



# SOUTHWEST RESEARCH INSTITUTE

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**To:** Don Bannon Div20/Bldg57  
**From:** Walt Hill, Metrology Group Leader  
Institute Calibration Laboratory

**Date:** Dec. 01, 2005  
**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:** Keithley

**Model:** 614

**Description:** Electrometer

**Serial Number:** 467374

**Asset Number:** 1438

**User ID Number:**

**Last Calibration:** 12-2-04

**Date Received for Service:** Nov. 18, 2005 **Work Order Number:** 303066845

**Service Requested:** Scheduled calibration

**Remarks:** nC function inoperative. All other functions within tolerance.

## OUT OF TOLERANCE

Southwest Research Institute  
Calibration Laboratory  
Measurement Report

Work Order:	303066845	Mfr.	KEITHLEY	Technician	MSY
Asset No.	001438	Model	614	Cal Date.	01-Dec-05
Serial No.	467374	Type.	Electrometer		
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/-Test Limits	+/-Uncertainty	Found
Zero	mVolts	mVolts	mVolts	mVolts	mVolts	Results
	0.00000	0.00000	0.00000	0.00001	0.0000012	Pass
DCV	Volts	Volts	Volts	Volts	Volts	
0.2 V	0.19000	0.19000	0.00000	0.00017	0.000022	Pass
0.1 V	0.10000	0.10001	0.00001	0.00010	0.000022	Pass
2 Volt	1.9000	1.8998	-0.0002	0.0016	0.00012	Pass
	1.0000	1.0000	0.0000	0.0009	0.00012	Pass
20 Volt	19.000	18.998	-0.002	0.016	0.0012	Pass
	10.000	10.000	0.000	0.009	0.0012	Pass
DC Amps	uAmps	uAmps	uAmps	uAmps	uAmps	
20 uAmp	19.00	19.00	0.00	0.08	0.014	Pass
	nAmps	nAmps	nAmps	nAmps	nAmps	
200 nAmp	190.0	190.0	0.0	1.1	0.12	Pass
	pAmps	pAmps	pAmps	pAmps	pAmps	
2000 pAmp	1900	1886	-14	29	0.12	Pass
Resistance	kOhm	kOhm	kOhm	kOhm	kOhm	
20 kOhm	19.00	18.90	-0.10	0.11	0.012	Pass
200 kOhm	190.0	189.0	-1.0	1.1	0.12	Pass
	MOhm	MOhm	MOhm	MOhm	MOhm	
20 MOhm	10.00	9.98	-0.02	0.10	0.012	Pass
	GOhm	GOhm	GOhm	GOhm	GOhm	
20 GOhm	10.00	9.98	-0.02	0.02	0.014	Pass
Charge Calibration	nC	nC	nC	nC	nC	
2 n Coulomb	1.0000	0.0000	-1.0000	0.0500	0.00012	Fail

END OF REPORT



# SOUTHWEST RESEARCH INSTITUTE®

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



## Certificate of Calibration

0972-01

**Submitted By:** DIV20  
**Address:** B57  
**Contact:** DON BANNON  
**Manufacturer Model:** KEITHLEY 614  
**Description:** ELECTROMETER  
**Serial No:** 467374  
**Asset No:** 001438  
**Procedure:** CL-741, APR/03

**Work Order:** 303066845  
**Date Issued:** Jan 12, 2006  
**Calibration Date:** Jan 12, 2006  
**\*Calibration Due:** Jan 12, 2007  
**Calibration Location:** Bldg. 64  
**Environment:** Temp. 72.0°F Hum. 38 %RH  
**\*\*Data Type:** AS-LEFT

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, ANSI/NCCL 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 client 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:** nC function not Cal'd

### Standards Used

Asset No.	Serial No.	Manufacturer	Model	Description	Cal Due
000101	86052	BIDDLE	72-5346-1	DECADE RESISTOR	Jan 05, 07
000182	5200003	FLUKE	5700A/EP	CALIBRATOR	Mar 17, 06
000185	26851	GENERAL RADIO	1433G	DECADE RESISTOR	Mar 01, 07

Reviewed by: blt ( ) jrg ( ) pwc ( ) wgh ( )

Metrology Technician

m:\a2la1.rpt Rev date August 15, 2005

Measurements by: Mike Young

Metrology Technician

Southwest Research Institute  
Calibration Laboratory  
Measurement Report

Work Order:	303066845	Mfr.	KEITHLEY	Technician	MSY
Asset No.	001438	Model	614	Cal Date.	12-Jan-06
Serial No.	467374	Type.	Electrometer		
Remarks: nC function not Cal'd					

Function/Range	Test Point	TI Reading	Difference	+/-Test Limits	+/-Uncertainty	Left
Zero	mVolts	mVolts	mVolts	mVolts	mVolts	Results
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END OF REPORT