SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

September 27, 2006

To: DON BANNON DIV20 B57

From: Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: KEITHLEY 6517A

Description: ELECTROMETER

Serial Number: 0735984

Asset Number: 007670

Work Order Number: 303070651

Date Calibrated: September 3, 2006

Supplier: ROTHE DEVELOPMENT, SAN ANTONIO TX - AUDIT - 648-3

Remarks:

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

( ) Supplier is <u>not</u> on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

(✓) Calibration is <u>not</u> ISO 17025 accredited.

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

Please contact the Institute Calibration Laboratory, extension 5215, if you have any questions about the condition of this equipment or calibration documentation.

Attachment(s) 4

120 --- Q200610110010
Instrument calibration record for Keithley Electrometer, Model # 6517A, Serial # 0735984, Asset No.: 007670 (09/03/2006)

m:\nonasl2.rpt Rev Nov. 15, 2005

CERT. NUMBER: 30280:1157298263

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: ELECTOMETER /HI RES
S/N: 0735984
CUST. ID: 7670

CAL DATE: 9/3/06
DUE DATE:

CONTROL NO: 103 - 30280
TECHNICIAN: 4
SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER: 002053262
CUSTOMER P.O.: 01882R/ST446550/1.20.OHD20.131
RECEIVED CONDITION: IN TOLERANCE
RETURNED CONDITION: IN TOLERANCE

CALIBRATION PERFORMED AT: RDMSD
CALIBRATION INTERVAL: 0
TEMPERATURE: 73.0°F
RELATIVE HUMIDITY: 41%

DATE RECEIVED: 8/24/06

COMMENTS:

ATTACHMENTS: CALIBRATION DATA 3 SHEETS

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	11/2/2006
258	FLUKE	5725A	6585002	11/2/2006
235	GUILDLINE	6500A	59660	2/17/2007
30	HP	3458A	2823A01926	10/12/2006

APPROVED BY: Peter H Timmer ☑ CMS ☐ QCO **DATE:** 9/19/06

RDMSD 1001
11/03

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ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517A ELECTROMETER

CUSTOMER: SWRI
WO NUMBER: 0020053262
SERIAL: 0735984
CUST ID: 7670

DATE: 3 Sep 06
TECH: [illegible]
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	1.89964	1.90052
	-1.9 V	1.89949	1.89963	1.90052
20 V	+19 V	18.9950	18.9955	19.0050
	-19 V	18.9950	18.9954	19.0050
200 V	+190 V	189.883	189.924	190.117
	-190 V	189.883	189.922	190.117

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	19.0198	19.1930
200 pA	190 pA	188.095	190.154	191.905
2 nA	1.9 nA	1.89590	1.89948	1.90410
20 nA	19 nA	18.9615	18.9987	19.0385
200 nA	190 nA	189.615	189.986	190.385
2 uA	1.9 uA	1.89800	1.89995	1.90200
20 uA	19 uA	18.9805	19.0013	19.0195
200 uA	190 uA	189.805	189.994	190.195
2 mA	1.9 mA	1.89800	1.89914	1.90200
20 mA	19 mA	18.9805	18.9953	19.0195

DOC.DATE: 6/4/2002

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	1.89640	1.90765
20 nC	19 nC	18.9235	18.9613	19.0765
200 nC	190 nC	189.235	189.578	190.765
2 uC	1.9 uC	1.89235	1.90371	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES >1.00000	<.999999	READING	TUR
2 MΩ	1.00000M	±126 C	±1260 C	1.00060	
20 MΩ	10.0001M	±126 C	±1260 C	10.0049	3.60
200 MΩ	100.230M	±151 C	±1510 C	100.314	
2 GΩ	995.861M	±226 C	±2260 C	996.604	
20 GΩ	9.97791G	±226 C	±2260 C	9.97574	3.23
200 GΩ	98.8572G	±351 C	±3510 C	98.7978	3.51
2 TΩ	994.991G	±351 C	±3510 C	995.521	1.76

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
±100 V	0.000 V	-0.01	0.000	0.01
	+25.000 V	24.9525	24.9827	25.0475
	+50.000 V	49.915	49.9675	50.085
	+75.000 V	74.8775	74.9540	75.1225
	+100.000 V	99.840	99.9387	100.160
	-25.000 V	24.9525	24.9843	25.0475
	-50.000 V	49.915	49.9687	50.085
	-75.000 V	74.8775	74.9541	75.1225
	-100.000 V	99.840	99.9381	100.160
±1000 V	+250.00 V	249.525	249.917	250.475
	+500.00 V	499.150	499.909	500.850
	+750.00 V	748.775	749.866	751.225
	+1000.00 V	998.40	999.720	1001.60
	-250.00 V	249.525	249.943	250.475
	-500.00 V	499.150	499.859	500.850
	-750.00 V	748.775	749.774	751.225
	-1000.00 V	998.40	999.716	1001.60

INST NO: 30280

DOC.DATE: 6/4/2002

✓ INCOMING
✓ OUTGOING

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

TEMPERATURE ACCURACY

TEMP	MIN	READING	MAX
-25° C	-23.4	-24.3	-26.6
0° C	-1.5	0.7	+1.5
50° C	48.3	50.5	51.7
100° C	98.2	100.4	101.8
150° C	148.0	150.4	152.0

HUMIDITY ACCURACY

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