SOUTHWEST RESEARCH INSTITUTE®
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Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-4834

Certificate of Calibration

ACCREDITED
Calibration Laboratory
Certificate #0972-01

Cost Center / Customer: DIV20 / DON BANNON
Mail Stop: B57
Manufacturer/Model: HEWLETT-PACKARD / 34970A
Description: DATA ACQUISITION/SWITCH UNIT
Serial Number: US37018965
Asset Number: 012733
Procedure: AGILENT 34970A & PLUG-IN MODULES - 14 JUL 11

Work Order: 303103326
Date Issued: 29-Aug-2011
Date Calibrated: 29-Aug-2011
*** Date Due :** 29-Aug-2012
**** Results:** FOUND-LEFT
Temperature: 72.0 °F
Humidity: 45 %RH
Barometer: N/A

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of the ISO 9000-2000 standard. This certificate shall not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. This certificate shall not be used to claim product endorsement by Southwest Research Institute, American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government. Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability of the instrument.

*Determined by the customer, does not imply the instrument will remain within tolerance as any number of factors may cause an out-of-tolerance condition before this date. **Data type found in this certificate or attached measurement report must be interpreted as: Found-left - adjustment and/or repair was not performed, As-found - data is before unit is adjusted and/or repaired, As-left - data is after adjusted and/or repaired was performed. The customer has sole responsibility for determination of in-/out-of-tolerance or compliance/noncompliance.

Measurement uncertainty calculated in accordance with the method described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM), for a confidence level of approximately 95 percent using a coverage factor of $k=2$.

Remarks: None

Standards Used

Asset #	Manufacturer	Model	Description	Cal Date	Due Date
000182	FLUKE	5700A/EP	MULT-FUNCTION CALIBRATOR	1-Aug-2011	1-Nov-2011
000201	FLUKE	5725A	MULT-FUNCTION CALIBRATOR AMPLIFIE	31-Jan-2011	31-Jan-2012
012268	AGILENT	33250A	ARBITRARY/FUNCTION GENERATOR	8-Mar-2011	8-Mar-2012

Walt Hill
Laboratory Manager

Bob Trollinger
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	303103326	Mfr:	Agilent	Technician:	blt
Asset No:	012733	Model:	34970A	Type Data:	Found-left
Serial No:	US37018965	Type:	Data Acquisition/Switch Unit	Cal Date:	29-Aug-11
Remarks:					

Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
DC I	mA	mA	mA	mA	mA		
10 mA	0.00000	-0.00001	-0.00001	0.0020	0.000064	Pass	1%
100 mA	0.0000	0.0000	0.0000	0.0050	0.00015	Pass	0%
	A	A	A	A	A		
1 A	0.000000	0.000001	0.000001	0.00010	0.0000027	Pass	1%
DC V	mV	mV	mV	mV	mV		
100 mV	0.0000	0.0000	0.0000	0.0040	0.00038	Pass	0%
	V	V	V	V	V		
1 V	0.000000	0.000000	0.000000	0.0000070	0.00000086	Pass	0%
10 V	0.00000	0.00000	0.00000	0.000050	0.0000058	Pass	0%
100 V	0.0000	0.0000	0.0000	0.00060	0.000058	Pass	0%
300 V	0.000	0.000	0.000	0.0090	0.00058	Pass	0%
Ω 4 Wire	Ω	Ω	Ω	Ω	Ω		
100 Ω	0.0000	0.0000	0.0000	0.0040	0.00034	Pass	0%
	kΩ	kΩ	kΩ	kΩ	kΩ		
1 kΩ	0.00	0.000000	0.000000	0.000010	0.00000058	Pass	0%
10 kΩ	0.0	0.00000	0.00000	0.00010	0.0000058	Pass	0%
100 kΩ	0	0.0000	0.0000	0.0010	0.000058	Pass	0%
	MΩ	MΩ	MΩ	MΩ	MΩ		
1 MΩ	0	0.000000	0.000000	0.000010	0.00000058	Pass	0%
10 MΩ	0	0.00000	0.00000	0.00010	0.0000058	Pass	0%
100 MΩ	0	0.0000	0.0000	0.010	0.000058	Pass	0%
Gain Verification DCV	mV	mV	mV	mV	mV		
100 mV	100.0000	99.9977	-0.0023	0.0090	0.0012	Pass	26%
	V	V	V	V	V		
1 V	1.000000	1.000003	0.000003	0.000047	0.000005	Pass	6%
10 V	10.00000	10.00004	0.00004	0.00040	0.000033	Pass	10%
100 V	100.0000	100.0004	0.0004	0.0051	0.00047	Pass	8%
300 V	300.000	300.000	0.000	0.023	0.0022	Pass	0%
4 Wire Ω	Ω	Ω	Ω	Ω	Ω		
100 Ω	100.00144	100.0011	-0.0003	0.014	0.0011	Pass	2%
	kΩ	kΩ	kΩ	kΩ	kΩ		
1 kΩ	0.9999320	0.999934	0.000002	0.00011	0.0000093	Pass	2%

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Measurement Report

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Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	%Limit
4 Wire Ω *(cont.)*	kΩ	kΩ	kΩ	kΩ	kΩ		
10 kΩ	9.999280	9.99934	0.00006	0.0011	0.000093	Pass	5%
100 kΩ	99.99397	99.9948	0.0008	0.011	0.010	Pass	8%
	MΩ	MΩ	MΩ	MΩ	MΩ		
1 MΩ	0.9998829	0.999898	0.000015	0.00011	0.000017	Pass	14%
10 MΩ	9.998900	9.99880	-0.00010	0.0014	0.00036	Pass	7%
100 MΩ	99.98485	99.9000	-0.0848	0.81	0.014	Pass	10%
DC I	mA	mA	mA	mA	mA		
10 mA	10.00000	10.00004	0.00004	0.0070	0.00035	Pass	1%
100 mA	100.0000	100.0018	0.0018	0.055	0.0054	Pass	3%
	A	A	A	A	A		
1 A	1.0000	0.999982	0.0000	0.0011	0.000081	Pass	2%
AC V	mV	mV	mV	mV	mV		
100 mV @ 1 kHz	100.0000	99.9626	-0.0374	0.10	0.006	Pass	37%
100 mV @ 50 kHz	100.0000	99.9708	-0.0292	0.17	0.021	Pass	17%
AC V	V	V	V	V	V		
1 V @ 1 kHz	1.000000	0.999599	-0.000401	0.0010	0.000058	Pass	40%
1 V @ 50 kHz	1.000000	0.999905	-0.000095	0.0017	0.000092	Pass	6%
10 V @ 1 kHz	10.00000	9.99610	-0.00390	0.014	0.00058	Pass	28%
10 V @ 50 kHz	10.00000	10.00408	0.00408	0.017	0.0009	Pass	24%
10 V @ 10 Hz	10.00000	9.99568	-0.00432	0.014	0.0030	Pass	31%
	mV	mV	mV	mV	mV		
10 mV @ 1 kHz	10.0000	9.9958	-0.0042	0.046	0.0010	Pass	9%
	V	V	V	V	V		
100 V @ 1 kHz	100.0000	99.9619	-0.0381	0.10	0.0069	Pass	38%
100 V @ 50 kHz	100.0000	99.9685	-0.0315	0.17	0.0092	Pass	19%
300 V @ 1 kHz	300.000	299.917	-0.083	0.42	0.016	Pass	20%
300 V @ 50 kHz	200.000	200.016	0.016	0.60	0.018	Pass	3%
AC I	mA	mA	mA	mA	mA		
10 mA @ 1 kHz	10.00000	9.99463	-0.00537	0.014	0.0017	Pass	38%
100 mA @ 1 kHz	100.0000	99.9689	-0.0311	0.60	0.013	Pass	5%
	A	A	A	A	A		
1 A @ 1 kHz	0.010000	0.010005	0.000005	0.00051	0.0004	Pass	1%
AC I	A	A	A	A	A		
1 A @ 1 kHz	1.000000	0.999736	-0.000264	0.0014	0.00032	Pass	19%

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Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	%Limit
Frequency	Hz	Hz	Hz	Hz	Hz		
10 mV @ 100 Hz	100.0000	100.00000	0.00000	0.1	0.00014	Pass	0%
	kHz	kHz	kHz	kHz	kHz		
1 V @ 100 kHz	100.0000	100.00000	0.00000	0.01	0.00028	Pass	0%

END OF REPORT