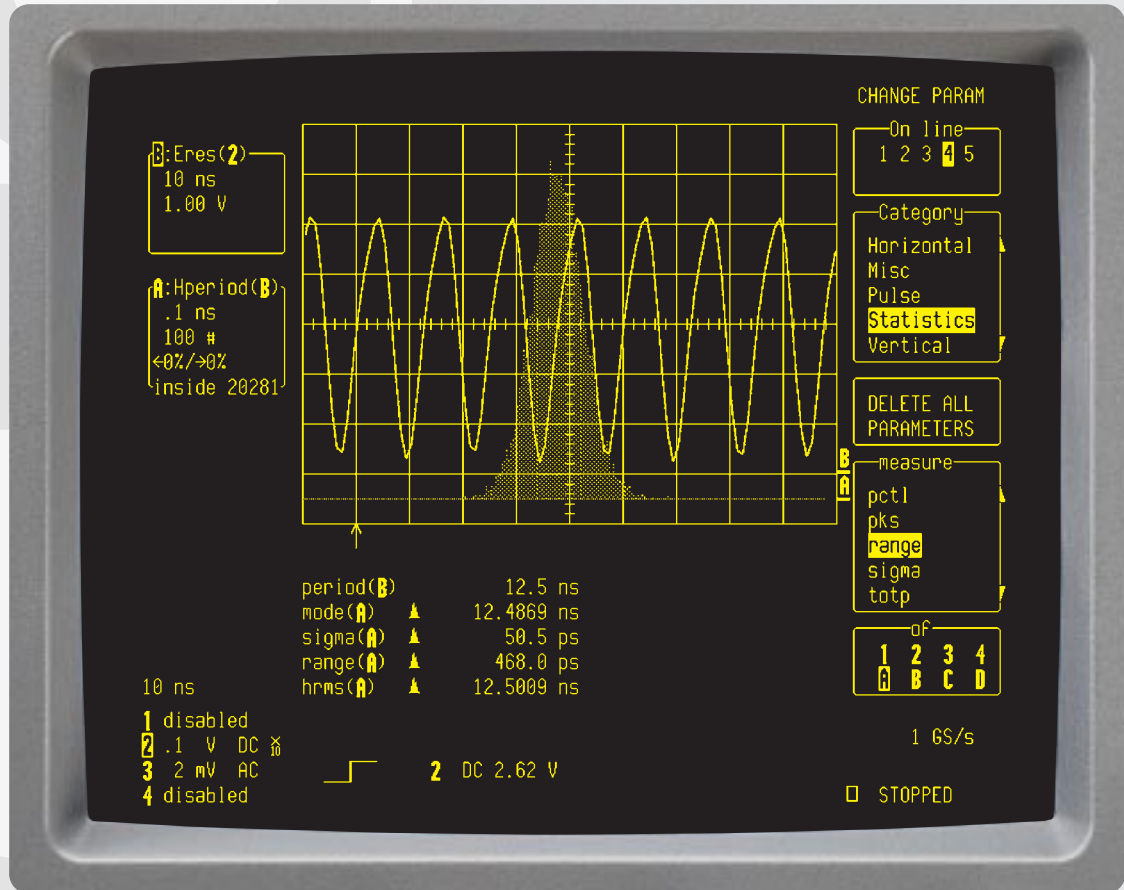


LeCroy Digital Oscilloscopes

Get the Complete Picture

9350C
9354C
9370C
9374C
9384C
Datasheet



LEADING SPECIFICATIONS

- **500 MHz and 1 GHz Bandwidth**
- **2 GS/s and 4 GS/s Max. Sample Rate**
- **Two and Four Channels**
- **Memory lengths to 8M points**
- **8-bit vertical resolution, 11 with ERES option**
- **Floppy Disk and Centronics Port standard**
- **Internal Printer option**
- **Histogram and FFT Signal Processing options**
- **Innovative Peak Detect**
- **Glitch, Pattern, Qualified, Interval, Dropout, TV, and Exclusion Triggers**

Digital oscilloscopes from LeCroy are designed to save engineers valuable time in troubleshooting and problem-solving.

Each oscilloscope is an integrated and powerful system providing the capability to:

- **Capture** fast signals with high resolution for longer time intervals

- **View** data like never before, giving you more information more quickly, with a large CRT and advanced zooming techniques

- **Analyze** your signal to get answers quickly and more accurately with a powerful processing system and math packages

LeCroy

BANDWIDTH

The LeCroy DSOs open up new horizons for engineers and scientists at the leading edge of technological developments. With 500 MHz (935xC) and 1 GHz (937xC, 9384C) bandwidth, long acquisition memories and a powerful trigger system, it is now possible to reveal previously hidden waveform details. Narrow glitches are more accurately defined; risetime measurements below 1 ns are more precise; and high frequency content, filtered out in lower bandwidth systems, is retained, thereby preserving signal amplitudes and overall signal integrity.

SAMPLE RATE

These LeCroy DSO's sample simultaneously on all channels at 500 MS/s (935xC, 937xC) and 1 GS/s (9384C). Thus, they are ideal for demanding high-speed applications. In addition, two channels can be combined to provide a sample rate of 1 GS/s (935xC, 937xC) and 2 GS/s (9384C), or 2GS/s (9354C, 9374C) and 4 GS/s (9384C) in single channel mode. Finer horizontal resolution and accuracy are assured by higher sample rates. This is especially critical in digital design where unpredictable circuit behavior needs to be identified and analyzed in detail to be fully understood. Together with this excellent single-shot performance the LeCroy oscilloscopes also provide a sample rate equivalent to 10 GS/s for repetitive signals. The innovative peak-detect mode enables glitch capture even at the slowest time settings without loss of precision.

ACQUISITION MEMORY

Channel record lengths of 50k, 100k, 500k, 1M and 2M are available on the LeCroy oscilloscopes. The memory power is revealed when the user seeks to sample at the highest speed over many timebase settings. DSOs with less memory may boast a high sample rate for short waveforms, but only LeCroy's long memory oscilloscopes deliver high sample rates for long waveforms. To exploit this capability to its fullest, the long memory version combines its channel acquisition memories to give the user up to 8 million sample points, thereby providing the waveform detail required on long and complex signals.

ADVANCED PEAK DETECT SYSTEM

The 93xxC series offers an innovative peak detect capture mode. This captures fast glitches by running the ADCs at a high sampling rate even at slow time base settings thereby capturing signal details that might have been missed due to under-sampling.

SMART TRIGGER™ SYSTEM

SMART Trigger functions including Glitch, Pattern, Interval, Exclusion, TV, Dropout, and State-or-Edge Qualified triggers are available. Pre- and Post-trigger delay are fully variable, Time and Events Holdoff are also included.

ACQUISITION SYSTEM

Bandwidth (-3 dB):

935XC:

@50 Ω: DC to 500 MHz

100 mV/div: 400 MHz

50 mV/div and above: 350 MHz

937xC/938xC:

@ 50 Ω: DC to 1 GHz 10 mV/div and above.

Bandwidth (-3 dB):

@ 1 MΩ: DC to 500 MHz typ. at probe tip with optional 1 GHz FET probe for 935xC and with PP005 supplied as standard for 937xC and 9384C.

No. of Channels:

4 (9354C/9374C/9384C) and

2 (9350C/9370C)

No. of Digitizers:

4 (9354C/9374C/9384C) and

2 (9350C/9370C)

Sensitivity:

935xC:

2 mV/div to 5 V/div, fully variable

937xC/9384C:

2 mV/div to 1 V/div, 50 Ω fully variable.

2 mV/div to 10 V/div, 1 MΩ fully variable.

Scale Factors: A wide choice of probe attenuation factors are selectable.

Offset Range:

935xC: 2.0 - 9.9 mV/div: ±120 mV

10.0 - 199 mV/div: ±1.2 V

0.2 - 5.0 V/div: ±24 V

937xC/9384C:

2.0 - 4.99 mV/div: ±400 mV

5.00 - 99 mV/div: ±1 V

0.1 - 1.0 V/div: ±10 V

1.0 - 10 V/div: ± 100 V

(1 MΩ only).

± 20 V across the whole sensitivity range when using the AP020 FET probe.



AP015 Current Probe, 50 MHz bandwidth

DC Accuracy: 1% typical.
Vertical Resolution: 8 bits.

Bandwidth Limiter:
 935xC: 30 MHz user selectable.
 937xC/9384C:
 25 MHz or 200 MHz
 user selectable.

Input Coupling: AC, DC, GND.

Input Impedance:
 935xC: 10 M Ω // 15 pF typical, system capacitance at probe tip using PP002 probe, or 50 Ω \pm 1%
 937xC/9384C: 10 M Ω // 11 pF typical, system capacitance at probe tip using PP005 probe, or 50 Ω \pm 1%

Max Input:
 935xC: 1 M Ω : 250 V (DC+peak AC \leq 10 kHz)
 50 Ω : \pm 5 V DC (500 mW) or 5 V RMS
 937xC/9384C:
 1 M Ω : 400 V (DC + peak AC \leq 10 kHz) or 5 V RMS
 50 Ω : \pm 5 V DC (500 mW) or 5 V RMS

MAXIMUM SAMPLE RATE

Models	4 Channels in use	2 Channels in use	1 Channel in use
9350C/9370C	n.a	500 MS/s	1 GS/s
9354C/9374C	500 MS/s	1 GS/s	2 GS/s
9384C	1 GS/s	2 GS/s	4 GS/s

TIME BASE SYSTEM

Timebases: Main and up to 4 zoom traces.

Time/Div Range:

1 ns/div to 1,000 s/div

Clock Accuracy: \leq 10 ppm

Interpolator Resolution: 10 ps

Roll Mode: ranges 500 ms to 1,000 s/div.
 For > 50k points: 10 s to 1,000 s/div.

TRIGGERING SYSTEM

Trigger Modes: Normal, Auto, Single.

Trigger Sources: CH1, CH2, CH3, CH4, External, Line, Slope, Level and Coupling are unique to each source.

Slope: Positive, Negative.

Coupling: AC, DC, HF, LFREJ, HFREJ.

Pre-trigger recording: 0 to 100% of full scale (adjustable in 1% increments).

Post-trigger: 0 to 10,000 divisions, (adjustable in 0.1 div increments).

Holdoff by Time: 10 ns to 20 s.

Holdoff by events: 0 to 99,999,999.

Internal Trigger Range: \pm 5 div.

EXT Trigger Max Input:

935xC: 1 M Ω //15 pF using PP002 probe 250 V DC + peak AC < 10 kHz
 50 Ω \pm 1%: \pm 5 V DC (500 mW) or 5 V RMS.

937xC/9384C:

1 M Ω // 11 pF using PP005 probe 400 V (DC + peak AC < 10 kHz)
 50 Ω \pm 1%: \pm 5 V DC (500 mW) or 5 V RMS.

EXT Trigger Range: \pm 0.5 V (\pm 5 V with Ext/10).

Trigger Timing: Trigger Date and Time are listed in the Waveform Status Menu.

MEMORY PER CHANNEL

Models	Memory per Channel		
	4 Channels in use	2 Channels in use	1 Channel in use
9350C/9370C	n.a	50 kpoints	100 kpoints
9354C/9374C	50 kpoints	100 kpoints	200 kpoints
9384C	100 kpoints	250 kpoints	500 kpoints
9350CM/9370CM	n.a	250 kpoints	500 kpoints
9354CM/9374CM	250 kpoints	500 kpoints	1 Mpoints
9354CTM/9374CTM 9384CM/9384CTM	500 kpoints	1 Mpoints	2 Mpoints
9350CL/9370CL	n.a	2 Mpoints	4 Mpoints
9354CL/9374CL/9384CL	2 Mpoints	4 Mpoints	8 Mpoints

SMART TRIGGER TYPES

Pattern: Trigger on the logic combination of 5 inputs - CH1, CH2, CH3, CH4, and EXT Trigger, (9350C and 9370C: 3 inputs - CH1, CH2, EXT) where each source can be defined as High, Low or Don't Care. The Trigger can be defined as the beginning or end of the specified pattern.

Signal or Pattern Width: Trigger on glitches <2.5 ns (1 ns typical) or on pulse widths between two limits selectable from 2.5 ns to 20s.

Exclusion Trigger: Trigger on a signal or period outside two limits selectable from 2.5 ns to 20s.

Signal or Pattern Interval: Trigger on an interval between two limits selectable from 10 ns to 20 s.

Dropout: Trigger if the input signal drops out for longer than a time-out from 25 ns to 20 s.

State/Edge Qualified: Trigger on any source only if a given state (or transition) has occurred on another source. The delay between these events can be defined as a number of events on the trigger channel or as a time interval.

TV: Allows selection of both line (up to 1500) and field number (up to 8) for PAL, SECAM, NTSC or non-standard video.

ACQUISITION MODE

Random Interleaved Sampling: 9384C (RIS):

For repetitive signals from 1 ns/div to 2 ms/div.

935xC/937xC (RIS):

For repetitive signals from 1 ns/div to 2 μ s/div. (M, L: signals from 1 ns/div to 5 μ s/div).

Random Interleaved Sampling Rate: 10 GS/s

Single Shot:

9384C:

For transient and repetitive signals from 2 ns/div (all channels active).

935xC/937xC:

For transient and repetitive signals from 10 ns/div (all channels active).

Peak Detect: Captures and displays <2.5 ns glitches or other high-speed events at 400 MS/s. Data points available at the same time.

Sequence: Stores multiple events - each of them time stamped - in segmented acquisition memories.

NUMBER OF SEGMENTS AVAILABLE

Model	Segments
9350C/9354C/9370C/9374C	2-200
9350CM/9354CM/9370CM/9374CM/9384C	2-500
9350CL/9354CL/9370CL/9374CL/9384CL 9354CTM/9374CTM/9384CTM/9384CM	2-2,000

DISPLAY

Waveform Style: Vectors connect the individual sample points, which are highlighted as dots. Vectors may be switched off.

CRT: 12.5 x 17.5 cm (9" diagonal) raster.

Resolution: 810 x 696 points.

Modes: Normal, X-Y, Variable or Infinite Persistence.

Real-time Clock: Date, hours, minutes, seconds.

Graticules: Internally generated; separate intensity control for grids and waveforms.

Grids: 1, 2 or 4 grids.

Formats: YT, XY, and both together.

Vertical Zoom: Up to 5x vertical expansion (25x with averaging, up to 80 μ V sensitivity with Advanced Waveform Math option WP01).

9354CL/9374CL: Waveforms can be expanded to give 2-2.5 points/division. Zoom factors up to 400,000x with all channels combined.

9384CL: Waveforms can be expanded to give 0.4-0.5 points/division. Zoom factors up to 2,000,000x with all channels combined.

MAXIMUM HORIZONTAL ZOOM

Model	Zoom Factor
9350C/9354C/9370C/9374C	2,000x
9350CM/9354CM/9370CM/9374CM	10,000x
9354CTM/9374CTM/9384C	20,000x
9350CL/9354CL/9370CL/9374CL/9384CM/9384CTM	100,000x
9384CL	400,000x

AUTOMATED PARAMETRIC MEASUREMENTS AND STATISTICS

The LeCroy DSOs provide more than 40 parametric measurements and their Average, Highest, Lowest values and Standard Deviation. Pass/Fail testing allows up to 5 parameters to be tested against selectable thresholds. Waveform Limit Testing can also be performed using Masks that may be defined inside the instrument. Any failure will activate preprogrammed actions such as Hardcopy, Save, Stop, Beep, GPIB SRQ, or Pulse Out.

ADVANCED WAVEFORM MATH PACKAGE

The Advanced Waveform Math Package option (WP01) provides Summed and Continuous Averaging, Waveform Math Functions, Extrema and Enhanced Resolution Modes.

Functions can be chained together, allowing complex computations. Waveform operations can be performed on live, stored, processed or expanded waveforms. The package is fully programmable over GPIB or RS-232-C. Advanced Math extends the processing capabilities of the oscilloscope and eliminates the need for external computers and controllers for processing.

SPECTRAL ANALYSIS PACKAGE

The Spectral Analysis Package option (WP02) provides comprehensive frequency analysis capabilities, permitting the system designer to identify characteristics that may not be apparent in the time domain. The Spectral Analysis Package provides a wide selection of windowing functions, as well as averaging in the frequency domain.

Spectrum analysis can be performed on repetitive and single events. Users can obtain time and frequency values simultaneously and compare phases of the various frequency components with each other.

PARAMETER ANALYSIS PACKAGE

The Parameter Analysis option (WP03) provides extensive analysis capabilities including trending and histogramming of key parameters. Detailed characterization can easily be performed on difficult-to-measure waveform phenomena such as amplitude fluctuation and timing jitter. Live displays include a line graph representing the trend of a parameter or bar chart showing the statistical distribution of selected waveform parameter measurements. Statistical information can be extracted directly from the histograms using automatic statistical measurements including max, min, average, median, std. deviation, etc.

CURSOR MEASUREMENTS

Relative Time: Two cursors provide time measurements with resolution of $\pm 0.05\%$ full-scale for unexpanded traces; up to 10% of the sampling interval for expanded traces. The corresponding frequency value is displayed.

Relative Voltage: Two horizontal bars measure voltage differences up to $\pm 0.2\%$ of full-scale in single-grid mode.

Absolute Time: A cross-hair marker measures time relative to the trigger and voltage with respect to ground.

Absolute Voltage: A reference bar measures voltage with respect to ground.

WAVEFORM PROCESSING

With the Optional Advanced Waveform Math Package up to four processing functions may be performed simultaneously. Functions available are: Add, Subtract, Multiply, Divide, Negate, Identity, Summation Averaging, and Sine x/x .

Average: Summed averaging of up to 1,000 waveforms in the basic instrument. Up to 10^6 averages are possible with the Advanced Math option.

Extrema : Roof, Floor, or Envelope values from 1 to 10^6 sweeps with the Advanced Math option.

ERES: Low-Pass digital filter provides up to 11 bits vertical resolution. Sampled data is always available, even when a trace is turned off (with the Advanced Math option).

FFT: Spectral Analysis with five windowing functions and FFT averaging with Spectrum analysis option.

Histogramming and trending: The Parameter Analysis option permits in-depth diagnostics on waveform parameters.

ADDITIONAL INFORMATION

INTERNAL PRINTER

The LeCroy DSOs offer an optional internal printer that can produce a 126 X 90 mm full resolution screen dump in under 10 seconds at the push of a button.

The unique "Strip-Chart" format expands the horizontal axis up to 200 cm per division for viewing fine waveform detail within long memory acquisitions. Most printers and plotters can be driven via GPIB, RS-232-C and standard Centronics interface.

REMOTE INTERFACING

GPIB and RS-232-C interfaces may be used for full remote control of the instrument. All front panel and internal processing functions can be controlled via either interface.

INTERNAL MEMORY

Waveform Memory: Up to four 16-bit Memories (M1, M2, M3, M4). The length of each memory is equal to the data acquisition memory.

Processing Memory: Up to four 16-bit Waveform Processing Memories (A, B, C, D).

Setup Memory: Four non-volatile memories. Optional IC Memory Cards, ATA Flash Card, floppy disk or PC Card (PCMCIA) hard drives may also be used for high-capacity waveform and setup storage.

AUTOSETUP

Pressing Autosegment sets timebase, trigger and sensitivity to display a wide range of repetitive signals. (Amplitude 2 mV to 40 V; frequency above 50 Hz; Duty cycle greater than 0.1%).

Autosegment Time: Approximately 2 seconds.

Vertical Find: Automatically sets sensitivity and offset.

PROBES

935xC: One PP002 (10: 1, 10 M Ω // 15 pF) probe supplied per channel. DC to 250 MHz typical at probe tip.

937xC/9384C: One PP005 (10:1, 10 Ω // 11 pF) probe supplied per channel. DC to 500 MHz typical at probe tip.

The 93xxC family is fully compatible with LeCroy's range of FET Probes, which may be purchased separately.

Probe Calibration: Max 1 V into 1 M Ω 500 mV into 50 Ω , frequency and amplitude programmable, pulse or square wave selectable, rise and fall time 1 ns typical. Alternatively the Calibrator output can provide a trigger output or a PASS/FAIL test output.



INTERFACING

Remote Control: Possible by GPIB and RS-232-C for all front-panel controls, as well as all internal functions.

RS-232-C Port: Asynchronous up to 115.2 kb/s for computer/terminal control or printer/plotter connection.

GPIB Port: (IEEE-488.1) Configurable as talker/listener for computer control and fast data transfer.

Centronics Port: Standard hardcopy parallel interface.

Hardcopy: Screen dumps are activated by a front panel button or via remote control. TIFF and BMP format are available for importing to Desktop Publishing programs. The following printers and plotters can be used to make hardcopies: HP ThinkJet, QuietJet, LaserJet, PaintJet, and EPSON printers, HP7400 and 7500 series, or HPGL compatible plotters.

An optional internal high-resolution graphics printer is also available.

GENERAL

Auto-calibration ensures specified DC and timing accuracy.

Temperature: 5°C to 40°C (41°F to 104°F) rated. 0°C to 50°C (32°F to 122°F) operating.

Humidity: <80%

Shock & Vibration: Conforms to selected sections of MIL-PRF-28800F, Class 3.

Power: 90-250 VAC, 45-66 Hz, 350 W (9384C), 230 W (935xC/937xC).

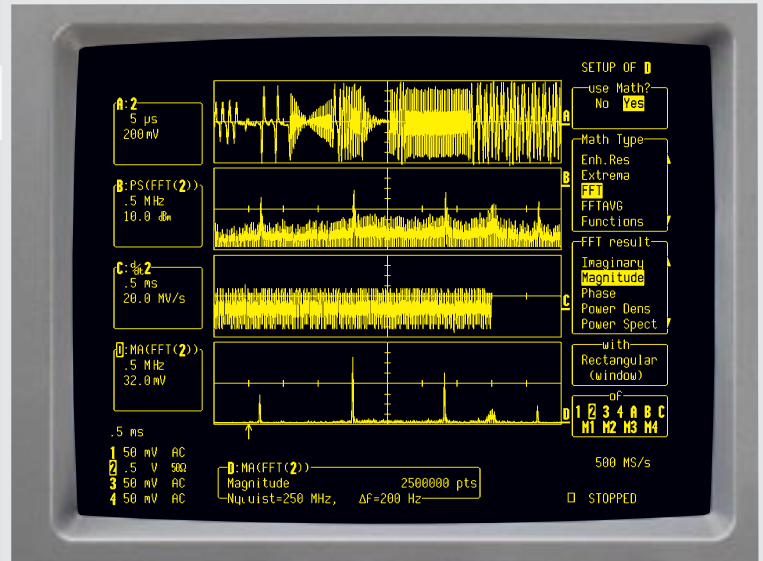
Battery Backup: Front panel settings maintained for two years.

Dimensions: (HWD)

8.5" x 14.5" x 16.25", (210mm x 370mm x 410mm).

Weight: 13 kg (28.6 lbs) net, 18.5 kg (40.7 lbs) shipping.

Warranty: Three years.



APPROVALS

EMC: Conforms to EN50081-1 (Emissions) and EN50082-1 (Immunity).

Safety: The oscilloscope has been designed to comply with EN61010-1 Installation Category (Over-voltage Category) II, Pollution Degree 2.

UL and cUL approved: UL standard: UL 3111-1; cUL Canadian Standard CSA-C22.2 No. 1010. 1-92.

ORDERING INFORMATION

Digital Oscilloscopes:

500 MHz, 500 MS/s, 50 kpts/ch, 2 or 4 channel DSO
500 MHz, 500 MS/s, 250 kpts/ch, 2 or 4 channel DSO
500 MHz, 500 MS/s, 500 kpts/ch, 4 channel DSO
500 MHz, 500 MS/s, 2 Mpts/ch, 2 or 4 channel DSO

1 GHz, 500 MS/s, 50 kpts/ch, 2 or 4 channel DSO
1 GHz, 500 MS/s, 250 kpts/ch, 2 or 4 channel DSO
1 GHz, 500 MS/s, 500 kpts/ch, 4 channel DSO
1 GHz, 500 MS/s, 2 Mpts/ch, 2 or 4 channel DSO

1 GHz, 1 GS/s, 100 kpts/ch, 4 channel DSO
1 GHz, 1 GS/s, 500 kpts/ch, 4 channel DSO
1 GHz, 1 GS/s, 2 Mpt/ch, 4 channel DSO

Included with Standard Configuration:

935xC: 10: 1, 10 MΩ Passive Probe (1 per channel)
937xC/9384C: 10:1, 10 MΩ Passive Probe (1 per channel)
Operator's Manual
Remote Control Manual
Hands on Guide
Floppy Disk Drive

PROBES & ACCESSORIES:

1 GHz 10:1 FET Probe
15 MHz (± 700 V) Differential Probe
15 MHz (± 1400 V) Differential Probe
A Wide Range of Differential Amplifiers and Probes are available
50 MHz Probe
2.5 GHz, 0.6pF FET Probe (x5)
8 GHz, 10:1, 500 Ω Passive Probe (x10)
1 GHz, 100:1, 5 kΩ Passive Probe (x10)
High Voltage Probe 2 kV, 400 MHz
High Voltage Probe 20 kV (40 kV peak), 100 MHz
SMD Kit for PP005
SMD Kit for AP020
Rackmount

SOFTWARE OPTIONS:

Advanced Waveform Math Package
Spectrum Analysis Package
Parameter Analysis Package
Disk Drive Measurements
Supplementary Disk Drive Measurements
Disk Drive Failure Analysis

HARDWARE OPTIONS:

Memory Card Reader with 512K Memory Card
512K Memory Card
HD01/HD02 Combination
Hard Disk Adapter
PCMCIA Hard Disk 170 MB
PCMCIA type III External Desktop Adaptor for PC (110V)
PCMCIA type III External Desktop Adaptor for PC (220V)
4 MB ATA Flash Card (requires HD01 option)
Internal Graphics Printer
External Clock, Reference Clock and Trigger Comparator
Order as model number: 935XC-CKTRIG, 937X-CKTRIG, 938X-CKTRIG

MANUALS:

935xC Service Manual
937xC Service Manual
9384C Service Manual

WARRANTY & CALIBRATION

Swiss OFMET Standard
US NIST Standard
5 Year Warranty
5 Year Calibration Contract
5 Year Warranty and Calibration

Product Code

9350C/9354C
9350CM/9354CM
9354CTM*
9350CL/9354CL

9370C/9374C
9370CM/9374CM
9374CTM*
9370CL/9374CL

9384C
9384CM/9384CTM*
9384CL

PP002
PP005
93XX-OM
93XX-RCM
93XX-HG

AP020
AP031
AP032

AP015
AP54701A**
PP063
PP064
PPE2KV
PPE20KV
PK006
PK106
93XX-RM01

93XX-WP01
93XX-WP02
93XX-WP03
93XX-DDM
93XX-PRML
93XX-DDFA

93XX-MC01/04
93XX-MC04
93XX-HDD
93XX-HD01
93XX-HD02
93XX-DA01-110
93XX-DA01-220
93XX-4MBFC
93X2-GP01

935xC-SM
937xC-SM
9384C-SM

93XX-CCOFMET
93XX-CCNIST
93XX-W5
93XX-C5
93XX-T5

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Datasheet
DS93XXC 0198



* Includes WP01, WP02 and graphics printer
** Requires AP1143A