RIGOL

TEST AUTOMATION

For DNA5000/6000 Series

Operation Guide

Mar. 2026

Guaranty and Declaration

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If you have any problem or requirement when using our products or this manual, please contact RIGOL.

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1 Document Overview

This manual provides instructions on how to upgrade the instrument and how to perform the test automation.

Tip: For the latest version of this manual, download it from the official website of RIGOL (http://www.rigol.com).

Format Conventions in this Manual

1. **Key**

   The front panel key is denoted by the menu key icon. For example, 

indicates the "Default" key.

2. **Menu**

   The menu item is denoted by the format of "Menu Name (Bold) + Character Shading" in the manual. For example, Frequency indicates clicking or tapping Frequency to enter the frequency setting menu.

3. **Operation Procedures**

   The next step of the operation is denoted by "**>**" in the manual. For example, Frequency **>** Center indicates that first clicking or tapping Frequency, then clicking or tapping Center.

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2 To Upgrade the Instrument

Before performing the test automation, ensure that your instrument has upgraded to the latest version. First, copy the upgrade package to the USB storage device. Then search for the desired upgrade file and perform the upgrade operation.

The following operations guide you on how to upgrade the instrument.

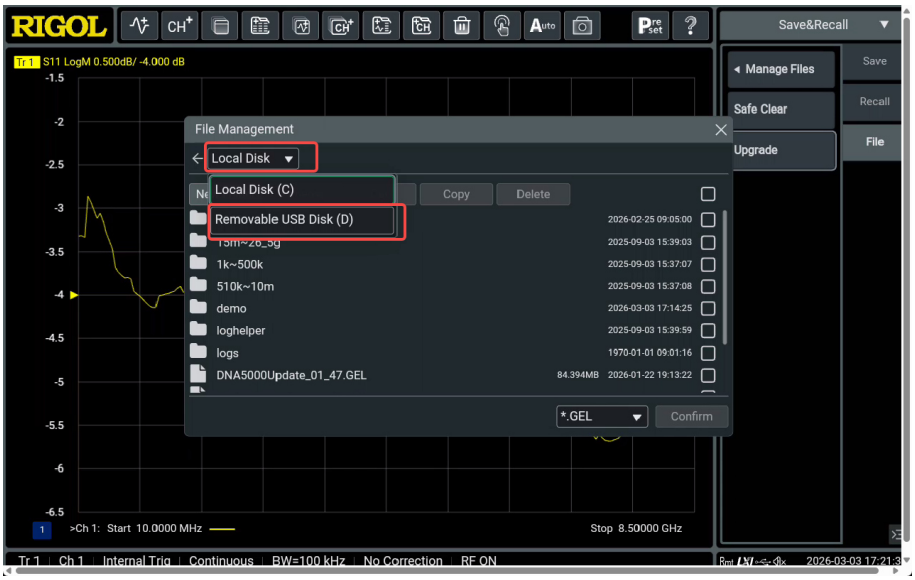
1. Click or tap Save&Recall to enter the Save&Recall menu, as shown in the figure below.



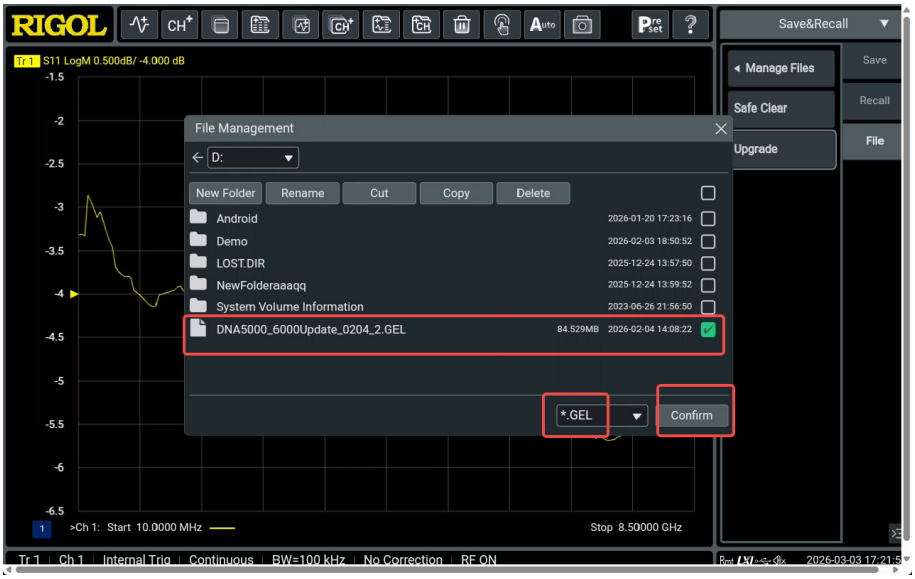
2. Click or tap File > Upgrade to enter the file management interface, as shown in the figure below.



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3. Select the USB storage device where the upgrade file is located. Find and select the upgrade file. Click or tap Confirm to confirm upgrading.



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3 To Perform the Test Automation

After upgrading the instrument, the test automation program is available. Perform the test according to the following procedures.

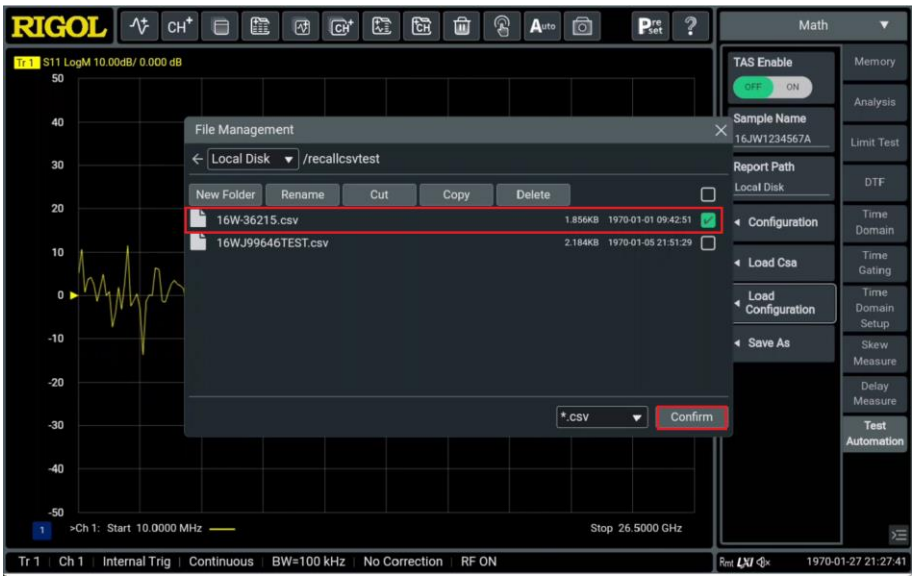
3.1 To Load the Specified File to the Test Automation Program

To perform the test automation, you can load the specified file to perform the test automation.

1. To load the file, click or tap Math > Test Automation > Load Configuration.

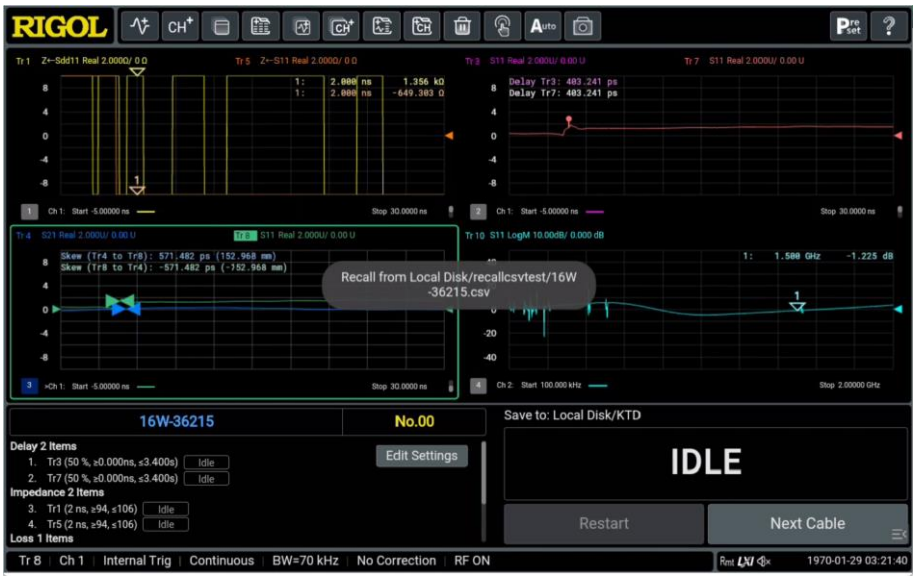


2. The file management interface is displayed. Select the desired file, then click or tap Confirm.



3. Then the file for the test automation is successfully loaded, as shown in the figure below.

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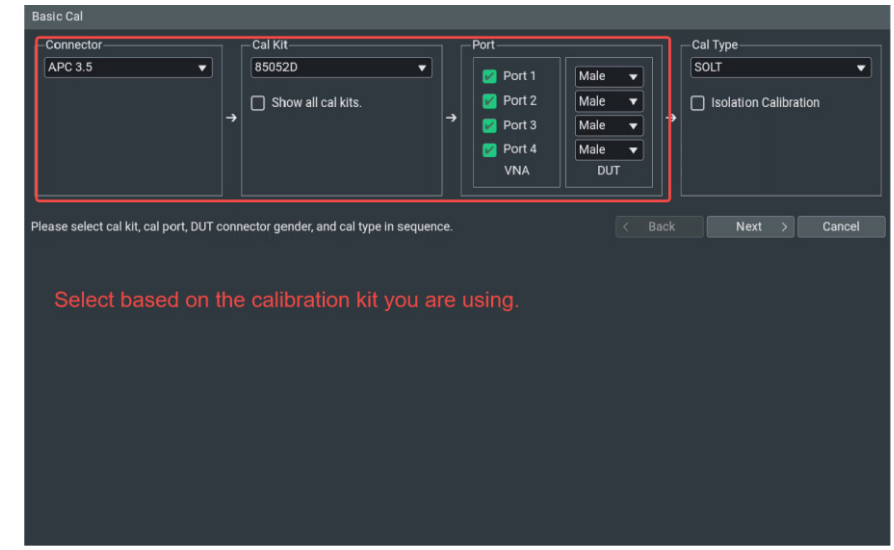
3.2 To Calibrate the Channel

Select the channel to be calibrated. Each channel needs to be calibrated separately.

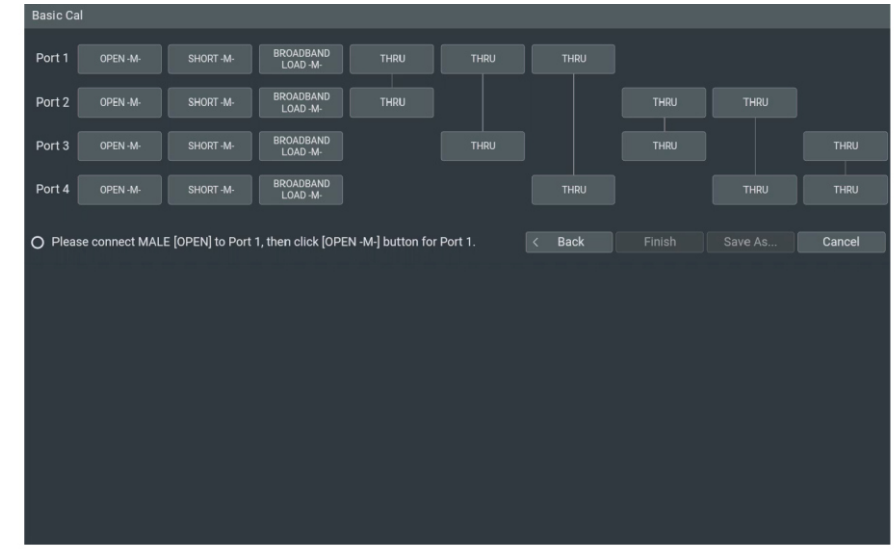
1. Click or tap Calibration > Basic Cal to enter the basic calibration interface.



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In the basic calibration interface, select the desired connector, calibration kit, and the calibration port based on the calibration kit you are using.



Be sure to perform the calibration carefully. After connecting the proper port(s), click or tap the specified calibration kit type for the specified port. Click or tap Finish to complete the calibration. You can also click or tap Save As... to save the calibration data.

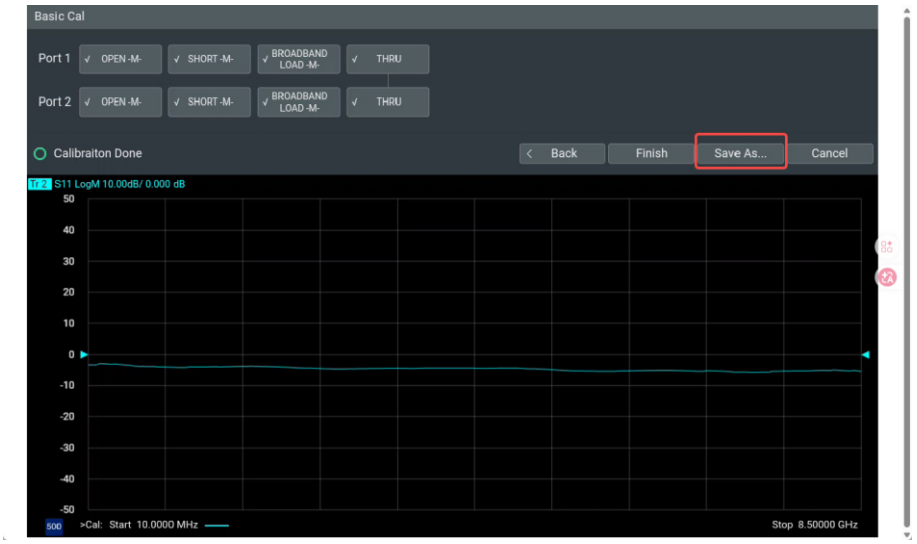
Note:
To avoid recalibrating caused by calibration failure, you can save and load the calibration data.

3.3 To Save and Load Calibration Data

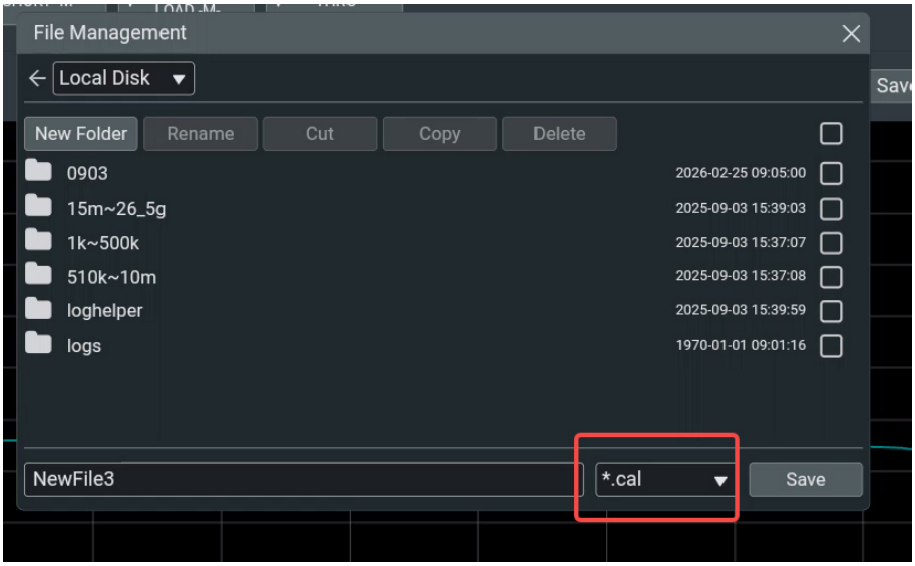
Save the Calibration Data

1. Click or tap Save As... to save the calibration data.

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2. The file management interface is displayed. You can select the desired path and rename the file to be saved. Select the suffix "*.cal". Click or tap Save to save the file suffixed with "*.cal".



Note:
If you don't want to calibrate manually as described above, you can directly load an existing ".cal" file. We recommend you perform the calibration process to ensure better accuracy.

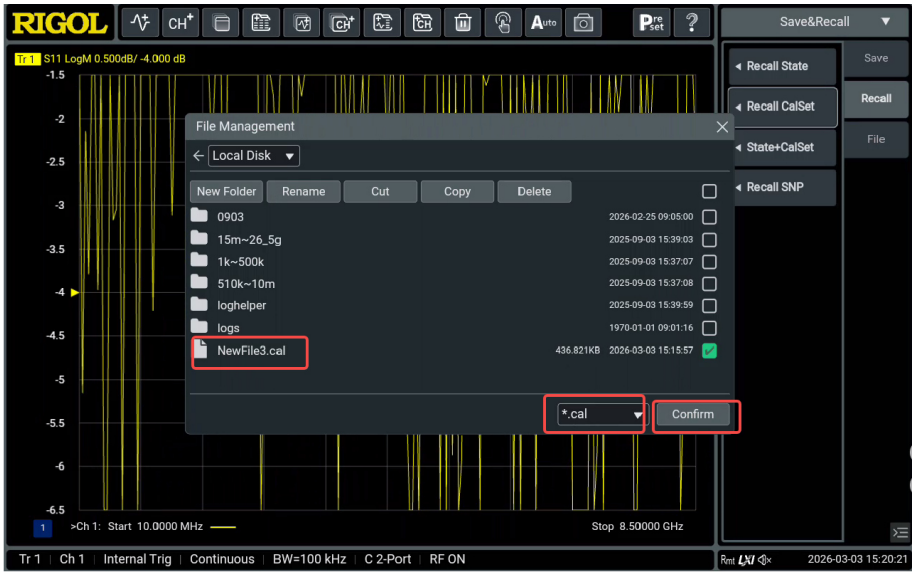
Load the Calibration Data

1. First select the channel to load the calibration data.
   As shown in the figure below, click or tap Save&Recall to enter the Save&Recall menu.
2. Click or tap Recall > Recall CalSet.

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3. Then the file recalling interface is displayed. Select the desired file to load, click or tap Confirm. Then the calibration data file will be loaded successfully.



3.4 Auto Port Extensions Settings

1. Click or tap Measure > Balanced > Topology, then the Balanced Setup interface is displayed.

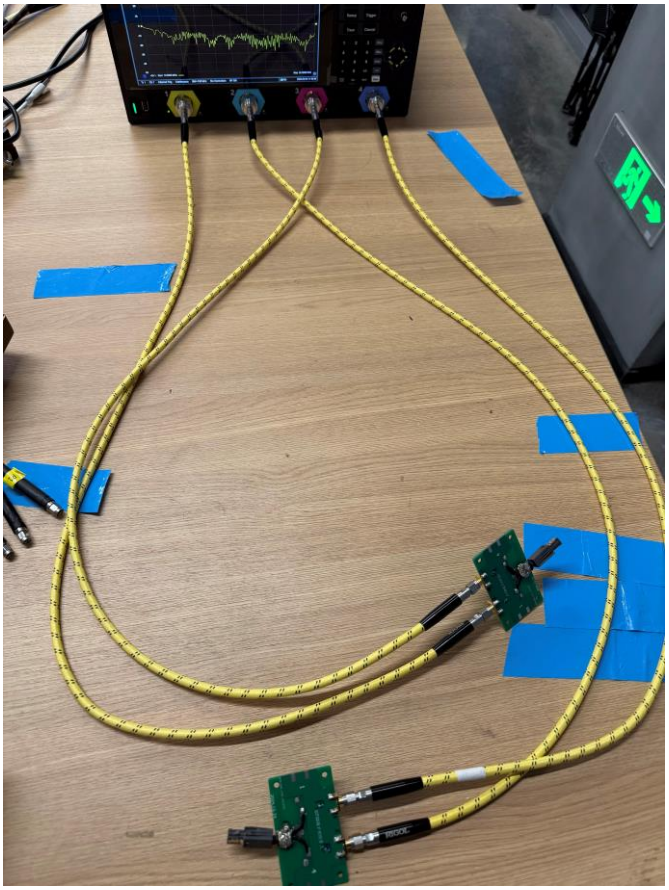
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2. First, connect the fixture to the VNA ports with the cables according to the configured topology. In this setup, Port 1 and Port 3 form one differential pair; Port 2 and Port 4 form another differential pair.

   Note:

   At this stage, do not connect the fixture to the DUT, leave it idle, as shown in the figure below.



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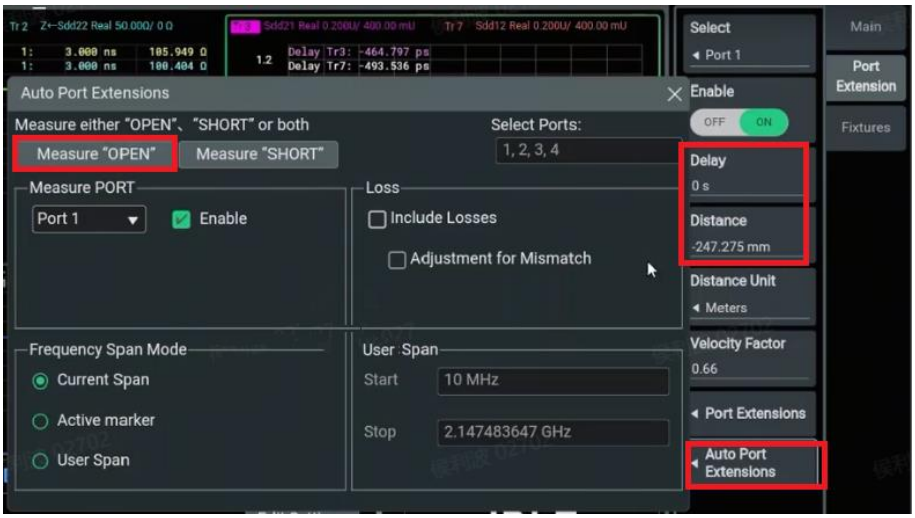
3. Select channel 1. Click or tap Calibration > Port Extension > Auto Port Extensions, as shown in the figure below.



Note:

In this test, Channel 2 does not require APE (Auto Port Extension).

4. In the Auto Port Extensions interface, click or tap Measure "Open", the Delay and Distance parameters in the right section are recalculated.



3.5 Set the Limits based on the DUT Model

Set the upper and lower limits according to your test requirements.
In the Automation Test view, click or tap Edit Settings, then the TAS Configuration interface is displayed. Set the upper limit and lower limit of the specified item.

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Once this step is complete, you can start testing.
Note:
We recommend you should learn how to save and load test items first.

3.6 To Save and Load the Test Item

After performing the calibration and setting the threshold, we recommended you to save the configuration as a file suffixed with ".csa". This allows you to reload the entire setup (including calibration) next time. However, to ensure measurement accuracy, recalibrating is still recommended if the environment changes.

Save the Test Item

- Click or tap Math > Test Automation > Save As, then the file management interface is displayed.

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- Rename the file to be saved and click or tap Save to save the desired file as a file suffixed with "*.csa".



Load the Test Item

- Click or tap Math > Test Automation > Load Csa, then the file management interface is displayed.

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- Select the desired file, click or tap Confirm to load the desired file.

Note:
Save both the calibration data and the newly set upper/lower limits. Next time, you can start the measurement directly from this file, which will load the previous calibration data and settings.
You can also click or tap Math > Test Automation > Load Configuration to load the existing configuration file from the specified path.
For example, the following file is loaded.

Version	2								
General Settings									
Device Name	16WJ99646TEST								
Output Directory	C:\DATA KTD								
Channel Settings									
Channel	Freq Start (MHz)	Freq End (MHz)	Point	Power (dBr	IFBW (kHz)	Balanced Ports			
Ch1	10	8500	850	0	70	2 x Balanced			
Ch2	0.1	2000	1601	0	70	2 x Balanced			
Time Domain Settings									
No	Time Domain	Time Start (ns)	Time End (ns)						
1	Td1	-5	60						
Trace Settings									
No	Channel	Trace	S-Para	Time Dom	Window	Selection			
1	Ch1	Trc1	Sdd11	Td1	1	0			
2	Ch1	Trc2	Sdd22	Td1	1	0			
3	Ch1	Trc3	Sdd21	Td1	2	0			
4	Ch1	Trc4	S21	Td1	3	0			
5	Ch2	Trc5	Sdd21		4	0			
7	Ch1	Trc7	Sdd12	Td1	2	0			
8	Ch1	Trc8	S43	Td1	3	1			
Eye Diagram Setting									
No	Eye Diagram	Polygon	Shape	W1 (ns)	W2 (ns)	H1 (V)	H2 (V)	Horizontal	Vertical (
1	Eye1	TRUE	Octagon	5	3	3.5	4.5	1	
Measurement Settings									
No	Item	Trace	Marker & Ref	Lower Limi	Upper Limit				
1	Impedance	Trc1	3ns	94	106				
2	Impedance	Trc2	3ns	94	106				
3	Skew	Trc4	Trc8	0	130.4				
4	Skew	Trc8	Trc4	0	130.4				
5	Delay	Trc3	50%	0	33.9				
6	Delay	Trc7	50%	0	33.9				
7	Loss	Trc5	MAX_1MHz_1MHz	-0.271	0				
8	Loss	Trc5	MAX_10MHz_10MHz	-0.863	0				
9	Loss	Trc5	MAX_50MHz_50MHz	-1.938	0				
10	Loss	Trc5	MAX_100MHz_100M	-2.763	0				
11	Loss	Trc5	MAX_400MHz_400M	-5.716	0				
12	Loss	Trc5	MAX_500MHz_500M	-6.443	0				
13	Loss	Trc5	MAX_1000MHz_1000	-9.408	0				

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By default, the Sample Name and Report Path show the "Device Name" and "Output Directory" specified in the file.
Modify the relevant parameters in the file if necessary.
Note:
The difference between Load Configuration and Load Csa is as follows:

- If you already have the existing configuration file, click or tap Math > Test Automation > Load Configuration to load the configuration file directly for test automation. The configuration file only contains the configuration data.
- To use Load Csa, you must ensure that you have saved the "*.csa" file first. The "*.csa" file contains both calibration data and configuration data. To save the "*.csa" file, click or tap Save; you can also click or tap Save As to save it.

  You can also click or tap Save&Recall **>** State+CalSet to find the specified "*.csa" file to load it, as shown in the figure below.



3.7 To Start the Test

Connect the DUT cable, then start the measurement.
Click or tap Next Cable to start testing, and the screen shows the test results, as shown below.

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After testing, you can view the test log in Excel format.
To view the test log, click or tap Save&Recall **>** File **>** Manage Files, then the file management interface is displayed.



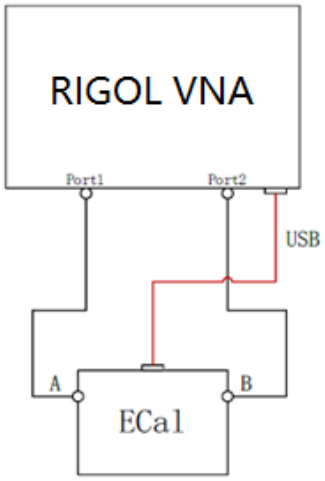
Find the path where the configuration file is located. In this path, you can find the corresponding Excel file to view the test log.

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4 Ecal Operation Guidance

4.1 To Connect and Disconnect the ECal Module

- Connect the ECal module to any of the USB Type-A connectors on the front or rear panel of the vector network analyzer via USB Type-A connector (USB Type-C to Type-A connector) of the USB cable. The vector network analyzer can be controlled or powered via a USB cable.
- When connecting an Ecal module to a vector network analyzer, the vector network analyzer automatically identifies the type of calibration module, frequency range, and connector type.



4.2 The status of the LED indicator

Status LED Color	Description
Off	The calibration piece is not properly connected to the instrument that needs to be calibrated
Steady Red	During warm-up, during start-up [1]
Steady Green	After warm-up, the ECal module is connected, functional, and ready for use.
Alternating Red/Green Flashing	ECal module is too hot or too cold and unable to regulate internal temperature to setpoint.

[1]Warm up before calibration

The electronic calibrator needs to be warmed up before calibration. After connecting the USB cable, the “Wait for” indicator lights red to warm up, allowing the internal temperature to reach a set constant temperature, and turns green when warm up is complete. This ensures consistency of the calibration state.

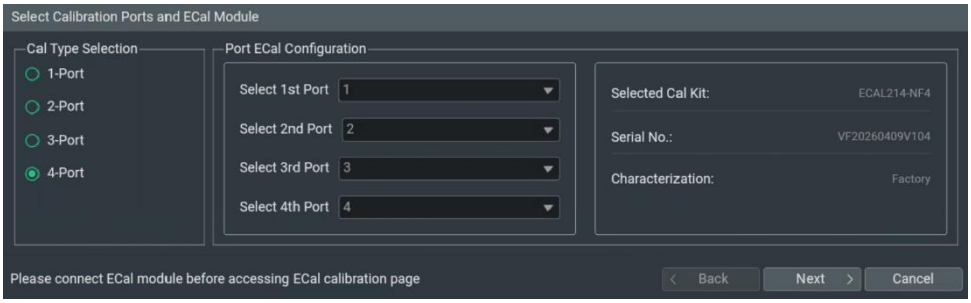
The warm-up time is related to the working ambient temperature, it is recommended that the working ambient temperature be kept between 20℃ and 28℃. The two port electronic calibrator warm-up time is typically 15 to 20 minutes, and the four port electronic calibrator warm-up time is typically 20 to 25 minutes. If the ambient temperature is below 20°C, the warm-up period is extended accordingly.

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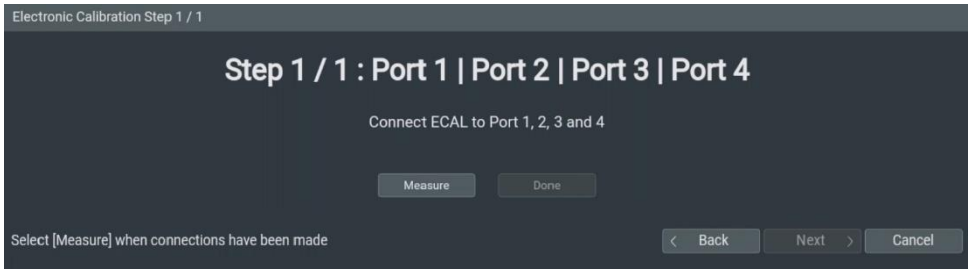
4.3 To Perform an Automatic Calibration

For all calibration types, complete the following steps:

1. Connect the ECal module to VNA with a matching frequency range and connector type, including the interface under test and the USB power connector, and wait until the LED turns green.
   The warm-up time is related to the working ambient temperature, it is recommended that the working ambient temperature be kept between 20℃ and 28℃. The two port electronic calibrator warm-up time is typically 15 to 20 minutes, and the four port electronic calibrator warm-up time is typically 20 to 25 minutes. If the ambient temperature is below 20°C, the warm-up period is extended accordingly.
2. Configure VNA excitation source parameters, including frequency range of transmitted signals, output power, number of scans, and more. View the response (uncorrected) and optimize the vector network analyzer settings as needed.
3. On the VNA, click or tap Calibration > Main > ECal to enter the following menu.



4. Select "Cal Type" and "Port ECal Configuration" as needed. Click or tap Next to enter the "Electronic Calibration Step" menu, as shown in the figure below.



5. As prompted, click or tap Measure to complete the calibration and save the calibration information.



6. When the calibration is complete, remove the ECal module, and connect the DUT. The calibrated measurements are then performed.

CAUTION

ECal modules can be damaged if you apply excessive torque to the connectors.

Tip: For optimal results, terminate any unused ECal ports with a 50 Ω load.

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