Installation and
Getting Started Guide

Keysight
PNA Series Network
Analyzers

KEYSIGHT
TECHNOLOGIES

Notices

Trademark Acknowledgments

Manual Part Number

E8356-90001

Edition

Edition 2, March 2020

Printed in USA/Malaysia

Published by:
Keysight Technologies
1400 Fountaingrove Parkway
Santa Rosa, CA 95403

Warranty

Technology Licenses

U.S. Government Rights

Safety Notices

CAUTION

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.

Keysight PNA Series Network Analyzers
Upgrade Kit Order Numbers: E8356-900001
Installation Note

In This Guide

NOTE

IMPORTANT! Much of the information in this document refers to Windows 10, but your instrument might have Windows 7 installed. This document is applicable to both Windows 7 and Windows 10 operating systems.

This guide contains the following information:

This section contains some general information and information on how to contact Keysight for support on your product.

This section discusses how to care for your instrument and to avoid damaging your instrument.

This section discusses how to install your PNA.

This section discusses the Windows 10 Operating System that is installed on PNA (B models only).

This section discusses where to go for resources to help with using your PNA.

This section contains the safety, regulatory, and environmental information on your PNA.

KEYSIGHT
TECHNOLOGIES

Getting Assistance from Keysight

Installing this upgrade kit requires special skills and experience. If you think you may not be qualified to do the work, or need advice, contact Keysight.

Contacting Keysight

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

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

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.

NOTE   **To contact Keysight for sales and technical support, refer to support links on the following Keysight websites: http://www.keysight.com/find (product specific information and support, software and documentation updates) http://www.keysight.com/find/assist (worldwide contact information for repair and service).**

Technology Licenses

The hardware and / or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Trademarks

Microsoft is a U.S. registered trademark of Microsoft Corporation. Windows and MS Windows are U.S. registered trademarks of Microsoft Corporation.

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   **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   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.

Documentation Map

The online Help file is embedded in the analyzer, offering quick reference to programming and user documentation. PNA Help is available in English only.

The Installation and Quick Start Guide helps to quickly familiarize yourself with the analyzer. Procedures are provided for installing, configuring, and verifying the operation of the analyzer.

Downloading PNA Documentation from the Web

Documentation for all PNA models is available at: http://na.support.keysight.com/pna/help This includes online and PDF versions of PNA Help, Service Guides, and Installation Notes.

Operating Precautions

WARNING Most causes of instrument failure can be avoided if you will apply the information in this section. PLEASE READ!

Preventing Electrostatic Discharge Damage

Protection against electrostatic discharge (ESD) is essential while removing assemblies from or connecting cables and assemblies (DUT) to the network analyzer. Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the instrument:

— always have a grounded, conductive table mat in front of your test equipment.

— always wear a grounded wrist strap, connected to a grounded conductive table mat, having a 1 MΩ resistor in series with it, when handling components and assemblies or when making connections.

— always wear a heel strap when working in an area with a conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.

— always ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port or cable connector briefly.

— always ground the center conductor of a test cable and DUT before making a connection to the analyzer test port or other static-sensitive device. This can be done as follows:

1. Connect a short (from your calibration kit) to one end of the cable and DUT to short the center conductor to the outer conductor.

2. While wearing a grounded wrist strap, grasp the outer shell of the cable and DUT connector.

3. Connect the other.

Installation Note E8356-90001

Figure 1   ESD Protection Setup
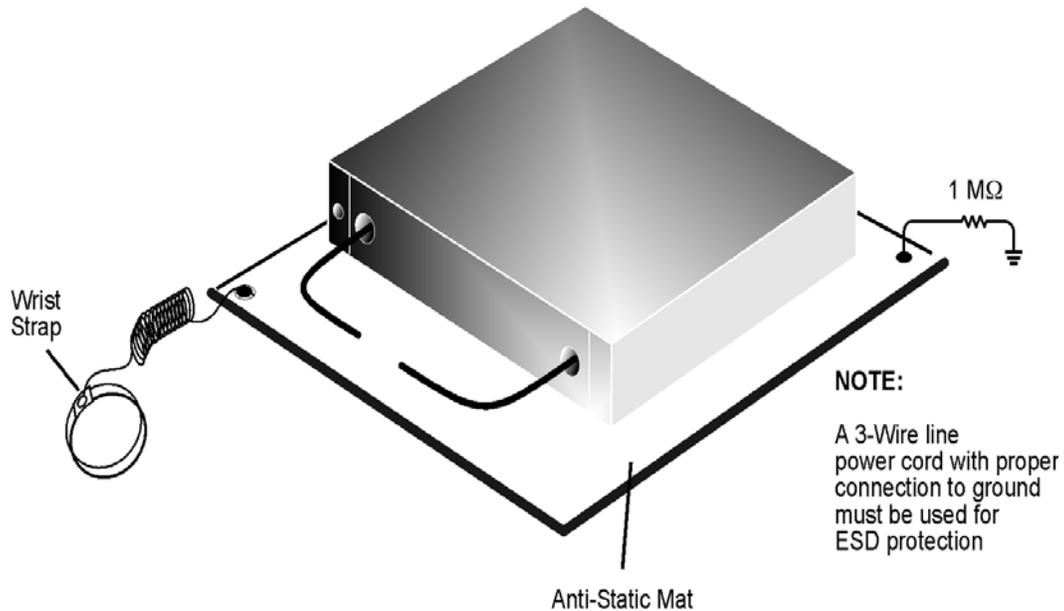
esd_setup

The following table lists Keysight part numbers for ESD protection devices. To order, refer to "Contacting Keysight" on page 4.

Description	Keysight Part Number
Grounding wrist strap	9300-1367
5-ft grounding cord for wrist strap	9300-0980
2 x 4 ft conductive table mat and 15-ft grounding wire	9300-0797

Preventing Electrical Overstress Damage

Excessive RF power or voltage applied to the ports and connectors on the front panel will damage the analyzer. Each port and front-panel connector has a label (see photo below) that shows damage levels. These levels must not be exceeded. Damage levels are also listed in the Specifications section of the analyzer's Help system.

There are two ways to protect the PNA input ports from high RF power:

1. Use power limiters at the ports. Information on limiters can be found at: www.keysight.com/find/mta.

2. Apply the recommendations in PNA Application Note 1408-10, "Recommendations for Testing High-Power Amplifiers," found at: http://literature.cdn.keysight.com/litweb/pdf/5989-1349EN.pdf

Figure 2   Example Label Showing Damage Level for Each Port and Connector

Preventing Test Port Connector Damage

Proper connector care and connection techniques are critical for accurate and repeatable measurements. The following table contains for tips on connector care.

Handling and Storage	
Do	**Do Not**
—Keep connectors clean	—Touch mating-plane surfaces
—Extend sleeve or connector nut	—Set connectors contact-end down
—Use plastic end-caps during storage	—Store connectors or adapters loose

Visual Inspection

Do	Do Not
—Inspect all connectors carefully	—Use a damaged connector - ever
—Look for metal particles, scratches, and dents	

Connector Cleaning

Do	Do Not
—Try compressed air first	—Use any abrasives
—Use isopropyl alcohol (see warning below)	—Get liquid into plastic support beads
—Clean connector threads	

Gaging Connectors

Do	Do Not
—Clean and zero the gage before use	—Use an out-of-specification connector
—Use the correct gage type	
—Use correct end of calibration block	
—Gage all connectors before first use	

Making Connections

Do	Do Not
—Align connectors carefully	—Apply bending force to connection
—Make preliminary connection contact lightly	—Over tighten preliminary connection
—Turn only the connector nut	—Twist or screw any connection
—Use a torque wrench for final connection	—Tighten past torque wrench "break" point

NOTE

Keysight strongly recommends that adapters be used as connector savers to minimize the wear on the analyzer test port connectors. Use instrument-grade quality adapters or better.

WARNING

Cleaning connectors with alcohol shall only be done with the instrument power cord removed and in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

For more information on the proper use and maintenance of connectors, see

http://na.support.keysight.com/pna/connectorcare/Connector_Care.htm

Preventing PNA Hard Drive Problems

Previously, the leading cause of PNA failures was problems with the PNA Hard Disk Drive (HDD). Most of these problems were solved when Keysight replaced the HDD with a solid state drive (SSD) in late 2010.

Follow the suggestions below to prevent problems with your PNA SSD.

Observe Proper Shutdown Procedures

See previous pages.

Do NOT Modify or Reconfigure the Operating System

The Microsoft Windows operating system has been modified and optimized by Keysight to improve the performance of the PNA.

— Do NOT install a standard version of the Windows operating system on the PNA.

— Do NOT change advanced performance settings or group policies.

— Do NOT add or delete any SSD partitions on the PNA.

— Do NOT delete the Keysight user account unless in a secured environment.

— Do NOT modify any of the Keysight software registry entries.

Install Antivirus and Firewall Protection

No antivirus software is shipped with the analyzer. It is recommended that you install antivirus software if your analyzer is connected to the LAN. Check with your IT department to see what they recommend.

The analyzer is shipped with the Windows firewall and Windows Defender enabled.

Do not modify the default network settings as this may cause problems with the operating system of the analyzer.

To adjust Windows Defender settings, log in as administrator (refer to "User Accounts" on page 24 and to the PNA Online Help, http://na.support.keysight.com/vna/help/latest/help.htm) and minimize the PNA-Series Application and click on the Start button and type: defender

Then click on Windows Defender from the Best match column.

See also, "Windows 10 Operating System (B Models Only)" on page 22.

Install Spyware Protection

There is no anti-spyware software installed on the instrument. This should not be a problem if you do not use the instrument for a lot of internet browsing. Having spyware in the instrument could have an impact on the instrument performance.

See also, "Windows 10 Operating System (B Models Only)" on page 22.

Use AgileUpdate

If your PNA is connected to the Internet, use AgileUpdate to obtain the latest firmware. On the PNA, press System, then [Service] softkey, then [AgileUpdate] to automatically update your firmware to the current revision.

If your PNA is NOT connected to the Internet, you must update firmware using a flash drive. Firmware can be downloaded from http://na.support.keysight.com/pna.

Installing Your Analyzer

Overview of the Installation Procedure

WARNING Safety of any system incorporating the equipment is the responsibility of the assembler of the system.

NOTE Only Keysight approved accessories shall be used.

NOTE This procedure requires an open or short calibration standard that mates with the front panel test ports. The open or short calibration standard is NOT included with the PNA.

"Step 1. Check the Shipment."

"Step 2. Meet Requirements."

"Step 3. Install the Analyzer."

"Step 4. Connect the Accessories."

"Step 5. Ferrite Cores."

"Step 6. Start Up the Analyzer."

"Step 7. Perform Administrative Tasks."

"Step 8. Run the Operator's Check."

"Step 9. Turn Off the Analyzer."

Step 1. Check the Shipment

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

WARNING More than one person is required to safely lift or carry this instrument. Alternately a mechanical lift can be used to eliminate the risk of personal injury.

NOTE The PNA is shipped with ESD-safe protective end caps on the test ports and metal covers for the front-panel jumpers. Save these items for reuse to ensure shipment safety of the PNA.

2. Carefully inspect the analyzer to make sure that it was not damaged during shipment. If damaged, refer to "Contacting Keysight" on page 4.

3. Use the Contents List in the shipping container to verify the completeness of your shipment. If not complete, refer to "Contacting Keysight" on page 4.

Step 2. Meet Requirements

Before installing the PNA on a bench top or in an equipment rack, first make sure that the electrical and environmental requirements of the location are met.

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

1. Ensure the available AC power source meets the following requirements:

Mains Supply Voltage	Frequency	Power
100/120 VAC	50/60/400 Hz	575W MAX
220/240 VAC	50 /60 Hz	575W MAX

CAUTION

1) This instrument has an autoranging line voltage input. Before switching on the instrument, be sure the supply voltage is within the specified range and voltage fluctuations do not exceed 10 percent of the nominal supply voltage.

2) Condensing humidity operating conditions are not allowed. Refer to "Environmental Information" on page 37.

3) The instruments can operate with mains supply voltage fluctuations up to ± 10% of the nominal voltage.

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

WARNING   Use Keysight supplied power cord or one with same or better electrical rating.

CAUTION   Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause personal injury or product damage.

Figure 3   Protective Earth Ground (Non-Floating)
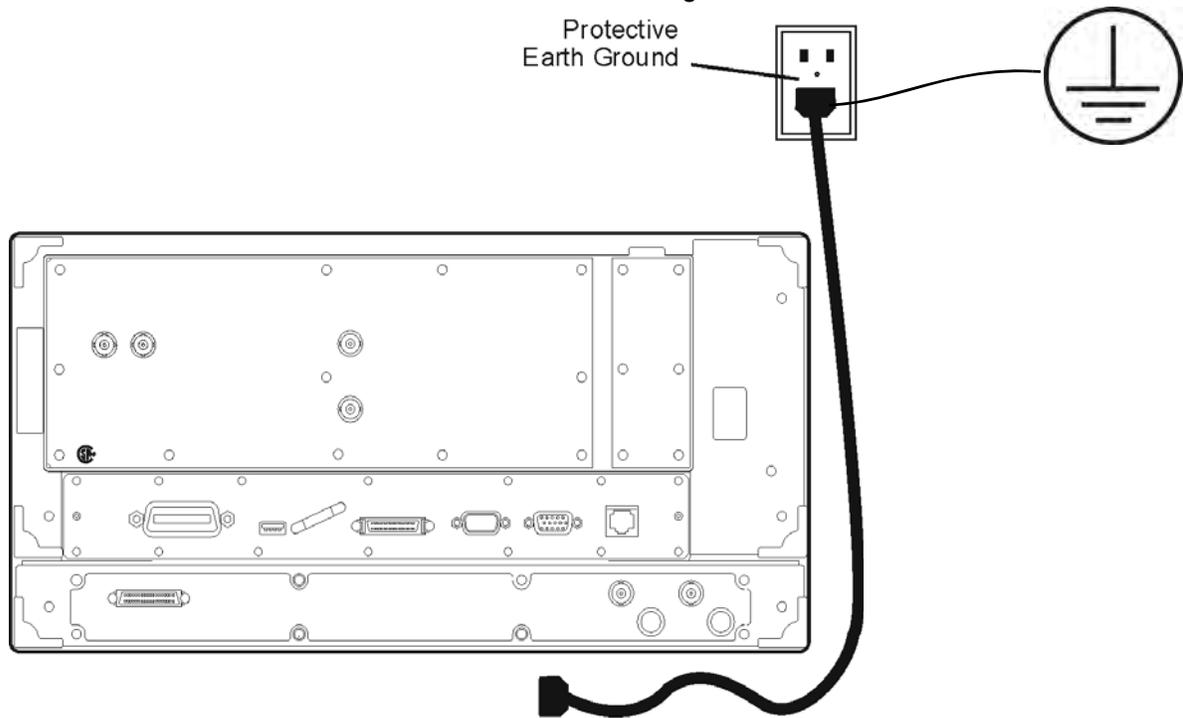
3. Ensure the operating environment meets the requirements found in "Safety, Regulatory, and Environmental Information" on page 31.

NOTE	Some analyzer performance parameters are specified for 25°C. Refer to the Help system in the analyzer for the complete specifications.

Step 3. Install the Analyzer

WARNING	Please review all safety information located in "Safety, Regulatory, and Environmental Information" on page 31, before proceeding with installing and using the analyzer

The analyzer can be installed on a bench top or in an equipment rack. When installing an analyzer equipped with handles in an equipment rack, use Option 1CP. When installing an analyzer not equipped with handles in an equipment rack, use Option 1CM.

In all installations, consider the following ventilation requirements when deciding where to set up your analyzer.

CAUTION	Ventilation Requirements: When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4°C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

Refer to the section below that applies to your installation.

To Install on a Bench Top

When you install the analyzer for bench top use, you may wish to attach the supplied handles to the analyzer. If you wish to install the handles, follow the instructions provided with the handle kit.

To Install in an Equipment Rack

(Option 1CP - Rack Mounting For Instruments Equipped With Handles)

(Option 1CM - Rack Mounting For Instruments Not Equipped With Handles)

When you install the analyzer in an equipment rack, you must install rails in the rack to support the weight of the analyzer. Attach either the Option 1CP or Option 1CM rack mount flanges to the analyzer. Secure the analyzer to the equipment rack. Replace the analyzer bottom plastic feet with the hole plugs provided.

For installation, follow the instructions provided with the rack mount kit and the rail kit.

Step 4. Connect the Accessories

USB devices can be connected to any available USB port. All ports comply with USB 2.0 specifications. The PNA will recognize the USB device when it is connected and run the appropriate software driver to make the device operate correctly. However, there is a limit to the amount of current that the PNA USB ports can provide. See PNA Help - "USB port specifications" (index entry) for more information.

The following is a list of USB devices commonly used with the PNA. Refer to the Help that is embedded in the PNA for more information.

— Mouse - standard

— Keyboard - standard

— Printer (separate product)

— USB flash drive (separate product)

— ECal module (separate product)

NOTE	Consider ergonomics when locating the mouse and keyboard.

| NOTE	Do NOT connect an ECal module to the USB until after the PNA is started. Once the PNA is started, press the front panel Help button to learn about 'Connecting an ECal module for the first time'.

Step 5. Ferrite Cores

CISPR 11 is an international regulation that specifies the maximum level of frequency emissions that can originate from an electronic device. The regulation is designed to minimize the interference that one electronic device may have with another.

Frequency emissions can occur when cables are connected to an electronic device. To minimize this, try to use high-quality cables with built-in molded ferrite cores, with the core closest to the PNA. If cables with built-in cores cannot be found, use clamp-on ferrite cores. It is especially important to use these cores on USB cables and LAN cables.

The core should snap closed to grip the cable firmly, but without damaging the cable. Attach the core to the cable as close as possible to the PNA connector end. Cable ties help ensure that the ferrite cores remain in place

Figure 4   Cable
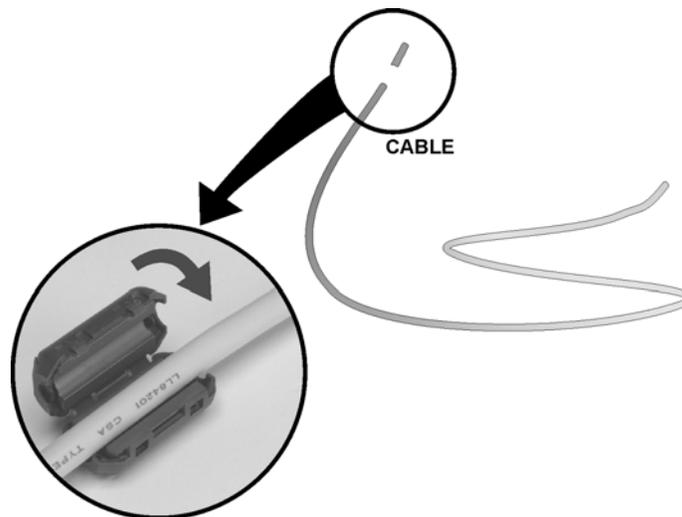
E8356_001_201

Step 6. Start Up the Analyzer

CAUTION   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 ON/Standby switch and is not a LINE (OFF) switch. 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

1. Connect the AC power cable.

Figure 5
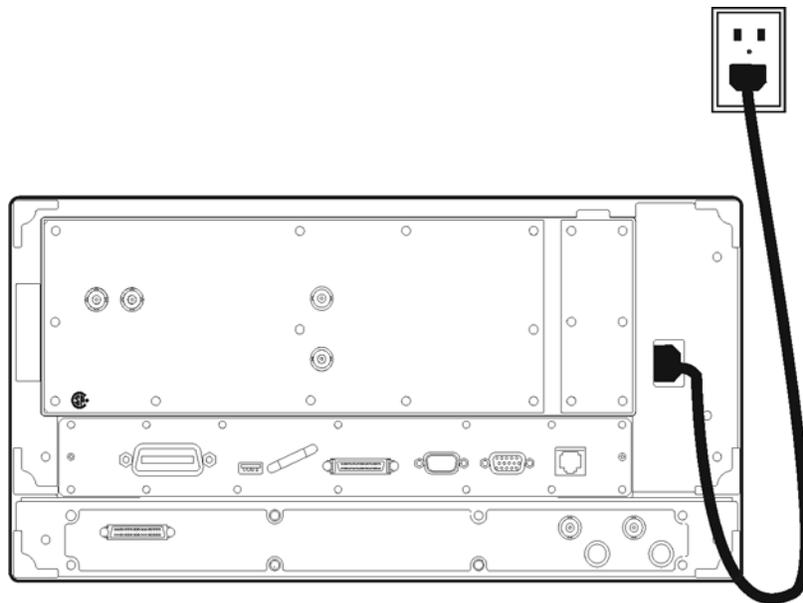
jc810a

2. Turn the analyzer on by pressing the front panel On/Standby switch.

CAUTION   Do NOT press keys on the front panel, rotate the RPG knob, or connect a USB device during boot up of Windows or of the PNA application program. Doing so may lead to a front panel lockup state.

Figure 6

ic859a
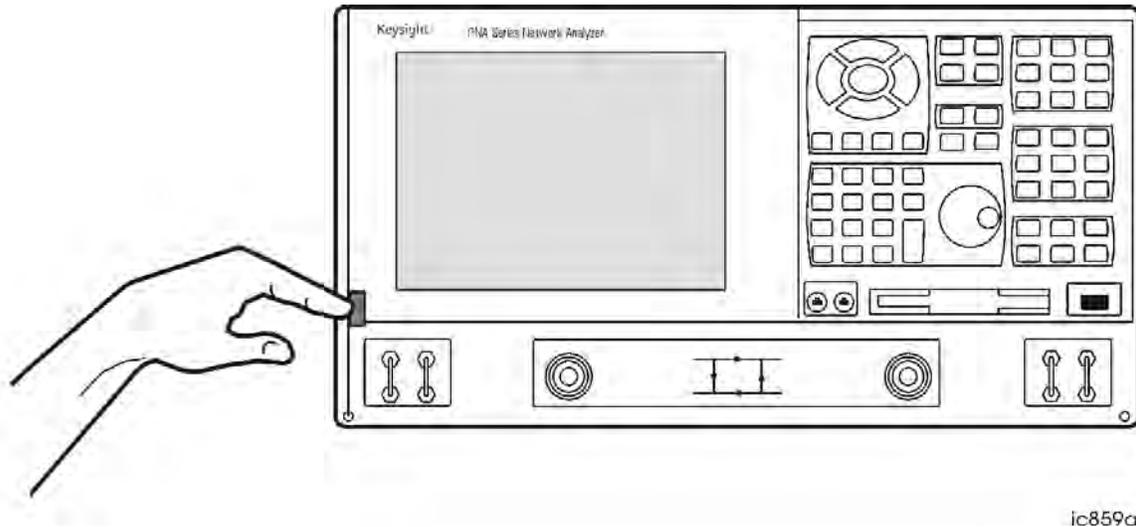
NOTE   This product contains a Windows operating system. The Network Analyzer application is supported and qualified only with the version of Windows that was installed when shipped.

Windows 10 Operating Systems

Beginning in on or around November 2018 all B model analyzers are shipped with Windows 10. If your analyzer has Windows 10, please refer to "Windows 10 Operating System (B Models Only)" on page 22.

Windows 7 and Windows 10 Operating Systems

Windows 7 and Windows 10 comes with a display technology called ClearType. This makes displayed text much easier to read on the PNA. The only drawback comes with viewing the display from the bottom. The colors of some small display elements will appear to shift when the viewer's eyes are more than 30 degrees below perpendicular. If necessary, ClearType can be disabled. On the PNA desktop, click Start, then Control Panel then Appearance and Personalization, then Display, then Adjust ClearType Text.

Step 7. Perform Administrative Tasks

We recommend that you consider performing the following administrative tasks shortly after powering up the analyzer for the first time.

— Set up the administrator password only if required for your location. The PNA already has a default password.

— Set the time, date, and time zone (if needed).

NOTE   Do NOT create additional User Accounts until you have read the PNA Help file topic: "PNA User Accounts and Passwords" which states why and how this should be done.

Procedures for the above tasks are in the Help system in the analyzer. To view these procedures:

— On the analyzer's front panel, press the **Help** button. Or, on the PNA display, click **Help** > **Network Analyzer Help**.

Click **Quick Start** in PNA Help.

Click **Perform Administrative Tasks**.

Click the task you wish to perform.

Step 8. Run the Operator's Check

The operator's check should be performed when you first receive your analyzer, and any time you wish to have confidence that the analyzer is working properly. The operator's check does not verify performance to specifications, but should give you a high degree of confidence that the instrument is performing properly. The only equipment required is an open or short calibration standard that mates with the front panel test ports. The open or short calibration standard is NOT included with the PNA.

NOTE	If a "Log Error" is displayed during the verification stating that a 'filename.csv' is already open and in use, verify that you only have a single verification window open. This can be verified by mousing over the verification icon on the toolbar as the bottom of the display. If there are two verification windows open, close the window on the right most side, which is the most recently opened window. And, resume the verification.

— On the A models: Press **System,** then **[Service]** softkey, then **[Verification]** softkey, then **[Operator's Check]**. Follow the prompts.

— On the B models: Press **System,** then **[Service]** softtab, then **[Verification]**, then **[Operator's Check]**. Follow the prompts.

— For assistance, use the Help button displayed on the screen of the Operator's Check.

Step 9. Turn Off the Analyzer

To turn the PNA OFF, BRIEFLY press the front panel On/Standby switch. The PNA will then begin to shutdown

Shutdown

The On/Standby indicator changes from green to yellow when power is Off.

The current instrument state is NOT saved to the PNA solid state drive.

When the PNA is powered ON, a full system boot-up is performed and the PNA powers-up in the Preset settings.

NOTE   Repeatedly doing either of the following two actions may cause damage to the PNA solid state drive.

1. Only in an emergency should the power cord be removed from the PNA without first being put in Shutdown mode.

2. If the PNA is locked and you cannot operate the mouse or keypad, turn OFF the PNA by pressing and holding the power button for at least four seconds.

Windows 10 Operating System (B Models Only[1])

This chapter describes the Microsoft Windows 10, configuration and the settings used with the Keysight instrument software. It includes information about changing some of the system settings. And it describes the Windows operating system configuration and the software installations that are present on the Disk Drive when the instrument leaves the factory.

It is possible to use the front panel and touchscreen for changing operating system configuration items, but it is easier to perform these tasks with a USB mouse and external keyboard.

NOTE **IMPORTANT!** If you choose to update your Windows 10 operating system, be aware that some updates may take up to ~1 hour to complete the download and install process.

NOTE This section does not cover Windows 10 features that can be found in the Windows 10 Help (e.g., keyboard shortcuts, etcetera).

The following topics can be found in this section:

---

1. Only B model PNAs are compatible with and can have the Windows 10 Operating System Installed.

Microsoft Windows

Your instrument has Microsoft Windows installed at the factory. Keysight has already configured many of the settings in Microsoft Windows for optimal behavior in your instrument. This chapter contains details about many of these settings.

Installed Software

Vector network analyzer software

The PNA Vector Network Analyzer Measurement Application software is installed in the vector network analyzer. Additional measurement applications are available. Each application requires a license to execute the software. All of these applications are installed by the factory at the time of manufacture, even if the licenses have not been purchased. You may purchase additional licenses at a later date.

Customer Information of Software

3rd party software verified by Keysight

Keysight has verified that the following programs are compatible with the

instrument's applications:

— MathWorks MATLAB

Installation of other 3rd Party Software

The PNA Vector Network Analyzer platform is an Open Windows environment, so you can install software on the instrument. However, installation of non-approved software may affect instrument performance. Keysight does not warrant the performance of the analyzers with non-approved software installed.

NOTE	Before installing any additional programs on the instrument, you should exit the Vector Network Analyzer application. Also, you must not remove any applications or programs that were installed on the instrument when it was shipped from the factory.

If you install programs other than those that Keysight has tested, it could cause problems with the instrument's applications. If this happens, you should try uninstalling the program that has caused the problem, or try changing the program's configuration. If this does not correct the problem, you may have to use the Instrument Recovery system to reinstall the instrument's system software.

User Accounts

Refer to "VNA User Accounts and Passwords" the PNA Online Help,
http://na.support.keysight.com/vna/help/latest/help.htm.

Keysight PNA Licensing Options

For information on PNA licensing options, refer to the
https://literature.cdn.keysight.com/litweb/pdf/N5242-90024.pdf.

Licensing New Measurement Application Software – After Initial Purchase

For information on PNA licensing options, refer to the
https://literature.cdn.keysight.com/litweb/pdf/N5242-90024.pdf.

Windows Configuration

The Windows settings have been optimized for the best measurement performance. Any modifications to these settings may degrade instrument performance and measurement speed. In general, most Windows System settings (typically set through the Windows Control Panel) should not be modified. Those that can be safely modified are listed below.

CAUTION　　To recover from problems caused by changing Windows Systems settings, you may have to reinstall the Windows system and instrument applications using the Instrument Recovery process.

Settings that can be changed

You may change the following Windows settings or administrative tasks (available from the Windows Control Panel) to suit your own personal preferences. It is recommended that you document any changes to the instrument's configuration in case an Instrument Recovery is performed and the configuration is reset.

NOTE　　Some of these actions can only be performed with Administrator privileges. Refer to the Windows 10 Help for how to set the permissions to Administrator.

You May Use This Feature:	To Do This:
Windows Update	Configure Microsoft Windows Automatic Updates. Microsoft recommends that you always get the latest critical Windows updates to ensure that the instrument's Windows operating system is protected. If the instrument has Internet access, the instrument default is set to automatically check for critical Windows Updates and notify you.
User Accounts	Setup new user accounts. **CAUTION** Do not delete or modify the "KeysightOnly" user account. Doing so may prevent Keysight from servicing the instrument.
Network and Sharing Center	Add the instrument to a network.
Devices and Printers	Install and configure a printer.
Date and Time	Set the time and date.
System	If you click on "Advanced System Settings" a dialog will open called "System Properties." On this dialog there is an "Advanced" tab, which opens up a dialog with a number of settings options. One of these is "Performance", and if you click on the "Settings" button under "Performance", you will see another dialog with a number of settings options. The default is "Let Windows choose what's best for my computer." You can also select "Adjust for best performance." You should leave the remaining selections unchanged.

Settings that must not be changed

Avoid changing the settings described below (available from the Windows Control Panel). Changes to these settings may degrade instrument performance, screen displays, and measurement speed.

Do NOT Use This Feature:	To Do This:
Power Options	Do not change power Options.

Do NOT Use This Feature:	To Do This:
System	If you click on "Advanced System Settings" a dialog will open called "System Properties."
	On this dialog there is a tab called "Hardware." You should not modify any settings under the "Hardware" tab.
	On this dialog there is also a tab called "Advanced." You should not modify any settings under the "Advanced" tab except as described above under "Settings that can be changed".
Fonts	Do not remove installed Fonts.
Display	Do not change the following settings: — Screen Saver settings (under "Personalization) — Screen resolution (under "Adjust Resolution") — DPI setting (under "Set custom text size")
Region and Language	Do not change any settings under "Region and Language" or the instrument keyboard and display may not operate properly.
User Accounts	Do not delete or modify the "KeysightOnly" user account.

In addition, Do Not:

— Add, delete, or modify disk drive partitions.

— Delete or modify Keysight registry entries.

— Change the contents of any directories containing the name "Keysight".

— Stop the IIS server

— Tamper with any virtual directories (or their contents) that came configured with the instrument.

- — Uninstall these libraries, interfaces, or programs:

    - — The I/O Libraries

    - — The .NET Framework or any Hotfixes or Service Packs for the .NET Framework

    - — The "Microsoft Visual J# .NET Redistributable Package 1.1"

    - — Programs that begin with "Keysight" — The Adobe Acrobat reader

- — Modify:

    - — The I/O Library "GPIB27", "GPIB28" interfaces shown as configured Instrument I/O in the Connection Expert or I/O Config

Autoplay/Autorun

Since the introduction of Windows XP, the term Autoplay (sometimes also called Autorun) has come to be associated with the feature which assists users in selecting appropriate actions when new media and devices are detected. The Autoplay/Autorun feature is turned off in the instrument, by default, for heightened security, unless the Administrator account is running.

If you wish to re-enable Autoplay/Autorun, you may use the Auto Play function in the Control Panel. However, be aware that if you do this you may be more subject to virus attack from portable media such as USB flash drives.

Configuring Printers

Refer to "Microsoft Windows Considerations" in the PNA Online Help. Refer to http://na.support.keysight.com/pna.

Configuring LAN

Refer to "Microsoft Windows Considerations" in the PNA Online Help. Refer to http://na.support.keysight.com/pna.

Windows Security

Microsoft recommends the following to ensure the instrument's Windows operating system is protected:

- — Use an internet firewall

- — Get the latest critical Windows updates.

- — Use up-to-date antivirus software.

Windows Firewall

The instrument is shipped with the Windows Firewall enabled. You can verify the status of Windows Firewall by going to the Control Panel and clicking on System and Security, Windows Firewall.

Windows Firewall Exceptions for programs and ports have been added to allow proper operation of the instrument over a network. Modifying these settings may cause the instrument to not operate properly.

Automatic Updates

Microsoft recommends that you always get the latest critical Windows updates to ensure that the instrument's Windows operating system is protected. If the instrument has internet access, the instrument default is set to automatically check for critical Windows Updates and notify you.

You can change the configuration of the Microsoft Automatic Updates. You can choose not to have automatic updates. However, if you do this then you should manually update Windows periodically.utomatic Updates

Virus and Firewall Protection

No third-party antivirus software is shipped with the analyzer. It is recommended that you install antivirus software if your analyzer is connected to the LAN. Check with your IT department to see what they recommend.

On or around November 2018, the analyzer is shipped with the Windows 10 firewall and Windows Defender enabled.

Do not modify the default network settings as this may cause problems with the operating system of the analyzer.

To adjust Windows Defender settings, log in as administrator (see"User Accounts" on page 24) and minimize the PNA-Series Application and click on the Start button and type: defender

Then click on Windows Defender from the Best match column.

Spyware Protection

There is no third-party anti-spyware software installed on the instrument. This should not be a problem if you do not use the instrument for a lot of internet browsing. Having spyware in the instrument could have an impact on the instrument performance.

System Maintenance

Refer to http://na.support.keysight.com/pna.

USB Connections

Refer to "Microsoft Windows Considerations" in the PNA Online Help. Refer to http://na.support.keysight.com/pna.

Disk Drive Partitioning and Use

The drive is partitioned into 3 sections: C:, D: and E:

— The C: partition contains the Windows 10 operating system and software installed by Keysight. This is an Open System which means you can install additional software, and these should be installed on the C: drive. However, only a limited set of software applications are tested for use with the Keysight measurement software. The installation and/or use of other software is not warranted and could interfere with the operation of the measurement software. If instrument repair is ever needed, the Keysight version of the C: drive is the only part of the instrument software that is restored by the Instrument Recovery process. You must reload any other software that you have added in the instrument.

— The D: partition is reserved for data storage. The User Accounts that are configured by Keysight have their My Documents folder mapped to the D: drive. This is for the convenience of backing-up the measurement data. You should always back-up the data on the D: drive to an external device. This allows you to restore the data if you ever need to replace the disk drive.

— The E: partition is reserved for Keysight's use. The primary use of the E: drive is for housing the Calibration and Alignment data. Do not change or overwrite the files on this drive. This could cause your instrument to not meet specifications, or even to stop functioning correctly. Do not use this drive for data storage.

Disk Drive Recovery Process

Refer to "Recovering from VNA Solid State Drive Problems" in the PNA Online Help. Refer to http://na.support.keysight.com/pna.

Problems with Windows 10

The Microsoft Windows 10 operating system settings have been optimized for the best performance. Modification of these settings may degrade instrument performance and measurement speed. Those that can be safely modified are described in "Settings that can be changed" on page 24.

The PNA Vector Network Analyzers operate in an open Windows environment, so you can install software on the instrument. However, installation of non-approved software may affect instrument performance. Keysight does not warrant the performance with non-approved software installed.

Getting Help with Your Analyzer

Help System

Use on-line Help to quickly reference programming and user documentation. On-line Help is only available in English.

We recommend that you begin by accessing Help and reading the topics in the Quick Start section. To access this information:

— On the analyzer's front panel, press the Help button. Or, on the PNA display, click Help, then Network Analyzer Help.

— Click Quick Start in PNA Help.

PNA on the Internet

The PNA Family Network Analyzer Support website is another resource for help with the analyzer. You can find all PNA documentation and other resources at: http://na.support.keysight.com/pna.

You can also post your questions for the measurement experts at the Keysight Network Analyzer Forum: http://www.keysight.com/owc_discussions.

Contacting Keysight

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

Safety, Regulatory, and Environmental Information

Maintenance

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

WARNING   To prevent electrical shock, disconnect analyzer 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.

Shipment for Service

Contact Keysight Technologies for instructions on where to ship the analyzer for service. Refer to "Getting Assistance from Keysight" on page 4.

Ship the analyzer using the original or comparable packaging and antistatic materials. Shipping the analyzer in anything other than the original or comparable packaging and antistatic materials may result in non-warranted damage.

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.

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

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.

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.

WARNING	If an instrument handle is damaged, you should replace it immediately. Damaged handles can break while you are moving or lifting the instrument and cause personal injury or damage to the instrument.

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 product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

CAUTION	The measuring terminals on this instrument are designed to be used with external signals described in Measurement Category I, but NOT with external signals described in Categories II, III, and IV. The input of this instrument cannot be connected to the mains.

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 Capable of rendering an electrical shock or burn.

WARNING Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended. Discard used batteries according to local ordinances and/or manufacturer's instructions.

WARNING Procedures described in this document may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

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

WARNING The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from its power supply.

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 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).

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.

Regulatory Information

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

NOTE	The Table below lists the definitions of markings that may be on or with the product.

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.

Table 1

⚠	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.
∿	This symbol indicates that the instrument requires alternating current (ac) input.
🗑	This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electrical and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC.

Table 1

I	This symbol indicates that the power line switch is ON.
⏻	This symbol indicates that the power line switch is in the STANDBY position.
O	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.
CE	The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)
CSA	The CSA mark is a registered trademark of CSA - International. This instrument complies with Canada: CAN/CSA-C22.2 No. 61010-1-12.
ISM1-A	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.
ICES/NMB-001	This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB du Canada.
▬ ▬ ▬	Direct current.
RCM	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
40	China RoHS regulations include requirements related to packaging, and require compliance to China standard GB18455-2001.

Table 1

KC	South Korean Certification (KC) mark; includes the marking's identifier code which follows this format: MSIP-REM-YYY-ZZZZZZZZZZZZZZ.
♻	This symbol indicates compliance with China RoHS regulations for paper/fiberboard packaging.

Declaration of Conformity

A declaration of conformity is available upon request, or a copy is available on the Keysight Technologies Web site at http://www.keysight.com/go/conformity or by contacting Keysight. See "Contacting Keysight" on page.

Acoustic Statement:

(European Machinery Directive)

Acoustic Noise Emission

LpA<70 dB

Operator Position

Normal Operation mode per ISO 7779

Acoustic Compliance

Some models will exceed 55 dB(A) sound pressure at the operator position at high ambient temperatures.

EMC and Safety Information

For ALL PNA Network Analyzers

EMC Information

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.

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 business environment.

사용자 안내문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.
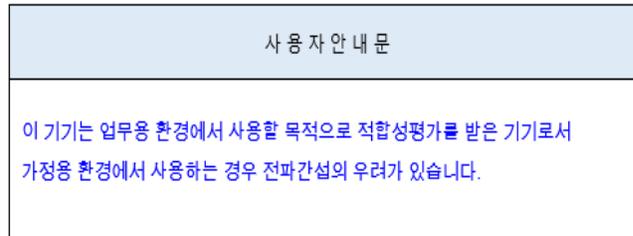
※ 사용자 안내문은 "업무용 방송통신기자재"에만 적용한다.

Safety Information

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

— IEC/EN 61010-1

— Canada: CAN/CSA-C22.2 No. 61010-1

— USA: UL std no. 61010-1

Environmental Information

NOTE

Samples of this product have been type-tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation and end-use; those stresses include but are not limited to temperature, humidity, shock, vibration, altitude, and power-line conditions. Test methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3.

Parameter	Required Values/Ranges
Operating Environment	For Indoor Use ONLY
	This instrument has no air filters on the fan ports. Operation in dirty, dusty, or similar environments must be avoided.
Operating Temperature	0 °C to +40 °C
	The instrument powers-up and displays no error messages within this temperature range (except for "source unleveled" error message that may occur at temperatures outside the specified performance temperature range of 25 ± 5 °C).
Storage Temperature	−40 °C to +70 °C
Error-corrected range	23 °C ±3 °C with less than 1 °C deviation from calibration temperature.
Operating Altitude	0 to 4,600 meters (15,000 feet)
Relative Humidity	Type tested, 0% to 95% at 40 °C, non-condensing
	In conditions of very high (below 95%) at changing temperature, there is a small risk of internal condensation that could cause the CPU real-time clock to temporarily stop incrementing time.

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 .