Agilent E5071C ENA Network Analyzer

USB 3.0 Connectors and Cable Assemblies

Compliance Tests VBA Operation Manual

Table of Contents

1. Revision History

Revision	Comments	Issue Date
1.00	Draft.	May 15, 2009
1.10	- Added the Near End Crosstalk for Time Domain. - Added the 4-Port calibration using the ECal module and De-Embedding. - Modified the test limit for the Near End Crosstalk and the Far End Crosstalk. - Changes to eight channels and six traces. - Displays dialog-box when you press the Set TD and the Set FD button. - Create the touchstone files (.s2p)	Dec 18, 2009

2. Introduction

This operation manual describes how to use the USB 3.0 Connectors and Cable Assemblies Compliance Test VBA sample program to measure USB 3.0 connectors and cable assemblies. Using this sample program you can efficiently evaluate the USB 3.0 connectors and cable assemblies following the E5071C MOI.

2.1. Outline of the measurements

2.1.1. Time Domain Measurements

- Mated Connector Impedance Measurements (Normative).
- Raw Cable Impedance Measurements (Informative).
- Intra-Pair Skew Measurement (Informative).
- Near End Crosstalk Measurement (Normative).

2.1.2. Frequency Domain Measurements

- Insertion Loss Measurements (Normative).
- Near End Crosstalk Measurement (Normative).
- Far End Crosstalk Measurement (Informative).
- Crosstalk between D+/D- and Super Speed Measurements (Normative).
- Common Mode Conversion Measurements (Normative).

2.2. Typeface Conventions

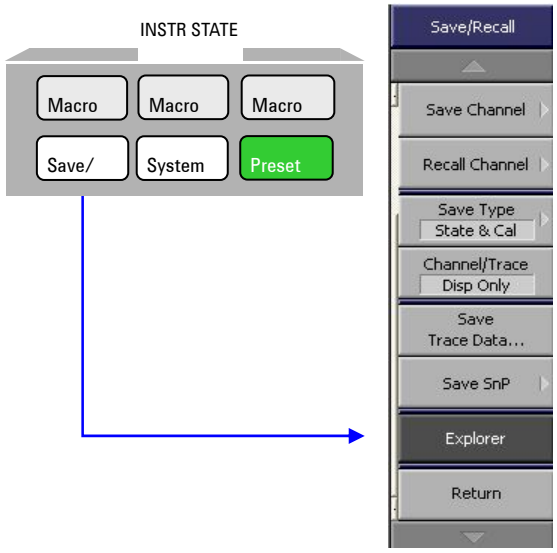
[Sample]	Indicates the hard key whose key label is “Sample”.
Sample	Indicates the soft key whose key label is Sample.
Sample	Shaded test is used when a file name or emphasized.

3. Preparation

3.1. Instrumentation Requirements

- E5071C Network Analyzer (Must include option 010 and either of option 480/485/4D5/4K5)
- A set of USB 3.0 test fixtures which includes TRL/M calibration boards from 4 MHz to 8.5 GHz
- For 3.5 mm(f)-Type N(m) adapters (1250-1744) [*1]
- For 3.5 mm cables 10 GHz bandwidth or equivalent
- 50 ohm terminations to terminate unused connectors. (ex. Agilent 909D-301)
- N4431B Electronic Calibration Module (ECal module)[*2]

3.2. Installing the VBA macro program



Obtain the VBA macro program from Agilent and install it on the E5071C.

- Press **[Save/Recall]** on the front panel, then press the **Explorer** soft key.
- Using **Explorer**, copy the file to the "D:¥VBA" folder.

[*1] Not required if E5071C includes option 4D5 and 4K5.
[*2] If E5071C includes option 4D5 or 4K5, select N4433A ECal module.

3.3. Confirm channel and trace settings

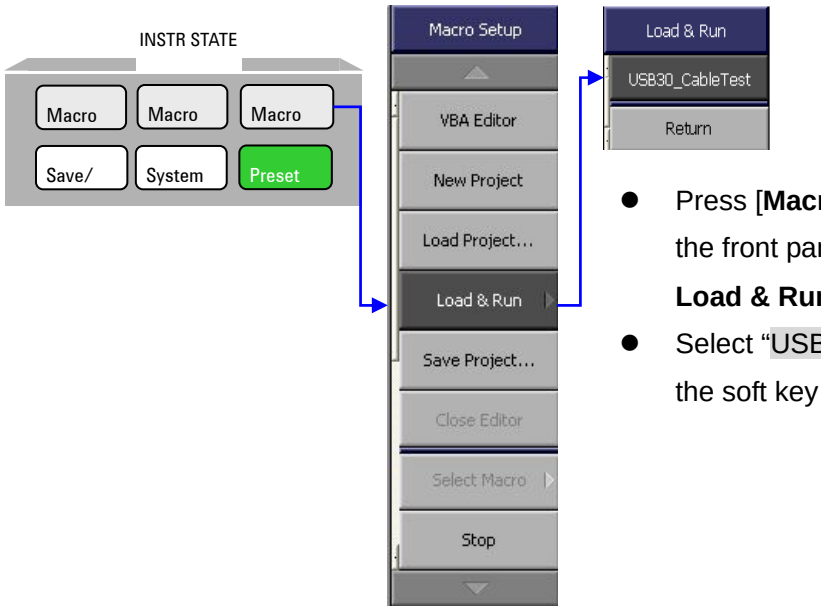
This program use eight channels and six traces. You must set channel greater than or equal to eight and trace greater than or equal to six.

3.3.1. How to perform channel and trace settings

This procedure describes how to perform channel and trace settings to 9 channel 9 traces.

1. Press **[System]** button.
2. Click the **Misc Setup** - **Channel/Trace Setup** - **9 Channels 9 Traces**.
3. Restart the E5071C.

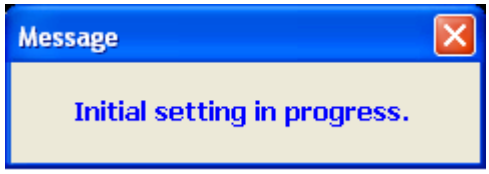
3.4. How to run the VBA macro program



- Press [**Macro Setup**] button from the front panel, then click the **Load & Run** soft key.
- Select "USB30_CableTest" from the soft key menu and click on it.

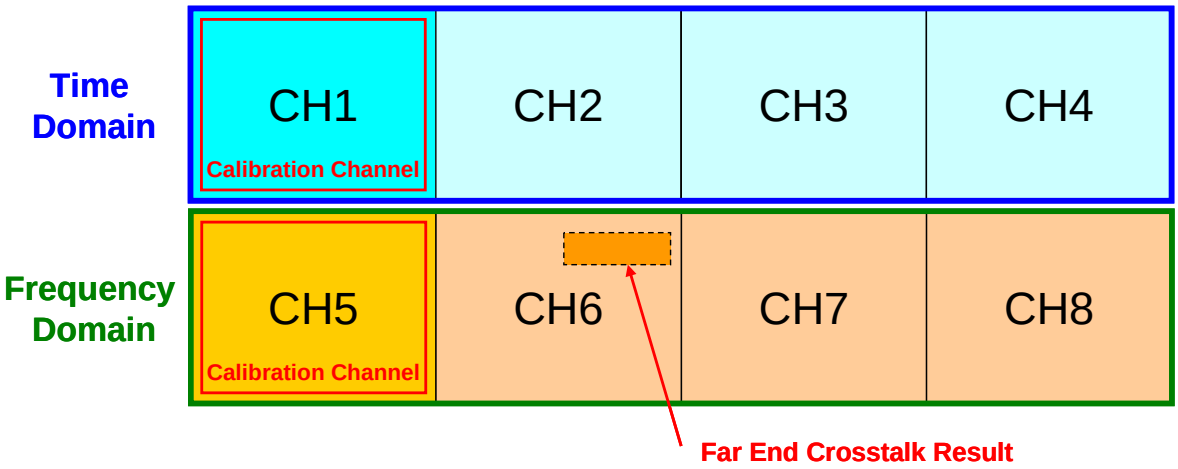
3.5. Display of Initial Settings

The following dialog is displayed while the program is starting.

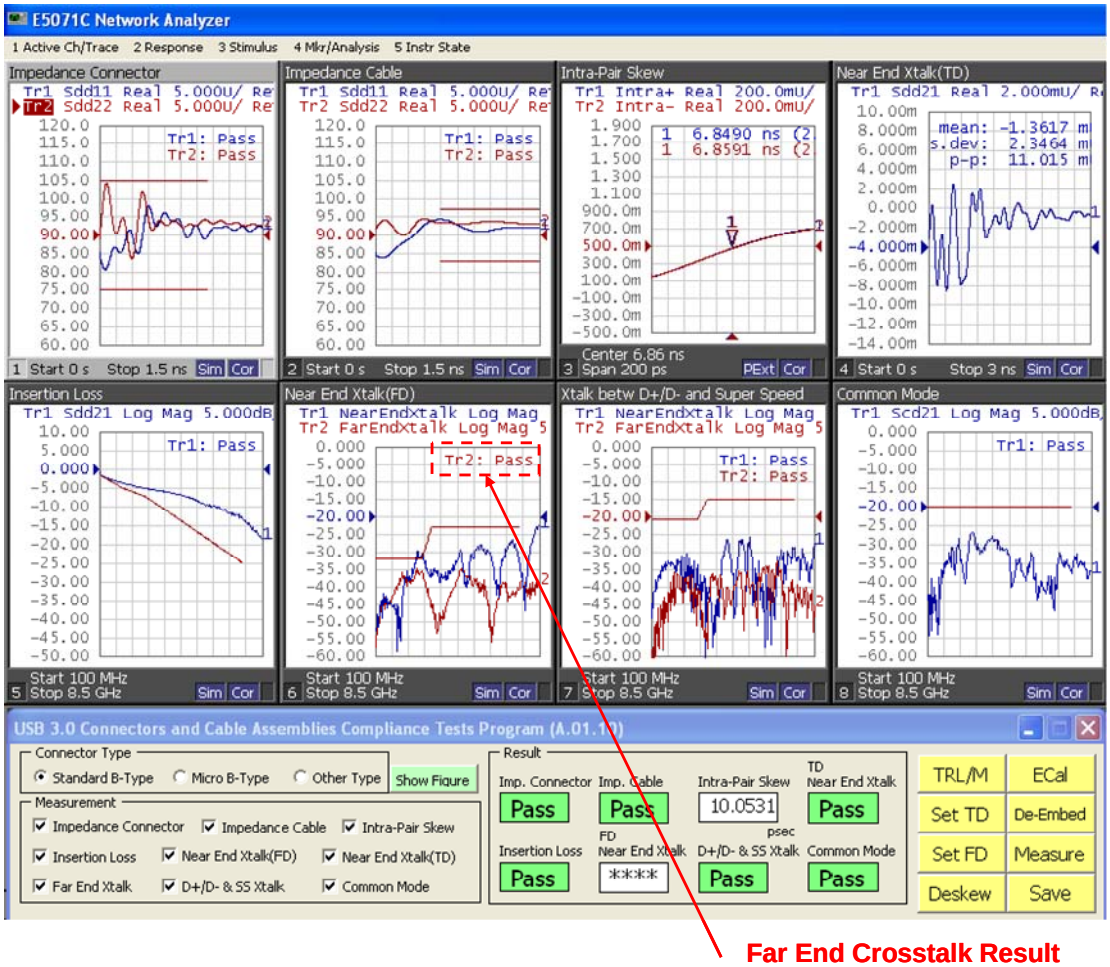


4. Description of Measurement Window

The following figure is the description of the measurement window.

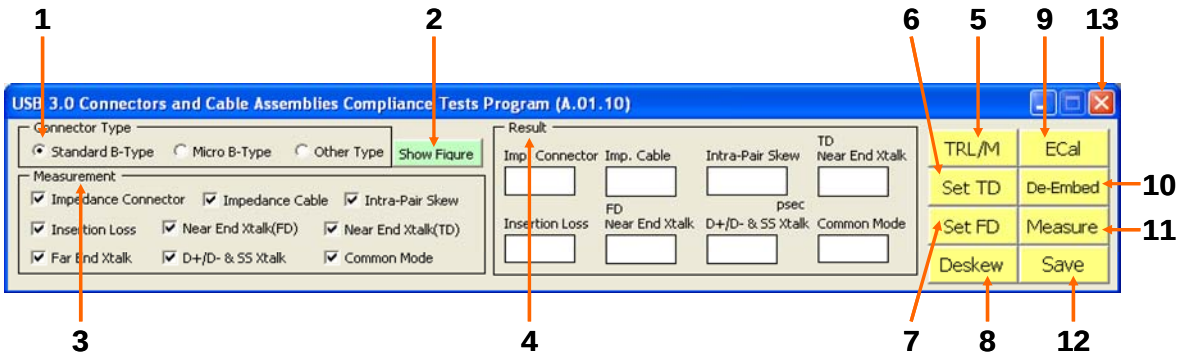


The following figure is the actual measurement example.



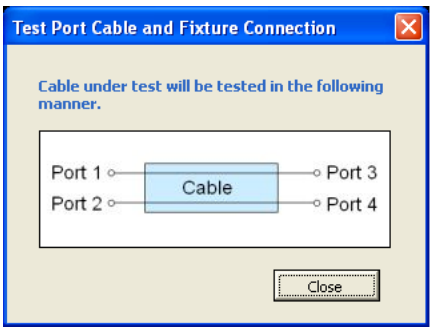
5. Description of User Interface

5.1. Main Menu



1 Select the measurement connector type. The value of limit changes according to the connector type. When you change the connector type, the display of the results can be cleared.

2 Show the test port cable and fixture connection figure.



3 Select the measurement parameters.[*1]

4 Displays pass/fail judgment when each measurement has finished.[*2*3]

5 Show the TRL/M calibration menu. For more information refer to 5.2 TRL/M Calibration Menu.

6 Click this button after completing calibration of time domain on channel 1 to copy

---

[*1] Near End Crosstalk for Time Domain measurement is not available for the Micro B-Type and the Other Type.

[*2] "***" is displayed in FD Near End Crosstalk result when below condition is satisfied.
-32 dB < Near End Crosstalk < -27 dB

[*3] TD Near End Crosstalk result is displayed only when FD Near End Crosstalk result shows "***".

calibration information to channel 2, 3 and 4. For channel number, refer to 4.Description of Measurement Window.

7 Click this button after completing calibration of frequency domain on channel 5 to copy calibration information to channel 6, 7 and 8. For channel number, refer to 4.Description of Measurement Window.

8 Executes deskew for intra-pair skew measurement.

9 Execute the 4-port calibration using the ECal module.

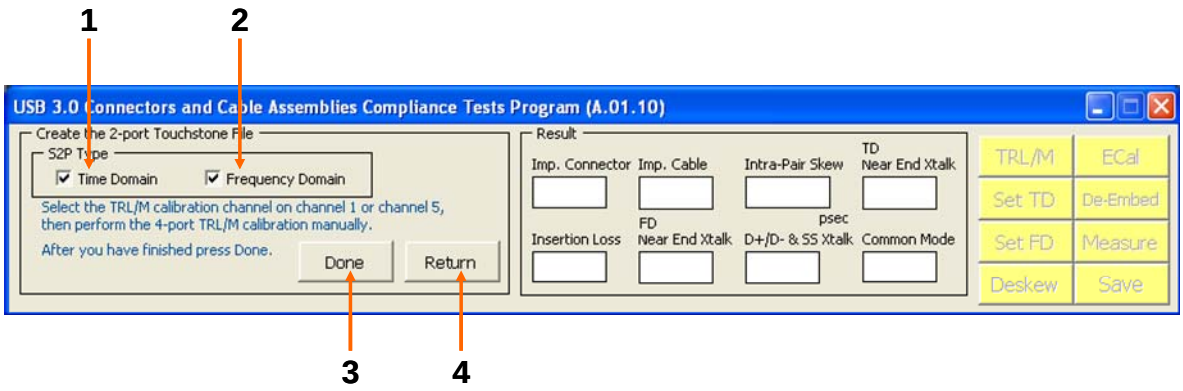
10 Sets the touchstone data file for test port from which a network is to be removed. Following the dialog box that appears, select the touchstone data file defining the characteristics of the network to be removed.

11 Executes measurement according to the selected measurement parameters. The connection dialog is displayed before each measurement.

12 Save trace data or pass/fail judgment to specified location. Refer to 5.3 Save Measurement Data Menu.

13 Cancel the operation and end the program.

5.2. TRL/M Calibration Menu



1 Check the Time Domain when you create the touchstone file for Time Domain.

2 Check the Frequency Domain when you create the touchstone file for Frequency Domain.

3 Press the Done button when you complete the TRL/M calibration.[*1] Then perform as below.

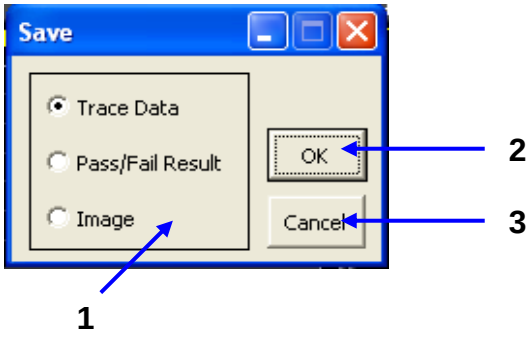
- Save the TRL/M calibration data to state file. [*2]
- Perform the 4-port calibration using the ECal module.
- Create the touchstone file (.s2p) for the selected S2P type.

4 Return to the Main Menu.

[*1] As for the TRL/M calibration procedure, refer to 6.1 TRL/M Calibration.
[*2] Default file name is "USB30_CableTest.sta".

5.3. Save Measurement Data Menu

When the Save button is clicked in the main window, the following dialog is displayed.



1 Select save type.

2 Save trace data, pass/fail judgment or image to specified location.

3 Return to main window.

5.3.1. Save Trace Data

The judgment and measurement data that has been displayed in the result area is saved by CSV format.

For the Far End Crosstalk, when the judgment is displayed in the measurement window, it's saved by CSV format. Refer to 4 Description of Measurement Window.

5.3.2. Save Pass/Fail Judgment

The judgment and measurement data that has been displayed in the result area is saved by CSV format.

For the Far End Crosstalk, when the judgment is displayed in the measurement window, it's saved by CSV format. Refer to 4 Description of Measurement Window.

5.3.3. Save Screen Image

Save the screen with a white background image of E5071C to a file by BMP or PNG format.

6. Calibration Procedure

You can select one of the following calibration methods for the measurements.

6.1. TRL/M Calibration

Perform TRL/M Calibration for Time Domain Measurements and Frequency Domain Measurements.

6.1.1. Define Calibration Kit

TRL/M calibration requires defining calibration kit before performing measurement setup.

For more information, refer to “Modifying Calibration Kit Definition” in E5071C online help.

6.1.2. Execute TRL/M Calibration

Time Domain and Frequency Domain must separately execute calibration.

- For Time Domain TRL/M calibration, you must select channel **1** on the E5071C screen.
- For Frequency Domain TRL/M calibration, you must select channel **5** on the E5071C screen.

For more information, refer to “4-port TRL Calibration” in E5071C online help.

6.2. ECal and De-Embedding

Perform ECal and De-Embedding for Time Domain Measurements and Frequency Domain Measurements.

6.2.1. Perform TRL/M Calibration

Refer to 6.1 TRL/M Calibration.

6.2.2. Create touchstone file

Refer to 5.2 TRL/M Calibration Menu.

6.2.3. Execute ECal and De-Embedding

Time Domain and Frequency Domain must separately execute calibration.

- For Time Domain ECal and De-Embedding, you must select channel **1** on the E5071C screen.
- For Frequency Domain ECal and De-Embedding, you must select channel **5** on the E5071C screen.

For more information, refer to “Extending the Calibration Plane Using Network De-embedding” in E5071C online help.

7. Measurement Flow Example

7.1. Using TRL/M Calibration

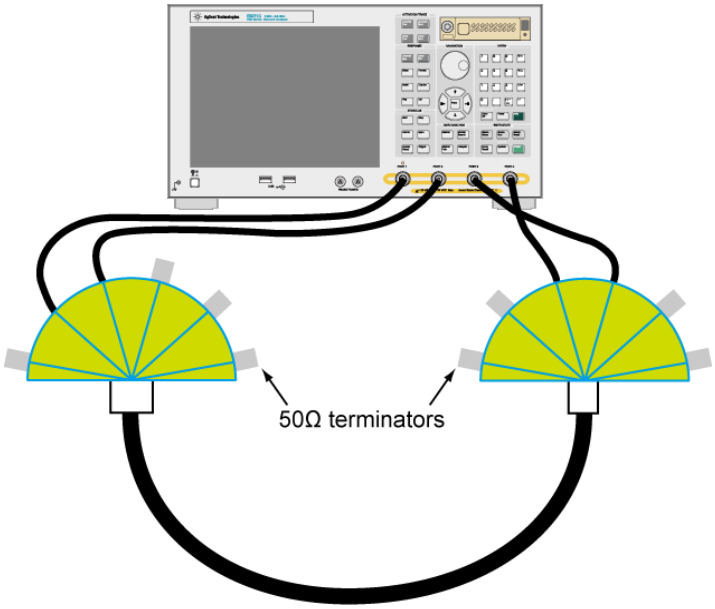
1. Select connector types. When connector type is changed, the result area can be cleared.
2. Press “TRL/M” button, then displays the TRL/M calibration menu.
3. Select channel 1 on the E5071C screen, then manually perform the TRL/M calibration for Time Domain.
4. Select channel 5 on the E5071C screen, then manually perform the TRL/M calibration for Frequency Domain.
5. If you want to create the touchstone file, check the Time Domain or the Frequency Domain in the S2P Type. Press “Done” button then follow the procedure described in 5.2 TRL/M Calibration Menu. If you don’t create the touchstone file, press “Return” button.
6. Press “Set TD” and “Set FD” button. The instrument state is copied to all channels automatically.
7. Connect fixture without USB 3.0 cable. (Open Condition)
8. Press “Deskew” button when you need to perform the Intra-Pair Skew measurement.
9. Select measurement parameters from measurement area.
10. Press “Measure” button. The dialog box of each measurement is displayed, then connect the cable to the fixture and press “OK” button.
11. Measurement results are displayed in the result area.

7.2. Using ECal and De-Embedding

1. Press “ECal” button, perform 4-port calibration for channel 1 and channel 5.
2. Press “De-Embed” button, then select corresponding touchstone file (.s2p) from dialog box for channel 1 and channel 5, respectively.
3. Repeat step 6 to step 11 in the 7.1 Using TRL/M Calibration.

7.3. Connection Example

The following figure is an example of connection configuration for insertion loss measurement.



8. Reference Document

1. Agilent MOI for USB 3.0 Connectors and Cable Assemblies Compliance Tests
2. USB 3.0 Specification
3. USB 3.0 Connectors and Cable Assemblies Compliance Document