Safety Information

This Meter complies with the standards IEC61010 safety measurement requirement: in pollution degree 2, overvoltage category (CAT. II 1000V, CAT.III 600V) and double insulation.

CAT.II: Local level, appliance, PORTABLE EQUIPMENT etc., with smaller transient overvoltages than CAT. III
CAT. III: Distribution level, fixed installation, with smaller transient overvoltage than CAT. IV

Use the Meter only as specified in this operating manual, otherwise the protection provided by the Meter may be impaired.

In this manual, a **Warning** identifies conditions and actions that may pose hazards to the user, or may damage the Meter or the equipment under test.

A **Note** identifies the information that user should pay attention to.

International electrical symbols used on the Meter and in this Operating Manual are explained on page 10.

Rules For Safe Operation

⚠ Warning

To avoid possible electric shock or personal injury, and to avoid possible damage to the Meter or to the equipment under test, adhere to the following rules:

- **Before using the Meter inspect the case. Do not use the Meter if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastic. Pay attention to the insulation around the connectors.**
- **Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads with identical model number or electrical specifications before using the Meter.**
- **Do not apply more than the 1000V rms between any terminal and grounding to avoid electric**

shock or damages to the Meter.

- The rotary switch should be placed in the right position and no any changeover of range shall be made during measurement is conducted to prevent damage of the Meter.
- When the Meter working at an effective voltage over 60V in DC or 42V rms in AC, special care should be taken for there is danger of electric shock.
- Use the proper terminals, function, and range for your measurements.
- Do not use or store the Meter in an environment of high temperature, humidity, explosive, inflammable and strong magnetic field. The performance of the Meter may deteriorate after dampened.
- When using the test leads, keep your fingers behind the finger guards.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes.
- Before measuring current, check the Meter's fuses and turn off power to the circuit before connecting the Meter to the circuit.
- Replace the battery as soon as the battery indicator appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.
- When servicing the Meter, use only the same model number or identical electrical specifications replacement parts.
- The internal circuit of the Meter shall not be altered at will to avoid damage of the Meter and any accident.
- Soft cloth and mild detergent should be used to clean the surface of the Meter when servicing. No abrasive and solvent should be used to prevent the surface of the Meter from corrosion, damage and accident.
- The Meter is suitable for indoor use.
- Turn the Meter off when it is not in us e and take out the battery when not using for a long time.
- Constantly check the battery as it may leak when it has been using for some time, replace the battery as soon as leaking appears. A leaking battery will damage the Meter.

l Under the influence of Radiated Radio-Frequency Electromagnetic Field phenomenon, the captioned model have a 20% measurement error, it will be back to normal when the interference is removed.

International Electrical Symbols

Symbols used on the Meter and in this manual are explained in Table1-2.

Table 1-2. International Electrical Symbols

⎓	AC or DC
⎓	DC Measurement
~	AC Measurement
•))	Continuity Test
⊣◁	Diode
⏚	Grounding
⧈	Double Insulated
⚠	Warning. Refer to the Operating Manual
▯	Deficiency of Built-In Battery
CE	Conforms to Standards of European Union

Chapter 2
Using the Testing Tool

Reading the Screen

The screen displays the menu that provides the following choices available:

Table 2-1. Reading the Screen

Display	Description
Contrast	The degree of contrast
Auto Off	Sleep mode time
BK Light	Display backlight
BEEP	Beeper on and off
ENTER	Confirm
▲	Increase
▼	Decrease
MOVE ▲	Waveform moves up
MOVE ▼	Waveform moves down
RANG▲	Increase a range

Table 2-1. Reading the Screen

Display	Description
RANG▼	Decrease a range
BASE ▲	Increase a time base
BASE ▼	Decrease a time base
BASE >	Waveform moves right
BASE <	Waveform moves left
TRIG ▲	Trigger moves up
TRIG ▼	Trigger moves down
SLOP	Trigger slope adjustment
AUTO	Auto trigger mode
NORM	Normal trigger mode
SHOT	Single trigger mode

The Meter Structure

The Figure 2-1 shows the Meter structure.

1. USB Terminals
2. LCD Display
3. Functional Buttons
4. Rotary Switch
5. Power adaptor Input Terminals
6. 10A Input Terminal
7. mAμA Input Terminals
8. COM Input Terminal
9. Other Input Terminals

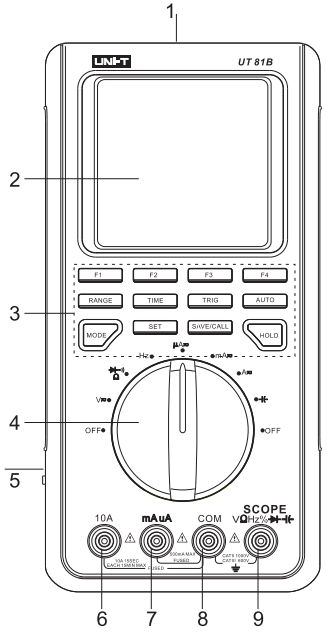

Figure 2-1. Meter Structure

Functional Buttons

The buttons activate features that augment the function selected with the rotary switch. The buttons are shown in Table 2-2.

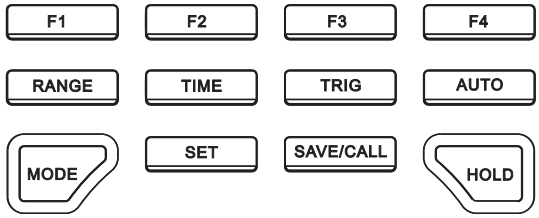

Figure 2-2. Functional Buttons

Table 2-2. Functional Buttons

Buttons	**Description**
F1, F2, F3 and F4	Software functional buttons, details please refer to the below.
Range	Under scope mode, Press **Range** button to switch between DC and AC measurement
Time	Under scope mode, press **Time** button to set the X-axis of time base.
Trig	Under scope mode, press **Trig** button to change the trigger mode.
Auto	In multimeter mode: Press **Auto** button to enter autoranging mode when measuring resistance, voltage and current. This button is invalid when measuring capacitance, diode, continuity buzzer and capacitance. In scope mode: Press **Auto** button to set the amplitude and time base to auto.

Table 2-2. Functional Buttons

Buttons	**Description**
Mode	To switch between waveform display (scope mode) and digital reading (multimeter mode). This button is only valid when under voltage, frequency, currents mode.
Set	Press **Set** button to set the auto power off, backlight, contrast and beep
Save/Call	Under scope mode, press **Save/Cal** to store and recall data.
Hold	Press **Hold** button to enter or exit hold mode.

Chapter 3
Making Measurement

Introduction
Chapter 3 explains how to make measurements.

You could turn the Meter off by turning to **OFF** position or set up the sleep mode from 1-30 minutes. Please must ensure the Meter is not under sleep mode if you turn the Meter on but without display.

To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator " " appears.

A. Scope Mode

- The LCD top right part display: RUN, HLD, REV
- The LCD top right corner has battery icon to indicate when the battery is lower than 5V.
- Under scope mode, both reading and waveform will be displayed.

i. Setting up Sleep Mode, Contrast, Beep

Based on the working environment to set up sleep mode, contrast, beep
Press **Set** button to set the auto power off, display backlight, contrast and beep

Auto off	**Bk Light**	**Contrast**	**Beep**
F1	F2	F3	F4

F1: Set auto power off time

Auto off	▲	**15**	▼	**ENTER**
F1	F2		F3	F4

The time level is from OFF, 1 to 30 minutes. Press F4 to confirm, save and return. Press functional button to exit and the setting remains unchanged.

F2: Set the Display Backlight

BK Light	▲	15	▼	ENTER
F1	F2		F3	F4

The brightness level from 0 to 31. Press F4 to confirm, save and return. Press functional buttons to exit, the setting is kept, but will not save. The setting will be lost after power off.

F3: Set the LCD contrast

Contrast	▲	15	▼	ENTER
F1	F2		F3	F4

The contrast level from 0 to 31. Press F4 to confirm, save and return. Press functional buttons to exit, the setting is kept, but will not save. The setting will be lost after power off.

F4: Set the beeps features, it can only be used under resistance, diode and continuity measurement.

Beep	ON	OFF	ENTER
F1	F2	F3	F4

F2 : to turn the beep on
F3 : to turn the beep off
F4 : to confirm , save and return

Press functional buttons to exit, the setting is kept, but will not save. The setting will be lost after power off.

ii. ACV, DCV, Hz, ACA and DCA range

Turn the rotary switch to ACV, DCV, Hz, ACA or DCA range, the Meter displays digital reading (Multimeter mode). Press Mode to switch to waveform display (scope mode) as below Figure 4. When entering scope mode, time base is auto trace, the amplitude is manual set, you may need to re-set them. You could set the trigger level as well if it is needed. Details of measurement operation of ACV, DC, Hz, ACA or DCA can be seen from B. Digital Multimeter Mode:

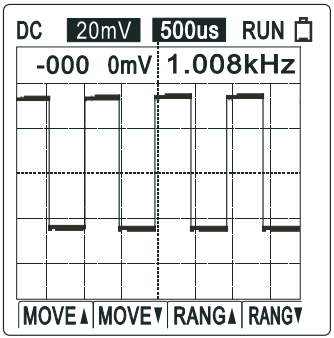

Figure 3-1. Waveform Display

- Press **Range** to switch between DC and AC measurement.
- When the frequency and amplitude of a waveform is unknown, press **Auto** :
  - When the amplitude is set to auto, the amplitude indicator will be shown white text in black background. When the amplitude is set to manual, the amplitude indicator will be shown black text in white background.
  - When the time base is set to auto, the time base indicator will be shown white text in black background. When the time base is set to manual trace, the time base indicator will be shown black text in white background.
  - When the time base is between 20ms - 100ns, it is possible to set the auto. When the time base is between 50ms - 5s, the auto feature will be in valid.

- Y-axis adjustment: Press **Range** button under scope mode, the corresponding functional button:

Move ▲	**Move** ▼	**Rang** ▲	**Rang** ▼
F1	F2	F3	F4

F1: move up the waveform
F2: move down the waveform
F3: go up range
F4: go down a range

The auto set feature will be off when changing the measurement mode

- Press **Time** button under scope mode, the corresponding functional button:

Base ▲	**Base** ▼	**Base <**	**Base >**
F1	F2	F3	F4

F1: increase the number of periods
F2: decrease the number of periods.
F3: trigger point move left
F4: trigger point right move

The auto set feature will be off when changing the measurement mode.

iii. Trigger function

Press **Trig** button under scope mode, the corresponding function buttons:

Trig ▲	**Trig** ▼	**Auto/Norm/Shot**	**Slop Rrise/Fall**
F1	F2	F3	F4

F1: move the trigger level up
F2: move the trigger level down
F3: select the trigger mode: auto, normal or single
F4: slope adjustment: rise or fall

iv. Waveform data save and recall

Press **Save/Call** button under scope mode, the corresponding functional buttons:

Save/Call	▲	**1**	▼	**Enter**
F1	F2	F3	F4	

F1: save or recall
F2 and F3: select location (location from 0-9, total 10 location)
F4: confirm

- When saving the data, it will overwrite the current data in the location no matter that location has data or not.
- If you recall the location has no data, the meter will appear error message, you need to press **HOLD** button to continue measurement,
- If you recall the location has data, it will save the current setting and display the data, the LCD top left shows **REV** to indicate recalling mode is on. Press **HOLD** button to return to working mode and continue measurement. You could continue recalling under recall mode or save the data.
- Recall mode can be used under any scope mode. For example, it is possible to recall the waveform or data saved from voltage or frequency mode when the meter is under current measurement mode.
- Recall mode can be worked under any waveform mode. For example: the Meter is at current mode but recalling the waveform or data which are saved under voltage or frequency mode. The Meter must

be returned to working mode to carry out measurement.

Remarks:

In order to have more accurate waveform, user can buy an optional BNC probe and scope probe to decrease signal attenuates. The scope probe directly connect to the BNC probe.

When measuring voltage and frequency signal, connect the BNC black probe to the COM input terminal and the red probe to the voltage terminal.

When measuring current signal, connect BNC black probe to the COM terminal and the red probe to mA terminal.

Don't connect the BNC probe to the 10A terminal.

B. Digital Multimeter Mode

i. Measuring Voltages

⚠ **Warning**

To avoid harms to you or damages to the Meter from electric shock, please do not attempt to measure voltages higher than DC 1000V, AC 750V, although readings may be obtained.

To measure voltages, set up the Meter as Figure 3-2 and do the following:

1. Insert the red test lead into the **V** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **V** ⎓ .
3. Connect test leads across with the object being measured.
4. The measured value shows on the display.
5. Press **MODE** button to toggle between Multimeter mode and Scope mode.
6. Press F1 to toggle between AC and DC voltage measurement.

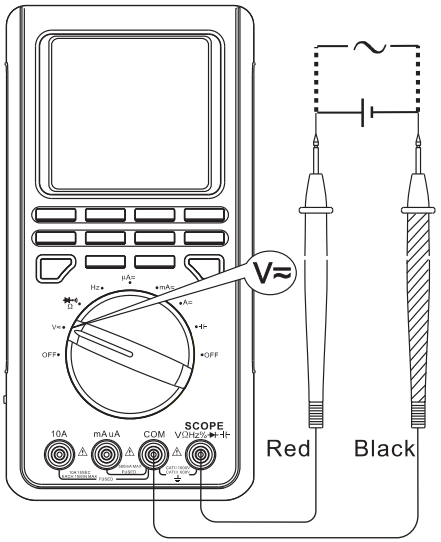

Figure 3-2. Voltages Measurement

When measuring voltage, the corresponding functional buttons

AC / DC	REL	Rang	▲	Rang	▼
F1	F2	F3		F4	

F1: toggle between AC or DC

F2: relative mode (REL will be displayed at the right bottom of the LCD when it is on)

F3: select a range up

F4: select a range down

Note:

- After changing the measurement mode, the autoranging will be off automatically and the AUTO will be disappeared at the bottom left of the LCD.
- When voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads away from the input terminals of the Meter.

II. Measuring Currents

⚠ Warning

If the fuse burns out during measurement, the Meter may be damaged or the operator himself may be hurt.

To avoid possible damage to the Meter or to the equipment under test, check the Meter's fuses before measuring current. Use proper terminals, function, and range for the measurement. Never place the testing leads in parallel with any circuit or component when the leads are plugged into the current terminals.

Turn off power to the circuit before test leads are connected in series to the return circuit to be tested.

- *μA Range Measurement*

  To measure ACμA or DCμA currents, set up the Meter as Figure 3-3 and proceed as follows:

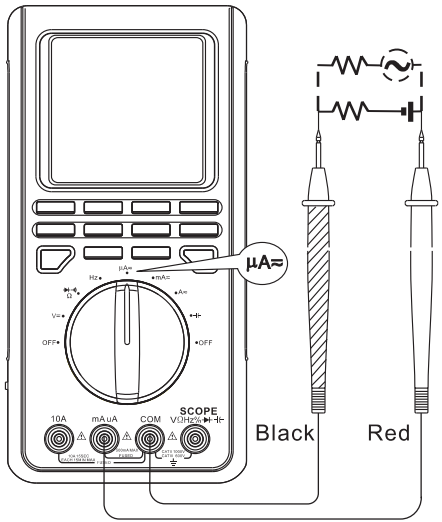

Figure 3-3. μA Range Measurement

1. Insert the red test lead into the μ**mA** terminal and black test lead into the **COM** terminal.
2. Set the rotary switch to μ**A≈**.
3. Connect the test lead in series with the return circuit to be tested.
4. The measured value shows on the display.
5. Press **MODE** button to toggle between Multimeter mode and Scope mode.
6. Press F1 to toggle between AC and DC current measurement.

- *mA Range Measurement*

  To measure ACmA or DcmA currents, set up the Meter as Figure 3-4 and proceed as follows:

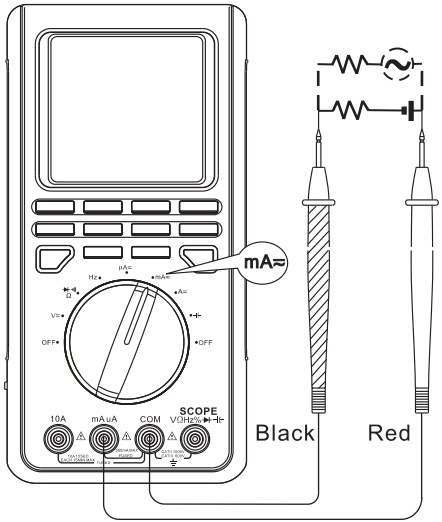

Figure 3-4. mA Range Measurement

1. Insert the red test lead into the μA**mA** terminal and black test lead into the **COM** terminal.
2. Set the rotary switch to **mA**≂.
3. Connect the test lead in series with the return circuit to be tested.
4. The measured value shows on the display.
5. Press **MODE** button to toggle between Multimeter mode and Scope mode.
6. Press F1 to toggle between AC and DC current measurement.

- *10A Range Measurement*

  To measure AC 10A or DC 10A currents, set up the Meter as Figure 3-5 and proceed as follows:

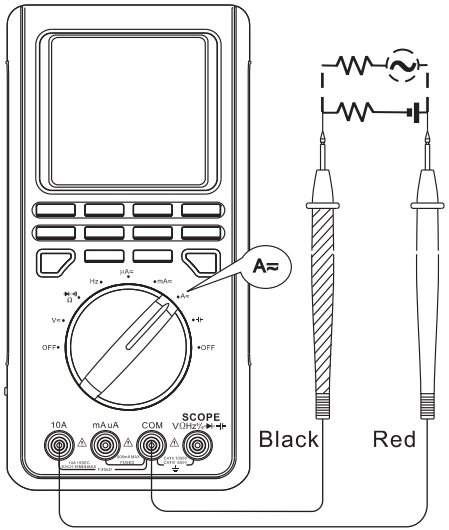

Figure 3-5. 10A Range Measurement

1. Insert the red test lead into the **10A** terminal and black test lead into the **COM** terminal.
2. Set the rotary switch to **A≈**.
3. Connect the test lead in series with the return circuit to be tested.
4. The measured value shows on the display.
5. Press **MODE** button to toggle between Multimeter mode and Scope mode.
6. Press F1 to toggle between AC and DC current measurement.

When measuring current, the corresponding functional buttons:

AC / DC	REL	Rang ▲	Rang ▼
F1	F2	F3	F4

F1: toggle between AC or DC
F2: relative mode (REL will be displayed at the right bottom of the LCD when it is on)
F3: select a range up
F4: select a range down

Note

- After changing the measurement mode, the autoranging will be off automatically and the AUTO will be disappeared at the bottom left of the LCD.
- If the value to be measured is unknown, use the maximum measurement position and reduce the range step by step until a satisfactory reading is obtained.
- When the measured current is ≤5A, continuous measurement is allowed.
- When the measured current is between 5A-10A, continuous measurement ≤10 seconds and interval more than 15 minutes.
- When current measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads away from the input terminals of the Meter.

iii. Measuring Resistance

⚠ Warning

To avoid possible damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance.

To measure resistance, set up the Meter as shown in Figure 3-6 and follow the following procedure:

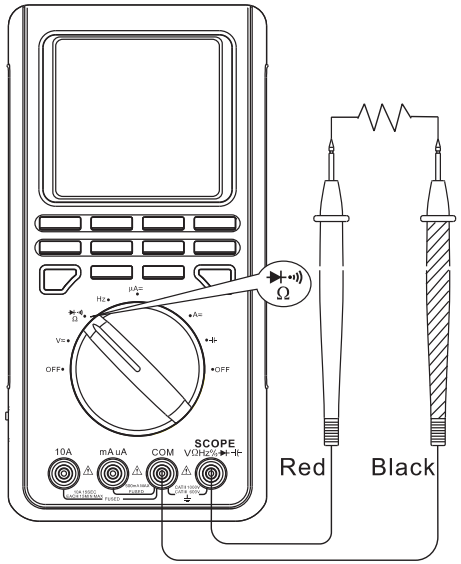

Figure 3-6. Resistance Measurement

1. Insert the red test lead into the Ω terminal and the black test lead into the COM terminal.
2. Set the rotary switch to Ω
3. Connect the test leads across with the object being measured.
4. The measured value shows on the display.

When measuring resistance, the corresponding functional buttons:

RES	REL	Rang ▲	Rang ▼
F1	F2	F3	F4

F1: toggle to diode mode
F2: relative mode
F3: select to a range up
F4: select to a range down

Note

- When measuring low resistance, the test leads can add 0.1Ω to 0.2Ω of error to resistance measurement. To test the leads, touch the probe tips together and read the resistance of the leads. Take the reading obtained to subtract the resistance of the leads to get the final reading.
- For high-resistance measurement (>1MΩ) or low resistance measurement (<40Ω), it is normal taking several seconds to obtain a stable reading.
- The LCD displays “OL” indicating open-circuit without input.
- When resistance measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads away from the input terminals.