Certificate of Calibration

Keysight Calibration

Certificate Number 1-14101470223-1

Model Number	33120A
Manufacturer	Agilent Technologies Inc
Description	15 MHz Function/Arbitrary Waveform Generator
Serial Number	MY40007867
Date of Calibration	3 Mar 2021
Procedure	STE-50111088-B.03.00
Temperature	(23 ± 5) °C
Humidity	(50 ± 30) %RH

Customer
Keysight Technologies Inc
1424 Fountain Grove Parkway Bldg 4LS 26HH
Attention: Factory Repair 5320 Agilent Technologies
SANTA ROSA CA 95403-1738
United States

Location of Calibration
Keysight Technologies Inc
10090 Foothills Blvd.
Roseville CA 95747-7102
UNITED STATES

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures in compliance with a quality management system registered to ISO 9001:2015.

As Received Conditions
The measured values of the equipment were observed in specification at the points tested.

Action Taken
- No corrective actions were necessary.

As Completed Conditions
The measured values of the equipment were observed in specification at the points tested.

Keysight considers the uncertainties of measurements during the development of performance tests. In this report, conformance statements of "Passed" or "Failed" are determined by simple comparison of observed measurements to the warranted specifications.

Remarks or Special Requirements

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.
This calibration report may refer to equipment manufactured by HP, Agilent and Keysight as being manufactured by Keysight Technologies.

Based on the customer's request, the next calibration is due on 3 Mar 2022.

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Traceability Information

Technician ID N1006272

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
3458A	Digital multimeter, 8.5 digit	3458A23115	9 Apr 2021	1-12671479104-1
53132A	Universal Counter, 225 MHz, 12 digit/s, 150 ps. GPIB, RS232	53132A01112	29 Jul 2021	1-11507200572-1
8491A	Coaxial attenuator, dc-12.4 GHz, Type N	8491A55797	30 Jan 2022	1-13001289182-1
E4440A	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A90005	25 Oct 2021	1-11745187020-1
E9304A	Power Sensor-Average, 9 kHz to 6 GHz, -60 to +20 dBm	E9304A70012	24 May 2021	1-11094739910-1
N1914A	Power Meter - Average, dual channel	N1914A50001	25 Feb 2022	1-12347959869-1

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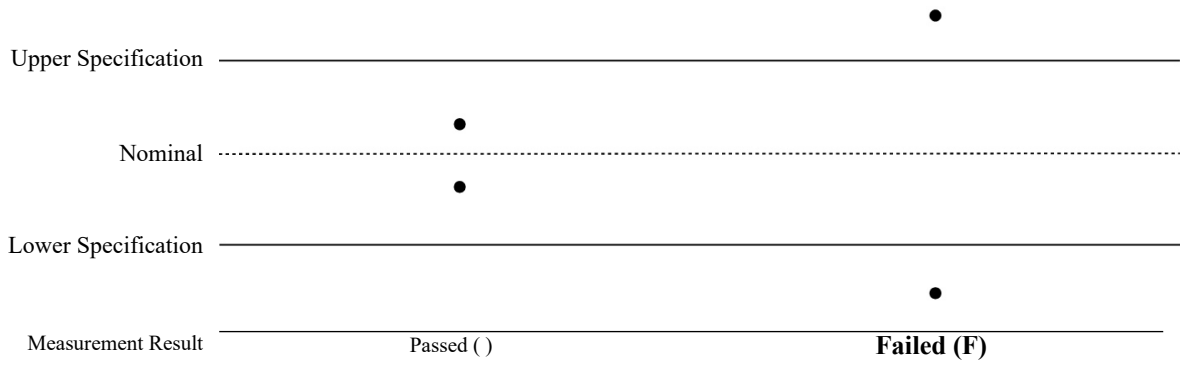
Compliance with Specification

Measured values of the equipment that were observed in specification at the points tested are determined to have Passed ( ). Measured values of the equipment that were observed out of specification at the points tested are determined to have Failed (F).

An overall statement of compliance for all tests performed as received, and as completed (if any adjustments / repairs were performed) is included at the beginning of this report. Statements of compliance apply only to warranted specifications. When functional verification tests are performed, results are reported in the “Functional Test” section, and do not affect these statements of compliance.
The status summaries relate to the tested item only. A final decision about whether the item's performance actually satisfies requirements of the user can only be made by the user.

Measurement results are reported as:

- Passed ( ) - The measured values of the equipment were observed in specification at the points tested.
- Failed (F) - One or more measured values of the equipment were observed out of specification at the points tested.



( ) This result is indicated on the measurement report as a blank space in the column labeled “Status” or “Sts”.
Note: For more information on the level of risk such as false accept and false reject and statistical assumptions of these statements of conformity, please visit: www.keysight.com/find/decisionrules.

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Calibration Test Results Summary

Test Name	As Received Status
FREQUENCY	Passed
HARMONICS_LOW	Passed
HARMONICS	Passed
SQ DUTY CYCLE	Passed
AC/DC VOLTS	Passed
AMPLITUDE FLATNESS	Passed

Functional Test Results Summary

The following functional test results are not part of an accredited delivery, even if they are part of an otherwise accredited calibration report.

The following tests document the functional verification of the instruments' non-warranted performance. Neither a statement of conformance or decision rule is used for a Functional Test, measurement uncertainties are only provided by exception. For a "Functional Test" the test results are reported as "As Expected" when showing expected performance and "Not As Expected" otherwise. "As Expected" results of individual test points are indicated in the measurement report by a blank space in the column labeled "Status" to allow easier recognition of any "Not As Expected" points. If a functional test result is reported as "Not As Expected", repair and/or adjustment is recommended. Test results reported as "Done" are possible if no limits are applied. For qualitative or quantitative "Functional Tests" the test results are not warranted, and no judgment is made. The "actual" measured results are helpful to users for some applications.

Test Name	As Received Status
SELF TEST	As Expected

Tested Configuration

Tested Options	001
(As Rec)	001

FREQUENCY — Passed

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	Status
1 kHz SINE WAVE	999.980 Hz	1000.000 Hz	1000.020 Hz	
BURST MODE, 500 Hz	495.000 Hz	500.154 Hz	505.000 Hz	

HARMONICS_LOW — Passed

TEST CONDITIONS	MEASURED	MAXIMUM	Status
REFERENCE 20 kHz, 1.1 Vrms	REF		
2nd Harmonic, 40 kHz	−75.4 dBc	−70.0 dBc	
3rd Harmonic, 60 kHz	−79.5 dBc	−70.0 dBc	
4th Harmonic, 80 kHz	−83.7 dBc	−70.0 dBc	
5th Harmonic, 100 kHz	−97.4 dBc	−70.0 dBc	
REFERENCE 100 kHz, 1.1 Vrms	REF		
2nd Harmonic, 200 kHz	−73.5 dBc	−60.0 dBc	
3rd Harmonic, 300 kHz	−71.2 dBc	−60.0 dBc	
4th Harmonic, 400 kHz	−82.4 dBc	−60.0 dBc	
5th Harmonic, 500 kHz	−98.7 dBc	−60.0 dBc	
REFERENCE 1 MHz, 1.1 Vrms	REF		
2nd Harmonic, 2 MHz	−73.3 dBc	−45.0 dBc	
3rd Harmonic, 3 MHz	−59.7 dBc	−45.0 dBc	
4th Harmonic, 4 MHz	−80.6 dBc	−45.0 dBc	
5th Harmonic, 5 MHz	−84.6 dBc	−45.0 dBc	

HARMONICS — Passed

TEST CONDITIONS	MEASURED	MAXIMUM	Status
REFERENCE 15 MHz, 1.1 Vrms	REF		
2nd Harmonic, 30 MHz	−47.3 dBc	−35.0 dBc	
3rd Harmonic, 45 MHz	−51.8 dBc	−35.0 dBc	
4th Harmonic, 60 MHz	−61.5 dBc	−35.0 dBc	
5th Harmonic, 75 MHz	−66.6 dBc	−35.0 dBc	

SQ DUTY CYCLE — Passed

Square Wave, 1.0 V (RMS) at 300 Hz

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	Status
50% Duty Cycle (DC)	−0.020 V	0.000 V	0.020 V	
25% Duty Cycle (DC)	−0.520 V	−0.504 V	−0.480 V	

SQ DUTY CYCLE (cont.)

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	Status
75% Duty Cycle (DC)	0.480 V	0.501 V	0.520 V	

AC/DC VOLTS

Passed

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	Status
Function Gain and Linearity Verification				
SIN 1.0 kHz, 7.0 V (RMS)	6.930 V	7.000 V	7.070 V	
SIN 1.0 kHz, 5.7 V (RMS)	5.643 V	5.700 V	5.757 V	
TRI 100 Hz, 5.7 V (RMS)	5.643 V	5.700 V	5.757 V	
RAMP 100 Hz, 5.7 V (RMS)	5.643 V	5.700 V	5.757 V	
SQU 100 Hz,10.0 V (RMS)	9.900 V	9.999 V	10.100 V	
SQU 100 Hz, 8.0 V (RMS)	7.920 V	8.039 V	8.080 V	
DC Function Offset Verification				
DC 10 V	9.800 V	9.999 V	10.200 V	
DC -10 V	−10.200 V	−9.997 V	−9.800 V	
AM Modulation Depth Verification				
SIN HIGH Z, 1 kHz, 1.0 V (RMS)				
AM MOD SIN 100 Hz, Depth 0%	0.495 V	0.500 V	0.505 V	
AM MOD SIN 100 Hz, Depth 100%	0.6039 V	0.6119 V	0.6161 V	
AC Amplitude Verification				
High Impedance Load, Freq 1.00 kHz				
SIN 7.0 V (RMS)	6.930 V	7.000 V	7.070 V	
SIN 5.7 V (RMS)	5.643 V	5.700 V	5.757 V	
SIN 5.5 V (RMS)	5.445 V	5.500 V	5.555 V	
SIN 4.4 V (RMS)	4.356 V	4.400 V	4.444 V	
SIN 3.5 V (RMS)	3.465 V	3.500 V	3.535 V	
SIN 2.8 V (RMS)	2.772 V	2.800 V	2.828 V	
SIN 2.2 V (RMS)	2.178 V	2.200 V	2.222 V	
SIN 1.7 V (RMS)	1.683 V	1.700 V	1.717 V	
SIN 1.4 V (RMS)	1.386 V	1.400 V	1.414 V	
SIN 1.1 V (RMS)	1.089 V	1.101 V	1.111 V	
SIN 0.88 V (RMS)	0.8712 V	0.8800 V	0.8888 V	
SIN 0.70 V (RMS)	0.6930 V	0.6999 V	0.7070 V	
SIN 0.55 V (RMS)	0.5445 V	0.5500 V	0.5555 V	
SIN 0.44 V (RMS)	0.4356 V	0.4399 V	0.4444 V	
SIN 0.35 V (RMS)	0.3465 V	0.3500 V	0.3535 V	
SIN 0.28 V (RMS)	0.2772 V	0.2800 V	0.2828 V	
SIN 0.22 V (RMS)	0.2178 V	0.2200 V	0.2222 V	
SIN 0.17 V (RMS)	0.1683 V	0.1700 V	0.1717 V	
SIN 0.14 V (RMS)	0.1386 V	0.1400 V	0.1414 V	
SIN 0.11 V (RMS)	0.1089 V	0.1101 V	0.1111 V	

AC/DC VOLTS (cont.)

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	Status
SIN 0.088 V (RMS)	0.08712 V	0.08803 V	0.08888 V	
SIN 0.070 V (RMS)	0.06930 V	0.07002 V	0.07070 V	
SIN 0.055 V (RMS)	0.05445 V	0.05501 V	0.05555 V	
SIN 0.044 V (RMS)	0.04356 V	0.04401 V	0.04444 V	
SIN 0.036 V (RMS)	0.03564 V	0.03600 V	0.03636 V	
50 Ohm Load, Freq 1.0000 kHz				
SIN 3.5 V (RMS)	3.465 V	3.496 V	3.535 V	
SIN 2.8 V (RMS)	2.772 V	2.797 V	2.828 V	
SIN 2.2 V (RMS)	2.178 V	2.198 V	2.222 V	
SIN 1.7 V (RMS)	1.683 V	1.698 V	1.717 V	
SIN 1.4 V (RMS)	1.386 V	1.399 V	1.414 V	
SIN 1.1 V (RMS)	1.089 V	1.100 V	1.111 V	
SIN 0.88 V (RMS)	0.8712 V	0.8792 V	0.8888 V	
SIN 0.70 V (RMS)	0.6930 V	0.6993 V	0.7070 V	
SIN 0.55 V (RMS)	0.5445 V	0.5495 V	0.5555 V	
SIN 0.44 V (RMS)	0.4356 V	0.4396 V	0.4444 V	
SIN 0.35 V (RMS)	0.3465 V	0.3497 V	0.3535 V	
SIN 0.28 V (RMS)	0.2772 V	0.2797 V	0.2828 V	
SIN 0.22 V (RMS)	0.2178 V	0.2198 V	0.2222 V	
SIN 0.17 V (RMS)	0.1683 V	0.1698 V	0.1717 V	
SIN 0.14 V (RMS)	0.1386 V	0.1399 V	0.1414 V	
SIN 0.11 V (RMS)	0.1089 V	0.1099 V	0.1111 V	
SIN 0.088 V (RMS)	0.08712 V	0.08795 V	0.08888 V	
SIN 0.070 V (RMS)	0.06930 V	0.06996 V	0.07070 V	
SIN 0.055 V (RMS)	0.05445 V	0.05497 V	0.05555 V	
SIN 0.044 V (RMS)	0.04356 V	0.04397 V	0.04444 V	
SIN 0.035 V (RMS)	0.03465 V	0.03498 V	0.03535 V	
SIN 0.028 V (RMS)	0.02772 V	0.02798 V	0.02828 V	
SIN 0.022 V (RMS)	0.02178 V	0.02198 V	0.02222 V	
SIN 0.018 V (RMS)	0.01782 V	0.01799 V	0.01818 V	

AMPLITUDE FLATNESS

Passed

Reference condition: Sinewave, 1 kHz at 3.0 V (RMS)

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	Status
100 kHz	−0.030 V	0.005 V	0.030 V	
500 kHz	−0.045 V	0.002 V	0.045 V	
1 MHz	−0.045 V	0.001 V	0.045 V	
3 MHz	−0.060 V	−0.001 V	0.060 V	
5 MHz	−0.060 V	0.001 V	0.060 V	
7 MHz	−0.060 V	0.001 V	0.060 V	
9 MHz	−0.060 V	−0.002 V	0.060 V	
11 MHz	−0.060 V	−0.001 V	0.060 V	
13 MHz	−0.060 V	0.002 V	0.060 V	
15 MHz	−0.060 V	0.003 V	0.060 V	

Measurement Report

Certificate Number 1-14101470223-1

Model 33120A **Serial** MY40007867
Options Tested 001

Test Date 3 Mar 2021
Condition As Received

SELF TEST

As Expected

TEST CONDITIONS	RESULT	Status
SELF TEST	DONE	

Keysight Technologies, Inc. March 18, 2021, 5992-3801EN