

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

NONCONFORMANCE REPORT

Project No. 20-01402-571

NCR No. 2000-06

PART 1: DESCRIPTION OF NONCONFORMANCE

Keithley Electrometer model 6517 SN 599913 (Asset number 004313) was found to be out of tolerance in the 2 V range.

Initiated by: Durrell Dunn

Date: 6/13/2000

Action Required by: Durrell Dunn

PART 2: PROPOSED DISPOSITION AND CORRECTIVE ACTION

Disposition:

Accept data obtained with this instrument as is. The electrometer is used to measure potential ± 0.001 V voltage measurements were out of tolerance by 0.00006 V on the 2 volt range

Basis of Disposition:

Measurements conducted on the 2 volt range are within the ± 0.001 V required by electrochemical tests performed at the CNWRA

Action to Correct Nonconformance:

Multiple problems with this electrometer have been documented in previous NCRs. The electrometer was replaced by Keithley. The new electrometer, SN 735984 (asset number 007670) was received in tolerance.

Target date for completion: 6/20/2000

Proposed by: Durrell Dunn

Date: 6/14/2000

PART 3: APPROVAL

Element Manager: Jim G. Smith

NS Date: 6/14/00

Director of QA: Durrell Dunn

Date: 6/15/2000

Comments/Instructions:

NOTE: D. Dunn stated that he contacted Keithley and discussed the previous nonconformance reports with this instrument and action was taken by the company. Done 6/14/2000

PART 4: CLOSE OUT

Comments:

No other activity/actions are required.

Verified by: M. Ehrstrom

Date: 6/15/2000

Distribution: orig to QA Records

~~D. Dunn~~

M. Ehrstrom

V. Jari

Element managers

S. Brossin

B. Sugar

H. Garcia

B. Masarik

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

Received by RCRUZ, 5/9/02 9:18:19AM



Arrived 5/9/02

Work Order **444048469**

Asset No. 007670 Manufacturer KEITHLEY

Model 6517A

Equipment Type ELECTROMETER

Serial No. 0735984

Accessory No.

Interval 12 M

Calibration Procedure ROTHER

Location B57

Div/Client DIV20

Custodian DARRELL DUNN

Mail Stop B57

Tel 6090

IN LINE

Special Instructions _____

Notify before adjustments or repairs. () Provide data with certificate (✓) Certificate Typ. _____

Charge/Project No. 00751.006 1.20

Requester / Telephone _____

This information is correct for the work requested.

Darrell Dunn

WORK NOTES

Date	Hours	Remarks/Notes
5/10/02		Cal. Send to Rother ST# 399484
6-27-02		Rother will fax quote from OEM.
8-1-02		Repair & Cal. - mpt. std. Cal. #51602
8-12-02		Repair & Cal. # 51602 approved by D. Perrin

Date	Hours	Part Name	Part Number	Failure Description	Cost
			ROTHER (210) 648-3131 ISO 9002		
			INST NO. 30280		

WORK SUMMARY

Failure Description ~6

Repair Action _____

Tech Rother Cal Hrs. _____ Repair Hrs. _____ Parts Cost _____ Temp 72 F Hum. 30 %

Standards Used Vendor

Date Picked Up 10/5/02

Picked Up By B. Dunn



Rothe Development, Inc.

METROLOGY SERVICES DIVISION

TRACEABLE TO NIST

4614 Sinclair Road

(210)648-3131

San Antonio, Texas 78222

Fax (210)648-4091

CHARGE # 107

CONTROL # CS103 - 30280

WORK ORDER # 002019828

RECEIVED FROM: Southwest Research Institute
(30)
ADDRESS: 6220 Culebra
San Antonio, TX 78284

DATE: 5/13/2002
PHONE # 522-5470
FAX # 522-3692

MFG: Keithley
MODEL: 6517A
NOMEN: ELECTROMETER /HI
S/N: 0735984
CUST ID: 7670
ACCESS
RCVD: Cable

CONTACT NAME: Mr. RALPH CRUZ
PURCHASE ORDER #: 01571R/ST399484/1.20 00760.000

CUSTOMER COMMENTS/REQUIREMENTS: N/T SEE CUST REQ LOG FOR PO INFO
CONTACT RALPH 522-5215 IF REPAIR IS NEEDED

OUR PO: 031405

DATA: BEFORE & AFTER DATA REQUIRED

RECEIVED:

(X) IN TOLERANCE
() OUT OF TOLERANCE
() INOPERATIVE

RETURNED:

(X) IN TOLERANCE
() LIMITED CALIBRATION
() REPAIR ONLY
() NO ACTION DATA 6

CALIBRATION INTERVAL: 12 Mo.

CAL DATE: 23 Sep 02
DUE DATE: 23 Sep 03

CAL'D AT:
(X) RDMSD
() ON-SITE
() SUB

ENVIRONMENTAL
CONDITIONS:

72 °F
38 %RH

SPECIFICATIONS:

(X) MFG
() RDMSD
() OTHER:

PROCEDURE:

(X) MFG
() RDMSD
() OTHER:

RDMSD
TECH:

PJS

SERVICE
CODE:

G

FAULT/SYMPTOM:

ISO 9002

WORK PERFORMED:

Cal Data Taken - unit within tolerance but
close to spec limit. Sent to MFG for cal.
Could unit when returned.

TR#s:

20, 258, 231, 235, 75

REGISTERED TO ISO 9002
CERTIFICATE NO. A9428

LIMITED CALIBRATION:

COMMENTS:

CKT REF	QTY	PART #	DESCRIPTION	COST	REPAIR LABOR HOURS: _____
		Factory Service		516.00	
THIS IS NOT AN INVOICE					PARTS TOTAL
					REPAIR LABOR /mfg 516.00
					SHIPPING
					TEAR DOWN
					CHARGE
					CALIBRATION 176.00
					TAX
					TOTAL 692.00

SHIP VIA:

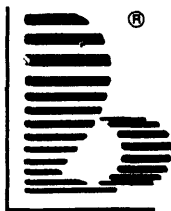
DATE:

RDMSD 2002
08/97

RCVD BY

(SIGNED):

(PRINTED):



CERT. NUMBER:
30280:1032797480

ROTHE DEVELOPMENT, INC.

METROLOGY SERVICES DIVISION

4614 SINCLAIR RD., SAN ANTONIO, TEXAS 78222 PH:210-648-3131

CERTIFICATE OF CALIBRATION

ISSUED TO: Southwest Research Institute MFG: Keithley
(30) MODEL: 6517A CAL DATE: 9/23/2002
6220 Culebra NOMEN: ELECTROMETER /HI RE DUE DATE: 9/23/2003
San Antonio, TX 78284 S/N: 0735984
CUST. ID: 7670

CONTROL NO.: 103 - 30280
TECHNICIAN: 4
SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER: 002019828
CUSTOMER P.O.: 01571R/ST399484/1.20 007
RECEIVED CONDITION: IN TOLERANCE
RETURNED CONDITION: IN TOLERANCE

CALIBRATION PERFORMED AT: RDMSD
CALIBRATION INTERVAL: 12Mo.
TEMPERATURE: 72.0 °F
RELATIVE HUMIDITY: 38 %

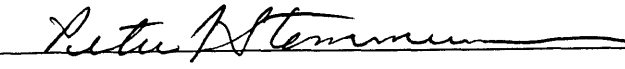
DATE RECEIVED: 5/13/2002

COMMENTS:

ATTACHMENTS: CALIBRATION DATA 6 SHEETS

All Calibrations performed at Rothe Development, Inc. Metrology Services Division meet the requirements of ANSI/NCSL Z540-1-1994, ISO/IEC GUIDE 25, and ISO 10012-1, and are traceable to the National Institute of Standards and Technology. The collective uncertainty of the measurement(s) does not exceed 25% (TUR $\geq$ 4:1) of the instrument specification(s) unless noted in the COMMENTS section.

TR#	MFG	MODEL	SERIAL NO.	DUE DATE
20	FLUKE	5700A/EP	4605002	9/27/2002
258	FLUKE	5725A	6585002	9/27/2002
231	HP	34401A	3146A45255	1/4/2003
235	GUILDLINE	6500A	59660	11/14/2002
75	JRL	NMN	75	1/9/2003

APPROVED BY: 

☒ CMS

☐ QCO

DATE

9/24/2002

RDMSD 1001
03/01

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ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517A ELECTROMETER

CUSTOMER: SWRI
 WO NUMBER: 002019828
 SERIAL: 0735984
 CUST ID: 7670

DATE: 4 Jan 02
 TECH: PJS
 INST NO: 30280

CALIBRATION DATA TAKEN

INCOMING ✓
 OUTGOING

CONDITION OF EQUIPMENT

IN TOLERANCE ✓
 OUT OF TOLERANCE

DC VOLTAGE ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 V	+1.9 V	1.89949	<u>1.89962</u>	1.90052
	-1.9 V	1.89949	<u>1.89963</u>	1.90052
20 V	+19 V	18.9950	<u>18.9994</u>	19.0050
	-19 V	18.9950	<u>18.9995</u>	19.0050
200 V	+190 V	189.883	<u>189.983</u>	190.117
	-190 V	189.883	<u>189.983</u>	190.117

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>18.9662</u>	19.1930
200 pA	190 pA	188.095	<u>189.790</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.90026</u>	1.90410
20 nA	19 nA	18.9615	<u>19.0086</u>	19.0385
200 nA	190 nA	189.615	<u>189.938</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.90026</u>	1.90200
20 uA	19 uA	18.9805	<u>19.0016</u>	19.0195
200 uA	190 uA	189.805	<u>189.971</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.89993</u>	1.90200
20 mA	19 mA	18.9805	<u>18.9965</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.89881</u>	1.90765
20 nC	19 nC	18.9235	<u>18.9686</u>	19.0765
200 nC	190 nC	189.235	<u>190.108</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90399</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING	TUR
		>1.00000	<.999999		
2 M Ω	<u>1.00000 m</u>	± 126 C	± 1260 C	<u>1.00014</u>	3.60
20 M Ω	<u>10.0001 m</u>	± 126 C	± 1260 C	<u>9.99962</u>	
200 M Ω	<u>100.226 m</u>	± 151 C	± 1510 C	<u>100.165</u>	
2 G Ω	<u>1.00190 G</u>	± 226 C	± 2260 C	<u>1.00227</u>	3.23
20 G Ω	<u>9.97340 G</u>	± 226 C	± 2260 C	<u>9.96912</u>	
200 G Ω	<u>98.800 G</u>	± 351 C	± 3510 C	<u>98.6490</u>	
2 T Ω	<u>.99439 T</u>	± 351 C	± 3510 C	<u>.995120</u>	1.76

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
± 100 V	0.000 V	-0.01	<u>0.0026</u>	0.01
	+25.000 V	24.9525	<u>24.9948</u>	25.0475
	+50.000 V	49.915	<u>49.9962</u>	50.085
	+75.000 V	74.8775	<u>74.9961</u>	75.1225
	+100.000 V	99.840	<u>99.9980</u>	100.160
	-25.000 V	24.9525	<u>25.0005</u>	25.0475
	-50.000 V	49.915	<u>49.9982</u>	50.085
	-75.000 V	74.8775	<u>75.0007</u>	75.1225
	-100.000 V	99.840	<u>99.9983</u>	100.160
± 1000 V	+250.00 V	249.525	<u>249.967</u>	250.475
	+500.00 V	499.150	<u>499.944</u>	500.850
	+750.00 V	748.775	<u>749.961</u>	751.225
	+1000.00 V	998.40	<u>999.973</u>	1001.60
	-250.00 V	249.525	<u>249.987</u>	250.475
	-500.00 V	499.150	<u>499.986</u>	500.850
	-750.00 V	748.775	<u>749.995</u>	751.225
	-1000.00 V	998.40	<u>999.963</u>	1001.60

INST NO: 30280

2 OF 3

DOC. DATE: 6/4/2002

☒ INCOMING
☐ OUTGOING

TEMPERATURE AND HUMIDITY TURN ON = MENU / GENERAL / A/D CONTROLS /
DATE-STAMP / ^ OR v

TEMPERATURE ACCURACY

TEMP	MIN	READING	MAX
-25° C	-23.4	<u>-24.2</u>	-26.6
0° C	-1.5	<u>0.8</u>	+1.5
50° C	48.3	<u>50.6</u>	51.7
100° C	98.2	<u>100.6</u>	101.8
150° C	148.0	<u>150.7</u>	152.0

HUMIDITY ACCURACY

VOLTAGE INPUT	MIN	READING	MAX
0.000 V	0	<u>0</u>	1 %
0.250 V	24	<u>25</u>	26
0.500 V	49	<u>50</u>	51
0.750 V	74	<u>75</u>	76
1.000 V	99	<u>100</u>	101

INST NO: 30280

DOC. DATE: 6/4/2002

3 OF 3

✓ INCOMING
OUTGOING

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517A ELECTROMETER

CUSTOMER: SWIRI
 WO NUMBER: 002019828
 SERIAL: 0735984
 CUST ID: 7670

DATE: 23 Sep 02
 TECH: PJS
 INST NO: 30280

CALIBRATION DATA TAKEN

INCOMING _____
 OUTGOING ✓

CONDITION OF EQUIPMENT

IN TOLERANCE ✓
 OUT OF TOLERANCE _____

DC VOLTAGE ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 V	+1.9 V	1.89949	<u>1.89983</u>	1.90052
	-1.9 V	1.89949	<u>1.89983</u>	1.90052
20 V	+19 V	18.9950	<u>18.9995</u>	19.0050
	-19 V	18.9950	<u>18.9995</u>	19.0050
200 V	+190 V	189.883	<u>189.988</u>	190.117
	-190 V	189.883	<u>189.987</u>	190.117

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>19.0012</u>	19.1930
200 pA	190 pA	188.095	<u>189.985</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.89986</u>	1.90410
20 nA	19 nA	18.9615	<u>19.0032</u>	19.0385
200 nA	190 nA	189.615	<u>189.962</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.89990</u>	1.90200
20 uA	19 uA	18.9805	<u>18.9996</u>	19.0195
200 uA	190 uA	189.805	<u>190.003</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.89990</u>	1.90200
20 mA	19 mA	18.9805	<u>18.9995</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.89992</u>	1.90765
20 nC	19 nC	18.9235	<u>18.9991</u>	19.0765
200 nC	190 nC	189.235	<u>190.198</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90525</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING	TUR
		>1.00000	<.999999		
2 MΩ	<u>1.00000m</u>	±126 C	±1260 C	<u>999.950 KΩ</u>	
20 MΩ	<u>10.0001m</u>	±126 C	±1260 C	<u>9.99951 MΩ</u>	3.60
200 MΩ	<u>100.224m</u>	±151 C	±1510 C	<u>100.150 MΩ</u>	
2 GΩ	<u>1.00190G</u>	±226 C	±2260 C	<u>1.00226 GΩ</u>	
20 GΩ	<u>9.9760G</u>	±226 C	±2260 C	<u>9.97345 GΩ</u>	3.23
200 GΩ	<u>98.880G</u>	±351 C	±3510 C	<u>98.6917 GΩ</u>	3.51
2 TΩ	<u>.99431T</u>	±351 C	±3510 C	<u>994.376 GΩ</u>	1.76

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
±100 V	0.000 V	-0.01	<u>0.000</u>	0.01
	+25.000 V	24.9525	<u>24.9971</u>	25.0475
	+50.000 V	49.915	<u>49.998</u>	50.085
	+75.000 V	74.8775	<u>75.0004</u>	75.1225
	+100.000 V	99.840	<u>99.999</u>	100.160
	-25.000 V	24.9525	<u>24.9973</u>	25.0475
	-50.000 V	49.915	<u>49.998</u>	50.085
	-75.000 V	74.8775	<u>74.9964</u>	75.1225
	-100.000 V	99.840	<u>99.997</u>	100.160
±1000 V	+250.00 V	249.525	<u>249.989</u>	250.475
	+500.00 V	499.150	<u>499.990</u>	500.850
	+750.00 V	748.775	<u>750.001</u>	751.225
	+1000.00 V	998.40	<u>1000.003</u>	1001.60
	-250.00 V	249.525	<u>249.984</u>	250.475
	-500.00 V	499.150	<u>499.978</u>	500.850
	-750.00 V	748.775	<u>749.976</u>	751.225
	-1000.00 V	998.40	<u>999.970</u>	1001.60

INST NO: 30280

2 OF 3

DOC. DATE: 6/4/2002

INCOMING
☒ OUTGOING

TEMPERATURE AND HUMIDITY TURN ON = MENU / GENERAL / A/D CONTROLS /
DATE-STAMP / ^ OR v

TEMPERATURE ACCURACY

TEMP	MIN	READING	MAX
-25° C	-23.4	<u>24.4</u>	-26.6
0° C	-1.5	<u>0.6</u>	+1.5
50° C	48.3	<u>50.4</u>	51.7
100° C	98.2	<u>100.2</u>	101.8
150° C	148.0	<u>150.2</u>	152.0

HUMIDITY ACCURACY

VOLTAGE INPUT	MIN	READING	MAX
0.000 V	0	<u>0</u>	1 %
0.250 V	24	<u>25</u>	26
0.500 V	49	<u>50</u>	51
0.750 V	74	<u>75</u>	76
1.000 V	99	<u>100</u>	101

INST NO: 30280

DOC. DATE: 6/4/2002

3 OF 3

✓ INCOMING
OUTGOING

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517A ELECTROMETER

CUSTOMER: SWRI
 WO NUMBER: 002019828
 SERIAL: 0735984
 CUST ID: 7670

DATE: 4 Jan 02
 TECH: PJS
 INST NO: 30280

CALIBRATION DATA TAKEN

INCOMING ✓
 OUTGOING

CONDITION OF EQUIPMENT

IN TOLERANCE ✓
 OUT OF TOLERANCE

DC VOLTAGE ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 V	+1.9 V	1.89949	<u>1.89962</u>	1.90052
	-1.9 V	1.89949	<u>1.89963</u>	1.90052
20 V	+19 V	18.9950	<u>18.9994</u>	19.0050
	-19 V	18.9950	<u>18.9995</u>	19.0050
200 V	+190 V	189.883	<u>189.983</u>	190.117
	-190 V	189.883	<u>189.983</u>	190.117

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>18.9662</u>	19.1930
200 pA	190 pA	188.095	<u>189.790</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.90026</u>	1.90410
20 nA	19 nA	18.9615	<u>19.0086</u>	19.0385
200 nA	190 nA	189.615	<u>189.938</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.90026</u>	1.90200
20 uA	19 uA	18.9805	<u>19.0016</u>	19.0195
200 uA	190 uA	189.805	<u>189.971</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.89993</u>	1.90200
20 mA	19 mA	18.9805	<u>18.9965</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.89881</u>	1.90765
20 nC	19 nC	18.9235	<u>18.9686</u>	19.0765
200 nC	190 nC	189.235	<u>190.108</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90399</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING	TUR
		>1.00000	<.999999		
2 M Ω	<u>1.00000 M</u>	± 126 C	± 1260 C	<u>1.00014</u>	3.60
20 M Ω	<u>10.0001 M</u>	± 126 C	± 1260 C	<u>9.99962</u>	
200 M Ω	<u>100.226 M</u>	± 151 C	± 1510 C	<u>100.165</u>	
2 G Ω	<u>1.00190 G</u>	± 226 C	± 2260 C	<u>1.00227</u>	3.23
20 G Ω	<u>9.97340 G</u>	± 226 C	± 2260 C	<u>9.96912</u>	
200 G Ω	<u>98.800 G</u>	± 351 C	± 3510 C	<u>98.6490</u>	
2 T Ω	<u>.99439 T</u>	± 351 C	± 3510 C	<u>.995120</u>	1.76

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
± 100 V	0.000 V	-0.01	<u>0.0026</u>	0.01
	+25.000 V	24.9525	<u>24.9948</u>	25.0475
	+50.000 V	49.915	<u>49.9962</u>	50.085
	+75.000 V	74.8775	<u>74.9961</u>	75.1225
	+100.000 V	99.840	<u>99.9980</u>	100.160
	-25.000 V	24.9525	<u>25.0005</u>	25.0475
	-50.000 V	49.915	<u>49.9982</u>	50.085
	-75.000 V	74.8775	<u>75.0007</u>	75.1225
	-100.000 V	99.840	<u>99.9983</u>	100.160
± 1000 V	+250.00 V	249.525	<u>249.967</u>	250.475
	+500.00 V	499.150	<u>499.944</u>	500.850
	+750.00 V	748.775	<u>749.961</u>	751.225
	+1000.00 V	998.40	<u>999.973</u>	1001.60
	-250.00 V	249.525	<u>249.987</u>	250.475
	-500.00 V	499.150	<u>499.986</u>	500.850
	-750.00 V	748.775	<u>749.995</u>	751.225
	-1000.00 V	998.40	<u>999.963</u>	1001.60

INST NO: 30280

DOC. DATE: 6/4/2002

2 OF 3

☒ INCOMING
☐ OUTGOING

TEMPERATURE AND HUMIDITY TURN ON = MENU / GENERAL / A/D CONTROLS /
DATE-STAMP / ^ OR v

TEMPERATURE ACCURACY

TEMP	MIN	READING	MAX
-25° C	-23.4	<u>-24.2</u>	-26.6
0° C	-1.5	<u>0.8</u>	+1.5
50° C	48.3	<u>50.6</u>	51.7
100° C	98.2	<u>100.6</u>	101.8
150° C	148.0	<u>150.7</u>	152.0

HUMIDITY ACCURACY

VOLTAGE INPUT	MIN	READING	MAX
0.000 V	0	<u>0</u>	1 %
0.250 V	24	<u>25</u>	26
0.500 V	49	<u>50</u>	51
0.750 V	74	<u>75</u>	76
1.000 V	99	<u>100</u>	101

INST NO: 30280

DOC.DATE: 6/4/2002

3 OF 3

☒ INCOMING
☐ OUTGOING

**SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM**

October 2, 2002

To: DARRELL DUNN DIV20 B57

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: KEITHLEY 6517A

Description: ELECTROMETER

Serial Number: 0735984

Asset Number: 007670

Work Order Number: 444048469

Date Calibrated: October 2, 2002

Supplier: ROTHE DEVELOPMENT, INC., SAN ANTONIO, TX

Remarks: Rothe Cert # 30280:1032797480

☒ Supplier is on the Approved Suppliers List (ASL).

☐ Supplier is not on the Approved Suppliers List.

☐ Calibration is ISO 17025 accredited.

☒ Calibration is not ISO 17025 accredited.

☐ There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 7

**SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM**

October 2, 2002

To: DARRELL DUNN DIV20 B57

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory



Subject: Status of Calibration Supplier

Manufacturer/Model: KEITHLEY 6517A

Description: ELECTROMETER

Serial Number: 0735984

Asset Number: 007670

Work Order Number: 444048469

Date Calibrated: October 2, 2002

Supplier: ROTHE DEVELOPMENT, INC., SAN ANTONIO, TX

Remarks: Rothe Cert # 30280:1032797480

☒ Supplier is on the Approved Suppliers List (ASL).

☐ Supplier is not on the Approved Suppliers List.

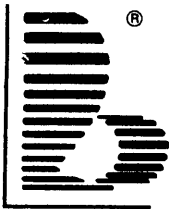
☐ Calibration is ISO 17025 accredited.

☒ Calibration is not ISO 17025 accredited.

☐ There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 7



CERT. NUMBER:
30280:1032797480

ROTHE DEVELOPMENT, INC.

METROLOGY SERVICES DIVISION

4614 SINCLAIR RD., SAN ANTONIO, TEXAS 78222 PH:210-648-3131

CERTIFICATE OF CALIBRATION

ISSUED TO: Southwest Research Institute MFG: Keithley
(30) MODEL: 6517A CAL DATE: 9/23/2002
6220 Culebra NOMEN: ELECTROMETER /HI RE DUE DATE: 9/23/2003
San Antonio, TX 78284 S/N: 0735984
CUST. ID: 7670

CONTROL NO.: 103 - 30280
TECHNICIAN: 4
SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER: 002019828
CUSTOMER P.O.: 01571R/ST399484/1.20 007
RECEIVED CONDITION: IN TOLERANCE
RETURNED CONDITION: IN TOLERANCE

CALIBRATION PERFORMED AT: RDMSD
CALIBRATION INTERVAL: 12Mo.
TEMPERATURE: 72.0 °F
RELATIVE HUMIDITY: 38 %

DATE RECEIVED: 5/13/2002

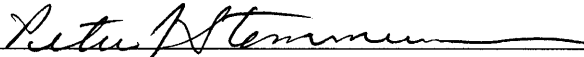
COMMENTS:

ATTACHMENTS: CALIBRATION DATA 6 SHEETS

All Calibrations performed at Rothe Development, Inc. Metrology Services Division meet the requirements of ANSI/NCSL Z540-1-1994, ISO/IEC GUIDE 25, and ISO 10012-1, and are traceable to the National Institute of Standards and Technology. The collective uncertainty of the measurement(s) does not exceed 25% (TUR $\geq$ 4:1) of the instrument specification(s) unless noted in the COMMENTS section.

TR#	MFG	MODEL	SERIAL NO.	DUE DATE
20	FLUKE	5700A/EP	4605002	9/27/2002
258	FLUKE	5725A	6585002	9/27/2002
231	HP	34401A	3146A45255	1/4/2003
235	GUILDLINE	6500A	59660	11/14/2002
75	JRL	NMN	75	1/9/2003

REGISTERED TO ISO 9002
CERTIFICATE NO. 103280

APPROVED BY: 

☒ CMS

☐ QCO

DATE

9/24/2002

RDMSD 1001
03/01

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1 OF 1

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517A ELECTROMETER

CUSTOMER: SWRT
 WO NUMBER: 002019828
 SERIAL: 0735984
 CUST ID: 7670

DATE: 23 Sep 02
 TECH: PJS
 INST NO: 30280

CALIBRATION DATA TAKEN

INCOMING _____
 OUTGOING ✓

CONDITION OF EQUIPMENT

IN TOLERANCE ✓
 OUT OF TOLERANCE _____

DC VOLTAGE ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 V	+1.9 V	1.89949	<u>1.89983</u>	1.90052
	-1.9 V	1.89949	<u>1.89983</u>	1.90052
20 V	+19 V	18.9950	<u>18.9995</u>	19.0050
	-19 V	18.9950	<u>18.9995</u>	19.0050
200 V	+190 V	189.883	<u>189.988</u>	190.117
	-190 V	189.883	<u>189.987</u>	190.117

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>19.0012</u>	19.1930
200 pA	190 pA	188.095	<u>189.985</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.89986</u>	1.90410
20 nA	19 nA	18.9615	<u>19.0032</u>	19.0385
200 nA	190 nA	189.615	<u>189.962</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.89990</u>	1.90200
20 uA	19 uA	18.9805	<u>18.9996</u>	19.0195
200 uA	190 uA	189.805	<u>190.003</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.89990</u>	1.90200
20 mA	19 mA	18.9805	<u>18.9995</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.89992</u>	1.90765
20 nC	19 nC	18.9235	<u>18.9991</u>	19.0765
200 nC	190 nC	189.235	<u>190.198</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90525</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING	TUR
		>1.00000	<.999999		
2 MΩ	<u>1.00000m</u>	±126 C	±1260 C	<u>999.950 KΩ</u>	
20 MΩ	<u>10.0001m</u>	±126 C	±1260 C	<u>9.99951 MΩ</u>	3.60
200 MΩ	<u>100.224m</u>	±151 C	±1510 C	<u>100.150 MΩ</u>	
2 GΩ	<u>1.00190G</u>	±226 C	±2260 C	<u>1.00226 GΩ</u>	
20 GΩ	<u>9.9760G</u>	±226 C	±2260 C	<u>9.97345 GΩ</u>	3.23
200 GΩ	<u>98.880G</u>	±351 C	±3510 C	<u>98.6917 GΩ</u>	3.51
2 TΩ	<u>.99431T</u>	±351 C	±3510 C	<u>994.376 GΩ</u>	1.76

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
±100 V	0.000 V	-0.01	<u>0.000</u>	0.01
	+25.000 V	24.9525	<u>24.9971</u>	25.0475
	+50.000 V	49.915	<u>49.998</u>	50.085
	+75.000 V	74.8775	<u>75.0004</u>	75.1225
	+100.000 V	99.840	<u>99.999</u>	100.160
	-25.000 V	24.9525	<u>24.9973</u>	25.0475
	-50.000 V	49.915	<u>49.998</u>	50.085
	-75.000 V	74.8775	<u>74.9964</u>	75.1225
	-100.000 V	99.840	<u>99.997</u>	100.160
±1000 V	+250.00 V	249.525	<u>249.989</u>	250.475
	+500.00 V	499.150	<u>499.990</u>	500.850
	+750.00 V	748.775	<u>750.001</u>	751.225
	+1000.00 V	998.40	<u>1000.003</u>	1001.60
	-250.00 V	249.525	<u>249.984</u>	250.475
	-500.00 V	499.150	<u>499.978</u>	500.850
	-750.00 V	748.775	<u>749.976</u>	751.225
	-1000.00 V	998.40	<u>999.970</u>	1001.60

INST NO: 30280

DOC.DATE: 6/4/2002

2 OF 3

☐ INCOMING
☒ OUTGOING

TEMPERATURE AND HUMIDITY TURN ON = MENU / GENERAL / A/D CONTROLS /
DATE-STAMP / ^ OR v

TEMPERATURE ACCURACY

TEMP	MIN	READING	MAX
-25° C	-23.4	<u>24.4</u>	-26.6
0° C	-1.5	<u>0.6</u>	+1.5
50° C	48.3	<u>50.4</u>	51.7
100° C	98.2	<u>100.2</u>	101.8
150° C	148.0	<u>150.2</u>	152.0

HUMIDITY ACCURACY

VOLTAGE INPUT	MIN	READING	MAX
0.000 V	0	<u>0</u>	1 %
0.250 V	24	<u>25</u>	26
0.500 V	49	<u>50</u>	51
0.750 V	74	<u>75</u>	76
1.000 V	99	<u>100</u>	101

INST NO: 30280

DOC. DATE: 6/4/2002

3 OF 3

✓ INCOMING
OUTGOING

**SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM**

May 14, 2004

To: DARRELL DUNN DIV20 B57

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory



Subject: Status of Calibration Supplier

Manufacturer/Model: KEITHLEY 6517A

Description: ELECTROMETER

Serial Number: 0735984

Asset Number: 007670

Work Order Number: 444055341

Date Calibrated: May 8, 2004

Supplier: ROTHE DEVELOPMENT, SAN ANTONIO TX - AUDIT - 648-3131

Remarks: Rothe Cert. #30280: 1084022032

☒ Supplier is on the Approved Suppliers List (ASL).

☐ Supplier is not on the Approved Suppliers List.

☐ Calibration is ISO 17025 accredited.

☒ Calibration is not ISO 17025 accredited.

☐ There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 7



Rothe Development, Inc.

METROLOGY SERVICES DIVISION

4614 SINCLAIR RD., SAN ANTONIO, TEXAS 78222 PH:210-648-3131

CERTIFICATE OF CALIBRATION

ISSUED TO: Southwest Research Institute (30)

6220 Culebra
San Antonio, TX 78284

MFG: Keithley

MODEL: 6517A

NOMEN: ELECTROMETER /HI RES

S/N: 0735984

CUST. ID: 7670

CAL DATE: 5/8/04

DUE DATE:

CONTROL NO: 103 - 30280

TECHNICIAN: 4

SPECIFICATIONS: MFG

PROCEDURE: MFG

WORK ORDER: 002032069

CUSTOMER P.O.: 01571R/ST417997/1.20.00755.000

RECEIVED CONDITION: OUT OF TOLERANCE

RETURNED CONDITION: IN TOLERANCE

COMMENTS: TUR ON RESISTANCE SECTION- SEE DATA SHEET.

ATTACHMENTS: CALIBRATION DATA 6 SHEETS

CALIBRATION PERFORMED AT: RDMSD

CALIBRATION INTERVAL: 0

TEMPERATURE: 72.0°F

RELATIVE HUMIDITY: 35%

DATE RECEIVED: 9/15/03

All calibrations performed at Rothe Development, Inc. Metrology Services Division meet the requirements of ANSI / NCSL Z540-1-1994, ANSI / ISO / IEC 17025, ISO / IEC GUIDE 25, and ISO 10012-1, and are traceable to the National Institute of Standards and Technology. The collective uncertainty of the measurement(s) does not exceed 25% (TUR ≥ 4:1) of the instrument specification(s) unless noted in the COMMENTS section.

TR#	MFG	MODEL	SERIAL NO.	DUE DATE
20	FLUKE	5700A/EP	4605002	7/12/2004
258	FLUKE	5725A	6585002	7/12/2004
100	FLUKE	5500A	6320016	10/17/2004
231	HP	34401A	3146A45255	7/15/2004
235	GUILDLINE	6500A	59660	1/22/2005
186	GEN RAD	1689	7241583008	10/13/2004

APPROVED BY:

Peter J. Stumm

☒ CMS

☐ QCO

DATE: 5/11/04

RDMSD 1001
11/03

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1 OF 1

CALIBRATION DATA: KEITHLEY MODEL 6517A ELECTROMETER

DATE: 17 Sep 03
TECH: Ruby J. Thomas
INST NO: 30280

INCOMING ✓
OUTGOING

IN TOLERANCE _____
OUT OF TOLERANCE ✓

RANGE	INPUT	MIN	READING	MAX
2 V	+1.9 V	1.89949	<u>1.89997</u>	1.90052
	-1.9 V	1.89949	<u>1.89996</u>	1.90052
20 V	+19 V	18.9950	<u>18.9976</u>	19.0050
	-19 V	18.9950	<u>18.9973</u>	19.0050
200 V	+190 V	189.883	<u>189.937</u>	190.117
	-190 V	189.883	<u>189.933</u>	190.117

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	inop	19.1930
200 pA	190 pA	188.095		191.905
2 nA	1.9 nA	1.89590		1.90410
20 nA	19 nA	18.9615		19.0385
200 nA	190 nA	189.615		190.385
2 uA	1.9 uA	1.89800		1.90200
20 uA	19 uA	18.9805		19.0195
200 uA	190 uA	189.805		190.195
2 mA	1.9 mA	1.89800		1.90200
20 mA	19 mA	18.9805		19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX	
2 nC	1.9 nC	1.89235	<u>inop</u>	1.90765	✕
20 nC	19 nC	18.9235	<u>(</u>	19.0765	
200 nC	190 nC	189.235	<u>)</u>	190.765	
2 uC	1.9 uC	1.89235	<u>(</u>	1.90765	

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING	TUR	✕
		>1.00000	<.999999			
2 MΩ	<u> </u>	±126 C	±1260 C	<u>inop</u>	3.60	
20 MΩ	<u> </u>	±126 C	±1260 C	<u>(</u>		
200 MΩ	<u> </u>	±151 C	±1510 C	<u>)</u>		
2 GΩ	<u> </u>	±226 C	±2260 C	<u>(</u>	3.23	
20 GΩ	<u> </u>	±226 C	±2260 C	<u>)</u>		
200 GΩ	<u> </u>	±351 C	±3510 C	<u>(</u>	3.51	
2 TΩ	<u> </u>	±351 C	±3510 C	<u>)</u>	1.76	

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
±100 V	0.000 V	-0.01	<u>0.00</u>	0.01
	+25.000 V	24.9525	<u>24.9961</u>	25.0475
	+50.000 V	49.915	<u>49.9959</u>	50.085
	+75.000 V	74.8775	<u>74.9974</u>	75.1225
	+100.000 V	99.840	<u>99.9946</u>	100.160
	-25.000 V	24.9525	<u>24.9964</u>	25.0475
	-50.000 V	49.915	<u>49.9959</u>	50.085
	-75.000 V	74.8775	<u>74.9935</u>	75.1225
	-100.000 V	99.840	<u>99.9929</u>	100.160
±1000 V	+250.00 V	249.525	<u>249.977</u>	250.475
	+500.00 V	499.150	<u>499.965</u>	500.850
	+750.00 V	748.775	<u>749.966</u>	751.225
	+1000.00 V	998.40	<u>999.960</u>	1001.60
	-250.00 V	249.525	<u>249.974</u>	250.475
	-500.00 V	499.150	<u>499.957</u>	500.850
	-750.00 V	748.775	<u>749.948</u>	751.225
	-1000.00 V	998.40	<u>999.930</u>	1001.60

INST NO: 30280

2 OF 3

☒ INCOMING
☐ OUTGOING

DOC. DATE: 6/4/2002

TEMPERATURE AND HUMIDITY TURN ON = MENU / GENERAL / A/D CONTROLS /
DATE-STAMP / ^ OR v

TEMPERATURE ACCURACY

TEMP	MIN	READING	MAX
-25° C	-23.4	<u>24.5</u>	-26.6
0° C	-1.5	<u>0.5</u>	+1.5
50° C	48.3	<u>50.3</u>	51.7
100° C	98.2	<u>100.1</u>	101.8
150° C	148.0	<u>150.2</u>	152.0

HUMIDITY ACCURACY

VOLTAGE INPUT	MIN	READING	MAX
0.000 V	0	<u>0</u>	1 %
0.250 V	24	<u>25</u>	26
0.500 V	49	<u>50</u>	51
0.750 V	74	<u>75</u>	76
1.000 V	99	<u>100</u>	101

INST NO: 30280

DOC.DATE: 6/4/2002

3 OF 3

☒ INCOMING
☐ OUTGOING

CALIBRATION DATA: KEITHLEY MODEL 6517A ELECTROMETER

DATE: 8 May 04
TECH: Butyltin
INST NO: 30280

INCOMING _____
OUTGOING ✓

IN TOLERANCE ✓
OUT OF TOLERANCE

RANGE	INPUT	MIN	READING	MAX
2 V	+1.9 V	1.89949	<u>1.89982</u>	1.90052
	-1.9 V	1.89949	<u>1.89982</u>	1.90052
20 V	+19 V	18.9950	<u>19.0000</u>	19.0050
	-19 V	18.9950	<u>19.0000</u>	19.0050
200 V	+190 V	189.883	<u>190.001</u>	190.117
	-190 V	189.883	<u>190.000</u>	190.117

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>18.9923</u>	19.1930
200 pA	190 pA	188.095	<u>190.021</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.89950</u>	1.90410
20 nA	19 nA	18.9615	<u>18.9986</u>	19.0385
200 nA	190 nA	189.615	<u>190.031</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.89937</u>	1.90200
20 uA	19 uA	18.9805	<u>18.9993</u>	19.0195
200 uA	190 uA	189.805	<u>190.000</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.89930</u>	1.90200
20 mA	19 mA	18.9805	<u>18.9995</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.89830</u>	1.90765
20 nC	19 nC	18.9235	<u>18.9847</u>	19.0765
200 nC	190 nC	189.235	<u>189.803</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90609</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING	TUR
		>1.00000	<.999999		
2 M Ω	<u>1.00000 M</u>	± 126 C	± 1260 C	<u>1.00010</u>	3.60
20 M Ω	<u>10.0003 M</u>	± 126 C	± 1260 C	<u>10.0015</u>	
200 M Ω	<u>100.2212 M</u>	± 151 C	± 1510 C	<u>100.260</u>	
2 G Ω	<u>.995989 G</u>	± 226 C	± 2260 C	<u>.995872</u>	3.23
20 G Ω	<u>9.97774 G</u>	± 226 C	± 2260 C	<u>9.96958</u>	
200 G Ω	<u>98.8805 G</u>	± 351 C	± 3510 C	<u>98.7594</u>	
2 T Ω	<u>.994633 T</u>	± 351 C	± 3510 C	<u>.995342</u>	1.76

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
± 100 V	0.000 V	-0.01	<u>0.000</u>	0.01
	+25.000 V	24.9525	<u>24.9958</u>	25.0475
	+50.000 V	49.915	<u>49.9929</u>	50.085
	+75.000 V	74.8775	<u>74.9919</u>	75.1225
	+100.000 V	99.840	<u>99.9893</u>	100.160
	-25.000 V	24.9525	<u>24.9964</u>	25.0475
	-50.000 V	49.915	<u>49.9931</u>	50.085
	-75.000 V	74.8775	<u>74.9911</u>	75.1225
	-100.000 V	99.840	<u>99.9877</u>	100.160
± 1000 V	+250.00 V	249.525	<u>249.945</u>	250.475
	+500.00 V	499.150	<u>499.958</u>	500.850
	+750.00 V	748.775	<u>749.939</u>	751.225
	+1000.00 V	998.40	<u>999.891</u>	1001.60
	-250.00 V	249.525	<u>249.974</u>	250.475
	-500.00 V	499.150	<u>499.922</u>	500.850
	-750.00 V	748.775	<u>749.874</u>	751.225
	-1000.00 V	998.40	<u>999.866</u>	1001.60

INST NO: 30280

DOC. DATE: 6/4/2002

2 OF 3

☒ INCOMING
☐ OUTGOING

TEMPERATURE AND HUMIDITY TURN ON = MENU / GENERAL / A/D CONTROLS /
DATE-STAMP / ^ OR v

TEMPERATURE ACCURACY

TEMP	MIN	READING	MAX
-25° C	-23.4	<u>24.3</u>	-26.6
0° C	-1.5	<u>0.7</u>	+1.5
50° C	48.3	<u>50.5</u>	51.7
100° C	98.2	<u>100.3</u>	101.8
150° C	148.0	<u>150.2</u>	152.0

HUMIDITY ACCURACY

VOLTAGE INPUT	MIN	READING	MAX
0.000 V	0	<u>0</u>	1 %
0.250 V	24	<u>25</u>	26
0.500 V	49	<u>50</u>	51
0.750 V	74	<u>75</u>	76
1.000 V	99	<u>100</u>	101

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✓ INCOMING
OUTGOING