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Keysight Technologies 855xxA/B Series CalPods and 85523B CalPod Controller

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KEYSIGHT TECHNOLOGIES

User's and Service Guide

Notices

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A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Printing Copies of Documentation from the Web

To print copies of documentation from the Web, download the PDF file from the Keysight website:

- Go to http://www.keysight.com
- Enter the product model number (Ex: 85531B) in the **Search** function.
- Click **Search**.
- Click the **Manuals** hyperlink.
- Click the hyperlink title for the document you want to print - this downloads the PDF.
- Print the document after the PDF has fully downloaded.

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1 Usage Information

KEYSIGHT TECHNOLOGIES

Setup and Use of Keysight 855xxA/B Series CalPods

To get the most out of your purchase, it is recommended that this *User's Guide* be read carefully and completely.

This document provides information on 855xxA/B Series CalPods, explaining how to set up all software and hardware, how to confirm operation, and how to use with a PNA Microwave Network Analyzer.

855xxA/B Series CalPods eliminate errors due to cable or test system instability. CalPods simplify the process of recalibrating the PNA by not requiring the removal of the Device Under Test (DUT) or the physical connection of standards. This allows recalibrating from a remote location, such as when the DUT is used with very long cables in a temperature chamber or TVAC (thermal-vacuum) chamber.

855xxA/B Series CalPod Models:

- 85530B 20 GHz CalPod (Standard)
- 85531B 20 GHz CalPod (Temperature Characterized)
- 85532B 20 GHz CalPod (Thermal-Vacuum Environments)
- 85540A 40 GHz CalPod (Standard)
- 85541A 40 GHz CalPod (Temperature Characterized)
- 85542A 40 GHz CalPod (Thermal-Vacuum Environments)
- 85540B 40 GHz CalPod (4-State, 40 GHz Standard)
- 85541B 40 GHz CalPod (4-State, 40 GHz Temperature Characterized)
- 85542B 40 GHz CalPod (4-State, Thermal-Vacuum Environments)

Each 855xxA/B Series CalPod is controlled with the 85523B CalPod Controller.

Chapter Overview (Hyperlinks)

- "Step 1. Inspect the Shipment" on page 1-3
- "Step 2. Meet Electrical and Environmental Requirements" on page 1-7
- "Step 3. Download the CalPod Installation Package" on page 1-7
- "Step 4. Load Temperature Characterization Data" on page 1-11
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- "Step 11. Configure the Hardware for a Measurement" on page 1-22
- "Step 12. Recorrect (Refresh) the CalPods" on page 1-22
- "Step 13. Measure the DUT" on page 1-23

Step 1. Inspect the Shipment

1.1 Unpack the contents of the shipping container. Keep the container and packaging material in case the contents needs to be returned to the factory.

1.2. Use the Contents List in the shipping container to verify the completeness of your shipment. If not complete, refer to “Contacting Keysight” on page 3-2.

1.3. Carefully inspect each item in your shipment to make sure it was not damaged during shipment. If damaged, refer to “Contacting Keysight” on page 3-2.

NOTE **The following pages list items that may be included in your shipment, depending on what you purchased. Your shipment may not contain all items shown.**

Table 1-1 Shipment Items

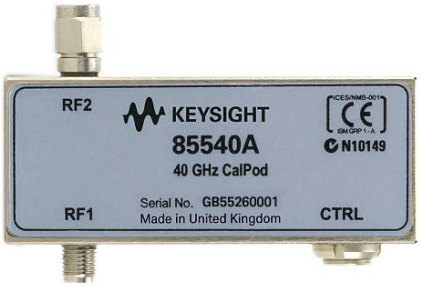
85530B 100 MHz to 20 GHz CalPod (Standard)[1], or
85540A/B 500 MHz to 40 GHz CalPod (Standard)[1, 2]



Table 1-1 Shipment Items

85531B 100 MHz to 20 GHz CalPod (Temperature Characterized)[1], or
85541A/B 500 MHz to 40 GHz CalPod (Temperature Characterized)[1, 2]

NOTE As shown in the graphic below, each temperature characterized CalPod comes with a USB drive that has a matching serial number. Each USB drive contains temperature characterization data that is unique to each 85531B 20 GHz CalPod or 85541A 40 GHz CalPod.



CalPod



USB Drive

85532B 100 MHz to 20 GHz CalPod (Thermal-Vacuum Environments)[1], or
85542A/B 500 MHz to 40 GHz CalPod (Thermal-Vacuum Environments)[1, 2]

Photos of the 85532B 20 GHz CalPod and the 85542A 40 GHz CalPod are not available. However, these CalPod models look the same as the 85531A 20 GHz CalPod shown above, except for the label.

85523B CalPod Controller[1]



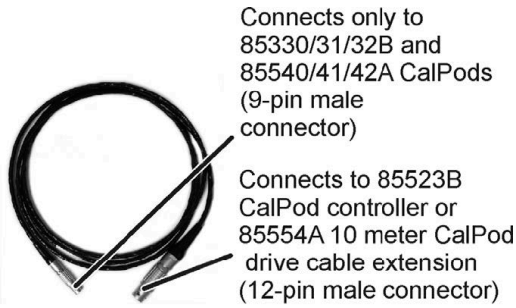
0960-2955 USB 2.0 to LAN Adapter, 7.5 inch[3]



Table 1-1 Shipment Items

85553A CalPod Drive Cable (2 meter, 28 AWG) included with:

- 85530B 20 GHz CalPod (Standard)
- 85531B 20 GHz CalPod (Temperature Characterized)
- 85532B 20 GHz CalPod (Thermal-Vacuum Environments)
- 85540A/B 40 GHz CalPod (Standard)
- 85541A/B 40 GHz CalPod (Temperature Characterized)
- 85542A/B 40 GHz CalPod (Thermal-Vacuum Environments)



NOTE

CalPod drive cables vary, depending on the CalPod model. The cables have connector alignment keys that allow only the proper cable to connect to the appropriate CalPod. This ensures that no mistake is made when connecting the drive cable to the CalPod.

A CalPod drive cable with two alignment keys (shown below) is used with the 85530/31/32B 20 GHz CalPods as well as the 85540/41/42 A and B, 40 GHz CalPods. The older 85530/31/32A CalPods use the drive cable with only one alignment key (shown below).



Table 1-1 Shipment Items

85554A 20 GHz and 40 GHz CalPod Drive Cable Extension[4] (10 meter, 22 AWG)



Connects to 85552/53A CalPod drive cables, another 10 meter CalPod drive cable extension, or 85555A splitter drive cable. (12-pin female connector)

Connects to 85523B CalPod controller (12-pin male connector)

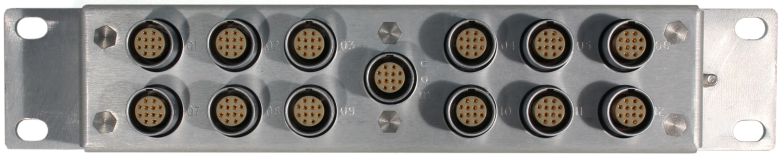
85555A Splitter Drive Cable (2 meter, 22 AWG) included with 85556A 1x12 Fan-Out Cable Splitter



Connects to 85523B CalPod controller or 85554A 10 meter CalPod drive cable extension (12-pin male connector)

Connects to 85556A 1x12 fan-out cable splitter (12-pin female connector)

85556A 1x12 Fan-Out Cable Splitter



The 85556A 1x12 fan-out cable splitter is used to drive up to 12 CalPods from a single port on the 85523B CalPod controller.

For information on connecting more than four CalPods in a measurement hardware configuration, refer to "Configuration: Using a 1 x 12 CalPod Cable Fan-Out Splitter for More Than Four CalPods" on page 2-7.

1. For CalPod drive cables, see Table 1-1, "Shipment Items," on page 1-3.
2. Although the 85540A/B, 85541A/B, and the 85542A/B 40 GHz CalPods are only characterized from 500 MHz to 40 GHz, they can function from 100 MHz to 40 GHz.
3. The device driver software for the USB 2.0 to LAN Adapter is installed during the procedure "Step 3. Download the CalPod Installation Package" on page 1-7
4. CalPod drive cable extensions may be used with either the 85552A 20 GHz CalPod drive cable or the 85553A 40 GHz CalPod drive cable.

Step 2. Meet Electrical and Environmental Requirements

CAUTION This instrument has autoranging line voltage input. Be sure the supply voltage is within the specified range.

2.1 Ensure the available AC power source meets the following requirements:

- Frequency
  - ❏ 50/60 Hz
- Voltage
  - ❏ 100/120/220/240 VAC

NOTE The instrument can operate with mains supply voltage fluctuations up to +/- 10% of the nominal voltage.

- Power (maximum consumed)
  - ❏ 350 W

2.2 Ensure the operating environment meets the requirements found in "Environmental Information" on page 3-9.

2.3. Verify that the AC power cable is not damaged, and that the power-source outlet provides a protective earth contact.

CAUTION Use the Keysight supplied power cord or one with the same or better electrical rating. Failure to ensure adequate earth grounding by not using this cord may cause personal injury or product damage.

Step 3. Download the CalPod Installation Package for Windows XP and Win7 OS

NOTE Step 3 assumes that the *CalPod Installation Package* has not previously been installed on the PNA.

The CalPod Installation Package is a software package that includes all software required for full CalPod operation. It is compatible with PNA firmware (application code) version A.09.33.05 or later. If you have an old version of PNA firmware, go to http://na.support.keysight.com/pna/firmware and download the latest version.

3.1 On the PNA, select **File > Minimize Application**.

3.2 Connect a LAN cable to the PNA for access to the Internet.

3.3 Select **Start > Programs > Internet Explorer**.

3.4 Navigate to the 855xxA/B Series CalPod website at: http://na.support.keysight.com/calpod/

3.5 Scroll down the Web page and click the link titled: **CalPod Software Installation**.

3.6 Select the download according to the PNA Windows OS. At the prompt ("This File Download - Security Warning"), select **Save** (do not select Run) to save the file to the PNA.

3.7 When the download is complete, click **Run** and follow the prompts. At the end of the installation, click **Close** and the software is ready to use.

NOTE For Windows 7, skip Steps 3.8 through 3.12 and continue to Step 3.13.
For Windows XP, continue with Steps 3.8 through 3.13.

3.8 Select **1. Install the USB-to-LAN adapter driver.**

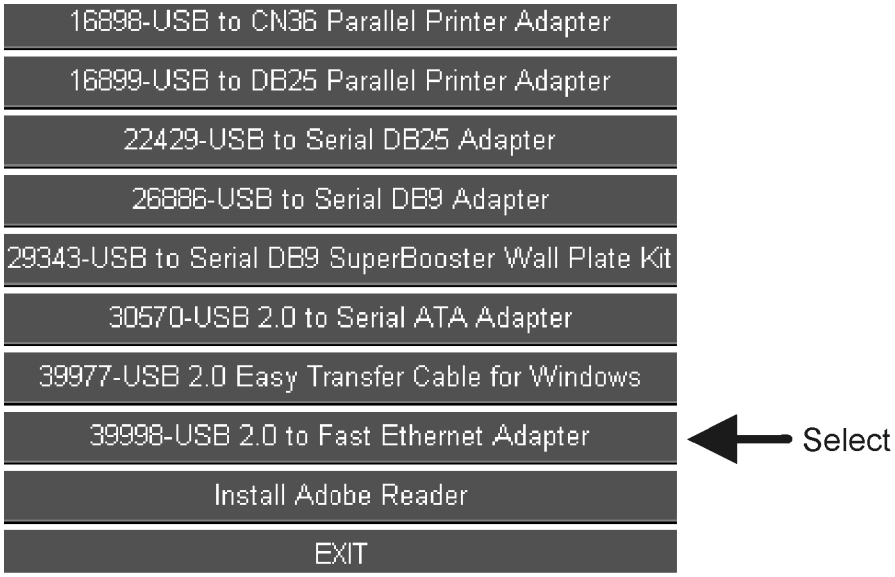


85523_001_112

At the end of the installation process, a screen is displayed that allows the driver software for the USB 2.0 to LAN adapter to be installed.

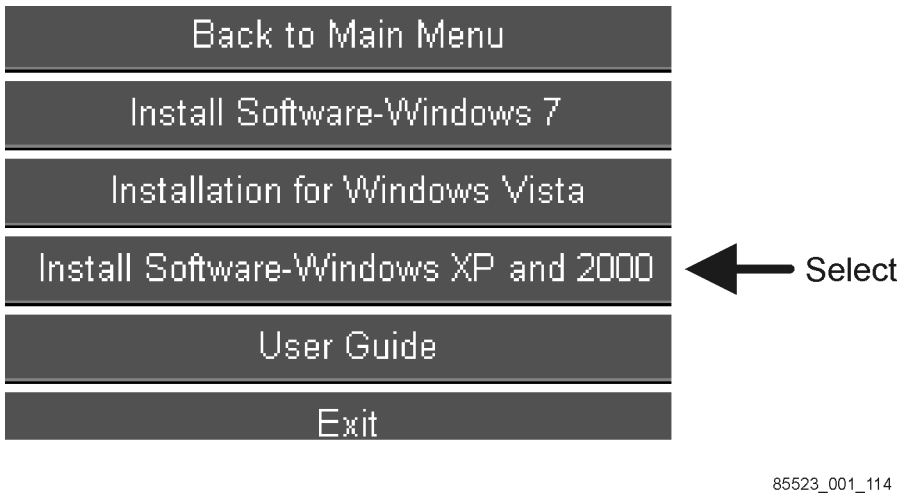
3.9 Press any key to continue at the information window.

3.10 Select **39998-USB 2.0 to Fast Ethernet Adapter** from the list.



85523_001_113

3.11 Select **Install Software - Windows XP and 2000** from the list.



If there is a prompt to completely remove the selected application, perform the following:

1. Click **Yes**.
2. At the next dialog window, wait for approximately five seconds before clicking **Finish**.
3. Repeat **Step 3.11** to reinstall the driver application.

3.12 Wait for an Install Shield Wizard screen with a "Finish" button. When it appears, select **Finish**.

3.13 Enable the CalPod firmware license (option 301 or 302).

NOTE **This step (Step 3.13) only applies to a network analyzer with firmware version A.09.xx.xx or older. Version A.10.49.11 or higher does not require enabling option 301 or 302.**

To use the CalPod Installation Package that was downloaded in "Step 3. Download the CalPod Installation Package for Windows XP and Win7 OS" on page 1-7, the CalPod firmware license option (301 or 302) has to be enabled using a keyword that is specific for your PNA model and serial number. This keyword was sent to you by Keysight. Use the following instructions to enter the keyword in the PNA using the PNA front panel HARDKEYs and [softkeys].

1. On the PNA, press **SYSTEM** > **[Service]** > **[Option Enable]**.
2. In the Option Enable dialog box, use the pull-down menu to select the CalPod firmware option you bought with your initial purchase. If you don't know which option was purchased, refer to the papers in the shipment container.
3. Enter the keyword.
4. Select **Permanent** > **Enable**.
5. Click **Yes** to restart the PNA and enable the new firmware.

6. Confirm the PNA Model, Firmware Revision, and Installed Options.

   a. If not already active, start the PNA application.

   b. Select the **Help** pull-down menu.

   c. Select **About Network Analyzer** and note the following:

      1. PNA model.
      2. PNA firmware (application code) version.
      3. PNA option 301 or 302 is installed.

   d. Compare the information you just noted with the information in Table 1-2. If your PNA is not compatible with your CalPods, or if Option 301 or 302 is not installed, contact Keysight. Refer to "Contacting Keysight" on page 3-2. If you have an old version of PNA firmware, go to http://na.support.keysight.com/pna/firmware and download the latest version.

   e. Select **OK**.

   f. Select the **File** pull down menu and select **Minimize Application**.

Table 1-2 PNA Models, Firmware, Firmware Options Required for 855xxA/B Series CalPods

PNA Models	PNA Firmware Version	PNA Options (CalPod Firmware License)	855xxA/B CalPod Modules
N524xA PNA-X	A.09.33.05 or later	Option 301	85530B 20 GHz CalPod
N522xA PNA			85540A 40 GHz CalPod
N523xA PNA-L		Option 302	85531B 20 GHz CalPod
N5230C PNA-L			85532B 20 GHz CalPod
E836xC PNA	A.09.85.07 or earlier		85541A 40 GHz CalPod
			85542A 40 GHz CalPod

PNA Options for CalPod Firmware

PNA firmware option 301 is used for ambient temperature operation of CalPods and provides accurate recorrection capabilities over the temperature range +20 to +30 °C. A maximum of only four CalPods can be controlled with option 301. The temperature compensated and thermal-vacuum environment CalPods can be used with firmware option 301, but they will not have temperature compensation capabilities.

PNA firmware option 302 is used for temperature compensated and thermal-vacuum CalPods, and provides accurate recorrection capabilities over the temperature range –30 to +80 °C. With firmware option 302, up to 48 CalPods can be controlled, but only four CalPods at a time can be recorrected.

Step 4. Load Temperature Characterization Data

NOTE **The following process is required for 85531B, 85532B, 85541A, and 85542A Cal Pods. It is not required for an 85530B or 85540A CalPod since these models do not have Temperature Characterization data.**

If your CalPod model is an 85531B, 85532B, 85541A/B, or 85542A/B, it is temperature compensated, and was shipped with a USB drive that has a matching serial number – refer to Figure 1-1., “USB Drive Matches Serial Number on CalPod,” on page 1-12. The USB drive contains Temperature Characterization data that must be loaded into the PNA. To do so, use the following procedure.

4.1 Insert the USB drive into any USB port on the PNA.

4.2 To access the Windows desktop when the PNA application is active, select **File > Minimize Application**.

4.3. Right-click on **Start** and select **Explore**.

4.4 Navigate to the files on the USB drive, and double-click **setup.exe** to run the program.

4.5 In the dialog window titled “CalPod Thermal Characterization Data Install Utility,” click **“I accept license terms...”** and wait for additional text to be displayed. This loads CalPod Temperature Characterization data in the PNA.

4.6 When “PNA restore archive complete” is displayed at the bottom of the window, close the window.

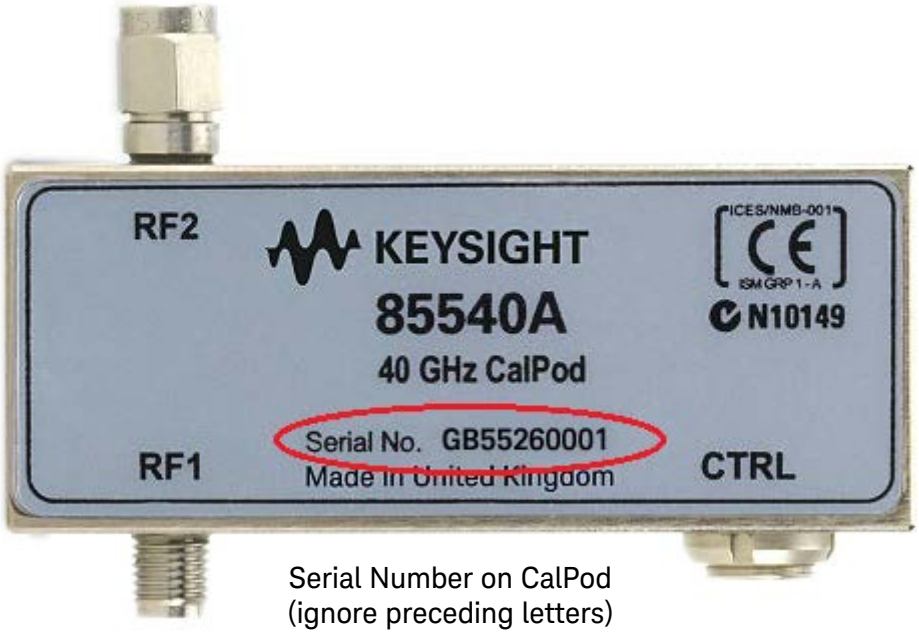
4.7 Remove the USB drive from the PNA.

4.8 Repeat “Step 4. Load Temperature Characterization Data” on this page for each CalPod to be used with the PNA.

Figure 1-1 USB Drive Matches Serial Number on CalPod



Serial Number on USB Drive
(ignore preceding letters)

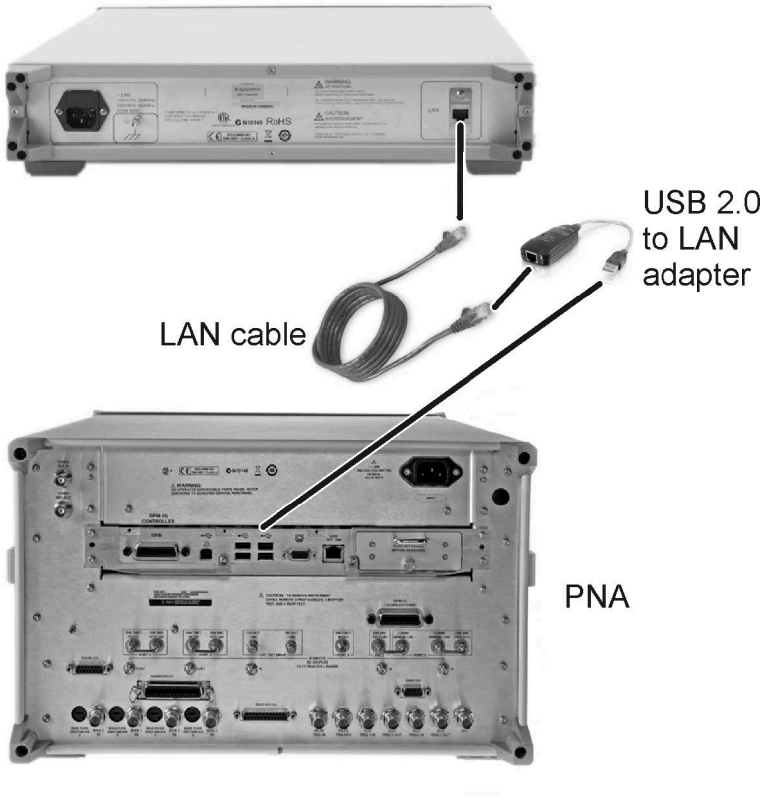


Serial Number on CalPod
(ignore preceding letters)

Step 5. Connect the LAN Cable

NOTE A LAN cable is required, but is not included. Either a standard or cross-over LAN cable can be used. (A cross-over LAN cable is used to connect computing devices together directly where they would normally be connected via a network switch, hub, or router.)

- The following graphic shows the recommended configuration for the LAN cable. Information on an alternative configuration can be found at "Alternative Configuration for the LAN Cable (Not Recommended)" on page 2-4. Although this alternative is not recommended, it can be used when the USB 2.0 to LAN adapter is not available.
- 85523B CalPod Controllers do not support DHCP networking.
- The 85523B CalPod Controller is set to a static IP Address (default: 192.168.0.100.)
- For additional information on making connections to the LAN using network switches and network hubs, contact your network administrator.



5.1 As shown in the graphic above, connect a LAN cable (not included) to the rear of the 85523B CalPod Controller and connect the other end to the USB 2.0 to LAN adapter (part number 0960-2955).

5.2 As shown in the graphic above, connect the USB 2.0 to LAN adapter to a USB port on the PNA. (Typically this is on the rear of the PNA, but any USB port can be used.)

5.3 Verify that AC line cords are connected to both the PNA and CalPod Controller and that they are powered on.

5.4 Select File > Minimize Application.

5.5 Run the CalPod LAN Config icon on the PNA desktop and select 2. USB-to-LAN-Adapter.

5.6 Follow the remaining prompts.

Step 6. Confirm the Settings on the CalPod Controller

Use either of the following methods to run the IP setup utility and confirm the default settings shown in the table below.

Method 1: Using the PNA front panel HARDKEYs and [softkeys].

- On the PNA, press CAL > [More] > [CalPod] > [CalPod].
- On the dialog window titled “Calibration Module Refresh Configuration,” click [CalPod Setup].
- On the dialog window titled “CalPod Setup,” click [IP Setup].

Method 2: Using the mouse and the PNA pull-down menus.

- On the PNA, click Start > Programs > CalPod > API > IP Setup.

If the default settings are not correctly displayed, use the keypad to enter them in the IP Setup dialog window.

The default addresses for the 85523B CalPod Controller are shown in the following table.

Setting	Default Address
IP	192.168.0.100
Network mask	255.255.255.0
Gateway	192.168.0.1
DNS	0.0.0.0 (or leave blank)

For additional information on making connections to the LAN using network switches and network hubs, contact your network administrator.

Step 7. Configure the CalPods

7.1 Connect each CalPod to the CalPod controller, as shown in the following graphic.



For CalPod drive cables, see "Step 1. Inspect the Shipment" on page 1-3.

7.2 If not already active, start the PNA application.

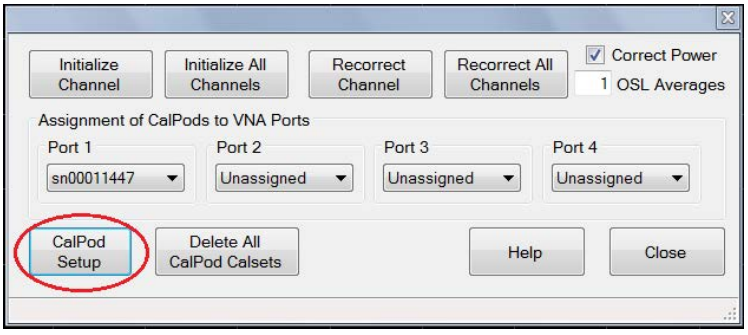
7.3 Start the CalPod dialog window titled 'Calibration Refresh Module Configuration" using either method below.

Method 1: Using the PNA front panel HARDKEYS and [softkeys].
Press **CAL > [More] > [Calpod] > [Calpod]**

Method 2: Using the mouse and the PNA pull-down menus.
Click **Response > Cal > Calpod > Calpod**

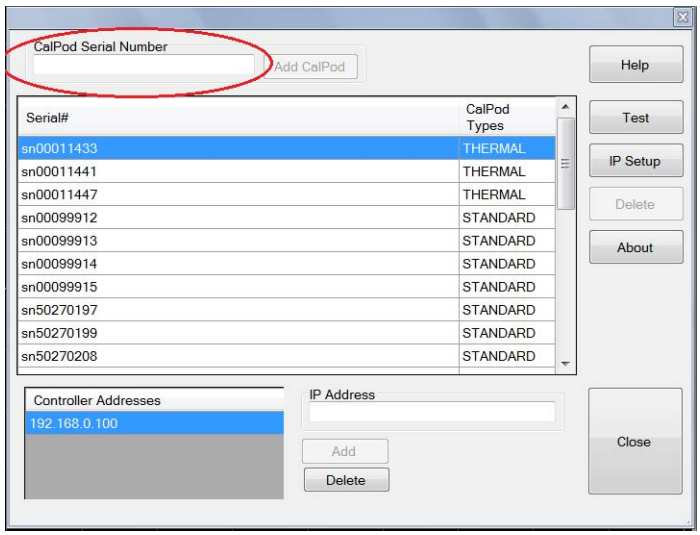
NOTE **If a "Windows Security Alert" appears that is related to the etrak Api, select "Unblock."**

7.4 Select **CalPod Setup** on the Calibration Refresh Module Configuration window.



7.5 If using thermal CalPods, the serial numbers will automatically appear in the CalPod Setup dialog window. However, if using standard CalPods, enter a CalPod serial number, omitting preceding letters, the click **Add CalPod**.

Enter serial number



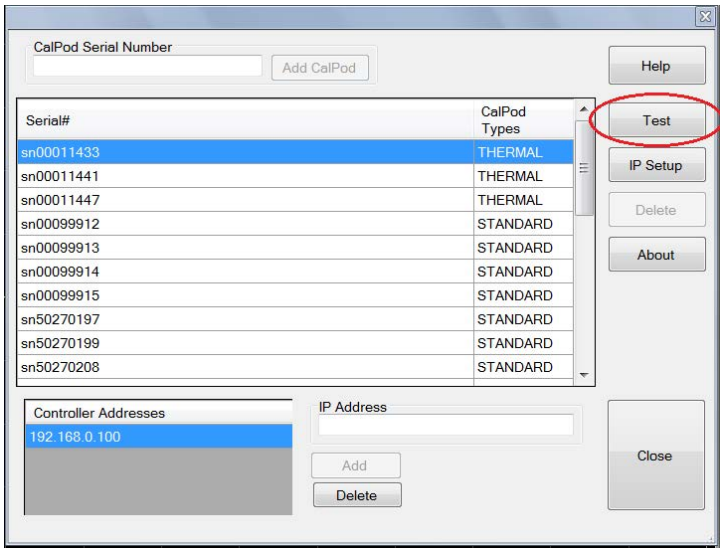
In the dialog window column "CalPod Types:"

- "STANDARD" refers to the 85530B 20 GHz CalPod and 85540A/B 40 GHz CalPod, and requires software Option 301 or 302.[1] The list is limited to four entries when Option 301[1] is the only option installed.
- "THERMAL" refers to the 85531/32B 20 GHz CalPod and 85541/42A and B 40 GHz CalPod, and requires software Option 302.[1] More than four entries can be listed with Option 302.[1]

In order for a CalPod to be listed as "THERMAL," its Temperature Characterization data must have been installed previously in "Step 4. Load Temperature Characterization Data" on page 1-11. Without its Temperature Characterization data loaded, each CalPod will be listed as a "STANDARD."

7.6 Repeat the previous step for each standard CalPod you are using with the PNA.

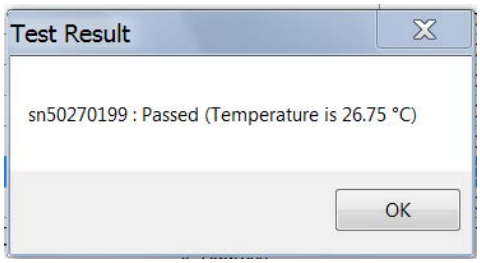
7.7 Using the CalPod Setup Dialog window, highlight a CalPod serial number and click **Test**. The dialog windows displays a list of one or more CalPod serial numbers.



Highlight the serial number and select **Test**

1. Applies to firmware version A.09.33.xx or earlier.

- If the Test Result dialog window shows “Passed,” the CalPod is functioning. The temperature displayed is the internal temperature of the CalPod microcircuit.



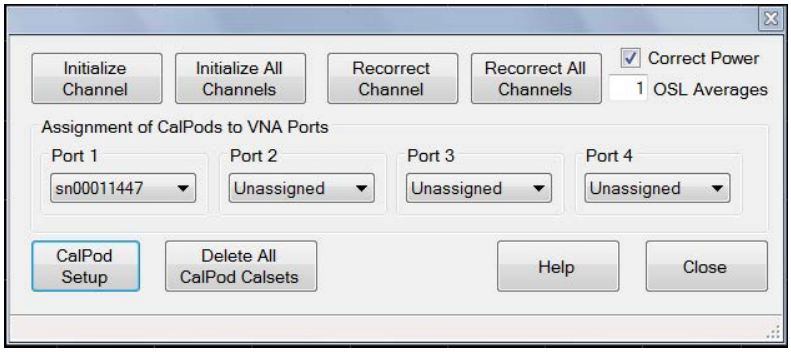
- If Test Result shows "Failed" and the window text contains the words “Controller @ .... :Failed”
  - Check that the CalPod Controller is powered on and connected to the PNA correctly. See “Step 5. Connect the LAN Cable” on page 1-13.
  - If all connections appear to be correct and the USB 2.0 to LAN Adapter is being used, set a static IP address on the PNA. See "Setting a Static IP Address on the PNA (When Using USB 2.0 to LAN Adapter)" on page 2-3.

- If Test Result shows "Failed" and the window text contains the words “sn .... :Failed,” check that the CalPod is properly connected to the CalPod Controller.

7.8 After each CalPod serial number has been highlighted and tested, click **Close** to return to the “Calibration Refresh Module Configuration” dialog menu.

7.9 Assign each CalPod to a PNA test port.

1. In the “Calibration Refresh Module Configuration” dialog window shown below, under the heading “Assignment of CalPods to VNA Ports,” assign a CalPod to each test port on the PNA. Note that Port 1, Port 2, Port 3, and Port 4 refer to the PNA test ports, and not the connector labels on the 85523B CalPod controller.



NOTE Clicking **Help** in the dialog window displays CalPod information in the PNA Series Network Analyzer Help System, stored in the PNA.

As indicated in the example above, CalPod serial number 00011447 has been assigned to PNA test Port 1.

2. After each CalPod has been assigned to a test port on the PNA, click **Close**.

Step 8. Configure the Hardware for a Calibration

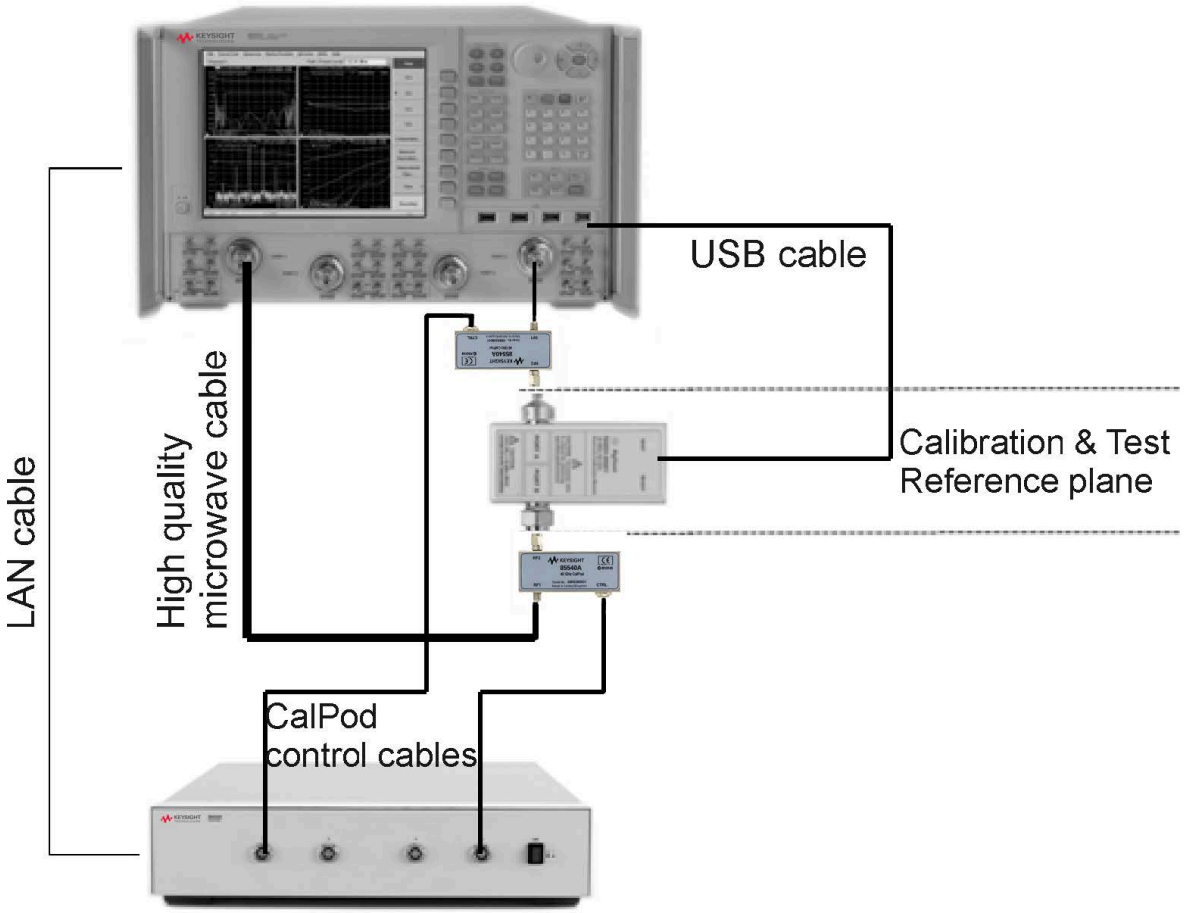
Figure 1-2, “Basic Measurement Hardware Configuration for Calibration (2-Port DUT),” on page 1-19 shows a recommended, basic measurement hardware configuration for calibrating the PNA when measuring a 2-port DUT. For information on more complex configurations, see the 855xxA/B Series CalPod Information website at: http://na.support.keysight.com/calpod.

The following items may be required, depending on your measurement hardware configuration.

- RF Cables – required to connect each CalPod to a PNA port. CalPods work well with cable losses (one- way loss from CalPod to PNA test port) up to 20 dB. CalPods will also work with cable losses greater than 20 dB, but the recorrection performance may be degraded. Consult the 855xxA/B Series CalPod Performance Characteristics document (85523-90007) available at: http://na.support.keysight.com/calpod/calpod_pc_85523-90007.pdf
- RF Adapters for the Device Under Test (DUT) – required if the DUT connectors are not compatible with the CalPod RF2 (2.92 mm male) connector.
- Calibration Kit or ECal – compatible with DUT connectors.
- (Optional) CalPod Drive Cable Extensions – The standard CalPod drive cable is 2 meters in length. The 85554A CalPod drive cable extension provides an additional 10 meter length. These CalPod drive cable extensions can be cascaded.

NOTE Figure 1-2 shows an ECal module with 3.5 mm f-f connectors. If using an ECal module with 3.5 mm m-f connectors, the female connector on the ECal module must be connected to each CalPod one-at-a-time. Follow the guided ECal calibration procedure on the PNA. Avoid using adaptors between the ECal module and the CalPod connectors, if possible.

Figure 1-2 Basic Measurement Hardware Configuration for Calibration (2-Port DUT)



Step 9. Perform Initial 2-Port Calibration

Information

- The instructions in this step assume that CalPods are connected to PNA Port 1 and Port 2, and that a 2-Port calibration is used.
- Most PNA calibration types may be used with CalPods. For details, see "Calibration Types Not Supported by CalPods" on page 2-3.
- For information on PNA traces and channels, see the Quick Start section of the PNA Series Network Analyzer Help System (available online and stored in the PNA).
- Notes on the calibration:
  - An ECal or a mechanical calibration kit may be used to perform the calibration. An ECal is preferred because the RF cables can remain totally undisturbed during the calibration and initialization steps.
  - When an ECal is used and multiple connections are required, order the steps such that the final step is an ECal "Thru" state connection.
  - When a mechanical calibration kit is used, take precautions to minimize cable movement. Leave the final standards connected during the initialization step in the following procedure.
  - When the ECal or calibration kit is a 2.4 mm connector type, use appropriate adapters on the CalPod RF1 and RF2 connectors (2.92 mm) during calibration.

Procedure

9.1 Connect the CalPods to the CalPod Controller.

9.2 Power on the CalPod Controller.

9.3 Start the CalPod dialog window titled "Calibration Refresh Module Configuration" using either method below.

Method 1: Using the PNA front panel HARDKEYS and [softkeys].
Press **CAL > [More] > [CalPod] > [CalPod]**

Method 2: Using the mouse and the PNA pull-down menus.
Click **Response > Cal > CalPod > CalPod**

NOTE **If a "Windows Security Alert" appears that is related to the etrak Api, select "Unblock."**

9.4 Assign CalPods to PNA Port 1 and Port 2 or confirm that the appropriate assignments already exist. Click the down arrow to select from available CalPods for a given port.

CAUTION **It is important to activate the CalPod dialog window at this point to ensure the CalPods are in the "thru" state.**

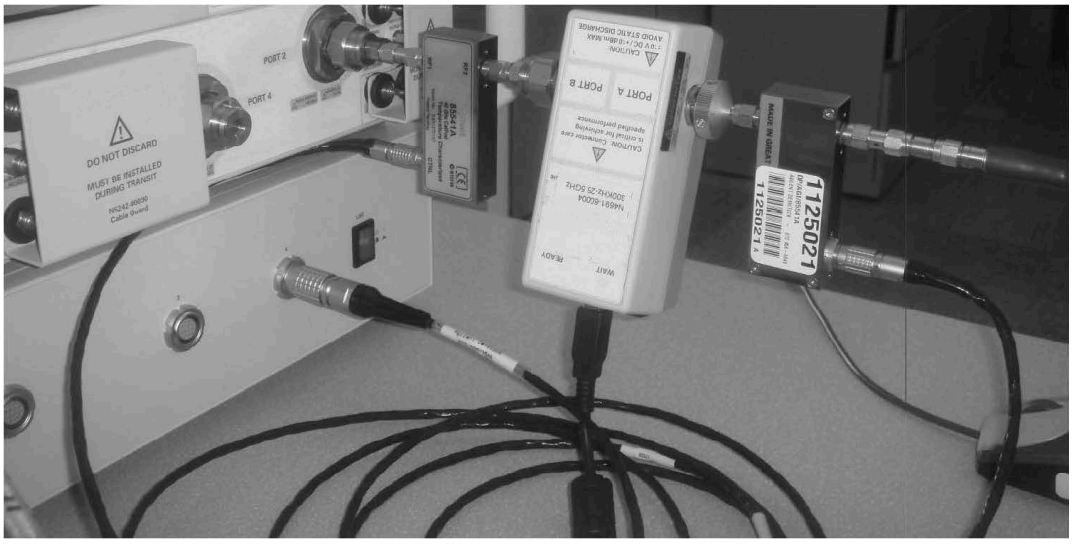
9.5 Close the CalPod dialog window.

9.6 Configure the measurement hardware for the initial calibration.

The initial calibration consists of performing a normal calibration (typically with an ECal module), and

then transferring this correction array to the CalPods when the Initialize Channel command is performed in Step 9.8.

The configuration for the initial ECal calibration and CalPod channel initialization can be significantly different from the final measurement configuration. A short cable between the PNA test port and the CalPod – as shown in the following graphic – can be used for the initial calibration. For the measurement, an entirely different cable with greater length and higher loss can be substituted between the PNA test ports and the CalPods. Additionally, different adapters, and even switch matrices can be added after the initial calibration to enable a measurement configuration.



9.7 Setup the measurement parameters on the PNA.

- Preset the PNA.
- Set up a 2-port measurement channel with the desired parameters for your DUT, including:
  - class (choose from S-parameters, source power cal and receiver power calibrations, scalar and vector mixer measurements, gain compression for amplifiers and mixers, noise figure for amplifiers and mixers, noise figure for amplifiers or mixers, IMD measurements for amplifiers or mixers, IMD spectrum mode)
  - start and stop frequencies (20 GHz CalPods are characterized from 100 MHz to 20 GHz; 40 GHz CalPods are characterized from 500 MHz to 40 GHz).
  - number of points

NOTE For best initial calibration results, use a 1 kHz or lower IF bandwidth with an averaging factor of eight. Sweep averaging is recommended. For the actual DUT measurements, the IF bandwidth and number of averages can vary.

9.8 Use either of the following methods to perform a full 2-port calibration on the PNA, using an ECAL module (for highest accuracy) or a mechanical calibration kit.

Method 1: Using the PNA front panel HARDKEYS and [softkeys].

Press Cal > [Start Cal] > [Cal Wizard].

Method 2: Using the mouse and the PNA pull-down menus.

Click Response > Cal > Start Cal > Cal Wizard.

- Follow the prompts in the calibration wizard to complete the calibration
- Select Save as User CalSet. Any file name that does not contain “calpod” may be used.

NOTE You must select **Save as User CalSet** (rather than “Finish”) to save the calibration in the channel 1 cal register.

IMPORTANT After completing the calibration, do not disturb any of the measurement hardware, until “Step 10. Initialize the CalPods” is completed, and the Initialize Channel operation has been performed on the CalPods. During this operation, the CalPods make a measurement requiring the same measurement hardware to properly initialize the CalPod correction arrays.

Step 10. Initialize the CalPods

Without disturbing any of the measurement hardware, use either of the following methods to save the initial calibration into the CalPod correction array. This must be done immediately after completing the last step of the initial calibration.

Method 1: Using the PNA front panel HARDKEYs and [softkeys].

Press CAL > [More] > [Calpod] > [Initialize Channel]

Method 2: Using the mouse and the PNA pull-down menus.

Click Response > Calpod > Initialize Channel

The calibration correction array established by the initial calibration is transferred to the CalPod correction array in this step. Any disturbances of the measurement hardware (such as cable movements) prior to performing the Initialize Channel step will affect the quality of the recorrection array.

IMPORTANT Do not **Initialize Channel** at any future point in time or the recorrection array will be corrupted, causing improper recorrections and inaccurate measurement data.

Step 11. Configure the Hardware for a Measurement

After the Initialize Channel procedure is completed, as detailed in the previous step, the measurement hardware can be reconfigured. For example, the short, stable cable between PNA port 1 and the CalPod can be replaced with a longer cable to reach a CalPod and DUT located inside a temperature or TVAC chamber. Other modifications in the path between the PNA and the CalPod – such as different adapters, and even switch matrices – can now be made.

Step 12. Recorrect (Refresh) the CalPods

When a calibration refresh is performed, the initial calibration is reestablished at the new location of the CalPods.

12.1 Connect the CalPods to the DUT and recorrect the calibration using either of the following methods.

Method 1: Using the PNA front panel HARDKEYs and [softkeys].

Press CAL > [More] > [Calpod] > [Recorrect Channel]

Method 2: Using the mouse and the PNA pull-down menus.

Click Response > Cal > Calpod > Recorrect Channel

The system is now ready to make calibrated measurements on the DUT.

12.2 When you want to reestablish the initial calibration, refresh the calibration using either of the methods above. Some examples of situations that call for a calibration refresh:

- Moving the location of the CalPods and DUT. For example, moving them from close proximity with the PNA to inside a temperature or thermal-vacuum chamber.
- Changing cables, cable lengths, or connectors in the path between the PNA and the CalPod.
- Adding a switch matrix or adaptors in the path between the PNA and the CalPod.
- Changing switch positions in a switch matrix.
- Changing temperatures inside of a temperature or thermal-vacuum chamber where the CalPod and DUT are located.
- Moving or flexing the cables.
- Wanting to be certain that a valid calibration is present at the calibration plane.

Step 13: Measure the DUT

Gather data from the PNA measurement of the DUT.

2 Reference Information

Miscellaneous Reference Information

Chapter Overview (Hyperlinks)

- "Websites with Additional PNA Information Related to CalPods" on page 2-2
- "85523B CalPod Controller Dimensions and Weight" on page 2-2
- "85523B CalPod Controller Front Panel Output Connectors" on page 2-3
- "CalPod Operational Check" on page 2-3
- "Calibration Types Not Supported by CalPods" on page 2-3
- "Setting a Static IP Address on the PNA (When Using USB 2.0 to LAN Adapter)" on page 2-3
- "Alternative Configuration for the LAN Cable (Not Recommended)" on page 2-4
- "Configuration: Distance Between Controller and CalPod is 2 Meters or Less" on page 2-6
- "Configuration: Distance Between Controller and CalPod is More Than 2 Meters" on page 2-7
- "Configuration: Using a 1 x 12 CalPod Cable Fan-Out Splitter for More Than Four CalPods" on page 2-7
- "Configuration: Distance Between Controller and Splitter is More/Less Than 2 Meters" on page 2-8
- "Configuration: Using as Many as 48 CalPods with One Controller" on page 2-9
- "Configuration: Using as Many as 48 CalPods with One Controller Over a Long Distance" on page 2-10
- "Configuration: Long Distance Between Splitter and CalPod" on page 2-10
- "Configuration: Control Through a TVAC Chamber Wall" on page 2-11

Websites with Additional PNA Information Related to CalPods

- Keysight 855xxA/B Series CalPod Information
  http://na.support.keysight.com/calpod
- Keysight 855xxA/B Series CalPod Performance Characteristics
  http://na.support.keysight.com/pna/calpod/calpod_pc_85523-90007.pdf
- Keysight 855xxA/B Series CalPod Performance Information in PNA Online Help
  http://na.support.keysight.com/pna/calpod/calpod_help.htm
- Network Analyzer Firmware
  http://na.support.keysight.com/pna/firmware
- General PNA Documentation
  http://na.support.keysight.com/pna

85523B Calpod Controller Dimensions and Weight

- Height: 89 mm
- Width: 425 mm
- Depth: 500 mm
- Weight: 7.5 kg

85523B CalPod Controller Front Panel Output Connectors

- Connector type: LEMO USA ECG.2B.312.CLV (Keysight part number 1254-1449)
- Maximum output: +/- 15 VDC

CalPod Operational Check

A CalPod module may be tested using the CalPod Operational Check. For instructions, refer to the CalPod portion of PNA Online Help at:
http://na.support.keysight.com/pna/calpod/calpod_help.htm#OpCheck

Calibration Types Not Supported by CalPods

Keysight 855xxA/B Series CalPods support almost all PNA S-parameter calibration types. The exceptions are calibration types that do not include a return loss portion for the port connected to the CalPod. An example of an unsupported calibration type is a Response Calibration.

When an unsupported calibration type is used, the CalPod software reports an error during "Initialize Channel."

Setting a Static IP Address on the PNA (When Using USB 2.0 to LAN Adapter)

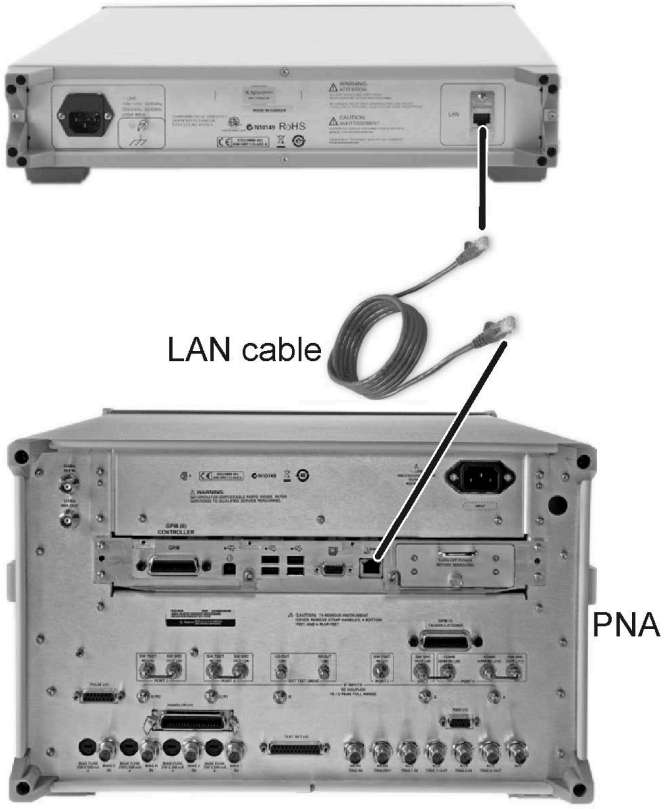
When the CalPod Controller connects to the PNA via the USB 2.0 to LAN adapter, sometimes it is necessary to manually set a Static IP address on the LAN interface. Multiple installations of the CalPod Installation Package may require this procedure.

1. Minimize the PNA application to access the desktop.
2. Click **Start** > **Settings** > **Network Connections**.
   There should be two or more listings with the name "Local Area ConnectionsN" (where N may be blank or an arbitrary character).
3. Right-click on the last item in the list and select **Properties**.
   The listing under "Connect using:" should display **"ASIX AX88772 USB2.0 to Fast Ethernet."**
   If this text is not displayed, click **Cancel** and try another item in the list until this device is found.
4. In the listing under "This connection uses the following items:", scroll down the list and highlight **"Internet Protocol (TCP/IP)."**
5. Click **Properties** or double-click the item on the list.
6. Click **"Use the following IP address."**
7. Enter IP Address **192.168.0.1** with a Subnet Mask of **255.255.255.0**. "Default Gateway" can be left blank.
8. Leave the DNS settings blank.
9. Click **OK** as necessary to close the dialog windows. If you are presented with a dialog window about entering a different IP address, click **No**.
10. Return to "Step 7. Configure the CalPods" on page 1-15 and follow the steps to test and verify that each CalPod is working.

Alternative Configuration for the LAN Cable (Not Recommended)

If the USB 2.0 to LAN adapter is not available, the following LAN cable configuration can be used. However, this configuration is not recommended because it does not allow the PNA to communicate over the LAN with instruments other than the controller.

NOTE A LAN cable is required but is not included. If your PNA model is an E836xC or N5230C, the LAN cable required is the cross-over type; for N524xA, see Figure 2-1 on page 2-5. Any LAN cable may be used with all other PNA models. (A cross-over LAN cable is used to connect computing devices together directly where they would normally be connected via a network switch, hub, or router.)



1. As shown in the graphic above, connect an appropriate type of LAN cable (not included) to the rear of the 85523B CalPod Controller.
2. As shown in the graphic above, connect the other end of the LAN cable to the PNA. (There is no network connector available for Web access.)
3. Verify that AC line cords are connected to both the PNA and CalPod Controller and that they are powered on.
4. Select **File > Minimize Application.**
5. Run the **CalPod LAN Config** icon on the PNA desktop and select **1. Direct Cable Connect**. (This configures the PNA to a static IP address.)

6. Follow remaining prompts.

NOTE To return to DHCP on the built-in PNA LAN adapter when CalPod operation is no longer required, run the CalPod LAN Config icon again and select option 3.

As shown in the following graphic, if your N524xA has a removable hard drive, it can be connected to the 85523B CalPod Controller with any type of LAN cable. However, if the N524xA has a non-removable hard drive, it must use a cross-over LAN cable.

Figure 2-1 LAN Cable Requirements for PNA-X N524xA Models



Non-removeable hard drive: use a cross-over LAN cable

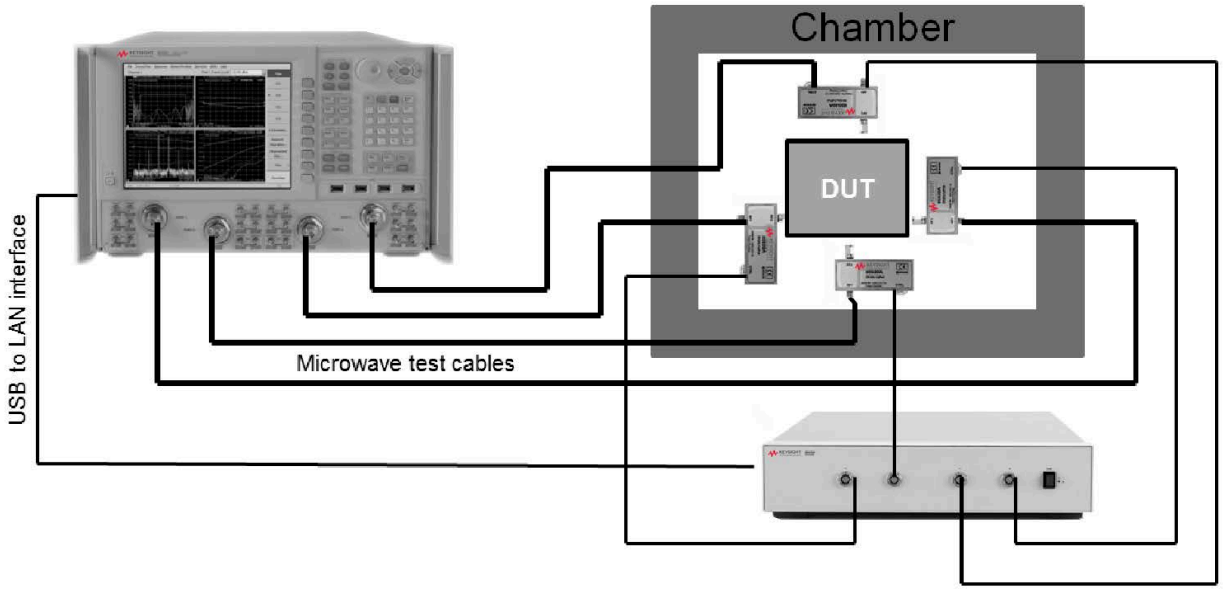


Removeable hard drive: use any LAN cable

Advanced Multiport CalPod Configurations

This section provides information on creating multiport CalPod configurations.

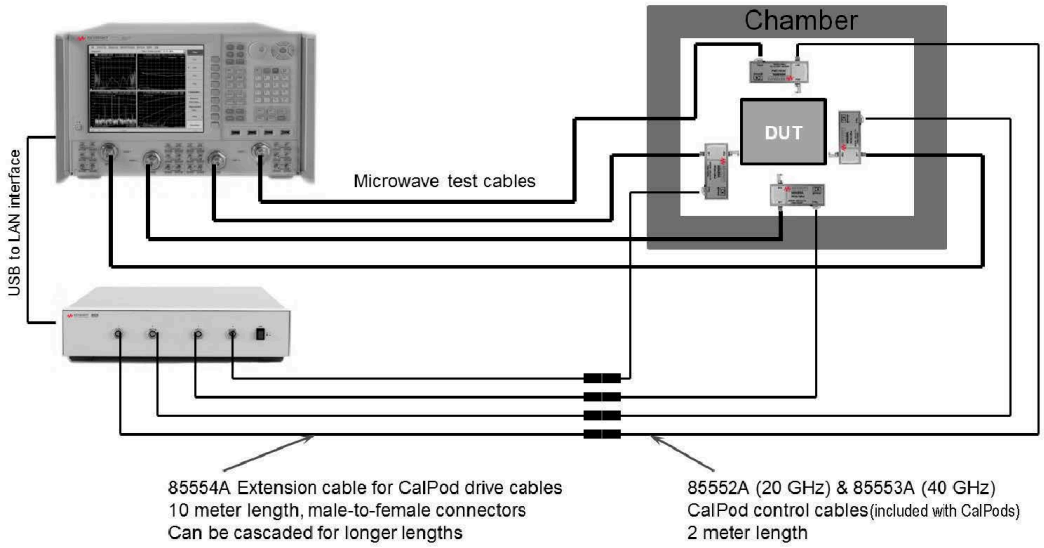
Configuration: Distance Between Controller and CalPod is 2 Meters or Less



When the distance between the 85523B CalPod controller and the CalPod unit is two meters or less, use the 85552A or 82553A CalPod drive cables (included with the CalPods) directly between them.

CalPod drive cables vary, depending on the CalPod model. The cables have connector alignment keys that allow only the proper cable to connect to the appropriate CalPod. This ensures that no mistake is made when connecting the drive cable to the CalPod. Refer to page 1-5 for information on CalPod drive cable compatibility.

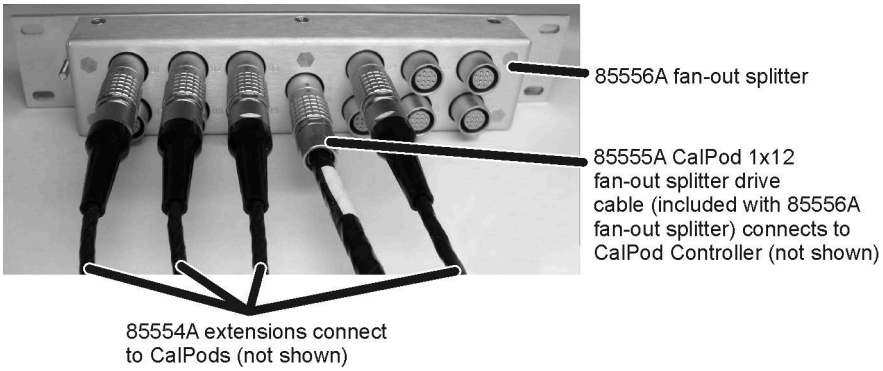
Configuration: Distance Between Controller and CalPod is More Than 2 Meters



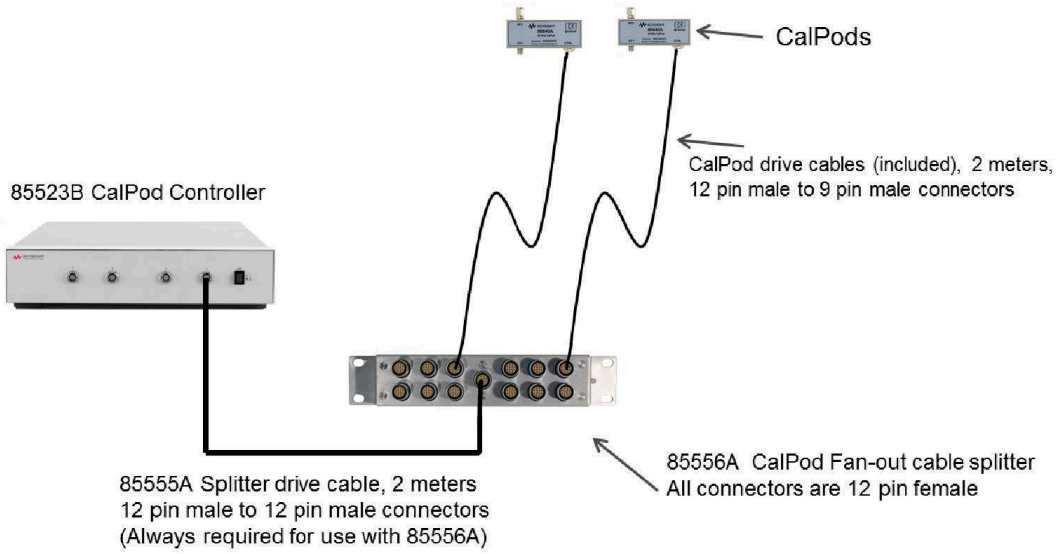
When the distance between the 85523B CalPod Controller and the CalPod unit is more than two meters, an 85554A extension cable for CalPod drive cables is required. This extension cable is 10 meters in length. The 12-pin male connector joins with the 85523B CalPod controller, and the 12-pin female connector joins with the 12-pin connector on the 85552/53A CalPod drive cable (2 meter length). The 9-pin male connector of the 85552/53A CalPod drive cable joins with the CalPod.

Configuration: Using a 1 x 12 CalPod Cable Fan-Out Splitter for More Than Four CalPods

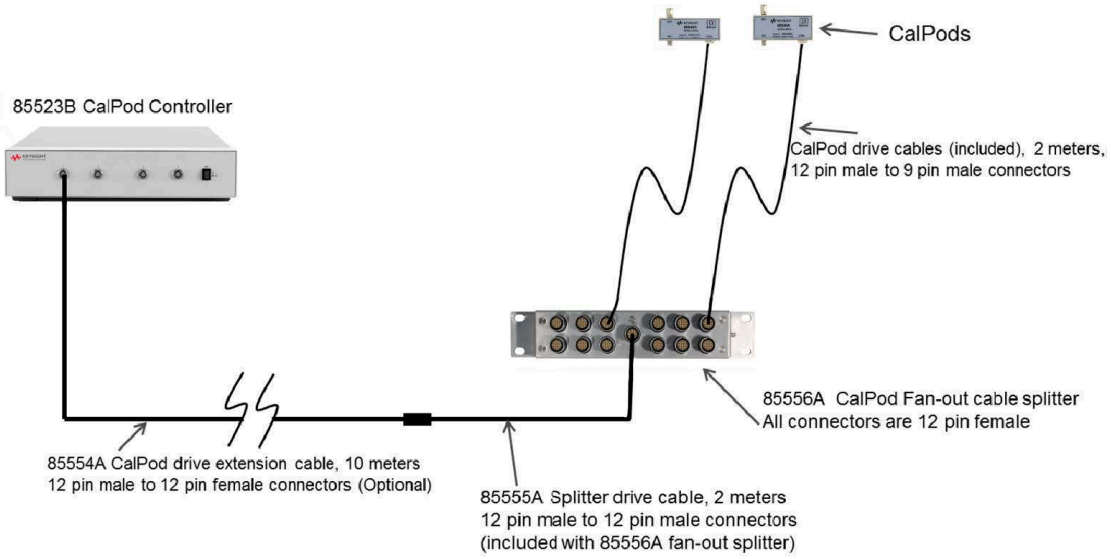
As shown in the following graphic, a Keysight 85556A 20 GHz and 40 GHz CalPod 1x12 fan-out splitter can be used to connect four or more 855xxA/B Series CalPods to an 85523B CalPod Controller.



Configuration: Distance Between Controller and Splitter is Less Than 2 Meters

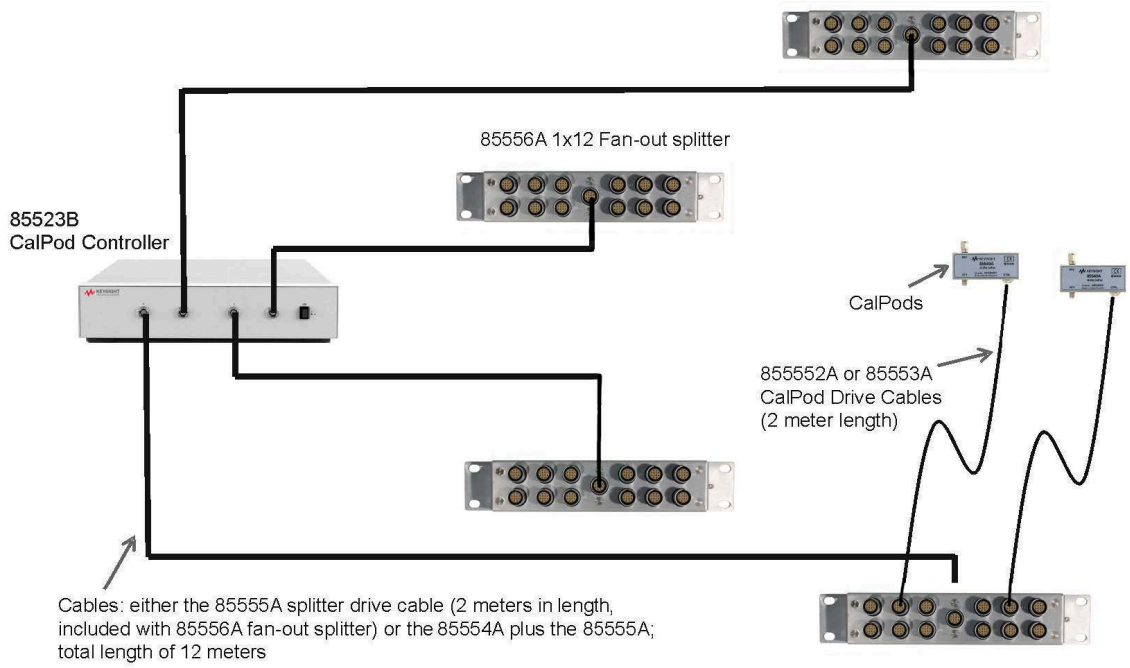


Configuration: Distance Between Controller and Splitter is More Than 2 Meters



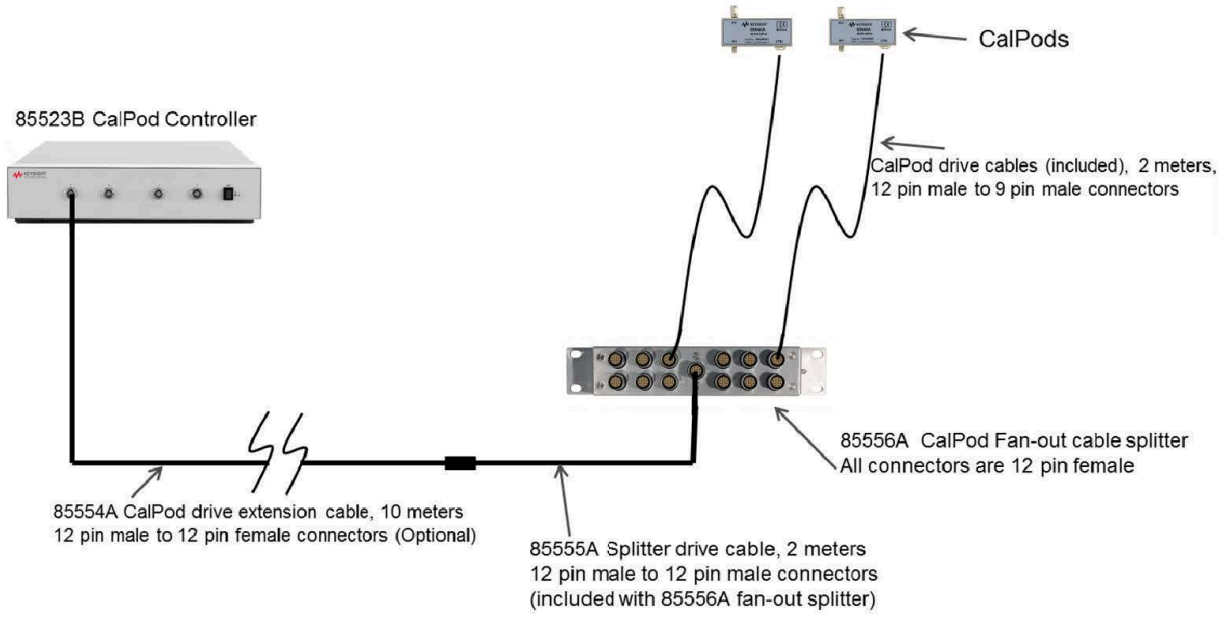
When the distance between the controller and the splitter is more than 2 meters, both the 85554A CalPod drive extension cable and the 85555A splitter drive cable are required.

Configuration: Using as Many as 48 CalPods with One Controller

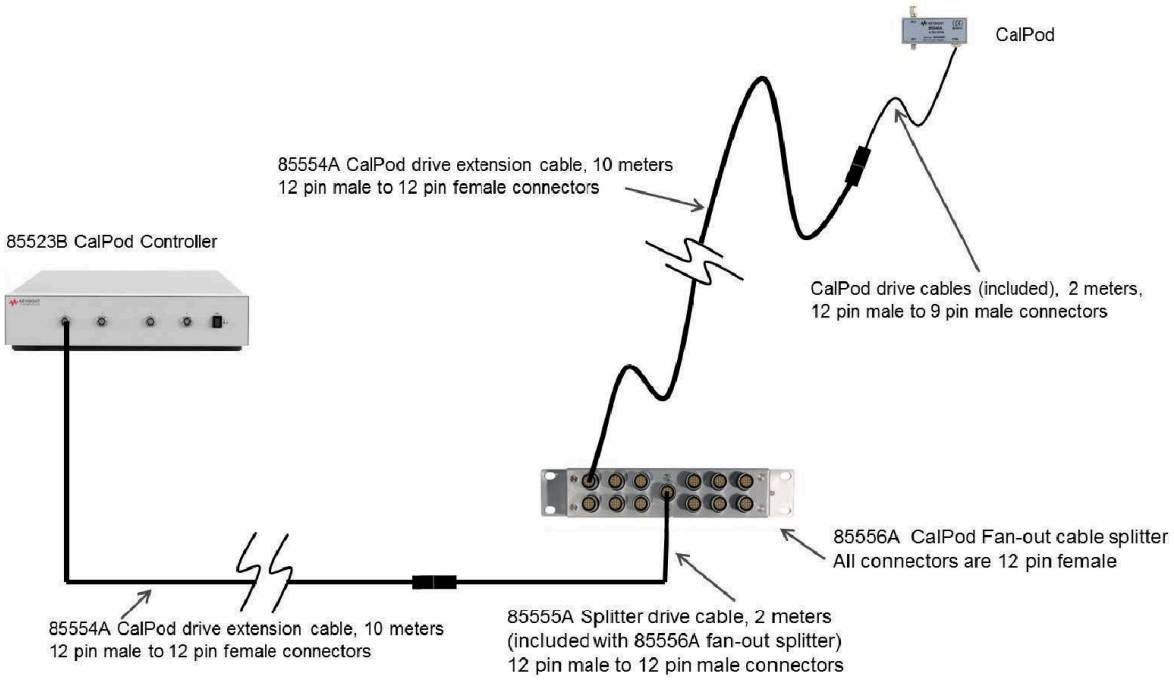


As many as 48 CalPods can be controlled by one 85523B CalPod controller. Each of the four ports on the CalPod controller can drive an 85556A fan-out cable splitter which can each drive up to 12 CalPods. The drive cable between the 85523B controller and the 85556A splitters requires either a 2 meter 85555A splitter drive cable, or a combination of an 85554A 10 meter extension cable with a 2 meter 85555A splitter drive cable, as shown in “Configuration: Using as Many as 48 CalPods with One Controller Over a Long Distance” on page 2-10. If additional distance is required, the extension cables can be cascaded.

Configuration: Using as Many as 48 CalPods with One Controller Over a Long Distance

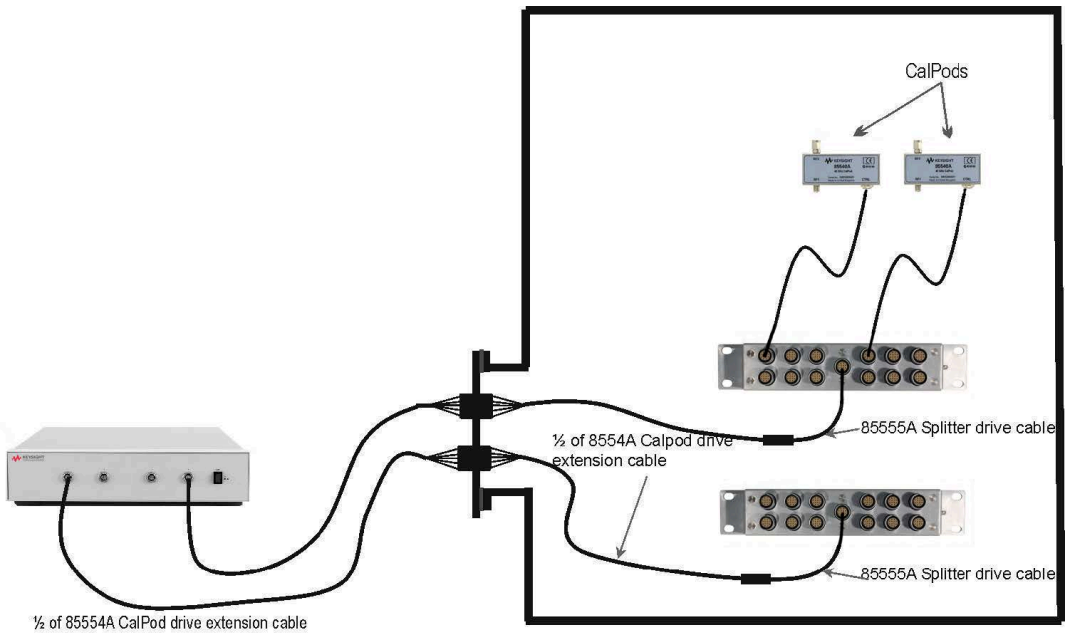


Configuration: Long Distance Between Splitter and CalPod



When there is a long distance required between the cable splitter and the CalPods, the 85554A CalPod drive extension cable can be used to provide additional length as shown in the previous graphic.

Configuration: Control Through a TVAC Chamber Wall



Thermal-vacuum testing requires controlling the CalPods inside of a TVAC chamber using an 85554A CalPod drive extension cable. This cable is cut to the appropriate length, and the cable conductors soldered to an appropriate TVAC bulkhead connector to provide DC connections through the TVAC chamber wall. Alternatively, Pave Technology (www.pavetechnology.com) has an SP37/13-E-150-15-20-DSUB-DSUB connector that is used for TVAC bulkheads. The control voltages are +/-15 Vdc with 60 mA per cable conductor.

3 Safety and Regulatory Information

KEYSIGHT TECHNOLOGIES

Contacting Keysight

Assistance with test and measurements needs and information on finding a local Keysight office are available on the Web at: www.keysight.com/find/assist

If you do not have access to the Internet, please contact your Keysight field engineer.

NOTE **In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine whether your product is still within its warranty period.**

Maintenance

To remove dirt or dust from the external case of the Keysight products, clean the case using a dry or slightly-dampened cloth only.

If alcohol is used to clean the connectors, the power cord to the instrument must be removed. All cleaning should take place in a well ventilated area. Allow adequate time for the fumes to disperse and moist alcohol to evaporate prior to energizing the instrument.

WARNING **To prevent electrical shock, disconnect instrument from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

WARNING **Keep isopropyl alcohol away from heat, sparks, and flame. Store in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemical, or carbon dioxide; water may be ineffective.**

Shipment for Service

Contact Keysight Technologies for instructions on where to ship the Keysight products for service. Refer to “Contacting Keysight” above.

Ship the Keysight products using the original packaging materials. Shipping the Keysight products in anything other than the original packaging may result in non-warrantied damage. If returning a Keysight product for repair, attach a complete description of failure symptoms.

Safety Symbols

The following safety symbols are used throughout this manual. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

CAUTION Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, would result in damage to or destruction of the product. Do not proceed beyond a caution note until the indicated conditions are fully understood and met.

WARNING **Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**

General Safety Considerations

Safety Earth Ground

CAUTION The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure to ensure adequate earth grounding by not using the correct components may cause product damage and serious injury.

Before Applying Power

WARNING **If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**

CAUTION This instrument has autoranging line voltage input. Be sure the supply voltage is within the specified range.

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC standards.

CAUTION **Ventilation Requirements:** When installing the instrument into a cabinet, consideration shall be given to the convection flow into and out of the cabinet. Consideration shall also be given to the individual instruments to avoid having the heated discharge of one instrument become the cooling intake air for another instrument. Another area of concern is verification that the maximum ambient operating temperature of the instrument is not exceeded due to cabinet installation. Keysight recommends forced air convection whenever an instrument is installed in a cabinet and further recommends that the maximum operating temperature of the cabinet be reduced 10 °C lower than the maximum operating temperature of a single instrument. If there are any concerns or special requirements, a Keysight Field Engineer should be consulted to assure instrument temperature compliance and performance.

Servicing

WARNING **These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.**

WARNING **No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.**

WARNING **The opening of covers or removal of parts may expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**

WARNING **The main power cord can be used as the system disconnecting device. It disconnects the mains circuits from the mains supply.**

WARNING **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**

WARNING **For continued protection against fire hazard, replace line fuse only with same type and rating: Fuse 5A/250V, Part Number 2110-0709. The use of other fuses, circuit breakers or materials is prohibited.**

Regulatory Information

This section contains information that is required by various government regulatory agencies.

Instructions for Use

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Install the instrument so that the detachable power cord is readily identifiable and is easily reached by the operator.

The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby and ON switch and is not a LINE switch (disconnecting device.

Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator may be used as a disconnecting device.

Instrument Markings

Listed below are definitions for the markings that may be found on the product.



The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.



The AC symbol indicates the required nature of the line module input power.



This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive).

This symbol indicates that the power line switch is ON.



This symbol indicates that the power line switch is in the STANDBY position.



This symbol indicates that the power line switch is in the OFF position.



This symbol is used to identify a terminal which is internally connected to the product frame or chassis.



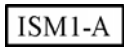
The CE mark is a registered trademark of the European Community.

ccr.keysight@keysight.com

The Keysight email address is required by EU directives applicable to our product.



The CSA mark is a registered trademark of the CSA International.



This is a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 5).



This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001). Cet appareil ISM est conforme à la norme NMB du Canada.



Direct Current.

IP 2 0

The instrument has been designed to meet the requirements of IP 2 0 for egress and operational environment.



The RCM mark is a registered trademark of the Australian Communications and Media Authority.



Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.



This symbol on all primary and secondary packaging indicates compliance to China standard GB 18455-2001.



South Korean Certification (KC) mark; includes the marking's identifier code which follows the format: MSIP-REM-YYY-ZZZZZZZZZZZZZZ.

Compliance Notices

This product has been designated and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

EMC and Safety Information

EMC

Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity):

- IEC/EN 61326-1
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11
- ICES/NMB-001
  This ISM device complies with Canadian ICES-001.
  Cet appareil ISM est conforme a la norme NMB-001 du Canada.000

South Korean Class A EMC Declaration

Information to the user:

This equipment has been conformity assessed for use in business environments. In a residential environment, this equipment may cause radio interference.

※ This EMC statement applies to the equipment only for use in a business environment.

사 용 자 안 내 문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

※ 사용자 안내문은 "업무용 방송통신기자재"에만 적용한다.

Safety Information

European Low Voltage Directive is not applicable for these products.

Declaration of Conformity

A declaration of conformity for any of these ECal modules is available at http://www.keysight.com/go/conformity or by contacting Keysight - see "Contacting Keysight" on page 3-2.

Environmental Information

Table 3-1 Environmental Information

Parameter	Required Values/Ranges
Temperature	For Indoor Use ONLY
Operating	0 °C to +55 °C
Storage	-40 °C to +70 °C
Altitude (Operating)	0 to 3,000 meters
Relative Humidity	Type tested, 0% to 95% at 40 °C, non-condensing

Warranty

The actual warranty on your instrument depends on the date it was ordered as well as whether or not any warranty options were purchased at that time. To determine the exact warranty on your instrument, contact Keysight Technologies with the model and serial number of your instrument. Refer to "Contacting Keysight" on page 3-2.

This information is subject to change without notice. © Keysight Technologies 2015, 2018
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