

DEPARTMENT OF THE NAVY



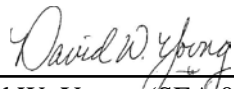
CERTIFICATE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MAR)

Norfolk, VA

is recognized by the NAVSEA METCAL Quality Program for satisfactory compliance to criteria set forth in the Navy and Marine Corps Calibration Laboratory Audit/Certification Manual, NAVAIR 17- 35QAC-01B, NAVSEA 04-4734B, and USMC TI-4733-35/23B. These criteria encompass the relevant requirements of Naval Fleet and Type Commander directives. Certification is issued for specific measurement areas and ranges listed on the attached Scope of Competency.

JNAC Program Document
04-4734-MAR-05192018



David W. Young (SEA 04RM3)
NAVSEA METCAL Program Manager

Expiration Date
19 May 2021

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
ELECTRICAL		
AC Current/ Generate	Arbiter Systems 1040C Panel Meter Calibrator* Fluke 5520A Calibrator Fluke 5700ANV3SERIESII Calibrator w/ Fluke 5725A Amplifier Valhalla 2555A AC Current Generator w/ Fluke 5700ANV3SERIESII Calibrator Fluke 5700ANV3SERIESII Calibrator w/ Fluke 5725A Amplifier and Fluke 5500 Multi-Turn Coil	0.1 to 5 A @ 60 and 400 Hz 33.00 μ A to 20 A @ 10 Hz to 30 kHz; 0.33 to 2.99999 A @ 10 Hz to 10 kHz; 3 to 20.0 A @ 45 Hz to 5 kHz 220 μ A to 220 mA @ 10 Hz to 10 kHz; 220 mA to 2.2 A @ 40 Hz to 10 kHz; 2.2 to 11 A @ 40 Hz to 10 kHz 1 mA to 100 A @ 60 Hz and 1 kHz 200 μ A to 1,000 A @ 60 Hz; 200 μ A to 390 A @ 400 Hz
AC Current/ Measure	Agilent 3458A Digital Multimeter w/ Fluke Y5020 Current Shunt Agilent 3458A Digital Multimeter w/ Fluke A40-1A Current Shunts Agilent 3458A Digital Multimeter	10 to 20 A @ 60 Hz to 5 kHz 1 A @ 400 Hz, 5 kHz, 20 kHz, and 50 kHz 100 μ A to 1 mA @ 10 Hz to 5 kHz; 1 to 100 mA @ 10 Hz to 100 kHz; 100 mA to 1 A @ 10 Hz to 50 kHz
AC Voltage/ Generate	Arbiter Systems 1040C Panel Meter Calibrator* Fluke 5700ANV3SERIESII OPT3 Calibrator w/ Fluke 5725A Amplifier	1.5 to 750 V @ 60 and 400 Hz 22 mV to 220 V @ 10 Hz to 1 MHz; 110 to 1,100 V @ 50 Hz to 1 kHz; 110 to 1,100 V @ 20 Hz to 30 kHz; 75 to 750 V @ 50 Hz to 100 kHz; 11 mV to 3.5 V @ 30 Hz to 30 MHz
AC Voltage/ Measure	Agilent 3458A Digital Multimeter w/ Fluke 80K40 High Voltage Probe Keysight 34461A Digital Multimeter Fluke 5790A AC Measurement System	1 to 28 kV rms @ 60 Hz 0 to 750 V @ 3 Hz to 300 kHz 2.2 mV to 1,000 V @ 10 Hz to 1 MHz; 2.2 mV to 7 V @ 10 Hz to 30 MHz

* NOTE: All measurement systems used outside the laboratory are denoted with an asterisk (*).

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
ELECTRICAL		
Bandwidth/ Generate	Fluke 9500B600 or 9500-600OPT5 Oscilloscope Calibrator	0.1 Hz to 600 MHz
Bandwidth/ Measure	Tektronix DSA8200 Digital Serial Analyzer w/ Tektronix 80E03 Plug-In	0.1 Hz to 20 GHz
Capacitance/ Generate	GenRad 1413 Decade Capacitor GenRad 1408 Capacitance Standard GenRad 1404A Capacitance Standard	1 pF to 1.11111 μ F @ 1 kHz 10 pF and 100 pF @ 1 kHz 1,000 pF @ 1 kHz and 10 kHz
Capacitance/ Measure	Andeen-Hagerling 2500AOPTe Capacitance Bridge GenRad 1620A Capacitance Measuring Assembly	10 pF to 1 μ F @ 1 kHz 10 aF to 1.1111 μ F @ 50 Hz to 10 kHz
DC Current/ Generate	Arbiter Systems 1040C Panel Meter Calibrator* Measurement International 6010C Resistance Measuring System Any 20 A Calibrator w/ Fluke 5500 Multi-Turn Coil	0.025 mA to 10 A 0 to 400 A 0 to 1,000 A (clamp-on meters only)
DC Current/ Measure	Measurement International 6010C Resistance Measuring System with the following Shunts: Leeds & Northrup 4360 Current Shunt Leeds & Northrup 4361 Current Shunt Leeds & Northrup 4363 Current Shunt	0 to 15 A 15 to 100 A 100 to 300 A
DC Voltage/ Generate	Fluke 5700ANV3SERIESII Calibrator Fluke 410B Power Supply Fluke 732B DC Reference Standard	0 to 1,000 V 0 to 10 kV 10 V
DC Voltage/ Measure	Agilent 3458A Digital Multimeter Fluke 8508A Reference Multimeter Sensitive Research ESH Static Voltage Meter	0 to 1,000 V 0 to 1,420 V 0 to 50 kV

* NOTE: All measurement systems used outside the laboratory are denoted with an asterisk (*).

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
ELECTRICAL		
Electrolytic Conductivity Cells	Electro Scientific Industries 253 Impedance Bridge and locally prepared Standard Conductivity Solutions	0.01 to 0.09 cm ⁻¹ (cell constant); 0.0 to 2.0 cm ⁻¹ (cell constant)
Frequency/ Generate	Keysight 33220AOPH01 Function Generator Keysight E8257DOPT550 Signal Generator Hewlett Packard 5061B Cesium Beam Frequency Standard or Datum 9390-6000-34 GPS w/ Satellite Lock	1 μHz to 20 MHz 250 kHz to 50 GHz 1, 5, 10 MHz and 1 PPS
Frequency/ Measure	Keysight 53220AN Universal Counter Hewlett Packard 5352BOPT010 Microwave Frequency Counter Keysight N5531S Microwave Measuring Receiver w/ Keysight N5532OPT550 Sensor Module	10 μHz to 6 GHz 10 Hz to 40 GHz 3 Hz to 50 GHz
Inductance/ Generate	GenRad 1491G Decade Inductor GenRad 1482 Series Inductor Standards	100 μH to 11.111 H @ 1 kHz 100 μH to 10 H @ 100 Hz and 1 kHz
Inductance/ Measure	Tegam 253 Digital Impedance Meter	199.9 μH to 199.9 H @ 1 kHz
Magnetic Field Strength/ Generate Only	Norfolk Naval Shipyard 500G Helmholtz Coil w/ RB Annis 25 Dip Meter and Agilent 3458A Digital Multimeter	1 to 20 G
Modulation (AM/FM)/ Generate	Hewlett Packard 11715A AM-FM Test Source w/ Keysight 33220AOPH01 Function Generator or w/ Agilent 8648B Signal Generator and Keysight N5331S Microwave Measurement Receiver	<u>AM</u> : Carrier 100 kHz to 2 GHz, AM Depth 5 to 99% @ Mod Rate 20 Hz to 100 kHz <u>FM</u> : Carrier 100 kHz to 2 GHz, Deviation <400 kHz @ Mod Rate 20 Hz to 200 kHz
Modulation (AM/FM)/ Measure	Keysight N5331S Microwave Measurement Receiver	<u>AM</u> : Carrier 100 kHz to 50 GHz, AM Depth 5 to 99% @ Mod Rate 20 Hz to 100 kHz <u>FM</u> : Carrier 100 kHz to 50 GHz, Deviation <400 kHz @ Mod Rate 20 Hz to 200 kHz

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
ELECTRICAL		
Phase/ Generate	Clarke-Hess 5500 Digital Phase Standard	0.000 to $\pm 999.999^\circ$ @ 1 Hz to 100 kHz
Phase/ Measure	North Atlantic 2000S3528 Precision Phase Meter	0 to 359° @ 0.5 Hz to 700 kHz
Ratio Transformers	NBS LINDECK Ratio Transformer Comparator w/ ESI DT72A Inductive Divider	0.001 to 1 @ 400 Hz and 1 kHz
Resistance/ Generate	<u>Resistance Standards:</u> Leeds & Northrup 4223 Leeds & Northrup 4222 Leeds & Northrup 4221 Leeds & Northrup 4210 Leeds & Northrup 4025 Leeds & Northrup 4030B Leeds & Northrup 4035 Electro Scientific Industries SR104 Leeds & Northrup 4045 Leeds & Northrup 4050B Guildline 9330-10M Guildline 9331S/100M Guildline 65206	0.001 Ohm 0.01 Ohm 0.1 Ohm 1 Ohm 10 Ohm 100 Ohm 1 kOhm 10 kOhm 100 kOhm 1 MOhm 10 MOhm 100 MOhm 1 GOhm
Resistance/ Measure	Measurement International 6010C Resistance Measuring System w/ Various Resistance Standards Measurement International 6000B Resistance Measuring System w/ Various Resistance Standards Guildline 6530XR Tera-Ohmmeter	0.001 Ohm to 1 kOhm 10 kOhm to 100 MOhm 1 GOhm to 10 POhm

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
ELECTRICAL		
RF Level	Keysight N5531S Microwave Measuring Receiver	-129 to 30 dBm @ 100 kHz to 2 MHz; -134 to 30 dBm @ 2 to 10 MHz; -140 to 30 dBm @ 10 MHz to 13.2 GHz; -137 to 30 dBm @ 13.2 to 19.2 GHz; -123 to 30 dBm @ 19.2 to 26.5 GHz; -122 to 30 dBm @ 26.5 to 31.15 GHz; -110 to 30 dBm @ 31.15 to 41 GHz; -100 to 30 dBm @ 41 to 45 GHz; -88 to 30 dBm @ 45 to 50 GHz
RF Power	NBS Type IV Power Meter, Hewlett Packard 83630A Signal Generator, Hewlett Packard 83554A Wave Source Module, Hewlett Packard 432A Power Meter, and Hewlett Packard 3457A Digital Multimeter: <i>w/ Standard Power Sensors:</i> Hewlett Packard 8482A Hewlett Packard 8481A Hewlett Packard 8481D Hewlett Packard 8485A Hewlett Packard 8485D Hewlett Packard R8486A <i>w/ Standard Thermistor Mounts:</i> Hewlett Packard 478AOPH75 Hewlett Packard 8478B Hewlett Packard X486A Hewlett Packard P486A Hewlett Packard K486A Hewlett Packard R486A	-30 to 20 dBm @ 100 kHz to 4.2 GHz -30 to 20 dBm @ 10 MHz to 18 GHz -70 to -20 dBm @ 10 MHz to 18 GHz -30 to 20 dBm @ 50 MHz to 26.5 GHz -70 to -20 dBm @ 50 MHz to 26.5 GHz -30 to 20 dBm @ 26.5 to 40 GHz -30 to 10 dBm @ 1 MHz to 1 GHz -30 to 10 dBm @ 10 MHz to 18 GHz -20 to 10 dBm @ 8.2 to 12.4 GHz -20 to 10 dBm @ 12.4 to 18 GHz -20 to 10 dBm @ 18 to 26.5 GHz -20 to 10 dBm @ 26.5 to 40 GHz

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
ELECTRICAL		
RF Power (CW)/ Generate	Agilent E8257DOPT550 Signal Generator	-110 to 12 dBm @ 250 kHz to <10 MHz; -110 to 14 dBm @ 10 to <60 MHz; -110 to 18 dBm @ 60 to <400 MHz; -110 to 19 dBm @ 0.4 to <3.2 GHz; -110 to 17 dBm @ 3.2 to <15 GHz; -110 to 13 dBm @ 15 to <30 GHz; -90 to 9 dBm @ 30 to 50 GHz
RF Pulse Power/ Generate	Unique Broadband 2770 Pulsed Calibration Source	2.6 kW max @ 960 to 1215 MHz
RF Pulse Power/ Measure	Boonton 4500BS2 Peak Power Meter w/ Narda 22990-60 Coaxial Directional Coupler Boonton 4500BS2 Peak Power Meter	0 to 4 kW @ 950 to 1.25 GHz -30 to 20 dBm @ 50 MHz to 18 GHz
RF Wattmeter	Comtech PST BHED16587-500 Wattmeter Calibrator System w/ Bird 4021/4022 Sensors and Bird 4221 Power Meter	1 to 480 W @ 2 to 10 MHz; 1 to 180 W @ 15 to 500 MHz
S-Parameter (S11/S22) VSWR/ Measure Only	Hewlett Packard 8510C Network Analyzer w/ Hewlett Packard Calibration Kits: <u>Coaxial:</u> 85054B (Type N) 85050C (APC-7) 85052C (APC-3.5) 85056A (APC-2.4) <u>Waveguide:</u> H7005E (H Band) X11644A (X- Band) P11644A (P- Band) K11644A (K- Band) R11644A (R- Band) Q11644A (Q- Band)	(Reflection Coefficient) 0 to 1 @ 0.045 to 18 GHz 0 to 1 @ 0.045 to 18 GHz 0 to 1 @ 0.045 to 26.5 GHz 0 to 1 @ 0.045 to 50 GHz 0 to 1 @ 7.1 to 10 GHz 0 to 1 @ 8.2 to 12.4 GHz 0 to 1 @ 12.4 to 18 GHz 0 to 1 @ 18 to 26.5 GHz 0 to 1 @ 26.5 to 40 GHz 0 to 1 @ 33 to 50 GHz

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
ELECTRICAL		
S-Parameter (S12/S21) Attenuation/ Measure Only	Hewlett Packard 8510C Network Analyzer w/ Hewlett Packard Calibration Kits: <u>Coaxial:</u> 85054B (Type N) 85050C (APC-7) 85052C (APC-3.5) 85056A (APC-2.4) <u>Waveguide:</u> X11644A (X- Band) P11644A (P- Band) K11644A (K- Band) R11644A (R- Band) Q11644A (Q- Band)	-50 to 0 dB @ 0.045 to 18 GHz -50 to 0 dB @ 0.045 to 18 GHz -50 to 0 dB @ 0.045 to 26.5 GHz -50 to 0 dB @ 0.045 to 50 GHz -50 to 0 dB @ 8.2 to 12.4 GHz -50 to 0 dB @ 12.4 to 18 GHz -50 to 0 dB @ 18 to 26.5 GHz -50 to 0 dB @ 26.5 to 40 GHz -50 to 0 dB @ 33 to 50 GHz
Thermal Voltage Convertors (TVCs)	Fluke 382 DC Voltage/Current Calibrator and Keithley 182 NanoVoltmeter w/ Ballantine 1395 Series Thermal Voltage Convertors (TVCs)	0.40 to 6.0 V @ 1 MHz; 0.40 to 6.0 @ 10 MHz; 0.40 to 6.0 @ 30 MHz; 0.40 to 6.0 @ 50 MHz; 0.40 to 6.0 @ 70 MHz; 0.40 to 6.0 @ 100 MHz
Total Harmonic Distortion/ Measure Only	Hewlett Packard 334A Distortion Analyzer	5 Hz to 600 kHz

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
ELECTRO-OPTICS		
Fiber Optics/ Generate Only	NSWC Corona MM50P OTDR Calibrator NSWC Corona ADFOCS Fiber Optic Calibrator	(Distance) 0 to 5,534 m (Attenuation) 0 to 10 dB
Illuminance/ Generate Only	General Electric 100T8-1-2/DPT1000W Standard Lamp w/ generic Optical Rail Kit and Baffles	1 to 1,000 fc
Night Vision	Avinstro AVI1014 Night Vision Radiometer w/ NSWC Crane 8347610 Telescope	690, 810, and 820 nm
Optical Power/ Generate	NSWC Corona LCS8513 Fiber Optic Superposition Linearity Standard	-55 to 10 dBm @ 1,300 nm
Optical Power/ Measure	Keysight 81618A Interface Module w/ Keysight 81624B (Single Mode) or Keysight 81623B (Multi-Mode) Optical Power Heads	-10 to -60 dBm @ 850 nm; -10 to -60 dBm @ 1,300 nm; -10 to -60 dBm @ 1,550 nm
UV Irradiance/ Measure Only	Spectronics DM-365N Ultraviolet Meter	0 to 2,000 μ W/cm ²
Wavelength & Bandwidth/ Measure Only	Anritzu MS9030A/MS9701A Optical Spectrum Analyzer	350 to 1,750 nm
MECHANICAL		
Altitude & Airspeed/ Measure Only	King Nutronics 3688A Air Data Calibrator	-1,500 to 6,500 ft (15.51 to 0.82 psia); 20 to 1,000 kts (0.01 to 36.12 psia)
Angle/ Generate	Brunson Instrument Co. 470NA Small Angle Generator Brown & Sharpe 599-925-10 Sine Plate w/ Starrett SS88A1X Gage Block Set AA Gage D10833 Rotary Index Table	0 to 200 arc second 0 to 60° 7 in from 0 to 360°
Angle/ Measure	Rank Precision A142-43 Clinometer	0 to 360°
Auto-Collimation/ Generate Only	Brunson 270BN Universal Short Range Calibrator	2 feet to infinity

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Dew Point/ Generate Only	General Eastern HYGROM3 Humidity Calibrator or OPTICA Chilled Mirror Hygrometer w/ General Eastern DPG300 Generator	-80 min DP @ -80 to 100 °C
Dial Indicators	Starrett 716(M) Dial Indicator Calibrator Mahr Federal 400B1 Dial Indicator Calibrator Mahr Federal 400B5 Dial Indicator Calibrator	0 to 25 mm 0 to 1 in (0.0001 in resolution) 0 to 0.5 in (0.00001 in resolution)
Flatness/ Measure Only	Davison Optronics D309L Plano Interferometer Rahn Repeat-O-Meter Surface Plate Comparator	1 to 6 in -0.001 to 0.001 in
Flow (Air Flow/Velocity)/ Generate Only	Airflow Developments OJWT Wind Tunnel w/ TSI Inc. 8455-12 Air Velocity Transducer	200 to 6,000 ft/min
Flow (Gas Flow)/ Generate Only	Local Regulated Pressure Source w/ Singer AL13 Bell Prover Calibration System Local Regulated Pressure Source w/ Singer AL14 Bell Prover Calibration System Local Regulated Pressure Source w/ Fluke MOLBOX Gas Flow Calibration System and Flow Elements: Fluke 5E1VCRVQ Laminar Flow Element Fluke 5E2VCRVQ Laminar Flow Element Fluke 5E3VCRVQ Laminar Flow Element Fluke 3E4VCRVQ Laminar Flow Element Fluke 5E2S Sonic Flow Element Fluke 2E3S Sonic Flow Element	0.25 to 10 SCFM 10 to 40 SCFM 5 to 110 SCCM 50 SCCM to 1 SLPM 500 SCCM to 10 SLPM 3 to 40 SLPM 67 to 250 SLPM 248 to 1,200 SLPM

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Flow (Liquid Flow)/ Measure	Exact Flow EF3554S Flow Calibrator* with the following Turbine Flowmeters: Cox AN8-6 Cox AN8 Cox AN10 Cox AN12 Cox AN16 Cox AN24 Cox AN32 Cox LF6-00 Cox LF6-3	0.25 to 2.5 GPM 0.75 to 7.5 GPM 1.25 to 12.5 GPM 2.5 to 25.0 GPM 5.0 to 50.0 GPM 12.5 to 125 GPM 25.0 to 250 GPM 0.012 to 0.125 GPM 0.125 to 1.25 GPM
Flow (Liquid Flow)/ Generate	Local Regulated Pressure Source w/ EG & G Flow Technology MT-10 Liquid Flow Calibrator Local Regulated Pressure Source w/ EG & G Flow Technology BFCF-1.5-4-1200HT Liquid Flow Calibrator Local Regulated Pressure Source w/ EG & G Flow Technology BFC-S-1200 Liquid Flow Calibrator Local Regulated Pressure Source w/ Calibron Systems S25C1A2A2 Synchrotrac Flow Prover	0.001 to 10 gpm 4 to 1,200 gpm 1 to 1,200 gpm 6 to 2,100 gpm
Force/ Generate Only	Morehouse 100000 or 300000 Universal Force Machine and HBM Inc. DMP40S2 Force Indicating System with the following Load Cells: HBM Inc. Z3H3R-200KGF HBM Inc. Z3H3R-500KGF Revere USP1-2.5-A HBM Inc. C3H3-2T HBM Inc. C3H3-5T HBM Inc. C3H3-10T Revere USP1-50-A HBM Inc. C3H3-50T	0 to 400 lb 0 to 1,000 lb 0 to 2,500 lb 0 to 4,000 lb 0 to 10,000 lb 0 to 20,000 lb 0 to 50,000 lb 0 to 100,000 lb

* NOTE: All measurement systems used outside the laboratory are denoted with an asterisk (*).

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Gas Analysis/ Generate Only	NSWC Corona D311 Standard Gas Mixture NSWC Corona D310 Standard Gas Mixture NSWC Corona D309 Standard Gas Mixture	0.2 % Hydrogen in Air 1.0 % Hydrogen in Air 1.9 % Hydrogen in Air
Humidity/ Generate Only	Thunder Scientific 2500ST Two Pressure Humidity Chamber	0 to 70 °C @ 10 to 98% RH
Length	<p><u>End Standards:</u></p> <p>Pratt & Whitney B and C Super Micrometers w/ Multiple Starrett Gage Block Sets</p> <p>Pratt & Whitney U3034396 Measuring Machine w/ Multiple Starrett Gage Block Sets</p> <p><u>Gage Blocks:</u></p> <p>Mahr Federal130B16/24 Gage Block Comparator</p> <p>Mahr Federal130B16/24 Gage Block Comparator w/ Starrett SS8AAX and DoAll 119R Gage Block Sets</p> <p>Mahr Federal130B16/24 Gage Block Comparator w/ Starrett RC88AA and DoAll 112RM Gage Block Set</p> <p><u>Micrometers:</u></p> <p>Starrett SS88A1X Gage Block Set</p> <p>Starrett SS8AAX Gage Block Set</p>	<p>0 to 24 in</p> <p>0 to 80 in</p> <p>Steel: 0.01 to 4.0 in</p> <p>Steel: 5.0 to 20.0 in; Chromium: 0.05 to 4.0 in</p> <p>Steel: 0.5 to 100 mm</p> <p>0.02 to 4 in</p> <p>5 to 20 in (84 in total length)</p>
Mass/ Generate	Rice Lake Weighing Systems Class 3 Weight Sets Troemner Class 3 Weight Set NSWC Corona D77 Class C and/or AKO Class F and/or Troemner Class Q and/or Fisher Scientific Class S-1 Weight Sets NSWC Corona D77 Class C and/or AKO Class F and/or Troemner Class Q and/or Fisher Scientific Class S-1 Weight Sets	<p>1 mg to 32 kg</p> <p>1/32 oz to 110 lb</p> <p>1 mg to 100 kg</p> <p>1/32 oz to 6,000 lb</p>

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Mass /Measure	Voland HCE50 Equal Arm Balance w/ Rice Lake Weighing Systems Class 3 Weight Set	20 kg
	Voland 1115DN Equal Arm Balance w/ Rice Lake Weighing Systems Class 3 Weight Set	2 to 10 kg
	Mettler Instruments B6C1000 Single Pan Balance w/ Rice Lake Weighing Systems Class 3 Weight Set	200 g to 1 kg
	Mettler Instruments HL52 Single Pan Balance w/ Rice Lake Weighing Systems Class 3 Weight Set	30 to 100 g
	Mettler Instruments M5 Single Pan Balance w/ Rice Lake Weighing Systems Class 3 Weight Set	5 to 20 g
	Mettler Instruments ME22 Single Pan Balance w/ Rice Lake Weighing Systems Class 3 Weight Set	1 mg to 3 g
	Voland HCE50 Equal Arm Balance w/ Troemner Class 3 Weight Set	50 lb
	Voland 1115DN Equal Arm Balance w/ Troemner Class 3 Weight Set	3 to 20 lb
	Mettler Instruments B6C1000 Single Pan Balance w/ Troemner Class 3 Weight Set	8 oz to 2 lb
	Mettler Instruments HL52 Single Pan Balance w/ Troemner Class 3 Weight Set	1 to 4 oz
Mettler Instruments M5 Single Pan Balance w/ Troemner Class 3 Weight Set	1/32 to 1/2 oz	
Plug and Ring Gages	Mahr Federal 136B5 Comparator w/ Starrett RC88.AAX Gage Block Set	External: 0.01 to 10.75 in; Internal: 0.125 to 12.00 in
Pressure/ Generate	Local Regulated Pressure Source w/ King Nutronics 3461-1-1 Port Gas/Hydraulic Pressure Calibrator* and 3689A Precision Pressure Standard	0 to 10,000 psi
	w/ Schvien 1025FX110-2 Mercury Manometer	0.5 to 110 inHg
	w/ Ruska 2450 Dead Weight Tester	8 to 4,000 psi; 31 to 20,000 psi; 60 to 40,000 psi

* NOTE: All measurement systems used outside the laboratory are denoted with an asterisk (*).

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Pressure/ Measure	King Nutronics 3689A Precision Pressure Standard	0 to 10,000 psi
	NSWC Corona D585 Very Low Pressure Calibrator	0 to 60 inH2O
Rotation/ Generate Only	Quantum Dynamics N11ECS/3A Tachometer Tester	200 to 40,000 rpm
	Hewlett-Packard 3325A Function Generator w/ GenRad 1531A Strobo-Tac	0 to 250,000 rpm
Specialty Tools	Starrett HB 400 Optical Comparator	(Contour, Lead, Helix, Length, Diameter, etc.) Horizontal: 0 to 12 in Vertical: 0 to 8 in Screen Angle: 0 to 360°
Specific Gravity/ Generate	NSWC Corona DMA35-STD Sulfuric Acid Solution	1.2899 SG
Specific Gravity/ Measure	Fisher Scientific ASTM83H Hydrometer	0.70 to 0.75 SG
	H-B Instrument ASTM84H Hydrometer	0.75 to 0.80 SG
	H-B Instrument ASTM85H Hydrometer	0.80 to 0.85 SG
	Brooklyn Thermometer ASTM88H Hydrometer	0.95 to 1.00 SG
	Brooklyn Thermometer ASTM111H Hydrometer	1.00 to 1.05 SG
	Fuchs, George & Son ASTM112H Hydrometer	1.05 to 1.10 SG
	Fuchs, George & Son ASTM113H Hydrometer	1.10 to 1.15 SG
	Fuchs, George & Son ASTM114H Hydrometer	1.15 to 1.20 SG
	Fuchs, George & Son ASTM115H Hydrometer	1.20 to 1.25 SG
	Kessler, Walter ASTM116H Hydrometer	1.25 to 1.30 SG
Fisher Scientific ASTM117H Hydrometer	1.30 to 1.35 SG	
Temperature (Infrared)/ Generate	Hart Scientific 4180 Precision Infrared Calibrator	-15 to 120 °C
	Hart Scientific 4181 Precision Infrared Calibrator	35 to 500 °C

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Temperature (PRTs)/ Generate	Automatic Systems Labs F18 Resistance Bridge w/ Leeds & Northrup 4020, 4025B, and 4030 Resistance Standards w/ Intrinsic Standards: Boiling Point Nitrogen Triple Point Mercury Triple Point Water Freezing Point Tin Freezing Point Zinc Freezing Point Aluminum	0 to 100 ohms -195.798 °C -38.8344 °C 0.010 °C 231.9280 °C 419.5270 °C 660.3230 °C
Temperature/ Generate	Ectron 1140A Thermocouple Simulator Calibrator Xitron 2000MN Thermocouple Simulator Calibrator* Hart Scientific 9007 Portable Low Temperature Calibrator* King Nutronics 3604/3605 Thermo Units General Signal 55347 Furnace w/ Fluke 5650 Thermocouple and Ectron 1140A Thermocouple Simulator Rosemont 162CE Platinum Resistance Thermometer (PRT) or Fluke 5699 PRT and Instrulab 4202B13-15 Digital Temperature Indicator with the following Baths: Hart Scientific 7037 High Precision Temperature Bath Hart Scientific 7040 Temperature Bath Hart Scientific 7103 Temperature Micro Bath Hart Scientific 6020 High Precision Temperature Bath Hart Scientific 6102 Micro Bath Hallikainen Instruments 1132 Thermometer Calibration Bath Precision Scientific Instruments 41132 Temperature Bath Hart Scientific 6050H High Precision Temperature Bath	-270 to 1,820 °C (millivolt equivalent) -270 to 1,820 °C -40 to 284 °F -40 to 1,199 °F 200 to 1,200 °C -40 to 120 °F -40 to 175 °F -22 to 257 °F 125 to 340 °F 95 to 392 °F 72 to 500 °F 200 to 500 °F 340 to 1,000 °F

* NOTE: All measurement systems used outside the laboratory are denoted with an asterisk (*).

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Temperature/ Measure	Rosemont 162CE Platinum Resistance Thermometer (PRT) w/ Instrulab 4202B13-15 Digital Indicator or Fluke 1590 Super Thermometer	-200 to 660 °C
Thread Plugs	SIP Soci�t� Genevoise SIP-305M Measuring Machine w/ Starrett RC88.AAX Gage Block Set	0.06 to 6 in; 20 pitch and coarser; 20 to 40 pitch; 40 pitch and finer
Thread Wires	C. E. Johansson 7VZ510E-8 or 7 Horizontal or Vertical Mikrokator with the following Wires: Van Keuren 22AB Acme Best Wires or Van Keuren 37HS Master Wires	1 to 20 TPI (29° Pitch) 4 to 100 TPI (60° Pitch)
Torque (Tools)/ Measure	AKO TSD1200 or TSD404 Torque Digital Indicator w/ AKO Torque Cells: TSD011-20D12 TSD011 TSD011/020 TSD111 TSD111/200 TSD521 TSD511 TSD2011 TSD4011 TSD6521 TSD12011 Consolidated Devices TFC2000-0-03M Calibration System/ 2000-800-02 Indicator w/ Consolidated Devices Transducers: 2000-4-02 2000-5-02 2000-65-02 2000-8-02 2000-400-02 2000-10-02 2000-11-02 2000-12-02 2000-13-02 2000-14-02	1.6 in-oz to 20 in-lb 10 to 100 in-lb 24 to 240 in-lb 10 to 100 ft-lb 20 to 200 ft-lb 50 to 500 ft-lb 50 to 500 ft-lb 200 to 2,000 ft-lb 100 to 4,000 ft-lb 250 to 6,500 ft-lb 1,000 to 12,000 ft-lb 5 to 50 in-oz 15 to 200 in-oz 15 to 150 in-lb 80 to 1,000 in-lb 4 in-lb to 250 ft-lb 10 to 125 ft-lb 20 to 250 ft-lb 60 to 600 ft-lb 100 to 1,000 ft-lb 200 to 2,000 ft-lb

SCOPE OF COMPETENCY

Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Torque/ Generate	Consolidated Devices Inc. 2500-50-0 Calibration Wheel w/ Standard Weights	0 to 200 in-oz
	AKO TSD024 Torque Tester Calibration System w/ Standard Weights	2.5 to 20 in-lb
	NSWC Corona D524 Low Range Torque Calibration Kit	10 in-oz to 100 in-lb
	Consolidated Devices Inc. 2000-151-0 Calibration Wheel w/ Standard Weights	0 to 150 in-lb
	Utica CTS2000P Torque Standard w/ Standard Weights	20 to 2,000 in-lb
	Utica CTS1000F Torque Standard w/ Standard Weights	200 to 12,000 in-lb
	AKO TSD125 Torque Tester Calibration System w/ Standard Weights	10 to 100 ft-lb
	AKO TSD125S Calibration Arm Assembly w/ Standard Weights	0 to 200 ft-lb
	Consolidated Devices Inc. 2000-152-0 Calibration Arm w/ Standard Weights	30 in-lb to 250 ft-lb
	AKO TSD1005 Torque Tester Calibration System w/ Standard Weights	0 to 1,000 ft-lb
	Consolidated Devices Inc. 2000-154-0 Calibration Arm w/ Standard Weights	60 to 2,000 ft-lb
	AKO TSD2052 Torque Standard w/ Standard Weights	125 to 2,500 ft-lb
	AKO TSD4052 Torque Tester Calibration System w/ Standard Weights	125 to 4,000 ft-lb
AKO TSD6552 Torque Tester Calibration System w/ Standard Weights	125 to 6,500 ft-lb	
AKO TSD20052 Torque Calibration System w/ Standard Weights	2,000 to 20,000 ft-lb	

SCOPE OF COMPETENCY

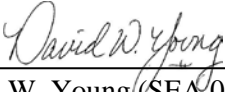
Mid-Atlantic Regional Calibration Center (MARCC) Calibration Laboratory (MAR)

9349 Fourth Avenue, Norfolk, VA 23511

Measurement Area	Measurement System	Measurement Capabilities by Ranges
MECHANICAL		
Vacuum/ Generate	Datametrics Vacuum 1127-2 Portable Gage Calibrator MKS Instruments PVS6S Vacuum Calibration System	0 to 30 inHg 0.00003 to 1000 Torr
Vacuum/ Measure	King Nutronics 3689A Precision Pressure Standard	0 to 30 inHg
Vibration/ Measure Only	Unholtz-Dickie 680 Vibration Measurement System Dynamic Instruments DI811A Portable Vibration Analyzer*	10 Hz to 10 kHz 0 to 10 G @ 10 Hz to 10 kHz
Viscosity/ Generate Only	Cannon Instrument N & S Viscosity Standards: 25, 50, 75, and 100 150, 200, and 300 350, 400, and 450 500	< 10 cSt 10 to 100 cSt 100 to 1,000 cSt 1,000 to 10,000 cSt
OTHER		
Divers Life-Support Systems (DLSS) (MIL-STD-1622)	King Nutronics Corp. 3461-1-104-BLK Critical Air Pressure Calibration System w/ Heise CM Pressure Gages	0 to 10,000 psi
Oxygen Clean Calibration (MIL-STD-1330)	King Nutronics Corp. 3461-1-104 Oxygen Pressure Calibration System* w/ Heise CM pressure Gages (Flow) Aerospace Control Products Inc. FCS8C Gas Flow Calibration System*	0 to 10,000 psi 0.03 to 1,000 LPM
Oxygen Instrument Cleanliness	Avatar 360 FT-IR Spectrometer w/ NSWC Corona D340 Quartz Infrared Cell Set	<5 ppm Hydrocarbon
Solvent Removal Verification	Gastech RI-413 Freon Indicator	<100 ppm CFC-113 (Freon)

* NOTE: All measurement systems used outside the laboratory are denoted with an asterisk (*).

JNAC Program Document
04-4734-MAR-05192018



 David W. Young (SEA 04RM3)
 NAVSEA METCAL Program Manager

Expiration Date
19 May 2021