Array 372xA Calibration Methods

1 Calibration Equipments

Digital Voltmeter (DVM):

ARRAY M3500：To test the DC current below 3.5A;

KEITHLEY 2000：To test the DC voltage and measure the large current with a shunt resistance of 2.2mΩ;

Shunt Resistance：PBV 2.2mΩ 50ppm 10W；

DC Power Source：

HP 6674A：To calibrate CC and CR；

ARRAY 3646A：To calibrate CV；

ARRAY 3631A：To calibrate CR；

2 Notes

● The environment temperature should be within a range of 25±2℃. All the testing devices should be heated for 30 minutes before the calibration. And the electronic load also needs a warm up for 30 minutes.

● Before the calibration, please measure the value of the shunt resistance accurately to avoid the metering errors caused by temperature.

● As a shunt resistance of 2.2mΩ, its value is small , so its voltage drop is low as well. And the contact resistance and thermo-emf between the shunt resistance lead-out line and the test probe will influence testing accuracy and stability. As a result, please use special wire to connect resistance test pin to the input terminal of DVM.

● when KEITHLEY 2000 and the 2.2mΩ shunt resistance are used to measure the heavy current, KEITHLEY 2000 should be set to DC 100 mV voltage to get the voltage drop in the shunt resistance. Then make use of the MX+B function of KEITHLEY2000 to make its show value is equal to its actual current value. The M value should be calculated according to the shunt resistance value. M = 1 / R, R represents the shunt resistance value, the unit is mΩ, and B value is set as 0. To improve the testing accuracy, please short the input of KEITHLEY 2000 and use Rel function to clear the zero drift of the DVM. To ensure the accuracy of the value displayed in KEITHLEY 2000, please set ARRAY M3500 to 3A and connect it with the shunt resistance in series, and then input a 3A current to observe if the show value in KEITHLEY 2000 is the same with that in ARRAY M3500.

●when the shunt resistance is electrified, its temperature will grow up and the resistance value will change, accordingly the testing precision will be affected. Therefore please measure the large current as soon as possible.

3 Gain Adjustment of the Current Measurement Amplifier

After manufacturing or maintenance, it needs to adjust the current measurement amplifier gain. And there is no need for further adjustment after later calibrations.

Set the output of ARRAY 3631A as 5V 4A and connect it to the electronic load calibrated. At the same time, set ARRAY M3500 to 3A and connect it with the other devices in series.。

Set the load as CCH 3A, adjust RP1 to make the current value showed in ARRAY M3500 be between 2.99A to 3.00A.

4 Calibration Methods

Power on the load by pressing “0” in the keyboard, input the password”1566” and press ‘’Enter” to enter into calibration menu. Make a choice in the calibration menu via the direction key and enter into the procedures for CC or CV or CR calibration. If choose DEF, all calibration parameters will be restored to the default value. The accuracy of CP mode depends on correction parameters of CC and CV mode. A particular calibration for it is not required.

The correct calibration sequence is CC, CV and next CR. After the calibration for each mode, please return to the calibration menu. And press “ESC” to quit calibration state.

4.1 CC Mode Calibrations

Please calibrate CCL and CCH range to complete CC mode calibration. In CCL mode, it needs to test 0.5mA and 2.8A current points; while in CCH mode, it needs to test 1mA and 28A current

points.

4.1.1 CCL

Make the wire connection as shown in Figure 1. Set the output of HP 6674A as 5V 4A.

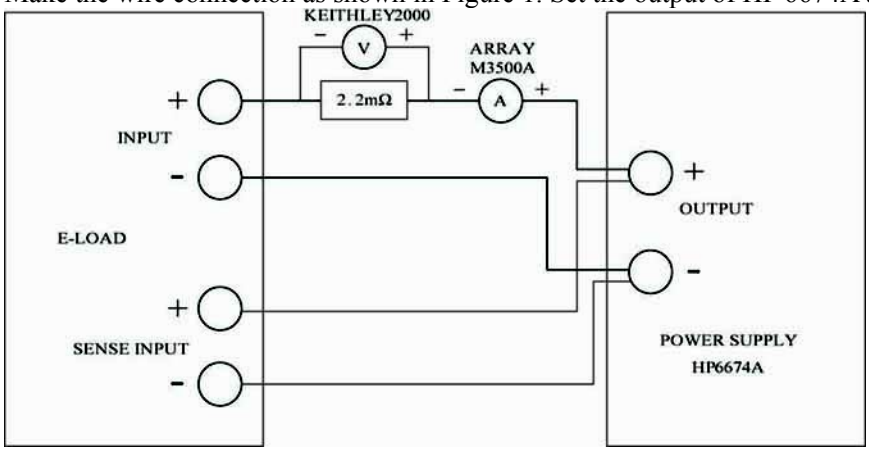


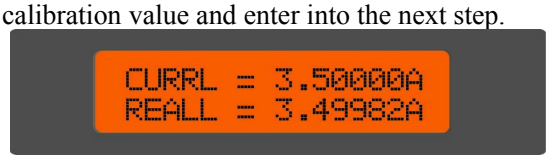
Figure 1

● 0.5mA Calibration

Set ARRAY M3500 as DC 10mA, and the load display interface is illustrated by the following figure. Rotate the load knob counter clockwise firstly, the adjusting parameters in the load will decrease, and the load current will increase. Then observe the load current with ARRAY M3500 and make the current as a value between 1mA to 10mA. Turn the load knob clockwise to make ARRAY M3500 show as 0.5mA. Press Enter to affirm adjusting parameters and enter into the next step.

● 2.8A Calibration

Switch ARRAY M3500 to DC 3A, and the displayed current value is about 2.8A. For example, if the actual current is 2.79982A, input this value with the load keys, as shown in the figure below. Then press Enter to affirm calibration value and enter into the next step.



4.1.2 CCH

Make the wire connection as shown in figure 1. Set the output of HP 6674A as 5V 4A

● 1mA Calibration

Set ARRAY M3500 as DC 10mA, and the load display interface is illustrated by the following figure. Rotate the load knob counter clockwise firstly, the adjusting parameters in the load will decrease, and the load current will increase. Then observe the load current with ARRAY M3500 and make the current as a value between 1mA to 10mA. Turn the load knob clockwise to make ARRAY M3500 show as 1mA. Press Enter to affirm adjusting parameters. Disable HP 6674A output and enter into the next step.

Notes：As the test for the 28A current will be carried out in the following, please make sure to disable HP 6674A output before that to avoid the damage to the current location of ARRAY M3500.

● 28A Calibration

Make the wire connection as shown in Figure 2. Set KEITHLEY 2000 to DC 100mV and enable MX+B function. Calculate M value through the shunt resistance value: M = 1 / R, (the unit of R is mΩ). Input that value to KEITHLEY 2000 and B value is 0.

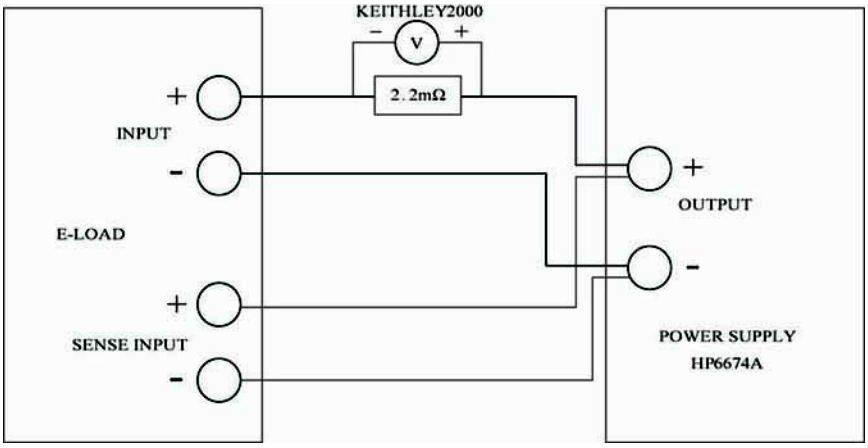


Figure 2

Enable HP 6674A output, the value displayed in KEITHLEY 2000 is about 28. If the value is 28.0012, input this value with the load keyboard, which is explained by the figure below. Then press Enter to affirm calibration value. At this time, the instrument will ask if the prior calibration data should be stored. Press Enter to store calibration value and exit to the calibration menu.

4.2 CV Mode Calibration

To complete the calibration of CV mode, it only needs to test 1mV and 70V voltage point.

Make the wire connection as Figure 3. Set ARRAY 3646A as 5V 0.05A. And use KEITHLEY 2000 to measure DC voltage.

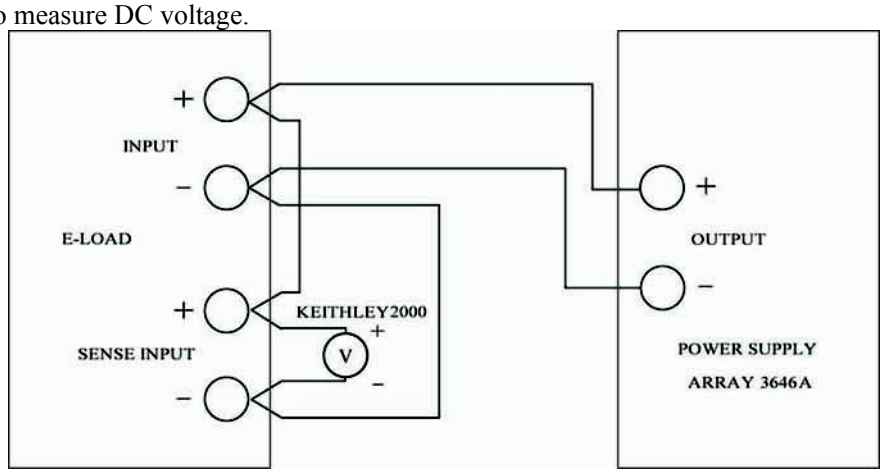
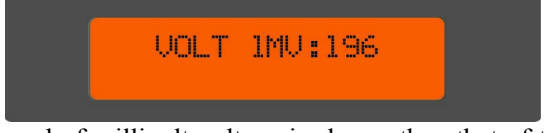


Figure 3

● 1mV Calibration

The load display interface is illustrated by the following figure. Rotate the load knob clockwise firstly, the adjusting parameters in the load will increase, and the load input voltage will increase as well. Then observe the load voltage with KEITHLEY 2000 to make the voltage as a value between 1mV to 10mV. Turn the load knob counter clockwise to make the voltage decrease to about 1mV. Press Enter to affirm adjusting parameters and enter into the next step.



Notes: As the adjustment speed of millivolt voltage is slower than that of the current, please turn the knob slowly to adjust the parameters till the voltage is stable.

● 70V Calibration

Set ARRAY 3646A output as 72V 0.05A and the voltage displayed is about 70V. If the actual test value is 70.0012V, input this value through load keys, as shown in the figure below. Press Enter to affirm. At this time, the instrument will ask if the prior calibration data should be stored. Press Enter to store the calibration value and exit to the calibration menu.

4.3 CR Mode Calibration

CR mode calibration includes the calibration of CRL, CRM and CRH. CRL calibration requires the test of zero and 2Ωpoint, CRM calibration requires the test of 2Ω point and CRH calibration requires the test of 20Ωpoint.

4.3.1 CRL

● Zero Point Adjustment

Zero Point Adjustment aims at making the input current in proportion to the input voltage in CR mode. When regulating, it is need to input two kinds of current: I1 and I2. And it is also need to test two kinds of voltage V1 and V2 when inputting I2 into the electronic load. Through zero point adjustment, V1: V2 = I1: I2. For operation convenience, set I2 ten times as large as I1 and set V2 ten times as large as V1 through adjusting load parameters. In other words, the displayed voltage is the same in the two kinds of current input conditions and just position of the radix point is one digit difference.

Make the wire connection as shown in Figure 4.

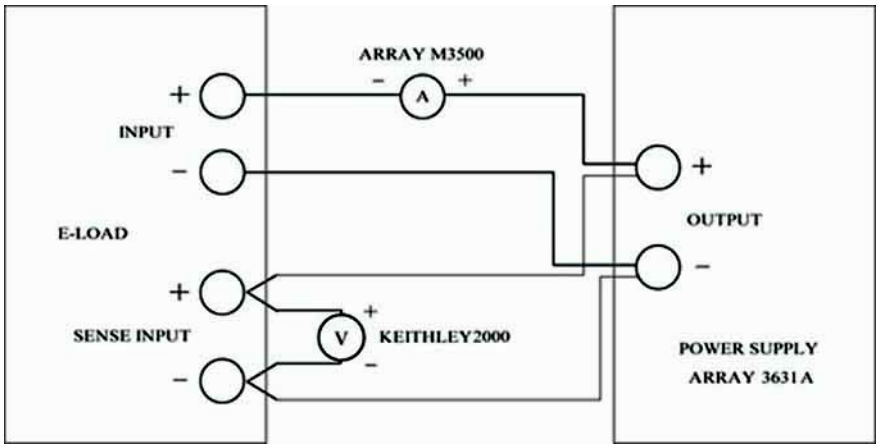


Figure 4

Set ARRAY M350 to DC current, KEITHLEY 2000 to DC voltage and set the output of ARRAY 3631A to 6.2V 0.25A. At this time, the measured current of ARRAY M3500 should be about 0.25A, for instance 0.24936A, which is I1. Then change ARRAY 3631A current to make the displayed current on ARRAY M3500 is ten times of 0.24936A, namely 2.494A, and this value is I2.

Record V2 displayed in KEITHLEY 2000 when the input current is I2, and set ARRAY 3631A current to I1. At this time the voltage reading is V1. Adjust the load knob to make V1 be one tenth of V2.

Adjust ARRAY 3631A output current to I2 again. The voltage reading in this case is different from that in prior condition. Record the voltage at this time, which is V2. Then set the input current as I1 and turn the load knob to make the present voltage reading is one tenth of V2. Repeat this procedure several times until the voltage difference in the two current conditions could be a multiple of ten. Press Enter to affirm and the display interface is shown as below.

● 2ΩCalibration

Make the wire connection as shown in Figure 5.

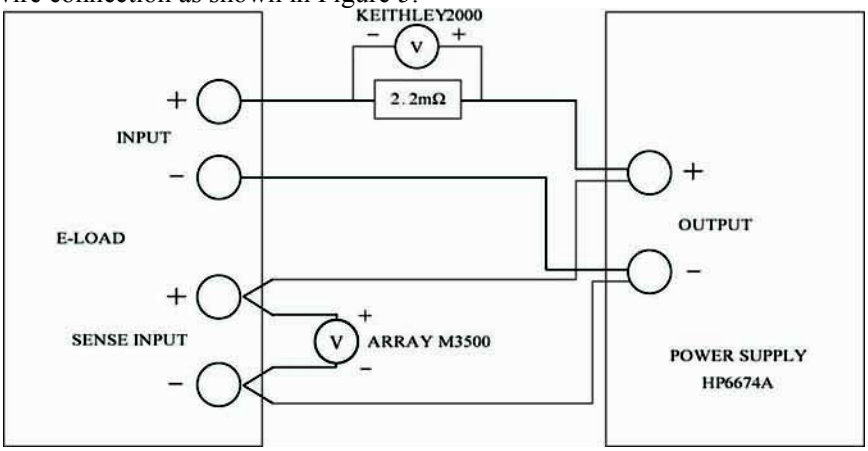


Figure 5

Set HP6674 output as 22V/10A. Calculate the actual resistance according to the measured voltage and the current. Input this value via load keys, press Enter to affirm and enter into the next step.

4.3.2 CRM

● 2Ω Calibration

Make the wire connection as shown in Figure 6.

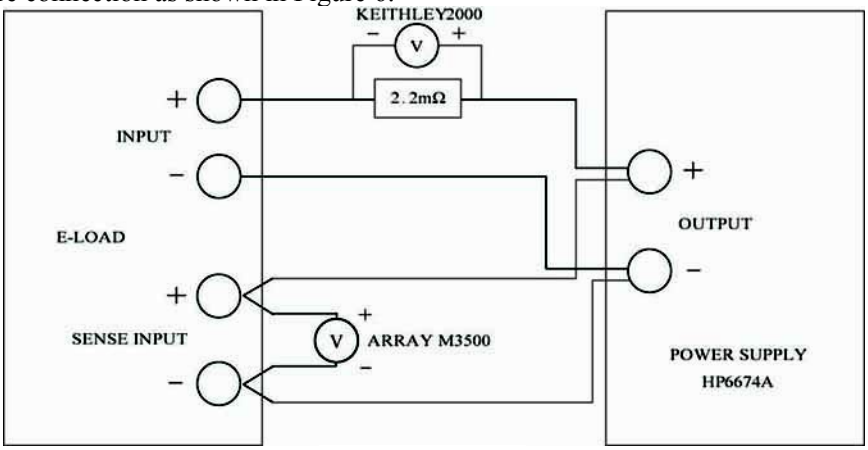


Figure 6

The display interface is shown as below. Set HP6674 output as 20V/12A. Calculate the actual resistance according to the measured voltage and the current. It is about 2Ω. For instance, if the value is 2.0102, input this value via load keys, as shown in the following graph. Press Enter to affirm and enter into the next step.

4.3.3 CRH

● 20Ω Calibration

Make the wire connection as shown in Figure 7.

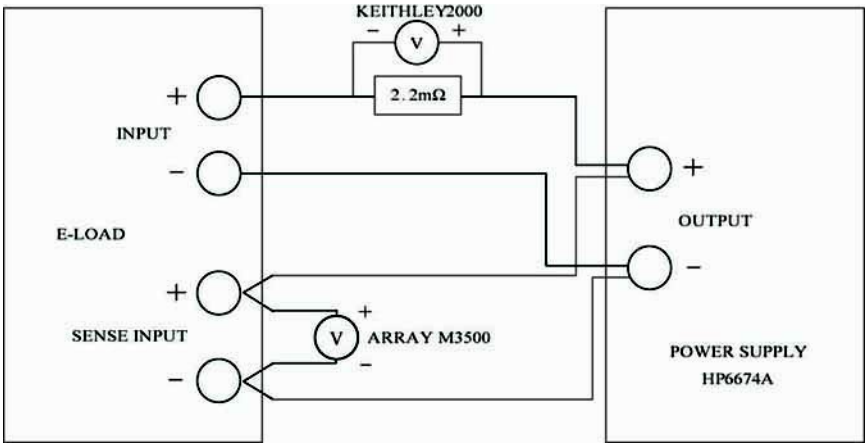


Figure 7

Set HP6674 output as 60V/3.5A. Calculate the actual resistance according to the measured voltage and the current. It is about 20Ω. For instance, if the value is 20.0102, input this value via load keys and press Enter to affirm. The display interface is shown as below. At this time, the instrument will ask if the prior calibration data should be stored. Press Enter again to store the calibration value and return to the calibration menu. Press ESC to exit calibration procedure.