SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-4834

ACCREDITED
Calibration Laboratory
Certificate #0972-01

Certificate of Calibration

Cost Center: DIV20
Mail Stop: B51
Customer: DON BANNON
Manufacturer/Model: HEWLETT-PACKARD / 34970A
Description: DATA ACQUISITION/SWITCH UNIT
Serial Number: MY44010920
Asset Number: 012033
Procedure: AGILENT 34970A - 21 MAR 06

Work Order: 303085598
Date Issued: 19-Jan-2009
Date Calibrated: 19-Jan-2009
***Date Due :** 19-Jan-2010
****Results:** FOUND-LEFT
Temperature: 74°F
Humidity: 40 %

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. **Found/Left = adjustment and/or repair was not required, As Left = adjusted and/or repaired was required. The customer has sole responsibility for determination of in-/out-of-tolerance or compliance/noncompliance. See Remarks or attached Measurement Report with the same Work Order number for data.

Reported uncertainty calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) and represents an expanded uncertainty with a coverage factor of k=2 to approximate a 95% confidence level.

Remarks:

Standards Used

Asset #	Manufacturer	Model	Description	Cal Date	Due Date
000182	FLUKE	5700A/EP	CALIBRATOR	5-Nov-2008	5-Feb-2009
000201	FLUKE	5725A	AMPLIFIER	5-Nov-2008	5-Feb-2009

Reviewed By: ( )srk ( ) mar ( ) wgh
Laboratory Quality Manager
m:\A2LA OCT_08.rpt

Calibrated By: Bob Trollinger
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	303085598	Mfr:	HP	Technician:	blt
Asset No:	012033	Model:	34970A		
Serial No:	MY44010920	Type:	Data Acquisition Switch	Cal Date:	19-Jan-09
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found/Left
DC I	mA	mA	mA	mA	mA	Result
10 mA	0.00000	-0.00004	-0.00004	0.002	0.0000058	Pass
100 mA	0.0000	0.0001	0.0001	0.005	0.000058	Pass
	A	A	A	A	A	
1 A	0.000000	0.000001	0.000001	0.0001	0.000058	Pass
DC V	mV	mV	mV	mV	mV	
100 mV	0.0000	-0.0005	-0.0005	0.004	0.000058	Pass
	V	V	V	V	V	
1 V	0.000000	0.000000	0.000000	0.000007	0.00000058	Pass
10 V	0.00000	0.00000	0.00000	0.00005	0.0000058	Pass
100 V	0.0000	0.0000	0.0000	0.0006	0.000058	Pass
300 V	0.000	0.000	0.000	0.009	0.00058	Pass
Ω 4 Wire	Ω	Ω	Ω	Ω	Ω	
100 Ω	0.0000	0.0005	0.0005	0.004	0.000058	Pass
	kΩ	kΩ	kΩ	kΩ	kΩ	
1 kΩ	0.00	0.000000	0.000000	0.00001	0.00000058	Pass
10 kΩ	0.0	0.00000	0.00000	0.0001	0.0000058	Pass
100 kΩ	0	0.0000	0.0000	0.001	0.000058	Pass
	MΩ	MΩ	MΩ	MΩ	MΩ	
1 MΩ	0	0.000000	0.000000	0.00001	0.00000058	Pass
10 MΩ	0	0.00000	0.00000	0.0001	0.0000058	Pass
100 MΩ	0	0.0000	0.0000	0.01	0.000058	Pass
Gain Verification DCV	mV	mV	mV	mV	mV	
100 mV	100.0000	100.0021	0.0021	0.009	0.00012	Pass
	V	V	V	V	V	
1 V	1.000000	1.000022	0.000022	0.000047	0.0000040	Pass
10 V	10.00000	10.00016	0.00016	0.0004	0.000028	Pass
100 V	100.0000	100.0016	0.0016	0.0051	0.00038	Pass
300 V	300.000	300.003	0.003	0.0225	0.0017	Pass
4 Wire Ω	Ω	Ω	Ω	Ω	Ω	
100 Ω	100.00125	100.0016	0.0003	0.014	0.00060	Pass
	kΩ	kΩ	kΩ	kΩ	kΩ	
1 kΩ	0.9999312	0.999935	0.000004	0.00011	0.0000076	Pass
10 kΩ	9.999276	9.99930	0.00002	0.0011	0.000050	Pass
100 kΩ	99.99389	99.9944	0.0005	0.011	0.00060	Pass
	MΩ	MΩ	MΩ	MΩ	MΩ	
1 MΩ	0.9998821	0.999896	0.000014	0.00011	0.000012	Pass
10 MΩ	9.998899	9.99841	-0.00049	0.0014	0.00021	Pass

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	303085598	Mfr:	HP	Technician:	blt
Asset No:	012033	Model:	34970A		
Serial No:	MY44010920	Type:	Data Acquisition Switch	Cal Date:	19-Jan-09

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found/Left
4 Wire Ω	MΩ	MΩ	MΩ	MΩ	MΩ	Result
100 MΩ	99.87513	99.9012	0.0261	0.81	0.0063	Pass
DC I	mA	mA	mA	mA	mA	
10 mA	10.00000	9.99968	-0.00032	0.007	0.00027	Pass
100 mA	100.0000	99.9985	-0.0015	0.055	0.0037	Pass
	A	A	A	A	A	
1 A	1.0000	0.999934	-0.0001	0.0011	0.000070	Pass
AC V	mV	mV	mV	mV	mV	
100 mV @ 1 kHz	100.0000	99.9586	-0.0414	0.1	0.0097	Pass
100 mV @ 50 kHz	100.0000	99.8909	-0.1091	0.17	0.017	Pass
AC V	V	V	V	V	V	
1 V @ 1 kHz	1.000000	0.999617	-0.000383	0.001	0.000030	Pass
1 V @ 50 kHz	1.000000	0.999119	-0.000881	0.0017	0.000050	Pass
10 V @ 1 kHz	10.00000	9.99617	-0.00383	0.014	0.00030	Pass
10 V @ 50 kHz	10.00000	9.99420	-0.00580	0.017	0.00050	Pass
10 V @ 10 Hz	10.00000	9.99703	-0.00297	0.014	0.0017	Pass
	mV	mV	mV	mV	mV	
10 mV @ 1 kHz	10.0000	9.9985	-0.0015	0.046	0.0097	Pass
	V	V	V	V	V	
100 V @ 1 kHz	100.0000	99.9493	-0.0507	0.1	0.0035	Pass
100 V @ 50 kHz	100.0000	99.9498	-0.0502	0.17	0.0057	Pass
300 V @ 1 kHz	300.000	299.892	-0.108	0.42	0.019	Pass
300 V @ 50 kHz	200.000	199.933	-0.067	0.6	0.079	Pass
AC I	mA	mA	mA	mA	mA	
10 mA @ 1 kHz	10.00000	9.99363	-0.00637	0.014	0.0010	Pass
100 mA @ 1 kHz	100.0000	99.9958	-0.0042	0.6	0.0075	Pass
	A	A	A	A	A	
1A @ 1 kHz	0.010000	0.010024	0.000024	0.00051	0.0000075	Pass
AC I	A	A	A	A	A	
1A @ 1 kHz	1.000000	0.999726	-0.000274	0.0014	0.00018	Pass
Frequency	Hz	Hz	Hz	Hz	Hz	
100 mV @ 100 Hz	100.0000	99.99722	-0.00278	0.1	0.0067	Pass
	kHz	kHz	kHz	kHz	kHz	
1 V @ 100 kHz	100.0000	99.99679	-0.00321	0.01	0.0067	Pass

END OF REPORT