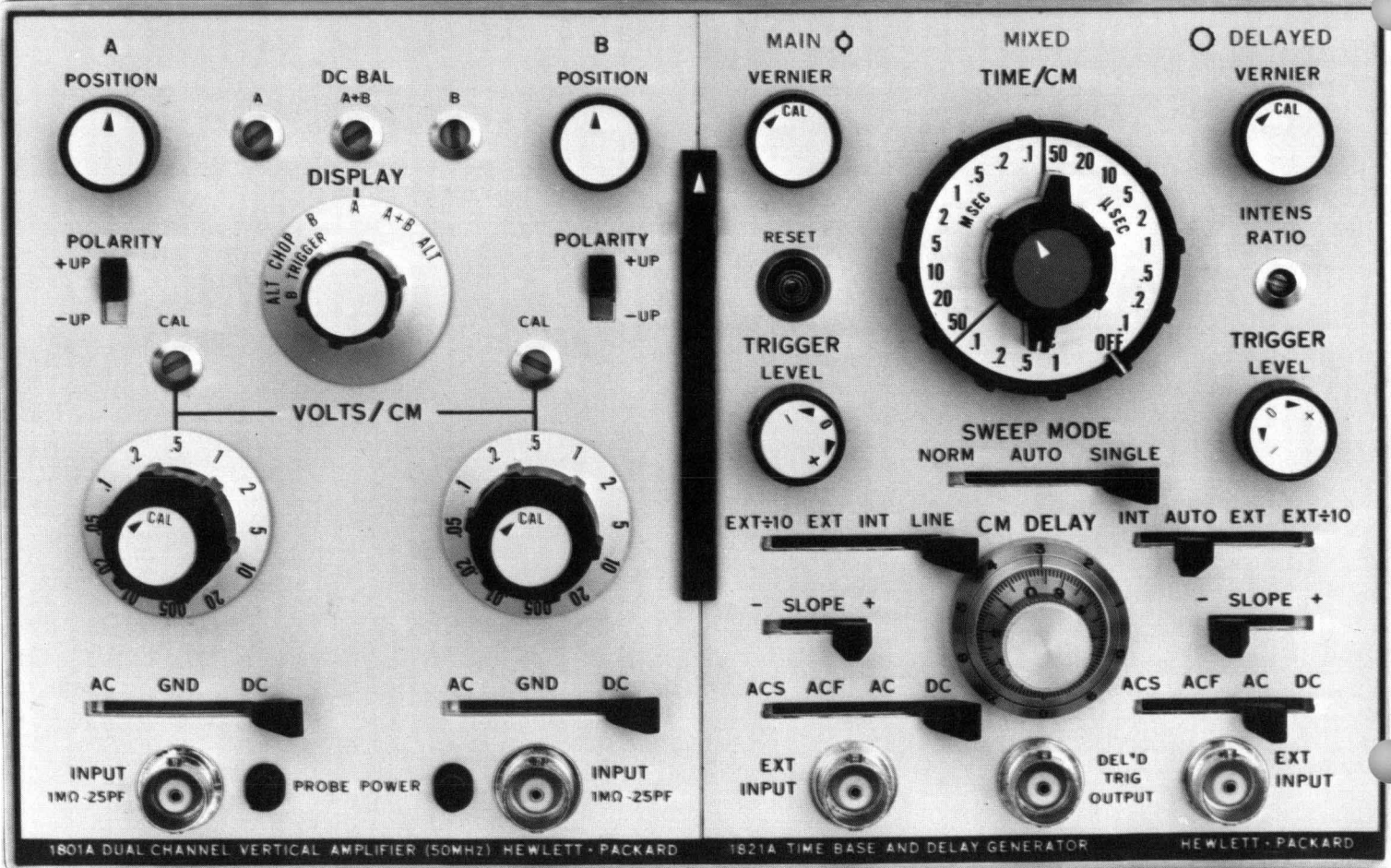
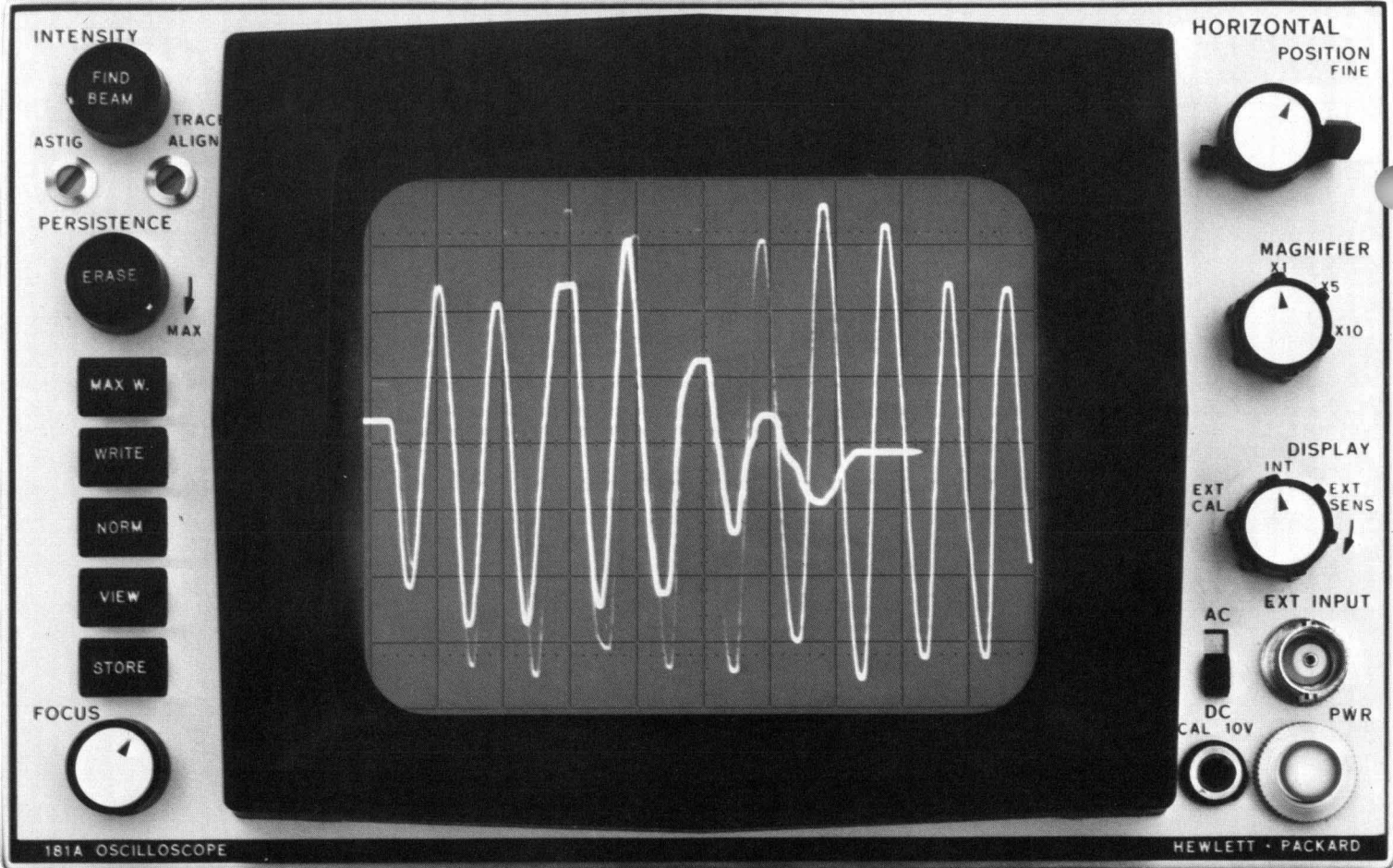


## A NEW GENERATION OF HIGH PERFORMANCE HIGH FREQUENCY OSCILLOSCOPES

- VARIABLE PERSISTENCE AND STORAGE
- ALL SOLID STATE
- 50 MHz BANDWIDTH
- LOW POWER, LIGHT WEIGHT



ACTUAL SIZE

WWW.HPARCHIVE.COM

## Description

The 180A and 181A establish a new standard in high-performance general purpose oscilloscope design. Small and light weight, these all solid-state scopes are ideal for both field and laboratory use.

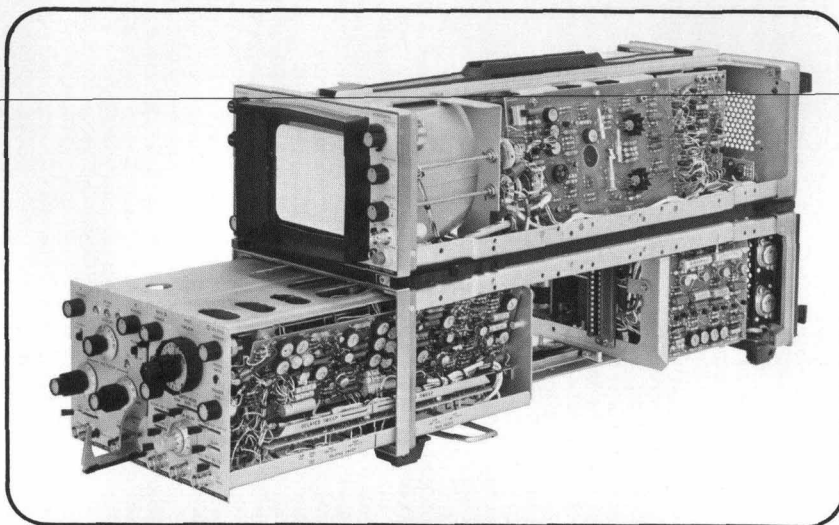
**VARIABLE PERSISTENCE AND STORAGE**—or normal operation. The 181A lets you change the cathode ray tube characteristics at will. Persistence may be varied up to a minute in duration, just by turning a knob. Or a trace may be stored an hour or more just by pushing a button—ideal for measuring turn-on transients, shock measurements, one-shot pulses or random signals.

**50 MHz BANDWIDTH**—at the probe tip or at the scope—under all environmental conditions and at all sensitivities—a new first for storage oscilloscopes. No need for you to sacrifice bandwidth to have all the advantages of storage and variable persistence.

**LARGE SCREEN DISPLAY**—the largest of any high-frequency scope, regardless of package size. Both versions feature an internal graticule, eliminating error caused by visual parallax. The 12 kV CRT on the 180A produces bright, clear traces even at the fastest sweep speeds, while the 181A's variable persistence feature allows you to "develop" or integrate successive traces which are nearly invisible on an ordinary oscilloscope.

**ALL SOLID STATE**—except for the CRT. All active components are fully solid state. Low power consumption eliminates the need for forced air cooling, yet all units operate within specification in ambient temperatures up to 65°C (149°F). FET inputs assure stable, low noise operation with a virtual absence of microphonics.

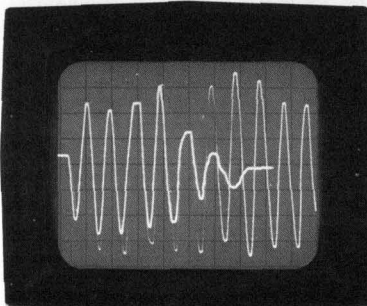
**FOOLPROOF OPERATION**—the 180 series oscilloscopes are designed to cut test time and minimize errors. Controls are



*The all solid-state plug-in concept of the 180A/181A system allows easy and convenient calibration and maintenance. The plug-ins can be removed from the main frame thereby exposing all components and adjustments. The side covers are easily removed for access to the main frame components. The aircraft-type frame construction is designed for maximum ruggedness with a minimum of weight.*

logically grouped. An HP-developed beam finder brings the beam on screen regardless of the setting of position, intensity, sweep or trigger controls. A unique delayed sweep interlock prohibits unusable sweep settings, and makes delayed sweep measurements easier than using a magnifier, yet with far greater accuracy.

### THE SCOPE WITH AN ADJUSTABLE MEMORY



The 181A main frame gives you all the advantages of the 180A main frame—plus the exclusive benefits of variable persistence and storage.

The hp 181A has a post accelerator CRT—with unique mesh storage. By turning a knob, you can adjust the 181A's memory span (trace persistence) from 0.2 seconds to more than a minute.

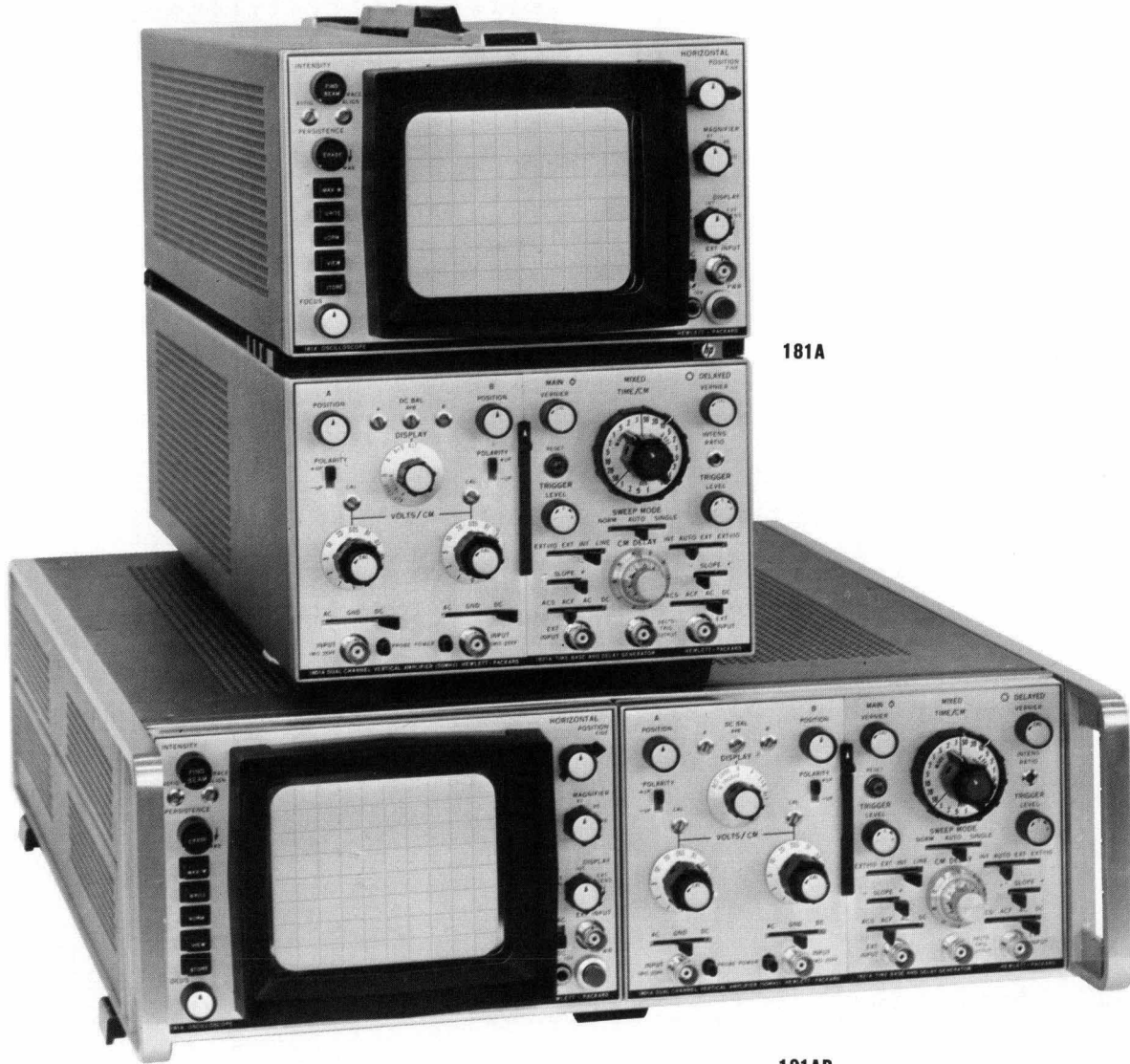
This exclusive hp variable persistence allows you to adjust the CRT persistence to

match the changing characteristics of a signal—any necessary number of traces can be held for trend comparisons, or for flicker-free displays.

The hp mesh storage tube offers many advantages. The stored trace has the same high contrast as a conventional CRT. Intermediate trace values stand out clearly, you can easily distinguish between several separate trace intensities. Maximum viewing intensity in write view mode is 200 foot lamberts. The trace brightness and writing speed are maintained over the entire life of the tube—specified performance is warranted for one year.

In addition to conventional storage, the 181A CRT is also capable of storage after power has been turned off. This feature permits a graphic display of some critical parameter prior to (a) system failure, (b) activation of a safety device, or (c) excursions beyond some predetermined limit. As much as a full minute of information can be stored in this manner for days.

Utilize the hp 181A scope for variable persistence, conventional persistence, and storage—it's like having three scopes in one! Also, you have the advantage of choosing from any of the hp high-performance 1800 Series plug-ins.



181A

181AR

## 181A/AR SPECIFICATIONS

### Horizontal Amplifier:

#### Ext. Input:

**Bandwidth:** dc coupled, dc to 5 MHz; ac coupled, 5 Hz to 5 MHz.

**Deflection Factor (Sensitivity):** 1 v/cm, X1; .2 v/cm, X5; .1 v/cm, X10; vernier provides continuous adjustment between ranges. Dynamic range  $\pm 5$  v.

**Input Rc:** 1 megohm shunted by approximately 30pf.

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

#### Calibrator:

**Type:** approximately 1 kHz square wave, 3 $\mu$ s rise time.

**Voltage:** 10 volt peak-to-peak,  $\pm 1\%$ .

#### Cathode Ray Tube and Controls:

**Type:** post accelerator storage tube; 8.5 kv accelerating potential; aluminized P31 phosphor.

**Graticule:** 8 x 10 div parallax-free internal graticule marked in 0.95 cm squares. Sub-divisions of .2 div on major axes. Front panel recessed TRACE ALIGN aligns trace with graticule. Y axis may be aligned to be perpendicular with X axis with internal control, for accurate rise time measurements.

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

**Intensity Modulation:** approximately +2 volts, dc to 15 MHz, will blank trace at normal intensity. Input R, 5.1k ohms.

**Persistence:** normal, natural persistence of P31 phosphor. Variable continuously variable from less than 0.2 seconds to more than 1 minute.

#### Storage Writing Rate:

Write mode; greater than 20 cm/ms

Max. Write mode; greater than 1 cm/ $\mu$ s

**Brightness:** measured with entire screen faded positive; greater than 200 foot lamberts.

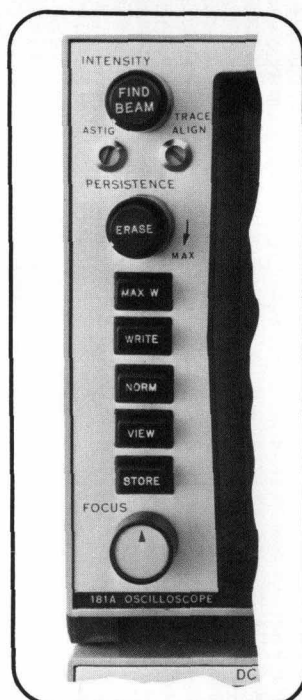
- **Storage Time:** from write mode to store, traces may be stored at reduced intensity for more than one hour. To view mode, traces may be viewed at normal intensity for more than one minute. From MAX write mode to store, traces may be stored at reduced intensity for more than 5 minutes. To view mode, traces may be stored at normal intensity for more than 15 seconds.

**Erase:** manual, push-button erasure takes approximately 300 ms.

#### Outputs:

Four emitter follower outputs for main and delayed gates, main and delayed sweeps. Maximum current available,  $\pm 3$  ma.

Outputs will drive impedances down to 1k ohm without distortion.



#### General:

**Active Components:** all solid state, no vacuum tubes (except CRT).

**Environment:** 181A scope operates within specifications over the following ranges:

Temperature: 0°C 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 10 to 55 Hz.

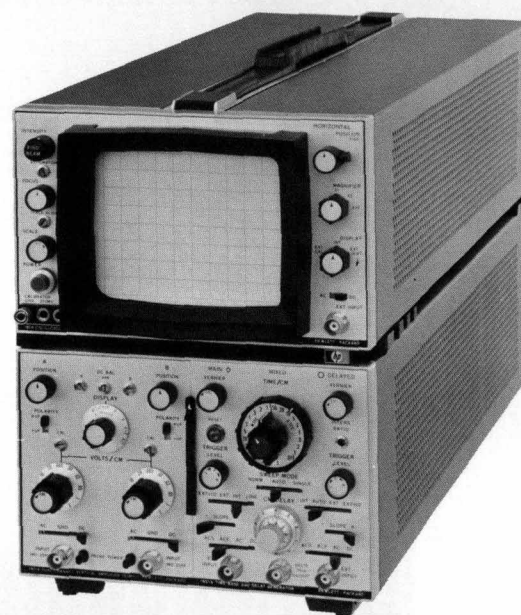
**Power:** 115 or 230 volts,  $\pm 10\%$ , 50-400 Hz, less than 115 watts at normal line, convection cooled.

**Weight:** (without plug-ins)  
Model 181A; net, 24 lbs (10.9 kg); shipping, 32 lbs (14.5 kg). Model 181AR net, 26 lbs (11.8 kg); shipping, 35 lbs (15.9 kg).

**Accessories Furnished:** mesh contrast filter, rack mounting hardware (181AR only).

**Price:** HP Model 181A (cabinet), \$1850; HP Model 181AR (modular rack), \$1925.

## 180A



## 180A/AR SPECIFICATIONS

### Horizontal Amplifier:

#### External Input:

**Bandwidth:** dc coupled, dc to 5MHz; ac coupled, 5 Hz to 5 MHz.

**Deflection Factor (Sensitivity):** 1 v/cm, X1; 0.2 v/cm, X5; 0.1 v/cm, X10; vernier provides continuous adjustment between ranges; dynamic range  $\pm 5$  v.

**Maximum Input:** 600 v dc (ac-coupled input).

**Input Rc:** 1 megohm shunted by approximately 30 pf.

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

#### Calibrator:

**Type:** approximately 1 kHz square wave, 3  $\mu$ sec rise time.

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

#### General:

**Cathode Ray Tube:** post accelerator, 12 kv accelerating potential; aluminized P31 phosphor (other phosphors available; see modifications) safety glass face plate.

**Graticule:** 8 x 10 cm parallax-free internal graticule marked in cm squares, 2mm subdivisions on major axes; front panel recessed screwdriver adjust 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:** approximately +2 v, dc to 15 MHz will blank trace of normal intensity; input Z, 5.1 k $\Omega$ ; input connector on rear panel.

**Active Components:** all solid-state (except CRT).

**Environment:** same as 181A except:

Temperature: -28°C to +65°C.

**Power:** 115 or 230 v,  $\pm 10\%$ , 50 to 1000 Hz, less than 110 watts with plug-ins at normal line, convection cooled.

**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 on rear for main and delayed gates, main and delayed sweeps; maximum current available,  $\pm 3$  ma; outputs will drive impedances down to 1 k $\Omega$  without distortion.

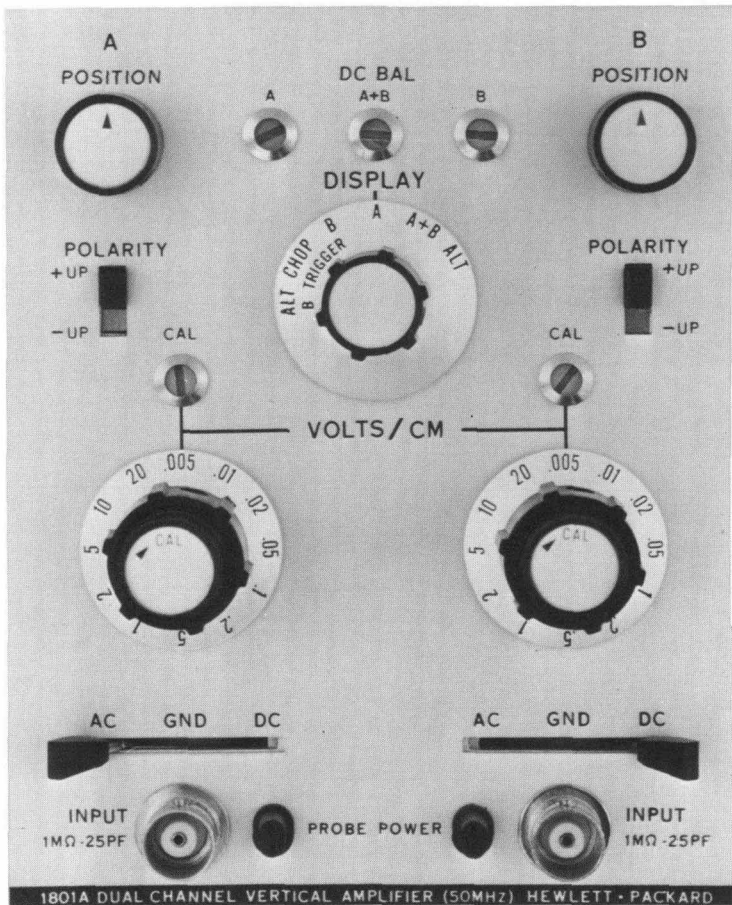
**Accessories Furnished:** mesh contrast filter; rack mounting hardware, (180AR only).

**Price:** Model 180A, \$825; 180AR (modular rack), \$900.

**Modifications:** CRT phosphor (specify by phosphor number); P31 standard; P2, P7, P11 available, no extra charge.

► Indicates change from prior specification

## 1801A DUAL CHANNEL VERTICAL AMPLIFIER



### ACTUAL SIZE

This dual channel amplifier is ideal for general-purpose use in the 180A or 181A. Its high sensitivity of 5 mV/cm provides the extra gain needed when divider probes are used. The 1801A has FET inputs for low drift and instant warm-up, plus a virtual absence of microphonics. All attenuation, which sets deflection factor, occurs prior to any active component—eliminating trace shift with range changes and also assuring constant bandwidth in excess of 50 MHz on all ranges. Internal triggering on the B channel signal assures time correlation between traces in either chopped or alternate operation.

### 1801A SPECIFICATIONS

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

#### Each Channel:

**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 ns with 8 cm input step.

**Deflection Factor (Sensitivity):** 0.005 v/div to 20 v/div; 12 ranges in a 1, 2, 5 sequence; accuracy  $\pm 3\%$ ; vernier extends minimum sensitivity to 50 v/div; a sensitivity calibration adjustment for each channel is provided on the front panel.

**Input RC:** 1 megohm shunted by approximately 25 pf.

**Maximum Input:** 600 v peak ac coupled; dc coupled, 150 v at 5 mv/division increasing to 350 v at 20 v/division.

**Polarity Presentation:** + or - up, selectable.

#### A + B Input:

**Amplifier:** bandwidth and deflection factor 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/div, 20 db on other ranges for frequencies up to 5 MHz; common mode signal should not exceed an amplitude equivalent to 50 cm.

#### Triggering:

**Mode:** Channel A, B or A + B on the signal displayed. Chopped mode on the B channel. Alternate mode on either the B channel or the composite waveform.

**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 in all modes except CHOP; 100 kHz in CHOP.

#### General:

**Weight:** net, 4 lbs (1,8 kg); shipping, 6½ lbs (3 kg).

**Price:** HP Model 1801A, \$650.

**Special Order:** Model 1801A with switchable X5 magnifier. Increases the deflection factor to 1 mv/div on both channels. Bandwidth reduced to 20 MHz in X5 mode, no effect on specifications in X1 mode. Order H05-1801A, price \$745.

► **Accessories:** Two 10004A Probes.

## WIDE BAND DIRECT-ACCESS PLUG-INS

(Special Order)

**Model K02-1801A.** Provides access to vertical deflection plates through a delay line, so that the leading edge of a pulse may be seen even if a pretrigger is not available. The plug-in unit provides a trigger signal to the time base for internal triggering. A position control allows setting baseline anywhere on screen.

### Specifications

**Input:** Single channel, 50 ohms terminated. GR874 connector.

**Rise Time:** Less than 3.5 nsec.

**Delay:** Approx. 160 nsec.

**Deflection Factor:** Approx. 3 v/cm.

**Triggering:** Provides sufficient signal to the time base for triggering over the range of dc to 100 MHz with 1 cm p-p signal or more on the CRT.

**Coupling:** ac; less than 5% sag in 5  $\mu$ sec.

**Price:** Model K02-1801A, \$400.

**Model K03-1801A.** This plug-in provides direct access to the vertical deflection plates without a delay line or trigger take-off. The baseline may be positioned anywhere on screen.

### Specifications

**Input:** Single channel, 50 ohms terminated. BNC connector.

**Rise Time:** Less than 2.5 nsec.

**Deflection Factor:** Approx. 3 v/cm.

**Coupling:** ac; less than 5% sag in 5  $\mu$ sec.

**Price:** Model K03-1801A, \$125.

► Indicates change from prior specification

# 1821A TIME BASE

## Specifications

### Main Time Base:

**Range:** 22 ranges, 0.1  $\mu\text{sec}/\text{div}$  to 1 sec/div in 1, 2, 5 sequence; accuracy,  $\pm 3\%$ ; vernier provides continuous adjustment between steps and extends slowest step to at least 5 sec/div, horizontal magnifier expands fastest step to 10 nsec/div.

### 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 100 MHz.

**Automatic:** bright baseline 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 100 MHz; and from line voltage.

**Trigger Point and Slope:** controls allow selection of level and positive and negative slope; trigger level on external sync signal adjustable over range of  $\pm 3$  volts,  $\pm 30$  volts in  $\div 10$  position.

**Coupling:** ac, dc, acf, acs; ac attenuates signals below approximately 20 Hz; acf attenuates signals below approximately 15 kHz; acs attenuates signals above approximately 30 kHz.

**Trace intensification:** used for setting up delayed or mixed time base; increases in brightness that part of main time base to be expanded full screen in delayed time base; rotating delayed time base switch from OFF position activates intensified mode. Front panel INTENSITY RATIO control adjusts relative intensity of brightened segment.

**Delayed Time Base:** delayed time base sweeps after a time delay set by main time base and delay controls.

**Range:** 18 ranges, 0.1  $\mu\text{sec}/\text{div}$  to 50 msec/div in 1, 2, 5 sequence; accuracy,  $\pm 3\%$ ; vernier provides continuous adjustment between steps and extends slowest step to at least 125 msec/div.

**Triggering:** applied to intensified Main, Delayed, and Mixed time base triggering.

### Delay (Before Start of Delayed Time Base):

**Time:** continuously variable from 0.1  $\mu\text{sec}$  to 10 sec.

**Accuracy:**  $\pm 1\%$ ; linearity,  $\pm 0.2\%$ ; time jitter is less than 0.005% of maximum delay of each step (1 part of 20,000).

**Trigger Output (At End of Delay Time):** approximately 1.5 v with less than 50 nsec rise time from  $1\text{k}\Omega$  impedance.

**Mixed Time Base:** dual time base display in which main time base drives first portion of display and delayed sweep completes display at speeds up to 1000 times faster.

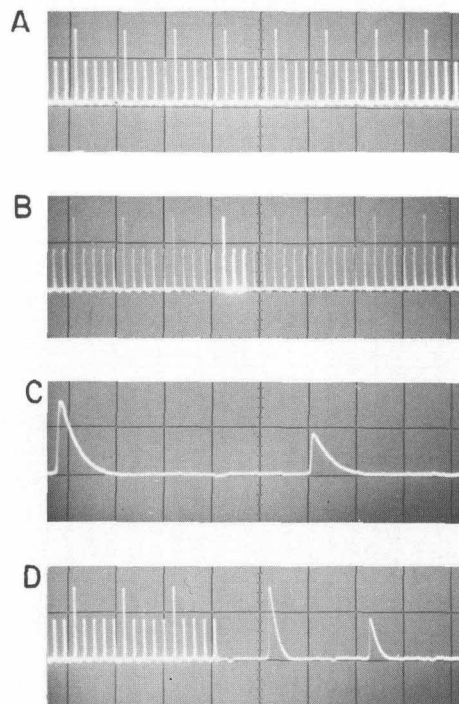
**Single Sweep:** any display may be operated in single sweep.

**Weight:** net  $3\frac{3}{4}$  lbs (1.7 kg), shipping,  $6\frac{1}{2}$  lbs (2.8 kg).

**Price:** Model 1821A, \$800.

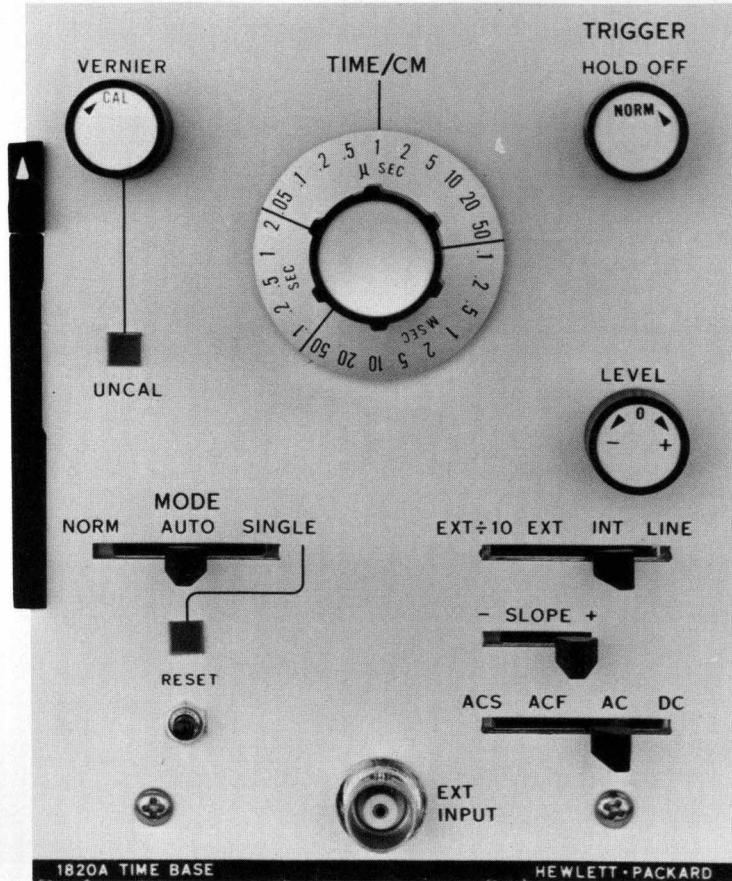


ACTUAL SIZE



The four basic sweep modes of the 1821A are shown above. (A) Normal Sweep; (B) Intensified Sweep, the deflection developed by the delaying sweep and the trace brightened during the time that the delayed sweep is running; (C) Delayed Sweep, the brightened portion of (B) expanded to full screen; and (D) Mixed Sweep, beam deflected initially by delaying sweep and then by the faster delayed sweep.

## 1820A TIME BASE



ACTUAL SIZE

## Specifications

**Time Base:** 24 ranges, 0.05  $\mu$ sec/div to 2 sec/div in a 1, 2, 5 sequence; accuracy,  $\pm 3\%$ ; vernier provides continuous adjustment between steps and extends slowest step to at least 5 sec/div; horizontal magnifier expands fastest step to 5 nsec/div.

### 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 100 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 100 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  $\pm 3$  v,  $\pm 30$  v in  $\div 10$  position.

**Coupling:** ac, dc, acf, acs; ac attenuates signals below approximately 20 Hz; acf attenuates signals below approximately 15 kHz; acs attenuates signals above approximately 30 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, 2 $\frac{3}{4}$  lbs (1.3 kg). Shipping, 5 $\frac{1}{2}$  lbs (2.4 kg).

**Price:** Model 1820A, \$475.



## 180E SYSTEM

Now the new HP 180E offers you the solution to an age-old problem; to provide a highly accurate, versatile, light-weight, general-purpose oscilloscope which will meet the rigid requirements of military operations. The 180E is fully specified for electrical performance as well as environmental performance.

In the past, the military user has had to sacrifice electrical performance in order to have an instrument rugged enough to withstand extreme environments. The 180E meets all the electrical performance specifications of the 180A shown on these pages, but offers unexcelled environmental performance:

- Operating Altitude to 25,000 feet.
- Vibration 0.020 to 0.060 D.A., 5-55 Hz.
- Shock to MIL-S-901C grade A (400 pound hammer drop)
- Operating humidity to 95% R.H. at 65° C.
- RFI protection to MIL-I-6181D and MIL-I-16910C Class I

The complete system, including 180E main frame, 1801E vertical amplifier plug-in, 1821E time base plug-in, and the 10164A front panel cover, may be ordered through a government contract only as the AN/USM 281. Price, \$3,100. The system is also available under Federal Stock Number 6625-053-3112. Alternatively, the individual items may be ordered by HP Model Number.



## Testmobiles

### Model 1118A Testmobile

The HP Model 1118A Testmobile for the Cabinet Model 180A or 181A provides adjustable height from 32 to 42 inches, 360° rotation, and instrument tilt from +45° to -45°. The Model 1118A with its large 3-inch locking wheels adds to the "go anywhere" feature of the Model 180A. Price: \$95.

### Model 1119A Testmobile

For the 180AR or 181AR, the 1119A Testmobile provides adjustable tilt and the optional storage cabinet provides room for plug-ins and a drawer for cables and adapters. Price, 1119A Testmobile with 10479A Tilt Tray, \$145; 10480A Storage Cabinet, \$35.



## Camera and Camera Accessories

The HP Model 197A Camera attaches directly to HP oscilloscopes without the need for an adapter. The 197A features an electronic shutter, adjustable object-to-image ratio from 0.7:1 to 1:1, f/1.9 lens, UV light for graticule illumination, and choice of Polaroid® or Graflok® back. Price, HP 197A, \$540. See the 197A Data Sheet for optional lenses and backs.

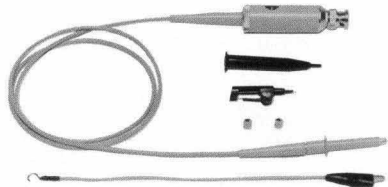
Bezel adapters are required for other cameras:

HP Model 10360A; for HP 196A/B and most Fairchild/DuMont and Beattie-Coleman cameras. Price, \$15.

HP Model 10361A; for Tektronix C12 camera. Price, \$15.

HP Model 10362A; for Tektronix C27 camera. Price, \$15.

®"Polaroid"® by Polaroid Corp. ®"Graflok"® by Graflex, Inc.



### Divider Probes

These miniature, light weight, 10:1 divider probes reduce loading on the circuit under test while maintaining full bandwidth capability of the oscilloscope. They may be used with any oscilloscope having a 1 megohm input impedance and an input capacitance between 15 and 30 pF. A thumbwheel adjustment on the probe boot permits compensation for optimum step response. Each probe includes slip-on pincer tip, spanner tip and ground lead.

#### Model 10004A:

Length: 3½ feet  
Capacitance: 10 pf  
Price: \$35

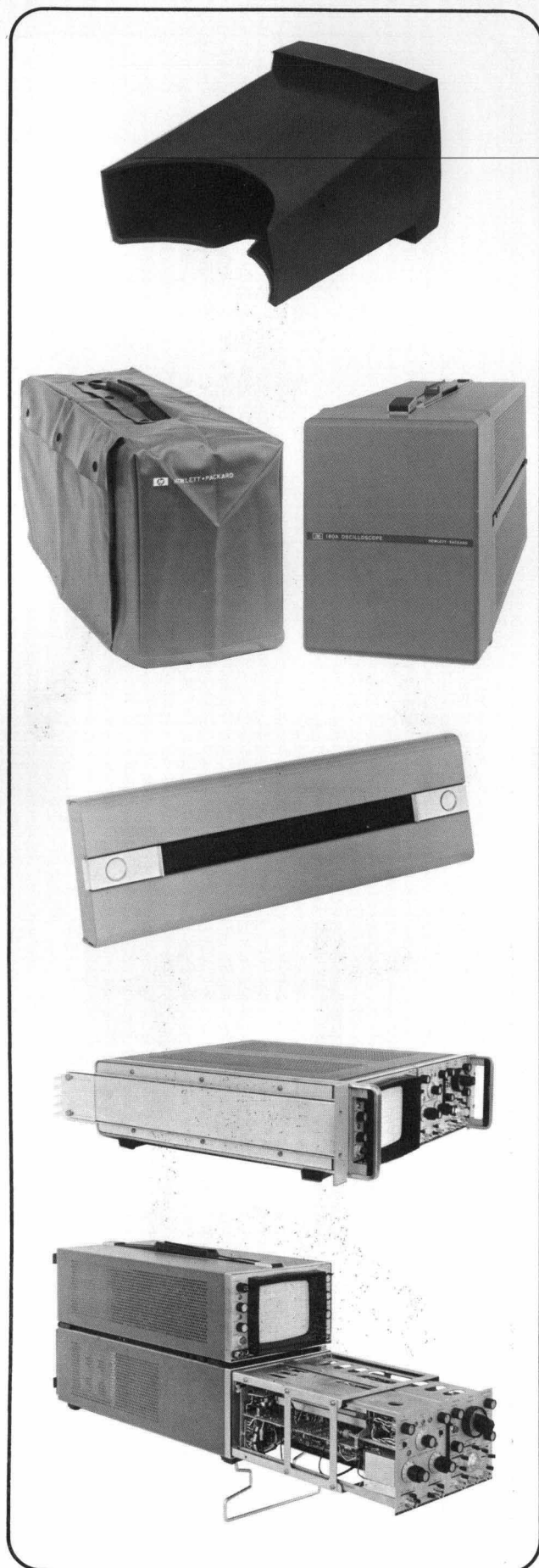
#### Model 10006A:

Length: 6 feet  
Capacitance: 14 pf  
Price: \$40

#### Model 10005A:

Length: 10 feet  
Capacitance: 17 pf  
Price: \$45





### 10176A Viewing Hood

The 10176A viewing hood is a face-fitting, vinyl mask to aid in viewing fast transients. Price: \$7.

### Model 10167A Carrying Cover

The HP Model 10167A carrying cover, made of flexible vinyl material, fits over the cabinet Model 180A or 181A. The top of the cover is slotted for access to the carrying handle. Price: \$20.

### Model 10166A Panel Cover

The HP Model 10166A panel cover, made of fiberglass material, provides protection to the front panel controls of the Model 180A or 181A. Price: \$25.

### Panel Cover

Cover for 180AR or 181AR protects panel from dust and accidental damage. May be used on the instrument whether rack mounted or when carried as a portable instrument. Price: 5060-0437, \$25.

### Slide Adapter

Both fixed and pivoted 22-inch slides are available for slide mounting the 180AR/181AR. Price: 1490-0768 slide adapter (required for either slide), \$22.50; 1490-0714 fixed slides, \$32.50; 1490-0719 pivoted slides, \$37.50.

### Plug-in Extender

The plug-in extender, HP Part No. 10407A, is available to allow calibration and maintenance of the plug-ins while the unit is operating. Price: 10407A, \$65.

# HP FIELD OFFICES

## UNITED STATES

### ALABAMA

P.O. Box 4207  
2003 Byrd Spring Road S.W.  
Huntsville 35802  
Tel: (205) 881-4591  
TWX: 810-726-2204

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Scottsdale 85251  
Tel: (602) 945-7601  
TWX: 910-950-1282

5737 East Broadway  
Tucson 85716  
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TWX: 910-952-1162

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TWX: 910-373-1280

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Sacramento 95821  
Tel: (916) 482-1463  
TWX: 910-367-2092

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Tel: (714) 223-8103  
TWX: 910-335-2000

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TWX: 910-935-0705

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Tel: (203) 289-9394  
TWX: 710-425-3416

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Tel: (203) 853-1251  
TWX: 710-468-3750

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Wilmington 19807  
Tel: (302) 655-6161  
TWX: 510-666-2214

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410 150th Avenue  
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Tel: (813) 391-0211  
TWX: 810-863-0366

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Atlanta 30328  
Tel: (404) 436-6181  
TWX: 810-766-4890

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Skokie 60076  
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TWX: 910-223-3613

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Tel: (504) 721-6201  
TWX: 810-955-5524

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TWX: 710-862-0850

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Twinbrook Station 20851  
12303 Twinbrook Parkway  
Rockville  
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TWX: 710-828-9684

### MASSACHUSETTS

32 Hartwell Road  
Lexington 02173  
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TWX: 710-332-0382

### MICHIGAN

24315 Northwestern Highway  
Southfield 48075  
Tel: (313) 353-9100  
TWX: 810-232-1532

### MINNESOTA

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