



SOUTHWEST RESEARCH INSTITUTE®

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Institute Quality Systems
Institute Calibration Laboratory
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Calibration Laboratory
Certificate #0972-01

Certificate of Calibration

Cost Center / Customer: DIV20 / DON BANNON

Mail Stop: B51

Manufacturer/Model: FLUKE / 87 III

Description: MULTIMETER

Serial Number: 73980497

Asset Number: 007646

Procedure: FLUKE 83,85,87 SERIES III - 11 OCT 07

Work Order: 303092910

Date Issued: 22-Feb-2010

Date Calibrated: 19-Feb-2010

*** Date Due :** 19-Feb-2011

**** Results:** FOUND-LEFT

Temperature: 71.0 °F

Humidity: 41 %RH

Barometer: N/A

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, 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of the ISO 9000-2000 standard. This certificate shall not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. This certificate shall not be used to claim product endorsement by Southwest Research Institute, American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government. Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability of the instrument.

*Determined by the customer, does not imply the instrument will remain within tolerance as any number of factors may cause an out-of-tolerance condition before this date. **Data type found in this certificate or attached measurement report must be interpreted as: Found-left - adjustment and/or repair was not performed, As-found - data is before unit is adjusted and/or repaired, As-left - data is after adjusted and/or repaired was performed. The customer has sole responsibility for determination of in-/out-of-tolerance or compliance/noncompliance.

Measurement uncertainty calculated in accordance with the method described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM), for a confidence level of approximately 95 percent using a coverage factor of $k=2$.

Remarks: None

Standards Used

<u>Asset #</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Description</u>	<u>Cal Date</u>	<u>Due Date</u>
006413	FLUKE	5520A/SC1100	MULTI-PRODUCT CALIBRATOR	27-Jan-2010	27-Jan-2011

Walt Hill

Laboratory Manager

Thomas Wallace

Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	303092910	Mfr:	FLUKE	Technician:	tew
Asset No:	007646	Model:	87 III	Type Data:	Found-left
Serial No:	73980497	Type:	MULTIMETER	Cal Date:	19-Feb-10

Remarks:

Function/Range	Test Point	TI Reading	Difference	+/- Limit	+/- Uncertainty	Result	% Limit
Switch Test							
ACV	0	0	0	12	Self Test	Pass	
DCV	-32	-32	0	12		Pass	
Mv/DC	-64	-64	0	12		Pass	
OHMS	-96	-96	0	12		Pass	
DIODE	-128	-128	0	12		Pass	
mA/A	-160	-160	0	12		Pass	
uA	-192	-192	0	12		Pass	
ACV 400 mV							
60 Hz	mV	mV	mV	mV	mV	Pass	45%
1 kHz	350.0	348.7	-1.3	2.9	0.20	Pass	33%
5 kHz	350.0	348.7	-1.3	3.9	0.20	Pass	18%
20 kHz	350.0	348.7	-1.3	7.4	0.20	Pass	18%
	350.0	354.6	4.6	9.0	0.40	Pass	51%
AC Volts							
4 V at 60 Hz	V	V	V	V	V	Pass	41%
1 kHz	3.500	3.489	-0.011	0.027	0.0024	Pass	28%
5 kHz	3.500	3.489	-0.011	0.039	0.0024	Pass	26%
20 kHz	3.500	3.481	-0.019	0.074	0.0024	Pass	26%
	3.500	3.486	-0.014	0.090	0.014	Pass	16%
40 V at 60 Hz							
1 kHz	35.00	34.89	-0.11	0.27	0.028	Pass	41%
5 kHz	35.00	34.99	-0.01	0.39	0.028	Pass	3%
20 kHz	35.00	35.13	0.13	0.74	0.028	Pass	18%
	35.00	35.10	0.10	0.90	0.036	Pass	11%
400 V at 60 Hz							
1 kHz	350.0	348.8	-1.2	2.7	0.30	Pass	44%
2.5 kHz	350.0	349.5	-0.5	3.9	0.30	Pass	13%
	350.0	349.4	-0.6	7.4	0.80	Pass	8%
4000 V at 60 Hz							
1 kHz	900	901	1	8	0.9	Pass	13%
	900	903	3	13	0.9	Pass	23%
Frequency							
150 mV rms	kHz	kHz	kHz	kHz	kHz		
	19.000	18.999	-0.001	0.002	0.00058	Pass	50%
	190.00	189.99	-0.01	0.02	0.0060	Pass	50%
Sensitivity							
4 Vac 300 mV ac rms	Hz	Hz	Hz	Hz	Hz	Pass	50%
4 Vdc 1.7 V ac rms	1000.0	999.9	-0.1	0.2	0.080	Pass	50%
4 Vdc 1 V ac rms	1000.0	999.9	-0.1	0.2	0.080	Pass	50%
40 Vdc 6 V ac rms	0.0	0.0	0.0	0.2	0.080	Pass	0%
40 Vdc 2 V ac rms	1000.0	999.9	-0.1	0.2	0.080	Pass	50%
	0.0	0.0	0.0	0.2	0.080	Pass	0%

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Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Result	% Limit
DC Volts	V	V	V	V	V		
4 Volts	3.500	3.499	-0.001	0.003	0.00064	Pass	33%
40 Volts	35.00	34.99	-0.01	0.03	0.0064	Pass	33%
	-35.00	-34.99	0.01	0.03	0.0064	Pass	33%
400 Volt	350.0	349.9	-0.1	0.3	0.062	Pass	33%
4000 Volt	1000	1000	0	2	0.58	Pass	0%
Min-Max	V	V	V	V	V		
2 V ac at 60 Hz	2.828	2.800	-0.028	0.123	0.0012	Pass	23%
	-2.828	-2.828	0.028	0.123	0.0012	Pass	23%
DC mV	mV	mV	mV	mV	mV		
	350.0	349.9	-0.1	0.5	0.062	Pass	20%
Resistance	Ω	Ω	Ω	Ω	Ω		
400	190.0	189.8	-0.2	0.6	0.06	Pass	33%
	k Ω	k Ω	k Ω	k Ω	k Ω		
40 k Ω	19.00	19.00	0.00	0.05	0.006	Pass	0%
	M Ω	M Ω	M Ω	M Ω	M Ω		
4 M Ω	1.900	1.900	0.000	0.012	0.0018	Pass	0%
40 M Ω	19.00	19.00	0.00	0.22	0.0058	Pass	0%
Conductance	nS	nS	nS	nS	nS		
	10.00	9.97	-0.03	0.20	0.070	Pass	15%
Capacitance	μ F	μ F	μ F	μ F	μ F		
	1.00	0.98	-0.02	0.05	0.0074	Pass	40%
	0.470	0.468	-0.002	0.008	0.0024	Pass	25%
	0.0470	0.0471	0.0001	0.0008	0.00026	Pass	13%
	nF	nF	nF	nF	nF		
	4.70	4.75	0.05	0.08	0.034	Pass	63%
Diode Test	V	V	V	V	V		
	3.000	2.978	-0.022	0.061	0.00060	Pass	36%
DC mA	mA	mA	mA	mA	mA		
	35.00	35.00	0.00	0.11	0.010	Pass	0%
	350.0	349.8	-0.2	0.9	0.18	Pass	22%
AC mA	mA	mA	mA	mA	mA		
60 Hz	35.00	34.90	-0.10	0.37	0.072	Pass	27%
1 kHz	35.00	34.97	-0.03	0.37	0.072	Pass	8%
60 Hz	350.0	349.3	-0.7	3.7	0.76	Pass	19%

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Serial No:	73980497	Type:	MULTIMETER	Cal Date:	19-Feb-10

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Result	% Limit
AC mA (cont.)	mA	mA	mA	mA	mA		
1 kHz	350.0	349.9	-0.1	3.7	0.76	Pass	3%
DC uA	uA	uA	uA	uA	uA		
	350.0	350.3	0.3	1.1	0.13	Pass	27%
	3500	3500	0	9	0.90	Pass	0%
AC uA	uA	uA	uA	uA	uA		
60 Hz	350.0	349.2	-0.8	3.7	0.34	Pass	22%
1 kHz	350.0	350.0	0.0	3.7	0.34	Pass	0%
60 Hz	3500	3495	-5	37	7.0	Pass	14%
1 kHz	3500	3501	1	37	7.0	Pass	3%
DC A	mA	mA	mA	mA	mA		
	3500	3498	-2	11	2.8	Pass	18%
	A	A	A	A	A		
	10.00	9.99	-0.01	0.04	0.011	Pass	25%
AC A	mA	mA	mA	mA	mA		
60 Hz	3500	3488	-12	37	2.6	Pass	32%
1 kHz	3500	3497	-3	37	13	Pass	8%
AC A	A	A	A	A	A		
60 Hz	10.00	10.01	0.01	0.12	0.012	Pass	8%
1 kHz	10.00	10.05	0.05	0.12	0.040	Pass	42%

END OF REPORT