



METROLOGY BULLETIN

Measurement Science Department, Corona Division, Naval Surface Warfare Center

FEBRUARY 2007

Inside this issue:

*NSWC Corona Model 4NVYMOD1
Digital Torque Tester Deployment*

*New Strontium Atomic Clock Has
Super-Fine 'Ticks'*

*Multimode OTDR Calibration
Standard Available*

and much more.....

Happy Valentine's Day



NSWC Corona Model 4NVYMOD1 Digital Torque Tester Deployment

*by Jefferson Trajano
(NSWC Corona, Code MS33)*

The NAVAIR METCAL program is in the process of deploying modifications to the Sturtevant Richmond Model 4NVY Digital Torque Tester to prevent transducer damage due to over-ranging. This over-ranging issue was first reported in the November 2002 issue of the METBUL.

The Model D565 Torque-Limiting Clutch Kit is a device designed and produced by NSWC Corona to prevent over-ranging of the lowest range transducer (6.25 in-lb 100 in-oz). This transducer has an over-range limit of 150 in-oz. The Torque-limiting Clutch kit prevents transducer damage by releasing torque before reaching 150 in-oz. This is accomplished using a spring-loaded ball mechanism that is set to disengage at about 125 in-oz.

The Model D565 Torque-limiting Clutch kit consists of the following:

- Installation guide; Technical Note TN 06-1
- Torque-limiting Clutch mounted on a small L-bracket
- Gold transducer label (6.25 in-lb 100 in-oz)
- Large L-bracket
- Blue transducer label (100 in-lb)
- Silver transducer label (25 in-lb 400 in-oz)

Two white labels (Model: 4NVYMOD1 CAGE: 27266)



4NVY



4NVYMOD1

(Continued on page 3)

All activities are invited to submit material of general interest to the Editor for publication. Please include your name, activity, and DSN and/or commercial phone number. Color and black and white drawings, graphs, and/or photographs will be accepted.



Please circulate this Bulletin to all laboratory technicians and personnel.





METROLOGY BULLETIN

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In This Issue...

NSWC Corona Model 4NVYMOD1 Digital Torque Tester Deployment	1
Additions to METRL	3
New and Revised Calibration Procedures	3
Significant Calibration Interval Changes	3
New Strontium Atomic Clock Has Super-Fine 'Ticks'	4
Navy METCAL Labels and Tags	4
Changes to ICPs to Accommodate New Model Numbers	4
Instrument Calibration Procedure (ICP) Cancellations and Supersessions	4
Multimode OTDR Calibration Standard Available	5
Calendar of Upcoming Events	5
Requests for Measurement Science Directorate Publications	5
ICP Changes Resulting from CPR/CTFR Submissions	6

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Instruments referred to in this publication are either test equipment known to be in use within the Navy, or calibration equipment known to be on hand in Navy and Marine Corps Standards and Calibration Laboratories and Field Calibration Activities. These references carry no implication of preference, recommendation, or approval by the Navy for use by other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance for any particular application. Citation of trade names and manufacturers does not constitute endorsement or approval of any product or manufacturer.

NSWC Corona Model 4NVYMOD1 Digital Torque Tester Deployment

(Continued from page 1)

The Model 4NVY transducers are mounted on one L-bracket, as shown in the figures. The modification removes the transducers from this L-bracket. The 6.25 in-lb (100 in-oz) transducer is remounted onto the Torque-limiting Clutch and the remaining two transducers are remounted onto the large L-bracket, included in the Torque-limiting Clutch kit. Labels are applied on the L-brackets to clearly identify the transducers locations and range limits. Once these modifications are completed, the modified Model 4NVY will be relabeled as the Model 4NVYMOD1.

The calibration procedures have been revised to use (NA 17-20MU-71) and support (NA 17-20MU-72) both the Model 4NVY and Model 4NVYMOD1 and will be published in the February issue of METPRO. This will allow non-NAVAIR assets to be used and supported as a non-modified Model 4NVY. Instructions for using the Torque-Limiting Clutch kit were also included in both procedures, as well as in the installation guide.

Modification of all NAVAIR digital torque testers will be performed by the current supporting laboratories:

- Mobile Calibration Complex One (MCC-1), MCAS Iwakuni (ICE)
- Mobile Calibration Complex Two (MCC-2), MCAS Cherry Point (MCC)
- Mobile Calibration Complex Three (MCC-3), MCAS Miramar (PCC)
- NAS Corpus Christi (CCQ)
- Navy Support Activity, New Orleans (NOL)
- NAWC Patuxent River (PRL)

When a Model 4NVY comes in for calibration, the supporting lab will request a kit from and report the serial number of the modified digital torque tester to the NAVAIR calibration standards manager. The calibration standards manager point of contact is Tony Bradshaw; phone number (301) 757-2183, e-mail tony.bradshaw@navy.mil.

Technical questions concerning the Model 4NVYMOD1 Digital Torque Tester should be directed to Jefferson Trajano, MS33G, at DSN 933-5378, commercial (951) 273-5378, or e-mail jefferson.trajano@navy.mil. ❖

Additions to METRL

by Jeff Walden
(NSWC Corona, Code MS30)

As requirements become known, new Test Instruments (TIs) which require calibration are identified. The calibration requirements for these items are analyzed and calibration intervals are established. The data is then entered into the METRL database and will appear in the next published issue of METRL. Enclosure (2) is a listing of TIs which have been added since the last issue of METBUL. ❖

New and Revised Calibration Procedures

by Jeff Walden
(NSWC Corona, Code MS30)

A list of new and revised calibration procedures and guides issued since the previous issue of METBUL, is provided in Enclosure (3). ❖

Significant Calibration Interval Changes

by Dr. Dennis Jackson
(NSWC Corona, Code MS40)

We continually review accumulated calibration data and, when supported by adequate statistical evidence, adjust the calibration interval of applicable test instruments. These changes are then published in METRL. In order to take advantage of the calibration cost savings possible when calibration intervals are significantly extended, and to avoid reliability problems when calibration intervals are significantly reduced, advance information of such extensions and reductions is reported in the Metrology Bulletin prior to publication in METRL. The same method is used when a particular instrument is reclassified from periodic calibration to No Calibration Required (NCR) and vice versa. NAVAIR activities shall implement interval changes issued by NSWC COR upon receipt, in accordance with COMNAVAIRFORINST 4790.2, Volume V, Chapter 19.5 and NAVAIR METCAL Program policy. Non-NAVAIR activities may want to change the recall date for such instruments already serviced by forwarding a replacement calibration label, which reflects the new submission date, to the customer activity. Each label should indicate the serial number of the individual instrument involved to ensure the integrity of labeling. If this procedure is not practicable, initiate the use of the adjusted interval at the time of resubmission.

Significant calibration interval change is defined as:

1. An extension of more than 25 percent
2. A decrease of more than 25 percent
3. A change from an interval or SR to NCR
4. A change from NCR to an interval or SR

A list of instruments that have had recent significant calibration interval revisions is provided in Enclosure (4). ❖

New Strontium Atomic Clock Has Super-Fine 'Ticks'

NIST Tech Beat
December 7, 2006

Using an ultra-stable laser to manipulate strontium atoms trapped in a "lattice" made of light, scientists at JILA, a joint institution of the National Institute of Standards and Technology (NIST) and the University of Colorado at Boulder, have demonstrated the capability to produce the most precise "ticks" ever recorded in an optical atomic clock. In addition to timekeeping, JILA's strontium lattice may have applications in precision measurements of high frequencies and quantum computing.

The JILA design described in the Dec. 1 issue of *Science** is a leading candidate for next-generation atomic clocks that operate at optical frequencies, which divide time into much smaller and more precise units than the microwaves used in today's standard atomic clocks. The research team led by NIST Fellow Jun Ye achieved the highest "resonance quality factor"—indicating strong, stable signals when a very specific frequency of laser light excites the atoms—ever recorded in coherent spectroscopy, or studies of interactions between matter and light. "We can define the center, or peak, of this resonance with a precision comparable to measuring the distance from the Earth to the sun with an uncertainty the size of a human hair," according to co-author Martin Boyd, a CU-Boulder graduate student.

Although the new strontium clock currently is less accurate overall than NIST's mercury ion clock, it is among the best optical atomic clocks described to date in the published literature, and because it produces much stronger signals, its "resonant" frequency was measured with higher resolution than in the mercury clock. The result is a frequency "ruler" with finer hash marks.

Improved time and frequency standards have many applications. For instance, ultra-precise clocks can be used to improve synchronization in navigation and positioning systems, telecommunications networks, and wireless and deep-space communications. Better frequency standards can be used to improve probes of magnetic and gravitational fields for security and medical applications, and to measure whether "fundamental constants" used in scientific research might be varying over time—a question that has enormous implications for understanding the origins and ultimate fate of the universe.

For more details, see www.nist.gov/public_affairs/releases/strontium_atomic_clock.html.

The JILA research is supported by NIST, the Office of Naval Research and the National Science Foundation.

*M.M. Boyd, T. Zelevinsky, A.D. Ludlow, S.M. Foreman, S. Blatt, T. Ido, and J. Ye. Optical atomic coherence at one second time scale. *Science*. Dec. 1, 2006.

Navy METCAL Labels & Tags

by Jeff Davis
(NSWC Corona, Code MS43)

Enclosure (5) provides ordering information for requisitioning Navy METCAL Labels and Tags. All orders should be coordinated through your local supply office.

Labels and Tags can be requisitioned via the internet by going to the "Navy Forms On-line" website at <https://forms.daps.dla.mil/>. Users can also determine the availability of Labels and Tags, as well as check on the status of previously placed orders at this same website.

The NSWC COR point of contact for issues relating to Labels and Tags is Jeff Davis, MS43, DSN 933-5103, commercial (951) 273-5103, or e-mail jeffrey.a.davis1@navy.mil.

Changes to ICPs to Accommodate New Model Numbers

by Jeff Walden
(NSWC Corona, Code MS30)

As test instruments (TIs) are identified, their calibration procedure requirements are analyzed. Many newly identified TIs can be calibrated utilizing an existing Instrument Calibration Procedure (ICP) without any changes required to the ICP. These TIs are listed in METRL with the approved ICP. The ICP will not be modified to add the new TI until it is revised for some other reason. Enclosure (1) is a listing of ICPs for which TIs have been added since the last issue of METBUL.

Instrument Calibration Procedure (ICP) Cancellations and Supersessions

by Julie Cunavelis
(NSWC Corona, Code MS30B)

The following ICPs were cancelled or superseded during January 2007. Removal of these ICPs from the Metrology Requirements List (METRL), Section 4, resulted in changes to METPRO produced by the Measurement Science Directorate.

The point of contact on this issue is Julie Cunavelis, MS 30B, at (951) 273-4758, DSN 933-4758, or e-mail julie.cunavelis@navy.mil.

SUPERSEDED

ICP #	Workload	New ICP #
17-20AX-371L	TS-3390/AWM-71 California Microwave, Inc. 50-004373-01	17-20AX-371

CANCELLED

ICP #	Workload
None	

Multimode OTDR Calibration Standard Available

by Lance Doddridge
(NSWC Corona, Code MS32)

The Measurement Science Department at the Naval Surface Warfare Center (NSWC) Corona Division has completed the development of a standard for the calibration of multimode optical time domain reflectometers (OTDR). The project to develop calibration support for the multimode OTDR was funded by the Navy METCAL R&D program, and was completed at the end of FY06.

The multimode OTDR is used throughout the Fleet to maintain and troubleshoot the fiber optic networks installed on ships. Previous methods of multimode OTDR calibration make use of standards that are no longer procurable or supported. A standardized methodology for multimode OTDR calibration has been addressed at national and international standards organizations such as the Telecommunications Industry Association (TIA) and the International Electrotechnical Committee (IEC). However, to date, these organizations have not been able to finalize a standard methodology.

The project completed at NSWC Corona Division resulted in a standard that is capable of calibrating distance, point attenuation, and absorption loss. The standard is comprised of different precision lengths of spooled optical fiber that have been characterized for time-of-flight at the Navy Primary Standards Laboratory (NPSL). The total combined uncertainty in each length of optical fiber is less than 0.25 m in lengths of up to 1000 m. The standard makes use of optical fiber lengths that are similar to the installed lengths on the ships where the OTDR is used.

For more information on the multimode OTDR calibration standard, contact Lance Doddridge at NSWC Corona Division, at (951) 273-5741, DSN 933-5741, or by email at lance.doddridge@navy.mil. ❖

Requests for Measurement Science Department Publications

NOTE: Requests should not be ordered via MILSTRIP, as NSWC CORONA does not have the capability to process electronically transmitted MILSTRIP orders.

Requests for documentation and software listed in METRL or METPRO, and produced by the Measurement Science Department, should be directed to the appropriate NSWC Corona point of contact (POC) as indicated below. Requests may be submitted by correspondence to:

Commanding Officer
Corona Division (Attn: Name/Code)
Naval Surface Warfare Center
P.O. Box 5000
Corona, CA 92878-5000

Or call the NSWC Corona POC at the number listed below. Phone calls should be reserved for requests of an urgent nature.

- NAVAIR
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Calendar of Upcoming Events

by METBUL Staff

July/August 2007

29—02 2007 NCSLI Workshop & Symposium
Saint Paul RiverCentre, Saint Paul, MN
Www.ncsli.org ❖

ICP Changes Resulting from CPR/ CTFR Submissions

by Sean Shehee (NSWC Corona, Code MS23S),
Keena Mancini (NSWC Corona, Code MS22H),
Lars Poling (NSWC Corona, Code MS13J), Eric
Steele (NSWC Corona, Code MS12F) and LaRon
Scott, (NSWC Corona, Code MS14G)

The following is a list of Instrument
Calibration Procedures (ICPs) that
were published to incorporate correc-
tions identified by Calibration Prob-
lem Reports (CPRs) or Calibration
Trouble and Failure Reports (CTFRs).

Thank you for your participation in
the CPR/CTFR program. The points
of contact on this issue are:

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- FMS
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DSN 933-5760
laron.scott@navy.mil

<u>ICP NUMBER</u>	<u>SPONSOR</u>	<u>CPR/CTFR</u>
17-20AQ-401	NAVSEA	KBS060599
	SSP	8623830
	SSP	8623540
	NAVAIR	MAR060312
17-20AX-710	NAVAIR	SDP06071
17-20AN- 32	NAVAIR	AKI061273
17-20AX-239	NAVAIR	NOL061156
17-20SJ- 74	NAVAIR	JFB041764
17-20AE- 78	NAVAIR	SDP031191
17-20AX-371	NAVAIR	SDB060927
17-20SJ- 08	NAVAIR	JFB041731
	NAVSEA	OHA950060
	NAVSEA	KWA950009
	NAVSEA	7LS963540
17-20AL- 07	SSP	8664071
17-20AE-197	NAVAIR	NOL060963
17-20AW-407	SSP	8664290
	NAVSEA	OHA060742
17-20AC- 26	SSP	8625271
	NAVSEA	CAB040467
17-20AE- 211	SSP	8625115
17-20MD- 16	SSP	8663484
17-20AF-118	SSP	8664373
17-20ST-173	NAVAIR	MCC061284
	NAVAIR	MAR060321
	NAVAIR	NOL070236
	NAVAIR	PRL060769
	NAVSEA	OHA050752 ❖

<u>ICP NUMBER</u>	<u>SPONSOR</u>	<u>CPR/CTFR</u>
17-20AR- 45	NAVAIR	CPB060954
	SSP	8663647
17-20AG-439	SSP	8664352
	SSP	8664207
	NAVSEA	OHA050731
17-20AX- 85	NAVAIR	MAR061212
17-50A260	NAVAIR	AKI061368
	NAVSEA	MAR060298
17-50A330	NAVAIR	CIQ060973
17-20AE-290	NAVAIR	JFB061288
17-20AX-713	NAVAIR	QFQ020780
	NAVAIR	MCC031878
	NAVAIR	SDP050736
17-20AX-564	NAVAIR	QLQ051205
17-20GD- 29	NAVAIR	PRL060924
17-20AX-675	NAVAIR	BDQ061045

CHANGES TO ICPS TO ACCOMMODATE NEW MODEL NUMBERS

<u>MODEL NUMBER</u>	<u>CAGE</u>	<u>DESCRIPTION</u>	<u>PROCEDURE</u>
4NVYMOD1	27266	DIGITAL TORQUE TESTER	17-20MU- 72
587AS100-1	80020	AIRCRAFT GENERATOR	17-20AN- 32
REMARKS: SAME AS TTU317EV (80020)			
MBEU149683	U1604	TIME AND ALTITUDE TEST SET	17-20MX-241
N3305A	1LQK8	DC ELECTRONIC LOAD	17-20AQ-441

Enclosure (1)

1-1

ADDITIONS TO METRL

<u>MODEL NUMBER</u>	<u>CAGE</u>	<u>DESCRIPTION</u>	<u>INT</u>
24-384-0	7M955	DIAL BORE GAGE	24
REMARKS: TOL: ± 0.0002 "			
4NVYMOD1	27266	DIGITAL TORQUE TESTER	12
DP116KF1GR	29907	DIGITAL THERMOMETER	12
REMARKS: ± 2.7 DEG F			
MBEU149683	U1604	TIME AND ALTITUDE TEST SET	06
N3300A	1LQK8	DC ELECTRONIC LOAD MAINFRAME	SR
REMARKS: CAL INDIVIDUAL COMPONENT			
N3305A	1LQK8	DC ELECTRONIC LOAD	15

NEW AND REVISED CALIBRATION PROCEDURES ISSUED

<u>PROCEDURE</u>	<u>DATE</u>	<u>MODEL</u>	<u>CAGE</u>	<u>DESCRIPTION</u>
17-20AC- 26	2/1/2007	VARIOUS	PRECISION VARIABLE CAPACITORS	
17-20AE- 78	2/1/2007	VARIOUS	ELECTROSTATIC VOLTMETERS	
17-20AE-197	2/1/2007	5440A	89536	DIRECT VOLTS CALIBRATOR
		5440B	89536	DIRECT VOLTS CALIBRATOR
		5442A	89536	DIRECT VOLTS CALIBRATOR
17-20AE-211	2/1/2007	3330B	89536	VOLTAGE/CURRENT CALIBRATOR
17-20AE-290	2/1/2007	MSD970-1	81855	BATTERY CHARGER ANALYZER
17-20AF-118	2/1/2007	VARIOUS	MICROWAVE FREQUENCY COUNTERS	
17-20AF-119	2/1/2007	VARIOUS	MICROWAVE FREQUENCY COUNTERS	
17-20AG-439	2/1/2007	8904A	28480	MULTIFUNCTION SYNTHESIZER
		8904A0PT2-6H19	28480	MULTIFUNCTION SYNTHESIZER
		8904AOPT002	28480	MULTIFUNCTION SYNTHESIZER
		8904AOPT002,006	28480	MULTIFUNCTION SYNTHESIZER
		8904AOPT002,006,H19	28480	MULTIFUNCTION SYNTHESIZER
		8904AOPT006	28480	MULTIFUNCTION SYNTHESIZER
		8904AOPT006,H16	28480	MULTIFUNCTION SYNTHESIZER
17-20AL- 07	2/1/2007	1491D	0PK96	DECADE INDUCTOR
		1491D	24655	DECADE INDUCTOR
		940E	24655	DECADE INDUCTOR
		940F	24655	DECADE INDUCTOR
17-20AN- 32	2/1/2007	587AS100-1	80020	AIRCRAFT GENERATOR
		TTU317EV	80020	AIRCRAFT GENERATOR T/S
17-20AQ-401	2/1/2007	3458A	28480	DIGITAL MULTIMETER
		3458AOPT002	28480	DIGITAL MULTIMETER
17-20AQ-441	2/1/2007	N3305A	1LQK8	DC ELECTRONIC LOAD
17-20AR- 45	2/1/2007	115	25284	AC-DC HI POT TESTER
		125	25284	HI POTENTIAL TESTER
		H125	25284	AC-DC HIPOT TESTER
		HD115	25284	AC-DC HI POT TESTER
		HD125	25284	AC-DC HIPOT TESTER
		HD125-10182	25284	AC-DC HIPOT TESTER
		HD125A	25284	AC-DC HIGHPOT TESTER
		HD140	25284	AC-DC HIPOT TESTER
		HDA10	25284	AC HIPOT TESTER
17-20AW-407	2/1/2007	54825A	28480	OSCILLOSCOPE
		54825N	1LQK8	OSCILLOSCOPE
		54825N	28480	OSCILLOSCOPE
17-20AX- 85	2/1/2007	510-1006-01	25583	INDICATOR T/S
		JT27A	25583	INDICATOR T/S
17-20AX-239	2/1/2007	GS3980	73030	MODULE TESTER
17-20AX-371	2/1/2007	50-004373-01	30890	ANALYZER T/S
		TS3390AWM71	30890	ANALYZER T/S
17-20AX-564	2/1/2007	65700-90000-044	78286	AFCS T/S
17-20AX-675	2/1/2007	1574AS1100	30003	WEAPONS CONTROL T/S
		ANAWM96A	30003	WEAPONS CONTROL T/S
17-20AX-710	2/1/2007	MK432MOD4	16623	TORPEDO PRESETTER TEST SET
17-20AX-713	2/1/2007	361-028-031	76301	FUEL TANK SIMULATOR BOTTLE
		361-028-032	76301	FUEL TANK SIMULATOR BOTTLE
		361-028-033	76301	FUEL TANK SIMULATOR BOTTLE
		75D460002-1001	76301	TESTER FUEL QTY GAGE
17-20GD- 29	2/1/2007	VARIOUS	WAVEGUIDE THERMISTOR MOUNTS	
17-20MD- 16	2/1/2007	521-102	S3257	CALIBRATION TESTER
		521-104	S3257	CALIBRATION TESTER
		F3-70250	56745	UNIVERSAL CALIBRATOR
		F3-70251	56745	UNIVERSAL CALIBRATOR
17-20MU- 71	2/1/2007	VARIOUS	TORQUE WRENCHES AND TORQUE SCREWDRIVERS	
17-20MU- 72	2/1/2007	4NVY	64334	DIGITAL TORQUE TESTER
		4NVYMOD1	27266	DIGITAL TORQUE TESTER
17-20MX-241	2/1/2007	MBEU149683	U1604	TIME AND ALTITUDE TEST SET

Enclosure (3)

3-1

NEW AND REVISED CALIBRATION PROCEDURES ISSUED

<u>PROCEDURE</u>	<u>DATE</u>	<u>MODEL</u>	<u>CAGE</u>	<u>DESCRIPTION</u>
17-20SJ- 08	2/1/2007	VARIOUS SYNCHRO STANDARDS		
17-20SJ- 74	2/1/2007	SS1	88869	SYNCHRO STANDARD
		SS1R	88869	SYNCHRO STANDARD
		SS2AR	88869	SYNCHRO STANDARD
		SS2R	88869	SYNCHRO STANDARD
		SS3R	88869	SYNCHRO STANDARD
		SS4R	88869	SYNCHRO STANDARD
		SS5	88869	SYNCHRO STANDARD
		SS5A	88869	SYNCHRO STANDARD
		SS5AR	88869	SYNCHRO STANDARD
		SS5R	88869	SYNCHRO STANDARD
17-20ST-173	2/1/2007	2000M	0WK04	THERMOCOUPLE SIMULATION CALIBRATOR
		2000MEJ	0WK04	THERMOCOUPLE SIMULATOR CALIBRATOR
17-50A260	2/1/2007	1040C	55597	PANEL METER CALIBRATOR
17-50A330	2/1/2007	3638AS100-1	072E5	FIRING CIRCUIT TEST SET
		ANAWM102	30003	FIRING CIRCUIT TEST SET

Enclosure (3)

3-2

SIGNIFICANT CALIBRATION INTERVAL CHANGES

<u>MODEL NUMBER</u>	<u>CAGE</u>	<u>DESCRIPTION</u>	<u>PREVIOUS INTERVAL</u>	<u>NEW INTERVAL</u>
5700A	89536	CALIBRATOR	36	22
5700AAN	89536	CALIBRATOR	36	22
5700AAN1	89536	CALIBRATOR	36	22
5700AANSERIESII	89536	CALIBRATOR	36	22
5700AOPT03	89536	CALIBRATOR	36	22
5700AOPT03,EP	89536	CALIBRATOR	36	22

NAVY METCAL LABELS AND TAGS

<u>TITLE</u>	<u>COLOR</u>	<u>WIDTH/LENGTH</u>	<u>NAVSEA #</u>	<u>COG—NSN</u>	<u>UI</u>
CALIBRATED	Black on White	1-3/8 x 1-1/8	4734/8	1I—0116-LF-009-4700	BX
		1-3/8 x 1-1/8 (flap)	4734/9	1I—0116-LF-009-4800	BX
		7/8 x 5/8	4734/10	1I—0116-LF-009-4900	BX
		5/8 x 3/8	4734/11	1I—0116-LF-009-5000	BX
CALIBRATED -	Red/White	1-3/8 x 1-1/8	4734/12	1I—0116-LF-009-5100	BX
REFER TO REPORT		7/8 x 5/8	4734/13	1I—0116-LF-009-5200	BX
SPECIAL CALIBRATION	Black/Yellow	3-1/8 x 4-1/4 (tag)	4734/6	1I—0116-LF-018-5100	BX
		1-3/8 x 1-1/8	4734/14	1I—0116-LF-009-5300	BX
		2 x 3	4734/15	1I—0116-LF-009-5400	BX
		7/8 x 5/8	4734/16	1I—0116-1LF009-5500	BX
INACTIVE	Green/White	1-3/8 x 1-1/8	4734/17	1I—0116-LF-009-5600	BX
REJECTED	Black/Red	3-1/8 x 6-1/4 (tag)	4734/7	1I—0116-LF-009-4600	BX
		1-3/8 x 1-1/8	4734/18	1I—0116-LF-009-5700	BX
USER CALIBRATION	Black/White	1-1/4 x 7/16	4734/19	1I—0116-LF-009-5800	BX
WARNING—CLEANED	Black/Green	2 x 3	4734/20	1I—0116-LF-009-5900	BX
FOR OXYGEN SERVICE					
CALIBRATION STANDARD	Black/Blue	1-1/4 (diam)	4734/21	1I—0116-LF-009-6000	BX
		11/16 (diam)	4734/22	1I—0116-LF-009-6100	BX
CLEANED FOR	Black/Green	1 x 3/4 (oval)	4734/23	1I—0116-LF-009-6200	BX
OXYGEN SERVICE					
USE COUNTER-CLOCKWISE	Red/White	1 x 1/2	4734/24	1I—0116-LF-009-6300	BX
ONLY					
USE CLOCKWISE ONLY	Red/White	1 x 1/2	4734/25	1I—0116-LF-009-6400	BX
CALIBRATION	Orange/White	1-3/8 x 1-1/8	4734/26	1I—0116-LF-009-6500	BX
NOT REQUIRED		7/8 x 5/8	4734/27	1I—0116-LF-009-6600	BX
CALIBRATION VOID IF	Black/White	2 x 11/16	4734/28	1I—0116-LF-009-6700	BX
SEAL BROKEN		3/4 (diam)	4734/29	1I—0116-LF-009-6800	BX

