



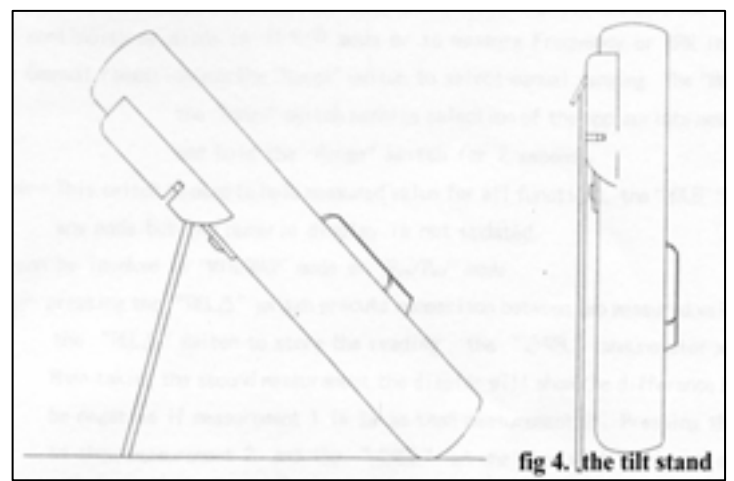
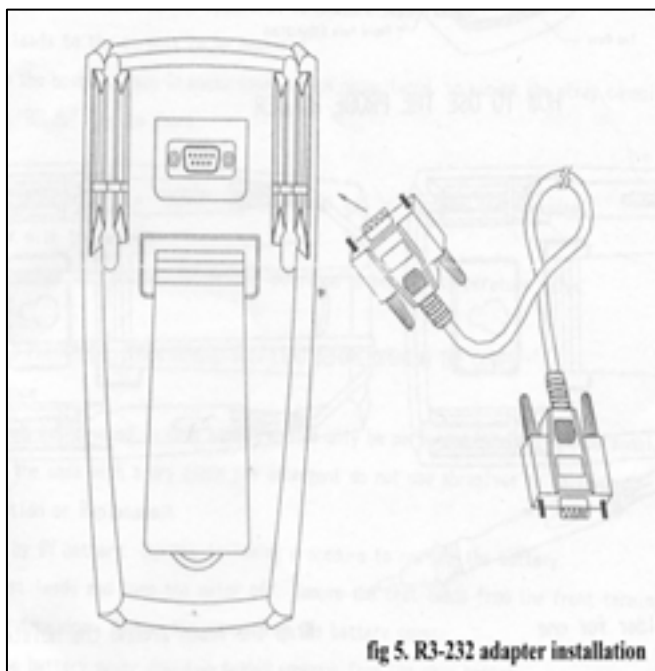
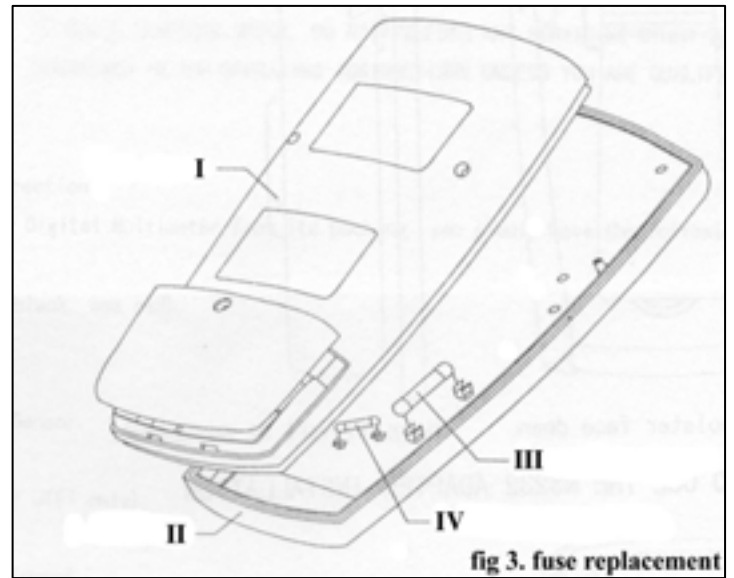
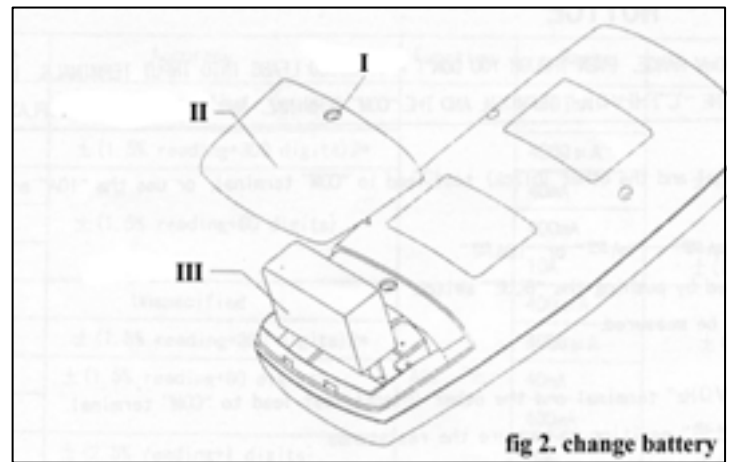
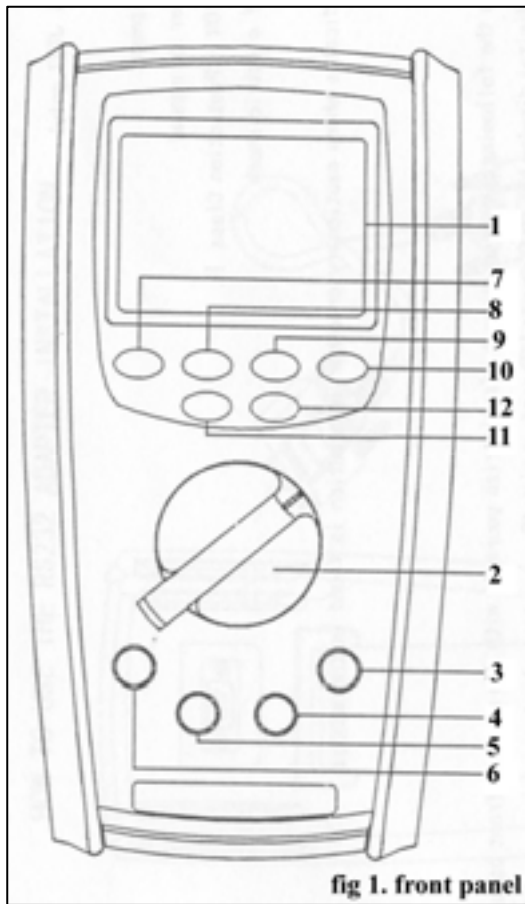
**PROFESSIONAL MULTITESTER WITH TRUE RMS  
MM103**

**PROFESSIONAL MULTITESTER  
MM106**

**PROFESSIONAL MULTITESTER WITH RS-232  
MM109**

Instruction Manual

## Figures



# GB

Congratulations to the purchase of this Quasar professional Multimeter with true RMS (MM103). Please read the manual thoroughly prior to using the unit.

## **WARNING**

To avoid possible electric shock or personal injury, follow these guidelines:

- Do not use the meter if it is damaged. Before you use the meter, inspect the case. Pay particular attention to the insulation surrounding the connectors
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before you use the meter.
- Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.
- Do not operate the meter around explosive gas, vapour, or dust.
- Do not apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.
- Before use, check the meter's operation by measuring a known voltage.
- When servicing the meter, use only specified replacement parts.
- Use with caution when working above 30V AC RMS, 42V peak, or 60V dc. Such voltages pose a shock hazard.
- When using the probes, keep your fingers behind the finger guards on the probes.
- Connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- Remove the test leads from the meter before you open the battery door.
- Do not operate the meter with the battery door or portions of the cover removed or loosened.
- To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator ("⚡") appears.

## **Introduction**

### Packaging

Contents of the packaging

- Multimeter
- Test leads (a red and a black one)
- Instruction manual
- Holster
- "K" type temperature sensor
- Sensor adaptor
- RS-232 Kit (only for MM109)

### Safety symbols



Important safety information. Refer to the manual.



DOUBLE INSULATION – Protection class II



DANGER –Electrical shock hazard

## Symbols used in the manual



Warnings or other information



Fuse



Battery

## Functions on the front panel

Please refer to fig. 1

- 1) Digital display – The 4000 pixel LCD has a 40 segment analogue bar graph, auto polarity indication, decimal point, "AC, DC" range, hold, apo, rel, max, min, pmax, pmin and a buzzer.
- 2) Range and function selector switch – Use this rotating button to select the required function and the appropriate range.
- 3) °C, °F, V, Ω, Hz input terminal – Positive terminal for voltage, resistance, capacity, frequency and temperature measurements.
- 4) COM input terminal - Negative input.
- 5) μA, mA input terminal - Positive input for current measurements (up to 400 mA).
- 6) 20A input terminal - Positive input for current measurements (up to 20 A).
- 7) Blue button – This button switches among the different types of measurements. Following positions are possible:
  - Voltage / current: To measure AC or DC voltage / current
  - Ω: To measure resistance, continuity or diodes
  - Hz / RPM: To measure frequency or RPM (rotations per minute)
- 8) The function of this button differs depending on the model. Please see below:
  - a) Range button (manual selection): Press the range button to set the manual range. 'MANU' will be displayed. Set the correct range via the range selector switch. (MM103 & MM106)
  - b) Hold button: This button allows to 'hold' the measured value of any function. The 'HOLD' and 'MANU' indicators are displayed. You can make conversions but the displayed value will not change. This function is used to measure MIN/MAX (MM109)
- 9) The function of this button differs depending on the model. Please see below:
  - a) RelΔ button: The RelΔ button allows you to compare two measurements. Once you have made the first measurement, press the RelΔ button. The 'RelΔ' indicator is displayed. The value will now disappear from the LCD. Once you have carried out the second measurement, the difference between measurement 1 and 2 is displayed. This value will be negative if the value of measurement 1 is higher than the value of measurement 2. If you press the RelΔ button once again, the value of the second measurement will be displayed. To leave the RelΔ function, keep the button pressed down for 2 seconds (MM106 & MM109)
  - b) Hold button: same instruction as in 8b. This function is used to measure MIN/MAX values. (MM103)
- 10) MIN/MAX button: This button is used to display the minimum or maximum value of a measurement. Press the button for 2 seconds to leave this function. If the function is activated, MAXMIN is displayed.
- 11) This button has a different function depending on the model. Please see below:
  - a) Range button (manual range selection): same instruction as 8a. (MM106)
  - b) RS232C button: Press this button to activate serial data transfer. The RS-232 indicator on the display will flash. (MM109)
  - c) RelΔ button: same function as 9a (MM103)
- 12) Light button: Press this button to switch the backlight on.

## Surrounding conditions

Maximum working height: ..... 2000 meter  
Installation class: ..... IEC 1010, 1000 V cat II, 600 V cat III  
Degree of pollution: .....2

## **Electrical specifications**

The precision (+/-x% + x digits) is measured at 23°C +/- 5°C with a relative humidity of <80%.

1)

DC Voltage			
Range	Resolution	Accuracy	Protection
400 mV	0.1 V	± 0.8% + 3 digits	1000 mV RMS
4 V	1 mV	± 0.8% + 1 digit	
40 V	10 mV		
400 V	100 mV		
1000 V	1 V	± 1% + 3 digits	

Input impedance: 10 MΩ

2a)

AC Voltage		MM103 + MM106	
Range	Resolution	Accuracy	Protection
400 mV	0.1 mV	± 2% + 8 digits <sup>1</sup>	1000 mV RMS
4 V	1 mV	± 1.3% + 5 digits <sup>2</sup>	
40 V	10 mV		
400 V	100 mV		
1000 V	1 V		

2b)

AC Voltage		MM109	
Range	Resolution	Accuracy	Protection
400 mV	0.1 mV	± 1.5% + 5 digits	1000 mV RMS
4 V	1 mV	± 1% + 5 digits	
40 V	10 mV		
400 V	100 mV		
1000 V	1 V		

Input impedance: 10 MΩ

1. Frequency range: 50 Hz – 60 Hz
2. Frequency range: 40 Hz – 1 kHz
3. Frequency range: 40 Hz – 400 Hz

ACc conversion type: AC conversion is ac-coupled via RMS response. Calibrated to the RMS value of the sinus wave input. The MM103 features a TRUE RMS function.

3)

DC Current			
Range	Resolution	Accuracy	Protection
400 $\mu$ A	100 nA	$\pm 1\% + 2$ digits	500 mA / 250 V
4000 $\mu$ A	1 $\mu$ A		
40 mA	10 $\mu$ A	$\pm 1.2\% + 3$ digits	
400 mA	100 $\mu$ A		
20 A	10 mA	$\pm 1.5\% + 5$ digits	10 A / 250 V

4)

AC Current			
Range	Resolution	Accuracy	Protection
400 $\mu$ A	100 nA	$\pm 1.5\% + 2$ digits	500 mA / 250 V
4000 $\mu$ A	1 $\mu$ A		
40 mA	10 $\mu$ A	$\pm 1.2\% + 3$ digits	
400 mA	100 $\mu$ A		
20 A	10 mA	$\pm 1.5\% + 5$ digits	10 A / 240 V

Frequency range: 40 Hz – 400 Hz (MM103 & MM106)

Frequency range: 40 Hz – 1 KHz (MM109)


AC conversion type: AC conversion is ac-coupled via RMS response. Calibrated to the RMS value of the sinus wave input. The MM103 features a TRUE RMS function.

5)

Resistance			
Range	Resolution	Accuracy	Protection
400 $\Omega$	0.1 $\Omega$	$\pm 1.2\% + 2$ digits	600 V RMS
4 k $\Omega$	1 $\Omega$	$\pm 1\% + 2$ digits	
40 k $\Omega$	10 $\Omega$		
400 k $\Omega$	100 $\Omega$		
4 M $\Omega$	1 k $\Omega$	$\pm 1.2\% + 2$ digits	
40 M $\Omega$	10 k $\Omega$	$\pm 1.5\% + 2$ digits	

Open circuit voltage:  $\pm -1.3$  V

6)

Diode and Continuity test				
Range	Resolution	Accuracy	Max. test current	Max. open circuit voltage
	1 mV	$\pm 1.5\% + 5$ digits	1.5 mA	3 V

For 0.4 V – 0.8 V

Overload protection: 600 V RMS max.

Continuity: A buzzer sounds if the resistance is less than 30  $\Omega$

7)

Frequency / RPM				
Range	Resolution	Sensitivity	Precision	Protection
4 kHz / 40 kRPM	1 Hz / 30 RPM	200 mV RMS	$\pm 0.1\% + 3$ digits	600 V RMS
40 kHz / 400 kRPM	10 Hz / 300 RPM			
400 kHz / 4 MRPM	100 Hz / 3 kRPM			
4 MHz / 40 MRPM	1 kHz / 30 kRPM	300 mV RMS		
40 MHz / 400 MRPM	10 kHz / 300 kRPM	1 V RMS		
400 MHz / 4000 MRPM	100 kHz / 3 MRPM			

8)

Capacity (capacitor)			
Range	Resolution	Accuracy	Protection
4 nF	1 pF	± 4% + 10 digits	600 V RMS
40 nF	10 pF	± 4% + 3 digits*	
400 nF	100 pF		
4 µF	1 nF		
40 µF	10 nF		
400 µF	100 nF		
4 mF*	1 µF	± 5% + 20 digits**	
40 mF*	10 µF		

\* The accuracy of the 4mF and 40 mF ranges might fluctuate.

\*\* Specification of the measurement: <half scale on the range.

9)

Temperature				
Range	Resolution		Accuracy	Protection
-40 °C ~ 1000 °C	1 °C	-40 °C ~ 0 °C	± 3% + 4 digits	600 mV RMS
		0 °C ~ 400 °C	± 1% + 3 digits	
		400 °C ~ 1000 °C	± 2% + 10 digits	
-40 °F ~ 1832 °F	1 °F	-40 °F ~ 32 °F	± 3% + 4 digits	
		32 °F ~ 752 °F	± 1% + 4 digits	
		752 °F ~ 1832 °F	± 2.5% + 4 digits	

10)

Peak hold					
Function	Range	Accuracy	Function	Range	Accuracy
DCV	400 mV	Unspecified	DCI	400 µA	± 3% + 60 digits
	4 V	± 1.5% + 300 digits*		4000 µA	
	40 V	± 1.5% + 60 digits		40 mA	
	400 V			400 mA	
	1000 V			20 A	
ACV	400 mV	Unspecified	ACI	400 µA	± 3% + 60 digits
	4 V	± 1.5% + 300 digits*		4000 µA	
	40 V	± 1.5% + 60 digits		40 mA	
	400 V	± 2.5% + 1 digit		400 mA	
	750 V			20 A	

Remarks:

1. Calibrated to 0 prior to the measurement.
2. \* The V range shows measurements that are above 10% of full scale of that range.
3. Ampere ranges are displayed at <90% of full scale.
4. There might be intervals in the sound generation.

#### 11) Auto Power Off (APO)

If APO is displayed, this function is activated. If the meter is not used for more than 30 minutes, it will switch off automatically. In this case, the position of the meter is stored. You can switch the meter on with any key except the backlight button and the range selector button. When it is switched on, the stored value will be displayed. Press the hold button to leave the hold mode. 15 seconds prior to switching off, the meter will make a periodical alarm sound. If you press a button before it switches off, the count down of 30 minutes will start again.

#### 12) Auto Power Off (APO) de-activation

To switch the APO function off you have to press down any button except the hold or the blue button while you switch the meter on.


#### 13) Installation of the RS-232 adaptor (MM109) (see fig. 5)

The meter features a communication function which helps the user to store the data easily. The RS-232 adaptor is supplied with a communication lead and a software CD.



- I) Switch the meter on and press the RS-232 button. The RS-232 symbol will be displayed.
- II) Connect one side of the lead to your multimeter and the other side to one of the com ports on your computer (COM1 or COM2). These ports have 9 pins.
- III) Start the software and download the required data to store or to process them.

## Operation

### Setup of the unit

- 1) Prior to using the multimeter, switch the unit on and let it reach temperature for 60 seconds.
- 2) Do not turn the selector switch while the test leads are still connected to a circuit or appliance.
- 3) If the multimeter is used near a noise making unit, it might become instable and show wrong readings.
- 4)  The admissible voltage to be measured for voltage and current measurements must not exceed 1000V for CAT II and 600V for CAT III.

### Voltage measurements

- 1) Connect the red test lead to the °C, °F, , V, Ω, Hz input terminal and the black lead to the COM terminal.
- 2) Turn the range selector switch to the  position.
- 3) The measurement of AC or DC voltage starts when you press the blue button.
- 4) Connect the leads to the circuit under test.

## **WARNING**

TO AVOID SHOCK HAZARD AND DAMAGE TO THE METER DO NOT CONNECT CIRCUITS WITH A VOLTAGE OF MORE THAN 1000V RMS TO THE METER.


## **ATTENTION!**

THERE MIGHT BE AN UNSTABLE READING IN THE 400mV RANGE. IN THIS CASE SHORT CIRCUIT THE C/F/H/OHM/Hz TERMINAL WITH THE COM TERMINAL UNTIL 0 IS DISPLAYED.


### Current measurements

- 1) Connect the red test lead to the  $\mu\text{A}/\text{mA}$  terminal and the black lead to the COM terminal.
- 2) Turn the selector switch to the  $\mu\text{A}$ , mA or the 20A position.
- 3) The measurement of AC or DC current starts when you press the blue button.
- 4) Connect the leads to the circuit under test.


### Resistance measurements

- 1) Connect the red test lead to the °C, °F, —■—, V, Ω, Hz input terminal and the black lead to the COM terminal.
- 2) Turn the selector switch to the Ω  position.
- 3) To ensure a proper reading make sure that the unit that you want to measure is voltage free.
- 4) Connect the leads to the circuit to be tested. For accurate readings at low resistances, store the first reading, short circuit the leads and calibrate the meter to 0. Measure the resistance again and calculate the average of the two readings.

### Continuity test with buzzer

- 1) Connect the red test lead to the °C, °F, —■—, V, Ω, Hz input terminal and the black lead to the COM terminal.
- 2) Turn the selector switch to the Ω  position.
- 3) Connect the leads to the circuit you wish to test. If the measured resistance is lower than 30 Ω, the buzzer will sound.

### Diode test

- 1) Connect the red test lead to the °C, °F, —■—, V, Ω, Hz input terminal and the black lead to the COM terminal.
- 2) Turn the selector switch to the Ω  position.
- 3) Connect a diode to the leads. A normal diode has a voltage between 0.4V and 0.9V. If the display shows "0.000" (short circuit) or "OL" (infinite), the diode is faulty.

### Hz / RPM measurements

- 1) Connect the red test lead to the °C, °F, —■—, V, Ω, Hz input terminal and the black lead to the COM terminal.
- 2) Turn the selector switch into the Hz / RPM position.
- 3) Connect the leads to the circuit to be tested.

### Capacity / capacitor measurements

- 1) Connect the red test lead to the °C, °F, —■—, V, Ω, Hz input terminal and the black lead to the COM terminal.
- 2) Turn the selector switch to the —■— position.
- 3) Connect the leads to the circuit to be tested.

### Temperature

- 1) Connect the '+' terminal of the adaptor to the °C, °F, —■—, V, Ω, Hz input terminal and the '-' terminal of the adaptor to the COM terminal.
- 2) Connect the sensor via the adaptor
- 3) Set the selector switch to the °C/°F position and measure the temperature.

## **Maintenance**

 WARNING: TO AVOID SHOCK HAZARD DISCONNECT THE METER FROM THE CIRCUIT.

### General maintenance

- 1) Repairs or maintenance which are not described in this manual must be carried out by a qualified technician
- 2) Clean the unit regularly with a dry cloth. Do not use solvents or detergents. The use of a normal household cleaner is allowed.

### Battery installation and replacement (fig. 2)

The meter is powered by a 9V battery. Follow the steps below to replace the battery.

- 1) Switch the meter off and disconnect the test leads.
- 2) Put the meter with the front side downside on a flat surface. Loosen the screw (I).
- 3) Remove the door of the battery compartment (II).
- 4) Disconnect the battery (III) carefully from the wires.
- 5) Take a new battery and connect it to the wires.
- 6) Put the battery cover back into place and fasten the screws. Make sure that no wire is squeezed between the cover and the case.

### Replacement of fuses (fig. 3)

- 1) Follow the first 3 steps in the chapter 'Battery replacement'.
- 2) Unscrew the 2 screws on the rear side (I) and remove them from the front panel (II).
- 3) Remove the blown fuse and replace it by a new fuse with the same specifications (III – Quick blow (10 A / 250 V), IV – Quick blow (500 mA / 250 V))
- 4) Place the rear cover on the front cover and fasten the screws. Make sure that no wire is squeezed.

### Use of the stand (fig. 4)

The stand can be fixed in various angles so that the unit can stand upright on a table.

## **Specifications**

- Power supply: ..... standard 9V battery  
Display: ..... LCD, max reading 4000, 40 segment bar graph  
Polarity indication: ..... automatic, with negative indication  
Overflow indication: ..... OL or-OL  
Battery voltage indication: ..... "⎓" for low battery voltage  
Sampling: ..... 2 times/sec for digits, 12 times/sec for bar graph  
Auto Off: ..... about 30 minutes  
Ambient conditions: ..... 0 °C – 30 °C (80% R.H.)  
..... 30 °C – 40 °C (< 75% R.H.)  
..... 40 °C – 50 °C (< 45% R.H.)  
Storage temperature: ..... -20 °C – 60 °C (< 80% R.H.) (without battery)  
Dimensions (lxwx d): ..... 190 x 95 x 40 mm (without holster)  
Dimensions (lxwx d): ..... 200 x 105 x 55 mm (incl. holster)
- Specifications and design subject to changes without prior notice.

*Do not attempt to make any repairs yourself. This would invalid your warranty.*

*Do not make any changes to the unit. This would also invalid your warranty.*

*The warranty is not applicable in case of accidents or damages caused by inappropriate use or disrespect of the warnings contained in this manual.*

*Quasar Electronics cannot be held responsible for personal injuries caused by a disrespect of the safety recommendations and warnings. This is also applicable to all damages in whatever form.*