

SOUTHWEST RESEARCH INSTITUTE

Department of Quality Assurance

Calibration Laboratory • 522-5215

WORK ORDER

WORK ORDER # 36610 ASSET # 007647 DATE 11/1/99

ITEM DATA:

Manufacturer Fluke Model 87 III

Description True RMS Multimeter Serial # 73980493

Accessories test leads + holster

ACTION REQUESTED cal

CUSTODIAN Div. 20, Derrell 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 J. J. J. 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

CAL ENVIRONMENT:
Temperature 73 °F Humidity 49 %RH

CALIBRATED/REPAIRED:
By VM Cal Procedure Fluke 87III §14R 5720A OCT99
Date 3 NOV 99 Accuracy Mfg
Cal Interval R Reliability Code 1
Next Cal Due 3 NOV 00 Cal Time 1.0 Repair Time _____
Standards used (Asset #) 182, 204, 3121, 114

DATE COMPLETED 3 NOV 99

DATE PICKED UP 11/17/99 PICKED UP BY Derrell D

36610

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

RUSH

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

1 100011 00011 00011 00011 00011 00011 00011

Work Order 444041325

Arrived 11/7/00

Asset No. 007647 Manufacturer FLUKE

Model 87 III

Instrument Type/Class TRUE RMS MULTIMETER

Serial No. 73980493

Accessory No.

Calibration Procedure ~~87-223, 8/99~~ *W.D.*

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

Date	Hours	Remarks/Notes
<i>11/7/00</i>	<i>1.0</i>	<i>Unit found to have marginal readings @ 1.0V</i>
	<i>.5</i>	<i>performed adjustment procedure.</i>
	<i>1.0</i>	<i>re-cal'd.</i>

SwRI Cal-Lab By: vm
CAL: 11/03/99 DUE: 11/03/00
AN: 007647 SN: 73980493
1 100011 00011 00011 00011 00011 00011 00011

REPAIR PARTS

Date	Hours	Part Name	Part Number	Failure Description	Cost
		<i>Battery, 9V</i>			

WORK SUMMARY

Failure Description Marginal readings

Repair Action performed adjustment

Calibration Procedure 11-230, 8/99 Temp 72 F Hum. 36 %

Tech Andrew Romero Totals Cal Hours 2.0 Repair Hours .5 Parts Cost _____

Standards Used 182, 114, 3121, 201

Date Picked Up 11/14/2000

Picked Up By *Dunn*

41325-1

Calibration Results

SwRI Calibration Laboratory

UUT: FLUKE 87 III
 TRUE RMS MULTIMETER
 Serial No: 73980493
 Asset No. 007647

Result: **PASS**
 Performed on: 11/8/00 at 10:08:26
 Performed by: Mark Anthony Romero
 Environment: Temp. 72.0°F Humid. 36 %
 Condition F/L: AS-FOUND
 Procedure Completed: YES

Notes: MARGINAL READINGS FOUND @ ACV. ADJUSTMENT REQUIRED.

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	----- READING	UNIT UNDER TEST TOLERANCE	----- UUT ERROR	ERROR in (% of Tol)	NOTIFY TUR USER
DISPLAY TEST							PASS
Result of Operator Evaluation							
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		348.9	2.9mV	-1.1mV	38	
10	350.0mV @ 1kHz		347.6	3.9mV	-2.4mV	62	
11	350.0mV @ 5kHz		345.3	7.4mV	-4.7mV	64	
12	350.0mV @ 20kHz		349.2	9mV	-800uV	9	
4V Range							
13	3.500V @ 60Hz		3.490	27mV	-10mV	37	
14	3.500V @ 1kHz		3.479	29mV	-21mV	72	M
15	3.500V @ 5kHz		3.446	74mV	-54mV	73	M
16	3.500V @ 20kHz		3.454	90mV	-46mV	51	
40V Range							
17	35.00V @ 60Hz		34.90	270mV	-100mV	37	

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST			ERROR in (% of Tol)	NOTIFY TUR. USER
			READING	TOLERANCE	UUT ERROR		
18	35.00V @ 1kHz		34.96	390mV	-40mV	10	
19	35.00V @ 5kHz		35.02	740mV	20mV	3	
20	35.00V @ 20kHz		35.00	900mV	0V	0	
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		99.4	4V	-600mV	15	
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		999.9	.2h	-0.1h	50	
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		3.499	3mV	-1mV	33	
40V Range							
35	35.00V		34.99	30mV	-10mV	33	
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		2.800	.123VP	-0.028VP	23	
40	-2.828VP		-2.816	.123VP	0.012VP	10	
DC MILLIVOLT TEST							
400mV Range							
41	350.0mV		349.9	500uV	-100uV	20	
RESISTANCE TESTS							
400 Ohm Range							
42	190.0 Ohm	189.99	190.0	600 mOhm	5.58 mOhm	1	
40 kOhm Range							
43	19.00 kOhm	18.999	19.00	50 Ohm	1.388 Ohm	3	
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	19.01	220 kOhm	11.649 kOhm	5	
CONDUCTANCE TEST							
40nS Range							
46	10.00nS	10.002	9.97	200pS	-31.66228pS	16	
DIODE TEST							
47	3.000V		2.986	61mV	-14mV	23	
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	----- READING	UNIT UNDER TEST TOLERANCE	----- UT ERROR	ERROR in (% of Tol)	NOTIFY TUR USER
0.0500uF Range							
48-3	0.0470uF		0.0473	800E-6uF	0.0003uF	38	0.0
5.00nF Range							
48-4	4.70nF		4.74	.08nF	0.04nF	50	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		34.92	370uA	-80uA	22	
52	35.00mA @ 1kHz		34.97	370uA	-30uA	8	
400mA Range							
53	350.0mA @ 60Hz		349.3	3.7mA	-700uA	19	
54	350.0mA @ 1kHz		349.6	3.7mA	-400uA	11	
DC MICROAMP TESTS							
400uA Range							
55	350.0uA		350.3	900nA	300nA	33	
4000uA Range							
56	3500uA		3500	9uA	0A	0	
AC MICROAMP TESTS							
400uA Range							
57	350.0uA @ 60Hz		349.5	3.7uA	-500nA	14	
58	350.0uA @ 1kHz		350.0	3.7uA	0A	0	
4000uA Range							
59	3500uA @ 60Hz		3496	37uA	-4uA	11	
60	3500uA @ 1kHz		3499	37uA	-1uA	3	
DC AMP TESTS							
4000mA Range							
61	3500mA		3496	11mA	-4mA	36	
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		3497	37mA	-3mA	8	
10A Range							
65	10.00A @ 60Hz		10.02	120mA	20mA	17	
66	10.00A @ 1kHz		10.04	120mA	40mA	33	

End of Test Data

Calibration Results

SwRI Calibration Laboratory

UUT: FLUKE 87 III
 TRUE RMS MULTIMETER
 Serial No: 73980493
 Asset No. 007647

Result: **PASS**
 Performed on: 11/8/00 at 12:59:43
 Performed by: Mark Anthony Romero
 Environment: Temp. 72.0°F Humid. 36 %
 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	----- READING	UNIT UNDER TEST TOLERANCE	----- UUT ERROR	ERROR in (% of Tol)	NOTIFY TUR 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		348.9	2.9mV	-1.1mV	38	
10	350.0mV @ 1kHz		348.9	3.9mV	-1.1mV	28	
11	350.0mV @ 5kHz		349.1	7.4mV	-900uV	12	
12	350.0mV @ 20kHz		354.1	9mV	4.1mV	46	
4V Range							
13	3.500V @ 60Hz		3.489	27mV	-11mV	41	
14	3.500V @ 1kHz		3.487	29mV	-13mV	45	
15	3.500V @ 5kHz		3.489	74mV	-11mV	15	
16	3.500V @ 20kHz		3.505	90mV	5mV	6	
40V Range							
17	35.00V @ 60Hz		34.89	270mV	-110mV	41	

TEST#	STD PARAMETER	TRUE VALUE	UNIT UNDER TEST			ERROR in (% of Tol)	NOTIFY TUR USER
			READING	TOLERANCE	UUT ERROR		
18	35.00V @ 1kHz		34.94	390mV	-60mV	15	
19	35.00V @ 5kHz		34.98	740mV	-20mV	3	
20	35.00V @ 20kHz		34.94	900mV	-60mV	7	
400V Range							
21	350.0V @ 60Hz		348.9	2.7V	-1.1V	41	
22	350.0V @ 1kHz		349.4	3.9V	-600mV	15	
23	350.0V @ 2.5kHz		349.3	7.4V	-700mV	9	
24	100.0V @ 20kHz		99.4	4V	-600mV	15	
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		999.9	.2h	-0.1h	50	
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		3.500	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		350.0	300mV	0V	0	
1000V Range							
38	1000V		1001	2V	1V	50	
1ms MIN/MAX TESTS							
39	2.828VP		2.800	.123VP	-0.028VP	23	
40	-2.828VP		-2.828	.123VP	0VP	0	
DC MILLIVOLT TEST							
400mV Range							
41	350.0mV		350.1	500uV	100uV	20	
RESISTANCE TESTS							
400 Ohm Range							
42	190.0 Ohm	189.99	190.0	600 mOhm	5.58 mOhm	1	
40 kOhm Range							
43	19.00 kOhm	18.999	19.00	50 Ohm	1.388 Ohm	3	
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	19.01	220 kOhm	11.649 kOhm	5	
CONDUCTANCE TEST							
40nS Range							
46	10.00nS	10.002	9.97	200pS	-31.66228pS	16	
DIODE TEST							
47	3.000V		2.987	61mV	-13mV	21	
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			ERROR in (% of Tol).	TUR	NOTIFY USER
			READING	TOLERANCE	UUT ERROR			
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		4.72	.08nF	0.02nF	25	0.1	
DC MILLIAMP TESTS								
40mA Range								
49	35.00mA		35.00	90uA	0A	0		
400mA Range								
50	350.0mA		349.9	900uA	-100uA	11		
AC MILLIAMP TESTS								
40mA Range								
51	35.00mA @ 60Hz		34.92	370uA	-80uA	22		
52	35.00mA @ 1kHz		34.96	370uA	-40uA	11		
400mA Range								
53	350.0mA @ 60Hz		349.2	3.7mA	-800uA	22		
54	350.0mA @ 1kHz		349.6	3.7mA	-400uA	11		
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		349.4	3.7uA	-600nA	16		
58	350.0uA @ 1kHz		349.9	3.7uA	-100nA	3		
4000uA Range								
59	3500uA @ 60Hz		3495	37uA	-5uA	14		
60	3500uA @ 1kHz		3499	37uA	-1uA	3		
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		3490	37mA	-10mA	27		
64	3500mA @ 1kHz		3497	37mA	-3mA	8		
10A Range								
65	10.00A @ 60Hz		10.02	120mA	20mA	17		
66	10.00A @ 1kHz		10.04	120mA	40mA	33		

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

8 November 2000

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: FLUKE 87 III
Description: TRUE RMS MULTIMETER
Serial Number: 73980493
Asset Number: 007647

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: 36 % RH

Calibration Date: 8 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

Certificate # 444041325

m\A2la.rpt Rev date 22 May 00

Measurements performed by:

Mark Romero, Technician