I,V, R Probe - QC Manual

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The I, V, and R Probes are highly adaptable, plug and play modules to measure current, voltage, and resistance, respectively. This manual is intended to serve as a quick guide for effectively testing these instruments while manufacturing their PCBs.

Procedure for testing the I, V, R Probes:

V Probe

For testing a V Probe, we will measure the voltage of a known power source, e.g., a battery. The steps are as follows:

1. Connect V probe to one of the analog channels of the PhysLogger, which is further attached to the PC. The red LED of V Probe should turn on.
2. In the PhysLogger application, select 'PhysLogger' and continue.
3. To measure voltage, click on Measure > Voltage. Set the input voltage range [-10V to +10V] for the channel to which your V probe is connected and then, click "Proceed".
4. Connect the two terminals of the battery of 8 V (the voltage of which is to be determined) with the two terminals of the V probe (keeping in mind the polarity of the connections) as shown in Figure 1.
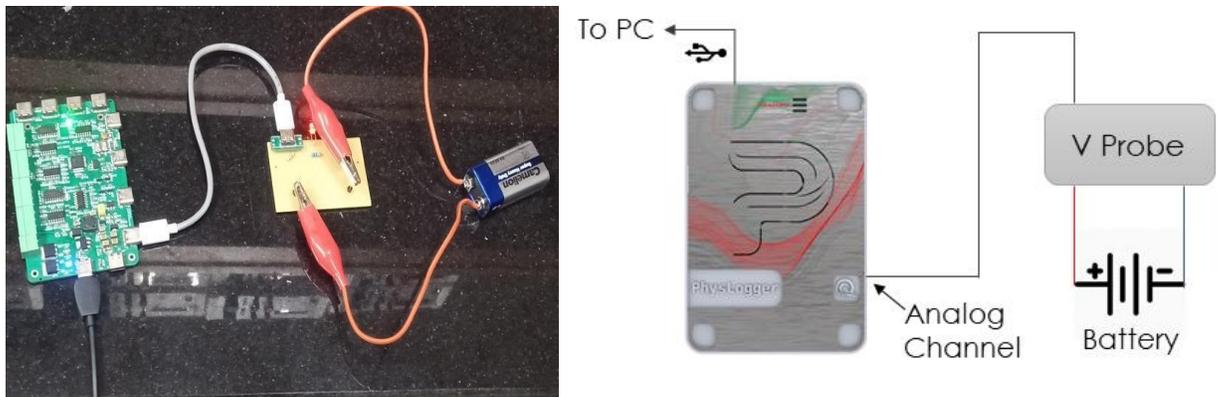
Figure 1: (a) A Photograph of the Setup, and (b) Schematic diagram of the connections required for quality testing a V Probe.

5. Plot a live graph of the voltage. The peak voltage appearing on the graph should be 7.98 V to 8 V (for a battery of 8 V) as shown in Figure 2. If the voltage displayed on PhysLogger App for this battery does not correspond to this range, it indicates that the PCB is defective. (To confirm, you may check the voltage of the battery with a typical multimeter as well.)
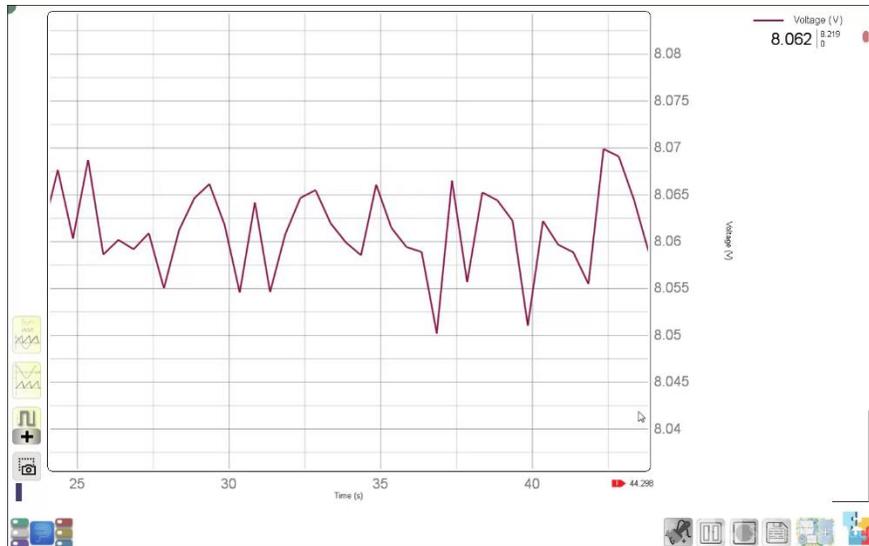
Figure 2: A live graph of the voltage obtained in PhysLogger App using V-Probe.

6. Reverse the terminals of the battery connected to the V probe. Plot a live graph of the voltage again. The value of the peak voltage should be the same as earlier but with a negative sign.

I Probe

For testing an I Probe, perform the following steps:

1. Connect I probe to one of the analog channels of the PhysLogger which is further linked to a PC.
2. In the PhysLogger App, select 'PhysLogger' and continue.
3. Click on Measure > Voltage. Set the input voltage range [-1V to +1V] for the channel to which your I probe is connected and then, click "Proceed".
4. Attach a resistor of 4.7 Ω, 5 W to one of the terminals of the I probe as shown in Figure 3.

(a)
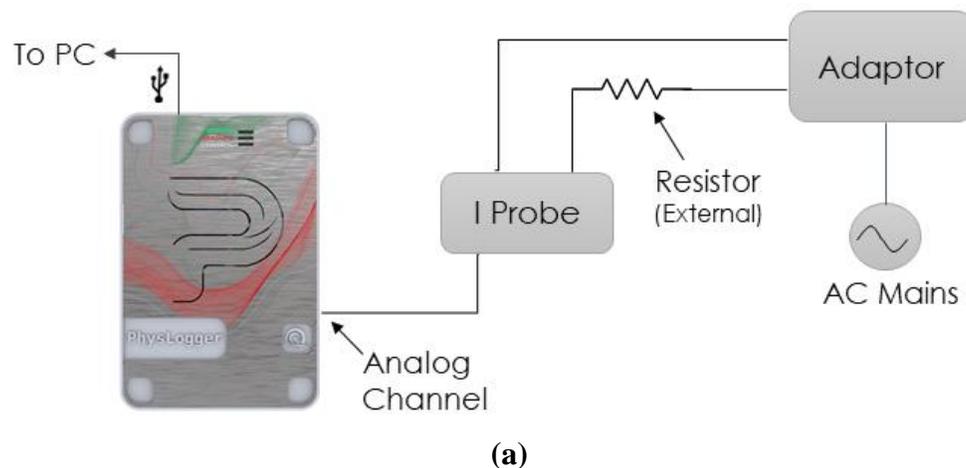
(b)

Figure 3: (a) Schematic diagram, and (b) a photograph showing the connections required for testing an I Probe.

5. Connect a DC voltage adapter to the two terminals of the I probe.
6. Plot a live graph of voltage.
7. The voltage displayed on the live plot is according to this equation that follows Kirchoff's law:
   V * (R1 / (R1 + R2)) where,
   R1 is the internal resistance of I Probe and is equal to 0.1 Ω;
   R2 is the resistance of the external resistor attached (4.7 Ω in this case);
   and V is the DC source voltage (supplied by adapter).
   For example, Figure 4 demonstrates a live plot with a peak voltage in the range of 80 mV to 85 mV when the adapter was outputting a voltage of 4V.
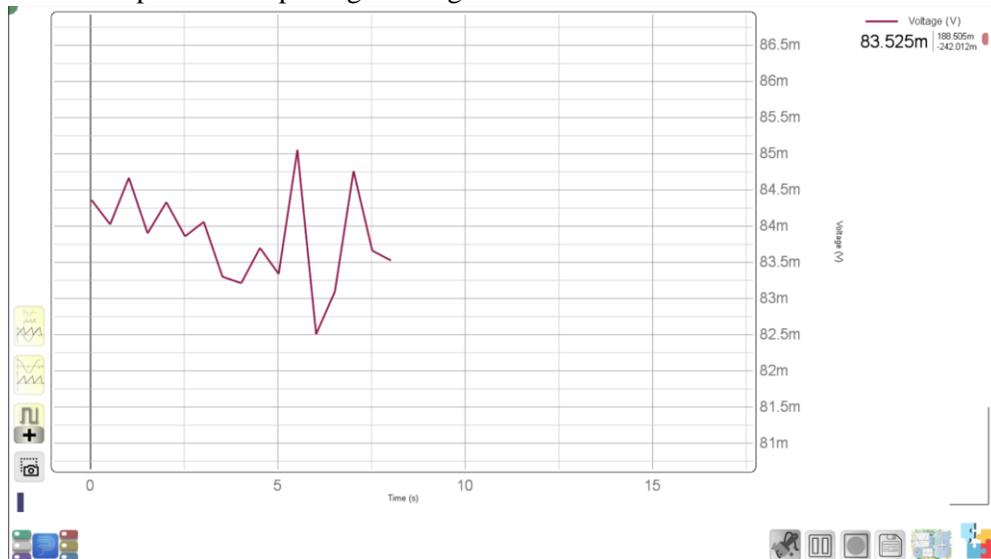
Figure 4: A live plot of the voltage obtained in PhysLogger Desktop App using I Probe.

R Probe

For testing a R Probe, perform the following steps:

1. Connect R probe to one of the analog channels of the PhysLogger, which is further attached to the PC.
2. In the PhysLogger application, select 'PhysLogger' and continue.
3. To measure the resistance, click on Measure > Resistance. Set the input resistance range {50 kΩ} of the channel to which your R probe is connected to and then, click "Proceed".
4. Connect the two ends of the resistor with the two terminals of the R probe as shown in Figure 5. **Note**: To simplify plugging and unplugging, a resistor is soldered to the crocodile wires.

(a)

(b)
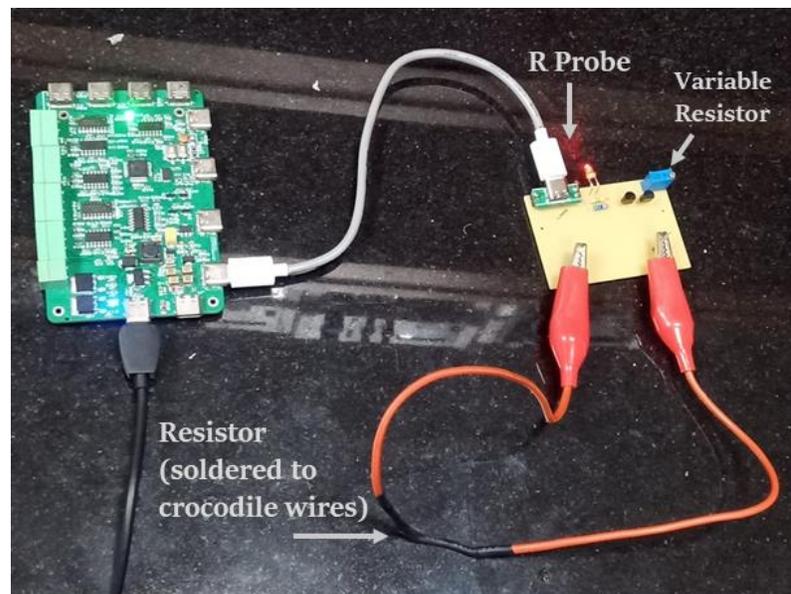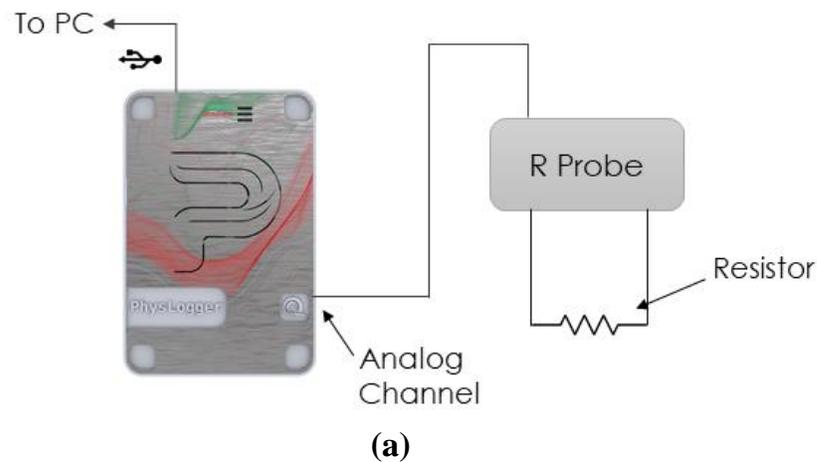
Figure 5: (a) Schematic depicting the connections required to test the R Probe, and (b) A Photograph of the setup.

5. Plot a live graph of resistance. The resistance value displayed on the live plot should be the same as the resistance measured by DM3068 Rigol Multimeter as shown in Figure 6.

6. If there is any difference, it needs to be adjusted by rotating the variable resistor, shown in Figure 5 (b), using a screwdriver. Rotate this resistor until both values coincide.
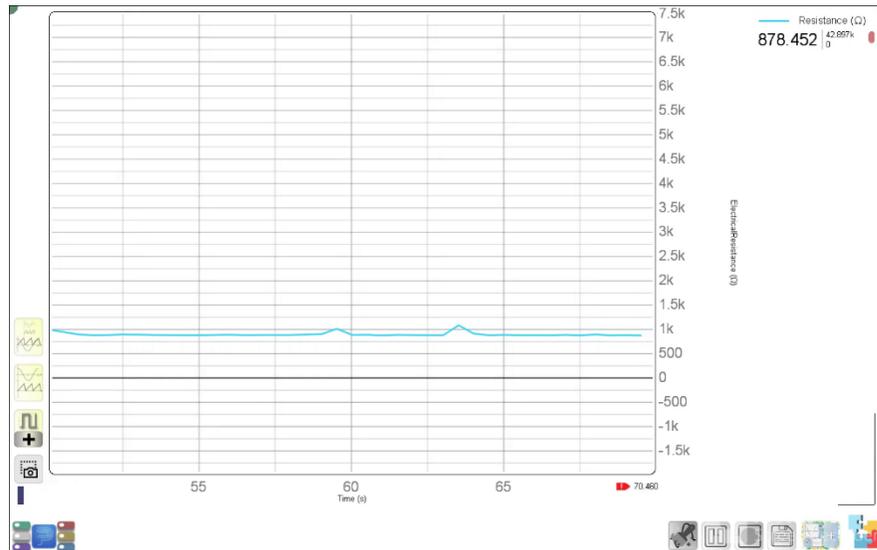
Figure 6: A live plot of the resistance obtained in PhysLogger App using R-Probe.

7. To ensure the best accurate testing, repeat the same procedure with some different resistors (4.5 kΩ, 6 kΩ, etc.).