

Get Big Picture Displays,
Plug-In Versatility,
100% Solid State Circuitry,
Superior Performance,
In a New 30-Pound Package
For Field, Laboratory and
Production Applications

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An extra measure of quality

NEW 180A OSCILLOSCOPE

New Step-Ahead Design Gives Big Scope Features In a Rugged, Lightweight Instrument

You get more total performance, more usability in the new hp 180A Oscilloscope—*more than any other scope on the market!* You get this greater measurement capability in a 30-pound package that goes anywhere—field, laboratory or production line. Designed from the user's viewpoint in, this new high-frequency scope is packed with new ideas and innovations to give you big picture CRT, plug-in versatility, step-ahead electrical performance, minimum weight and rugged design.

With hp's all-new CRT, you get a big picture 8 x 10 cm display in a compact 17-inch tube length to allow portability. Display area is 30% larger than on existing high-frequency scopes—and 100% larger than some portable scopes. This means that you make accurate measurements, easier!

The vertical amplifier drives the CRT vertical deflection plates directly, requiring only 3 v/cm. This allows extended bandwidth capabilities, and means the vertical amplifier is lightweight, requires low power. Solid-state amplifiers with FET input stages provide stable gain and low drift for accurate measurements. Vertical attenuation, which sets vertical deflection factor, is ahead of the amplifier. This prevents trace jumps as you change ranges; bandwidth is maintained on all ranges even when verniers are used.

For easy viewing of the leading edge of a fast pulse, a new lightweight 160 nsec, 140 MHz etched circuit delay line was developed. Wide bandwidth together with good impedance characteristics insure clean display of input signal.

A new type of horizontal amplifier has wide bandwidth with X10 magnification to provide linear 5 nsec/cm sweeps, giving you greater resolution of high frequency signals and fast pulses.

Circuitry in the new 180A is 100% solid state. Only premium quality components were used throughout. This means you have lower power requirements, lighter weight and increased reliability. This results in the utilization of convection cooling—no fans.

Circuit boards in the scope are arranged to provide easy access to all circuitry. Snap-off covers give quick access. The control panel has been "human-engineered"—control knobs and switches are "convenience-grouped" and plainly marked to make them easier to see, easier to operate. Control panel and nomenclature are selective dye anodized for permanence.

Ask your nearest hp field representative for a demonstration of the 180A Oscilloscope, and he will show how you can see *more, do more* with this new big picture, 30-pound scope!

SEE MORE! 

DO MORE! 

More Performance Than Any Other Scope—And in a 30-Pound Package!



Large Area 8 x 10 cm CRT

- New design breakthrough offers a shorter, high-frequency CRT with picture area from 30% to 100% greater than any other high-frequency scope. Accurate measurements are easier to read and view.
- Deflection plates require only 3 v/cm drive—allows extended bandwidth capabilities.
- 12 kv accelerating potential produces bright, easy-to-see traces, even at 5 nsec/cm sweeps.
- Snap-off bezel for easy installation of new hp contrast filters or special graticules.
- Beam finder for rapid location of trace.
- Internal graticule calibrated in centimeters eliminates parallax error; flood guns allow variable background illumination for optimum contrast of graticule and trace.



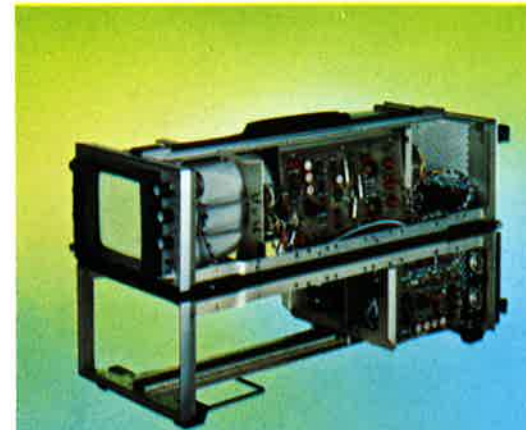
Plug-In Versatility

- Now 1801A dual channel vertical amplifier
 - dc to 50 MHz bandwidth (all ranges). 7 nsec rise time.
 - 5 mv/cm to 20 v/cm range.
 - A + B, and A - B operation.
 - internal trigger on Channel B in ALT and CHOP modes for time correlation of traces.
- Now 1821A time base and delay generator
 - triggering to 90 MHz.
 - sweeps from 1 sec/cm to 10 nsec/cm.
 - easy-to-use delayed sweep.
 - mixed sweep for slow/fast sweep display.
 - bright line automatic triggering.
- Now 1820A time base
 - triggering to 90 MHz.
 - sweeps from 2 sec/cm to 5 nsec/cm.
 - variable holdoff locks-in complex waveforms.
 - bright line automatic triggering.
- More plug-ins to come—for extended capabilities.



Step-Ahead Electrical Performance

- Solid triggering capability to 90 MHz, as shown above.
- New horizontal amplifier permits linear 5 nsec/cm sweep speed.
- Maximum stability with 100% solid state circuitry.
- Premium components—capacitors, potentiometers and metal film resistors.
- FET input amplifiers for exceptionally low drift, quick 15-second warm-up.
- Operates on 115 or 230 volts, 50-1000 Hz, only 95 watts—convection cooled.
- New hp CRT design permits 3 v/cm drive; therefore, vertical amplifier is smaller, lower power. Amplifier drives CRT vertical deflection plate directly. These features provide extended bandwidth capability.
- DC coupled Z axis input.
- New etched circuit delay line for clean pulse response—minimum weight and size.



Rugged Design for Use Anywhere

- Aircraft-type frame construction for maximum ruggedness with minimum weight.
- Easy-to-get-at circuits—covers snap off.
- Conveniently-grouped controls are easier to see, easier to operate.
- Operates with confidence at -28°C to +65°C, 95% relative humidity to 40°C, 15,000 feet.
- Withstands shock and vibration—built for portable use.
- Scope with plug-ins weighs only 30 pounds.
- 8" x 10" cabinet, or 5¼" x 19" rack mount models.



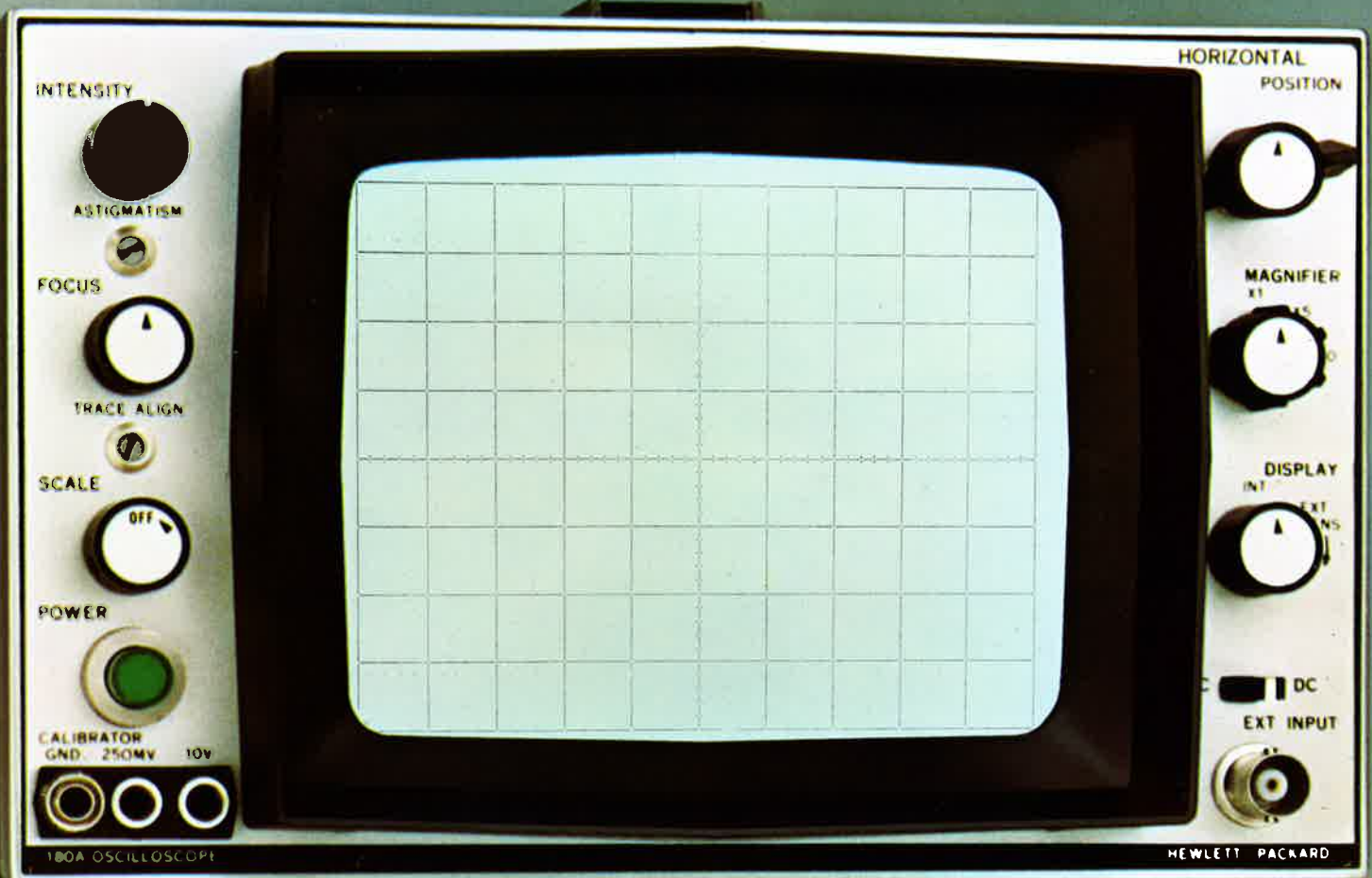
ACCESSORIES



- 1118A Testmobile, \$95.00
- 197A Camera, \$475.00
- 10176A Flexible Viewing Hood, \$7.00
- 10166A Panel Cover, \$25.00
- 10167A Carrying Cover, \$20.00
- 10004A 3½-foot 10:1 Divider Probe, \$35.00
- 10110A BNC Male to Binding Post Adapter, \$5.00
- 10360A Camera Adapter for hp 196A/B Camera, \$15.00
- 10361A Camera Adapter for Tektronix C12 Camera, \$15.00
- 10362A Camera Adapter for Tektronix C27 Camera, \$15.00

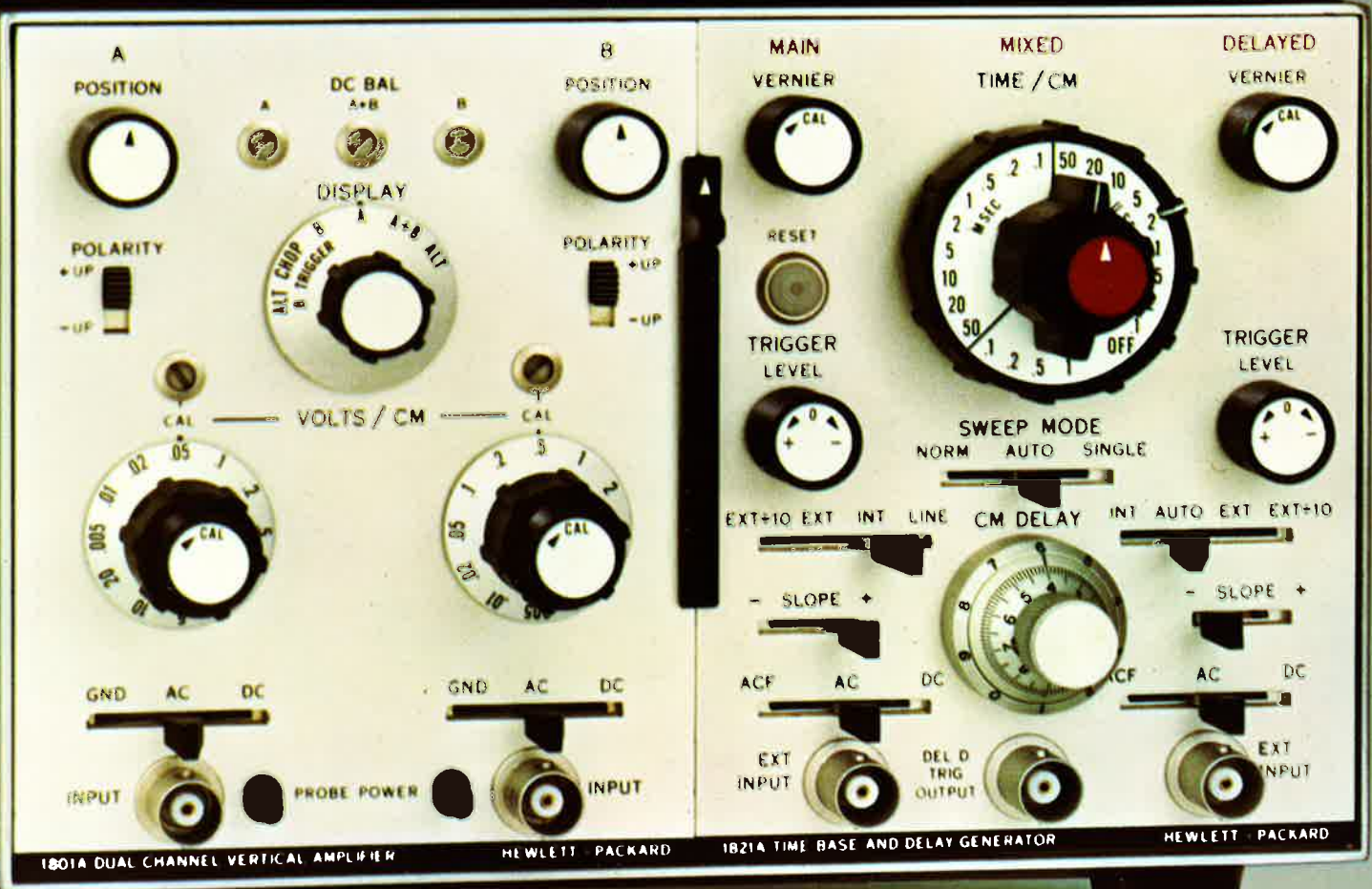
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Get the BIG picture! Write or call for your demonstration, today! Hewlett-Packard, Palo Alto, California 94304, Tel. (415) 326-7000; Europe: 54 Route des Acacias, Geneva. Price: hp Model 180A Oscilloscope, \$825.00; hp Model 180AR (rack) Oscilloscope, \$900.00; hp Model 1801A Dual Channel Vertical Amplifier, \$650.00; hp Model 1820A Time Base, \$475.00; hp Model 1821A Time Base and Delay Generator, \$800.00, f.o.b. factory.



180A OSCILLOSCOPE

HEWLETT PACKARD



1801A DUAL CHANNEL VERTICAL AMPLIFIER

HEWLETT PACKARD

1821A TIME BASE AND DELAY GENERATOR

HEWLETT PACKARD

ACTUAL SIZE

180A Oscilloscope**Horizontal Amplifier:****External Input:**

Bandwidth: DC coupled, dc to 5 MHz; AC coupled, 5 Hz to 5 MHz.

Sensitivity: 1 v/cm, X1; 0.2 v/cm, X5; 0.1 v/cm, X10; vernier provides continuous adjustment between ranges. Dynamic range ≈ 5 v.

Input RC: 1 megohm shunted by approximately 30 pf.

Sweep Magnifier: X1, X5, X10; magnified sweep accuracy $\approx 5\%$.

Calibrator:

Type: Approx. 1 kHz square wave, 3 μ sec rise time.

Voltage: 2 outputs, 250 mv and 10 v p-p, $\approx 1\%$.

Cathode-ray Tube and Controls:

Type: Post-accelerator tube, 12 kv accelerating potential; aluminized P31 phosphor (P2, P7, and P11 available at no extra charge. Specify by phosphor number).

Writing Rate: (Using HP 197A Camera with f1.9 lens and Polaroid® 3000 speed film): P31 phosphor, approx. 700 cm/ μ sec.

Graticule: 8 x 10 cm parallax-free internal graticule marked in cm squares. 2mm subdivisions on major axes. Front panel recessed TRACE ALIGN aligns trace with graticule; internal Y-align aligns Y-trace with X-trace. SCALE control illuminates CRT phosphor for viewing with hood or taking photographs.

Beam Finder: Pressing Beam Finder control brings trace on CRT screen regardless of setting of horizontal, vertical or intensity controls.

Intensity Modulation: Approx. +2v, dc to 15 MHz, will blank trace of normal intensity. Input R, 5.1 kohms.

Active Components: All solid state (except CRT).

Environment: 180A Scope with plug-ins operates within specs over the following ranges. Temperature: -28 to +65°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" excursion from 10 to 55 Hz.

Power: 115 or 230 v, $\approx 10\%$, 50-1000 Hz, 95 watts at normal line, convection cooled.

Dimensions: Cabinet (overall dimensions with feet, handle): 8" x 11" x 22½" deep. Rack mount: 5¼" x 19"x19½" deep behind front panel, 21½" deep overall.

Weight: (without plug-ins): Model 180A, Net, 22 lbs. (9.9 kg). Shipping, 30 lbs (13.5 kg). Model 180AR (rack); Net, 25 lbs (11.3 kg). Shipping, 33 lbs. (14.9 kg).

Outputs: Four emitter follower outputs for main and delayed gates, main and delayed sweeps. Maximum current available, ≈ 3 ma. Outputs will drive impedances down to 1 k Ω without distortion.

Accessories Furnished: Two Model 10004A 10:1 voltage divider probes, mesh contrast filter, detachable power cord, rack mounting hardware (rack only).

Price: (without plug-ins) Model 180A, \$825.00; Model 180AR (rack), \$900.00.

1801A Dual Channel Amplifier

Modes of Operation: Chan. A alone; Chan. B alone; Chan. A and B displayed on alternate sweeps; Chan. A and B displayed by switching at approximately a 400 kHz rate, with blanking during switching; Chan. A plus Chan. B (algebraic addition).

Each Channel:

Deflection Factor (Sensitivity): 0.005 v/cm to 20 v/cm; vernier extends minimum sensitivity to 50 v/cm; a sensitivity calibration adjustment for each channel is provided on the front panel.

Attenuator Accuracy: $\approx 3\%$.

Bandwidth (Direct or with probes, 3 db down from 8 cm 50 kHz reference signal.): DC coupled, dc to 50 MHz; AC coupled, 2 Hz to 50 MHz.

Rise Time (Direct or with probes): Less than 7 nsec. with 8 cm input step.

Input RC: 1 megohm shunted by approximately 25 pf.

Maximum Input Signal: AC coupled, 600 volts peak; DC coupled, 150 v at 5 mv/cm increasing to 350 v at 20 v/cm.

Polarity Presentation: + or - Up, selectable.

A + B Input:

Amplifier: Bandwidth and sensitivity remain unchanged. Either Channel A or B may be inverted to give A - B operation.

Differential Input (A - B): Common mode rejection at least 40 db at 5 mv/cm, 20 db on other ranges for frequencies up to 1 MHz. Common mode signal should not exceed an amplitude equivalent to 50 cm.

Triggering:

Mode: Chan. A or Chan. B alone, or Chan. A plus Chan. B, on the signal displayed; Chan. A and Chan. B displayed by switching at approx. a 400 kHz rate, on Chan. B alone; Chan. A and B displayed on alternate sweeps, on the signal displayed on each channel or Chan. B alone.

Frequency: Provides sufficient signal to the time base for triggering over the range of dc to 50 MHz with 0.5 cm p-p signal or more displayed on the CRT.

General:

Weight: Net, 4 lbs (1.8 kg), Shipping, 6½ lbs (3 kg).

Price: Model 1801A, \$650.00.

1820A Time Base

Sweep Range: 24 ranges, 0.05 μ sec/cm to 2 sec/cm in a 1,2,5 sequence; accuracy, $\approx 3\%$; vernier provides continuous adjustment between ranges and extends slowest sweep to at least 5 sec/cm; horizontal magnifier expands fastest sweep to 5 nsec/cm.

Triggering:

Internal: See vertical amplifier plug-in.

External: dc to 50 MHz from signals 0.5 v p-p or more increasing to 1 v at 90 MHz.

Automatic: Bright base line displayed in absence of input signal. Internal, from 40 Hz, see vertical amplifier specification. External from 40 Hz on signals 0.5 v p-p or more to greater than 50 MHz, increasing to 1 v at 90 MHz.

Trigger point and slope: Controls allow selection of level and positive or negative slope; trigger level on external sync signal adjustable over range of ≈ 5 v, ≈ 50 v in $\div 10$ position.

Coupling: AC, DC, ACF: AC attenuates signals below approx. 20 Hz; ACF attenuates signals below approx. 15 kHz.

Single Sweep: Front panel switch provides single sweep operation.

Variable Holdoff: Permits variation of time between sweeps to allow triggering on asymmetrical pulse trains.

Weight: Net, 2¾ lbs. (1.3 kg), Shipping, 5¼ lbs. (2.4 kg).

Price: Model 1820A, \$475.00.

1821A Time Base and Delay Generator**Main Sweep:**

Range: 22 ranges, 0.1 μ sec/cm to 1 sec/cm in 1,2,5 sequence; accuracy, $\approx 3\%$; vernier provides continuous adjustment between ranges and extends slowest sweep to at least 2.5 sec/cm; horizontal magnifier expands fastest sweep to 10 nsec/cm.

Triggering:

Internal: See vertical amplifier plug-in.

External: dc to 50 MHz from signals 0.5 v p-p or more increasing to 1 v at 90 MHz.

Automatic: Bright base line displayed in absence of an input signal. Internal, from 40 Hz, see vertical amplifier specification. External, from 40 Hz on signals 0.5 v p-p or more to greater than 50 MHz increasing to 1 v at 90 MHz.

Trigger point and slope: Controls allow selection of level and positive and negative slope; trigger level on external sync signal adjustable over range of ≈ 5 volts, ≈ 50 v in $\div 10$ position.

Coupling: AC, DC, ACF: AC attenuates signals below approx. 20 Hz; ACF attenuates signals below approx. 15 kHz.

Trace Intensification: Used for setting up delayed or mixed sweep. Increases in brightness that part of main sweep to be expanded full screen in delayed sweep or made magnified part of display in mixed sweep. Rotating Delayed Sweep time switch from OFF position activates intensified mode.

Delayed Sweep: Delayed time base sweeps after a time delay set by main sweep and delay controls.

Range: 18 ranges, 0.1 μ sec/cm to 50 msec/cm in 1,2,5 sequence; accuracy, $\approx 3\%$; vernier provides continuous adjustment between ranges and extends slowest sweep to at least 125 msec/cm.

Triggering: Applied to intensified Main, Delayed, and Mixed Sweep modes.

Automatic: Delayed sweep starts at end of delayed period.

Internal, External, Slope, Level, and Coupling: Same as Main Sweep triggering.

Delay (before start of delayed sweep):

Time: Continuously variable from 0.1 μ sec to 10 sec. Accuracy: $\approx 1\%$; linearity, $\approx 0.2\%$; time jitter is less than 0.005% of maximum delay of each range (1 part in 20,000).

Trigger Output (at end of delay time): approximately 1.5 v with less than 50 nsec rise time from 1 k impedance.

Mixed Sweep: Dual sweep display in which main sweep drives first portion of display and delayed sweep completes display at speeds up to 1000 times faster.

Single Sweep: Any display may be operated in Single Sweep.

Weight: Net, 3¾ lbs. (1.7 kg), Shipping, 6¼ lbs. (2.8 kg).

Price: Model 1821A, \$800.00.

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