OCEAN ENGINEERING DIVISION
UNITED STATES COAST GUARD
WASHINGTON D.C.

FEBRUARY 1999

SPECIFICATION FOR
SOLAR BATTERY LOAD TESTER

SPECIFICATION G-SEC-471B

1. SCOPE.

1.1 General. This specification sets forth the requirements for the design and fabrication of a Solar Battery Load Tester. The load tester will be used to determine the health of 12-volt batteries used in aids to navigation. The load tester is comprised of a series of toggle switches activating resistors that load the battery.

1.2 Government Furnished Property (GFP). One GFP Solar Battery Load Tester is available for inspection as listed in section H of the Solicitation/Contract.

1.3 Precedence. Any ambiguity or conflict between the following documents shall be resolved by utilizing the following precedence:

a. This specification.
b. Applicable documents.

2. APPLICABLE DOCUMENTS.

2.1 Military Specifications.

MIL-P-15024E 27 Nov 97	Plates, Tags and Bands for Identification of Equipment

2.2 Military Handbooks.

MIL-HDBK-454 28 Apr 95	Standard Requirements for Electronic Equipment

3. REQUIREMENTS.

3.1 General. The Contractor shall furnish all parts, materials labor and services necessary to design, fabricate and deliver a battery load tester in accordance with this specification. The schematic for the load tester is shown in figure 1.

3.2 Design and Construction.

3.2.1 Weight. The load tester shall not exceed 10 pounds.

3.2.2 Dimensions. The case shall not exceed 8 inches in length, 6 inches in width and 4 inches in depth.

3.2.3 Case. The case shall be constructed of die-cast aluminum with a removable cover. The case shall be painted with gloss gray weather resistant coating. The case shall be free of sharp edges or protrusions that might catch the clothing or lacerate servicing personnel. The interior of the case shall be or anodized to prevent corrosion in the salt air atmosphere. The case shall contain warnings imprinted on it if any portion exceeds 120 degrees F during use.

3.2.4 Switches. The switches shall be single pole, single throw, sealed toggle switch. The contact rating shall be at least 20 amperes at 28 volts DC. The switch shall have an embossed tag fastened beneath the retaining nut indicating the “ON” and “OFF” positions, or this information may be incorporated into the label (3.2.13).

3.2.5 Resistors. All resistors shall be 13 ohm, 5%, 20 watt, wireround type and shall be fastened to an iridited or anodized aluminum channel. The aluminum channel shall be installed in the case in a manner to allow the entire case to dissipate heat, minimizing hot spots. The use of 5% (minimum) tolerance trimmer resistors is acceptable provided they are sized to carry at least twice the anticipated power.

3.2.6 Leads. There shall two 14AWG test leads, one black and one white, 36 ± 2 inches in length as measured from the case to the tip of the clip assembly. The wire shall be polyvinyl chloride insulated (300 volt minimum) with copper or copper alloy conductors.

3.2.7 Grommet/Strain Relief. There shall be a strain relief or grommet mechanically affixed to the case to protect the leads and prevent pullout. The leads shall be capable of withstanding 10 pounds of tension applied to any direction without damage to the leads or load tester.

3.2.8 Test Clip. Each lead shall have a 20 amp, solid copper test clip soldered to its end with a jaw opening of at least 1/2" and tip width of less than 5/16" (ex. Mueller 51-C).

3.2.9 Test Clip Boots. A molded vinyl boot that fully insulates the clip while allowing maximum jaw opening shall cover each test clip. The boots shall be color coded to match the leads.

3.2.10 Internal Wiring. All internal wiring shall be 18 AWG (minimum) stranded copper wire insulated with vinyl or PVC and soldered to the terminations, as shown in MIL-HDBK-454.

3.2.11 Shoulder Strap. An adjustable, black nylon shoulder strap, one inch wide, 54 ± 1 inches long (at full extension) shall be fastened to each side of the case with stainless steel "D" rings and stainless steel clips. The strap is measured from the attachment point to the case. The strap shall have two locking stainless steel slide adjusters to facilitate length adjustment.

3.2.12 Hardware. Unless otherwise specified, all hardware used in the construction of the load tester shall be stainless steel, including replacing plated hardware supplied with the enclosure.

3.2.13 Label. Nameplate and instructions (Figure 2.) shall be silkscreened on the cover or printed on an adhesive-backed metal foil label in accordance with MIL-P-15024E. Alignment of the instructions to the switches shall be ensured to convey the proper information.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Inspection Responsibility. First article inspections and production inspections are the responsibility of the Contractor and shall be conducted at a facility acceptable to the Government.

4.2 First Article Testing. The contractor shall submit a first article lot consisting of two load testers to verify conformance with every requirement in this specification. The requirement for first articles will be indicated in the Solicitation/Contract by the line item identified as "First Article Solar Battery Load Tester".

4.2.1 First Article Test Plan. The contractor shall develop and submit for approval a first article acceptance test plan. At a minimum the first article acceptance test plan shall include:

a. Location and description of the test facilities.
b. A list of test procedures and test equipment that the contractor intends to use in the tests.
c. Detailed listing of the salient characteristics of test equipment specially designed to test the load tester.
d. Test procedures for visual inspections and performance tests of the load tester.
e. Block diagrams of test configurations.
f. Test data sheets to record and document test results.
g. Accept/Reject Criteria for each test/inspections.
h. Information on any specifically built test equipment.

4.2.2 Test Data Sheets. Test data sheets for first article testing are required for each load tester. The first article test data sheets shall be provided with the test plan and shall be used to record observations. Included with the completed

test data sheet shall be a summary of deficiencies noted and the corrective action taken. It shall also include any recommended changes to the detailed test procedures. The first article test data sheet shall include the following:

a. Time and date of test - start/finish.
b. Location of test.
c. Equipment serial numbers.
d. Test equipment and serial numbers.
e. Name of test being performed. Include reference to the requirement and test paragraphs of this specification and reference the applicable test plan paragraph.
f. Accept—reject criteria.
g. Actual measured values or observation.
h. Date and signatures of test personnel.
i. Appropriate space for the Government representative' s signature if test is witnessed.

4.2.3 First Article Tests and Inspections. The first article lot shall be subjected to the following tests:

a. Visual inspection
b. Performance test

4.2.3.1 Visual. The contractor shall visually inspect the first article lot to verify conformance with section 3.2 of this specification. Internal inspections of the tester shall be conducted.

4.2.3.2 Performance. The contractor shall conduct performance tests on the first article lot to verify conformance with the following:

4.2.3.2.1 Leads. Attach a 10 pound weight to both leads, lift the load tester by the case with the strain relief facing down. Turn the case 90 degrees so that the strain relief axis is horizontal, then rotate the case about the axis 360 degrees. Visually inspect the leads and strain relief for damage.

4.2.3.2.2 Shoulder Strap. Extend the shoulder strap to full length. Secure the center of the strap to a rigid overhead surface. Raise the tester to the overhead level and allow to drop three times. Remove the strap and check the slide adjusters and attachment points on the case for damage and pullout.

4.2.3.2.3 Current Test. Connect the black and white leads of the load tester to a 13.0 +/- 0.1 volt DC, 10 ampere power supply and measure the current through the load tester in each of the 10 battery positions for 30 seconds. The current values shall be as listed below:

Number of Batteries	Current	
1	0.95 amps to	1.05 amps
2	1.90 amps to	2.10 amps
3	2.85 amps to	3.15 amps
4	3.80 amps to	4.20 amps
5	4.75 amps to	5.25 amps
6	5.70 amps to	6.30 amps
7	6.65 amps to	7.35 amps
8	7.60 amps to	8.40 amps
9	8.55 amps to	9.45 amps
10	9.50 amps to	10.50 amps

4.2.3.2.4 Resistance Test. Connect the black and white leads of the load tester to a digital ohmmeter. Measure the resistance of the tester in each of the ten battery positions. The resistance readings shall be as listed below:

Number of Batteries	Resistance		
1	12.35 ohms to	13.65 ohms	
2	6.18 ohms to	6.83 ohms	
3	4.12 ohms to	4.55 ohms	
4	3.09 ohms to	3.41 ohms	
5	2.47 ohms to	2.73 ohms	
6	2.06 ohms to	2.28 ohms	
7	1.76 ohms to	1.95 ohms	
8	154 ohms to	1.71 ohms	
9	1.37 ohms to	1.52 ohms	
10	1.24 ohms to	1.37 ohms	

4.2.3.3 Acceptance/Rejection Criteria. Failure of the load tester to comply with all aspects of the first article tests (4.2.3) shall constitute a failure of the first article test.

4.2.4 First Article Test Report. The contractor shall submit a test report upon completion of the test. The test report shall fully document the test as required by the test plan and procedures. The report shall include data sheets, changes incorporated into the load testers, changes to the test procedures, test failures, corrective action taken, and the contractor's evaluation of testing.

4.2.5 First Article Corrective Action. If any load tester fails first article testing, the contractor shall be responsible for any rework, or redesign, and shall bear any costs incident to correcting any deficiencies. The contractor shall update the load tester delivered under this contract with any changes resulting from the first article testing. Any deficiencies shall be corrected and the first article lot shall be re-tested within 30 calendar days of the failure.

4.3 Production Inspection. The Contractor shall conform to the requirements of section H of the Solicitation/Contract.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be in accordance with section D of the Solicitation/Contract.

5.2 Marking. Marking shall be in accordance with section D of the Solicitation/Contract. The National Stock Number (NSN) is CG6625-01-361-1357.

Schematic for
Solar Battery Load Tester

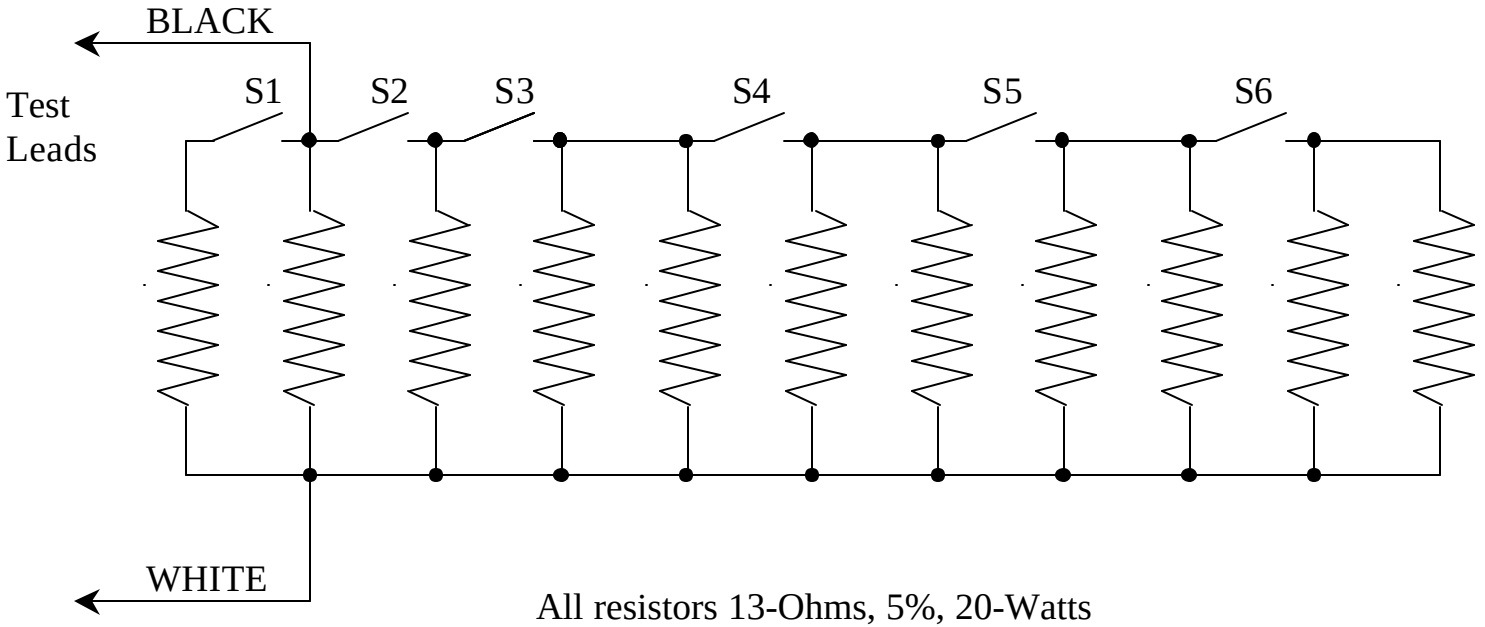

Figure 1.

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Number of Batteries	Switch Position	Resistance Check Min	Ideal	Max	Min Voltage (Buoys Only)
1	All Switches OFF	12.35	13.00	13.65	11.95
2	S2 ON	6.18	6.50	6.83	11.90
3	S1 and S2 ON	4.12	4.33	4.55	11.85
4	S2 and S3 ON	3.09	3.25	3.41	11.80
5	S1 thru S3 ON	2.47	2.60	2.73	11.75
6	S2 thru S4 ON	2.06	2.17	2.28	11.70
7	S1 thru S4 ON	1.76	1.86	1.95	11.65
8	S2 thru S5 ON	1.54	1.63	1.71	11.60
9	S1 thru S5 ON	1.37	1.44	1.52	11.55
10	S2 thru S6 ON	1.24	1.30	1.37	11.50

INSTRUCTIONS

1. Turn all switches OFF.
2. Connect leads to positive and negative terminals of the flasher or battery.
3. Set switches to setting corresponding to number of batteries connected in parallel.
4. Wait ten minutes, then measure battery voltage. If voltage reading is less than12.0V*, break down batteries and load test individually.
5. Turn all switches OFF.
6. Remove leads from flasher or battery.

*12.0 volts when measured at the battery. “Min Voltage” column accounts for SO cable voltage drop in buoys.

Figure 2.

Specification G-SEC-471B
Solar Battery Load Tester

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