

INCH-POUND

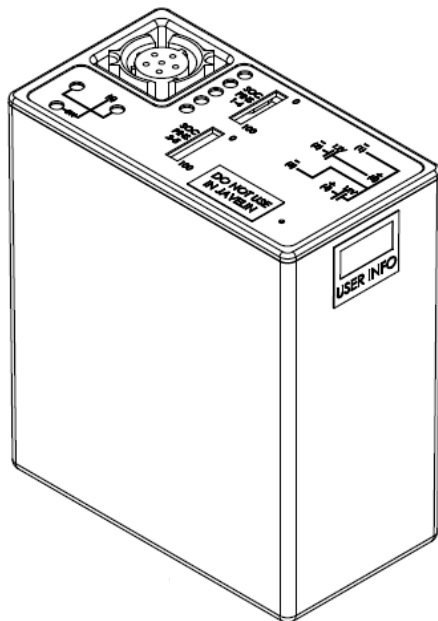
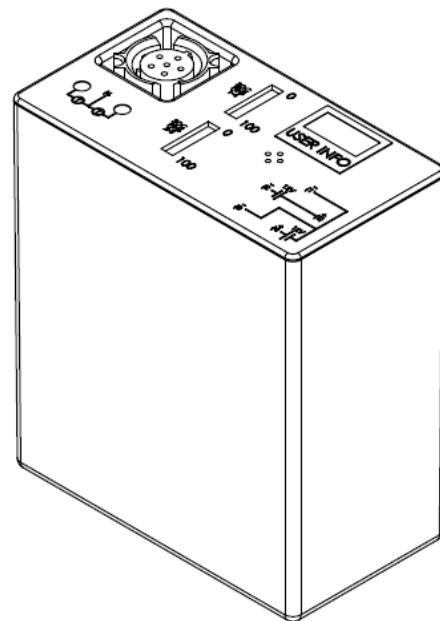
MIL-PRF-32383/3

16 June, 2011

## PERFORMANCE SPECIFICATION SHEET

## BATTERY, RECHARGEABLE, SEALED, BB-2590()/U, BB-390()/U, AND BB-3590()/U

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

FIGURE 1. BB-2590()/U and BB-3590()/UFIGURE 2. BB-390()/U

## FIGURE 1 &amp; 2 NOTE:

Approximate size: 5in x 2.5in x 4.4in. See FIGURE 3 and FIGURE 4 for exact dimensions.

## REQUIREMENTS

BB-390()/U Type – II (see 1.2 for classification) PIN – M32383/3-2 (see 1.3 for PIN)

BB-2590()/U Type – III (see 1.2 for classification) PIN – M32383/3-3 (see 1.3 for PIN)

BB-3590()/U Type – IV (see 1.2 for classification) PIN – M32383/3-4 (see 1.3 for PIN)

## MIL-PRF-32383/3

**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:

Inspection	Requirement Paragraph	Test Method Paragraph	Applicability		
			BB-390()/U	BB-2590()/U	BB-3590()/U
Multilayer finish	3.4.4.1.3	Certification	Yes	Yes	Yes
<i>Gold plating</i>	<i>3.4.4.1.4</i>	<i>Certification</i>	<i>No</i>	<i>No</i>	<i>No</i>
Motor inrush current	3.5.5	4.7.2.12	No	Yes	Yes
Charge enable <u>1/</u>	3.5.6	4.7.2.6	No	Yes	Yes
SMBus <u>1/</u>	3.5.9	4.7.2.14, 4.7.2.15	No	Yes	Yes
Immersion, shallow <u>1/</u>	3.6.6	4.7.3.8.1	Yes	Yes	Yes
<i>Immersion, deep</i>	<i>3.6.6</i>	<i>4.7.3.8.2</i>	<i>No</i>	<i>No</i>	<i>No</i>
Transit drop, normal	3.6.7	4.7.3.9.1	Yes	No	No
Transit drop, severe	3.6.7	4.7.3.9.2	No	Yes	Yes
<i>Drop while mated</i>	<i>3.6.7</i>	<i>4.7.3.9.2</i>	<i>No</i>	<i>No</i>	<i>No</i>
Nail penetration, cell	3.7.1.2	4.7.4.4	No	Yes	Yes
Crush, cell	3.7.1.3	4.7.4.5	No	Yes	Yes
Projectile	3.7.2.6	4.7.4.11	No	Yes	Yes
Lithium Battery Safety Program (US Navy) Tests (Group 4)	3.7.2.7	4.7.5	No	Yes	Yes
<i>Electromagnetic interference (Group 2)</i>	<i>3.8</i>	<i>4.7.7</i>	<i>No</i>	<i>No</i>	<i>No</i>

1/ As modified herein

**Details:** The following are details specific to M32383/3-x including those referenced in MIL-PRF-32383 as “specified”.

1. Dimensions and weight (3.4.3)

Dimensions: See FIGURE 3 and FIGURE 4

Maximum weight: BB-390()/U 4.2lb

BB-2590()/U 3.2lb

BB-3590()/U 4.2lb

2. Battery connector and electrical interfaces (3.4.4)

Connector : SC-C-179495 (or equivalent).

The face of connector shall be flush to .031 inch below top of battery

Mating connector: N/A

Multilayer finish: Flat contacts shall be brass with multilayer finish

Gold plating: N/A

Battery charger adapter: J-6538B/P

3. Battery case vent (3.4.5.3)

See FIGURE 3 and FIGURE 4 for quantity and location.

4. Markings (3.4.6)

See FIGURE 3 and FIGURE 4.

## MIL-PRF-32383/3

5. Instructions / notes (3.4.6.5)  
See FIGURE 3 and FIGURE 4.
6. Simplified battery label (3.4.6.6)  
The simplified battery label location is optional. It shall be sized to remain legible.
7. Battery condition for shipping (3.4.8)  
The instruction card shall at a minimum contain operation, storage, handling, maintenance, and warranty (if applicable) information.
8. Battery voltage (3.5.2)

Battery open circuit voltage:

Battery	Minimum		Maximum	
	Single / Parallel	Series	Single / Parallel	Series
BB-390()/U	7V	14V	15.5V	31V
BB-2590()/U	10V	20V	16.5V	33V
BB-3590()/U	10V	20V	16.5V	33V

## MIL-PRF-32383/3

9. Capacity (3.5.3)

Minimum final voltage: 20 volts (series mode)

Each battery, discharged at the specified rate to minimal final voltage, shall have the following minimum capacity:

Test	Requirement Paragraph	Test Method Paragraph	Discharge Rate (A)	Minimum Capacity (Ah)		
				BB-390	BB-2590	BB-xx90
Capacity discharge	3.5.3	4.7.2.3	2	4.6	7.5	10
Cycle life (224 <sup>th</sup> cycle)	3.5.3.1	4.7.2.4	2	2.3	6.5	9
High rate discharge <u>1/</u>	3.5.3	4.7.2.5	10	3	6.5	9
Low temperature discharge <u>1/</u>	3.5.3	4.7.2.7	2	3	6.5	9
High temperature discharge	3.5.3	4.7.2.8	2	3.6	6.5	9
Motor inrush current <u>1/</u>	3.5.5	4.7.2.12	See detail 9	3	6.5	9
Charge acceptance	3.5.10.1	4.7.2.9	2	4	6.5	9
Retention of charge	3.5.6	4.7.2.10	2	4	6.5	9
Pulse discharge <u>2/</u>	3.5.3	4.7.2.11	See detail 19	7	10.5	13
Extreme low temperature discharge	3.6.1	4.7.3.2	2	2	5.5	8
Extreme high temperature discharge	3.6.1	4.7.3.3	2	2	5.5	8
Thermal shock (post-test)	3.6.3	4.7.3.5	2	4.6	7.5	10
Mechanical shock (post-test)	3.6.3	4.7.3.6	2	4.6	7.5	10
Vibration (during test)	3.6.5	4.7.3.7	0.8	4.6	7.5	10
Battery storage life	3.6.8	4.7.3.10	2	3	6.5	9
Overcharge/electric leakage (post-test)	3.7.2.2	4.7.4.7	2	3.6	8	10.5
Short circuit protection (post-test)	3.7.2.3	4.7.4.8	2	4.6	7.5	10
High temperature temporary cut off	3.7.2.4	4.7.4.9	2	4	6.5	9

1/ Minimum voltage for BB-390()/U is 18V series

2/ Parallel mode; minimum final voltage is 10V, minimum final voltage for BB-390()/U is 9V

## MIL-PRF-32383/3

10. Motor inrush current (3.5.5)

The discharge profile shall be no less than as follows.

Step	Start time	End time	Current (A)
	(minute:second:millisecond)		
1	00:00:000	<b>05:00:000</b>	5
2	<b>05:00:000</b>	05:00: <b>010</b>	22.5
3	05:00: <b>010</b>	05:00: <b>020</b>	20
4	05:00: <b>020</b>	05:00: <b>030</b>	19
5	05:00: <b>030</b>	05:00: <b>040</b>	18
6	05:00: <b>040</b>	05:00: <b>060</b>	17
7	05:00: <b>060</b>	05:00: <b>100</b>	16
8	05:00: <b>100</b>	05:00: <b>175</b>	15
9	05:00: <b>175</b>	05:00: <b>325</b>	14
10	05:00: <b>325</b>	05:00: <b>575</b>	13
11	05:00: <b>575</b>	05:00: <b>850</b>	12
12	05:00: <b>850</b>	05: <b>01:000</b>	11
13	05: <b>01:000</b>	<b>10:00:000</b>	10
14	Repeat steps 1 through 13		
15	<b>20:00:010</b>	Until cutoff voltage	5

11. Charge enable (3.5.4)

For BB-2590()/U and BB-xx90/U batteries, the charge enable terminal shall comply with the following:

- a. Maximum charge without enable: 400 mA
- b. Equivalent resistor: 235  $\Omega$
- c. Equivalent diode  $V_F$ : 1.3 V
- d. Approximate activation current: 7 mA

12. High temperature temporary cut off devices (3.7.5).

There shall be not less than four temporary cut off devices complying with 3.7.5.

13. High temperature permanent cut off devices (3.7.6).

For BB-390()/U batteries there shall be not less than two permanent cut off devices complying with 3.7.6. For BB-2590()/U and BB-xx90/U batteries there shall be not less than two permanent cut off devices complying with 3.7.6.

14. Electromagnetic compatibility (3.8):

N/A

15. Constant potential, current limited (4.6.1).

A constant potential of 16.5 volts shall be applied to each battery section independently with current limited to 3 amperes, to a charge cut off of 100 milliamperes.

## MIL-PRF-32383/3

16. Constant current (4.6.2).

Constant current charging is divided into two stages as follows:

- a. Fast-charge each battery section independently at  $4.3 \pm 0.3$  amperes until either the battery reaches 16.5 volts or a negative voltage drop is detected;
- b. Topping charge is in two parts: (1) continue charge at  $480 \pm 5$  milliamperes for not greater than 2 hours, then (2) charge at  $230 \pm 5$  milliamperes until the total charge capacity reaches 6.9 amp-hours.
- c. Rest periods during charge are permitted but not required, provided the total charge time is not more than 5 hours.

17. Alternate charging (4.6.3).

The following methods may be used whenever the general specification allows use of alternate charging:

- a. BB-390()/U:  
Charge fully discharged batteries in the 24-volt mode at 480 ma constant current for 12 hours.
- b. BB-2590()/U and BB-3590()/U:  
Charge each section independently with a constant potential of 16.5 volts and current limit of 3 amperes max.

18. Capacity discharge (4.7.2.3).

Discharge at 2A in series mode.

19. Cycle life test (4.7.2.4).

All cycles shall be at a 2A discharge rate.

20. Pulse discharge (4.7.2.11).

Discharge with the battery sections connected in parallel with 36 amperes for 5 seconds followed by 25 seconds off load.

21. Overcharge/electric leakage (4.7.4.7).

Charge in parallel mode at 4.0 amperes with a charge voltage limit of 40 volts during the 21-hour overcharge period of 4.7.4.7b. Discharge batteries at a constant 2A load to final voltage in step 4.7.4.7e.

22. Electromagnetic interference (4.7.7).

N/A.

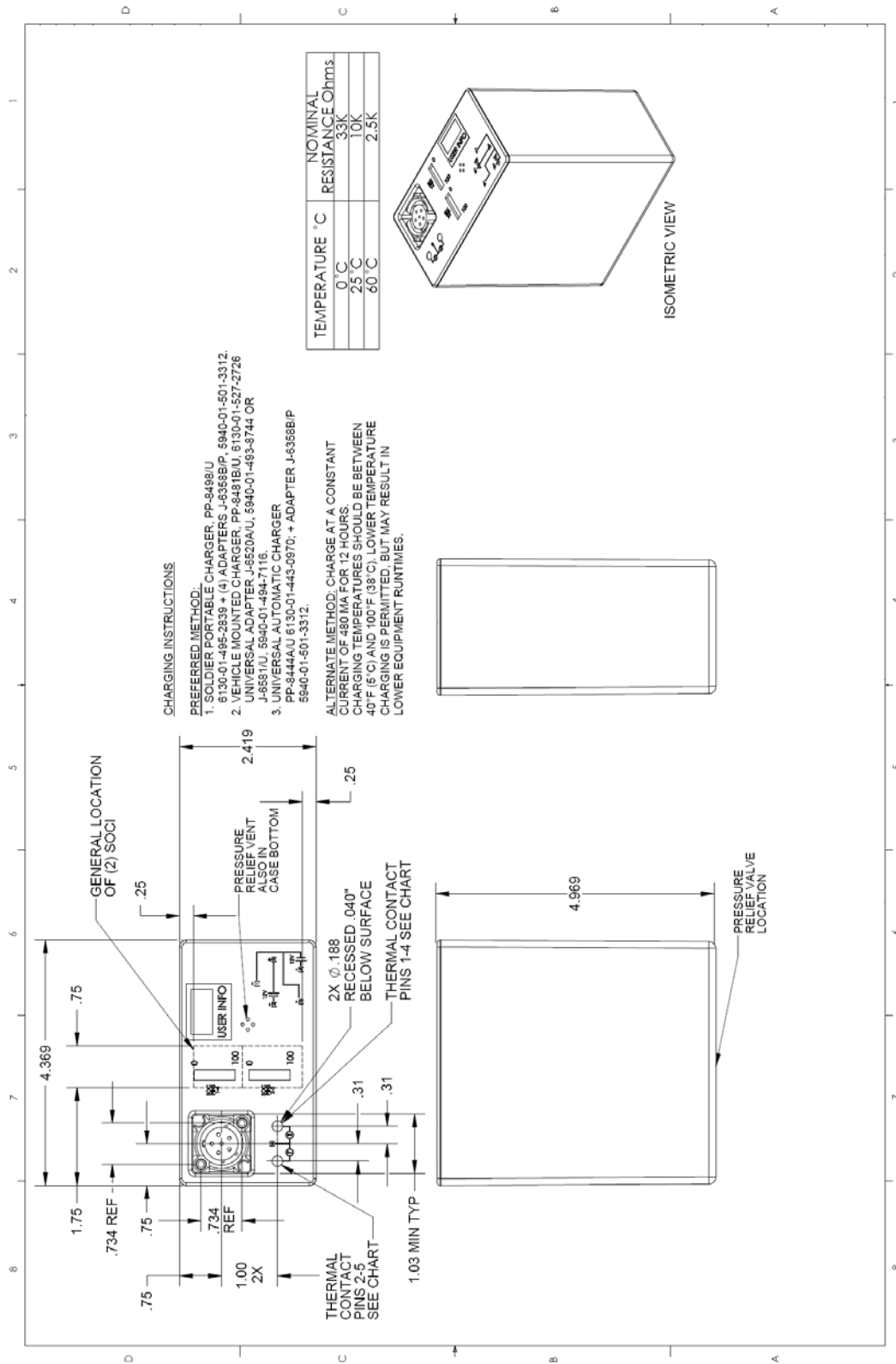
VARIANCES: Each battery shall comply with MIL-PRF-32383 except as follows.

- A. State-of-charge display characteristics (3.5.7.2). For BB-390()/U batteries ONLY, modify as follows:

Delete:		Replace with:	
SEGMENTS	STATE OF CHARGE	SEGMENTS	STATE OF CHARGE
0	= 0% (Fully Discharged)	0	= 0% (fully discharged)
1	= 1 to 20%	1	= 0 to 24%
2	= 21 to 40%	2	= 25 to 42%
3	= 41 to 60%	3	= 43 to 65%
4	= 61 to 80%	4	= 66 to 92%
5	= 81 to 100%	5	= 93 to 100%

MIL-PRF-32383/3

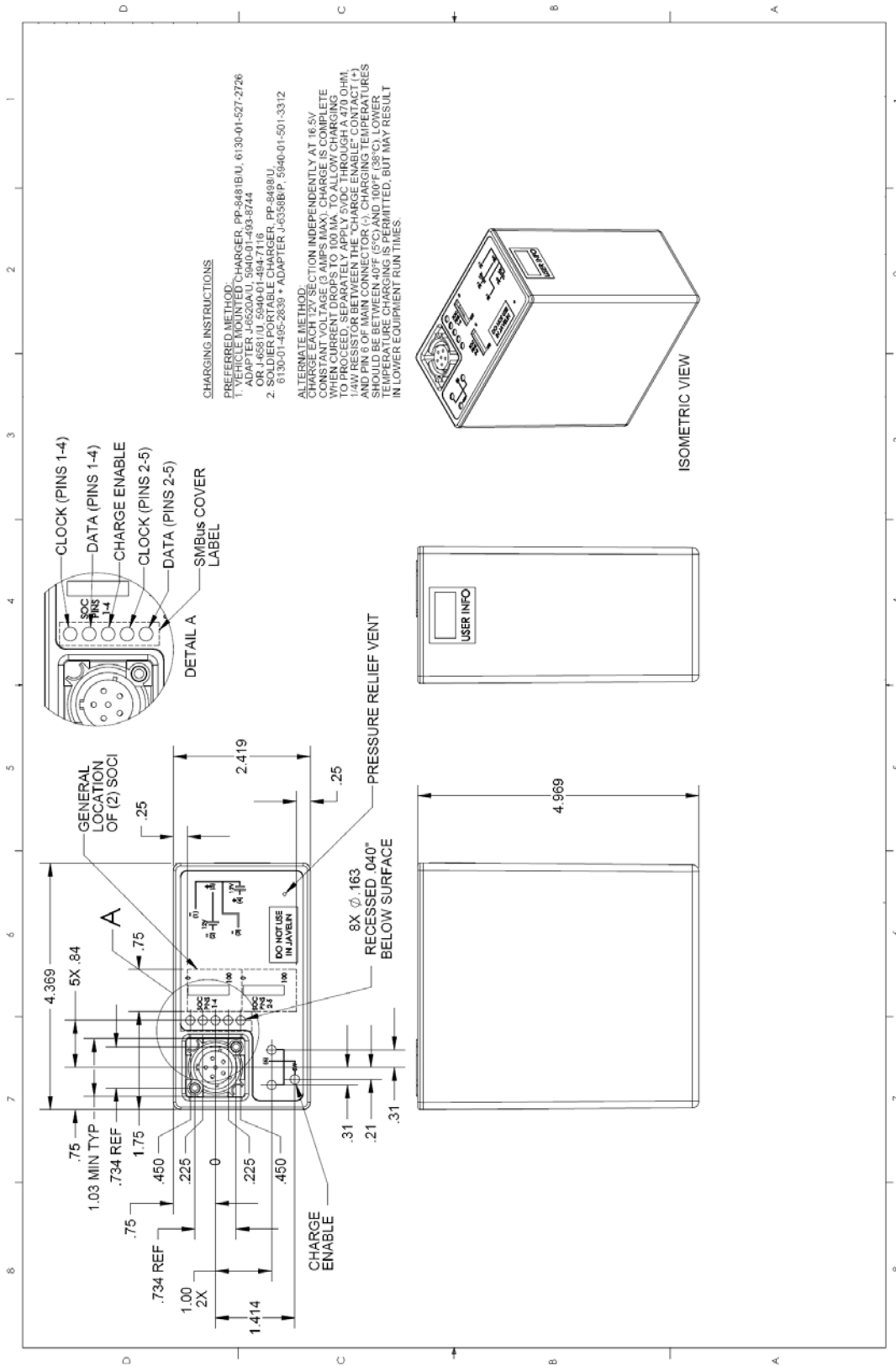
ADDITIONAL FIGURES



Note: Dimensions are in inches. Tolerance is ± 0.031 inches.

FIGURE 3. BB-390

MIL-PRF-32383/3



Note: Dimensions are in inches. Tolerance is ± 0.031 inches.

FIGURE 4. BB-2590 and BB-3590



## MIL-PRF-32383/3

NOTES: (This section contains information of a general nature which may be helpful, but is not mandatory)

Nominal ratings: The following are the nominal ratings for the battery described by this specification sheet. They are provided for information purposes.

<b>Battery PIN: M32383/3</b>	<b>-2</b>	<b>-3</b>	<b>-4</b>
<i>Type Classification:</i>	BB-390()/U	BB-2590()/U	BB-3590()/U
<i>Chemistry:</i>	Ni-MH	Li-Ion	Li-Po
<i>Color:</i>	Green	"Desert tan"	"Earth Yellow"
<i>Weight (max):</i>	4.2 lbs (1.9 kg)	3.2 lbs (1.5 kg)	4.2 lbs (1.9 kg)
<i>Voltage Range:</i>	14-31	20-33	20-33
<i>Nominal Voltage:</i>	24	28.8	28.8
<i>Nominal Capacity:</i>	4.6 Ah	7.4 Ah	10 Ah
<i>Nominal Energy (new battery):</i>	110 Wh	213 Wh	288 Wh
<i>Rated power output:</i>	≤ 180 W	≤ 200 W	≤ 200 W
<i>Battery Life:</i>	≥ 224 cycles, ≥ 3 years		
<i>Continuous load rating:</i>	≤ 10 A		
<i>Pulse load rating:</i>	≤ 36 A (5 SEC)		
<i>Charge temperature range:</i>	-4 to 122°F (-20 to 50°C)		
<i>Operating temperature range:</i>	-22 to 140°F (-30 to 55°C)		
<i>Storage temperature range:</i>	-4 to 122°F (-20 to 50°C)		
<i>MAX abusive temperature: (non-operating):</i>	199°F (93°C)		
<i>Connector:</i>	SC-C-179495		
<i>Overall Dimensions:</i>	~ 5 in. x 2.5 in. x 4.4 in.		
<i>Non-rechargeable equivalent / Specification:</i>	BA-5590()/U and BA-5390()/U / MIL-PRF-32271/1		
Note 1: BB-390()/U requirements were structured around low self discharge cells			
Note 2: BB-2590()/U requirements were structured around 2.6Ah 18650 cells.			

Other data:

Navy safety tests of NAVSEA S9310-AQ-SAF-010 are required for the BB-2590()/U and the BB-3590()/U batteries during first article testing. The test data provided from the testing will be used to evaluate applications for specific using devices and Navy platforms. Devices using this battery will require US Navy Safety Approval prior to use by Department of Navy users unless such approval has already been granted. Please consult with NAVSEA Instruction 9310.1 for further information.

Custodians:  
 Army – CR  
 Navy – MC  
 Air Force – 99

Preparing activity:  
 Army – CR  
 (Project Number 6140-2010-012)

Review activities:  
 Navy – AS, SH  
 Air Force – 71  
 DLA – CC

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