



# SAV2040X Electronic Calibration Kit Module

## User Manual

Saluki Technology Inc.

## Model No.

Saluki SAV2040X

## GPIO Address

0-30

## Interface

GPIO: GPIO address required

LAN: IP address required

## Calibration Ports

1-4

## Compatibility

The software is compatible with following VNA:

- Keysight PNA
  - N5242A
  - N5244A
  - N5245A
  - N5247A
  - N5230C
- Keysight ENA
  - E5071C
  - E5061B
- R&S
  - ZVA
- Saluki
  - All Bench top VNA

For other VNAs not listed above, may need to do a series of experiment to verify the compatibility

## Preface

Thanks for choosing SAV2040X electronic calibration kit produced by Saluki Technology Inc. Please read this user manual carefully for your convenience.

We devote ourselves to meeting customers' demands, providing high-quality measuring instrument and the best after-sales service. We persist with "superior quality and considerate service", and are committed to offering satisfactory products and service for our clients.

## Manual No.

SAV2040X-03-01

## Version

Rev02 2020.03

Saluki Technology

## Manual Authorization

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## Product Quality Certificate

The product meets the indicator requirements of the manual at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

## Quality/Environment Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

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## Content

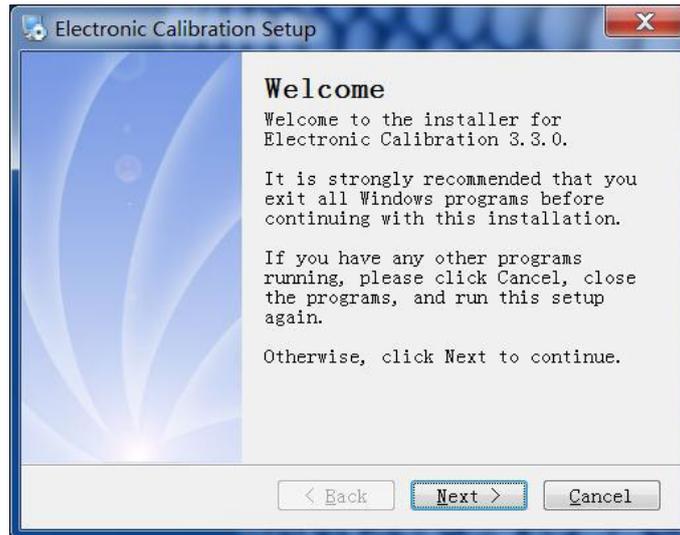
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# 1. Installation

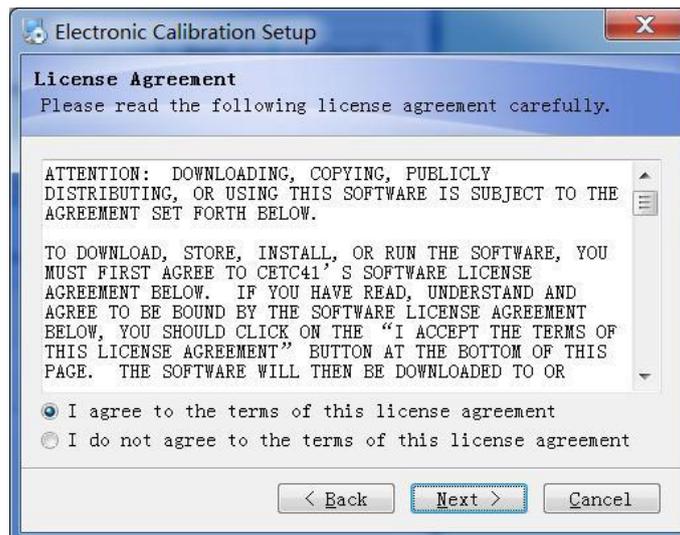
## 1. 1. Software Installation

Please kindly follow the steps below to install Electronic Calibration software on a VNA or a computer

- 1) Double click the software installation file. A welcome page is shown, click [Next]



- 2) Select "I agree to...." to accept the agreement, then click [Next]



- 3) Enter the user name and the company name, then click [Next]

The screenshot shows a dialog box titled "Electronic Calibration Setup" with a close button (X) in the top right corner. The main heading is "User Information" and the instruction is "Enter your user information and click Next to continue." There are two text input fields: "Name:" and "Company:". At the bottom, there are three buttons: "< Back", "Next >" (highlighted with a blue border), and "Cancel".

- 4) Select Installation directory, then click [Next]

The screenshot shows a dialog box titled "Electronic Calibration Setup" with a close button (X) in the top right corner. The main heading is "Installation Folder" and the question is "Where would you like Electronic Calibration to be installed?". Below this, there is explanatory text: "The software will be installed in the folder listed below. To select a different location, either type in a new path, or click Change to browse for an existing folder." There is a text field containing "C:\Program Files\Electronic Calibration 3.3.0" and a "Change..." button to its right. Below the text field, it says "Space required: 75.3 MB" and "Space available on selected drive: 28.34 GB". At the bottom, there are three buttons: "< Back", "Next >" (highlighted with a blue border), and "Cancel".

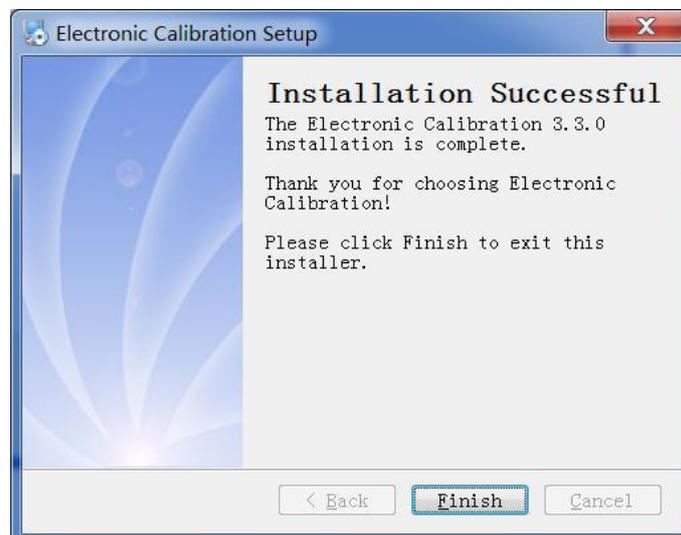
- 5) Create a shortcut folder, then click [Next]

The screenshot shows a dialog box titled "Electronic Calibration Setup" with a close button (X) in the top right corner. The main heading is "Shortcut Folder" and the question is "Where would you like the shortcuts to be installed?". Below this, there is explanatory text: "The shortcut icons will be created in the folder indicated below. If you don't want to use the default folder, you can either type a new name, or select an existing folder from the list." There is a dropdown menu labeled "Shortcut Folder:" with "Electronic Calibration 3.3.0" selected. Below the dropdown, there are two radio button options: "Install shortcuts for current user only" (which is selected) and "Make shortcuts available to all users". At the bottom, there are three buttons: "< Back", "Next >" (highlighted with a blue border), and "Cancel".

- 6) Check all installation information in the “Ready to install” box. If all information is OK, click [Next].

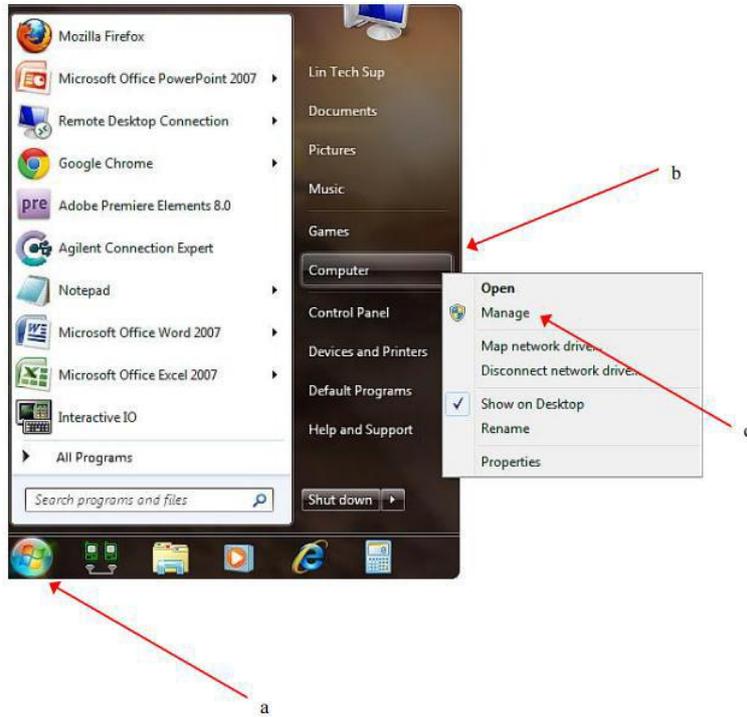


- 7) Click [Finish] to complete the installation

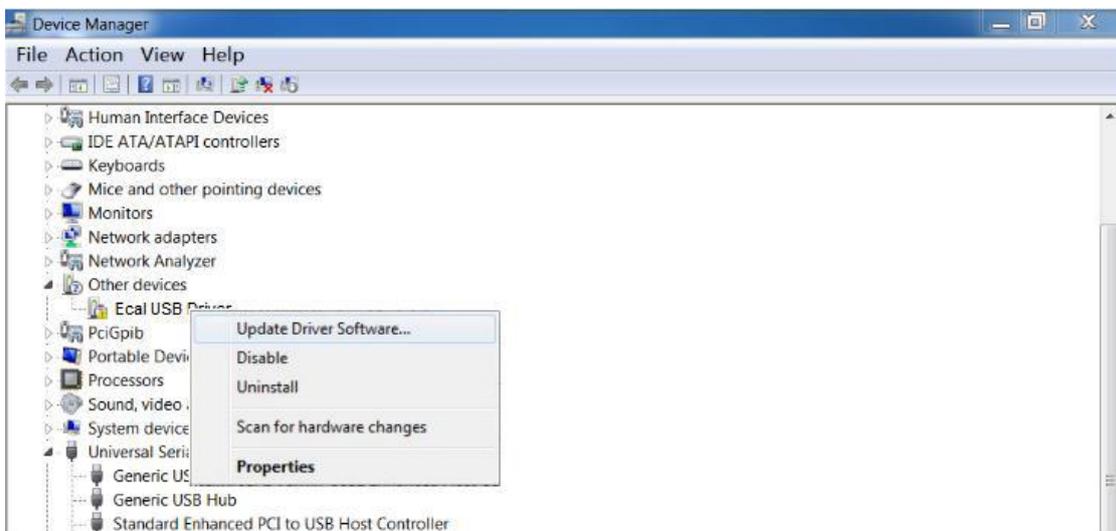


## 1. 2. Ecal Kit USB Driver Installation

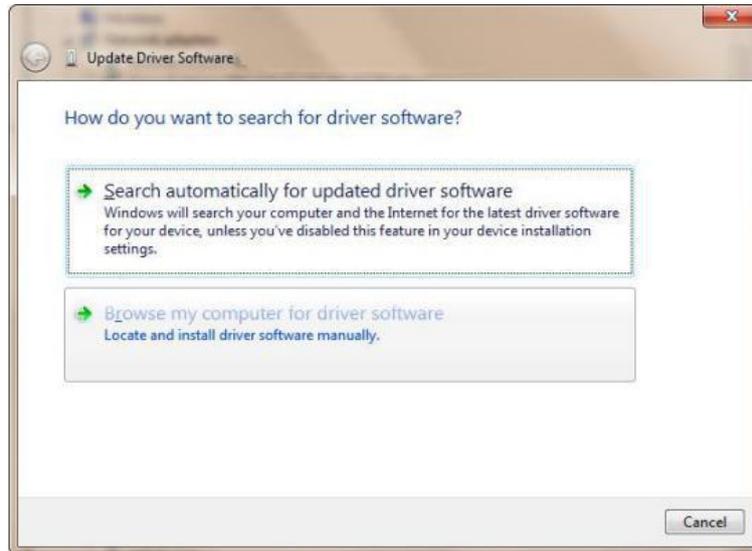
- 1) Open the computer manage window
  - a. Click on the Windows button
  - b. Right click on Computer
  - c. Left click on Manage



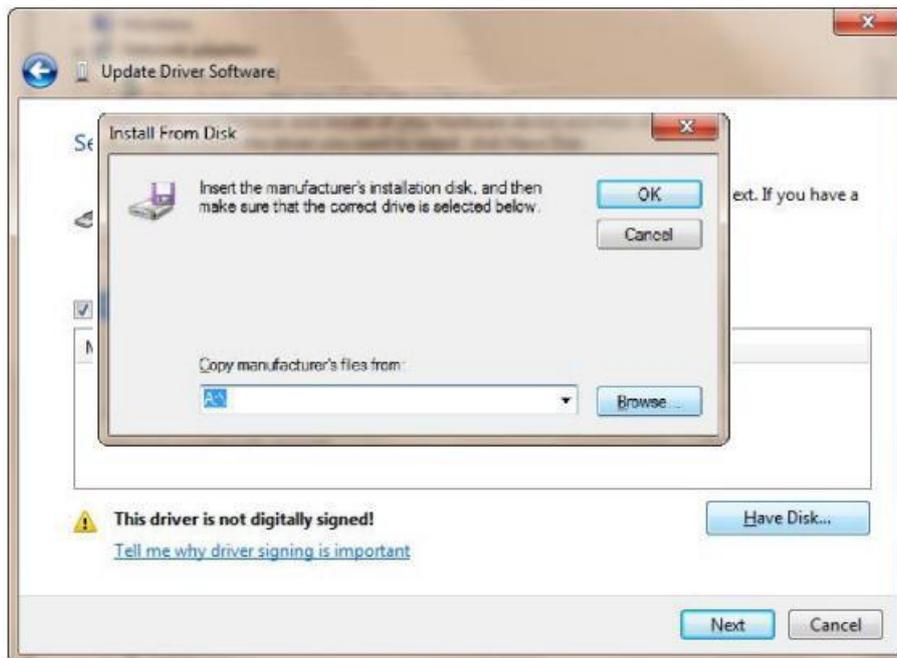
- 2) Find Ecal USB Driver in Computer Management, Right click and select "Update Driver Software..."



- 3) Select "Browse my computer for driver software"



- 4) Select "Have Disk", then click "Browse" in the popped out window.



- 5) Browse the Software installation directory mentioned in section 1.2. In it, there are 2 folders. [XP] folder contains the driver for XP system. [Win 7] folder contains the driver for Win 7 system. Please select the driver of your OS. Driver name is "EcalDrv.inf"

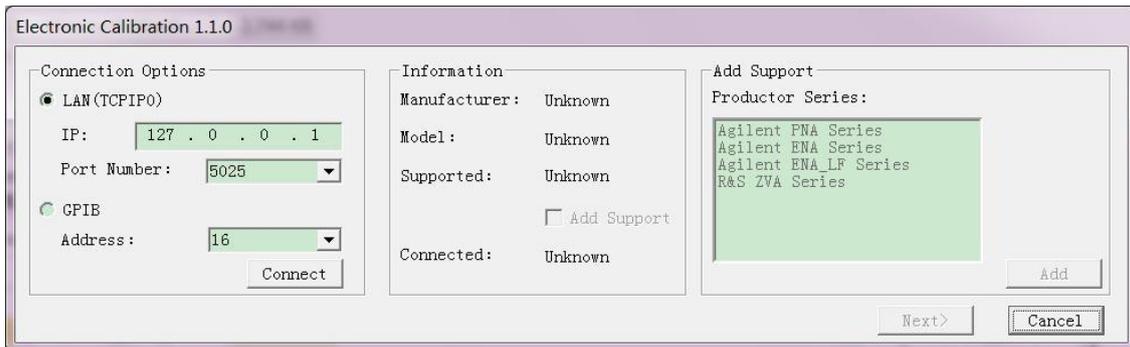


- 6) Select the driver and Windows will install it automatically.

## 2. Access Software

The software control the VNA and the Ecal kit to calibrate the VNA automatically. It can be used for VNAs from different manufacturers and help to cut the cost.

### 2.1. Connection Window



- Connection Options

User can choose LAN or GPIB connections. IP address or GIPB address should be provided.

If the controller computer is connected to VNA via LAN interface, please fill in the IP and port number. If the software is installed on VNA itself, please use IP address 127.0.0.1. Port Number is provided by the VNA manufacturer. Keysight usually use 5025.

If the controller computer is connected to VNA via GPIB cable, please fill in the VNA GPIB address.

Click [Connect] button when the address is configured. Connection states will be shown in Information area.

- Information

This area will show the connected VNA information such as manufacturer, model, software compatible or not, VNA connected or not.

[Add Support] check box will be available if the connected VNA is not in the supported VNA list. Select it and the Add Support area on right will be activated.

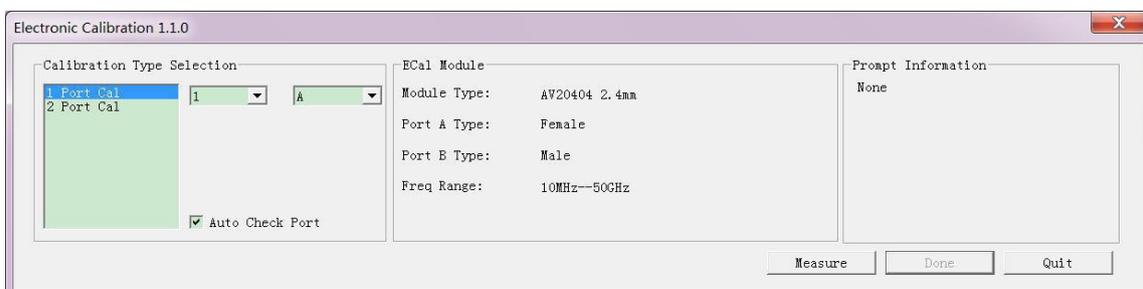
- Add Support

This area will only be activated when the connected VNA is not in supported VNA list and “Add Support” check-box is selected.

User can select the VNA series which the connected VNA belongs to and click [Add] button. The software will recognize this connected VNA automatically next time.

**Note:** If the connected VNA does not belong to any VNA series listed in Add support area. Please do not add it and contact Saluki.

### 2.2. Measurement Window



- Calibration Type

User can select calibration type here

When [Auto Check Port] check box is selected, the software will match the VNA port and the Ecal kit port automatically.

- Ecal Module

This area shows the Ecal kit information

- Prompt Information

This area shows the warnings or errors. If everything is OK, this area shows "None"

- Measure/Done Button

Click [Measure] button will start the calibration. Click [Done] button to finish the calibration

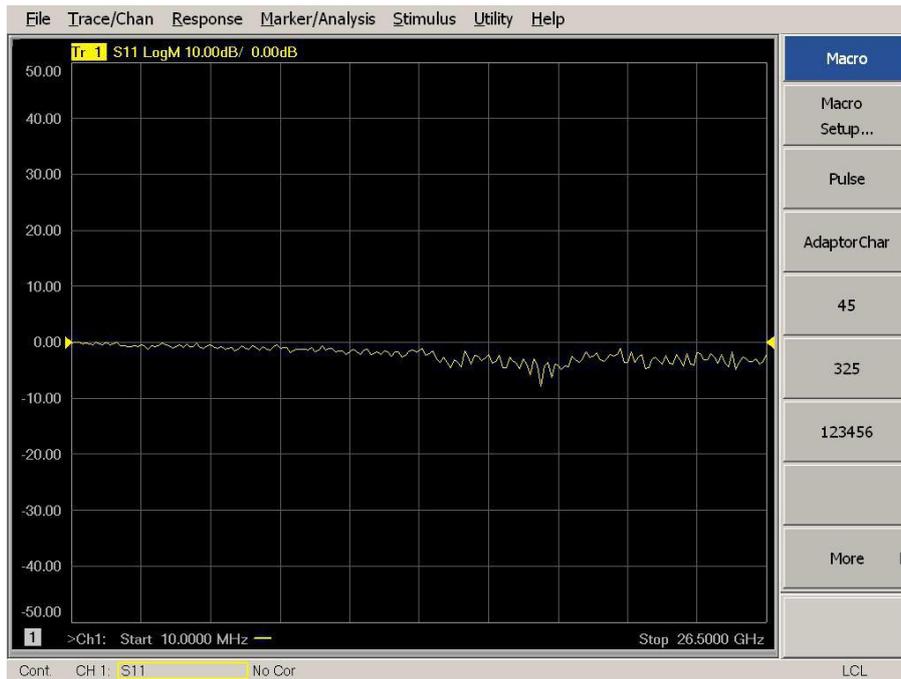
**Note:** When the calibration is completed, please click [Done] button. Otherwise the calibration status will not be valid.

### 3. Macro Embedded

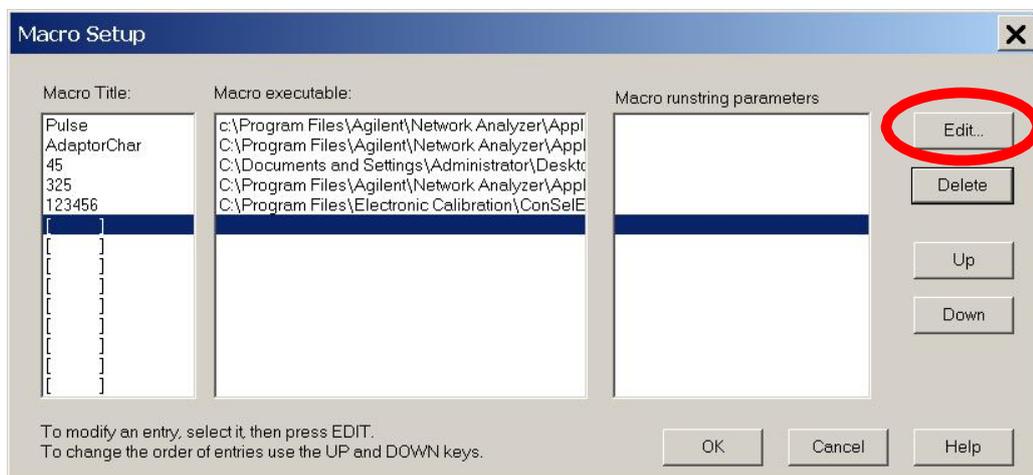
Saluki E-cal software provide Micro files for Keysight PNA and ENA series vector network analyzer. These files are saved in the software installation folder. This chapter will introduce how to embed the macro to Keysight PNA and ENA.

➤ **PNA series:**

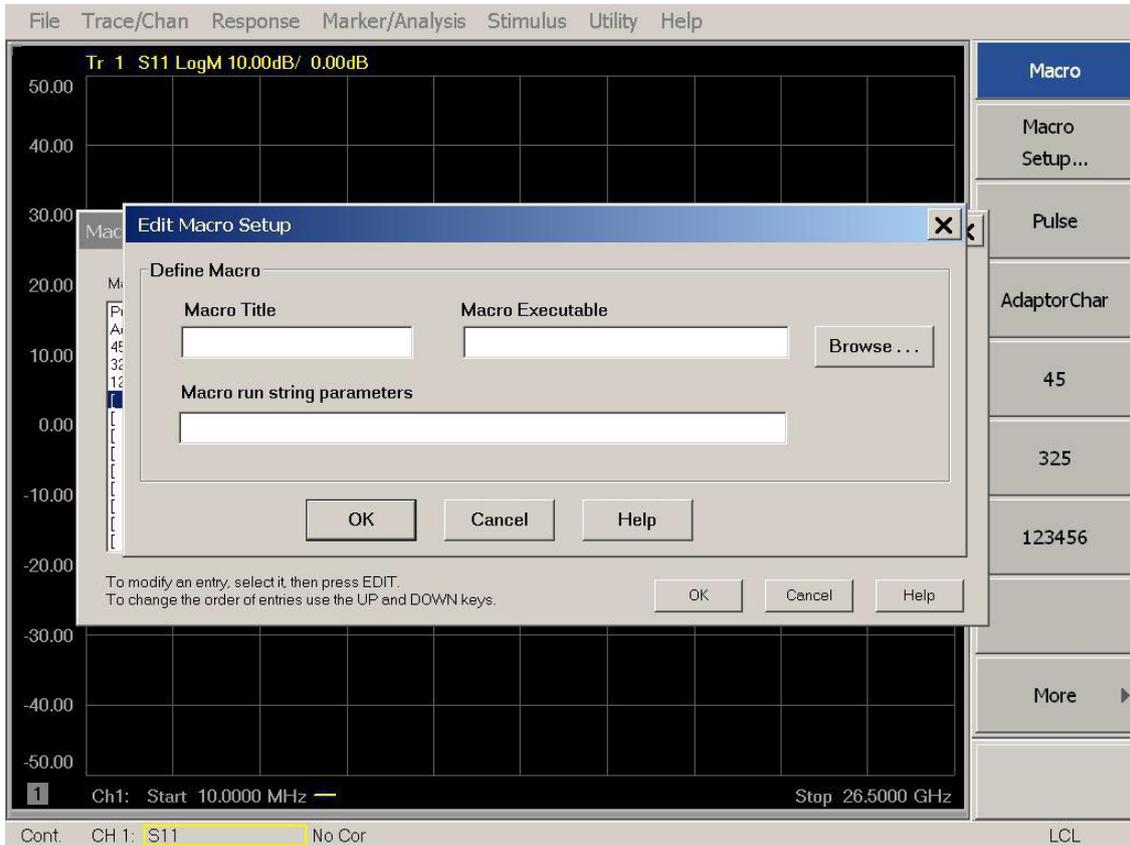
- 1) Open N5242A Macro panel



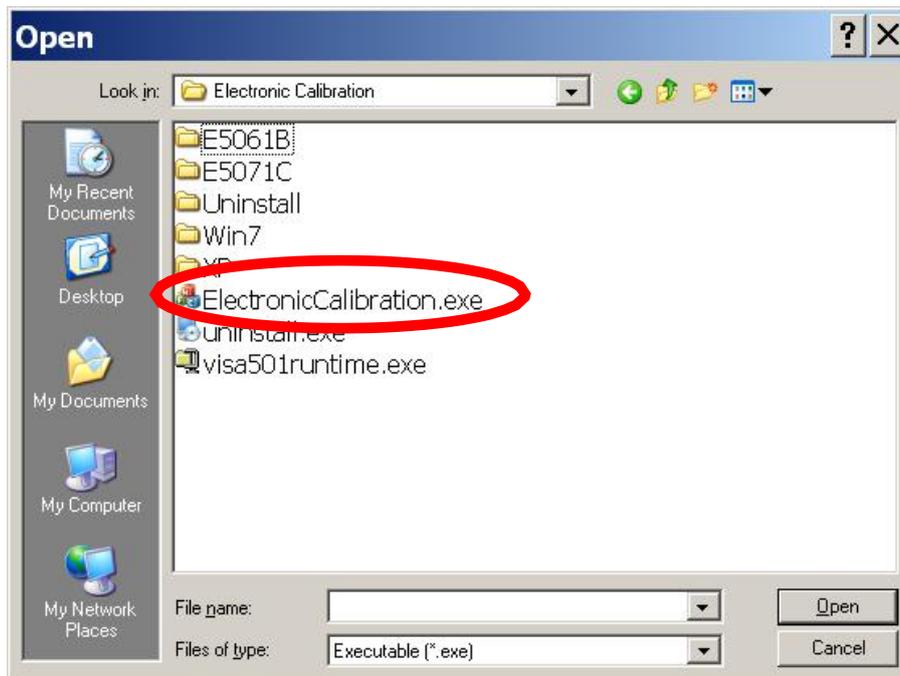
- 2) Press [Macro Setup]



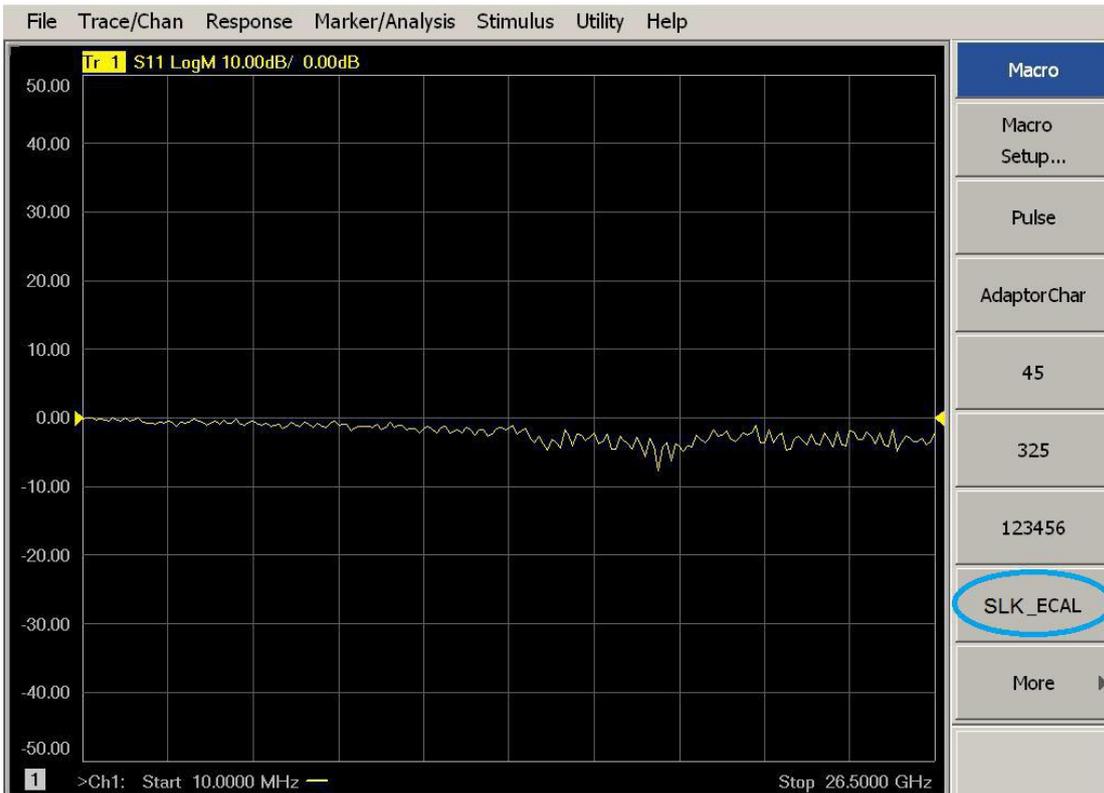
Select a blank in [macro title] box on left, then click [Edit] button



- 3) Enter macro name in [Macro Title] box, in this case we name it "SLK\_ECAL". For [Macro Executable] box, click [Browse] and select "ElectronicCalibration.exe" under installation folder. Then click [OK].



- 4) Then the macro is embedded. User may use the macro to do the calibration

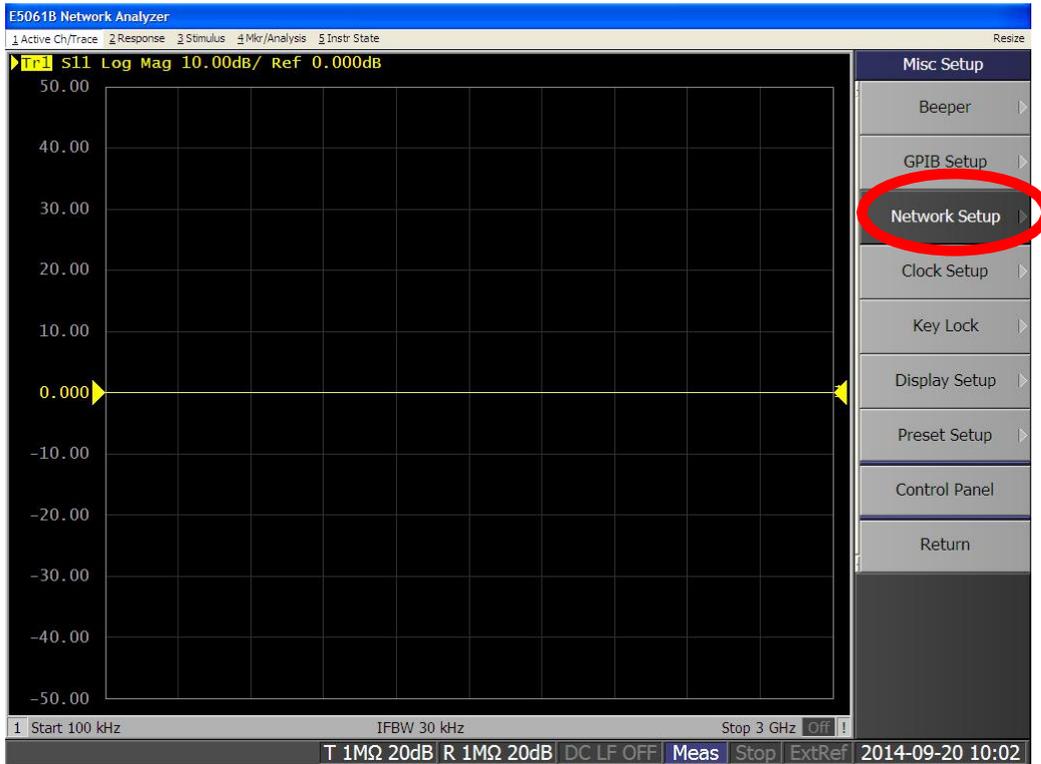


➤ **ENA series:**

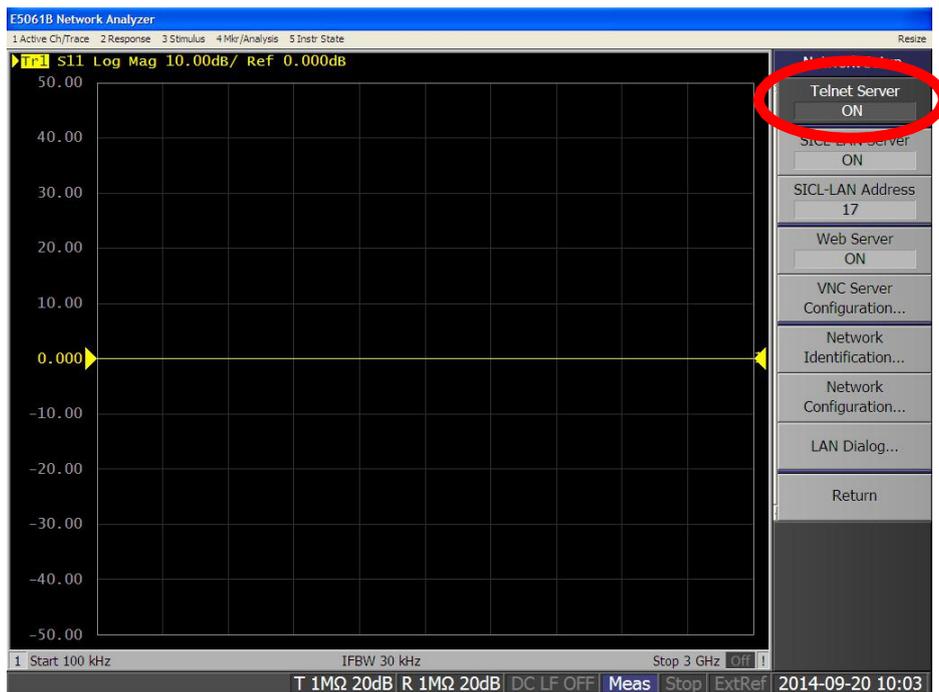
- 1) Open E5061B Macro panel



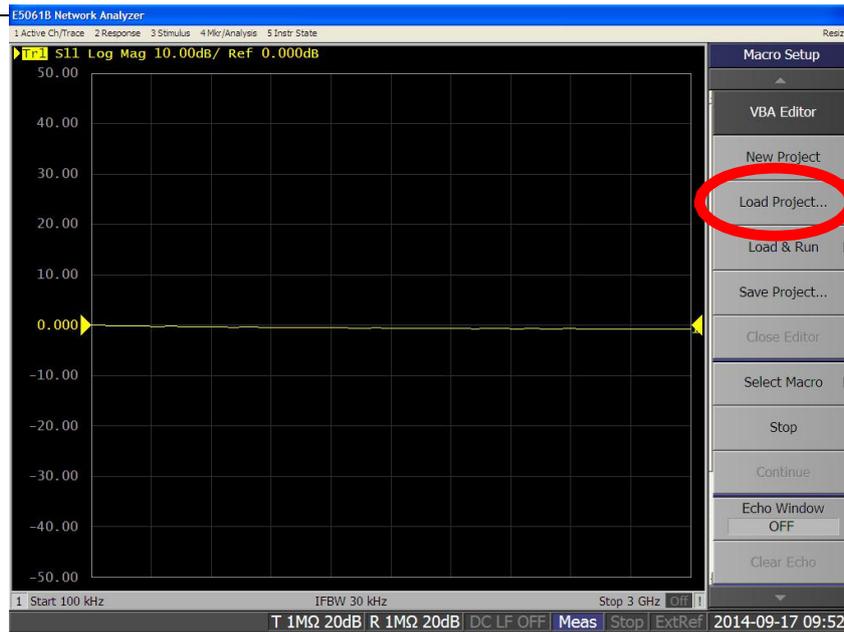
- 2) Press [Misc Setup]



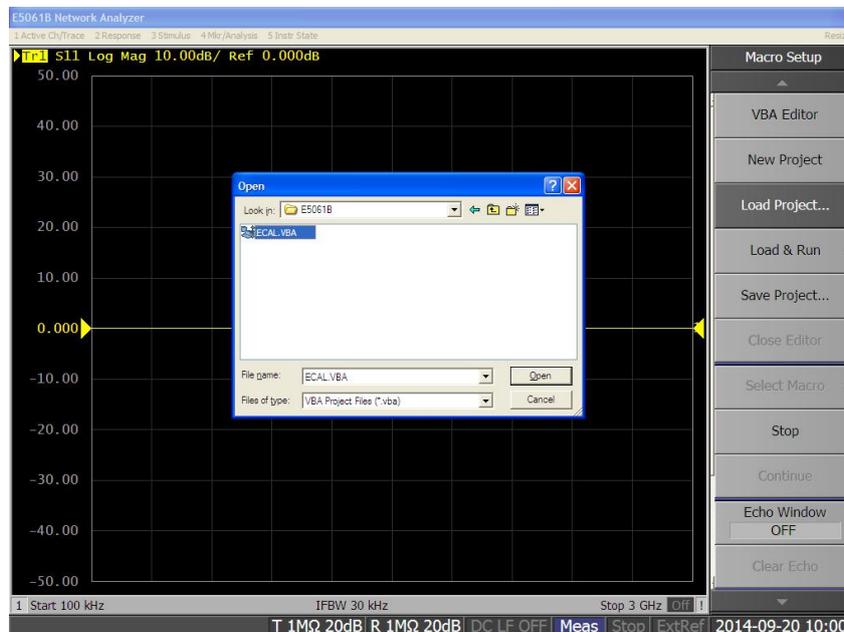
- 3) Click [Network Setup], enter network setting interface. Then click [Telnet Server], make sure the state is “ON”, open the network server function.



- 4) Press [Macro Setup] on the front panel.

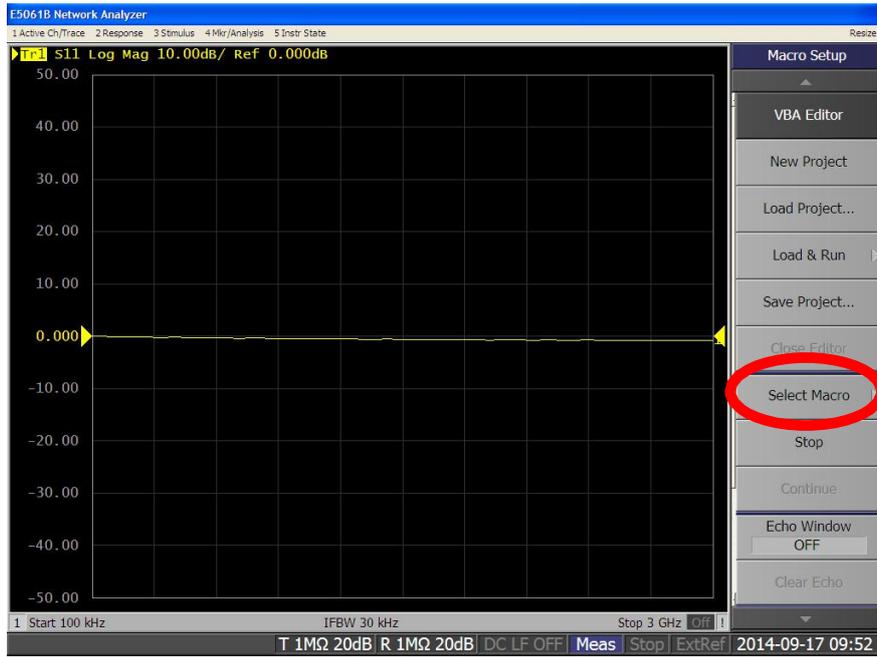


- 5) Click the [Load Project] button on the soft panel on the right to open the macro project import interface dialog box. And it is necessary to apply the VBA startup project program corresponding to this software. Select the "ECAL.VBA" file under the software installation directory (the default installation path is "C:\Program Files\Electronic Calibration 3.3.2\E506B"). Click [Open] to open the project file.

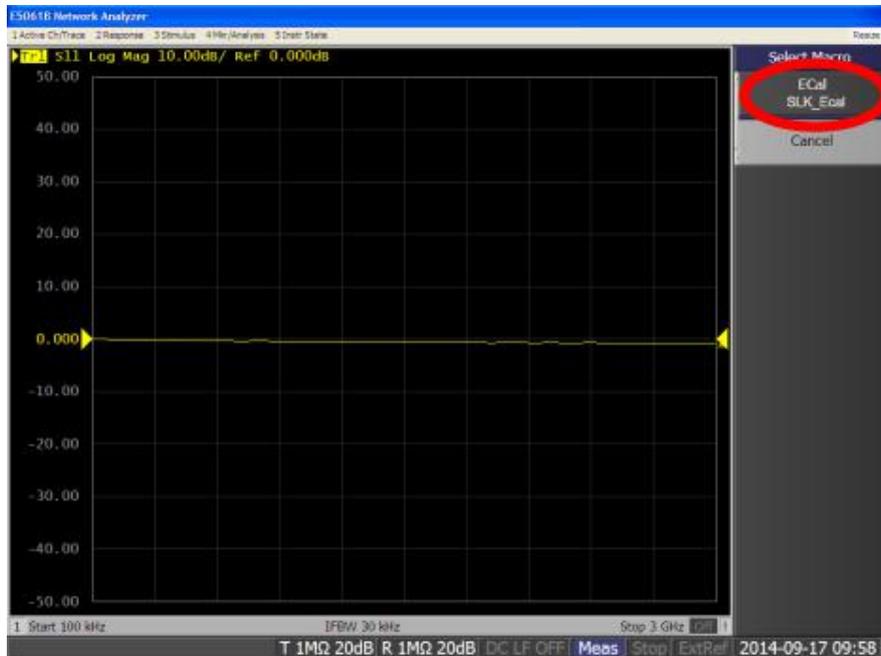


Note: If you connect to the E5071C, please select the "ECAL.vba" file under the "E5071C" folder in the installation directory. The file with the same name under the "E5061B" folder cannot be used, and the two cannot be used in common.

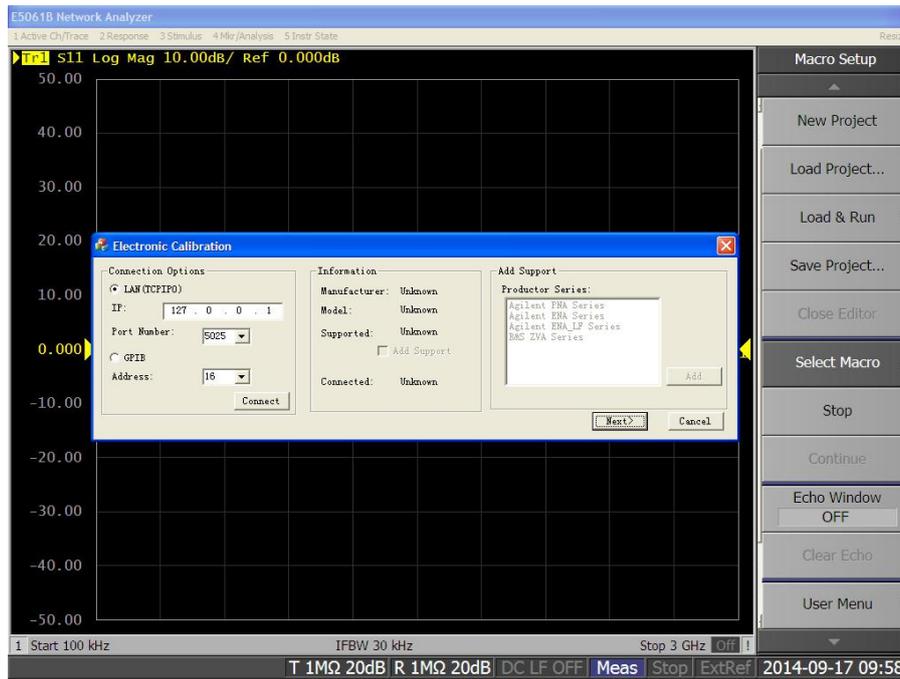
- 6) In the macro setting soft panel, click [Select Macro].



7) In the Select Macro interface, click [Ecal SLK\_Ecal] to start e-cal kit software.



8) Then the macro is embedded. User may use the macro to do the calibration.



## 4. Software Operation

The software simultaneously controls the vector network analyzer and the electronic calibration kit, coordinates the two to automatically complete the measurement of each standard, and corrects various system errors. Using the above solution, the same electronic calibration kit can be used on mainstream vector network analyzers, which breaks through the limitations of instrument manufacturers. Instruments of different manufacturers can use the same electronic calibration kit to complete the calibration. It greatly reduces the cost of using electronic calibration technology, and significantly increases the scope of use of electronic calibration components.

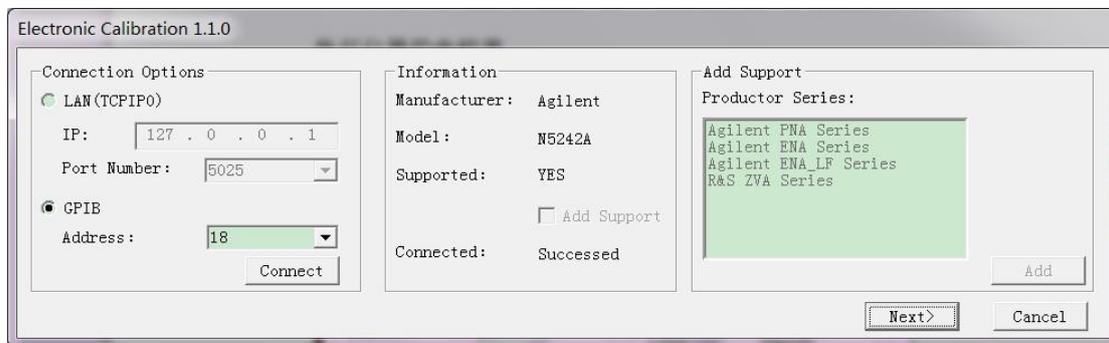
### 4.1. User Interface

The soft UI has 2 windows:

- Connection window is used to build the connections.
- Measurement window is used to configure the calibration details.

#### ➤ Connection window

As shown in the figure below, the interface for connecting the software to the instrument, the functions of each part are as follows:



#### 【IP】

Specify the IP address of the vector network analyzer when controlling the vector network analyzer via LAN.

#### 【Port Number】

The port number of the vector network analyzer SOCKET server.

#### 【Address】

Specify the GPIB address of the vector network analyzer.

#### 【Connect】

Connect the specified vector network analyzer through the specified method (LAN or GPIB), and the Information function block will display the connection result.

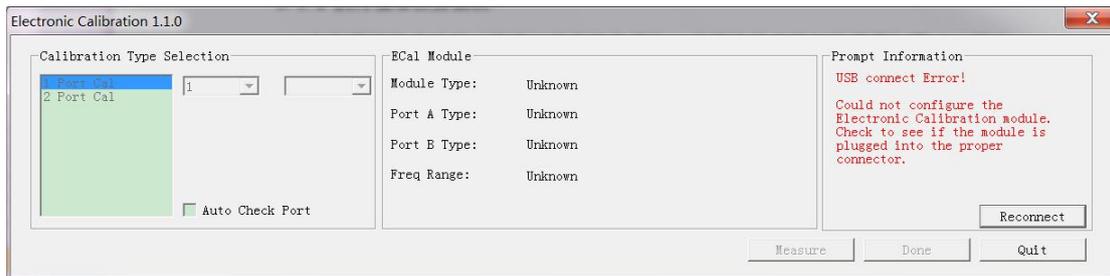
#### 【Add Support】

When connected to a vector network analyzer, and this instrument is not supported by this software, and the product model is not supported by the above

When the product model is selected, this button is activated. Select this button, and the add support module on the right will be activated.

**【Add】**

After confirming that the connected vector network analyzer model belongs to a certain product series listed in the list box, select the product series and click the [Add] button to add support. After the program is started next time, it will no longer prompt that the software is not displayed. Support this model.

**➤ Measurement window**

The functions of each part are as follows:

**【Auto Check Port】**

After selection, the corresponding relationship between the vector network port and the electronic calibration module port will be automatically matched.

**【Prompt Information】**

Prompt information.

**【Reconnect】**

After confirming that the ECal module is properly connected to the vector network, reload the ECal module information.

**【Measure】**

Perform calibration.

**【Done】**

Complete the calibration process.

**【Quit】**

Exit the software.

## 4. 2. Operation

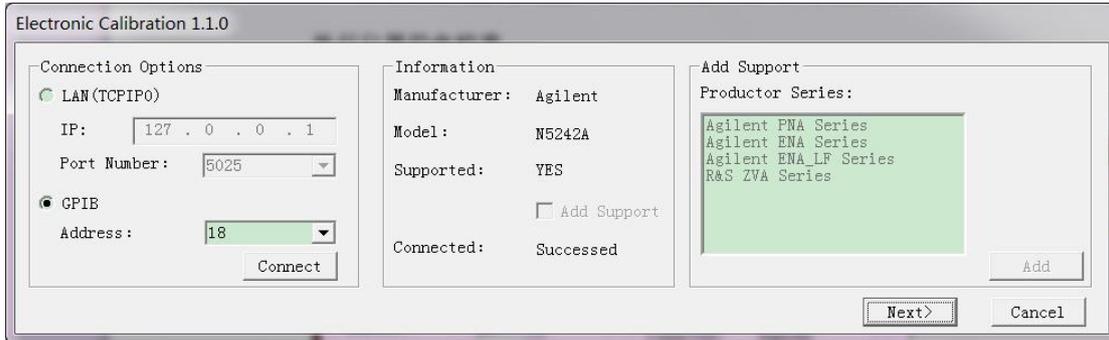
The hardware environment required is: The hardware used for calibration includes electronic calibration kits, coaxial cables, USB cables used with the electronic calibration kits, vector network analyzers, and industrial computers (optional). The ECal module and the vector network analyzer are connected through a coaxial cable. If you need to switch, please plug in an adapter; connect the ECal module to the USB port of the vector network analyzer through a USB data cable.

The use of this software mainly includes the identification and connection of the vector network analyzer and the execution of calibration tasks.

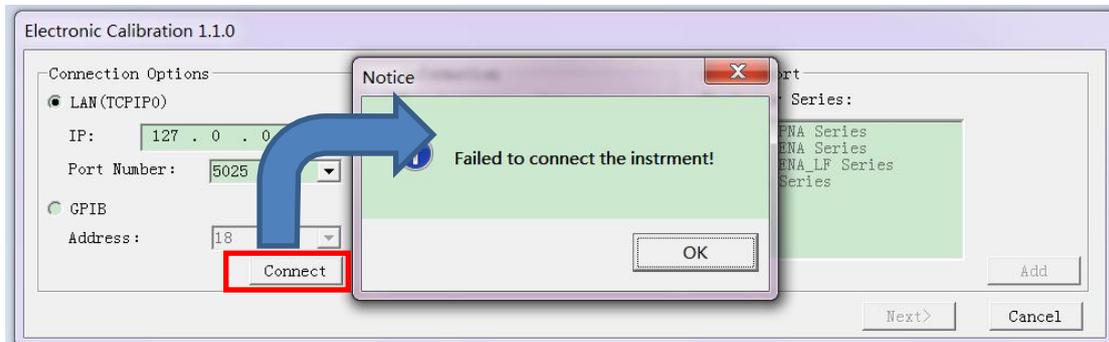
➤ **Identification and Connection of VNA**

Open the electronic calibration software. This software first initializes the system parameters, reads the relevant files, and then automatically scans the GPIB bus or the vector network analyzer available on the network.

The connection interface is shown below:



If the VNA is connected to the industrial computer through the network, please fill in the IP address and port number. If the software is used in the VNA itself, please fill in the default IP address (127.0.0.1), the port number is provided by the instrument manufacturer, and Agilent is generally "5025". If you connect via a GPIB cable, please fill in the GPIB address set at the vector terminal, and click the [Connect] button. If the connection is successful, go directly to the next step. If the connection is not successful, the display interface is as shown in the figure below.



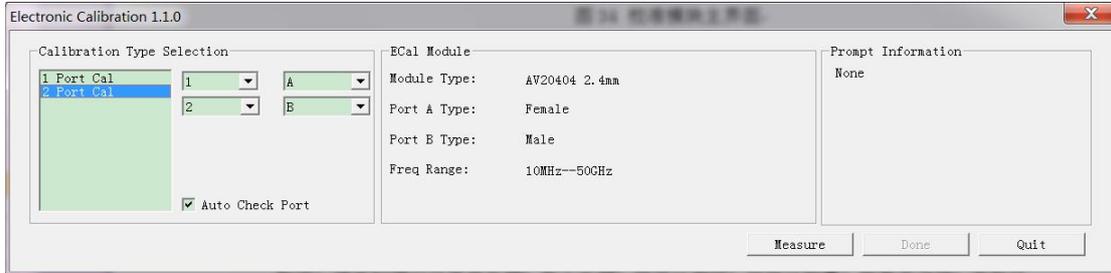
At this time, it is necessary to confirm whether the instrument is connected correctly, whether the port connector is tightened, and whether the corresponding address is correct. After the connection is successful, if the driver supports this instrument model, click [Next] to directly enter the next module, if not, the display interface is as follows:



If the connected instrument belongs to a certain product series listed on the right, please select [Add Support], and the [Add] button on the right will become available. After selecting the corresponding product series and clicking [Add], the software can support this model. After the software is restarted, the software will support this model by default.

### ➤ Perform Calibration Tasks Module

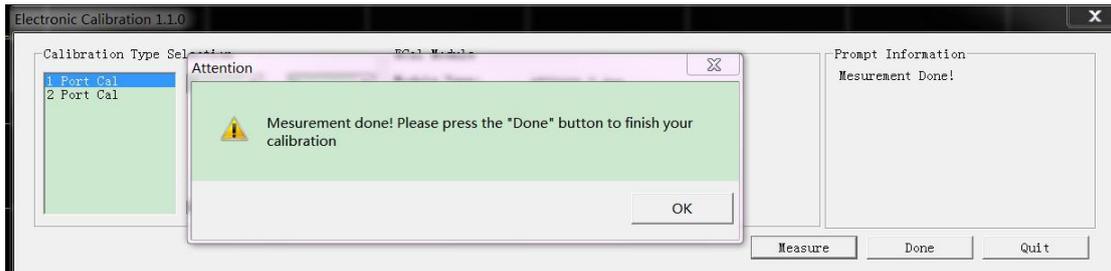
After successfully connecting with VNA, it will enter the calibration task module. The normal initial interface of this module is shown in the figure:



The leftmost list box allows you to select the type of calibration. For example, if you want to perform dual-port calibration, select "2 Port Cal" in the left list, and the right side will display the default vector network port and the calibration port corresponding situation. (1, 2) is the port number of the vector network analyzer, (A, B) corresponds to the two ports A and B of the calibration part, here you need to set according to the specific connection, for example, the vector network port 1 is connected to the calibration part B port, B should be selected in the second list box of the first row.

You can check [Auto Check Port] to specify automatic port connection detection. The software will combine specific algorithms to determine whether the port pair specified by the user is correct. If not, it will be modified for measurement. If it is not checked, the software will directly perform measurement regardless of port correspondence. At this time, make sure that the vector network port corresponds to the calibration unit port correctly.

Click the [Measure] button to perform calibration measurement. The measurement completion interface is shown in the figure below.



Click the [Done] button, and the entire calibration process is completed.

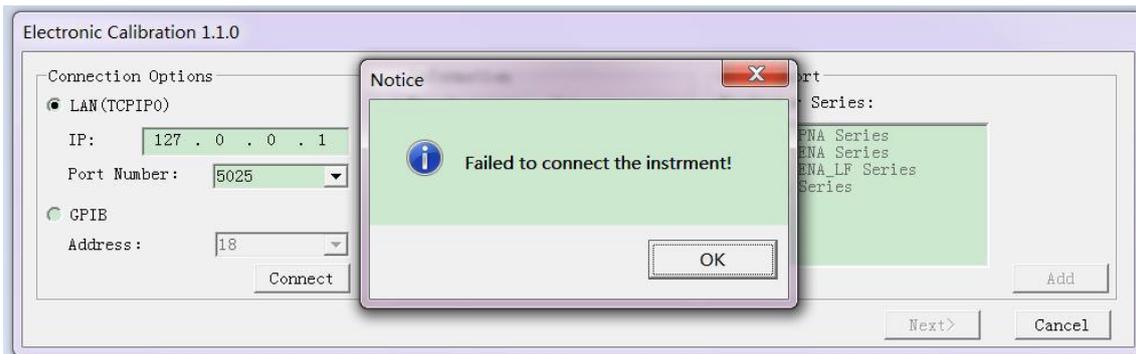
**Note:** After the calibration is completed, be sure to click the [Done] button to end the calibration. Otherwise, the calibration status of VNA cannot be saved.

## 5. Troubleshooting

### 5.1. Connection Fail

- Description

When IP address/GPIB address is configured. Click [Connect] button. A Notice Box pops out. Connection fails



- Solution

Check if the control computer and VNA are firmly connected.

Check the physical port of VNA/computer is well contacted with the connector of the cable.

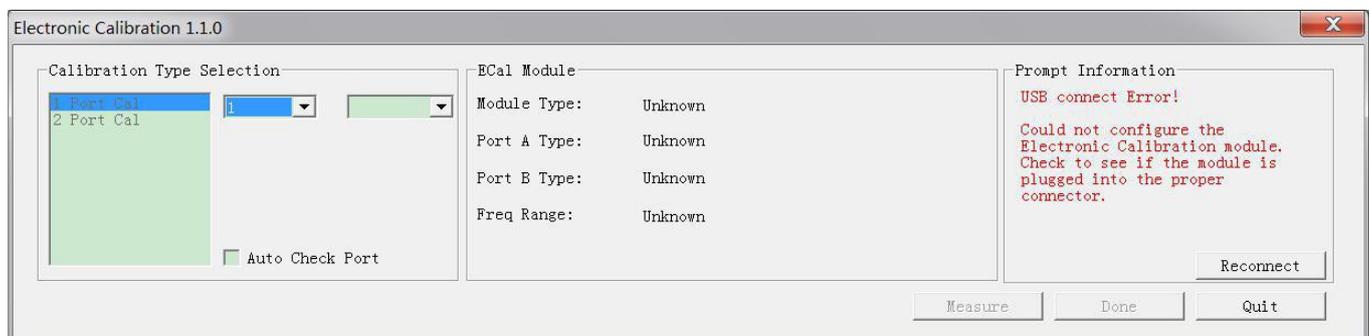
Check and confirm the IP/GPIB address.

Replace the connection cable.

### 5.2. USB Connected Error

- Description

Warning information is show in Measurement window.



- Solution

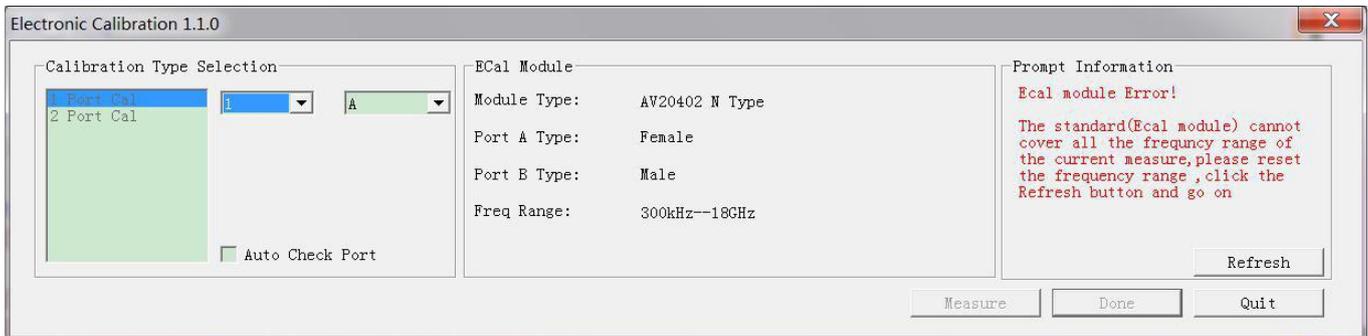
Check the USB cable is firmly connected both ends.

Click [Reconnect] button

### 5. 3. E-cal Module Error

- Description

Warning message as shown below. It is caused by a mismatch between the frequency range of VNA and E-cal kit



- Solution

This warning means the frequency range of E-cal kit can not cover the frequency range of the VNA. 2 solutions for this situation.

- 1) Please re-configure the VNA frequency range and ensure it will not be wider than the E-cal kit frequency range.
- 2) Replace the E-cal kit with a wider frequency range model

Then click [Refresh] button.

### 5. 4. EcalDll Failure

- Description

When start the software a notice box pops out.



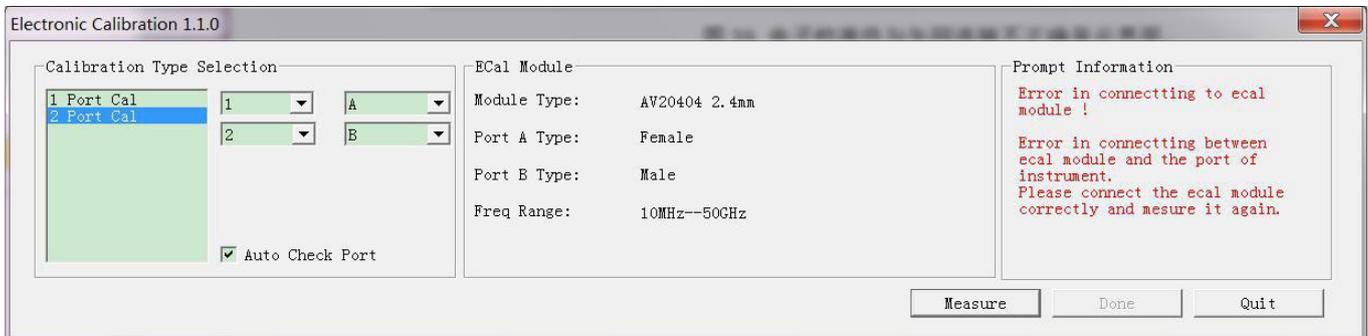
- Solution

It caused by a broken or missing EcalDll.dll

Uninstall the software and re-install it.

## 5. 5. Connection Lost between Ecal and VNA

- Description



- Solution

Recheck the connection.

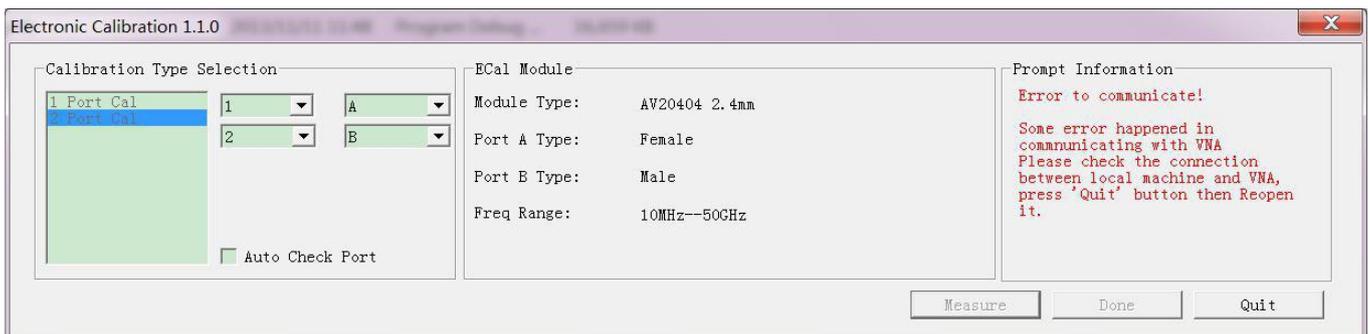
Check the cable is firmly fixed on VNA.

Check the connection cable

Click [Measure] button and try again

## 5. 6. Collection Lost between VNA and control computer

- Description



- Solution

The software used SCPI to communicate with VNA. VNA command error, W/R timeout, I/O failure will cause this error.

Please try to restart the software and VNA and ensure the VNA is supported by E-cal kit.

If the problem is not solved, please contact Saluki.

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