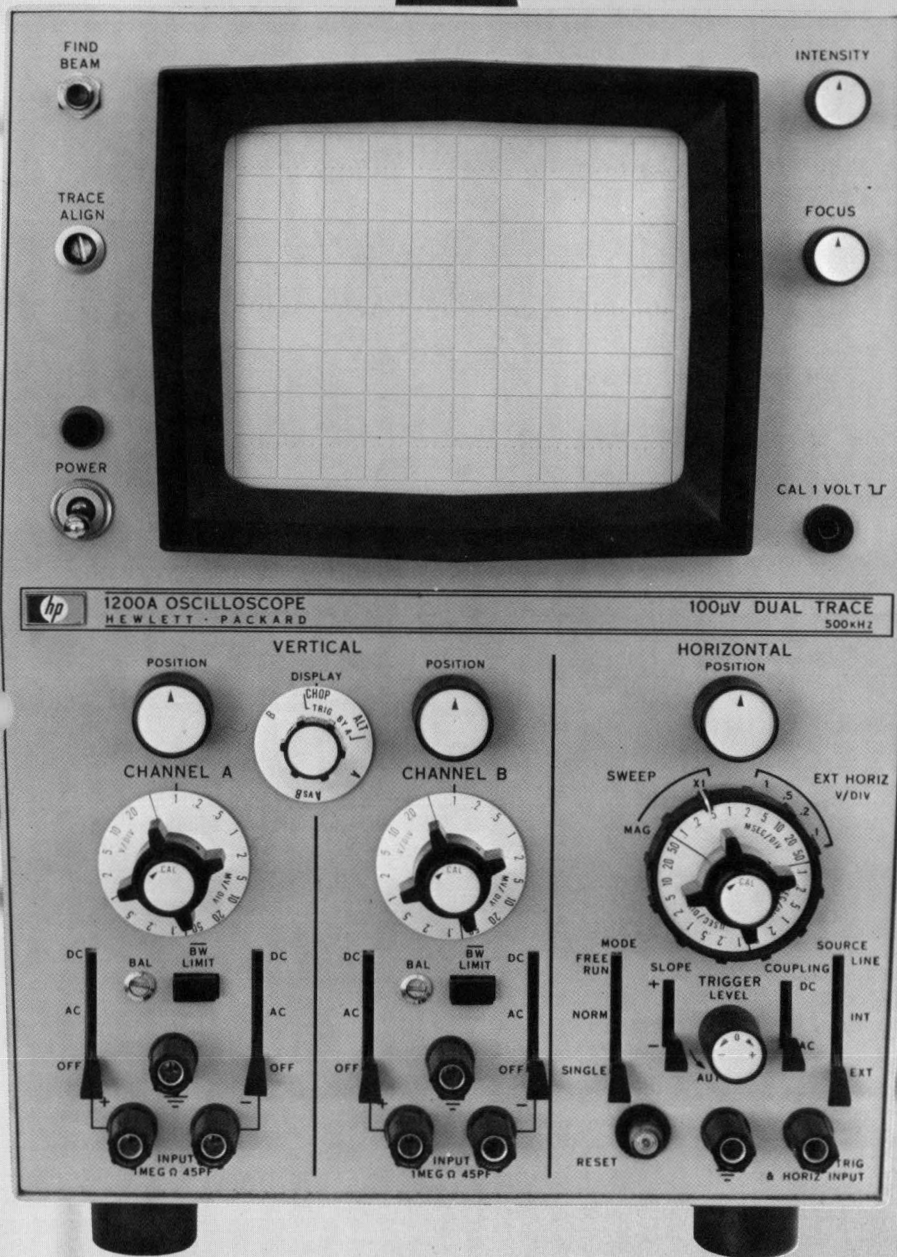


LOW FREQUENCY OSCILLOSCOPES

1200A/AR
1202A/AR
1205A/AR
1206A/AR

TECHNICAL DATA 1 MARCH 68

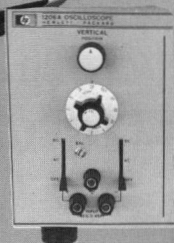


A NEW CONCEPT IN HIGH PERFORMANCE DC TO 500 kHz OSCILLOSCOPES

- ALL SOLID-STATE RELIABILITY AND STABILITY
- 100µV DIV DEFLECTION FACTOR
- 100,000:1 COMMON MODE REJECTION RATIO
- SMALL — LIGHTWEIGHT — LOW POWER



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ADVANCED PERFORMANCE IN LOW FREQUENCY OSCILLOSCOPES

The totally new all solid state, 500 kHz bandwidth 1200-series oscilloscopes offer advanced performance with operating features previously available only on much wider bandwidth, more expensive instruments. A wide selection from eight instruments allows you to choose the right instrument for your exact need.

Solid state circuit design throughout the new 1200-series scopes provides portable, reliable, stable, and versatile operation in a variety of measurement applications. Typical applications for these oscilloscopes include:

- R & D laboratory design
- Production line testing
- Scientific research
- Systems instrumentation
- Information display
- Educational laboratories

MATCH INSTRUMENT TO MEASUREMENT APPLICATION

Single or dual channel display, 5 mV/div or 100 μ V/div deflection factor (sensitivity), compact rack or bench style cabinet—these are offered as basic choices to help solve your low frequency measurement application whether it's specialized or general purpose.

When type of display, sensitivity, and cabinet style have been selected, other operating features contribute to making the most convenient low frequency measurements available:

- 100dB (100,000 to 1) CMR (on 100 μ V/div models).
- Differential or single-ended input on all deflection factor ranges.
- Input coupling selectable for + and - inputs.
- Direct-reading X10 sweep magnifier.
- Single sweep capability.
- 0.2 volt external triggering.
- Automatic and amplitude selection triggering.
- DC-coupled Z-axis amplifier.

PORTABLE, RELIABLE, STABLE OPERATION

Portable, reliable, stable operation has been achieved in the new 1200-series by use of all solid state circuitry, unprecedented in low frequency oscilloscopes.

A valuable space-saving instrument package, lower costs for maintenance and calibration, and less waiting to make measurements after turn-on are only some of the benefits derived from the solid state technology used in these instruments.

Portability. 1200-series scopes are portable; they are far more compact and lighter weight. Individual instruments weigh only 23 to 25 pounds, about one-third less than previous comparable instruments. Correspondingly, the size is approximately one-third less. As a result, measurements are more practical in remote or difficult-access areas such as aircraft flight lines, communications field sites, or weapons test sites. One of the most significant size differences is the 5 $\frac{1}{4}$ inch panel height of the rack mount instruments. (For additional information, refer to Systems Applications heading.) A convenient carrying strap on bench models and front panel handles on rack models completes the portability of the 1200-series. These new oscilloscopes are true space-savers and are easily—very easily—hand-carried between measurement locations.

Reliability. Proven circuit design techniques and carefully determined tolerances on components, combined with rugged mechanical design and skilled workmanship have resulted in highly reliable operation. The 1200-series sacrifices nothing from, in fact adds to, the reliable performance standards set by other HP low frequency scopes. 1200-series scopes are designed for dependable operation in many different measurement surroundings. Environmental testing (e.g. humidity, temperature, etc.) has been carried on throughout the design phase of instrument development, ensuring a reliable, proven scope.

Power consumption is only approximately 33 watts and no cooling fan is required. This eliminates many component failure problems encountered in higher wattage instruments requiring forced air cooling.

Stability. The 1200-series oscilloscopes are all solid state circuit design—no vacuum tube devices except the CRT. Temperature variations have essentially negligible effect on circuit stability. Field effect transistors at the vertical amplifier input provide very low drift, low noise operation virtually free of annoying trace shifts caused by temperature changes, shock and vibration. On models with

100 μ V/div vertical deflection factor, noise is less than 50 μ V peak-to-peak at full 500 kHz bandwidth. Accuracy of low level signal measurement can be further improved by use of a front panel bandwidth limit switch; Figure 1 illustrates noise reduction using this feature.

Long term stability means less frequent calibration and lower periodic maintenance costs. On models with 100 μ V/div vertical deflection factor, at constant temperature the

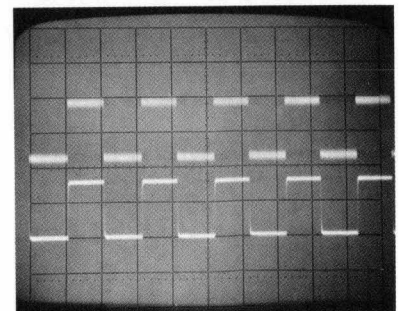


Figure 1. Noise present in upper trace has been significantly reduced in lower trace by use of bandwidth limit switch. Eliminating noise in unused portion of bandwidth typically reduces noise to only 15 μ V pk-pk for improved resolution of low level signals.

drift is typically less than 50 μV per hour (compared to about 500 μV per hour for vacuum tube oscilloscope amplifiers). The rapid warm-up and excellent dc stability make these more-sensitive models ideal for drift measurement of other devices and circuits. Figure 2 is a recording showing the low drift characteristics.

SYSTEMS APPLICATIONS

Systems instrumentation requirements in low frequency applications are fulfilled by the 1200-series. All solid state circuitry provides reliable, low maintenance operation and virtually no warm-up time is required before measurements can be made and results recorded. The rack versions in the 1200-series are only 5 1/4 inches high (refer to Figure 3) as compared to 7 inches and greater on previous low frequency oscillo-

scopes. This saves valuable space and allows addition of other instruments to provide a more versatile system. The improvement in rack height is possible because of the new rectangular CRT and grouping of logically-placed front panel controls and connectors.

Since these instruments are complete oscilloscopes with wide ranges of sensitivity and sweep speed, they offer to the system user not only a read-out device but a convenient calibration and service tool.

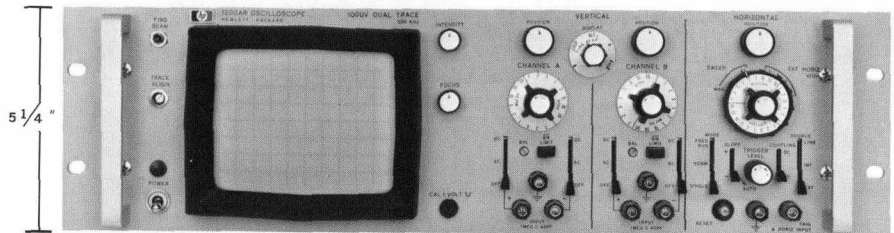


Figure 3. Rack versions of 1200-series are only 5 1/4 inches high, saving inches of valuable space in systems applications.

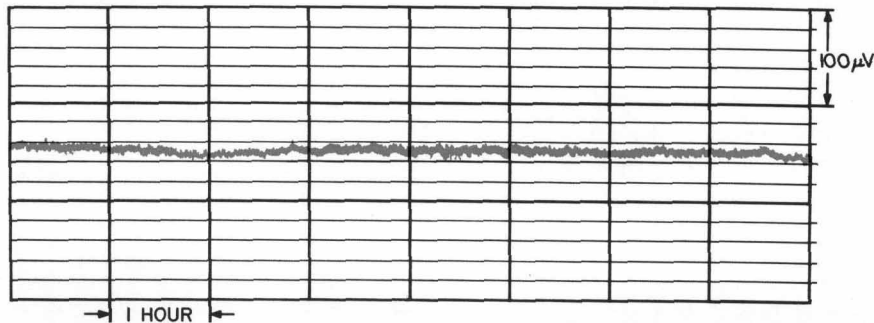


Figure 2. Recording shows low-drift operation (20 μV) over an eight-hour period in a normal measurement environment. Typical drift for 100 μV models is less than 50 μV per hour.

INSTRUMENT SELECTION CHART

FEATURE	1200A/AR*	1202A/AR*	1205A/AR*	1206A/AR*
Deflection Factor	0.1 mV/div to 20 V/div	0.1 mV/div to 20 V/div	5 mV/div to 20 V/div	5 mV/div to 20 V/div
Bandwidth	500 kHz	500 kHz	500 kHz	500 kHz
Number of Traces	2	1	2	1
Differential Input	all ranges	all ranges	all ranges	all ranges
Common Mode Rejection	100 dB (100,000:1)	100 dB (100,000:1)	50 dB	50 dB
Common Mode Signal	± 10 V	± 10 V	± 3 V	± 3 V
Phase (A vs. B)	1° to 100 kHz	—	1° to 100 kHz	—
Sweep Speeds	1 $\mu\text{sec}/\text{div}$ to 5 sec/div	1 $\mu\text{sec}/\text{div}$ to 5 sec/div	1 $\mu\text{sec}/\text{div}$ to 5 sec/div	1 $\mu\text{sec}/\text{div}$ to 5 sec/div
Ext. Horiz. Input	yes	yes	yes	yes
DC-coupled Z-axis	yes	yes	yes	yes
Page	6 and 7	8 and 9	6 and 7	8 and 9
Price	\$990	\$790	\$875	\$715

* "A" denotes standard bench model, e. g. 1200A. "AR" denotes standard rack model, e. g. 1200AR.

VERSATILE, EASY-TO-USE DISPLAYS

The many new features in the 1200-series add up to accurate, versatile, easy-to-read, and easy-to-obtain displays. The logical grouping of controls, beam finder location of off-screen traces, and automatic triggering make operation easy, especially important to inexperienced persons in production line testing and classroom or laboratory instruction. These features include the following:

... Direct-reading Sweep Magnifier. A unique combination of the sweep time and magnifier controls provides a direct reading of a magnified sweep. No need to divide to determine the magnified sweep time. It's done for you by concentric controls where the magnifier control itself provides the index for reading the magnified sweep speed selected.

... Rectangular CRT. The new rectangular cathode-ray tube for the 1200-series features an internal graticule with a large 8 x 10 division (1 division = 1 centimeter) display area. The internal graticule, developed by HP, is in the same plane as the display on the phosphor, eliminating parallax error inherent in CRT's with an external graticule. The CRT provides a bright display with a small spot size and an etched safety glass face plate reduces glare. Black graticule lines contrast better with the display giving easier, more accurate readings. This is especially important in oscilloscope trace photography in obtaining desired contrast between background, display, and graticule lines. A selection of CRT phosphors is available at no extra cost; consult modifications in

the Specifications. Special graticules, no graticule or external graticules are available on special order.

... Beam Finder. Beam finder convenience is standard on the 1200-series. Depressing the push button causes an off-screen trace to appear, allowing proper adjustment of vertical, horizontal, and intensity controls for a usable, on-screen display after the button is released.

... Versatile, Simplified Sweep Operation. Single, normal, and free run modes of sweep operation are sufficiently flexible for complex measurements, yet operation is simple and straightforward. Trigger coupling, slope, source, and level can all be selected by the operator. Automatic triggering is provided to minimize trigger adjustments. The amplitude, frequency, or dc level of the triggering signal may change over a wide range without affecting synchronization or requiring adjustment of the level control. The single sweep mode has a push-to-reset control. For very long sweep times where the information of interest occurs near the start of the display, the operator may reset the sweep from any point rather than waiting for its normal termination and reset.

... Convenient Controls. The front panel layout and logical grouping of related controls simplifies operation

of the 1200-series scopes. Controls are easy to set, but are not subject to accidental movement from the desired setting. Controls, switches, and connectors for vertical, horizontal, and CRT display are located in a logical pattern. The identical pattern is repeated on all models, with addition of the display control between vertical controls on dual trace models, and the bandwidth limit switch on 100 $\mu\text{V}/\text{div}$ deflection factor models. No reorientation or retraining is required when more than one instrument version is being used in the same area.

... X-Y Displays. Displays comparing inputs on the horizontal and vertical axes are easily obtained. On single trace models, the external horizontal input, with four deflection factors, is used to display a signal versus the vertical input signal. Dual channel models include a mode to display channel A signal versus channel B signal on identical amplifiers with less than 1° phase shift up to 100 kHz.

COMMON MODE CHARACTERISTICS

Common mode rejection up to 100,000 to 1 (100 dB) is available on models with the 100 $\mu\text{V}/\text{div}$ deflection factor. This CMR applies for a common mode signal up to ± 10 volts over a dc to 10 kHz frequency range. This is a valuable combination of high CMR and high common mode signal, previously unavailable in low frequency oscilloscopes. For example, a common mode signal of 10 volts would be reduced to only 100 microvolts. No time-consuming front panel CMR adjustments are necessary. On the less-sensitive 5 mV models, CMR is 50 dB on the most sensitive range for a common mode signal up to ± 3 volts.

DC-COUPLED Z-AXIS AMPLIFIER

A dc-coupled Z-axis amplifier is a standard feature on all 1200-series scopes. It allows CRT intensity modulation with signals up to +5 V for displays of normal intensity. This permits a display of more information by using contrasts in intensity (gray scales). This dc-coupled amplifier is well-suited for computer information displays. On an application where the input signal duty cycle changes, the Z-axis input may be externally programmed to maintain constant intensity for any frequency.

EXTERNAL HORIZONTAL INPUT

External horizontal inputs can be applied to a front panel connector, adding to over-all convenience and versatility. On single trace versions, the external horizontal input can be used to obtain X-Y displays. On dual trace models, the external horizontal input can be used to obtain dual X-Y displays or, in a specialized application, to make swept frequency measurements, observing detected input and output on the two vertical channels.

SPECIAL MODIFICATIONS

Special modifications to provide oscilloscopes for specific applications are also available.

The 1200-series oscilloscopes can be readily adapted to many physical and electrical configurations. The mechanical design and construction (see Figure 4) provides the versatility for modifications ranging from special paint or different handles on rack models to circuit changes or additions.

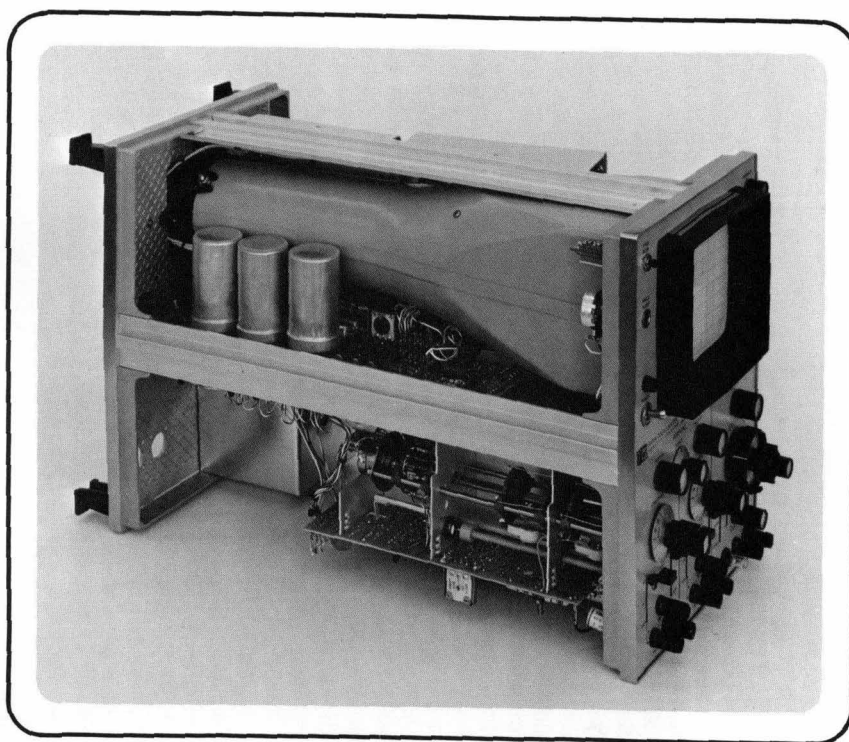


Figure 4. 1200-series instruments in either bench or rack configuration are of rugged design and construction. This permits versatility for special requirement modifications.

Refer to the Specifications for modifications or options which have already been established. Consult your local HP Field Engineer for assistance on your special requirements.

HEWLETT-PACKARD SERVICE

For almost three decades users of measurement instrumentation have relied on the performance of HP's products. HP firmly adheres to a philosophy of continuing its obligation to you beyond the delivery date of your new instrument.

The new 1200-series oscilloscopes have been designed with improved performance and ease of service as primary requirements. More than 100 HP field offices in North America and throughout the world provide rapid, convenient service for these and all HP instruments. Consult the list of field offices on the inside back cover.

DUAL TRACE OSCILLOSCOPES

MODELS 1200A/AR AND 1205A/AR

Models 1200A/AR and 1205A/AR Dual Trace Oscilloscopes have the same basic display capabilities, but differ in deflection factor and the related common mode and noise characteristics.

Both the Model 1200A/AR and the Model 1205A/AR include many improved operation features which are standard on the entire 1200-series. These include: 500 kHz bandwidth, all-range differential inputs, dc-coupled Z-axis, single sweep, auto and amplitude selection triggering, external horizontal input, and all solid state circuitry.

Dual trace 1200-series oscilloscopes provide a variety of useful display modes. Displays can be obtained of either channel alone, both channels together, or one channel versus the other for X-Y comparisons.

Two signals can be compared simultaneously and directly by automatic switching between traces in either Chop or Alternate modes. In Chop operation, switching occurs at approximately 100 kHz between traces during the sweep; either internal time base or an external horizontal input signal can be used. In Alternate operation, switching occurs alternately between channels at the end of each sweep.

In Chop or Alternate operation, internal triggering of the start of the sweep is always derived from the signal on Channel A. This technique maintains the time relationship between the two vertical input signals, eliminating a shortcoming inherent in some previous dual trace oscilloscopes.

Dual trace displays are useful for viewing both the input and output signals of amplifiers, filters, and other networks

to determine transmission or rejection characteristics. In vibration studies a rapid analysis is possible since the vibration pattern and the driving source waveform can be displayed at the same time. With a sweeper signal driving the external horizontal input, the oscilloscope functions as a swept frequency indicator; one vertical channel monitors the detected output signal while the other channel monitors the detected input signal.

The Channel A vs. B mode, selected by a front panel control, provides convenient X-Y displays of two variables. The two vertical amplifiers are identical, with less than 1° phase shift up to 100 kHz. This is useful for measurement checks such as: phase shift in servo systems; phase difference of push-pull outputs; and time delays (phase shifts) in low frequency amplifiers. Figure 5 illustrates the phase shift characteristic of the vertical amplifiers.

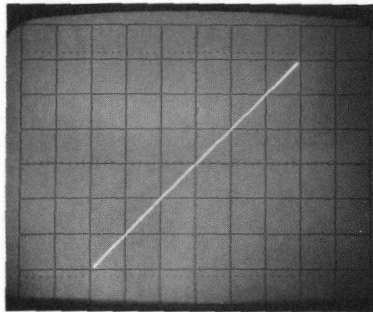
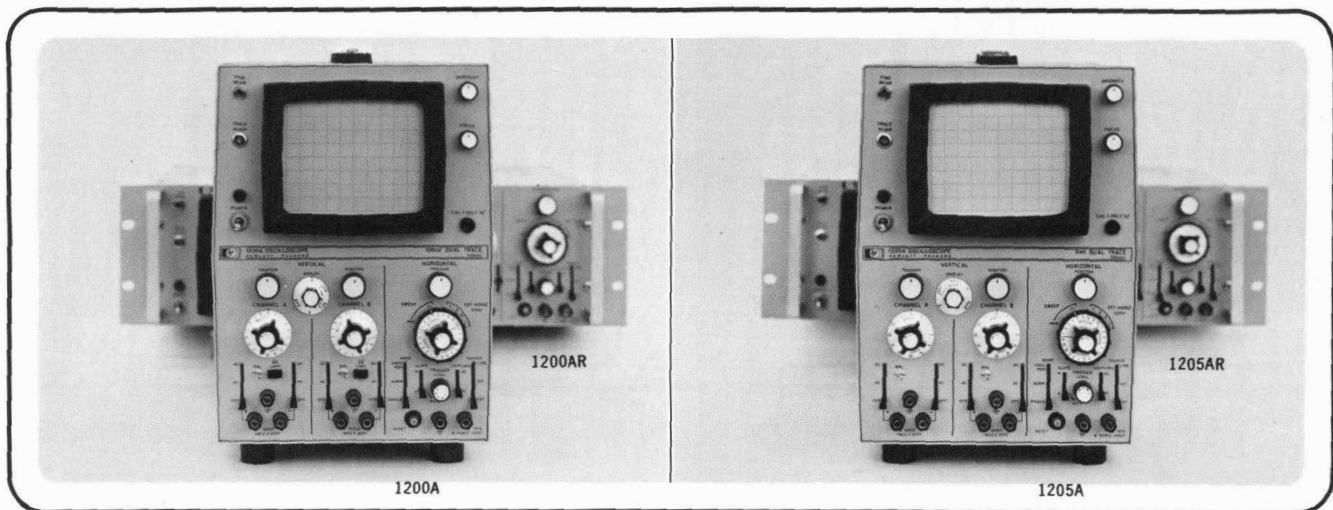


Figure 5. For convenient Channel A vs. B X-Y displays, phase shift is less than 1° to 100 kHz. Photo shows display obtained from same 100 kHz input signal applied to both vertical channels.



MODEL 1200A/AR

Model 1200A/AR provides the capability to accurately measure and analyze low level signals. In addition to 100 $\mu\text{V}/\text{div}$ deflection factor, both vertical amplifiers have very low drift of typically less than 50 μV per hour and low noise of less than 50 μV pk-pk (refer to Figures 1 and 2).

The low drift, very stable characteristics of the Model 1200A/AR result in simpler operation and in less frequent circuit calibration. Operation is so stable that the balance control requires only infrequent adjustment and hence is now a front panel screwdriver control. With this high degree of stability, ac-coupling in the amplifier is no longer necessary as a means of eliminating drift, again simplifying operating controls.

Model 1200A/AR has a common mode rejection of 100,000 to 1 (100 dB) on the most sensitive deflection factor of .1 mV/div, over a dc to 10 kHz frequency range. This high CMR is made even more useful by the ± 10 volts common mode signal specification on the more sensitive deflection factors, a combination not previously available in low frequency oscilloscopes. High CMR eliminates concern about inaccuracies caused by voltages induced in differential signal leads.

There are many measurement areas for which the Model

1200/AR is well-suited. These include: audio systems, biological research, circuit design, drift measurement, filter design, phase measurement, servo design, strain gage and transducer monitoring, educational instruction, and X-Y displays.

MODEL 1205A/AR

Model 1205A/AR is a highly portable, reliable dual trace oscilloscope for low frequency applications which do not require the higher sensitivity and common mode characteristics of the Model 1200A/AR.

Many systems applications are met satisfactorily by the economy and versatility offered in the Model 1205A/AR.

Deflection factors are provided from 5 mV/div to 20 V/div with a vernier extending maximum deflection factor to 50 V/div. At least 50 dB common mode rejection with a ± 3 volt common mode signal is specified for the six most sensitive deflection factors.

Measurement applications for the Model 1205A/AR include: circuit design, component testing, computer information display, filter design, phase measurement, research and educational laboratories, swept frequency indicator, timing measurement, ultrasonic systems, and X-Y displays.

SPECIFICATIONS

MODEL 1200A/AR SPECIFICATIONS

VERTICAL AMPLIFIERS

DEFLECTION FACTOR

RANGES: From 0.1 mV/div to 20 V/div (17 positions) in 1, 2, 5 sequence. $\pm 3\%$ accuracy with Vernier in calibrated position.

VERNIER: Continuously variable between all ranges; extends maximum deflection factor to at least 50 V/div.

BANDWIDTH

DC to 500 kHz with a maximum rise time of 0.7 μ sec. 2 Hz to 500 kHz when ac-coupled. Front panel control provided to reduce upper frequency limit to approx. 50 kHz.

NOISE

Less than 50 μ V peak-to-peak at full bandwidth.

INPUT

Differential or single-ended on all ranges, selectable by front panel control.

COMMON MODE

FREQUENCY: DC to 10 kHz on all ranges.

REJECTION: 100 dB (100,000 to 1) on 0.1 mV/div range, decreasing by less than 20 dB per decade of deflection factor to at least 40 dB on the 0.2 V/div range; CMR is at least 30 dB on the 0.5 V/div to 20 V/div ranges.

VOLTAGE: Common mode signal up to ± 10 V (dc + peak ac) on 0.1 mV/div to 0.2 V/div ranges; ± 400 V (dc + peak ac) on all other ranges.

MODEL 1205A/AR SPECIFICATIONS

VERTICAL AMPLIFIERS

DEFLECTION FACTOR

RANGES: From 5 mV/div to 20 V/div (12 positions) in 1, 2, 5 sequence. $\pm 3\%$ accuracy with Vernier in calibrated position.

VERNIER: Continuously variable between all ranges; extends maximum deflection factor to at least 50 V/div.

BANDWIDTH

DC to 500 kHz with a maximum rise time of 0.7 μ sec. 2 Hz to 500 kHz when ac-coupled.

INPUT

Differential or single-ended on all ranges, selectable by front panel control.

COMMON MODE

FREQUENCY: DC to 10 kHz on all ranges.

REJECTION: 50 dB on 5 mV/div to 0.2 V/div ranges; CMR is at least 30 dB on 0.5 V/div to 20 V/div ranges.

VOLTAGE: Common mode signal up to ± 3 V (dc + peak ac) on 5 mV/div to 0.2 V/div ranges; ± 300 V (dc + peak ac) on all other ranges.

FOLLOWING SPECIFICATIONS APPLY TO BOTH MODEL 1200A/AR AND MODEL 1205A/AR

VERTICAL AMPLIFIERS (continued)

INPUT COUPLING

Front panel selection of DC, AC, or Off for both + and - inputs.

INPUT RC

1 megohm shunted by 45 pF; constant on all ranges.

MAXIMUM INPUT

± 400 volts (dc + peak ac).

DISPLAY

1. Channel A.
 2. Channel B.
 3. Channels A and B (either Chop or Alternate).
 4. Channels A and B vs. horizontal input (Chop only).
 5. Channel A vs. B (A-vertical, B-horizontal).
- Chop display frequency is approx. 100 kHz.

INTERNAL TRIGGER

By Channel A signal for A, Chop, and Alternate displays. By Channel B signal for B display.

ISOLATION

Greater than 80 dB between channels at 500 kHz, with input connectors shielded.

PHASE SHIFT

(For Channel A vs. B) Less than 1° , to 100 kHz (Verniers in calibrated position).

TIME BASE

SWEEP

RANGES: From 1 μ sec/div to 5 sec/div (21 positions) in 1, 2, 5 sequence. $\pm 3\%$ accuracy with Vernier in calibrated position.

VERNIER: Continuously variable between ranges; extends slowest sweep speed to at least 12.5 sec/div.

X10 MAGNIFIER

Indicates magnified sweep speed directly with $\pm 5\%$ accuracy.

AUTOMATIC TRIGGERING

Baseline is displayed in absence of an input signal.

INTERNAL: 50 Hz to above 500 kHz on most signals causing 0.5 division or more vertical deflection. Triggering on line frequency also selectable.

EXTERNAL: 50 Hz to above 1 MHz on most signals at least 0.2 volt peak-to-peak.

TRIGGER SLOPE: Positive or negative slope on internal, external or line trigger signals.

AMPLITUDE SELECTION TRIGGERING

INTERNAL: DC to above 500 kHz on signals causing 0.5 division or more vertical deflection.

EXTERNAL: DC to 1 MHz on signals at least 0.2 volt peak-to-peak. Input impedance is 1 megohm shunted by approx. 20 pF.

TRIGGER LEVEL AND SLOPE: Internal, at any point on vertical waveform displayed; or continuously variable from +100 V to -100V on either slope of the external trigger signal.

form; or continuously variable from +100 V to -100 V on either slope of the external trigger signal.

TRIGGER COUPLING: DC or AC for external, line, or internal triggering. Lower ac cutoff is 1.6 Hz for external; 5 Hz for internal.

SINGLE SWEEP

Selectable by front panel switch. Reset pushbutton with armed indicator light.

FREE RUN

Selectable by front panel switch.

MAXIMUM INPUT

± 350 volts (dc + peak ac).

HORIZONTAL AMPLIFIER

BANDWIDTH

DC to 300 kHz. With input ac-coupled, low frequency cutoff is 1.6 Hz.

DEFLECTION FACTOR

RANGES: 0.1 V/div, 0.2 V/div, 0.5 V/div, and 1 V/div.

VERNIER: Continuously variable between ranges; extends maximum deflection factor to at least 2.5 V/div.

INPUT

Single-ended.

INPUT RC

1 megohm shunted by approx. 20 pF.

MAXIMUM INPUT

± 350 volts (dc + peak ac).

GENERAL

CATHODE-RAY TUBE

TYPE: Mono-accelerator, 3,000-volt accelerating potential; P31 phosphor standard (see Modifications for other phosphors); etched safety glass faceplate reduces glare.

GRATICULE: 8 x 10 divisions; parallax-free internal graticule; 0.2 subdivision markings on horizontal and vertical major axes. 1 div = 1 cm.

INTENSITY MODULATION: +5-volt signal blanks trace of normal intensity; +12-volt signal blanks any intensity. DC-coupled input on rear panel; amplifier rise time approx. 200 ns; input resistance is 10 k ohms.

CALIBRATOR

TYPE: Line frequency square wave.

OUTPUT: 1 volt $\pm 1.5\%$, front panel connector.

BEAM FINDER

Push button to locate beam on CRT screen regardless of setting of vertical, horizontal, and intensity controls.

DIMENSIONS

CABINET: 8 5/16 in. wide x 11 3/4 in. high x 18 11/16 in. deep (211,1 x 298,5 x 474,4 mm).

RACK: Refer to outline drawing on Page 9.

WEIGHT

CABINET: net, 25 lbs (11,3 kg); shipping, 34 1/2 lbs (15,6 kg).

RACK: net 22 1/2 lbs (10,2 kg); shipping, 35 lbs (15,8 kg).

POWER

115 or 230 volts $\pm 10\%$; 47 to 440 Hz; approx. 33 watts.

PRICE

Model 1200A/AR, \$990.00.

Model 1205A/AR, \$875.00.

MODIFICATIONS

CRT PHOSPHORS (specify by phosphor number): P31 standard. P2, P7 (with amber filter), and P11 available at no extra cost.

OPTIONS AND SPECIALS: Check with HP Sales Office for latest information.

SINGLE TRACE OSCILLOSCOPES

MODELS 1202A/AR AND 1206A/AR

Single trace Models 1202A/AR and 1206A/AR include all the 1200-series improved performance features, but differ in basic deflection factor and related common mode and noise characteristics.

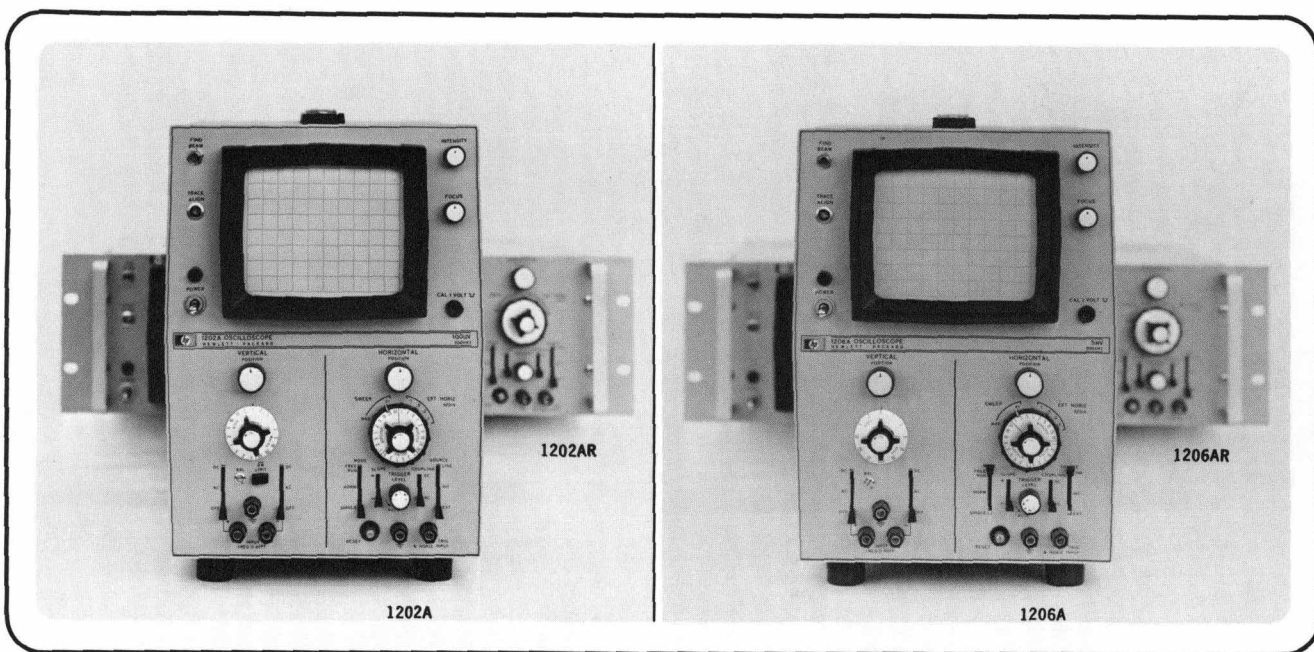
Models 1202A/AR and 1206A/AR have 500 kHz bandwidth, all-range differential input, dc-coupled Z-axis, single sweep, auto and amplitude selection triggering, external horizontal input, and all solid state circuitry.

X-Y displays of two variables can be obtained by use of the external horizontal input. Bandwidth for the horizontal

amplifier is 300 kHz. There are four horizontal deflection factors: .1 V/div, .2 V/div, .5 V/div, and 1 V/div. A vernier extends the maximum deflection factor to 2.5 V/div.

The horizontal deflection system time base provides a wide range of sweep speeds from 1 μ sec/div to 5 sec/div. The vernier provides continuous coverage between ranges and extends the slowest sweep speed to 12.5 sec/div.

With solid state portability, reliability, and stability, Models 1202A/AR and 1206A/AR can fulfill any low frequency measurement application requiring only single trace capability.



MODEL 1202A/AR

Model 1202A/AR provides the capability to accurately measure and analyze low level signals. Its 100 μ V/div vertical amplifier has very low drift of typically less than 50 μ V per hour and low noise of less than 50 μ V pk-pk (refer to Figures 1 and 2).

The low drift, very stable characteristics of the Model 1202A/AR result in simpler operation and in less frequent circuit calibration. Operation is so stable that the balance control requires only infrequent adjustment and hence is now a front panel screwdriver control. With this high degree of stability, ac-coupling in the amplifier is no longer necessary as a means of eliminating drift, again simplifying operating controls.

Model 1202A/AR has a common mode rejection of 100,000 to 1 (100 dB) on the most sensitive deflection factor of .1 mV/div, over a dc to 10 kHz frequency range. This high CMR is made even more useful by the ± 10 volts common mode signal specification on the more sensitive deflection factors, a combination not previously available in low frequency oscilloscopes. High CMR eliminates concern about inaccuracies caused by voltages induced in differential signal leads.

Measurement areas for which the Model 1202A/AR is well-suited include: audio systems, biological research, circuit design, drift measurement, remote indicator, servo design, strain gage and transducer monitoring, tuner alignment, and ultrasonic systems.

MODEL 1206A/AR

Model 1206A/AR is a highly portable, reliable general purpose oscilloscope. It is a versatile instrument for single channel applications not requiring the greater sensitivity and common mode characteristics of the Model 1202A/AR.

Many systems applications are met satisfactorily by the economy and versatility offered in the Model 1206A/AR.

Deflection factors are provided from 5 mV/div to 20 V/div with a vernier extending maximum deflection factor to 50 V/div. At least 50 dB common mode rejection with a ± 3 volt common mode signal is specified for the six most sensitive deflection factors.

Measurement applications for the Model 1206A/AR include: audio systems, circuit design, component testing, computer information display, system monitoring, research and educational laboratories, timing measurements, and ultrasonic systems.

SPECIFICATIONS

MODEL 1202A/AR SPECIFICATIONS

VERTICAL AMPLIFIER

DEFLECTION FACTOR

RANGES: From 0.1 mV/div to 20 V/div (17 positions) in 1, 2, 5 sequence. $\pm 3\%$ accuracy with Vernier in calibrated position.

VERNIER: Continuously variable between all ranges; extends maximum deflection factor to at least 50 V/div.

BANDWIDTH

DC to 500 kHz with a maximum rise time of 0.7 μ sec. 2 Hz to 500 kHz when ac-coupled. Front panel control provided to reduce upper frequency limit to approx. 50 kHz.

NOISE

Less than 50 μ V peak-to-peak at full bandwidth.

INPUT

Differential or single-ended on all ranges, selectable by front panel control.

COMMON MODE

FREQUENCY: DC to 10 kHz on all ranges.

REJECTION: 100 dB (100,000 to 1) on 0.1 mV/div range, decreasing by less than 20 dB per decade of deflection factor to at least 40 dB on the 0.2 V/div range; CMR is at least 30 dB on the 0.5 V/div to 20 V/div ranges.

VOLTAGE: Common mode signal up to ± 10 V (dc + peak ac) on 0.1 mV/div to 0.2 V/div ranges; ± 400 V (dc + peak ac) on all other ranges.

MODEL 1206A/AR SPECIFICATIONS

VERTICAL AMPLIFIER

DEFLECTION FACTOR

RANGES: From 5 mV/div to 20 V/div (12 positions) in 1, 2, 5 sequence. $\pm 3\%$ accuracy with Vernier in calibrated position.

VERNIER: Continuously variable between all ranges; extends maximum deflection factor to at least 50 V/div.

BANDWIDTH

DC to 500 kHz with a maximum rise time of 0.7 μ sec. 2 Hz to 500 kHz when ac-coupled.

INPUT

Differential or single-ended on all ranges, selectable by front panel control.

COMMON MODE

FREQUENCY: DC to 10 kHz on all ranges.

REJECTION: 50 dB on 5 mV/div to 0.2 V/div ranges; CMR is at least 30 dB on 0.5 V/div to 20 V/div ranges.

VOLTAGE: Common mode signal up to ± 3 V (dc + peak ac) on 5 mV/div to 0.2 V/div ranges; ± 300 V (dc + peak ac) on all other ranges.

FOLLOWING SPECIFICATIONS APPLY TO BOTH MODEL 1202A/AR AND MODEL 1206A/AR

VERTICAL AMPLIFIERS (continued)

INPUT COUPLING

Front panel selection of DC, AC, or Off for both + and - inputs.

INPUT RC

1 megohm shunted by 45 pF; constant on all ranges.

MAXIMUM INPUT

± 400 volts (dc + peak ac).

TIME BASE

SWEEP

RANGES: From 1 μ sec/div to 5 sec/div (21 positions) in 1, 2, 5 sequence. $\pm 3\%$ accuracy with Vernier in calibrated position.

VERNIER: Continuously variable between ranges; extends slowest sweep speed to at least 12.5 sec/div.

X10 MAGNIFIER

Indicates magnified sweep speed directly with $\pm 5\%$ accuracy.

AUTOMATIC TRIGGERING

Baseline is displayed in absence of an input signal.

INTERNAL: 50 Hz to above 500 kHz on most signals causing 0.5 division or more vertical deflection. Triggering on line frequency also selectable.

EXTERNAL: 50 Hz to above 1 MHz on most signals at least 0.2 volt peak-to-peak.

TRIGGER SLOPE: Positive or negative slope on internal, external or line trigger signals.

AMPLITUDE SELECTION TRIGGERING

INTERNAL: DC to above 500 kHz on signals causing 0.5 division or more vertical deflection.

EXTERNAL: DC to 1 MHz on signals at least 0.2 volt peak-to-peak. Input impedance is 1 megohm shunted by approx. 20 pF.

TRIGGER LEVEL AND SLOPE: Internal, at any point on vertical waveform displayed; or continuously variable from +100 V to -100 V on either slope of the external trigger signal.

TRIGGER COUPLING: DC or AC for external, line, or internal triggering. Lower ac cutoff is 1.6 Hz for external; 5 Hz for internal.

SINGLE SWEEP

Selectable by front panel switch. Reset pushbutton with armed indicator light.

FREE RUN

Selectable by front panel switch.

MAXIMUM INPUT

± 350 volts (dc + peak ac).

HORIZONTAL AMPLIFIER

BANDWIDTH

DC to 300 kHz. With input ac-coupled, low frequency cutoff is 1.6 Hz.

DEFLECTION FACTOR

RANGES: 0.1 V/div, 0.2 V/div, 0.5 V/div, and 1 V/div.

VERNIER: Continuously variable between ranges; extends maximum deflection factor to at least 2.5 V/div.

INPUT

Single-ended.

INPUT RC

1 megohm shunted by approx. 20 pF.

MAXIMUM INPUT

± 350 volts (dc + peak ac).

GENERAL

CATHODE-RAY TUBE

TYPE: Mono-accelerator, 3,000-volt accelerating potential; P31 phosphor standard (see Modifications for other phosphors); etched safety glass faceplate reduces glare. GRATICULE: 8 x 10 divisions; parallax-free internal graticule; 0.2 subdivision markings on horizontal and vertical major axes. 1 div = 1 cm.

INTENSITY MODULATION: +5-volt signal blanks trace of normal intensity; +12-volt signal blanks any intensity. DC-coupled input on rear panel; amplifier rise time approx. 200 ns; input resistance is 10 k ohms.

CALIBRATOR

TYPE: Line frequency square wave.

OUTPUT: 1 volt $\pm 1.5\%$, front panel connector.

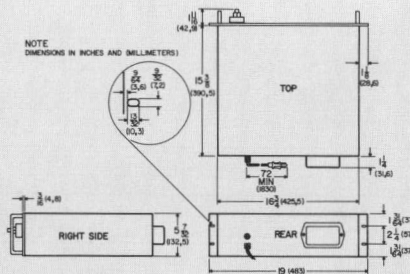
BEAM FINDER

Push button to locate beam on CRT screen regardless of setting of vertical, horizontal, and intensity controls.

DIMENSIONS

CABINET: 8 5/16 in. wide x 11 3/4 in. high x 18 11/16 in. deep (211,1 x 298,5 x 474,4 mm).

RACK: Refer to outline drawing.



WEIGHT

CABINET: net 23 1/2 lbs (10,6 kg); shipping, 33 lbs (15,0 kg).

RACK: net, 21 lbs (9,5 kg); shipping, 33 1/2 lbs (15,2 kg).

POWER

115 or 230 volts $\pm 10\%$; 47 to 440 Hz; approx. 33 watts.

PRICE

Model 1202A/AR, \$790.00.

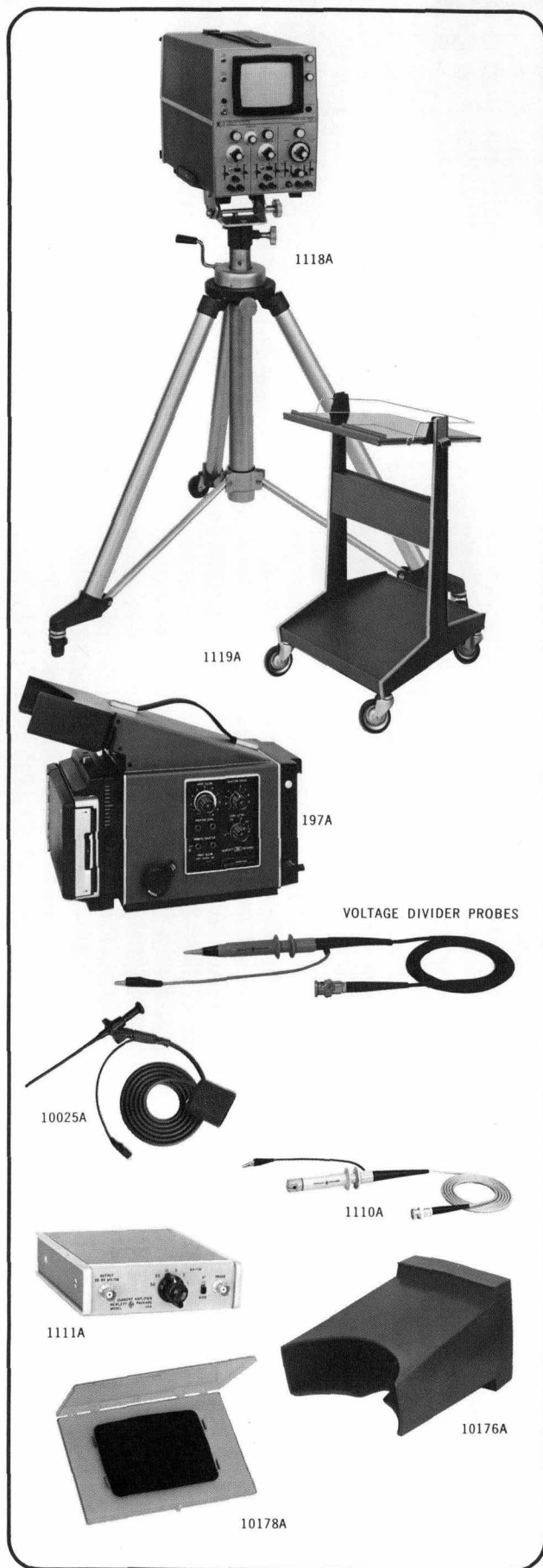
Model 1206A/AR, \$715.00.

MODIFICATIONS

CRT PHOSPHORS (specify by phosphor number): P31 standard. P2, P7 (with amber filter), and P11 available at no extra cost.

OPTIONS AND SPECIALS: Check with Hp Sales Office for latest information.

1200-SERIES ACCESSORIES



TESTMOBILES

MODEL 1118A TESTMOBILE for the 1200-series cabinet models provides adjustable heights from 32 to 42 inches, 360° rotation, and instrument tilt from +45° to -45°. Price, \$95.

MODEL 1119A TESTMOBILE for the 1200-series rack models, provides adjustable tilt and the optional storage cabinet provides room for large accessories and a drawer for cables and adapters. Price, 1119A Testmobile with 10479A Tilt Tray, \$145; 10480A Storage Cabinet, \$35.

MODEL 1117B TESTMOBILE (not pictured) accepts rack models and has adjustable tilt tray on top, making it a mobile test station. Price, \$185.

CAMERA AND CAMERA ACCESSORIES

MODEL 197A CAMERA provides a convenient way to accurately record oscilloscope displays. Model 197A has an electronic shutter, adjustable object-to-image ratio from 0.7:1 to 1:1, f/1.9 lens, UV light for graticule illumination, and choice of camera backs. See Model 197A Technical Data for additional information on accessories and options. Price, \$540.

VOLTAGE DIVIDER PROBES

The high impedance input of these probes reduces loading of oscilloscopes on the circuit under test, and the probes provide attenuation for large signals. The probes may be quickly and accurately compensated for optimum step response.

Probe	Atten.	Bandwidth (0.5 dB)	Resist-ance (Meg-ohms)	Capaci-tance	Div. Accu-racy	Peak Input Volts	Approx. Over-all Length	Approx. Rise Time	Price
10001A or C*	10:1	dc to 30 mc	10	20 pf	2%	600	5'	5 nsec	\$30.00
10001B or D*	10:1	dc to 30 mc	10	20 pf	2%	600	10'	5 nsec	35.00
10002A or C*	50:1	dc to 30 mc	9	2.5 pf	3%	1000	5'	5 nsec	40.00
10002B or D*	50:1	dc to 30 mc	9	5 pf	3%	1000	10'	5 nsec	40.00
10003A or B*	10:1	dc to 40 mc	10	10 pf	2%	600	4'	3 nsec	30.00

* These probes have black identification boots; the others have red boots.

VOLTAGE DIVIDER PROBES

STRAIGHT-THROUGH PROBE

MODEL 10025A PROBE is a thin, flexible probe with push-button pincer jaws to provide a straight-through connection to difficult access test points. Price, \$15.

PROBE TIP KIT

MODEL 10035A PROBE TIP KIT provides maximum versatility when used with the voltage divider probe. The kit contains a pincer jaw, banana tip, pin tip, hook tip, and spring tip. Price, \$5.

CURRENT PROBE AND AMPLIFIER

MODEL 1110A PROBE AND MODEL 1111A AMPLIFIER permit direct measurement of current from 50 Hz to 20 MHz. Sensitivity is 1 mA/cm to 5 A/cm. Price, 1110A (usable separately, 1700 Hz to 40 MHz), \$100; 1111A, \$160.

VIEWING HOOD

MODEL 10176A VIEWING HOOD is a face-fitting, vinyl mask to aid in viewing low-intensity displays. Price, \$7.

CONTRAST IMPROVEMENT SCREEN

MODEL 10178A CONTRAST IMPROVEMENT SCREEN (and RFI filter) fits over CRT face to aid viewing of low intensity displays. Price, \$5.

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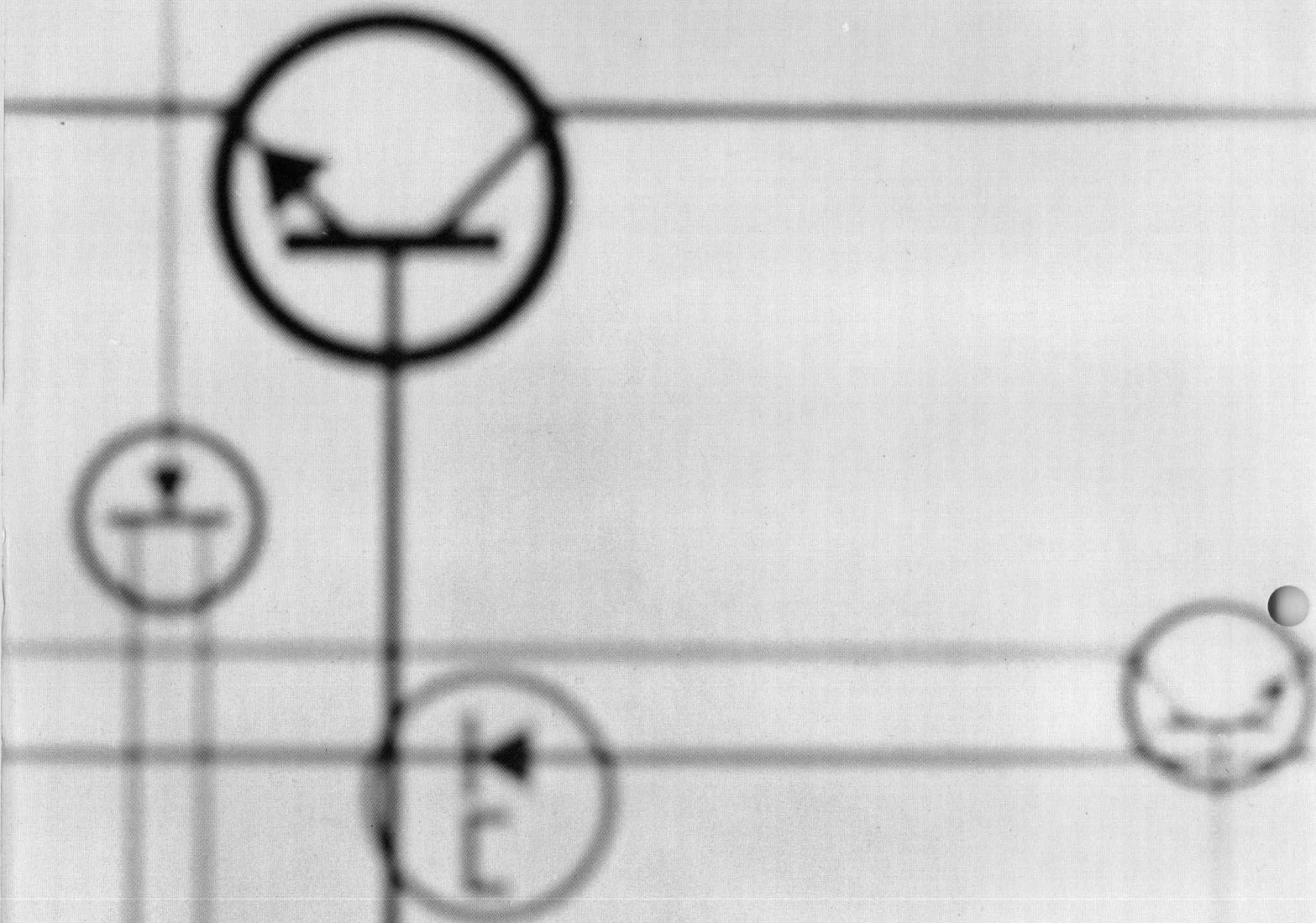
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