

# Sapphire Instruments Co., Ltd.

## Calibration Procedure of SI-9110

1. How to open the case, please follow the steps.

1.1 Remove the battery lid.

1.2 You will see the two screws and loosen them.



Fig. 1

1.3 Use fingers to press the bottom case inward, and pull it backward and upward.

1.4

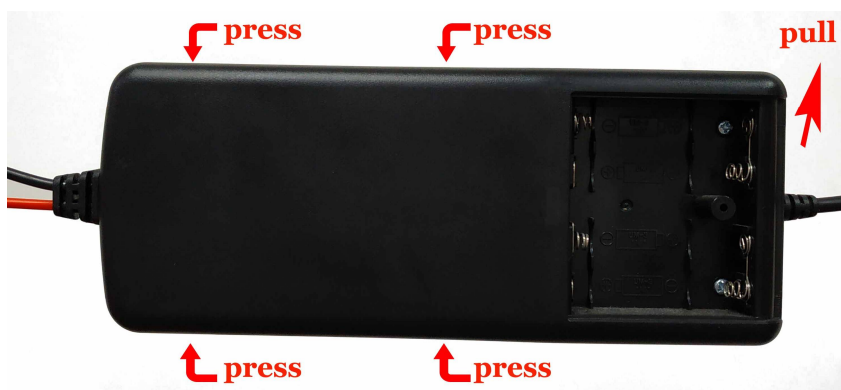


Fig. 2

1.5 Hold the bottom case and pull the upper case backward (to input lines direction).

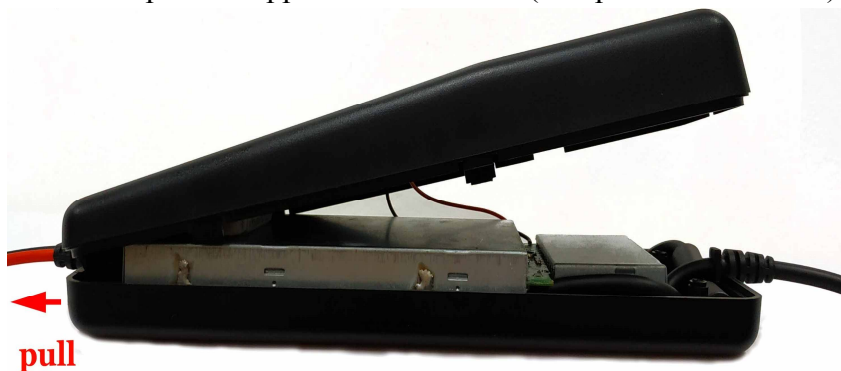


Fig. 3

1.6 You will see the two metal cases. There is one screw on the PCB. Loosen it, and then the whole metal case can be taken out. There are two wires still connected with the upper case. Leaves them there.



Fig. 4

2. Explanation of adjustment point. Please refer to Fig. 5.

- (1) SW1: Switch for selecting attenuation ratio.
- (2) SW2: Power switch.
- (3) VR2: Variable resistor for adjusting output offset at 100:1.
- (4) VR4: Variable resistor for adjusting output offset at 1000:1.
- (5) VC1: Variable capacitor for adjusting positive square wave compensation.
- (6) VC2: Variable capacitor for adjusting negative square wave compensation.
- (7) VR1: Variable resistor for adjusting 100:1 low frequency 60 Hz CMRR.
- (8) VC1: Variable capacitor for adjusting 100:1 high frequency 20 kHz CMRR.
- (9) VR3: Variable resistor for adjusting accuracy.
- (10) CON1: Power jack for connecting to 6 VDC power adapter.

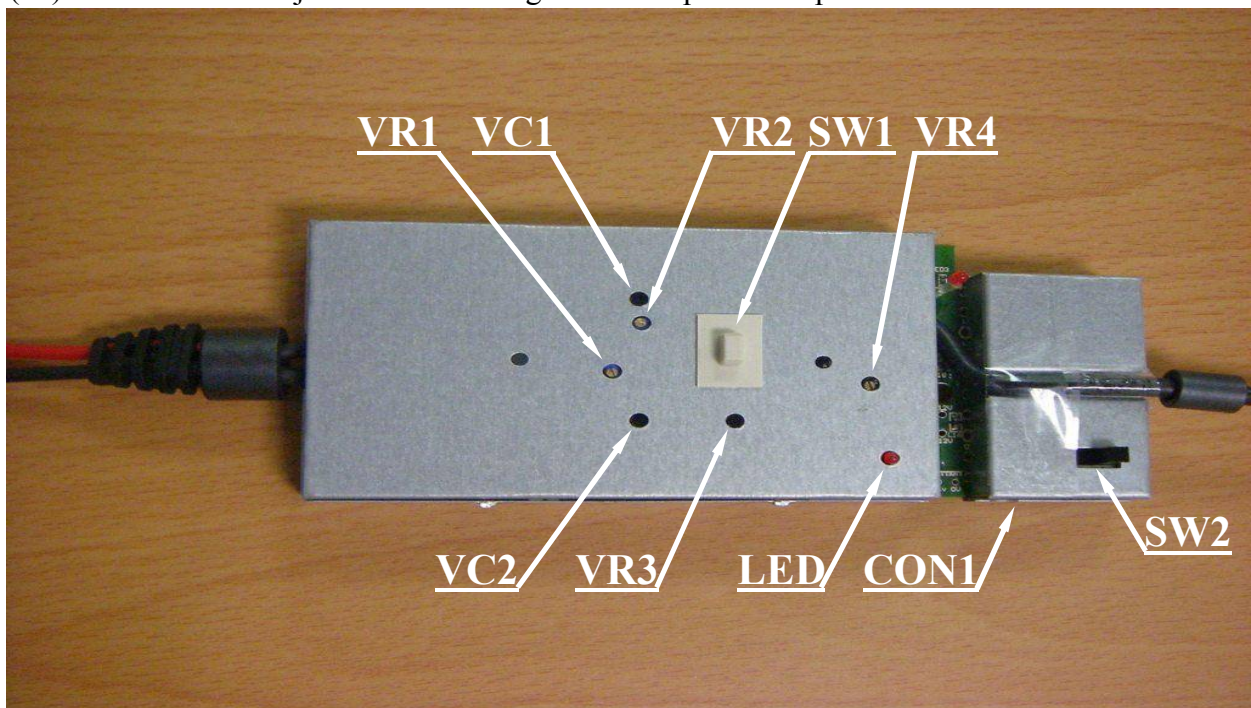


Fig. 5

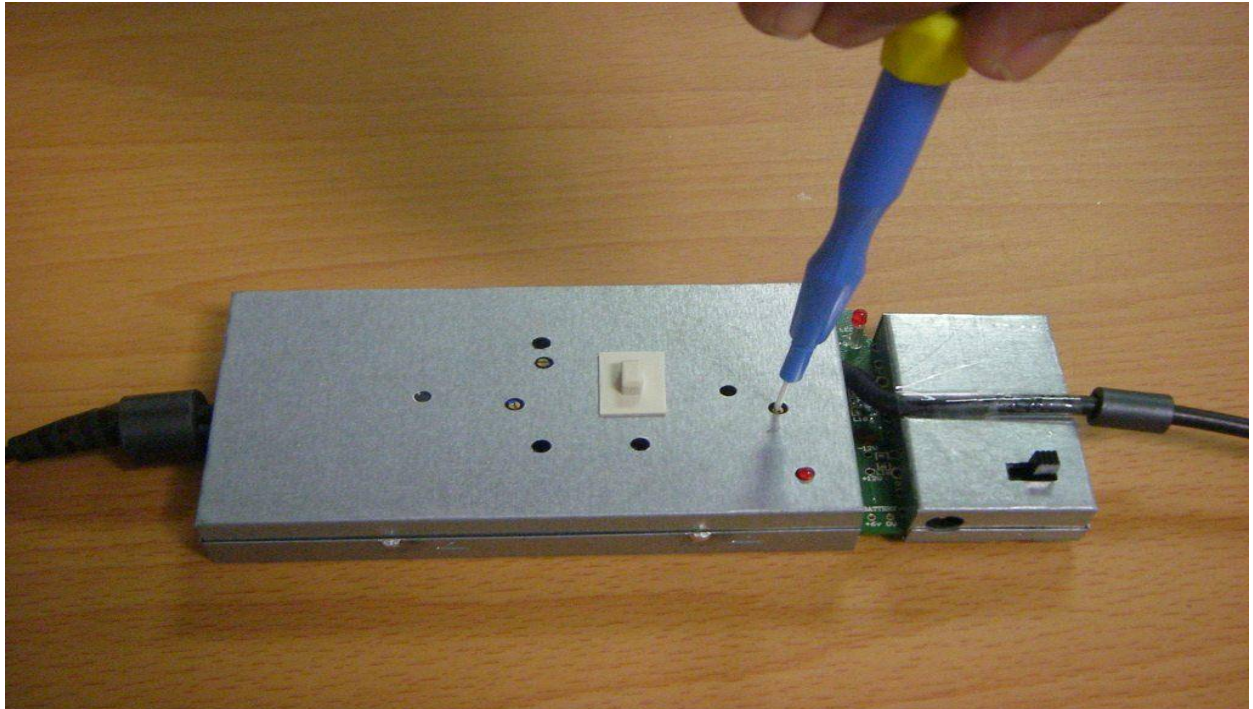


Fig. 6

### 3. Adjustment Procedure:

Please connect a 6VDC power adapter to CON1, and turn SW2 on to warm up for 10 minutes. Then follow the steps below.

### 3.1 Offset Adjustment:

- a. Referring to Fig. 7, connect both input lines together.
- b. Connect output BNC connector to a DMM.
- c. Put SW1 at 1/100
- d. Adjust VR2 to make output voltage approach to zero as small as possible.
- e. Put SW1 at 1/1000.
- f. Adjust VR4 to make output voltage approach to zero as small as possible.
- g. Repeat “c” to “g” steps until output voltage is always within  $\pm 5$  mV at either “e” or “g” step.

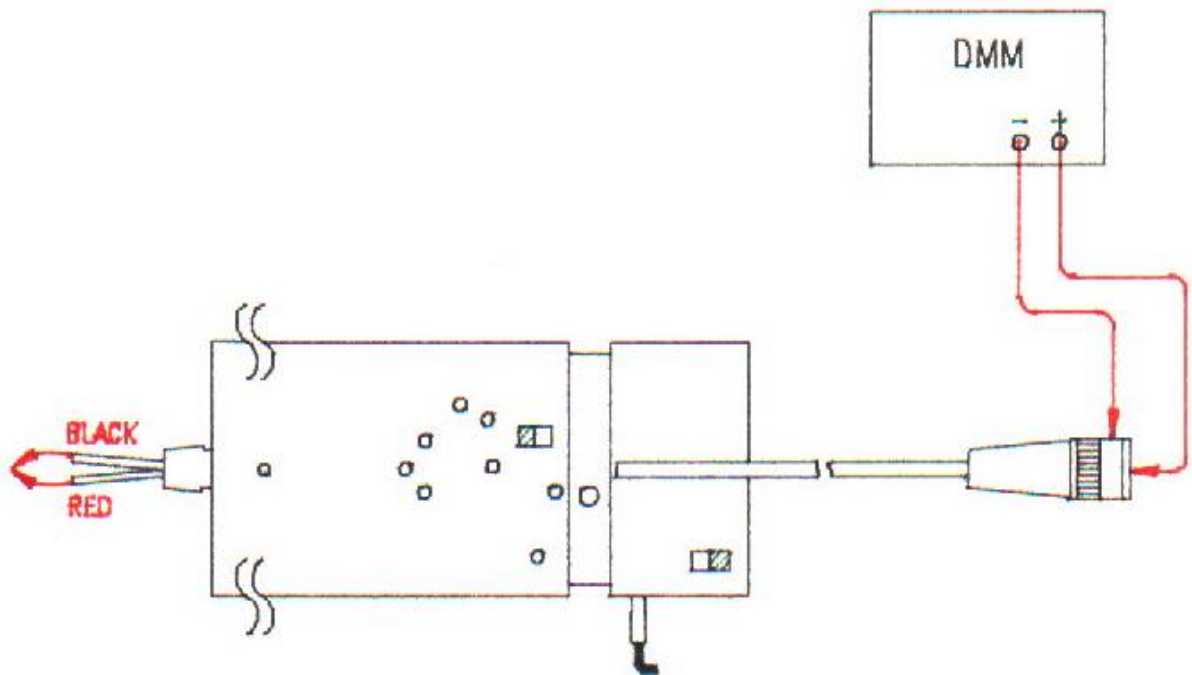


Fig. 7



### 3.2 Square Wave Adjustment

- Referring to Fig. 8, connect output BNC to the oscilloscope has good grounding.
- Connect the red input line to a 20 Vp-p, 10 kHz square wave signal source and the black input line to ground.
- Put SW1 at 1/100.
- Set the VOLTS/DIV switch on oscilloscope's panel to 0.1V for 1/100 and the TIME/DIV switch to 20  $\mu$ s.
- Adjust VC1 to make the displayed waveform become as Fig. 9(b).
- Connect the black input line to 20 Vp-p, 10 kHz square wave signal source and the red input line to ground.
- Adjust VC2 to make the displayed waveform become as Fig. 9(b).

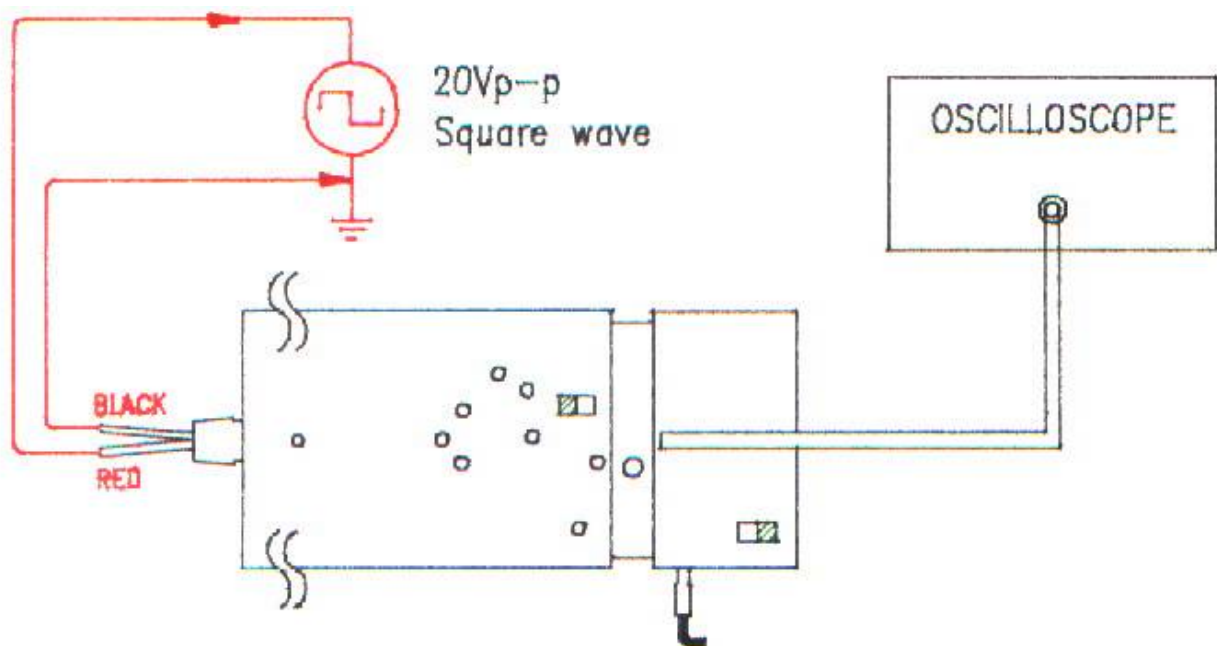


Fig. 8

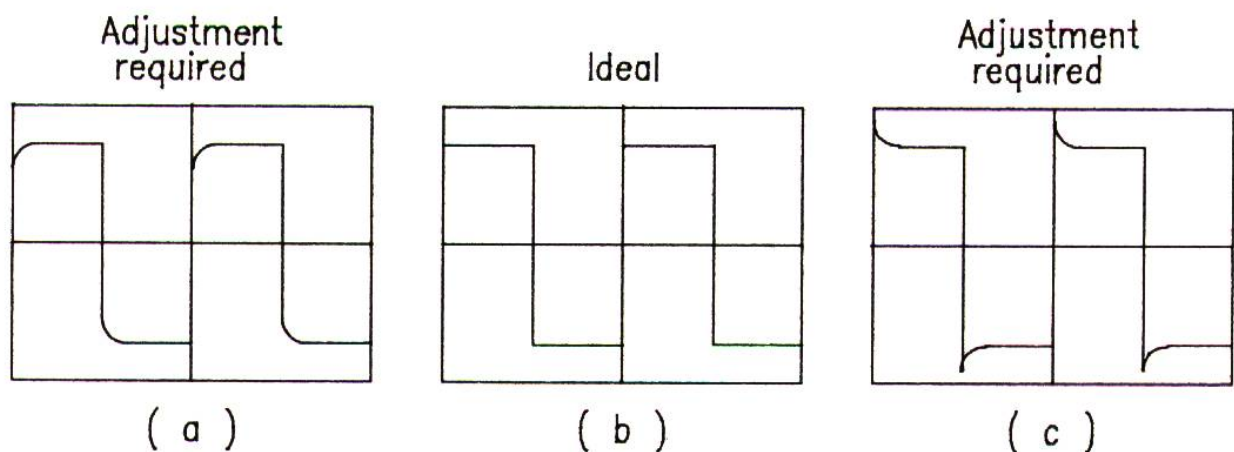


Fig. 9

### 3.3 Low Frequency CMRR Adjustment

- Referring to Fig. 10, connect output BNC to an oscilloscope has good grounding.
- Connect both input lines to a 220/200 VAC, 60/50 Hz power source.
- Put SW1 at 1/100.
- Set the VOLTS/DIV switch on oscilloscope's panel to 1 mV and the TIME/DIV switch to 5ms. Then a 60/50 Hz sinusoid waveform should be displayed on the screen.
- Adjust VR1 to make the amplitude of displayed waveform as small as possible. Finally the amplitude should be less than 1.5 mVp-p (after excluding noise).

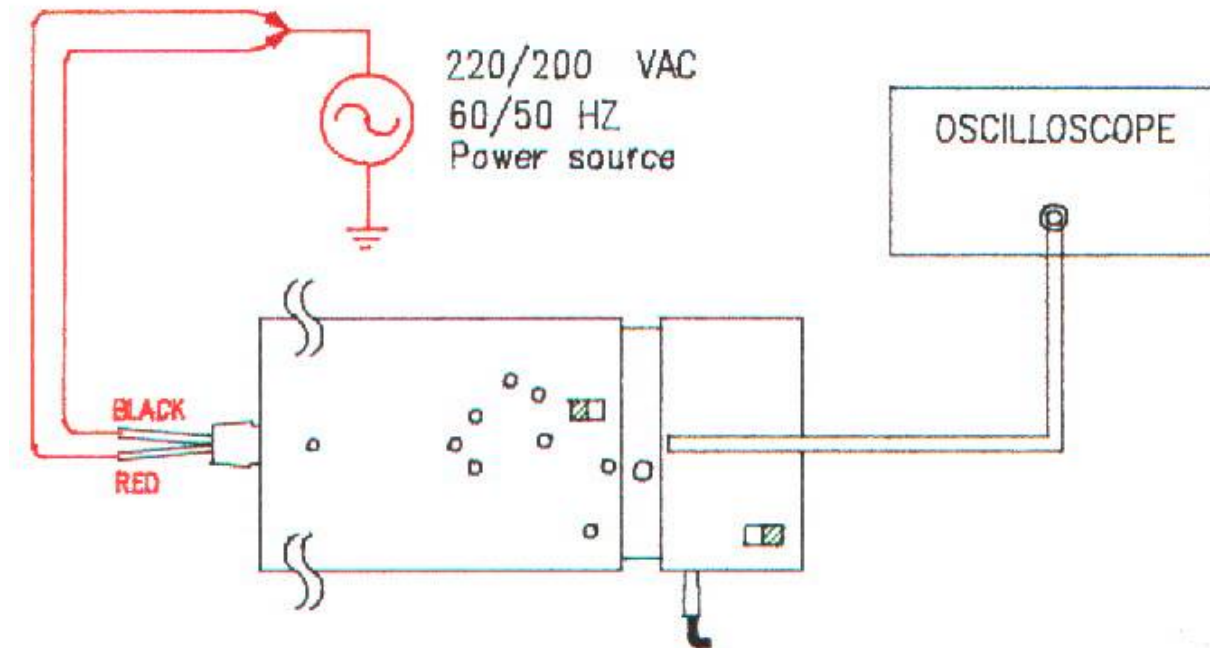


Fig. 10

3.4 Repeat 3.2 and 3.3 adjustment until both adjustments are O.K.

### 3.5 High Frequency CMRR adjustment

- Referring to Fig. 11, connect output BNC to the oscilloscope has good grounding.
- Connect both input lines to a 155 Vp-p, 20 kHz, sine wave signal source.
- Put SW1 at 1/100.
- Set VOLTS/DIV switch on oscilloscope's panel to 1 mV and the TIME/DIV switch to 0.1 ms.
- Adjust VC1 slightly to make the amplitude of displayed waveform as small as possible.  
Finally the amplitude should be less than 4.9 mVp-p (after excluding noise)..

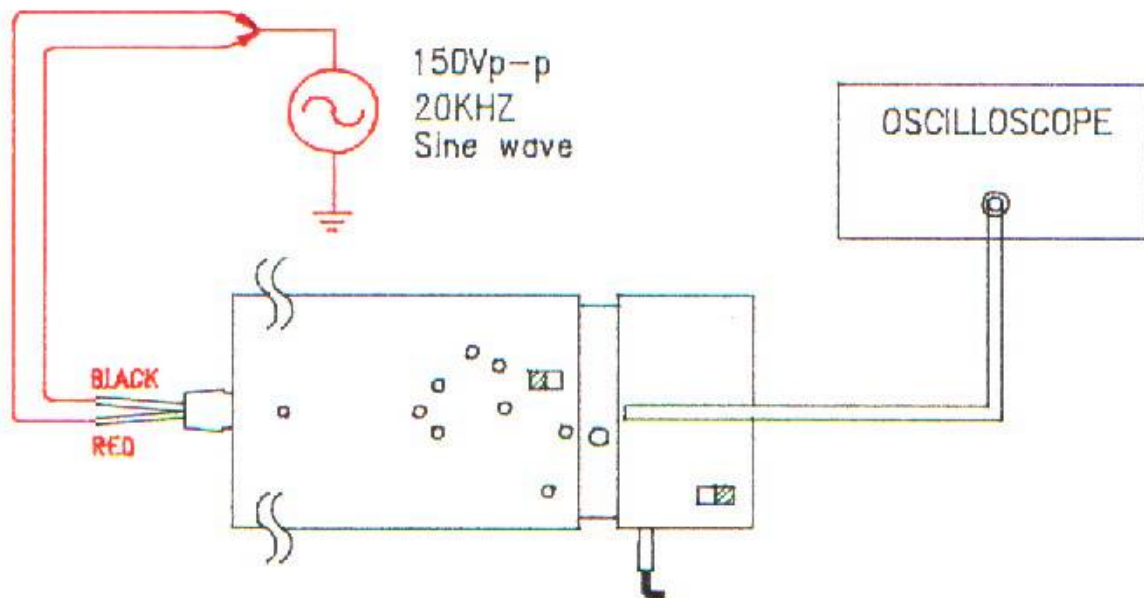


Fig. 11

3.6 Repeat 3.2 and 3.5 adjustment until both adjustments are O.K.

### 3.7 Accuracy Adjustment

- Referring to Fig. 12, connect output BNC to a DMM.
- Connect the red input line to the positive terminal of a DC voltage source (70VDC) and the black input line to the negative terminal source (70VDC).
- Put SW1 at 1/100.
- Adjust VR3 to make the output voltage equal to 0.703 V.

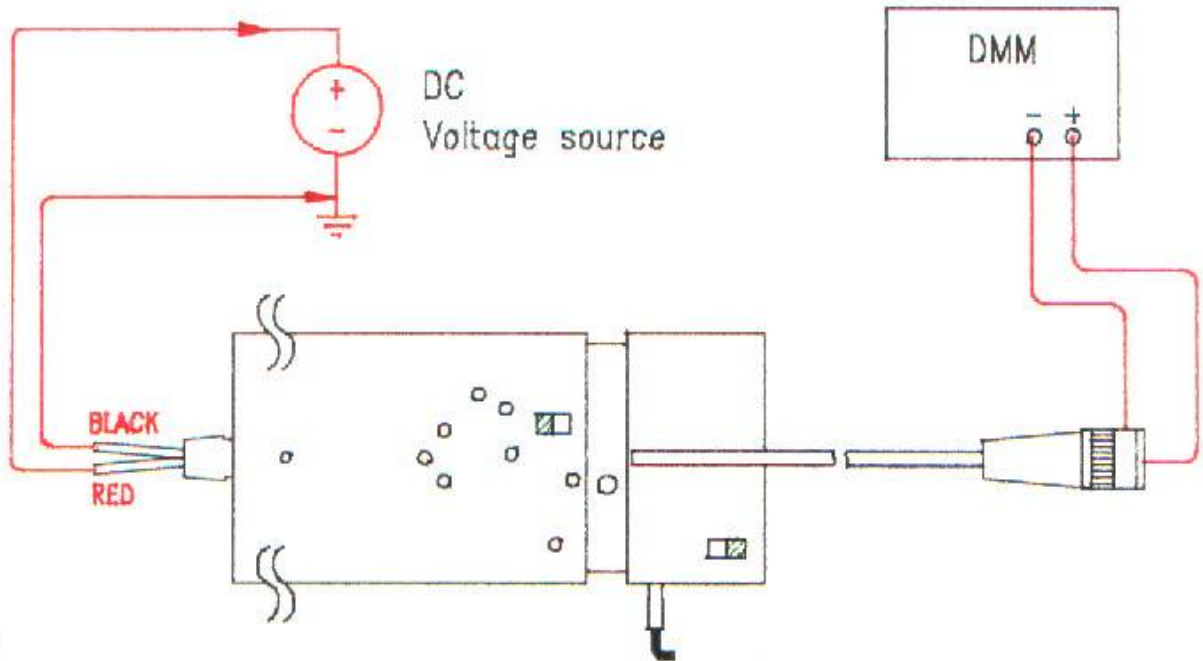


Fig. 12