SOUTHWEST RESEARCH INSTITUTE

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OUT OF TOLERANCE

To: Ron Green, Div.20, Bldg. 57

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Date: Nov. 14, 2003

Subject: Out-of-tolerance Notice

The purpose of this notice is to alert you of a condition, which may have caused erroneous measurements affecting safety or the quality of products or services your organization provides. The attached as-found readings are provided for your evaluation to determine if the instrument listed below had an impact and if further action is required.

When the as-found results are near the specification limit, +/- a margin less than the measurement uncertainty, it is not possible to state in-tolerance or out-of-tolerance with a 95% level of confidence. It is the Institute Calibration Laboratory policy that the client is made aware of this situation because the end-user is taking some of the risk that the instrument listed below may not meet the end-user measurement requirements.

Your review/evaluation should be conducted in accordance with your organizational quality policy and procedural requirements. If we can be of further assistance, please contact the Calibration Laboratory at 522-5215.

Manufacturer: Hp **Model:** 34970A

Description: Data Acquisition Unit **Serial Number:** US37011843

Asset Number: 10567 **User ID Number:** None

Last Calibration: Nov. 14, 2003

Date Received for Service: Nov. 13, 2003 Work Order Number: 444056343

Service Requested: Initial calibration

Remarks: Notified customer that unit was received with error codes, which indicated that the cal constants had been lost. Upon initial calibration DCV, ACV, DCI, ACI, Ohms, gain out of toleance. Refer to attached Calibration Report for more details.

Southwest Research Institute
Calibration Laboratory
Calibration Report

Work Order:	444056343	Mfr.	HP	Technician	Vmorales
Asset No.	10567	Model	34970A		
Serial No.	US37011843	Type.	MULTIMETER	Cal Date.	14-Nov-03
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found
DC CURRENT	mAmp	mAmp	mAmp	mAmp	mAmp	Result
10 mAmp	0.00000	-0.00067	-0.00067	0.002	0.0012	Pass
100 mAmp	0.0000	0.0005	0.0005	0.005	0.0012	Pass
	Amp	Amp	Amp	Amp	Amp	
1 A	0.000000	0.000035	0.000035	0.0001	0.0012	Pass
DC Volts	mVolts	mVolts	mVolts	mVolts	mVolts	
100 mVolt	0.0000	0.0004	0.0004	0.004	0.0012	Pass
	Volts	Volts	Volts	Volts	Volts	
1 Volt	0.000000	0.000000	0.000000	0.000007	0.0000012	Pass
10 Volt	0.00000	0.00000	0.00000	0.00005	0.000012	Pass
100 Volt	0.0000	0.0002	0.0002	0.0006	0.00012	Pass
300 Volt	0.000	0.000	0.000	0.009	0.0012	Pass
Ohms 4 Wire	Ohm	Ohm	Ohm	Ohm	Ohm	
100 Ohm	0.0000	0.0000	0.0000	0.004	0.00012	Pass
1 kOhm	0.00	0.000000	0.00	0.01	0.0012	Pass
10 kOhm	0.0	0.00000	0.0	0.1	0.012	Pass
100 kOhm	0	0.0000	0	1	0.12	Pass
1 MOhm	0	0.000000	0	10	1.2	Pass
10 MOhm	0	0.00000	0	100	12	Pass
100 Mohm	0	0.0000	0	10000	120	Pass
Gain Verification DCV	mVolts	mVolts	mVolts	mVolts	mVolts	
100 mVolt	100.0000	99.5973	-0.4027	0.009	0.0002	Fail
	Volts	Volts	Volts	Volts	Volts	
1 Volt	1.000000	0.997029	-0.002971	0.000047	0.0000042	Fail
10 Volt	10.00000	9.97480	-0.02520	0.0004	0.00003	Fail
100 Volt	100.0000	99.6913	-0.3087	0.0051	0.0004	Fail
300 Volt	300.000	299.219	-0.781	0.0225	0.005	Fail
Ohms 4 Wire	Ohm	Ohm	Ohm	Ohm	Ohm	
100 Ohm	100.001260	99.7016	-0.2997	0.014	0.0049	Fail
	kOhm	kOhm	kOhm	kOhm	kOhm	
1 kOhm	0.99993180	0.997995	-0.001937	0.00011	0.00004	Fail
10 kOhm	9.9992790	9.96577	-0.03351	0.0011	0.0004	Fail
100 kOhm	99.993900	99.4577	-0.5362	0.011	0.004	Fail
	MOhm	MOhm	MOhm	MOhm	MOhm	
1 MOhm	0.99988820	1.000316	0.000428	0.00011	0.00004	Fail
10 MOhm	9.9988970	9.99657	-0.00233	0.0014	0.00032	Fail
100 Mohm	99.984190	101.8419	1.8577	0.81	0.01	Fail

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Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found
DC CURRENT	mAmp	mAmp	mAmp	mAmp	mAmp	Result
10 mAmp	10.00000	10.16742	0.16742	0.007	0.0014	Fail
100 mAmp	100.0000	101.7901	1.7901	0.055	0.015	Fail
	Amp	Amp	Amp	Amp	Amp	
1 A	1.0000	0.994567	-0.0054	0.0011	0.0003	Fail
AC Volts	mVolts	mVolts	mVolts	mVolts	mVolts	
100 mV @ 1 kHz	100.0000	96.3109	-3.6891	0.1	0.02	Fail
100 mV @ 50 kHz	100.0000	95.8998	-4.1002	0.17	0.026	Fail
AC Volts	Volts	Volts	Volts	Volts	Volts	
1 V @ 1 kHz	1.000000	0.965610	-0.034390	0.001	0.0001	Fail
1 V @ 50 kHz	1.000000	0.961953	-0.038047	0.0017	0.0001	Fail
10 V @ 1 kHz	10.00000	9.66606	-0.33394	0.014	0.0004	Fail
10 V @ 50 kHz	10.00000	9.63208	-0.36792	0.017	0.0008	Fail
10 V @ 10 Hz	10.00000	9.67291	-0.32709	0.014	0.0026	Fail
	mVolts	mVolts	mVolts	mVolts	mVolts	
100 mV @ 1 kHz	10.0000	9.6950	-0.3050	0.046	0.0051	Fail
	Volts	Volts	Volts	Volts	Volts	
100 V @ 1 kHz	100.0000	94.6863	-5.3137	0.1	0.0053	Fail
100 V @ 50 kHz	100.0000	96.3456	-3.6544	0.17	0.0085	Fail
300 V @ 1 kHz	300.000	289.332	-10.668	0.42	0.044	Fail
300 V @ 50 kHz	200.000	195.320	-4.680	0.6	0.12	Fail
AC Amp	mAmps	mAmps	mAmps	mAmps	mAmps	
10 mA @ 1 kHz	10.00000	9.83156	-0.16844	0.014	0.0014	Fail
100 mA @ 1 kHz	100.0000	96.8546	-3.1454	0.6	0.07	Fail
1A @ 1 kHz	10.000000	9.831760	-0.168240	0.51	0.001	Pass
AC Amp	Amps	Amps	Amps	Amps	Amps	
1A @ 1 kHz	1.000000	0.961746	-0.038254	0.0014	0.001	Fail
Frequency	Hz	Hz	Hz	Hz	Hz	
100 mV @ 100 Hz	100.0000	99.99662	-0.00338	0.1	0.012	Pass
	kHz	kHz	kHz	kHz	kHz	
1 V @ 100 kHz	100.0000	99.99811	-0.00189	0.01	0.012	Pass
Thermocouple Test	Deg C	Deg C	Deg C	Deg C	Deg C	
	23.1	22.9	-0.2000	1.0	0.01	Pass

END OF REPORT

SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

ACCREDITED
Certificate #
0972-01

Certificate of Calibration

Submitted By:	DIV20	**Work Order:**	444056343
Address:	B57	**Date Issued:**	Nov 14, 2003
Contact:	RON GREEN	**Calibration Date:**	Nov 14, 2003
Manufacturer Model:	HEWLETT-PACKARD 34970A	****Calibration Due:**	Nov 14, 2004
Description:	DATA ACQUISITION/SWITCH UNIT	**Calibration Location:**	Bldg. 64
Serial No:	US37011843	**Environment:**	Temp. 71.0°F Hum. 34 %RH
Asset No:	010567	***As Found:**	OUT OF TOLERANCE
Procedure:	MULTIMETERS, DEC/02	***As Left:**	IN TOLERANCE

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, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
000182	FLUKE	5700A/EP	CALIBRATOR	Dec 03, 03
004965	ERTCO	1005-FC	THERMOMETER	Jun 25, 04

Approved by: Walt Hill
Metrology Group Leader

Measurements by: Vince Morales
Metrology Technician

m:\a2la1.rpt Rev date 15, August 02

Southwest Research Institute
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Calibration Report

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Asset No.	10567	Model	34970A		
Serial No.	US37011843	Type.	MULTIMETER	Cal Date.	14-Nov-03
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Left Result
DC CURRENT	mAmp	mAmp	mAmp	mAmp	mAmp	
10 mAmp	0.00000	0.00000	0.00000	0.002	0.0012	Pass
100 mAmp	0.0000	0.0000	0.0000	0.005	0.0012	Pass
	Amp	Amp	Amp	Amp	Amp	
1 A	0.000000	0.000000	0.000000	0.0001	0.0012	Pass
DC Volts	mVolts	mVolts	mVolts	mVolts	mVolts	
100 mVolt	0.0000	0.0007	0.0007	0.004	0.0012	Pass
	Volts	Volts	Volts	Volts	Volts	
1 Volt	0.000000	0.000000	0.000000	0.000007	0.0000012	Pass
10 Volt	0.00000	0.00000	0.00000	0.00005	0.000012	Pass
100 Volt	0.0000	0.0000	0.0000	0.0006	0.00012	Pass
300 Volt	0.000	0.000	0.000	0.009	0.0012	Pass
Ohms 4 Wire	Ohm	Ohm	Ohm	Ohm	Ohm	
100 Ohm	0.0000	0.0001	0.0001	0.004	0.00012	Pass
1 kOhm	0.00	0.000000	0.00	0.01	0.0012	Pass
10 kOhm	0.0	0.00000	0.0	0.1	0.012	Pass
100 kOhm	0	0.0000	0	1	0.12	Pass
1 MOhm	0	0.000000	0	10	1.2	Pass
10 MOhm	0	0.00000	0	100	12	Pass
100 Mohm	0	0.0000	0	10000	120	Pass
Gain Verification DCV	mVolts	mVolts	mVolts	mVolts	mVolts	
100 mVolt	100.0000	99.9991	-0.0009	0.009	0.0002	Pass
	Volts	Volts	Volts	Volts	Volts	
1 Volt	1.000000	0.999999	-0.000001	0.000047	0.0000042	Pass
10 Volt	10.00000	9.99999	-0.00001	0.0004	0.00003	Pass
100 Volt	100.0000	99.9998	-0.0002	0.0051	0.0004	Pass
300 Volt	300.000	299.999	-0.001	0.0225	0.005	Pass
Ohms 4 Wire	Ohm	Ohm	Ohm	Ohm	Ohm	
100 Ohm	100.001260	100.0006	-0.0007	0.014	0.0049	Pass
	kOhm	kOhm	kOhm	kOhm	kOhm	
1 kOhm	0.99993180	0.999931	-0.000001	0.00011	0.00004	Pass
10 kOhm	9.9992790	9.99928	0.00000	0.0011	0.0004	Pass
100 kOhm	99.993900	99.9941	0.0002	0.011	0.004	Pass
	MOhm	MOhm	MOhm	MOhm	MOhm	
1 MOhm	0.99988820	0.999879	-0.000009	0.00011	0.00004	Pass
10 MOhm	9.9988970	9.99881	-0.00009	0.0014	0.00032	Pass
100 Mohm	99.984190	99.9744	-0.0098	0.81	0.01	Pass

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Asset No.	10567	Model	34970A		
Serial No.	US37011843	Type.	MULTIMETER	Cal Date.	14-Nov-03

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Left
DC CURRENT	mAmp	mAmp	mAmp	mAmp	mAmp	Result
10 mAmp	10.00000	9.99994	-0.00006	0.007	0.0014	Pass
100 mAmp	100.0000	100.0000	0.0000	0.055	0.015	Pass
	Amp	Amp	Amp	Amp	Amp	
1 A	1.0000	0.999997	0.0000	0.0011	0.0003	Pass
AC Volts	mVolts	mVolts	mVolts	mVolts	mVolts	
100 mV @ 1 kHz	100.0000	99.9987	-0.0013	0.1	0.02	Pass
100 mV @ 50 kHz	100.0000	100.0072	0.0072	0.17	0.026	Pass
AC Volts	Volts	Volts	Volts	Volts	Volts	
1 V @ 1 kHz	1.000000	1.000185	0.000185	0.001	0.0001	Pass
1 V @ 50 kHz	1.000000	1.000182	0.000182	0.0017	0.0001	Pass
10 V @ 1 kHz	10.00000	9.99989	-0.00011	0.014	0.0004	Pass
10 V @ 50 kHz	10.00000	10.00306	0.00306	0.017	0.0008	Pass
10 V @ 10 Hz	10.00000	10.00674	0.00674	0.014	0.0026	Pass
	mVolts	mVolts	mVolts	mVolts	mVolts	
100 mV @ 1 kHz	10.0000	9.9993	-0.0007	0.046	0.0051	Pass
	Volts	Volts	Volts	Volts	Volts	
100 V @ 1 kHz	100.0000	99.9982	-0.0018	0.1	0.0053	Pass
100 V @ 50 kHz	100.0000	99.9820	-0.0180	0.17	0.0085	Pass
300 V @ 1 kHz	300.000	299.994	-0.006	0.42	0.044	Pass
300 V @ 50 kHz	200.000	199.975	-0.025	0.6	0.12	Pass
AC Amp	mAmps	mAmps	mAmps	mAmps	mAmps	
10 mA @ 1 kHz	10.00000	9.99813	-0.00187	0.014	0.0014	Pass
100 mA @ 1 kHz	100.0000	100.0234	0.0234	0.6	0.07	Pass
1A @ 1 kHz	10.000000	9.993000	-0.007000	0.51	0.001	Pass
AC Amp	Amps	Amps	Amps	Amps	Amps	
1A @ 1 kHz	1.000000	1.000103	0.000103	0.0014	0.001	Pass
Frequency	Hz	Hz	Hz	Hz	Hz	
100 mV @ 100 Hz	100.0000	99.99874	-0.00126	0.1	0.012	Pass
	kHz	kHz	kHz	kHz	kHz	
1 V @ 100 kHz	100.0000	99.99815	-0.00185	0.01	0.012	Pass
Thermocouple Test	Deg C	Deg C	Deg C	Deg C	Deg C	
	23.1	23.0	-0.1000	1.0	0.01	Pass

END OF REPORT