

Keysight Technologies V2802A Option M81

User's and
Service Guide

Notices

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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.

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V2802A Option M81

Description

The Keysight V2802A Option M81 is an eight channel LO Distribution Instrument. It is designed for use with Keysight M9381A PXI VSG and M9391A PXI VSA product family. It facilitates the time or phase synchronization of a multi-channel source or signal analyzer measurement system by allowing them to share the same LO signal.

The Distribution unit has the following key features:

- Frequency Range of Operation: 400 MHz to 6 GHz.
- Maximum of eight instruments for system phase lock capability.
- 3.5 mm RF Ports (female connectors).
- Output LO power levels are near unity gain.
- It has no automated or monitoring controls features; it is simply an active pass-thru instrument.

NOTE

The V2802A Option M81 may also be referred to as the Distribution Unit throughout this document. MIMO configuration designations are used (8 x 8) and refer to (number of sources) x (number of receivers) in the system configuration.

Verifying the Shipment

To verify the contents shipped with your product, refer to the “Box Content List” included with the shipment.

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is physical damage refer to [“Contacting Keysight” on page 30](#). Keep the damaged shipping materials (if any) for inspection by the carrier and a Keysight Technologies representative.

Table 1

V2802A-M81 Accessories Supplied

Description	Part Number	Qty
Termination, 50 Ohm, SMA female	1810-0118	8
User’s and Service Guide V2802A-M81	V2800-90002	1
RF Cable Interface Set for 8 x 0 VSG Source System: Figure 8 on page 19		
RF Cable, Upper PXI LO OUT to Distribution Unit LO IN	V2800-20006	1
RF Cable, Upper PXI LO OUT to Out 1 to 4	U3020-20008	4
RF Cable, Lower PXI LO OUT to Out 5 to 8	U3020-20009	4
RF Cable Interface Set for 0 x 8 VSA Analyzer System: Figure 7 on page 17		
RF Cable, Upper PXI LO OUT to Distribution Unit LO IN	V2800-20007	1
RF Cable, Upper PXI LO OUT to Out 1 to 4	U3020-20010	4
RF Cable, Lower PXI LO OUT to Out 5 to 8	U3020-20011	4
Hardware Lock-link Material: Figure 4 on page 13		
Screws, T10 M3x0.5, 8 mm (Spacers)	0515-0372	6
Screws, T20 M4x0.7, 10 mm (PXI)	0515-0380	16
Screws, T20 M4x0.7, 18 mm (Distribution Unit)	0515-0436	4
Lock-link Bracket, Struts	V2800-00007	4
Lock-link Bracket, Front Spacer	V2800-20012	2
Lock-link Bracket, Rear Spacer	V2800-20013	2

PXI, VSA and VSG Requirements

It is required that the PXI modules M9381A and M9391A have Option 012 (LO sharing for phase coherency) to operate with the Distribution unit in a phase coherency configuration.

Available Options

Distribution unit

The Distribution Unit has three available options:

- V2802A Option 1CM – Rack mount kit without handles
- V2802A Option 1CN – Front handle kit
- V2802A Option 1CP – Rack mount kit with handles

PXI System Interface Accessories

The Distribution Unit uses the following Lock-links, RF cables and material for your VSA or VSG system configuration. RF cables can be used with either configuration; however, the Lock-Link hardware material is for one of the two configurations only.

Table 2 Interface Lock-Link and Cable Sets

System Configuration	Hardware Lock-link	RF Cable Port Number – Conn. Type
VSG 8 x 0	V2800-00007, V2800-20012 &	V2800-20006, 20008, 20009 – SMA/SMA ^b
VSA 0 x 8	V2800-20013 ^a	V2800-20007, 20010, 20011 –SMA/SMA ^c

a. Refer to “[Hardware Lock-link Setup for a Three Instrument Stack](#)” on page 13.

b. Refer to “[VSA RF Interface Cable Connections](#)” on page 16.

c. Refer to “[VSG RF Interface Cable Connections](#)” on page 18.

General Specifications

Specifications for the Distribution Unit (400 MHz to 6.0 GHz) are characteristic performance. A functional test certificate is offered only for the Distribution Unit.

Power Requirements

Verify that the required ac power is available before installing the Distribution Unit.

- 100/120 Vac
220/240 Vac 50/60 Hz
- 40 Watts
- The instruments can operate with mains supply voltage fluctuations up to $\pm 10\%$ of the nominal voltage.
- Air conditioning equipment (or other motor-operated equipment) should not be placed on the same ac line that powers the Distribution Unit.

WARNING

This is a Safety Class I 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.

Environmental Requirements

Refer to the standard documentation for environmental requirements.

Environmental Tests

The Distribution Unit complies with all applicable safety and regulatory requirements for the intended location of use.

- Altitude (Operation)
3,000 meters (~10,000 feet)
- The instrument can safely operate in a relative humidity of 80% for temperatures to 31 degrees C, decreasing linearly to 50% relative humidity at 40 degrees C.

Equipment Heating and Cooling

If necessary, install air conditioning and heating to maintain the ambient temperature within the appropriate range.

CAUTION

Ventilation Requirements: When installing the instrument in a cabinet, the convection into and out of the instrument 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, forced convection must be used.

Dimensions and Space Requirements

Standard installation of the measurement instrumentation should include configuration and installation on a customer provided lab bench or table top of adequate size and strength. For weight, dimensions and space requirements refer to the instrument documentation that is being used.

Table 3

Instrument Dimensions

Model	Weight	Height	Width	Depth
V2802A-M81	5.5 kg (12 lb)	88 mm (3.5 in)	425 mm (16.75 in)	500 mm (19.7 in)

RF Specifications at 25 Degree Celsius

CAUTION

It is recommended that you do not operate components near damage levels. The power levels must be 3 dB below maximum level to ensure no damage, see [Table 4](#).

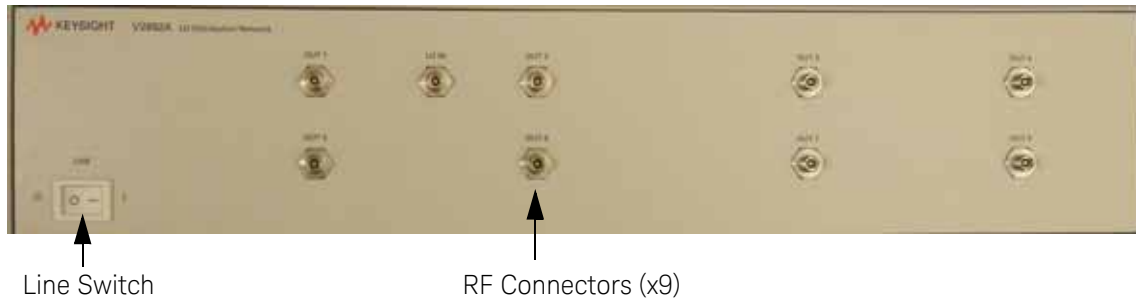
Table 4

Performance Information

Frequency Range and Power Levels:	
Port Power Damage Level	15 dBm
RF Frequency Range	400 MHz to 6 GHz
Nominal Performance	
Gain	> 0.5 dB
Channel to Channel Gain Variation	< ± 1.5 dB
LO IN Match	< 10 dB
OUT (1-8) Match	< 10 dB
1 dB Compression	> +4.5 dBm

Front and Rear Panel Features

Figure 1 V2802A-M81 Front Panel



NOTE

The Distribution Unit has no automated control features; all signal path configurations are performed manually with the available front panel coaxial accessory interface cables

-
- Line Switch** The front panel LINE switch disconnects the mains circuits from the mains supply. The switch is located at the bottom left corner of the front panel.
- RF Connectors** All of the RF connectors are 50 Ohm, 3.5 mm female connectors.

Figure 2 V2802A-M81 Rear Panel



Chassis Ground A threaded terminal post for connecting the Distribution Unit to a conductive object, cabinet or structure to ensure a common potential and reduce leakage current in a system. Requires a (M4 x 0.7) threaded nut.

Line Module The line fuse, as well as a spare, reside within the line module. [Figure 3](#) illustrates where the fuses are located and how to access them.

Install the instrument so that the ON/OFF switch is readily identifiable and is easily reached by the operator. The ON/OFF switch is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument, or the detachable power cord can be removed from the electrical supply. Alternately, 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.

Power Cords A line power cord is supplied in one of several configurations, depending on the destination of the original shipment. Keysight can supply additional certified power cords to meet region electrical supply and receptacle configurations. Please contact Keysight at: www.keysight.com for assistance in power cord selection.

WARNING This is a Safety Class I 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.

Available Fuse Fuse F 3 A/250V (2110-0780)

WARNING

For continued protection against fire hazard replace line fuse only with same type and rating. The use of other fuses or material is prohibited.

Figure 3 Line Module



CAUTION

Verify that the premise electrical voltage supply is within the range specified on the instrument.

Hardware Lock-link Setup for a Three Instrument Stack

Stacking the Distribution Unit Using Two PXI Chassis

NOTE

The Lock-link material provided will be used in these instructions to mechanically secure the Distribution Unit to two M9018A PXI chassis.

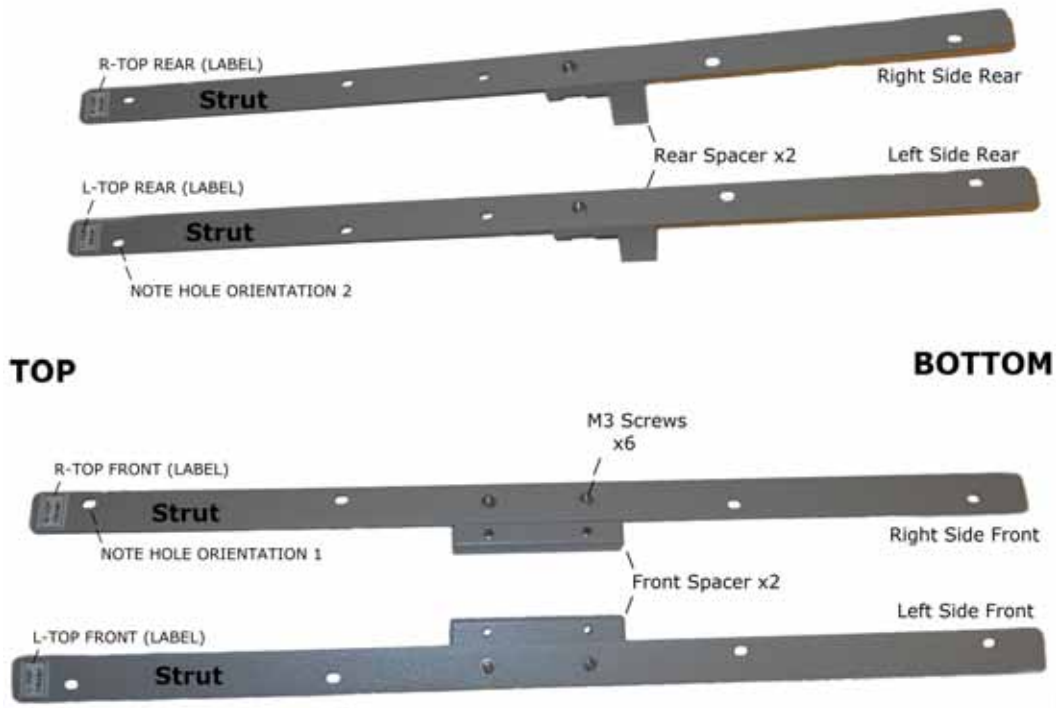
1. The lock-link kit materials needed:

- 0515-0372 - Screw T10 M3x0.5, 8 mm (x6), for Struts/Spacers
- 0515-0380 - Screw T20 M4x0.7, 10 mm (x16), for PXI Chassis
- 0515-0436 - Screw T20 M4x0.7, 18 mm (x4), for Dist. Unit
- V2800-00007 - Lock-link, Struts (x4)
- V2800-20012 - Lock-link, Front Spacer (x2)
- V2800-20013 - Lock-link, Rear Spacer (x2)

NOTE

The lock-link struts and spacers have already been assembled for your convenience using the 0515-0372 M3 screws, as shown in [Figure 4](#). The top of each strut has also been labeled to aid in the correct location.

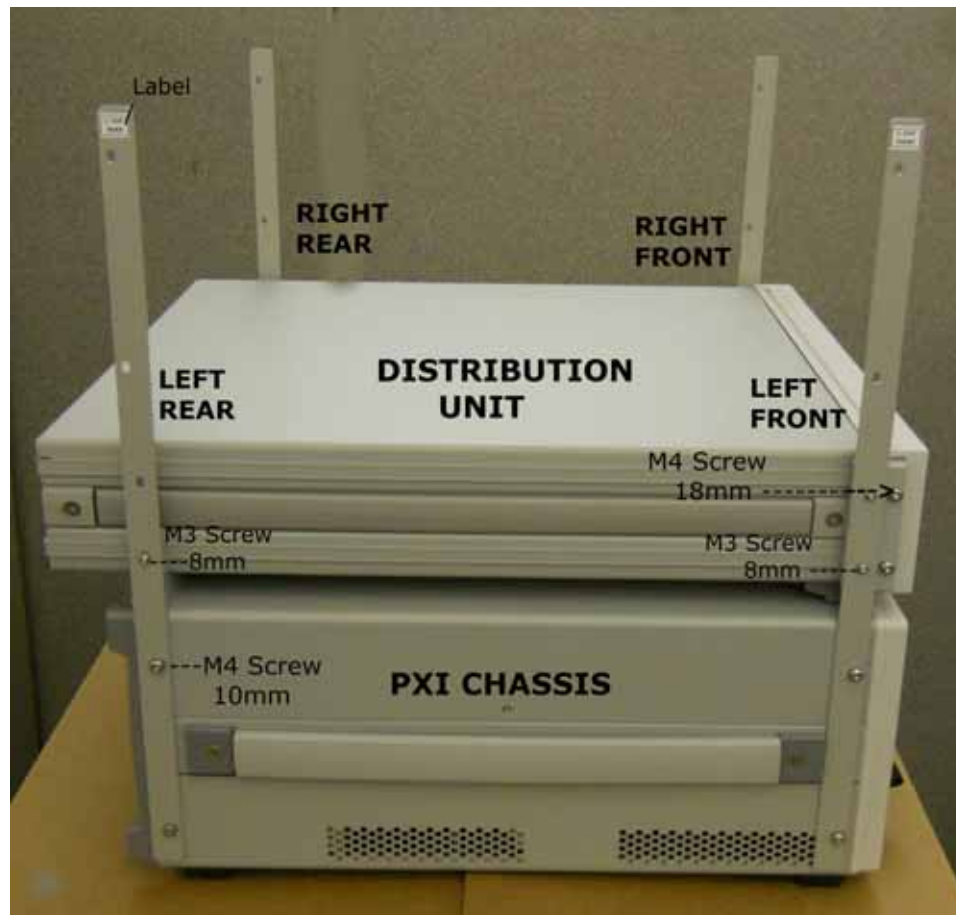
Figure 4 Lock-Link Strut and Spacer Assemblies



V2802A Option M81
Hardware Lock-link Setup for a Three Instrument Stack

2. Remove the two rear feet from the bottom of the Distribution Unit.
3. Place the Distribution Unit on top of the first PXI chassis.
4. Using a T20 Torx driver, attached the two struts labeled “L-TOP FRONT” and “R-TOP FRONT” to the front side frame of the Distribution Unit using two screws (0515-0436). Torque to 9 in-lb.
5. Align the holes in the bottom PXI Chassis with the Front Strut holes and install two M4 10 mm screws (0515-0380) using a T20 Torx driver on both the left and right Front sides. If may be necessary to loosen the two M3 screws (0515-0372), Use a T10 Torx driver, on the Front Spacer so the strut can move more freely to align the holes. Leave the screws slightly loose for now.

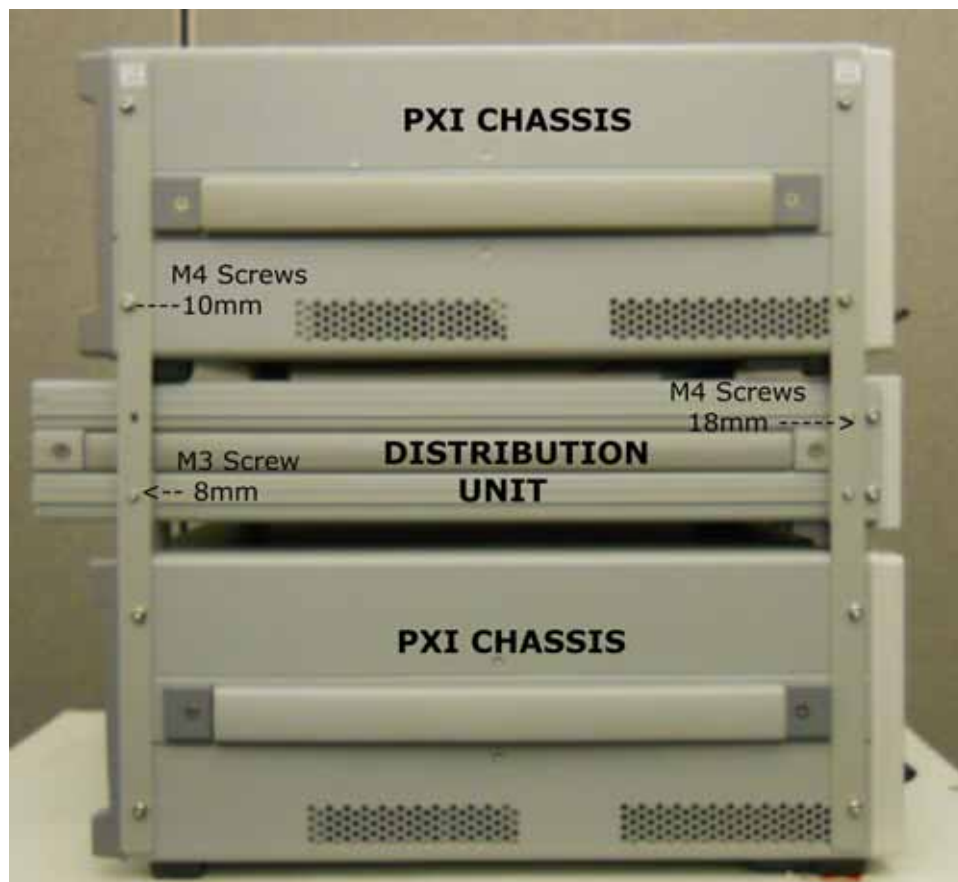
Figure 5 Attaching the Distribution Unit to the Lower PXI Chassis



V2802A Option M81
Hardware Lock-link Setup for a Three Instrument Stack

6. Lift the rear of the Distribution Unit and place the two remaining struts labeled L-TOP REAR and R-TOP REAR so that the attached rear spacer remains held in place by the weight of the Distribution Unit.
 - a. Attached the struts to the lower PXI Chassis with two M4 10 mm, screws (0515-0380) using a T20 Torx driver on the left and right sides. It may be necessary to loosen the M3 screw (0515-0372) using a T10 Torx driver in the spacer above to align the holes. Leave the screws slightly loose for now.
7. Place the second PXI Chassis on top of the Distribution Unit.
 - a. Align the holes in the top PXI Chassis with the Strut holes and install two M4 10 mm screws (0515-0380) using a T20 Torx driver on both the left and right sides. It may be necessary to loosen the M3 screw (0515-0372) in the spacer above using a T10 torx driver to align the holes. Leave the screws slightly loose for now.
8. Once all the screws are installed into the two PXI Chassis, tighten to 9 in-lbs. Ensure the M3 screws (0515-0372), used to attach the Spacers to the Strut, are tighten to 9 in-lb as well.

Figure 6 Attaching the Distribution Unit to the Lower PXI Chassis



VSA RF Interface Cable Connections

Figure 7 illustrates the system configuration (0x8) and cable connections.

1. Connect the RF interconnect cables from the PXI Chassis to the Distribution Unit.
As you are connecting each cable, torque to 8 in-lb. Refer to Table 5.

CAUTION

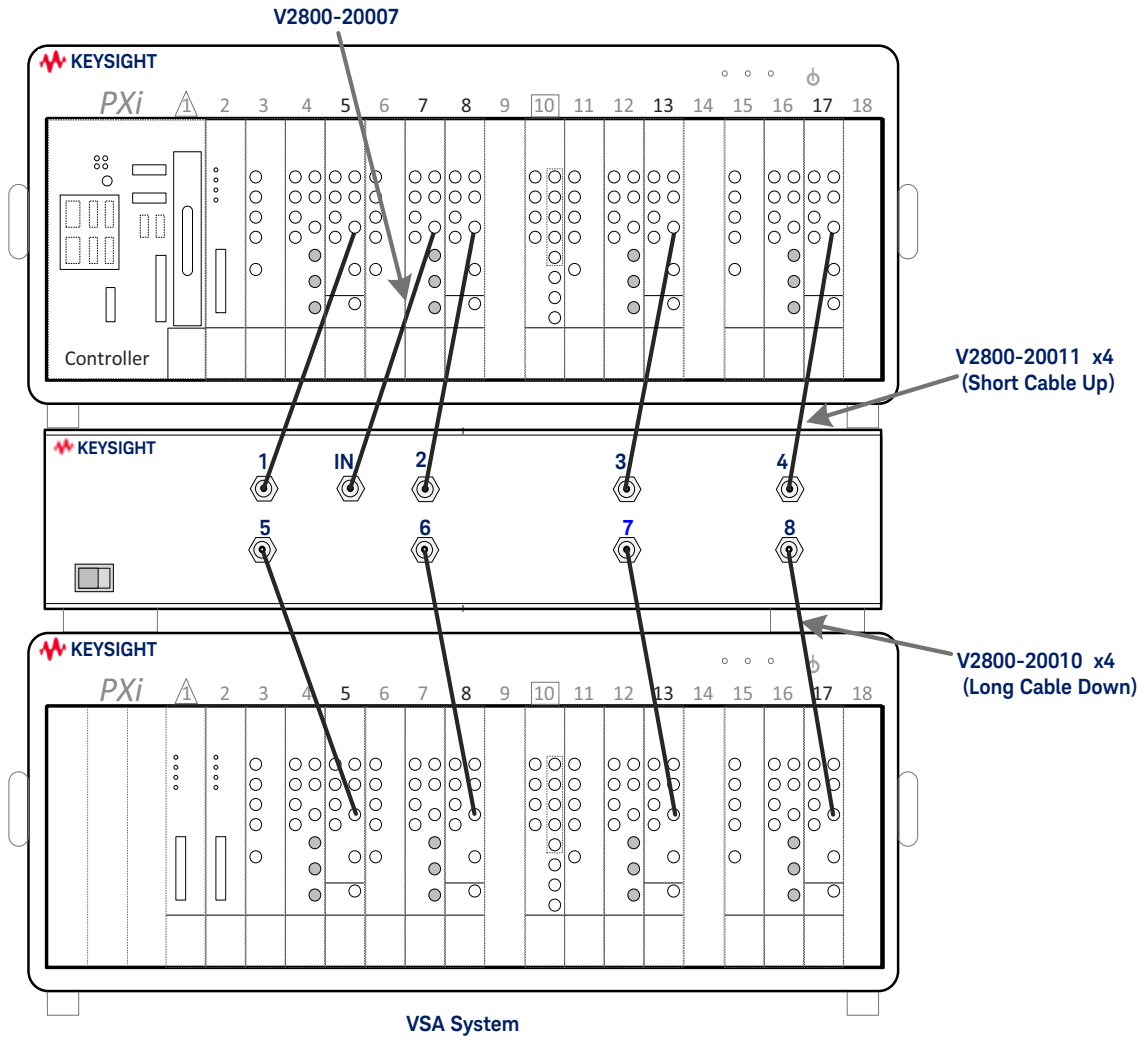
Over torque will cause damage and may cause connectors to spin or become loose.

Table 5

VSA RF Interface Cable Connections

Keysight Part Numbers	From: PXI	To: Distribution Unit
V2800-20007	LO OUT - Slot 7	LO IN
V2800-20010	LO IN - Slot 5	OUT 5
V2800-20010	LO IN - Slot 8	OUT 6
V2800-20010	LO IN - Slot 13	OUT 7
V2800-20010	LO IN - Slot 17	OUT 8
V2800-20011	LO IN - Slot 5	OUT 1
V2800-20011	LO IN - Slot 8	OUT 2
V2800-20011	LO IN - Slot 13	OUT 3
V2800-20011	LO IN - Slot 17	OUT 4

Figure 7 VSA Front Panel RF Cables



VSG RF Interface Cable Connections

Figure 8 illustrates the system configuration (8 x 0) and cable connections.

1. Connect the RF interconnect cables from the PXI Chassis to the Distribution Unit.
As you are connecting each cable, torque to 8 in-lb. Refer to Table 6.

CAUTION

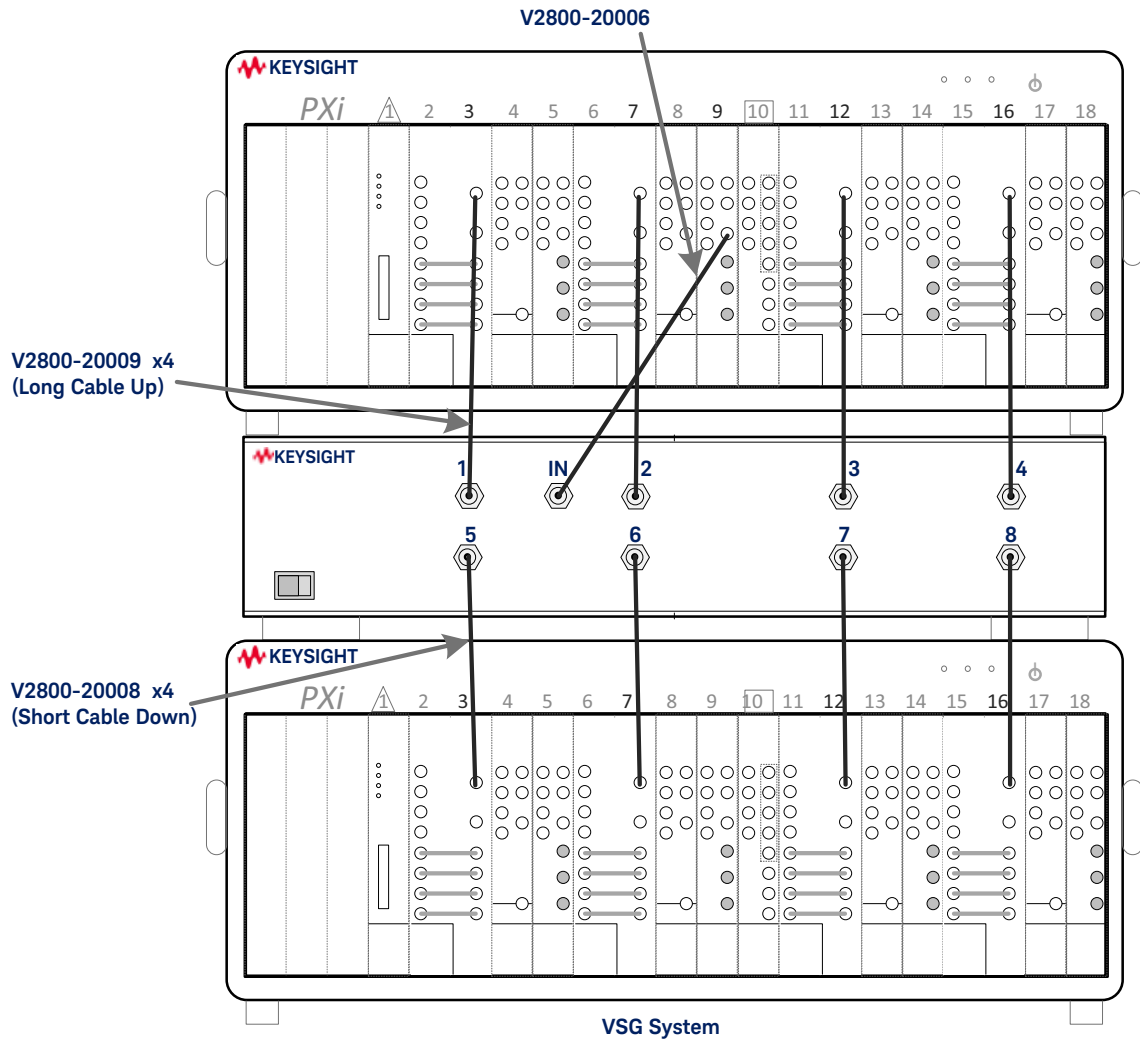
Over torque will cause damage to the connectors to spin or become loose.

Table 6

VSG RF Interface Cable Connections

Keysight Part Numbers	From: PXI	To: Distribution Unit
V2800-20006	LO OUT - Slot 9	LO IN
V2800-20008	LO IN - Slot 3	OUT 5
V2800-20008	LO IN - Slot 7	OUT 6
V2800-20008	LO IN - Slot 12	OUT 7
V2800-20008	LO IN - Slot 16	OUT 8
V2800-20009	LO IN - Slot 3	OUT 1
V2800-20009	LO IN - Slot 7	OUT 2
V2800-20009	LO IN - Slot 12	OUT 3
V2800-20009	LO IN - Slot 16	OUT 4

Figure 8 VSG Front Panel RF Cables



Service Information

Refer to “Contacting Keysight” on page 30.

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.

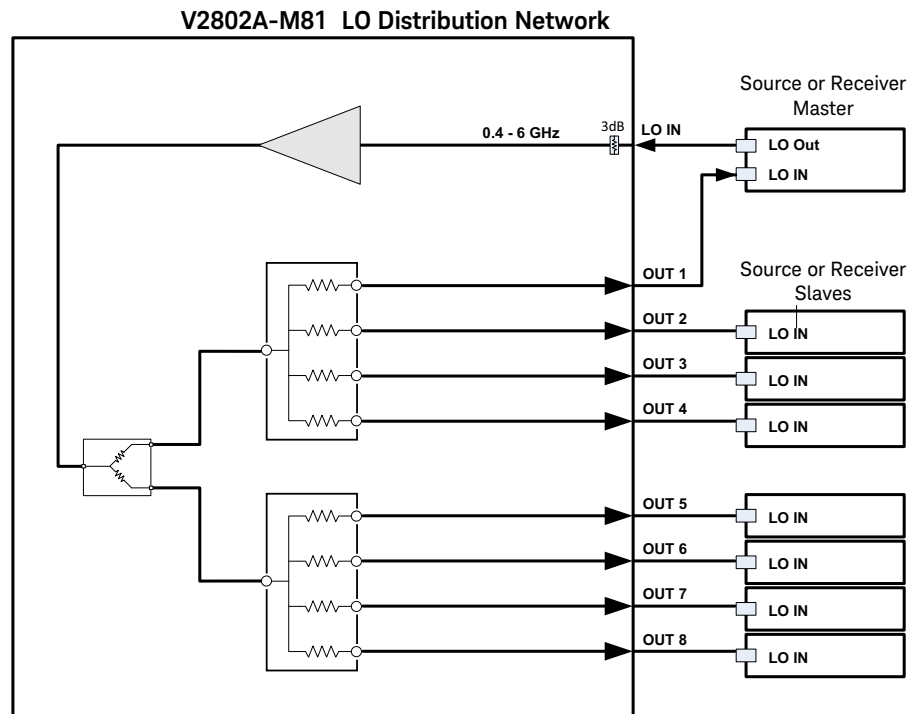
Table 7

Replacement Parts

Description	Part Number
AC/DC Power Supply, 4 Output Ports	0950-5667
RF Amplifier, 26 dBm, SMA	0955-2712
Termination, 50 Ohm, SMA male	1810-0118
Fuse 3A 250V Non-Time delay	2110-0780
Bulkhead Coax Adapter, 3.5 mm (f/f)	1250-3805
Cable Assembly with fan, 12 V	87050-60027
V2802A Option M81 Guide	V2800-90002

Figure 9

RF Block Diagram



Troubleshooting the Distribution Unit

RF Path Checks

If you suspect a RF signal path problem, the following procedure is provided to check all RF signal paths through the Distribution unit.

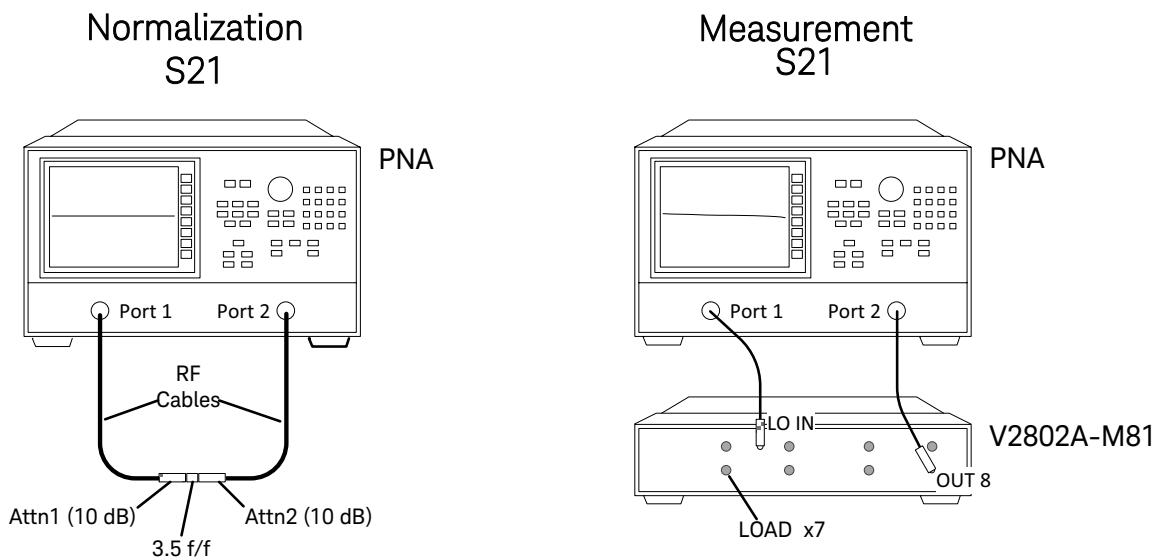
Equipment Needed

- Two RF flex cables, 3.5 mm (m/f)
- Two coax attenuators, 3.5 mm, 10 dB
- One coax connector adapter, 3.5 mm (f/f)
- Seven 50 Ohm Terminations, 3.5 mm or SMA male
- Network Analyzer with 400 MHz to 6 GHz operating capability

Equipment Setup

1. Turn on the Distribution unit and the PNA (or equivalent).
2. Set the analyzers frequency range of 400 MHz to 6 GHz and IF BW to 1 kHz.
3. Connect two flexible RF cables to Ports 1 and 2 on the analyzer.
4. Configure the analyzer and make an S21 measurement.
5. Set the source power level to -5 dBm.
6. Using appropriate coax attenuators and adapters connect the two cable ends together.
7. Perform an S21 Normalization.

Figure 10 Equipment Setup



Check Results

Connect the flexible RF cables with attenuators to the Distribution unit ports as described Table 8. Connect a 50 Ohm termination to all unconnected OUT ports. Refer to Figure 12, "Typical Path Response," which illustrates a typical path response for all eight signal paths.

Table 8 Test Set RF Signal Path (S21)

Path Description
LO IN to Out 8
LO IN to Out 7
LO IN to Out 6
LO IN to Out 5
LO IN to Out 4
LO IN to Out 3
LO IN to Out 2
LO IN to Out 1

Figure 11 RF Signal Path Check

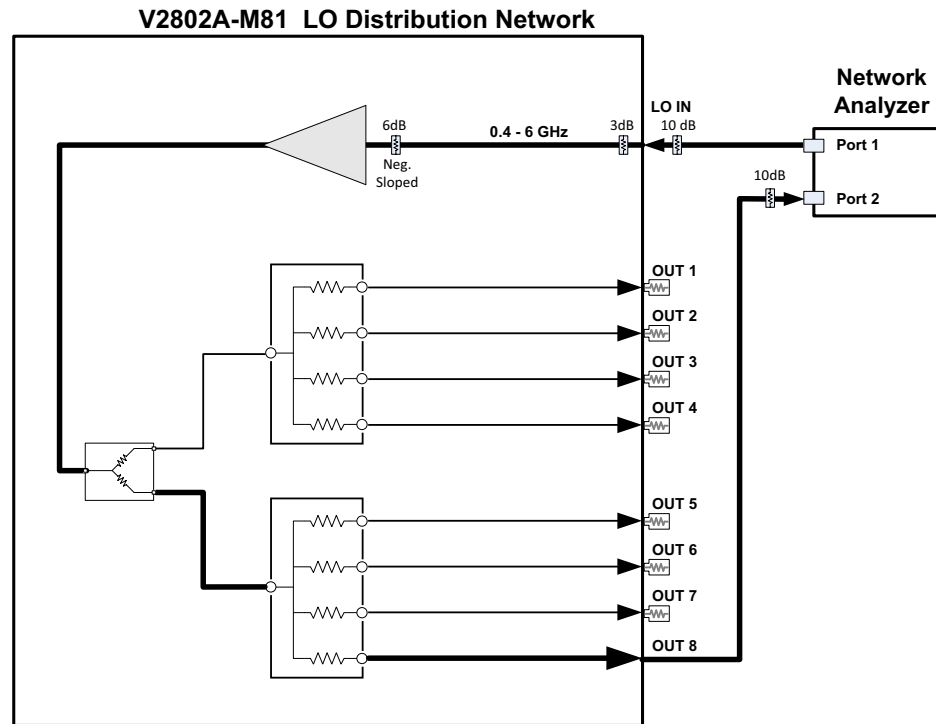
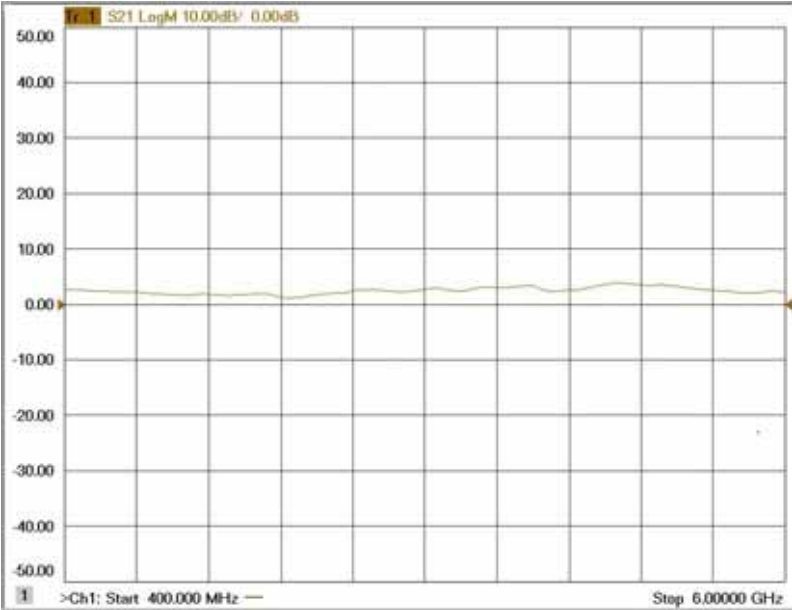


Figure 12

Typical Path Response



Safety and Regulatory Information

Introduction

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument.

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.

Safety Earth Ground

WARNING

This is a Safety Class I 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.

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 product damage and the risk of electrical shock.

Declaration of Conformity

A copy of the Declaration of Conformity is available upon request, or a copy is available on the Keysight Technologies web site at <http://regulations.keysight.com/DoC.htm>

Statement of Compliance

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.

Before Applying Power

Verify that the premises electrical supply is within the range of the instrument. The instrument has an autoranging power supply.

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

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.

CAUTION

This product is designed for use in Installation Category II and Pollution Degree 2.

CAUTION

Verify that the premise electrical voltage supply is within the range specified on the instrument.

CAUTION

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 product 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

This instrument has auto-ranging line voltage input, be sure the supply voltage is within the specified range and voltage fluctuations do not to exceed 10 percent of the nominal supply voltage.

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

The opening of covers or removal of parts is likely to expose the user to dangerous voltages. Disconnect the instrument from all voltage sources before opening.

WARNING

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

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 switch and is not a LINE switch (disconnecting device).

WARNING

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

Connector Care and Cleaning Precautions

Remove the power cord to the instrument. To clean the connectors use alcohol in a well ventilated area. Allow all residual alcohol moisture to evaporate, and fumes to dissipate prior to energizing the instrument.

WARNING

To prevent electrical shock, disconnect the **V2802A Option M81** from mains electrical supply 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

If flammable cleaning materials are used, the material shall not be stored, or left open in the area of the equipment. Adequate ventilation shall be assured to prevent the combustion of fumes, or vapors.

Electrostatic Discharge Protection

Electrostatic discharge (ESD) can damage or destroy electronic components. The product is shipped in materials that prevent damage from static, and should only be removed from the packaging in an anti-static area ensuring that the correct anti-static precautions are taken.

Two types of ESD protection are listed below. Purchase acceptable ESD accessories from your local supplier.

- Conductive table-mat and wrist-strap combination
- Conductive floor-mat and heel-strap combination

















Both types, when used together, provide a significant level of ESD protection. To ensure user safety, static-safe accessories must provide at least 1 Meg Ohm of isolation from ground.

WARNING

These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

Instrument Markings

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

	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 ingress 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.

Regulatory Information

Battery Collection

Do not throw batteries away but collect as small chemical waste, or in accordance with your country's requirements. You may return the battery to Keysight Technologies for disposal. Refer to ["Contacting Keysight" on page 30](#) for assistance.

Electrical Safety Compliance

SAFETY

Complies with European Low Voltage Directive 2014/35/EU

- IEC/EN 61010-1:2010, 3rd Edition
- Canada: CSA C22.2 No. 61010-1-12
- USA: UL std no. 61010-1, 3rd Edition
- Acoustic statement (European Machinery Directive 2022/42/EC, 1.7.4.2U)
Accoustical noise emission
LpA<70 dB
Operator position
Normal operation mode
Per ISO 7779

EMI and EMC Compliance

EMC

Complies with European EMC Directive 2014/30/EU

- IEC 61326-1:2012/EN 61326-1:2013
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11:2011
- ICES/NMB-00 1
This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme a la norme NMB du Canada.
- 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.

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Keysight Support, Services, and Assistance

Service and Support Options

There are many other repair and calibration options available from the Keysight Technologies support organization. These options cover a range of service agreements with varying response times. Contact Keysight for additional information on available service agreements for this product.

Contacting Keysight

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

If you do not have access to the Internet, contact your 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 the warranty status of your unit.

Shipping Your Product to Keysight for Service or Repair

IMPORTANT

Keysight Technologies reserves the right to reformat or replace the internal hard disk drive in your analyzer as part of its repair. This will erase all user information stored on the hard disk. It is imperative, therefore, that you make a backup copy of your critical test data located on the analyzer's hard disk before shipping it to Keysight for repair.

If you wish to send your instrument to Keysight Technologies for service or repair:

- To improve turn-around time, return your Distribution unit along with your analyzer and cables to Keysight so that we may verify the operation of the complete system.
- Include a complete description of the service requested or of the failure and a description of any failed test and any error message.
- Remove and retain the front handles and all rack mount hardware. The analyzer should be sent to Keysight in the same configuration as it was originally shipped.
- Ship the analyzer using the original or comparable antistatic packaging materials.
- Contact Keysight for instructions on where to ship your analyzer.

This information is subject to change
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www.keysight.com