



GENERAL POLYTRONIC SYSTEMS LTD.

# User Manual



## GPS-98

Auto-Range Digital Multimeter

## SAFETY INFORMATION

The following safety information must be observed to insure maximum personal safety during the operation at this meter:

- Do not use the meter if the meter or test leads look damaged, or if you suspect that the meter is not operating properly.
- Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.
- Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.
- Use caution when working above 60V dc or 30V ac rms. such voltages pose a shock hazard.
- When using the probes, keep your fingers behind the finger guards on the probes.
- Measuring voltage which exceeds the limits of the multimeter may damage the meter and expose the operator to a shock hazard. Always recognize the meter voltage limits as stated on the front of the meter.

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### SPECIFICATIONS

**Safety:** Designed to Protection Class III requirement of EN61010-1 over-voltage Category III (CATIII).

**Maximum Voltage:** 500V rms. (Between any terminal and earth ground)

**RS232:** Optically isolated PC interface-optional RS-232 cable windows® 95/98/2000 compatible software allows user to collect, display, plot and save data.

**Display:** Oversized high contrast 4000 counts backlight LCD display with dual display

**Polarity:** Automatic, (-) negative polarity indication.

**Overrange:** "OL" mark indication.

**Low battery indication:** The "BAT" is displayed when the battery voltage drops below the operating level.

**Measurement rate:** 2 times per second, nominal.

**Auto power off:** Meter automatically shuts down after approx. 30 minutes of inactivity. (Auto power off or when RS-232 is off)

**Operating environment:** 0 °C to 50 °C at < 70 % relative humidity.

**Storage temperature:** -20 °C to 60 °C at < 80 % relative humidity.

**Power:** Standard 9V battery (NEDA 1604, IEC 6F22)

**Dimensions:** 197 (H) x 88.4 (W) x 41.2 (D) mm

**Weight: Approx.:** 635g including holster.

**Accuracy** is given at 18 °C to 28 °C , less than 70 % RH

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### DC Voltage (Auto-ranging)

| Range   | Resolution | Accuracy                        |
|---------|------------|---------------------------------|
| 400.0mV | 0.1mV      | $\pm 0.5\%$ of rdg $\pm 2$ dgts |
| 4.000V  | 1mV        | $\pm 1.2\%$ of rdg $\pm 2$ dgts |
| 40.00V  | 10mV       |                                 |
| 400.0V  | 100mV      |                                 |
| 1000V   | 1V         | $\pm 1.5\%$ of rdg $\pm 2$ dgts |

Input Impedance approx.: 50M $\Omega$  & 400mV Range; 8.2M $\Omega$  & other Ranges.

Maximum Input: 1000V dc or 750V ac rms.

### AC Voltage (Auto-ranging except 400mV)

| Range   | Resolution | Accuracy                         |
|---------|------------|----------------------------------|
| 400.0mV | 0.1mV      | $\pm 2.0\%$ of rdg $\pm 30$ dgts |
| 4.000V  | 1mV        | $\pm 0.8\%$ of rdg $\pm 3$ dgts  |
| 40.00V  | 10mV       |                                  |
| 400.0V  | 100mV      |                                  |
| 750V    | 1V         | $\pm 2.0\%$ of rdg $\pm 4$ dgts  |

Input Impedance approx.: 50M $\Omega$  & 400mV Range; 8.2M $\Omega$  & other Ranges.

Frequency Range: 40 to 400Hz

Maximum Input: 1000V dc or 750V ac rms.

**DC Current (Auto-ranging for uA and mA)**

| Range   | Resolution | Accuracy                        |
|---------|------------|---------------------------------|
| 400.0uA | 0.1uA      | $\pm 1.5\%$ of rdg $\pm 3$ dgts |
| 4000uA  | 1uA        |                                 |
| 40.00mA | 10uA       |                                 |
| 400.0mA | 100uA      |                                 |
| 20A     | 10mA       | $\pm 2.5\%$ of rdg $\pm 5$ dgts |

Overload Protection: 0.5A / 250V and 20A / 600V Fuse.

Maximum Input: 400mA dc or 400mA AC rms on uA / mA ranges, 20A DC or AC rms on 20A range.

**AC Current (Auto-ranging for uA and mA)**

| Range   | Resolution | Accuracy                        |
|---------|------------|---------------------------------|
| 400.0uA | 0.1uA      | $\pm 1.8\%$ of rdg $\pm 5$ dgts |
| 4000uA  | 1uA        |                                 |
| 40.00mA | 10uA       |                                 |
| 400.0mA | 100uA      |                                 |
| 20A     | 10mA       | $\pm 3.0\%$ of rdg $\pm 7$ dgts |

Overload Protection: 0.5A / 250V and 10A / 600V Fuse.

Frequency Range: 40 to 400 Hz

Maximum Input: 400mA dc or 400mA ac rms on uA / mA ranges, 20A dc or ac rms on 20A range.

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## Resistance (Auto-ranging)

| Range   | Resolution | Accuracy                        |
|---------|------------|---------------------------------|
| 400.0Ω  | 0.1Ω       | $\pm 1.2\%$ of rdg $\pm 4$ dgts |
| 4.000kΩ | 1Ω         | $\pm 1.0\%$ of rdg $\pm 2$ dgts |
| 40.00kΩ | 10Ω        |                                 |
| 400.0kΩ | 100Ω       |                                 |
| 4.000MΩ | 1kΩ        |                                 |
| 40.00MΩ | 10kΩ       | $\pm 2.0\%$ of rdg $\pm 3$ dgts |

Input Protection: 500V dc or 500V ac rms.

## Capacitance (Auto-ranging)

| Range   | Resolution | Accuracy                        |
|---------|------------|---------------------------------|
| 40.00nF | 10pF       | $\pm 5.0\%$ of rdg $\pm 7$ dgts |
| 400.0nF | 0.1nF      | $\pm 3.5\%$ of rdg $\pm 5$ dgts |
| 4.000uF | 1nF        |                                 |
| 40.00uF | 10nF       |                                 |
| 100.0uF | 0.1uF      | $\pm 5.0\%$ of rdg $\pm 5$ dgts |

Input Protection: 500V dc or 500V ac rms.

## Frequency (Auto-ranging)

| Range    | Resolution | Accuracy                        | Sensitivity   |
|----------|------------|---------------------------------|---------------|
| 9.999Hz  | 0.001Hz    | $\pm 1.2\%$ of rdg $\pm 5$ dgts | 0.5V RMS min. |
| 99.99Hz  | 0.01Hz     | $\pm 1.2\%$ of rdg $\pm 3$ dgts |               |
| 999.9Hz  | 0.1Hz      |                                 |               |
| 9.999kHz | 1Hz        |                                 | 0.8V RMS min. |
| 99.99kHz | 10Hz       | 3.5V RMS min.                   |               |
| 999.9kHz | 100Hz      |                                 |               |
| 9.999MHz | 1kHz       | $\pm 1.5\%$ of rdg $\pm 4$ dgts | 8.0V RMS min. |

Sensitivity: RMS min. at  $>20\%$  and  $<80\%$  duty cycle.

Effect Reading: More than 100 digits at pulse width  $>2\mu\text{Sec}$ .

Overload protection: 500V dc or ac rms.

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### Duty Cycle

| Range      | Resolution | Accuracy                        |
|------------|------------|---------------------------------|
| 0.1%~99.9% | 0.1%       | $\pm 1.2\%$ of rdg $\pm 2$ dgts |

Frequency: 1Hz to 150KHz;

Sensitivity: 0.5V RMS min. when  $F < 10\text{KHz}$ ; 0.8V RMS min.  
when  $F > 10\text{KHz}$ ,  $< 100\text{KHz}$ ; 3.5V RMS min.  
when  $F > 100\text{KHz}$ ,  $< 150\text{KHz}$ .

Pulse width:  $> 100\mu\text{s}$ ,  $< 100\text{ms}$ .

Overload protection: 500V dc or ac rms.

### Temperature (Auto-ranging)

| Range                                            | Resolution                             | Accuracy                                                  |
|--------------------------------------------------|----------------------------------------|-----------------------------------------------------------|
| $-20^{\circ}\text{C} \sim +1000^{\circ}\text{C}$ | $0.1^{\circ}\text{C}/^{\circ}\text{C}$ | $\pm 3\%$ of rdg $\pm 2^{\circ}\text{C}/^{\circ}\text{F}$ |
| $-4^{\circ}\text{F} \sim +1832^{\circ}\text{F}$  | $0.1^{\circ}\text{F}/^{\circ}\text{F}$ |                                                           |

Sensor: Type K Thermocouple

Input Protection: 60VDC or 24VAC rms.

\* Room temperature (Second display):

Resolution:  $1^{\circ}\text{C}$

Accuracy:  $\pm 3^{\circ}\text{C}$

### Diode Test

| Test current  | Resolution | Accuracy                       |
|---------------|------------|--------------------------------|
| 0.3mA typical | 1 mV       | $\pm 10\%$ of rdg $\pm 5$ dgts |

Open circuit voltage: 1.5V dc typical

Overload protection: 500V dc or ac rms.

### **Audible continuity**

Audible threshold: Less than 30 $\Omega$

Test current: <0.3mA

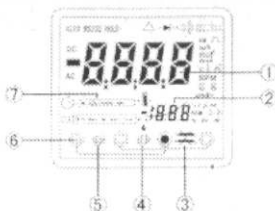
Overload protection: 500V dc or ac rms.

### **OPERATION**

Before taking any measurements, read the Safety Information Section.

Always examine the instrument for damage, contamination (excessive dirt, grease, etc.) and defects. Examine the test leads for cracked or frayed insulation. If any abnormal conditions exist do not attempt to make any measurements.

### **Safety Warning LCD-Annunciator:**





1. First LCD display:  
Measured values, unit, symbols, and decimal points are displayed
2. Second LCD display:  
Display Room temperature
3. Wrong position test leads
4. F2 fuse open
5. F1 fuse open
6. Display the 2 proper input holes location at each measuring range.
7. "Disconnect Power" displayed at Ohm, Buzzer, Capacitance, Diode and Temperature range ie please measure free from voltage only.

***DC/AC OR OHM/DIODE/CONTINUITYCAPACITANCE OR TEMPERATURE °C/°F SELECTING BUTTON:***

Push this button to select AC/DC Voltage measuring function when the function switch is set at "V" positions

Push this button to select AC/DC current measuring function when the function switch is set at uA, mA, 20A positions.

Push this button to select Ohm/diode/continuity /Capacitance measuring function when the function switch is set at Ohm/diode/continuity /Capacitance.

Push this button to select Temperature °C/°F measuring function switch is set at °C/°F position.

**HZ/%DUTY CYCLE :**

Push this button to select HZ/%duty cycle measuring function switch is set at HZ/% duty cycle position.

**RANGE CONTROL BUTTON:**

This is the manual range setting switch.

When power is first switched on, auto-ranging is automatically selected.

Whenever this switch is pressed, manual range setting is possible. Pressing the button once switches to the manual ranging mode and RANGE mark is displayed. Subsequent Button.

When the highest range is reached, the next press returns the instrument to its lowest range. To cancel manual range, hold the range hold switch in for more than 1 second and the RANGE mark disappears and the auto-ranging function is restored (Manual range except capacitance and frequency)

**DATA HOLD BUTTON:**

When this button is pushed, the display will show the last reading and "HOLD" symbol will appear until pushing it again.

Data holding will be canceled automatically when the function switch is rotated.

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### **RELATIVE ZERO BUTTON:**

For convenient readings comparison & offset

### **FUNCTION / POWER SWITCH:**

Switch for changing the measurement function and power on and off.

### **INPUT JACKS:**

This meter has four input jacks that are protected against overload to the limits except 20A. During use, connect the black test lead to the COM jack and the red test lead as shown below:

| Function         | Red lead Connection | Input limits           |
|------------------|---------------------|------------------------|
| DCV/ACV          | "+"                 | 1000V dc or 750ac rms. |
| $\Omega$         | "+"                 | 500V dc or ac rms      |
| CONTINUITY/DIODE | "+"                 | 500V dc or ac rms.     |
| CAP              | "+"                 | 500V dc or ac rms      |
| Hz/%             | "+"                 | 500V dc or ac rms.     |
| $\mu$ A/mA       | "+"                 | 400mA dc or ac rms.    |
| A                | "10A"               | 10A dc or ac rms.      |
| TEMP.            | Temp. jack          | 60V dc or 24 ac rms    |

### **MEASURING VOLTAGE**

1. Connect the black test lead to the (-) jack COM and red lead to the (+) jack (V).
2. Set the function at DCV / ACV range to be used and connect test leads connects test leads across the source or load under

measurement.

3. Read LCD display. The polarity of red connection will be indicated when making a DC measurement.

### MEASURING CURRENT

1. Connect the black test lead to the (-) jack COM and red lead to the (+) jack ( $\mu\text{A}$ , mA) for a maximum of 400mA. For a maximum of 10A, move the red lead to the (+) jack (A).
2. Set the function switch at  $\mu\text{A}$ , mA or A range to be used and push DC/AC button to select DCA or ACA measuring mode.
3. Connect test leads in series with the load in which the current is to be measured.
4. Read LCD display, The polarity of red lead connection will be indicated when making a DC measurement.

### MEASURING RESISTANCE

1. Connect the black test lead to the (-) jack COM and red lead to the (+) jack ( $\Omega$ ).
2. Set the function switch to  $\Omega$ .
3. Make sure all the power of the circuit to be measured is off.
4. Connect the test leads to the circuit to be measured. The range will change automatically, and will hold on the range that will display the measured resistance with the best resolution.
5. The value indicated on the display is the measured value of resistance with proper decimal point and annunciation indication.

## DIODE TEST

1. Connect the black test lead to the (-) jack COM and red lead to the (+) jack (Diode).
2. Set the function switch to diode/continuity (I))).
3. Make sure all the power is off.
4. To select diode test, touch the mode selection switch (diode/continuity) and the "diode" mark is indicated in the left side on the display. This is diode check mode.

When you touch the switch again, the mode changes to the continuity test mode.

5. Next, connect the test leads to the diode be tested. When measuring the forward voltage across diode a normal diode will indicate 0.4V to 0.7V and the reverse voltage will indicate "OL" (same as on open condition).

For a short-circuited diode, a value near 0 mV will be displayed.

## CONTINUITY CHECK

1. Connect the black test lead to the (-) jack COM and red lead to the (+) jack ( $\Omega$ ).
2. Set the function switch to diode/continuity.
3. To select continuity test, touch the mode selection switch (diode/buzzer) and the "I)))" mark is indicated in the left side on the display. This is continuity check mode. In the continuity mode, a buzzer sounds when the resistance of the circuit to be measured is less than approx. 30  $\Omega$ .

### MEASURING CAPACITANCE

1. Connect the black test lead to the (-) jack COM and red lead to the (+) jack (CAP).

(NOTE: The polarity of the lead connection is positive "+")

2. Connect test leads across the capacitor under measurement and be sure that the polarity of connection is observed.

#### NOTE:

1. When checking in-circuit capacitance, be sure that the circuit has all power removed and all capacitor are fully discharged
2. The range control mode in capacitance measurement is auto-ranging.

### MEASURING FREQUENCY

1. Connect the black test lead to the (-) jack COM and red lead to the (+) jack (Hz).
2. Set the function switch to "Hz/% duty" range.
3. Connect the test leads to the circuit to be measured. The range will change that will display the measured frequency with the best resolution.

When you push the "HZ/%" button, the mode changes to the duty cycle check mode.

### MEASURING DUTY CYCLE

1. Connect the black test lead to the (-) jack COM and red lead to the (+) jack (Hz).
2. Set the function switch to "Hz/% duty".
3. Push the "Hz/%" button changing the function to % duty cycle.
4. Connect the test leads to the circuit to be measured. The range will change that will display the measured duty cycle with the best resolution.

### MEASURING TEMPERATURE

1. Set the function switch to "TEMP °C/°F".
2. Connect sensor positive to the "uA mA" terminal and sensor negative to "COM" terminal
3. Connect K-Type test line to the sensor (positive to positive, negative to negative)
4. Test line to the test point being measured
5. Read the temperature value (°C or °F) on LCD

### RS-232 PC INTERFACE MEASUREMENTS

1. Connect the RS-232 wires to the meter's "RS-232" interface and PC "COM" port.
2. Presses the meter's RS232 button and the indicator "RS232" will be appear in the display.
3. PC will display the meter's measuring model.

**Note:** First of all please read the "README" file in the attached

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soft disk and then comply with it set the SET UP Program from soft disk up to your PC.

### **BATTERY AND FUSE REPLACEMENT**

If the sign "BAT" appears on the LCD display, it indicates that the battery should be replaced. Remove screws on the back cover and open the case. Replace the exhausted battery with new battery. ( Standard 9V battery NEDA 1604, IEC 6F22)

Fuse rarely need replacement and blow almost always as a result of the operator's error. Open the case as and replace the blown fuse with ratings specified.

#### **WARNING:**

Before attempting to open the case, be sure that test leads have been disconnected from measurement circuit to avoid electric shock hazard.

Replace fuse only with specified ratings:

Fuse: F1 500mA / 250V fast blow, F2 10A / 600V fast blow.

## **GENERAL POLYTRONIC SYSTEMS LTD.**

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