

International Accreditation Service, Inc.

CERTIFICATE OF ACCREDITATION

This is to signify that

TESTWAVE, LLC

1515 GREG STREET
SPARKS, NEVADA 89431

Calibration Laboratory CL-109
(Revised June 12, 2009)

has demonstrated compliance with the ANS/ISO/IEC Standard 17025:2005, *General criteria for the competence of testing and calibration laboratories*, and has been accredited commencing September 20, 2007, for the calibration discipline(s) listed in the approved scope of accreditation. The laboratory meets the IAS program requirements in the field of calibration.



Patrick V. McCullen
Vice President



C. P. Ramani, P.E.
President

(see attached scope of accreditation for measurement area or type of test, range or quantity, best measurement capability, technique reference, standard equipment or unique conditions)

This accreditation certificate supersedes any IAS accreditation certificate bearing an earlier date. The certificate becomes invalid upon suspension, cancellation, revocation, or expiration of accreditation. See the IAS *Accreditation Listings* on the web at www.iasonline.org for current accreditation information, or contact IAS directly at (562) 699-0541. Print Date: 06/12/2009 (page 1 only)

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SCOPE OF ACCREDITATION

Testwave, LLC CL-109

Testwave, LLC
1515 Greg St
Sparks, NV 89431-5915

Kevin J. Haddock
Chief Executive Officer
(775) 356-8378

MEASUREMENT AREA	RANGE & RESOLUTION	BEST MEASUREMENT CAPABILITY ¹ (BMC) (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
<i>Thermal</i> Laboratory Thermometers – Measure Zero Point	0°C	$3.68 \times 10^{-03} \text{°C}$	Hart 1502A with Hart 5627-12 PRT, Ice Bath prepared per U.S.A.F. T.O. 33K-1-104, dated 30-May-2001
<i>Electrical – DC/LF</i> DC Voltage – Generate	0 to 320mV 0.32001V to 3.2V 3.2001V to 32V 32.001V to 320V 320.01V to 1050V	$1.14 \times 10^{-03} \text{mV}$ $1.27 \times 10^{-05} \text{V}$ $2.35 \times 10^{-04} \text{V}$ $2.43 \times 10^{-03} \text{V}$ $5.77 \times 10^{-03} \text{V}$	Wavetek 9100
DC Voltage - Measure	0 to 100mv >100mV to 1V >1V to 10V >10V to 100V >100V to 1000V	$1.67 \times 10^{-03} \text{mV}$ $8.27 \times 10^{-06} \text{V}$ $7.59 \times 10^{-05} \text{V}$ $9.0 \times 10^{-04} \text{V}$ $1.04 \times 10^{-02} \text{V}$	Keithley 2000, 0.1µV Resolution Keithley 2000, 1µV Resolution Keithley 2000, 10µV Resolution Keithley 2000, 100µV Resolution Keithley 2000, 1mV Resolution

September 20, 2007
Commencement Date



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President

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<i>Electrical – DC/LF</i> DC Current – Generate DC Current – Measure	0 to 320µA 0.32001mA to 3.2mA 3.2001mA to 32mA 32.001mA to 320mA 320.01mA to 3.2A 3.2001A to 32A 0-100mA >100mA to 1A >1A to 3A	$8.68 \times 10^{-03} \mu\text{A}$ $9.01 \times 10^{-05} \text{mA}$ $8.0 \times 10^{-04} \text{mA}$ $2.65 \times 10^{-03} \text{mA}$ $1.82 \times 10^{-04} \text{A}$ $5.81 \times 10^{-04} \text{A}$ $7.25 \times 10^{-03} \text{mA}$ $1.11 \times 10^{-04} \text{A}$ $2.13 \times 10^{-04} \text{A}$	Wavetek 9100 Keithley 2000, 0.1µA Resolution Keithley 2000, 1µA Resolution Keithley 2000, 10µA Resolution
<i>Electrical – DC/LF</i> AC Voltage – Generate	0mV -320mV @ 1KHz 0mV -320mV @ 30KHz >320mV to 3.2V @ 1KHz >320mV to 3.2V @ 30KHz 320mV to 3.2V @ 100KHz >3.2 to 32V @ 1KHz >3.2 to 32V @ 30KHz >3.2 to 32V @ 100KHz	$5.56 \times 10^{-02} \text{mV}$ $1.25 \times 10^{-01} \text{mV}$ $2.6 \times 10^{-03} \text{V}$ $5.31 \times 10^{-03} \text{V}$ $2.47 \times 10^{-02} \text{V}$ $6.44 \times 10^{-03} \text{V}$ $1.24 \times 10^{-02} \text{V}$ $4.30 \times 10^{-02} \text{V}$	Wavetek 9100

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	>32 to 100VAC @ 1KHz >32 to 100VAC @ 30KHz >32 to 100VAC @ 100 KHz 100 to 320VAC @ 300Hz 100 to 320VAC @ 10KHz 320 to 750VAC @ 40Hz >320 to 750VAC @ 300Hz	1.59x10 ⁻⁰² V 3.06x10 ⁻⁰² V 9.06x10 ⁻⁰² V 7.46x10 ⁻⁰² V 7.62x10 ⁻⁰² V 1.51x10 ⁻⁰¹ V 1.51x10 ⁻⁰¹ V	
<i>Electrical – DC/LF</i> AC Voltage – Measure	0 to 100mV @ 1KHz 0 to 100mV @ 50 KHz >100mV to 1V @ 1KHz >100mV to 1V @ 50 KHz >1 to 10V @ 1KHz >1 to 10V @ 50 KHz >10 to 100VAC @ 1KHz >100 to 750V @ 1KHz	1.87 x10 ⁻⁰² mV 4.09 x10 ⁻⁰² mV 8.29 x10 ⁻⁰⁵ V 1.43 x10 ⁻⁰⁴ V 8.26 x10 ⁻⁰⁴ V 1.43 x10 ⁻⁰³ V 8.97 x10 ⁻⁰³ V 6.11 x10 ⁻⁰² V	Keithley 2000

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<i>Electrical – DC/LF</i> AC Current – Measure	0 to 1.000000A @ 1KHz >1 to 3.0000A @ 1KHz 1 to 3.0000A @ 5KHz	7.03 x10 ⁻⁰⁴ A 1.51 x10 ⁻⁰³ A 8.51 x10 ⁻⁰⁴ A	Keithley 2000
<i>Electrical – DC/LF</i> AC Current – Generate	0 to 320µA @ 110Hz 0 to 320µA @ 3KHz 0 to 320µA @ 10KHz 0.32001mA to 3.2mA @ 110Hz 0.32001mA to 3.2mA @ 3KHz 0.32001mA to 3.2mA @ 10KHz 3.2001mA to 32mA @ 110Hz 3.2001mA to 32mA @ 3KHz 3.2001mA to 32mA @ 10KHz 32.001mA to 320mA @ 110Hz	2.37µA 2.37µA 2.37µA 3.25 x10 ⁻⁰³ mA 3.25 x10 ⁻⁰³ mA 3.5 x10 ⁻⁰³ mA 3.25 x10 ⁻⁰² mA 3.25 x10 ⁻⁰² mA 3.25 x10 ⁻⁰² mA 3.25 x10 ⁻⁰² mA 4.30 x10 ⁻⁰¹ mA	Wavetek 9100

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<i>Electrical – DC/LF</i> AC Current – Generate (<i>continued</i>)	32.001mA to 320mA @ 3KHz 32.001mA to 320mA @ 10KHz 0.32001A to 3.2A @ 110Hz 0.32001A to 3.2A @ 3KHz 0.32001A to 3.2A @ 10KHz 3.2001A to 20A @ 110Hz 3.2001A to 20A @ 3KHz 3.2001A to 20A @ 10KHz	4.64 x10 ⁻⁰¹ mA 4.64 x10 ⁻⁰¹ mA 5.03 x10 ⁻⁰³ A 3.11 x10 ⁻⁰³ A 3.11 x10 ⁻⁰³ A 1.13 x10 ⁻⁰² A 5.11 x10 ⁻⁰³ A 5.15 x10 ⁻⁰³ A	Wavetek 9100
<i>Electrical – DC/LF</i> Resistance – Generate	0 to 40Ω 40.001Ω to 400Ω 400.01Ω to 4kΩ 4.0001kΩ to 40kΩ 40.001kΩ to 400kΩ	4.93 x10 ⁻⁰⁴ Ω 4.01 x10 ⁻⁰³ Ω 3.23 x10 ⁻⁰⁵ kΩ 4.05 x10 ⁻⁰⁴ kΩ 4.96 x10 ⁻⁰³ kΩ	Wavetek 9100

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Resistance – Measure	400.01kΩ to 4MΩ	1.3 x10 ⁻⁰⁵ MΩ	Keithley 2000, 100μΩ Resolution, 4 wire Keithley 2000, 1mΩ Resolution, 4 wire Keithley 2000, 10mΩ Resolution, 4 wire Keithley 2000, 100mΩ Resolution, 4 wire Keithley 2000, 1Ω Resolution, 4 wire Keithley 2000, 10Ω Resolution, 2 wire Keithley 2000, 100Ω Resolution, 2 wire
	4.0001MΩ to 40MΩ	1.5 x10 ⁻⁰² MΩ	
	40.001MΩ to 400MΩ	1.67 x10 ⁻⁰² MΩ	
	0 to 100Ω	1.91 x10 ⁻⁰³ Ω	
	>100Ω to 1kΩ	1.34 x10 ⁻⁰⁵ kΩ	
	>1kΩ to 10kΩ	1.24 x10 ⁻⁰⁴ kΩ	
	>10kΩ to 100kΩ	1.47 x10 ⁻⁰³ kΩ	
	>100kΩ to 1MΩ	2.09 x10 ⁻⁰⁵ MΩ	
>1MΩ to 10MΩ	4.7 x10 ⁻⁰⁴ MΩ		
>10MΩ to 100MΩ	4.96 x10 ⁻⁰⁴ MΩ		

¹ "Best Measurement Capability" is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or of nearly ideal measuring instruments. Best Measurement Capabilities are expressed as uncertainties at approximately the 95% level of confidence, usually using a coverage factor of $k=2$. The measurement uncertainty of a specific calibration performed by the laboratory may be greater than the least uncertainty due to the behavior of the customer's device, to the environment (if the calibration is performed in the field), and to influences from the circumstances of the specific calibration.

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