

# MODEL DT9604 / TP9605 / Q1074A

## 6000 COUNT AUTO RANGING, SELF-CALIBRATING & DATA-LOGGING DIGITAL MULTIMETER


### OPERATION MANUAL

*This LCD Auto Range, Self-Calibration & Data-Logging digital multimeter provides portability, compactness and a 6000 COUNT display. It is ideally suited for fieldwork, lab, workshop, car and home applications.*

#### Safety Information

##### **Warning**

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

- Do not use the meter if it is damaged. Before you use the meter, inspect the case. Look for cracks or missing plastic. 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 the meter is used.
- The RESPONSIBLE BODY shall be made aware that if this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- 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, verify the meter's operation by measuring a known voltage.
- When measuring current, turn off circuit power before connecting the meter in the circuit. Remember to place the meter in series with the circuit.
- When servicing the meter, use only specified replacement parts.
- Use caution when working above 30VAC RMS, 42V peak or 60VDC. Such voltages pose a shock hazard that could be life-threatening.
- Do not allow any part of the body to touch any metal part of any test probe when measuring hazardous voltages.
- Avoid working alone. Someone should be nearby to render aid if necessary.
- Connect the common (earth or ground) test lead before connecting the live test lead. When disconnecting test leads, disconnect the live test lead first.
- Remove test leads from the meter before opening the battery cover.
- Do not operate the meter with the battery cover or portions of the cover removed or loose.
- 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.
- Use only a standard 9 volt battery (NEDA 1604, IEC 6F22 or equivalent), properly installed in the meter case, to power the meter.
- To avoid the potential for fire or electric shock, do not connect the thermocouple or temperature probe to electrically live circuits.

##### **Caution**

To avoid possible damage to the meter or to the equipment under test, follow these guidelines:

- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes or capacitance.
- Use the proper terminals, function, and range for all measurements.
- Before measuring current, check the meter's fuses and always turn the power OFF to the circuit before connecting the meter in the circuit.

## Safety Symbols

Symbols used on the meter and in this manual are explained as below:

### International Electrical and Relative Symbols

	AC (Alternating Current)		Important information
	DC (Direct Current)		Caution risk of electric shock
	European Safety Standard		Earth ground
	Double insulated		Low Battery Indicator
	The symbol indicating separate collection for electrical and electronic equipment.		Australian and New Zealand electrical safety approval RCM mark.

## 1. SPECIFICATIONS

### 1.1 GENERAL SPECIFICATIONS

- Display : 6000 Count LCD display, max. reading 6000 (frequency 9999).
- Range control : Auto range / Manual range control.
- Polarity : Automatic negative polarity indication.
- Zero adjustment : Automatic.
- Overrange indication : **OL** is displayed.
- Low battery : is displayed when the battery voltage is below 3V approx.
- Auto Power Off : 10 minutes after operating the switch, or any operation of the buttons, the meter automatically enters the power off mode. An audible warning is given after 9 minutes approx.
- Safety standards : **ETL EMC LVD**. The meter is up to the standards of IEC1010 Pollution Degree 2, Overvoltage Category III.
- Operating environment: Temperature 0°C to 40°C (32°F to 104°F), humidity < 80% RH.
- Storage environment: Temperature -20°C to 60°C (-4°F to 140°F), humidity < 90% RH.
- Power: Standard 9 volt battery (NEDA 1604 IEC, 6F22 or equivalent).
- Dimensions: 98(W) × 177(H) × 39(D) mm.
- Weight: Approx. 320g (including battery).

### 1.2 ELECTRICAL SPECIFICATIONS

Accuracy is  $\pm$  (% of reading + number in last digit) at 23 $\pm$ 5°C <75% RH.

#### DC Voltage

- 60mV, 600mV, 6V, 60V :  $\pm(0.2\% + 2)$
- 600V :  $\pm(0.3\% + 2)$
- Overload protection : 600V DC/AC RMS

#### AC Voltage (True RMS)

- 60mV, 600mV, 6V, 60V :  $\pm(1.0\% + 3)$
- 600V :  $\pm(1.5\% + 3)$
- Frequency response : 50Hz ~ 1kHz
- Overload protection : 600V DC/AC RMS

**Note: the input impedance for all DC/AC ranges is approx. 10M $\Omega$  except 60mV and 600mV ranges which are greater than 1000M $\Omega$ . On some low AC and DC voltage ranges, with the test leads not connected to a circuit, the display may show a random, changing reading. This is normal and is caused by the high-input impedance and the input sensitivity. The reading will stabilize when connected in a circuit.**

### DC Current

600 $\mu$ A, 6000 $\mu$ A, 60mA, 600mA :  $\pm(0.5\% + 3)$

6A, 10A :  $\pm(0.8\% + 5)$

10A for 15sec max. each 15min.

Overload protection: Fast fuse 0.8A/600V & Fast fuse 10A/600V.

Input voltage drop :  $\leq 0.3V$

**Note: Do not measure a current in a circuit with voltage more than 600V.**

### AC Current (True RMS)

600 $\mu$ A, 6000 $\mu$ A, 60mA, 600mA :  $\pm(1.5\% + 4)$

6A, 10A :  $\pm(2.0\% + 5)$

10A for 15sec max. each 15min.

Overload protection: Fast fuse 0.8A/600V & Fast fuse 10A/600V.

Input voltage drop :  $\leq 0.3V$

Frequency Response : 50Hz~1kHz

**Note: Do not measure a current in a circuit with voltage more than 600V.**

### Resistance

600 $\Omega$ , 6k $\Omega$ , 60k $\Omega$ , 600K $\Omega$ , 6M $\Omega$  :  $\pm(0.5\% + 2)$

60M $\Omega$  :  $\pm(1.0\% + 3)$

Overload protection : 250V DC/AC RMS.

### Capacitance

10nF, 100nF, 1 $\mu$ F, 10 $\mu$ F, 100 $\mu$ F, 1000 $\mu$ F, 40mF, 100mF:  $\pm(5\% + 10)$

Overload protection : 250V DC/AC RMS.

### Temperature

-50 $^{\circ}$  ~ 150 $^{\circ}$ C :  $\pm(3^{\circ}\text{C} + 1)$  (Using built-in temperature sensor)

-58 $^{\circ}$ F ~ 302 $^{\circ}$ F :  $\pm(5^{\circ}\text{F} + 2)$

150 $^{\circ}$ C ~ 700 $^{\circ}$ C :  $\pm 3\% \pm 1^{\circ}\text{C}$

302 $^{\circ}$ F ~ 1292 $^{\circ}$ F :  $\pm 3\% \pm 2^{\circ}\text{F}$

Overload protection : 250V DC/AC RMS

### Frequency

9.999Hz ~ 9.9999MHz :  $\pm(0.1\% + 5)$

Sensitivity :  $\leq 100\text{kHz}$ : 1.5V RMS;  $> 100\text{kHz}$ : 5V RMS

Overload protection : 250V DC/AC RMS

### Duty Cycle

0.1~99.9% :  $\pm(2\% + 5)$  @ frequency  $\leq 10\text{kHz}$

Overload Protection : 250V DC/AC RMS

### Diode Test

Test current :  $1 \pm 0.6\text{mA}$

Test voltage : Approx. 2.8V (suitable for LED testing)

Overload protection : 250V DC/AC RMS

### Continuity Test

Audible indication : less than 50 $\Omega$  Approx.

Overload protection : 250V DC/AC RMS

## 2. OPERATION

### WARNING

- 1) When measuring voltage ensure that the meter is not connected or switched to the resistance range. Always ensure that the correct meter terminals are used for the type of measurement being made.

- 2) Use extreme care when measuring voltages above 30VAC or 60VDC, especially from sources where high energy exists.
- 3) Avoid making connections to "live" circuits whenever possible.
- 4) When making current measurements ensure that the circuit is not "live" before breaking the circuit in order to connect the test leads.
- 5) Before making resistance measurements or testing diodes, ensure that the circuit under test is de-energized.
- 6) Always ensure that the correct function and range is selected. If in doubt about the correct range to use, start with the highest range and work down.
- 7) Extreme care should be taken when using the instrument to check a current transformer as an open-circuit on the secondary can cause dangerously high voltages.
- 8) Ensure that the test leads and probes are in good condition with no damage to the insulation.
- 9) Take care not to exceed the over-load limits as shown in the specifications.
- 10) Before opening the case of the instrument, either to replace the battery or fuse, disconnect the test leads from any external circuit and set the selector switch to the **OFF** position.

## 2.1 Function of the Push Buttons

### 1) **SELECT** (Sub-function or mode selection)

There are several functions for each rotary switch position, press the **SELECT** button to choose the function required. Selects AC or DC voltage or current measurement; Resistance, Diode, Continuity or Capacitance measurement; °C or °F temperature measurement.



### 2) **RANGE** (Range selection)

When a new selection is made, the meter automatically enters the auto ranging mode. To manually select a range, press the **RANGE** button. The Auto range indicator will turn off. Pressing the **RANGE** button will step through the available ranges. Pressing the **RANGE** button for more than 2 seconds returns the meter to Auto mode. This button does not affect the frequency, duty cycle, capacitance, diode, continuity and temperature measurements.

### 3) **REL/RS232** (Relative Measurement / RS232 enable)

Press this button momentarily to enter the relative measurement mode; the  $\Delta$  symbol appears on the display. The relative measurement displays the difference between the current measured value and a reference value. The reference value is set when the **REL/RS232** button is pressed. Press **REL/RS232** momentarily again to exit this mode and the  $\Delta$  symbol will disappear on the display. The relative mode only works in the voltage, current, capacitance and resistance test modes. The secondary function of the **REL/RS232** button is to enable or disable the RS232 or USB communications. Press the button for more than 2 seconds to enable the RS232 mode, "**RS232**" will appear on the display. Press again for more than 2 seconds to cancel the RS232 communications mode.

### 4) / (Data Hold / Backlight)

Press this button momentarily to enter the data hold mode and HOLD appears on the display. The current value is frozen on the display. Press the button again to exit the hold mode. The hold function works with all measurements. The secondary function of this button is to enable and disable the display backlight. Press the  /  button for more than 2 seconds to turn the backlight on. Press it again for more than 2 seconds will turn the backlight off.

### 5) **Hz/DUTY** (Frequency and Duty Cycle button)


Whilst in frequency (Hz), AC voltage or AC current modes press the **Hz/DUTY** button to switch to frequency (Hz) and duty cycle (%) test modes.

### 6) **MAX/MIN** (Maximum value / Minimum value)




Press this button to enter the Maximum (peak) and Minimum (sag) recording modes. The "**MAX**" or "**MIN**" symbol will appear on the display. The display will show the maximum

value or minimum value from the time when this mode is activated. Each time a new MAX/MIN value is set the beeper will sound. Press **MAX/MIN** for more than 2 seconds to exit this mode. This button has no effect in capacitance, temperature or frequency measurement modes.




## 2.2 Check the 9-volt battery

If the battery is low, a "  " symbol appears on the bottom-left of the display. Measurements may be inaccurate unless the battery is replaced.

## 2.3 DC/AC Voltage measurement




- 1) Connect the black test lead to **COM** socket and red test lead to the **V** socket.
- 2) Set the selector switch to **V**  or **mV**  position and press the **SELECT** button for DC or AC measuring mode. Note **mV**  is for measurements up to 600mV.
- 3) Connect the probes to two points in the circuit to measure the voltage difference.

## 2.4 DC/AC Current measurement

- 1) Connect the black test lead to **COM** socket and red test lead to the **µA/mA** socket for measurements to up 600mA.
- 2) Set the selector switch to **µA**  or **mA**  position and press the **SELECT** button for DC or AC current measuring mode.
- 3) For current measurements up to 10A, connect the red test lead to the **10A** socket. Set the selector switch to **A**  position and press the **SELECT** button for DC or AC current measuring mode.
- 4) Remove power from the circuit under test and then open the point in the circuit where you wish to measure current and connect the probes. Power up the circuit and read the value.








**Note: Do not measure current in a circuit with voltage more than 600V.**

## 2.5 Resistance measurement

- 1) Connect the black test lead to **COM** socket and red test leads to the **Ω** socket.
- 2) Set the selector switch to **Ω** /  /  /  position, and ensure that the ohm mode is selected.
- 3) Connect the probes across the circuit or part being tested.




**Caution: Ensure that the circuit being tested is "dead".**  
**Maximum input over-load: 250V RMS for <10sec.**

## 2.6 Diode and Continuity Test

- 1) Connect the black test lead to **COM** socket and red test leads to the   socket. Set the selector switch to **Ω** /  /  /  position and then press the **SELECT** button and select diode  or continuity  test mode.
- 3) Connect the black and red test probe to the cathode (-) and anode (+) ends of diode to be tested respectively.
- 4) Read the forward voltage drop (junction) on the display. If the reverse polarity is connected to the diode, display should show "OL" or over-load.
- 5) Press the **SELECT** button again for the continuity test. The beeper sounds when the measured resistance is less than 50Ω approx.

**Caution: Ensure that the circuit being tested is "dead".**  
**Maximum input over-load: 250V RMS for <10sec.**

## 2.7 Capacitance measurement

- 1) Before testing, discharge the capacitor by shorting its leads together. Use caution in handling capacitors because they may have a charge on them of considerable power before discharging.
- 2) Connect the black test lead to **COM** socket and red test leads to the **CAP** socket.
- 3) Set the selector switch to **Ω** /  /  /  position and press the **SELECT** button to select the capacitance measuring mode.

- 4) Press the **REL** button, to eliminate any zero error when measuring small values.
- 5) Connect the probes to the capacitor being tested.

Note: When testing large value capacitors, there will be approx. 30 sec time lag.

**Caution: Ensure that the circuit being tested is "dead".**  
**Maximum input over-load: 250V RMS for <10sec.**

## 2.8 Frequency measurement

- 1) Connect the black test lead to **COM** socket and red test lead to the **Hz** socket.
- 2) Set the selector switch to **Hz** position.
- 3) Connect the probes to the circuit being tested.

## 2.9 Temperature measurement

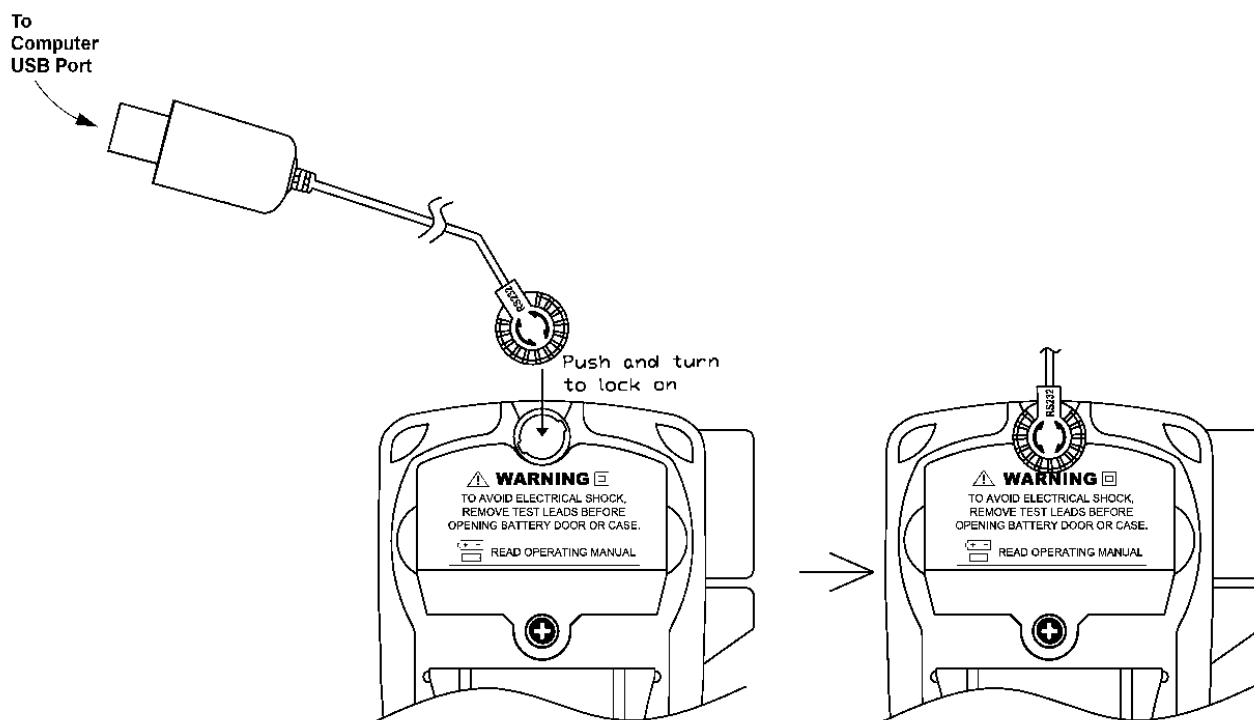
- 1) Set the selector switch to the **TEMP** position and connect the K type thermocouple probe to the **COM (-)** socket and **TEMP (+)** socket making sure to observe the correct polarity. Read the value on the display. The range of the thermocouple measurements is -50°C to +700°C or -58°F to 1292°F.
- 2) Press the **SELECT** button to switch between °C or °F.
- 3) Shorting the input terminals will display the ambient temperature using the internal sensor.

## 2.10 Auto Power Off ↻

When the meter has been turned on for around 10 minutes without any activity, the meter will automatically switch to the "OFF" mode. Warning beeps are given after 9 minutes. Operate the selector switch or press any button to restart the APO timer or to power it up again. Press the **SELECT** button for more than 2 seconds to turn off the APO function.

## 2.11 Using Communications

- 1) Connect the RS232 cable to the meter and plug it into a computer as shown below.
- 2) Turn on the meter and then press the **REL/RS232** button for more than 2 seconds to start the RS232 communications function. "**RS232**" will appear on the display. Pressing the button again for more than 2 seconds will cancel the communications function.
- 3) Install and launch the software and establish communications. Up to 3 times per second data can be displayed, plotted and inserted into a list on the PC screen.



**RS232/USB Communication**



### 3. CARE AND MAINTENANCE

#### 3.1 Caring for the Multimeter

The Q1074A is an example of superior design and craftsmanship. The following suggestions will help you care for the multimeter so you can enjoy it for years to come.

- 1) Keep the multimeter dry. If it gets wet, wipe it dry immediately. Liquids can contain minerals that can corrode metal parts.
- 2) Use and store the multimeter only in normal temperature environments. Temperature extremes can shorten the life of electronic components, damage batteries, and distort or melt plastic parts.
- 3) Handle the multimeter gently and carefully. Dropping it can damage the circuit board and/or case and can cause the multimeter to work improperly although the holster can provide some protection.
- 4) Keep the multimeter away from dust and dirt, which can cause premature wear of parts.
- 5) Wipe the multimeter with a damp cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the multimeter.
- 6) Use only fresh batteries of the required size and type. Always remove old or weak batteries. They can leak chemicals that corrode metal parts.

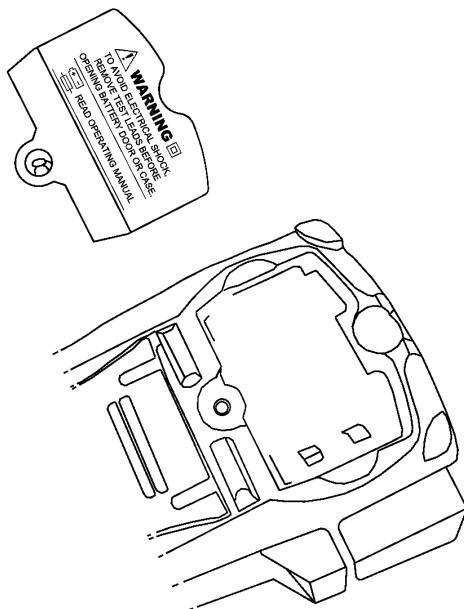
#### 3.2 Maintenance – 9 Volt battery replacement and fuse replacement



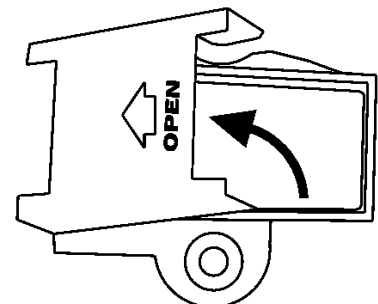
#### **WARNING**

**TO AVOID ELECTRIC SHOCK, REMOVE TEST LEADS BEFORE OPENING THE BATTERY COVER OR BACK OF THE CASE.**

- 1) Ensure the instrument is not connected to any external circuit. Set the selector switch to **OFF** position and remove the test leads from the terminals.
- 2) Remove the screw on the battery case and lift out the battery holder. Remove the spent battery and replace it with a battery of the same type, observing proper polarity.



Lift the lid on the battery holder

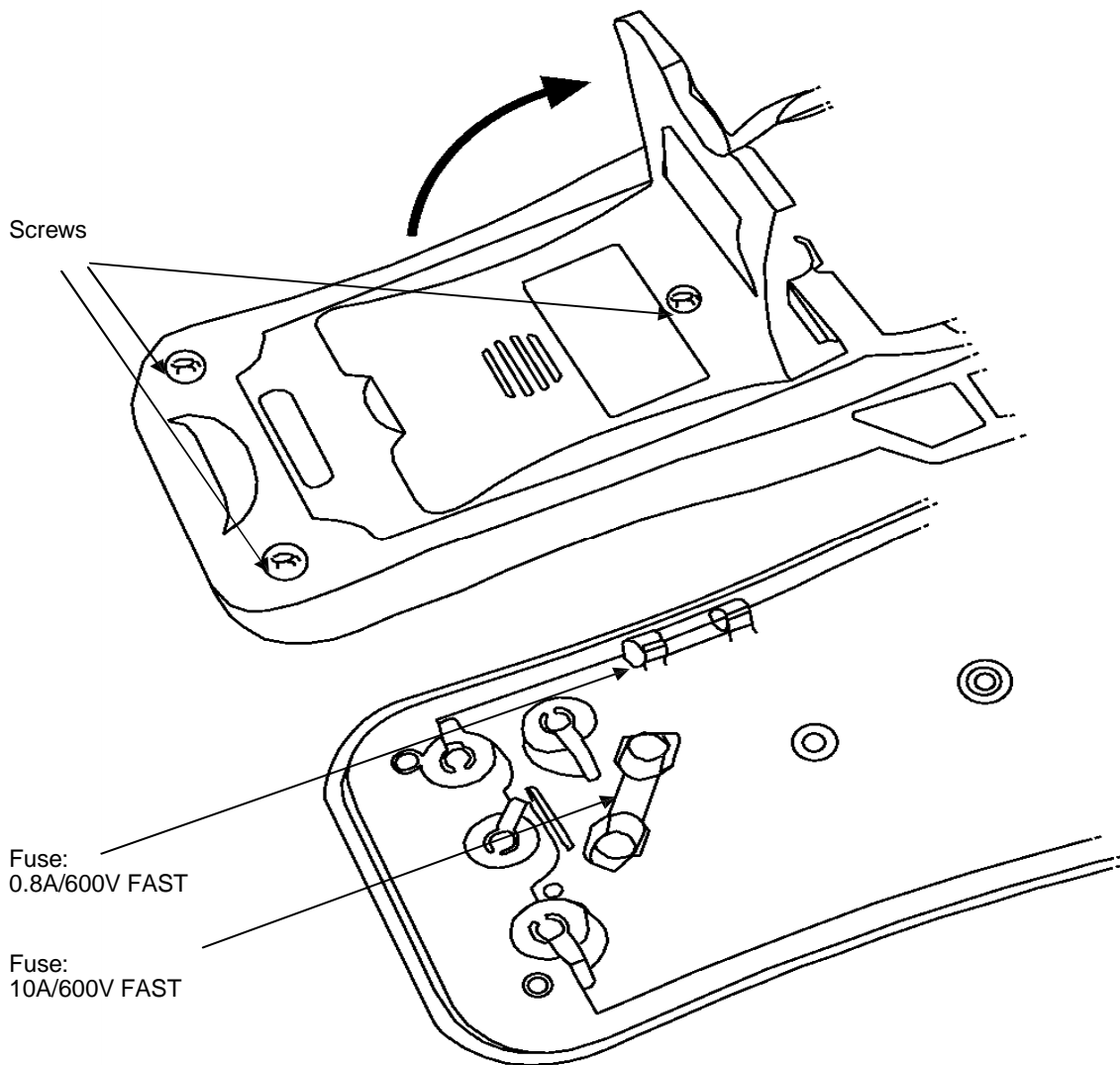


Battery: One standard 9 volt battery (NEDA 1604, IEC 6F22 or equivalent)

#### **Battery Replacement**

- 3) Do not dispose of the old battery in the household waste. Refer to your local authority for the proper disposal of used batteries.

- 4) Remove the screws on the bottom of the case and lift the case back. Replace only with the same type and rating of fuse **F2 0.8A/600V FAST** or **F1 10A/600V FAST**. Both are 3AB (6.3x32mm) ceramic fuses.



### Fuse Replacement

## 4. SELF CALIBRATION

### 4.1 Why use the Self-Calibration?

To minimize the effects of environmental changes and component change over time, self-calibration should be performed regularly. Self-calibration should be performed at least every 90 days or when the temperature changes by more than 5°C.

### 4.2 How to perform Self-Calibration

- 1) Rotate the selector switch to the  $\Omega / \rightarrow / \rightarrow / \rightarrow$  position. Ensure that the Ohm mode is selected.
- 2) Press the SELECT button for more than 5 seconds until CAL appears on the display.
- 3) The self-calibration process will complete within 35 seconds.
- 4) When finished, the meter automatically powers off.