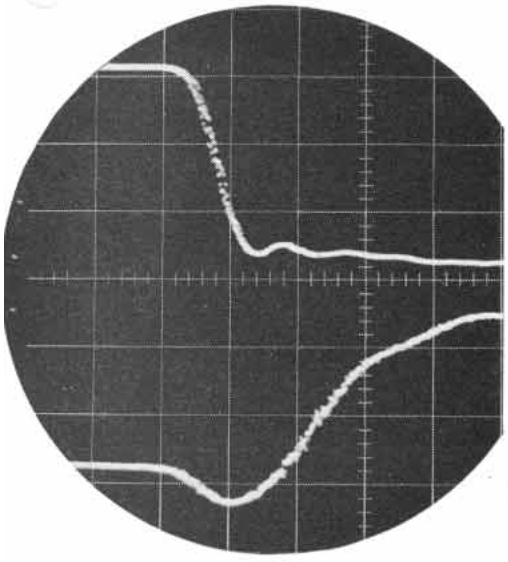
This new-concept hp 500 MC oscilloscope

can help you now...and here's how!



Dual pulse presentation on hp 185A. Top trace shows pulse from mercury pulser applied to 2N1385 mesa transistor. Bottom trace shows responding turn-on of transistor. Dip in bottom trace at start of turn-on results from capacitance. Scope sweep speed 1 millimicrosecond/cm.

- **Analyze millimicrosecond pulses**
- **Measure transistor response time**
- **Make fractional millimicrosecond time comparisons**
- **Measure diode switching time**
- **Determine pulse jitter**
- **Make permanent X-Y plots**
- **Measure memory-unit switching**
- **Measure uhf voltage amplitude**

...here, now, is the convenience of conventional pulse measurement in the millimicrosecond region

The hp 185A 500 MC Oscilloscope is a completely new instrument that is virtually as simple, convenient and easy to read as conventional broadband oscilloscopes, yet provides a wealth of fast-circuit information never before available.

In such fields as computer and radar research and design, and semiconductor research, the Model 185A is the first practical, available answer to the pressing need for measuring and viewing millimicrosecond phenomena.

It should be emphasized that the 185A is an existing instrument—ready for you now, with bright, clear 5″ scope traces that are totally comparable in information, clarity and usefulness with presentations you associate with much lower frequencies.

SAMPLING OSCILLOSCOPE

℔ 185A is a sampling oscilloscope, whereas most previous oscilloscopes have been broadband instruments.

The sampling technique avoids several inherent limitations of the broadband approach which arise in the millimicrosecond region. One of these is the intrinsic sensitivity-bandwidth-display-size limitation of cathode ray tubes; another is the characteristic gain-bandwidth limitation of associated amplifiers.

A third critical problem with the broadband approach in the 500 MC band pass area is that, frequently, fast pulses or occurrences happen at low repetition rates. This means that the writing rate is not sufficient to provide a bright trace on the cathode ray tube.

℔ 185A adroitly sidesteps all these roadblocks by immediately translating the input signal to a much lower frequency, through the sampling technique, then proceeding with more conventional signal processing to provide standard oscilloscope operating ease and bright, clear, large-screen presentation.

"Sampling" in this application is analogous to stroboscopic light methodology in that both techniques simulate slowing down the "motion" for better visual study —and both depend on repetition to build a faithful image.

OPERATION DESCRIBED

In the case of the ℔ 185A, the sampling approach is applied in the following manner.

The first step in building the 185A's cathode ray tube picture is to apply a staircase voltage to step the beam across the CRT face. (Figure 1).

Figure 1

Next, input voltage samples, each taken from a differing point on the waveform, are fed through the vertical amplifier to the scope face.

Now, between the staircase steps, the beam is blanked so that the signal becomes a series of dots. In operation, many dots are present, and the pattern appears continuous. (Figure 2).

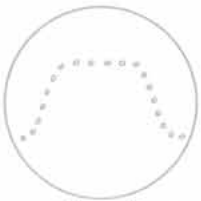


Figure 2

A basic element of the sampling technique as here applied is the incremental delay of each sampling pulse—such delay insuring that a different or successive portion of the wave is examined each time.

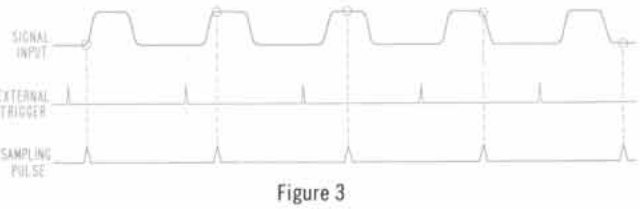


Figure 3

Figure 3 illustrates this delay process. Electrically speaking, it operates as follows. A gate is opened for a very brief time and a capacitor charged to a voltage proportional to the instantaneous amplitude of the test signal. The voltage on the capacitor remains after the gate is closed, and is amplified to provide vertical cathode ray tube deflection.

So that the entire signal under examination is scanned, each succeeding sample is gated at a slightly later point along the waveform. Each time such a sample is taken the "spot" on the CRT is moved horizontally along the waveform. Thus, a complete picture of a repetitive high speed signal is synthesized by a build-up of image-retaining "dots" on the conventional 5AQP 5″ scope face. (As in Figure 2).

Ad No. 6041—Prepared by L. C. C
Electronics; E

UNIQUE ADVANTAGES

The result is a compact, practical instrument of conventional oscilloscope configuration and operating ease which offers you these truly unique features:

- *bright, clear presentation of repetitive short pulses requiring a bandwidth up to 500 MC and beyond*
- *bright, steady traces even at repetition rates down to 50 cps*
- *at least 0.7 millimicrosecond rise time, permitting brilliant viewing of millimicrosecond pulses*
- *dual channel input for waveform comparisons*
- *simultaneous sampling of both channels allows accurate time comparison*
- *times-100 sweep expansion increasing sweep speed to 0.1 millimicrosecond/cm for extreme resolving capability*
- *1.0% time calibrator for accurate rise time measurements and time comparisons*
- *high sensitivity for viewing small signals; wide dynamic range for viewing small voltages on higher voltage plateaus*
- *differential input for studying signal differences*
- *high resistance 100,000 ohm probe to minimize disturbance to circuits under test*
- *X-Y recorder output—plot input vs. time or one input against another*
- *time, amplitude calibrators; beam finder, panel similar to conventional scope controls*
- *unique feedback circuit stabilizes vertical sensitivity; 5 calibrated ranges*
- *balanced sampling circuit minimizes feedback of sampling pulses to circuit under test*

SPECIAL, EASY-TO-USE PROBES

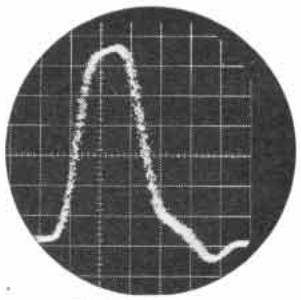
An outstanding feature of the hp 185A is the pair of compact, new-concept probes arranged for easy application to the circuit under test. The probes provide a high 100,000 ohm input resistance shunted by 3 $\mu\mu$f to virtually eliminate loading to the circuit under test. For maximum versatility, the probes may be used with Type N, BNC or other conventional fittings.

Calibrated vertical sensitivity controls permit the instrument to measure a wide range of input levels from 10 to 200 mv/cm. A vernier between steps further increases sensitivity to 3 mv/cm.

To assure maximum usefulness, the 185A has a variable time delay and a four-range time scale with a six-step scale magnifier. These features permit study of fast pulses in extreme detail and under varied trigger conditions.

Model 185A syncs with external triggers up to 50 MC, and also provides a front panel delayed sync pulse which may be used to trigger the circuit under test. In situations where the circuit will respond to this trigger, a delay line is unnecessary.

Front panel controls are few in number and grouped in familiar oscilloscope array. One unusual control is a front panel scanning control governing the number of samples contained in a single trace. Density of these samples may be adjusted from 50 samples (a series of spaced dots) to 1,000 samples (where the presentation appears as a continuous trace).



2 millimicrosecond pulse on 5" CRT of hp 185A.

A particularly helpful feature of the hp 185A is its X-Y recorder output. The Manual Scan control can be used to further slow the input signal, permitting X-Y plotting for permanent records, reports, etc., with such instruments as the Moseley Model 2D Autograf Recorder.

DUAL OR DIFFERENTIAL INPUT

hp 187A Dual Trace Amplifier is a plug-in unit for use with hp 185A. It permits observation and comparison of two high speed signals simultaneously, or comparisons of time, duration and spacing. The amplifier has a wide dynamic range of 3 mv to 2 volts peak; each channel has an independent sensitivity control calibrated to ± 5%.

SPECIFICATIONS

hp 185A with hp 187A Dual Trace Amplifier

VERTICAL (Dual Channel)

Bandwidth:	Greater than 500 MC at 3 db; less than 0.7 mμsec rise time
Sensitivity:	Calib. ranges 10 to 200 mv/cm, ± 5% accuracy Vernier sens. increase to 3 mv/cm
Voltage Calibrator:	10 to 500 mv, ± 3% accuracy
Input Impedance:	100,000 ohms, 3 $\mu\mu$f shunt

HORIZONTAL

Sweep Speeds:	0.1 mμsec/cm to 100 mμsec/cm, 5% full sweep, 1 mμsec/cm to 100 mμsec/cm except on x100 scale and first 30 mμsec of 100 mμsec/cm scale.
Time Scale:	10, 20, 50, 100 mμsec/cm, vernier
Time Scale Magnifier:	x2, x5, x10, x20, x50, x100
Jitter:	Less than 0.05 mμsec peak-peak
Time Calibrator:	500 and 50 MC damped sine waves
Minimum Delay:	120 millimicroseconds
Variable Delay Range:	10 times TIME SCALE less display time
External Trigger:	± 50 mv, 20 mμsec; ± 0.5 v, 1 mμsec
Sampling Rep Rate:	100 KC maximum
Trigger Rate:	50 cps to 50 MC

SYNC PULSE OUTPUT:

Amplitude:	Negative 3 v into 50 ohms
Rise Time:	Approx 2 millimicroseconds
Timing:	Approx 20 mμsec after undelayed trace start
Accessories Furnished:	hp 187A-76A BNC Adaptors (2); hp 185A-21A Sync Probe
Accessories Available:	hp 187A-76B type N Adaptor, $8.00; hp 187A-76C 10:1 Divider, $12.50; hp 187A-76D Blocking Capacitor, $3.50; hp 187A-76E 50 ohm T Connector, $15.00
PRICES:	hp 185A Oscilloscope, $2,000.00 hp 187A Dual Trace Amplifier, $1,000.00

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NOW! hp IN EUROPE!

Recently Hewlett-Packard S.A. was established in Geneva, with a branch in Frankfurt am Main, offering technical sales and engineering help and information. Previously established relationships with representatives in other parts of Europe, of course, continue. In addition, there is a new hp warehouse in Basel stocking instruments and parts, and an hp factory near Stuttgart is producing hp instruments for customers throughout Europe.

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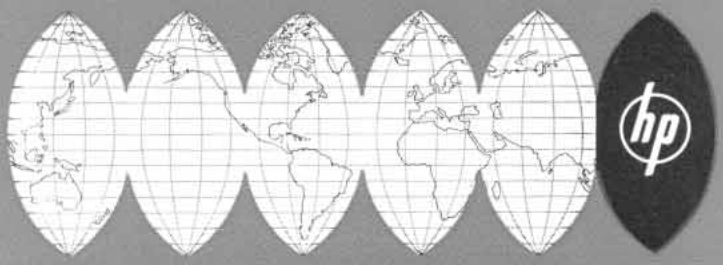

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