SEW

7016 IN

Digital Variable High Voltage Insulation Tester

INSTRUCTION MANUAL

Index Page

1. Safety Precautions..... 1-2
2. Overview..... 2
3. Features..... 3
4. Specifications..... 4
5. Connections..... 5
6. Instrument layout..... 6
7. Measuring procedure..... 7-15
8. Charge..... 16
9. Maintenance & repair..... 17
10. Interface connection and operation..... 18-29

1. Safety Precautions

Electricity can cause severe injuries even with low voltages or currents.

Therefore it is extremely important that you read the following information before using your high voltage insulation tester.

a. This Instrument must only be used and operated by a competent trained person and in strict accordance with the instructions. we will not accept liability for any damage or injury caused by misuse or non compliance with instructions and safety procedures.

b. This instrument must not be used on live circuits. Ensure all circuits are de-energised before testing. see paragraph for details of built-in warning features should your high voltage insulation tester be connected to a live system.

c. Always inspect your high voltage insulation tester and test leads before use for any sign of abnormality or damage. If any abnormal conditions exist (broken test leads, cracked case, display faulty etc...) do not attempt to take any measurement or use the tester. Return your high voltage insulation tester to your nearest distributor for service.

d. Your high voltage insulation tester has been designed with your safety in mind. However, no design can completely protect against incorrect use. Electrical circuits can be dangerous and / or lethal when a lack of caution or poor safety practice is used.

e. Pay attention to cautions and warnings which will inform you of potentially dangerous procedures.

f. Your high voltage insulation tester has a live circuit warning beeper. If it is connected to a live circuit, a rapid pulsating bleep will be heard. DO NOT proceed to test and immediately disconnect the instrument from the circuit. In addition your tester will display the warning message.

g. Rated environmental conditions :
   (1) Indoor use.
   (2) Installation Category Ⅳ.
   (3) Pollution Degree 2.
   (4) Altitude up to 2000 meters.
   (5) Relative humidity 80% max.
   (6) Ambient temperature 0ºC~40ºC.

h. Observe the international Electrical Symbols listed below :

Meter is protected throughout by double insulation or reinforced insulation.

Warning ! Risk of electric shock.

Caution ! Refer to this manual before using the meter.

Earth

2. Overview

This is a variable high voltage insulation tester from 500V to 15kV in 500V steps.

The is menu driven and uses Dynamic Current Auto ranging technology.

When pressing the on/off button, the top line of the display shows current year, month, date, hour and minutes indication. The bottom line of the display shows Insulation Meter.

When doing the test, the top line of the display shows Ω reading and the time duration.

The bottom line of the display shows output voltage and current.

This instrument displays a voltage warning and sounds when AC or DC is present before injecting the test voltage.

3. Features

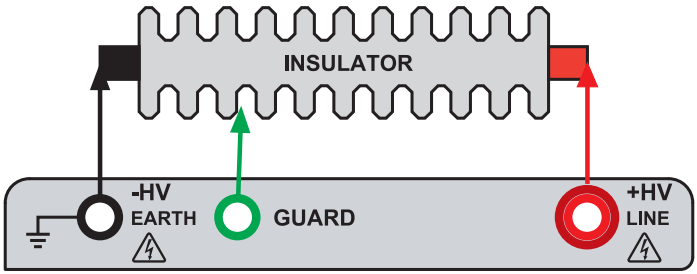
- Microprocessor controlled.
- 2 Lines x 16 characters, large intelligent LCD module.
- 30 insulation test voltages :

  500V, 1kV, 1.5kV, 2kV, 2.5kV, 3kV,
  3.5kV, 4kV, 4.5kV, 5kV, 5.5kV, 6kV,
  6.5kV, 7kV, 7.5kV, 8kV, 8.5kV, 9kV,
  9.5kV, 10kV, 10.5kV, 11kV, 11.5kV, 12kV,
  12.5kV, 13kV, 13.5kV, 14kV, 14.5kV, 15kV
- AC/DC Voltmeter.
- PI (Polarization Index) indication.
- DAR (Dielectric Absorption ratio) indication.
- Auto-ranging on all insulation ranges.
- Current measurement.
- Backlight function.
- Menu driven.
- Visual and audible warning if external voltage is present. (≥30Vac or ≥30Vdc)
- Short-circuit current up to 5mA
- Auto-hold function to freeze the reading.
- Overload protection.
- Adjustment for testing time (duration) : 1~30 minutes.
- Calendar.
- Indication memory for data storage.
- Optical USB to RS-232 data transmission.
- Auto-off.
- 200 measurement results can be saved in the memory and recalled on the display.

4. Specifications

Test Voltage	From 500Vdc to 15kVdc Adjustable in 500V steps	
Preset buttons	1kV, 5kV, 10kV, 15kV	
Measuring ranges	1TΩ / 0.5kV 1TΩ at 0.5kV~30TΩ at 15kV	
Accuracy	1kV : 0~200GΩ 5kV : 0~1TΩ 10kV : 0~2TΩ 15kV : 0~3TΩ	±(5%rdg+5dgt)
	1kV : 200GΩ~2TΩ 5kV : 1TΩ~10TΩ 10kV : 2TΩ~20TΩ 15kV : 3TΩ~30TΩ	±20%
Resolution	1GΩ : 0.001GΩ 10GΩ : 0.01GΩ 100GΩ : 0.1GΩ 1TΩ : 1GΩ 10TΩ : 10GΩ 30TΩ : 100GΩ	
Short circuit current	up to 5mA	
Current measurement	0.5nA~0.55mA (Depending on the insulation resistance)	
PI (Polarization Index)	√	
DAR (Dielectric Absorption Ratio)	√	
Voltmeter	ACV : 30~600V (50/60Hz) DCV : 30~600V Accuracy : ±(2.0%rdg+3dgt) Resolution : 1V	
Power source	Rechargeable battery	
AC Adapter	Input : 100-240Vac ,0.4A ,50-60Hz Output : 24Vdc 0.62A	
Dimensions	430(L) x 324(W) x 127(D)mm	
Weight	Approx : 6.56kg	

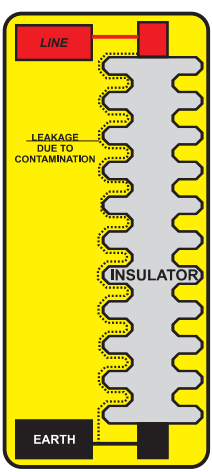
5. Connections



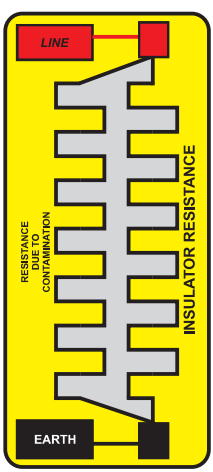
FIRST MEASUREMENT

MEASURE WITHOUT THE GUARD TO TAKE EVERYTHING INTO ACCOUNT AND FIND OUT IF NEED CLEANING.

DIRTY INSULATOR



ELECTRICAL EQUIVALENT CIRCUIT DIRTY INSULATOR

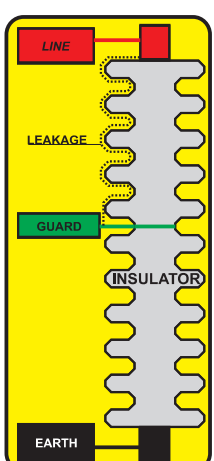


RESISTANCE DUE TO CONTAMINATION CAN BE VERY LOW AND LOWER THE TOTAL RESISTANCE.
CLEANING PERIODICALLY CAN ALSO REDUCE SYSTEM POWER CONSUMPTION.

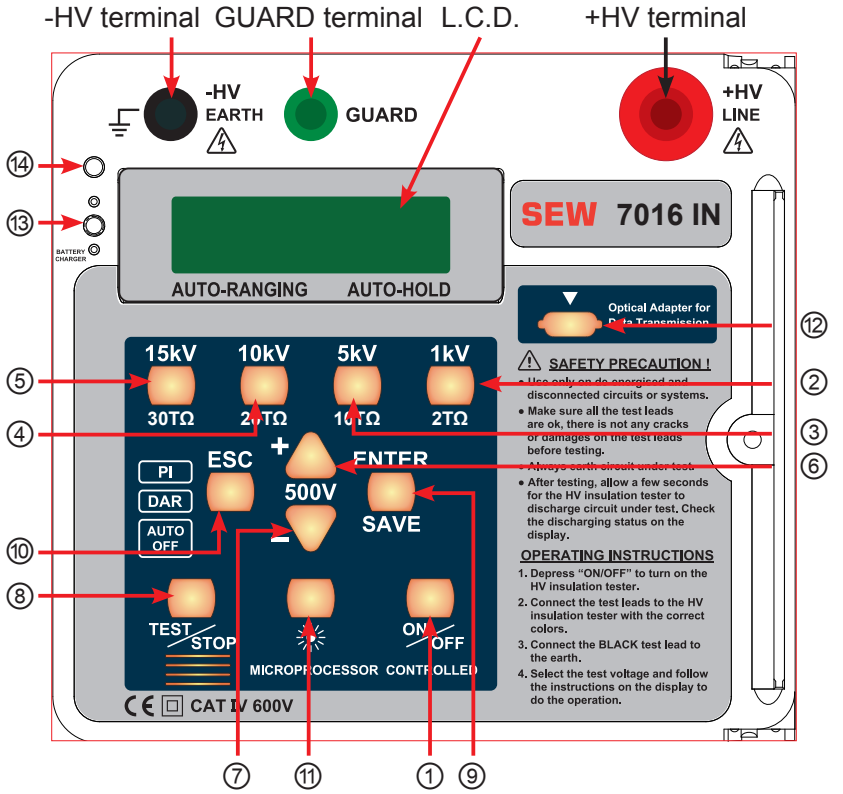
SECOND MEASUREMENT

MEASURE WITH THE GUARD TO ENSURE INSULATOR IS CORRECT.

TYPICAL TEST



6. Instrument layout



① Power ON/OFF button
② Insulation resistance test at 1kV button
③ Insulation resistance test at 5kV button
④ Insulation resistance test at 10kV button
⑤ Insulation resistance test at 15kV button
⑥ To add (+500V) button to the selected test voltage
⑦ To subtract (-500V) button to the selected test voltage
⑧ TEST/STOP button
⑨ ENTER & SAVE button
⑩ ESC button
⑪ BACKLIT button
⑫ Connection socket for data transmission
⑬ Battery-charge socket
⑭ Charge indicator

7. Measuring procedure

This tester provide one main and five minor functions:
Main Function: insulation resistance test.
Minor functions:
Function 1 ─ Voltage meter
Function 2 ─ RTC Adjustment
Function 3 ─ Test Timer
Function 4 ─ LOG Display
Function 5 ─ LOG Clear

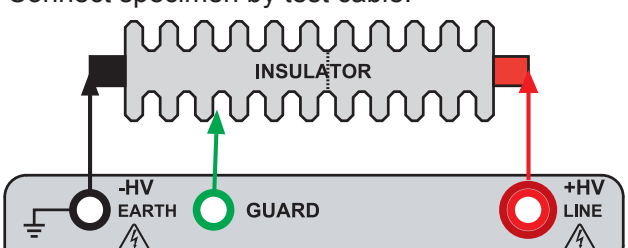
(A) Insulation resistance measurement test (main function)

⚠ Note:

1. Before test performed, be sure that no voltage is made on the specimen. If voltage exists therein, remove the power supplied.
2. To secure operator's safety, check if there is any damage on the tester or test cable.
3. During the test, do not touch the metal on the specimen surface or test cable.
4. Wear insulation gloves and rubber shoes while operating this high-voltage measuring instrument.

(a) Checks before test is performed:
Press the power switch and check if power supply is sufficient? If insufficient, "Low Battery" will be displayed on the LCD display. Charge the battery before making measurement.

(b) Measuring procedure:
1. Connect specimen by test cable.



2. Press ① (ON/OFF) button.

(Main page)

3. Select test voltage:
   (1) Select one from 1kV, 5kV, 10kV or 15kV, press (② , ③, ④ or ⑤) respectively.
   (2) To select voltage other than the four indicated, press anyone among ②, ③, ④, ⑤ , then, press ⑥ (volt-add) or ⑦ (volt-reduce) till the required voltage is reached.
4. Be sure that the cable connecting the specimen and Tester is correct. Then, press ⑧ (TEST/STOP); LCD displays as below:

5. Then, press ⑧ (TEST/STOP).

⚠ Note:

a. During test process, if there is a exterior voltage (above AC30V or DC30V) exerted, beeper activates in response; and LCD displays the warning picture as shown in below:

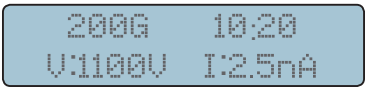
Now, test cannot be performed. To go on the test it should remove the exterior voltage.

b. While test is running, beeper activates to remind operator that test is underway.

c. After the set test time is due (see Function 3: the test time setting), test stops and system will automatically lock down the test value.

d. To read the test value on the LCD display, press the ⑪ BACKLIT button(☀).

6. Read the test value from LCD display.



7. Press ⑧ (TEST/ STOP); LCD shows the “discharging”.

8. To store the data, press ⑨ (ENTER/SAVE); LCD displays the picture shown in below.

⚠ Note:

When do the insulation test, always connect the test leads to the object we want to measure before pressing the TEST button.

Do not press the TEST button in advance.

(B) Measure voltage (Voltage Meter) ─ Function 1

1. Press ① (ON/OFF) button.

(Main page)

2. Press ⑥ value-add “+” or ⑦ value-reduce “-”; LCD displays the picture shown in below:

3. Press ⑨(ENTER/SAVE) to perform measurement; LCD displays the picture shown in below:

4. Read the data measured from LCD display.
5. Press ⑩ (ESC) to return back to the former screen.
6. Then, press ⑩ (ESC) to return back to the main page.

⚠Note: SAVE cannot be applied during voltage measurement process.

(C) Date/time adjustment (RTC Adjustment) ─ Function 2

1. Press ① (ON/OFF) button.

(Main page)

2. Press ⑥ (value-add) "+" for 2 times; LCD display the following pictures respectively:

3. Press ⑨ (ENTER/SAVE) button.
4. Press ⑥ (value-add) "+" or ⑦ (value-reduce) "-" till the correct voltage is reached. Press ⑧ (TEST/STOP) to switch to next time unit and go on the required adjustment.
5. After all adjustments are complete, press ⑨ (ENTER/SAVE) to confirm and save the data measured.

⚠ Note: if time unit (year, month, day, hour, minute or second) needs not to be adjusted, press ⑧ (TEST/STOP) to skip it.

6. Press ⑩ (ESC) to return back to the main page.

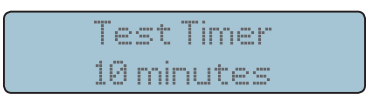
(D) Measurement time setting (Test Timer) ─ Function 3

1. Press ① (ON/OFF) button.

(Main page)

2. Press ⑥ (value-add) "+" for 3 times; LCD display the following pictures respectively:

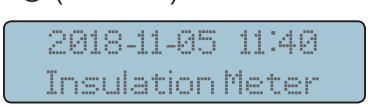
3. Press⑨ (ENTER/SAVE), LCD displays the picture shown in below:



4. Press ⑥ value-add“+” or ⑦ value-reduce “-” to set the test time.
5. After setting is complete, press ⑨ (ENTER/SAVE) to confirm & save the data measured.
6. Press ⑩ (ESC) to return back to the main page.

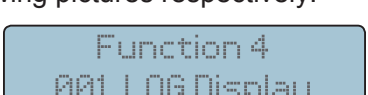
(E) Display the data stored (LOG Display) ─ Function 4

1. Press ① (ON/OFF) button.



(Main page)

2. Press ⑥(value-add) "+" for 4 times; LCD display the following pictures respectively:



3. Press ⑨ (ENTER/SAVE), LCD displays the picture shown in below:

4. Press ⑨ (ENTER/SAVE), LCD displays the “DAR” and “PI” picture shown in below:

5. Press ⑨ (ENTER/SAVE), LCD displays the “Volt” picture shown in below:

6. Press ⑨ (ENTER/SAVE), LCD displays the “Date” and “Time” picture shown in below:

7. Press ⑥ value-add”+” or ⑦ value-add”-” to find LOGS which has been saved.
8. Press ⑥ value-add“+” or ⑦ value-reduce “-” to select the required data value. If no data available, LCD displays the picture shown in below:

9. Press ⑨ (ENTER/SAVE) to query the subpage of data.
10. After the query is over, press ⑩ (ESC) twice to go back the main page.

(F) Clear/erase the display of data stored (LOG Clear) ─ Function 5

1. Press ① (ON/OFF) button.

(Main page)

2. Press ⑥(value-add) "+" for 5 times; LCD display the following pictures respectively:

3. Press ⑨ (ENTER/SAVE) to inquire whether to clear up the data or not; LCD displays the picture shown in below:

Erase ─ press ⑨ (ENTER/SAVE). LCD displays the picture shown in below:

Not erase ─ press ⑩ (ESC) to go back to the main page.

(G) Introduction of other functions

1. Dielectric absorption ratio (DAR):
   Ratio of insulation resistance between 1-min and 30-sec

$$\text{DAR} : \frac{\text{1-min insulation resistance}}{\text{30-sec insulation resistance}}$$

2. Polarization index (PI):
   Ratio of insulation resistance between 10-min and 1-min

$$\text{PI} : \frac{\text{10-min insulation resistance}}{\text{1-min insulation resistance}}$$

Lower insulation resistance tested takes longer test time, which would deteriorate the specimen. Thus, higher DAR or PI (as close to 1) would create better insulation grade of specimen.

⚠ Operation:

During the test run, wait for one minute, DAR will be displayed automatically; wait for 10 minutes, PI will be displayed automatically.

3. AUTO OFF:
   System will shutdown automatically after 3 minutes without operation.

8. Charge

(A) Timing:

After "Low Battery" is displayed on LCD display, perform battery charge; LCD displays the picture shown in below:

(B) Process:

1. Plug one end of charger into the battery plug-in socket (Fig ⑬); and the other end into the ACV power socket.
2. If ACV plug socket is energized, the charge indicator (Fig ⑭) is lit on indicating that charge is underway.

   If the ACV plug socket isn't energized, remove to another power-energized one making power charge.
3. After the voltage reaches 16.5V, charge process is complete. (It can be observed on LCD display.)

⚠ No measurement can be performed during the charging process.

9. Maintenance & repair

(A) To avoid and electric-shock or device damage, do not wet inner part of the tester.

(B) Avoid the tester from being dropped down that would damage or disconnect devices apart.

(C) Wipe the tester surface with soft, dry cloth and mild detergent. Prohibit from using sand paper or solvent.

⚠ Note:

1. This tester is HV operated; user should not open the outer casing. If any damage occurs, take the tester back to manufacturer for repair.

⚠ REMEMBER TO CHARGE THE BATTERY!

ALWAYS recharge the battery when the Low Battery info appears on the display. Leaving the battery uncharged for a long period of time may affect the lifespan of the battery.

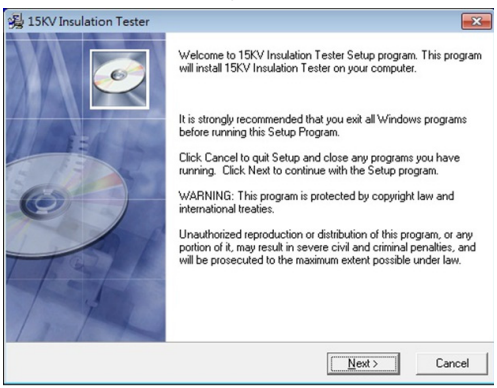
Charging interval: Every 3 months

10. Interface connection and operation

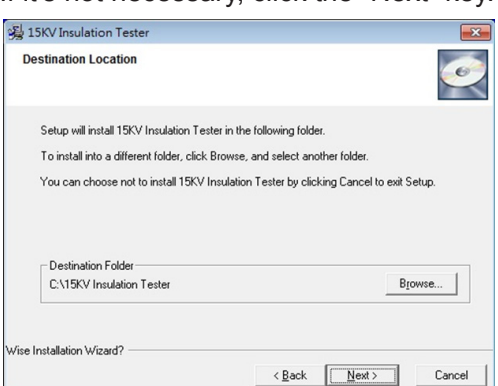
(A) Insulation Tester Installation Steps:

1. This program will install Insulation Tester on your computer automatically.

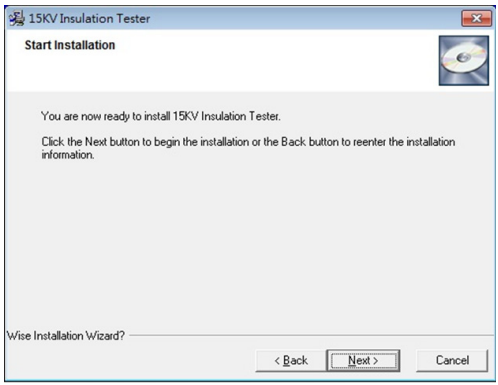
2. Click the “Next” key to set.



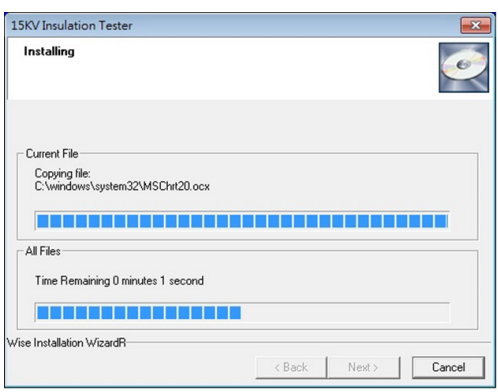
3. If you want to install a different folder, click Browse, and select another folder.
   If it’s not necessary, click the “Next” key.



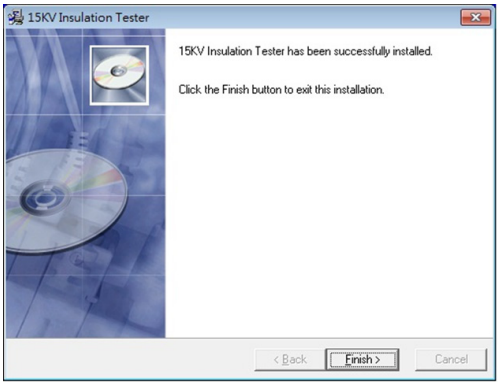
4. Click the “Next” key.



5. It will show the information of all files are Installing to your personal computer.



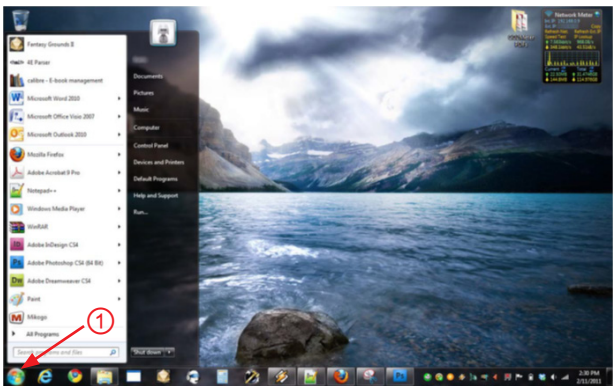
6. It will show the information of Insulation tester has been successfully installed and then click “Finish” key.



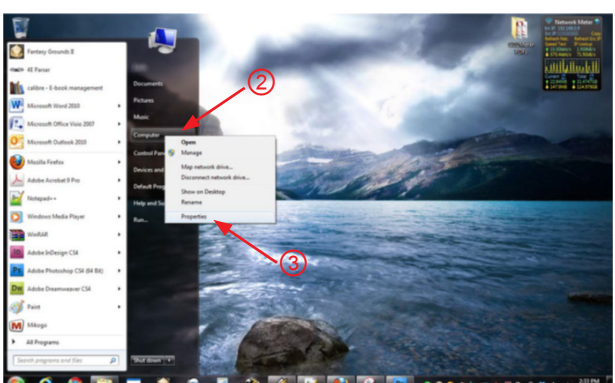
(Note: If your personal computer system is Windows 7, it will indicate the driver automatically. It’s necessary to install the driver if your computer system is not windows 7, then the driver is in the compact disk (CD). The directory is “ E:USB DRIVER/CDM 2.08.24 WHQL Certified x 86-32 bit”.)

(B) Windows Comm Port setting:

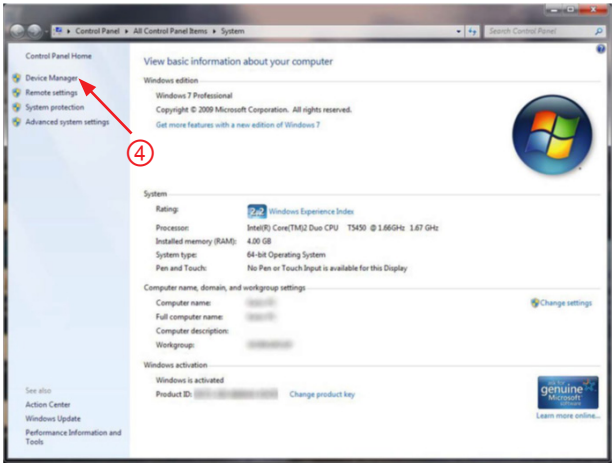
1. Plug the data transmission cable into the personal computer USB port.
2. On the windows interface, ① open the start Menu.



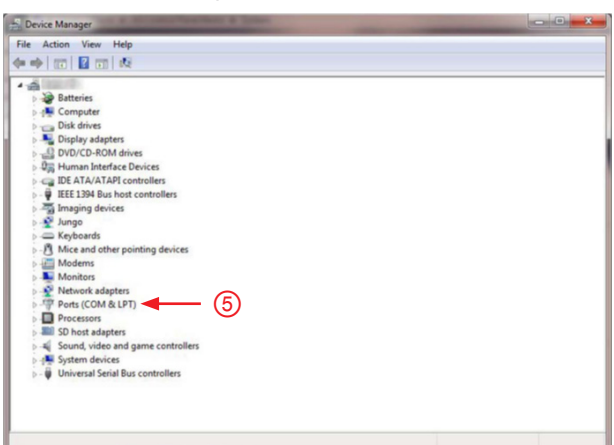
3. ② Right-click on Computer, ③ Click on Properties in the sub-menu.



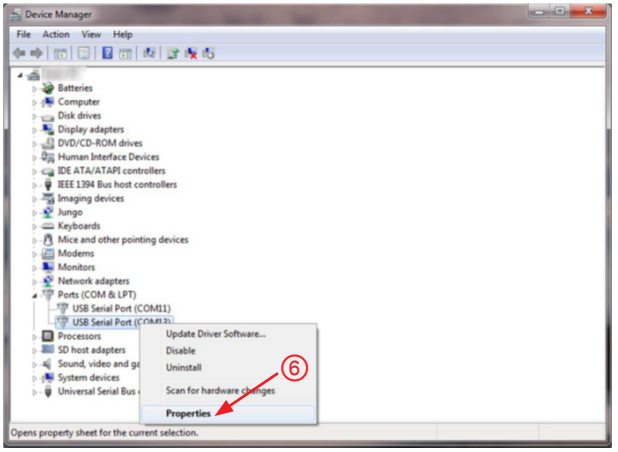
4. The windows appears Control Panel Home, On the left hand side of the window ④ click on Device Manger.



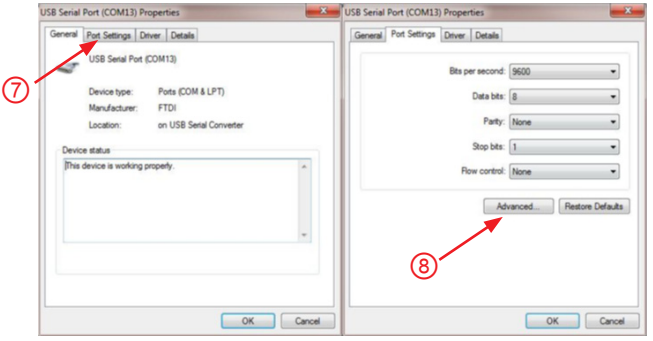
5. The windows appears Device Manager.
(Alternatively, you can: open the Run command window (Start Menu → Run… or press + R) and type “devmgmt. msc” without the quotation marks.)
⑤ Click on the arrow to the left of Ports “(COM & LPT)” to expand the listing.



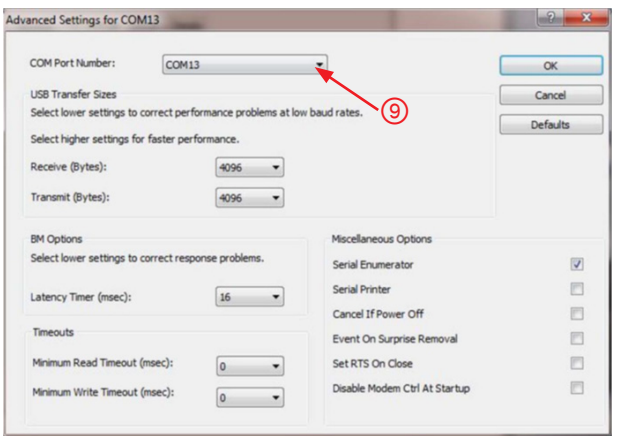
6. ⑥ right click on the correct COM port and click on Properties in the sub-menu that pops up.



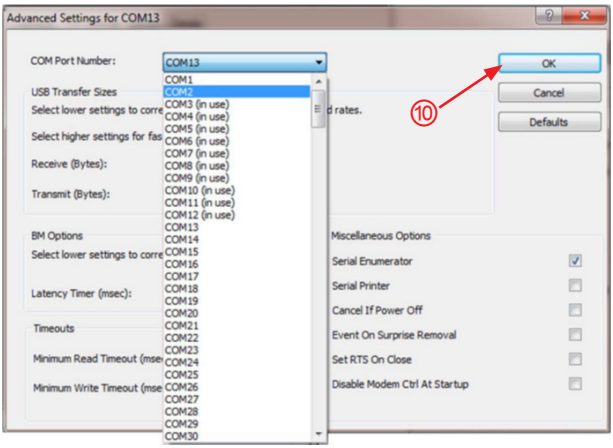
7. In the window that appears ⑦ click on the Port Settings tab at the top and the display will change.
⑧ Click on the Advance button, the windows appears shows the Advance Setting for COMxx.



8. ⑨ Click on the COM Port number list to expand it and click on a COM port number within the range of COM1 to COM8 (preferably one not in use, avoid choosing COM1; if all are in use and there are no other peripherals connected to your PC, assign it no any port between 1 and 8; this will cause the PC to lose the addressing of the last peripheral connected there (a USB printer for example) and will cause the PC to assign it to another number when you reconnect it).



9. Once the new COM port is chosen, ⑩ click on OK and again in the USB Serial Port Properties window. Close the device manager.

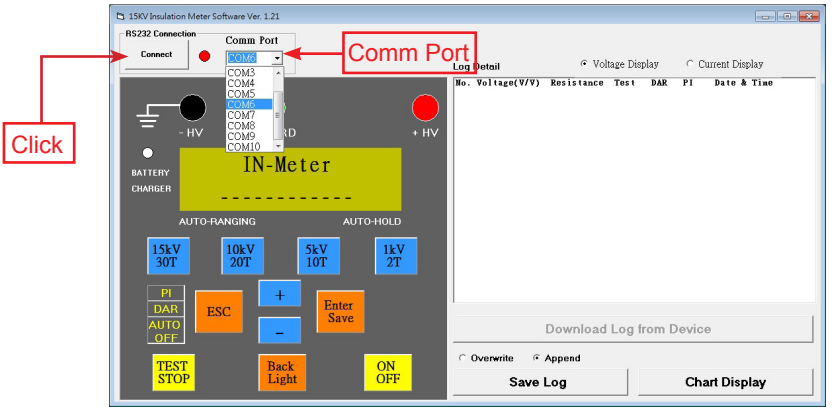

Advanced Settings for COM13
COM Port Number:
COM13
OK
Cancel
Defaults
⑩
USB Transfer Sizes
Select lower settings to corre
Select higher settings for fas
Receive (Bytes):
Transmit (Bytes):
d rates.
BM Options
Select lower settings to corre
Latency Timer (msec):
Timeouts
Minimum Read Timeout (mse
Minimum Write Timeout (mse
Miscellaneous Options
Serial Enumerator
Serial Printer
Cancel If Power Off
Event On Surprise Removal
Set RTS On Close
Disable Modem Ctrl At Startup
COM1
COM2
COM3 (in use)
COM4 (in use)
COM5 (in use)
COM6 (in use)
COM7 (in use)
COM8 (in use)
COM9 (in use)
COM10 (in use)
COM11 (in use)
COM12 (in use)
COM13
COM14
COM15
COM16
COM17
COM18
COM19
COM20
COM21
COM22
COM23
COM24
COM25
COM26
COM27
COM28
COM29
COM30

(C) Insulation Tester Software Comm Port setting:

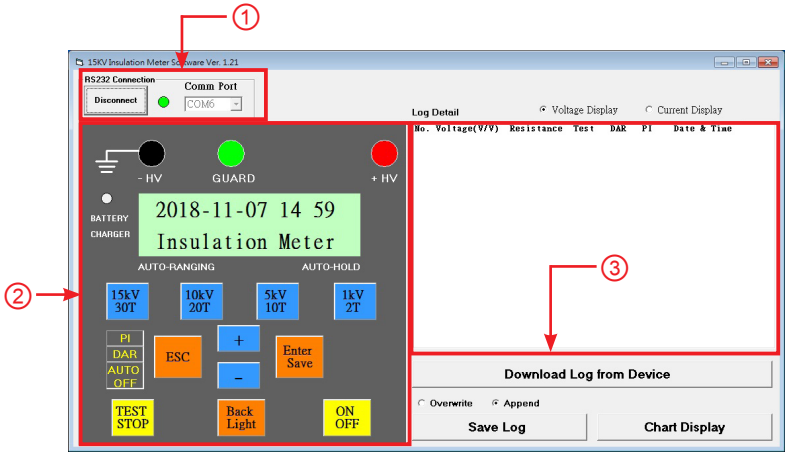
1. Connect data transmission cable to the Insulation Tester.

2. Click the icon of the “15kV Insulation Tester” on the desktop of the personal computer.

3. On the 15kV Insulation Tester window, select the correct “Comm Port and click the RS232 connection button.



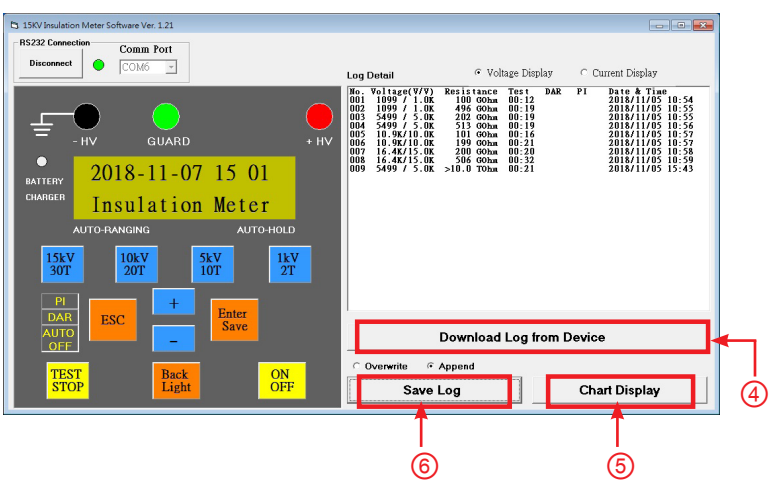
(D) Insulation Tester Interface:



① RS 232 Connection.

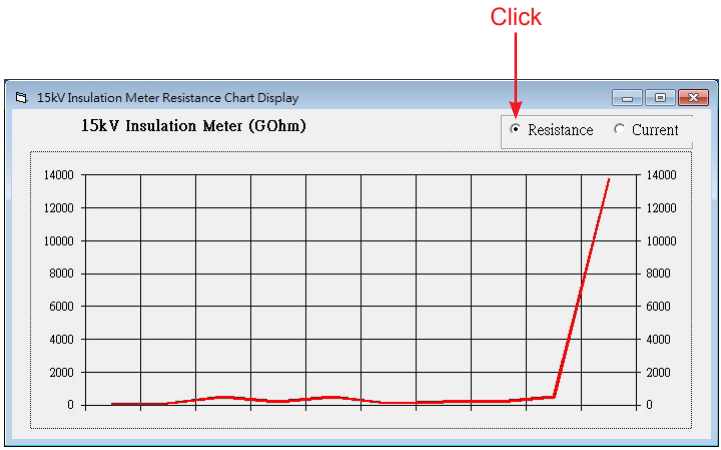
② Main operation interface.

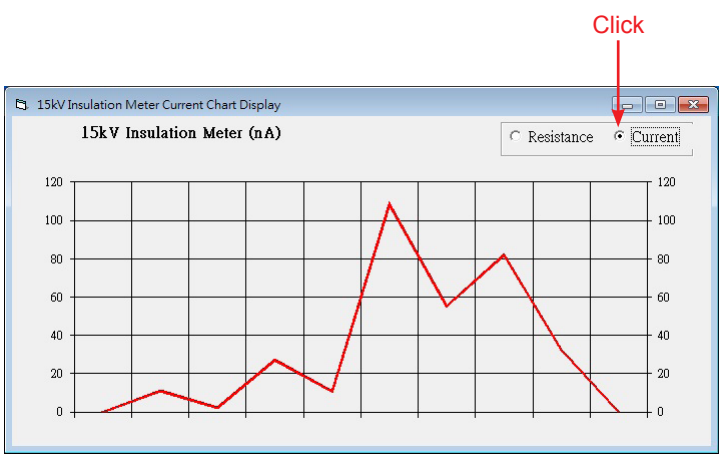
③ Memory saving and downloading interface.



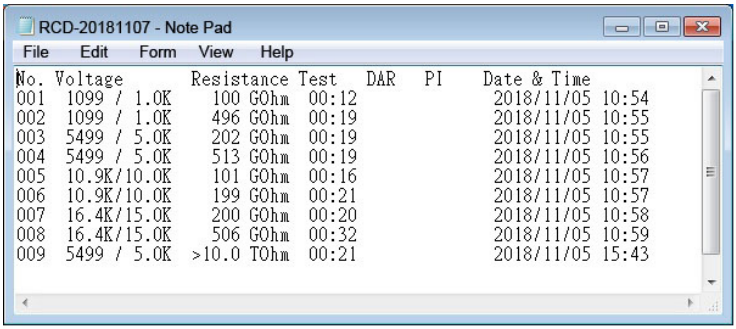
④ Click the "Download Log from Device" key to download the current data and statistics.

⑤ Click the "Chart Display" key to see the chart, picture shown in below:





⑥ Click the "Save Log" key to the file, picture shown in below:



Q16