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

WORK ORDER

WORK ORDER # 36608 ASSET # 007645 DATE 11/1/99

ITEM DATA:

Manufacturer Fluke Model 87 III

Description True RMS Multimeter Serial # 73850992

Accessories test leads + holster + user's manual

ACTION REQUESTED cal

CUSTODIAN Div. 20, Darrell Dunn

Turned in by: Phone 6090

CHARGE # 20.00751.006 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 Date 11/1/99

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

CONDITION RECEIVED:
✓ Out of tolerance
___ In tolerance
___ Damaged (Contact customer)
___ Contact ___ Date ___
___ Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) Checked battery + fuse o.k.

CAL ENVIRONMENT:
Temperature 73 °F Humidity 49 %RH

CALIBRATED/REPAIRED:
By V Morales Cal Procedure Fluke 87 III 14R 5720A OCT 99
Date 3 NOV 99 Accuracy MFG
Cal Interval 12 Reliability Code 1
Next Cal Due 3 NOV 00 Cal Time 1.5 Repair Time
Standards used (Asset #) 182, 114, 3121, 201

DATE COMPLETED 3 NOV 99
DATE PICKED UP 11/17/99 PICKED UP BY

SwRi Form QA-174-0

36608

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

Processed by RCRUZ at 3:27:19PM on 11/7/00

Work Order 444041323 **Arrived** 11/7/00

Asset No. 007645 **Manufacturer** FLUKE **Model** 87 III

Instrument Type/Class TRUE RMS MULTIMETER **Serial No.** 73850992

Accessory No. **Calibration Procedure** ~~CL 223, 8/99~~ MAN. **Location** B57

Div/Client DIV20 **Custodian** DARRELL DUNN **Mail Stop** B57 **Tel.** 6090

Charge/Project No. 20.00751.006 **Delivered By / Telephone**

IN4CAL **Special Instructions**

WORK NOTES

SwRI Cal-Lab By: vm
CAL: 11/03/99 DUE: 11/03/00
AN: 007645 SN: 73850992

Date	Hours	Remarks/Notes
09 Nov	1.0	Ckt. found w/ marginal readings @ 4kV
	.5	performed adjustment procedure.
	1.0	re-cal'd

REPAIR PARTS

Date	Hours	Part Name	Part Number	Failure Description	Cost
		battery, 9V			

WORK SUMMARY

Failure Description

Repair Action

Calibration Procedure CL 230, 8/99 **Temp** 72 F **Hum.** 34 %

Tech Mark Anthony Romero **Totals** **Cal Hours** 2.0 **Repair Hours** .5 **Parts Cost**

Standards Used 182, 201, 3121, 114

Date Picked Up 11/14/2000 **Picked Up By** Darrell Dunn

Calibration Results

SwRI Calibration Laboratory

UUT: FLUKE 87 III
TRUE RMS MULTIMETER
Serial No: 73850992
Asset No. 007645

Result: **PASS**
Performed on: 11/9/00 at 07:36:50
Performed by: Mark Anthony Romero
Environment: Temp. 72.0°F Humid. 34 %
Condition F/L: AS-FOUND
Procedure Completed: YES

Notes:

Standards Used

Asset	Mfg	Model	Description	Cal. Date	Due Date
000182	FLUKE	5700A/EP	CALIBRATOR	11-Oct-00	11-Jan-01
000201	FLUKE	5725A	AMPLIFIER	10-Aug-99	10-Aug-01
000114	HEWLETT-PACKAR	3325A	SYNTHESIZER/FUNCTION GENERATOR	20-Sep-00	20-Sep-01
003121	GENERAL RADIO	1413	PRECISION DECADE CAPACITOR	15-Aug-00	15-Aug-01

Test Data

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST READING	TOLERANCE	UUT ERROR	ERROR in (% of Tol)	TUR	NOTIFY USER
DISPLAY TEST								
Result of Operator Evaluation						PASS		
ROTARY SWITCH TESTS								
VAC								
2	0display		0		0display	0		
VDC								
3	-32display		-32		0display	0		
mVDC								
4	-64display		-64		0display	0		
Ohms								
5	-96display		-96		0display	0		
Diode								
6	-128display		-128		0display	0		
mA/A								
7	-160display		-160		0display	0		
uA								
8	-192display		-192		0display	0		
AC VOLTAGE TESTS								
400mV Range								
9	350.0mV @ 60Hz		348.5	2.9mV	-1.5mV	52		
10	350.0mV @ 1kHz		347.4	3.9mV	-2.6mV	67		
11	350.0mV @ 5kHz		345.3	7.4mV	-4.7mV	64		
12	350.0mV @ 20kHz		350.2	9mV	200uV	2		
4V Range								
13	3.500V @ 60Hz		3.487	27mV	-13mV	48		
14	3.500V @ 1kHz		3.479	29mV	-21mV	72		M
15	3.500V @ 5kHz		3.447	74mV	-53mV	72		M
16	3.500V @ 20kHz		3.452	90mV	-48mV	53		
40V Range								
17	35.00V @ 60Hz		34.87	270mV	-130mV	48		

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST READING	TOLERANCE	UUT ERROR	ERROR in (% of Tol)	TUR	NOTIFY USER
18	35.00V @ 1kHz		34.92	390mV	-80mV	21		
19	35.00V @ 5kHz		34.94	740mV	-60mV	8		
20	35.00V @ 20kHz		34.89	900mV	-110mV	12		
400V Range								
21	350.0V @ 60Hz		348.7	2.7V	-1.3V	48		
22	350.0V @ 1kHz		349.3	3.9V	-700mV	18		
23	350.0V @ 2.5kHz		349.2	7.4V	-800mV	11		
24	100.0V @ 20kHz		99.8	4V	-200mV	5		
1000V Range								
25	900V @ 60Hz		902	8V	2V	25		
26	900V @ 1kHz		903	13V	3V	23		
FREQUENCY TESTS								
19.999kHz Range								
27	19.000Kh @ 150mV		18.999	.002Kh	-0.001Kh	50		
199.99kHz Range								
28	190.00kh @ 150mv		189.99	.02kh	-0.01kh	50		
FREQUENCY SENSITIVITY AND TRIGGER LEVEL								
4V AC Range								
29	1000.0h @ 300mv		1000.0	.2h	0h	0		
4V DC Range								
30	1000.0h @ 300mv		999.9	.2h	-0.1h	50		
displaying all zeros								
Result of Operator Evaluation						PASS		
40V DC Range								
32	1000.0h @ 6.0v		999.9	.2h	-0.1h	50		
displaying all zeros								
Result of Operator Evaluation						PASS		
DC VOLTAGE TESTS								
4V Range								
34	3.500V		3.498	3mV	-2mV	67		
40V Range								
35	35.00V		34.98	30mV	-20mV	67		
36	-35.00V		-34.98	30mV	20mV	67		
400V Range								
37	350.0V		349.9	300mV	-100mV	33		
1000V Range								
38	1000V		1000	2V	0V	0		
1ms MIN/MAX TESTS								
39	2.828VP		2.804	.123VP	-0.024VP	20		
40	-2.828VP		-2.848	.123VP	-0.02VP	16		
DC MILLIVOLT TEST								
400mV Range								
41	350.0mV		349.8	500uV	-200uV	40		
RESISTANCE TESTS								
400 Ohm Range								
42	190.0 Ohm	189.99	189.9	600 mOhm	-94.42 mOhm	16		
40 kOhm Range								
43	19.00 kOhm	18.999	18.99	50 Ohm	-8.612 Ohm	17		
4 MOhm Range								
44	1.900 MOhm	1.8999	1.900	12 kOhm	55.2 Ohm	0		
40 MOhm Range								
45	19.00 MOhm	18.998	19.00	220 kOhm	1.649 kOhm	1		
CONDUCTANCE TEST								
40nS Range								
46	10.00nS	10.002	9.97	200pS	-31.66228pS	16		
DIODE TEST								
47	3.000V		2.973	61mV	-27mV	44		
CAPACITANCE TESTS								
5.00uF Range								
48-1	1.00uF		0.98	.05uF	-0.02uF	40	0.1	
0.500uF Range								
48-2	0.470uF		0.469	.008uF	-0.001uF	13	0.0	

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST READING	TOLERANCE	UUT ERROR	ERROR in (% of Tol)	TUR	NOTIFY USER
0.0500uF Range								
48-3	0.0470uF		0.0473	800E-6uF	0.0003uF	38	0.0	
5.00nF Range								
~~48-4~~	~~4.70nF~~		~~4.76~~	~~.08nF~~	~~0.06nF~~	~~75~~	~~0.1~~	~~M~~
48-4	4.70nF		4.70	.08nF	0nF	0	0.1	
DC MILLIAMP TESTS								
40mA Range								
49	35.00mA		34.99	90uA	-10uA	11		
400mA Range								
50	350.0mA		349.7	900uA	-300uA	33		
AC MILLIAMP TESTS								
40mA Range								
51	35.00mA @ 60Hz		34.89	370uA	-110uA	30		
52	35.00mA @ 1kHz		34.95	370uA	-50uA	14		
400mA Range								
53	350.0mA @ 60Hz		349.1	3.7mA	-900uA	24		
54	350.0mA @ 1kHz		349.5	3.7mA	-500uA	14		
DC MICROAMP TESTS								
400uA Range								
55	350.0uA		350.2	900nA	200nA	22		
4000uA Range								
56	3500uA		3499	9uA	-1uA	11		
AC MICROAMP TESTS								
400uA Range								
57	350.0uA @ 60Hz		349.0	3.7uA	-1uA	27		
58	350.0uA @ 1kHz		349.6	3.7uA	-400nA	11		
4000uA Range								
59	3500uA @ 60Hz		3493	37uA	-7uA	19		
60	3500uA @ 1kHz		3497	37uA	-3uA	8		
DC AMP TESTS								
4000mA Range								
61	3500mA		3498	11mA	-2mA	18		
10A Range								
62	10.00A		9.99	40mA	-10mA	25		
AC AMP TESTS								
4000mA Range								
63	3500mA @ 60Hz		3489	37mA	-11mA	30		
64	3500mA @ 1kHz		3496	37mA	-4mA	11		
10A Range								
65	10.00A @ 60Hz		10.03	120mA	30mA	25		
66	10.00A @ 1kHz		10.05	120mA	50mA	42		

End of Test Data

Calibration Results

SwRI Calibration Laboratory

UUT: FLUKE 87 III
TRUE RMS MULTIMETER
Serial No: 73850992
Asset No. 007645

Result: **PASS**
Performed on: 11/9/00 at 08:31:46
Performed by: Mark Anthony Romero
Environment: Temp. 72.0°F Humid. 34 %
Condition F/L: AS-LEFT
Procedure Completed: YES

Notes:

Standards Used

Asset	Mfg	Model	Description	Cal. Date	Due Date
000182	FLUKE	5700A/EP	CALIBRATOR	11-Oct-00	11-Jan-01
000201	FLUKE	5725A	AMPLIFIER	10-Aug-99	10-Aug-01
000114	HEWLETT-PACKAR	3325A	SYNTHESIZER/FUNCTION GENERATOR	20-Sep-00	20-Sep-01
003121	GENERAL RADIO	1413	PRECISION DECADE CAPACITOR	15-Aug-00	15-Aug-01

Test Data

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST READING	TOLERANCE	UUT ERROR	ERROR in (% of Tol)	TUR	NOTIFY USER
DISPLAY TEST								
Result of Operator Evaluation						PASS		
ROTARY SWITCH TESTS								
VAC								
2	0display		0		0display	0		
VDC								
3	-32display		-32		0display	0		
mVDC								
4	-64display		-64		0display	0		
Ohms								
5	-96display		-96		0display	0		
Diode								
6	-128display		-128		0display	0		
mA/A								
7	-160display		-160		0display	0		
uA								
8	-192display		-192		0display	0		
AC VOLTAGE TESTS								
400mV Range								
9	350.0mV @ 60Hz		348.7	2.9mV	-1.3mV	45		
10	350.0mV @ 1kHz		348.4	3.9mV	-1.6mV	41		
11	350.0mV @ 5kHz		349.4	7.4mV	-600uV	8		
12	350.0mV @ 20kHz		354.0	9mV	4mV	44		
4V Range								
13	3.500V @ 60Hz		3.490	27mV	-10mV	37		
14	3.500V @ 1kHz		3.489	29mV	-11mV	38		
15	3.500V @ 5kHz		3.489	74mV	-11mV	15		
16	3.500V @ 20kHz		3.503	90mV	3mV	3		
40V Range								
17	35.00V @ 60Hz		34.89	270mV	-110mV	41		

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST READING	TOLERANCE	UUT ERROR	ERROR in (% of Tol)	TUR	NOTIFY USER
18	35.00V @ 1kHz		34.95	390mV	-50mV	13		
19	35.00V @ 5kHz		34.99	740mV	-10mV	1		
20	35.00V @ 20kHz		34.95	900mV	-50mV	6		
400V Range								
21	350.0V @ 60Hz		349.0	2.7V	-1V	37		
22	350.0V @ 1kHz		349.5	3.9V	-500mV	13		
23	350.0V @ 2.5kHz		349.4	7.4V	-600mV	8		
24	100.0V @ 20kHz		99.8	4V	-200mV	5		
1000V Range								
25	900V @ 60Hz		903	8V	3V	38		
26	900V @ 1kHz		903	13V	3V	23		
FREQUENCY TESTS								
19.999kHz Range								
27	19.000Kh @ 150mV		18.999	.002Kh	-0.001Kh	50		
199.99kHz Range								
28	190.00kh @ 150mv		189.99	.02kh	-0.01kh	50		
FREQUENCY SENSITIVITY AND TRIGGER LEVEL								
4V AC Range								
29	1000.0h @ 300mv		999.9	.2h	-0.1h	50		
4V DC Range								
30	1000.0h @ 300mv		1000.0	.2h	0h	0		
displaying all zeros								
Result of Operator Evaluation						PASS		
40V DC Range								
32	1000.0h @ 6.0v		999.9	.2h	-0.1h	50		
displaying all zeros								
Result of Operator Evaluation						PASS		
DC VOLTAGE TESTS								
4V Range								
34	3.500V		3.500	3mV	0V	0		
40V Range								
35	35.00V		35.00	30mV	0V	0		
36	-35.00V		-35.00	30mV	0V	0		
400V Range								
37	350.0V		350.1	300mV	100mV	33		
1000V Range								
38	1000V		1001	2V	1V	50		
1ms MIN/MAX TESTS								
39	2.828VP		2.804	.123VP	-0.024VP	20		
40	-2.828VP		-2.824	.123VP	0.004VP	3		
DC MILLIVOLT TEST								
400mV Range								
41	350.0mV		350.1	500uV	100uV	20		
RESISTANCE TESTS								
400 Ohm Range								
42	190.0 Ohm	189.99	189.9	600 mOhm	-94.42 mOhm	16		
40 kOhm Range								
43	19.00 kOhm	18.999	18.99	50 Ohm	-8.612 Ohm	17		
4 MOhm Range								
44	1.900 MOhm	1.8999	1.900	12 kOhm	55.2 Ohm	0		
40 MOhm Range								
45	19.00 MOhm	18.998	19.00	220 kOhm	1.649 kOhm	1		
CONDUCTANCE TEST								
40nS Range								
46	10.00nS	10.002	9.97	200pS	-31.66228pS	16		
DIODE TEST								
47	3.000V		2.975	61mV	-25mV	41		
CAPACITANCE TESTS								
5.00uF Range								
48-1	1.00uF		0.98	.05uF	-0.02uF	40	0.1	
0.500uF Range								
48-2	0.470uF		0.469	.008uF	-0.001uF	13	0.0	

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST READING	TOLERANCE	UUT ERROR	ERROR in (% of Tol)	TUR	NOTIFY USER
0.0500uF Range								
48-3	0.0470uF		0.0473	800E-6uF	0.0003uF	38	0.0	
5.00nF Range								
48-4	4.70nF		4.75	.08nF	0.05nF	62	0.1	
DC MILLIAMP TESTS								
40mA Range								
49	35.00mA		35.01	90uA	10uA	11		
400mA Range								
50	350.0mA		350.0	900uA	0A	0		
AC MILLIAMP TESTS								
40mA Range								
51	35.00mA @ 60Hz		34.91	370uA	-90uA	24		
52	35.00mA @ 1kHz		34.97	370uA	-30uA	8		
400mA Range								
53	350.0mA @ 60Hz		349.4	3.7mA	-600uA	16		
54	350.0mA @ 1kHz		349.8	3.7mA	-200uA	5		
DC MICROAMP TESTS								
400uA Range								
55	350.0uA		350.4	900nA	400nA	44		
4000uA Range								
56	3500uA		3501	9uA	1uA	11		
AC MICROAMP TESTS								
400uA Range								
57	350.0uA @ 60Hz		349.3	3.7uA	-700nA	19		
58	350.0uA @ 1kHz		349.8	3.7uA	-200nA	5		
4000uA Range								
59	3500uA @ 60Hz		3496	37uA	-4uA	11		
60	3500uA @ 1kHz		3500	37uA	0A	0		
DC AMP TESTS								
4000mA Range								
61	3500mA		3500	11mA	0A	0		
10A Range								
62	10.00A		9.99	40mA	-10mA	25		
AC AMP TESTS								
4000mA Range								
63	3500mA @ 60Hz		3491	37mA	-9mA	24		
64	3500mA @ 1kHz		3498	37mA	-2mA	5		
10A Range								
65	10.00A @ 60Hz		10.03	120mA	30mA	25		
66	10.00A @ 1kHz		10.06	120mA	60mA	50		

End of Test Data

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

Certificate #
0972-01

Certificate of Calibration

9 November 2000

Issued to:	DARRELL DUNN DIV20 B57
Manufacturer/Model:	FLUKE 87 III
Description:	TRUE RMS MULTIMETER
Serial Number:	73850992
Asset Number:	007645

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. The results of this calibration relate only to the individual item as described above. 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 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.

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results of this calibration certificate were determined in accordance with the terms of accreditation unless stated otherwise below.

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: 34 % RH

Calibration Date: 9 Nov 00 **Calibration Procedure:** FLUKE 87III 1YR 5720A OCT 99

Condition as Received: IN TOLERANCE

Condition as Released: IN TOLERANCE

Remarks:

Approved by:

Jim Patterson, Supervisor, or Walt Hill, Metrologist

Measurements performed by:

Mark Romero, Technician

Certificate # 444041323

m:\a2la.rpt Rev date 22 May 00

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

Received by RCRUZ,12/6/01 2:25:38PM

Arrived 12/6/01 Work Order **444046367**

Asset No. 007645 Manufacturer FLUKE Model 87 III

Equipment Type MULTIMETER Serial No. 73850992 Accessory No.

Interval 12 M Calibration Procedure CL-230, 8/99 Location B57

Div/Client DIV20 Custodian DARRELL DUNN Mail Stop B57 Tel 6090

IN4CAL 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

ROTHE (210) 648-3131
ISO 9002
INST NO. 45190
RDI 04
CAL ON DEC 21 2001
DATE DUE CAL DEC 21 2002
TRACEABLE TO NIST

Date	Hours	Part Name	Part Number	Fail	Cost

WORK SUMMARY

Failure Description

Repair Action

Tech Rothe Cal Hrs. Repair Hrs Parts Cost Temp 72 F Hum. 32 %

Standards Used Vendor

Date Picked Up 1/7/2002 Picked Up By

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: FLUKE 87 SERIES III MULTIMETER

CUSTOMER: SWRI
WO NUMBER: 0020165556
SERIAL: 73850992
CUST ID:

DATE: 21 Dec 01
TECH: PJS
INST NO: 45190

CALIBRATION DATA TAKEN

INCOMING ✓
OUTGOING

CONDITION OF EQUIPMENT

IN TOLERANCE
OUT OF TOLERANCE ✓ *
AC & DC Voltage

ROTARY SWITCH TEST

ACV POSITION-DISPLAY READS	0	±12 C	PASS	/ ~~FAIL~~
DCV POSITION-DISPLAY READS	-32	±12 C	PASS	/ ~~FAIL~~
mV DC POSITION-DISPLAY READS	-64	±12 C	PASS	/ ~~FAIL~~
OHMS POSITION-DISPLAY READS	-96	±12 C	PASS	/ ~~FAIL~~
DIODE POSITION-DISPLAY READS	-128	±12 C	PASS	/ ~~FAIL~~
mA/A POSITION-DISPLAY READS	-160	±12 C	PASS	/ ~~FAIL~~
uA POSITION-DISPLAY READS	-192	±12 C	PASS	/ ~~FAIL~~

AC VOLTAGE ACCURACY

INPUT	MIN	READING	MAX
350 mV 60 Hz	347.2	348.6	352.9
350 mV 1 kHZ	346.1	349.2	353.9
350 mV 5 kHz	342.6	349.6	357.4
350 mV 20 kHz	341.0	356.5	359.0
3.5 V 60 Hz	3.473	3.489	3.527
3.5 V 1 kHZ	3.461	3.489	3.539
3.5 V 5 kHz	3.426	3.494	3.574
3.5 V 20 kHz	3.410	3.508	3.590
35 V 60 Hz	34.73	34.90	35.27
35 V 1 kHz	34.61	34.95	35.39
35 V 5 kHz	34.26	34.97	35.74
35 V 20 kHz	34.10	34.92	35.90
350 V 60 Hz	347.3	349.5	352.7
350 V 1 kHZ	346.1	350.1	353.9
350 V 2.5 kHz	342.6	349.9	357.4

900 V 60 Hz	892	919	908	*
900 V 1 kHz	887	920	913	*

FREQUENCY TEST

INPUT	MIN	READING	MAX
150 mV RMS 19 kHz	18.998	18.999	19.002
150 mV RMS 190 kHz	189.98	189.99	190.02

FREQUENCY SENSITIVITY AND TRIGGER LEVEL TEST

RANGE	INPUT SIGNAL	MIN	READING	MAX
4 V AC	300 mV 1 kHz	999.8	999.9	1000.2
4 V DC	1.7 V 1 kHz	999.8	999.9	1000.2
4 V DC	1.0 V 1 kHz		0	0000
40 V DC	6.0 V 1 kHz	999.8	999.9	1000.2
40 V DC	2.0 V 1 kHz		0	0000

DC VOLTAGE ACCURACY

INPUT	MIN	READING	MAX	
+3.5 V	3.497	3.501	3.503	
+35.0 V	34.97	35.02	35.03	
-35.0 V	-34.97	35.02	-35.03	
+350 V	349.7	351.6	350.3	*
+1000 V	998	OL	1002	*

900 applied - 937

1-mS MIN MAX TEST
SIGNAL APLLIED - 2.0 V 60 Hz

LEVEL	MIN	READING	MAX
MAX	2.705	2.820	2.951
MIN	-2.705	2.864	-2.951

mV DC VOLTAGE ACCURACY

INPUT	MIN	READING	MAX
350 mV	349.5	350.1	350.5

INST NO: 45190

DOC. DATE: 11/7/2000

✓ INCOMING
___ OUTGOING

OHMS ACCURACY

INPUT	MIN	READING	MAX
190.0 Ω	189.4	189.9	190.6
1.9 KΩ	1.895	1.900	1.905
19 KΩ	18.95	19.00	19.05
190 KΩ	188.8	189.4	191.2
1.9 MΩ	1.888	1.900	1.912
19 MΩ	18.78	19.00	19.22
100 MΩ (nS RANGE)	9.80	9.95	10.20

CAPACITANCE ACCURACY

INPUT	MIN	READING	MAX
1.0 uF	0.95	.99	1.05
0.470 uF	0.463	.470	0.477
0.0470 uF	0.0463	.0472	0.0477
4.70 nF	4.62	4.73	4.78

DIODE TEST

INPUT	MIN	READING	MAX
3.0 V	2.939	2.976	3.061

CURRENT ACCURACY

FUNCTION	INPUT	MIN	READING	MAX
mA/A	35.0 mA	34.89	35.02	35.11
	350 mA	349.1	350.0	350.9
	35.0 mA 60 Hz	34.63	34.91	35.37
	35.0 mA 1 kHz	34.63	34.97	35.37
	350 mA 60 Hz	346.3	349.4	353.7
	350 mA 1 kHz	346.3	349.8	353.7
uA	350 uA	348.9	350.5	351.1
	3500 uA	3491	3501	3509
	350 uA 60 Hz	346.3	349.3	353.7
	350 uA 1 kHz	346.3	349.8	353.7
	3500 uA 60 Hz	3463	3496	3537
	3500 uA 1 kHz	3463	3499	3537

INST NO: 45190

DOC. DATE: 11/7/2000

✓ INCOMING
___ OUTGOING

A	3500 mA	3489	3500	3511
	10.0 A	9.96	9.99	10.04
	3500 mA 60 Hz	3463	3491	3537
	3500 mA 1 kHz	3463	3498	3537
	10.0 A 60 Hz	9.88	10.04	10.12
	10.0 A 1 kHz	9.88	10.05	10.12

INST NO: 45190

DOC. DATE: 11/7/2000

✓ INCOMING
OUTGOING

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA: FLUKE 87 SERIES III MULTIMETER

CUSTOMER: SwRI
WO NUMBER: 0020016556
SERIAL: 73850992
CUST ID:

DATE: 21 Dec 01
TECH: PJS
INST NO: 45190

CALIBRATION DATA TAKEN

INCOMING
OUTGOING ✓

CONDITION OF EQUIPMENT

IN TOLERANCE ✓
OUT OF TOLERANCE

ROTARY SWITCH TEST

ACV POSITION-DISPLAY READS	0	±12 C	PASS	/ ~~FAIL~~
DCV POSITION-DISPLAY READS	-32	±12 C	PASS	/ ~~FAIL~~
mV DC POSITION-DISPLAY READS	-64	±12 C	PASS	/ ~~FAIL~~
OHMS POSITION-DISPLAY READS	-96	±12 C	PASS	/ ~~FAIL~~
DIODE POSITION-DISPLAY READS	-128	±12 C	PASS	/ ~~FAIL~~
mA/A POSITION-DISPLAY READS	-160	±12 C	PASS	/ ~~FAIL~~
uA POSITION-DISPLAY READS	-192	±12 C	PASS	/ ~~FAIL~~

AC VOLTAGE ACCURACY

INPUT	MIN	READING	MAX
350 mV 60 Hz	347.2	348.7	352.9
350 mV 1 kHZ	346.1	349.1	353.9
350 mV 5 kHz	342.6	349.3	357.4
350 mV 20 kHz	341.0	355.9	359.0
3.5 V 60 Hz	3.473	3.490	3.527
3.5 V 1 kHZ	3.461	3.489	3.539
3.5 V 5 kHz	3.426	3.490	3.574
3.5 V 20 kHz	3.410	3.502	3.590
35 V 60 Hz	34.73	34.90	35.27
35 V 1 kHz	34.61	34.95	35.39
35 V 5 kHz	34.26	34.97	35.74
35 V 20 kHz	34.10	34.92	35.90
350 V 60 Hz	347.3	349.0	352.7
350 V 1 kHZ	346.1	349.5	353.9
350 V 2.5 kHz	342.6	349.4	357.4

900 V 60 Hz	892	903	908
900 V 1 kHz	887	903	913

FREQUENCY TEST

INPUT	MIN	READING	MAX
150 mV RMS 19 kHz	18.998	18.999	19.002
150 mV RMS 190 kHz	189.98	189.99	190.02

FREQUENCY SENSITIVITY AND TRIGGER LEVEL TEST

RANGE	INPUT SIGNAL	MIN	READING	MAX
4 V AC	300 mV 1 kHz	999.8	999.9	1000.2
4 V DC	1.7 V 1 kHz	999.8	999.9	1000.2
4 V DC	1.0 V 1 kHz		0	0000
40 V DC	6.0 V 1 kHz	999.8	999.9	1000.2
40 V DC	2.0 V 1 kHz		0	0000

DC VOLTAGE ACCURACY

INPUT	MIN	READING	MAX
+3.5 V	3.497	3.500	3.503
+35.0 V	34.97	35.00	35.03
-35.0 V	-34.97	35.00	-35.03
+350 V	349.7	350.1	350.3
+1000 V	998	1001	1002

1-mS MIN MAX TEST
SIGNAL APLLIED - 2.0 V 60 Hz

LEVEL	MIN	READING	MAX
MAX	2.705	2.812	2.951
MIN	-2.705	2.820	-2.951

mV DC VOLTAGE ACCURACY

INPUT	MIN	READING	MAX
350 mV	349.5	350.0	350.5

INST NO: 45190

DOC. DATE: 11/7/2000

___ INCOMING
✓ OUTGOING

OHMS ACCURACY

INPUT	MIN	READING	MAX
190.0 Ω	189.4	189.9	190.6
1.9 KΩ	1.895	1.900	1.905
19 KΩ	18.95	19.00	19.05
190 KΩ	188.8	189.4	191.2
1.9 MΩ	1.888	1.900	1.912
19 MΩ	18.78	19.01	19.22
100 MΩ (nS RANGE)	9.80	9.96	10.20

CAPACITANCE ACCURACY

INPUT	MIN	READING	MAX
1.0 uF	0.95	.99	1.05
0.470 uF	0.463	.470	0.477
0.0470 uF	0.0463	.0472	0.0477
4.70 nF	4.62	4.73	4.78

DIODE TEST

INPUT	MIN	READING	MAX
3.0 V	2.939	2.975	3.061

CURRENT ACCURACY

FUNCTION	INPUT	MIN	READING	MAX
mA/A	35.0 mA	34.89	35.01	35.11
	350 mA	349.1	349.9	350.9
	35.0 mA 60 Hz	34.63	34.92	35.37
	35.0 mA 1 kHz	34.63	34.97	35.37
	350 mA 60 Hz	346.3	349.4	353.7
	350 mA 1 kHz	346.3	349.8	353.7
uA	350 uA	348.9	350.4	351.1
	3500 uA	3491	3501	3509
	350 uA 60 Hz	346.3	349.3	353.7
	350 uA 1 kHz	346.3	349.8	353.7
	3500 uA 60 Hz	3463	3497	3537
	3500 uA 1 kHz	3463	3500	3537

INST NO: 45190

DOC. DATE: 11/7/2000

___ INCOMING
✓ OUTGOING

A	3500 mA	3489	3500	3511
	10.0 A	9.96	9.99	10.04
	3500 mA 60 Hz	3463	3491	3537
	3500 mA 1 kHz	3463	3499	3537
	10.0 A 60 Hz	9.88	10.04	10.12
	10.0 A 1 kHz	9.88	10.06	10.12

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

December 27, 2001

To: DARRELL DUNN DIV20 B57

From: Walt Hill, Supervisor
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: FLUKE 87 III
Description: MULTIMETER
Serial Number: 73850992
Asset Number: 007645
Work Order Number: 444046367
Date Calibrated: December 21, 2001
Supplier: ROTHE DEVELOPMENT, INC., SAN ANTONIO, TX
Remarks: ROTHE CERTIFICATE NO.: 45190:1008932270

( ) Supplier is on the Approved Suppliers List (ASL) and is accredited.

(✓) Supplier is on the Approved Suppliers List (ASL) but is <u>not accredited</u>.

( ) 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) 9

m:\nonasl2.rpt Rev 7 Dec 01

OUT OF TOLERANCE

CERT.
45190:1008932270

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: FLUKE
MODEL: 87-3
NOMEN: DMM
S/N: 73850992
CUST. ID:

CAL DATE: 12/21/2001
DUE DATE: 12/21/2002

CONTROL NO.: 103-45190
TECHNICIAN: 4
SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER: 002016556
CUSTOMER P.O.: 01571R/ST391033/1.20.007
RECEIVED CONDITION: OUT OF TOLERANCE
RETURNED CONDITION: IN TOLERANCE

CALIBRATION PERFORMED AT: RDMSD
CALIBRATION INTERVAL: 12Mo.
TEMPERATURE: 72.0 °F
RELATIVE HUMIDITY: 32 %

DATE RECEIVED: 12/20/2001

COMMENTS:

ATTACHMENTS: CALIBRATION DATA 8 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≥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	12/24/2001
258	FLUKE	5725A	535002	12/24/2001
81	ARCO	SS-32	1554	7/18/2002
174	HP	3325A	2512A19899	5/7/2002

ISO 9002

UL REGISTERED FIRM

REGISTERED TO ISO 9002
CERTIFICATE NO. A9428

APPROVED BY: Peter J Stemmer ☑ CMS ☐ QCO **DATE:** 12/24/2001

RDMSD 1001
03/01

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