Installation and
Quick Start Guide

Keysight
PNA Series
Network Analyzers

KEYSIGHT
TECHNOLOGIES

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Certification

Keysight Technologies, Inc. certifies that this product met its published specifications at the time of shipment from the factory. Keysight Technologies, Inc. further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

Contacting Keysight

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

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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.

Table of Contents

Operating Precautions

IMPORTANT	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 end of the cable and DUT to the test port and remove the short from the cable.
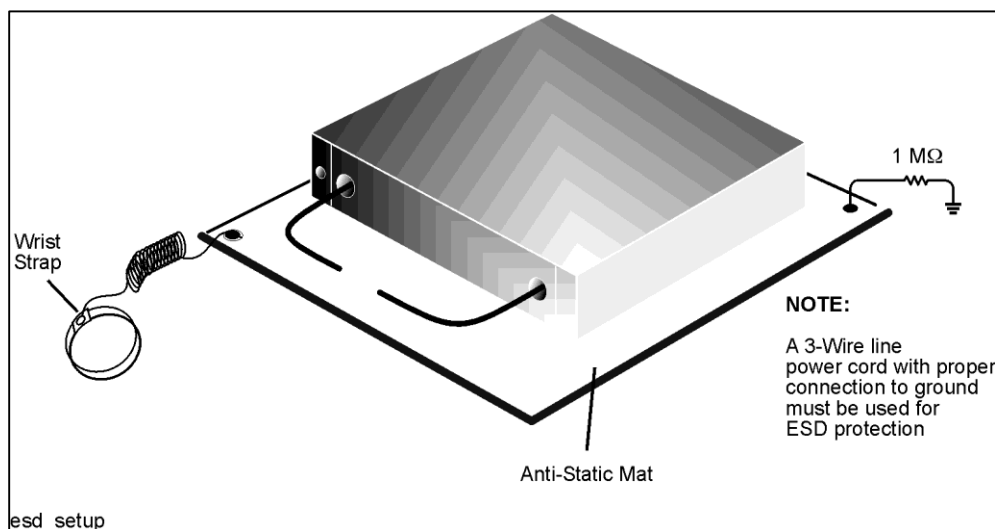

Figure 1   ESD Protection Setup

The following table lists Keysight part numbers for ESD protection devices. To order, refer to "Contacting Keysight" on page 15.

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 ground 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.

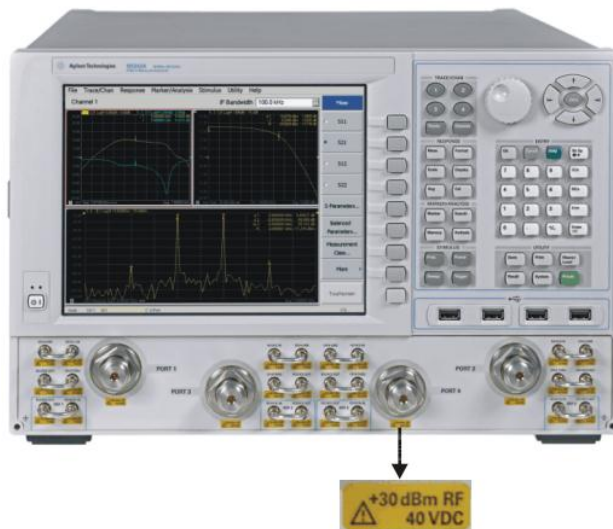2. Apply the recommendations in PNA Application Note 1408-10, "Recommendations for Testing High-Power Amplifiers," found at: http://literature.cdn.keysight.com/litweb/pdf/5989-1349EN.pdf

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 • Extend sleeve or connector nut • Use plastic end-caps during storage	• Touch mating-plane surfaces • Set connectors contact-end down • Store connectors or adapters loose

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

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

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

Making Connections	
Do	Do Not
• Align connectors carefully • Make preliminary connection contact lightly • Turn only the connector nut • Use a torque wrench for final connection	• Apply bending force to connection • Over tighten preliminary connection • Twist or screw any 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 Protection

The PNA does NOT have antivirus protection when shipped. Use of an antivirus program is strongly recommended if you connect the PNA to the Internet.

In addition, the use of a firewall could help to protect the PNA from viruses. However, some firewalls could limit DCOM connectivity of the PNA.

Install Windows Critical Updates

The PNA is always shipped with the latest service packs and critical updates that were available at the time that the PNA is produced. We recommend that you maintain the latest available protection for your PNA by automatically accepting and installing the latest critical security patches from the Microsoft Windows Update website: http://windowsupdate.microsoft.com

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

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	The network analyzer is heavy. It is recommended that two individuals, or a mechanical lift, be used to lift or transport the instrument.

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 15.
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 15

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:

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

- For E836xC, N5230C, and N523x models:
  - Voltage: 100/120/220/240 VAC
  - Frequency: 50/60/400 Hz for 100/120 VAC; 50/60 Hz for 220/240 VAC
  - Power (maximum consumed): 350 W
- For all other models:
  - Voltage: 100/120/220/240 VAC
  - Frequency: 50/60/400 Hz for 100/120 VAC; 50/60 Hz for 220/240 VAC
  - Power (maximum consumed): 450 W

2. Ensure the operating environment meets the requirements found in "Environmental Information" on page 20.

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

3. Verify that the AC power cable is not damaged, and that the power-source outlet provides a protective earth contact.
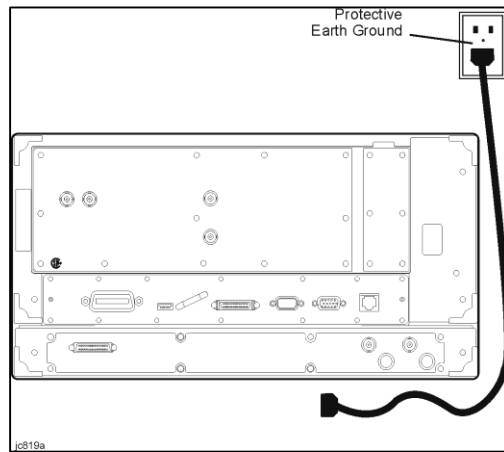
CAUTION	Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause personal injury or product damage.

STEP 3. Install the Analyzer

IMPORTANT	Please review all safety information located in Chapter 4 , "Safety, Regulatory, and Environmental Information," 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. Install 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 one of the clamp-on ferrite cores that are included with the PNA. 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 are included to help ensure that the ferrite cores remain in place.
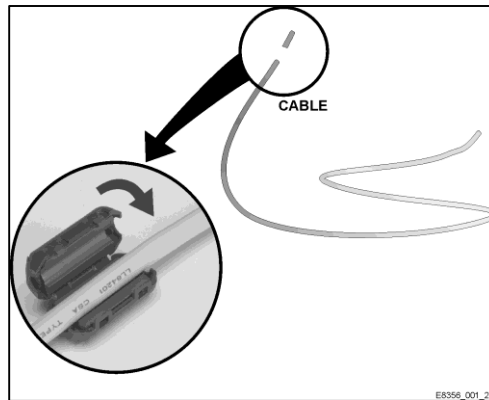
## STEP 6. Start Up the Analyzer

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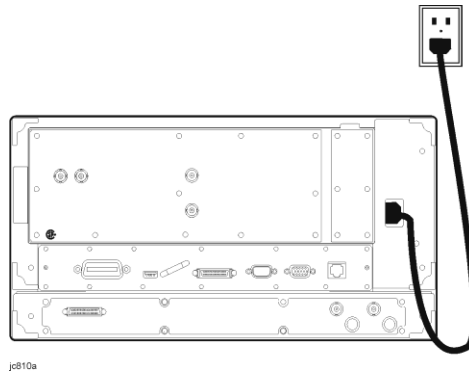
2. Turn the analyzer on by pressing the front panel On/Standby switch.

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.
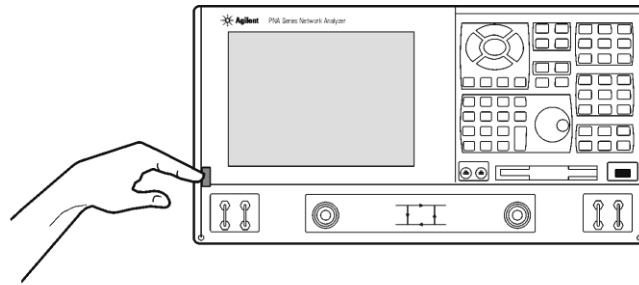
jc859a

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 7 comes with a new 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 that mates with the front panel test ports. The open or short is NOT included with the PNA.

- Press **System**, then **[Service]** softkey, 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.

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 "Contacting Keysight" on page 15.

Ship the analyzer using the original packaging materials. Shipping the analyzer in anything other than the original packaging 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.

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.

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	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 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.

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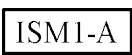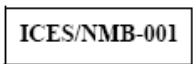
Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

Instrument Markings

⚠	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.
I	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.
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.
☑ N10149	This is a required mark signifying compliance with an EMC requirement. The C–Tick 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.
KC	South Korean Certification (KC) mark; includes the marking's identifier code which follows the format: KCC–REM–YYY–ZZZZZZZZZZZZZZ or 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://regulations.about.keysight.com/DoC/search.htm or by contacting Keysight. See "Contacting Keysight" on page 15.

Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermrerordung **–**3.GSGV Deutschland).

Acoustic Noise Emission -- Geraeuschemission

LpA<70 dB   Lpa<70 dB

Operator Position   am Arbeitsplatz

Normal Operation   normaler Betrieb

per ISO 7779   nach DIN 45635 t. 19

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 European EMC Directive 2004/108/EC.

- IEC/EN 61326-2-1:2005
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11:2004
- ICES/NMB-001:2006

South Korean Class A EMC declaration:

This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

A급 기기

(업무용 방송통신기자재)

이 기기는 업무용(A급) 전자파적합기기로서 판
매자 또는 사용자는 이 점을 주의하시기 바라
며, 가정외의 지역에서 사용하는 것을 목적으
로 합니다.

Safety Information Complies with European Low Voltage Directive 2006/95/EC

- IEC/EN 61010-1, Third Edition
- Canada: CAN/CSA-C22.2 No. 61010-1-12
- USA: UL std no. 61010-1, Third Edition

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
Temperature	For Indoor Use ONLY
Operating	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	−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 humidity (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 "Contacting Keysight" on page 15

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