HEWLETT hp PACKARD

OSCILLOSCOPE SYSTEMS

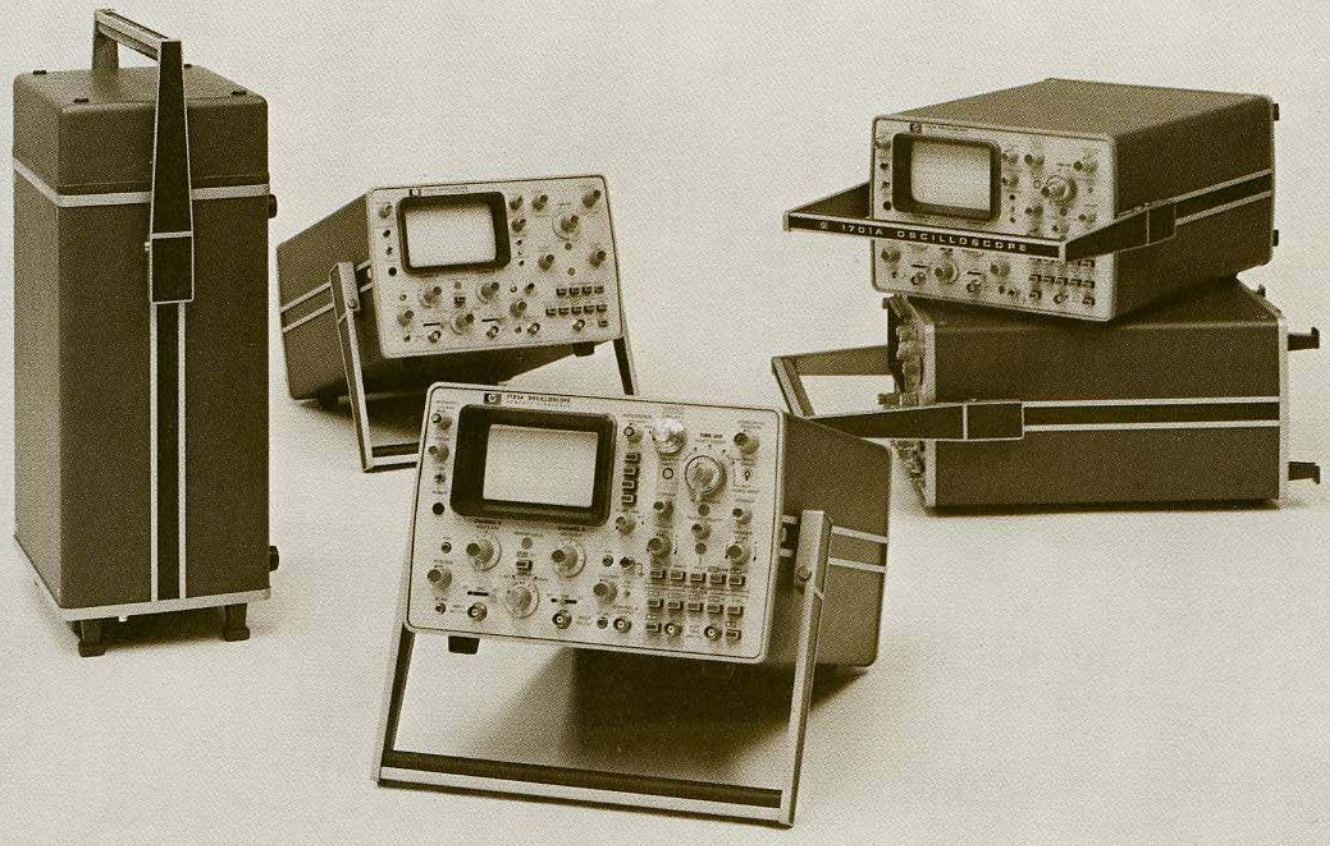
PORTABLE OSCILLOSCOPES

35 and 75 MHz Bandwidths

Models
1700A, 1701A
1702A, 1703A
1706A, 1707A

TECHNICAL DATA 15 DEC 71

- **RUGGED, LIGHTWEIGHT, PORTABLE**
- **AC, DC, or BATTERY OPERATION**
- **STANDARD CRT or VARIABLE PERSISTENCE/STORAGE**
- **10 ns/div SWEEP CAPABILITY**
- **DUAL CHANNEL, 10 mV/div**
- **LOW POWER, NO FAN**



For more information, call your local HP Sales Office or East(201) 265-5000 . Midwest (312) 677-0400 . South (404) 436-6181
West (213) 877-1282. Or, write: Hewlett-Packard, 1501 Page Mill Road, Palo Alto, California 94304. In Europe, 1217 Meyrin-Geneva

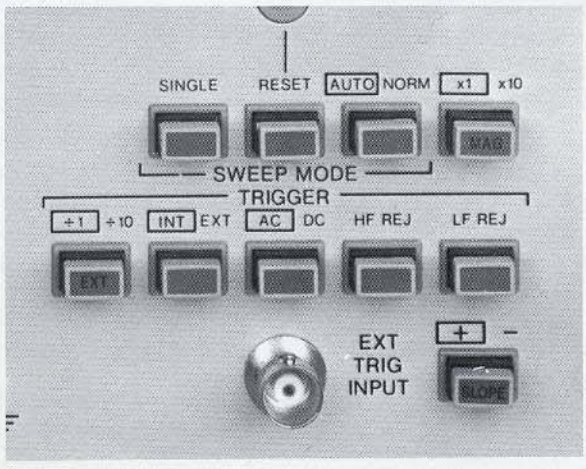
INTRODUCTION

The HP 1700 Series Oscilloscopes are lightweight, battery operated, portable instruments designed for both lab and field service applications. All models are dual channel and have either 35 or 75 MHz bandwidths. You can choose models with a main time base only or with both main and delayed time bases. The 1700 series also includes two models with variable persistence and storage CRT's.

OPERATOR CONVENIENCE

All 1700 Series models have large CRT's and sharp traces for easy viewing and high resolution. Standard CRT's are 6 x 10 cm; variable persistence CRT's are slightly smaller.

Front panel controls are grouped according to function for fast familiarization and pushbuttons are used to further simplify operation. By releasing all pushbuttons you can easily locate the trace giving you a head start in viewing your waveform. Delayed sweep



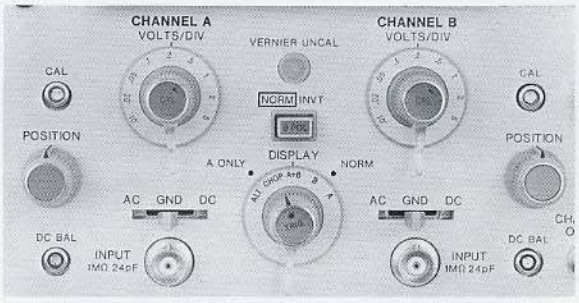
Pushbuttons for sweep and trigger circuits simplify operation.

controls are grouped in a gray front panel strip for quick identification. Main and delayed sweep speeds are selected with separate controls allowing you to change the sweep speed on one time base without having to reset the other. An interlock is provided which prevents the delayed time base from sweeping slower than the main time base.

Another convenience feature found on all standard models is scale illumination, which aids in photographic work. A beamfinder allows quick location of the trace regardless of the INTENSITY, HORIZONTAL, or VERTICAL control positions. Warning lights are provided which indicate uncalibrated vertical deflection factors or sweep speeds. Additional conveniences provided are front panel adjustments for vertical deflection factors, dc balance, and a 1 volt square wave calibrator for probe compensation.

PERFORMANCE

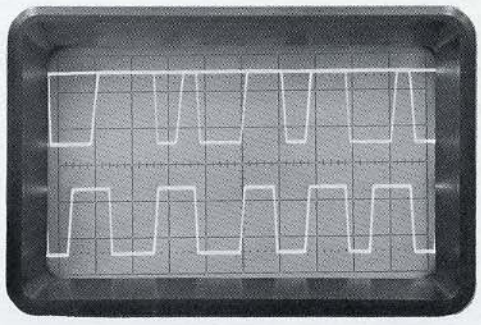
The 1700 series — though lightweight, rugged and portable — give you the performance ordinarily expected of laboratory oscilloscopes. Vertical bandwidths are specified over the full 6 divisions of vertical display and maximum sensitivities are useable over the entire bandwidth. In addition, display mode and trigger source flexibility assure you of the right trigger signal combination for your application.



The 1700 Series display mode, trigger source, attenuator, and coupling controls.

Emphasis on performance is also provided in the 1700 Series horizontal system. Sweep linearity is specified over the full 10 divisions of horizontal display for maximum usefulness and accuracy. In models with calibrated delay (Option 020), you can make differential timing measurements to approximately 1% accuracy by using a common reference graticule.

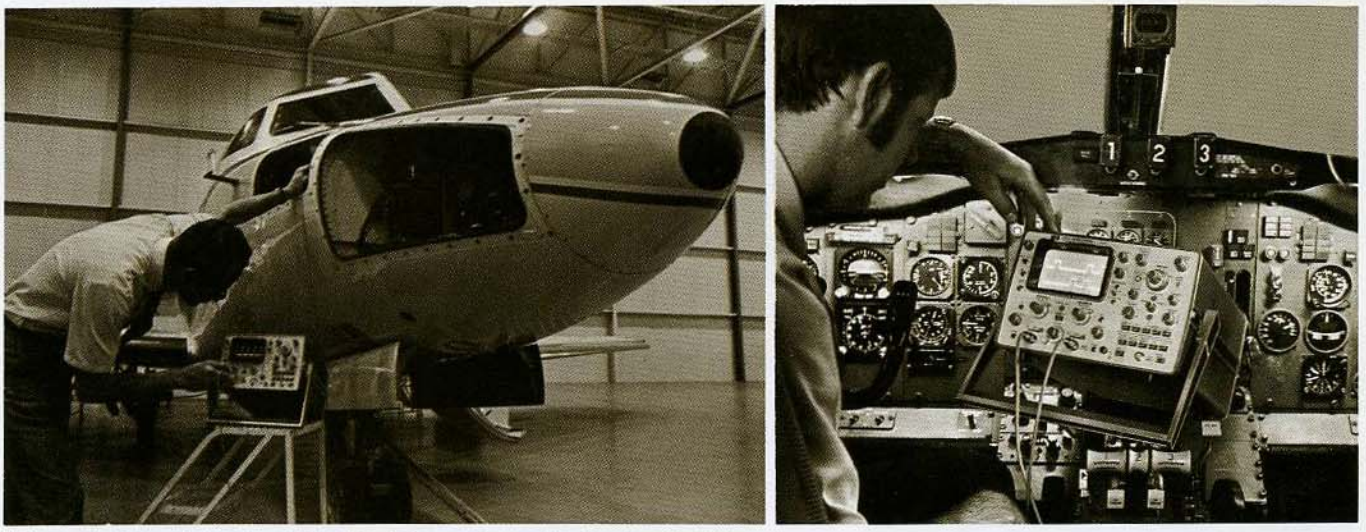
Internal trigger circuits have emitter-coupled logic gates for greater reliability and stable operation over a wide temperature range. A trigger holdoff control is



Double exposure shows how stable triggering on a digital word can be obtained with the TRIGGER HOLDOFF control.

used to eliminate double triggering on complex digital waveforms while maintaining a full-screen, calibrated sweep.

Though the performance of the 1700 Series is high quality, the price is kept low by offering just the features necessary for most applications. A laboratory package is available on all models which adds many features often used in a laboratory environment. This model flexibility assures you of the optimum price/performance ratio.



Battery operation gives you electrical isolation and complete freedom of movement.

BATTERY OPERATION

All 1700 Series models may be operated from a battery pack which fits snugly inside the instruments.

Many portable oscilloscope users are discovering the advantages of battery operation:

1. Convenience of working in an installation without having to turn off scope, move power cord, and reset and stabilize display;
2. isolation from ground loops and conducted RFI; and
3. freedom from errors due to power line fluctuations and supply variations.

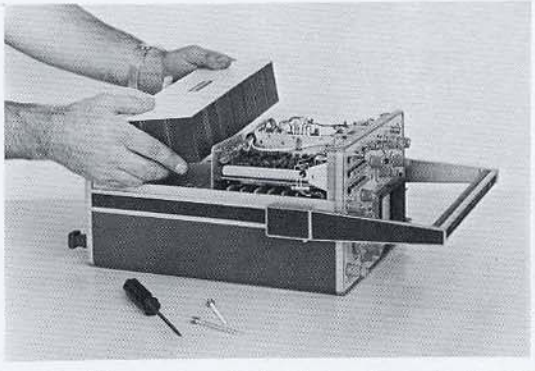
The battery allows up to six hours of operation (1700A and 1701A) and is rechargeable over night. Other power modes are ac (115 V or 230 V ±20%, 48 to 440 Hz) or external dc from 11.5 to 36 volts. This flexibility insures that power will be available in almost any possible situation.

RELIABILITY

The 1700 Series oscilloscopes have been designed for low power consumption which not only allows battery operation but increases reliability since most active components operate at only 10 to 20% of their power ratings. For example, the vertical output transistors do not require heat sinks. Low power consumption also means that the 1700 Series scopes do not require ventilating holes or fans for cooling which reduces the amount of dust and dirt that can accumulate. Also the lack of ventilation holes reduces dc drift since the scope is less susceptible to short term temperature changes caused by drafts. Reliability is also enhanced in the trigger circuits by using emitter-coupled logic circuits instead of conventional tunnel diodes.

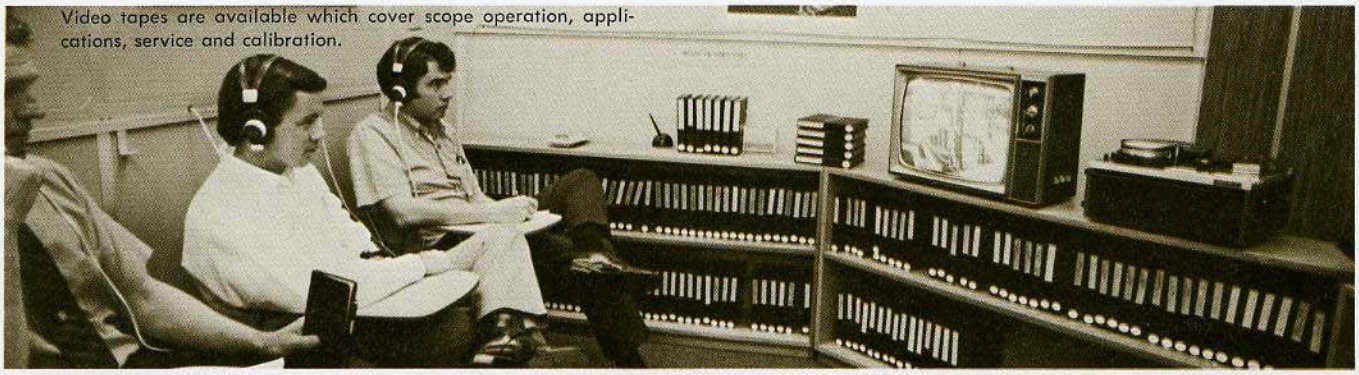
STORAGE COVER

The Model 10101A Storage Cover, supplied with each oscilloscope, helps to protect the front panel during transportation and provides storage space for accessories. Accessories included with the 1700 oscilloscopes are two probes with probe accessories, power cord, dc plug, and spare fuses.



The optional battery is easily installed and operates the scope up to 6 hours (1700A/1701A).

Scope accessories may be stored in the front panel cover.



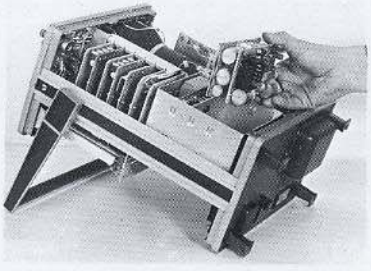
Video tapes are available which cover scope operation, applications, service and calibration.

FIELD SUPPORT

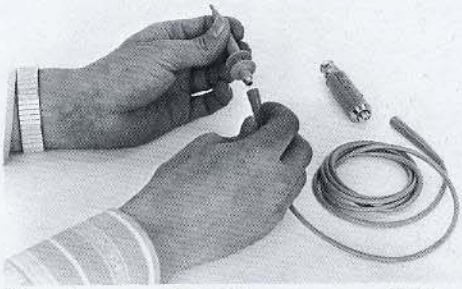
Video tapes are available which supply training and help you to become accustomed to 1700 Series operation and applications. Ask your HP field engineer for details.

SERVICEABILITY

Ease of service is assured with the plug-in circuit boards and the low number of internal adjustments. For example, if all internal adjustments were misaligned, a technician (with a working knowledge of the scope) could completely recalibrate the 1700A in as little as one hour. This means real dollar savings over the lifetime of the instrument. Serviceability also extends to the probes supplied with the oscilloscopes. The 10006B Probe cables are supplied with spin-on/spin off connectors on both ends which reduces replacement time to just a few minutes.



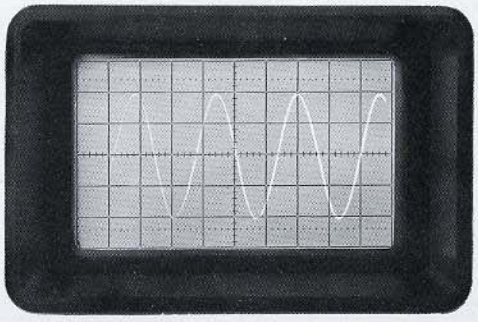
Low calibration times mean significant dollar savings over the life of the instrument.



New, stronger probe cables are more reliable, more serviceable than ever before.

VARIABLE PERSISTENCE AND STORAGE

Model 1703A combines 1700 series features of dual channel, 10 mV/div deflection factor, and main and delayed time base sweep speeds to 10 ns/div, with variable persistence and storage. Model 1702A is identical to the 1703A but is without the delayed time base.



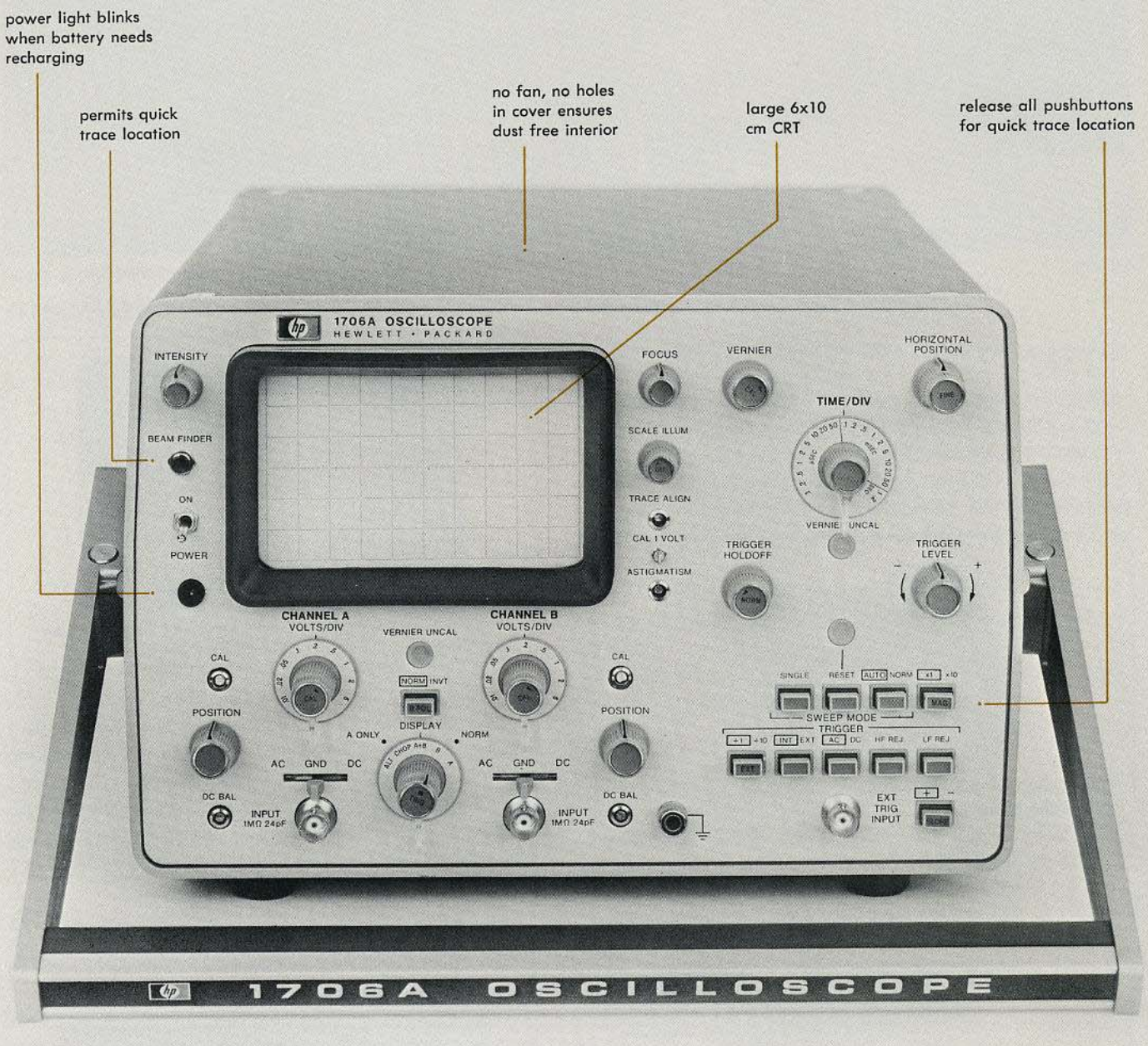
Variable persistence permits a clutter-free CRT while simultaneously preserving low rep-rate signals for analysis.

HP's storage mesh CRT allows you to adjust the amount of time a trace is retained, from less than 1 second to over 1 hour. For example, when making timing adjustments between two low rep rate pulses, the persistence can be set so that the pulses are on screen for just one sweep. You can make your timing adjustments quickly and accurately, without the screen becoming cluttered with old traces.

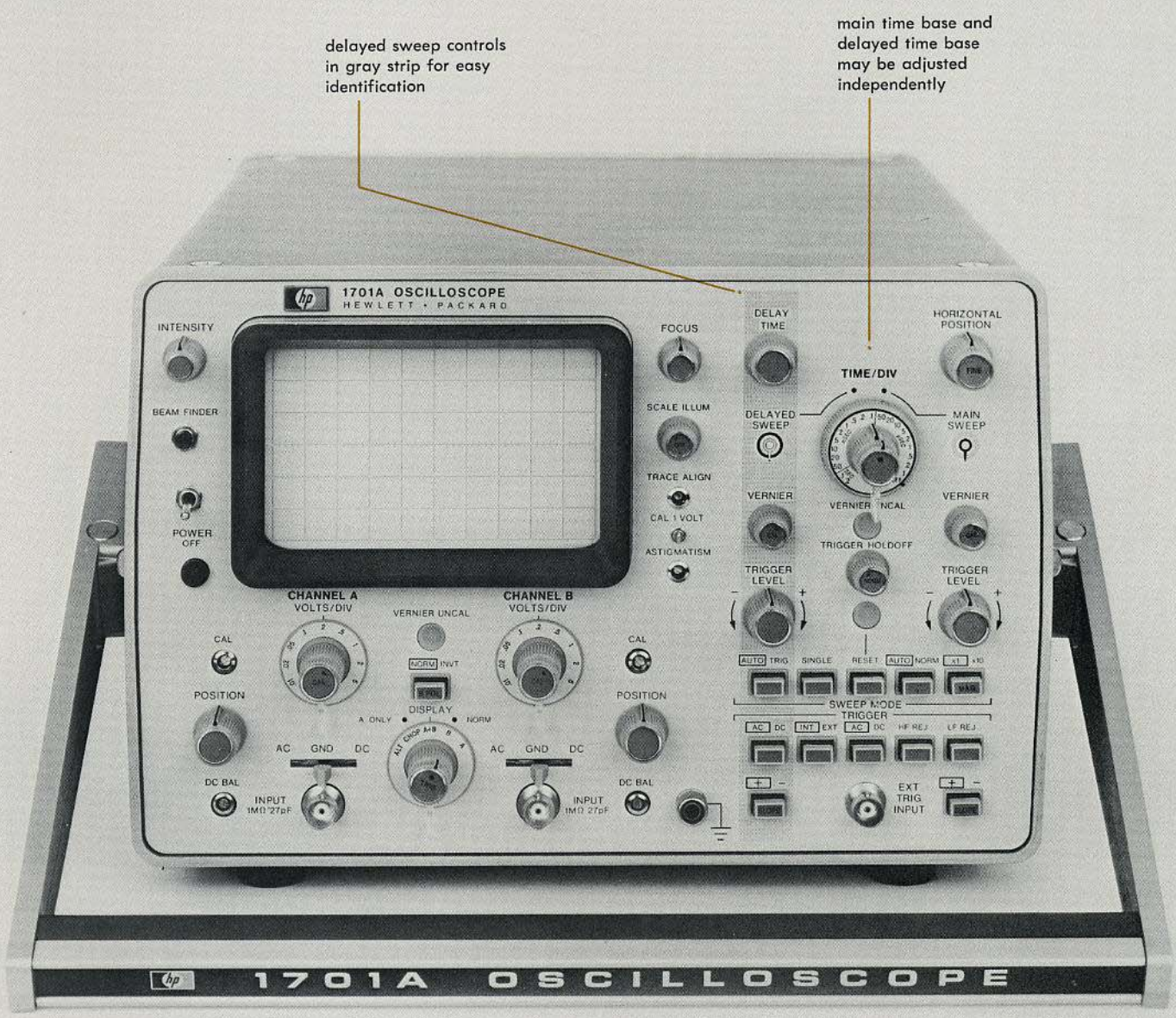
Variable persistence is also very useful as a pseudo-normal write mode, when extra brilliance is required, or any time the sweep speed is low enough to cause flicker.

In addition to variable persistence, the 1703A offers storage capability, for over 1 hour. This display capability is especially useful for single shot phenomena and other events with very infrequent occurrence. The armed trigger circuits will patiently wait for the event to happen, then capture the waveform when it occurs. All variable persistence and storage controls are conveniently grouped to the right of the CRT.

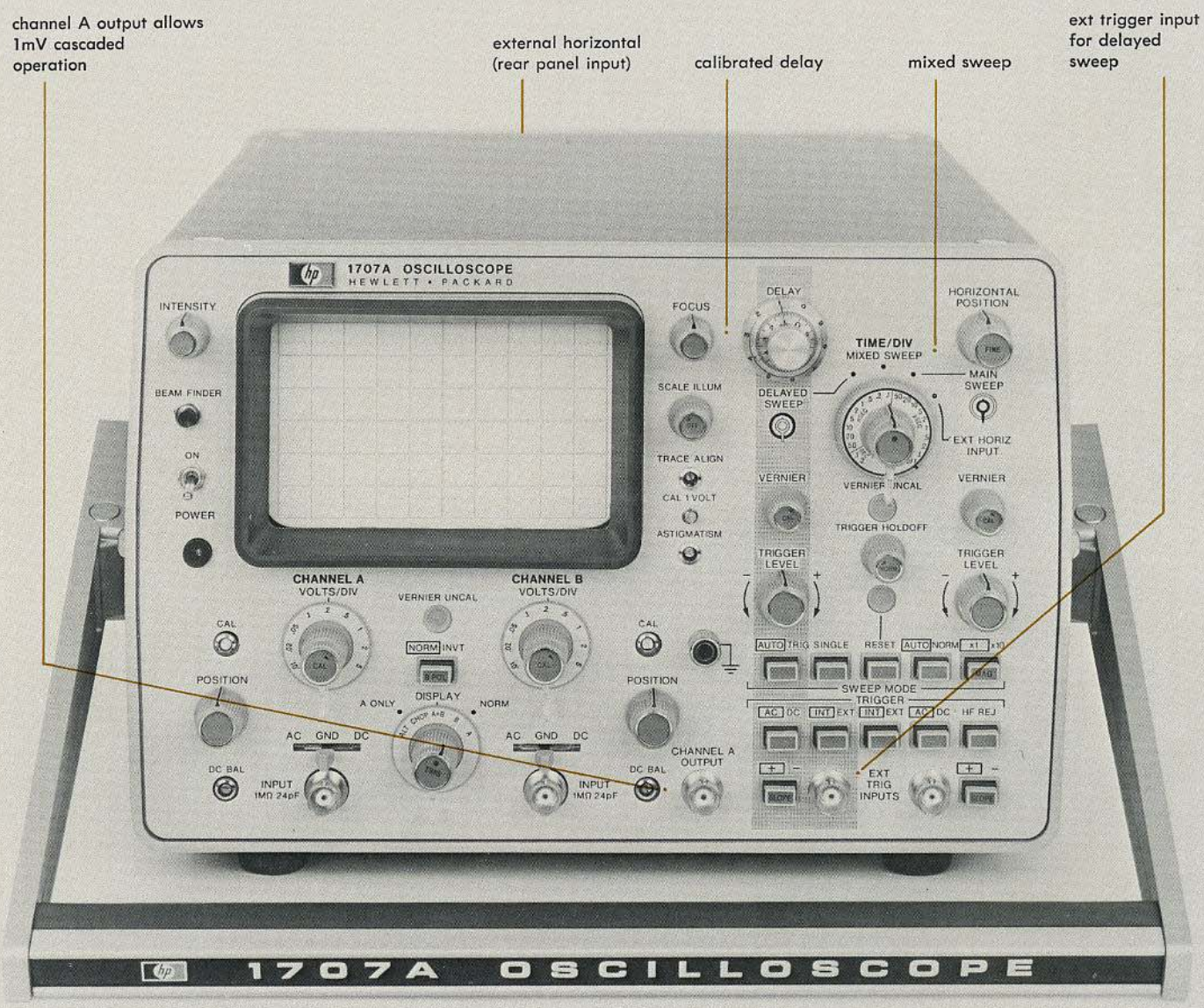
The 1703A's writing speed in the storage mode is 100div/ms. And a mode called "Max Write" uses a fogging technique to increase writing speed to 1000 div/ms, with only a slight reduction in contrast between trace and background.



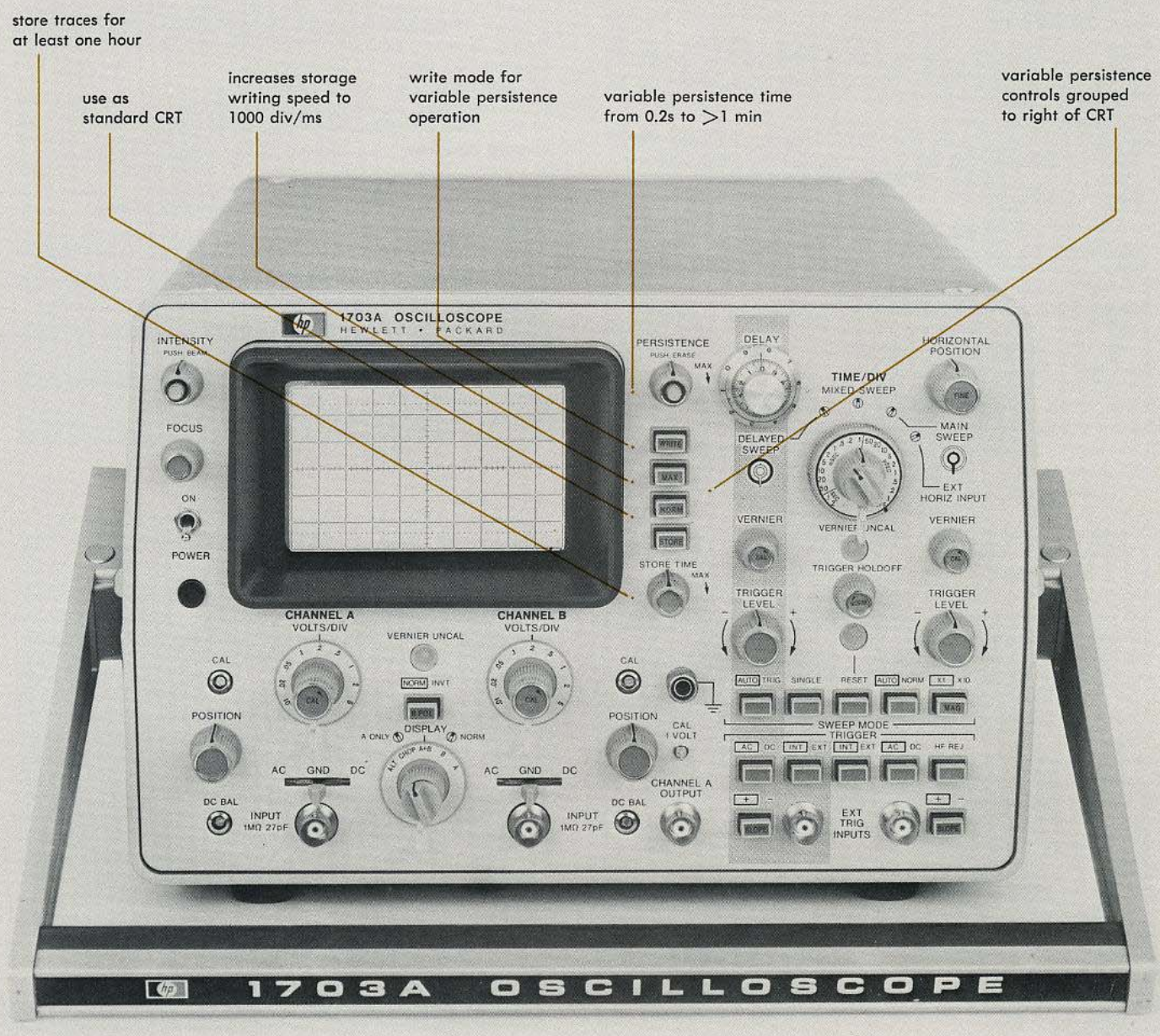
Two non-delayed sweep models form the basis for the 1700 Series: the 1700A (35 MHz) and the 1706A (75 MHz). The 1702A (35 MHz) adds variable persistence and storage. The controls are grouped according to function, and pushbuttons simplify operation.



Models 1701A (35 MHz), 1703A (35 MHz, variable persistence and storage), and 1707A (75 MHz) add a delayed time base to the basic model. All retain essential 1700 Series features and may be operated from an internal battery.



A laboratory package (Opt. 020) is available which adds many features commonly used in lab applications. A TV sync option is also available on the 1701A and 1707A.



Models 1702A (non-delayed sweep) and 1703A (delayed sweep) combine 1700 Series features of portability, high performance, and battery operation with variable persistence and storage

SPECIFICATIONS

(Except as noted, specifications apply to all models.)

VERTICAL AMPLIFIERS

MODES OF OPERATION: 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 400 kHz rate with blanking during switching (Chop); channel A + channel B (algebraic addition).

EACH CHANNEL (2)

Bandwidth: (Direct or with Model 10006B probe, 3 dB down from 50 kHz, 6 div reference signal from a terminated 50 ohm source.)

DC-COUPLED: dc to 35 MHz in 1700A, 1701A, 1702A, 1703A; dc to 75 MHz in 1706A, 1707A.

AC-COUPLED: lower limit is approx. 10 Hz.

Risetime: <10 ns in 1700A thru 1703A; <4.7 ns in 1706A, 1707A. Direct or with Model 10006B probe, 10% to 90% points with 6 div input step from a terminated 50 ohm source.

DEFLECTION FACTOR

Ranges: from 10 mV/div to 5 V/div (9 ranges) in 1,2,5 sequence. ±3% accuracy with vernier in calibrated position.

Vernier: continuously variable between all ranges, extends maximum deflection factor to at least 12.5 V/div.

Polarity: NORM or INV, selectable on channel B.

Signal Delay: input signals are delayed sufficiently to view leading edge of input signals without advanced external trigger.

Input RC

1700A THRU 1703A: 1 megohm ±2%, shunted by approx. 27 pF.

1706A, 1707A: 1 megohm ±2%, shunted by approx. 24 pF.

Input Coupling: AC, DC or Ground selectable. Ground position disconnects signal input and grounds amplifier input.

MAXIMUM INPUT

AC-coupled: ±600 V (dc + peak ac); rms ac <350 V, 5 V/div to 20 mV/div; <150 V at 10 mV/div (10 kHz or less).

DC-coupled: <350 V (rms) 5 V/div to 20 mV/div; <150 V at 10 mV/div (10 kHz or less).

A + B OPERATION

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

Common Mode (A-B)

FREQUENCY: dc to 1 MHz.

REJECTION RATIO: at least 40 dB on 10 mV/div, at least 20 dB on all other ranges with verniers set for optimum rejection. Common mode signal amplitude equivalent to 30 div.

TRIGGERING

Source (applies for all five modes of operation)

NORM: on displayed signal.

A ONLY: on signal from Channel A.

TIME BASE

SWEEP

Ranges: from 0.1 μs/div to 0.2 s/div (20 ranges) in 1, 2, 5 sequence. ±3% accuracy with vernier in calibrated position.

Vernier: continuously variable between all ranges, extends slowest sweep to at least 0.5 s/div. Vernier uncalibrated light indicates when vernier is not in Cal position.

Magnifier: expands all sweeps by a factor of 10 and extends fastest sweep to 10 ns/div. Accuracy ±5% (including 3% accuracy of time base).

SWEEP MODE

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

Automatic: bright baseline displayed in absence of input signal. Triggering is same as normal above 40 Hz.

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

1700A thru 1703A: dc to 35 MHz on signals causing 0.5 div or more vertical deflection increasing to 1.5 div at 75 MHz in all display modes except chop; dc to 400 kHz in chop mode.

1706A and 1707A: dc to 35 MHz on signals causing 0.5 div or more vertical deflection increasing to 1 div at 75 MHz in all display modes except chop; dc to 400 kHz in chop mode.

External: dc to 35 MHz on signals 50 mV p-p or more, increasing to 100 mV p-p at 75 MHz.

External Input RC: approx. 1 megohm shunted by approx. 27 pF.

Level and Slope

INTERNAL: at any point on the vertical waveform displayed.

EXTERNAL: continuously variable from +1.5 V to −1.5 V on either slope of the trigger signal. Maximum input, ±100 V. In Models 1700A, 1702A, and 1706A, ÷ 10 extends external trigger input range to +15 V to −15 V.

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

AC: attenuates signals below approx. 20 Hz.

LF REJ: attenuates signals below approx. 15 kHz.

HF REJ: attenuates signals above approx. 30 kHz.

TRIGGER HOLDOFF: time between sweeps continuously variable.

DELAYED TIME BASE (Models 1701A, 1703A, 1707A)

TRACE INTENSIFICATION: intensifies that part of main time base to be expanded to full screen in delayed time base mode. Rotating time base switch from OFF position activates intensified mode.

SWEEP

Ranges: 0.1 μs/div to 0.1 s/div (19 ranges) in 1, 2, 5 sequence. ±3% with vernier in calibrated position.

Vernier: continuously variable between all ranges, extends slowest sweep to 0.25 s/div.

Magnifier: expands all sweeps by a factor of 10 and extends fastest sweep to 10 ns/div. Accuracy is ±5% (including 3% accuracy of time base).

SWEEP MODE

Trigger: delayed sweep is armed at end of delay period.

Auto: delayed sweep is automatically triggered at end of delay period.

TRIGGERING

Internal: same as main time base.

External (Option 020): same as main time base. Input RC is approx. 1 megohm shunted by approx. 27 pF.

Level and Slope

INTERNAL: at any point on the vertical waveform displayed.

EXTERNAL (Option 020): continuously variable from +1.5 V to −1.5 V on either slope of the trigger signal.

Coupling: selectable, AC or DC. AC attenuates signals below approx. 20 Hz.

DELAY (Before start of delayed sweep.)

Time: continuously variable from 0.1 μs to 2 s.

Time Jitter: <0.005% (1 part in 20,000) of maximum delay in each sweep.

Calibrated Delay Accuracy (Option 020): ±1%; linearity, ±0.2%.

MIXED SWEEP (Option 020)

Combines main and delayed sweeps into one display. Sweep is started by the main time base and is completed by the faster delayed time base.

CATHODE-RAY TUBE AND CONTROLS

STANDARD CRT (Models 1700A, 1701A, 1706A and 1707A)

TYPE: post-accelerator, ≈22 kV accelerating potential; aluminized P31 phosphor.

GRATICULE: 6 x 10 div internal graticule; 0.2 subdivisions on major horizontal and vertical major axes. 1 div = 1 cm. Front panel adjustment for trace alignment and astigmatism.

BEAM FINDER: returns trace to CRT screen regardless of setting of horizontal, vertical, or intensity controls.

INTENSITY MODULATION: >+ 4V, dc to 1 MHz blanks trace of any intensity. Input R, 1000 ohms ±10%. Maximum input ±10 V (dc + peak ac).

STORAGE/VARIABLE PERSISTENCE CRT

TYPE: post-accelerator, ≈ 8.5 kV accelerating potential; aluminized P31 phosphor.

GRATICULE: 6 x 10 div internal graticule; 0.2 subdivisions on major horizontal and vertical major axes. 1 div = 0.85 cm. Rear panel adjustments for trace alignment and astigmatism.

BEAM FINDER: returns trace to CRT screen regardless of setting of horizontal, vertical, or intensity controls.

INTENSITY MODULATION: >+ 4V, dc to 1 MHz blanks trace of any intensity. Input R, 1000 ohms ±10%. Maximum input, ±10 V (dc + peak ac).

PERSISTENCE
Normal: natural persistence of P31 phosphor (approx. 40 μs).
Variable: from <0.2 s to > 1 min.

STORAGE WRITING SPEED
Write Mode: >100 div/ms over central 5x9 divisions.
Maximum Write Mode: >1000 div/ms over central 5x9 divisions.

BRIGHTNESS: ≈ 100 foot lamberts.

STORAGE TIME: from Write mode to Store, traces may be stored at reduced intensity for >1 hour. With STORE TIME in full counterclockwise position, traces may be viewed at normal intensity for >1 minute. From Max. Write mode to Store, traces may be stored at reduced-intensity for >5 minutes. With STORE TIME in full counterclockwise position, traces may be viewed at normal intensity for >15 seconds.

ERASE: manual, pushbutton erasure takes approx. 300 ms.

GENERAL

CALIBRATOR

Type: 1 kHz, ±10% squarewave.
Voltage: 1 V p-p, ±1%.

POWER REQUIREMENTS
AC Line: 115 or 230 V ±20%, 48 to 440 Hz.
1700A, 1701A: 30 VA max.
1702A, 1703A: 50 VA max.
1706A, 1707A: 50 VA max.
DC Line: 11.5 to 36 V.
1700A, 1701A: 18 watts max.
1702A, 1703A: 25 watts max.
1706A, 1707A: 25 watts max.
Battery (optional)
OPERATING TIME: up to 6 hours in 1700A or 1701A; up to 4 hours in 1702A or 1703A; up to 4.5 hours in 1706A or 1707A.
RECHARGE TIME: 14 hours maximum, with power switch off, if not operated after power indicator flashes.
LOW BATTERY INDICATOR: power light flashes to indicate that batteries are discharged and further operation may damage battery.
RECHARGING: batteries are recharging whenever power mode switch is set to AC with power applied. With power switch off, full charge is applied. With power switch on, trickle charge is applied.

WEIGHT
Without Panel Cover: net, 24 lb (11 kg); shipping, 35 lb (15,9 kg).
With Panel Cover and Accessories: net, 27 lb (12,3 kg); shipping, 38 lb (17,2 kg).
With Panel Cover, Accessories, and Battery Pack: net, 35 lb (16 kg); shipping, 46 lb (20,9 kg).

DIMENSIONS: refer to outline drawing.

ENVIRONMENT (Oscilloscope operates within specifications over the following ranges): temperature 0°C to + 55°C; humidity, to 95% relative humidity to 40°C, altitude, to 15,000 ft; vibration, vibrated in three planes for 15 min. each with 0.010 inch excursion, 10 to 55 Hz.

ACCESSORIES FURNISHED: blue contrast filter, Model 10115A; front panel storage cover, Model 10101A; two Model 10006B probes; one dc power plug for assembling a dc power cord; one ac power cord with right angle plug; and one instruction manual.

PRICE

Model 1700A Oscilloscope	*
Model 1701A Delayed Sweep Oscilloscope	*
Model 1702A Storage Oscilloscope	*
Model 1703A Delayed Sweep Storage Oscilloscope	*
Model 1706A Oscilloscope	*
Model 1707A Delayed Sweep Oscilloscope	*

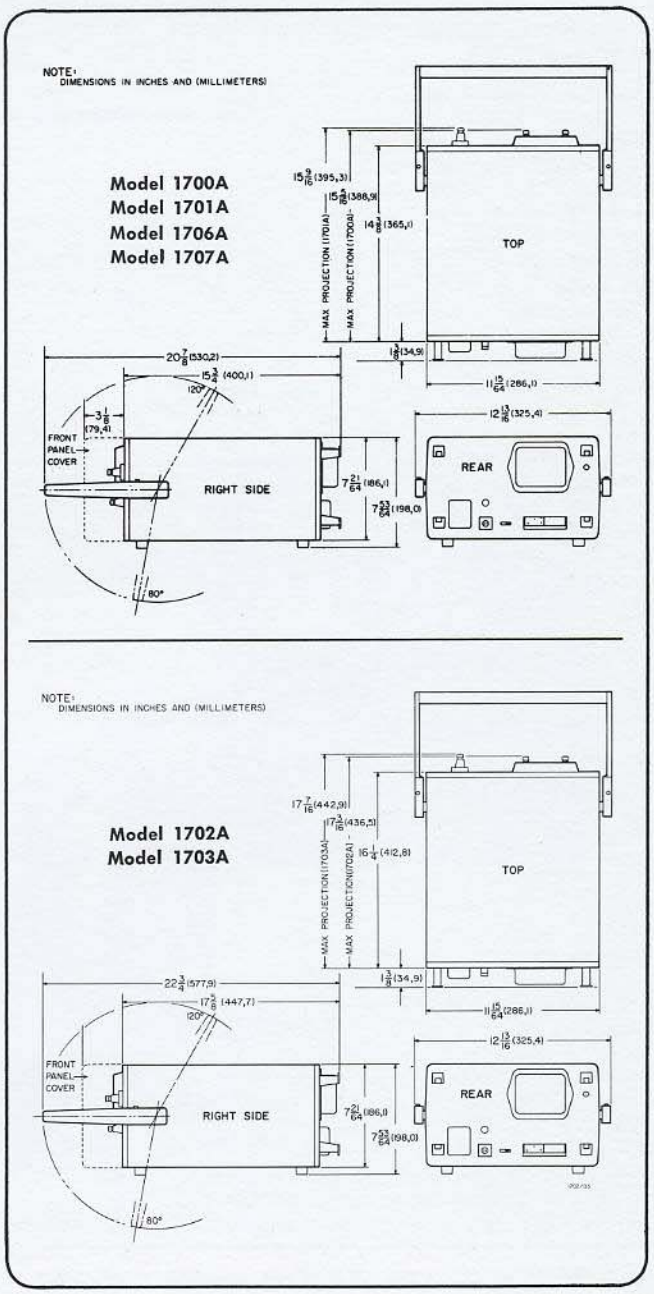
OPTIONS (order by Option Number)

012: Model 10103A battery pack installed,*
016: TV sync separator (may not be ordered with Option 020),*

020 (Models 1700A, 1702A, 1706A): external horizontal input; Channel A output which provides single channel, 1 mV/div deflection factor at reduced bandwidth when cascaded into Channel B.*

020 (Models 1701A and 1707A): mixed sweep; calibrated sweep delay; external trigger input for delayed sweep; external horizontal input; Channel A output which provides single channel, 1 mV/div deflection factor at reduced bandwidth when cascaded into Channel B.*

Note: Option 020 features included on standard 1703A.



***For prices, contact your local Hewlett-Packard field office.**

ADDITIONAL ACCESSORIES

MODEL 10101A STORAGE COVER (supplied with 1700 Series Oscilloscopes): a dual purpose cover that serves as a storage container for probes and other accessories and provides front panel protection during transportation and storage.

NOTE

For replacement decals for a storage cover, contact your local HP Field Engineer.

Price: Model 10101A,*

MODEL 10102A CONTRAST SCREEN: a metal mesh contrast screen which attenuates RFI signals from or to the CRT screen for added RFI protection.

Price: Model 10102A,*

MODEL 10103A BATTERY PACK: a 26¼ V battery that can be easily installed inside a 1700 Series oscilloscope and provides up to 6 hours of operation. Battery installation does not require any instrument modifications.

Price: Model 10103A,*

MODEL 10104A VIEWING HOOD: aids the operator in viewing single-shot transients or very low repetition rate signals that cannot be observed easily in normal ambient light conditions. The viewing hood is collapsible and will fit inside the 10101A storage cover.

Price: Model 10104A,*

MODEL 10105A TESTMOBILE ADAPTER: attaches to the bottom cover of 1700 series oscilloscopes and allows the scopes to be mounted on 1118A, 1119C, 1119D Testmobiles.

Price: Model 10105A,*

MODEL 10106A CAMERA ADAPTER: adapts Tektronix, Inc. C30A or C31 cameras to 1700 series oscilloscopes.

Price: Model 10106A,*

MODEL 10107A CONTRAST SCREEN: a polyester contrast screen that increases trace to background contrast.

Price: Model 10107A,*

MODEL 10108A PROTECTIVE COVER. rugged, vinyl coated cotton fabric cover which has been mildew-proofed and scotch-guarded. Fits 1700A, 1701A, 1706A and 1707A.

Price: Model 10108A,*

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