

Keysight U7227A/C/F USB Pre-Amplifier

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.

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 <p>The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives.</p>	 <p>ICES/NMB-001 indicates that this ISM device complies with the Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.</p>
 <p>The RCM mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australia EMC Framework regulations under the terms of the Radio Communication Act of 1992.</p>	 <p>This symbol 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.</p>
 <p>This instrument is Class A suitable for professional use and is for use in electromagnetic environments outside of the home. 이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.</p>	 <p>This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.</p>

Waste Electrical and Electronic Equipment (WEEE) Directive

This instrument complies with the WEEE Directive marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit <http://about.keysight.com/en/companyinfo/environment/takeback.shtml> for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/mta
(product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
(worldwide contact information for repair and service)

Table of Contents

Regulatory Markings	3
Waste Electrical and Electronic Equipment (WEEE) Directive	4
Product category:	4
Sales and Technical Support	4
List of Figures	7
List of Tables	9
1 Getting Started	
Product Overview	12
Key features of the U7227A/C/F USB pre-amplifier	13
2 Installation	
Initial Inspection	16
Verify the U7227A/C/F Shipment Contents	17
Service and Recalibration	18
Operating and Safety Precautions	19
ESD damage	19
Connector care	20
Cable handling	21
USB Pre-Amplifiers Covered by this Guide	22
Signal Analyzer Retrofit Requirements	23
N9010A, N9020A, or N9030A signal analyzer	23
3 Operating Guides	
Operating Instructions	26
Operator's check	26
Service and Maintenance	29
Service	29
Maintenance	29

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List of Figures

Figure 1-1	U7227A/C/F USB pre-amplifier	12
Figure 2-1	Cable handling	21
Figure 2-2	U7227A/C/F	22
Figure 3-1	Quick-check configuration for the S-parameter test	26

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List of Tables

Table 2-1	U7227A/C contents	17
Table 2-2	U7227F contents	17
Table 3-1	S-parameter measurement parameters	27
Table 3-2	Noise figure measurement parameters	28

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1 Getting Started

Product Overview 12

This chapter provides an overview of the Keysight U7227A/C/F USB pre-amplifier

Product Overview

The Keysight U7227A/C/F USB pre-amplifier which operates up to 50 GHz is a general-purpose low noise amplifier that offers reliable gain and low noise figure. With the ability to be powered directly using USB connectivity, it eliminates the need for a separate power supply which presents an invaluable alternative for you to optimize the efficiency of your test system. Compact, with a rugged and portable design, this USB pre-amplifier is suitable for benchtop measurements or remote front-end field applications.

The U7227A/C/F USB pre-amplifier provides a simple means to achieve accurate and repeatable noise figure measurements on low-noise low-gain devices, using Keysight X-series analyzers. The total solution will provide performance and ease-of-use exceeding competitive signal analyzer based solutions.



Figure 1-1 U7227A/C/F USB pre-amplifier

Key features of the U7227A/C/F USB pre-amplifier

- Automatic gain correction value with temperature compensation and transfer of calibration data (noise figure and S-parameters) through USB plug-and-play features for improved noise figure measurements with Keysight X-series analyzers
- Excellent noise figure and optimized gain with the X-series signal analyzers improve measurement accuracy and minimize uncertainty
- Provides ultra-broadband operating frequency from 10 MHz up to 50 GHz for various application needs
- Rugged and portable design for benchtop measurements or remote front-end applications

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2 Installation

Initial Inspection	16
Verify the U7227A/C/F Shipment Contents	17
Service and Recalibration	18
Operating and Safety Precautions	19
USB Pre-Amplifiers Covered by this Guide	22
Signal Analyzer Retrofit Requirements	23

This chapter provides you important information on how to check and prepare your instrument for operation.

Initial Inspection

- 1** Unpack and inspect the shipping container and its contents thoroughly to ensure that nothing was damaged during shipment. If the shipping container or cushioning material is damaged, the contents should be checked both mechanically and electrically.
 - Check for mechanical damage such as scratches or dents.
 - Procedures for checking electrical performance are given under “**Operator’s check**” on page 26.
- 2** If the contents are damaged or defective, contact your nearest Keysight Technologies Service and Support Office. Refer to “**Sales and Technical Support**” on page 4 of this manual. Keysight Technologies will arrange for repair or replacement of the damaged or defective equipment. Keep the shipping materials for the carrier's inspection.
- 3** If you are returning the instrument under warranty or for service, repackaging the instrument requires original shipping containers and material or their equivalents. Keysight Technologies can provide packaging materials identical to the original materials. Refer to “**Sales and Technical Support**” on page 4 of this manual for the Keysight Technologies nearest to you. Attach a tag indicating the type of service required, return address, model number, and serial number. Mark the container FRAGILE to insure careful handling. In any correspondence, refer to the instrument by model number and serial number.

Verify the U7227A/C/F Shipment Contents

The following table lists the items that are shipped with the U7227A/C/F.

Table 2-1 U7227A/C contents

Quantity	Description	Part number
1	Certificate of Calibration	5962-0476
1	3.5 mm (f) to Type-N (m) adapter	1250-1744

Table 2-2 U7227F contents

Quantity	Description	Part number
1	Certificate of Calibration	5962-0476
1	2.4 mm (f) to 2.4 mm (f) adapter	85056-60006

Service and Recalibration

If your U7227A/C/F USB pre-amplifier requires service or repair, contact the nearest Keysight office for information on where to send it. Refer to “[Sales and Technical Support](#)” on page 4 of this manual. The performance of the U7227A/C/F can only be verified by specially-manufactured equipment and calibration standard from Keysight. The recommended interval for recalibration is 12 months.

Operating and Safety Precautions

Observe the following guidelines before connecting or operating the U7227A/C/F USB pre-amplifier.

ESD damage

Protection against electrostatic discharge (ESD) is important while handling and operating the U7227A/C/F USB pre-amplifier.

Static electricity can build up on your body and can easily damage sensitive components when discharged.

Static discharges too small to be felt can cause permanent damage to the unit.

To prevent damage from ESD:

- **Use** a grounded antistatic mat in front of your test equipment and wear a grounded wrist strap attached to it when handling or operating the U7227A/C/F.
- **Wear** a heel strap when working in an area with a conductive floor.
- **Ground** yourself before you clean, inspect, or make a connection to the U7227A/C/F. You can, for example, grasp the grounded outer shell of the analyzer test port or cable connector briefly.
- **Avoid** touching the exposed connector pins.

Connector care

Because connectors can become defective due to wear during normal use, all connectors should be inspected and maintained to maximize their service life.

- Inspect the mating surface each time a connection is made. Metal particles from connector threads often find their way onto the mating surface when a connection is made or disconnected.
- Clean dirt and contamination from the connector mating surface and threads. This simple step can extend the service life of the connector and improve the quality of your calibration and measurements.
- Gage connectors periodically. This not only provides assurance of proper mechanical tolerances, and thus connector performance, but can also indicate situations where the potential for damage to another connector may exist.

CAUTION

The U7227A/C/F can be damaged if excessive torque is applied to the connectors.

The recommended torque value is 8 lb-in for 2.4 mm and 3.5 mm type connectors.

For the input port, the recommended torque wrench is 20 mm with part number 8710-1764.

For the output port, the recommended torque wrench is 5/16" with part number 8710-1765.

Cable handling

Because excessive bending of the cable may damage the cable over time and will affect the performance of the U7227A/C/F, the minimum bend radius of the cable is 100 mm. Excessive bending could result in internal damage caused by compression. This preventive measure during handling could significantly extend the life of the cable.

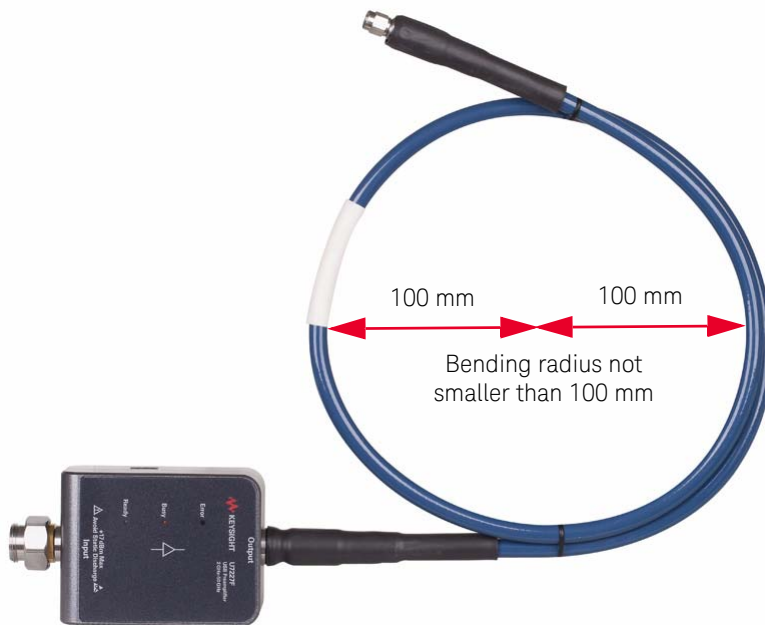


Figure 2-1 Cable handling

USB Pre-Amplifiers Covered by this Guide

There are three models available as follows:

- U7227A: USB pre-amplifier, 10 MHz to 4 GHz
- U7227C: USB pre-amplifier, 100 MHz to 26.5 GHz
- U7227F: USB pre-amplifier, 2 GHz to 50 GHz

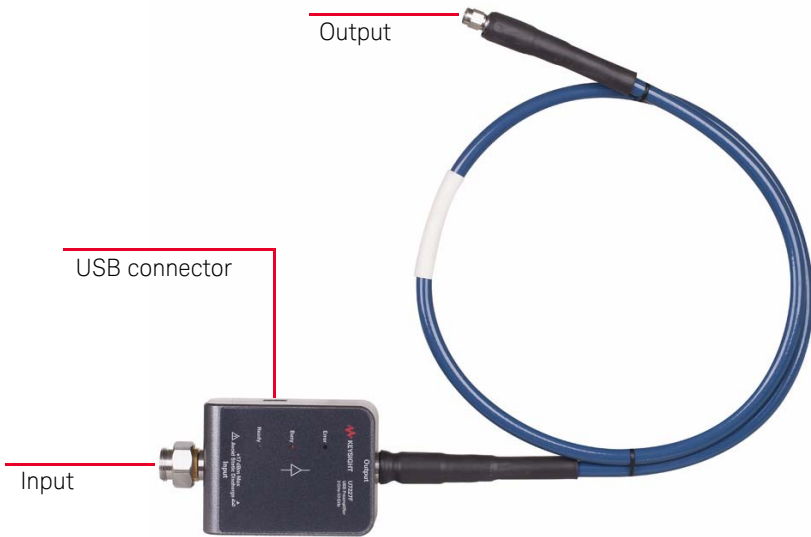


Figure 2-2 U7227A/C/F

Indication light description

Ready	When the USB pre-amplifier is connected with the X-series signal analyzer.
Busy	When communication between the USB pre-amplifier and the X-series signal analyzer is in progress.
Error	<ul style="list-style-type: none">- When there is a connection error or a data download error. The X-series signal analyzer is unable to communicate with the USB pre-amplifier.- When there is an input power overload at the X-series signal analyzer.

Signal Analyzer Retrofit Requirements

X-series analyzers

There is no required Option in the signal analyzer in order to connect the U7227A/C/F to the signal analyzer.

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3 Operating Guides

Operating Instructions	26
Service and Maintenance	29

This chapter provides simple quick-check instructions to verify the U7227A/C/F USB pre-amplifier functionality prior to usage.

Operating Instructions

Operator's check

The operator's check is supplied to allow the operator to make a quick check of the U7227A/C/F prior to usage or if a failure is suspected.

CAUTION

ESD exceeding the level specified or RF power applied is greater than the maximum specified may cause permanent damage to the device.

Operator's check for the S-parameter test

Any network analyzer with a USB supply can be used for performance test verification. The equipment setup is as illustrated below.

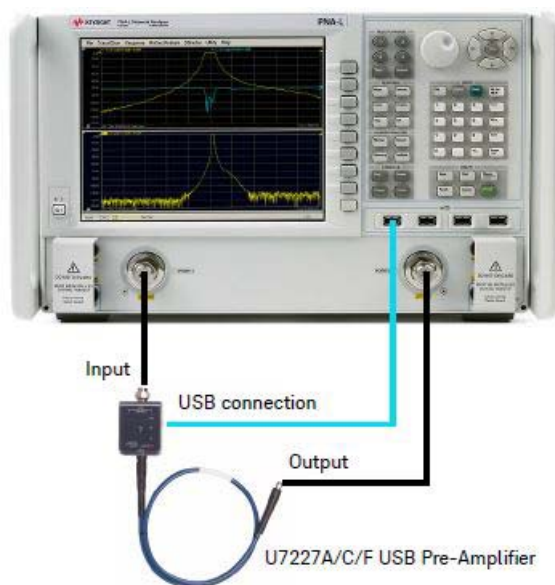


Figure 3-1 Quick-check configuration for the S-parameter test

Quick-check procedure

- 1
- Set the following parameters on the network analyzer to perform 2-port measurements:

Table 3-1 S-parameter measurement parameters

	U7227A	U7227C	U7227F
Start frequency ^[a]	10 MHz	100 MHz	2 GHz
Stop frequency ^[a]	4 GHz	26.5 GHz	50 GHz
Points ^[a]	201	201	201
IFBW	100 Hz	100 Hz	100 Hz
Input power	-30 dBm	-40 dBm	-50 dBm

[a] The same frequency settings (start frequency and stop frequency) and number of points apply for all parameters.

- 2
- Calibrate the network analyzer using the appropriate calibration procedure.
- 3
- Connect the input of the pre-amplifier to port 1 of the network analyzer and the output to port 2.
- 4
- Connect the pre-amplifier to the USB supply of the network analyzer.
- 5
- Obtain the measurement result for S11 (input return loss), S22 (output return loss), and S21 (gain).
- 6
- Compare the measurement results with the specifications.

Operator's check for the noise figure measurement

- 1 Set the following parameters on the network analyzer to perform 2-port measurements:

Table 3-2 Noise figure measurement parameters

	U7227A	U7227C	U7227F
Start frequency ^[a]	10 MHz	100 MHz	2 GHz
Stop frequency ^[a]	4 GHz	26.5 GHz	50 GHz
Points ^[a]	201	201	201
Input power	-30 dBm	-40 dBm	-50 dBm
Bandwidth	2 MHz	2 MHz	2 MHz
Gain	Medium	Medium	Low

[a] The same frequency settings (start frequency and stop frequency) and number of points apply for all parameters.

- 2 Calibrate the network analyzer for noise figure measurements.
- 3 Connect the input of the pre-amplifier to port 1 of the network analyzer and the output to port 2.
- 4 Connect the pre-amplifier to the USB supply of the network analyzer.
- 5 Obtain the measurement result for noise figure.
- 6 Compare the measurement results with the specifications.

Service and Maintenance

Service

The U7227A/C/F does not have internal adjustments and should not be opened; it should only be repaired by service-trained personnel. Should it become necessary to return the U7227A/C/F for repair or service, contact your nearest Keysight Sales and Service Center.

Maintenance

The connectors of the U7227A/C/F, particularly the connector faces must be kept clean. Keysight recommends that the connectors be periodically inspected and cleaned if necessary. For instructions on the connection and maintenance of your connectors, refer to the Connector Care Quick Reference Card (08510-90360).

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This information is subject to change without notice. Always refer to the English version at the Keysight website for the latest revision.

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