



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005  
& ANSI/NCSL Z540-1-1994

WEST CALDWELL CALIBRATION LABORATORIES, INC.  
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CALIBRATION

Valid To: January 31, 2012

Certificate Number: 1533.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1</sup>:

I. Acoustical Quantities

Parameter/Equipment	Frequency	CMC <sup>2</sup> (±)	Comments
Microphones – Measure	250 Hz	0.18 dB	B&K 4134/4144
	20 Hz to 200 kHz	0.46 dB	WB 0736 & UA0033
Microphones <sup>3</sup> – Measure	250 Hz	0.23 dB	B&K 4134/4144
	20 Hz to 200 kHz	0.54 dB	WB 0736 & UA0033
Acoustic Calibrators – Measure	125 Hz to 5 kHz	0.18 dB	Comparison to B&K 4134
Acoustic Calibrators <sup>3</sup> – Measure	125 Hz to 5 kHz	0.23 dB	Comparison to B&K 4134
Pistonphones – Measure	250 Hz	0.18 dB	B&K 4144
Pistonphones <sup>3</sup> – Measure	250 Hz	0.23 dB	B&K 4144

Parameter/Equipment	Frequency	CMC <sup>2</sup> (±)	Comments
Sound Level Meter – Generate	2 Hz to 200 kHz	0.30 dB	AC voltage standard Agilent 33120A
Sound Level Meter <sup>3</sup> – Generate	2 Hz to 200 kHz	0.35 dB	AC voltage standard Agilent 33120A
Filters, Analyzers and Measuring Amplifiers Measuring Equipment	2 Hz to 200 kHz	0.72 dB	AC voltage standard Agilent 33120A
Filters <sup>3</sup> , Analyzers <sup>3</sup> and Measuring Amplifiers <sup>3</sup> Measuring Equipment	2 Hz to 200 kHz	0.77 dB	AC voltage standard Agilent 33120A
Microphones – Phase	10 Hz to 100 kHz	0.15° 0.10°	B&K 2133 B&K 3560
Accelerometers – Phase	10 Hz to 100 kHz	0.05°	B&K 2034/9610
Dosimeters Measuring Equipment	2 Hz to 20 kHz	0.50 dB	AC voltage standard Agilent 33120A
Dosimeters Measuring Equipment <sup>3</sup>	2 Hz to 20 kHz	0.55 dB	AC voltage standard Agilent 33120A
Artificial Mastoid – Measure	100 Hz to 10 kHz  1 kHz	2.0 dB  1.0 dB	Constant force-frequency plot, B&K 8000  Force standard, B&K 8000

## II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2, 4, 5, 6</sup> (±)	Comments
DC Voltage – Generate	Up to 220 mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	0.12 % 1.2 % 1.3 % 1.3 % 1.3 % 1.3 %	Fluke 5700A
DC Voltage – Measure	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V	0.12 % 1.2 % 1.3 % 1.3 % 1.3 %	HP 3458A
DC Voltage <sup>3</sup> – Measure	1 mV to 1000 V	1.3 %	HP 34401A
DC Current – Generate	Up to 220 µA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	0.17 % 0.17 % 0.16 % 0.12 % 1.2 %	Fluke 5700A
DC Current – Measure	Up to 100 nA (0.1 to 1) µA (1 to 10) µA (10 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	0.17 % 0.17 % 0.17 % 0.17 % 0.17 % 0.16 % 0.12 % 1.2 %	HP 3458A
DC Current <sup>3</sup> – Measure, Fixed Points	10 mA 100 mA 1 A 3 A	0.23 % 0.14 % 1.3 % 1.3 %	Agilent 34401A

*Peter Abney*

Parameter/Equipment	Range	CMC <sup>2,4,6</sup> (±)	Comments
Resistance – Generate	(40 to 400) Ω (0.4 to 40) kΩ (4 to 40) kΩ (40 to 400) kΩ (0.4 to 4) MΩ (4 to 40) MΩ	1.3 % 1.4 % 1.3 % 1.3 % 1.4 % 3.8 %	Wavetek 9100
Resistance – Measure	(1 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (0.1 to 1) GΩ	1.3 % 1.3 % 1.3 % 1.3 % 1.3 % 1.3 % 1.3 % 1.4 % 2.4 %	Agilent 3458A

Parameter/Range	Frequency	CMC <sup>2,6</sup> (±)	Comments
Attenuator – Generate			
(0 to -60) dB	DC to 200 kHz	0.1 dB	WB 0785
(-30 to -100) dB	10 Hz to 50 kHz 2 Hz to 200 kHz	0.2 dB 0.5 dB	B&K 2636, 2610
Attenuator <sup>3</sup> – Generate			
(-30 to -100) dB	2 Hz to 200 kHz	0.5 dB	B&K 2636, 2610
AC Voltage – Generate			
Up to 320 mV (0.32 to 32) V (32 to 320) V	10 Hz to 100 kHz	0.26 % 1.6 % 1.5 %	Wavetek 9100
(320 to 1050) V	40 Hz to 1 kHz	1.8 %	

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Parameter/Range	Frequency	CMC <sup>2,4,6</sup> (±)	Comments
AC Voltage – Measure			
10 mV	(1 to 40) Hz 40 Hz to 20 kHz (50 to 100) kHz (100 to 300) kHz	0.14 % 0.13 % 0.61 % 4.7 %	Agilent 3458A
100 mV to 10 V	(1 to 40) Hz 40 Hz to 20 kHz (50 to 100) kHz (100 to 300) kHz	1.2 % 1.2 % 1.2 % 1.5 %	
100 V	(1 to 40) Hz 40 Hz to 20 kHz (50 to 100) kHz (100 to 300) kHz	1.3 % 1.3 % 1.4 % 1.7 %	
1000 V	(1 to 40) Hz 40 Hz to 20 kHz (50 to 100) kHz	1.3 % 1.3 % 1.6 %	
AC Voltage <sup>3</sup> – Measure			
100 mV	10 Hz to 20 kHz (50 to 100) kHz (100 to 300) kHz	0.17 % 0.80 % 5.2 %	Agilent 34410A
(1 to 750) V	10 Hz to 20 kHz (50 to 100) kHz (100 to 300) kHz	1.1 % 1.7 % 6.2 %	
AC Current – Measure			
100 µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 1) kHz	0.17 % 0.17 % 0.17 % 0.17 %	Agilent 3458A
(1 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.51 % 0.23 % 0.15 % 0.13 %	
1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	1.6 % 1.4 % 1.3 % 1.3 %	

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III. Mechanical

Parameter/Range	Frequency	CMC <sup>2,6</sup> (±)	Comments
Velocity Transducer – Measure  (10 to 2500) mV/in·s <sup>-1</sup>	(15 to 1000) Hz	2.0 %	B&K 9610
Accelerometers – Measure  Charge	100 Hz and 160 Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 2 kHz (2 to 4) kHz (4 to 7) kHz (7 to 10) kHz  (2 to 45) kHz	1.3 % 1.4 % 1.3 % 1.4 % 1.8 % 2.2 % 2.5 %  4.0 %	B & K 9610 (0.02 to 5000) pC/g B&K 4808, 4809  B&K 4290 (0.02 to 5000) pC/g
Voltage	100 Hz and 160 Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 2 kHz (2 to 4) kHz (4 to 7) kHz (7 to 10) kHz  (2 to 45) kHz	1.3 % 2.0 % 1.6 % 1.4 % 1.8 % 2.2 % 2.5 %  4.0 %	B & K 9610 (0.02 to 5000) mV/g B&K 4808, 4809  B&K 4290 (0.02 to 5000) mV/g
Calibration Exciters	50 Hz to 160 kHz 10 Hz to 10 kHz	1.6 % 4.1 %	B&K 8305/4393
Calibration Exciters <sup>3</sup>	50 Hz to 160 kHz	1.7 %	B&K 8305/4393

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Parameter/Range	Frequency	CMC <sup>2,6</sup> (±)	Comments
Dynamic Force Transducer – Measure  (0.05 to 0.25) N	100 Hz	2.0 %	B&K 4809 & WA0426
	160 Hz	2.0 %	
	200 Hz to 35 kHz	4.0 %	B&K 4290
Dynamic Pressure Sensor – Measure	250 Hz	0.18 dB	B&K 4228
	20 Hz to 200 kHz	1.0 dB	WB 0736 & UA0033 stepped sine response

#### IV. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Frequency Measuring Equipment	DC to 10 MHz	45 µHz/Hz	Agilent 34401A
Frequency – Measure	DC to 100 MHz	41 µHz/Hz	Agilent 53131A

<sup>1</sup> This laboratory offers commercial calibration services and field calibration services.

<sup>2</sup> Calibration and Measurement Capability (CMC) 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 nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of  $k = 2$ . The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

<sup>3</sup> Field calibration service is available for this calibration and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

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<sup>4</sup> Based on using the standard at the temperature the Agilent 3458A was calibrated ( $t_{cal} \pm 5 \text{ }^{\circ}\text{C}$ ) and an auto-calibration (ACAL) was performed within the previous 24 hours ( $\pm 1 \text{ }^{\circ}\text{C}$  of ambient temperature).

<sup>5</sup> Based on using the standard at the temperature the Fluke 5700A was calibrated ( $t_{cal} \pm 5 \text{ }^{\circ}\text{C}$ ) and assuming the instrument is zeroed at least every seven days or when the ambient temperature changes more than  $5 \text{ }^{\circ}\text{C}$ . For resistance, a zero calibration is performed at least every 12 hours within  $\pm 1 \text{ }^{\circ}\text{C}$  of use.

<sup>6</sup> In the statement of CMC, percentages are to be read as percent of reading.