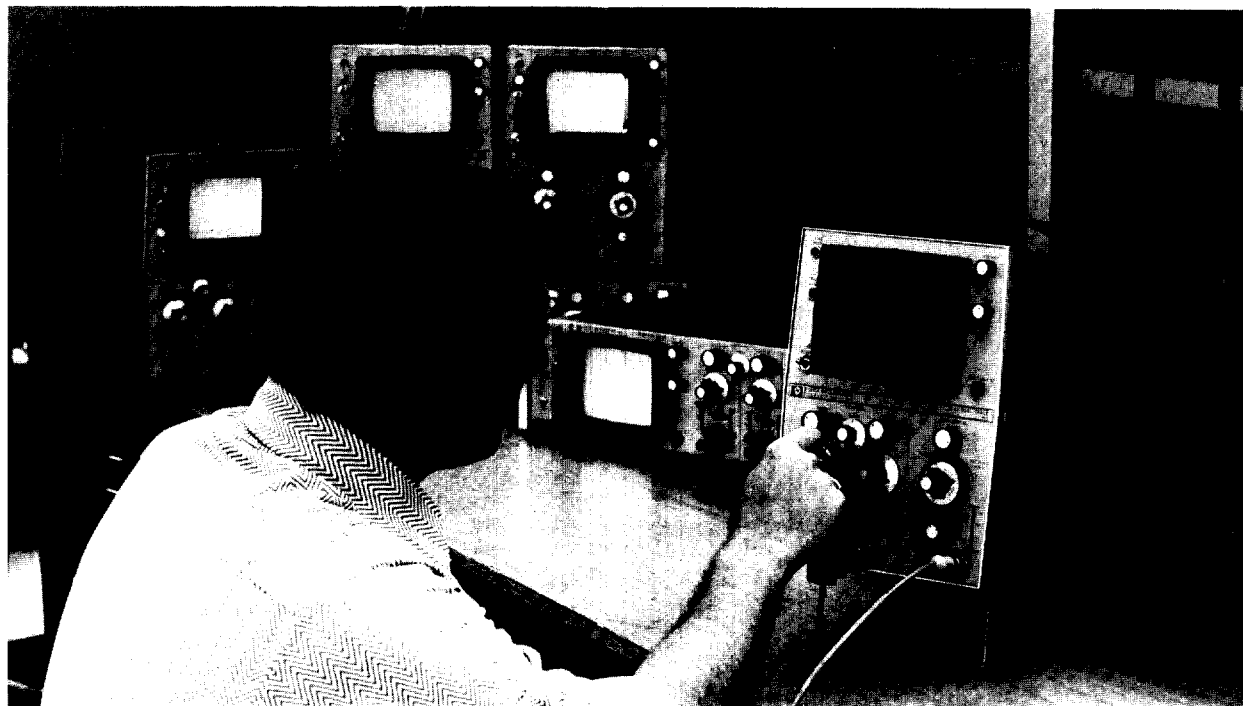


500 kHz, 7 MHz BANDWIDTH
Solid State—Low drift
1200 Series



OSCILLOSCOPES



1200 Series

1200 Series Description

The 1200 series 500 kHz and 7 MHz oscilloscopes provide the most versatile, general purpose instruments for today's low frequency applications. These oscilloscopes are all solid-state, light-weight, reliable, stable, which makes them ideal for a variety of applications. The many features of these scopes provide accurate, versatile, easy-to-obtain and read displays. Logical arrangement of controls, a beam finder to locate off-screen displays, and automatic triggering make operation easy, which is important to persons in production line testing, system applications, and classroom or laboratory instruction.

The wide variety of instruments assure an oscilloscope that will match your measurement requirement. Basic choices for specialized or general purpose, low frequency measurement applications are: single or dual channel 500 kHz displays, 5 mV/div or 100 μ V/div deflection factors, standard or storage CRTs, and a 7 MHz, dual channel, 5 mV/div model—all available in cabinet or rack configurations. In addition, these lightweight instruments allow measurements in remote or difficult access areas such as: aircraft flight lines, communications field sites, or weapons test sites.

The 500 kHz models provide balanced inputs on all ranges and on each channel which is useful in low level audio applications. An additional feature on the dual channel models is an A vs. B mode, which displays channel A signal versus channel B signal through identical amplifiers with less than 1° phase shift up to 100 kHz.

Field effect transistors at the vertical amplifier input provide stable, low-drift operation virtually free of annoying trace

shifts caused by temperature changes, shock, and vibration. Long term stability also means less frequent calibration and lower periodic maintenance costs.

Rack versions (designated by a B, "1200B," following the model number) are only 5¼ inches high which saves valuable rack space and allows more instruments to be included in a rack for a more versatile system. Since these instruments are complete oscilloscopes, they offer the system user a read-out device and a convenient calibration and service tool.

In applications with displays that occur at slow rates, a storage/variable persistence CRT is available that will eliminate the annoying flicker or retain single occurrence traces. This longer persistence is useful when displaying slowly moving bio-medical phenomena and applications where the trace or display information must persist after the excitation is removed.

Single, normal, and free run modes of sweep operation are flexible enough for complex measurements, yet operation is simple and straight forward. The sweep time and magnifier controls provide a direct reading of a magnified sweep which reduces the chance of error and time for measurements.

Specification grouping

Due to the similarity of these oscilloscopes, the specifications have been grouped to reduce redundancy and increase usability. The layout is as follows: Cathode-Ray Tube (standard and storage); vertical amplifiers in sequence of 500 kHz, 100 μ V/div and 5 mV/div, and 7 MHz, 5 mV/div; Time Base, common to all 1200 oscilloscopes; followed by combined general information.

OSCILLOSCOPES



STANDARD & STORAGE CRT 500 kHz, 100 μ V/div 1200 Series

1200 Series Oscilloscope Selection Chart

Feature	1200A/B*	1201A/B*	1202A/B*	1205A/B*	1206A/B*	1217A/B*
Deflection Factor/div	0.1 mV to 20 V	0.1 mV to 20 V	0.1 mV to 20 V	5 mV to 20 V	5 mV to 20 V	5 mV to 20 V
Bandwidth	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz	7 MHz
Number of Traces	2	2	1	2	1	2
Differential Input	all ranges	all ranges	all ranges	all ranges	all ranges	all ranges (B-A)
CMRR	100 dB	100 dB	100 dB	50 dB	50 dB	30 dB
Common-mode Signal Maximum	± 10 V	± 10 V	± 10 V	± 3 V	± 3 V	30 div
Phase Shift (A vs B)	1° to 100 kHz	1° to 100 kHz	—	1° to 100 kHz	—	—
Sweep Speeds/div	1 μ s to 5 s	1 μ s to 5 s	1 μ s to 5 s	1 μ s to 5 s	1 μ s to 5 s	1 μ s to 5 s
Ext. Horiz. Input	yes	yes	yes	yes	yes	yes
DC-coupled Z-axis	yes	yes	yes	yes	yes	yes
Variable Persistence and storage	no	yes	no	no	no	no
Price	\$1050	\$1900	\$790	\$895	\$715	\$1175

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

Specifications, 1200 Series

Cathode-ray tube and controls

Standard CRT

- Type:** mono-accelerator, 3000 V accelerating potential; P31 phosphor standard (refer to options for other phosphors).
Graticule: 8 x 10 div internal graticule, 0.2 subdivision markings on horizontal and vertical major axes. 1 div = 1 cm.
Beam finder: returns trace to CRT screen regardless of setting of horizontal, vertical, or intensity controls.
Intensity modulation: +2 V signal blanks trace of normal intensity; +8 V signal blanks any intensity trace. DC-coupled rear panel input; amplifier risetime, approx 200 ns; input R, 5 k ohms.

Variable persistence/storage CRT

1201A/B

- Type:** post-accelerator, variable persistence storage tube; 10.5 k V accelerating potential; aluminized P31 phosphor.
Graticule: 8 x 10 div internal graticule. 0.2 subdivision markings on major axes. 1 div = 0.95 cm. Front panel recessed screwdriver adjustment aligns trace with graticule.
Intensity modulation: +2 volt signal blanks trace of normal intensity. +8 volt signal blanks trace of any intensity. DC-coupled input on rear panel; amplifier risetime approx 200 ns; input R is approx 5 k ohms.
Beam finder: returns trace to CRT screen regardless of horizontal or vertical control settings.
Persistence/storage characteristics
 (Referenced to a centered 7 x 9 div area in STD mode and to a centered 6 x 8 div area in FAST mode.)
Persistence: conventional, natural persistence of P31 phosphor, approx 40 μ s. Variable, continuously variable from 0.2 s to >1 min. in STD mode; and from 0.2 s to 15 s in FAST mode.
Storage writing speed: STD mode, 20 div/ms; FAST mode, 0.5 div/ μ s.
Brightness: 100 foot-lamberts in write mode.
Storage time: STD writing speed, variable from approx 1 minute to >2 hours. Fast writing speed, variable from approx 15 s to >15 min.
Erase: pushbutton erasure takes approx 1.2 s. Write gun is blanked and sweep is reset until erasure is completed.

Vertical amplifiers

100 μ V, 500 kHz 1200A/B, 1201A/B, 1202A/B

- Bandwidth:** dc-coupled, dc to 500 kHz; ac-coupled, 2 Hz to 500 kHz.
Bandwidth limit switch: allows selection of upper bandwidth limit to approx 50 kHz or 500 kHz.
Risetime: 0.7 μ s max.
Deflection factor
Ranges: from 0.1 mV/div to 20 V/div (17 positions) in 1, 2, 5 sequence.
Attenuator accuracy: $\pm 3\%$ with vernier in calibrated position.
Vernier: continuously variable between all ranges; extends maximum deflection factor to at least 50 V/div.
Noise: <20 μ V measured tangentially at full bandwidth.
Input: differential or single-ended on all ranges, selectable.
Common mode
Frequency: dc to 10 kHz on all ranges.
Rejection ratio: 100 dB (100,000 to 1) with dc-coupled input on 0.1 mV/div range, decreasing by <20 dB per decade of deflection factor to at least 40 dB on the 0.2 V/div range; CMRR is at least 30 dB on the 0.5 V/div ranges.
Maximum signal: ± 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.
Input coupling: selectable AC; DC, or OFF for both + and - inputs.
Input RC: 1 megohm shunted by approx 45 pF; constant on all ranges.
Maximum input: ± 400 V (dc + peak ac).
Remaining vertical amplifier specifications apply only to dual channel models
Modes of operation: Channel A alone; Channel B alone; Channels A and B (either Chop or Alternate); Channels A and B vs. horizontal input (Chop only); Channel A vs. B (A-vertical, B-horizontal). Chop frequency is approx 100 kHz.
Internal trigger source: on Channel A signal for A, Chop, and Alternate displays. On Channel B signal for B display.
Isolation: >80 dB between channels at 500 kHz, with shielded input connectors.

SOLID STATE, ECONOMICAL

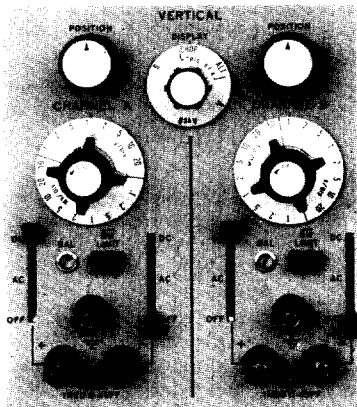
7 MHz, 500 kHz, 5 mV/div

1200 Series



OSCILLOSCOPES

Phase shift: (Channel A vs. B) $< 1^\circ$ to 100 kHz with verniers in calibrated position.



1201A/B
Vertical Amplifier

5 mV/div, 500 kHz

1205A/B, 1206A/B, 1207A/B

Bandwidth: dc-coupled, dc to 500 kHz; ac-coupled, 2 Hz to 500 kHz.

Risetime: 0.7 μ s max.

Deflection factor

Ranges: from 5 mV/div to 20 V/div (12 positions) in 1, 2, 5 sequence.

Attenuator accuracy: $\pm 3\%$ with vernier in calibrated position.

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

Input: differential or single-ended on all ranges, selectable.

Common mode

Frequency: dc to 10 kHz on all ranges.

Rejection ratio: 50 dB with dc-coupled input on 5 mV/div to 0.2 V/div ranges; CMRR is at least 30 dB on the 0.5 V/div to 20 V/div ranges.

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

Input coupling: selectable AC, DC or OFF for both + and - inputs.

Input RC: 1 megohm shunted by approx 45 pF; constant on all ranges.

Maximum input: ± 400 V (dc + peak ac).

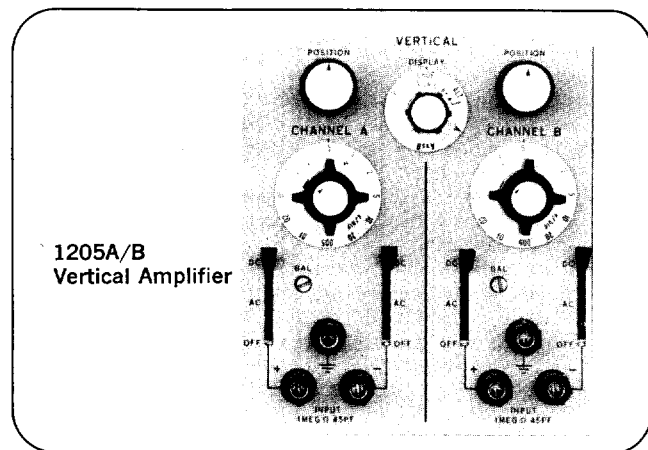
Remaining vertical amplifier specifications apply only to dual channel models

Modes of operation: Channel A alone; Channel B alone; Channels A and B (either Chop or Alternate); Channels A and B vs. horizontal input (Chop only); Channels A vs. B (A-vertical, B-horizontal). Chop frequency is approx 100 kHz.

Internal trigger source: on Channel A signal for A, Chop, and Alternate displays. On Channel B signal for B display.

Isolation: > 80 dB between channels at 500 kHz, with shielded input connectors.

Phase shift: (Channel A vs. B) $< 1^\circ$ to 100 kHz with verniers in calibrated position.



1205A/B
Vertical Amplifier

5 mV/div, 7 MHz

1217A/B

Bandwidth: dc-coupled, dc to 7 MHz; ac-coupled, 2 Hz to 7 MHz.

Risetime: 50 ns max.

Deflection factor

Ranges: from 5 mV/div to 20 V/div (12 positions) in 1, 2, 5 sequence.

Attenuator accuracy: $\pm 3\%$ with vernier in calibrated position.

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

Input RC: 1 megohm shunted by approx 35 pF; constant on all ranges.

Input: single-ended on all ranges.

Input coupling: selectable AC, DC, or OFF.

Modes of operation: Channel A alone; Channel B alone; Channels A and B (either Chop or Alternate triggered by Channel A); Channels A + B (triggered by Channels A + B). Chop frequency is approx 100 kHz.

Differential input: Channel A may be inverted for differential operation. Bandwidth and deflection factors remain unchanged.

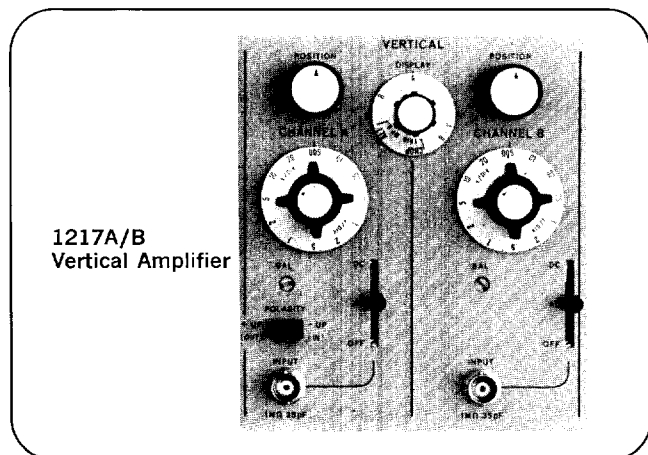
Common mode

Frequency: dc to 100 kHz.

Rejection ratio: 30 dB on 5, 10, and 20 mV/div ranges and 20 dB on all other ranges.

Maximum signal: 30 div.

Internal trigger source: on Channel A signal for A, Chop, and Alternate displays; on Channel B signal for B display; on Channels A + B signal for Channel A + B display.



1217A/B
Vertical Amplifier

OSCILLOSCOPES



FLEXIBLE SWEEP & TRIGGER

Direct reading magnifier
1200 Series

Time Base

All models

Sweep

Ranges: from 1 μ s/div to 5 s/div (21 positions) in 1, 2, 5 sequence. $\pm 3\%$ accuracy with vernier in calibrated position.

Vernier: continuously variable between ranges; extends slowest sweep to at least 12.5 s/div.

Magnifier: direct reading x10 magnifier expands fastest sweep to 100 ns/div with $\pm 5\%$ accuracy.

Automatic triggering

Baseline is displayed in absence of an input signal.

Internal: 50 Hz to above 500 kHz (2 MHz in 1217A/B) on most signals causing 0.5 division or more vertical deflection, increasing to 1 div at 7 MHz in Models 1217A/B. Triggering on line frequency also selectable.

External: 50 Hz to above 1 MHz (2 MHz in 1217A/B) on most signals at least 0.2 V p-p, increasing to 0.5 V p-p at 7 MHz in Models 1217A/B.

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 V p-p. 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 2 Hz for external; 5 Hz for internal.

Internal low frequency triggering (1217A/B only): internal trigger signal is attenuated at approx 6 dB per octave for frequencies above 5 MHz.

Single sweep: selectable by front panel switch. Reset switch with armed indicator light.

Free run: selectable by front panel switch.

Maximum input: ± 350 V (dc + peak ac).

Horizontal amplifier

Bandwidth: dc-coupled, dc to 300 kHz; ac-coupled, 2 Hz to 300 kHz.

Deflection factor

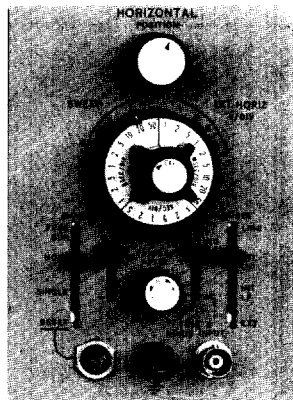
Ranges: 0.1 V/div, 0.2 V/div, 0.5 V/div, and 1 V/div.

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

Maximum input: ± 350 V (dc + peak ac).

Input RC: 1 megohm shunted by approx 20 pF.

Input: single-ended on all ranges.



Typical Horizontal
Time Base

General

Calibrator

Type: line frequency square wave.

Output: 1 V $\pm 1.5\%$.

Dimensions

Cabinet models (designated by A suffix). 8-5/16" wide x 11 3/4" high x 8-11/16" deep (211, 2 x 298, 5 x 474,7 mm).

Rack models (designated by B suffix): 19" wide x 5 1/4" high x 17 1/8" deep over-all (483 x 132, 5 x 435 mm), 15 3/8" (390,5 mm) behind front panel.

Power: 115 or 230 V $\pm 10\%$, 48 to 440 Hz, approximate watts
1200A/B, 50 W; 1201A/B, 60 W; 1202A/B, 40 W; 1205A/B, 45 W; 1206A/B, 40 W; 1217A/B, 75 W.

Weight

1200A: net, 25 lbs (11,4 kg); shipping, 34 1/2 lbs (15,7 kg).

1200B: net, 22 1/2 lbs (10,2 kg); shipping, 35 lbs (15,9 kg).

1201A: net, 30 lbs (13,6 kg); shipping, 39 1/2 lb (17,9 kg).

1201B: net, 27 1/2 lbs (12,5 kg); shipping, 40 lbs (18,2 kg).

1202A: net, 23 1/2 lbs (10,6 kg); shipping, 33 lbs (15 kg).

1202B: net, 21 lbs (9,5 kg); shipping, 33 1/2 lbs (15,2 kg).

1205A: net, 25 lbs (11,4 kg); shipping, 34 1/2 lbs (15,7 kg).

1205B: net, 22 1/2 lbs (10,2 kg); shipping, 35 lbs (15,9 kg).

1206A: net, 23 1/2 lbs (10,6 kg); shipping, 33 lbs (15 kg).

1206B: net, 21 lbs (9,5 kg); shipping, 33 1/2 lbs (15,2 kg).

1217A: net, 24 1/2 lbs (11,1 kg); shipping, 34 1/2 lbs (15,7 kg).

1217B: net, 23 lbs (10,4 kg); shipping, 35 lbs (15,9 kg).

Price

Model 1200A or 1200B Dual Channel, 100 μ V Oscilloscope	\$1050
Model 1201A or 1201B Dual Channel, 100 μ V Storage Oscilloscope	\$1900
Model 1202A or 1202B Single Channel, 100 μ V Oscilloscope	\$ 790
Model 1205A or 1205B Dual Channel, 5 mV Oscilloscope	\$ 895
Model 1206A or 1206B Single Channel, 5 mV Oscilloscope	\$ 715
Model 1217A or 1217B Dual Channel, 5 mV, 7 MHz Oscilloscope	\$1175

Options (order by Option number)

002 (standard CRT only): P2 phosphor in lieu of P31, no charge.

006 (rack models only): rear input terminals wired in parallel with front panel vertical and horizontal input terminals. Vertical input shunt capacitance is increased to approx 100 pF on 500 kHz models and to approx 85 pF on 7 MHz models. Horizontal input shunt capacitance is increased to approx 75 pF on 500 kHz and 7 MHz models.

Price: add \$35 for single channel models and \$55 for dual channel models.

007 (standard CRT only): P7 phosphor in lieu of P31, no charge.

009 (variable persistence/storage models only): remote erase through rear panel banana jack, shorting to ground provides erasure, add \$25.

011 (standard CRT only): P11 phosphor in lieu of P31, no charge.

Beamfinder does not intensify display on Option 011 Oscilloscopes.

015 (500 kHz models only): vertical channel signal outputs through rear panel connectors.

Vertical output signal specifications

Output: 0.3 V/div $\pm 10\%$, 0 V offset unaffected by position control setting.

Bandwidth: dc to 500 kHz.

Dynamic range: ± 3.5 V.

Maximum slewing rate: 12 V/ μ s with 300 pF load.

Minimum load RC: 10 k ohms shunted by approx 300 pF.

Source impedance: approx 300 ohms.

Price: single channel models, add \$70; dual channel models, add \$95.