Oscilloscopes

PM 3370B   60 MHz   CombiScope
PM 3380B & PM 3384B 100 MHz CombiScopes
PM 3390B & PM 3394B 200 MHz CombiScopes

New Series

Combined Digital Storage and State of the Art Analog Oscilloscope in One Instrument

- 200 MHz, 100 MHz and 60 MHz Analog and Digital Bandwidth
- Up to 25 GS/s Sample Rate for Repetitive Signals
- 200 MS/s Single Shot Performance
- 4 and 2 Channel Models
- Up to 32K Acquisition Memory
- Continuously Variable Timebase in Digital and Analog Mode
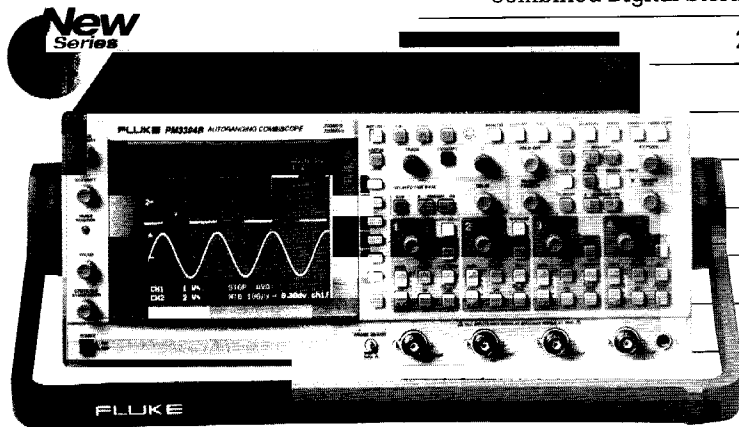- Storage of More than 200 Traces
- Extensive TV and Logic Triggering
- Real Time Digital Signal Processing (DSP)
- Extensive Mathematical Functions, incl. FFT.
- RS-232 Interface Standard, Centronics Interface Optional
- GPIB/IEEE-488.2 (SCPI) Interface Capability

PM 3394B

GPIB IEEE-488

RS-232

CombiScope: The Best of Both Worlds

The oscilloscopes described here are CombiScopes®. This means each instrument combines a high performance Digital Storage Oscilloscope (DSO) with a fully featured analog oscilloscope. At the touch of a button, the operation changes from analog display to Digital Storage Oscilloscope operation and back. Better said: these are DSOs with an analog mode built-in. Why?

Because many users can't rely solely on the capabilities of a pure DSO. Furthermore, some signals do not take kindly to being digitized. Examples include simple AM signals, complex data streams and video signals. If you don't see what you expect, or don't trust what you see, just touch the button to switch operating mode. For a full discussion on the topic of "Analog, Digital, or Both?", see the introduction in the oscilloscope section of this catalog.

Autoranging

These CombiScopes now give you Autoranging to make them really the easiest scopes to operate. Forget about manual set-up; every time you probe another test point, Autoranging, once selected, will automatically scale vertical and horizontal settings to get the signals displayed correctly without you having to touch a single button! You can concentrate on the system under test, and watch how your scope works for you! With every new test point, automatically the scope re-adjusts to show the signal optimally. Thanks to Autoranging.

Probe Mounted Command Switch

To enhance ease of operation even further, the instruments are delivered with probes that have an exceptional feature: a probe mounted command switch. While probing a system, the command switch can be pressed to initiate a user selectable function: for instance freeze the acquisition on screen, take a quick measurement, switch over to analog mode or back, or select the next setting from an array of pre-defined instrument settings. All without having to reach for the front panel, so that you can concentrate on the task at hand.

Delayed Time Base

Delayed time base is available in both the analog as well as the digital storage mode of operation. In addition, the digital mode offers pre-trigger recording as well as delay by events. All delay functions can be combined to select that one special event from even the most complex signals.

Up to 4 Channels – Up to 200 MHz

This family of CombiScopes consists of five models, to give you a wide choice of bandwidths, channels and sample rate.

Each of these instruments can be further enhanced by a choice of up to four options:

- **Math+:** Offering extensive signal analysis features that include Integration, Differentiation and FFT. This option also includes limit testing on measurement parameters or waveform comparison for ATE applications, as well as multiple single shot recording of up to 200 traces in memory.

- **Extended Memory:** Offering user partitioned acquisition and reference memory to permit storage of up to 32K long records, or over 200 traces of 512 points.
- **IEEE-488/SCPI:** Full control of all of the oscilloscope functions, and full waveform transfers with a SCPI compatible GPIB/IEEE-488 option.
- **Auxiliary Outputs:** giving extended analog scope interfacing for complex measurements. Includes ch1 signal output, MTB and DTB gate output and an external trigger input.

Operation of Digital Storage That is as Easy as if it Were Analog

With oscilloscopes this powerful, easy access to all functions is of paramount importance. These CombiScopes have been designed with the controls and layout so that the most frequently used functions have their own control or button giving instant direct access. Layout is logical, and all functions that work in the Analog mode work in the same way in the Digital mode. A dedicated processor continuously scans the controls and buttons, so that the operation of these models is as fast as if they were fully analog. Additional functions are in logical and easy to understand, "shallow" menus.

Triggering to Deal With the Impossible

Trigger features include full triggering for either time base, in either operating mode. In the digital mode, logic state and logic pattern triggering allow you to set qualified trigger conditions using all of the four

input channels (not on PM 33x0B). Glitch triggering allows for time qualified trigger conditions starting from 10 ms to a fast 20 ns, where triggering occurs in response to the duration of an event.

Choice of Memory
The four channel models come with 32K of waveform memory as a standard. On the two channel models, 8K memory is standard, and is optionally expandable to 32K. Memory is easily partitioned by the user giving the optimum between record length, number of traces stored, and update speed (shorter records provide faster update rates). With standard memory, the choice can be from three 32K (or 8K) records to 204 records of 512 points. Regardless of the record length selected, the user can always display the full contents of the memory.

Cursors and Measurements
Cursors are available in both Analog and Digital modes. In the DSO mode, the cursors are supplemented by automatically calculated measurements that include: Vp-p, Vrms, Vmax and Vmin, frequency and period, rise time and overshoot. "Touch-Hold and Measure" gives you instant measurement results. It provides a quick update of Vdc, Vp-p, Vrms and Frequency at the touch of the command button located on the probe.

Signal Analysis
These CombiScopes offer a very extensive set of signal analysis functions that include Addition, Subtraction, and Multiplication of signals. Digital Filtering permits noise or high frequency components to be removed from signals, including single events. With the Math+ option installed, waveforms can be Differentiated to find Slew rate, Integrated for Area under the curve, and an FFT is included to find frequency components of any signal. The fast Digital Signal Processor (DSP) presents the results in almost real time.

Supports Test Engineering and Factory Automation
The Math+ option includes a variety of features to support factory automation. Measurement results can be updated, with statistical records of the highest and lowest values kept in memory. Measurement data can be used to perform automatic Pass/Fail tests. In addition, Pass/Fail tests can be performed on the actual waveform itself, by comparing it with a template stored in memory. You can create such templates in the scope, or download them from a PC.

Field Service Support
With heavyweight performance weighing in at approximately 20 pounds (9.5kg), and with their rugged construction, these scopes are built to go. A full analog scope and a full Digital Storage Oscilloscope in one instrument, means you don't have to compromise. And they are easy to use! Supporting software is available, enabling service personnel to upload and download waveforms, instrument settings, and measurements from and to any DOS or Windows based PC.

Hard Copy
These scopes support 9 pin and 24 pin dot-matrix printers, LaserJets (HP PCL 4 and PCL 5) and DeskJets, and compatibles. Plotter support is also provided for a selection of HP compatible plotters, as well as a generic HPGL driver. The HPGL driver is also useful to provide output to PCs, so that HPGL files can be directly imported in most popular word processing packages to provide professional documentation with ease.

Digital Three-Processor Architecture for Fast Response
In order to get the highest possible update rate and in order to have a fast response to control changes, these scopes are all equipped with a powerful three-processor architecture, taking care of all hardware control and data management. All digital signal processing tasks are carried out by a dedicated Digital Signal Processor (DSP), ensuring extremely fast update rates for even the most demanding operations like a Fast Fourrier Transform (FFT).

Built to Last, at Low Cost
Hi-tech design eliminating trimmers and pots means no internal adjustments. Calibration is performed "closed case". Calibration is METCAL supported and completed in less then one hour. With all of the controls being μP operated, and all of the switching being done in sealed environments, controls are impervious to dust, moisture, or wear. And with a calculated MTBF of over 15,000 hours, a three year warranty, and a five year warranty on the CRT, these scopes will perform reliably and at low cost to the owner for many years to come.

	PM 3370B	PM 3380B	PM 3384B	PM 3390B	PM 3394B
Bandwidth	60 MHz	100 MHz		200 MHz	
Number of Channels	2 + External Trigger View		4	2 + External Trigger View	4
Max. Sample Rate for Repetitive Signals	10 GS/s			25 GS/s	
Max. Sample Rate, Single Shot	200MS/s				
Risetime	5.8 ns	3.5 ns		1.75 ns	
Max. Acquisition Memory, Standard Memory (with Extended Memory)	8K (32K)		32K	8K (32K)	32K
Max. Number of Traces Stored, Standard Memory (incl. Extended Memory)	27 (153)		204	27 (153)	204
Autoranging	Yes	Yes	Yes	Yes	Yes
RS-232 Interface	standard	standard	standard	standard	standard
IEEE-488/GPIB	optional	optional	optional	optional	optional

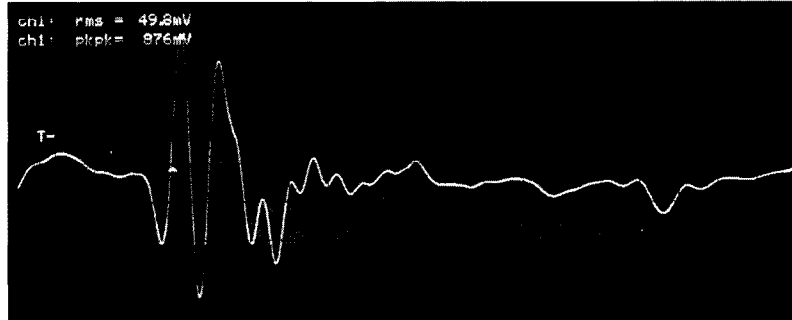Table 1

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Oscilloscopes

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For high resolution video application HDTV tri-level-sync triggering is included. The scopes also include a digital line selector. Delay and magnification or a fully triggered delayed time base can be used to expand any part of a selected line or any other part of a signal.

Also, in the Math + option is a multiple single shot mode. This feature allows you to capture consecutive single shot events and store them into individual memory locations. Up to 200 traces can be stored (see table 1).

The X versus Y mode lets you display any of the four channels against another. This XY mode is extremely useful for modulation, voltage/current curves, and mechanical signals phase displays.

With the Math+ option, reference templates for pass/fail testing can be created in seconds on screen simply by using cursor controls. That way, you can create your own reference envelope, for example, by recreating a CCITT reference template for PCM testing. Frequently used reference templates can be stored in the reference memories and protected. Templates can also be downloaded from an external computer using AnyWave V2.0 software (PM 2273).

Specifications

Technical Specifications

CombiScopes

Analog and Digital: These CombiScopes are analog/digital combination scopes with screen readout, cursors and a fully triggered delayed timebase. At the touch of a button one can switch between the familiar analog mode with a real time signal display and the digital mode. In the digital mode all typical DSO benefits apply: trace storage, pre-trigger view, calculated measurements, hardcopy facilities, advanced trigger modes, averaging and FFT. The probe operated Touch Hold and Measure™ freezes the display and instantly displays measured signal parameters: Vdc, Vrms, Vp-p and frequency.

Autoranging: Automatically and continuously adapts the instruments' horizontal and vertical deflection settings to keep the signals applied on screen. Allows for hands-free operation when a system is probed or when signal amplitude is changing, for instance during adjustment of the system under test.

Display: 8 × 10 cm viewing area, 16.5 kV acceleration voltage. Parallax free graticule with continuously variable illumination. On screen settings readout.

Autoset: Selects proper channel-, timebase- and trigger settings. Function can be customized by the user to leave specified functions unchanged.

Autocal: Automatic fine adjustment for enhanced accuracy to get optimum performance even under extreme environmental conditions.

Automatic Testing: The additional pass/fail testing offered by the Math+ option in combination with the GPIB/IEEE-488.2 interface make these scopes a powerful fully programmable tool in automatic test applications.

Memory: The record length is optionally expandable to 32K samples and over 200 traces in memory (at 512 samples/trace). On PM 3384B and PM 3394B the memory extension is standard.

Analog Mode

Input Channels: Four channels, or two channels plus external trigger view (see table 2). On screen channel identifiers with ground level indication on all inputs.

Display Modes: CH1, +/-CH2, CH3, +/-CH4 (see table 1 & 2); Add, Subtract; Alternate or Chopped

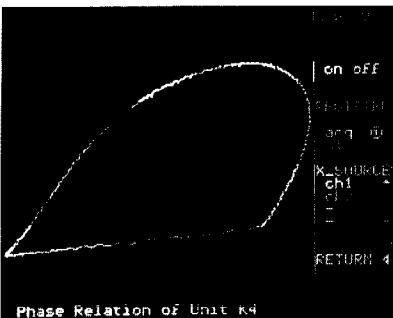**Error Limit:** 1.3% (measured over center 6 divisions)

Input Impedance: All models, all channels: 1 MΩ ±1% // 25 pF ±2 pF; PM339xB: user selectable 50Ω ±1%.

Maximum Rated Input Voltage: In 1 MΩ position: 400V (dc + ac peak; <10 kHz). In 50Ω position: 5V rms; 50V ac-peak (maximum of 50 mJ during any 100 ms interval).
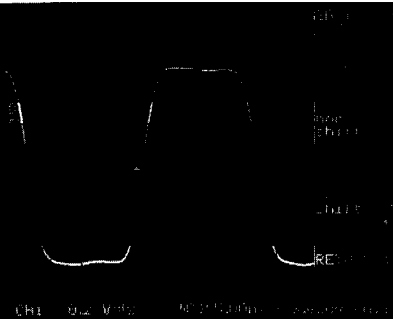
Dynamic Range: 24 div at 50 MHz

CMRR: 100:1 at 1 MHz, 25:1 at 50 MHz

Channel Isolation: 50:1 at full bandwidth (60, 100 or 200 MHz)

Vertical Deflection

	PM 3370B	PM 3380B	PM 3384B	PM 3390B	PM 3394B
Analog Bandwidth (-3 dB)	60 MHz	100 MHz		200 MHz	
Risetime (Calculated from the Bandwidth)	5.8 ns	3.5 ns		1.75 ns	
Number of Channels	2 + Ext. Trigger View		4	2 + Ext. Trigger View	4
Attenuator Control	2 mV/div .... 5 V/div (in a 1, 2, 5 sequence) 2 mV/div .... 12.5 V/div calibrated continuously variable				
Bandwidth Limiter	-3 dB @ ≥ 20 MHz				
Input Impedance	1 MΩ			1 MΩ and 50Ω	

Table 2

Horizontal (Main and Delayed Time Base)
Display Modes: Main time base, Delayed time base, Alternate time base (Main and Delayed time base), X-Y mode.
Time Coefficients: 0.5 s/div to 20 ns/div in a 1-2-5 sequence or calibrated variable control giving 1.25 s/div to 20 ns/div. For PM 338xB and PM 3370B the fastest time base setting is 50 ns/div.
Fastest Sweep (magn x10): 2 ns/div; 5 ns/div for PM 338xB/PM 3370B
Error Limit (magn x1): ±(1.3% of reading + 0.5% of 8 divisions)

Delay Time Multiplier
Resolution: 1:40,000
Error Limit (magn x1): ±(0.8% of reading + 0.3% of 8 divisions + 4 ns)
Jitter: 1:25,000

Video Triggering
Video Standard:
NTSC, PAL, SECAM, HDTV
Main TB Trigger Source: Any input channel; lines or any specific line from the video frame using built-in line counter.
Delayed TB Trigger Source: Starts after delay or triggered on any input channel edge, TV-line; the Delayed time base can be used to expand any part of the line selected with the TV-line selector.
Signal Polarity: Positive or negative
Sensitivity: 0.7 div (sync. pulse)

Triggering (Main and Delayed Time Base)
Trigger Modes: Auto free run, Triggered, Single; Edge triggering, TV triggering.

Edge Triggering
Main TB Trigger Source:
PM 33x4B: Any input channel or Line (= mains); Optional rear mounted External Trigger input replacing Line triggering.
PM 33x0B: CH1, CH2, External.
Delayed TB Trigger Source: Starts after delay or triggered on any input channel
Slope: Positive or negative
Coupling: DC, AC (>10 Hz), LF-rej (30 kHz), HF-rej (30 kHz).
Trigger Gap: 0.4 div; or 0.8 div for triggering on noisy signals
Level Range: ±8 div or automatic level within signal peak-peak range
Level Indication: On screen level indicators and numeric readout

Trigger Sensitivity	PM 339xB	PM 338xB	PM 3370B
30 MHz	–	–	0.6 div
50 MHz	–	0.6 div	–
60 MHz	–	–	1.2 div
100 MHz	0.6 div	1.2 div	–
150 MHz	–	–	2.0 div
200 MHz	1.2 div	2.0 div	–
300 MHz	2.0 div	–	–

Cursor Measurements
Cursor Modes: Horizontal, Vertical, Both
Readout: Vertical: dV, V1 to gnd, V2 to gnd, Ratio
Horizontal: dT, 1/dT (in Hz), Ratio, Phase
Accuracy: (magn x1) 1% of full scale within the central 8 horizontal and 6 vertical divisions.

X-Y Mode
X-Deflection Source: Any input channel or Line
X-Deflection Coefficient: Same as for vertical deflection
Dynamic Range: 20 div up to 100 kHz; >10 div up to 2 MHz
Frequency Response: ≥2 MHz at -3 dB
Error Limit: 5% measured over central 6 divisions
Phase Shift: <3° up to 100 kHz

	PM 3370B	PM 3380B	PM 3384B	PM 3390B	PM 3394B
Bandwidth (-3 dB)	60 MHz	100 MHz		200 MHz	
Risetime (Calculated from the Bandwidth)	< 5.8 ns	< 3.5 ns		< 1.75 ns	
Max. Single Shot Sample Rate	200 MS/s				
Calculated Max. Captured Frequency (Single Shot) Using 5 Samples Per Cycle and Sine Interpolation:	40 MHz				
Max. Sample Rate for Repetitive Signals	10 GS/s			25 GS/s	
Max. Captured Frequency, Repetitive Signals	>60 MHz	>100 MHz		>200 MHz	
Max. Acquisition Length (Standard Memory)	1CH x 8K		1CH x 32K	1CH x 8K	1CH x 32K
Max. Acquisition Length (Expanded Memory)	1CH x 32K		– –	1CH x 32K	– –
Number of Autoranging Input Channels	2	2	4	2	4
Autoranging Time Base	Yes	Yes	Yes	Yes	Yes
Logic Triggering	glitch		state, pattern, glitch	glitch	state, pattern, glitch

Table 3

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PM 3384B, PM 3394B

	Standard Memory			
Acquisition Length	1CH x 32K	2CH x 16K	4CH x 8K	4CH x 512
Trace Storage	3 traces	6 traces	12 traces	204 traces

PM 3370B, PM 3380B, PM 3390B

	Standard Memory				With Extended Memory Option Installed			
Acquisition Length	1CH x 8K	2CH x 4K	2CH + Trig. View x 2K	2CH + Trig. View x 512	1CH x 32K	2CH x 16K	2CH + Trig. View x 8K	2CH + Trig. View x 512
Trace Storage	3 traces	6 traces	9 traces	27 traces	3 traces	6 traces	9 traces	153 traces

Table 4

Digital Mode

Acquisition

Repetitive Sample Rate
Random sampling gives an equivalent sample rate of up to 25 GS/s (PM 339xB) or up to 10 GS/s (PM 3370B and PM 338xB) on all input channels, over the full bandwidth (see table 3) for optimum time resolution.

Single Shot Sample Rate
Real time sampling up to 200 MS/s (single channel), 100 MS/s (dual channel). In PM 33x4B, a fast chopper offers 200 ns horizontal resolution in 4 channel single shot mode.

Calculated Maximum Captured Frequency in Single Shot Mode
- Using sine interpolation to reconstruct signals from 5 samples per period: up to 40 MHz in 1 CH mode, 20 MHz in 2 CH mode, 1 MHz in 4 channel mode or when trigger view (PM 33x0B) is active.
- For 10 samples per period with linear interpolation: up to 20 MHz in 1 CH mode, 10 MHz in 2 CH, 0.5 MHz in 4 channel mode or when trigger view (PM 33x0B) is active.

Vertical Resolution: ADC resolution 8 bit, Memory resolution 16 bit.

Memory: acquisition and reference memory can be segmented offering a choice between long acquisition records or a high update speed and a maximum number of traces in memory. (See table 4)

Average: Factor: 2,4,8 to 4096; giving resolution up to 14 bit

Peak Detection: Captures glitches up to 5 ns (single channel), 10 ns (dual channel) or 10 ns (4 channel alternating)

Envelope Mode: For continuous tracking of changing waveforms

Vertical

Auto-ranging Vertical Deflection Automatically and continuously adapts vertical deflection setting to have 2 to 6 divisions display of input signal. Can be selected individually on any input channel. Minimum deflection setting automatically selected is 50 mV/div.

Bandwidth: 60 MHz, 100 MHz or 200 MHz (see table 3)

Magnification: Up to x32 magnification for higher deflection sensitivity; can be used with averaging (up to 4096x) for maximum resolution (up to 14 bit)

Display Modes: CH1, +/-CH2, CH3, +/-CH4, Calculated Add and Subtract (see table 2)

Bandwidth Limiter: 20 MHz @ -3 dB

Window Mode: 2 or 4 windows to display two or four traces above each other while using the full dynamic range of the ADC

Horizontal

Autoranging Timebase: Continuously adapts sweep speed to the frequency of the trigger signal in order to keep 2 to 6 cycles on screen; user selectable function. Autoranging timebase can work with timebase in 1-2-5 sequence or with continuously variable timebase mode, freezing the number of cycles on screen.

Acquisition Modes: Recurrent (Auto and Triggered), Single shot, Multiple single shot (part of Math+ option), Roll, Triggered Roll

X-Y Mode: Any trace in memory or any of the input channels can be used as X source

Time Base

- **Real Time Sampling (magn x1):** 200 s/div to 500 ns/div in a 1-2-5 sequence.
- **Variable Timebase:** Continuously variable sweep speed: 1 μs/div to 500 μs/div in 1 μs increments; 500 μs/div to 200 s/div with 0.2% or smaller increments.
- **Recurrent:** 200 ns/div to 2 ns/div (5 ns/div for PM 338xB and PM 3370B) in 1-2-5 sequence.
- **Roll Mode:** 200 s/div to 200 ms/div, triggered or free roll mode, in 1-2-5 sequence or continuously variable.

Display Resolution: Horizontal resolution for 1x magnification: 500 samples = 10 divisions = 1 screen width.

Magnification: x2, x4 to x32 to zoom in on parts of waveform, compression to allow a compact full information display of a full record (8K or 32K).

Interpolation: Dots only display or Sine or Linear interpolated display; sine interpolation offers natural signal representation of expanded single shot acquisitions up to 10 ns/div

Triggering

Trigger Coupling: Same as for analog mode.

Edge Triggering: Same as for analog mode; Dual Slope Triggering available when in single shot, real time sampling mode

TV Triggering: Same as for analog mode (including digital TV-line selector)

Logic Trigger Modes: State (4 bit), Pattern (4 bit), Glitch (time qualified pulse). See table 3 for availability per model number. Channels can be 'high', 'low', or 'don't care'.

Sensitivity: 1 div if time present ≥10 ns (20 ns for PM 338xB, 30 ns for PM 3370B), 2 div if time present ≥2 ns (4 ns for PM 338xB, 6 ns for PM 3370B)

State Triggering: Max. clock rate: 150 MHz. Any of the channels can be selected as clock, triggering occurs if combination of all other channels matches description at moment of clock edge.

Pattern Triggering: Mode: Enter, Exit, Time qualified (lower limit, upper limit, range)

Range of Limits for Pattern Triggering: 20 ns to 167 ms; smallest resolution: 10 ns; minimum time for pattern to be present is 2 ns (4 ns for PM 3384B)

Glitch Triggering: Minimum glitch width: 2 ns (4 ns for PM 338xB, 6 ns for PM 3370B). Pulse width time qualification: lower limit, upper limit, range.

Range of Limits for Glitch Triggering: 20 ns to 167 ms; smallest resolution 10 ns.

Delay

Time Delay: 0 to 1,000 div. continuously adjustable.

Pre-Trigger View: Up to a complete record can be filled with pre-trigger information (160 div for an 8K record, 640 divisions for 32K memory)

Event Delay: 1 to 16,384 events; maximum count rate: 50 MHz (typical); source: any channel; modes: Event delay, Time delay after event delay
Delay Modes: Start after time delay or wait for trigger after time delay

Cursor Measurements
Cursor Modes: Horizontal, Vertical, Both; Free or locked to trace
Readout Vertical: dV, V1 to gnd, V2 to gnd, Ratio
Horizontal: dT, 1/dT (in Hz), Ratio, Phase (cycle is automatically referenced to trigger signal)

Calculated Measurements
Measurements can be performed over a full record or within a cursor limited area.
Volt: DC, rms, minimum, maximum, peak to peak, Low level, High level, Overshoot (positive and negative), Preshoot (positive and negative)
Time: Frequency, Period, Pulsewidth, Rise time, Fall time, Duty cycle
Delay: Channel to channel; rising and falling edges
Quick Measurement: Probe operated "Touch, Hold and Measure" instantly gives calculated measurement of: frequency, dc, rms and Vp-p

Processing
Standard: Add, Subtract, Multiply, Digital filter (For instance, for low pass filtering after single shot capture)
Math+ Option: Integrate, Differentiate, FFT, Histogram

General Specifications

Interfacing
● **RS-232C Serial Interface:**
Installed as standard. Enables printing and plotting as well as full remote control of the instrument. Also provides fast trace dump to PC or Fluke arbitrary waveform generator. DB-9 male connector.
Baudrate: 75 to 19200 (full duplex), 38400 dump only.
Handshake: DSR/DTR, CTS/RTS and Xon/Xoff.
Format: 1 Stopbit; 7 or 8 databits; odd/even/no parity.
Protocol: CPL = Compact Programming Language = reduced set of powerful instructions for remote control through RS-232C

● **GPIB/IEEE-488.2 Interface:**
Factory installed option. Remote control conforming to SCPI (Standard Commands for Programmable Instruments).

● **Waveform Dump:** Fast trace dump to PM 5150, PM 5138 and PM 5139 arbitrary waveform generators using either IEEE or RS-232 interfaces.

Hardcopy
Output: Printed or plotted hardcopy of the screen (digital mode) in scalable format and, if selected, with a status report of the complete instrument settings and with real-time clock data on acquired waveform and hardcopy timestamp.
User Text: Two lines of on-screen text for documentation.
Interface: RS-232C included; GPIB/IEEE-488.2 optional.
Printer Drivers: FX Series (9-pins), LQ1500 (24 pins), HP 2225 (ThinkJet), HP LaserJet (series II and III), HP 540 DeskJets, and compatibles
Plotters: HP 7440, HP 7550, HP 7475A, HP 7470A and compatibles, HPGL
Camera: Camera kit PM 9381/001 available as optional accessory

Miscellaneous
Setting Memory: 10 complete instrument setups, with battery back-up. Settings can be recalled from front panel or under control of probe mounted command switch
Calibration Output: 600 mV peak-peak (±1%), 2 kHz square (±20%)
Z-Modulation Input: BNC, 10 kΩ, >2.4V= blanked, <0.5V= unblanked. (analog mode only)
Time Between Calibration: 2,000 hrs or 1 year with specified accuracy; 4,000 hrs or 2 years if error limits are doubled
Probe: Automatic detection of indication ring or manual selectable scale factor. Manual selection of non-standard scale factors and units of measure are part of Math+ option

Power Requirements
Line Voltage: 100V to 240V ±10% in one range
Line Frequency: 50 Hz to 400 Hz ±10%
Power Consumption: 115W; 130W with all options installed

Environmental Data
Meets: Requirements of MIL-T-28800D Type III, Class 3, Style D, Color R, as specified below
Temperature: 0°C to +50°C (operating), 5°C to +40°C (use), −40°C to +70°C (storage)
Humidity: ≤95% (storage)
Altitude: Max. 4.6 km = 15,000 ft (operating), 12 km = 40,000 ft (transport)
Vibration: Frequency 5 Hz to 55 Hz, Maximum Acceleration at 55 Hz 30 m/s²
Shock: 6 shocks along each axis, half sine wave, 6 to 9 msec, peak acceleration 400 m/s²
Bench Handling: Meets MIL-STD-810, method 516, procedure V
Safety: Meets requirements of: IEC 348 Class I, UL 1244, VDE 0411, CSA C22.2 No 231 approved
EMI: VDE 0871 Grenzwertklasse B; MIL-STD-461C: CE01 Part 2 (narrow band),

CE03 Part 4, CS01 Part 2, CS06 Part 5 (300V max.), RE01 Part 5 and 6, RE02 Part 2 (1GHz max.)
Magnetic Susceptibility: Deflection for extreme conditions: <0.7 div/mT tested at 1.42 mT peak-peak, 45 Hz to 66 Hz
CE: Compliant

Mechanical Data
Fan: Proportionally regulated forced air
Dimensions:
Width: 391 mm (15.4 in) incl. handle; 341 mm (13.4 in) excl. handle
Length: 551 mm (21.7 in) incl. handle; 481 mm (18.9 in) excl. handle
Height: 147 mm (5.8 in) incl. feet; 139 mm (5.5 in) excl. feet
Weight: 9.5kg (21 lb)

Options

Extended Memory Option
Allows acquisition and storage of traces of up to 32K samples or storage of over 200 traces of 512 samples each. See table 4 for details per typenumber. Extended memory is standard on PM 3384B and PM 3394B.

Math+ Option
Additional Waveform Processing: Integrate, Differentiate, FFT, Histogram
FFT: High update rate due to dedicated Digital Signal Processor.
User selectable Hamming, Hanning or rectangular window. Relative level (dB) or absolute signal level read-out in mV$_{rms}$, dBm (for 50Ω and 600Ω) or dBμV.
Pass/Fail Testing: Test waveforms against reference envelope; Test calculated measurement against preset limits; Test cursor measurement against preset limits
Action On Violation: User selectable: Beep, Lock, Save acquisition, Print, Plot, send plot to PC with FlukeView software running
Envelope Creation Internal: Draw on screen using cursor controls
Envelope Creation External: Download from PC
Advanced Cursors: Amplitude qualified cursors for timing measurements with time cursors automatically positioned relative to the signal's Max peak, Min peak, High level, Low level, or to absolute levels
Multiple Single Shot: For capturing and storing of consecutive single shot acquisitions in all non-protected memory locations (up to 200)
Probe Correction: can be used to get correct read-out when non-standard probes are used, or to work with units of measure other than volts.

GPIB/IEEE-488.2 Option
Protocol: SCPI = Standard Commands for Programmable Instruments = Standardized protocol. Fully compatible with IEEE-488.2.

FLUKE

Oscilloscopes

PM 3370B 60 MHz CombiScope
PM 3380B & PM 3384B 100 MHz CombiScopes
PM 3390B & PM 3394B 200 MHz CombiScopes

1997/8
Catalog

Section
2

Auxiliary Output/External Trigger Option

Factory Installed Option Includes:
- **Channel 1 Y-out:** BNC, 50Ω, 10 mV/div into 50Ω, 20 mV/div into 1 MΩ
- **MTB-Gate-out:** BNC, 1 kΩ, TTL compatible levels
- **DTB-Gate-out:** BNC, 1 kΩ, TTL compatible levels
- **External Trigger Input with the Following Characteristics (PM33x4B only)**

MTB Trigger Source: CH1 to CH4, external (no line triggering)
Impedance: 1 MΩ
Coupling: AC, DC, LF-rej (30 kHz), HF-rej (30 kHz)
Slope: Positive (+) or negative (−)
Trigger Gap: 80 mV; trigger gap can be doubled for triggering on noisy signals
Bandwidth: Sensitivity at 10 MHz: 200 mV
Input Amplifier: Dynamic range of the dc coupled input amplifier:
−2.5V to +2.5V (on BNC connector);
−25V to +25V (on probe tip of 10:1 probe)
Maximum Input Voltage: 400V peak

Ordering Information

Models

PM 3370B 60 MHz CombiScope with 2 channels and Delayed Time Base
PM 3380B 100 MHz CombiScope with 2 channels and Delayed Time Base
PM 3384B 100 MHz Full 4 Channel CombiScope with Delayed Time Base
PM 3390B 200 MHz CombiScope with 2 channels and Delayed Time Base
PM 3394B 200 MHz Full 4 Channel CombiScope with Delayed Time Base

Included with Instrument

Three-year product warranty, parts and labor, five-year CRT warranty; two 100 MHz 10:1 probes, model PM 9010/091, with 1.5m (5 ft) cable and scale factor readout (PM339xB); or two wide bandwidth 10:1 or equivalent probes, model PM 9020/091, with 1.5m (5 ft) cable and scale factor readout (PM 339xB) or equivalent; blue CRT contrast filter on CRT; memory back up batteries; protective front cover; operator and reference manual; programming manual (IEEE versions only); a service manual is available upon return of reply card included with each instrument; and Certificate of Calibration Practices. Guide to Mathematical Functions & Pass/Fail testing (Math+ versions only).

Optional Configurations

When ordering, select basic (PM) model number and add the configuration option code listed as a suffix.

PM 3370B, PM 34380B, PM 3390B

/02n Standard Instrument with Math+ (MP)
/08n Standard Instrument with MP and Extended Memory (EM)
/42n GPIB/IEEE-488.2 Interface with SCPI (IEEE-488) and MP
/48n IEEE-488 + MP + EM
/93n IEEE-488 + AuxOut + MP
/99n IEEE-488 + AuxOut + MP + EM

PM 3384B, PM 3394B

/08n MP + EM
/48n IEEE-488 + MP + EM
/99n IEEE-488 + AuxOut/ExtTrig + MP + EM

Options are not retrofittable. All required options must be included when order is placed.
The **n** indicates the required line cord. To select your line cord substitute the **n** by:
1 Universal Euro 220V/16A, 50 Hz
3 Standard North American 120V/15A, 60 Hz
4 UK 240V/13A, 50 Hz
5 Switzerland 220V/16A, 50 Hz
8 Australia 240V/10A, 50 Hz

Example, Ordering Configuration

To order a 200 MHz, full four channel CombiScope with Extended Memory and Math+, plus GPIB/IEEE-488 interface installed, and U.S. line cord select:

	Model
Basic Oscilloscope	PM 3394B
MP + EM + GPIB/IEEE-488	/48x
US line cord (n = 3)	/xx3
Complete Model Number	PM 3394B/483

Accessories

Passive Probes

PM 9011/001 Switchable 1:1 or 10:1 Probe, 1.5m (5 ft) Cable, useful BW: 100 MHz (in 10:1 mode), 10 MHz (in 1:1 mode)
PM 9021/001 Switchable 1:1 or 10:1 Probe, 1.5m (5 ft) Cable, useful BW: 200 MHz (in 10:1 mode), 10 MHz (in 1:1 mode)
PM 9001/001 Modular 1:1 Probe, 1.5m (5 ft) Cable
PM 9001/091 Modular 1:1 Probe, 1.5m (5 ft) Cable, Range Indicator and Command Button
PM 9001/201 Modular 1:1 Probe, 2.5m (8 ft) Cable
PM 9001/291 Modular 1:1 Probe, 2.5m (8 ft) Cable, Range Indicator and Command Button
PM 9010/001 Modular 100 MHz 10:1 Probe, 1.5m (5 ft) Cable
PM 9010/091 Modular 100 MHz 10:1 Probe, 1.5m (5 ft) Cable, Range Indicator and Command Button
PM 9010/201 Modular 100 MHz 10:1 Probe, 2.5m (8 ft) Cable

PM 9010/291 Modular 100 MHz 10:1 Probe, 2.5m (8 ft) Cable, Range Indicator and Command Button
PM 9020/001 Modular 200 MHz 10:1 Probe, 1.5m (5 ft) Cable
PM 9020/091 Modular 200 MHz 10:1 Probe, 1.5m (5 ft) Cable, Range Indicator and Command Button
PM 9100/101 Modular 200 MHz 100:1 Probe, 1.5m (5 ft) Cable
PM 9100/191 Modular 200 MHz 100:1 Probe, 1.5m (5 ft) Cable, Range Indicator
PM 8918/301 Low-Pass filter probe, bandwidth 4 kHz
PM 9002/001 General accessory set for PM 9000 series probes
PM 9102/101 General accessory set for PM 9100 series probes
PM 9003/001 Accessory extension set for PM 9000 series probes
PM 9639/011 Wide bandwidth (1GHz), low impedance 10:1 probe

Other Accessories

PAC33 Print Adapter Cable, Serial to parallel
PM 8914/001 CombiScope Serial Interface Cable
PM 8960/041 Retrofittable Rack Mount
PM 8989A/031 Traveller Carrying Case with Accessory Storage Compartments
PM 8991/041 Oscilloscope Cart
PM 8992/801 Accessory Pouch
PM 9051/001 BNC male to 4 mm Banana Jack/Binding Posts
PM 9074/001 50Ω Coaxial Cable 1m (3 ft)
PM 9075/001 75Ω Coaxial Cable
PM 9585/011 50Ω Feedthrough Termination, 1W
PM 9381/001 Oscilloscope Camera System
80i-110s AC/DC Current Probe for Oscilloscopes
80i-500s AC Current Probe for Oscilloscopes
80i-1000s AC Current Probe for Oscilloscopes
TC100 Instrument Cart

Supporting Software

SW33W FlukeView™ CombiScope for Windows™
PM 2273 AnyWave

Customer Support Services

Factory Warranty

Three-year product warranty. Five-year CRT warranty.

Visit Fluke on the world wide web at:
http://www.fluke.com