

# Sapphire Instruments Co., Ltd.

## Calibration Procedure of SI-1501

This procedure is for use by qualified service personnel to adjust SI-1501 properly. The equipments required are listed in Table 1.

No.	Item	Minimum Requirements
1	Power Supply	9VDC/100mA or 6VDC/150mA mains adaptor or 9V battery.
2	DMM	DC Accuracy < 0.5%
3	Function Generator	Maximum Frequency > 10MHz Sine-wave Distortion < 1%
4	Oscilloscope	Bandwidth $\geq$ 20MHz Accuracy $\leq$ 2%

**Table 1**

This procedure is divided into following steps;

- A. Prepare the probe for adjustment.
- B. Adjust input bias voltage.
- C. Adjust output offset voltage.
- D. Adjust CMRR at 60Hz.
- E. Adjust square-wave compensation for +input.
- F. Adjust square-wave compensation for -input.
- G. Adjust CMRR at 1MHz.

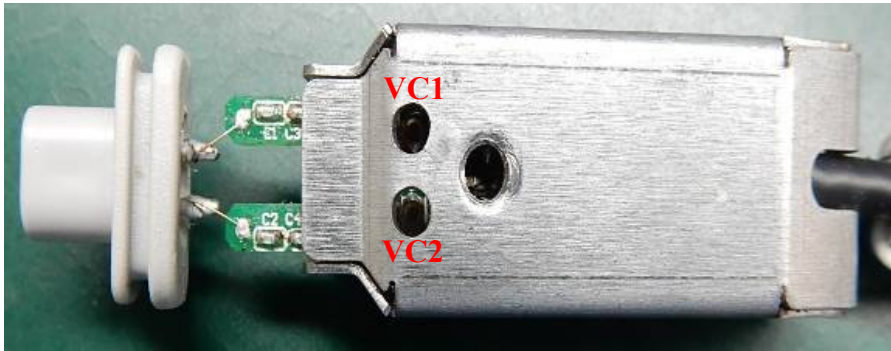
**A. Prepare the probe for adjustment.**

A-1. Use a small flat screwdriver to peel the both panels off, referring to Fig. 1.



**Fig. 1**

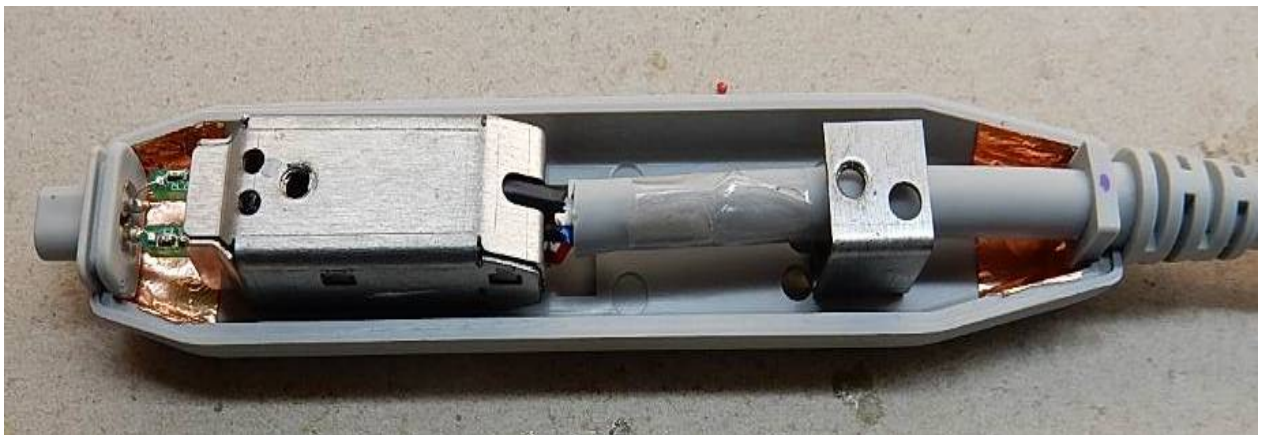
- A-2. Loosen the four screws on the plastic cases.
- A-3. Remove the plastic cases. Fig. 2a & Fig. 2b shows the location of adjustments on the top and bottom side of the metal case respectively.
- A-4. Connect the power source.
- A-5. Allow the probe and test equipments to warm up 20 minutes at an ambient temperature of 18 degree Celsius to 28 degree Celsius.
- A-6. In order to make following operation easier, use one plastic case to support the metal case and the input head as shown in Fig. 3.



**Fig. 2a: Top side**



**Fig. 2b: Bottom side**



**Fig. 3**

## B. Adjust input bias voltage

- B-1. Connect the probe as shown in Fig. 4.
- B-2. The value of input bias voltage now is displayed on the digital multimeter.
- B-3. Adjust VR3 to make the input bias voltage as small as possible.
- B-4. The criterion is  $-10\text{mV} \leq V_{ib} \leq +10\text{mV}$ .

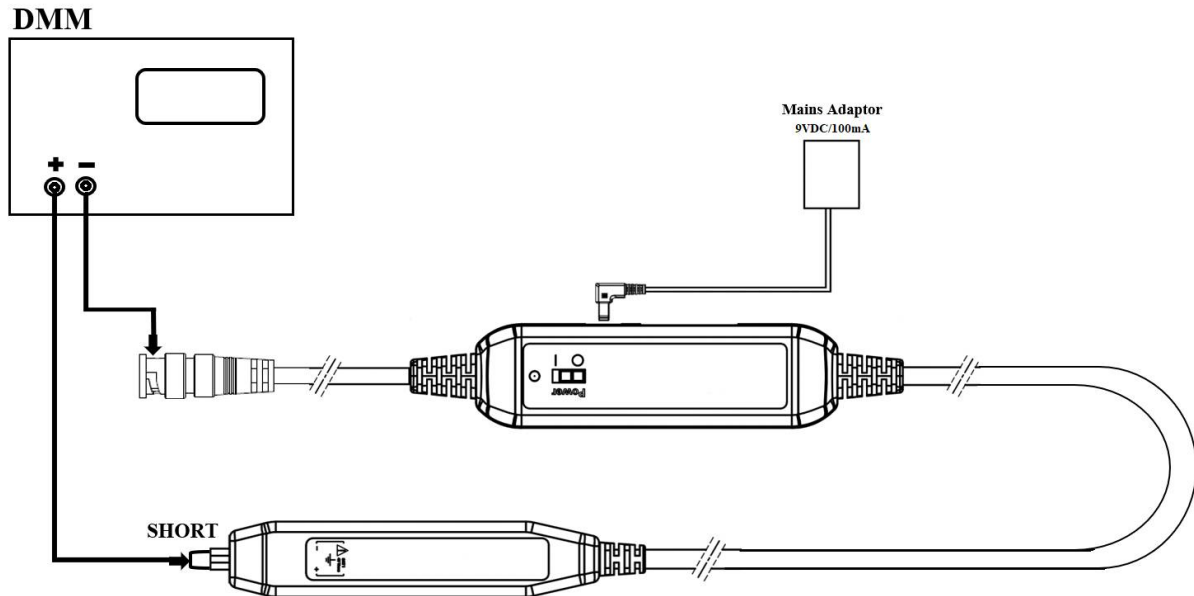


Fig. 4

## C. Adjust output offset voltage

- C-1. Connect the probe as shown in Fig. 5.
- C-2. Adjust VR2 for minimum output offset voltage.
- C-3. The criterion is  $-5\text{mV} \leq V_{out} \leq +5\text{mV}$ .

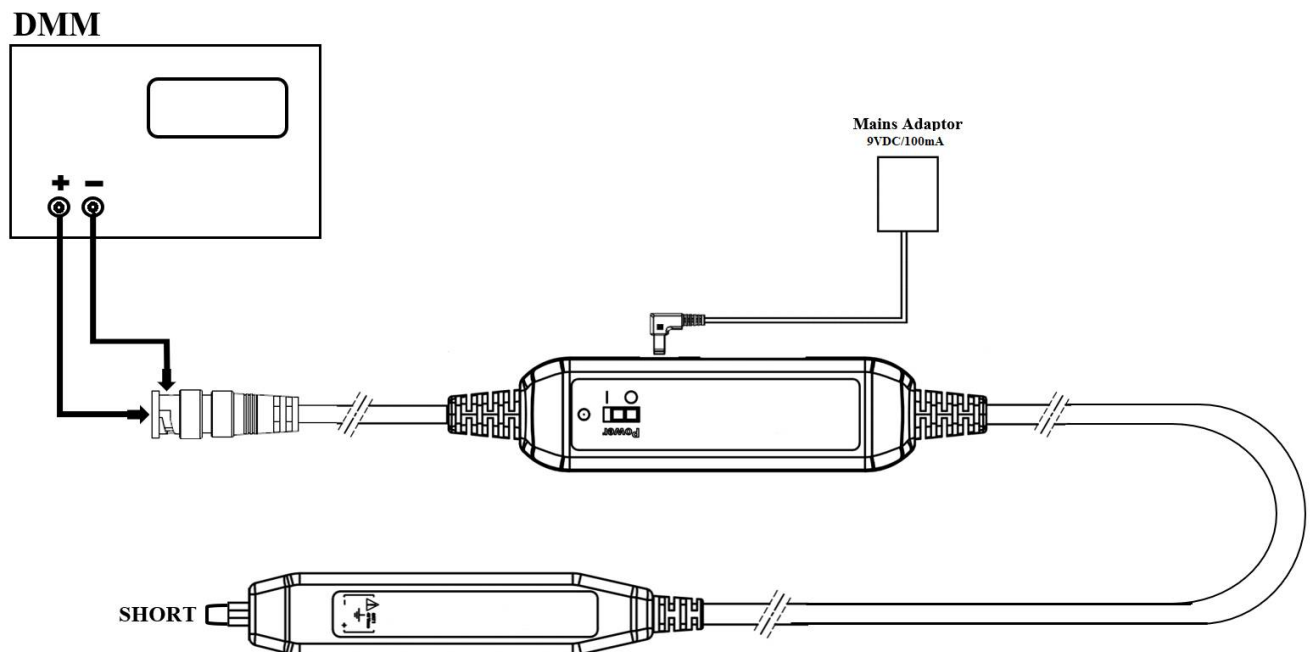


Fig. 5

#### D. Adjust CMRR at 60Hz

- D-1. Connect the probe as shown in Fig. 6.
- D-2. Set the output of the function generator to 20Vp-p 60Hz sine-wave.
- D-3. Set the input impedance of the oscilloscope to 50-ohm. If the oscilloscope doesn't provide the 50-ohm input impedance, add a feed through 50-ohm terminator to the input.
- D-4. Set the VOLTS/DIV of the oscilloscope's panel to 1mV and the TIME/DIV to 2mS.
- D-5. Adjust VR1 for minimum  $V_{out}$  displayed on the oscilloscope.
- D-6. The criterion is  $V_{out} \leq 5\text{mVp-p}$ .

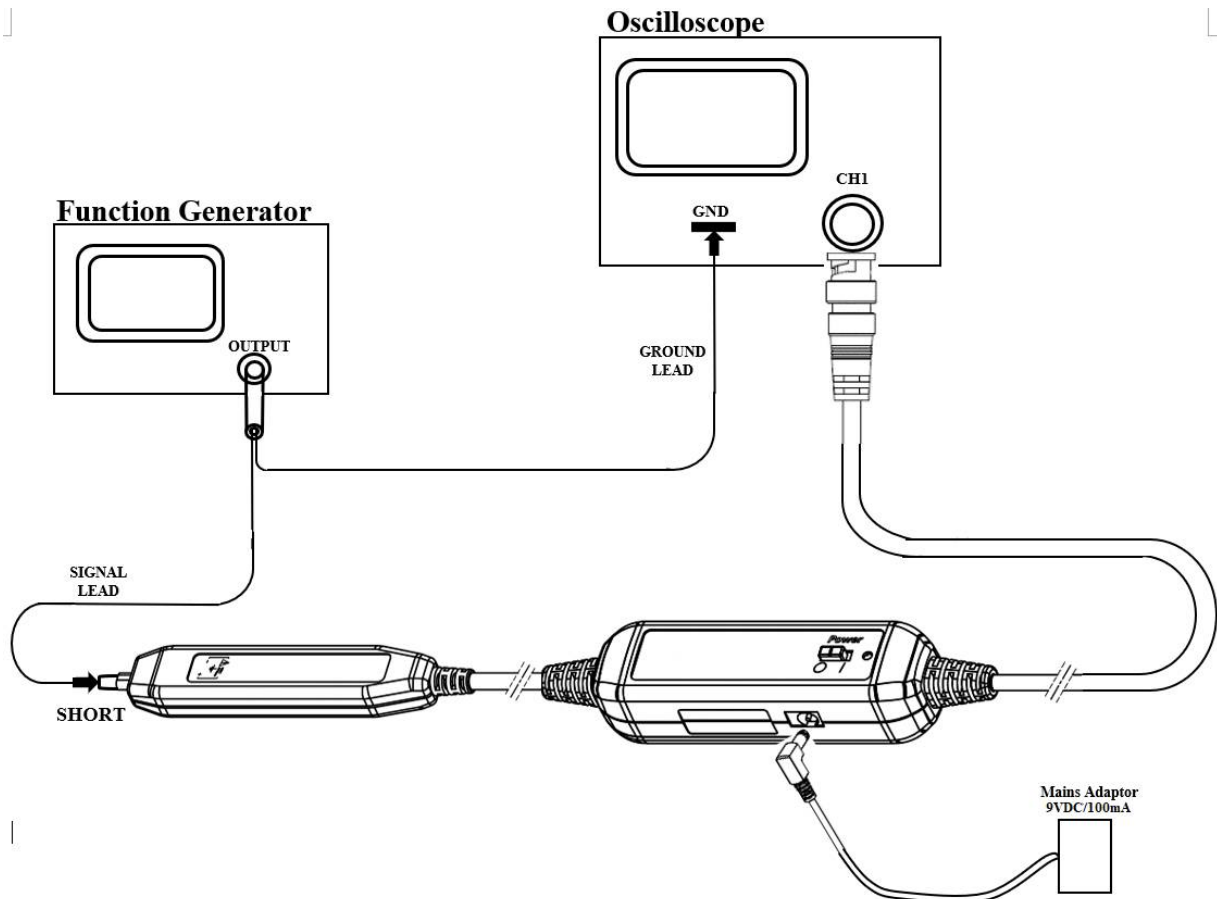


Fig. 6

#### E. Adjust square-wave compensation for +input.

- E-1. Connect the probe as shown in Fig. 7.
- E-2. Set the output of the function generator to 1.4Vp-p, 100KHz square-wave.
- E-3. Set the input impedance of the oscilloscope to 50-ohm. If the oscilloscope doesn't provide the 50-ohm input impedance, add a feed through 50-ohm terminator to the input.
- E-4. Set the VOLTS/DIV of the oscilloscope's panel to 100mV and the TIME/DIV to 2uS.
- E-5. Adjust VC1 to make the front corner roll off or overshoot of the square-wave displayed on the oscilloscope less than 2.8mV.

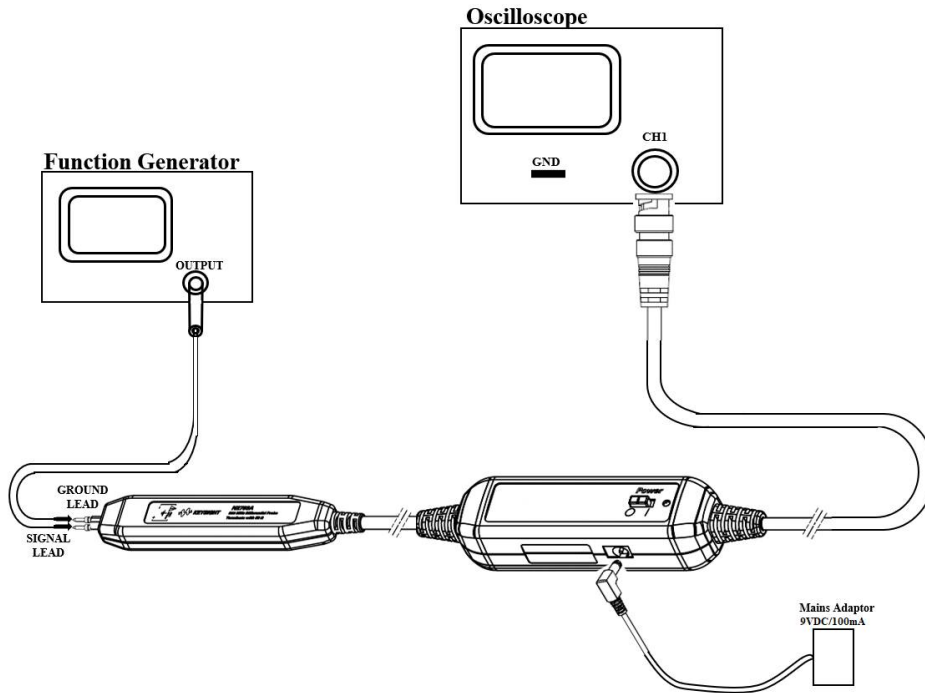


Fig. 7

**F. Adjust square-wave compensation for -input.**

- F-1. Connect the probe as shown in Fig. 8.
- F-2. Set the output of the function generator to 1.4Vp-p, 100KHz square-wave.
- F-3. Set the input impedance of the oscilloscope to 50-ohm. If the oscilloscope doesn't provide the 50-ohm input impedance, add a feed through 50-ohm terminator to the input.
- F-4. Set the VOLTS/DIV of the oscilloscope's panel to 100mV and the TIME/DIV to 2uS.
- F-5. Adjust VC2 to make the front corner roll off or overshoot of the square-wave displayed on the oscilloscope less than 2.8mV.

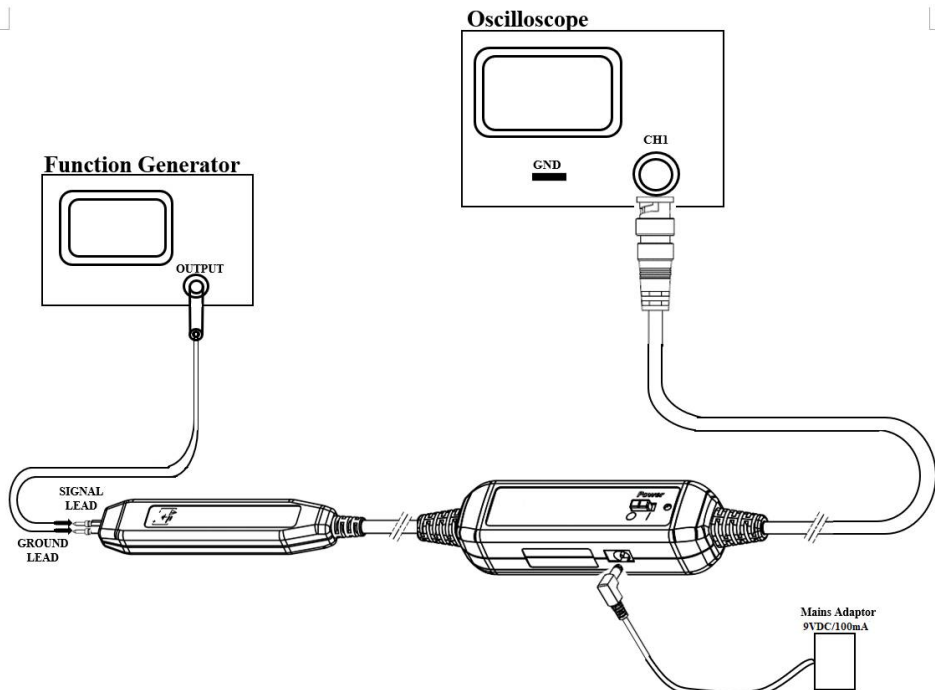


Fig. 8

### G. Adjust CMRR at 1MHz

- G-1. Connect the probe as shown in Fig. 9.
- G-2. Set the output of the function generator to 20Vp-p 1MHz sine-wave.
- G-3. Set the input impedance of the oscilloscope to 50-ohm. If the oscilloscope doesn't provide the 50-ohm input impedance, add a feed through 50-ohm terminator to the input.
- G-4. Set the VOLTS/DIV of the oscilloscope's panel to 1mV and the TIME/DIV to 2mS.
- G-5. Adjust VC2 for minimum  $V_{out}$  displayed on the oscilloscope.
- G-6. The criterion is  $V_{out} \leq 5\text{mVp-p}$ .

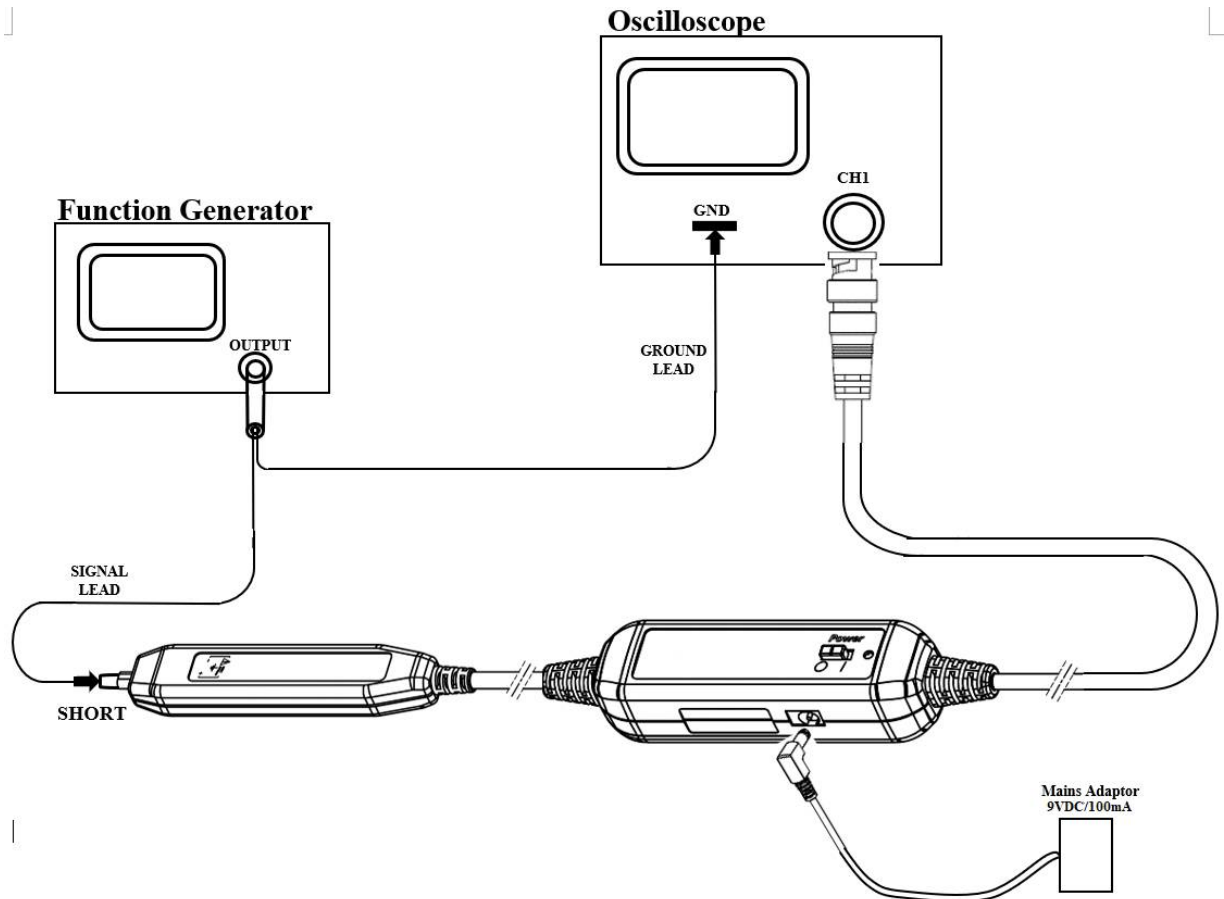


Fig. 9