Keysight J7203A Atomic Frequency Reference

KEYSIGHT TECHNOLOGIES

User's Guide

NOTICE: This document contains references to Agilent Technologies. Agilent's former Test and Measurement business has become Keysight Technologies. For more information, go to **www.keysight.com.**

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.

Compliance Notices and Regulatory Information

Compliance with Electromagnetic Compatibility (EMC)

This product conforms with the protection requirements of EMC Directive 2004/108/EC for Electromagnetic Compatibility.

This product complies to the EMC Directive by assessment according to the IEC/EN61326-1 EMC standard.

In order to preserve the EMC performance of this product, any cable which becomes worn or damaged must be replaced with the same type and specifications.

WEEE Compliance

This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control Instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Keysight office, or see www.keysight.com for more information.

Regulatory Markings

CE	The CE mark shows that the product complies with all the relevant European Legal Directives.
ISM GRP.1 CLASS A	This symbol indicates that this is an Industrial Scientific and Medical Group 1 Class A product.
ICES/NMB-001	ICES/NMB-001 indicates that this ISM device complies with Canadian ICES-001. Cet appareill ISM est conforme a la norme NMB-001 du Canada.
N10149	The C-Tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australian EMC Framework Regulations under the terms of the Radio Communications Act of 1992.
40	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.
KCC-CRM-ABC-XXXXXXXXXXXXXX	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 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Declaration of Conformity

A copy of the Manufacturer's European Declaration of Conformity for this J7203A Atomic Frequency Reference can be obtained by contacting your local Keysight Technologies sales representative, or copies can be downloaded from the Keysight Technologies Web site at:

http://regulations.products.keysight.com/DoC/search.htm

Contacting Keysight

For more information, please contact your nearest Keysight office.

Americas	
Canada	(877) 894-4414
Latin America	305 269 7500
United States	(800) 829-4444
Asia Pacific	
Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	81 426 56 7832
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Thailand	1 800 226 008
Europe	
Austria	0820 87 44 11
Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700
Germany	01805 24 6333
Ireland	1890 924 204
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
Switzerland(French)	41 (21) 8113811 (Opt 2)
Switzerland(German)	0800 80 53 53 (Opt 1)
United Kingdom	44 (0) 118 9276201
Other European Countries:	www.keysight.com/find/contactus

Or, go to www.keysight.com/find/assist for more information.

Contents

1
Introduction

This chapter provides an overview of the Keysight J7203A Atomic Frequency Reference.

Product Overview

The Keysight J7203A Atomic Frequency Reference (AFR) is an accessory for the X-Series Signal Analyzer that provides a highly accurate 1 pps timebase to use in conjunction with the Pulse Freq Ref In setting. With the J7203A, the 1 pps signal is guaranteed to meet the input requirements of the EXT REF IN port, and the improved accuracy of the analyzer's internal frequency reference is specified. This is the only 1 pps signal that is guaranteed to function properly with the X-Series.

This accessory will be attached to the rear of the instrument and receives power from the USB port.

Figure 1-1 Keysight J7203A Atomic Frequency Reference

2
Installation

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 throughly 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.

2. If the contents are damaged or defective, contact your nearest Keysight Service and Support Office. Refer to "Contacting Keysight" in the front matter of this manual. Keysight 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 can provide packaging materials identical to the original materials. Refer to "Contacting Keysight" in the front matter 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.

Service and Recalibration

If your J7203A requires service or repair, contact the nearest Keysight office for information on where to send it. Refer to "Contacting Keysight" in the front matter of this manual. The performance of the J7203A can only be verified by specially-manufactured equipment and calibration standard from Keysight.

Verify the J7203A Shipment Contents

The following table lists the items that are shipped with the J7203A.

Table 2-1 J7203A contents

Item	Part number	Description
User's Guide	J7203-90001	Provides instructions on usage, retrofit requirements, troubleshooting, specifications, and general information.
BNC cable	8121-1707	BNC cable required to connect the J7203A to the signal analyzer's EXT REF IN connector.
USB cable	N9020-60139	USB cable required to connect the J7203A to the signal analyzer.
Calibration certificate	5962-0476	Provides information regarding the instrument calibration.
Screws	0515-0372	Screws (M3 – 0.5 x 8 mm) required for connection to the rear panel of the signal analyzer.

J7203A Atomic Frequency Reference Covered by this Guide

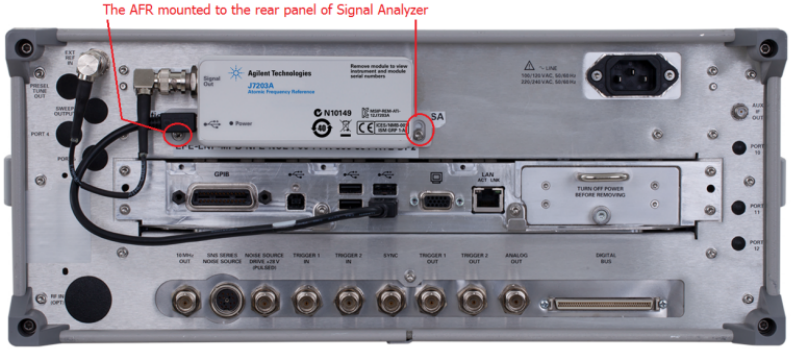
Serial numbers

A serial number label is attached to your J7203A that shows the serial number and country of manufacture.

J7203A Atomic Frequency Reference installation

Install the J7203A to the rear panel of the signal analyzer:

1 When installing the J7203A to the rear panel of the signal analyzer, ensure proper mating of the screws. It is important to tighten all screws equally. To do this, tighten opposed screws in pairs by a small amount until all are snug. Final torques must not exceed 7 in pounds.



NOTE

The J7203A has two holes in each of its mounting tabs.

The N9010A (EXA) and N9020A (MXA) use the lower screw holes while the N9030A (PXA) uses the upper screw holes.

2 Always connect the BNC cable to the signal analyzer BEFORE connecting the USB cable to the J7203A.

Un-install the J7203A from the rear panel of the signal analyzer:

1 Remove the USB cable from the signal analyzer to power off the J7203A.

2 Remove the BNC cable.

3 Loosen and remove the screws holding the J7203A. Remove the J7203A from the rear panel of the signal analyzer.

4 Place back the screws to the rear panel of the signal analyzer.

5 Cover the BNC connector with a BNC cover cap.

Signal Analyzer Retrofit Requirements

N9010A, N9020A, or N9030A signal analyzer

There is no required Option in the signal analyzer in order to connect the J7203A to the signal analyzer.

NOTE The N9010A, N9020A, or N9030A instrument software version must be A.14.00 or higher for use with the J7203A.

3
Operation

This chapter guides you on how to operate the J7203A.

Operating Precautions

Electrostatic discharge

When installing the J7203A, always connect the BNC cable to the signal analyzer BEFORE connecting to the J7203A. This will minimize the danger of an electrostatic discharge.

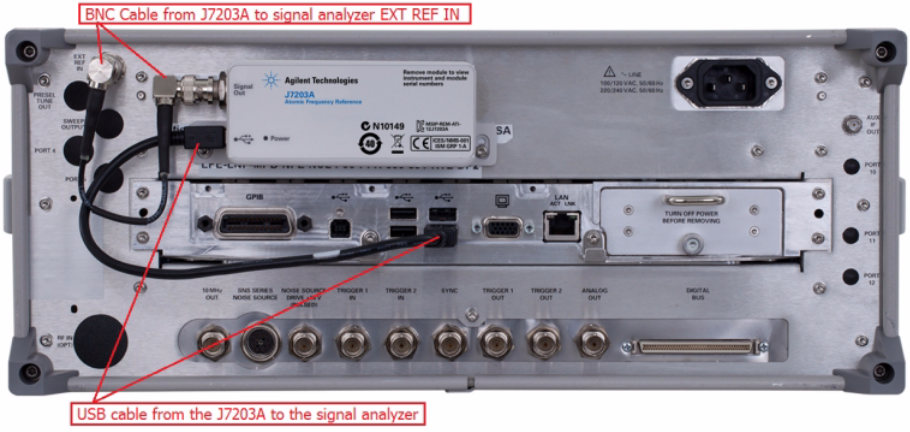
Using the J7203A with Signal Analyzers

The following examples explain how to connect the J7203A to the signal analyzer.

For additional information regarding use with a particular series analyzer, refer to the analyzer's User's Guide.

Equipment setup

Step	Action	Notes
BNC connection	**a** Connect a BNC cable from the J7203A to the signal analyzer's EXT REF IN at the rear panel.	—
USB connection	**a** Connect a USB cable from the J7203A to the signal analyzer.	When a connection is made, the green LED on the J7203A lights up indicating that the J7203A has power.



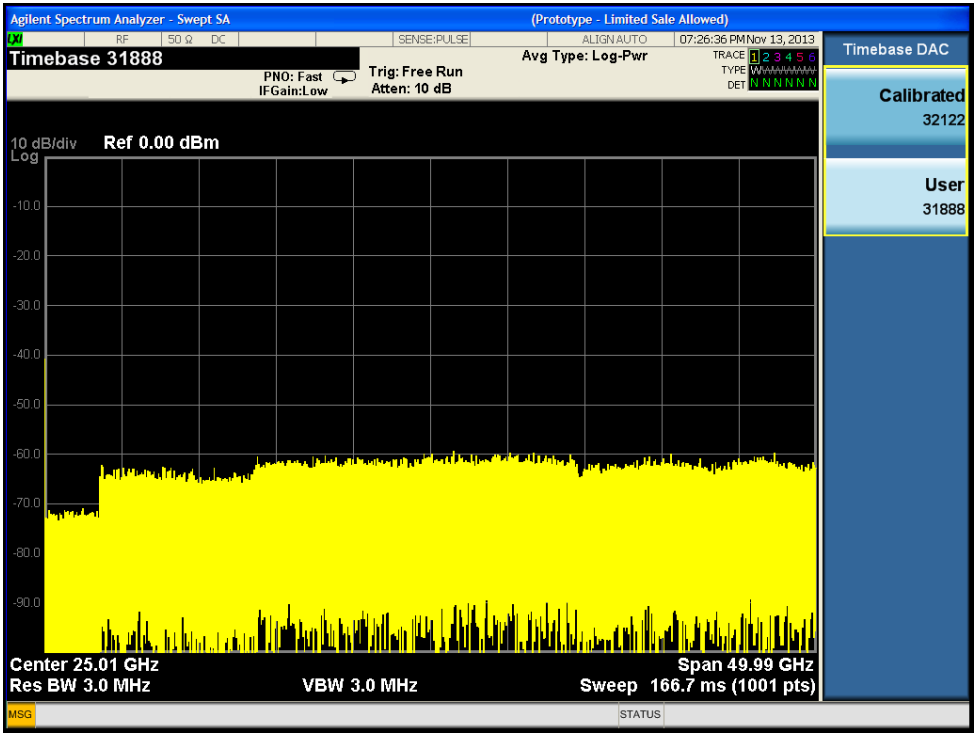
WARNING **When installing the J7203A, always connect the BNC cable to the signal analyzer BEFORE connecting to the J7203A.**

This will minimize the danger of an electrostatic discharge.

Operation

Step	Action	Notes
Turn on the frequency reference	**a** Press Input/Output, More 1 of 2, Freq Ref In, and verify that either Sense or Pulse is selected.	The J7203A is engaged if the signal analyzer is in the Pulse or Sense mode: • If the instrument is set to Sense and the J7203A is removed, the instrument switches to Internal. • If the instrument is set to Pulse and the J7203A is removed, an error message appears: “Ref missing or out of range; Pulse”.

Step	Action	Notes
To view the J7203A timebase value	**a** Press System, Alignments, Timebase DAC, User.	When the J7203A is engaged, the User Timebase DAC is adjusted automatically and you cannot adjust it. The Calibrated Timebase DAC value is the value set when the Internal Reference Frequency is calibrated. It is usually a number around 30000 ± 4000.



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4
Troubleshooting and Maintenance

This chapter provides troubleshooting and maintenance information for the J7203A.

CAUTION The J7203A is not field-repairable, and requires return to Keysight for both repair and calibration. Do not attempt to open the J7203A enclosure.

Troubleshooting

Problem	Possible cause/troubleshooting process
Green Active LED does not turn on when the J7203A is connected to the signal analyzer through a USB cable.	Signal analyzer not providing power. Faulty or loose USB cable. Faulty J7203A. **Troubleshooting**: Connect another USB device to the signal analyzer.
No output signal from the module.	**Troubleshooting**: You can utilize an oscilloscope to measure the 1 PPS signal and verify its characteristics. The characteristics should refer to the specifications in Chapter 5.

Maintenance

Preventive maintenance includes covering the BNC connector with the BNC cap when the J7203A is not in use, and avoiding rough handling that could damage the BNC and USB connectors.

Replacement parts

Table 4-1 J7203A replacement parts

Part number	Description
8121-1707[1]	BNC cable required to connect the J7203A to the signal analyzer's EXT REF IN connector.
N9020-60139[1]	USB cable required to connect the J7203A to the signal analyzer.
0515-0372[1]	Screws (M3 – 0.5 x 8 mm) required for connection to the rear panel of the signal analyzer.
J7203-20002[2]	ARF module

[1] Customer-orderable part.

[2] Non customer-orderable part. This is a replacement part if the AFR module (J7203A) is returned to Keysight under warranty.

Returning a J7203A for Service

Calling Keysight Technologies

Keysight Technologies has offices around the world to provide you with complete support for your J7203A. To obtain servicing information or to order replacement parts, contact the nearest Keysight Technologies office listed under "Contacting Keysight" in the front matter of this manual. In any correspondence or telephone conversations, refer to your J7203A by its product number and full serial number.

NOTE

Refer to "J7203A Atomic Frequency Reference installation" on page 14 for instructions to remove your J7203A from the rear panel of the signal analyzer.

5
Specification

This chapter provides the specifications of the J7203A Atomic Frequency Reference.

General Specifications

Specifications

Specifications describe warranted performance over the temperature range of 0 to +55 °C after one hour of continuous operation unless otherwise noted.

Nominal values indicate expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

Table 5-1 J7203A Specifications

Description	Specification	Supplemental information
Calibration cycle		2 years
USB requirement		5 V nominal, 500 mA maximum
1-PPS signal amplitude	4.5 V < V < 5.2 V	
1-PPS signal pulse width	> 20 ns	

NOTE

The frequency accuracy of the J7203A is given by:
±[(time since last adjustment × aging rate) + temperature stability + calibration accuracy].

Keysight recommends two years for the calibration cycle, because that is the calibration cycle for many of the instruments (EXA and MXA) that host the J7203A, and because the resulting accuracy is adequate for most needs. But, where possible, the J7203A can also be calibrated more frequently for better accuracy, such as on a 1-year cycle with the PXA, or less often if the resulting accuracy is acceptable to your needs.

Table 5-2 Stability Specifications

Description	Specification
Aging rate per year	$\pm 1 \times 10^{-9}$
Temperature stability	$\pm 5 \times 10^{-10}$
Achievable initial calibration accuracy	$\pm 5 \times 10^{-11}$

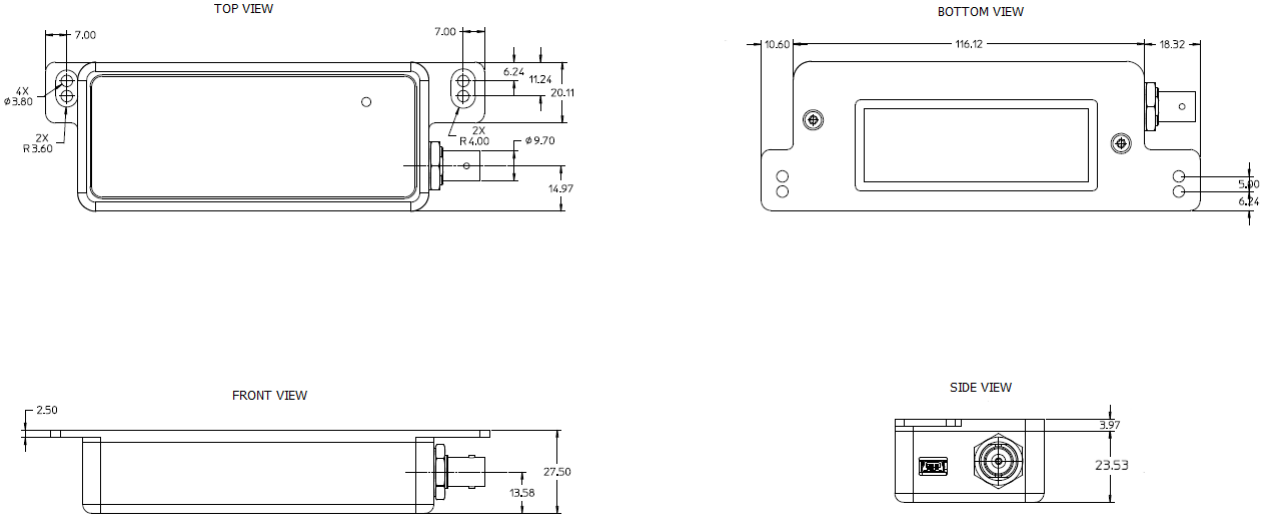
Physical Characteristics

Table 5-3 J7203A Physical Characteristics

Model	Weight	Height	Width	Length
J7203A	0.195 kg	27.50 mm	49.28 mm	145.04 mm

NOTE Outline measurements included the mounting kit.

Dimensions in millimeters



Environmental Specifications

The J7203A is designed to fully comply with Keysight Technologies's product operating environment specifications. The following table shows the summarized environmental specifications for this product.

Table 5-4 J7203A Environmental Specifications

Temperature range	
• Operating	0°C to 55 °C
• Storage	–40 °C to 70 °C
Relative humidity (RH)	
• Operating	95% RH at 40 °C (non-condensing)
Shock	
• End use handling shock	Half sine waveform
• Transportation shock	70 g
Vibration	
• Operating	0.21g rms
• Survival	2.09 g rms
Altitude	
• Operating	< 4572 meters (15000 feet)
ESD immunity	
• Contact discharge	4.0 kV per IEC 61000-4-2
• Air discharge	4.0 kV per IEC 61000-4-2

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