

System Safety Engineering

Battery Safety

Battery Safety Reference Guide

This guide contains practical safety related information for users of CECOM LCMC supported batteries or equipment using these batteries.

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Secondary (Rechargeable) Batteries

New Secondary (Rechargeable) Batteries are being fielded every year that are equivalent to Primary (Non-Rechargeable) Batteries. If you want to find out the current list of Rechargeable batteries available go to the following website: <http://ww.monmouth.army.mil/cecom/lrc/lrchq/power/rechargebat.html>

Primary Batteries

Go to <https://lrcteams.monmouth.army.mil/ipm> and go to the battery support section to find further information on the batteries available in the Government inventory

AN/PSN-11 GPS PLGR External Power Connection Requirements

A failure mode of the AN/PSN-11 GPS PLGR has been linked to the improper installation of the wiring harness of the PLGR to the host vehicle. If the host vehicle has two batteries in series and the PLGR connection is made ONLY to the battery not connected to vehicle ground, the PLGR ground will not be the same as vehicle ground. This difference can cause an internal hardware failure inside the PLGR which will cause the memory battery to receive a charge from the host vehicle battery. The Lithium 3.6VDC PLGR memory battery will explode when charged. This deflagration can cause significant bodily harm and equipment damage. The following information is provided for proper installation procedures:

1. The PLGR can be installed into a host vehicle using 9-33 VDC power input.
2. The host vehicle typically has two batteries installed in series. Figure 1 shows two 12 volt batteries in series, providing 24 volts DC.

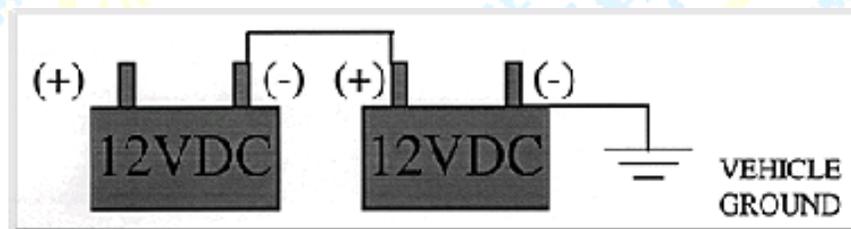


Figure 1 Two 12 Volt Batteries in Series

3. Figure 2 shows three ways to connect the PLGR to the batteries.

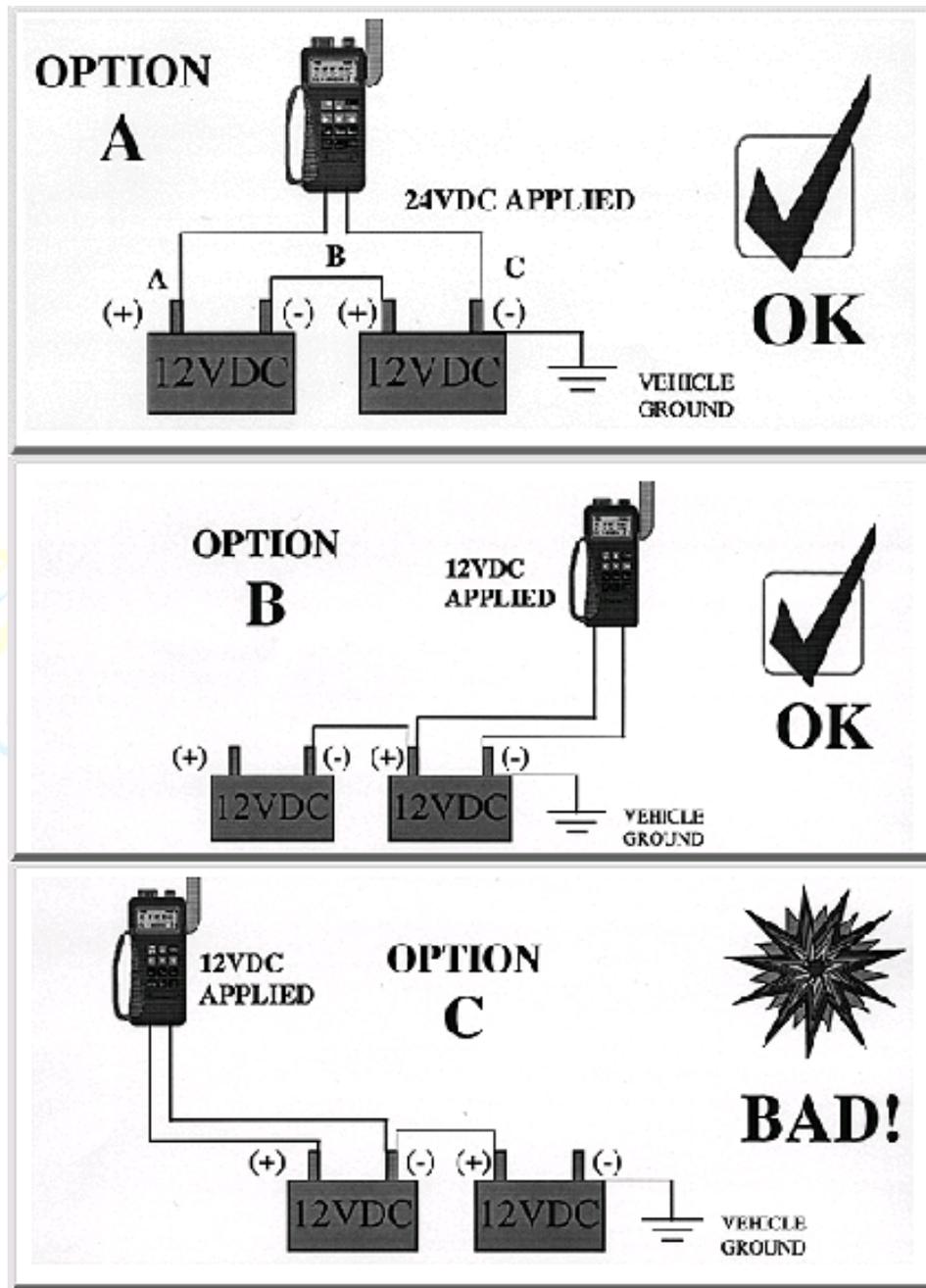


Figure 2 Three Ways to Connect the PLGR to the Batteries

- 4. Option A is good
- 5. Option B is good, but it looks too much like C, which is bad!

6. Just do A!

Failure to comply with this installation could result in the explosion of the memory battery within a few minutes. This could result in significant damage and bodily injury!

Battery Storage

The following battery storage guidelines are provided for all battery types. Typical storage locations include convex structures for bulk storage or smaller facilities for end item users. Precautions are also provided for specific chemistries.

1. Store new batteries in original packaging. This helps to identify damage such as swelling or leakage of batteries. Swelling of the bag indicates a battery that has vented.
2. Do not mix new and used batteries since it is difficult to distinguish between them.
3. Do not accumulate used batteries, dispose of on a regular basis.
4. Segregate storage from other hazardous materials and other battery chemistries. It is critical that lead acid batteries be kept away from nickel cadmium or nickel metal hydride batteries.
5. Protect from crushing, punctures, and shorting.
6. Keep in a cool, dry, well ventilated area, below 130 degrees F.
7. Thermal runaway of nickel cadmium batteries may occur if temperatures exceeds 130 degrees F.
8. Coordinate battery storage locations with your local fire department/safety office and have periodic inspections conducted by fire department/safety office.
9. Protect bulk storage of batteries with sprinklers.
10. No smoking or eating.
11. Ensure that fire extinguishers are available. Use a type "AB" (H₂O) extinguisher to fight fires involving small quantities of batteries. A type "D" extinguisher would be used to fight a lithium fire by professional fire fighters.

Battery Handling

The following battery handling guidelines are provided for all battery types. These guidelines are intended for use at battery storage facilities, by the battery users, or any time batteries are handled. Precautions are also provided for specific chemistries.

1. Keep batteries in original packaging until ready to use. This helps to identify damage, such as swelling and leakage of LiSO₂ batteries.
2. Inspect Lithium batteries for defects such as bulging, cracks, leakage. Don't use suspect batteries.
3. A Lithium battery that is abnormally warm to the touch may indicate that the battery CDD has been depressed and is being discharged. Separate such batteries from other batteries.
4. A pungent odor - "Rotten Eggs" indicates a LiSO₂ battery is in the process of venting. Ventilate the area and get away from the battery until the venting is completed.
5. A hissing/popping sound in equipment indicates a LiSO₂ battery in the process of venting. A sweet ether-type odor and/or the presence of a liquid indicates a LiMnO₂ battery has vented.

6. Use only authorized batteries in equipment to prevent equipment damage. For example, don't substitute the 3.6 volt LS6 lithium AA battery for the 1.5 volt L91 lithium or 1.5 volt alkaline AA batteries. Do not mix battery chemistries. For example, use all lithium or all alkaline batteries.
7. Remove batteries from equipment for long term storage to prevent damage from battery leakage.
8. Don't force batteries into equipment. The batteries can be hard or dangerous to remove, causing personal injury and/or damaging equipment and battery.
9. Don't mix new and old batteries in equipment to prevent charging of old batteries by new batteries. This could force the old batteries into voltage reversal and a violent venting.
10. Don't short circuit (metal tools).
11. NEVER attempt to charge primary batteries. Even very small charging currents can cause batteries to explode violently.
12. Don't over discharge batteries. Remove them when they no longer power the equipment.
13. Proper Personal Protective Equipment (PPE), such as gloves, face shield, and apron must be worn when handling leaking batteries or electrolyte.

Battery Maintenance

The following maintenance guidelines are to be followed at battery maintenance shops in which vehicle, aircraft, or other rechargeable batteries are maintained.

1. Proper PPE must be used when handling leaking batteries or electrolytes.
2. PPE should include neoprene, rubber or latex-nitrile protective gloves, chemical resistant apron, and eye protection.
3. Personnel handling damaged batteries or electrolytes must not wear contact lenses.
4. All electrolyte refilling areas must be segregated between battery chemistries.
5. The same tools and materials must not be used between battery chemistries. Color code tools for added precaution.
6. Nickel cadmium battery shops must be separated from other battery shops, particularly Lead-Acid battery shops, and be clearly identified.
7. Do not smoke, have open flames, or make sparks around lead acid batteries since a battery that is gassing can explode.
8. Do not smoke in the area of nickel-cadmium batteries.
9. Do not strike lead acid battery terminals with metallic tools since this can contribute to sparks and cause subsequent explosions.
10. Make sure vent holes in vent caps are open to prevent dangerous buildup of gases. Ensure caps are screwed on tightly and the rubber gaskets are in place.
11. Personnel must be thoroughly trained in battery maintenance procedures, first aid, protective equipment, and precautions and hazards of battery maintenance operations.
12. Temperatures of battery maintenance facilities must be kept below 120 degrees F and be well ventilated. Recommend keeping temperatures below 110 degree F.
13. Temperatures during NiCd, Ni-MH, and Li-Ion battery charging must be kept below 90 degrees F. Recommend keeping temperatures between 60 and 80 degrees F.

Battery Disposal

This section identifies those batteries that must be disposed of as hazardous waste for environmental concerns. These batteries are typically disposed of through the DRMO. It may also be necessary to dispose of batteries that are not hazardous waste as regulated waste (i.e., through the DRMO), depending on local regulations.

1. Non-Rechargeable Batteries that are considered Hazardous or Regulated Universal Waste are the following:

- i. Alkaline (AK, CA, MN, RI, WA only)
- ii. Carbon-Zinc (AK, CA, MN, RI, WA only)
- iii. Lead-Acid
- iv. Magnesium batteries at greater than 50 % state of charge.
- v. Mercury
- vi. Silver
- vii. Thermal Batteries
- viii. Non-Discharged Lithium-Manganese Dioxide Batteries
- ix. Discharged Lithium-Manganese Dioxide Batteries (AK, CA, MN, RI, WA only)
- x. Non-Discharged Lithium-Sulfur Dioxide Batteries
- xi. Discharged Lithium-Sulfur Dioxide Batteries are Regulated Universal Waste because of their Acetonitrile content.
- xii. Zinc-Air (AK, CA, MN, RI, WA only)

2. Rechargeable Batteries that are considered Hazardous or Regulated Universal Waste are the following: (Note that all rechargeable batteries should be considered as candidates for recycling.)

- i. Lead-Acid
- ii. Lithium-Ion (AK, CA, MN, RI, WA only)
- iii. Nickel-Cadmium
- iv. Nickel-Metal Hydride (AK, CA, MN, RI, WA only)

3. Lithium-Iron Disulfide Batteries (ie. Energizer L91) containing less than 1.0 g. of Lithium are non-regulated waste.

4. Activate the CDD on multi-cell Lithium Non-Rechargeable Batteries using trained, designated personnel only in designated discharge areas.

5. Dispose of all batteries in accordance with local regulations.

CDD Activation Procedures

Lithium-Sulfur Dioxide (Li-SO₂) and Lithium-Manganese Dioxide (Li-MnO₂) Multi-Cell Battery Disposal Processing Procedures

The following procedures must be followed in order to safely process LiSO₂ and Li-MnO₂ multi-Cell batteries for disposal. Complete Discharge Devices (CDD) are utilized in multi-cell LiSO₂ batteries to reduce the amount of reactive lithium after usage, to allow disposal as non-hazardous material. Field personnel are not to activate the CDD. Activation of the CDD is to be completed by personnel designated by their commander and trained in or having experience in the proper storage, handling, and disposal of LiSO₂ and Li-MnO₂ batteries as well as handling damaged batteries. The following procedures and precautions must be followed for the safe use of the CDD:

Warning:

DO NOT depress the CDD of any battery showing signs of damage such as bulging or cracks. Dispose of such batteries as hazardous waste.

1. CDD Activation (Push Type)

- a. Carefully slit or remove the protective label covering the CDD. Never pierce the CDD label with any object to activate the CDD. This may damage or short the CDD circuit.
- b. Gently depress the CDD with a small screwdriver. Push the screwdriver in a straight down motion until you hear a single click. Do not use a knife or any sharp object that may cause damage during CDD activation. Never twist any object in the CDD slot since this could dislodge the CDD switch causing a short circuit and subsequent venting.

2. CDD Activation (Pull Type)

- a. Lift the protective label covering the CDD.
- b. Pull out the plastic tab completely from underneath the label and out of the CDD slot.

Warning:

Any battery in which the CDD is damaged during activation may be unstable, resulting in a violent battery venting during handling and disposal.

3. Storage of Discharging Batteries

- a. After depressing the CDD, place the batteries in a secure, well-ventilated area isolated from personnel and separated from other hazardous material.
- b. Separate all discharging batteries by at least two inches on all sides, as shown in Figure 3.



Figure 3 Battery Separation for Discharge

c. Allow the batteries to sit a minimum of five to seven days (see the label covering the CDD) for complete discharge. Note that the newer batteries may require 7 days for full discharge. **NEVER Handle the batteries during the discharge period.**

NOTE: It is normal for the batteries to become hot (even to the point of deforming the plastic case) after activating the CDD (see Figure 4). However, if a hissing sound or a strong pungent odor is noticed, clear the area immediately until the area is odor free, since this is a battery venting. Batteries that vent must be disposed of as hazardous material.



Figure 4 Normal Battery Deformation During Discharge

4. Battery Voltage Check

Prior to disposal, measure battery voltage using a simple voltmeter. The voltage must be less than 1 volt per cell per string in a series connection. See List 1, below, for the required voltage of each LiSO₂ and Li-MnO₂ battery after 5-7 days of discharge. The table also identifies where to take voltage measurements. The BA-5557/U and BA-5590/U batteries each contain two series strings of cells, each requiring two voltage measurements. For example, for the BA-5590/U battery, measure the voltage across terminals 1 to 4 and 2 to 5 with a voltmeter. If the voltage is less than 5 volts in each string, the battery may be disposed of as regulated Universal Waste in accordance with local regulations. If 5 volts or greater in either string, depress the CDD a second time and wait an additional 5 days or dispose of as hazardous waste. After 5 days recheck the battery voltage and dispose of accordingly. If the voltage exceeds these guidelines then dispose of the batteries as hazardous waste.

Warning:

DO NOT pack the batteries in any container until:

- (1) At least 5-7 days following activation of the CDD in which the batteries are cool to the touch, and
- (2) It is verified that the battery has been properly discharged

NOMENCLATURE	QTY. CELLS	CDD	MAX. VOLTAGE AFTER DISCHARGE	MEASURE VOLTAGE BETWEEN:
(All Versions)				
Li-SO₂ Batteries:				
BA-5093	9	YES	9	+/- Terminals
BA-5112	4	YES	4	+/- Terminals
BA-5557	2 Strings of 5 ea.	YES	5 Vdc per String	1st String, Pins 1&4 2nd String, Pins 2&5
BA-5567	1	NO	Not Required, < 0.5 g. Li	N/A
BA-5588	5	YES	5	+/- Terminals
BA-5590	2 Strings of 5 ea.	YES	5 Vdc per String	1st String, Pins 1&4 2nd String, Pins 2&5
BA-5598	5	YES	5	Pins -A ₁ /-A ₂ & +A ₂
BA-5599	3	YES	3	Pins 4 & 6
BA-5600	3	YES	3	+/- Terminals
BA-5800	2	YES	2	+/- Terminals
Li-MnO₂ Batteries:				
BA-5312	4	YES	4	+/- Terminals
BA-5347	2	YES	2	+/- Terminals

BA-5357	2 Strings of 5 ea.	YES	5 Vdc per String	1st String, Pins 1&4 2nd String, Pins 2&5
BA-5360	3	YES	3	+/- Terminals
BA-5367	1	NO	Not Required, < 0.5 g. Li	N/A
BA-5368	4	NO	Not Required, < 0.5 g. Li	N/A
BA-5372	2	NO	Not Required, < 0.5 g. Li	N/A
BA-5380	2	YES	2	+/- Terminals
BA-5388	5	YES	5	+/- Terminals
BA-5390	2 Strings of 5 ea.	Yes	5 Vdc per String	1st String, Pins 1&4 2nd String, Pins 2&5
BA-5398	5	YES	5	Pins -A ₁ /-A ₂ & +A ₂
BA-5399	3	YES	3	Pins 4 & 6

List 1 Discharge Voltages

Battery Transportation

Packaging and marking guidelines are provided for the transportation of both unregulated and regulated batteries. Regulated batteries include lithium, lead acid, and nickel cadmium batteries.

General Requirements

You must coordinate shipping of regulated batteries with your local Installation Transportation Office/Officer.

1. DS will provide assistance as necessary.
2. Separate damaged and undamaged batteries.
3. Batteries must be securely packaged to prevent movement.

Unregulated batteries

The following batteries are unregulated for shipping purposes:

- | | | |
|----|-------------|--|
| 1. | Alkaline | BA-3XXX series |
| 2. | Carbon Zinc | BA-2 thru BA-471 series |
| 3. | Magnesium | BA-4XXX series |
| 4. | Mercury | BA-1XXX series |
| 5. | Silver | BA-245, BA-472, BA-485, BA-486, and BA-2245 only |

- | | | |
|----|-----------------------|--|
| 6. | Thermal | BA-6XX series |
| 7. | Nickel Metal Hydride | All |
| 8. | Lithium Ion Batteries | Containing less than 8.0 grams of equivalent Lithium Content when fully charged. The equivalent Lithium Content in grams is equal to 0.3 times the maximum capacity of the battery in Amp-Hrs. |

Packaging Requirements -
Unregulated batteries:

1. Prevent short circuits.
2. Place batteries in non-reactive plastic bag and seal (except mercury batteries).

Regulated Lithium batteries:

Undischarged or damaged multi-cell lithium sulfur dioxide batteries are regulated for shipping purposes. All Lithium Non Rechargeable batteries are **banned** from passenger aircraft.

1. Prevent short circuits.
2. For surface vessel (rail, truck, ship) transportation of batteries outside of equipment, packaging must be one of the following: wooden box (4C1, 4C2, 4D, or 4F), fiberboard box (4G), or metal drum (1A2, or 1B2). Each package must not contain more than 500 g of lithium (i.e., no more than 20 BA-5590 batteries per package).
3. For cargo air transportation of batteries outside of equipment, inner and outer packaging is required. Inner packaging must be one of the following: wooden box (4C1, 4C2, 4D, or 4F), fiberboard box (4G), or metal drum (1A2, or 1B2). Each package must not contain more than 125 g of Lithium. The outer package must be a metal drum (1A2 or 1B2) fitted with gas-tight gasket. The inner packages must be separated from each other and outer wall by at least 1 inch of non-combustible cushioning material.
4. Maximum quantities per outer package:
 - i. Commercial Cargo Air - 35 kg of total battery weight per package.
 - ii. Military air transport - Batteries must be spares or installed in equipment for training or mission purposes only.

Rechargeable batteries, wet, filled with acid or alkali (i.e., batteries with vented filler caps such as Lead Acid (vehicle batteries), or Nickel Cadmium (aircraft batteries)) :

1. Prevent short circuits and damage to terminals.
2. Place batteries upright into shipping container to prevent spillage of electrolyte.
3. Packaging must be one of the following: wooden box (4C1, 4C2, 4D, or 4F), fiberboard box (4G), fiber drum (1G), or plastic drum/boxes (1H2, 3H2, or 4H2).

4. Do not stack batteries directly on terminals.
5. Batteries must not be packaged with other material.
6. Separate battery chemistries, specifically lead acid from nickel cadmium batteries or nickel metal hydride.
7. 1 to 3 batteries (25 lbs each) up to a maximum weight of 75 lbs per outer box.
8. 1 to 4 batteries (15 lbs each) up to a maximum weight of 65 lbs per outer box consisting of fiberboard.
9. 1 to 5 batteries (10 lbs each) up to a maximum weight of 65 lbs per outer box consisting of fiberboard.
10. Separate and secure away from other hazardous materials.

Rechargeable batteries, wet, non-spillable (Lead Acid Maintenance Free, Nickel Cadmium, Silver/BB-622):

1. Prevent short circuits and damage to terminals.
2. Packaging must be one of the following: wooden box (4C1, 4C2, 4D, or 4F), fiberboard box (4G), fiber drum (1G), or plastic drum/boxes (1H2, 3H2, or 4H2).
3. Must not be packaged with other material.
4. Separate and secure away from other hazardous materials
5. Separate battery chemistries, specifically lead acid from nickel cadmium batteries.
6. Can be transported in equipment (i.e., sealed lead acid batteries used in Uninterruptable Power Supplies (UPS)).

**Marking Requirements -
Unregulated batteries:**

1. Identify contents of package with nomenclature and NSN.
2. Markings must be in a contrasting color to the packaging.
3. The name and address of the shipper and destination must be marked on the container.

Regulated Lithium batteries:

1. Class 9 requirements must be followed. Affix class 9 label on outside of package.
2. Non-rechargeable Lithium batteries must have a label indicating they are banned from passenger aircraft.
3. Markings must be in a contrasting color to the packaging.
4. The name and address of the shipper and destination must be marked on the container.
5. Battery marking "Lithium battery UN3090".
6. Equipment containing lithium battery marked with "Lithium batteries contained in equipment UN3091"

Rechargeable batteries (Lead Acid, Nickel Cadmium, Silver/BB-622):

1. Affix corrosive label (class 8) on outside of package.
2. Markings must be in a contrasting color to the packaging.
3. The name and address of the shipper and destination must be marked on the container.
4. Lead Acid batteries with vented filler caps. Battery marking "Batteries, wet, filled acid UN2794".
5. NiCd with vented filler caps. Battery marking "Batteries, wet, filled alkali UN2795".
6. All batteries with out vented filler caps. Battery marking "Batteries, wet, non-spillable UN2800".

Battery Incident Reporting Requirements (Word Document)

Appendix A - DLA Managed and CECOM LCMC supported Batteries and Applications

The information provided in Table 1 and Table 2 was extracted from SB 11-6 and is provided as a general reference.

TYPE	CHEM	APPLICATION
BA-4		
BA-1006	Hg	AN/PQS-1 IM-174/PD IM-174A,B/PD KS-19B KS-99C1 ME-74/U M-77M-000

BA-5372	LiMnO2	AN/PRC-119 ANPSQ-4 ANVSQ-1 KYK-13/TSEC OA-9263/GRC PATRIOT RT-1476/ARC RT-1477/ARC RT-1478/ARC SYK-15/TSEC TSEC/KY-84
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		MK7/MODU SIDEWINDER TEST SET
BA-1092	Hg	
BA-1093	Hg	VIBRATION METER
BA-1232	Hg	
BA-1312	Hg	AN/PAS-5 AN/PAS-6 AN/PDR-10 AN/PQS-1 AN/USM-223 AN/VRC-53 AN/VRC-64 KS-19B
BA-1393	Hg	
BA-15	Zn-C	KS-14103L5 SB-867A/FQQ SUBROC CAL TS-816/U
BA-261	Zn-C	AN/PAR-1 AN/PMQ-6/6A AN/PSM-4/4A/4B/4C AN/PTM-5 AN/URM-105C AN/USM-319A KE-7-1 KS-15-1/3/4 KS-4B MX989/PP
BA-3517	Alkaline	M8 M8-A1 M11 OQ-290(v)1/MSM
BA-4386	Mg	AN/GRA-114 AN/PPS-15(V)2 AN/PRC-25 AN/PRC-74 AN/PRC-77 AN/PRD-10 AN/PRD-11 AN/PSN-6 AN/URR-69 AN/USA-32 AN/USQ-46 RT-505/PRC-25
BA-44	Zn-C	
BA-4840	Mg	AN/TRN-30(V)1

		TSEC/KOI-18 TSEC/KYK-13 TSEC/KYX-15/15A TSEC/KY-57 TSEC/KY-58 TSEC-KY-65 TSEC-KY-68 TSEC-KY-75A
BA-5557	LiSO2	AN/GMQ-33 ANPSQ-2A/2B AN/PSG-5 AN/TMQ-34 M-43A1
BA-5567	LiSO2	AN/AVS-6 AN/PAQ-4/4A AN/PVS-X AN/PVS-4 AN/PVS-5A/B/C AN/PVS-7A/B AN/TVS-5 AN/VVS-2(V)1,2 TSEC/KOK-12
BA-5588	LiSO2	AERP AN/PRC-68/A AN/PRC-126 AN/PRC-128 M-23
BA-5590	LiSO2	AMBIENT BACKPACK AMUT AN/PDR-75 AN/PIH-1 AN/PPN-19 AN/PRC-104 AN/PRC-113 AN/PRC-119 AN/PRC-119A AN/PSC-3 AN/PSQ-4 AN/PSQ-6 (EPLRS) AN/TAS-4A AN/TAS-6A AN/UIH-6 AN/UIH-6A AN/URC-100 AN/URC-110 AN/URN-27

BA-5093	LiSO2	M-43
BA-5112	LiSO2	AN/PRC-112 KY-913
BA-5372	LiMnO2	AN/GRC-210

		C-10377/GTC C-11166/GRC C-11561(C)/U COMMO DECEPTION
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Table 1

BA-5590	LiSO2	COMPACT LASER DEMONSRATOR EFCS JAVELIN L B S R LST-5 LTM M-22 ACADA M21 MAFIS UFE MST-20 PLUS OD-144/GYK-29 OE-239 PLAYER UNIT PM-15 PM-15A RT-1175/GSQ SAWE-MILES II SM-755/GSQ SOFLAM, AN/PEQ-1 SOLDIER SYSTEM COMPUTER TSEC/HYX-57 TSEC/KY-57 TSEC/KY-67 TSEC/KY-99
BA-5598	LiSO2	AN/GRA-114 AN/GRC-122C AN/GRQ-26 AN/MSC-25 AN/PPS-15B AN/PRC-25 AN/PRC-74 AN/PRC-77 AN/PRD-10 AN/PRD-11

BA-5600	LiSO2	AN/PSC-2 MU-848/PSC-2
BA-5800	LiSO2	AN/ASN-169 AN/PSG-7 (V)1 AN/PSG-7 (V)2 AN/PSN-10 AN/PSN-11 AN/PSN-11(V)1 CAM CP-1995/U
BA-5847	LiSO2	AN/PRM-34
BB-2847	Li Ion	TWS
BB-388A	NiMH	AN/PRC-126
BB-390A	NiMH	SINCGARS
BB-412	NiCd	AN/ASM-189C AN/ASM-190A AN/GRA-39/B AN/MTC-7 AN/MTC-10 LIFE PRESERVERS ME-9 OQ-290(V)1/MSM SB-22/PT
BB-422	NiCd	
BB-432A	NiCd	CH-47A,B,C
BB-432B	NiCd	CH-47D
BB-433	NiCd	UH-1, OV-1D
BB-476	NiCd	OH-58A,B,C
BB-501	NiCd	AN/TAS-5
BB-503A	NiCd	TOW
BB-516A	NiCd	MELIOS
BB-542	NiCd	AN/PPN-19 AN/PRC-70 AN/PSC-3
BB-557	NiCd	SEE BA-5557

		AN/UGC-74/A/B AN/USQ-46 DT-561/GSQ DT-562/GSQ DT-565/GSQ MSC-25 R-2016/GSQ RT-505/PRC-25 TSEC/KY-38 TSEC/KY-65
BA-5599	LISO2	AN/PAS-7A TS-4161/P
BA-5600	LISO2	AN/MLQ-36

BB-558	NiCd	OH-58D
BB-586	NiCd	SEE BA-4386
BB-622	NiCd	AN/PPS-5
BB-649	NiCd	AH-1
BB-664	NiCd	AH-64
BB-678	NiCd	
BB-693	NiCd	VULCAN
BB-708	NiCd	OV-1D (Mission Gear)
BB-716	NiCd	UH-60

Table 2

**Appendix C - Battery POC's
CECOM LCMC Directorate for Safety:**

Mailing Address:

US Army CECOM Life Cycle Management Command
 Directorate for Safety (DS)
 ATTN: AMSEL-SF
 Bldg 2539, Laboratory Road, Charles Wood Area
 Fort Monmouth, New Jersey 07703-5024

Phone Numbers:

Commercial: 732-427-7445, Fax: 732-532-6403
 DSN: 987-7445, DSN Fax: 992-6403

Email: monm-amselsfsec@conus.army.mil

CECOM LCMC LRC CCS Avionics Power Sources Team:

For PQDR's, DSN: 992-8824, Commercial: 732-532-8824

Appendix D - PQDR Form

Appendix D - PQDR Form

PRODUCT QUALITY DEFICIENCY REPORT						<input type="checkbox"/> CATEGORY I <input type="checkbox"/> CATEGORY II	
1a. FROM (Originator)				2a. TO (Screening point)			
1b. NAME, TELEPHONE NO. AND SIGNATURE			1c. DATE	2b. NAME, TELEPHONE NO. AND SIGNATURE			2c. DATE
3. REPORT CONTROL NO.		4. DATE DEFICIENCY DISCOVERED		5. NATIONAL STOCK NO. (NSN)		6. NOMENCLATURE	
7a. MANUFACTURER/CITY/STATE			7b. MFRS. CODE		7c. SHIPPER/CITY/STATE		8. MFRS. PART NO.
9. SERIAL/LOT/BATCH NO.		10a. CONTRACT NO.	10b. PURCHASE ORDER NO.		10c. REQUISITION NO.	10d. GBL NO.	10e. FTM Doc No.
11. ITEM REPAIRED/ <input type="checkbox"/> NEW <input type="checkbox"/> OVERHAULED		12. DATE RECD, MFRD, RE-PAIRED, OR OVERHAULED		13. OPERATING TIME AT FAILURE		14. GOVERNMENT FURNISHED MATERIAL <input type="checkbox"/> YES <input type="checkbox"/> NO	
15. QUANTITY		a. RECEIVED		b. INSPECTED		c. DEFICIENT	d. IN STOCK
16. DEFICIENT ITEM WORKS ON/WITH	a. END ITEM (Aircraft, mower, etc.)	(1) TYPE/MODEL/SERIES					(2) SERIAL NO.
	b. NEXT HIGHER ASSEMBLY	(1) NATIONAL STOCK NO. (NSN)		(2) NOMENCLATURE		(3) PART NO.	(4) SERIAL NO.
17. UNIT COST \$		18. ESTIMATED REPAIR COST \$		19a. ITEM UNDER WARRANTY <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		19b. EXPIRATION DATE	
20. WORK UNIT CODE/EIC (Navy and Air Force Only.)							
21. ACTION/DISPOSITION <input type="checkbox"/> HOLDING EXHIBIT FOR ___ DAYS <input type="checkbox"/> RELEASED FOR INVESTIGATION <input type="checkbox"/> RETURNED TO STOCK <input type="checkbox"/> DISPOSED OF <input type="checkbox"/> REPAIRED <input type="checkbox"/> OTHER (Explain in Item 22)							
22. DETAILS (Describe, to best ability, what is wrong, how and why, circumstances, prior to difficulty, description of difficulty, cause, action taken, including disposition recommendations. Attach copies of supporting documents. Continue on separate sheet if necessary.)							

23. LOCATION OF DEFICIENT MATERIAL

24a. TO (Action Point)		25a. TO (Support Point) (Use Items 26 and 27 if more than one)	
24b. NAME, TELEPHONE NO. AND SIGNATURE	24c. DATE	25b. NAME, TELEPHONE NO. AND SIGNATURE	25c. DATE
26a. TO (Support Point)		27a. TO (Support Point)	
26b. NAME, TELEPHONE NO. AND SIGNATURE	26c. DATE	27b. NAME, TELEPHONE NO. AND SIGNATURE	27c. DATE
368-102 368 (REV. 10-85)	COMPUTER GENERATED	STANDARD FORM	

Table 3

Appendix E - Technical Manual Warnings

Warning:**Lithium-Sulfur Dioxide Non-Rechargeable Batteries**

Lithium-Sulfur Dioxide (Li-SO₂) Batteries have been designed to provide a safe, high capacity power source in a relatively small lightweight package. However, if misused or abused, these batteries can be dangerous.

1. Li-SO₂ batteries contain liquefied Sulfur Dioxide (corrosive and will cause burns to the skin), acetonitrile (mildly toxic) and Lithium metal (extremely reactive and flammable). All Li-SO₂ batteries have multiple safety features to contain these hazards.

2. Store Li-SO₂ batteries at temperatures below 130 degrees F. Segregate different battery chemistries from each other.
3. Keep batteries in original packaging until ready for use. Examine packages/batteries for bulging, cracking, or any signs of leakage before putting the batteries into equipment. Use only the appropriate batteries for each particular item.
4. When replacing batteries in equipment containing more than one Li-SO₂ battery, replace all Li-SO₂ batteries at the same time. Replace with batteries from the same contract number and date code only.
5. Never charge a Lithium-Sulfur Dioxide battery.
6. Never short circuit the terminals.
7. Remove batteries from equipment if it is not to be used within 30 days.
8. Depleted batteries should be turned in to designated personnel for disposal processing (CDD activation) and disposal in accordance with local regulations or through the Defense Reutilization Management Office.
9. In the event of a venting, clear the area until the pungent odor of Sulfur Dioxide (rotten eggs) is cleared. Handle leaking batteries with rubber or plastic gloves. Get immediate medical attention for any skin or respiratory irritation.
10. Refer to TB 43-0134, BATTERIES, DISPOSITION AND DISPOSAL for additional information.
11. DO NOT mix primary and rechargeable batteries in the equipment, such as the BA-5590/U and the BB-390A/U batteries.
12. When using LiSO₂ batteries, immediately shut equipment off and replace with new batteries upon low power indication.

Warning:**Nickel-Cadmium and Nickel-Metal Hydride Rechargeable Batteries**

The Nickel-Cadmium (Ni-Cd) batteries and the Nickel-Metal Hydride (Ni-MH) are very similar to one another except that the Ni-MH battery does not contain Cadmium. The Ni-MH is more environmentally friendly than the Ni-Cd battery.

1. These batteries may overheat if overcharged or not charged in accordance with the manufacturer's requirements.
2. Use only authorized batteries for each equipment item. Use only the authorized charger for the particular battery.
3. If the battery is excessively overcharged the internal vents may pop and release Hydrogen gas (extremely flammable) and Potassium Hydroxide (corrosive and will burn your skin). If multiple batteries are being charged in a single location, adequate ventilation must be provided to exhaust possible hydrogen gas released during a venting. Use rubber or plastic gloves when handling leaking batteries.
4. If any of the electrolyte comes in contact with the skin, wash the affected area with soap and water and seek immediate medical attention.
5. Always segregate Ni-Cd and Ni-MH batteries from Lead-Acid Batteries. Placing them together could result in explosive consequences.
6. The batteries may overheat and leak if the terminals are short circuited.
7. Depleted batteries that will no longer accept a charge should be turned in for disposal in accordance with local regulations or through the Defense Reutilization Management Office in accordance with local regulations.

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