

WatchfulEye

Watchful Eye Solutions, Inc.

WTH-CS/BT-1000V

Surge Protective Device Tester ❦



WTH-CS/BT-1000V Surge Protective Device Tester

Contents

Type & Ordering Code -----	2
Main Features -----	2
Technical Specification -----	3
Data for Reference -----	3
Dimensions -----	3
Controls, Jacks & Display -----	4
Testing Procedure & Flowchart -----	5
Safety Instructions -----	6
Power Supply of the SPD Tester -----	6
Test Error -----	6
Test Banana Plugs and Test Pens -----	6
Test Preparation and Choosing the Testing Mode -----	6
Operation Instructions:	
I . Rapid Test of MOV Type SPD -----	7
II . MOV Accurate Test and Leakage Current Calibration -----	8
III . Leakage Current Test under in the Fine-Turning Ad Voltage Mode -----	9
IV . Accurate Break-Over Voltage Test and Calibration Mode -----	10
V . GDT Test and Calibration -----	11
VI . Calibration Steps of the Tester -----	12

Has the surge protective device (SPD) in the system been broken down?

Can the SPD which has been used for years continue to be used?

If the system voltage is 277/480V, is the voltage of SPD selected correctly or not?



Portable Surge Protective Device Tester

Type: WTH-CS/BT-1000V

Ordering Code: US128001

I . Testing methods for voltage limiting type SPD:

On Side A, press the testing button, “Break-over Voltage” and “Leakage Current” will display on the screen.

II . Testing methods for voltage switching type SPD:

On Side B, press the testing button, “Breakdown Voltage” will display on the screen.

WTH-CS/BT-1000V Portable SPD Tester applies to the measurement of the parameters of the voltage limiting type and voltage switching type SPDs. These data are used for evaluating the operating characteristics of the SPD and the product selection to cooperate with the construction site.

Main Features of WTH-CS/BT-1000V Tester:

1. Portable and convenient use with batteries, rechargeable batteries or external power supply; suitable for office and onsite measurements
2. Easy, rapid and accurate measurement by pressing one button for testing and immediate display SPD data features
3. Applied to testing both MOV type and GDT type SPDs
4. Accurate break-over voltage test under the constant current 1mA
5. Accurate leakage current test under the constant voltage of 75% of the break-over voltage
6. The voltage of the tester can be boosted up to 1000V DC

The Technical Specification of WTH-CS/BT-1000V:

Range of break-over voltage for testing $U_n(U_{1mA})$: 0~1000V

Range of leakage current for testing: 0~25 μ A, \pm 2.5%, \pm 0.5 μ A

Side A for testing voltage limiting type SPD, break-over voltage and leakage current will display in about 2.5 seconds.

Range of breakdown voltage for testing: 0~1000V, \pm 2.5%, \pm 5V(120-1000V)

Side B for testing voltage switching type SPD, boost the DC voltage step by step by 100V/second for an accurate measurement of breakdown voltage.

Minimum resolution of the break-over Voltage: 1V

Minimum resolution of the leakage current: 0.1 μ A

Operation temperature: 32°F ~ +122°F (0°C ~ +50°C)

Power supplies: four AA1.2V rechargeable batteries, four AA1.5V batteries or 5V2.5A external power transformers

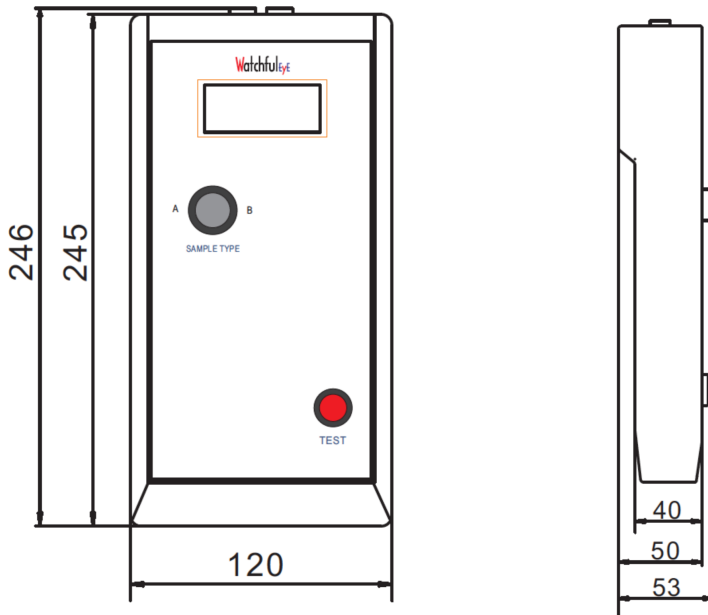
Weight: 570g (Without accessories)

Dimensions: 245mm×120mm×50mm

Data for Reference:

Power Supply System	UC	V1mA	Surge Arrester Testing
110V、120/208V	150V	215-265V	WTH-40/C/R/2P-150
220/380V	275V	385-475V	WTH-40/C/R/4P-275
220/380V、277/480V	385V	560-680V	WTH-40/C/R/4P-385
347/600V	550V	820-1000V	WTH-40/C/R/4P-550

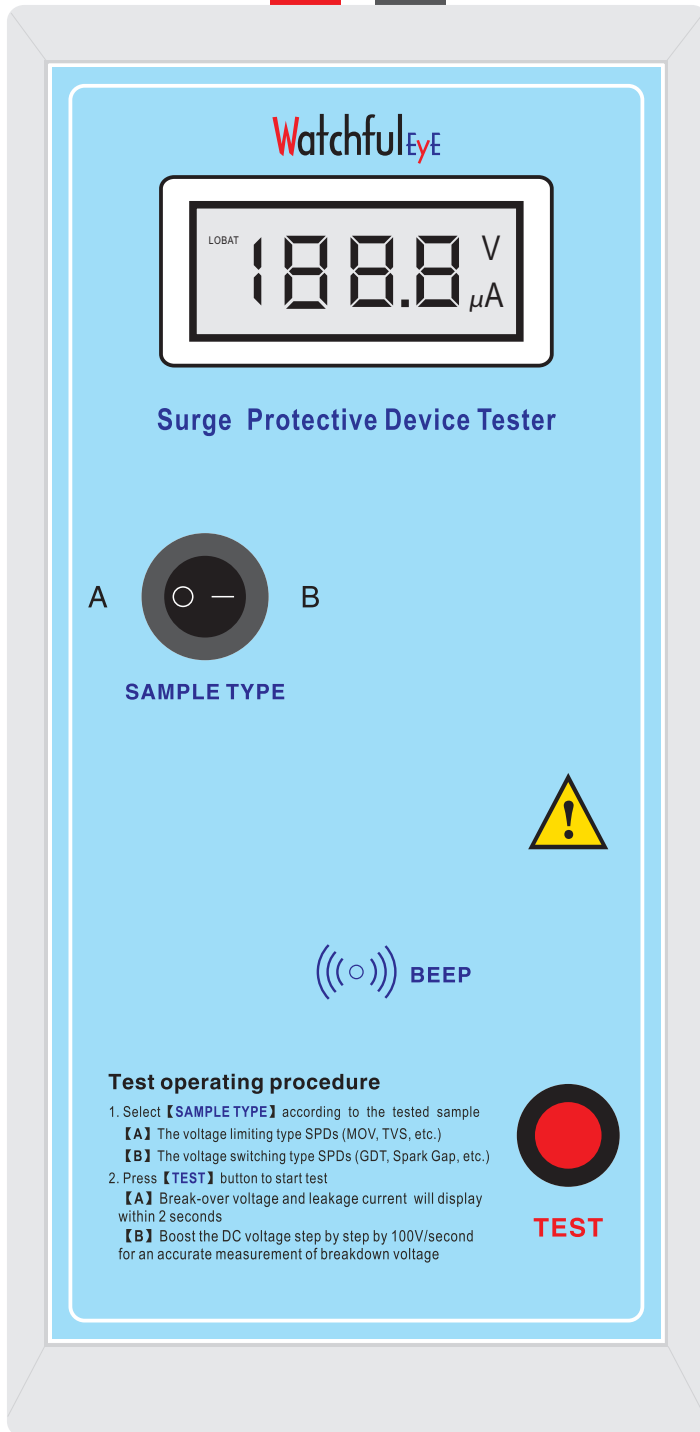
Dimensions:



Red banana plug jack



Black banana plug jack



Display

Standby mode



Low voltage



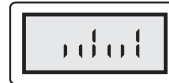
Voltage



Leakage current



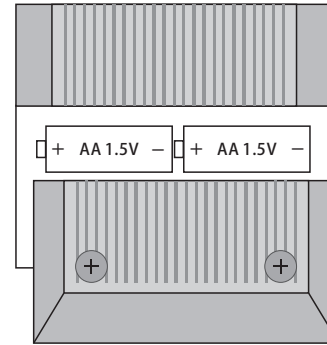
Testing



No sample



Battery compartment



5V2.5ADc
Input



SAMPLE TYPE



Battery
On/off

>1000VDC



TEST button

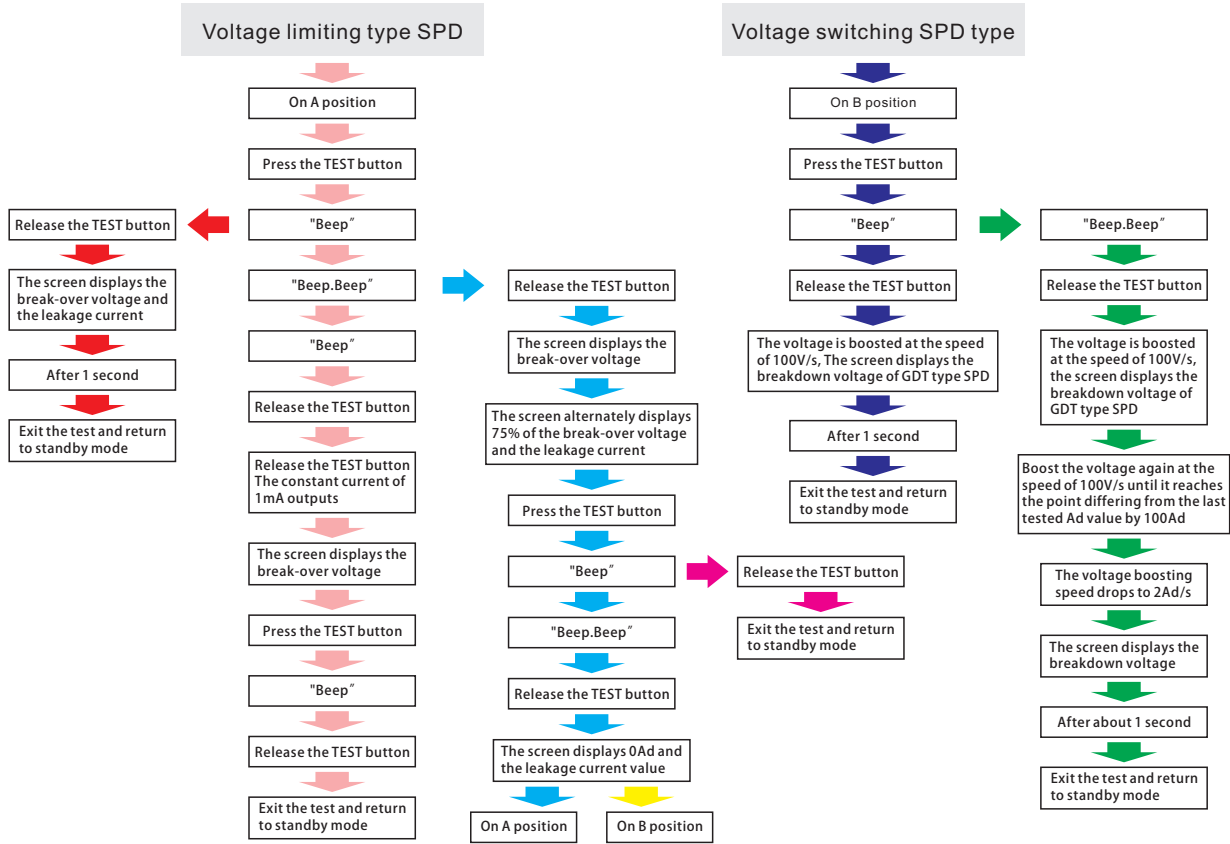
BEEP

TEST

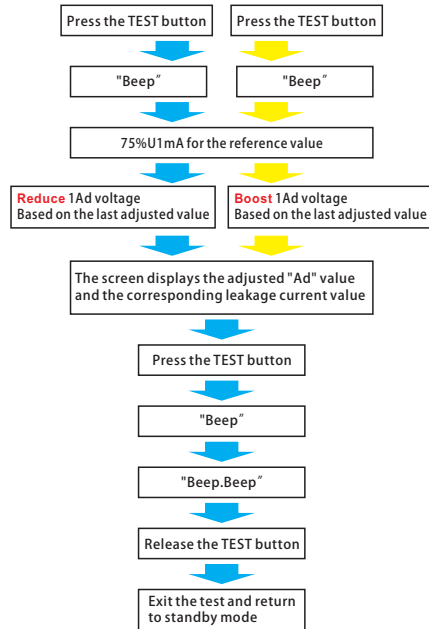
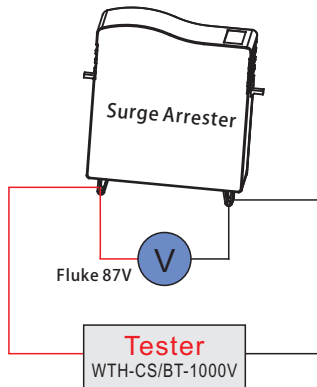
Test Preparation

1. Connect to 5V2.5ADC external power supply or install 4 AA batteries. If batteries are used, press the red button (batteries power) on the right side. "0" will display on the screen, that is the standby mode.
2. Connect the test pens to the tester, clamp the SPD module to be tested, press the mode button to choose the testing mode according to the SPD type.

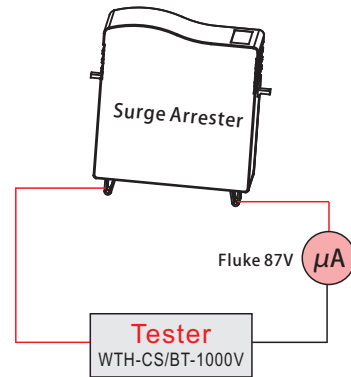
A position: for voltage limiting type SPD, such as MOV type SPD test
 B position: for voltage switching type SPD, such as GDT type SPD test



Break-over voltage calibration



Leakage current calibration



Safety Instructions

1. **USE EXTREME CAUTION** In the testing process, the voltage boosts up to above 1000V, and the maximum current is 1mA. **DO NOT** touch the exposed part of the test banana plug or the test pens.
2. **DO NOT** press the TEST button when the tester isn't connected to a tested sample. Doing so can damage the tester.
3. **ALWAYS** turn off the power supply promptly during the long standby mode prompting.
4. **ALWAYS** do the testing strictly according to the operation instructions. Non-qualified persons are not allowed to do the calibration or open the tester without professional guidance.

Power Supply of the SPD Tester

There are two power supply modes:

1. Connect to 5V2.5ADC external power supply, plug in the power supply, the initial value "0" will display on the screen, that is the standby mode.
2. Install 4 AA batteries or rechargeable batteries, press the red button on the right side to turn on the battery power supply switch, the voltage of the batteries will display on the screen first, and then display the initial value "0", that is the standby mode.
3. If the voltage is lower than 4.5V, the upper left corner of the screen will display "Lobat".
4. If the standby time exceeds 300 seconds(after each 300 seconds interval), the tester will emit a sound of "**Beep.Beep**" to remind you to shut down to save energy, avoiding running out of batteries due to long-time standby.

Test Error

If the test error is in the unacceptable range, calibrate to the common voltage segments and critical leakage current, e.g., if a calibration for the 500V voltage segment is applied in a 300V voltage segment test, it will produce errors.

Test Banana Plugs and Test Pens

1. There are two test banana plug jacks on the top of the tester, insert the red and black test banana plugs into the corresponding colored jacks.
2. The test pens include a clip type and a probe type. The other ends of the two test banana plugs can be put on test clips or test probes according to the test needs.(e.g., use the clip type test pens for testing SPD modules without bases)
3. Take out the SPD module to be tested
4. Clamp the two poles of the MOV type SPD with the test clips.

Test Preparation and Choosing the Testing Mode

1. Set the mode button according to the tested SPD sample type. Note:
 - A** position: for voltage limiting type SPD, such as MOV type SPD
 - B** position: for voltage switching type SPD, such as GDT type SPD
2. Take WTH-40/C/1P-385 as the tested product sample of voltage limiting type SPD
3. Take WTH-65/G-255 as the tested product sample of voltage switching type SPD

I . Rapid Test of MOV Type SPD

1. Testing

For MOV type SPD, set the mode button to A position, press the TEST button; when you hear a "**Beep**". Release the TEST button.

2. Read the test data

The screen displays the break-over voltage and the leakage current under 75% of the break-over voltage of the tested MOV type SPD; the whole process takes about 2.5 seconds.

3. Continue to test

1) According to the features of the MOV, it is normal that data inconsistency may occur between the first test and the second test, this characteristic of MOVs can be judged by the data from several more tests.

2) When the leakage current displays on the screen, press the TEST button; you'll hear a "**Beep**". After the first test is completed, the second test will start automatically.

3) Also, when the screen returns to the "0" standby mode, press the TEST button to start the second test.

4. Exit to the standby mode

When the leakage current displays on the screen, after 1 second without any key operation, the screen will be cleared to "0" and will exit the test to return to standby mode.

II . MOV Accurate Test and Leakage Current Calibration

1. Testing

For an MOV type SPD, set the mode button to the A position, press the TEST button continually until hearing a sound of "**Beep---Beep.Beep**". Then release the TEST button.

2. Read the test data

The screen displays the break-over voltage of the tested MOV SPD, and this is then followed by the display of the leakage current under 75% of the break-over voltage every 1 second.

3. Accurate testing of leakage current

In this mode, the constant voltage is 75% of the break-over voltage outputs. Read the accurate leakage current value of the MOV type SPD.

4. The calibration of 75% of the break-over voltage value

The characteristics of MOV and the error of 75% of the break-over voltage may have a great influence on the accuracy of the leakage current.

1) Choose a multimeter "Fluke 87V" or any other multimeter with an accuracy of 0.1V.

2) Connect the multimeter probes in parallel with the SPD and the test pens.

3) In this mode, the constant voltage is 75% of the break-over voltage outputs. The tester screen continually and alternately displays 75% of the break-over voltage value and the leakage current value as well.

4) Open the tester and adjust the tester R14(Potentiometer) to make the multimeter display the same value as that the tester. At this point, the calibration of 75% of the break-over voltage is completed.

5. The calibration of the leakage current

1) Choose a multimeter "Fluke 87V" or any other multimeter with the accuracy of 0.1 μ A.

2) Connect the multimeter probes in series with the SPD and the test pens.

3) In this mode, the constant voltage is 75% of the break-over voltage outputs. The tester screen continually and alternately displays 75% of the break-over voltage value and the leakage current value as well.

4) Open the tester and adjust the tester R17(Potentiometer) to make the multimeter display the same value as the tester. At this point, the calibration of the leakage current is completed.

6. Exit to the standby mode

In the alternate display mode, press the TEST button, release the button when hearing a sound of "**Beep**". The screen will be cleared to "0" and exit the test to return to the standby mode.

III. Leakage Current Test under the Mode of Fine-Turning "Ad" Voltage

Note: $1Ad=0.293V$

1. Testing

For MOV type SPD, set the mode button to A position, press the TEST button continually until hearing a sound of "**Beep---Beep.Beep**". Then release the TEST button.

2. Read the test data

The screen displays the break-over voltage of the tested MOV type SPD. This is followed by the screen displaying the leakage current under 75% of the break-over voltage every 1 second.

3. The accurate testing of leakage current

In this mode, the constant voltage is 75% of the break-over voltage outputs. Read the leakage current value of the MOV type SPD.

4. Enter the fine-turning voltage testing mode under 75% of the break-over voltage

In the alternate display mode, press the TEST button continually until hearing a sound of "**Beep---Beep.Beep**". Release the TEST button, and the screen alternately displays "0" and the leakage current, it enters the fine-turning voltage testing mode.

5. Leakage current testing under the Fine-turning testing "Ad" voltage mode

"0" represents $0Ad$, which is the default base value of 75% of the break-over voltage. In this mode, adjust the constant voltage value based on the accuracy of $1Ad=0.293V$.

1) Set the mode button to A position and press the TEST button. When hearing a sound of "**Beep**", each time reduce $1Ad$ voltage based on 75% of the break-over voltage value. The screen displays the adjusted "Ad" value, and the tester will accurately display the fine-turning constant voltage of the leakage current value.

2) Set the mode button to B position and press the TEST button. When hearing a sound of "**Beep**", each time boost $1Ad$ voltage based on 75% of the break-over voltage value. The screen displays the adjusted "Ad" value, and the tester will accurately display the fine-tuning constant voltage of the leakage current value.

6. More instructions of this function

1) According to the characteristics of MOV, the tested leakage current value will be inconsistent under 76%, 75% or 74% of the break-over voltage.

2) This function can test different leakage current values under different voltages more accurately

7. Exit to standby mode

In the test mode of adjusting "Ad" voltage, press the TEST button continually until hearing a sound of "**Beep---Beep.Beep**". Release the TEST button and the screen will be cleared to "0" and exit the test to return to standby mode.

IV. Accurate Break-Over Voltage Test and Calibration Mode

1. Testing

For MOV type SPD, set the mode button to A position, and press the TEST button continually until hearing a sound of "**Beep---Beep.Beep---Beep**". Then release the TEST button.

2. Read the test data

Accurately test the value of the break-over voltage. The screen continually displays the tested break-over voltage of the MOV type SPD.

3. Verify the current value of 1mA

1) Choose a multimeter "Fluke 87V" or any other multimeter with an accuracy of 0.1 μ A. Connect the multimeter in series with the MOV type SPD and the test pens, and verify the constant current output of 1mA.

2) The description of the MOV leakage current is given by the tested voltage value when the constant current is 1mA. According to this characteristic, the more accurate the 1mA constant current outputs, the more accurate the testing data of the break-over voltage will show on the display.

4. The calibration of the break-over voltage

1) Choose a multimeter "Fluke 87V" or any other multimeter with the accuracy of 0.1V.

2) Connect the multimeter probes in parallel with the SPD and the test pens.

3) In this mode, while maintaining the constant current of 1mA outputs, the tester continually displays the break-over voltage value.

4) Open the tester and adjust the tester R3 (Potentiometer) to make the tester display the same value as the multimeter. At this point, the calibration of the break-over voltage is completed.

5. Exit to the standby mode

In the state of displaying the break-over voltage, press the TEST button. When you hear a "**Beep**". Release the TEST button and the screen will be cleared to "0". Then exit the test to return to the standby mode.

V . GDT Test and Calibration

1. Testing

For GDT type SPD, set the mode button to B position and press the TEST button. Release the button when you hear a **"Beep"**. And the screen will display the boosting progress status.

2. Read the test data

The voltage is boosted at the speed of 100V/s. The screen will then display the breakdown voltage of the tested GDT type SPD.

3. Exit to the standby mode

After about 1 second without any key operation, the screen will be cleared to "0". At this point, exit the test to the standby mode.

4. Slow boosting and calibration test with a multimeter

Press the TEST button, and release the TEST button when hearing a sound of **"Beep---Beep.Beep"**.

5. Read the testing data

The voltage is boosted at the speed of 100V/s. The screen will display the breakdown voltage of the tested GDT type SPD. Boost the voltage at the speed of 100V/second again. When the voltage reaches close to the breakdown point of 100Ad, slow down boosting the voltage at a speed of less than 1V/second. The screen will keep displaying the corresponding voltage values until the SPD is broken down, after which the breakdown voltage will display on the screen.

6. Breakdown voltage calibration

1) Choose a multimeter "Fluke 87V" or any other multimeter with the accuracy of 0.1V.

2) Connect the multimeter probes in parallel with the SPD and the test pens.

3) In this slow boosting mode, voltage will be boosted at the speed of less than 1V/second. Compare the voltage displayed on the tester screen with the measured voltage from the multimeter.

4) Open the tester and adjust the tester R4(Potentiometer) to make the tester display the same value as the multimeter. The calibration of the breakdown voltage is then completed.

7. Exit to the standby mode

After about 1 second without any key operation, the screen will be cleared to "0" and you can exit the test to the standby mode.

VI. Calibration Steps of the Tester

Step 1. Calibrate the constant current of 1mA

Step 2. Calibrate the break-over voltage with R3

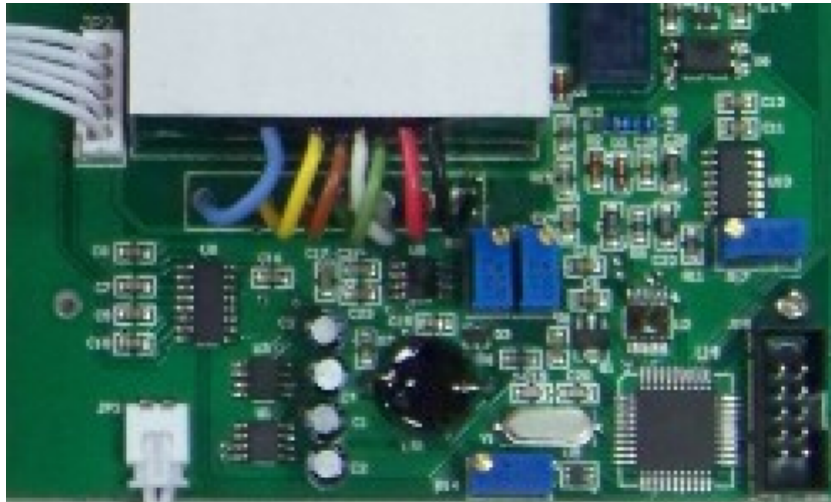
Step 3. Calibrate 75% of the break-over voltage with R14

Step 4. Calibrate the leakage current with R17

Step 5. Calibrate the breakdown voltage with R4

Note: R3, R14, R17 and R4 indicate potentiometers

(Open the SPD tester with a screwdriver, the blue components in the following picture refer to potentiometers R3, R14, R17 and R4)



(Partial screenshot of the main board of the SPD tester)

Watchfuleye is specialized in a complete range of lightning and surge protective devices, with wide applications in low voltage DC & AC power supply system, data and control system, intelligent monitoring system and new energy industry like solar and wind power system, etc. Our company also offers reliable custom technical solutions in lightning & surge protection for global customers.

Headquartered in New York, watchful Eye has a network of sales to serve our customers world wide. with high quality products and optimal service, Watchful Eye can meet your strict technical standards and unique requirements.

Watchful Eye

The Guardian that Protects Your System against Surge and Lightning

 Watchful Eye Solutions, Inc.



www.watchfuleyesolutions.com

