



# Rothe Development Inc.

## Metrology Services Division

4614 SINCLAIR RD., SAN ANTONIO, TEXAS 78222 512-648-3131 FAX 512-648-4091

# Certificate of Calibration

# 23312

CAL DATE: 11/21/91

ISSUED TO: Southwest Research Institute  
6220 Culebra, Bldg. 68/Division 5  
San Antonio, TX 78284  
684-5111 \* 2702

DUE DATE: 05/21/92  
(5)

MFG Keithley

MODEL 485

SERIAL # 509163

CONTROL: 103 - 13096

TYPE DMM

PROCEDURE/TOL: MFG PROCEDURE/MFG SPECS

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 73.0oF , Relative Humidity 34%

### Test Report Number and Calibration Standards Used

Ref #	Model #	Mfr	Serial #	Description	Cal Date	Int
TR 20	5700A	FLUKE	4605002	CALIBRATOR	11/14/91	3
TR 30	3458A	HP	2823A01926	DMM	09/16/91	3
TR 75	NMN	JRL	75	RESISTANCE BOX	12/14/90	12

### ----- Test Report Numbers -----

DCV FLUKE CERT# DH70  
ACV FLUKE CERT# 658637  
OHM NIST TEST# 244645  
TEMP CERT# 245046  
Hz WWVB Transmission

INSPECTED BY Jon A. Mendez  
COMMENTS:



# Rothe Development, Inc.

4614 SINCLAIR RD. SAN ANTONIO, TEXAS 78222-2099

512-648-3131 FAX: 512-648-4091

METROLOGY SERVICES DIVISION  
PRECISION MEASUREMENT EQUIPMENT LABORATORY  
TRACEABLE TO NIST

CHARGE # 107

CONTROL # 103 - 10096

WORK ORDER # 1921

CUSTOMER	RECEIVED FROM Southwest Research Institute (S) DATE 11/13/91	MFG Keitner
	ADDRESS 6220 Culebra, Bldg. 68/Division 5 PHONE# 654-5111 * 2702	MODEL 485
	San Antonio, TX 78284	SERIAL # 509165
	CONTACT (NAME) Mr. Jim Patterson FAX# 654-3133	TYPE DMM
	PURCHASE ORDER # 05602/ST#175737/203704041	ACCES. RCVD. MANUAL
CUSTOMER COMMENTS NON TAXABLE		

- REPAIR
- OPERATIONAL CHECK
- CALIBRATION

CALIBRATION DATE 21 Nov 91  
 DATE DUE 21 May 92

CALIBRATION INTERVAL

- RECEIVED IN SPECS.
- RECEIVED INOPERATIVE
- RECEIVED OUT OF SPECS.

CKT REF #	QTY.	MFG PART #	DESCRIPTION	COST	ROTHE TECH.	OUR P.O. #
					FSS	
					REPAIR LABOR HRS.	SERVICE CODE
						J
					PARTS TOTAL	
					REPAIR LABOR	
					SHIPPING	
					TEAR DOWN CHARGE	
					TAX	
					CALIBRATION	68.00
					<b>TOTAL</b>	<b>68 00</b>

THIS IS NOT AN INVOICE

TR #'s 20, 30, 75

COMMENTS

WORK PERFORMED:

CAL

TEMP. 73 °F

R.H. 34 %

RDI 2002

SHIP VIA: \_\_\_\_\_ DATE: \_\_\_\_\_ RECEIVED BY: \_\_\_\_\_

Division 05 - Instrument Repair and Calibration Laboratory  
CERTIFICATE OF CALIBRATION

ISSUED TO: DIV 20 (CNWRA)  
MFGR/MODEL KEITHLEY  
ITEM DESCRIPTION DICOMETER  
MODEL 485 S/N 509163 SWRI NO. \_\_\_\_\_  
PLUG-INS, ETC. NONE  
TOLERANCE MFR SPEC'S

STANDARDS

Standard No.	MFGR Model	Description	S/N	Cal. Due	Cal. Rec. No.
* See certificate of calibration,					

\* ENVIRONMENT: Temperature \_\_\_\_\_ Humidity \_\_\_\_\_  
Location \_\_\_\_\_

PROCEDURE

\*  Essentially as outlined in MFGRS Service Manual \_\_\_\_\_  
 \_\_\_\_\_

CONCLUSION

\*  Item within tolerance \_\_\_\_\_  
 Item out of tolerance \_\_\_\_\_  
 Item ADJ/repaired to tolerance \_\_\_\_\_  
 \_\_\_\_\_

Calibration was in accord with requirements of MIL-STD-45662A. Measurements are traceable to the National Institute of Standards and Technology. Inspection and test data are on file and available for inspection.

SIGNED [Signature]  
DATE 21 NOV 91  
RECORD NUMBER: 0008619 NEXT CALIBRATION DUE: 21 MAY 92

**KEITHLEY** INSTRUMENTS

Keithley Instruments, Inc.  
28775 Aurora Road  
Cleveland, Ohio 44139  
(216) 248-0400  
Telefax: 248-6168

## Certificate of Calibration

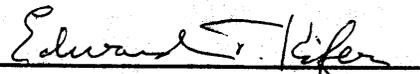
Model 485/485.3 Serial No. 509163 Date 8-14-91

This notification serves to certify that the unit described above has been inspected and tested in accordance with specifications published by Keithley Instruments, Inc.

The accuracy and calibration of this instrument are traceable to the National Institute of Standards and Technology through equipment which is calibrated at planned intervals by comparison to certified standards maintained in the laboratories of Keithley Instruments, Inc.

The reference standards which support this calibration are calibrated on a schedule to maintain required accuracy level. Applicable NIST Test Report numbers are listed below:

DC Voltage: 247945  
AC Voltage: 238764  
Resistance: 247956  
Temperature: 246568  
Capacitance: 246592  
Frequency: WWVB

  
Edward T. Kifer  
Quality Assurance Manager



# Rothe Development Inc.

## Metrology Services Division

4614 SINCLAIR RD., SAN ANTONIO, TEXAS 78222 512-648-3131 FAX 512-648-4091

# Certificate of Calibration

# 26817

CAL DATE: 09/21/92

DUE DATE: 09/21/93

ISSUED TO: Southwest Research Institute  
6220 Culebra, Blds. 68/Division 5  
San Antonio, TX 78284  
684-5111 \* 2702

(5)

MFG Keithley

MODEL 485

SERIAL # 509163

CONTROL: 103 - 13096

TYPE DMM

PROCEDURE/TOL: MFG PROCEDURE/MFG SPECS

WORK ORDER #: 34247

CUSTOMER PO #: 03602/ST#202085/20-3704-0

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 73.0oF , Relative Humidity 40% .

### Test Report Number and Calibration Standards Used

Ref #	Model #	Mfgr	Serial #	Description	Cal Date	Int	Cal Due
TR 20	5700A	FLUKE	4605002	CALIBRATOR	08/11/92	3	11/11/92
TR 182	1433-H	GEN RAD	32941	DECADE RESISTOR	08/10/92	12	08/10/93
TR 75	NMN	JRL	75	RESISTANCE BOX	01/03/92	12	01/03/93

### Test Report Numbers

DCV FLUKE CERT# DH70  
ACV FLUKE CERT# 658637  
OHM NIST TEST# 244645  
TEMP CERT# 245046  
Hz WWVB Transmission

INSPECTED BY Jose A Mendez  
COMMENTS:



# Rothe Development, Inc.

4614 SINCLAIR RD. SAN ANTONIO, TEXAS 78222-2099

512-648-3131 FAX: 512-648-4091

METROLOGY SERVICES DIVISION  
PRECISION MEASUREMENT EQUIPMENT LABORATORY  
TRACEABLE TO NIST

CHARGE # 107

CONTROL # 103 - 13096

WORK ORDER # 34247

RECEIVED FROM <b>Southwest Research Institute</b>	(5) DATE <b>09/21/92</b>	<b>ITEM</b>	MFG <b>Keithley</b>
ADDRESS <b>6220 Culebra, Blds. 68/Division 5</b>	PHONE# <b>684-5111 + 2702</b>		MODEL <b>485</b>
<b>San Antonio, TX 78284</b>	FAX# <b>684-3133</b>		SERIAL # <b>509163</b>
CONTACT (NAME) <b>Mr. Jim Patterson</b>			TYPE <b>DMM</b>
PURCHASE ORDER # <b>03602/ST#202085/20-3704-0</b>			ACCES. RCVD. <b>Manual</b>
CUSTOMER COMMENTS <b>NON TAXABLE</b> <b>Need 1yr. Calibration</b>			

- REPAIR
- OPERATIONAL CHECK
- CALIBRATION

CALIBRATION DATE 21 SEPT 92

CALIBRATION INTERVAL 13 mo.

DATE DUE 21 SEPT 93

- RECEIVED IN SPECS.
- RECEIVED INOPERATIVE
- RECEIVED OUT OF SPECS.

CKT REF #	QTY.	MFG PART #	DESCRIPTION	COST	ROTHE TECH.	OUR P.O. #
					<i>[Signature]</i>	
					REPAIR LABOR HRS.	SERVICE CODE
						<i>J</i>
					PARTS TOTAL	
					REPAIR LABOR	
					SHIPPING	
					TEAR DOWN CHARGE	
					CALIBRATION	
					TAX	60.00
					<b>TOTAL</b>	<b>60.00</b>

TR #'s 20 182 75

COMMENTS

WORK PERFORMED:

*cal'd*

TEMP. 73 °F  
R.H. 40 %

*Anthony Olsen*

*[Signature]*

*23 Sept 92*

RDI 2002

SHIP VIA: \_\_\_\_\_ DATE: \_\_\_\_\_

RECEIVED BY: \_\_\_\_\_

S O U T H W E S T   R E S E A R C H   I N S T I T U T E

Department of Quality Assurance  
Calibration Laboratory

CERTIFICATE OF CALIBRATION

Issued to: DIV20 B168 NARASI SRIDHAR

Device No: 1437

Manufacturer: KEITHLEY

Model: 485

Nomenclature: PICOAMMETER

Serial Number: 509163

SwRI No:

Remarks

Accuracy: MFGR SPECS

Procedure: MFGR

ENVIRONMENT

Temperature: 73   Humidity: 40   Location: ROTHE DEVE., SAN ANTONIO

CONCLUSION

Tolerance/Remarks: Received in tolerance, no adjustments made

Calibrated by Rothe Development, calibration certificate #26817.

Calibration was in accord with requirements of MIL-STD-45662A. Measurements are traceable to the National Institute of Standards and Technology. Inspection and test data are on file and available for inspection.

Signed \_\_\_\_\_

Calibration Date: 09/21/92

Record Number: 00009822

Next Calibration Due: 09/21/93

S O U T H W E S T   R E S E A R C H   I N S T I T U T E

Department of Quality Assurance  
Calibration Laboratory

CERTIFICATE OF CALIBRATION

Issued to: DIV20 B57 NARASI SRIDHAR

Device No: 1437

Manufacturer: KEITHLEY

Model: 485

Nomenclature: PICOAMMETER

Serial Number: 509163

SwRI No:

Cal interval 12 Mo.

Remarks

Accuracy: MFGR SPECS

Procedure: MFGR

ENVIRONMENT

Temperature: 72    Humidity: 35    Location: ROTHE DEVELOPMENT, INC.

CONCLUSION

Tolerance/Remarks: Received in tolerance, minor adjustments/repairs made

Calibrated by Rothe Development.

Calibration Certificate #32147

Calibration was in accord with requirements of MIL-STD-45662A. Measurements are traceable to the National Institute of Standards and Technology. Inspection and test data are on file and available for inspection.

Signed

Calibration Date: 10/07/93

Cal interval: 12 Months

Record Number: 00012404

Next Calibration Due: 10/07/94



# 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 - 13096

WORK ORDER # 40281

RECEIVED FROM Southwest Research Institute (5) DATE 10/05/93

ADDRESS 6220 Culebra, Blds. 68/Division 5 PHONE# 684-5111 # 2702  
San Antonio, TX 78284

CONTACT (NAME) Mr. Jim Patterson FAX# 684-3133

PURCHASE ORDER # 03602/ST#226840/20-0760

CUSTOMER COMMENTS N/T BEFORE & AFTER DATA OUT OF SPEC ITEM

ITEM

MFG Keithley  
MODEL 485  
SERIAL # 509163  
TYPE DMM  
ACCES. RCVD. Cable

- REPAIR
- OPERATIONAL CHECK
- CALIBRATION

CALIBRATION DATE 7 Dec 93  
DATE DUE 7 Dec 94

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. #
					P35	
					REPAIR LABOR HRS.	SERVICE CODE
						J
					PARTS TOTAL	
					REPAIR LABOR	
					SHIPPING	
					TEAR DOWN CHARGE	
					CALIBRATION	68.00
					TAX	
					<b>TOTAL</b>	<b>68.00</b>

R #'s 20, 235, 20

### COMMENTS

WORK PERFORMED: Repaired cable ground.

CAL

EMP. 72 °F

SPECS: MFG RDI

H. 35 %

PROCEDURE: MFG RDI OTHER

RDI-2002

SHIP VIA: \_\_\_\_\_ DATE: \_\_\_\_\_

RECEIVED BY: \_\_\_\_\_



# Rothe Development Inc.

## Metrology Services Division

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

# Certificate of Calibration

# 32147

CAL DATE: 10/07/93

DUE DATE: 10/07/94

ISSUED TO: Southwest Research Institute (5)  
6220 Culebra, Bldg. 68/Division 5  
San Antonio, TX 78284  
684-5111 \* 2702

MFG Keithley

MODEL 485

SERIAL # 509163

CONTROL: 103 - 13096

TYPE DMM

SPECIFICATIONS: MFG

PROCEDURE: MFG

WORK ORDER #: 40281

CUSTOMER PO #: 03602/ST#226840/20-0760

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 35%

### Test Report Number and Calibration Standards Used

Ref #	Model #	Mfgr	Serial #	Description	Cal Date	Int	Cal Due
TR 20	5700A	FLUKE	4605002	CALIBRATOR	08/27/93	3	11/27/93
TR 235	6500A	GUILDLINE	59660	TERAOhMETER	07/01/93	12	07/01/94
TR 30	3458A	HP	2823A01926	DMM	08/27/93	3	11/27/93

### Test Report Numbers

DCV FLUKE CERT# DH70  
ACV FLUKE CERT# DP30  
OHM NIST TEST# 250839  
TEMP NIST TEST# 248798  
Hz WWVB Transmission

INSPECTED BY Jon A Mendez  
COMMENTS:

# ROTHER DEVELOPMENT METROLOGY SERVICES

## CALIBRATION DATA : KEITHLEY 485

CUSTOMER : <u>SWRT</u>	DATE : <u>7 Oct 93</u>
WD NUMBER : <u>40281</u>	TECH : <u>PSS</u>
SERIAL : <u>509163</u>	INST NO : <u>13096</u>

CAL DATA TAKEN	INCOMING <u>✓</u>
	OUTGOING _____

CONDITION	IN TOLERANCE <u>✓</u>
	OUT OF TOLERANCE _____

### CURRENT ACCURACY

RANGE	ACTUAL INPUT	TOLERANCE	READING
2 MA (19)	<u>1.9000</u>	±20 C	<u>1.9001</u>
200 UA	<u>190.00</u>	±20 C	<u>190.04</u>
20 UA	<u>19.000</u>	±20 C	<u>19.003</u>
2 UA	<u>1.9000</u>	±29 C	<u>1.9005</u>
200 NA	<u>190.00</u>	±39 C	<u>190.03</u>
20 NA	<u>18.955</u>	±77 C	<u>18.959</u>
2 NA	<u>1.8975</u>	±80 C	<u>1.8971</u>





# 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 - 13096

WORK ORDER # 46596

RECEIVED FROM Southwest Research Institute (30) DATE 01/26/95	MFG Keithley
ADDRESS 6220 Culebra, Bldg. 64/Division 30 San Antonio, TX 78284	MODEL 485
CONTACT (NAME) Mr. Jim Patterson	PHONE# 684-5111 * 2702
PURCHASE ORDER # 03602/ST244926/20-5704041	FAX# 684-3133
CUSTOMER COMMENTS N/T BEFORE & AFTER DATA OUT OF SPEC ITEM	SERIAL # 509163
	TYPE DMM
	ACCES. RCVD. Lead

- REPAIR
- OPERATIONAL CHECK
- CALIBRATION

CALIBRATION DATE 2 Feb 95  
DATE DUE 2 Feb 96

CALIBRATION INTERVAL  
12 M  
999 MO.

- RECEIVED IN SPECS.
- RECEIVED INOPERATIVE
- RECEIVED OUT OF SPECS.

CKT REF #	QTY.	MFG PART #	DESCRIPTION	COST	ROTHER TECH.	OUR P.O. #
					PSS	
					REPAIR LABOR HRS.	SERVICE CODE
						J
					PARTS TOTAL	
					REPAIR LABOR	
					SHIPPING	
					TEAR DOWN CHARGE	
					CALIBRATION	78.00
					TAX	
					<b>TOTAL</b>	<b>78.00</b>

TR #s 20, 75, 235

COMMENTS  
WORK PERFORMED: Cal Data Taken -

*CAL*

TEMP. 72 °F

SPECS: MFG RDI

R.H. 28 %

PROCEDURE: MFG RDI OTHER

RDI 2002

SHIP VIA: \_\_\_\_\_ DATE: \_\_\_\_\_

RECEIVED BY: \_\_\_\_\_



# Rothe Development Inc.

## Metrology Services Division

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

# Certificate of Calibration

# 37624

CAL DATE: 02/02/95

DUE DATE: 02/02/96

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

MFG Keithley

MODEL 485

SERIAL # 509163

CONTROL: 103 - 13096

TECHNICIAN #: 4

SPECIFICATIONS: MFG

PROCEDURE: MFG

WORK ORDER #: 46596

CUSTOMER PO #: 03602/ST244926/20-5704041

TYPE DMM

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 28%

### Test Report Number and Calibration Standards Used

Ref #	Model #	Mfgr	Serial #	Description	Cal Date	Int	Cal Due
TR 20	5700A	FLUKE	4605002	CALIBRATOR	11/25/94	3	02/25/95
TR 75	NMN	JRL	75	RESISTANCE BOX	05/03/94	12	05/03/95
TR 235	6500A	GUILDLINE	59660	TERAOhMETER	08/24/94	12	08/24/95

----- Test Report Numbers -----  
 DCV FLUKE CERT# DH70  
 ACV FLUKE CERT# DP30  
 Ohm NIST TEST# 250839  
 TEMP NIST TEST# 251316  
 Hz WWVB Transmission

INSPECTED BY Jose A Mendiga  
COMMENTS:

# ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA : KEITHLEY 485

CUSTOMER : SWR-I  
 WO NUMBER : 46596  
 SERIAL : 509163

DATE : 2 Feb 95  
 TECH : PSS  
 INST NO : 13096

CAL DATA TAKEN

INCOMING ✓  
 OUTGOING ✓

CONDITION

IN TOLERANCE ✓  
 OUT OF TOLERANCE \_\_\_\_\_

CURRENT ACCURACY

RANGE	ACTUAL INPUT	TOLERANCE	READING
2 MA (19)	<u>1.9000 ma</u>	±20 C	<u>1.9001</u>
200 UA	<u>190.00 ua</u>	±20 C	<u>190.04</u>
20 UA	<u>19.000 ua</u>	±20 C	<u>19.003</u>
2 UA	<u>1.9000 ua</u>	±29 C	<u>1.9007</u>
200 NA	<u>190.00 na</u>	±39 C	<u>190.00</u>
20 NA	<u>19.000 na</u>	±77 C	<u>19.003</u>
2 NA	<u>1.9000 na</u>	±80 C	<u>1.9006</u>

**SOUTHWEST RESEARCH INSTITUTE**

**Department of Quality Assurance  
Calibration Laboratory**

**CERTIFICATE OF CALIBRATION  
02/02/96**

Issued to: DARRELL DUNN                    DIV20                    ,B57  
Manufacturer/Model: KEITH/485  
Nomenclature: PICOAMMETER  
Serial Number: 509163  
Asset Number: 001437  
Notes:

**ENVIRONMENTAL CONDITIONS**

Temperature: 73.0F

Relative Humidity: 40%

**CALIBRATION INFORMATION**

Procedure Number: MFG  
Remarks: CALIBRATED BY ROTHE DEVELOPMENT, INC.  
CERTIFICATE #41939

Accuracy: MFGR SPECS  
Received IN Tolerance

**Calibration was in accordance with requirements of MIL-STD-45662A.  
Measurements are traceable to the National Institute of Standards and Tech-  
nology. Inspection and test data are on file and available for inspection.**

**STANDARDS USED FOR CERTIFICATION**

Asset #	Serial #	Mfg	Model #	Nomenclature	Cal Date	Int. Cal Due
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-----  
VENDOR

Certified by : \_\_\_\_\_

Calibration Date: 01/30/96  
Interval: / 12 months  
Next Calibration Due: 01/30/97

Certificate#: 20016



# 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 - 13096

WORK ORDER # 51988

RECEIVED FROM Southwest Research Institute (30) DATE 01/30/96	MFG Keithley
ADDRESS 6220 Culebra, Bldg. 64/Division 30 San Antonio, TX 78284	MODEL 485
CONTACT (NAME) Mr. Jim Patterson	PHONE# 684-5111 * 2702
PURCHASE ORDER # 03602/ST278262/20-0754	FAX# 522-3692
CUSTOMER COMMENTS N/T BEFORE & AFTER DATA OUT OF SPEC ITEM	SERIAL # 509163
	TYPE DMM
	ACCES. RCVD. Lead

- REPAIR
- OPERATIONAL CHECK
- CALIBRATION

CALIBRATION DATE 30 Jan 96  
DATE DUE 30 Jan 97

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. #
					PJS	
					REPAIR LABOR HRS.	SERVICE CODE
						K
					PARTS TOTAL	
					REPAIR LABOR	
					SHIPPING	
					TEAR DOWN CHARGE	
					CALIBRATION	78.00
					TAX	
					<b>TOTAL</b>	<b>78 00</b>

TR #s 20, 75, 835

COMMENTS

WORK PERFORMED: Cal Data Taken - minor adjustments made to improve readings.

*CA*

TEMP. 73 °F  
SPECs: MFG RDI  
R.H. 40 %  
PROCEDURE: MFG RDI OTHER

RDI 2002

SHIP VIA: \_\_\_\_\_ DATE: \_\_\_\_\_ RECEIVED BY: \_\_\_\_\_



# Rothe Development Inc.

## Metrology Services Division

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

# Certificate of Calibration

# 41939

CAL DATE: 01/30/96

DUE DATE: 01/30/97

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

MFG Keithley

MODEL 485

SERIAL # 509163

TYPE DMM

CONTROL: 103 - 13096

TECHNICIAN #: 4

SPECIFICATIONS: MFG

PROCEDURE: MFG

WORK ORDER #: 51988

CUSTOMER PO #: 03602/ST278262/20-0754

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 73°F, Relative Humidity 40%.

### Test Report Number and Calibration Standards Used

Ref #	Model #	Mfgr	Serial #	Description	Cal Date	Int	Cal Due
TR 20	5700A	FLUKE	4605002	CALIBRATOR	12/04/95	3	03/04/96
TR 75	NMN	JRL	75	RESISTANCE BOX	07/11/95	12	07/11/96
TR 235	6500A	GUILDLINE	59660	TERADHMETER	09/01/95	12	09/01/96

### ----- Test Report Numbers -----

DCV FLUKE CERT# DH70  
ACV FLUKE CERT# DP30  
DMM NIST TEST# 255975  
TEMP NIST TEST# 253806  
Hz WWVE Transmission

INSPECTED BY  
COMMENTS:

*Jose A Mendez*

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY 485 AUTORANGING PICOAMMETER

CUSTOMER: SWRI  
 WO NUMBER: 51988  
 SERIAL: 509163  
 CUST ID: \_\_\_\_\_

DATE: 30 Jan 96  
 TECH: PJS  
 INST NO: 13096

CALIBRATION DATA TAKEN

INCOMING \_\_\_\_\_  
 OUTGOING ✓

CONDITION OF EQUIPMENT

IN TOLERANCE ✓  
 OUT OF TOLERANCE \_\_\_\_\_

CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 mA	1.9 mA	1.8980	<u>1.9000</u>	1.9020
200 uA	190 uA	189.80	<u>190.00</u>	190.20
20 uA	19 uA	18.980	<u>19.000</u>	19.020
2 uA	1.9 uA	1.8971	<u>1.9000</u>	1.9029
200 nA	190 nA	189.61	<u>189.99</u>	190.39
20 nA	19 nA	18.923	<u>19.002</u>	19.077
2 nA	1.9 nA	1.8920	<u>1.8999</u>	1.9080

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY 485 AUTORANGING PICOAMMETER

CUSTOMER: SWRT DATE: 30 Jan 96  
 WO NUMBER: 51988 TECH: PJS  
 SERIAL: 509163 INST NO: 13096  
 CUST ID: \_\_\_\_\_

CALIBRATION DATA TAKEN INCOMING ✓  
 OUTGOING \_\_\_\_\_

CONDITION OF EQUIPMENT IN TOLERANCE ✓  
 OUT OF TOLERANCE \_\_\_\_\_

CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 mA	1.9 mA	1.8980	<u>1.9001</u>	1.9020
200 uA	190 uA	189.80	<u>190.05</u>	190.20
20 uA	19 uA	18.980	<u>19.003</u>	19.020
2 uA	1.9 uA	1.8971	<u>1.9008</u>	1.9029
200 nA	190 nA	189.61	<u>190.06</u>	190.39
20 nA	19 nA	18.923	<u>19.007</u>	19.077
2 nA	1.9 nA	1.8920	<u>1.9006</u>	1.9080





Southwest Research Institute  
6220 Culebra Road  
San Antonio, TX 78238  
(210) 522-5215  
Department of Quality Assurance  
Calibration Laboratory

## Certificate of Calibration

31 March 1999

**Issued to:** DARRELL DUNN DIV20 B57  
**Manufacturer/Model:** KEITHLEY 485  
**Description:** AUTORANGING PICOAMMETER  
**Serial Number:** 509163  
**Asset Number:** 001437

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

**Ambient Conditions:** Temperature: 72.0 Degrees Fahrenheit Humidity: 31 % RH

**Calibration Date:** 19 Mar 99 **Calibration Procedure:** MFG

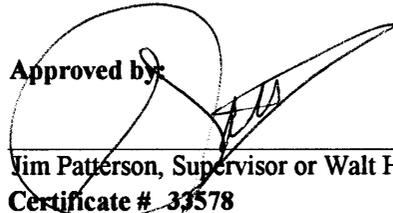
**Condition as Received:** IN TOLERANCE

**Condition as Released:** IN TOLERANCE

**Calibration Measurements by:** ROTHE DEVELOPMENT, SAN ANTONIO, TX

**Remarks:** ROTHE CERTIFICATE NO.: 57185.

Approved by:

  
\_\_\_\_\_  
Jim Patterson, Supervisor or Walt Hill, Metrologist  
Certificate # 33578

m:\nona2lav.rpt Rev date 10 Mar 99

**SOUTHWEST RESEARCH INSTITUTE  
CALIBRATION LABORATORY  
MEMORANDUM**

**June 9, 2003**

**To:** DARRELL DUNN DIV20 B57

**From:** Walt Hill, Metrology Group Leader  
Institute Calibration Laboratory 

**Subject:** Status of Calibration Supplier

**Manufacturer/Model:** KEITHLEY 485

**Description:** PICOAMMETER

**Serial Number:** 509163

**Asset Number:** 001437

**Work Order Number:** 444053958

**Date Calibrated:** June 6, 2003

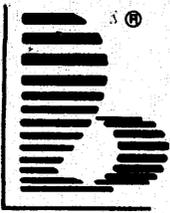
**Supplier:** ROTHE DEVELOPMENT, SAN ANTONIO TX - AUDIT - 648-3131

**Remarks:** Rothe Cert # 13096:1054918216

- 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)   2



CERT. NUMBER:  
13096:1054918216

**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	CAL DATE:	6/6/2003
		MODEL:	485	DUE DATE:	
		NOMEN:	PICOAMMETER		
		S/N:	509163		
		CUST. ID:	1437		

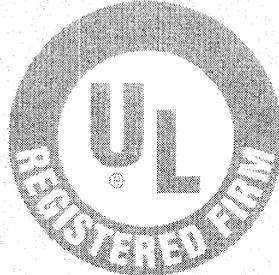
CONTROL NO.:	103 - 13096	CALIBRATION PERFORMED AT:	RDMSD
TECHNICIAN:	4	CALIBRATION INTERVAL:	0
SPECIFICATIONS:	MFG	TEMPERATURE:	72.0 °F
PROCEDURE:	MFG	RELATIVE HUMIDITY:	39 %
WORK ORDER:	002029596	DATE RECEIVED:	6/5/2003
CUSTOMER P.O.:	01571R/ST408442/1.20.007		
RECEIVED CONDITION:	IN TOLERANCE		
RETURNED CONDITION:	IN TOLERANCE		

COMMENTS:

ATTACHMENTS: CALIBRATION DATA 1 SHEET

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<sub>≥</sub>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	6/25/2003
258	FLUKE	5725A	6585002	6/25/2003
75	JRL	NMN	75	1/8/2004
235	GUILDLINE	6500A	59660	12/19/2003



REGISTERED TO ISO 9002  
CERTIFICATE NO. A9428

APPROVED BY: *Aster P. Stemann*

CMS

QCO

DATE

6/6/2003

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: KEITHLEY 485 AUTORANGING PICOAMMETER

CUSTOMER: SWRI  
 WO NUMBER: 002029596  
 SERIAL: 509163  
 CUST ID: 1437

DATE: 6 Jun 03  
 TECH: Patricia Tomm  
 INST NO: 13096

CALIBRATION DATA TAKEN

INCOMING ✓  
 OUTGOING ✓

CONDITION OF EQUIPMENT

IN TOLERANCE ✓  
 OUT OF TOLERANCE \_\_\_\_\_

CURRENT ACCURACY

RANGE	INPUT	MIN	READING	MAX
2 mA	1.9 mA	1.8980	<u>1.9001</u>	1.9020
200 uA	190 uA	189.80	<u>190.02</u>	190.20
20 uA	19 uA	18.980	<u>19.001</u>	19.020
2 uA	1.9 uA	1.8971	<u>1.9002</u>	1.9029
200 nA	190 nA	189.61	<u>189.99</u>	190.39
20 nA	19 nA	18.923	<u>18.991</u>	19.077
2 nA	1.9 nA	1.8920	<u>1.9004</u>	1.9080



# SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510  
Institute Quality Systems  
Institute Calibration Laboratory  
Phone: 210-522-5215 Fax 210-522-3692



Certificate #  
0972-01

## Certificate of Calibration

**Submitted By:** DIV20  
**Address:** B57  
**Contact:** DARRELL DUNN  
**Manufacturer Model:** KEITHLEY 485  
**Description:** PICOAMMETER  
**Serial No:** 509163  
**Asset No:** 001437  
**Procedure:** CL-722, MAR/03

**Work Order:** 444059299  
**Date Issued:** Jun 8, 2004  
**Calibration Date:** Jun 8, 2004  
**\*\*Calibration Due:** Jun 8, 2005  
**Calibration Location:** Bldg. 64  
**Environment:** Temp. 73.0°F Hum. 40 %RH  
**\*As Found:** IN TOLERANCE  
**\*As Left:** IN TOLERANCE

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 and ANSI/NC SL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. See Remarks or attached Calibration Report with the same Work Order number for calibration data.

\*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

\*\*Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

**Remarks:** None

### Standards Used

Asset	Manufacturer	Model	Description	Cal Due
000101	BIDDLE	72-5346-1	DECADE RESISTOR	Oct 06, 04
006413	FLUKE	5520A/SC1100	MULTI-PRODUCT CALIBRATOR	Feb 19, 05
000185	GENERAL RADIO	1433G	DECADE RESISTOR	Mar 05, 05

Approved by: Walt Hill  
Metrology Group Leader

Measurements by: Scott Kester  
Metrology Technician

Southwest Research Institute  
Calibration Laboratory  
Measurement Report

Work Order:	444059299	Mfr.	Keithley	Technician	SRK
Asset No.	001437	Model	485		
Serial No.	509163	Type.	Picoammeter	Cal Date.	08-Jun-04
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found/Left
DC Current	mAmp	mAmp	mAmp	mAmp	mAmp	Result
	1.9000	1.8999	-0.0001	0.0020	0.00012	Pass
	uAmp	uAmp	uAmp	uAmp	uAmp	
	190.00	190.02	0.02	0.20	0.013	Pass
	19.000	19.004	0.004	0.020	0.0013	Pass
	1.9000	1.9001	0.0001	0.0030	0.00013	Pass
	nAmp	nAmp	nAmp	nAmp	nAmp	
	190.00	189.95	-0.05	0.39	0.012	Pass
	19.000	18.975	-0.025	0.077	0.0018	Pass
	1.9000	1.8976	-0.0024	0.0080	0.0014	Pass

END OF REPORT