PERFORMANCE SPECIFICATION SHEET

BATTERY, RECHARGEABLE, SEALED, LITHIUM-ION, BB-2525 and BB-3525

The requirements for acquiring the product herein shall consist of this specification sheet and MIL-PRF-32383

FIGURE 1. M32383/4-3 (BB-2525) Lithium Ion and M32383/4-4 (BB-3525) Lithium Polymer Conformal Batteries (See Figure 7 for dimensions)

Note: Depicted battery is representative of a potential solution but is not a requirement within this document.
Unless otherwise specified, paragraph numbers are in reference to MIL-PRF-32383. Note that the requirement and verification paragraphs included in this document that are in addition to or modified from MIL-PRF-32383 are highlighted in **BOLD**.

2. **APPLICABLE DOCUMENTS.**

2.2 **Government documents.**

2.2.1 **Specifications, standards, and handbooks.**

**Add:**

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-83133 Turbine Fuels, Aviation, Kerosene Types, NATO F-34 (JP-8), NATO F-35, and JP-8 + 100

DEPARTMENT OF DEFENSE STANDARDS


MIL-STD-461 Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

MIL-STD-1472 Department of Defense Design Criteria Standard Human Engineering

MIL-STD-1916 Department of Defense Test Method Standard

(Copies of these documents are available online at http://quicksearch.dla.mil/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 **Other Government documents, drawings, and publications.**

**Add:**

ADS-37A-PRF Electromagnetic Environmental Effects (E3) Performance and Verification Requirements (Relevant pages of this document can be found in APPENDIX A herein)

2.3 Non-Government publications.

Add:

<table>
<thead>
<tr>
<th>IEC 61000-4-5</th>
<th>Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 61000-4-9</td>
<td>Electromagnetic compatibility (EMC) – Part 4-9: Testing and measurement techniques - Pulse magnetic field immunity test</td>
</tr>
</tbody>
</table>

(Copies of this specification available online from International Electrotechnical Commission [https://webstore.iec.ch](https://webstore.iec.ch))

<table>
<thead>
<tr>
<th>ASTM G115-10</th>
<th>Standard Guide for Measuring and Reporting Friction Coefficients</th>
</tr>
</thead>
</table>

(Copies of this specification are available online from ASTM International [http://astm.org](http://astm.org))

<table>
<thead>
<tr>
<th>Smart Battery Data Specification Revision 1.1 paragraph 4.4.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Copies of this specification are available online from SBS Implementers Forum (SBS-IF) at: <a href="http://www.sbs-forum.org">www.sbs-forum.org</a>)</td>
</tr>
</tbody>
</table>

3. REQUIREMENTS.

Add: Specification requirements and test methods: The following requirements and test methods of MIL-PRF-32383, identified therein as “when specified”, are applicable as indicated below:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Requirement Paragraph</th>
<th>Test Method Paragraph</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multilayer finish</td>
<td>3.4.4.1.3</td>
<td>Certification</td>
<td>Yes</td>
</tr>
<tr>
<td>Gold plating</td>
<td>3.4.4.1.4</td>
<td>Certification</td>
<td>No</td>
</tr>
<tr>
<td>Motor inrush current</td>
<td>3.5.5</td>
<td>4.7.2.12</td>
<td>Yes</td>
</tr>
<tr>
<td>Charge enable</td>
<td>3.5.6</td>
<td>4.7.2.6</td>
<td>No</td>
</tr>
<tr>
<td>SMBus 1/</td>
<td>3.5.9</td>
<td>4.7.2.14; 4.7.2.15</td>
<td>Yes</td>
</tr>
<tr>
<td>Immersion, shallow 1/</td>
<td>3.6.6</td>
<td>4.7.3.8.1</td>
<td>Yes</td>
</tr>
<tr>
<td>Immersion, deep</td>
<td>3.6.6</td>
<td>4.7.3.8.2</td>
<td>No</td>
</tr>
<tr>
<td>Transit drop, normal</td>
<td>3.6.7</td>
<td>4.7.3.9.1</td>
<td>No</td>
</tr>
<tr>
<td>Transit drop, severe</td>
<td>3.6.7</td>
<td>4.7.3.9.2</td>
<td>Yes</td>
</tr>
<tr>
<td>Drop while mated 1/</td>
<td>3.6.7</td>
<td>4.7.3.9.2</td>
<td>Yes</td>
</tr>
<tr>
<td>Nail penetration, cell</td>
<td>3.7.1.2</td>
<td>4.7.4.4</td>
<td>Yes</td>
</tr>
<tr>
<td>Crush, cell</td>
<td>3.7.1.3</td>
<td>4.7.4.5</td>
<td>Yes</td>
</tr>
<tr>
<td>Projectile</td>
<td>3.7.2.6</td>
<td>4.7.4.11</td>
<td>Yes</td>
</tr>
<tr>
<td>Lithium Battery Safety Program (US Navy) Tests</td>
<td>3.7.2.7</td>
<td>4.7.5</td>
<td>Yes</td>
</tr>
<tr>
<td>Electromagnetic interference</td>
<td>3.8</td>
<td>4.7.7</td>
<td>Yes</td>
</tr>
</tbody>
</table>

1/ As modified herein, both mated and unmated configurations.
### 3.2.1 Certifications

Delete 3.2.1 from MIL-PRF-32383 and replace with the following:

#### REQUIREMENT PARAGRAPH

<table>
<thead>
<tr>
<th>Metals</th>
<th>3.3.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissimilar metals</td>
<td>3.3.2</td>
</tr>
<tr>
<td>Resistance of elastomeric materials</td>
<td>3.3.5</td>
</tr>
<tr>
<td>Electrical connection wires and tabs</td>
<td>3.3.6</td>
</tr>
<tr>
<td>Electrical contacts</td>
<td>3.4.4.1</td>
</tr>
<tr>
<td>Net Warrior Connector</td>
<td>3.4.4.1.1</td>
</tr>
<tr>
<td>Nett Warrior Connector disconnect pull force</td>
<td>3.4.4.1.1.1</td>
</tr>
<tr>
<td>Flat terminal</td>
<td>3.4.4.1.2</td>
</tr>
<tr>
<td>Battery case</td>
<td>3.4.5</td>
</tr>
<tr>
<td>State of charge indicator window</td>
<td>3.4.5.1</td>
</tr>
<tr>
<td>Dust cap or cover</td>
<td>3.4.8.1</td>
</tr>
<tr>
<td>Digital display characteristics</td>
<td>3.5.8</td>
</tr>
<tr>
<td>SMBus</td>
<td>3.5.9</td>
</tr>
<tr>
<td>High temperature temporary cutoff</td>
<td>3.7.2.4</td>
</tr>
<tr>
<td>Protective devices</td>
<td>3.7.2.8.2</td>
</tr>
<tr>
<td>Battery Safety Protection Circuits</td>
<td>3.7.2.8.4</td>
</tr>
<tr>
<td>Transportation requirements</td>
<td>3.9</td>
</tr>
</tbody>
</table>

### 3.4.3 Dimensions and weight

Add:

- Width shall be 7.60 +/- 0.06 inches.
- Height shall be 8.65 +/- 0.05 inches.
- Depth shall be no less than 0.50 inches and not greater than 0.70 inches.
- Weight shall be no greater than 2.6 pounds.

All other dimensions shall be accordance with FIGURE 7 Conformal Battery Dimension.
3.4.4.1.1 Connector.

Delete 3.4.4.1.1 from MIL-PRF-32383 and replace with the following

3.4.4.1.1. **Nett Warrior Connector**

Glenair connector Part Number 8070-1939-07ZNU6.7SY (printed circuit board tails or solder cup) or TE Connectivity Part Number: 2828420-2 (7 position). The primary (master) keyway shall be oriented downward, facing the charge terminal contacts.

The battery connector shall maintain a fully functional interface after 500 insertions and extractions. When tested as specified in 4.7.1.3, battery connector shall not tear, rip, be displaced, or separate from the battery case.

The connector shall provide a shell to shell shield impedance of not greater than 4 milliohms when mated with any of the mating connectors listed in NWPAN-WP-01112013.

Sockets 1, 2, and 3 shall be capable of carrying not less than 5 amps continuous each.

Connector shall be capable of mating with plugs having the 6-6 or 6-7 pin configuration. The connector shall be sealed to meet the requirements of section 3.6.6 (Immersion). The connector shall be sealed in a way such that insertion of a plug with a 6-7 pin configuration does not compromise the ability to meet Immersion and other requirements herein.

The pinout for the connector shall be as follows in "Nett Warrior Connector Pinout Description" with socket numbering depicted in FIGURE 2. Certification is required.

### Nett Warrior Connector Pinout Description

<table>
<thead>
<tr>
<th>SOCKET</th>
<th>DESCRIPTION</th>
<th>TERMINAL MARKINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V+ Battery Voltage</td>
<td>Batt +</td>
</tr>
<tr>
<td>2</td>
<td>V- Battery Ground 3/</td>
<td>Batt -</td>
</tr>
<tr>
<td>3</td>
<td>Charge + 1/</td>
<td>Charge +</td>
</tr>
<tr>
<td>4</td>
<td>SMBus Data</td>
<td>Data</td>
</tr>
<tr>
<td>5</td>
<td>SMBus Clock</td>
<td>Clock</td>
</tr>
<tr>
<td>6</td>
<td>SMBus ID ('T-pin') 2/</td>
<td>SB ID</td>
</tr>
<tr>
<td>7</td>
<td>No Connection (N/C) 4/</td>
<td>N/C</td>
</tr>
</tbody>
</table>

1/ Charge + shall be input only
2/ Safety Signal IAW Smart Battery Data Specification Revision 1.1 paragraph 4.4.4
3/ Require internal termination of Ground to Shield Ground.
4/ Shall not be used for any electrical connectivity or for grounding.
Add:

3.4.4.1.1  **Nett Warrior Connector disconnect pull force.**
The connector shall have a 12.0 +/- 4.0 pounds of force disconnect. Test per 4.7.1.3.1

3.4.4.1.2  **Flat terminal.**
Add: The charge terminals shall be as shown in FIGURE 3, Charge Terminal Pinout Assignment. Charge terminals shall be electrically protected against short circuit and shall not source battery current. All four contacts shall be recessed 0.020 +/- 0.005 inches. The contacts shall support charging at a minimum of 7.5 Amps. They shall be designed minimally to sustain a 20 Lbs. force each for 10 minutes without degradation to the battery contacts from a charge contact pin. Test per 4.6.1 and 4.7.1.4.

The battery shall be capable of being charged via both the Nett Warrior connector and the charge terminal contacts. The battery shall be capable of “wake up” charging via both the Nett Warrior connector and the charge terminal contacts. Wake up charge charging via the Nett Warrior connector shall be IAW the Smart Battery Specified behavior for the Safety Signal. Wake up charging via the charge terminal contacts shall be performed by accepting +5V between terminal 1 and 2 and responding to SMBus commands before charging voltage is provided.

<table>
<thead>
<tr>
<th>POSITION (Left to Right)</th>
<th>DESCRIPTION</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Charge Terminal, Positive</td>
<td>CHG +</td>
</tr>
<tr>
<td>2</td>
<td>Charger Terminal, Negative (Ground)</td>
<td>CHG -</td>
</tr>
<tr>
<td>3</td>
<td>SMBus Data</td>
<td>DATA</td>
</tr>
<tr>
<td>4</td>
<td>SMBus Clock</td>
<td>CLK</td>
</tr>
</tbody>
</table>
Add:

3.4.4.1.5 **USB power port connector(s).**

The CWB shall provide at least one USB 3.0 Type-A connector located just above or just below the Nett Warrior connector for device output power with the following characteristics:

- A minimum of 1.5 Amps at 5 VDC female port (receptacle) shall be available.
- A tethered protective cover
- Connection of the Nett Warrior connector and USB Type-A connector shall be accomplished by the user wearing cold weather gloves when tested IAW MIL-STD-1472.
- One (1) USB BC1.2 Dedicated Charging Port (DCP) capable of supplying 1.5 A of current.
- A charger adapter emulator circuit to accommodate proprietary charging protocols such as Apple, Samsung, or Qualcomm Quick Charge.
- Verify in accordance of section 4.7.2.17

Delete from MIL-PRF-32383 and replace with the following:

3.4.5 **Battery case.**

The battery case shall be capable of maintaining the specified dimensions during the life of the battery. The surface of the case shall have a smooth finish free from pitting, blow-holes, rough spots, or other deformations. The case shall be fabricated of material having sufficient strength to withstand the environmental and electrical tests specified herein. Material shall be nonflammable. The case material shall be classified in accordance with UL Standard 94, Test for Flammability of Plastic Materials for Parts in Devices and Appliances, except as otherwise noted herein. Acceptable ratings include V-0, 5VA, or 5VB. If the manufacturer elects to use material classified in accordance with UL 94, certification is required. If it is not UL-94 certified, test as specified in 4.7.1.7 and as approved by the government for validation; test specimens shall self-extinguish within 5 seconds after removal from flame.
3.4.5.6 **Surface friction.**
Batteries shall slide easily in and out of their pouch. When tested as specified in 4.7.1.8 batteries shall have a coefficient of static friction of not greater than 0.40 against a Cordura® fabric containing meta-aramid, nylon and cotton in a blend ratio of 43/30/27 percent by weight.

**Add:**
3.4.5.7 **Battery case edges.**
The battery case edges, seams, and corners shall be smooth.

3.4.6 **Marking.**
**Add:**
All marking and labels shall be in accordance with MIL-STD-130

3.4.6.2 **Warning marking.**
**Add:**
Warning labels shall be not less than a 12 point font; other labels shall not be less than a 10 point font..

3.4.6.5 **Instructions / notes.**
**Add:**
The following charging instructions shall be marked on each battery:

*CHARGE CONSTANT VOLTAGE AT 16.8V AT 5 AMPS MAX THROUGH NETT WARRIOR CONNECTOR.*

*BATTERY TEMPERATURE SHOULD BE BETWEEN 32°F (0°C) AND 113°F (45°C) DURING CHARGE.*

*LOWER TEMPERATURE CHARGING IS PERMITTED BUT RUNTIES WILL BE LOWER.*

*WARNING/STORAGE
DO NOT STORE ABOVE 160°F (71°C), CRUSH, MUTILATE, REVERSE POLARITY, DISASSEMBLE, OR DISPOSE OF IN FIRE.*

(Note: if charge voltage is different than 16.8 VDC, appropriate voltage should be stated on battery charging instructions.)

3.4.6.6 **Simplified battery label.**
**Add:**
The simplified battery label location shall be located on the same surface as the charging instructions.

**Add:**
3.4.6.9  **Nett Warrior connector marking.**

The Nett Warrior Connector marking shall be as shown in FIGURE 4 and orientated as in FIGURE 7.

![Nett Warrior Connector Marking](image)

FIGURE 4. Nett Warrior Connector marking details

3.4.8  **Battery condition for shipping.**

Delete MIL-PRF-32383 3.4.8 in its entirety and replace with the following:

3.4.8. Battery condition for shipping.

Each battery shall be shipped with an instruction card that shall contain instructions for operation, charging, and maintenance of the battery to include long term storage/shipping requirements per (Safety Data Sheet, class of shipping, and shipping markings).

3.4.8.1  **Dust cap or cover.**

Replace “Each battery shall be furnished with a dust cap” to “Each battery shall be furnished with a dust cap for shipping/transportation only”

3.5.2  **Battery voltage.**

Add:

Battery shall operate within the range of 10.0 volts to 20.0 volts.

3.5.3  **Capacity.**

Add:

Minimum final voltage: 10 volts.

When subjected to the specific test listed below and discharged at the specified rate to minimal final voltage, the battery shall have the following minimum capacity:
## Test Capacity Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Test Method</th>
<th>Discharge Rate</th>
<th>Minimum Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity Discharge</td>
<td>3.5.3</td>
<td>4.7.2.3</td>
<td>See 4.7.2.3</td>
</tr>
<tr>
<td>Cycle life (224th cycle)</td>
<td>3.5.4</td>
<td>4.7.2.4</td>
<td>See 4.7.2.4</td>
</tr>
<tr>
<td>High rate discharge</td>
<td>3.5.3</td>
<td>4.7.2.5</td>
<td>5 A</td>
</tr>
<tr>
<td>Low temperature discharge</td>
<td>3.5.3</td>
<td>4.7.2.7</td>
<td>18 W</td>
</tr>
<tr>
<td>High temperature discharge</td>
<td>3.5.3</td>
<td>4.7.2.8</td>
<td>18 W</td>
</tr>
<tr>
<td>Motor inrush current</td>
<td>3.5.5</td>
<td>4.7.2.12</td>
<td>See 4.5.5</td>
</tr>
<tr>
<td>Charge acceptance</td>
<td>3.5.10.1</td>
<td>4.7.2.9</td>
<td>18 W</td>
</tr>
<tr>
<td>High temperature charge acceptance</td>
<td>3.5.10.1</td>
<td>4.7.2.9</td>
<td>18 W</td>
</tr>
<tr>
<td>Low temperature charge acceptance</td>
<td>3.5.10.1</td>
<td>4.7.2.9</td>
<td>18 W</td>
</tr>
<tr>
<td>Retention of charge</td>
<td>3.5.10.2</td>
<td>4.7.2.10</td>
<td>18 W</td>
</tr>
<tr>
<td>Pulse discharge</td>
<td>3.5.3</td>
<td>4.7.2.11</td>
<td>See 4.7.2.12</td>
</tr>
<tr>
<td>Extreme low temperature discharge</td>
<td>3.6.1</td>
<td>4.7.3.2</td>
<td>18 W</td>
</tr>
<tr>
<td>Extreme high temperature discharge</td>
<td>3.6.1</td>
<td>4.7.3.3</td>
<td>18 W</td>
</tr>
<tr>
<td>Thermal shock (post-test)</td>
<td>3.6.3</td>
<td>4.7.3.5</td>
<td>18 W</td>
</tr>
<tr>
<td>Mechanical shock (post-test)</td>
<td>3.6.3</td>
<td>4.7.3.6</td>
<td>18 W</td>
</tr>
<tr>
<td>Vibration (during test)</td>
<td>3.6.5</td>
<td>4.7.3.7</td>
<td>18 W</td>
</tr>
<tr>
<td>Battery storage life</td>
<td>3.6.8</td>
<td>4.7.3.10</td>
<td>See 4.7.2.3</td>
</tr>
<tr>
<td>Impact</td>
<td>3.6.9</td>
<td>4.7.3.11</td>
<td>18 W</td>
</tr>
<tr>
<td>Flexibility</td>
<td>3.6.10</td>
<td>4.7.3.12</td>
<td>18 W</td>
</tr>
<tr>
<td>Salt Fog</td>
<td>3.6.12</td>
<td>4.7.3.14</td>
<td>18 W</td>
</tr>
<tr>
<td>Electrostatic discharge</td>
<td>3.6.13</td>
<td>4.7.3.15</td>
<td>18 W</td>
</tr>
<tr>
<td>Conformability</td>
<td>3.6.14</td>
<td>4.7.3.16</td>
<td>18 W</td>
</tr>
<tr>
<td>Overcharge/electric leakage (post-test)</td>
<td>3.7.2.2</td>
<td>4.7.4.7</td>
<td>18 W</td>
</tr>
<tr>
<td>Short circuit protection (post-test)</td>
<td>3.7.2.3</td>
<td>4.7.4.8</td>
<td>18 W</td>
</tr>
<tr>
<td>High temperature temporary cut off</td>
<td>3.7.2.4</td>
<td>4.7.4.9</td>
<td>18 W</td>
</tr>
<tr>
<td>Electromagnetic compatibility / interference</td>
<td>3.8</td>
<td>4.7.7</td>
<td>18 W</td>
</tr>
</tbody>
</table>

### Add:

3.5.5 Motor inrush current.

The discharge profile shall be as follows. Verify values in accordance with 4.7.4.12.
### Table

<table>
<thead>
<tr>
<th>STEP</th>
<th>Start time</th>
<th>End time</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>00:000:000</td>
<td>00:000:400</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>00:000:400</td>
<td>00:000:915</td>
<td>33</td>
</tr>
<tr>
<td>3</td>
<td>00:000:915</td>
<td>00:025:000</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>00:025:000</td>
<td>01:000:000</td>
<td>6.5</td>
</tr>
<tr>
<td>5</td>
<td>01:000:000</td>
<td>02:000:000</td>
<td>5.5</td>
</tr>
<tr>
<td>6</td>
<td>02:000:000</td>
<td>Until Cutoff Voltage</td>
<td>5</td>
</tr>
</tbody>
</table>

#### 3.5.8 State-of-charge Indicator (SOCI).

**Delete** 3.5.8 from MIL-PRF-32383 and replace with the following:

##### 3.5.8 Digital display characteristics.

When tested as specified in 4.7.2.14, the display shall have the following characteristics:

a. There shall be a single digital display located on the top central edge of the battery (see Figure 7) that will have the capability of displaying State of Charge (SOC), State of Health (SOH), Run-Time-To-Empty (RTTE) and Run-Time-To-Full (RTTF). The digital display actuator shall be recessed and shall be protected from inadvertent operation.

b. The load applied by the digital display circuitry on the battery shall be not greater than 50 micro-amperes in the non-operating mode.

c. The device shall be designed to compensate for usage temperature and discharge rate and shall monitor and adjust for changes in both during battery use.

d. The accuracy of the information displayed shall be +0%/-5% based upon actual initial battery capacity.

e. The digital display shall provide readings for SOC and SOH of 0 to 100% in 1% increments and RTTE and RTTF in hh:mm. The display shall not be less than ¼ inch in height. The display shall visually distinguish between SOC, SOH, RTTE and RTTF. The output of the display shall be discernable from any direction (i.e. distinguish between readings of 001 and 100 or 85 and 58)

f. The digital display shall flash 000 indicating the battery has an internal fault preventing it from providing output power through any connector.

g. RTTE shall be a display of the SMBus AverageTimeToEmpty(), calculated based on power, and represented in hh:mm format.

h. RTTF shall be a display of the SMBus AverageTimeToFull(), calculated based on power, and represented in hh:mm format.

i. The display shall be compatible with Night Vision Imaging Systems. The output of the display at full intensity, measured in a direction normal to the display shall be 1.0 to 10.0 milli candelas. The display shall be capable of providing the correct information in a temperature range of −30 to 55°C and be capable of surviving temperature extremes of −40°C to 93°C. Certification to the full intensity output and storage temperature range requirements is required.

j. The digital display shall normally be in the ‘off’ mode and shall require a push-button actuator to activate the display. The push-button shall be capable of operation by Soldiers wearing Mission Oriented Protective Posture (MOPP) IV and cold weather gloves. The push-button actuator shall comply with the following displacement and resistance requirements:
Push Button Requirements

<table>
<thead>
<tr>
<th>DISPLACEMENT</th>
<th>RESISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not less than</td>
<td>0.008 in.</td>
</tr>
<tr>
<td>Not greater than</td>
<td>0.050 in.</td>
</tr>
</tbody>
</table>

k. At full intensity, the display shall only illuminate the state of charge level appropriate to its usage level when viewed from a direction normal to the indicator (i.e., no light bleed-through to levels/spaces meant for higher states of charge). Time to full light intensity shall be not greater than two seconds. The display shall remain at full intensity for not less than 3 seconds and shall self-extinguish in not greater than 7 seconds of actuation when the actuator is held down. The display shall extinguish any time the actuator is released in not greater than 7 seconds.

3.5.9 SMBus.
Delete 3.5.9 from MIL-PRF-32383 and replace with the following:

Each battery shall be compliant with System Management Bus (SMBus) Specification Revision 1.1 and Smart Battery Data (SBData) Specification, version 1.1. Batteries shall be compatible with appropriate Level 2 and Level 3 chargers (see 6.3.9). When tested as specified in 4.7.2.14, Relative State of Charge value shall be accurate within +0/-5% of the actual state of charge for the battery under test throughout the discharge. Manufacturer and battery data shall be correctly programmed (see 4.7.2.15).

SMBus shall use 5V logic circuitry. Pull-up resistors will be provided by the charger. SMBus output from the connector should be sufficient to maintain signal integrity through two (2) C1 Nett Warrior or equivalent cables connecting to a charger or power and data manager. SMBus circuitry shall respond to a SMBus query within 45 seconds.

Add:

3.5.11 Concurrent charge / discharge.
When tested as specified in 4.7.2.16, the battery shall be capable of being charged via pin 3 and simultaneously discharged via pin 1 of the Nett Warrior connector (3.4.4.1.1).

When tested as specified in 4.7.2.16, the battery shall be capable of being charged via the flat terminal contacts (see 3.4.4.1.2) and simultaneously discharged via pin 1 of the Nett Warrior connector (3.4.4.1.1).

Commented [DJM1]: Removed because this does not fall within the scope of “Concurrent charge/discharge”. This requirement & verification is already covered in 3.4.4.1.5 and 4.7.2.17.
3.6 Environmental Requirements.

Delete Table I and replace it with the following:

<table>
<thead>
<tr>
<th>Tests</th>
<th>Req't Paragraph</th>
<th>Test Paragraph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme low temperature discharge</td>
<td>3.6.1</td>
<td>4.7.3.2</td>
</tr>
<tr>
<td>Extreme high temperature discharge</td>
<td>3.6.1</td>
<td>4.7.3.3</td>
</tr>
<tr>
<td>Altitude</td>
<td>3.6.2</td>
<td>4.7.3.4</td>
</tr>
<tr>
<td>Thermal shock</td>
<td>3.6.3</td>
<td>4.7.3.5</td>
</tr>
<tr>
<td>Mechanical shock</td>
<td>3.6.4</td>
<td>4.7.3.6</td>
</tr>
<tr>
<td>Vibration</td>
<td>3.6.5</td>
<td>4.7.3.7</td>
</tr>
<tr>
<td>Immersion</td>
<td>3.6.6</td>
<td>4.7.3.8.1</td>
</tr>
<tr>
<td>Transit drop</td>
<td>3.6.7</td>
<td>4.7.3.9.2</td>
</tr>
<tr>
<td>Battery storage life</td>
<td>3.6.8</td>
<td>4.7.3.10</td>
</tr>
<tr>
<td>Impact</td>
<td>3.6.9</td>
<td>4.7.3.11</td>
</tr>
<tr>
<td>Flexibility</td>
<td>3.6.10</td>
<td>4.7.3.12</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>3.6.11</td>
<td>4.7.3.13</td>
</tr>
<tr>
<td>Salt fog</td>
<td>3.6.12</td>
<td>4.7.3.14</td>
</tr>
<tr>
<td>Electrostatic discharge</td>
<td>3.6.13</td>
<td>4.7.3.15</td>
</tr>
<tr>
<td>Conformability</td>
<td>3.6.14</td>
<td>4.7.3.16</td>
</tr>
<tr>
<td>Chemical Resistance</td>
<td>3.6.15</td>
<td>4.7.3.17</td>
</tr>
</tbody>
</table>

3.6.5 Vibration.

Replace "When tested as specified in 4.7.3.7" with "When tested as specified in 4.7.3.7"
Add:

3.6.9 **Impact.**

Batteries shall be capable of being impacted without sustaining physical or electrical damage. When tested as specified in 4.7.3.11 batteries shall meet the impact test capacity requirements of 3.5.3 and the requirements of 3.6 (with the exception of defects in 106 of TABLE VIII).

Add:

3.6.10 **Flexibility.**

Batteries shall be capable of flexing with a 1 inch displacement in both directions on each axis without sustaining physical or electrical damage. When tested as specified in 4.7.3.12 batteries shall meet the flexibility test capacity requirements of 3.5.3 and the requirements of 3.6.

Add:

3.6.11 **Solar radiation.**

Batteries shall be capable of withstanding prolonged exposure to sunlight without sustaining physical or electrical damage. When tested as specified in 4.7.3.13 batteries shall meet the requirements of 3.5.3.

Add:

3.6.12 **Salt fog.**

Batteries shall withstand a salt fog atmosphere. When tested as specified in 4.7.3.14 batteries shall meet the salt fog test capacity requirements of 3.5.3 and the requirements of 3.5.

Add:

3.6.13 **Electrostatic discharge (ESD).**

Batteries shall withstand ESD to ±8kV, contact discharge and ±15kV air discharge on any surface, panel component (including vent) or connector, including exposed pins, in both operating and non-operating mode. When tested as specified in 4.7.3.15 batteries shall meet the ESD capacity requirements of 3.5.3 and the requirements of 3.5.

Add:

3.6.14 **Conformability.**

Batteries shall be capable of bending under not greater than 35 pounds of force around curved surfaces of a 7 inch radius. Batteries shall conform to the curvature of the above cited curved surface and maintain no greater than 3/16 inch distance between the curved surface and entire battery surface while conformed. When tested in accordance of 4.7.3.16 batteries shall meet the conformability capacity requirements of 3.5.3 and the requirements of 3.5.

Add:

3.6.15 **Chemical resistance.**

Batteries shall not be affected by common chemicals in the operational environment such as military decontamination or fuel. When testing in accordance of 4.7.3.17 batteries shall meet the requirements of TABLE VIII.
3.7 Safety.
Add: Batteries shall be evaluated for any unsafe conditions when penetrated by a sharp object(s). An unsafe condition includes but not limited to, (a) temperature above 170 °C (338 °F) on the surface of the battery case, (b) sustained flame and/or smoke generation, (b) violent reaction or (d) ejection of materials that present an unsafe condition to the user when tested as specified in 4.7.4.8. The battery shall not exhibit any of the aforementioned unsafe conditions for not less than two minutes after the penetration of the last object as required by the specific test. The results of this test shall support a hazard no higher than a MEDIUM risk IAW MIL-STD-882.

Add:
3.7.2.1 Overvoltage protection.
The battery shall withstand not less than 50V continuous both on the Nett Warrior connector and charge terminal contacts.

3.7.2.4 High temperature temporary cutoff devices.
Add: The quantity of thermoswitches shall be not less than 2. Certification is required

Add:
3.7.2.8 Safety, battery.
Add:
3.7.2.8.1 Nail penetration, battery.
When tested IAW 4.7.4.12, batteries shall be capable of safely withstanding penetration by sharp objects. Battery should continue to provide degraded operational capability after being punctured. However, if a cell in the battery is determined to have failed, charging shall be disabled and SOH should be reported as flashing "000."

Add:
3.7.2.8.2 Protective devices.
The battery shall include protective devices/circuitry/material to prevent thermal event propagation between cells. Certification is required.

Add:
3.7.2.8.3 Weapons characterization.
Batteries shall be capable of safely withstanding penetration by bullets/projectiles and not have propagation to adjacent cells. Safety characterization tests shall be conducted in accordance with 4.7.4.13 and 4.7.4.13.1.

Add:
3.7.2.8.4 Battery safety protection circuits.
The battery shall include three (3) distinct and separate protective devices/circuitry/material to prevent improper charging, system overload, or system malfunction, disabling energy entry or exit as needed to prevent catastrophic outcomes. Batteries shall have a battery management system, no less than two FETS, a resettable and permanent fuse protecting all of the terminals.
Certification required.

3.8 Electromagnetic compatibility.

**Add:** The battery shall be appropriately filtered and shielded to comply with the applicable emissions and susceptibility requirements of MIL-STD-461 Table V, Aircraft, Army, including Flight Line and as tailored herein. When tested as specified in 4.7.7 the batteries and system shall function properly.

3.9 Transportation requirements.


3.10 Interchangeability.

**Add:** Applicable “currently fielded” chargers are listed under 4.6.3

**Add:**

3.11 Systems level Integration

**Add:** The battery shall be capable of supplying voltage (volts) as defined in Section 3.5.2 to a connected Nett Warrior system IAW with current (amps) requirements in Section 3.5.5. The batteries shall not prevent Air Worthiness Certification for Nett Warrior.
4. VERIFICATION

4.4 First article inspection.

Modify MIL-PRF-32383 sample sizes as defined below:

a. Group 1 (GR1) – functional tests: increase sample size from 12 samples to 16 samples.

b. Group 2 (GR2) – Electromagnetic interference tests: decrease sample size from five samples to two samples.

Add:

e. Group 5 (GR5) – Nail penetration tests (battery level) and Weapons Characterization tests - sample size of 17

Replace Table IV with the following:

<table>
<thead>
<tr>
<th>Inspection/Test</th>
<th>Req't</th>
<th>Test Method</th>
<th>Samples or Group (GR)</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>GR1</td>
<td>GR2</td>
<td>GR3</td>
<td>GR4</td>
<td>GR 5</td>
<td>C/ GT test (1)</td>
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<td>Vibration (loose cargo)</td>
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<td>✔</td>
<td>✔</td>
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<tr>
<td>Immersion, shallow (post drop &amp; flex)</td>
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<td>Digital display characteristics</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>SMBus</td>
<td>3.5.5</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Full capacity discharge</td>
<td>3.5.5</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Concurrent charge / discharge</td>
<td>3.5.11</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Extreme low temp. discharge</td>
<td>3.6.1</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Extreme high temp. discharge</td>
<td>3.6.1</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Battery case vent</td>
<td>3.4.5.3</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>3.7.2.3</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>High temp. temporary cut-off</td>
<td>3.7.2.4</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>High temp. permanent cut-off</td>
<td>3.7.2.5</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Electromagnetic compatibility/interference</td>
<td>3.8</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Interchangeability</td>
<td>3.10</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>US Navy Safety Tests</td>
<td>3.7.2.7</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Weapons Characterization</td>
<td>3.7.2.8, 3.1</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

(1) – Contractor (C) and/or Government (G) conducted test
MIL-PRF-32383/X DRAFT

4.4 Conformance inspection.

Add:
Sampling shall be conducted IAW MIL-STD-1916.

4.5.1 Group A inspection.
Add: to TABLE V of MIL-PRF-32383 the following rows:

<table>
<thead>
<tr>
<th>Inspection / Criteria</th>
<th>Requirement Paragraph</th>
<th>Test Method Paragraph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity discharge (initial)</td>
<td>3.5.3</td>
<td>4.7.2.3</td>
</tr>
<tr>
<td>Immersion, shallow (modified)</td>
<td>3.6.6</td>
<td>4.7.3.8.1</td>
</tr>
</tbody>
</table>

4.5.2 Group B inspection.
Remove: from TABLE VI of MIL-PRF-32383 the following rows:

<table>
<thead>
<tr>
<th>Inspection / Criteria</th>
<th>Requirement Paragraph</th>
<th>Test Method Paragraph</th>
<th>Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immersion, shallow</td>
<td>3.6.6</td>
<td>4.7.3.8.1</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Capacity discharge (initial)</td>
<td>3.5.2</td>
<td>4.7.2.3</td>
<td></td>
</tr>
</tbody>
</table>

Add: to TABLE VI of MIL-PRF-32383 the following rows (these additional tests shall be performed in the order listed below):

<table>
<thead>
<tr>
<th>Inspection / Criteria</th>
<th>Requirement Paragraph</th>
<th>Test Method Paragraph</th>
<th>Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concurrent charge / discharge</td>
<td>3.5.11</td>
<td>4.7.2.16</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>SMBus</td>
<td>3.5.9</td>
<td>4.7.2.15</td>
<td></td>
</tr>
<tr>
<td>Flexibility Test</td>
<td>3.6.10</td>
<td>4.7.3.12</td>
<td></td>
</tr>
<tr>
<td>Immersion, Shallow</td>
<td>3.6.6</td>
<td>4.7.3.8.1</td>
<td></td>
</tr>
<tr>
<td>Transit drop, severe</td>
<td>3.6.7</td>
<td>4.7.3.9.2</td>
<td></td>
</tr>
<tr>
<td>Immersion, Shallow</td>
<td>3.6.6</td>
<td>4.7.3.8.1</td>
<td></td>
</tr>
<tr>
<td>Electrostatic discharge (ESD)</td>
<td>3.6.13</td>
<td>4.7.3.15</td>
<td></td>
</tr>
</tbody>
</table>

4.5.3.1 Group C frequency.
Add: to TABLE VII of MIL-PRF-32383 the following rows:

<table>
<thead>
<tr>
<th>Inspection / Criteria</th>
<th>Requirement Paragraph</th>
<th>Test Method Paragraph</th>
<th>Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
<td>3.6.9</td>
<td>4.7.3.11</td>
<td>1 2</td>
</tr>
<tr>
<td>Salt Fog</td>
<td>3.6.12</td>
<td>4.7.3.14</td>
<td>3 4</td>
</tr>
<tr>
<td>Flexibility Test</td>
<td>3.6.14</td>
<td>4.7.3.16</td>
<td></td>
</tr>
<tr>
<td>Overcharge/Electrical Leakage</td>
<td>3.7.2.2</td>
<td>4.7.4.7</td>
<td></td>
</tr>
<tr>
<td>Nail penetration, battery</td>
<td>3.7.2.8.1</td>
<td>4.7.4.12</td>
<td>1 2 3</td>
</tr>
</tbody>
</table>
4.6.1 Constant potential, current limited.

Add: A constant potential of 16.8 volts or appropriate voltage requested via the SMBus interface shall be applied with current to up 7.5 amperes, to a charge cut off of 750 milli-amperes.

4.6.3 Alternate charging.

Add: The following chargers may be used whenever the requirement allows use of alternate charging:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NUMBER</th>
<th>NSN</th>
<th>CAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charger (Ultralife)</td>
<td>CH0008</td>
<td>6130-01-545-1983</td>
<td>0UU59</td>
</tr>
<tr>
<td>Charger (Thales UBC)</td>
<td>4102871-501</td>
<td>6130-01-659-7090</td>
<td>23386</td>
</tr>
<tr>
<td>Charger (Thales eMUBC)</td>
<td>1100743-1672</td>
<td>6130-01-643-5527</td>
<td>23386</td>
</tr>
<tr>
<td>Charger (Thales UBC-Lite)</td>
<td>1600903</td>
<td>TBD</td>
<td>23386</td>
</tr>
<tr>
<td>Squad Power Mgr. (Protonex/Revision)</td>
<td>SPM-612</td>
<td>6130-01-617-5294</td>
<td>380F7</td>
</tr>
<tr>
<td>Squad Power Mgr. (Protonex/Revision)</td>
<td>SPM-622</td>
<td>6130-01-626-9656</td>
<td>380F7</td>
</tr>
<tr>
<td>SPC Charger, PP-8498 (Bren-Tronics)</td>
<td>BTC-70801</td>
<td>5310-01-495-2839</td>
<td>51828</td>
</tr>
<tr>
<td>ABC Charger (Bren-Tronics)</td>
<td>BTC-70100</td>
<td>6310-01-660-3696</td>
<td>51828</td>
</tr>
<tr>
<td>CWB General Adapter (Bren-Tronics)</td>
<td>BTA-70910A</td>
<td>5940-01-659-4717</td>
<td>51828</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.7.1.3 Connector insertion test.

Add:

Mate and un-mate the connector with a plug having the 6-7 pin configuration. Perform a visual inspection on the plug and socket and verify no pins or sockets are crushed, recessed, or otherwise damaged. Batteries shall meet requirements in 3.4.4.1.1.

Add:

4.7.1.3.1 Nett Warrior connector disconnect pull force test.

a. Secure battery in a stationary holding device and grip the cable 6 to 12 inches away.
b. The grip should not slip or damage the cable during the test.
c. Apply a static force of between 20 and 25 pounds.
d. Verify that the quick disconnect breaks.
e. Perform a visual and mechanical examination in accordance with 4.7.1.1.
f. Repeat steps a-e with force between 8 and 10 pounds and verify item does not disconnect.

Batteries shall meet requirements in 3.4.4.1.1.1.

4.7.1.4 Flat terminal strength.

Add:

a. Secure battery in a stationary holding device and apply a point force with a 20 Lbs. force for 10 minutes to the center of the right most flat terminal.
b. Repeat step a for the 2nd contact.
c. Repeat step a for the 3rd contact.
d. Repeat step a for the 4th contact.
e. Visually inspect contacts to see that there is no deformation or separation of housing.
f. Conduct an 1 meter immersion of the battery for two hours. Verify that there was no
ingress of water into battery.

Batteries shall meet requirements in 3.4.4.1.2.

Add:

4.7.1.8 Surface friction.
Verify battery surface is dry and free of any lubricants prior to test. Measure and report the
coefficient of static friction per test method D2394 of ASTM G115-10, Standard Guide for
Measuring and Reporting Friction Coefficients. Verify that the value is not greater than 0.4.
Batteries shall meet requirements in 3.4.5.6.

4.7.2.3 Capacity discharge.
Replace: a. with: "Charge batteries IAW 4.6. Use of 4.6.3 is acceptable."
Add: to c. Use a constant rate of 18 W.

Add: Press and release digital display actuator. Observe display and verify operability.

4.7.2.4 Cycle life test.
Delete 4.7.2.4 from MIL-PRF-32383 in its entirety and replace with the following:

a. Cycles 1 through 27 - Charge the batteries in accordance with 4.6; use of 4.6.3 is
permitted. Allow batteries to rest for not greater than one hour. Discharge at 18 W to
cutoff voltage. Allow batteries to rest for not greater than one hour prior to the start of
the next cycle. Every seventh cycle a rest of not greater than five hours is permitted
before and after charge.
b. Cycle 28 - Charge the batteries in accordance with 4.6; use of 4.6.3 is permitted.
Perform the electric leakage test of 4.7.4.7d. Allow batteries to rest for not less than 4
hours. Discharge at 2A to cutoff voltage. Record battery capacity.
c. Repeat steps a through c above until the 224 cycles are obtained.
d. After completion of the cycle life test, visually examine batteries for the criteria of
TABLE VIII. Batteries shall meet the cycle life and visual mechanical requirements (see
3.1 and 3.5.3).

4.7.2.9 Charge acceptance.
Modify MIL-PRF-32383 as defined below:
- Change Step C to "Charge batteries with a Smart Battery Specification compliant
charger."
- Change the temperature in Step F from 50°C to 55°C.

4.7.2.11 Pulse discharge.
Add: Discharge at 5 A for 5 seconds, rest for 25 seconds. Continue discharge to final voltage

4.7.2.14 State-of-charge indicator.
Delete 4.7.2.14 from MIL-PRF-32383 in its entirety and replace with the following:
4.7.2.14 Digital display characteristics.

The following test shall be performed.

a. Charge each battery in accordance with 4.6; use of 4.6.3 is permitted.

b. Verify location and marking of the digital display indicator is in accordance with 3.5.8.

c. Press and release the digital display actuator.

d. Measure and record the following to the nearest tenth of a second: (1) time from actuation to full intensity of the lights or digital display; (2) time from reaching full intensity until the lights extinguish; and (3) the total time from actuation until the lights extinguish.

e. Measure displacement and resistance values for the actuator and record the results.

f. Press each sample against a flat, transparent surface with not less than 5 lbs. of force, with the face including the actuator against the surface.

g. Observe whether or not the display illuminate in accordance with 3.5.8; record and verify the response(s) as applicable.

h. Discharge batteries at the C/10 rate as follows: one battery at −10 ± 2°C (+14°F) and one at 55 ± 2°C (130°F).

i. Continuously discharge batteries to the following approximate states of charge, stopping the discharge at each state: 90%; 70%; 50%; 30%; 10%.

j. Obtain the digital display readings while the test battery is not subject to discharge. For each of the states of charge states in (i), observe the indication of the state of charge indicator, read the SMBus data output, and record both indications after each partial discharge. Environmental chambers may be paused or shut off while accessing batteries to obtain the digital display readings. For samples tested at −10°C, care is needed to limit the freezing of condensation at the battery to test circuit interface.

k. Once the digital display readings have been obtained, restart the environmental chamber and restart the discharge in not less than 15 minutes after return to the required test temperature (for samples tested at −10°C, allow sufficient time to clear the frost if condensation has frozen on batteries).

l. Discharge the batteries to final voltage.

m. Observe the indication of the state of charge indicator, read the SMBus data output, and record the indications. Batteries shall meet the requirements of 3.5.8.

n. Begin charging each battery in accordance with 4.6; use of 4.6.3 is permitted.

Charge one battery at −10 ± 2°C (+14°F) and one at 55 ± 2°C (130°F).

o. Within 5 minutes from the start of charging, record the digital display Run Time to Full indication for each battery.

p. Allow charging to complete and record the total time for charging to complete for each battery.

q. Compare the values in steps o and p and verify they are within 20% of one another.

r. Discharge batteries at the 18W rate as follows: one battery at −10 ± 2°C (+14°F) and one at 55 ± 2°C (130°F).

s. Within 5 minutes from the start of discharge, record the digital display Run Time to Empty indication on each battery.
t. Allow discharge to complete and record the total time for the discharge for each battery.

u. Compare the values in steps s and t and verify they are within 20% of one another.

4.7.2.15 SMBus.

Add: Connect two 20-inch Nett Warrior C1 or two equivalent cables in series for a total length of 40 inches to the Nett Warrior connector. Connect the other end of the cable to the current Nett Warrior End User Device (EUD) with Hub and verify that the SMBus data is accurately displayed on the EUD.

The following test shall be performed.

a. Charge each battery in accordance with 4.6; use of 4.6.3 is permitted.

b. Discharge batteries at the 18W rate as follows: one battery at −10 ± 2ºC (+14ºF) and one at 55 ± 2ºC (130ºF). Record the SMBus RelativeStateOfCharge and total amp hours during discharge.

c. Plot the two data curves recorded in step b and verify that the RelativeStateOfCharge tracks the amp hour charge within +0/-5%.

Battery shall meet requirements in 3.5.9.

Add:

4.7.2.16 Concurrent charge / discharge

Perform the following charge & discharge tests. Verify that no charge condition or battery failure occurs:

a. Test A. Connect a 100% SOC battery to a 2 Amp load at pin 1 of the battery Nett Warrior connector. Apply a 16.8 VDC 1 Amp current limited supply at pin 3 of the battery Nett Warrior connector. Allow charge to continue for 2 hours at room temperature. Verify that for 2 hours that the battery does not take in a charge current less than 0.95 Amps at pin 3 and that the battery SOC is not less than 80% (+0/-5%).

b. Test B. Connect battery from Test A to a 1 Amp load at pin 1 of the battery Nett Warrior connector. Apply a 16.8 VDC 2 Amp current limited supply at pin 3 of the battery Nett Warrior connector. Allow charge to continue for 2 hours at room temperature. Verify that after 2 hours the battery does not take in a charge current greater than 1.0 Amps at pin 3 and that the battery SOC is greater than 90%. Continue charge/discharge conditions for another 4 hours and verify that the battery SOC is at 100% and verify that SMBus current never exceeds 0 Amps.

c. Test C. Connect a 90% SOC battery to a 0.9 Amp load at pin 1 of the battery Nett Warrior connector. Apply a 16.8 VDC 1 Amp current limited supply at pin 3 of the battery Nett Warrior connector. Allow charge to continue for 2 hours at room temperature. Verify that after 2 hours the battery SOC is equal to or greater than 90%.

d. Test D. Connect a 100% SOC battery to a 2 Amp load at pin 1 of the battery Nett Warrior connector. Apply a 16.8 VDC 1 Amp current limited supply at the Charge + flat terminal contact of the battery. Allow charge to continue for 2 hours at room temperature. Verify that for 2 hours that the battery does not take in a charge current less than 0.95 Amps at the Charge + flat terminal contact and that the battery SOC is not less than 80% (+0/-5%).
Batteries shall meet requirements in 3.5.11.

Add:

4.7.2.17 **USB power port connector(s).**
Verify that the USB Socket output is compliant to the USB BC1.2 specification by performing the steps of USB Battery Charging 1.2 Compliance Plan, Section 8 (Dedicated Charging Port Compliance). Verify that the USB port can provide a minimum of 1.5 Amps at 5 VDC and that this is provided concurrently with an 18W load on the Nett Warrior connector. Batteries shall meet the requirements in 3.4.4.1.5.

Add:

4.7.3.7.1 **Vibration, loose cargo transportation.**
Charge batteries in accordance with 4.6; use of 4.6.3 is permitted. Batteries shall be subjected to loose cargo testing in accordance with MIL-STD-810 Method 514 Procedure II for not less than 20 minutes duration. Batteries shall initially be placed stacked one on top of another in the battery tester with no other equipment present. After Step 4 of Procedure II, proceed to Step 9. Batteries shall meet the requirements of para 3.5.3.

4.7.3.8.1 **Immersion, shallow.**
Delete MIL-PRF-32383 4.7.3.8.1 in its entirety and replace with the following:

4.7.3.8.1 **Immersion, shallow.**
Test batteries in accordance with MIL-STD-810, Method 512, Procedure I. The test samples shall be fully charged and configured as follows: half of the batteries in operating configuration (with sealed mating Nett Warrior connector attached to 18 W load) and the other half of the batteries in transport configuration (i.e. connector unmated). Note, cleaning procedures allowed in accordance with Appendix B for systems under test without connector attached are allowed post immersion. Duration shall be for a minimum of 2 hours immersion at 1 meter each test.

For Step 6, use a duration of 2 hours in saltwater per ASTM D-1141.

During the immersion period verify that the batteries provide a constant 18 W to the load for the connected (mated) CWBs.

For Step 9, conduct Capacity Discharge Test in 4.7.2.3. Note, immersion testing shall be conducted post other battery stress testing such as drop or flexibility as required here for test sequences. Batteries shall meet the requirements in 3.6.6.

For Group A testing ONLY; duration shall be for a minimum of 30 minutes at 1 meter each test, with the battery temperature 20°C above the water temperature. For step 9 of MIL-STD-810, Method 512, Procedure I, perform the battery open circuit voltage check according to 4.7.2.2, as well as demonstrating the USB port(s) voltage is 5.0V±0.25V. Batteries shall meet the requirements in 3.6.6.
4.7.3.8.2   Immersion, deep.

Delete 4.7.3.8.2 from MIL-PRF-32383 in its entirety.

4.7.3.9.2 Transit drop, severe.

Modify MIL-PRF-32383 delete steps a-e and replace with the following:

   a. Fully charge batteries in accordance with 4.6; use of 4.6.3 is permitted and verify that the State of Charge Indicators are properly functioning.
   b. Replace "height not less than 30 inches onto cured concrete" with "height not less than 48 inches onto surface specified in MIL-STD 810 Method 516 Procedure IV".
   c. Perform drops 1 – 10 in Table IX on unmated batteries.
   d. Verify that here are no indications of potential start of structural or mechanical damage that could further lead to system failures. At a minimum verify each battery with visual inspection of battery skin, contact terminals, Connectors, and digital display indicators for any physical damage, also verify that capacity meets that of section 3.5.3.

Batteries shall meet requirements in 3.6.7.

Add:

4.7.3.11   Impact.

The following test shall be performed:

   a. Fully charge batteries in accordance with 4.6; use of 4.6.3 is permitted and verify that the State of Charge Indicators are properly functioning.
   b. Place the battery on an ESAPI side plate backed by a sandbag.
   c. Drop a 16 lb. Professional Bowlers Association (PBA) certified bowling ball or equivalent from not less than 36 inches onto the center-point of the battery +/- one inch.
   d. Repeat step c for the left and right sides of the horizontal centerlines of the battery not less than one half inch and not greater than two inches from the edge.
   e. Perform the capacity discharge of 4.3.7.2 and verify that capacity is not below that of 3.5.3 for Capacity Discharge minimum.
   f. Verify each battery with visual inspection of battery skin, contact terminals, Connectors, and digital display indicators for any physical damage.

Batteries shall meet the requirements of 3.5.3, 3.6, and 3.6.9.

Add:

4.7.3.12   Flexibility test.

The following test shall be performed. Refer to Figure 5.

   a. Fully charge batteries in accordance with 4.6; use of 4.6.3 is permitted.
   b. Soak the battery for not less than four hours at not less than -20°C.
   c. Place the battery in a fixture which allows the center of the battery to bend while holding the edges. The edges can pivot in the direction of the bend.
   d. At a distance equidistant between the centerline edges of the battery provide
sufficient force to move the battery up and down 1 inch in each direction 200
times. One flex consists of an upward and a downward motion.

e. Rotate the centerline of the battery 90 degrees in the fixture.
f. Repeat step d.
g. Soak the battery for not less than four hours at not less than 60°C.
h. Repeat steps c through f.
i. Verify proper digital display functionality with 4.7.2.14. Charge battery IAW
   4.7.2.6
j. Verify each battery with visual inspection of battery skin, contact terminals,
   Connectors, and digital display indicators for any physical damage.

Batteries shall meet the requirements of 3.5.3, and 3.10

FIGURE 5 Battery Flexibility

Note: Figure not to scale

Add:

4.7.3.13 Solar radiation.

Fully charge batteries in accordance with 4.6; use of 4.6.3 is permitted and verify that the State
of Charge Indicators are properly functioning. The following test shall be performed. Test
batteries per MIL-STD-810, Method 505, Procedure II using the spectral power distribution
below for seven days. Position one battery with the front face up and one battery with the front
face down Wind speed shall be sufficient to maintain the battery surface temperature below
75°C. Below 65°C surface temperature wind speed shall be 0 mph. Batteries shall meet the
requirements of 3.6.11 and 3.5.

Spectral power distribution
Add:

4.7.3.14 Salt fog
The following test shall be performed. Test batteries per MIL-STD-810, Method 509 for four 24 hour cycles alternating 24-hour periods of salt fog exposure and drying conditions for a minimum of four 24-hour periods (two wet and two dry). The water used for the saltwater solution shall have a resistivity of not greater than 5 mega-ohms per cm. The battery shall meet the requirements of 3.6, 3.6.12, and 3.5.3. Note, posttest battery cleaning is allowed as described in accordance with Section 6 notes - Appendix B for cleaning of an unconnected, unplugged - unprotected power connector, prior to the verification of the requirements of 3.5, 3.6.12, and 3.5.3

Add:

4.7.3.15 Electrostatic discharge (ESD)
Charge batteries in accordance with 4.6; use of 4.6.3 is permitted. Subject the batteries to both the contact and air discharge test of IEC 61000-4-2, Level 4, to include each contact (both charge and main connector), connector shield, battery case, seams, and the digital display. The battery shall be tested with no load and under an 18 W load. Verify that a load of 18 W can be sustained for 1 minute following the test. Fully charge the battery via the SMBus and perform the discharge test of 4.7.2.3 once with the primary connector and once with the bottom charge contacts. The battery shall meet the requirements of 3.5, 3.6.13, and 3.5.3.

Add:

4.7.3.16 Conformability
An Electrical Mechanical (EM) load frame equipped with a reversible load cell (capacity not to exceed 200 lb-ft) shall be used to measure the compressive force required to conform the battery to the 7 inch radius curved surface. Refer to Figure 6.
Battery primary side will be with the power connector positioned in the upper left corner coming out the left side and charge contacts coming out the bottom (refer to FIGURE 7). Top to bottom will be considered the vertical axis and left to right the horizontal axis. The other side of the battery will be the secondary side.

The following test shall be performed: The rollers shall roll freely on the battery while the upper fixture moves vertically downward. The rollers shall be spread at a fixed distance when the battery is centered over the lower fixture to minimize friction as it curves the battery.

a. Ensure that the batteries are not tested in a prior conformed, pre-stressed condition, each battery shall be placed on a flat surface between each compressive trial to allow it to return to a flat condition.
b. Center the upper fixture above the lower fixture.
c. Place the battery on the center of the lower fixture, oriented primary side (power connector to left and contacts out of front of the fixture) along the vertical axis.
d. Move the upper fixture to just above or to touch the battery.
e. Ensure that the rollers are within ½ inch of the edges of the battery (+/- ¼ inch).
f. Once the battery is in position for test, allow no than 1 minute time to start test. Note: Battery relaxation may start and roller contact may be lost when the battery is placed on curved surface for an excessive amount of time.
g. Perform test by lowering the upper fixture with a compressive cross head rate of 2 inches per minute.
h. Record load, displacement, and time measurements at a data acquisition rate of 100 ms.
i. Stop the test when the compressive load threatens to crush the battery.
j. Remove the tension of the upper fixture and lay the battery down flat on a table for 2 minutes between each measurement.
k. Repeat steps b. through i. in each of the other three orientations (secondary side horizontal axis, primary side horizontal axis, and secondary side vertical axis) and...
record data for each orientation. Each test set shall be performed by alternating
the battery orientation after each measurement.

i. Repeat the same procedure for each orientation a total of five (5) times for a total
number of 20 runs for the battery.

Verify batteries meet requirements of 3.6.14.

Verify discharge capacity as part of 4.7.2.3.

Add:

4.7.3.17 Chemical resistance.
Batteries shall be sprayed separately with each of the following substances below. The
substance shall cover not less than 50% of the surface area of the battery and include portions
of all seams, digital display, vent, label, charge terminal contacts, and connector. After standing
for not less than 10 minutes, the batteries shall be rinsed with soap and water. Batteries shall
meet the requirements of 3.6.15.

a. JP-8 per MIL-DTL-83133G or commercial diesel fuel.

b. Sodium Hypochlorite 5.25% (household bleach).

4.7.4.7 Overcharge / electrical leakage.
Add: Charge at 2.36 amperes with a charge voltage limit of 50 volts minimum during the 21-
hour overcharge period of 4.7.4.7b. Discharge batteries at a constant 28 W load to final voltage
in step 4.7.4.7e. One sample shall be tested via the main connector and one sample shall be
tested via the charge contacts. Verify that the battery meets the overcharge/electrical leakage
capacity requirements of 3.5.3.
Replace: 4.7.4.7 step "f. Repeat steps a through e for a total of 1 cycles" with: "F. Repeat steps
a through e for a total of 1 cycles.

Add:

4.7.4.7.1 Overvoltage protection.

a. Fully charge the battery in accordance with 4.6; use of 4.6.3 is permitted.
b. Connect the battery Nett Warrior Connector pins 2 & 3 to a DC source supplying
50V at 5A.
c. Leave the battery connected for a minimum of 10 minutes.
d. Disconnect the battery and allow the battery to rest for 2 minutes.
e. Perform the Battery open circuit voltage check according to 4.7.2.2.
f. Repeat steps b-e using the Nett Warrior Connector pins 1 & 2.
g. Repeat steps b-e using the flat terminal contacts 1 & 2.

Batteries shall meet the requirements of 3.7.2.2.1

Add:

4.7.4.12 Nail penetration, battery.
The following test shall be performed. The batteries under test shall be recorded using video (at
not less than 1080p 30 frames per second) and thermal cameras while subject to the following
nail penetration tests. Recordings shall not cease until 10 minutes following the impact of the
last nail in the test.
Single penetration test

- Fully charge the battery in accordance with 4.6; use of 4.6.3 is permitted.
- Place the batteries on a surface that will not inhibit the movement of the nail
- Mark a random location on each test sample to be penetrated, avoiding any critical areas.
- Batteries shall be placed on a resistive load of 30Ω +/- 10%.
- Use an 8D stainless steel nail with a length that exceeds the width or diameter of the battery. Drive the nail through the samples so that the nail protrudes through both sides of the battery.
- Record for each test: the date, time, place, ambient and battery temperatures, (not less often than once per 15 seconds), and any events (e.g. smoke, fire, cell activity, and disassembly) along with the event time and associated event severity.
- Batteries shall meet the requirements of section 3.7.2.8.

Add:

4.7.4.13 Weapons characterization.

The following test shall be performed for weapon / bullet impact characterization. Refer to notes in section 6.13.

- Fully charge batteries in accordance with 4.6; use of 4.6.3 is permitted.
- Orientate the battery as shown in Figure 8.
- Mark at government designated location(s) on each test sample to be shot. Ensure, at a minimum, one cell will be impacted.
- Conduct each of the tests below targeting the spots marked in step c. Batteries shall be placed on a resistive load of 30Ω +/- 10%. Muzzle velocity shall be 2390 FPS (+/- 800 FPS). Distance shall be not less than 20 feet and not greater than 100 ft. from battery to firing device.
- Batteries shall be placed on top of a ballistic plate, inside an approved pouch, and backed by ballistic clay or a sand bag, etc.
- At the completion of each test verify compliance with 3.7.2.8.3.
g. Record battery output with a 30Ω +/- 10% load for not less than 4 minutes after each penetration to categorize power output capability post impact. Note, battery safety protocols are overall more important than battery power output.

h. Capacity (if any) should be measured at a minimum 2, 5, and 10 minutes post bullet impact.

Batteries shall be charged to 100% state of charge unless designated otherwise. Power output with an 30Ω +/- 10% load should be checked before and after (30 second intervals – minimum of 2 minutes) bullet impacts to assist with the probability of continued power from the battery. Power from the battery is no longer a requirement over battery safety, however, it shall be tracked and generally quantified so Soldiers can have a knowledge and general expectation of what to expect post an impact.

Test configurations (Battery orientation with primary power connector facing top to left when viewed from weapon – when looking at a compass, this would be West orientation on Front Face) – Other orientations are possible as dictated by the Government), Angles of impact:

1) Straight on shot (Battery perpendicular to weapon shot)
2) 45 Degrees Left Side Impact (Rotate Stand on vertical axis 45 degrees clockwise)
3) 45 Degrees Right Side Impact (Rotate Stand on vertical axis 45 degrees counter clockwise)

The batteries under this test shall be recorded using videotape for a minimum of 10 minutes after the battery is shot.

Initial Potential Threats for Evaluation (subject to Government selection of current threats):

A) 7.62x54 mm API Tracer Round
B) 7.62x54 mm API Round
C) 7.62x54 mm Trace Round
D) 7.62x54 mm Ball Round
E) 7.62x39 mm API Tracer Round
F) 7.63x39 mm API BZ Round
G) 7.62x39 mm Tracer Round
H) 7.62x39 mm Ball Round (e.g. PS1943)
I) 5.56x39 mm Tracer Round
J) 5.56x39 mm Ball Round
K) Others…
Add: 4.7.4.13.1 Multiple bullet penetration.

Following the procedures in 4.7.4.13 above, at the Government’s discretion, select two areas for bullet penetration test in two different quadrants of the conformal battery. Refer to Figure 9 as an example of battery quadrants. Each test of two rounds would count as just one of the 12 tests to be conducted, though multiple rounds are shot at the same CWB. The batteries under this test shall be recorded using videotape as called out in 4.7.4.13, but with 10 minutes post the 2nd shot and verifications shall meet the requirements of 3.7.2.8.3 and 3.7.3.8.3.
4.7.7 Electromagnetic interference.

Replace MIL-PRF-32383 4.7.7 with the following:

CWB EMI shall be characterized with a PM CCS GSS approved U.S. Army system such as a
Nett Warrior System as a load for the CWB. Conducted tests shall reflect battery contributions
shall be recorded and verified to not exceed that of MIL-STD-461. Note, the Government may
require personnel with security clearance or may conduct independent testing and adjudication
of independent test results.

CS114: Applicable if permanently integrated power cable is part of battery. Testing shall utilize
Aircraft (External or Safety Critical) level limits

CS115: Applicable if permanently integrated power cable is part of battery. Testing shall utilize
Aircraft (External or Safety Critical) level limits


RE101: Use the limites of FIGURE RE 101-1

RE102: Use limits of FIGURE RE102-4 from 2 MHz to 18 GHz for Navy Mobile &
Army

RS101: Not applicable

RS103. Testing shall utilize Aircraft (External or Safety Critical) level limits for 2 MHz to 18 GHz.

Add:

4.7.8 System level integration.

Verify through demonstration that the CWB can communicate its status over SMBus to the Nett
Warrior system:

1. Connect the CWB to the battery input port on an ISPDS-C.
2. Connect a 7W load representing the radio to one of the PAN ports of the ISPDS-C.
3. Connect a Nett Warrior EUD to the host port of the ISPDS-C.
4. Verify that the CWB information including State of Charge, State of Health, and Run-time
to empty can be displayed on the EUD by Jupiter or other power monitoring app.
5. Verify the information displayed on the EUD matches that displayed on the CWB State-
of-Charge/State-of-Health display.

Verify through analysis that the CWB does not include any design elements which prevent air
worthiness certification.
NOTE: Dimensions are in inches and degrees. Unless otherwise specified, tolerances are:
For distances +/- 0.01 inches
For angles +/- 0.05 degrees
6 NOTES.
Add:
Changes from previous issue: Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.
Add: (This section contains information of a general nature which may be helpful but is not mandatory)

6.1 Intended use.
Add: This battery is intended for use in the Nett Warrior and Integrated Visual Augmentation System. Please note that this battery shall be electromagnetically compatible with these systems. Such compatibility is no guarantee of similar compatibility with any other system. Electromagnetic compatibility with any other system needs to be evaluated separately, and in the case of failure, either that system will need to adjust to this battery or another battery will need to be developed.

6.3.12 Approved chargers.
Replace: 6.3.12 with the following
6.3.12 Approved chargers.
See 4.6.3.
Add: 6.9.1 Electromagnetic interference testing.
Verification requirements include electromagnetic interference tests of MIL-STD-461 with the battery connected to the system. Battery vendors will need to coordinate with the Project Manager, Close Combat Squad (PM CCS), in order to arrange to have their products evaluated in the system. Their address is: Project Manager, Close Combat Squad, ATTN: SFAE-SDR-CCS, 5966 12th Street, Building 1024, Fort Belvoir, VA 22060-5820.
Add: 6.12 Navy safety tests.
Navy safety tests of NAVSEA S9310-AQ-SAF-010 are required for this battery during first article testing. The test data provided from the testing will be used to evaluate applications for specific use devices and Navy platforms. Devices using this battery will require US Navy Safety Certification prior to use by Department of Navy and USMC users unless such certification has already been granted. Please consult with NAVSEA Instruction 9310.1 for further information.
Add: 6.13 Weapons Characterization
All weapons characterizations must be witnessed by PM CCS representatives.
For each test record the date, time, place, ambient and battery temperatures, (not less often than once per 15 seconds), and any events (e.g. smoke, fire, cell activity, and disassembly) along with the event time and associated event severity.
Add:

6.14 Nominal ratings.

The following are the nominal ratings for the battery described by this specification sheet. They are provided for information purposes. The following is nominal data for the 148 Watt-Hour Variant:

<table>
<thead>
<tr>
<th>Battery PIN:</th>
<th>M32383/4-3 (lithium ion) and M32383/4-4 (lithium polymer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type Classification:</td>
<td>BB-2525/U and BB-3525/U</td>
</tr>
<tr>
<td>Chemistry:</td>
<td>M32383/4-3 Li-Ion / M32383/4-4 Lithium Polymer</td>
</tr>
<tr>
<td>Color:</td>
<td>Tan 499</td>
</tr>
<tr>
<td>Weight (max):</td>
<td>2.6 lbs. (1180 grams)</td>
</tr>
<tr>
<td>Voltage Range:</td>
<td>10 - 20</td>
</tr>
<tr>
<td>Nominal Voltage:</td>
<td>14.8</td>
</tr>
<tr>
<td>Nominal Capacity:</td>
<td>10.0 Ah</td>
</tr>
<tr>
<td>Nominal Energy (new battery):</td>
<td>148 Wh at C/5</td>
</tr>
<tr>
<td>Battery Life:</td>
<td>≥ 224 cycles, ≥ 3 years</td>
</tr>
<tr>
<td>Rated power output:</td>
<td>≤ 148 W</td>
</tr>
<tr>
<td>Continuous load rating:</td>
<td>≤ 5.0 A</td>
</tr>
<tr>
<td>Inrush load rating:</td>
<td>35 A (915 μSEC) setting 33A test; 30A (≤52ms) 25A Test; 6.4A (≤500ms) 6.4A Test; 5.5 A (≤5000ms) 5.5 A Test; 5A Continuous</td>
</tr>
<tr>
<td>Charge temperature range:</td>
<td>20 to 50°C (-4 to 122°F)</td>
</tr>
<tr>
<td>Operating temperature range:</td>
<td>-20 to 50°C (-4 to 122°F)</td>
</tr>
<tr>
<td>Storage temperature range:</td>
<td>-32 to 71°C (-27 to 160°F)</td>
</tr>
<tr>
<td>MAX abusive temperature (non-operating):</td>
<td>93°C (199°F)</td>
</tr>
<tr>
<td>Connector:</td>
<td>Glenair connector Part Number 8070-1939-07ZNU6.7SY or TE Connectivity Part Number: 2828420-2 (7 position)</td>
</tr>
<tr>
<td>Overall Dimensions:</td>
<td>8.7 in. x 7.66 in. x 0.70 in.</td>
</tr>
<tr>
<td>Non-rechargeable equivalent:</td>
<td>N/A</td>
</tr>
<tr>
<td>Battery storage life:</td>
<td>&gt; 12 months of warehouse storage, without any maintenance.</td>
</tr>
</tbody>
</table>

Note 1: Maximum charge current for connector is 5A for connector (unless connector supports higher currents) and 5 Amps minimum with target of >7.5A minimum for bottom contacts to allow for more rapid charging in the future as chargers improve.
Add:

APPENDIX A
Excerpt from ADS-37A-PRF (28 May 1996)

Subsystem. A subsystem is a major functional element of a system, usually consisting of several components that are essential to the operational completeness of the subsystem. Subsystem examples include airframe, propulsion, guidance, navigation, and communication with reference to the air vehicle as the overall system. The terms system and subsystem are often used interchangeably in defining a functional element (e.g., flight control system/subsystem, environmental control system/subsystem, etc.)

TABLE I - PART A

<table>
<thead>
<tr>
<th>FREQUENCY (MHz)</th>
<th>MODULATION TYPE</th>
<th>FIELD STRENGTH (Vrms)</th>
<th>SAMPLE FREQUENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>.014-1.99</td>
<td>CW, AM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>2-19.9</td>
<td>CW, AM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>20-149.9</td>
<td>CW, AM, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>150-249.9</td>
<td>AM, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>250-499.9</td>
<td>AM, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>500-999.9</td>
<td>AM, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>1000-1999.9</td>
<td>AM, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>2000-3999.9</td>
<td>AM, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>4000-7999.9</td>
<td>AM, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>8000-9999.9</td>
<td>AM, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
<tr>
<td>10,000-40,000</td>
<td>CW, FM</td>
<td>200</td>
<td>Continuous Sweep</td>
</tr>
</tbody>
</table>

NOTES: CW = Continuous Wave
FM = Frequency Modulation. Below 1 GHz use a 20 kHz deviation modulated by 1 kHz tone, above 1 GHz use a 1 MHz deviation, modulated by a 10 kHz square wave.
AM = Amplitude Modulation. Modulated by 1000 Hz tone; 50% modulation

Figure 4A-9 . ADS-37A-PRF page 4
TABLE I-PART B

<table>
<thead>
<tr>
<th>FREQUENCY (MHz)</th>
<th>PW (μSEC)</th>
<th>PRF (Hz)</th>
<th>PEAK FIELD (V/m RMS)</th>
<th>AVERAGE FIELD (V/m RMS)</th>
<th>SAMPLE FREQUENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-24.9</td>
<td>833.3</td>
<td>300</td>
<td>204</td>
<td>102</td>
<td>25</td>
</tr>
<tr>
<td>150-249.0</td>
<td>200-250</td>
<td>200-300</td>
<td>3120</td>
<td>200</td>
<td>4</td>
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<tr>
<td>250-499.9</td>
<td>250-333</td>
<td>300</td>
<td>2830</td>
<td>200</td>
<td>6</td>
</tr>
<tr>
<td>500-999.9</td>
<td>333</td>
<td>100-300</td>
<td>3480</td>
<td>244</td>
<td>3</td>
</tr>
<tr>
<td>1,000-1999.9</td>
<td>1-20</td>
<td>670-1000</td>
<td>8420</td>
<td>200</td>
<td>6</td>
</tr>
<tr>
<td>2000-3999.9</td>
<td>250-600</td>
<td>21270</td>
<td>21270</td>
<td>336</td>
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<tr>
<td>4000-7999.9</td>
<td>250</td>
<td>21270</td>
<td>21270</td>
<td>336</td>
<td>3</td>
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<td>8000-9999.9</td>
<td>1.0</td>
<td>150-250</td>
<td>21270</td>
<td>336</td>
<td>2</td>
</tr>
<tr>
<td>10,000-40,000</td>
<td>1.0</td>
<td>1000</td>
<td>6892</td>
<td>200</td>
<td>6</td>
</tr>
</tbody>
</table>

NOTES: PRF = Pulse Repetition Frequency
PW = Pulse Width
AVERAGE FIELD = PEAK FIELD * SQRT(PW*PRF)

3.0 $E^3$ PERFORMANCE REQUIREMENTS

3.1 Safety Margins. $E^3$ safety margins shall be established for subsystems and equipment assigned to criticality types which would result in a catastrophic failure if susceptible to $E^3$. Flight subsystems and equipment shall have a safety margin of at least 6 dB. The safety margin for electroradioactive devices (EEDs) shall be 16.5 dB.

3.2 Electromagnetic Interference (EMI). All equipment and subsystems shall meet the requirements of MIL-STD-461 as modified by this document:

3.2.1. CE101, CE102, CS101, CS114, CS115, CS116, RE101, RE102, RS101 and RS103 apply to all equipment and subsystems.

3.2.2. CE106 shall apply to all antenna connected receivers and their associated amplifiers or pre-amplifiers. CE106 shall also apply for all transmitters, with their associated amplifiers or pre-amplifiers, in their standby or non-transmitting mode. Where testing to the CE106 requirement cannot be performed, the requirements of RE102 shall be met with the receiver, transmitter (in the standby or non-transmitting mode) or amplifier and associated antenna tested together.

3.2.3. CE106 shall apply to all antenna connected transmitters and associated amplifiers or pre-amplifiers in the transmit mode(s). Where testing to the CE106 requirement cannot be performed, the requirements of RE103 shall apply.

3.2.4. RS103 limits shall be changed to the levels and modulations specified in Table I, parts A and B.

3.3 Electromagnetic Compatibility (EMC). EMC is required among all subsystems and equipment internal to a system as well as between the aircraft and supporting subsystems external to the aircraft such as ground support equipment (GSE). All subsystems and equipment shall meet specified performance requirements when operated simultaneously with any single or multiple combination of subsystems and equipment's. This requirement applies for all specified modes of operation for each subsystem and equipment. A minimum 16.5 dB safety margin shall be provided for all EEDs.

Figure 4A – 10 ADS-37A-PRF page 5
JDS - Rev 11 Nov 2019
APPENDIX B:

Conformal Wearable Battery

Suggested Pin Connector Socket Care & Cleaning Guide

Introduction:

As a battery carrier it is a primary responsibility to protect and insure the operability of the battery(s) you carry. The pin connector socket (PCS) is the critical inter-connect used to provide power to devices, as such it needs to be protected from damage and contamination.

The PCS is especially susceptible to Damage and Contamination by Moisture, Salt Water, Dirt, and Dust. The PCS is also susceptible to "Plugging" when it is exposed to mud, snow and ice. As the battery carrier you should make every attempt to avoid or protect against these damaging contaminates, in the event you cannot, this guide will help you to restore the PCS to a serviceable condition.

Protecting the Pin Connector Socket:

Connector Nomenclatures

Figure 1.0

Figure 2.0
By understanding the damage threats listed above you can easily protect the PCS.

When provided / When possible:

1. Avoid removing the protective PCS cover (cap) unless you are installing a mating connector.
   a. If a PCS plug is not available, always “Ruck” your battery(s) in a water proof or water protective bag or wrap.

2. Always try to keep the PCS covered when not in use.

3. Always try to store a battery in a protective wrap, specifically protecting the PCS and charging terminals.
   a. Make every effort to prevent exposer by the damage threats listed above.
   b. Improvise and protect; a foam ear plug works, tape covering works…

4. When possible, battery your Conformal Wearable Battery (CWB) PCS down, allowing it to expel potential contaminates should the PCS cap / cover be lost.

User Damage Avoidance:

• Avoid using a contaminated PCS, (quick clean if possible).
• Avoid forcing a mating connector into the PCS.
• Avoid inserting anything into pin well sockets of a PCS.
  o Never attempt to clean a pin socket by pushing an object into the socket.

General PCS Care:

1. Weekly, you can care for a dry PCS by turning it down, using dry soft bristle brush in circular motion, brush away any dry contamination or dust from the socket well and pin wells.

2. Periodically, a silicone spray (WD40) can be lightly applied to protect and lubricate the socket wells.

Cleaning a Contaminated Pin Connector Socket:

1. Visually inspect the PCS and the pin wells to determine what type or condition of contamination has occurred. There three main types of contamination:
   • Wet.
   • Dry Crystalized.
   • Plugs.
     o Moist plug (wet mud or snow).
     o Dry plug (dry mud).
     o Ice Plug.
Wet Contamination:

Other than rain water, it should be assumed whenever the PCS gets wet it is contaminated. Quickly as possible the PCS should be cleaned and dried.

Using about two (2) ounces of clean potable water (drinkable water) and not more than four (4) ounces execute a *wet flush* cleaning of the PCS:

1. Orient the CWB with the connector in the up position.

2. Pour clean potable (drinkable) water into the connector socket well (CSW), if possible, stop when a water dome is created above the socket well.
   a. If available, other none abrasive minor solvents such as glass cleaner or rubbing alcohol can also be used.
   b. A hand pump spray bottle can also be used, do not over force the spray into the pin wells.
   c. If a solvent is used, the CSW should still be rinsed with water a few times (3 times) to remove any solvent residue.

3. Once the CSW is full, gently tap your finger over the CSW causing an agitation effect, give the water 5 – 10 taps causing pressure to loosen any contamination.
4. Turn the CWB connector down and allow the flush water to drain.

5. Continue this process at least six (6) times, visually inspect the CSW / PCS and determine if it is clean. If it is clean proceed to step #6 below, if it is not clean, repeat steps #1 - #5 above until clean.

**NOTE:** The CSW holds about 1/8 of a teaspoon of fluid, this means two (2) ounces of water will serve about 96 wash cycles. In most cases the CSW should be clean after six (6) wash cycles.

6. With the CSW clean, take a piece of fabric or other absorbent material and dab the CSW / PCS until dry. (a clean rifle patch is good for this effort).

7. **OPTIONAL – TIME ALLOWING:** do a quick connect of the CWB into the NETT Warrior system (or other power requirement) to assure serviceability of the CWB – Cleaning is complete.

8. Secure the clean CWB in a safe dry location, readied for use when needed.

**Dry Crystalized Contamination:**

1. Dry Crystalized should be easily visible but may also require close inspection of the pin socket wells.
   a. Always inspect the pin socket wells for dried stuck crystalized contamination (example – dried salt water).
      i. Crystalized contamination in the pin sockets is a serious concern and may prevent a serviceable power / communications connection.

2. Using a medium stiffness bristle dry brush, plastic rifle cleaning brush is recommended (avoid use of a metal brush), brush the CSW in circular motion to remove as much contamination as possible.
   a. Crystalized contamination may not be completely removed. Dry brushing will help to clean the main PCS / CSW area allowing for a successful wet flush clean, executing step 2 shall occur before attempting a wet flush method as described under the wet contamination section.
3. Once the dry brushing will not remove any more contamination, follow the “Wet Contamination” procedure above.

**Plugs:**

**Moist plug / Dry plug:**

1. Using a small stick (tooth pick, nail, wire ...) with very genital efforts remove as much of the plug mass as possible.
   a. Do not push the plug mass into the pin wells, the wet flush cleaning method should be able to remove the mass from the pin wells.
   b. Avoid forcing a mating connector into the PCS when contamination exists.

2. Once the as much of the plug mass as possible is removed proceed to the “Wet Contamination” procedure above.

**Ice Plug:**

1. Place the CWB in a warm dry environment with the connector down in a drainable position allowing the ice plug to melt and drain away from the CSW.
   a. Always assume the ice plug is a contaminant.

2. Once the plug has melted proceed to the “Wet Contamination” procedure above.

- Document End -

Custodians:       Preparing activity:
Army – CR       Army – CR
(Project Number 6140-2015-001)

Review activities:
DLA – CC

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil
Section | Change Made
--- | ---
3.0 | Type and PIN removed
3.0 | "Transit drop, normal" updated to grey (N/A) and "Nail Penetration, cell" is applicable- updated to black
3.11 | New Section added to describe requirement for system level integration
3.6 | Environmental requirements table (Table I) added and revised
3.7 | changed should to shall
4.4 | Table IV updated to reflect group updated and paragraph name/number changes
4.4 | Table IV, System level integration added to FAT table
4.5 | updated test requirements about sampling
6.13 | Weapons characterization note added
6.16 | pulse load rating changed to inrush load rating
2.2.1 | MIL-STD-1275 deleted
2.2.2 | ANSI/ASQ Z1.4 deleted
3.2.1 | Required certifications added:
3.2.1 | *Nett Warrior connector disconnect pull force (3.4.4.1.1.1)
3.2.1 | *Flat terminal (3.4.4.1.2)
3.2.1 | *High temperature temporary cutoff (3.7.2.4)
3.2.1 | *Protective devices (3.7.2.8.4)
3.4.4.1.1 | Name updated from Connector to Nett Warrior connector
3.4.4.1.1.1 | name updated from connector disconnect pull force to nett warrior connector disconnect pull force
3.4.4.1.5 | Paragraph number updated from 3.4.4.1.3 to 3.4.4.1.5
3.4.4.1.5 | Requirements paragraph updated
3.4.4.1.5 | step c was edited, word concurrent was deleted
3.4.5 | Battery case requirement paragraph updated
3.4.5 | Requirement updated
3.4.5.6 | MIL-STD-130 was added in replace of MIL-STD-1472
3.4.5.6 | Surface friction requirement paragraph updated (last sentence added)
3.4.6.9 | paragraph number and name updated from 3.4.6.6.3 Terminal marking to 3.4.6.9 Net warrior connector marking
3.4.8.1 | Additional information added about dust cap/cover
3.5.11 | Added second paragraph
3.5.3 | Test capacity Requirements table was updated to show correct requirement and test method paragraph numbers
3.5.5 | note deleted
3.5.5 | Start in step 6 was updated to fect the correct time of 2 seconds
3.5.8 | Paragraph name updated from State of charge/state of health indicator display characteristics to digital display characteristics
3.5.8 | Requirement paragraph updated to include RTTE and RTTF characteristics
3.5.8 | Safety requirements paragraph added
3.5.8 | changed paragraph number from 3.7.2.8.1 to 3.7.2.2 (11/19 version)
deleted | addition to overcharge / electrical leakage requirements added to 3.7.2.2.1
3.7.2.2.1 | Overvoltage protection requirement added
3.7.2.4 | certification added
3.7.2.8 | Safety section added
3.7.2.8.1 | paragraph number changed from 3.7.2.8 to 3.7.2.8.1
3.7.2.8.1 | requirements reference added
3.7.2.8.1 | requirements paragraph updated to reflect "SOH should be reported as flashing "000""
3.7.2.8.3 | paragraph name changed from bullet penetration to weapons characterization test
3.7.2.8.4 | requirements added to reflect the addition of three protective devices
3.7.2.8.4 | name updated from pack safety protection circuits to battery safety protection circuits
3.7.2.8.4 | Changed last sentence from "protecting the output terminal" to "protecting all of the terminals"
4.5.1 | Immersion added to Group A inspection (modified)
4.5.2 | add SMBus to Table VI
4.6.1 | test requirements updated
4.7.1.3.1 | name updated from connector disconnect pull force test to nett warrior connector disconnect pull force test
testing requirements updated
4.7.1.3.1 | testing requirements updated
4.7.2.11 | Note removed
4.7.2.14 | name updated from state-of-charge/state of health (SOC/SH) display to digital display characteristics
test methods updated
4.7.2.15 | test methods updated
4.7.2.16 | removed step e.
defined which connector (Nett Warrior), modified test protocol
4.7.2.17 | added test requirement paragraph for USB power port connectors
4.7.3.8.1 | Added Group A testing only
4.7.3.8.1 | Modified test protocol for Group A
testing paragraph updated
4.7.4.13 | Weapons characterization test updated- will be a contractor test
4.7.4.13 | name updated from bullet penetration to weapons characterization
testing paragraph updated
4.7.4.13.1 | paragraph number changed from 4.7.4.13.2 to 4.7.4.13.1
4.7.4.7 | replacing step f.
4.7.4.7.1 | addition of overvoltage protection verification method
4.7.7 | RE102 changed
4.7.8 | System level integration testing paragraph updated
4.7.8 | Defined system level integration test
6.9.1 | content added

Figure 7 | Deleted notches.

Section 6 | from the previous version sections 6.13, 6.9, 6.14, and 6.15 were removed

Throughout the whole document- test paragraph numbers and requirement paragraph numbers were updated in each appropriate section.
PROPOSED AMENDMENT:

1. The Government is projecting the procurement of 945,987 Conformable Wearable Batteries (CWB) over the course of a three year base period and six, one-year options for a potential contract duration of nine years. These are estimates and are subject to change. The official solicitation that will be posted will trump any conflicting information.

2. The Government will employ a source selection process that will require total of four (4) hardware samples in conjunction with a written technical proposal. One (1) hardware sample must be unsealed, but contains the actual layout of all the internal components. Inert (dummy cells) must be used for this sample. Three (3) Hardware samples will be tested to validate the design and performance characteristics as described in the written proposal. The testing will evaluate the following Criteria, and the protocol will be defined in the Bid Sample Test Plan attached to the solicitation.

<table>
<thead>
<tr>
<th>Test</th>
<th>MIL-PRF 32383/4 Para.</th>
<th>Hardware Sample Test/Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>4.7.1.2</td>
<td>Width ≤7.66 in, Height ≤8.70 in, Depth 0.50 to 0.700 in</td>
</tr>
<tr>
<td>Weight</td>
<td>4.7.1.2</td>
<td>≤ 2.6 lbs.</td>
</tr>
<tr>
<td>SMBus Communication</td>
<td>3.5.9</td>
<td>-</td>
</tr>
<tr>
<td>Capacity Discharge</td>
<td>3.5.3</td>
<td>@18 W and 24 °C</td>
</tr>
<tr>
<td>Low Temperature</td>
<td>3.5.3</td>
<td>@18 W and 24 °C</td>
</tr>
<tr>
<td>Low Temp Charge</td>
<td>3.5.10.1</td>
<td>3 Amps @ -20 °C, 130Wh</td>
</tr>
<tr>
<td>High Temp Charge</td>
<td>3.5.10.1</td>
<td>3 Amps @ +50 °C, 130Wh</td>
</tr>
<tr>
<td>USB Charging</td>
<td>3.4.4.1.5</td>
<td>USB BC1.2 specification</td>
</tr>
<tr>
<td>Flexibility</td>
<td>3.6.10</td>
<td>.5” bend in each axis and direction, 10 times</td>
</tr>
</tbody>
</table>