

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

WORK ORDER

CERTIFICATE # 33133 ASSET # 7088 DATE 02 FEB 99

ITEM DATA:

Manufacturer KEITHLEY Model 614
Description ELECTRO METER Serial # 0704934
Accessories _____

ACTION REQUESTED _____

CUSTODIAN DARRELL DUNN

Turned in by: _____ Phone _____

CHARGE # 20-1402-571 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 MDJ Date 02/02/99

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) Vmoe looking into calibration by lab.
02/10 Radio Dev. ST# 3416005.

CAL ENVIRONMENT:
Temperature 73 °F Humidity 32 %RH

CALIBRATED/REPAIRED:
By Rocher Dev. Sam Antenor Cal Procedure MTG
Date 03-02-99 Accuracy MTG
Cal Interval 12mos Reliability Code: 1
Next Cal due 03-02-00 Cal Time _____ Repair Time _____
Standards used (Asset#) Vendor

DATE COMPLETED 03 March 99
DATE PICKED UP 3/4/99 PICKED UP BY [Signature]

33133

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY 614 ELECTROMETER

CUSTOMER: Southwest Research
 WO NUMBER: 70171
 SERIAL: 0704934
 CUST ID: _____

DATE: 2 Mar 99
 TECH: YMH
 INST NO: 28150

CALIBRATION DATA TAKEN

INCOMING ✓
 OUTGOING ✓

CONDITION OF EQUIPMENT

IN TOLERANCE ✓
 OUT OF TOLERANCE _____

INPUT CURRENT VERIFICATION

RANGE	INPUT	MIN	READING	MAX
20 pA	NONE	-00.06	<u>.01</u>	+00.06

DC VOLTMETER ACCURACY

RANGE	INPUT	MIN	READING	MAX
.2 V	0.0 mV	-.00002	<u>.00000</u>	+.00002
	+190 mV	+1.8983	<u>1.8999</u>	+.19017
	-190 mV	-.18983	<u>1.8999</u>	-.19017
2 V	+1.9 V	+1.8984	<u>1.8999</u>	+1.9016
	-1.9 V	-1.8984	<u>1.8998</u>	-1.9016
20 V	+19 V	+18.984	<u>18.998</u>	+19.016
	-19 V	-18.984	<u>18.998</u>	-19.016

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
200 uA	+190 uA	+189.3	<u>190.0</u>	+190.7
200 nA	+190 nA	+189.0	<u>190.3</u>	+191.0
2000 pA	+1900 pA	+1871	<u>1900</u>	+1929

RESISTANCE ACCURACY

RANGE		ACTUAL INPUT	TOLERANCE	READING
20 KΩ	(19)	<u>19.00</u>	±11 C	<u>18.99</u>
200 KΩ		<u>190.0</u>	±11 C	<u>189.8</u>
20 MΩ	(10)	<u>10.00</u>	±10 C	<u>9.98</u>
20 GΩ	(10)	<u>9.98</u>	±2 %	<u>9.97</u>

CHARGE ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.0 VDC INTO 1000 pF	0.9500	<u>.9954</u>	1.0500



CERT. NUMBER: 56840

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: 614
NOMEN: Electrometer
S/N: 0704934
CUST. ID:

CAL DATE: 03/02/1999
DUE DATE: 03/02/2000

CONTROL NO.: 103 - 28150
TECHNICIAN: 9
SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER: 70171
CUSTOMER P.O.: 02127/ST341685/20-1402571
RECEIVED CONDITION: IN TOLERANCE
RETURNED CONDITION: IN TOLERANCE

CALIBRATION PERFORMED AT: RDMSD
CALIBRATION INTERVAL: 12mos.
TEMPERATURE: 73 °F
RELATIVE HUMIDITY: 32 %

DATE RECEIVED: 02/11/1999

COMMENTS:

ATTACHMENTS: CALIBRATION DATA

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_≥4:1) of the instrument specification(s) unless noted in the COMMENTS section.

TR#	MFG	MODEL	SERIAL NO.	DUE DATE
235	GUILDLINE	6500A	59660	06/23/1999
20	FLUKE	5700A/EP	4605002	03/28/1999
258	FLUKE	5725A	6585002	03/28/1999

APPROVED BY: *Peter J. Stammen*

CMS

QCO

DATE: 03/02/1999

WORK ORDER 37930

Date Received 2/24/00

Asset No. 007088 Manufacturer KEITHLEY Model 614
Description ELECTROMETER Serial Number 0704934
Accessory Received/Required TRIAx CABLE
Div/CC ID NONE Accessory to Asset No. N/A Accuracy MFG SPECS
Div/CC DIV20 Location B57 Custodian DARRELL DUNN Tel. 6090
Charge/Project No. 20.00751.006 Proprietary/Confidential N Date Required ROUTINE
Work Requested CALIBRATION
Receiving Inspection O.K.
Delivered By DARRELL DUNN Tel. 6090

WORK HISTORY

Date	Start Time	Stop Time	Notes
<u>02/15</u>			<u>Roche Dev. STA 366525</u>

PARTS

Part Name	Part Number	Cost	Failure Description

WORK SUMMARY

Failure Description _____
Repair Action _____
Cal Procedure MFG Temp 13 F Hum 32 %
Tech Roche Dev. Cal Hrs. _____ Repair Hrs. _____ Part Cost _____
Action Taken Calibrated
Standards Used Vander
Date Cal 03-18-2000 Int. 12 Mo. Date Due 03-18-2001 Reliability Code 1
Date Picked Up 3/22/2000 Picked Up By [Signature]

37930

**SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM**

March 22, 2000

To: DARRELL DUNN DIV20 B57

From: Jim Patterson 

Subject: Calibration by an approved supplier

Manufacturer/Model: KEITHLEY 614

Description: ELECTROMETER

Serial Number: 0704934

Asset Number: 007088

Calibration Due: March 16, 2001

Remarks: ROTHE CERTIFICATE NO.: 28150:953362986.

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

The above item was sent to an approved supplier who is listed on the SwRI Approved Suppliers List (ASL). This supplier is qualified to supply a product or service in support of project activities that require the use of approved suppliers. Please notify Mark Romero, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1



CERT. NUMBER:
28150:953362986

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: 614 NOMEN: Electrometer S/N: 0704934 CUST. ID:	CAL DATE: 3/18/2000 DUE DATE: 3/18/2001
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CONTROL NO.: 103 - 28150
 TECHNICIAN: 4
 SPECIFICATIONS: MFG
 PROCEDURE: MFG
 WORK ORDER: 002002201
 CUSTOMER P.O.: 02127/ST366525/20.00760.
 RECEIVED CONDITION: IN TOLERANCE
 RETURNED CONDITION: IN TOLERANCE

CALIBRATION PERFORMED AT: RDMSD
 CALIBRATION INTERVAL: 12Mo.
 TEMPERATURE: 73.0 °F
 RELATIVE HUMIDITY: 32 %

DATE RECEIVED: 2/28/2000

COMMENTS:

ATTACHMENTS:

All Calibrations performed at Rothe Development, Inc. Metrology Services Division meet the requirements of ANSI/NC SL 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	3/23/2000
258	FLUKE	5725A	6585002	3/23/2000
235	GUILDLINE	6500A	59660	10/26/2000
75	JRL	NMN	75	11/15/2000

APPROVED BY: Peter J. Stammen

CMS QCO

DATE:

3/20/2000

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

Processed by JIBARRA at 2:53:51PM on 3/16/01

1 0000 0000 0000 0000 0000 0000 0000

Work Order 444042841

Arrived 3/16/01

Asset No. 007088 Manufacturer KEITHLEY

Model 614

Instrument Type/Class ELECTROMETER

Serial No. 0704934

Accessory No. Calibration Procedure VENDOR

Location B57

Div/Client DIV20

Custodian DARRELL DUNN

Mail Stop B57

Tel. 6090

Charge/Project No. 20.00751.006

Delivered By / Telephone BRIAN DERBY / X6627

IN4CAL

Special Instructions w/ test leads + power cord

WORK NOTES

Date	Hours	Remarks/Notes
<u>3-23-01</u>		<u>Lothc \$110.00 S.F.# 380520</u>
		<u>Shipped</u>

ROTHE (210) 440-5191
INST NO. 218150
MAR 28 2001
RDJ 07
MAR 28 2002
TRACEABLE TO NIST

REPAIR PARTS

Date	Hours	Part Name	Part Number	Failure Description	Cost

WORK SUMMARY

Failure Description _____

Repair Action _____

Calibration Procedure _____ Temp _____ F Hum. _____ %

Tech _____ Totals Cal Hours _____ Repair Hours _____ Parts Cost _____

Standards Used _____

Date Picked Up 4/10/2001

Picked Up By Darrell Dunn

42841

**SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM**

March 30, 2001

To: DARRELL DUNN DIV20 B57

From: Walt Hill, Supervisor *WHA*
Institute Calibration Laboratory

Subject: Calibration by an approved supplier

Manufacturer/Model: KEITHLEY 614
Description: ELECTROMETER
Serial Number: 0704934
Asset Number: 007088
Work Order Number: 444042841
Date Calibrated: March 28, 2001
Remarks: ROTHE CERTIFICATE NO.: 28150:985790043

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

The above item was sent to an approved supplier who is listed on the SwRI Approved Suppliers List (ASL). This supplier is qualified to supply a product or service in support of project activities that require the use of approved suppliers. Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

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

1 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1

Arrived 5/9/02

Work Order **444048468**

Asset No. 007088 Manufacturer KEITHLEY

Model 614

Equipment Type ELECTROMETER

Serial No. 0704934

Accessory No.

Interval 12 M

Calibration Procedure VENDOR

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.

WORK NOTES

Date	Hours	Remarks/Notes
<u>5/10/02</u>		<u>Cal. Send to Rothe ST # 399484</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

ROTHE (210) 648-3131
ISO 9002

INST NO. 28150

CAL ON
RDI MAY 26 2002

04 DATE DUE CAL
MAY 26 2003

TRACEABLE TO NIST

Date	Hours	Part Name	Part Number	Failure Descr	Cost
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

WORK SUMMARY

Failure Description N/A

Repair Action _____

Tech Rothe Cal Hrs. _____ Repair Hrs. _____ Parts Cost _____ Temp 74 F Hum. 33 %

Standards Used Vendor

Date Picked Up 6/6/2002

Picked Up By Darrell Dunn

444048468

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY 614 ELECTROMETER

CUSTOMER: SWRJI
 WO NUMBER: 002019829
 SERIAL: 0704934
 CUST ID: 7088

DATE: 26 May 02
 TECH: PJS
 INST NO: 28150

CALIBRATION DATA TAKEN

INCOMING ✓
 OUTGOING ✓

CONDITION OF EQUIPMENT

IN TOLERANCE ✓
 OUT OF TOLERANCE

INPUT CURRENT VERIFICATION

RANGE	INPUT	MIN	READING	MAX
20 pA	NONE	-00.06	<u>00.02</u>	+00.06

DC VOLTMETER ACCURACY

RANGE	INPUT	MIN	READING	MAX
.2 V	0.0 mV	-.00002	<u>.00000</u>	+.00002
	+190 mV	.18983	<u>.19001</u>	.19017
	-190 mV	.18983	<u>.19001</u>	.19017
2 V	+1.9 V	1.8984	<u>1.9000</u>	1.9016
	-1.9 V	1.8984	<u>1.9000</u>	1.9016
20 V	+19 V	18.984	<u>19.000</u>	19.016
	-19 V	18.984	<u>19.000</u>	19.016

DC CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
200 uA	190 uA	189.3	<u>190.0</u>	190.7
200 nA	190 nA	189.0	<u>190.3</u>	191.0
2000 pA	1900 pA	1871	<u>1900</u>	1929

RESISTANCE ACCURACY

RANGE		ACTUAL INPUT	TOLERANCE	READING
20 K Ω	(19)	<u>19.00 K</u>	± 11 C	<u>18.98</u>
200 K Ω		<u>190.0 K</u>	± 11 C	<u>189.7</u>
20 M Ω	(10)	<u>10.00 M</u>	± 10 C	<u>9.98</u>
20 G Ω	(10)	<u>9.986</u>	± 2 %	<u>9.96</u>

CHARGE ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 nC	1.0 VDC INTO 1000 pF	0.9500	<u>.9962</u>	1.0500

INST NO: 28150

DOC. DATE: 2/22/2001

INCOMING
 OUTGOING

**SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM**

June 4, 2002

To: DARRELL DUNN DIV20 B57

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory 

Subject: Status of Calibration Supplier

Manufacturer/Model: KEITHLEY 614

Description: ELECTROMETER

Serial Number: 0704934

Asset Number: 007088

Work Order Number: 444048468

Date Calibrated: May 26, 2002

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

Remarks: Rothe Cert # 28150:1022430355

- Supplier is on the Approved Suppliers List (ASL) and is accredited.
- Supplier is on the Approved Suppliers List (ASL) but is not accredited.
- There is no known accredited supplier at this time.
- Supplier is not on the Approved Suppliers List (ASL). Please contact Don Dunavant at ext. 2942 if you wish to add the supplier to the ASL.

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

Attachment(s) 2



CERT. NUMBER:
29150:1022430355

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 (301) 6220 Gulebra San Antonio, TX 78284	MFG:	Keithley	CAL DATE:	5/26/2002
		MODEL:	614	DUE DATE:	5/26/2003
		NOMEN:	Electrometer		
		S/N:	0704934		
		CUST. ID:	7098		

CONTROL NO.: 103 - 29150
TECHNICIAN: J
SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER: 000019729
CUSTOMER P.O.: 01571P/ST399464/1.20 007
RECEIVED CONDITION: IN TOLERANCE
RETURNED CONDITION: IN TOLERANCE

CALIBRATION PERFORMED AT: REMSD
CALIBRATION INTERVAL: 12Mo.
TEMPERATURE: 74.0 °F
RELATIVE HUMIDITY: 39 %
DATE RECEIVED: 5/13/2002

COMMENTS:

ATTACHMENTS: CALIBRATION DATA SHEETS

All Calibrations performed at Rothe Development, Inc. Metrology Services Division meet the requirements of ANSI/NC SL 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
00	FLUKE	8700A/EP	1605000	12/31/2002
059	FLUKE	8700A	6888000	12/31/2002
75	J&L	NRN	75	12/31/2003
035	WATSONLINE	6010R	89560	12/31/2002

APPROVED BY: Peter Stemmer

CMS QCO DATE