

Combination Analog/Digital Storage Oscilloscopes

PM 3335



RS-232



PM 3335

PM 3335, 60 MHz, 20 MS/s Digital Storage Oscilloscope

Analog oscilloscope plus full function Digital Storage Oscilloscope

20 MS/s synchronous real time sample rate on each channel

60 MHz analog bandwidth

Deep 8K bytes x 8-bit waveform acquisition memory even at max sample rate

Second reference memory for comparison of waveforms

AUTOSET for instant on-screen trace display

Standard cursors for many on-screen measurements

GPIB/IEEE-488 and RS-232C interface options

Two Scopes in One

Philips PM 3335 sets a standard in performance and economy. This instrument is two professional scopes in one: it operates as a real time 60 MHz analog oscilloscope and at the touch of a button, becomes a full function digital oscilloscope for advanced applications. Now, for the first time in a cost-effective scope, you have the power for digital capture and analysis of elusive single shots with a full 20 MS/s sample rate on each channel simultaneously. Unlike some scopes in this class, the full sample rate is maintained for all channel combinations, giving a single event resolution of 50 ns for both channels. Repetitive signal analysis is also possible up to 60 MHz in analog oscilloscope mode. A x10 expansion allows 5 ns sweep speeds for detailed viewing and furthermore, with the 100 MHz trigger bandwidth, you have a higher trigger sensitivity over the full range.

Extensive Memory Capability

In a DSO, it is vital that the memory be large enough to capture all the data in the intended areas of use. The PM 3335 will be used in automotive, medical, mechanical, video and general electronics industries, as well as in

education and training. Here, scopes must capture typical waveforms over a full cycle and have an adequate sample resolution to show fine details within a cycle. Typical examples here are in video waveforms or engine injection cycles. With its deep 8K bytes x 8-bit acquisition memory and 20 MS/s sample rate, the PM 3335 fully meets this requirement – indeed no other instrument in this price class has such a large memory.

For waveform comparison, a second reference memory is available. The full 8K bytes x 8-bit memory allows storage and display of up to 2 reference waveforms. Together with the 2 live waveforms from the acquisition memory, a total of 4 waveforms can be displayed.

Measurement Cursors as Standard

Independent voltage and time cursors make signal parameter extraction both accurate and fast. Along with measurement of voltage and time differences (dV, dt), the measurement functions include selection of ratio, phase and track. To aid the user further, a simple frequency calculation is made by 1/dt.

Positioning cursors on the easily identified 10% and 90% of peak-to-peak value gives a rise/fall time readout. Cursors are particularly valuable in

dc measurements where any point on the captured waveform can be measured to reference ground. This further extends use of the cursors so that readouts can show not only difference in results on a single trace, but also from trace to trace.

Powerful Triggering

The PM 3335's deep memory can also be used to show extensive pretrigger information. Unlike a conventional scope, a DSO can pretrigger, i.e. capture and display events prior to a trigger. A DSO continuously acquires data until stopped by detection of a valid trigger signal, rather than starting the sweep on detection of the trigger, like an analog oscilloscope. Thus all samples captured by the DSO are effectively in "negative time" and contain pretrigger waveform information.

This function is very useful in showing, for example, the complete leading edge of a pulse waveform for rise/fall time measurement (compared to an analog scope that can only show the edge form from the trigger moment on). Another example is to examine preshoot signals or transients leading up to the trigger edge. In the PM 3335, up to 20 divisions of pretrigger information can be captured and analyzed.

Two Interfaces in One

The PM 3335 has communication facilities normally only expected in instruments in much higher price ranges. Its optional interface has both RS-232C and GPIB/IEEE-488* capability. Either can control instrument set-up and transfer waveform data in remote control applications. When combined with the increasing range of programming and control packages, the PM 3335 is ideal for automatic signal capture and analysis. In particular, the software package for Oscilloscope Signal Processing (OSP) PM 2260 enables cross-correlations, algebraic manipulations, FFT and many other manipulations on acquired traces.

Mass storage of captured waveforms is also possible via the interfaces. If the large internal memory of 8K bytes is insufficient, connect the scope to a PC and run the OSP. Simply answer 'yes' to the prompt 'mass storage?' and the software automatically routes all captured data to external storage. Since PM 2260 is a package specifically designed for handling data from scopes, you need not become involved in making the scope communicate with the external storage – that's all done for you by OSP.

Advanced Plot and Print Capability

The PM 3335 has so many functions not usually found in competitive instruments, it should not come as a surprise that it has extensive plot and print capabilities. The plot function outputs screen copies to industry standard plotters and printers via the optional interface card. Plot language is HP GL or Philips GL, covering virtually all available XY plotters. Screen copies can also be sent to Epson compatible printers or compatibles over both interfaces.

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Simple to Operate

While the PM 3335 offers capabilities never before seen in a cost-effective scope, this is not at the expense of ease of use. Ergonomics was a vital element in design of the instrument. All the innovations first introduced by on Philips SMART scope range of 60 MHz and 100 MHz analog oscilloscopes are shared by the PM 3335. Innovations such as:

- Direct parameter readout of the present set-up on an LCD panel for at-a-glance checking of information, avoiding the need to look at control settings on a crowded text plate.
- Fast action up/down controls give finger tip setting of range values quickly and securely. Reliability is guaranteed by cold switching through microprocessor control. All rocker keys are located directly next to the clear LCD for readout and immediate confirmation of set-up.
- Front panel layout is logical, with similar functions grouped together for instant recognition. All controls that relate to variable settings such as Y-pos or VAR are located on the right hand side of the front panel resulting in a clear layout.
- Softkeys are positioned directly under the CRT display, mounted flush in the screen bezel. Softlabels appear on the screen just above these keys with a readily understandable menu sequence and selection. After acquisition of the signal, attention is focused on the display, avoiding mistakes that can occur when selections are out of the field of vision.

The result is an instrument that is readily understood and easy to use, while offering a versatile capability for fast problem solving.

Autoranging, Autoscaling and Autoreset

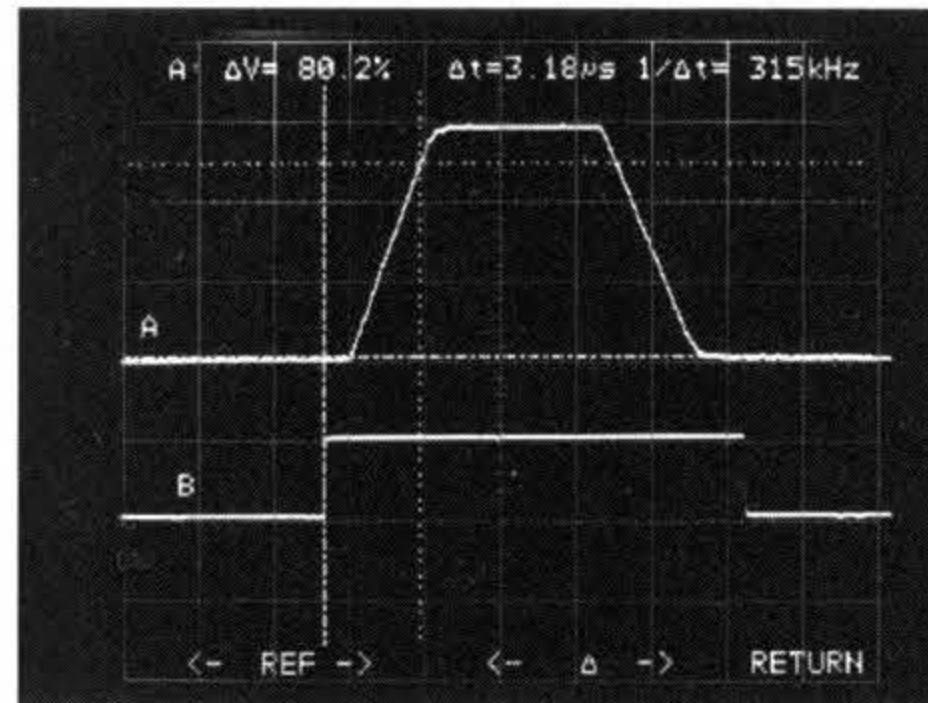
Another first for the PM 3335 is its full function autoreset. A single push of the autoreset button and any signal is automatically scanned and an optimum display of the trace is provided. It is not a factory preset, but is a full autoranging of time base and amplitude parameters depending on the incoming input signal. In addition, each channel is searched for a signal and if no signals are present, that channel is not displayed to avoid confusing information. Moreover, the auto-set selects the best trigger source for maximum trace stability. No other manufacturer gives you all these facilities for such a low price.

Modular Construction

The PM 3335's modular design and construction gives unparalleled serviceability. Swing up PCBs allow easy access to all circuits, for quick and efficient repair and service. Built in test routines with on screen prompts guide the service engineer quickly to the problem; and a quick check and adjust facility provides verification of the correct functioning of the instrument for reliable measurement results.

The modular construction also allows thorough testing of each module in production, before being built into the complete instrument, after

which final functional tests and adjustments are made. This results in reliable instruments that give trouble free operation throughout their life.



Phase measurements between channels are quickly and accurately made thanks to the extensive cursor facilities and the simultaneous acquisition on both channels. Without this simultaneous sampling the timing difference between the channels would result in measurement faults.

Specifications

Technical Specifications

Analog Mode

Vertical

Display Modes: Ch A, Ch B, -Ch B, Ch A+Ch B, Ch A-Ch B (ALTERNATE or CHOPPED)

Frequency Response: DC to >60 MHz, -3 dB (20 mV/div to 10 V/div); dc to >35 MHz, -3 dB (2 mV/div to 10 mV/div); ac, lower 3 dB point is <10 Hz

Rise Time: <5.8 ns (20 mV/div to 10 V/div); <10 ns (2 mV/div to 10 mV/div)

Deflection Coefficient: 2 mV/div to 10 V/div in 1, 2, 5 sequence

Error Limit: ±3%, continuous control between steps with ">" flashing on LCD panel as warning symbol for uncalibrated setting

Input Impedance: 1 MΩ ±2%; 20 pF ±2 pF

Max Input Voltage: 400V (dc + ac peak)

Dynamic Range: >24 div at 10 MHz, >8 div at 60 MHz

CMRR: 100:1 at 1 MHz

Horizontal

Display Modes: Time base, or XY displays using Ch A and/or Ch B (vertical) and Ch A, Ch B or Ext (horizontal)

Time Base: 0.5 s/div to 50 ns/div in 1, 2, 5 sequence

Expansion: x10, fastest sweep speed 5 ns/div

Error Limit: ±3%; ±4% in x10; continuous control between steps with ">" flashing on LCD panel as warning symbol for uncalibrated setting

Triggering

Trigger Modes: Auto (free run), non-auto triggered, single sweep

Trigger Sources: Ch A, Ch B, composite (Ch A, Ch B), Ext (dc or ac); line LCD indicates not-triggered, triggered or armed status

Trigger Coupling: Auto peak-to-peak (p-p), dc, TVF, TVL, LF Reject, HF Reject

Trigger Sensitivity:

	Internal	External
10 MHz	0.5 div	50 mV
60 MHz	1.0 div	150 mV
100 MHz	2.0 div	500 mV
TVF/TVL	0.7 div sync	70 mV sync
Level Range	±8 div	±800 mV

Slope, positive or negative; TVF or TVL, positive or negative

X-Deflection

Deflection Coefficient: Via Ch A or Ch B, 2 mV/div to 10 V/div; via Ext input, 100 mV/div

Frequency Response: DC to 2 MHz

Error Limit: ±5%

Phase Shift: <3° (at 100 kHz)

Ext Input Impedance: 1 MΩ ±2%; 20 pF ±2 pF

Max Input Voltage: 400V (dc + ac peak)

Digital Mode

All specifications as analog part unless otherwise stated

Vertical

Resolution: 8 bit

Display Modes: Ch A, Ch B, -Ch B

Frequency Response: DC to >5 MHz, -3 dB (2 mV/div to 10 V/div)

Horizontal

Display Modes: Recurrent, single shot, multiple shot (up to 2)

Time Base

Recurrent, Single, Multiple Shot: 50 s/div to 10 μs/div

Timing Accuracy: ±0.1%

Display Expansion: x1 to x32

Horizontal Resolution

Single Channel: 8192 samples/channel

Dual Channel: 4096 samples/channel

Signal Acquisition

Maximum Sample Rate: 20 MS/s, simultaneously for both channels

Trigger Delay: 20 divisions of pretrigger

Display Expansion: x1 to x32 horizontal

Memory

Storage Registers: 2

Number of Traces Stored in Each Register: up to 2

Depth of Acquisition Memory: 8192 words

Depth of Reference Memory: 8192 words

Vertical Memory Resolution: 8 bit

Display Modes: Ch A, Ch B, Reg A, Reg B in any combination

Cursors

Horizontal Resolution: (all display modes) 1:1000 over 10 divisions

Vertical Resolution: 1:200 over 8 divisions

Read Out Resolution: 3 digits amplitude and time

Calculation Functions: dV, dt, 1/dt, ratio, phase

Interface Option PM 8959/001 or Option /403

Contains both IEEE-488 and RS-232C capability

Programming Functions

Autoset: Automatically selects proper channel(s), trigger and time base mode, and scales the display for proper amplitude and timing. Autoset operates in the analog, as well as the digital storage modes.

Remote Control: The IEEE-488 and RS-232C interface provides full control over all switchable functions of either instrument. This includes acquisition and measurement functions. Waveform data can be transferred from scope to controller and back, and measurement results and instrument settings can be read by the controller as well.

IEEE-488

Bus Driver: E2 (three state)

Function Repertoire: SH1, AH1, T5, L3, SR1, RL2, PP0, DT1, DC1, C0

RS-232C

Handshake: Software XON/XOFF, hardware DSR/DTR and CTS/DTR

Baud Rate: Transmit and receive 75 to 4800 bits/sec

Stop Bits: 1 or 2

Parity: Odd, even or none

Character Length: 7 or 8 bits

Interface Option PM 8961/001 or Opt /503

RS-232C (Data Dump only)

Handshake: Software XON/XOFF, hardware DSR/DTR and CTS/DTR

Baud Rate: Transmit 75 to 4800 bits/sec

Stop Bits: 1 or 2

Parity: Odd, even or none

Character Length: 7 or 8 bits

Digital Plot (Option /403 or /503)

Language: HP GL or Philips GL dependent on plotter type selected

Plotter Select: Philips PM 8153/1,* PM 8153/6,* PM 8154,* PM 8155, HP 7450, HP 7475A

Pen Select: Pen 1 for Ch A; Pen 2 for Ch B; Pen 3 for Register Ch A; Pen 4 for Register Ch B; Pen 5 for graticule and alphanumerics

Plot Area: Softkey selectable

Dot Matrix Printer Screen Dump: Compatible with Epson FX80 and HP Thinkjet® graphics protocol or compatibles

Drawing Area: 10 cm x 10 cm

**Not available in North America*

General Specifications

Display

Screen: CRT with 8 x 10 cm viewing area; P31 phosphor, 16 kV acceleration voltage. Softkey display area on CRT for selection of menu choices.

Graticule: Parallax-free with continuously variable illumination

LCD Display: Separate constantly backlit LCD for display of status information, settings, etc

Power Supply

Line Voltage Range: 100V to 240V ac $\pm 10\%$

Line Frequencies: 50 Hz to 400 Hz $\pm 10\%$

Power Consumption: 70W

Environmental Data

Temperature

Rated Range of Use: $+10^{\circ}\text{C}$ to $+40^{\circ}\text{C}$

Operating Range: 0°C to $+50^{\circ}\text{C}$

Storage: -40°C to $+75^{\circ}\text{C}$

Altitude

Operating: 4500m (15,000 ft)

Transport: 12,000m (40,000 ft)

EMI: Meets requirements of MIL-STD-461 Class B, VDE 6871 and VDE 0875 Grenzwertklasse B

Safety: Meets requirements of IEC 348 Class 1, VDE 0411, UL 1244. CSA Certified (CSA556 B)

Shock: Operating and non-operating: Max acceleration 30g, $\frac{1}{2}$ sine, 11 ms duration, 6 shocks on each axis, 3 shocks on each face giving a total of 18 shocks

Bench Handling: MIL-STD-810 method 516, procedure V

Mechanical Data

Width: 387 mm (15.2 in) incl handle, 350 mm (13.8 in) excl handle

Length: 531 mm (20.9 in) incl handle and knobs; 518 mm (20.4 in) incl handle, excl knobs; 456 mm (17.9 in) excl handle, incl knobs; 434 mm (17.1 in) excl handle and knobs

Height: 146.5 mm (5.8 in) incl feet, 134.5 mm (5.3 in) excl feet

Weight: Approx 9.5 kg (20.9 lb) excl accessories

Included with Instrument: 2 x 10:1 probes (with scale factor readout), blue CRT contrast filter, operator manual, power cord

Ordering Information

Models

PM 3335 20 MS/s, 60 MHz Digital

Storage Oscilloscope

PM 3337 Same, w/19 in Rackmount

Optional Configurations

When ordering, select the basic "PM" model from above, and add the configuration option number listed below as a suffix.

/00n Basic Model

/40n GPIB IEEE-488/RS-232C Interface

Installed (PM 8959/001)

/50n RS-232C Dump Only Interface

Installed (PM 8961/001)

Example, Ordering Configuration

To order the 60 MHz, 20 MS/s Digital Storage Oscilloscope in rackmountable configuration, with GPIB IEEE-488/RS 232 interface installed, and 115 V AC power card.

Basic Oscilloscope	Model
Configuration Option Suffix	PM 3335
Complete Model Number	/403
	PM 3335/403

Accessories (Also see end of Section 3)

Passive Probes

PM 9011/001 1:1 or 10:1 probe, cable length 1.5m (5 ft)

PM 9001/001 1:1 probe, cable length 1.5 m (5 ft)

PM 9001/201 1:1 probe, cable length 2.5 m (8 ft)

PM 9010/091 10:1 probe with readout, cable length 1.5 m (5 ft)

PM 9010/291 10:1 probe with readout, cable length 2.5 m (5 ft)

PM 9100/091 20 M Ω 100:1 probe with readout, cable length 1.5 m (5ft)

Active Probes

PM 8940/09Q High Voltage Isolation

Amplifier w/Readout

PM 8943A 650 MHz FET Probe

PM 9355/09Q AC Current Probe w/Readout

Other Accessories

PM 8902/001 12V dc-ac Power Converter

PM 8903/003 Battery Pack/Charger Kit

PM 8917/003 Video Sync Separator and Line Selector

PM 8959/001 Retrofittable IEEE-488 (GPIB) and RS-232C Interface

PM 8961/001 RS-232C Data Dump Interface

PM 8988 Protective Front Panel Cover

PM 8989/001 Ruggedized Case

PM 8992/65 Accessory Pouch

PM 9051 BNC to 4 mm Banana Adapter

PM 9381 Oscilloscope Camera

PM 2122/01 50 Ω Coaxial Switch

PM 2255/001 Instrument Drivers Series

PM 2240/002 TestTeam Software

PM 2250/001 TestTeam Plus software

PM 2270/001 DSO COM Software

PM 2260/002 Oscilloscope Signal Processing Software