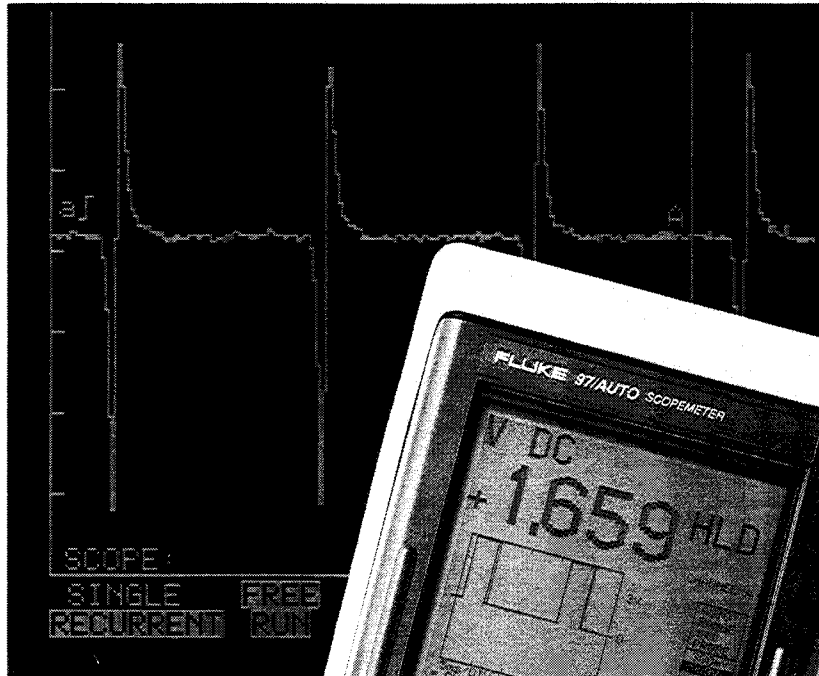


97/AUTO SCOPEMETER®

USERS MANUAL



FLUKE®

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PN 932835

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FLUKE®

Appendix 8A

Specifications

INTRODUCTION

Performance Characteristics

FLUKE guarantees the properties expressed in numerical values with the stated tolerance. Specified non-tolerance numerical values indicate those that could be nominally expected from the mean of a range of identical ScopeMeters.

For definitions of terms, refer to IEC Publication 351-1.

Safety Characteristics

ScopeMeter has been designed and tested in accordance with IEC Publication 348, Safety Requirements for Electronic Measuring Apparatus. This manual contains information and warnings that must be followed by the user to ensure safe operation and to keep ScopeMeter in a safe condition. Use of this equipment in a manner not specified by the manufacturer may impair protection provided by the equipment.

Environmental Data

The environmental data mentioned in this manual are based on the results of the manufacturer's verification procedures.

MULTIMETER

DC Volt

Ranges: 300 mV, 3V, 30V and 300V
Accuracy: $\pm 0.5\%$ ± 5 counts

AC Volt

Ranges: 300 mV, 3V, 30V and 250V
Accuracy:

$\pm 1\%$ ± 10 counts, 50 Hz to 60 Hz
 $\pm 2\%$ ± 15 counts, 20 Hz to 20 kHz
 $\pm 3\%$ ± 20 counts, 5 Hz to 1 MHz
Additional error $\pm 1\%$ ± 1 kHz

For < 10 Hz with 10:1 probe or < 100 Hz direct (1:1 probe), use function V_{rms} AC + V DC.

The 10:1 accessory probe increases the ranges by a factor of 10.

To create more accurate measurements on ac, or on dc with a large ac component, the time base often can be optimized by pressing **AUTO SET** or by changing the setting accessed by pressing **s TIME ns**.

mV DC

Ranges: 300 mV and 3V
Accuracy: $\pm 0.5\%$ ± 5 counts

This range has a low-pass filter with a bandwidth of 5 kHz.

Ω

Ranges: 300 Ω , 3 k Ω , 30 k Ω , 300 k Ω , 3 M Ω and 30 M Ω .
Accuracy: $\pm 0.5\%$ ± 5 counts
Range: 30 Ω
Accuracy: $\pm 2.5\%$ ± 25 counts

Diode

Measuring Current: 0.5 mA
Maximum Voltage: 4V

If Output Voltage is higher than 2.8V, OL (OverLoad) is displayed.



Display Modes

FREQUENCY

The frequency can be displayed within the following parameters:

Range: 1 Hz ... 5 MHz

Accuracy: $\pm 0.5\%$

Resolution: 4 digits

TRACE DISP

The display trace can be switched off.

DUTY%+, DUTY%-

Relative on-to-off time of a varying input can be displayed as a percentage.

- Range: from $<2.0\%$ to $>98.0\%$ for signal amplitudes $>10\%$ of the input voltage range.
- Resolution: 0.1%
- Accuracy (logic or pulse waveforms): within $\pm 0.5\%$
- Accuracy (sine or triangle waveforms): within $\pm 1\% + ((\text{Voltage Range}/\text{RMS Input Voltage}) \times 1\%)$

%/DELTA

Displays the difference after $\text{0}\%$ or $\text{\%}\Delta$ is pressed.

SCALING

0% and 100% can be set, creating an $a + bx$ computed reading where a and b are the 0 and 100% values, respectively, and x is the measured value.


VOLT MATH

Results can be displayed in dBV, dBm, dBW, or Audio Watt. The assumed load resistance can be chosen from: 1, 2, 4, 8, 16, 50, 60, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000 or 1200Ω , depending on the display mode.

Record

In Meter Mode, the actual value is displayed simultaneously with the maximum, average, and minimum values.

Touch Hold® Feature

Can be activated by pressing .

OSCILLOSCOPE**Vertical System****DEFLECTION FACTOR**

1 mV to 100V per division in 1-2-5 sequence, for time base 60s/division to 1ms/division. This can be expanded by a factor of 10 with the 10:1 accessory probe.

VERTICAL RESOLUTION

8 bits, 25 levels per division.

DC ACCURACY

±2%

RISE TIME

Vertical amplifier response limits the rise time to 7 ns. For time base settings slower than 200 ns the rise time is smaller than the sample distance, so the measured rise time is unreliable if it is smaller than $(2 \times s/div)/25$

BANDWIDTH

With 10:1 probe only: > 50 MHz (-3 dB)

NONLINEARITY

Including Analog to Digital Converter, which will have no missing codes and is monotonic: $\pm(2\% \pm 1 \text{ digit})$

MOVE CONTROL RANGE

From +4 divisions to -4 divisions

DC BALANCE

Base line is automatically readjusted after switching the attenuator or ac/dc/ground.

MIN/MAX

Acquisition mode at 1 ms per division or slower on Channel A only. Pulse width for 100% probability of detection is 40 ns.

AVERAGE

The running average can be set to 256 maximum. In Roll Mode, the average is fixed at 10.

ZOOM

Expand or contract view centered around the 4th division, within the limits of the time base and the maximum delay.

Horizontal System**RANGE**

5s to 10 ns per division with triggered start.

The Roll Mode is active from 60s to 10s.

Single shots are possible from 5s to 100 ns per division.



For time base settings faster than 1 ms, an automatic interpolation takes place. The useful bandwidth is about 6 MHz.

For time base settings of 50 ms or slower, the channels are chopped.

For time base settings of 20 ms or faster, the channels are alternated. Channel A is displayed first and, after a second trigger pulse, Channel B is displayed second.

ACCURACY

Accuracy is $\pm 0.1\% \pm 1$ LSB

SAMPLE FREQUENCY

Dependent on time base:

(25/sec-per-div) Hz (maximum 25 MHz)

In Min/Max: 25 MHz

RECORD LENGTH

512 samples calibrated for 25 samples per division.

CAPTURE allows selection of a record length of 10 or 20 divisions.

MOVE CONTROL

From +4 divisions to -16.5 divisions.

A VERSUS B

Channel A is displayed along the vertical axis, and Channel B along the horizontal axis. The time base is set manually.

Trigger

INTERNAL SENSITIVITY

For frequencies lower than 10 MHz: <0.8 div

Extra amplification in the vertical system allows for 2 mV and 1 mV per division for the input signal, but not for the trigger. Therefore, sensitivity at 2 mV and 1 mV decreases by a factor of 5.

LEVEL RANGE

From +4 divisions to -4 divisions.

EXTERNAL

TTL compatible. Selectable for 0.2V or 2V.

Trigger level is indicated on the screen.

DELAY RANGE

TIME DELAY: -20 to +640 divisions

EVENTS: 1 to 1023

N_CYCLE: trigger frequency divided by N (2 to 255.)

Waveform Memories

For waveform storage, eight extra memories are available. The memories can be cleared all together.

Each memory contains 512 words for waveform and the setup belonging to this waveform.

Mathematics

The following math functions can be carried out on the waveforms: multiplication, addition, subtraction, filtering, inversion, and integration. The result is stored in a selected memory.

Cursors

The following measurements can be made on the waveform selected between the cursors:

- dV, dt, 1/dt, RMS, mean, maximum, minimum, peak to peak, rise or fall time, frequency, and phase.
- The time between trigger and cursor.
- Ratio
- The voltage at the cursor relative to ground.

A maximum of any five of these measurements can be displayed at the right hand side of the display.

Autoset

Autoset automatically sets the vertical deflection, the horizontal time base, and the trigger selection. Trigger selection can be left unaffected by selecting ONLY AMPLITUDE, ONLY TIME, or TIME & AMPLITUDE.

Autoset can also be fully configured via a Pop-Up Menu. Selections are as follows (default in parentheses):

VERTICAL

MOVE: (zero), or not affected
Input Coupling: (ac), or not affected
A versus B: (off), or not affected
Average: (off), or not affected
Separation, 1 channel: (Center of screen)
Separation, dual channel: (Channel A+1 div, Channel B-1 div)

HORIZONTAL

MOVE: (zero), or not affected

TRIGGERING

Delay (>0): (off), or not affected
Delay (<0): (not affected)
Include External: include external or (A or B)
Level: (50% of signal), or not affected
Slope: (positive), or not affected

MISCELLANEOUS

Cursors: (not affected), or off
Mathematics: (off), or not affected
Generator: (not affected), or off
Dot Join: (not affected), or off



Record

In Scope Mode, all the measured values are displayed. A reset is possible every 2, 5, 10, or 60 seconds.

GENERATOR

The generator can be used for probe calibration. The output impedance is typically 400Ω.

- Square Wave

Amplitude: 5V p-p typical
Frequency: 488 Hz, 976 Hz or 1.95 kHz (selectable)

- Sinewave

Amplitude: 1V p-p typical
Frequency: 976 Hz

- Slow Ramp Current

Range: 0 to 3 mA
Maximum Voltage: 2V

- Slow Ramp Voltage

Range: -2V to 2V
Maximum Current: 1 mA

SETUP MEMORIES

A maximum of 10 setups (meter and/or scope) can be stored. You can recall, save, or delete each

setup. Separate Initial Setup and Auto Set memories are also maintained.

UNDO

The front panel setup is stepped backward once per press of . After 10 steps backward, continued presses step the setup forward.

GENERAL

Input Terminals (Channels A, B and External Trigger)

Impedance: 1 MΩ // 25 pF

Maximum Voltage: 300V up to 1 MHz (maximum allowed voltage decreases 6 dB per octave at higher frequencies)

The maximum input voltage between any terminal and earth ground is 600V.

Input Protection: The inputs are protected for line voltages of 600V and surge voltages of 4 kV.

Channels A and B have insulated BNC connectors. Two 4-mm banana jacks are used for external triggering, mV DC measurement, resistor measurement, diode testing, and generator output.

Commons of all inputs are connected together.

Display

LCD Type: Super Twisted Nematic

Active Area: 240x240 pixels, diagonal of 4.7 inches (12 cm).

Trace Area: 200x240 pixels

A graticule with 25 pixels per division can be chosen via softkey.

An electro-luminescent backlight can be activated via softkey.

The CONTRAST ratio is adjustable in the LCD Softkey Menu.

External Power Requirements

Input Voltage Range: 8V to 20V



WARNING

THE MINUS VOLTAGE IS CONNECTED TO COMMON. WHEN USING A POWER SUPPLY THAT IS NOT DOUBLE INSULATED, CONNECT COMMON TO PROTECTIVE GROUNDING.

Power Consumption: 5W (typical)

Internal Battery Power

Operating Time

NiCad Pack: 4 hours (typical)

Alkaline C-Cell: 4 hours (KR27/50 or R-14 size can be used.)

Charging Time: 16 hours (typical) while not operating

Charging Current:

100 mA with ScopeMeter ON

200 mA with ScopeMeter OFF

Maximum Temperature During Charging: 45 °C

Temperature and Humidity

Operating Temperature: 0 °C to 50 °C

Storage Temperature: -20 °C to 70 °C

Relative Humidity:

90% from 20 °C to 30 °C

70% from 30 °C to 50 °C

Shock and Vibration

Per MIL-T-28800 for a Class 3 instrument.

Meets requirements of MIL-T-28800D Type III Class 3, Style C, except for temperature range and power switch.



Size (HxWxL)

ScopeMeter only

60 mm x 129 mm x 262 mm
(2.4 inch x 5.1 inch x 10.3 inch)

With holster

62 mm x 140 mm x 281 mm
(2.5 inch x 5.5 inch x 11.1 inch)

Weight

ScopeMeter only: 1.5 kg (3.3 lbs)

With holster: 1.8 kg (4.0 lbs)

Safety

Designed to protection Class II per IEC 348 and UL1244 for 600V.

Sealing

Dust and splash proof

