



Agilent Technologies

AGILENT TECHNOLOGIES
INTERNAL ASSESSMENT
PROGRAM : EMG
E102/1995

EMG Support Operation
10090 Foothills Blvd.
Roseville, CA. 95747
(800) 829-4444

Certificate of Calibration
ISO/IEC 17025:2005 and ANSI/NCSL Z540.3-2006
Certificate Number: 1-3016228636-1



Calibration Cert 1920.01

Manufacturer: Agilent Technologies, Inc.
Model Number: 34401A
Serial Number: US36043788
Customer:
Oregon State University
130 Burt Hall
CORVALLIS OR 97331
UNITED STATES

Description: Digital Multimeter, 6.5 Digit
Options Installed:
Customer Asset No:
Location of Calibration:
EMG Support Operation
10090 Foothills Blvd.
Roseville, CA. 95747
(800) 829-4444

Procedure: STE-50111013-C.01.14
Date of Calibration: 4 Feb 2011
Temperature: (23 +/- 5) °C

Customer PO Number
Humidity: (50 +/- 30)% RH

This certifies that this product has been calibrated in accordance with a quality system registered to ISO9001:2008 and accredited to ISO/IEC 17025:2005 and ANSI/NCSL Z540.3-2006 using applicable Agilent Technologies procedures.

As Received Conditions:

Initial testing found the equipment to be **IN-SPECIFICATION** for the parameters tested. The instrument was adjusted to **OPTIMIZE** the performance as recommended for this model.

As Shipped Conditions:

At the completion of the calibration, measured values were **IN-SPECIFICATION** for the parameters tested.

Remarks or Special Requirements:

The reported expanded uncertainty of measurement is the standard uncertainty multiplied by the coverage factor $k=2$ (for a normal distribution) or $k=1.65$ (for a uniform distribution), which corresponds to a coverage probability of approximately 95%. Where this is not the case, the distribution, coverage factor, k , effective degrees of freedom, ν_{eff} , and coverage probability, p , are stated.

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

Based on the recommended calibration interval, the next calibration is due on 4 Feb 2012 .

Larry Goins Engineering Manager

Print Date: 4 Feb 2011



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Calibration Cert 1920.01

Traceability Information:

Technician ID Number: 813497

Traceability is to national standards administered by the U.S. NIST, NRC Canada, Euromet members (NPL, PTB, BNM, etc.) or other recognized standards laboratories.

Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

Supporting documentation relative to traceability is available for review by appointment.

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

This calibration report is composed of a certificate of calibration, performance test results and/or certificate appendices. Each report section may be numbered separately.

Calibration Equipment Used:

Model Number:	Model Description:	Trace Number:	Cal Due Date:	Certificate Number:
5720A	Multifunction Calibrator	5720A60202	6 May 2011	1-2310313182-2
33250A	Function/ARB Waveform Generator	33250A05005	2 Jan 2012	1-2580837334-1
5725A	Amplifier	5725A90005	6 May 2011	1-2310313182-1



Agilent Technologies

Customer Service Report

Customer Purchase Order Number S1180a	
Service Order Number 1-3016228636	Date Received 01-Feb-2011

Attention: David Ogorman
Ship To:
Oregon State University
130 Burt Hall
CORVALLIS OR 97331
United States

Telephone: (541) 737-1504

Please Direct Inquiries To: Customer Contact Center Telephone: 800-829-4444 Fax: 800-111-1111 Email: usa_orders@agilent.com	Agilent Hub Address: Agilent Technologies Inc Roseville Service Center A03 10090 Foothills Blvd ROSEVILLE CA 95747 United States
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Problem Description:
ISO 17025 Calibration /

Cal Interval: 12 Months /
Are Firmware Upgrades OK: Yes to upgrade firmware /
Installed Options: NA /
Special Requirements: /
Cust Asset #: NA

Product Number/ Description	Manufacturer	Serial Number
34401A Digital multimeter, 6.5 digit	Agilent Technologies Inc	US36043788
Parts Used:		Quantity:

Services Provided:
Calibration completed to manufacturer's specifications. Calibration certificate and data provided.



Measurement Report

AGILENT TECHNOLOGIES
TMO Support Operation
10090 Foothills Blvd.
Roseville, CA. 95747

As Received and As Completed Data

Report Number: 1-3016228636-1 **Test Date:** 4 Feb 2011
Customer: OREGON STATE UNIVERSITY
Manufacturer: Hewlett-Packard Co.
(Agilent Technologies)
Model Number: 34401A **Serial Number:** US36043788
Installed Options:
Temperature: (23 ± 5) °C **Humidity:** 20 to 80 % RH
Tested By: 813497
Test Program Name: HP34401A, 5011-1013
Test Program Version: C.01.14
Test Executive: STE/9000, C.08.60W
Test Subsytem: MENDOR, B.06.27A

Specification Limits:

Unless otherwise indicated, the units for minimum and/or maximum specification limits are the same as the units stated for the measured value.

Uncertainties:

Unless otherwise indicated, the uncertainties shown are calculated using the process defined in the Guide to the expression of Uncertainty in Measurement (GUM).

Uncertainties are evaluated at the specification limits and may not be accurate expressions of the uncertainty for the stated measured result.

Unless otherwise indicated, expanded uncertainties are stated with a coverage factor of 2 (k=2). This represents a coverage probability of approximately 95% for a normal distribution.

Unless otherwise indicated, uncertainty value units are the same as the measured value units. Uncertainties stated with units of parts per million (ppm) are given relative to fundamental units.

Result Status Flags:

Within each section of the measurement report, measurement results are printed with a status flag in the last column on the page. The status flag gives an indication of the status for each measurement point.

PASS	The reported value is within specification.
PASS #	The value falls within the measurement uncertainty guardband.
FAIL	The reported value is outside the specification.
DONE	The reported value is a functional test only.

Measurement Report

Report Number: 1-3016228636-1
Model Number: HP 34401A
Serial Number: US36043788

Test Date: 4 Feb 2011

PERFORMANCE TEST RESULTS SUMMARY

<u>Test Name</u>	<u>As Received</u>	<u>As Completed</u>
INITIAL SETUP	DONE	DONE
ZERO OFFSET - FRONT TERMINALS	PASSED	PASSED
ZERO OFFSET - REAR TERMINALS	PASSED	PASSED
DC VOLTS	PASSED	PASSED
AC VOLTS	PASSED	PASSED
FREQUENCY	PASSED	PASSED
OHMS	PASSED	PASSED
DC CURRENT	PASSED	PASSED
AC CURRENT	PASSED	PASSED

Measurement Report

Report Number: 1-3016228636-1
 Model Number: HP 34401A
 Serial Number: US36043788

Test Date: 4 Feb 2011

ZERO OFFSET - REAR TERMINALS (As Received)

PASSED

Pre-Repair/Adjustment Data:

TEST CONDITIONS		MINIMUM	MEASURED	MAXIMUM	UNCERT.	
Range	Input (Rear)					

DC Volts Zero Offset						
100 mV	0 V	-3.5	-1.0 uV	3.5	0.88 uV	PASS
1 V	0 V	-7	-1 uV	7	0.91 uV	PASS
10 V	0 V	-0.05	0.00 mV	0.05	6.1 uV	PASS
100 V	0 V	-0.6	0.0 mV	0.6	74 uV	PASS
1000 V	0 V	-10	0 mV	10	0.61 mV	PASS
Range	Input (Rear)					

4-Wire Ohms Zero Offset						
100 Ohm	0 Ohm	-4.0	-0.2 mOhm	4.0	1.1 mOhm	PASS
1 kOhm	0 Ohm	-10	0 mOhm	10	0.82 mOhm	PASS
10 kOhm	0 Ohm	-0.10	-0.01 Ohm	0.10	8.3 mOhm	PASS
100 kOhm	0 Ohm	-1.0	-0.1 Ohm	1.0	0.16 Ohm	PASS
1 MOhm	0 Ohm	-10	-1 Ohm	10	0.98 Ohm	PASS
10 MOhm	0 Ohm	-0.10	0.00 kOhm	0.10	6.3 Ohm	PASS
100 MOhm	0 Ohm	-10.0	0.0 kOhm	10.0	58 Ohm	PASS
Range	Input (Rear)					

2-Wire Ohms Zero Offset						
100 Ohm	0 Ohm	-204.0	23.7 mOhm	204.0	6.1 mOhm	PASS
1 kOhm	0 Ohm	-210	24 mOhm	210	5.8 mOhm	PASS
10 kOhm	0 Ohm	-0.30	0.01 Ohm	0.30	7.2 mOhm	PASS
100 kOhm	0 Ohm	-1.2	-0.1 Ohm	1.2	68 mOhm	PASS
1 MOhm	0 Ohm	-10	-1 Ohm	10	0.60 Ohm	PASS
10 MOhm	0 Ohm	-0.10	-0.01 kOhm	0.10	9.7 Ohm	PASS
100 MOhm	0 Ohm	-10.0	-0.2 kOhm	10.0	58 Ohm	PASS
Range	Input (Rear)					

DC Current Zero Offset						
10 mA	0 A	-2.00	-0.01 uA	2.00	5.8 nA	PASS
100 mA	0 A	-5.0	0.0 uA	5.0	0.21 uA	PASS
1 A	0 A	-100	-1 uA	100	4.7 uA	PASS
3 A	0 A	-600	-3 uA	600	8.7 uA	PASS

Measurement Report

Report Number: 1-3016228636-1
Model Number: HP 34401A
Serial Number: US36043788

Test Date: 4 Feb 2011

AC VOLTS (As Received)

(continued)

<u>TEST CONDITIONS</u>		<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>	<u>UNCERT.</u>	
100 mV	1 kHz	86.94	100.44 mV	113.06	0.20 mV	PASS
1 V	1 kHz	0.99640	0.99982 V	1.00360	0.19 mV	PASS
10 V	10 Hz	9.99100	9.99927 V	10.00900	2.9 mV	PASS
10 V	1 kHz	9.99100	9.99945 V	10.00900	0.59 mV	PASS
10 V	50 kHz	9.98300	9.99737 V	10.01700	1.6 mV	PASS
Input	Freq.					
(Front)						

100 V Range						
100 V	1 kHz	99.9100	100.0031 V	100.0900	7.9 mV	PASS
100 V	50 kHz	99.8300	99.9952 V	100.1700	15 mV	PASS
Input	Freq.					
(Front)						

750 V Range						
700 V	1 kHz	699.355	700.029 V	700.645	73 mV	PASS
700 V	50 kHz	698.785	700.093 V	701.215	0.45 V	PASS
700 V	45 Hz	699.355	699.939 V	700.645	0.12 V	PASS

FREQUENCY (As Received)

PASSED

Pre-Repair/Adjustment Data:

<u>TEST CONDITIONS</u>		<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>	<u>UNCERT.</u>	
Input	Freq.					
(Front)						

100 mV Range						
10 mV	100 Hz	99.9000	99.9973 Hz	100.1000	4.8 mHz	PASS
1 V Range						
1 V	100 kHz	99.9900	100.0001 kHz	100.0100	0.65 Hz	PASS

Measurement Report

Report Number: 1-3016228636-1
Model Number: HP 34401A
Serial Number: US36043788

Test Date: 4 Feb 2011

AC CURRENT (As Received)

(continued)

<u>TEST CONDITIONS</u>	<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>	<u>UNCERT.</u>	
10 mA 1 kHz	8.590	9.964 mA	11.410	32 uA	PASS
1 A 1 kHz	0.998600	0.999995 A	1.001400	0.33 mA	PASS
3 Amp Range					
2 A 1 kHz	1.99520	1.99940 A	2.00480	0.65 mA	PASS

Measurement Report

Report Number: 1-3016228636-1
 Model Number: HP 34401A
 Serial Number: US36043788

Test Date: 4 Feb 2011

ZERO OFFSET - REAR TERMINALS

PASSED

Zero Offset Adjustments DONE

Post-Repair/Adjustment Data:

TEST CONDITIONS		MINIMUM	MEASURED	MAXIMUM	UNCERT.	
Range	Input (Rear)					

DC Volts Zero Offset						
100 mV	0 V	-3.5	-0.2 uV	3.5	0.88 uV	PASS
1 V	0 V	-7	0 uV	7	0.91 uV	PASS
10 V	0 V	-0.05	0.00 mV	0.05	6.1 uV	PASS
100 V	0 V	-0.6	0.0 mV	0.6	74 uV	PASS
1000 V	0 V	-10	0 mV	10	0.61 mV	PASS
Range	Input (Rear)					

4-Wire Ohms Zero Offset						
100 Ohm	0 Ohm	-4.0	0.0 mOhm	4.0	1.1 mOhm	PASS
1 kOhm	0 Ohm	-10	0 mOhm	10	0.82 mOhm	PASS
10 kOhm	0 Ohm	-0.10	0.00 Ohm	0.10	8.3 mOhm	PASS
100 kOhm	0 Ohm	-1.0	0.0 Ohm	1.0	0.16 Ohm	PASS
1 MOhm	0 Ohm	-10	0 Ohm	10	0.98 Ohm	PASS
10 MOhm	0 Ohm	-0.10	-0.01 kOhm	0.10	6.3 Ohm	PASS
100 MOhm	0 Ohm	-10.0	-0.1 kOhm	10.0	58 Ohm	PASS
Range	Input (Rear)					

2-Wire Ohms Zero Offset						
100 Ohm	0 Ohm	-204.0	-0.2 mOhm	204.0	6.1 mOhm	PASS
1 kOhm	0 Ohm	-210	0 mOhm	210	5.8 mOhm	PASS
10 kOhm	0 Ohm	-0.30	0.00 Ohm	0.30	7.2 mOhm	PASS
100 kOhm	0 Ohm	-1.2	0.0 Ohm	1.2	68 mOhm	PASS
1 MOhm	0 Ohm	-10	0 Ohm	10	0.60 Ohm	PASS
10 MOhm	0 Ohm	-0.10	-0.01 kOhm	0.10	9.7 Ohm	PASS
100 MOhm	0 Ohm	-10.0	-0.2 kOhm	10.0	58 Ohm	PASS
Range	Input (Rear)					

DC Current Zero Offset						
10 mA	0 A	-2.00	-0.07 uA	2.00	5.8 nA	PASS
100 mA	0 A	-5.0	0.0 uA	5.0	0.21 uA	PASS
1 A	0 A	-100	-2 uA	100	4.7 uA	PASS
3 A	0 A	-600	-3 uA	600	8.7 uA	PASS

Measurement Report

Report Number: 1-3016228636-1

Test Date: 4 Feb 2011

Model Number: HP 34401A

Serial Number: US36043788

AC VOLTS

(continued)

<u>TEST CONDITIONS</u>		<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>	<u>UNCERT.</u>	
10 V	10 Hz	9.99100	9.99990 V	10.00900	2.9 mV	PASS
10 V	1 kHz	9.99100	10.00004 V	10.00900	0.59 mV	PASS
10 V	50 kHz	9.98300	9.99757 V	10.01700	1.6 mV	PASS
Input Freq. (Front)						

100 V Range						
100 V	1 kHz	99.9100	99.9997 V	100.0900	7.9 mV	PASS
100 V	50 kHz	99.8300	99.9915 V	100.1700	15 mV	PASS
Input Freq. (Front)						

750 V Range						
700 V	1 kHz	699.355	699.998 V	700.645	73 mV	PASS
700 V	50 kHz	698.785	700.076 V	701.215	0.45 V	PASS
700 V	45 Hz	699.355	699.922 V	700.645	0.12 V	PASS

FREQUENCY

PASSED

Frequency Gain Adjustments DONE

Post-Repair/Adjustment Data:

<u>TEST CONDITIONS</u>		<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>	<u>UNCERT.</u>	
Input Freq. (Front)						

100 mV Range						
10 mV	100 Hz	99.9000	100.0009 Hz	100.1000	4.8 mHz	PASS
1 V Range						
1 V	100 kHz	99.9900	100.0000 kHz	100.0100	0.65 Hz	PASS

Measurement Report

Report Number: 1-3016228636-1
Model Number: HP 34401A
Serial Number: US36043788

Test Date: 4 Feb 2011

AC CURRENT

(continued)

<u>TEST CONDITIONS</u>		<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>	<u>UNCERT.</u>	
2 A	1 kHz	1.99520	1.99949 A	2.00480	0.65 mA	PASS