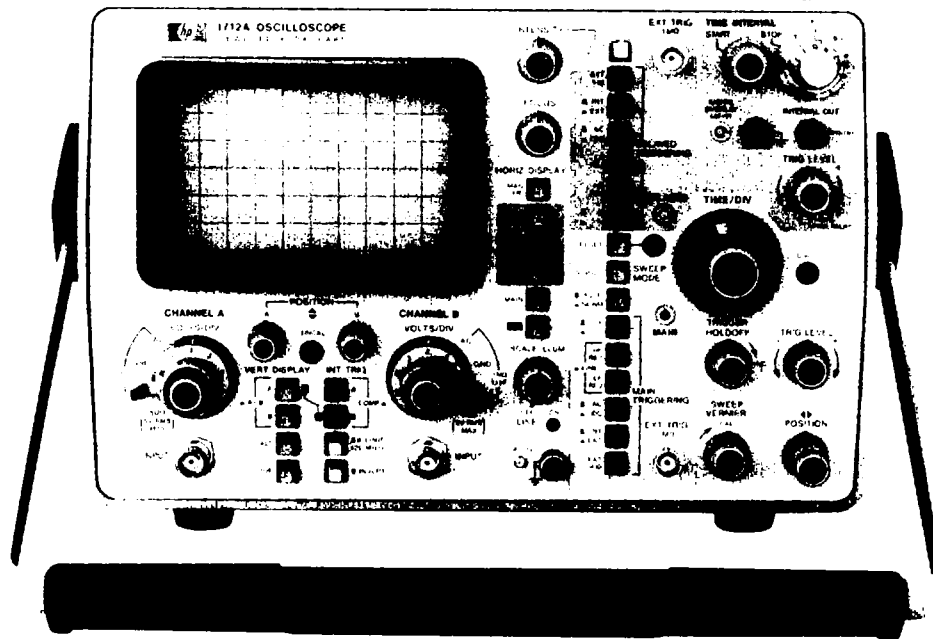


# OSCILLOSCOPES

## 200 MHz dual-delayed sweep

### Models 1710B & 1712A



### 1710B, 1712A Specifications

#### Vertical display modes

Channel A: channel B; channels A and B displayed alternately on successive sweeps (ALT); channels A and B displayed by switching between channels at approx. 1 MHz rate with blanking during switching (CHOP); channel A plus channel B (algebraic addition); X-Y (channel A vs. channel B).

#### Vertical amplifiers (2)

**Bandwidth:** (3 dB down from a 6 div reference signal.)

**DC-coupled:** dc to 200 MHz in both 50 ohm and high impedance input modes 10 mV/div to 5 V/div, to 150 MHz at 5 mV/div.

**AC-coupled:** lower limit is approx. 10 Hz.

**Bandwidth limit:** limits upper bandwidth to approx. 20 MHz.

**Rise time:** <1.75 ns 10 mV/div to 5 V/div, <2.3 ns at 5 mV/div (measured from 10% to 90% points of 6 div input step).

#### Deflection factor

**Ranges:** 5 mV/div to 5 V/div (10 calibrated positions) in 1, 2, 5 sequence.  $\pm 2\%$  attenuator accuracy.

**Vernier:** continuously variable between all ranges; extends maximum deflection factor to at least 12.5 V/div. Front panel light indicates when vernier is not in CAL position.

**Polarity:** channel B may be inverted, front panel pushbutton.

**Signal delay:** input signals are delayed sufficiently to view leading edge of input pulse without advanced trigger.

**Input coupling:** selectable, AC or DC, 50 ohms (dc) or ground. Ground position disconnects input connector and grounds amplifier input.

#### Input RC (selectable)

**AC and DC:** 1 megohm  $\pm 2\%$  shunted by approx. 11 pF.

**50 ohm:** 50 ohms  $\pm 2\%$ ; SWR <1.3 on 5, 10, 20, and 50 mV ranges and <1.15 on all other ranges.

#### Maximum input

**AC and DC:**  $\pm 250$  V (dc + peak ac) at 1 kHz or less.

**50 ohm:** 5 V rms or  $\pm 250$  V peak, whichever is less.

#### A + B operation

**Amplifier:** bandwidth and deflection factors are unchanged; channel B may be inverted for A-B operation.

**Differential (A - B) common mode:** CMRR is at least 40 dB from dc to 5 MHz decreasing to 26 dB at 50 MHz. Common mode signal amplitude equivalent to 12 cm with one vernier adjusted for optimum rejection.

#### Trigger source

Selectable from channel A, channel B, or Composite.

**Channel A:** all display modes triggered by channel A signal.

**Channel B:** all display modes triggered by channel B signal.

**Composite:** all display modes triggered by displayed signal.

#### Vertical output

**Amplitude:** one division of vertical deflection produces approx. 100 mV output (dc to 25 MHz).

**Cascaded deflection factor:** 1 mV/div with both vertical channels set to 10 mV/div.

**Cascaded bandwidth:** dc to 5 MHz with bandwidth limit engaged.

**Source resistance:** approx. 100 ohms.

**Source selection:** trigger source set to channel A selects channel A output, to channel B selects channel B output.

#### Horizontal display modes

Main, main intensified, delayed, mixed, mag. X10, X-Y.

#### Main time base

##### Sweep

**Ranges:** 10 ns/div to 0.5 s/div (24 ranges) 1, 2, 5 sequence.

##### Accuracy

Main Sweep Time/Div	Accuracy (0°C to +55°C)	
	X1	X10
10 ns to 50 ns	$\pm 3\%$	$\pm 5\%$
100 ns to 20 ms	$\pm 2\%$	$\pm 3\%$
50 ms to 0.5 s	$\pm 3\%$	$\pm 3\%$

**Vernier:** continuously variable between all ranges; extends slowest sweep to at least 1.25 s/div. Vernier uncalibrated light indicates when vernier is not in CAL position.

**Magnifier:** expands all sweeps by a factor of 10; extends fastest sweep to 1 ns/div.

#### Sweep mode

**Normal:** sweep is triggered by internal or external signal.

**Automatic:** bright baseline displayed in absence of input signal from 10 ns/div to 20 ms/div. Triggering is same as normal above 40 Hz. Normal triggering is generally required for sweep speeds from 50 ms/div to 0.5 s/div.

**Single:** in Normal mode, sweep occurs once with same triggering as normal, reset pushbutton arms sweep and lights indicator; in Auto mode, sweep occurs once each time Reset pushbutton is pressed.

**Triggering**

**Internal:** dc to 100 MHz on signals causing 0.5 div. or more vertical deflection, increasing to 1 div. of vertical deflection at 200 MHz in all display modes. Triggering on line frequency is also selectable.  
**External:** dc to 100 MHz on signals of 50 mV p-p or more increasing to 100 mV p-p at 200 MHz. Maximum input,  $\pm 250$  V (dc + peak ac) at 1 kHz or less.  
**External input RC:** approx. 1 megohm shunted by approx. 15 pF.

**Trigger level and slope**

**Internal:** at any point on the vertical waveform displayed.  
**External:** continuously variable from +1.0 V to -1.0 V on either slope of trigger signal, +10 V to -10 V in divide by 10 mode ( $\div 10$ ).

**Coupling:** AC, DC, LF REJ, or HF REJ.

**AC:** attenuates signals below approx. 10 Hz.  
**LF REJ:** attenuates signals below approx. 7 kHz.  
**HF REJ:** attenuates signals above approx. 7 kHz.

**Trigger holdoff:** time between sweeps continuously variable, exceeding one full sweep from 10 ns/div to 50 ms/div.

**Main intensified (1710B)**

Intensifies that part of main time base to be expanded to full screen in delayed time base mode. Delay control adjusts position of intensified portion of sweep. Rear panel intensity ratio control sets relative intensity of brightened segment.

**Main intensified (1712A)**

Intensifies two parts of main time base to be expanded to full screen in delayed time base mode. "START" control positions the first intensified portion of the sweep; "STOP" control positions the second intensified portion of the sweep. Rear panel intensity control sets relative intensity of brightened segments.

**Delayed time base**

**Sweep**

**Ranges:** 10 ns/div to 20 ms/div (20 ranges) in 1, 2, 5 sequence.  
**Accuracy (0 to +55°C):** same as main time base.  
**Magnifier (0 to +55°C):** same as main time base.

**Triggering**

**Internal:** same as main time base except there is no Line Frequency triggering.  
**Starts after delay:** delayed sweep automatically starts at end of delay period.  
**Trigger:** with delayed trigger level control out of detent (starts after delay) delayed sweep is triggerable at end of delay period.  
**External:** dc to 100 MHz on signals of 50 mV p-p or more, increasing to 100 mV p-p at 200 MHz. Maximum input,  $\pm 250$  V (dc + peak ac) at 1 kHz or less.  
**External input RC:** approx. 1 megohm shunted by approx. 15 pF.

**Trigger level and slope**

**Internal:** at any point on the vertical waveform displayed when in triggered mode.  
**External:** continuously variable from +1.0 V to -1.0 V on either slope of trigger signal, +10 V to -10 V in divide by 10 mode ( $\div 10$ ).

**Coupling:** AC, DC, LF REJ, or HF REJ.

**AC:** attenuates signals below approx. 10 Hz.  
**LF REJ:** attenuates signals below approx. 7 kHz.  
**HF REJ:** attenuates signals above approx. 7 kHz.

**Delay time range:** 0.5 to 10X Main Time/Div settings of 20 ns to 0.5 s (minimum delay 50 ns).

**Differential time measurement accuracy (1710B)**

Main time base setting	Accuracy (+15°C to +35°C)
50 ns/div to 20 ms/div	$\pm(0.5\% \pm 0.1\%$ of full scale)
20 ns/div	$\pm(1\% \pm 0.2\%$ of full scale)
50 ms/div to 0.5 s/div	$\pm 3\%$

**Delay jitter (1710B):** <0.005% (1 part in 20 000) of maximum delay in each step.

**Time interval (1712A)**

**Function:** measures time interval between two events on channel A (channel A display); between two events on channel B (channel B display); or between two events starting from an event on channel A and ending with an event on channel B (alternate display).

**Accuracy**

Main Time Base Setting	Accuracy (+20°C to +30°C)
100 ns/div to 20 ms/div	$\pm 0.5\%$ of measurement $\pm 0.05\%$ of fs
50 ns/div*	$\pm 0.5\%$ of measurement $\pm 0.1\%$ of fs
20 ns/div*	$\pm 0.5\%$ of measurement $\pm 0.2\%$ of fs
50 ms/div to 0.5 s/div	$\pm 3\%$

\*Starting after 60 ns of sweep

Measurement accuracy is the Time Interval Accuracy plus the external DVM accuracy.

**Stability (0 to +55°C):** short-term 0.005%. Temperature,  $\pm 0.03\%$  C deviation from calibration temperature range.

**Time interval output voltage:** varies from 10 V to 20 mV full scale. Full scale output voltage can be determined by multiplying the number on the TIME/DIV dial by 10 V (e.g. 0.05 s, 0.05 ms, or 0.05  $\mu$ s per div gives 0.5 V output full-scale).

**Mixed time base**

Dual time base in which the main time base drives the first portion of sweep and the delayed time base completes the sweep at the faster delayed sweep. Also operates in single sweep mode.

**X-Y operation**

**Bandwidth**

**Y-axis (channel A):** same as channel A.  
**X-axis (channel B):** dc to >1 MHz.

**Deflection factor:** 5 mV/div to 5 V/div (10 calibrated positions) in 1, 2, 5 sequence.

**Phase difference between channels:** <3°, dc to 1 MHz.

**Cathode-ray tube and controls**

**Type:** post accelerator, approx. 20.5 kV accelerating potential, aluminized P31 phosphor.

**Graticule:** 6  $\times$  10 div internal graticule. 0.2 subdivision markings on major horizontal and vertical axes. 1 div = 1 cm. Rear panel adjustment aligns trace with graticule. Internal flood gun graticule illumination.

**Beam finder:** returns trace to CRT screen regardless of setting of horizontal, vertical, or intensity controls.

**Intensity modulation (Z-axis):** +8 V,  $\geq 50$  ns width pulse blanks trace of any intensity, useable to 20 MHz for normal intensities. Input R, 1 k $\Omega$   $\pm 10\%$ . Maximum input,  $\pm 10$  V (dc + peak ac).

**Auto-focus:** automatically maintains beam focus with variations of intensity.

**Intensity limit:** automatically limits beam current to decrease possible CRT damage. Circuit response time ensures full writing speed for viewing low duty cycle, fast rise time pulses.

**Rear panel controls:** astigmatism, pattern, main/delayed intensity ratio, and trace align.

**General**

**Rear panel outputs:** main and delayed gates, -0.7 V to +1.3 V capable of supplying approx. 3 mA.

**Calibrator:** type, 1 kHz  $\pm 15\%$  square wave; 3 V p-p  $\pm 1\%$ ; <0.1  $\mu$ s rise time.

**Power:** 100, 120, 220, 240, -10%, +5%; 48 to 440 Hz; 110 VA max.

**Weight:** net, 13.2 kg (29 lb). Shipping, 18.1 kg (40 lb).

**Operating environment:** temperature, 0 to +55°C (+32°F to +130°F); humidity, to 95% relative humidity at 40°C (104°F); altitude, to 4600 m (15 000 ft); vibration, vibrated in three planes for 15 min. each with 0.254 mm (0.010 in.) excursion, 10 to 55 Hz.

**Dimensions:** 335 mm wide (13 $\frac{1}{8}$  in.); 197 mm high (7 $\frac{7}{8}$  in.); 570 mm length with handle (22 $\frac{3}{8}$  in.), 518 mm length without handle (20 $\frac{3}{8}$  in.).

**Accessories furnished:** one 10115A blue light filter; one front panel cover; two 10014A10:1 divider probes; one 2.3 m (7.5 ft) power cord; one vinyl storage pouch; one Operating and Service Manual.

**Options**

- 001:** U.S.A. fixed line power cord Price add \$15
- 003:** probe power supply with two rear panel jacks for use with HP active probes. Provides power to operate two 1120A, 1124A, or 1125A Active Probes add \$50
- 091:** two 10016B 10:1 voltage divider probes substituted for two 10014A probes N/C
- 101:** logic state display interface for operation with Model 1607A Logic State Analyzer \$150

**Model number and name**

- 1710B 200 MHz Oscilloscope \$3000
- 1712A Dual-Delayed Sweep Oscilloscope \$3100