FLUKE®

Biomedical

190M

Medical ScopeMeter® Portable Oscilloscope

Technical Data

The 190M: a new generation of medical oscilloscope

The 190M Medical ScopeMeter portable oscilloscope is a high-performance test tool built upon the legacy of Fluke and Fluke Biomedical oscilloscopes in partnership with real customers like you. The 190M is available with choice of two or four channels and offers an unprecedented level of performance, ruggedness, and portability. With the combined power of a high-performance oscilloscope, multimeter and paperless recorder in an easy-to-use test tool, the 190M is the one test tool you can rely on to tackle just about any troubleshooting task in the field.

To minimize downtime and repair costs, you need to get to the root cause of problems as quickly as possible. The 190M offers a number of unique features to help you quickly set up the scope and diagnose difficult problems like intermittent events, signal fluctuations or drift.

Extend your arsenal of troubleshooting capabilities with the new Fluke Biomedical 190M Medical ScopeMeter portable oscilloscope, designed to meet the demands of field service professionals.

Key features

- Two or four electrically-isolated inputs
- Fast sampling rate, up to 2.5 GS/s on two channels simultaneously with up to 400 ps resolution
- Deep memory: 10,000 samples per channel waveform capture so you can zoom in on the details (scope mode)
- Dedicated 5000 count digital multimeter in two-channel model
- Quad meter measurements via scope BNC inputs in four channel model
- Connect-and-View™ triggering for intelligent, automatic triggering on fast, slow and even complex signals
- Frequency spectrum using FFT-analysis
- High-resolution, non-interlaced video
- Smart averaging
- ScopeRecord roll mode gives 30,000 points per input channel and capture waveform sample data for up to 48 hours
- TrendPlot, trend measurement readings for up to 22 days
- Advanced automatic measurements, power (Vpwm, VA, W, PF) and time (mAs, V/s, w/s)
- Two USB ports make it easy to transfer data to a PC and store unlimited waveforms, screen captures and instrument setups on USB memory devices
- New high-perfomance Li-ion battery technology delivers the longest battery life on the market
- Charge spare battery using optional external battery charger
- Easy-access battery door for quick swaps in the field
- Security slot locks down oscilloscope with Kensington lock while unattended
- Environmentally tested to meet IP-51 and withstand 3 g vibration or 30 g shock

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Technical specifications

	190M-2	190M-4
Oscilloscope modes		
Vertical deflection		
Number of channels	2	4
Bandwidth	200 MHz	
Rise time	1.7 ns	
Number of scope inputs	2 input channels plus external trigger	4 input channels
Channel architecture	All inputs fully insulated from each other and from ground Inputs may be activated in any combination	
Input coupling	AC or DC, with ground level indicator	
Input sensitivity	2 mV/div to 100 V/div, plus variable attenuation	
Bandwidth limiter	User selectable: 20 kHz, 20 MHz or full bandwidth	
Normal/invert/variable	On each input channel, switched separately	
Extended offset	Not avalable currently	
Input voltage	CAT III 1000 V/CAT IV 600 V rated, see general specifications for further details	
Vertical resolution	8 bit	
Accuracy	± (2.1 % of reading + 0.04 x range/div) @ 5 mV/div to 100 V/div	
Input impedance	1 MΩ ± 1 %/14 pF ± 2 pF	
Horizontal		
Maximum real-time sample rate (sampled simultaneously)	2.5 GS/s (2ch)	2.5 GS/s (2ch) 1.25 GS/s (4ch)
Record length	Up to 10,000 samples per channel	
Time base range	2 ns/div to 4 s/div	
	Time base in a 1–2–4–sequence Slower time/division settings using ScopeRecord™ roll mode (see recorder mode)	
Maximum record length	10,000 samples per channel in scope mode	
	30,000 points per channel in ScopeRecord™ roll mode (see recorder mode)	
Timing accuracy	± (0.01 % of reading + 1 pixel)	
Glitch capture	8 ns peak detect on each channel (using real time sampling and data compression, at any timebase setting)	
Display and acquisition		
Display	153 mm (6 in) full-color LCD with LED backlight	
Display modes	Any combination of channels; average on/off; replay	
Visible screen width	12 divisions horizontally in scope mode	
Digital persistence modes	Off/short/medium/long/infinite and envelope mode	
Waveform mathematics	A + B, A – B, A x B, all with user-selectable scaling of resultant; A versus B (X-Y- mode); frequency spectrum using FFT analysis	
Acquisition modes	Normal, averaged, auto, single shot, ScopeRecord™ roll, glitch capture, waveform compare with automatic pass/fail testing; replay	
Trigger and delay		
Source	Input A, B or external (via meter input)	Input A,B,C or D
Modes	Automatic Connect-and-View™, free run, single shot, edge, delay, dual slope, video, video line, selectable pulsewidth (channel A only), N-cycle	
Connect-and-View™	Advanced automatic triggering that recognizes signal patterns, automatically sets up and continuously adjusts triggering, time base and amplitude Automatically displays stable waveforms of complex and dynamic signals like motor drive and control signals can be switched off if preferred	

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	190M-2	190M-4
Video triggering (on ch. A)	NTSC, PAL, PAL+, SECAM; includes field 1, field 2 and line select	
High-res, non-interlaced video	Non-interlaced video with line-select, for line frequencies in the range 14 kHz up to 65 kHz	
Pulse width triggering (on channel A)	Pulse width qualified by time allows for triggering < t, > t, = t, ≠ t, where t is selectable in minimum steps of 0.01 div or 50 ns	
Time delay	1 Full screen of pre-trigger view or up to 100 screens (= 1,200 divisions) of post-trigger delay	
Dual slope triggering	Triggers on both rising and falling edges alike	
N-cycle triggering	Triggers on N^{th} occurrence of a trigger event; N to be set in the range 2 to 99	
Automatic capture of 100 screens		
When in oscilloscope mode, the instrument always memorizes the last 100 screens—no specific user setup required. When an anomaly is seen, the replay button can be pressed to review the full sequence of screen events over and over. Instrument can be set to trigger on glitches or intermittent anomalies and will operate in baby-sit mode capturing 100 specified events.		
Replay	Manual or continuous replay. Displays the captured 100 screens as a live animation or under manual control. Each screen has date and time-stamp	
Replay storage	Two sets of 100 screens each can be saved internally for later recall and analysis Direct storage of additional sets on external flash memory drive through USB host port	
Fast Fourier Transform (FFT) frequency spectrum analysis		
Shows frequency content of oscilloscope waveform using Fast Fourier Transform		
Window	Automatic, hamming, hanning or none	
Automatic window	Digitally re-samples acquired waveform to obtain optimum frequency resolution in FFT resultant	
Vertical scale	Linear/logarithmic (in volts or amps)	
Frequency axis	Logarithmic frequency range automatically set as a function of timebase range of oscilloscope	
Waveform compare and pass/fail testing		
Waveform Compare	Provides storage and display of a reference waveform for visual comparison with newly acquired waveforms. Reference is derived from an acquired waveform and can be modified in the oscilloscope or externally using FlukeView Software.	
Pass/Fail Testing	In waveform compare mode, the oscilloscope can be set to store only matching (pass) or only non-matching (fail) acquired waveforms in the replay memory bank for further analysis	
Automatic scope measurements		
V dc, V ac rms, V ac + dc, Vpeak max, Vpeak min, Vpeak to peak, A ac, A dc, A ac + dc, frequency (in Hz), rise time (using cursors), fall time (using cursors), phase (between any 2 inputs), pulse width (pos./neg.), duty cycle (pos./neg.), temperature °C, temperature °F (not for Japan), dBV, dBm into 50 Ω and 600 Ω		
Advanced power and motor drive functions	V/Hz Ratio (190M-2 only), Power Factor (PF), watts, VA, VA reactive, VPWMac and VPWM (ac + dc) for measurement on pulse width modulated motordrives and frequency inverters	
Advanced functions	mA×s (Current-over-time, between cursors); V×s (voltage over time, between cursors); W×s (energy, between cursors)	
Cursor measurements		
Source	On any input waveform or on mathematical resultant waveform (Excluding X-Y-mode)	
Dual horizontal lines	Voltage at cursor 1 and at cursor 2, voltage between cursors	
Dual vertical lines	Time between cursors, 1/T between cursors (in Hz), voltage between markers, rise time with markers, fall time with markers; Vrms between cursors, watts between cursors	

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Single vertical line	Min/max and average voltage at cursor position; frequency and rms-value of individual frequency component in the FFT resultant	
ZOOM	Ranges from full record overview to zoom-in up to sample level at any record length	
Meter Modes		
Meter inputs	Via 4 mm banana inputs, fully isolated from scope inputs and scope ground	Via BNC scope inputs
Number of readings	One at a time	Up to 4 simultaneously
Maximum resolution	5,000 counts	99 counts
Input impedance	1 MΩ ± 1 %/14 pF ± 2 pF	
Advanced meter functions	Auto/manual ranging, relative measurements (Zero reference), TrendPlot™ recording	
	The specified accuracy is valid over the temperature range 18 °C to 28 °C Add 10 % of specified accuracy for each degree C below 18 °C or above 28 °C	
Voltage		
Vdc accuracy	± (0.5 % + 5 counts)	± (0.5 % + 5 counts)
Vac true rms accuracy 15 Hz to 60 Hz: 60 Hz to 1 kHz: 60 Hz to 20 kHz:	± (1 % + 10 counts) ± (2.5 % + 15 counts)	± (1.5 % + 10 counts) ± (2.5 % + 15 counts)
Vac+dc true rms accuracy 15 Hz to 60 Hz: 60 Hz to 1 kHz: 60 Hz to 20 kHz:	± (1 % + 10 counts) ± (2.5 % + 15 counts)	± (1.5 % + 10 counts) ± (2.5 % + 15 counts)
Voltmeter ranges	500 mV, 5 V, 50 V, 500 V, 1,000 V	
Resistance		
Ranges	500 Ω, 5 kΩ, 50 kΩ, 500 kΩ, 5 MΩ, 30 MΩ	Feature/function not available for this model
Accuracy	± (0.6 % + 5 counts)	
Other meter functions		
Continuity	Beeper on < 50 Ω (± 30 Ω)	Feature/function not available for this model
Diode test	Up to 2.8 V	
Current (A)	A dc, A ac, A ac + dc using an optional current clamp or shunt Scaling factors: 0.1 mV/A, 1 mV/A to 100 V/A and 400 mV/A	
Temperature	With optional accessories. Scale factors 1 °C/mV or 1 °F/mV	
Recorder Modes		
ScopeRecord™ Roll Mode		
Dual or multiple input waveform storage mode, using deep memory		
Source and display	Input A, Input B, Dual All channels sampled simultaneously	Any combination of inputs, up to four channels All channels sampled simultaneously
Bandwidth	20 MHz or 20 kHz, user selectable	

	190M-2	190M-4
Memory depth	30,000 data points, each holding min/max pair of information	
Min/max values	Min/max values are created at samples that are measured at high sample rate, ensuring capture and display of glitches	
Recording modes	Single sweep, continuous roll, Start-on-trigger (through external), Stop-on-trigger (through external)	Single sweep, continuous roll, Start-on-trigger (through any channel), Stop-on-trigger (through any channel)
Stop-on-trigger	ScopeRecord mode can be stopped by an individual trigger event or by an interruption of a repetitive trigger signal through any input channel (through external on 190M-2 model)	
Horizontal scale	Time from start, time of day	
Zoom	Ranges from full record overview to zoom in up to sample level, at any record length	
Memory	Two multiple input ScopeRecord waveforms can be saved internally for later recall and analysis. Direct storage on external flash memory drive through USB host port	
ScopeRecord™ Roll mode sample rate and recording timespan		
Time base range	5 ms/div to 2 min/div	
Recorded timespan	6 sec to 48 hr	
Time/division in 'view all' mode	0.5 s/div to 4 h/div	
Glitch capture	8 ns	
Sample rate	125 MS/s	
Resolution	200 µsec to 4.8 sec	
Trendplot™ Recording		
Multiple channel electronic paperless recorder graphically plots, displays and stores results of up to four automatic scope measurements or a DMM-reading over time		
Source and display	Any combination of scope measurements, made on any of the input channels, or DMM reading (two-channel instruments)	
Memory depth	18,000 Points (sets) per measurement; each recorded sample point contains a minimum, a maximum and an average value, plus a date and time stamp	
Ranges	Normal view: 5 s/div to 30 min/div In view-all mode: 5 min/div to 48 hr/div (overview of total record)	
Recorded time span	Up to 22 days, with a resolution of 102 seconds	
Recording mode	Continuous recording, starting at 5 s/div with automatic record compression	
Measurement speed	3 Automatic measurements per second or more	
Horizontal scale	Time from start, time of day	
Zoom	Up to 64x zoom-out for full record overview, up to 10x zoom-in for maximum detail	
Memory	Two multiple input TrendPlot records can be saved internally for later recall and analysis. Direct storage on external flash memory drive through USB host port	
Cursor measurements: all recorder modes		
Source	Any waveform trace in any waveform display mode (Scope, ScopeRecord or TrendPlot)	
Dual vertical lines	Cursors may be used to identify min, max or average value of any datapoint in a record, with time between cursors, time from start or absolute time	

	190M-2	190M-4
General specifications		
Input voltage range		
Rated maximum floating voltage	CAT III 1000 V/CAT IV 600 V (Maximum voltage between any contact and earth-ground voltage level)	
Maximum probe voltage	CAT III 1000 V/CAT IV 600 V (Maximum voltage between any contact and earth-ground voltage level)	
Maximum BNC input voltage	CAT IV 300 V (Maximum voltage on BNC input directly)	
Maximum voltage on meter input	CAT III 1000 V/CAT IV 600 V (Safety designed banana input connectors)	
Memory save and recall		
Memory locations (internal)	15 Waveform memories plus 2 recording memories	
15 waveform memory locations	Stores ScopeTrace waveform data (2 traces each) plus screen-copy plus corresponding setup	
Two recording memories	Each may contain: • a 100-screen replay sequence, or • a ScopeRecord roll-mode recording (two traces), or • a TrendPlot recording of up to four measurements	
External data storage	• On PC, using FlukeView™ Software, or • Direct storage on external flash memory drive (maximum 2 GB) through USB host port	
Screencopies	• On PC, using FlukeView™ Software, or • Internally (in instrument), which can be copied on to external flash memory drive as .BMP-file through USB host port	
Volatility	Measurement data is initially stored in RAM, which is maintained by the main battery with a 30-seconds back-up when battery is exchanged When storing data, this is written in non-volatile flash-ROM	
Real-time clock	Provides date and time stamp information for ScopeRecord, for 100-screen replay sequences and for TrendPlot recordings	
Case		
Design	Rugged, shock-proof with integrated protective holster. Handstrap and hangstrap included as standard Kensington lock supported to lock down instrument when left unattended	
Drip and dust proof	IP 51 according to IEC 529	
Shock and vibration	Shock 30 g, vibration (sinusoidal) 3 g according to MIL-PRF-28800F Class 2	
Display size	127 mm x 88 mm (153 mm/6.0 in diagonal) LCD	
Resolution	320 x 240 pixels	
Contrast and brightness	User adjustable, temperature compensated	
Brightness	200 cd/m^2 typical using power adapter, 90 cd/m^2 typical using battery power	
Mechanical data		
Size (HxWxD)	265 mm x 190 mm x 70 mm (10.4 in x 7.5 in x 2.8 in)	
Weight (including battery)	2.1 kg (4.6 lb)	2.2 kg (4.8 lb)
Power		
Line power	Mains adapter/battery charger BC190 included, version depending on country	
Battery power	Rechargeable double capacity Li-Ion battery (included). Battery swappable through easily-accessible battery door at the rear of the instrument	

	190M-2	190M-4
Battery type (included) and capacity [+opt. battery]	BP290; 2400 mAh [BP291 (4800 mAh) optional]	BP291; 4800 mAh
Battery charge indicator	Battery has built-in status indicator for use with external charger, next to battery status indicator on instrument screen	
Battery operating time (with backlight low)	Up to four hours using BP290 (included); up to eight hours using BP291 (optional)	Up to seven hours using BP291 (included)
Battery charging time	2.5 hours using BP290; 5 hours using BP291	5 hours BP291
Battery power saving functions	Auto power-down with adjustable power-down time; auto display off with adjustable power-down time; on-screen battery power indicator	
Safety		
Compliance	EN 61010-1:2001, Pollution Degree 2; CAN/CSA C22.2, No. 61010-1-04, with approval; UL61010B; ANSI/ISA-82.02.01	
Environmental		
Operating temperature	0 °C to +40 °C; +40 °C to +50 °C Excluding battery	
Storage temperature	-20 °C to +60 °C	
Humidity	10 °C to +30 °C: 95 % RH Non-condensing 30 °C to +40 °C: 75 % RH Non-condensing 40 °C to +50 °C: 45 % RH Non-condensing	
Maximum operating altitude	Up to 2,000 m (6666 ft) for CAT IV 600 V, CAT III 1000 V; up to 3,000 m (10,000 ft) for CAT III 600 V, CAT II 1000 V	
Maximum storage altitude	12 km (40,000 ft)	
Electro-magnetic-compatibility (EMC)	EN 61326 (2005-12) For emission and immunity	
Interfaces	Two USB ports provided. Ports are fully insulated from instrument's floating measurement circuitry. USB-host port directly connects to external flash memory drive (up to 2 GB for storage of waveform data, complete datasets in which data and setup information is included, instrument settings and screen copies. A mini-USB-B is provided which allows for interconnection to PC for remote control and data transfer under PC-control.	
Probe calibration output	Dedicated probe-cal output with reference contact provided, fully insulated from any measurement input channel	
Warranty	Three-years (parts and labor) on main instrument; one-year on accessories	
Included accessories		
Batterey charger/mains adapter	BC190	
Li-Ion battery pack	BP290 (2400 mAh)	BP291 (4800 mAh)
Voltage probe sets. Each set includes ground lead, hook clip, ground spring and probe tip insulation sleeve	VPS410 (One red, one blue)	VPS410 (One red, one grey, one blue, one green)
Test leads	TL175 (One red, one black) with test pins	N/A
Other	Handstrap affixed to instrument; hangstrap (user-selectable for left- or right-hand use); multi-language users manuals on CD-ROM; FlukeView® demo package (with restricted functionality); USB interface cable for PC connectivity	

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Ordering information

Item numbers/descriptions

190M-2 Medical ScopeMeter
Portable Oscilloscope

Included accessories:
VPS410-R Voltage probe set, 10:1, 300 MHz, one set red
VPS410-B Voltage probe set, 10:1, 300 MHz, one set blue
TL175 TwistGuard™ safety-designed test leads set (1 red, 1 black)
EBC290 External battery charger for BP290 and BP291
SW90W FlukeView Software for Windows (full version)
C290 Hard shell protective carrying case for 190 Series II
BP290 Li-Ion battery pack, 2400 mAh
MA190 Medical Accessory Kit (includes 50 ohm BNC feed-through, 50 ohm 10:1 attenuator feed through, 1 ohm current shunt, 50 ohm current shunt, 50 ohm coax cable, female BNC to 4 mm banana adapter, two female to female 4 mm banana plug adapters)

190M-4 Medical ScopeMeter
Portable Oscilloscope

Included accessories:
VPS410-R Voltage probe set, 10:1, 300 MHz, one set red
VPS410-G Voltage probe set, 10:1, 300 MHz, one set grey
VPS410-B Voltage probe set, 10:1, 300 MHz, one set blue
VPS410-V Voltage probe set, 10:1, 300 MHz, one set green
EBC290 External battery charger for BP290 and BP291
SW90W FlukeView Software for Windows (full version)
C290 Hard shell protective carrying case for 190 Series II
BP291 Li-Ion battery pack, 4800 mAh
MA190 Medical Accessory Kit (includes 50 ohm BNC feed-through, 50 ohm 10:1 attenuator feed through, 1 ohm current shunt, 50 ohm current shunt, 50 ohm coax cable, female BNC to 4 mm banana adapter, two female to female 4 mm banana plug adapters)

About Fluke Biomedical

Fluke Biomedical is the world's leading manufacturer of quality biomedical test and simulation products. In addition, Fluke Biomedical provides the latest medical imaging and oncology quality-assurance solutions for regulatory compliance. Highly credentialed and equipped with a NVLAP Lab Code 200566-6 accredited laboratory, Fluke Biomedical also offers the best in quality and customer service for all your equipment calibration needs.

Today, biomedical personnel must meet the increasing regulatory pressures, higher quality standards, and rapid technological growth, while performing their work faster and more efficiently than ever. Fluke Biomedical provides a diverse range of software and hardware tools to meet today's challenges.

Fluke Biomedical Regulatory Commitment

As a medical test device manufacturer, we recognize and follow certain quality standards and certifications when developing our products. We are ISO 9001 and ISO 13485 medical device certified and our products are:

- CE Certified, where required
- NIST Traceable and Calibrated
- UL, CSA, ETL Certified, where required
- NRC Compliant, where required

Fluke Biomedical.
Better products. More choices. One company.

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