

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-performance 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


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 available 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 | |

| | 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 $< t$, $> t$, $= t$, $\neq t$, 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 | |

| | 190M-2 | 190M-4 |
|---|---|---|
| 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: <ul style="list-style-type: none">• 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 | <ul style="list-style-type: none">• On PC, using FlukeView™ Software, or• Direct storage on external flash memory drive (maximum 2 GB) through USB host port | | |
| Screencopies | <ul style="list-style-type: none">• 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/m² typical using power adapter, 90 cd/m² 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 | | |
| Battery 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 | |

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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