



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

## Certificate of Calibration

8 November 1996

Issued to: SITAKANTA MOHANTY      DIV20      B189  
Manufacturer/Model: FLUKE 87  
Description: TRUE RMS MULTIMETER  
Serial Number: 61880517  
Asset Number: 003674

### Environmental Conditions

Temperature: 73.0 Deg. F      Humidity: 32%

### 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.

Calibration Date: 7 Nov 96      Calibration Procedure: MET/CAL 5700A/CAL VER. REV. 2.4  
Interval: 12 months      Accuracy: MFG  
Next Calibration Due: 7 Nov 97      Received: In Tolerance

Remarks:

Certificate # 23202

Signed:

LAST PAGE OF REPORT  
Total Pages Printed: 1

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

WORK ORDER

CERTIFICATE # 23202 ASSET # 3674 DATE 4 Nov 96

ITEM DATA:

Manufacturer JOHNFLUKE Model 87  
Description ~~SP17~~ TRENDS Multimeter # 61880517  
Accessories \_\_\_\_\_

ACTION REQUESTED Rubber Protection case  
Scheduled Cal.

CUSTODIAN Ron Green 11.20, Standards Monthly

Turned in by: Melissa Phone 2012

CHARGE # 20-04 90 Date Required ASAP

INSTRUMENT USED ON:  CLEAR  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) rechecked. 11/7/96

Replace 9V battery 11/7/96

CAL ENVIRONMENT:  
Temperature \_\_\_\_\_ °F Humidity \_\_\_\_\_ %RH

CALIBRATED/REPAIRED:  
By \_\_\_\_\_ Cal Procedure MET/CAL 5700A/CAL VER RE 2.4  
Date \_\_\_\_\_ Accuracy MFG  
Cal Interval \_\_\_\_\_ Time to complete: \_\_\_\_\_  
Next Cal due \_\_\_\_\_ Cal \_\_\_\_\_ Repair \_\_\_\_\_  
Standards used (Asset#) \_\_\_\_\_

DATE COMPLETED \_\_\_\_\_  
DATE PICKED UP \_\_\_\_\_ PICKED UP BY Melissa E. Hill

23202

Southwest Research Institute (Calibration Lab) MET/CAL RESULTS

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ASSET NUMBER: 003674  
UNIT UNDER TEST: Fluke 87: (1 year) CAL VER  
SERIAL NUMBER: 61880517  
RESULT: Y  
TEST STATUS: COMPLETED  
OPERATOR: Vince Morales  
DATE: 07-Nov-96  
TEMPERATURE: 76  
RELATIVE HUMIDITY: 32  
WORK ORDER NUMBER: 23202  
TEST TYPE: f

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TRACEABILITY INFORMATION

Fluke	5700A	000182	13-Nov-96
Fluke	5725A	000201	13-Nov-96
Gen Rad	1413	003121	12-jul-97

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TEST COMMENTS...

PARAMETER	TEST RESULT	ACCEPTANCE LIMITS	
		LOW	HIGH

## 1 DISPLAY TEST

1 Result of Operator Evaluation PASS

## ROTARY SWITCH TESTS

## VAC

2 0display 0 -12 12

## VDC

3 -32display -35 -44 -20

## mVDC

4 -64display -70 -76 -52

## Ohms

5 -96display -102 -108 -84

## Diode

6 -128display -131 -140 -116

## mA/A

7 -160display -162 -172 -148

## uA

8 -192display -192 -204 -180

## AC VOLTAGE TESTS

## 400mV Range

9	350.0mV @ 60Hz	349.2	347.1	352.9
10	350.0mV @ 1kHz	349.3	346.1	353.9
11	350.0mV @ 5kHz	347.5	342.6	357.4
12	350.0mV @ 20kHz	347.8	341.0	359.0

## 4V Range

13	3.500V @ 60Hz	3.490	3.473	3.527
14	3.500V @ 1kHz	3.489	3.461	3.539
15	3.500V @ 5kHz	3.470	3.426	3.574
16	3.500V @ 20kHz	3.460	3.410	3.590

PARAMETER	TEST RESULT	ACCEPTANCE LOW	LIMITS HIGH
36 1000.0Hz @ 6.0V	999.9	999.8	1000.2
displaying all zeros			
37 Result of Operator Evaluation	PASS		
DC VOLTAGE TESTS			
4V Range			
38 3.500V	3.500	3.495	3.505
40V Range			
39 35.00V	35.00	34.95	35.05
40 -35.00V	-34.99	-35.05	-34.95
400V Range			
41 350.0V	350.0	349.5	350.5
1000V Range			
42 1000V	1000	998	1002
1ms MIN/MAX TESTS			
43 2.828VP	2.820	2.783	2.873
44 -2.828VP	-2.816	-2.873	-2.783
DC MILLIVOLT TEST			
400mV Range			
45 350.0mV	349.9	349.5	350.5
RESISTANCE TESTS			
400 Ohm Range			
46 190.0Z	190.1	189.5	190.5
40 kOhm Range			
47 19.00kZ	19.00	18.95	19.05
4 MOhm Range			

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PARAMETER	TEST RESULT	ACCEPTANCE LOW	LIMITS HIGH
48 1.900MZ	1.901	1.895	1.905
40 MOhm Range			
49 19.00MZ	19.02	18.78	19.22
CONDUCTANCE TEST			
40nS Range			
50 10.00nS	9.98	9.80	10.20
DIODE TEST			
51 3.000V	2.994	2.939	3.061
CAPACITANCE TESTS			
5.00uF Range			
52-1 1.00uF	0.99	0.96	1.04
0.500uF Range			
52-2 0.470uF	0.470	0.462	0.478
0.0500uF Range			
52-3 0.0470uF	0.0475	0.0462	0.0478
5.00nF Range			
52-4 4.70nF	4.73	4.30	5.10
DC MILLIAMP TESTS			
40mA Range			
53 35.00mA	35.00	34.91	35.09
400mA Range			
54 350.0mA	349.8	349.1	350.9
AC MILLIAMP TESTS			
40mA Range			

PARAMETER	TEST RESULT	ACCEPTANCE LIMITS	
		LOW	HIGH
40V Range			
17 35.00V @ 60Hz	34.90	34.73	35.27
18 35.00V @ 1kHz	34.99	34.61	35.39
19 35.00V @ 5kHz	35.06	34.26	35.74
20 35.00V @ 20kHz	34.88	34.10	35.90
400V Range			
21 350.0V @ 60Hz	349.0	347.3	352.7
22 350.0V @ 1kHz	349.7	346.1	353.9
23 350.0V @ 5kHz	350.2	342.6	357.4
24 100.0V @ 20kHz	102.4	96.0	104.0
25 200.0V @ 20kHz	204.7	194.0	206.0
26 300.0V @ 20kHz	306.7	292.0	308.0
27 350.0V @ 20kHz	357.7	341.0	359.0
1000V Range			
28 900V @ 60Hz	902	892	908
29 900V @ 1kHz	902	887	913
30 900V @ 5kHz	905	878	922
FREQUENCY TESTS			
19.999kHz Range			
31 19.000kHz @ 150mV	18.999	18.998	19.002
199.99kHz Range			
32 190.00kHz @ 150mV	189.98	189.98	190.02
FREQUENCY SENSITIVITY AND TRIGGER LEVEL			
4V AC Range			
33 1000.0Hz @ 300mV	999.9	999.8	1000.2
4V DC Range			
34 1000.0Hz @ 1.7V	999.9	999.8	1000.2
displaying all zeros			
35 Result of Operator Evaluation	PASS		
40V DC Range			

PARAMETER	TEST RESULT	ACCEPTANCE LIMITS LOW	HIGH
55 35.00mA @ 60Hz	34.95	34.63	35.37
56 35.00mA @ 1kHz	35.01	34.63	35.37
400mA Range			
57 350.0mA @ 60Hz	349.4	346.3	353.7
58 350.0mA @ 1kHz	349.9	346.3	353.7
DC MICROAMP TESTS			
400A Range			
59 350.0uA	349.9	349.0	351.0
4000A Range			
60 3500uA	3497	3491	3509
AC MICROAMP TESTS			
400A Range			
61 350.0uA @ 60Hz	349.3	346.3	353.7
62 350.0uA @ 1kHz	349.9	346.3	353.7
4000A Range			
63 3500uA @ 60Hz	3492	3463	3537
64 3500uA @ 1kHz	3497	3463	3537
DC AMP TESTS			
4000mA Range			
10A Range			
66 10.00A	10.00	9.96	10.04
AC AMP TESTS			
4000mA Range			
67 3500mA @ 60Hz	3495	3463	3537
68 3500mA @ 1kHz	3502	3463	3537



Southwest Research Institute (Calibration Lab) 07-Nov-96

CALIBRATION DATA RECORD

MODEL NUMBER: 87

WORK ORDER : 23202

SERIAL NUMBER: 61880517

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PARAMETER	TEST RESULT	ACCEPTANCE LIMITS	
		LOW	HIGH
<hr/>			
10A Range			
69 10.00A @ 60Hz	10.03	9.88	10.12
70 10.00A @ 1kHz	10.04	9.88	10.12

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

**WORK ORDER**

CERTIFICATE # 27259 ASSET # 003674 DATE 14 OCT 97

ITEM DATA:

Manufacturer Fluke Model 97  
Description Fluke DMM Multimeter Serial # 61890517  
Accessories Case

ACTION REQUESTED Cal

CUSTODIAN Dr. No. [Signature] Stakanto Wakanty  
Turned in by: Melissa Hill Phone 2012

CHARGE # 20-0A 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 \_\_\_\_\_

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) Replaced 9V battery & checked fuses.

27259

CAL ENVIRONMENT:  
Temperature 75 °F Humidity 40 %RH

CALIBRATED/REPAIRED:  
By [Signature] Cal Procedure MET/CR 5700A/CAL VER REV 1.8  
Date 24 Oct 97 Accuracy MEG  
Cal Interval 12 Reliability Code: \_\_\_\_\_  
Next Cal due 24 Oct 98 Cal Time \_\_\_\_\_ Repair Time \_\_\_\_\_  
Standards used (Asset#) 182, 3121, 114, 201

DATE COMPLETED 24 Oct 97  
DATE PICKED UP 11/3/97 PICKED UP BY Melissa Hill



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

# Certificate of Calibration

24 October 1997

Issued to: SITAKANTA MOHANTY DIV20 B189  
Manufacturer/Model: FLUKE 87  
Description: TRUE RMS MULTIMETER  
Serial Number: 61880517  
Asset Number: 003674

## Environmental Conditions

Temperature: 75.00 Deg. F

Humidity: 40 % 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: 24 Oct 97

Calibration Procedure: FLUKE 87: (1 YEAR) CAL VER. REV. 1.5

Interval: 12 months

Next Calibration Due: 24 Oct 98

Received: In Tolerance

Remarks:

## Standards Used

Asset	MFR	Model	Description	Serial No.	Due Cal
000182	FLUKE	5700A	CALIBRATOR	5200003	3 Jan 98
000114	HEWLETT-PA	3325A	SYNTHESIZER/FUNCTION GENE	1748A17121	14 Feb 98
000201	FLUKE	5725A	AMPLIFIER	5195014	3 Jan 98
003121	GENERAL RA	1413	PRECISION DECADE CAPACITO	330	14 Jul 98

Certificate # 27259

# Certificate of Calibration

24 October 1997

Issued to: SITAKANTA MOHANTY DIV20  
Manufacturer/Model: FLUKE 87  
Description: TRUE RMS MULTIMETER  
Serial Number: 61880517  
Asset Number: 003674

B189

Signed: 

Title: Cal. Tech.

LAST PAGE OF REPORT  
Total Pages Printed: 6

Certificate # 27259



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

ACCREDITED



Certificate #  
0972-01

## Certificate of Calibration

21 October 1998

Issued to: SITAKANTA MOHANTY                      DIV20                      B189  
Manufacturer/Model: FLUKE 87  
Description: TRUE RMS MULTIMETER  
Serial Number: 61880517  
Asset Number: 003674

### 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.

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this calibration certificate have been determined in accordance with the laboratory's terms of accreditation unless stated otherwise in the report. The uncertainty of the calibration was sufficient to determine that the instrument met the manufacturer's specifications.

Temperature: 74.0      Deg. F                      Humidity: 40 % RH  
Calibration Date: 21 Oct 98                      Calibration Procedure: FLUKE 87: (1 YEAR) CAL VER  
Interval: 12      months                      Received: IN TOLERANCE  
Next Calibration Due: 21 Oct 99

Remarks:

### Standards Used

Asset	MFR	Model	Description	Serial No.	Due Cal
000182	FLUKE	5700A	CALIBRATOR	5200003	2 Jul 99
000201	FLUKE	5725A	AMPLIFIER	5195014	2 Jul 99
000114	HEWLETT-PACKARD	3325A	SYNTHESIZER/FUNCTION GENERAT	1748A17121	19 Feb 99
003121	GENERAL RADIO	1413	PRECISION DECADE CAPACITOR	330	21 Jul 99

Certificate # 27259

# Certificate of Calibration

21 October 1998

**Issued to:** SITAKANTA MOHANTY  
**Manufacturer/Model:** FLUKE 87  
**Description:** TRUE RMS MULTIMETER  
**Serial Number:** 61880517  
**Asset Number:** 003674

DIV20

B189

Signed: 

Title: Cal-Jack

LAST PAGE OF REPORT  
Total Pages Printed: 6

Certificate # 27259

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

WORK ORDER

WORK ORDER # 37229 ASSET # 003674 DATE 27 Dec. 99

ITEM DATA:

Manufacturer Fluke Model 87  
Description true rms multimeter Serial # 61880517  
Accessories holder

ACTION REQUESTED cal

CUSTODIAN Div. 20, Ron Green

Turned in by: Dwayne Halbardier Phone 2018

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 WMA Date 12-27-99

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) \_\_\_\_\_

CAL ENVIRONMENT:  
Temperature 70 °F Humidity 38 %RH

CALIBRATED/REPAIRED:  
By U. Moebs Cal Procedure Fluke 87 5720A 14R Sep95  
Date 4 JAN 00 Accuracy M5  
Cal Interval 12 Reliability Code 5  
Next Cal Due 4 JAN 01 Cal Time 1.5 Repair Time \_\_\_\_\_  
Standards used (Asset #) 182, 201, 3121, 114

DATE COMPLETED 4 JAN 00

DATE PICKED UP 01/10/99 PICKED UP BY Dwayne Halbardier

37229



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

4 January 2000

**Issued to:** RON GREEN DIV20 B57  
**Manufacturer/Model:** FLUKE 87  
**Description:** TRUE RMS MULTIMETER  
**Serial Number:** 61880517  
**Asset Number:** 003674

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: 70.0 Degrees Fahrenheit Humidity: 38 % RH

**Calibration Date:** 4 Jan 00 **Calibration Procedure:** FLUKE 87 5720A 1YR SEP 99

**Condition as Received:** IN TOLERANCE

**Condition as Released:** IN TOLERANCE

**Remarks:**

**Approved by:**

Jim Patterson, Supervisor, or Walt Hill, Metrologist

Certificate # 37229

m:\a2la.rpt Rev date 14 Dec 99

**Measurements performed by:**

Vince Morales, Technician

Page 1 of 1



# SOUTHWEST RESEARCH INSTITUTE

## Calibration Laboratory

### WORK ORDER

Processed by RCRUZ at 10:57:31AM on 1/3/01

1 10001 0010 0010 0010 0010 0010 0010 0010 0010

**Work Order 444041915**

Arrived 1/3/01

Asset No. 003674 Manufacturer FLUKE

Model 87

Instrument Type/Class MULTIMETER

Serial No. 61880517

Accessory No. Calibration Procedure CL-165, 8/99

Location B57

Div/Client DIV20

Custodian RON GREEN

Mail Stop B57

Tel. 5305

Charge/Project No. 20.00751.006

Delivered By / Telephone MELISSA HILL X2636

**IN4CAL**

Special Instructions \_\_\_\_\_

### WORK NOTES

SuRI Cal-Lab By: vm

CAL: 01/04/00 DUE: 01/04/01

AN: 003674 SN: 61880517

1 0001 0010 0010 0010 0010 0010 0010 0010 0010

Date	Hours	Remarks/Notes
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

### REPAIR PARTS

Date	Hours	Part Name	Part Number	Failure Description
_____	_____	<u>Fuse</u>	<u>BBS-1</u>	<u>blown</u>
_____	_____	<u>battery</u>	<u>9V</u>	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Cost

### WORK SUMMARY

Failure Description \_\_\_\_\_

Repair Action \_\_\_\_\_

Calibration Procedure Fluke 87 S120A 1yr sep 99 Temp 18 F Hum. 38 %

Tech MAR Anthony Lopez Totals Cal Hours 1.5 Repair Hours \_\_\_\_\_ Parts Cost \_\_\_\_\_

Standards Used 182, 20Y, 114, 3121

Date Picked Up 1-8-01

Picked Up By [Signature]

# Calibration Results

## SwRI Calibration Laboratory

UUT: FLUKE 87  
 TRUE RMS MULTIMETER  
 Serial No: 61880517  
 Asset No. 003674

Result: **PASS**  
 Performed on: 1/4/01 at 13:17:15  
 Performed by: Mark Anthony Romero  
 Environment: Temp. 72.0°F Humid. 38 %  
 Condition F/L: FOUND-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							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		349.1	2.9mV	-900uV	31	
10	350.0mV @ 5kHz		348.8	3.9mV	-1.2mV	31	
11	350.0mV @ 20kHz		350.3	7.4mV	300uV	4	
4V Range							
12	3.500V @ 60Hz		3.491	27mV	-9mV	33	
13	3.500V @ 5kHz		3.485	39mV	-15mV	38	
14	3.500V @ 20kHz		3.487	74mV	-13mV	18	
40V Range							
15	35.00V @ 60Hz		34.91	270mV	-90mV	33	
16	35.00V @ 5kHz		35.21	390mV	210mV	54	
17	35.00V @ 20kHz		35.17	740mV	170mV	23	

TEST#	STD PARAMETER	TRUE VALUE	----- READING	UNIT UNDER TEST TOLERANCE	----- UUT ERROR	ERROR in (% of Tol)	TUR	NOTIFY USER	
400V Range									
18	350.0V @ 60Hz		349.1	2.7V	-900mV	33			
19	350.0V @ 5kHz		348.9	3.9V	-1.1V	28			
20	100.0V @ 20kHz		99.2	2.4V	-800mV	33			
21	200.0V @ 20kHz		199.1	4.4V	-900mV	20			
22	300.0V @ 20kHz		298.5	6.4V	-1.5V	23			
23	350.0V @ 20kHz		348.2	7.4V	-1.8V	24			
1000V Range									
24	900V @ 60Hz		903	9V	3V	33			
25	900V @ 5kHz		901	14V	1V	7			
FREQUENCY TESTS									
19.999kHz Range									
26	19.000kHz		19.000	.002kHz	0kHz	0			
199.99kHz Range									
27	190.00kHz		190.00	.02kHz	0kHz	0			
FREQUENCY SENSITIVITY AND TRIGGER LEVEL									
4V AC Range									
28	1000.0Hz @ 300mV		999.9	30Hz	-100mHz	0			
4V DC Range									
29	1000.0Hz @ 1.7V		999.9	30Hz	-100mHz	0			
displaying all zeros									
Result of Operator Evaluation							PASS		
40V DC Range									
31	1000.0Hz @ 6.0V		999.9	30Hz	-100mHz	0			
displaying all zeros									
Result of Operator Evaluation							PASS		
DC VOLTAGE TESTS									
4V Range									
33	3.500V		3.500	5mV	0V	0			
40V Range									
34	35.00V		35.00	50mV	0V	0			
35	-35.00V		-35.00	50mV	0V	0			
400V Range									
36	350.0V		350.0	500mV	0V	0			
1000V Range									
37	1000V		1000	2V	0V	0			
1ms MIN/MAX TESTS									
38	2.828VP		2.808	.045VP	-0.02VP	44			
39	-2.828VP		-2.808	.045VP	0.02VP	44			
DC MILLIVOLT TEST									
400mV Range									
40	350.0mV		350.1	500uV	100uV	20			
RESISTANCE TESTS									
400 Ohm Range									
41	190.0 Ohm	189.99	190.1	500 mOhm	105.58 mOhm	21			
40 kOhm Range									
42	19.00 kOhm	18.999	19.01	50 Ohm	11.388 Ohm	23			
4 MOhm Range									
43	1.900 MOhm	1.8999	1.901	5 kOhm	1.0552 kOhm	21			
40 MOhm Range									
44	19.00 MOhm	18.998	19.02	220 kOhm	21.649 kOhm	10			
CONDUCTANCE TEST									
40nS Range									
45	10.00nS	10.002	10.00	200pS	-1.66228pS	1			
DIODE TEST									
46	3.000V		2.993	61mV	-7mV	11			
CAPACITANCE TESTS									
5.00uF Range									
47-1	1.00uF		0.99	.0399uF	-0.01uF	25			
0.500uF Range									
47-2	0.470uF		0.470	.0077uF	0uF	0			
0.0500uF Range									

TEST#	STD PARAMETER	TRUE VALUE	----- READING	UNIT UNDER TEST TOLERANCE	----- UUT ERROR	ERROR in (% of Tol)	TUR	NOTIFY .USER
47-3	0.0470uF		0.0474	774E-6uF	0.0004uF	52		
	5.00nF Range							
47-4	4.70nF		4.74	.3974nF	0.04nF	10		
	DC MILLIAMP TESTS							
	40mA Range							
48	35.00mA		35.03	90uA	30uA	33		
	400mA Range							
49	350.0mA		350.2	900uA	200uA	22		
	AC MILLIAMP TESTS							
	40mA Range							
50	35.00mA @ 60Hz		34.98	370uA	-20uA	5		
51	35.00mA @ 1kHz		35.03	370uA	30uA	8		
	400mA Range							
52	350.0mA @ 60Hz		349.8	3.7mA	-200uA	5		
53	350.0mA @ 1kHz		350.2	3.7mA	200uA	5		
	DC MICROAMP TESTS							
	400uA Range							
54	350.0uA		350.2	900nA	200nA	22		
	4000A Range							
55	3500uA		3500	9uA	0A	0		
	AC MICROAMP TESTS							
	400A Range							
56	350.0uA @ 60Hz		349.5	3.7uA	-500nA	14		
57	350.0uA @ 1kHz		350.0	3.7uA	0A	0		
	4000A Range							
58	3500uA @ 60Hz		3496	37uA	-4uA	11		
59	3500uA @ 1kHz		3500	37uA	0A	0		
	DC AMP TESTS							
	4000mA Range							
60	3500mA		3499	9mA	-1mA	11		
	10A Range							
61	10.00A		10.00	40mA	0A	0		
	AC AMP TESTS							
	4000mA Range							
62	3500mA @ 60Hz		3495	37mA	-5mA	14		
63	3500mA @ 1kHz		3502	37mA	2mA	5		
	10A Range							
64	10.00A @ 60Hz		10.04	120mA	40mA	33		
65	10.00A @ 1kHz		10.07	120mA	70mA	58		

**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

4 January 2001

**Issued to:** RON GREEN DIV20 B57  
**Manufacturer/Model:** FLUKE 87  
**Description:** TRUE RMS MULTIMETER  
**Serial Number:** 61880517  
**Asset Number:** 003674

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: 38 % RH

**Calibration Date:** 4 Jan 01 **Calibration Procedure:** FLUKE 87 5720A 1 YR SEP 99

**Condition as Received:** IN TOLERANCE

**Condition as Released:** IN TOLERANCE

**Remarks:**

**Approved by:**

Jim Patterson, Supervisor, or Walt Hill, Metrologist  
Certificate # 444041915

m:\a2la.rpt Rev date 22 May 00

**Measurements performed by:**

Mark Romero, Technician

Page 1 of 1

# SOUTHWEST RESEARCH INSTITUTE

## Calibration Laboratory

### WORK ORDER

Received by RCRUZ, 3/7/02 10:17:21AM

Arrived 3/7/02

Work Order **444047568**

Asset No. 003674 Manufacturer FLUKE

Model 87

Equipment Type MULTIMETER

Serial No. 61880517

Accessory No.

Interval 12 M

Calibration Procedure FLUKE 87 5720A 1YR SEP 99

Location B57

Div/Client DIV20

Custodian RON GREEN

Mail Stop T1

Tel 5305

### QUEUE

Special Instructions \_\_\_\_\_

Notify before adjustments or repairs. ( ) Provide data with certificate ( ) Certificate Typ. \_\_\_\_\_

Charge/Project No. 01402.661 1.20

Requester / Telephone MELISSA HILL

This information is correct for the work requested. \_\_\_\_\_

### WORK NOTES

Date	Hours	Remarks/Notes
<u>3/11</u>	<u>1</u>	<u>Cal</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

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

### WORK SUMMARY

Failure Description \_\_\_\_\_

Repair Action \_\_\_\_\_

Tech [Signature] Cal Hrs. 1 Repair Hrs \_\_\_\_\_ Parts Cost \_\_\_\_\_ Temp \_\_\_\_\_ F Hum. \_\_\_\_\_ %

Standards Used 096413

Date Picked Up 4/1/02

Picked Up By Melissa Hill

47568

## CALIBRATION CHECK FORM

Date Calibrated March 11, 2002 Work Order 444047568 Cal By BLT

Procedure No./Date: CL-165, AUG 99 Unit Under Test: DIGITAL MULTIMETER

Mfg FLUKE Model: 87 SN 61880517 AN 003674

STEP	FUNCTION OR RANGE	APPLIED	TOLERANCE		MEASURED VALUES		P/F
			MIN	MAX	AS FOUND	RELEASED	
3-15	DISPLAY TEST		()PASS/()FAIL		PASS		
3-16	ROTARY SWITCH TEST						
	ACV	0	-12	+12	0		
	DCV	-32	-20	-43	-32		
	mV/DC	-64	-52	-76	-64		
	OHMS	-96	-84	-108	-96		
	DIODE	-128	-116	-140	-128		
	mA/A	-160	-148	-172	-160		
	uA	-192	-180	-204	-192		
3-17	AC VOLTAGE TESTS						
		350mV @60Hz	347.2	352.9mV	349.0		
		350mV @5kHz	346.1	353.9mV	348.4		
		350mV @20kh	342.6	357.4mV	350.1		
		3.5V @60Hz	3.474	3.527V	3.490		
		3.5V @5kHz	3.461	3.539V	3.481		
		3.5V @20kh	3.426	3.574V	3.483		
		35V @60Hz	34.74	35.27V	34.90		
		35V @5kHz	34.61	35.39V	35.23		
		350V @60Hz	347.4	352.7V	349.0		
		350V@5kh	346.1	353.9V	348.8		
		100V @20kHz	97.6	102.4V	99.0		
		200V @20kHz	195.6	204.4V	198.9		
		300V	293.6	306.4V	298.2		

**CALIBRATION CHECK FORM**

		@20kHz			
--	--	--------	--	--	--

Date Calibrated March 11, 2002 Work Order 444047568 Cal By BLT

Procedure No./Date: CL-165, AUG 99 Unit Under Test: DIGITAL MULTIMETER

Mfg FLUKE Model: 87 SN 61880517 AN 003674

STEP	FUNCTION OR RANGE CONT'D	APPLIED	TOLERANCE		MEASURED VALUES		P/F
			MIN	MAX	AS FOUND	RELEASED	
	AC VOLTAGE						
		1KV @60HZ	991	1009V	1003		
		1KV @5kHz	986	1014V	1000		
	FREQUENCY TEST	150mV @19kh	18.998	19.002V	18.999		
		150mV @190k	189.98	190.02V	189.99		
	FREQUENCY SENSITIVITY						
		300mV @1kh	970	1030V	99.99		
		1.7V @1kHz	970	1030V	999.9		
		1V @1kHz		00.0	0		
		6V @1kHz	970	1030V	999.9		
		2V @1kHz		00.0	0		
	DC VOLTAGE						
		3.5V	3.495	3.505V	3.501		
		35.0V	34.95	35.05V	35.00		
		-35.0V	-34.95	-35.05V	-35.00		
		350V	349.5	350.5V	350.1		
		1000V	998	1002V	1000		
	1MS MIN-MAX						
		2V @60HZ	2.783	2.873V	2.820		
		2V @60HZ	-2.783	-2.873V	-2.816		



**CALIBRATION CHECK FORM**

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Date Calibrated March 11, 2002 Work Order 444047568 Cal By BLT

Procedure No./Date: CL-165, AUG 99 Unit Under Test: DIGITAL MULTIMETER

Mfg FLUKE Model: 87 SN 61880517 AN 003674

STEP	FUNCTION OR RANGE CONT'D	APPLIED	TOLERANCE		MEASURED VALUES		P/F
			MIN	MAX	AS FOUND	RELEASED	
	RESISTANCE						
		190Ω	189.5	190.5Ω	190.2		
		19.00KΩ	18.95	19.05KΩ	19.01		
		1.9MΩ	1.895	1.905MΩ	1.900		
		19MΩ	18.78	19.22MΩ	19.02		
		100MΩ	9.80	10.20MΩ	9.97		
	CAPACITANCE TEST						
		1.0uF	.97	1.03uF	.99		
		.470uF	.463	.477uF	.469		
		.0470uF	.0463	.0477uF	.0472		
		4.7nF	4.63	4.77nF	4.68		
	DC CURRENT						
		35mA	34.91	35.09mA	35.04		
		350mA	349.1	350.9mA	350.2		
	AC CURRENT						
		35mA @60Hz	34.63	35.37mA	34.97		
		35mA @1kHz	34.63	353.7mA	35.03		
		350mA @60Hz	346.3	353.7mA	349.7		
		350mA @1kHz	346.3	353.7mA	350.2		

**CALIBRATION CHECK FORM**

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Date Calibrated March 11, 2002 Work Order 444047568 Cal By BLT

Procedure No./Date: CL-165, AUG 99 Unit Under Test: DIGITAL MULTIMETER

Mfg FLUKE Model: 87 SN 61880517 AN 003674

STEP	FUNCTION OR RANGE CONT'D	APPLIED	TOLERANCE		MEASURED VALUES		P/F
			MIN	MAX	AS FOUND	RELEASED	
	DC UA TESTS						
		350uA	349.1	350.9uA	350.2		
		3500uA	3491	3509uA	3500		
	AC UA TESTS						
		350uA @60Hz	346.3	353.7uA	349.5		
		350uA @1kHz	346.3	353.7uA	350.0		
		3500uA @60Hz	3463	3537uA	3495		
		3500uA @1kh	3463	3537uA	3500		
	DC AMP TESTS						
		3500mA	3491	3509mA	3500		
		10A	9.96	10.04A	10.00		
	AC AMP TEST						
		3500mA @60h	3463	3537mA	3494		
		3500mA @1kh	3463	3537mA	3504		
		10A @60Hz	9.88	10.12A	10.04		
		10A @1kh	9.88	10.12A	10.07		



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

## Certificate of Calibration

11 March 2002

**Issued to:** RON GREEN DIV20 T1  
**Manufacturer/Model:** FLUKE 87  
**Description:** MULTIMETER  
**Serial Number:** 61880517  
**Asset Number:** 003674  
**Work Order Number:** 444047568

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: 42 % RH


**Calibration Date:** 11 Mar 02 **Calibration Procedure:** FLUKE 87 5720A 1YR SEP 99

**Condition as Received:** IN TOLERANCE

**Condition as Returned:** IN TOLERANCE

**Remarks:**

**Approved by:**

  
Walt Hill, Supervisor  
Institute Calibration Laboratory

**Measurements performed by:**

  
Bob Trollinger, Technician