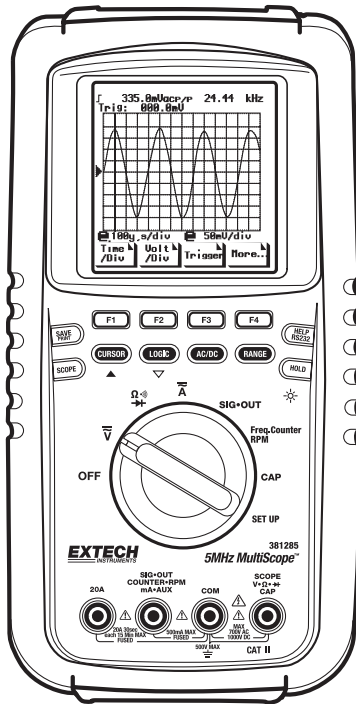


User's Guide



Handheld MultiScope

Model 381285



WARNING

MEASUREMENT OF VOLTAGE IN OSCILLOSCOPE MODE
GREATER THAN 250VAC OR 360VDC
WILL RESULT IN PERMANENT DAMAGE AND POSSIBLE INJURY

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Warranty

EXTECH INSTRUMENTS CORPORATION warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six month limited warranty applies on sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website at www.extech.com (click on 'Contact Extech' and go to 'Service Department' to request an RA number). A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

Calibration and Repair Services

Extech offers repair and calibration services for the products we sell. Extech also provides NIST certification for most products. Call the Customer Service Department for information on calibration services available for this product. Extech recommends that annual calibrations be performed to verify meter performance and accuracy.



Support line (781) 890-7440

Technical support: Extension 200; E-mail: support@extech.com

Repair & Returns: Extension 210; E-mail: repair@extech.com

Product specifications subject to change without notice

For the latest version of this User's Guide, Software updates, and other up-to-the-minute product information, visit our website: www.extech.com
Extech Instruments Corporation, 285 Bear Hill Rd., Waltham, MA 02451

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Safety

This meter has been designed to be safe in use, but the operator must use caution in its operation. The rules listed below should be carefully followed for safe operation.

1. **NEVER** apply voltage or current to the meter that exceeds the specified maximum for the function selected.

Input Limits	
Function	Maximum Input
V DC	1000V DC within 10 seconds
V AC	700V AC within 10 seconds
Ohms	250V DC/AC within 10 seconds
mA DC/AC	250V/500mA fused
20A DC/AC	250V/20A fused, 20A for 30 seconds max each 15 minutes
Logic Analyzer	50V p-p

2. **USE EXTREME CAUTION** when working with high voltages.
3. **DO NOT** measure voltage if the voltage on the "COM" input jack exceeds 500V above earth ground.
4. **NEVER** connect the meter leads across a voltage source while the function switch is in the current, resistance or diode mode. Doing so can damage the meter.
5. **ALWAYS** discharge capacitors in power supplies and disconnect the power when making resistance or diode tests.
6. **ALWAYS** turn off the power and disconnect the test leads before opening the back to replace the fuse or batteries.
7. **NEVER** operate the meter unless the back cover is in place and fastened securely.

International Safety Symbols



This symbol, adjacent to another symbol or terminal, indicates the user must refer to the manual for further information.



This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present



Double insulation

WARNING

The WARNING symbol indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death

CAUTION

The CAUTION symbol indicated a potentially hazardous situation which, if not avoided, may result in minor or moderate injury

Specifications

DIGITAL MULTIMETER



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DC Voltage

Range	Resolution	Accuracy
400mV	0.1mV	±(0.3%rdg + 5dgt)
4V	0.001V	
40V	0.01V	
400V	0.1V	
1000 V	1V	

AC Voltage (True rms)

Range	Resolution	Accuracy		
		50Hz to 1kHz	1kHz to 10kHz	10kHz to 30kHz
400mV	0.1mV	±(1.0%rdg + 10dgt)	±(5.0%rdg + 10dgt)	not specified
4V	1mV	±(0.75%rdg + 10dgt)	±(2.0%rdg + 10dgt)	±(5%rdg + 5dgt)
40V	10mV			
400V	100mV	±(1.0%rdg + 10dgt)		
700 V	1V	±(1.0%rdg + 10dgt)	not specified	not specified

Resistance

Ranges	Resolution	Accuracy
400Ω	0.1Ω	±(0.5%rdg + 10dgt)
4kΩ	1Ω	
40kΩ	10Ω	
400kΩ	0.1kΩ	
4MΩ	1MΩ	±(1%rdg + 5dgt)
40MΩ	10MΩ	

DC Current

Ranges	Resolution	Accuracy
40mA	0.01mA	±(1.2%rdg + 10dgt)
400mA	0.1mA	
4A	1mA	±(1.5%rdg + 10dgt)
20A	10mA	

AC Current (True rms)

Ranges	Resolution	Accuracy	
		50Hz to 1kHz	1kHz to 10kHz
40mA	0.01mA	±(1.2%rdg + 10dgt)	±(4%rdg + 10dgt)
400mA	0.1mA		
4A	1mA	±(2.0%rdg + 10dgt)	±(4%rdg + 10dgt)
20A	10mA		

Capacitance

Ranges	Resolution	Accuracy
40nF	0.01nF	±(2%rdg + 10dgt)
400nF	0.1nF	
4µF	1µF	
40µF	10µF	
100µF	0.1µF	

Frequency Counter

Range	Resolution	Accuracy
0.5Hz to 45MHz	0.1Hz	±(0.1%rdg + 5dgt)

Signal Output

Range	Form	Amplitude
2.5Hz to 78kHz	Square wave, 50% duty cycle, 300/10% steps (approx)	5V p-p

Automotive RPM

Range	RPM1	RPM2
0 to 12000 rpm	DIS electronic type engine (2 cycle engine)	Distributor type engine (4 cycle engine)

Logic Analyzer

Channels	Sweep Time	Sweep Mode
1	125ns to 2s per division (23 divisions)	Auto

Diode Test

Open circuit voltage: 5V max

dB (-80 to +80dB)

2, 3, 8, 16, 50, 75, 93, 110, 125, 135, 150, 300, 600, 900, 1000, or 1200 ohms reference

Continuity

Buzzer sounds for < 60Ω

Auxiliary Input

400.0mV DC range scaled for direct display of temperature, relative humidity or current (1 unit per mV)

DIGITAL STORAGE OSCILLOSCOPE

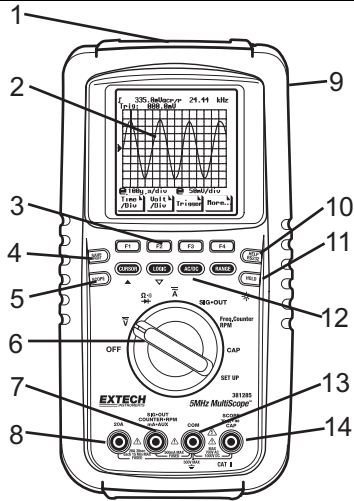
Channels	1
Bandwidth	DC to 5MHz
Sample rate	25Mega samples per second
Vertical Sensitivity	10mV/div to 200V/div (14 divisions)
Time base	125ns. to 2sec. per division (23 divisions)
Glitch capture	500nsec. (minimum)
Trigger	Level adjustable ± 2 divisions (in 0.1 steps) (Positive or negative edge moving trigger)

COMMON SPECIFICATIONS

Display	160x160 pixel graphic LCD with EL backlight
Viewing Area	2.48" x 2.48" (63 x 63mm)
Measurement rate	Digital: 4 times/sec. Bargraph: 7 times/sec.
AC Response	True rms
Crest Factor	3 at full scale, 5 at half scale
Input Impedance	10M Ω for numerical display, 1M Ω for graphical display
Auto Power Off	30 minutes (with disable feature)
Min/Max/Avg.	Displays minimum, average, & maximum readings over time
Hold	Captures displayed reading
Overrange	Indicates "OVER"
Storage	15 pages (text or graphics)
Dimensions	3.6x7.6x2.2inches (92x192x55mm)
Weight	1.0lbs. (450gm)
Power	6 size AA cells, 6 size AA NiMH batteries, 3 dual cell NiMH Battery Packs or AC adaptor
Charging time	10 hours approx.
Operating time	Alkaline (6hrs approx.), NiMH (6hrs approx.)
Temperature	Operating: 32 ^o F to 104 ^o F (0 ^o C to 40 ^o C), Storage (NiMH batteries removed): -4 ^o F to 140 ^o F (-20 ^o C to 60 ^o C), Charging: 32 ^o F to 113 ^o F (0 ^o C to 45 ^o C)

Meter Description

1. RS232 pc interface connector
2. LCD Dot matrix display
3. Soft function keys
4. Display storage key
5. Scope/multimeter key
6. Function switch
7. Sig. Out, mA, Frequency jack
8. 20A jack
9. AC adaptor jack
10. Help key
11. Hold key
12. Mode keys
13. Com jack
14. Volts, ohms, cap, diode jack



Symbols and Annunciators

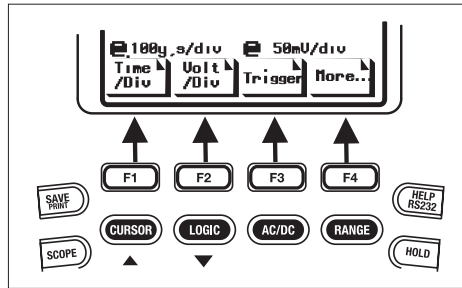
A	Ampere	RUN	restart in peak hold, min/max mode
AC	alternating current	SAVE	saves present signal in memory
AUTO	autoranging	SINGLE	single waveform
AVG	average	SLEEP	auto shut-off
CALL	recall stored data	TEST	self test
CLEAR	remove stored data	TIME	manually change time base
dB	decibel	TRIG	frequency trigger
DC	direct current	V	volts
F	farads(capacitance)	Ω	ohms(resistance)
LIMIT	compare	%Rh	relative humidity
GLITCH	glitch waveform		diode
Hz	hertz(frequency)		cursor (left or right)
MANU	manual		cursor (up or down)
RESET	reset		low battery
MAX	maximum		over range on V & A
MIN	minimum		AC adaptor in use
ms	milliseconds	Δt	signal pulse width
$^{\circ}\text{C}$	degrees centigrade	$\Delta 1/t$	frequency
$^{\circ}\text{F}$	degrees fahrenheit	ΔV	signal amplitude
PAUSE	pause in min/max peakhold, single glitch mode		time to auto power off
P-H	peak hold	\perp	trigger slope
RANGE	manual range	%	% DUTY CYCLE
REL	relative		Dwell Degree
RPM 1	2 stroke - DIS Engine		
RPM 2	4 stroke Engine		

Soft-Keys and Sub-Menus

Soft keys are located directly below the LCD display and perform multiple operation as indicated on the LCD and determined by the function selected by the rotary switch.

Some functions will produce a sub-menu on the display for further selection

Operation of the menus and sub-menus is described in the appropriate operation paragraph.



- F1** F1 to F4 Soft keys, function indicated on graphical display.
- SCOPE** Toggle between the multimeter and graphical display mode.
also power reset key to re-activate power if the auto-shutoff is in effect
- SAVE PRINT** Save and recall measurement data or graphical display.
also press for 3 seconds to print data or the graphical display
- HELP RS232** Display the basic meter warning, Input jack locations and test procedures
also press for 3 seconds to enable the RS232 interface.
- RANGE** Toggle between AUTORANGE and MANUAL RANGE.
- AC/DC** Toggle between AC and DC measurements in V and A functions.
- LOGIC** Logic analyzer function.
- CURSOR** Operation of the scope function, ΔV , $\Delta t\%$, Δt , $\Delta 1/t$ value display.
- HOLD** "Freezes" the reading on the display.

NOTE : Soft key Reaction Time: The soft keys react ONLY AFTER 250msec(millisecond) for all except in the Oscilloscope Mode (500msec).

Operation (Oscilloscope)

AC and DC VOLTAGE



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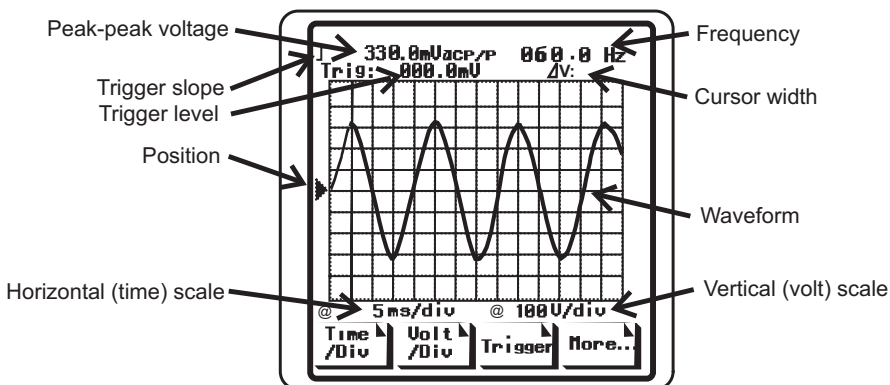


WARNING: Risk of Electrocutation. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances (contacts can be recessed deep in the outlets). As a result, the reading may show 0 volts when the outlet actually is live. Make sure the probe tips are contacting the metal contacts inside the outlet before assuming that no voltage is present.

CAUTION: Do not measure AC or DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur during the ON or OFF operations that can damage the meter.

CAUTION: To avoid meter damage, do not apply 700V AC or 1000V DC for more than 10 seconds.

1. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive **V** jack.
2. Set the function switch to the **V** position.
3. Select AC or DC voltage using the **AC/DC** key (default is AC).
4. Press and momentarily hold the **SCOPE** key to switch to the graphical display.
5. Touch the test probe tips to the circuit under test and observe the waveform.



Oscilloscope Functions

Time /Div	Volt /Div	Trigger	More...
F1	F2	F3	F4

Time /Div (F1): Time per division (horizontal).

▲	▼	AUTO MANUAL	EXIT
F1	F2	F3	F4

Time divisions are selected automatically when in the autoranging mode. The time division will vary to display the best wave pattern in the autoranging mode or the time / division can be set manually using the F1 and the sub-menu arrow (▲▼) keys. The @ symbol indicates that autoranging has been selected.

Volt /Div (F2): Volts per divisions (vertical).

▲	▼	AUTO MANUAL	EXIT
F1	F2	F3	F4

Voltage divisions are selected automatically when in the autoranging mode. The voltage division will vary to display the best amplitude in the autoranging mode or volts / division can be set manually using F2 and the sub-menu arrow (▲▼) keys. The @ symbol indicates that autoranging has been selected.

Trigger (F3): TRIGGER level.

↗	↘	▲	▼	EXIT
F1	F2	F3	F4	

The F1 slope key selects either a rising (↗) or falling (↘) trigger edge.
 The F2 (▲) and F3 (▼) key adjust the trigger level.
 The F3 **EXIT** key to return to the main screen.

More... (F4): MORE function (The **MORE** key redefines the function keys)

Single	Glitch	Position	EXIT
F1	F2	F3	F4

Single (F1): SINGLE shot.

RESET	▲	▼	EXIT
F1	F2	F3	F4

The **SINGLE** key will trigger a single measurement when the key is pressed, and open a sub-menu which allows time expansion or compression for enhanced waveform viewing.
 The F1 **RESET** key will trigger a new measurement.
 The F2 and F3 arrow key will expand or compress the time divisions and trigger a new measurement.
 The F4 **EXIT** key returns the screen to the "More" menu.

Glitch

(F2): GLITCH capture.

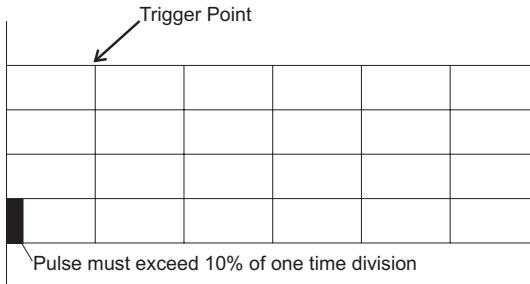
RESET	▲	▼	EXIT
F1	F2	F3	F4

The **Glitch** key sets the meter to trigger a measurement on any single event which causes an overrange indication or is greater than one vertical division or is greater than 10% of one horizontal division.

The F1 **RESET** key will trigger a new measurement. "SEARCHING" will appear on the display until a pulse arrives that triggers the event.

The F2 and F3 arrow keys adjust the time per division and trigger a new measurement.

The F4 **EXIT** key returns the screen to the "More" menu.

**Position**

(F3): POSITION

RESET	▲	▼	EXIT
F1	F2	F3	F4

The **POSITION** key adjusts the vertical position of the waveform.

The F1 **RESET** key sets the vertical position cursor to the default 0 position.

The F2 and F3 arrow keys adjust the vertical position of the waveform.

The F4 **EXIT** key returns the screen to the "More" menu.

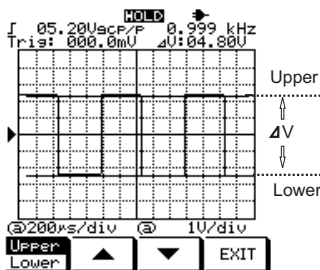
CURSOR**CURSOR FUNCTION**

The cursor function measures time difference or voltage difference between two cursors on the screen. Selecting ΔV will produce two horizontal cursors and selecting one of the Δt functions will produce two vertical cursors. The amplitude or time difference between the two cursors is displayed on the screen.

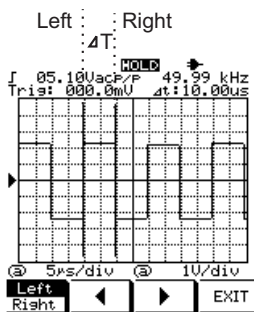
ΔV	$\Delta t\%$	Δt	$\Delta 1/t$
F1	F2	F3	F4

 ΔV (F1): Voltage difference.

Measures the voltage difference between the upper and lower cursor. For example, the voltage difference cursor function can be used to measure the peak to peak voltage. Select "Upper" or "Lower" and press the arrow keys to set the location of the cursors.

 **$\Delta t\%$ (F2): % of one cycle**

Measures the time between the left and right cursor and displays it as a percentage of one cycle of the input waveform. Select "Left" or "Right" and press the arrow keys to set the location of the cursors

 **Δt (F3): Time difference.**

Measures the time difference between the left and right cursor. For example, the time difference cursor function can be used to measure pulse width or the period of one cycle. Select "Left" or "Right" and press the arrow keys to set the location of the cursors.

 $\Delta 1/t$ (F4): Frequency.

Measure the frequency between the left and right cursor. For example, the frequency cursor function can be used while observing a waveform. Select "Left" or "Right" and press the arrow keys to set the location of the cursors

Operation (Digital Multimeter)

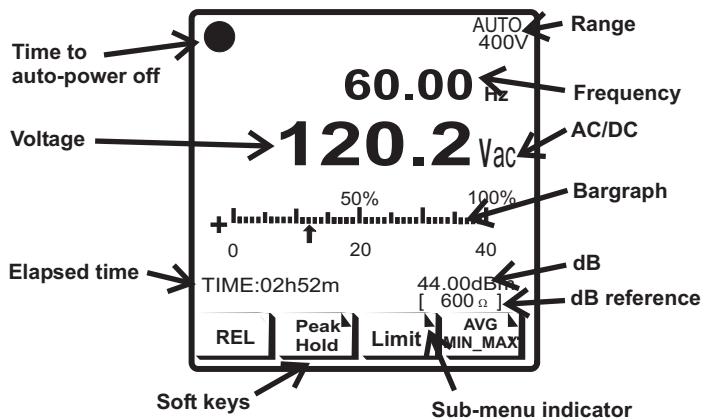
AC and DC VOLTAGE

WARNING: Risk of Electrocutation. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances (contacts can be recessed deep in the outlets). As a result, the reading may show 0 volts when the outlet actually is live. Make sure the probe tips are contacting the metal contacts inside the outlet before assuming that no voltage is present.

CAUTION: Do not measure AC or DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur during the ON or OFF operations that can damage the meter.

CAUTION: To avoid meter damage, do not apply 700V AC or 1000V DC for more than 10 seconds.

1. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive **V** jack.
2. Set the function switch to the **V** position.
3. Select AC or DC voltage using the **AC/DC** key (default is AC).
4. Touch the test probe tips to the circuit under test.
5. Read the voltage in the display. The display will indicate the proper decimal point, value and appropriate symbols.





RESISTANCE

WARNING: To avoid electric shock while taking any resistance measurements, disconnect power to the unit under test and discharge all capacitors. Remove the batteries and unplug the line cords.

1. Insert the black test lead into the negative **COM** jack and the red test lead into the positive Ω jack.
2. Set the function switch to the Ω position.
3. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
4. Read the resistance in the display. The display will indicate the proper decimal point, value and symbols.




CONTINUITY

WARNING: To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive Ω jack.
2. Set the function switch to the Ω  position.
3. Press the F2 key to select the  Continuity function.
4. Touch the test probe tips to the circuit or wire you wish to check. If the resistance is less than 60 Ω , the audible signal will sound.

DIODE test

WARNING: To avoid electric shock, do not test any diode that has voltage on it.

1. Insert the black test lead into the negative **COM** jack and the red test lead into the positive  jack.
2. Set the function switch to the  position.
3. Press the F2 key to select the  function.
4. Touch the test probe tips to the diode or semiconductor junction you wish to test. note the meter reading.
5. Reverse the probes polarity by switching probe position. Note this reading.
6. The diode or junction can be evaluated as follows:
If one reading shows a voltage value (approximately 0.2V to 0.7V) and the other reading shows "OVER" the diode is good.
If both reading show "OVER", the device is open.
If both reading are very small or 0, the device is shorted.

AC and DC CURRENT (mA, 20A)

WARNING: To avoid electric shock do not measure AC current on any circuit whose voltage exceeds 250V AC.

CAUTION: Do not make current measurements on the 20A scale for longer than 30 seconds once every 15 minutes, Exceeding 30 seconds may cause damage to the meter and/or the test leads.

1. Insert the black lead into the negative **COM** jack and the red test lead into the positive **mA** or **20A** jack.
2. Turn the rotary switch to the **A** position.
3. Press the **AC/DC** key to toggle between AC and DC measurements.
4. Press the **F3** key to select the **mA** or **20A** function.
5. Connect the test probe tips in series with the circuit under test. The display will indicate the proper decimal point, value and symbol.

CAPACITANCE

WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any capacitance measurements. Remove the batteries and unplug the line cords.

1. Insert the black test lead into the negative **COM** jack and the red test lead into the positive **CAP** jack.
2. Turn the rotary switch to the **CAP** position.
3. The meter will turn on in the capacitance autoranging mode.
4. Touch the test lead to the capacitor to be tested. The display will indicate proper decimal point, value and symbol.

Note: Manual ranging is not available in the Capacitance function.

RELATIVE

The Relative feature (available in Voltage, Resistance, Current, Capacitance and the AUX functions) displays the difference between a stored reference value and the actual measured value. Actuation of the relative mode automatically switches the meter to manual ranging.

1. When the F1 **REL** soft key is pressed the value in the display is stored as the reference value.
2. A blinking **REL** icon will appear will appear display indicating the mode is in active.
3. The displayed value will be the difference between the stored reference value and the measured value.
4. Press the F1 **REL** to exit relative mode.

AVG/MIN/MAX

The Average/Minimum/Maximum feature (available in Voltage, Resistance and Current) displays the Max, Avg and Min measured values with the elapsed time. The data is also plotted as either a bar or line graph. Update is once per second.

1. Press F4 **AVG/MIN-MAX** soft key to initialize this feature. The range currently used will be held.
2. The display will indicate the maximum value, the average value, and the minimum value since the feature was initiated. The meter will “beep” each time the MAX or MIN value is updated.
3. The elapsed time for each value is displayed next to the value. The time format is hrs:min:sec
4. Press F1 **Restart** to reset the time and begin recording a new series.
5. Press F2 **RUN PAUSE** to run or pause the recording.
6. Press F3 **LINE BAR** to change the history graph type(line or bar).
7. Press F4 **EXIT** to leave the Max/Min/Avg feature.



PEAK HOLD

The Peak Hold feature (available in Voltage and Current) displays the Max and Min measured values. The data is also plotted as either a bar or line graph. Update is once every 250ms.

1. Press F2 **Peak Hold** key to enter the this function.
2. The LCD will display the peak value of the measured parameter, the peak max and peak min values. The meter will beep whenever a new MIN or MAX is captured.
3. Press F1 **Restart** reset the values for a new run.
4. Press F2 **RUN PAUSE** to continue measuring or to hold the MIN/MAX values.
5. Press F3 **LINE BAR** to change the history graph type(line or bar)
6. Press F4 **EXIT** to return to the initial menu.

LIMIT (Compare)

The Limit feature (available in Voltage, Resistance and Aux functions) allows for testing or selection of components between a settable minimum and maximum limit. The measured value and HIGH, LOW or PASS will be displayed.

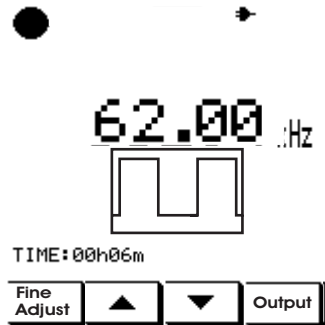
1. Press the **LIMIT** soft key to enter the LIMIT mode.
2. Press **◀** and **▶** arrow keys to select the Maximum or Minimum digit for editing. The digit will blink when selected.
3. Press **▲** (cursor) up or **▼** (logic) down arrow key to adjust the value of the digit.
4. Press the **SET** key to store the value and move to the next digit.
5. Adjust all minimum and maximum digits as needed to set the limits.
6. If the measured value fall between the maximum and minimum limits, the display will indicate "PASS".
7. If the measured value is greater than the maximum limit, "HIGH" will be displayed and if the value is less than the minimum limit "LOW" will be displayed.



SIG.OUT

The Signal Out function generates a 5V pk-pk square wave of 2.5Hz to 78kHz.

1. Insert the test leads into the positive "SIG.OUT" and the (COM) jacks
2. Set the function switch to SIG.OUT position.
3. Press F2 **▲** or F3 **▼** keys to approach the desired output frequency. Hold the key for three seconds for rapid adjustment.
4. Press F1 **Fine Adjust** key and then use the arrow keys to select the nearest frequency available to the desired frequency..



WARNING: Never attempt a Voltage measurement if a test lead is in SIG.OUT position. Doing so may result in personal injury or meter damage.

FREQUENCY COUNTER, DUTY CYCLE and DWELL

1. Insert the black test Lead into the negative (COM) jack and red test lead into the positive COUNTER jack
2. Turn the rotary switch to the Freq. Counter position
3. Press the F1 **Frequency** key to measure and display the frequency.
4. Press the F2 **Duty** to see the Duty Cycle in percent and the Dwell Angle in degrees.

Press the **RANGE** key to change the number of cylinders.

AUTOMOTIVE RPM

1. Insert the black test Lead into the negative (COM) jack and red test lead into the positive COUNTER jack
2. Turn the rotary switch to the RPM position
3. Connect the inductive pick-up to the meter and clamp the secondary ignition wire of the engine
4. Press the F3 **rpm(1)** key for distributorless electronic type engine (2 stroke/DIS) or the F4 **rpm(2)** key for conventional 4 stroke distributor type engines.
5. Read the rpm on the display.

NOTE : To avoid interference from noise or outside sources, keep the meter away from spark plugs or coil wires.

LOGIC ANALYZER

WARNING : To avoid meter damage, never measure signals greater than 40V dc when in the Logic Analyzer function.

1. Insert the black test lead into the negative (COM) jack and the red test lead into the positive SCOPE input jack.
2. Set the function switch to V and change to "dc" with **AC/DC** key.
3. Press the **LOGIC** key.
4. Read the voltage and frequency, timing chart.

Press F1 **Restart** to start the logic chart.

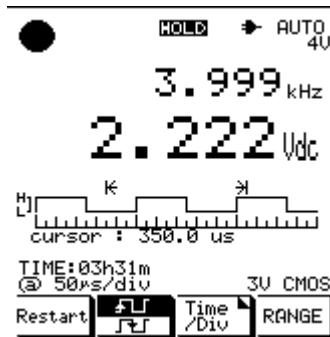
Press F2 **↑ ↓** to select a rising or falling trigger slope.

Press F3 **Time/Div** to change the sweep time.

Time divisions will vary to display the best wave pattern in the autoranging mode or they can be set manually using the arrow keys.

Press F4 **RANGE** to select the logic type. Select from TTL, 3V CMOS or 5V CMOS.

5. Press the **LOGIC** key to exit logic function.



SET UP

The setup function provides a means to set measurement default conditions and also provides access to a Self-Test, Auxiliary inputs and a Users Manual.

Press the F1 **Next Item** key to move the selection pointer to the desired item.

Press the F2 **◀▶** key to select the desired condition.

Press the F3 **Save** key to save the selection.

Printer	EPSON M-T102,
Baud rate	1200bps, 2400bps, 4800bps, 9600bps.
Parity bit:	NONE
dBm reference :	2Ω, 4Ω, 8Ω, 16Ω, 50Ω, 75Ω, 93Ω, 110Ω, 125Ω, 135Ω, 150Ω, 300Ω, 600Ω, 900Ω, 1000Ω, 1200Ω.
Beeper:	enable, disable.
Sleep mode:	enable, disable
Back-light:	OFF, 15s, 30s, 60s, no limit.

Press the F4 **More** key to redefine the function keys.

Press the F1 **Self Test** key to run a system and memory self test.

Press the F2 **Auxiliary** key to select auxiliary input from temperature, humidity or high current multimeter adaptors

Press the F3 **UsersManual** key to access the built-in users manual.

AUX

The auxiliary selection allows direct display of °C / °F, %RH, High DC Currents in the correct units when the meter is used with an external DC Adapter. The external DC Adapter should output 1mV DC / unit of measure.

1. Insert the black adapter banana plug into the negative (COM) jack and red adapter banana plug in to the positive AUX jack.
2. Set the function switch to the SET UP position.
3. Press the F4 **More** key and then the F2 **Auxiliary** key
4. Press the F1 **°C / °F** key, F2 **%RH** key or the F3 **High Current** key to match the adaptor being used.
5. Press the F4 **EXIT** key to return to the previous menu.

BACKLIGHT

Backlighting improves the display visibility in areas with low ambient light. A timeout function can be set in the SET UP function. Extended use of backlighting will reduce the battery life.

1. Press the **HOLD** key for 4 seconds to turn the EL backlighting on.
2. Press the **HOLD** key for 4 seconds to turn the EL backlighting off.

AUTO RANGE/MANUAL RANGE SELECTION

The meter will turn on in the auto ranging mode. For most application this is the easiest and most accurate method of measurement. For measurements that require the range to be held:

1. Press the **RANGE** key. The display will change from "AUTO" to "RANGE" with the full scale value displayed.
2. Each time the **RANGE** key pressed, the next available range will be set.
3. To return the AUTO range, hold the **RANGE** key for 4 seconds.

HELP

Press the **HELP** key to display any warnings, test lead connection diagrams and instructions for the function selected. Press the F1 and F4 arrow keys to scroll through the procedures.

Press **HELP** to exit the screens.

SAVE

In the SAVE mode, 15 digital or graphical displays can be saved in memory.

1. Press the **SAVE** key to enter this feature.
2. The display will list 15 memory locations and indicates what type of data is stored in each location. Locations with no data will be left blank.
3. Press the **CURSOR ▲** or **LOGIC ▼** arrow keys to scroll the arrow cursor up/down through the 15 memory locations.
4. At the selected memory location:
 - a. Press the F1 **Save** key to save the text or graphical display.
 - b. Press the F2 **Call** key to recall and display the saved data.
 - c. Press the F3 **Clear** key to clear the saved data from memory.
7. Press the **SAVE** key to exit the feature.

PRINT

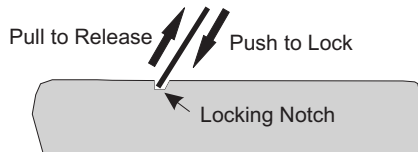
The display can be directly printed to the recommended thermal printer.

1. Connect the thermal print cable to the top of the meter.
2. Turn the thermal printer power on.
3. Press the **SAVE PRINT** key for 4 seconds.

TILT STAND

The Tilt Stand can be placed either in the locked stand position for flat surface use or in the hinged position for hanging use.

1. For use on a flat surface, lift the stand to approximately a 55 degree angle and push in until the Stand locks in the locking notch.
2. To hang the meter, squeeze the legs of the stand and remove it from the meter. Turn the stand 180 degrees and replace in the holder. The stand will now swing free over the top of the meter.



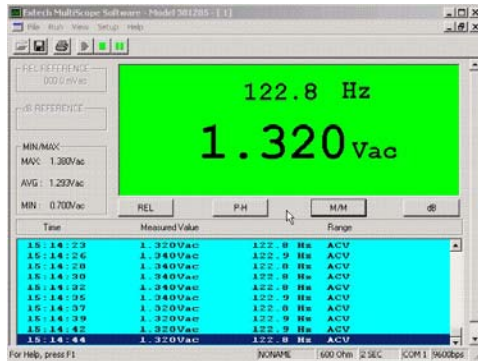
RS232 COMMUNICATIONS

Installation

1. Start the PC.
2. Insert the Software Program diskette into drive A :
3. Select "START" and then "RUN" from the Windows menu bar.
4. Type "A:\ SETUP" in the OPEN box and select "OK"
5. Follow the installation instructions on the screen.

Initialization

1. Connect the RS232 cable between the meter and the PC's serial port.
2. Turn the Rotary Switch to the measurement function desired.
3. Press and HOLD the **HELP** **RS232** key for 4 seconds to enable the RS232 output. A blinking "RS232" will appear on the display
4. Select the "MultiScope" icon in the START/PROGRAM menu to launch the program.



Operation

1. In the "MultiScope" opening screen, select "Setup / Comm port".
2. Select the proper COM port and click "OK"
3. Setup Menu:
 - a. Select "Setup / Sampling Time" to set the sampling (data record) time for each measurement. (250ms, 500ms, 1s, 2s, 5s, 10s, 30s, 1min, 10min, 30min, 1hr, 10hr, 1day)
 - b. Select "Setup: dB " to select the dB reference impedance.
 - c. Select "Setup: Baudrate " to select the communications baud rate.
4. View Menu:
 - a. Select "View: Bar " to display the data as a bar plot.
 - b. Select "View: Line " to display the data as a line plot.
 - c. Select "View: Text " to display the data in a numeric format.
5. Run Menu: Select Star, Stop or Pause to control the datalogging.
6. File Menu:
 - a. Select "File/Save" to save the recorded data.
 - b. Select "File/Open" to open an existing file.
 - c. Select "File/Print" to print the file.
7. To Capture a graphical display:
 - a. In the View menu, select either the Line or Bar display (Capture will not occur with Text display selected)
 - b. On the meter, Press HOLD key. The flashing HOLD icon will appear on the top center of the display and after a five second delay, the captured graphical display will appear in the display window of the monitor. (The captured display can be printed or saved to a file).
 - c. Capturing a graphical display interrupts the logging session. Press HOLD once more to exit the capture screen and return to the datalogging screen. Select RUN then START to resume logging.

MAINTENANCE

WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing the back cover or the battery cover.

WARNING: To avoid electric shock, do not operate your meter until the battery cover is in place and fastened securely.

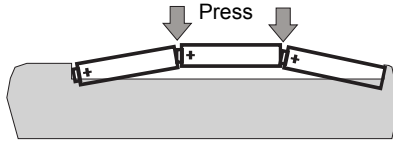
This multimeter is designed to provide years of dependable service, if the following care instructions are performed:

1. **KEEP THE METER DRY.** If it gets wet, wipe it off.
2. **USE AND STORE THE METER IN NORMAL TEMPERATURES.** Temperature extremes can shorten the life of the electronic parts and distort or melt plastic parts.
3. **HANDLE THE METER GENTLY AND CAREFULLY.** Dropping it can damage the electronic parts or the case.
4. **KEEP THE METER CLEAN.** Wipe the case occasionally with a damp cloth. DO NOT use chemicals, cleaning solvents, or detergents.
5. **USE ONLY A FRESH BATTERY OF THE RECOMMENDED SIZE AND TYPE.** Remove the old or weak battery so it does not leak and damage the unit.
6. **IF THE METER IS TO BE STORED FOR A LONG PERIOD OF TIME,** the battery should be removed to prevent damage to the unit.

BATTERY REPLACEMENT

CAUTION : Do not use non-rechargeable batteries (alkaline, carbon-zinc, etc) with meter's AC Power adapter. The AC Power adaptor maybe used whether or not the rechargeable Ni-Cd batteries are installed.

1. Disconnect and remove the test leads.
2. Remove the rubber holster (if installed).
3. Lift the Tilt Stand and remove the two screws using Philips screw driver.
4. Lift the two battery covers up to remove them.
5. Remove the Tilt Stand.
6. Align the three batteries as shown in the diagram (observe polarity) and press down until they snap into the battery holder.
7. Snap the two battery covers back into place and put the Tilt Stand in place.
8. Replace and tighten the two battery door screws.



NOTE: If your meter does not work properly, check the fuses and battery to make sure that they are still good and that they are properly inserted

WARNING: To avoid electric shock, do not operate your meter until the battery covers are in place and fastened securely.

NOTE: When the Battery becomes exhausted or drops below operating voltage the low battery symbol will appear in the top area of LCD display with a sound.
The alkaline battery should be replaced if alkaline batteries are installed.
If rechargeable batteries (NiMH) are installed, the NiMH batteries will be automatically recharged when the AC Adapter is connected.
NiMH recharging time will be reduced if the battery is charged with the meter off.
If the NiMH Battery is totally discharged (very rare case) the meter may not operate properly with the AC Adapter. In this case, recharge the NiMH battery with the AC Adapter for about 5 minutes with the meter's rotary switch in the "OFF" position.

FUSE REPLACEMENT

WARNING: To avoid electric shock, do not operate your meter until the battery covers are in place and fastened securely.

NOTE: If your meter does not work properly, check the battery and fuses to make sure that they are still good and that they are properly inserted.

1. Disconnect and remove the test leads.
2. Remove the rubber holster (if installed).
3. Lift the Tilt Stand and remove the two battery cover screws.
4. Lift the two battery covers up to remove them, remove the tilt stand and remove the batteries.
5. Remove the one screw at the rear bottom of the rear case and the two screws in the battery compartments.
6. Lift the rear case far enough to gain access to the fuses located opposite the input terminals
7. Replace the blown fuse. There are two fuses: 250V/500mA for the 400mA range and 250V/20A for the 20A range.
8. Replace the bottom case and secure with three screws. Replace the battery covers and tilt stand and secure with two screws.

CAUTION : Always replace fuses with fuses of the same size and value.

CAUTION : Do not open the top area of bottom case near the display. The display is connected with a sensitive pin socket and printed circuit board. Do not touch this area or attempt to remove any components in this area.