

SOUTHWEST RESEARCH INSTITUTE
Department of Quality Assurance
Calibration Laboratory • 522-5215

WORK ORDER

CERTIFICATE # 24577 ASSET # 004313 DATE 06 Mar 97

ITEM DATA:
Manufacturer Kellley Model 0517
Description electrometer / high resistance system Serial # 0599913
Accessories humidity loads (HUMIDITY PROBE / EXTENSION CABLE, TRIAX) THERMO COUPLER

ACTION REQUESTED Cal 029853 SVC manual & operating manual

CUSTODIAN D.V. D., David D.

Turned in by: _____ Phone _____

CHARGE # 20-5708-561 Date Required _____

INSTRUMENT USED ON: NUCLEAR DOD NASA GLP SPPE
 OTHER _____

COPY OF CALIBRATION CERTIFICATE Yes No

CONDITION RECEIVED: _____ Out of tolerance, repaired to specifications
_____ In tolerance, minor adjustments/repairs made
 In tolerance, no adjustments/repairs
_____ Out of tolerance, adjusted to specifications
_____ Received into system, introduced or reactivated
_____ Calibration interval
_____ Reliability code

ACTION TAKEN: (Calibration/Repair/Parts) st # 2700 & 20th 2/1/97

CAL ENVIRONMENT:
Temperature 70 °F Humidity 32 %RH

CALIBRATED/REPAIRED:
By Doche Dav, Sam Antonio, TX Cal Procedure MEG
Date 03/20/97 Accuracy MEG
Cal Interval 12 mos. Time to complete: _____
Next Cal due 03/20/98 Cal _____ Repair _____
Standards used (Asset#) Vander

DATE COMPLETED 24 Mar 97
DATE PICKED UP 3/26/97 PICKED UP BY [Signature]

24577



Rothe Development Inc.

Metrology Services Division

4614 SINCLAIR RD., SAN ANTONIO, TEXAS 78222 210-648-3131 FAX 210-648-4091

Certificate of Calibration

47349

CAL DATE: 03/20/97

DUE DATE: 03/20/98

ISSUED TO: Southwest Research Institute (30)
6220 Culebra, Bldg. 64/Division 30
San Antonio, TX 78284
684-5111 # 2702

MFG Keithley

MODEL 6517

SERIAL # 0599913

TYPE Electrometer/High Resistan

CONTROL: 103 - 21652

TECHNICIAN #: 6

SPECIFICATIONS: MFG

PROCEDURE: MFG

WORK ORDER #: 58416

CUSTOMER PO #: 02127/ST297061/20-5708561

RECEIVED IN-SPECS
OUT-OF-SPECS

All Calibration measurements performed at ROTHE DEVELOPMENT INC. METROLOGY SERVICES meet the requirements of MIL-STD-45662A, and are traceable to the National Institute of Standards and Technology through Primary NIST Calibration or Secondary Calibration performed by other Metrological facilities. Ambient conditions: Temperature 72°F, Relative Humidity 32%.

Test Report Number and Calibration Standards Used

Ref #	Model #	Mfgr	Serial #	Description	Cal Date	Int	Cal Due
TR 20	5700A	FLUKE	4605002	CALIBRATOR	03/03/97	3	06/03/97
TR 258	5725A	Fluke	6585002	Amplifier	07/10/96	12	07/10/97
TR 231	34401A	HP	3146A45255	DMM	02/27/97	6	08/27/97
TR 235	6500A	GUILDLINE	59660	TERAOMETER	09/17/96	12	09/17/97
TR 186	1689	GEN RAD	7241583008	RLC DIGIBRIDGE	07/29/96	12	07/29/97
TR 100	5500A	Fluke	6320016	Calibrator	06/15/96	12	06/15/97

----- Test Report Numbers -----
 DCV FLUKE CERT# DH70
 ACV FLUKE CERT# DP30
 NIST TEST# 255975
 NIST TEST# 8980
 Hz WWVB Transmission

INSPECTED BY
COMMENTS:

Jose A. Mendez

NOTE: The collective uncertainty of the measurement standards does not exceed 25% (k=1) of the instrument specification tested unless noted in COMMENTS section.

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517 ELECTROMETER

CUSTOMER: Southwest Research Inst.
 WO NUMBER: 58416
 SERIAL: 0599913
 CUST ID: 027833

DATE: Mar 20, 1997
 TECH: hm
 INST NO: 21652

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>1.90000</u>	1.90052
	-1.9 V	1.89949	<u>-1.89999</u>	1.90052
20 V	+19 V	18.9950	<u>19.0004</u>	19.0050
	-19 V	18.9950	<u>-19.0003</u>	19.0050
200 V	+190 V	189.883	<u>189.936</u>	190.117
	-190 V	189.883	<u>-189.935</u>	190.117

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>18.9600</u>	19.1930
200 pA	190 pA	188.095	<u>190.280</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.89890</u>	1.90410
20 nA	19 nA	18.9615	<u>18.9935</u>	19.0385
200 nA	190 nA	189.615	<u>189.922</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.90057</u>	1.90200
20 uA	19 uA	18.9805	<u>19.0004</u>	19.0195
200 uA	190 uA	189.805	<u>189.961</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.90007</u>	1.90200
20 mA	19 mA	18.9805	<u>19.0006</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.89800</u>	1.90765
20 nC	19 nC	18.9235	<u>18.9470</u>	19.0765
200 nC	190 nC	189.235	<u>190.059</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90479</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING
		>1.00000	<.999999	
2 MΩ	<u>1.89995</u>	±126 C	±1260 C	<u>1.90042</u>
20 MΩ	<u>18.9971</u>	±126 C	±1260 C	<u>18.9975</u>
200 MΩ	<u>100.244</u>	±151 C	±1510 C	<u>100.215</u>
2 GΩ	<u>1.00195</u>	±226 C	±2260 C	<u>1.00252</u>
20 GΩ	<u>9.98211</u>	±226 C	±2260 C	<u>9.98210</u>
200 GΩ	<u>98.6655</u>	±351 C	±3510 C	<u>98.8500</u>
2 TΩ	<u>.994411</u>	±351 C	±3510 C	<u>.996800</u>

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
±100 V	0.000 V	-0.01	<u>-0.007</u>	0.01
	+25.000 V	24.9525	<u>24.9947</u>	25.0475
	+50.000 V	49.915	<u>49.9997</u>	50.085
	+75.000 V	74.8775	<u>75.0055</u>	75.1225
	+100.000 V	99.840	<u>100.0107</u>	100.160
	-25.000 V	24.9525	<u>-25.0100</u>	25.0475
	-50.000 V	49.915	<u>-50.0161</u>	50.085
	-75.000 V	74.8775	<u>-75.0203</u>	75.1225
	-100.000 V	99.840	<u>-100.0272</u>	100.160
	±1000 V	+250.00 V	249.525	<u>249.964</u>
+500.00 V		499.150	<u>499.979</u>	500.850
+750.00 V		748.775	<u>750.050</u>	751.225
+1000.00 V		998.40	<u>1000.080</u>	1001.60
-250.00 V		249.525	<u>-250.098</u>	250.475
-500.00 V		499.150	<u>-500.107</u>	500.850
-750.00 V		748.775	<u>-750.206</u>	751.225
-1000.00 V		998.40	<u>-1000.200</u>	1001.60

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>-25.4</u>	-26.6
0° C	-1.5	<u>-0.4</u>	+1.5
50° C	48.35	<u>49.4</u>	51.65
100° C	98.2	<u>99.3</u>	101.8
150° C	148.05	<u>149.3</u>	151.95

HUMIDITY ACCURACY

VOLTAGE INPUT	MIN	READING	MAX
0.000 V	0	<u>00</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



Rothe Development, Inc.

4614 SINCLAIR RD. SAN ANTONIO, TEXAS 78222-2099

210-648-3131 FAX: 210-648-4091

METROLOGY SERVICES DIVISION
PRECISION MEASUREMENT EQUIPMENT LABORATORY
TRACEABLE TO NIST

CHARGE # 107

CONTROL # 103 - 21652

WORK ORDER # 58416

CUSTOMER	RECEIVED FROM	Southwest Research Institute (30)	DATE	03/10/97	ITEM	MFG	Keithley
	ADDRESS	6220 Culebra, Bldg. 64/Division 30 San Antonio, TX 78284	PHONE#	684-5111 * 2702		MODEL	6517
	CONTACT (NAME)	Mr. Jim Patterson	FAX#	522-3692		SERIAL #	0599913
	PURCHASE ORDER #	02127/ST297061/20-5708561				TYPE	Electrometer/High Resistan
	CUSTOMER COMMENTS	N/T BEFORE & AFTER DATA OUT OF SPEC ITEM				ACCES. RCVD.	Humidity Probe, Extension Cable, Triax

REPAIR
 OPERATIONAL CHECK
 CALIBRATION

CALIBRATION DATE Mar 20, 97
 DATE DUE Mar 20, 98

CALIBRATION INTERVAL
 12 mo.

RECEIVED IN SPECS.
 RECEIVED INOPERATIVE
 RECEIVED OUT OF SPECS.

CKT REF #	QTY.	MFG PART #	DESCRIPTION	COST	ROTHE TECH.	OUR P.O. #
					<i>mm</i>	
					REPAIR LABOR HRS.	SERVICE CODE
						<i>J</i>
					PARTS TOTAL	
					REPAIR LABOR	
					SHIPPING	
					TEAR DOWN CHARGE	
					CALIBRATION	<i>200.00</i>
					TAX	
					TOTAL	<i>200.00</i>

TR #'s 20, 258, 231, 235, 186, 100

COMMENTS

WORK PERFORMED: Data taken
 ***** Need Manual *****

TEM 72 °F SPECS: MFG RDI *Calibrated*
 R.H. 32 % PROCEDURE: MFG RDI OTHER

RDI 2002
 SHIP VIA: _____ DATE: _____ RECEIVED BY: _____

SOUTHWEST RESEARCH INSTITUTE
Department of Quality Assurance
Calibration Laboratory • 522-5215

WORK ORDER

CERTIFICATE # 29193 ASSET # 004313 DATE 30 Mar 98

ITEM DATA:

Manufacturer Kentley Model 6517
Description Electrometer / high resistance system Serial # 0549913
Accessories bag cables - frax cable, thermocouple, DA probe, extension cable

ACTION REQUESTED (A)

CUSTODIAN DIV. 20, Darrell Dunn # 027933

Turned in by: _____ Phone 6090

CHARGE # 10-1102-571 Date Required RUSH

INSTRUMENT USED ON: (DOD/NASA) (NUCLEAR) (GLP) (SPPE) (ISO)
 OTHER _____

COPY OF CALIBRATION CERTIFICATE (Yes) (No)

NEW WORK Yes No If yes, an evaluation shall be made to verify capabilities.

By _____ Date _____

Work involves proprietary/confidential information or equipment (Yes) (No)

CONDITION RECEIVED: _____ (F) Out of tolerance, repaired to specifications
_____ (G) In tolerance, minor adjustments/repairs made
_____ (J) In tolerance, no adjustments/repairs
 (K) Out of tolerance, adjusted to specifications
_____ (S) Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) Per the Rev. ST 326035 of 10/90
os of called case unit still @ Kentley, T.A.T 4 weeks. No expedited ser.

CAL ENVIRONMENT: Temperature 72 °F Humidity 41 %RH

CALIBRATED/REPAIRED:
By Donna Dow, San Antonio, TX Cal Procedure MEG
Date 05/17/98 Accuracy MEG spec
Cal Interval 12 mos Reliability Code: -1
Next Cal due 05/17/99 Cal Time _____ Repair Time _____
Standards used (Asset#) Vendor

DATE COMPLETED 18 May 98
DATE PICKED UP 5/18/98 PICKED UP BY [Signature]

29193



6220 Culebra Road
 San Antonio, TX 78238
 Department of Quality Assurance
 Calibration Laboratory



ACCREDITED

Certificate of Calibration

18 May 1998

Issued to: DARRELL DUNN DIV20 B57
 Manufacturer/Model: KEITHLEY 6517
 Description: ELECTROMETER/HIGH RESISTANCE SYSTEM
 Serial Number: 0599913
 Asset Number: 004313

Environmental Conditions

Temperature: 72 Deg. F Humidity: 41 % RH

Calibration Information

Calibration was in accordance with requirements of MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Measurements are traceable to the National Institute of Standards and Technology (NIST). This report may not be reproduced except in full without written approval of the originator. Inspection and test data are on file and available for inspection.

The uncertainty of the calibration was sufficient to determine that the instrument met the manufacturer's specifications.

Calibration Date: 17 May 98 Calibration Procedure: MFG

Interval: 12 months Received: Out of Tolerance

Next Calibration Due: 17 May 99

Remarks: CALIBRATED BY ROTHE DEV., SAN ANTONIO, TX.
 ROTHE CERT. #52829.

Out of Tolerance Data

The unit was found to be in an Out of Tolerance condition as indicated below. An evaluation should be made by the user to determine any adverse impact that may have occurred.

ADJUSTED TO SPECIFICATIONS: RECEIVED UNIT WITH DC VOLTAGE OUT OF TOLERANCE.
 SENT TO MFG FOR ADJUSTMENT. CALIBRATED WHEN RETURNED.
 DC VOLTAGE ACCURACY

RANGE	INPUT	TOL	READING	
			BEFORE	AFTER
2 V	+1.9 V	1.89949-1.90052	1.89907*	1.90015
	-1.9 V	1.89949-1.90052	-1.89905*	-1.90014
200 V	+190 V	189.883-190.117	189.824*	189.987
	-190 V	189.883-190.117	-189.822*	189.986

* INDICATES OUT OF TOLERANCE CONDITION.

OUT OF TOLERANCE

Certificate of Calibration

18 May 1998

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: KEITHLEY 6517
Description: ELECTROMETER/HIGH RESISTANCE SYSTEM
Serial Number: 0599913
Asset Number: 004313

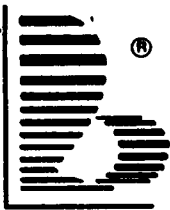
Signed: 

Title: Cal Lab Manager

Checked By: 

Title: _____

LAST PAGE OF REPORT
Total Pages Printed: 2



CERT. NUMBER: 52829

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
6220 Culebra, Bldg. 64/Division 30
San Antonio, TX 78284
522-5460

(30) MFG: Keithley
MODEL: 6517
NOMEN: Electrometer/High Resistan
S/N: 0599913
CUST. ID:

CAL DATE: 05/17/1998
DUE DATE: 05/17/1999

CONTROL NO.: 103 - 21652
TECHNICIAN:
SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER: 64799
CUSTOMER P.O.: 02127/ST326035/20-1402571
RECEIVED CONDITION: OUT OF TOLERANCE
RETURNED CONDITION: IN TOLERANCE

CALIBRATION PERFORMED AT: RDMSD
CALIBRATION INTERVAL: 12mos.
TEMPERATURE: 72 °F
RELATIVE HUMIDITY: 41 %

DATE RECEIVED: 03/30/1998

COMMENTS:

ATTACHMENTS: CALIBRATION DATA

All Calibrations performed at Rothe Development, Inc. Metrology Services Division meet the requirements of ANSI/NCCL 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_≥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	06/27/1998
258	FLUKE	5725A	6585002	03/27/1999
235	GUILDLINE	6500A	59660	05/19/1993
231	HP	34401A	3146A45255	08/27/1998
100	FLUKE	5500A	6320016	07/11/1998

APPROVED BY: *Detu J. Stammers*

CMS

QCO

DATE: 05/18/1998

ROTHER DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517 ELECTROMETER

CUSTOMER: SWRI
 WO NUMBER: 64799
 SERIAL: 0599913
 CUST ID: _____

DATE: 18 Apr 98
 TECH: PJS
 INST NO: 21652

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>1.89907</u>	1.90052	*
	-1.9 V	1.89949	<u>-1.89905</u>	1.90052	*
20 V	+19 V	18.9950	<u>19.0009</u>	19.0050	
	-19 V	18.9950	<u>-19.0007</u>	19.0050	
200 V	+190 V	189.883	<u>189.824</u>	190.117	*
	-190 V	189.883	<u>-189.822</u>	190.117	*

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>18.9496</u>	19.1930
200 pA	190 pA	188.095	<u>189.807</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.89870</u>	1.90410
20 nA	19 nA	18.9615	<u>18.9989</u>	19.0385
200 nA	190 nA	189.615	<u>189.877</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.89936</u>	1.90200
20 uA	19 uA	18.9805	<u>19.0050</u>	19.0195
200 uA	190 uA	189.805	<u>189.892</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.89934</u>	1.90200
20 mA	19 mA	18.9805	<u>19.0019</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.89421</u>	1.90765
20 nC	19 nC	18.9235	<u>18.9173</u>	19.0765
200 nC	190 nC	189.235	<u>190.254</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90151</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING
		>1.00000	<.999999	
2 MΩ	<u>1.89996</u>	±126 C	±1260 C	<u>1.90081</u>
20 MΩ	<u>18.9971</u>	±126 C	±1260 C	<u>19.0038</u>
200 MΩ	<u>99.9995</u>	±151 C	±1510 C	<u>99.9954</u>
2 GΩ	<u>1.00210</u>	±226 C	±2260 C	<u>1.00259</u>
20 GΩ	<u>9.97789</u>	±226 C	±2260 C	<u>9.97667</u>
200 GΩ	<u>98.7961</u>	±351 C	±3510 C	<u>98.8504</u>
2 TΩ	<u>.99426</u>	±351 C	±3510 C	<u>996.013</u>

VOLTAGE SOURCE ACCURACY

SOURCE RANGE	OUTPUT	MIN	READING	MAX
±100 V	0.000 V	-0.01	<u>-0.006</u>	0.01
	+25.000 V	24.9525	<u>24.997</u>	25.0475
	+50.000 V	49.915	<u>50.002</u>	50.085
	+75.000 V	74.8775	<u>75.008</u>	75.1225
	+100.000 V	99.840	<u>100.014</u>	100.160
	-25.000 V	24.9525	<u>25.009</u>	25.0475
	-50.000 V	49.915	<u>50.015</u>	50.085
	-75.000 V	74.8775	<u>75.020</u>	75.1225
	-100.000 V	99.840	<u>100.026</u>	100.160
	±1000 V	+250.00 V	249.525	<u>249.96</u>
+500.00 V		499.150	<u>499.966</u>	500.850
+750.00 V		748.775	<u>750.008</u>	751.225
+1000.00 V		998.40	<u>1000.006</u>	1001.60
-250.00 V		249.525	<u>250.071</u>	250.475
-500.00 V		499.150	<u>500.090</u>	500.850
-750.00 V		748.775	<u>750.131</u>	751.225
-1000.00 V		998.40	<u>1000.130</u>	1001.60

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>-25.9</u>	-26.6
0° C	-1.5	<u>-0.8</u>	+1.5
50° C	48.35	<u>49.0</u>	51.65
100° C	98.2	<u>98.8</u>	101.8
150° C	148.05	<u>148.8</u>	151.95

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

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517 ELECTROMETER

CUSTOMER: SWRI
 WO NUMBER: 64799
 SERIAL: 0599913
 CUST ID: _____

DATE: 17 May 98
 TECH: PJS
 INST NO: 21652

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>1.90015</u>	1.90052
	-1.9 V	1.89949	<u>-1.90014</u>	1.90052
20 V	+19 V	18.9950	<u>18.9990</u>	19.0050
	-19 V	18.9950	<u>-18.9989</u>	19.0050
200 V	+190 V	189.883	<u>189.987</u>	190.117
	-190 V	189.883	<u>189.986</u>	190.117

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>18.9765</u>	19.1930
200 pA	190 pA	188.095	<u>190.144</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.90060</u>	1.90410
20 nA	19 nA	18.9615	<u>19.0040</u>	19.0385
200 nA	190 nA	189.615	<u>189.938</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.90009</u>	1.90200
20 uA	19 uA	18.9805	<u>18.9983</u>	19.0195
200 uA	190 uA	189.805	<u>190.004</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.90020</u>	1.90200
20 mA	19 mA	18.9805	<u>18.9991</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.90137</u>	1.90765
20 nC	19 nC	18.9235	<u>19.0031</u>	19.0765
200 nC	190 nC	189.235	<u>190.105</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90427</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING
		>1.00000	<.999999	
2 MΩ	<u>1.89995 M</u>	±126 C	±1260 C	<u>1.89992</u>
20 MΩ	<u>18.9971 M</u>	±126 C	±1260 C	<u>18.9987</u>
200 MΩ	<u>99.9995 M</u>	±151 C	±1510 C	<u>100.014</u>
2 GΩ	<u>1.00204 G</u>	±226 C	±2260 C	<u>1.00238</u>
20 GΩ	<u>9.97822 G</u>	±226 C	±2260 C	<u>9.97680</u>
200 GΩ	<u>98.7530 G</u>	±351 C	±3510 C	<u>98.5241</u>
2 TΩ	<u>.99361 T</u>	±351 C	±3510 C	<u>993.643</u>

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>24.998</u>	25.0475
	+50.000 V	49.915	<u>49.996</u>	50.085
	+75.000 V	74.8775	<u>74.999</u>	75.1225
	+100.000 V	99.840	<u>100.000</u>	100.160
	-25.000 V	24.9525	<u>24.999</u>	25.0475
	-50.000 V	49.915	<u>49.998</u>	50.085
	-75.000 V	74.8775	<u>74.999</u>	75.1225
	-100.000 V	99.840	<u>99.998</u>	100.160
	±1000 V	+250.00 V	249.525	<u>249.978</u>
+500.00 V		499.150	<u>499.972</u>	500.850
+750.00 V		748.775	<u>749.967</u>	751.225
+1000.00 V		998.40	<u>999.942</u>	1001.60
-250.00 V		249.525	<u>250.001</u>	250.475
-500.00 V		499.150	<u>499.968</u>	500.850
-750.00 V		748.775	<u>749.981</u>	751.225
-1000.00 V		998.40	<u>999.948</u>	1001.60

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>-24.9</u>	-26.6
0° C	-1.5	<u>0.0</u>	+1.5
50° C	48.35	<u>49.9</u>	51.65
100° C	98.2	<u>99.8</u>	101.8
150° C	148.05	<u>149.9</u>	151.95

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

SOUTHWEST RESEARCH INSTITUTE
 Department of Quality Assurance
 Calibration Laboratory • 522-5215

WORK ORDER

CERTIFICATE # 34486 ASSET # 00433 DATE 13 May 99

ITEM DATA:
 Manufacturer Kentley Model 6517
 Description photometer Serial # 0599913
 Accessories fray cable, user's & service manual 027833
 ACTION REQUESTED cal

CUSTODIAN Div 20, Daniel Dunn
 Turned in by: _____ Phone 6090

CHARGE # 20-04 Date Required _____

INSTRUMENT USED ON: (DOD/NASA) (NUCLEAR) (GLP) (SPPE) (ISO)
 OTHER _____

COPY OF CALIBRATION CERTIFICATE (Yes) (No)

NEW WORK Yes No If yes, an evaluation shall be made to verify capabilities.

By [Signature] Date 05-13-99

Work involves proprietary/confidential information or equipment (Yes) (No)

CONDITION RECEIVED: _____ (F) Out of tolerance, repaired to specifications
 _____ (G) In tolerance, minor adjustments/repairs made
 _____ (J) In tolerance, no adjustments/repairs
 (K) Out of tolerance, adjusted to specifications
 _____ (S) Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) 05/14 Roche Dev. ST# 349328. 05/07 Roche requested manual.
06/08 Sent service & user's manual on ST# 349361.
(4:10p) Pete from Roche called. UUT O.A.T. again needs mfg adjustment. Called Daniel
who asked for Roche to put note on their ST to call him once evaluation is made.
07/01 called Roche for status, cust rep: Jose, received unit from mfg, undergoing cal. Expect delivery Monday 12/4.

CAL ENVIRONMENT:
 Temperature _____ °F Humidity _____ %RH

CALIBRATED/REPAIRED:
 By Roche Cal Procedure mfg
 Date ~~11/23/99~~ 06/08/99 Accuracy mfg
 Cal Interval N/A Reliability Code: -1
 Next Cal due _____ Cal Time _____ Repair Time _____
 Standards used (Asset#) _____

DATE COMPLETED 22 Nov. 99
 DATE PICKED UP 11/23/99 PICKED UP BY [Signature]

34486

WORK ORDER HISTORY

DATE	START STOP	CAL	REP	REMARKS:
07/15	2:00p			Phone of Roche called, unit still out. Need to return unit to Kertley. Will update on status later.
08/06	3:10p			called Roche for status, met rep: Jose. Unit still @ mtg. Asked to put a Rush on it. Jose w/ phone of Pete i mtg. Expedite. Will call w/ status tomorrow.
13 Sept.	8:50a			called Jose again, will call Kertley & return my call.
23 Sept.	9:15a			called Jose @ Roche again for status, Kertley still working on it. Keep replacing parts, but after running for certain amount of time, begins to drift. Asked Jose for Kertley's # 1-800-552-1115 #3 PMA# JS990716.02.
				Notified custodian who informed me that Kertley had sent him a loaner. Give them a little more time, then we may have them replace it @ their cost.
10/28	1:50p			called Jose @ Roche for status. Unit replaced. left message of Kertley for ETA. Will call back.
01 Nov.	8:30a			called Roche again, Jose said Kertley will ship unit out Wednesday (3rd Nov)
10 Nov.	1:55p			called Jose @ Roche. Unit in house. Going through cal. Will let run to see if unit drifts.
22 Nov				Received replacement unit - s/n 0735984. Closed out this record.

TOTAL CAL/REPAIR _____

TOTAL HOURS _____



Rothe Development, Inc. 4614 Sinclair Road San Antonio, Texas 78222
METROLOGY SERVICES DIVISION (210)648-3131 Fax (210)648-4091

DATE : 11/22/95

TO : SWRI

FAX :
PHONE:

ATTN.: Mark Romero

FROM : Jose A Mendosa
Rothe Development, Inc.
Metrology Services Division
4614 Sinclair Rd.
San Antonio, TX 78222

FAX : (210)648-4091
PHONE: (210)648-3131

MESSAGE:

MOD# 6517 SN 05999,3

DATA

NUMBER OF PAGES SENT INCLUDING THIS ONE: 4

CONFIDENTIALITY NOTICE: THE DOCUMENTS/INFORMATION ACCOMPANYING THIS FACSIMILE MAY CONTAIN CONFIDENTIAL INFORMATION WHICH IS LEGALLY PRIVILEGED AND PROTECTED BY FEDERAL LAW. THE INFORMATION IS ONLY INTENDED FOR THE PARTY(IES) TO WHOM IT IS ADDRESSED AND ALL OTHER USE IS A VIOLATION OF THE FEDERAL COMMUNICATIONS LAW WHICH PROTECTS SUCH TRANSMISSIONS. IF YOU HAVE RECEIVED THIS INFORMATION IN ERROR, PLEASE NOTIFY US IMMEDIATELY AT (210)648-3131 TO ARRANGE FOR THE RETURN OF THE DOCUMENTS. YOU ARE HEREBY NOTIFIED THAT ANY DISCLOSURE, COPYING, DISTRIBUTION OR TAKING OF ANY ACTION IN RELIANCE ON THE CONTENTS OF THIS INFORMATION IS STRICTLY PROHIBITED. THE FACSIMILE NUMBERS PROVIDED ON THIS DOCUMENT SHOULD NOT BE DISTRIBUTED OR USED FOR SOLICITATION PURPOSES.

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY MODEL 6517 ELECTROMETER

CUSTOMER: Southwest Research
 WO NUMBER: 72238
 SERIAL: 0599913
 CUST ID: _____

DATE: 8 Jun 99
 TECH: PJS
 INST NO: 21652

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>1.89943</u>	1.90052	*
	-1.9 V	1.89949	<u>1.89943</u>	1.90052	*
20 V	+19 V	18.9950	<u>18.9976</u>	19.0050	
	-19 V	18.9950	<u>18.9975</u>	19.0050	
200 V	+190 V	189.883	<u>189.907</u>	190.117	
	-190 V	189.883	<u>189.906</u>	190.117	

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
20 pA	19 pA	18.8070	<u>19.0482</u>	19.1930
200 pA	190 pA	188.095	<u>190.194</u>	191.905
2 nA	1.9 nA	1.89590	<u>1.89945</u>	1.90410
20 nA	19 nA	18.9615	<u>19.0030</u>	19.0385
200 nA	190 nA	189.615	<u>189.827</u>	190.385
2 uA	1.9 uA	1.89800	<u>1.89948</u>	1.90200
20 uA	19 uA	18.9805	<u>19.0014</u>	19.0195
200 uA	190 uA	189.805	<u>189.970</u>	190.195
2 mA	1.9 mA	1.89800	<u>1.89952</u>	1.90200
20 mA	19 mA	18.9805	<u>18.9972</u>	19.0195

COULOMBS ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.9 nC	1.89235	<u>1.90102</u>	1.90765
20 nC	19 nC	18.9235	<u>18.9775</u>	19.0765
200 nC	190 nC	189.235	<u>189.911</u>	190.765
2 uC	1.9 uC	1.89235	<u>1.90220</u>	1.90765

RESISTANCE ACCURACY

RANGE	INPUT	READING TOLERANCES		READING
		>1.00000	<.999999	
2 MΩ	<u>1.00006 M</u>	±126 C	±1260 C	<u>1.00012</u>
20 MΩ	<u>10.0007 M</u>	±126 C	±1260 C	<u>9.99936</u>
200 MΩ	<u>100.002 M</u>	±151 C	±1510 C	<u>100.042</u>
2 GΩ	<u>1.00190 G</u>	±226 C	±2260 C	<u>1.00277</u>
20 GΩ	<u>9.97941 G</u>	±226 C	±2260 C	<u>9.97352</u>
200 GΩ	<u>98.8083 G</u>	±351 C	±3510 C	<u>98.7766</u>
2 TΩ	<u>.994371 T</u>	±351 C	±3510 C	<u>995.341</u>

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>25.0000</u>	25.0475
	+50.000 V	49.915	<u>50.000</u>	50.085
	+75.000 V	74.8775	<u>75.0031</u>	75.1225
	+100.000 V	99.840	<u>100.006</u>	100.160
	-25.000 V	24.9525	<u>25.0001</u>	25.0475
	-50.000 V	49.915	<u>50.000</u>	50.085
	-75.000 V	74.8775	<u>75.0019</u>	75.1225
	-100.000 V	99.840	<u>100.003</u>	100.160
	±1000 V	+250.00 V	249.525	<u>249.951</u>
+500.00 V		499.150	<u>499.912</u>	500.850
+750.00 V		748.775	<u>749.886</u>	751.225
+1000.00 V		998.40	<u>999.85</u>	1001.60
-250.00 V		249.525	<u>249.980</u>	250.475
-500.00 V		499.150	<u>499.931</u>	500.850
-750.00 V		748.775	<u>749.927</u>	751.225
-1000.00 V		998.40	<u>999.89</u>	1001.60

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

TEMPERATURE ACCURACY

TEMP	MIN	READING	MAX
-25° C	-23.4	-24.8	-26.6
0° C	-1.5	0.0	+1.5
50° C	48.35	50.0	51.65
100° C	98.2	99.8	101.8
150° C	148.05	149.8	151.95

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