

# **RIGOL**

## **Calibration Guide**

### **DP700 Series Programmable Linear DC Power Supply**

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**RIGOL TECHNOLOGIES, INC.**



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# Document Overview

This manual gives a detailed description of the calibration notices and calibration process of DP700 series programmable linear DC power supply (hereinafter referred to as "DP700 series").

## Main Topics in this Manual:

### Chapter 1 Calibration Notices

This chapter gives a detailed description of the recommended calibration interval, calibration safety, how to stop the calibration, how to acquire the calibration service, the recommended calibration devices, and the precautions during calibration.

### Chapter 2 Calibration Process

This chapter gives a detailed description of the calibration page of DP series and the calibration process for each calibration item.

## Format Conventions in this Manual:

- The function key on the front panel is denoted by the format of "Key Name (Bold) + Text Box" in the manual. For example, **On/Off** denotes the "On/Off" key.
- Use the screen shot to indicate the key. For example,  denotes the **Power** key.

## Content Conventions in this Manual:

DP700 series programmable linear DC power supply includes the following two models. Unless otherwise specified, this manual takes DP711 as an example to illustrate the calibration notices and calibration process of DP700 series.

Model	Number of Channels	Output Voltage/Current
DP711	1	30 V/5 A
DP712	1	50 V/3 A

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# Chapter 1 Calibration Notices

## Calibration Interval

A regular calibration can ensure the performance specifications of DP700 series. The recommended calibration interval is one year. Please perform a regular calibration if a higher accuracy is required for DP700 series.

You are recommended to perform a complete calibration within the recommended calibration interval to guarantee its specifications before the next calibration.

## Calibration Safety

You need to input the correct password before manual calibration each time. The password authentication is to prevent accidental or unauthorized calibration of the instrument.

Before leaving factory, the instrument has been configured with a default calibration password **123456**. The password is stored in the internal non-volatile memory and will not be changed at power-off or remote interface reset.

You can also modify the calibration password. The procedures for modifying the password are as follows:

- (1) In the calibration page, press the Down arrow key or use the knob to switch the parameter focus to "Passwd".
- (2) Press **OK** and then a dialog box is displayed, requesting you to enter the new password. Enter the new password and then press **OK**.
- (3) Then, a dialog box is displayed, prompting you to enter the new password again for confirmation. Enter the confirmed password and then press **OK**.
- (4) Use the Up arrow key or use the knob to switch the parameter focus to "Save", and then press **OK** to save the modified calibration password and exit the calibration page.

**Note:** Please ensure that the confirmed password is the same as the new password that you have entered.

## To Stop the Calibration

During calibration, you can stop the calibration in the following two ways:

- Exit the calibration page by pressing keys or using the knob.

In the calibration page, use the Up arrow key or the knob to switch to the "TestCal" tab, then use the Left/Right arrow key or the knob to switch between tabs and exit the calibration page (For the save operation and precautions during calibration, refer to Chapter 2 in this manual).

- Turn off the instrument.

Press the **Power** key  to turn off the instrument.

When you stop calibration, the saved calibration data will not be lost. You do not need to calibrate the items already calibrated again in the next calibration.



### CAUTION

If you stop calibration when the instrument is writing the new calibration factors into the internal non-volatile memory, you may lose all the calibration factors and you need to perform the calibration for all the required items again.

## To Acquire the Calibration Service

**RIGOL** does not recommend users to perform manual calibration by themselves. If calibration is required, please contact **RIGOL** customer service department or the local distributor.

## Recommended Calibration Devices

You are recommended to use the devices listed in Table 1-1 or other devices whose performance specifications meet the "Performance Requirement" listed in Table 1-1.

Table 1-1 Recommended Calibration Devices

Device	Performance Requirement	Recommended Model
Digital Multimeter	6 <sup>1</sup> / <sub>2</sub>	<b>RIGOL</b> DM3068
Test Probe	Connect the output terminals of DP700 series and the input terminals of the multimeter	--

## Calibration Precautions

To achieve an optimal performance, you should follow the advices below to perform all the calibration procedures.

- Ensure that the ambient temperature stays between 18°C and 28°C. Ideally, the calibration should be performed at  $23^{\circ}\text{C}\pm 1^{\circ}\text{C}$ .
- Ensure that the ambient relative humidity is less than 80%.
- Ensure that the instrument has been warmed up for at least 30 minutes before the calibration.
- Keep the cables of the test probe as short as possible.



## Chapter 2 Calibration Process

The predures for calibration process for DP700 series are as follows:

**Step 1** Enter the calibration page

**Step 2** Select the calibration item

**Step 3** Select the calibration point

**Step 4** Enter the measurement value

**Step 5** Complete the calibration

**Step 6** Save the calibration data

The detailed operation method for each step is as follows:

### Step 1 Enter the calibration page

- (1) Warm up DP700 series for at least 30 minutes.
- (2) Press **System** to enter the system utility function interface. Press the Left/Right arrow key or use the knob to select the "TestCal" tab, as shown in Figure 2-1.

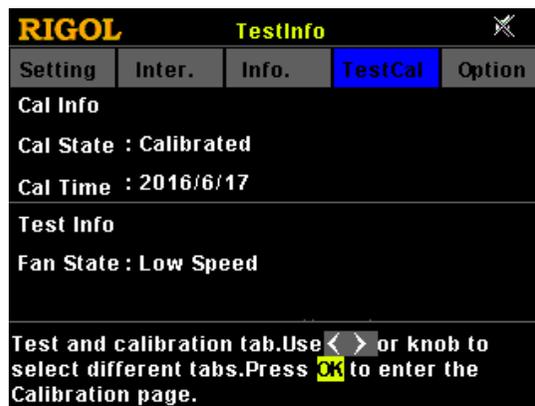


Figure 2-1 "TestCal" Tab

- (3) Press **OK**. Then, a message is displayed, prompting you to enter the password. Enter the correct calibration password. For the operation methods, refer to the descriptions of the help information below the instrument interface, as shown in Figure 2-2.

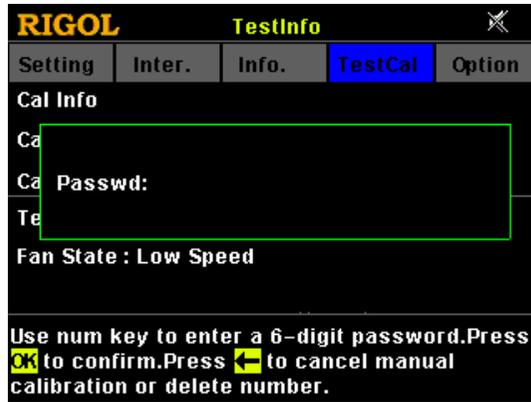


Figure 2-2 Calibration Password Input Box

- (4) Press **OK** to confirm your password, and then you enter the calibration page, as shown in Figure 2-3.

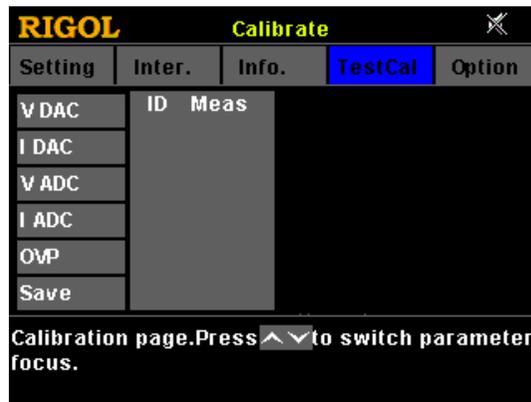


Figure 2-3 Calibration Page

### Step 2 Select the calibration item

In the calibration page, press Up/Down arrow key or use the knob to switch the calibration items. The calibration items for DP700 series are available in Table 2-1. You can select one or multiple items for calibration. **RIGOL** recommends that you perform the calibration for all the available items.

Table 2-1 Calibration Items

No.	Calibration Item
1	V DAC (calibrate the accuracy of the output voltage)
2	I DAC (calibrate the accuracy of the output current)
3	V ADC (calibrate the accuracy of the readback voltage)
4	I ADC (calibrate the accuracy of the readback current)
5	OVP (calibrate the accuracy of the overvoltage protection setting value)

**Note:**

- During calibrating the items, ensure that no load is connected to the output terminals.
- OVP calibration does not need any calibration devices. For its detailed calibration operation, see the following contents.
- After you complete the calibration, restart the instrument.

**Step 3 Select the calibration point**

After you select the calibration item, press the Right arrow key to switch to the calibration point. Then, ID of the first calibration point is highlighted. At this time, press the Down arrow key or use the knob to switch the calibration point.

**Note:** To guarantee the calibration effects, calibrate all the calibration points according to its ID sequence (in ascending order).

**Step 4 Enter the measurement value**

After you select the calibration point, press **OK**. Then "Meas" (measurement value) is highlighted and editable (the original values displayed under "Meas" are reference voltage/current values). At this time, use the num key or the knob (for a negative value input, use the knob) to enter the measurement value of the digital multimeter. For setting methods, refer to the descriptions of the help information below the instrument interface or descriptions of "Parameter Setting Method" in *DP700 User's Guide*.

**Step 5 Complete the calibration**

After you select the calibration point and input the measurement value, press **OK**. The value will be written into the system and the calibration for this calibration point is completed. Then, the cursor will be automatically moved to the next calibration point.

If you are calibrating the last calibration point, after you complete the calibration, the cursor will be automatically switched to the ID of the calibration point. Then, you need to press the Up arrow key or use the knob to switch the calibration point; or you can press the Left arrow key to switch to the calibration item.

**Note:** After you input the current measurement value of the digital multimeter, please wait for at least 3 seconds and then press **OK**. Otherwise, the calibration may fail.

## Step 6 Save the calibration data

In the calibration page, press the Up/Down arrow key or use the knob to switch the parameter focus to "Save", then, press **OK** to save the current calibration data and exit the calibration page.

If you calibrated the items but did not save your calibration data, when you exit the calibration page, a dialog box "Save the calibration data?" will be displayed, as shown in Figure 2-4. If you select "YES", the currently calibrated data will be saved and then you exit the calibration page; if "NO", the currently calibrated data will not be saved and then you exit the calibration page.

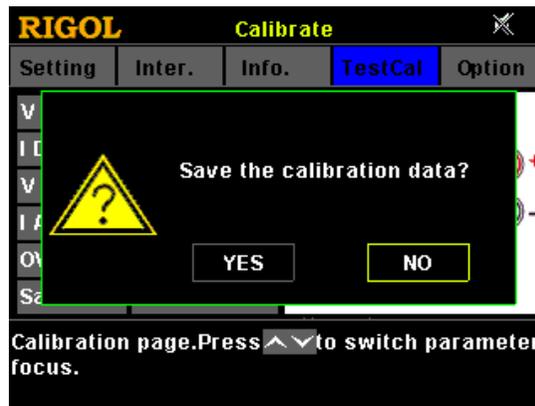


Figure 2-4 "Save the calibration data?" Dialog Box

### Note:

- If you want to calibrate multiple items, **RIGOL** suggests you complete the calibration for all the items and then save the calibration data, so that you do not have to enter the calibration password repeatedly to enter the calibration page for calibrating each calibration item.
- To guarantee the calibration results, perform the save operation for the calibration item after all the calibration points of a certain calibration item are all calibrated.

The following section describes the calibration method for each calibration item.



### CAUTION

Please strictly follow the calibration order listed below to perform the calibration for each item.

## V DAC

This section takes DP711 as an example to introduce the calibration method for the voltage DAC of DP700 series. Unless otherwise specified, this calibration method applies to all the models of the DP700 series.

- (1) Ensure that DP711 has been warmed up for at least 30 minutes. Use the test probe to connect the output terminals of DP711 to the voltage input terminals of the digital multimeter, as shown in Figure 2-5.

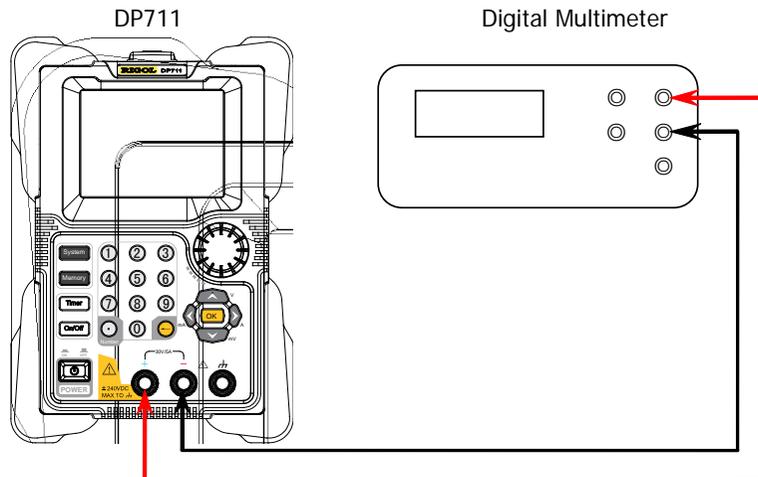


Figure 2-5 Connect DP711 and Digital Multimeter (Voltage)

**Note:** Connect the positive terminal of the digital multimeter with the (+) terminal of the channel output of DP711 and connect the negative terminal of the digital multimeter with the (-) terminal of the channel output of DP711.

- (2) Press **On/Off** on the front panel of DP711 to turn on the channel output.
- (3) Turn on the digital multimeter. Select the DC voltage (DCV) measurement function and set the range to "Auto".
- (4) Enter the DP711 calibration page, and select "V DAC", then press the Right arrow key. The cursor switches to ID of the first calibration point.
- (5) Press **OK**. The Meas value (measurement value) of the selected calibration point is highlighted and editable. Then, use the num key or the knob to enter the measurement value of the digital multimeter.
- (6) Press **OK**, and the measurement value will be written into the system. Thus, you have completed the calibration for the selected calibration point.

- (7) Select the rest of the calibration points according to the ID sequence, then repeat Step (5) and (6) until you complete the calibration operation for all the calibration points.
- (8) Press the Down arrow key or use the knob to switch the parameter focus to "Save", then, press **OK** to save the current calibration data. Till now, you have completed the voltage DAC calibration.

## V ADC

This section takes DP711 as an example to introduce the calibration method for the voltage ADC of DP700 series. Unless otherwise specified, this calibration method applies to all the models of the DP700 series.

- (1) Ensure that DP711 has been warmed up for at least 30 minutes. Use the test probe to connect the output terminals of DP711 to the voltage input terminals of the digital multimeter, as shown in Figure 2-5.
- (2) Press **On/Off** on the front panel of DP711 to turn on the channel output.
- (3) Turn on the digital multimeter. Select the DC voltage (DCV) measurement function and set the range to "Auto".
- (4) Enter the DP711 calibration page, and select "V ADC", then press the Right arrow key. The cursor switches to ID of the first calibration point.
- (5) Press **OK**. The Meas value (measurement value) of the selected calibration point is highlighted and editable. Then, use the num key or the knob to enter the measurement value of the digital multimeter.
- (6) Press **OK**, and the measurement value will be written into the system. Thus, you have completed the calibration for the selected calibration point.
- (7) Select the rest of the calibration points according to the ID sequence, then repeat Step (5) and (6) until you complete the calibration operation for all the calibration points.
- (8) Press the Down arrow key or use the knob to switch the parameter focus to "Save", then, press **OK** to save the current calibration data. Till now, you have completed the voltage ADC calibration.

## I DAC

This section takes DP711 as an example to introduce the calibration method for the current DAC of DP700 series. Unless otherwise specified, this calibration method applies to all the models of the DP700 series.

- (1) Ensure that DP711 has been warmed up for at least 30 minutes. Use the test probe to connect the output terminals of DP711 to the current input terminals of the digital multimeter, as shown in Figure 2-6.

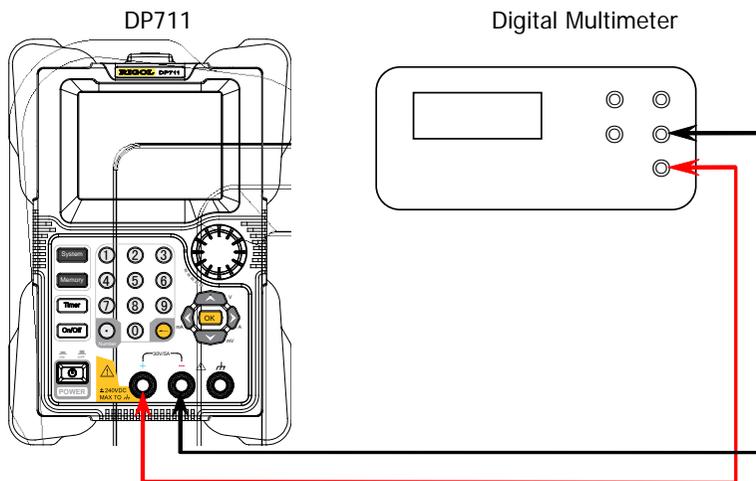


Figure 2-6 Connect DP711 and Digital Multimeter (Current)

**Note:** Connect the positive terminal of the digital multimeter with the (+) terminal of the channel output of DP711 and connect the negative terminal of the digital multimeter with the (-) terminal of the channel output of DP711.

- (2) Press **On/Off** on the front panel of DP711 to turn on the channel output.
- (3) Turn on the digital multimeter. Select the DC current (DCI) measurement function and set the range to "Auto" and the scale to "A".
- (4) Enter the DP711 calibration page, and select "I DAC", then press the Right arrow key. The cursor switches to ID of the first calibration point.
- (5) Press **OK**. The Meas value (measurement value) of the selected calibration point is highlighted and editable. Then, use the num key or the knob to enter the measurement value of the digital multimeter.
- (6) Press **OK**, and the measurement value will be written into the system. Thus, you have completed the calibration for the selected calibration point.

- (7) Select the rest of the calibration points according to the ID sequence, then repeat Step (5) and (6) until you complete the calibration operation for all the calibration points.
- (8) Press the Down arrow key or use the knob to switch the parameter focus to "Save", then, press **OK** to save the current calibration data. Till now, you have completed the current DAC calibration.

## I ADC

This section takes DP711 as an example to introduce the calibration method for the current ADC of DP700 series. Unless otherwise specified, this calibration method applies to all the models of the DP700 series.

- (1) Ensure that DP711 has been warmed up for at least 30 minutes. Use the test probe to connect the output terminals of DP711 to the current input terminals of the digital multimeter, as shown in Figure 2-6.
- (2) Press **On/Off** on the front panel of DP711 to turn on the channel output.
- (3) Turn on the digital multimeter. Select the DC current (DCI) measurement function and set the range to "Auto" and the scale to "A".
- (4) Enter the DP711 calibration page, and select "I ADC", then press the Right arrow key. The cursor switches to ID of the first calibration point.
- (5) Press **OK**. The Meas value (measurement value) of the selected calibration point is highlighted and editable. Then, use the num key or the knob to enter the measurement value of the digital multimeter.
- (6) Press **OK**, and the measurement value will be written into the system. Thus, you have completed the calibration for the selected calibration point.
- (7) Select the rest of the calibration points according to the ID sequence, then repeat Step (5) and (6) until you complete the calibration operation for all the calibration points.
- (8) Press the Down arrow key or use the knob to switch the parameter focus to "Save", then, press **OK** to save the current calibration data. Till now, you have completed the current ADC calibration.

## OVP

This section takes DP711 as an example to introduce the calibration method for the OVP of DP700 series. Unless otherwise specified, this calibration method applies to all the models of the DP700 series.

- (1) Ensure that DP711 has been warmed up for at least 30 minutes.
- (2) Enter the DP711 calibration page, and select "OVP", then press the Right arrow key. The cursor switches to ID of the first calibration point (there is only one calibration point for OVP calibration).
- (3) Press **OK**, and then the **On/Off** key on the front panel of DP711 is illuminated automatically. Then, the instrument starts to perform auto calibration for OVP.
- (4) After the calibration is complete, the backlight of the **On/Off** key is turned off automatically. Then, a prompt message indicating "OVP auto calibration is completed" is displayed, as shown in Figure 2-7.

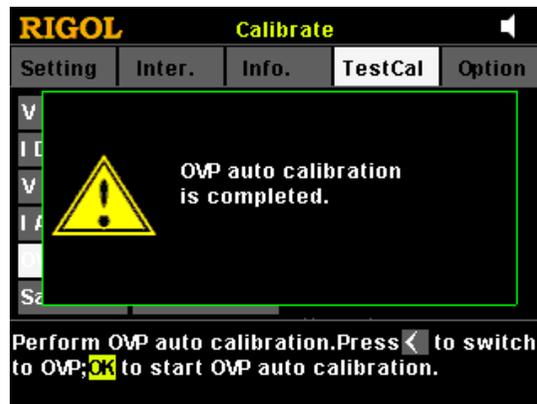


Figure 2-7 "OVP auto calibration is completed" Prompt Message

- (5) Press the Down arrow key or use the knob to switch the parameter focus to "Save", then, press **OK** to save the current calibration data. Till now, you have completed the OVP calibration.