



Certificate of Calibration

ISO/IEC 17025:2005 and ANSI/NCSL Z540.1-1994

Certificate Number 1-8548178041-1

Model Number MSOX3024A
Manufacturer Keysight Technologies Inc
Description Oscilloscope, mixed signal, 4channel, 200 MHz
Serial Number MY52161356
Date of Calibration 23 Jan 2017
Procedure STE-50114572-A.06.01
Temperature (23 ± 3) °C
Humidity (45 ± 25) %RH

Customer
Makerversity Ltd
West Goods Entrance
Somerset House
Victoria Embankment
LONDON WC2R 1LA
United Kingdom

Location of Calibration
Keysight Technologies UK Limited
610 Wharfedale Road
Winnersh Triangle
Wokingham Berkshire RG41 5TP
United Kingdom

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2005 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

As Received Conditions

The measured values of the equipment were observed in specification at the points tested. Additionally, the expanded measurement uncertainty intervals about the measured values were in specification.

Action Taken

- Refer to **Remarks or Special Requirements** Section.

As Completed Conditions

The measured values of the equipment were observed in specification at the points tested. Additionally, the expanded measurement uncertainty intervals about the measured values were in specification.

Remarks or Special Requirements

Repair Performed: Replaced faulty scope assembly.

This calibration certificate may refer to instruments manufactured by HP, Agilent and Keysight as being manufactured by Keysight Technologies, Inc.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Based on the customer's request, the next calibration is due on 23 Jan 2019.

Keysight Technologies UK Limited
610 Wharfedale Road
Winnersh Triangle
Wokingham Berkshire RG41 5TP
United Kingdom

Edgar Leckel - European Operations Manager

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Traceability Information

Technician ID Number N6004627

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.

This certificate shall not be reproduced, except in full, without prior written approval of the laboratory.

Calibration Equipment Used

Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
11667A	DC-18 GHz power splitter, type N, 50 ohm	UK15013	12 Feb 2018	1-6509964501-1
3458A	Digital multimeter, 8.5 digit	UK8659	29 Jan 2017	1-7601400204-1
5700A	AC DC Calibrator	ITSVC375	4 Mar 2017	1-7657913280-1
8482A	Power Sensor, 100 kHz to 4.2 GHz, -30 to +20 dBm	UK7903	4 May 2019	1-7796817134-1
B2912A	Precision Source/Measure Unit, 2ch, 10fA resolution, 210V, 3A DC/10.5A pulse	UK15960	1 Dec 2017	1-7496116747-1
E4419B	Power meter - EPM series, dual channel	UK15728	16 Aug 2018	1-8060946086-1
E4437B	ESG-DP digital series RF signal generator, 4 GHz	UK14682	28 Jan 2018	1-7606390563-1

Traceability Table

	Model	Model Description	Equipment ID	Certificate Number	Trace Value
W,R	11667A	DC-18 GHz power splitter, type N, 50 ohm	UK15013	1-6509964501-1-UKAS:C 0147	Reflection Coefficient
W,R	3458A	Digital multimeter, 8.5 digit	UK8659	1-7601400204-1-UKAS:C 0147	DC Voltage
W,R	5700A	AC DC Calibrator	ITSVC375	1-7657913280-1-UKAS:C 0147	DC Voltage
W,R	8482A	Power Sensor, 100 kHz to 4.2 GHz, -30 to +20 dBm	UK7903	1-7796817134-1-UKAS:C 0147	RF Power
W	B2912A	Precision Source/Measure Unit, 2ch, 10fA resolution, 210V, 3A DC/10.5A pulse	UK15960	1-7496116747-1	
R	5720A	CALIBRATOR	DE2362	1-5128665546-1-UKAS:C 0147	DC Voltage
W,R	E4419B	Power meter - EPM series, dual channel	UK15728	1-8060946086-1-UKAS:C 0147	RF Power
W	E4437B	ESG-DP digital series RF signal generator, 4 GHz	UK14682	1-7606390563-1	
R	53132A	Universal Counter, 225 MHz, 12 digit/s, 150 ps. GPIB, RS232	UK13584	1-7517864898-1-UKAS:C 0147	Frequency
R	E4419B	Power meter - EPM series, dual channel	UK14581	1-7545332355-1-UKAS:C 0147	RF Power

Legend

W - Working Standard The calibration equipment used for the calibration of the Model indicated on the first page of the Certificate of calibration.

R - Reference Standard The Reference Standard (Accredited or NMI-calibrated ETE) used to provide traceability to the SI-Units for the calibration parameters listed.

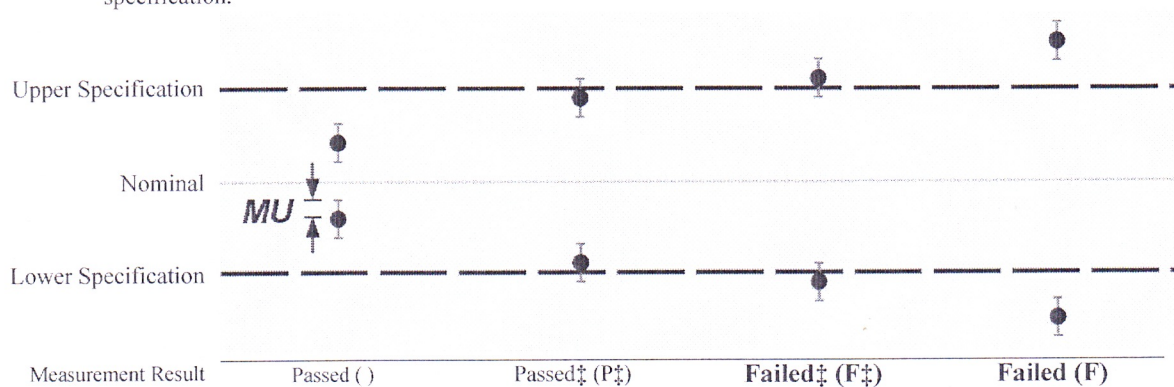
Compliance with Specification

The uncertainty of measurement has been taken into account when determining compliance with specification, as per ILAC-G8:03/2009. If the expanded measurement uncertainty intervals centered about one or more measured values were both in as well as out of specification (upper or lower), it is not possible to state compliance or non-compliance based on a 95% coverage probability for the expanded measurement uncertainty.

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. Additionally, the expanded measurement uncertainty intervals about the measured values were in specification.
- Passed \ddagger (P \ddagger) - The measured values of the equipment were observed in specification at the points tested. However, a portion of the expanded measurement uncertainty intervals about one or more measured values exceeded specification. Consequently, compliance with specification cannot be declared based on the stated coverage probability.
- Failed \ddagger (F \ddagger) - One or more measured values of the equipment were observed out of specification at the points tested. However, a portion of the expanded measurement uncertainty intervals about one or more measured values were in specification. Consequently, non-compliance with specification cannot be declared based on the stated coverage probability.
- Failed (F) - One or more measured values of the equipment were observed out of specification at the points tested. Additionally, the expanded measurement uncertainty intervals about one or more measured values were entirely outside the specification.



() This result is indicated on the measurement report as a blank space in the column labeled "Status" or "Sts".
 MU = 95% expanded measurement uncertainty.

Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported expanded measurement uncertainty, which corresponds to a coverage probability of approximately 95%, is the standard uncertainty multiplied by the coverage factor $k=2$. Where this is not the case, coverage factor (k), effective degrees of freedom (ν_{eff}) and coverage probability (p) are stated.



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Certificate Number 1-8548178041-1

Performance Test Results Summary

<u>Test Name</u>	<u>As Completed Status</u>
THRESHOLD ACCURACY	Passed
DC VERTICAL GAIN ACCURACY	Passed
DUAL CURSOR ACCURACY	Passed
ANALOG BANDWIDTH	Passed
TIME BASE ACCURACY	Passed
TRIGGER SENSITIVITY	Passed

THRESHOLD ACCURACY

Passed

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Sts
POD 1					
+5 V POS CHAN D7-D0	4.750 V	5.054 V	5.250 V	0.013 V	
+5 V NEG CHAN D7-D0	4.750 V	5.024 V	5.250 V	0.012 V	
0 V POS CHAN D7-D0	-0.100 V	0.050 V	0.100 V	0.012 V	
0 V NEG CHAN D7-D0	-0.100 V	0.020 V	0.100 V	0.012 V	
-5 V POS CHAN D7-D0	-5.250 V	-4.988 V	-4.750 V	0.013 V	
-5 V NEG CHAN D7-D0	-5.250 V	-5.018 V	-4.750 V	0.012 V	
POD 2					
+5 V POS CHAN D15-D8	4.750 V	5.054 V	5.250 V	0.013 V	
+5 V NEG CHAN D15-D8	4.750 V	5.024 V	5.250 V	0.012 V	
0 V POS CHAN D15-D8	-0.100 V	0.050 V	0.100 V	0.012 V	
0 V NEG CHAN D15-D8	-0.100 V	-0.010 V	0.100 V	0.012 V	
-5 V POS CHAN D15-D8	-5.250 V	-4.978 V	-4.750 V	0.013 V	
-5 V NEG CHAN D15-D8	-5.250 V	-5.028 V	-4.750 V	0.012 V	

DC VERTICAL GAIN ACCURACY

Passed

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
CH 1 - 5 V/Div	34.20 V	34.87 V	35.80 V	0.11 V	
CH 1 - 2 V/Div	13.68 V	13.97 V	14.32 V	0.047 V	
CH 1 - 1 V/Div	6.840 V	7.032 V	7.160 V	0.024 V	
CH 1 - 500 mV/Div	3.420 V	3.528 V	3.580 V	0.010 V	
CH 1 - 200 mV/Div	1.368 V	1.393 V	1.432 V	0.0045 V	
CH 1 - 100 mV/Div	684.0 mV	697.0 mV	716.0 mV	2.4 mV	
CH 1 - 50 mV/Div	342.0 mV	351.6 mV	358.0 mV	1.7 mV	
CH 1 - 20 mV/Div	136.8 mV	140.9 mV	143.2 mV	0.49 mV	
CH 1 - 10 mV/Div	68.40 mV	69.81 mV	71.60 mV	0.28 mV	
CH 1 - 5 mV/Div	34.20 mV	35.08 mV	35.80 mV	0.19 mV	
CH 1 - 2 mV/Div	13.36 mV	13.99 mV	14.64 mV	0.10 mV	
CH 1 - 1 mV/Div	6.36 mV	6.95 mV	7.64 mV	0.092 mV	
CH 2 - 5 V/Div	34.20 V	34.96 V	35.80 V	0.11 V	
CH 2 - 2 V/Div	13.68 V	13.99 V	14.32 V	0.047 V	
CH 2 - 1 V/Div	6.840 V	7.045 V	7.160 V	0.024 V	
CH 2 - 500 mV/Div	3.420 V	3.525 V	3.580 V	0.010 V	
CH 2 - 200 mV/Div	1.368 V	1.396 V	1.432 V	0.0045 V	
CH 2 - 100 mV/Div	684.0 mV	699.0 mV	716.0 mV	2.4 mV	
CH 2 - 50 mV/Div	342.0 mV	352.0 mV	358.0 mV	1.7 mV	
CH 2 - 20 mV/Div	136.8 mV	141.1 mV	143.2 mV	0.49 mV	
CH 2 - 10 mV/Div	68.40 mV	69.76 mV	71.60 mV	0.28 mV	
CH 2 - 5 mV/Div	34.20 mV	35.19 mV	35.80 mV	0.19 mV	
CH 2 - 2 mV/Div	13.36 mV	13.98 mV	14.64 mV	0.10 mV	
CH 2 - 1 mV/Div	6.36 mV	6.93 mV	7.64 mV	0.092 mV	
CH 3 - 5 V/Div	34.20 V	34.93 V	35.80 V	0.11 V	
CH 3 - 2 V/Div	13.68 V	14.00 V	14.32 V	0.047 V	
CH 3 - 1 V/Div	6.840 V	7.058 V	7.160 V	0.024 V	
CH 3 - 500 mV/Div	3.420 V	3.491 V	3.580 V	0.010 V	

DC VERTICAL GAIN ACCURACY (cont.)

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
CH 3 - 200 mV/Div	1.368 V	1.396 V	1.432 V	0.0045 V	
CH 3 - 100 mV/Div	684.0 mV	697.7 mV	716.0 mV	2.4 mV	
CH 3 - 50 mV/Div	342.0 mV	352.0 mV	358.0 mV	1.7 mV	
CH 3 - 20 mV/Div	136.8 mV	141.2 mV	143.2 mV	0.49 mV	
CH 3 - 10 mV/Div	68.40 mV	69.86 mV	71.60 mV	0.28 mV	
CH 3 - 5 mV/Div	34.20 mV	35.15 mV	35.80 mV	0.19 mV	
CH 3 - 2 mV/Div	13.36 mV	13.95 mV	14.64 mV	0.10 mV	
CH 3 - 1 mV/Div	6.36 mV	6.95 mV	7.64 mV	0.092 mV	
CH 4 - 5 V/Div	34.20 V	34.84 V	35.80 V	0.11 V	
CH 4 - 2 V/Div	13.68 V	13.94 V	14.32 V	0.047 V	
CH 4 - 1 V/Div	6.840 V	7.025 V	7.160 V	0.024 V	
CH 4 - 500 mV/Div	3.420 V	3.518 V	3.580 V	0.010 V	
CH 4 - 200 mV/Div	1.368 V	1.395 V	1.432 V	0.0045 V	
CH 4 - 100 mV/Div	684.0 mV	697.5 mV	716.0 mV	2.4 mV	
CH 4 - 50 mV/Div	342.0 mV	350.7 mV	358.0 mV	1.7 mV	
CH 4 - 20 mV/Div	136.8 mV	140.9 mV	143.2 mV	0.49 mV	
CH 4 - 10 mV/Div	68.40 mV	69.62 mV	71.60 mV	0.28 mV	
CH 4 - 5 mV/Div	34.20 mV	35.11 mV	35.80 mV	0.19 mV	
CH 4 - 2 mV/Div	13.36 mV	13.94 mV	14.64 mV	0.10 mV	
CH 4 - 1 mV/Div	6.36 mV	6.95 mV	7.64 mV	0.092 mV	

DUAL CURSOR ACCURACY

Passed

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
CH 1 - 5 V/Div	34.00 V	34.87 V	36.00 V	0.11 V	
CH 1 - 2 V/Div	13.60 V	13.97 V	14.40 V	0.045 V	
CH 1 - 1 V/Div	6.800 V	7.031 V	7.200 V	0.024 V	
CH 1 - 500 mV/Div	3.400 V	3.529 V	3.600 V	0.014 V	
CH 1 - 200 mV/Div	1.360 V	1.394 V	1.440 V	0.0044 V	
CH 1 - 100 mV/Div	680.0 mV	697.0 mV	720.0 mV	2.1 mV	
CH 1 - 50 mV/Div	340.0 mV	351.5 mV	360.0 mV	1.1 mV	
CH 1 - 20 mV/Div	136.0 mV	140.9 mV	144.0 mV	0.49 mV	
CH 1 - 10 mV/Div	68.00 mV	69.80 mV	72.00 mV	0.28 mV	
CH 1 - 5 mV/Div	34.00 mV	35.03 mV	36.00 mV	0.18 mV	
CH 1 - 2 mV/Div	13.20 mV	13.93 mV	14.80 mV	0.11 mV	
CH 1 - 1 mV/Div	6.20 mV	6.93 mV	7.80 mV	0.10 mV	
CH 2 - 5 V/Div	34.00 V	34.97 V	36.00 V	0.11 V	
CH 2 - 2 V/Div	13.60 V	13.99 V	14.40 V	0.045 V	
CH 2 - 1 V/Div	6.800 V	7.047 V	7.200 V	0.024 V	
CH 2 - 500 mV/Div	3.400 V	3.527 V	3.600 V	0.014 V	
CH 2 - 200 mV/Div	1.360 V	1.397 V	1.440 V	0.0044 V	
CH 2 - 100 mV/Div	680.0 mV	699.4 mV	720.0 mV	2.1 mV	
CH 2 - 50 mV/Div	340.0 mV	352.2 mV	360.0 mV	1.1 mV	
CH 2 - 20 mV/Div	136.0 mV	141.1 mV	144.0 mV	0.49 mV	
CH 2 - 10 mV/Div	68.00 mV	69.73 mV	72.00 mV	0.28 mV	
CH 2 - 5 mV/Div	34.00 mV	35.13 mV	36.00 mV	0.18 mV	
CH 2 - 2 mV/Div	13.20 mV	13.93 mV	14.80 mV	0.11 mV	
CH 2 - 1 mV/Div	6.20 mV	6.90 mV	7.80 mV	0.10 mV	
CH 3 - 5 V/Div	34.00 V	34.93 V	36.00 V	0.11 V	

DUAL CURSOR ACCURACY (cont.)

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
CH 3 - 2 V/Div	13.60 V	14.00 V	14.40 V	0.045 V	
CH 3 - 1 V/Div	6.800 V	7.060 V	7.200 V	0.024 V	
CH 3 - 500 mV/Div	3.400 V	3.492 V	3.600 V	0.014 V	
CH 3 - 200 mV/Div	1.360 V	1.397 V	1.440 V	0.0044 V	
CH 3 - 100 mV/Div	680.0 mV	698.0 mV	720.0 mV	2.1 mV	
CH 3 - 50 mV/Div	340.0 mV	352.3 mV	360.0 mV	1.1 mV	
CH 3 - 20 mV/Div	136.0 mV	141.2 mV	144.0 mV	0.49 mV	
CH 3 - 10 mV/Div	68.00 mV	69.88 mV	72.00 mV	0.28 mV	
CH 3 - 5 mV/Div	34.00 mV	35.18 mV	36.00 mV	0.18 mV	
CH 3 - 2 mV/Div	13.20 mV	13.98 mV	14.80 mV	0.11 mV	
CH 3 - 1 mV/Div	6.20 mV	6.95 mV	7.80 mV	0.10 mV	
CH 4 - 5 V/Div	34.00 V	34.86 V	36.00 V	0.11 V	
CH 4 - 2 V/Div	13.60 V	13.95 V	14.40 V	0.045 V	
CH 4 - 1 V/Div	6.800 V	7.027 V	7.200 V	0.024 V	
CH 4 - 500 mV/Div	3.400 V	3.519 V	3.600 V	0.014 V	
CH 4 - 200 mV/Div	1.360 V	1.395 V	1.440 V	0.0044 V	
CH 4 - 100 mV/Div	680.0 mV	697.9 mV	720.0 mV	2.1 mV	
CH 4 - 50 mV/Div	340.0 mV	351.2 mV	360.0 mV	1.1 mV	
CH 4 - 20 mV/Div	136.0 mV	140.9 mV	144.0 mV	0.49 mV	
CH 4 - 10 mV/Div	68.00 mV	69.58 mV	72.00 mV	0.28 mV	
CH 4 - 5 mV/Div	34.00 mV	35.03 mV	36.00 mV	0.18 mV	
CH 4 - 2 mV/Div	13.20 mV	13.95 mV	14.80 mV	0.11 mV	
CH 4 - 1 mV/Div	6.20 mV	6.85 mV	7.80 mV	0.10 mV	

ANALOG BANDWIDTH

Passed

TEST CONDITIONS	MINIMUM	MEASURED	UNCERT.	Status
200 MHz Bandwidth				
CH 1 - 200 mV/Div	-3.00 dB	-1.76 dB	0.47 dB	
CH 2 - 200 mV/Div	-3.00 dB	-1.69 dB	0.47 dB	
CH 3 - 200 mV/Div	-3.00 dB	-1.76 dB	0.47 dB	
CH 4 - 200 mV/Div	-3.00 dB	-1.69 dB	0.47 dB	

TIME BASE ACCURACY

Passed

TEST COND.	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
10.0000 MHz	-48.4 ppm	-17.9 ppm	48.4 ppm	4.1 ppm	

TRIGGER SENSITIVITY

Passed

<u>TEST CONDITIONS</u>	<u>RESULT</u>	<u>Status</u>
Internal Trigger		
200 MHz Bandwidth		
CH 1 - 5 mV/Div	PASS	
CH 1 - 10 mV/Div	PASS	
CH 2 - 5 mV/Div	PASS	
CH 2 - 10 mV/Div	PASS	
CH 3 - 5 mV/Div	PASS	
CH 3 - 10 mV/Div	PASS	
CH 4 - 5 mV/Div	PASS	
CH 4 - 10 mV/Div	PASS	
External Trigger		
EXT - 100 MHz	PASS	
EXT - 200 MHz	PASS	



Customer Service Report

Customer Purchase Order Number	
Keysight Order Number 1-8548178041	Date Received 20-Jan-2017

Contact: Alan Ambrose
Ship To Address:
Makerversity Ltd
Somerset House
West Goods Entrance
Victoria Embankment
LONDON
WC2R 1LA United Kingdom

Telephone: 7776258720

Please Direct Inquiries To: UK Contact Center Telephone: 0800 0260637 Fax: +44 (0) 1189 276855 Email: contactcentre_uk@keysight.com	Keysight Hub Address: Keysight Technologies UK Ltd GBS-2613 610 WHARFEDALE ROAD Winnersh Triangle WOKINGHAM Berks RG41 5TP United Kingdom
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Problem Description:

Failure I have a MSO-X-3024A that has suddenly refused to boot. The S/N is MY52161356. This seems to be a well-known problem e.g.:

<http://www.eevblog.com/forum/testgear/agilent-dsox2024-won't-boot/>

Can you tell me what my next steps should be?

Product Number/Description	Manufacturer	Serial Number
MSOX3024A Oscilloscope, mixed signal, 4+16-channel, 200 MHz	Keysight Technologies	MY52161356

Services Provided:

Service Performed: Repair and Calibration
For further information about calibration type and conditions, please refer to certificate

Fault Information: Unit won't power up. Only the cooling fan and two LEDs come on.

Repair Performed: Replaced faulty scope assembly.

Repairs are generally performed to assembly level (rather than component level) in order to reduce the turnaround time, and provide a more efficient and reliable repair

Instrument(s) cleaned and safety tested (if appropriate)

Calibration certificates and data reports are available electronically on Keysight Infoline: www.keysight.com/find/infoline.

Also products can, on occasions, be damaged accidentally. Please type 'Tips for preventing damage' into the search box on the above page, for latest preventative info.





Keysight Order Number: 3417862-001012

Keysight Certificate Number: 7SJZ-ZZFA

License Entitlement Certificate

This certificate is evidence of the entitlement for the following

Product	Description	Quantity
DSOX3APPBNDL	SW application bundle license for 3000 X-Series	1

INSTRUCTIONS:

HOW TO REDEEM YOUR LICENSE

- Download and install software
 - Some new oscilloscope licensed products require the latest firmware in order to operate.
 - The latest firmware can be downloaded for your respective product at
 - 6000 X-Series: <http://www.keysight.com/find/6000X-Series-sw>
 - 4000 X-Series: <http://www.keysight.com/find/4000X-Series-sw>
 - 3000 X-Series: <http://www.keysight.com/find/3000X-Series-sw>
 - 2000 X-Series: <http://www.keysight.com/find/2000X-Series-sw>
- Log into Keysight's licensing website at www.keysight.com/find/softwaremanager to redeem your license. You will need the following information:
 - Keysight Order Number and Keysight Certificate Number from the top of this certificate
 - The model number and serial number for each oscilloscope you wish to upgrade
 - The model number can be found on the upper left of the oscilloscope and the serial number is found on the back of the instrument.
 - Both can also be accessed from the user interface by pressing the 'Help' front panel key, then the 'About Oscilloscope' softkey.

For technical and sales support, visit www.keysight.com/find/contactus

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