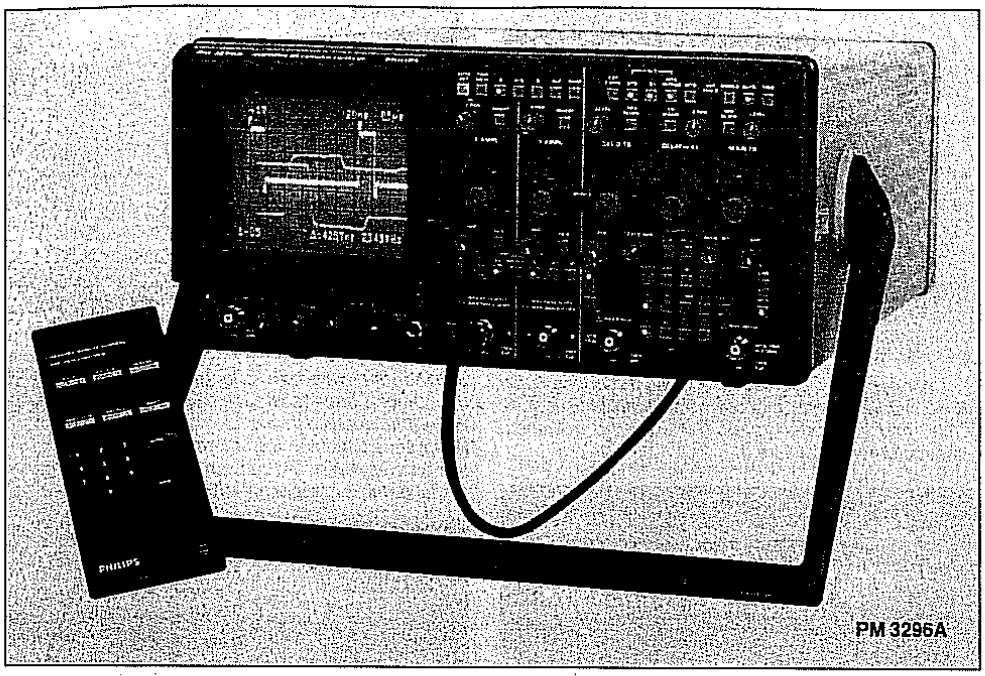
PM 3285A, PM 3286A, PM3295A & PM 3296A

GPIB IEEE-488

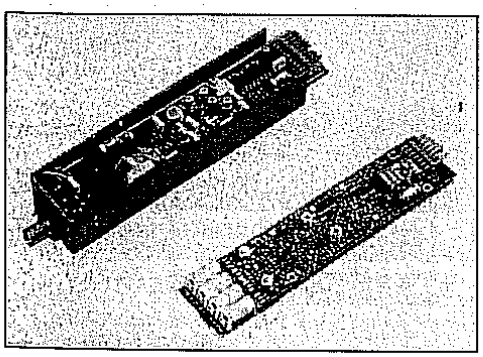

PM 3296A

PM 3285A/86A 200 MHz & PM 3295A/96A 400 MHz Oscilloscopes

- Bandwidths of 400 MHz and 200 MHz
- Risetimes of 0.9 ns at the probe tip (1.75 ns for PM 3285A/86A)
- High visual writing speed CRT's
- AUTOSET
- Menu operation from 75 non-volatile memories
- Cursor measurements for volt, time and frequency
- Dual delayed sweep
- LCD and LED status information for positive feedback

Performance

The PM 3285A/86A and PM 3295A/96A VHF oscilloscopes redefine portable, monolithic oscilloscope capabilities. With more capabilities and more straight foward operation than you will find in other portables.


The PM 3295A/96A split-band, drift corrected preamplifier, using state-of-the-art SMD technology.

Up to 400 MHz bandwidth offers portable subnanosecond performance all the way to the probe tip. Excellent for a wide array of applications including communications, avionics, radar, data processing and video processing.

CRT's with 24 kV acceleration potentials for optimum viewing. Ultra-fast writing speeds of up to 4 div/ns reveal the most elusive details and the narrowest glitches — even at high sweep speeds and low signal repetition rates. Triggering performance is in excess of 400 MHz, stable, and easy to use.

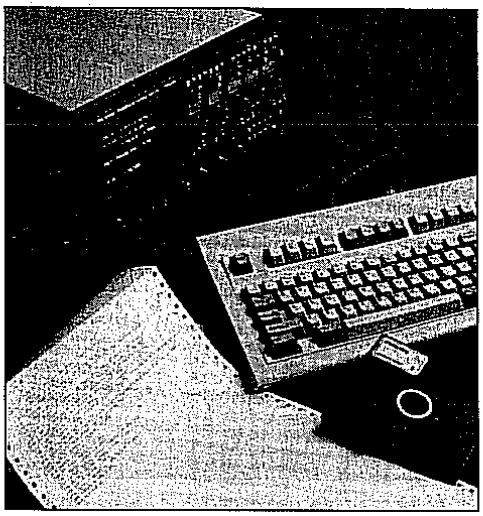
Probe factors are read out automatically. Philips probes automatically adjust the input for proper impedance setting and, where appropriate, sensitivity ranges. 50 Ohm input impedance can be selected. The 50 Ohm termination is protected by software, as well as a thermal sensor on the thin film circuit, causing the microprocessor to disconnect the 50 Ohm load, when overload conditions lead to overheating.

Autoset

Philips' AUTOSET is the first and the most comprehensive intelligent beamfinder available. It automatically selects the proper channel and trigger source for a properly triggered display, and sets amplitude and timebase speed to obtain optimum viewing of almost any input signal, even unknown, at the touch of just one button.

Built-in Programmability

For quick, correct measurements in routine tasks time after time, the PM 3286A and PM 3296A models offer programmability without a computer, by offering up to 75 front panel setups to be stored in non-volatile memory. These menus can be stored, modified and recalled at random or in sequences by using Philips IR remote control.



Cursor Measurements

On-screen cursors let you measure waveform parameters exactly as you see them, easily, with the screen providing numeric readouts of voltage, time and frequency. Absolute and relative measurements (referred to any reference as 100%) can be easily obtained.

Delayed Sweep and Delta-Time

Both timebases can be set to up to 1 ns/div, to match the risetime performance of the vertical channels (2ns/div for PM 3285A series). Delay values are visible in the screen and on the backlit LCD. The dual delayed delta time feature permits accurate differential time and frequency measurements.

Trigger Level Readout

Trigger levels can be set and adjusted using the level readout on the screen. Levels are displayed in divisions, or volts, for internal and external triggering respectively.

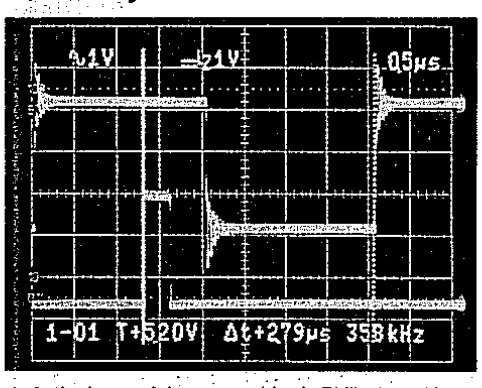
High Performance Engineering

Operation is based on microprocessor controlled cold-switching, in which all signal paths are switched in sealed environments, with no switches to wear out, or get dirty, ever. Not only does this arrangement enhance reliablity, it also permits the full implementation of before-mentioned AUTOSET, and programmability. Opto-encoders replace the front panel switches and provide control over the internal bus.

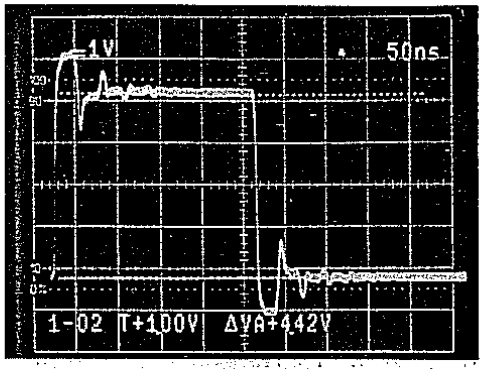
Programmability

GPIB/IEEE-488* is fully implemented in the PM 3286A and PM 3296A, at no extra charge. All front panel settings except intensity and focus are programmable. The controller can always interrogate the units' settings via the IEEE-488 bus. Programmability is further enhanced by the instrument's menu storage, allowing the scope to be controlled by simple, single commands via the bus.

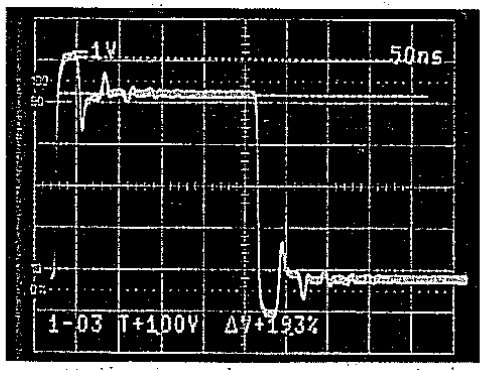
Versatility



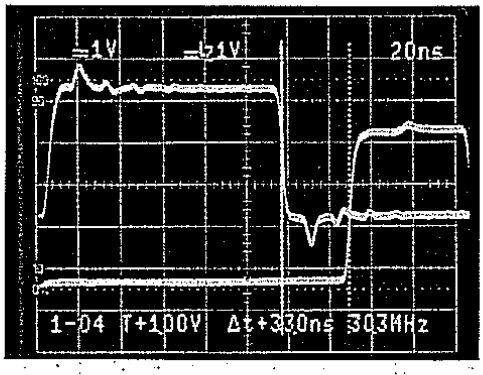
1. At the heart of these portables is Philips' proprietary 8 x 10 cm, 24 kV CRT, assuring bright, clear display of even the fastest signals. Graticule illumination is continuously variable. Intensity controls for traces and text are separate.
A complete information center, the screen exhibits input impedance, input coupling and scalefactor for each channel. Probefactors are automatically recalculated. Timebase speeds are displayed and corrected for magnifier use.
Delta time or cursor readouts appear in the lower righthand corner.
Trigger level is displayed in Volts (for Ext trigger) or Div (for Int trigger). Cursor time readouts are displayed in delta time and Hz.
Setting readouts are duplicated in LEDs and backlit LCDs on the front panel.
Input impedance is automatically set by the probe, so no mismatch can occur. Note the test sequence number in the lower left corner of this PM 3296A display.



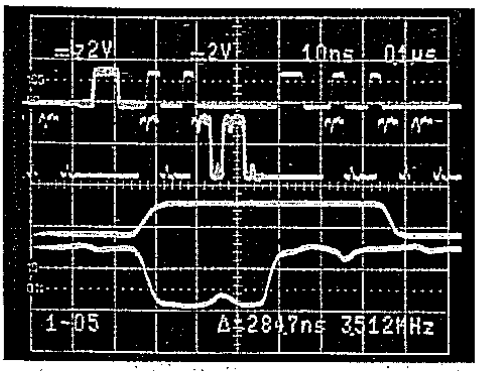
2. Channel is DC coupled at 1 V/div. Timebase is set at 50 ns/div. Cursor readout of pp amplitude is 4.42 Volts, and is referred to as 100% for the overshoot measurement in picture 3.



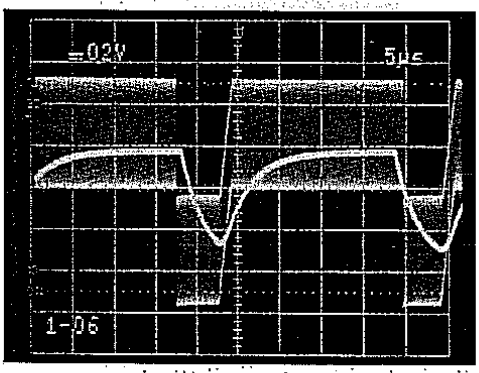
3. The PM 3296A's ability to set any amplitude as a reference lets you take quick readings of overshoot percentages — as in this picture — or measure modulation depth of an AM signal.
Note that the scope can perform relative measurements while channels remain calibrated.



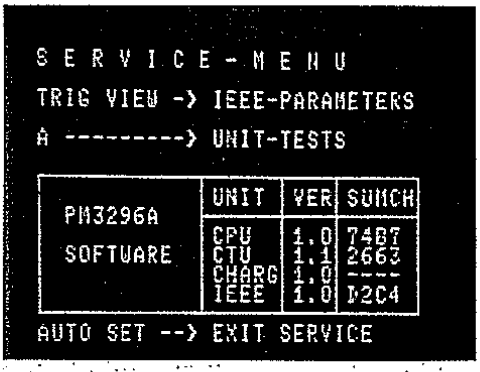
4. Cursors can be used to measure time between two events in the same signal, or between signals. Readout is in (fractions of) seconds, or in Hz.
Time measurements using cursors are simple to make and permit relative time readings on any time section using calibrated timebase settings.



5. When the waveform is too complex to properly set the cursors, better accuracy can be obtained by using delta-time delayed sweep.
Alternative timebase display mode allows you to view the total time-window and, at the same time, magnify signal detail for proper identification.



6. Triggerview can be used as an extra input channel, and also to verify proper trigger conditions.
Here, the trigger signal is obtained from channelA, and contains enough noise that it would make the display unstable and fuzzy.
Trigger selection is from channel A through HF reject. Lower trace shows signal after filtering through HF reject.
Note that the trigger level is midscreen for easy reference and setup.



7. The PM 3296A's extensive service menu facilitates performance check and calibration. Many adjustments can be performed by using internally generated signals to save calibration time.

**The terms GPIB and IEEE-488 may be used interchangeably throughout this catalog.*

Specifications

Technical Specifications

Autoset

Selects channel, amplitude, vertical position, timebase speed and triggering for surveyable display of input signal.

Display

CRT: Philips rectangular pda tube
Viewing Area: 8 x 10 cm
Acceleration Voltage: 24 kV (PM 3295/96A); 16.5 kV (PM 3285/86A)
Phosphor: Type GH (P31)

Readout: Alphanumerical display of relevant vertical and horizontal function selections, deflection coefficients and cursors.
Graticule: Internal with % indications for rise-time measurements. Illumination continuously variable.
Photographic Writing Speed:
4 cm/ns (PM 3295/96A);
2 cm/ns (PM 3285/86A),
with lens aperture F:1.2, object to image ratio: 1:0.5 and filmspeed 20,000 ASA.
External Z-Modulation: Positive voltage decreases intensity

Vertical Deflection

Sources: Y_A, Y_B, Trig view, Y_A and Y_B added. Y_A and Y_B can be inverted
Modes: Single channel or any combination of sources. Alternate or chopped. Display time in chopped mode 350 ns/channel.

Y_A and Y_B

Input Impedance (High Z): 1 MΩ in parallel with 9 pF
Input Impedance (50Ω): V.S.W.R.
1.3:1 at 400 MHz (PM 3295/96A);
1.2:1 at 200 MHz (PM 3285/86A)
Max. Input Voltage (High Z): 300V (DC + AC peak)
Max. Input Voltage (50Ω): 5 Vrms overload protected
Deflection Coefficient: 1 mV/div...5V/div (continuous control between steps)
Error Limit: 2%
Cursor Δt Error Limit: 2% overall

Frequency Response (pm 3295/96A):
DC...400 MHz (-3 dB) (15°C...35°C)
DC...350 MHz (-3 dB) (5°C...40°C)
In 1 mV/div and 2 mV/div settings: DC...70 MHz

Frequency Response (PM 3285/86A):
DC...200 MHz (-3 dB) (15°C...35°C)
DC...175 MHz (-3 dB) (5°C...40°C)
In 1 mV/div and 2 mV/div settings: DC...70 MHz

AC Coupled Lower -3 dB Point: 10 Hz

Rise Time*: .9 ns (PM 3295/96A);
1.75 ns (PM 3285/86A);
In 1 mV/div and 2 mV/div settings:
5 ns (PM 3295/96A);
5.4 ns (PM 3285/86A)
*Rise time calculated using $t_r = \frac{0.35}{\text{bandwidth}}$

Dynamic Range: 24 div up to 100 MHz
CMRR: 100:1 up to 1 MHz; 20:1 up to 50 MHz
Visual Signal Delay: 20 ns
Bandwidth Limiter: Reduces bandwidth to 20 MHz (-3 dB)

Trigger View
Deflection Coefficient: Via EXT. Input 100 mV/div or 1V/div; Via Y_A or Y_B 1 mV/div...5V/div
Frequency Response (PM 3295/96A):
Via EXT input: DC...370 MHz (-3 dB);
Via Y_A or Y_B: DC...350 MHz (-3 dB)
Frequency Response (PM 3285/86A):
Via EXT input: DC...200 MHz (-3 dB);
Via Y_A or Y_B: DC...150 MHz (-3 dB)
Delay Between EXT. Input and Y_A or Y_B: 2 ns

Horizontal Deflection

Display Sources: MTB, MTB intensified by single or dual DTB, DTB, MTB and DTB Alternate, EXT., Line. Trace separation between MTB and DTB in ALT mode continuously controllable over at least 4 divisions

Main Time Base
Modes: AUTO, Trig., Single
Deflection Coefficient: 1s/div...10 ns/div (PM 3295/96A);
1s/div...20 ns/div (PM 3285/86A)
(continuous control between steps)
Error Limit: 0.5% of full scale + 1% of reading
Cursor Δt: Error limit 0.5% of full scale + 1% of reading
Frequency Readout: 1/Δt
Time Base Magnifier: x 10 fastest sweep...
...1 ns/div (PM 3295/96A)
...2 ns/div (PM 3285/86A)
Error Limit: 1% of full scale + 1.5% of reading
Variable Hold Off: Up to 10 x min. value

Delayed Time Base
Modes: Starts immediately after delay time or upon first trigger after delay time
Deflection Coefficient:
0.5s/div...10 ns/div (PM 3295/96A);
0.5s/div...20 ns/div (PM 3285/86A)
(continuous control between steps)
Error Limit: 0.5% of full scale + 1% of reading
Time Base Magnifier: x 10 fastest sweep...
...1 ns/div (PM 3295/96A)
...2 ns/div (PM 3285/86A)
Error Limit: 1% of full scale + 1.5% of reading
Delay Time: 20 ns...10s
Error Limit: 1.2% of full scale + 1% of reading + 12 ns
Time Interval (Δt):
10 ns...10s (PM 3295/96A)
20 ns...10s (PM 3285/86A)
Error Limit: 0.1% of full scale + 0.5% of reading + 2 ns
Frequency Readout: 1/t
Resolution of Delay Time or Δt Control: 1:65,000
Jitter: 1:20,000

Triggering MTB Sources: YA, YB, Composite, EXT, EXT ÷ 10, Line
Coupling: DC, AC, LF REJ, HF REJ
Slope: + or -

Level Range:
Internal: +8...-8 div.
EXT: +0.8...-0.8V
EXT ÷ 10: +8V...-8V
Trigger level is read out on screen if instrument is equipped with GPIB IEEE interface.
Standard on PM 3286A/PM 3296A

Triggering Sensitivity

	PM 3295/96A	
	up to 100 MHz	up to 400 MHz
INT	0.5 div.	2 div.
EXT	50 mV	300 mV
EXT ÷ 10	500 mV	3V

	PM 3285/86A		
	up to 100 MHz	up to 200 MHz	up to 250 MHz
INT	0.5 div.	1 div.	—
EXT	50 mV	—	300 mV
EXT ÷ 10	500 mV	—	3V

Triggering DTB: See MTB triggering except for Line triggering

External

Sources: Y_A, Y_B, EXT
Input Impedance Via EXT: 1 MΩ in parallel with 9 pF
Deflection Coefficient Via EXT: 100 mV/div or 1V/div
Frequency Response: DC...2 MHz (3 dB)
Phase Difference Between Y and EXT: 3° up to 100 kHz
Line: 7 div for frequencies of 50 Hz...60 Hz

Signal Outputs

Calibration Voltage: Square wave, positive going
Amplitude: 0.8V ±1%
Frequency: 5 kHz ±0.1%
Impedance: 50Ω ±1%
Y Signal: Selectable via DTB trigger source
Amplitude: 20 mV/div into 1 MΩ; 10 mV/div into 50Ω
Range: 160 MV_{p-p} into 1 MΩ; 80 mV_{p-p} into 50Ω
Frequency: DC...300 MHz (-3 dB) (PM 3295/96A);
DC...200 MHz (-3 dB) (PM 3285/86A)
MTB Gate: TTL compatible
DTB Gate: TTL compatible

Cursors

Voltage Cursors
Cursor Range: Center 7 divisions
Ratio Range: 0.1%...999%; 100% reference at any amplitude

Timer Cursors
Cursor Range: Center 9 divisions
Ratio Range: 0.1%...999%; 100% reference at any time difference

GPIB/IEEE-488 Interface

All functions (except CRT controls) can be controlled or read by a controller via GPIB/IEEE-488 interface bus. GPIB/IEEE address and talker/listener functions can be set by front panel switches in service menu mode. In remote mode front panel is locked (remote LED on) or unlocked (remote LED blinking) by program. In unlocked mode SRQ function is available via AUTOSET.

Power

Voltage Range: 90...264 VAC, one range
Frequency Range: 45...440 Hz
Consumption: 136W
Battery Back-Up: Holds front panel setting when instrument is switched off
Retention Time: 2 years

Environmental Capabilities

The instrument meets the requirements of MIL-T-28800C, type III, class 5, style D.

Temperature
Operating: 0...50°C
Storage: -40...+75°C
Humidity: 95% R.H.

Altitude
Operating: 4.5 km (15,000 ft)
Storage: 12 km (50,000 ft)

Vibration
Frequency Range: 5 Hz...55 Hz
Max. Acceleration: 3g at 55 Hz held 10 min. at each resonance frequency
Shock: 6 shocks each axis, half sine wave pulse, 11 ms duration, peak acceleration 30g
Bench Handling: MIL-STD 810, method 516, procedure V
EMI: MIL-STD 461 class B, VDE 0871, VDE 875 Grenzwert Klasse B
Safety: The instrument meets the requirements of IEC 348 class I, VDE 411, UL 1244, CSA 556B

Mechanical

Height: Without feet and accessory pouch; 170 mm H (6.7 in)
Incl. feet and accessory pouch: 240 mm (9.4 in)
Width: Incl. feet and accessory pouch: 340 mm (13.4 in)
Depth (excl. handle):
PM 3295/96A: 523 mm (20.6 in)
PM 3285/86A: 473 mm (18.6 in)
Depth (incl. handle);
PM 3295/96A: 625 mm (24.6 in)
PM 3285/86A: 575 mm (22.6 in)
Weight:
PM 3295/96A: 13.9 kg (30.7 lbs)
PM 3285/86A: 13.6 kg (30 lb)

Setting Memory (PM 3296A and PM 3286A)
Memory Capacity: up to 75 front panel settings

Infrared Remote Control
Functions: RECALL, NEXT, PREVIOUS...for recall of programmed settings.
Special functions for protection of programmed settings and identification of instruments.
AUTO...for automatic setting-up of front panel for surveyable display of any input signal.
Transmission Type: Infrared
Batteries: 4 x AAA lifetime typically 2 years
Transmission Distance: Typically 10 ft. (3.5m)
Dimensions: 71 mm W x 16 mm H x 173 mm L (2.6 in W x 0.6 in H x 6.8 in L)
Weight: 135g (0.3 lbs)

Environmental Characteristics
Operating Temp. Range: +5...45°C
Storage Temp. Range: -25...+70°C (without batteries)
Unit is splash-proof; no functional failure after drying period of 24 hrs.

Included with the Instrument:
2 x 10:1 passive probes 1m (3 ft) (PM 3295/96A), 2 x 10:1 passive probes 1.5m (5 ft) (PM 3285/86A), Collapsible viewing hood, Blue contrast filter, Front cover, Operating Manual

Ordering Information

Models

PM 3285A/00n 200 MHz Oscilloscope
PM 3286A/40n 200 MHz Oscilloscope, with 75 setting memory, IR remote control and IEEE-488 interface
PM 3295A/00n* 400 MHz Oscilloscope
PM 3296A/40n* 400 MHz Oscilloscope, with 75 setting memory, IR remote control and IEEE-488 interface

**Subject to export regulations.*

Optional Configurations

When ordering, select one of the standard model numbers listed above and add configuration number listed below as suffix:
PM ..../00n Standard model, bench/portable configuration (PM 3285A, PM 3295A)
PM ..../30n 19-inch Rackmount version (PM 3285A, PM 3295A)
PM ..../40n Standard model, bench/portable configuration with IEEE-488 (GPIB) interface
PM ..../80n 19-inch Rackmount version with IEEE-488 (GPIB) interface

Accessories (Also see page 57)

Passive Probes
PM 8911/091 500Ω, 10:1 Probe with readout, cable length 1m (3 ft)
PM 8912/091 5 kΩ, 100:1 Probe with readout, cable length 1m (3 ft)
PM 8924/001 1:1 Probe, cable length 1.5m (5 ft)
PM 8929/091 10:1 Probe with readout, cable length 1.5m (5 ft)
PM 8929/191 10:1 Probe with readout, cable length 1m (3 ft)
PM 8929/291 10:1 Probe with readout, cable length 2.5m (8 ft)
PM 8931/091 20 MΩ, 100:1 Probe with readout
PM 9599/091 Set of VHF Attenuators

Active Probes
PM 8940/09n High Voltage Isolation Amplifier with readout
PM 8943/00n 650 MHz FET Probe
PM 9355/09n AC Current Probe with readout

Other Accessories
PM 9051 BNC to 4 mm Banana Adapter
PM 9310/00 Collapsible Viewing Hood
PM 9311/00 Long Viewing Hood
PM 9381 Oscilloscope Camera
PM 9877/00 Camera Adapter for stationary use
PM 8991/04 Oscilloscope Cart
PM 8992/80 Accessory Pouch
PM 8950/951 Retrofittable IEEE-488 (GPIB) Interface
PM 8917/003 Video Sync Separator and Line Selector
PM 2195/09 Probe Switch 400 MHz ..... See page 62
PM 2122 50Ω Coaxial Switch ..... See page 382
PM 2240 TestTeam Software ..... See page 62

Power Options (See Page 576)