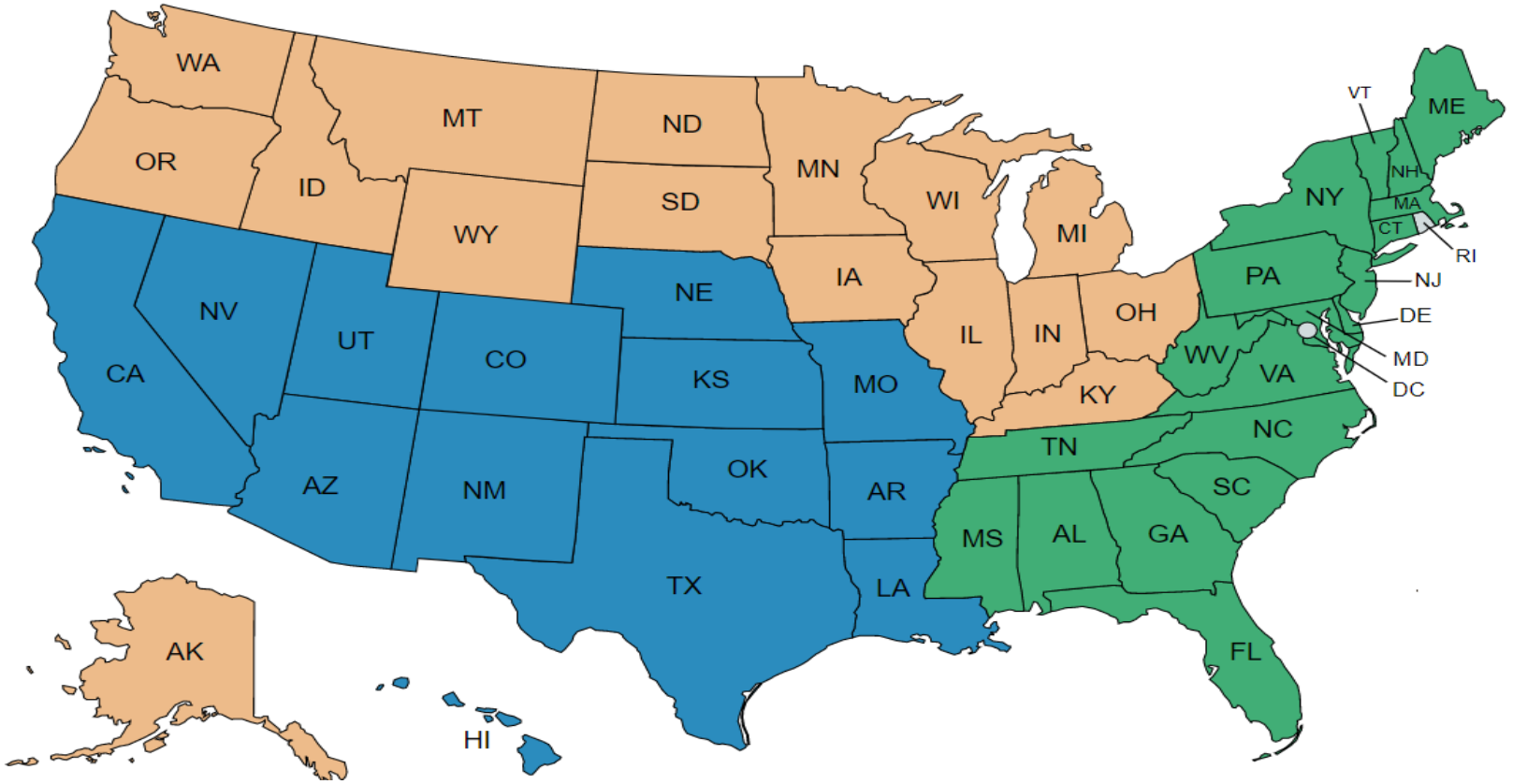
PulseTech™

THE U.S. ARMY BATTERY MAINTENANCE MANAGEMENT PROGRAM (BMMP)

PulseTech™

Military Team Support Map



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Since 1994 PulseTech has been working with the US Military to help reduce the consumption of vehicle and equipment lead-acid batteries.

Kuwait

Afghanistan

AR 750-1 (Feb 2023): 14–21. Army Battery Program. The Army Battery Program provides policy guidance on the use and maintenance of military and commercial standard batteries and rechargeable and/or reusable batteries. The procedures outlined in DA Pam 750–1 are mandatory.

There really is NO easy button for battery maintenance! When a BMMP program is properly implemented and enforced it ALWAYS reduces battery consumption rates, manhour expenditures and saves money. A successful BMMP depends on:

- **Training:**
  - **BMMP training being conducted as needed.**
  - **Mechanics trained to use and perform proper diagnostics, charging, and maintaining.**
- **Strong / Proactive SOP:**
  - **On platform diagnostics and charging as a first COA.**
  - **Batteries being tested and charged during services.**
  - **Newest batteries charged first for dismounted ops.**
- **BMMP Gear:**
  - **Sufficient serviceable BMMP gear on hand.**
  - **BMMP gear updated as needed.**
- **Maintainers:**
  - **Solar being properly used on equipment.**
  - **AC powered maintainers being used for equipment / batteries stored inside.**

PS Magazine: Aug 2022

Tactical Vehicles: Shocking Truth behind Defective Batteries

BLUF: Many batteries returned to the Army supply system as unserviceable, aren't. The reason is a general failure to follow established procedures and vehicle TMs.

TM-9-6140-200-13 (May 11), TB 9-6140-252-13 (Jan 12) and equipment TM all address battery testing and charging. Failure to follow established procedures and vehicle TMs is the main reason why new batteries are turned-in as unserviceable when they aren't.

ASC Battery Study: May 2015

AMSAA conducted an independent examination of potential systemic premature 6TAGM battery disposal and waste. They discovered that 80% of the "unserviceable" batteries were recoverable.

– Systemic weakness in vehicle battery maintenance and sustainment

– Premature disposal and waste across the Army – Costing the Army millions

Common Battery Terminology

Battery: A device that transforms chemical energy into electric energy.

A Battery Cell is the basic electrochemical current-producing unit in a battery, consisting of a set of positive plates, negative plates, electrolyte, separators and casing. In a lead-acid battery, the cell has an open-circuit voltage of approximately 2 volts.

Cold Cranking Amps (CCA) is a power rating used in the battery industry to define a battery's ability to start an engine in cold temperatures. CCAs represents the amps a new fully charged battery can deliver at 0°F for 30 seconds before the voltage falls to 7.20V (for a 12-volt battery).

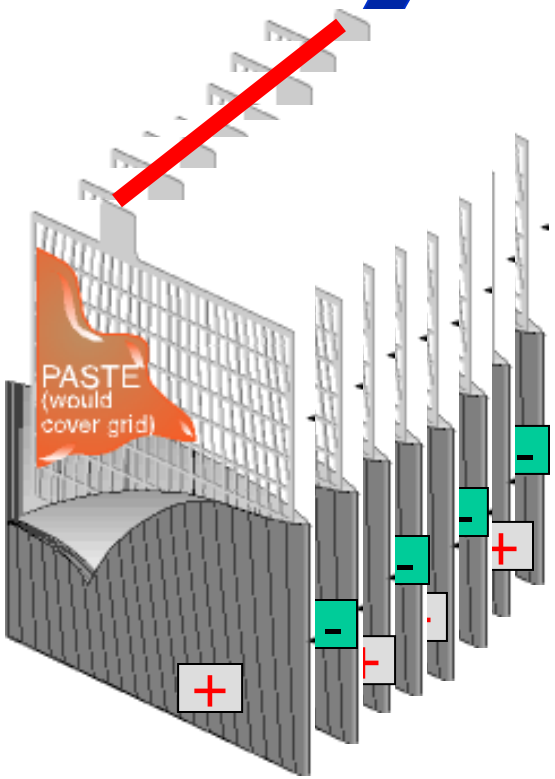
Amp Hours (Ah) is an energy rating usually found on deep cycle batteries. If a battery is rated at 100 amp hours it should deliver 5 amps for 20 hours, 20 amps for 5 hours, etc.

Reserve Capacity (RC) is a capacity rating defined as the number of minutes a fully charged 12-volt battery (at 80°F) can provide 25 amperes at ≥ 10.5 volts.

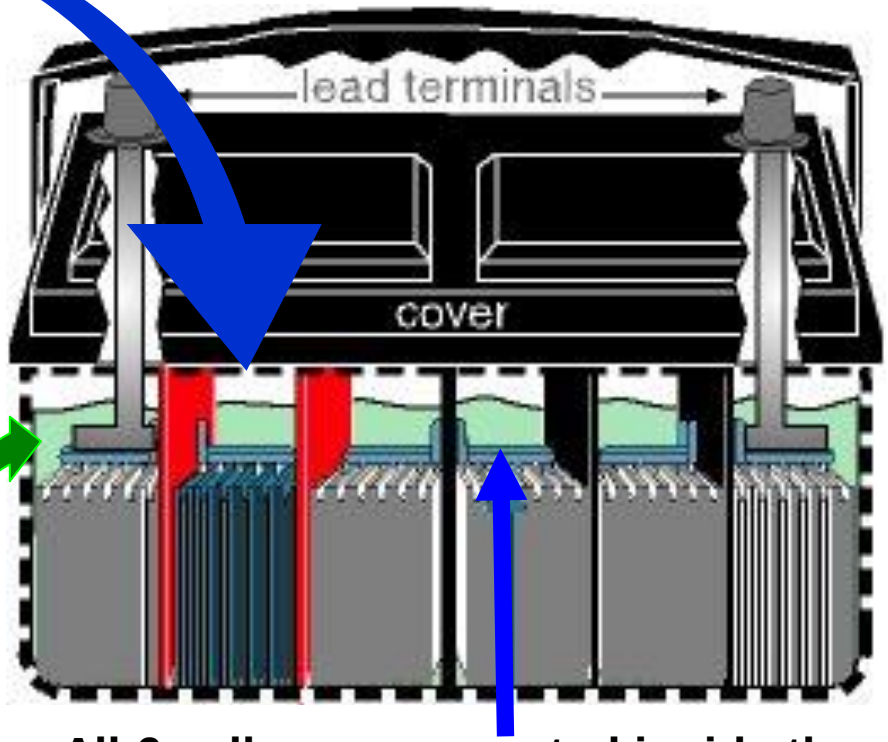
Open-Circuit Voltage is the difference in potential between the terminals of a cell when the circuit is open (*i.e.*, a no-load condition).

Sulfation is the process of lead sulfate crystals building up on a battery cell. Sulfation occurs to some degree in every battery throughout its lifetime. However, sulfation will increase on batteries with inactivity, left in a discharge state, undercharging, etc.

Flooded Lead Acid



(+) and (-) plates are connected to make a 2 volt cell.



All 6 cells are connected inside the box to make a 12 volt battery

The case is filled with electrolyte (sulfuric acid & water)

Electrolyte must always cover the battery plates **(but don't fill to top).**

Absorbed Glass Matt (AGM) / Valve Regulated Lead Acid (VRLA) Battery

Flat Plate

AGM TECHNOLOGY

AGM/VRLA Battery Design

Advantages of AGM batteries:

- **VRLA – Valve Regulated Lead Acid: Contains one-way safety valves to prevent out-gassing & loss of liquid during normal operation.**
- **Longer life, less maintenance and safer:**
  - **Transportation class = Non-spillable**
  - **No leaking acid**
  - **Eliminates corrosion to terminals & battery trays**
  - **No holes in your clothes, or burning skin**
  - **Reduced chance of battery explosion**
  - **Battery won't leak or spill even if tipped over or accidentally cracked.**
- **Some are made with high purity lead plus a little tin.**
- **Lower internal resistance**
  - **More Cranking Amps, more usable reserve capacity and faster recharge**
- **6TAGM battery does have the potential to freeze:**
  - **Fully charged = -94F or -70C**
  - **Extremely Over-discharged (>6Vdc) = 14F or -10C**

BMMP: Batteries

Our technicians on the shop floor deal with a plethora of batteries on military equipment everyday. There are flooded, AGM Flat Plate, AGM Spiral, and occasionally Gel.

- We must know the different characteristics, capacities (CCAs), applications and limitations of each. This will ensure we test, evaluate, and engage them properly. If not the unit's BMMP and recovery rates will suffer.

- A few examples:

  - 6TMF flooded is rated at 725 CCAs, a 6TAGM Exide is 1100 CCAs and the 6TAGM Hawker is 1225 CCAs.

  - The Teledyne 24V has twice the CCAs as the Concorde and recovers much better from deep discharge.

  - Your FSR can send Example BMMP SOP Appendix 2, which has NSNs, CCAs, and info on batteries.

6T Flooded and AGM Batteries

24V Batteries

12V - Group 31 Deep Cycle Batteries

12V – Flooded and AGM Batteries

12V Construction Equip Batteries

BMMP: 6TAGM Batteries

6TAGM: Similar but have different rated CCAs for the 3 approved batteries.

Summary:

- **All 3 are qualified under the same 6TAGM MILSPEC.**
- **Same NSN for all three.**
- **When ordered, there is no way to ensure which battery is issued. You will receive whichever battery DLA has on hand.**
- **They are authorized to be mixed as needed but should be tested at their rated CCAs.**

ENERSYS (Hawker) – 6TAGM
NSN 6140-01-485-1472
CCA - 1225

EXIDE – 6TAGM
NSN 6140-01-485-1472
CCA - 1100

FIAM – Batcore 6TAGM
NSN 6140-01-485-1472
CCA - 1100

PS Magazine engaged this in July 2023, see Ground Vehicles: 6TAGM MILSPEC Batteries Can be Mixed
YES, per TACOM, they can be mixed or matched.

BMMP: Optima Batteries

Optima Group 34 Batteries:

Part# D34: CCA 750
Deep cycle with top posts.
Alternative to D34/78, D34M, 34, and 34/78
NSN 6140-01-450-0141

Part# D34/78: CCA 750
Deep cycle with top and side posts.
Alternative to D34, D34M, 34, and 34/78
NSN 6140-01-441-4272

Part# D34M: CCA 750
Deep cycle with top posts and threaded studs.
Alternative to D34/78, D34, 34M, 34, and 34/78
NSN 6140-01-475-9355

Part# 34: CCA 800
Starting battery with top posts.
Alternative to 34/78
NSN 6140-01-378-8232

Part# 34/78: CCA 800
Starting battery with top and side posts.
Alternative to 34
NSN 6140-01-374-2243

Part# 34M: CCA 800
Starting battery with top posts and threaded studs.
Alternative to 34 and 34/78
NSN 6140-01-526-2605

Many of the Optima group 34 batteries have alternative options. Example:

If the physical battery connection configuration (some have posts and stud, etc.) is suitable then any of the deep cycle group 34 batteries can be used in place of another deep cycle, or any starting battery substituted for another starting battery.

In many cases a deep cycle could also be used as a substitute for a starting battery also, BUT a starting & deep cycle cannot be mixed.

Additionally, a starting battery is not a functional substitute for a deep cycle.

Example 24V Flooded & AGM Battery Design

4HN – Flooded Type

4HN Wet
NSN: 6140-01-390-1968
Lead Antimony Plates

AGM (VRLA) 4HN Replacements

Most Expensive battery in majority of shops.

Concorde AGM
NSN: 6140-01-476-8945
Lead Calcium Plates
200 CCA
***IPR = 180 Amps**

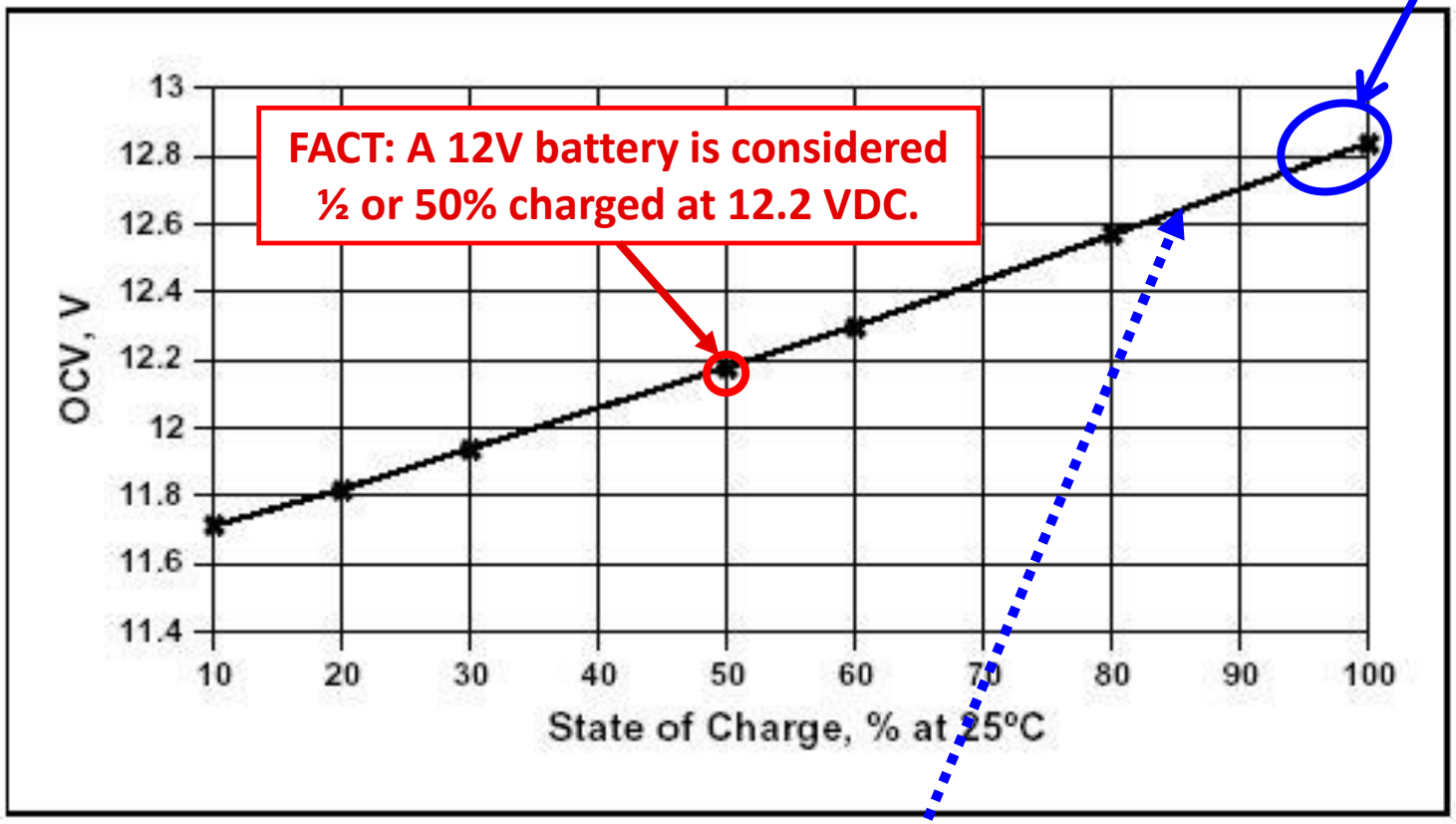
Teledyne/Gill AGM
NSN: 6140-01-610-6102
Pure Lead Tin Plates
300 CCA
***IPR = 280 Amps**

***IPR = 15 second cranking at -22F**

AGM State of Charge versus Open Circuit Voltage

A little voltage means a lot!

A fully charged 12V battery is between 12.7 to 12.9 VDC



IAW TM 9-6140-200-13 and TB 9-6140-252-13
A new 12V Battery MUST BE Above 12.65V Before installation!
If not above this VDC it Must be charged prior to installation.

Common Causes of Battery Failure

A battery is like a piggy bank.
If you take out more than you put in, soon it is empty!!

Where is the best place to Test and charge batteries?
On the platform without removing them!

This should be the first point of attack, as it will ALWAYS save time and effort.

Common Causes of Battery Failure

Non-proactive BMMP procedures causing unnecessary battery removal:

This is the #1 issue in most military maintenance shops.

Mission allowing, mechanics should ALWAYS attempt proper diagnostics & charging steps on the equipment before removal of any batteries or even battery cables.

Examples of pro-active BMMP approach:

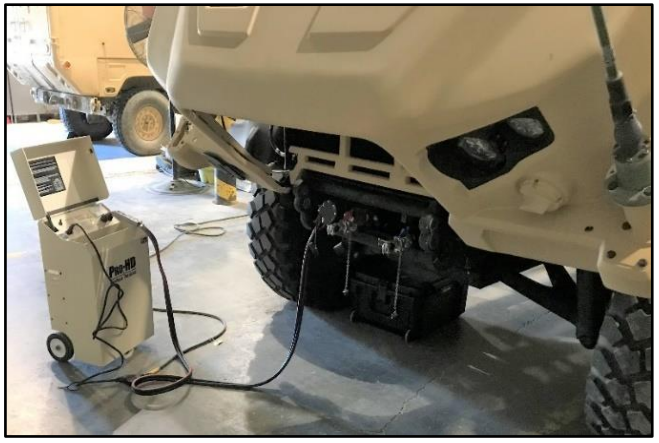
- **Mechanics consistently conduct 'on vehicle' diagnostics and charging as the first COA!**
- **Batteries are being tested and charged during scheduled services.**
- **Unit mechanics charge batteries on the equipment as needed. Example, slave start.**

Testing and charging on the vehicle ALWAYS saves more batteries and more importantly saves manhours!

490PT+ being used to test batteries on generator.

Army SATs Tester and Charger:

The 490PT+ diagnostic tester and the ProHD charger are designed to diagnose and charger without battery removal or even loosening any cables.



ProHD being used to charge the primary batteries on a JLTV.

Not testing a battery before placing it into service:

- IAW TB 9-6140-252-13: A new 12V battery is required to be tested prior to installation. The VDC MUST be at 12.65 or above. If below this, the battery must be charged before installation AND the date of installation should be marked on the yellow sticker on the battery top!

- There is an estimated 3 year "MINIMUM" service life from the install date.

- All attempts should be made to NOT remove a battery for the first 3 years after installation!

- Using PulseTech gear properly a shop should see a 90%+ recovery rates for batteries less than 3 years old, and 70% recovery rate for 3 to 4 year old batteries.

Common Causes of Battery Failure

Deficit Charging -

Is another very prevalent problem facing the military.

Deficit Charging can cause a decline in capacity and reduced battery life as a result of batteries not being sufficiently charged during normal operation.

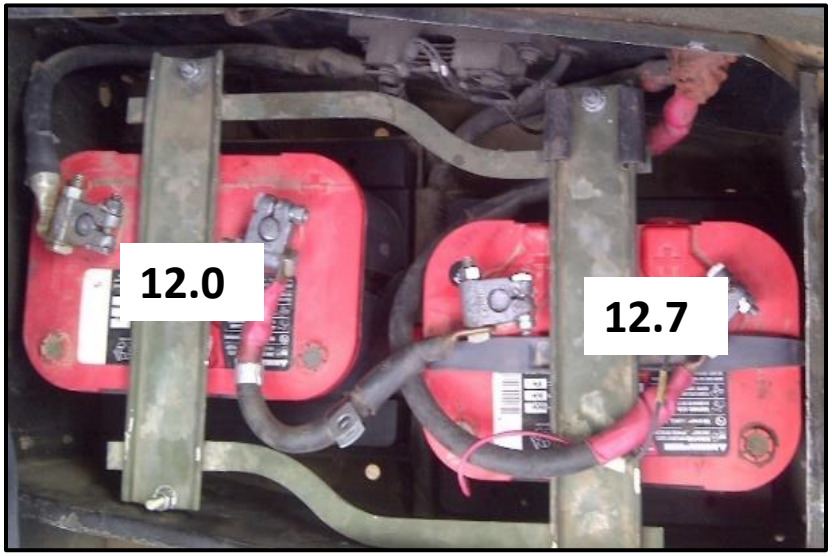
Typical causes of this are:

- **Engine run time not long enough to recharge batteries.**
- **Equipment not operated often enough.**
- **Engine alternator voltage and/or amperage is too low.**
- **High accessory loads (lights, radios, etc.).**

Solutions:

- **Run engine long enough to replace the energy used during start up:**
  - ❑ **AGM batteries: 40 – 50 minutes, in cold weather double the run time.**
  - ❑ **Flooded batteries: 20 – 30 minutes, in cold weather double the run time.**
- **Shut off accessories when possible (or leave engine running).**
- **Use an external charger to service and re-condition batteries during scheduled services and as needed during unscheduled maintenance.**

Example: Battery imbalance



Battery imbalance is very common in Vehicles with 12/24 Systems.

Batteries should be within .5 Vdc of each other.

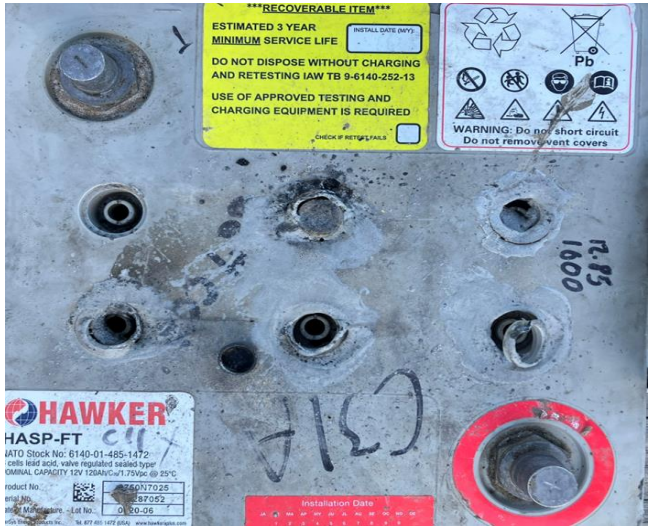
The problem is very easy to diagnose and correct using a 390, 490 or 890 Digital Analyzer and a charger, such as the Pro-HD.

Example: the pic above was from a 10KW Gen Set. 1 battery was replaced, and the second battery was not. Unfortunately, the second battery was also very discharged and heavily sulfated.

Running the gen set in a hot environment caused the very unbalanced batteries to charge at very different rates. This resulted in the highly sulfated older battery having a catastrophic failure.

Common Causes of Battery Failure

Example: Overcharging a battery can cause damage also.



Signs of overcharging:

- ❑ Strong rotten egg smell = Check the batteries!
- ❑ Excessive heat: **TB 9-6140-252-13: During the charging procedure, some heat is generated as a natural result of charging. However, if a battery becomes too hot to comfortably touch with the bare hand or the case or lid begins to melt or shows signs of swelling, it should be removed from the charger immediately. Note: The above pic is an extreme example and generally will NOT happen with PulseTech chargers.**

Mixing of different battery types is NOT Approved!

Mixing different battery types will lead to shorter battery life, possible overcharge, undercharge and battery imbalance problems.

Premature failure WILL happen.

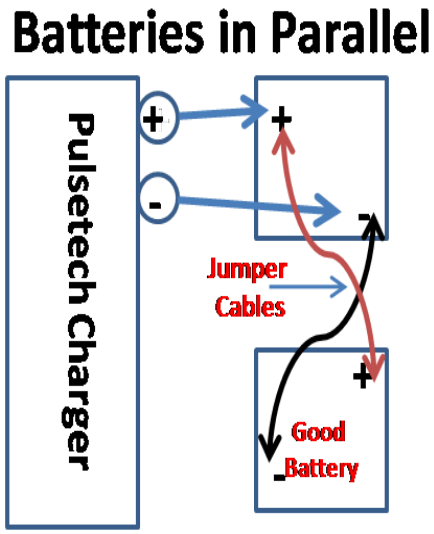
Common Causes of Battery Failure

Issue: Not jumping dead / severely depleted batteries to start a charge process.

There is sometimes a need to jump dead batteries, especially if they are less than 4 years old.

Dead, or severely depleted batteries usually need assistance in getting the charge process started. Failure to do this WILL cause recoverable batteries to be turned in unnecessarily.

If still on the equipment; the Batteries and cables do NOT need to be removed to use a ProHD to recover them.



Paralleled battery examples. Either approach works, although once started the jumper cables can be removed and the depleted battery can be charged on its own.

Batteries still in vehicle, and a jump start being used to start the charge process. Slave cables to another vehicle are just as effective.

Note: We have a complete step by step on how this is done in our example SOP.

Charge the newest / youngest batteries first:

Proactive, on the vehicle should always be the first COA. However, there will also be the need for off vehicle BMMP.

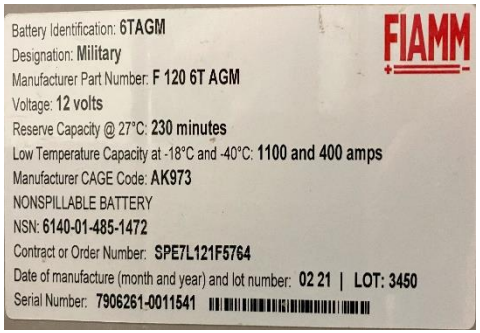
Highly recommend that the newest / youngest batteries be placed into higher charge priority than older ones. Rule of thumb for high quality AGM batteries using PulseTech gear regardless of VDC when first tested:

- **Batteries less than 3 years old should have a 90%+ recovery rate.**
- **3 – 4 years should see a 70% recovery rate.**

Examples at right of battery date of manufacture.

You can also look for ship dates.

6TAGM Hawker batteries use 2 digit month & year code on the top of their batteries. Manufacture date for the example above was Dec 2021.



6TAGM Fiamm batteries place the date of manufacture on the front face in a month – year display. Hard to see, but the manufacture date for the example above was Feb, 2021.

Optima batteries use a Julian date. The first 4 numbers, reading left to right, First digit - 0: This is the year, 2020. Next 3 digits - 356: The day of the year using a Julian calendar. Manufacture date for this battery was 22 Dec 2020.

Common Causes of Battery Failure

FACT: Leaving batteries in a discharged condition, even a partial discharge, will cause sulfation on the plates which reduces a batteries capacity and leads to premature failure.

Sulfation is the #1 killer of batteries worldwide.

Solutions:

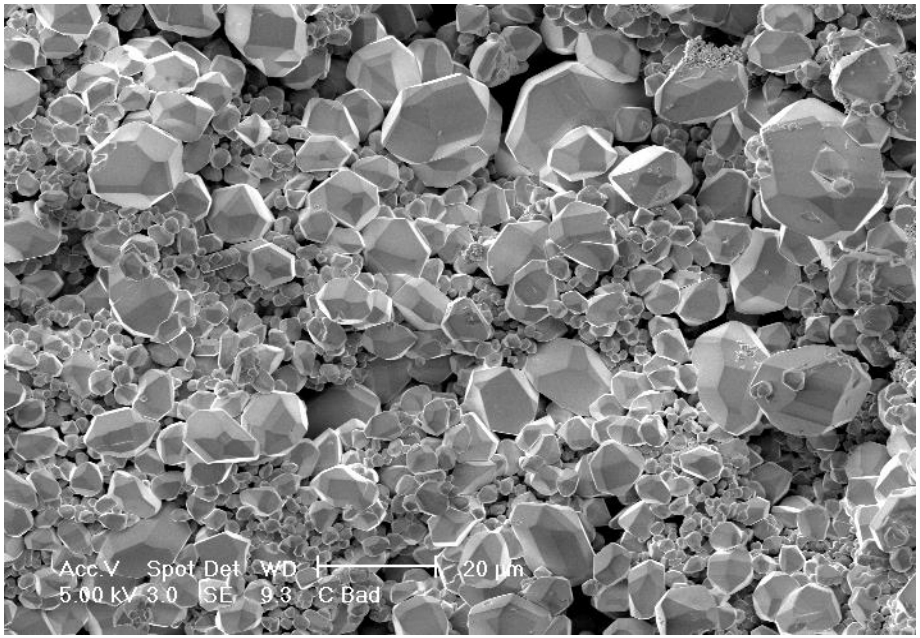
- **Service (Test and Charge) batteries whenever you service the vehicle!**
- **Test and charge new batteries or batteries on shop stock as needed.**
- **If the vehicle or equipment is not used on a regular basis, periodically check the battery OCV and charge when necessary.**
- **Charge whenever the battery OCV is:**
  - **Wet/flooded: 12.5 or less**
  - **AGM: 12.7 or less**
- **When storing vehicles, use a solar or AC powered maintainer. Maintainers can offset normal self-discharge and small parasitic drains.**

PulseTech Performance and Sulfation

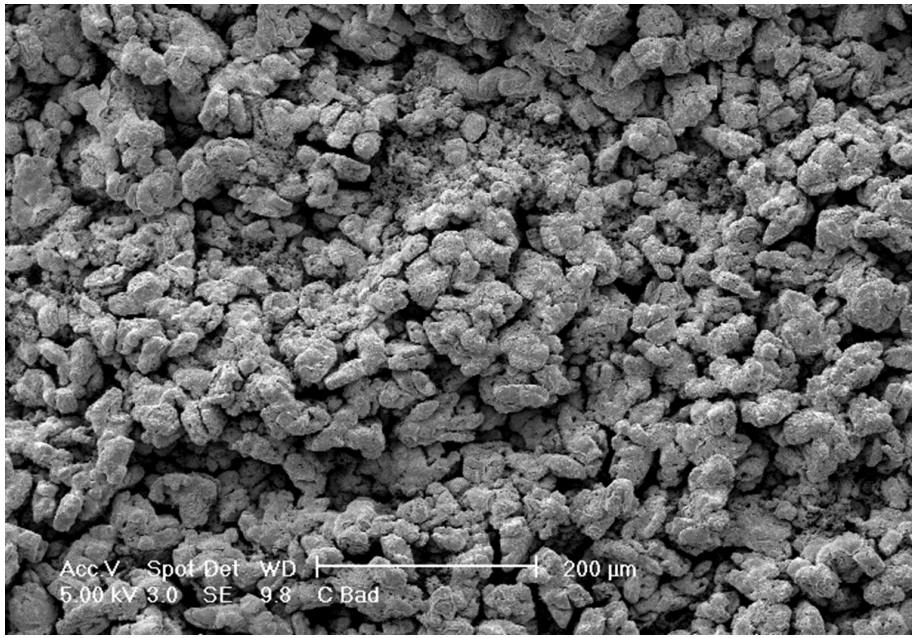
Sulfation is the #1 Killer of Batteries Worldwide

Here is where PulseTech comes in… it's all about microprocessor controlled charging and high frequency 25K per second PULSATION!

Multiple independent studies have confirmed performance. Below, results are from an Ohio State University comprehensive evaluation: The difference is extremely easy to see!



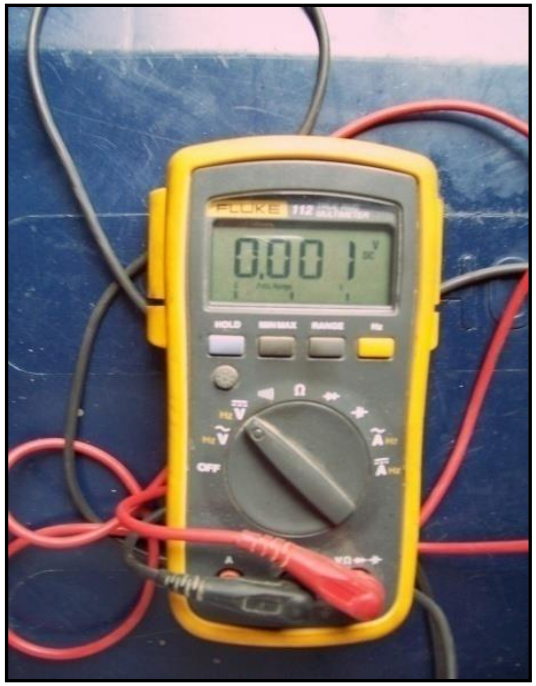
Cathode crystalline structures **remaining** after charging a deeply discharged battery **without pulsing**.



Cathode crystalline are **almost all removed** after charging a deeply discharged battery with high frequency pulsing.

Historically the Three Most Common Methods of Battery Testing have been:

Digital Multi-meter



Common Tool Room Load Tester

Specific Gravity Tester (Duo-check)

Diagnostics – Newer Types

CONDUCTANCE TESTING - Uses an algorithm to compare the battery's available capacity to a known standard.

390 Analyzer
6 and 12V Diagnostic Tester
NSN 6130-01-580-3882
Navy GSE Shops Approved
Can be ordered and used in Army and USMC shops.
Army CLIX

490PT+ Analyzer
12V Diagnostic Tester
NSN 6130-01-510-9594
Army SATS standard tester.
USMC LABM standard tester.
AF GSE Shops approved tester.

NEW: 890PT Analyzer
6, 12, and 24V Diagnostic Tester
Part #: 741X890
NSN - Pending

Conductance testers can be used repeatedly without heating up, opening caps (dealing with sulfuric acid), and immediately provides a digital read-out which displays the following:

- **> Cold Cranking Amps (CCA)**
- **> Whether the battery needs to be recharged and re-tested**
- **> OCV and If battery needs to be replaced**

- ❑ **The 490PT+ comes in a storage case.**
- ❑ **The 490PT+ and 890PT both have printers.**
- ❑ **The 890PT is also capable of testing LiON and LiFePO4 batteries.**

Mini Battery Load Tester
NSN: 6625-01-463-8499
Quick, Go-No-Go battery tester.
Army CLIX

Optima Steel Post Battery Testing Info

Test #1
Correct way to connect.
1240 CCAs

Test #2
Same battery.

Wrong way to connect.
115CCAs

Chargers: Why does the military prefer PulseTech Chargers?

AGM batteries need a high-quality charger: Voltage must be properly controlled to prevent overcharging / gassing of the battery.

ALL PulseTech Chargers have these common features:

- **Function anywhere in the world on local power; input voltage can range between 110 - 250Vac, and 50-60 Hz.**
- **Exclusive high frequency pulsation at over 25k pulses per second!**
- **Smart Charging; Microprocessor controlled charging circuits.**
- **One switch operations (on/off). Minimizes training requirements.**
- **On-platform charging capability. No need to remove batteries or cables on any equipment type.**
- **Reverse polarity protection.**
- **No spark between leads.**
- **Many systems can be repaired at the unit level.**

Battery Service Equipment Set (BSES) NSN: 6130-01-541-9731

Part # 746x100 - Army CLIX

This is a fully functional battery maintenance tool kit, which can be easily packed and shipped as needed with no need for additional vehicles or trailers.

The kit comes all items listed below (diagnostics, charging and maintaining) to immediately set up a battery maintenance operation anywhere in the world.

- **1 – 490PT+ Battery Analyzer**
- **10 – MBT-1 Battery Testers**
- **1 – Pro-HD 12/24V Charger**
- **1 – HD Pallet Charger**
- **1 – Redi-Pulse Pro-12 Maintainer**

Pro-12 Battery Maintainer
NSN: 6130-01-535-2718
Army CLIX

490PT+ Battery Analyzer
NSN 6130-01-510-9594

MBT-1 Mini Battery Load Tester
NSN: 6625-01-463-8499
Army CLIX

Pro-HD
NSN: 6130-01-500-3401

Pallet Charger
NSN: 6130-01-532-7711
Army CLIX

Pro-HD 12/24V Charger

NSN 6130-01-500-3401

- The Pro-HD is an auto sensing 12 & 24V pulse charger designed to charge any type of lead acid battery (AGM or flooded cell) using the supplied clamps or NATO connector.
- **Standard on all SATS, authorized in any Army or USMC maintenance shops along with AF GSE shops.**
- Recovers single 12V or single 24V batteries as well as 24V battery packs in the vehicle.
- **This is the best charger for use on the shop floor when on vehicle charging!**
- Troubleshooting info available and system is repairable at the unit level.

Item	NSN
Complete Replacement Insert.	6130-01-645-5003 Army CLIX
Power Cord - CORD 14/3 SJTOW 6'3"	6150-01-618-0289 Army CLIX
10 FT NATO SLAVE cable.	6150-01-548-0939 Army CLIX
10 FT Parrot Clamp cable.	6150-01-697-4954 Army CLIX
45 AMP 110/220 Power Supply	6130-01-548-0895 Army CLIX
Controller Board – Version E	5998-01-548-0932 Army CLIX

HD Pallet Charger

NSN 6130-01-532-7711

- The Pallet Charger is a 12V, 6.5 amp per channel, 12-station charging unit designed to charge any type or size 12V lead acid battery (AGM, VRLA, flooded, or Gel). **Army CLIX**
- **Authorized for any Army Maintenance shop, standard in all USMC maintenance facilities, and authorized use for AF GSE maintenance shops**.
- Charge stations 1-12 each operate in isolation from one another, allowing any combination of batteries to be recharged at the same time.
- Troubleshooting info available and system is repairable at the unit level.

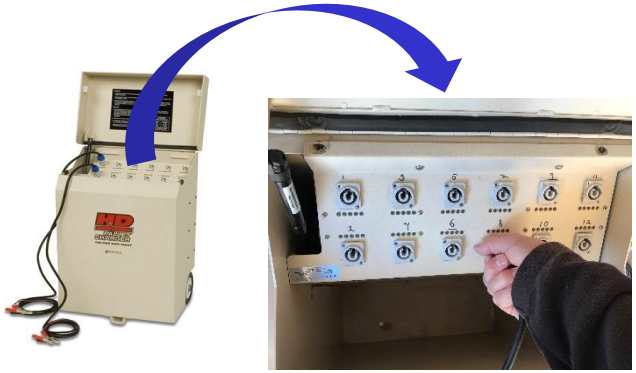
Pro-PC Chargers: Bench Top 6 and 12 Station Chargers

- The PRO-PC-6 and PRO-PC-12 are 12V, 6.5 amp per channel multi station chargers designed to charge any type or size 12V lead acid battery (AGM, VRLA, flooded, or Gel).
- **Authorized for use in any Army maintenance facility, Navy GSE shop standard chargers.**
- They can be connected to any type or size 12V lead acid battery; AGM, VRLA, Flooded, or Gel.
- Charging stations each operate in isolation from one another, allowing any combination of batteries to be recharged at the same time.
- Troubleshooting info available and system is repairable at the unit level.

PRO-PC-6 Army CLIX
NSN 6130-01-670-6729

PRO-PC-12 Army CLIX
NSN 6130-01-670-6428

Replacement Parts available for Pallet charger, PRO-PC-12 and PRO-PC-6 chargers.



Pallet Charger

PRO-PC-12

PRO-PC-6

Item	Part#	NSN
Pallet Charger Replacement Insert - Complete	746X805	5998-01-691-0141 Army CLIX
Replacement Charging circuit Board.	740X373	5998-01-645-7646 Army CLIX
Charging Cable – 8’ with clamps.	740X375	6150-01-618-5359 Army CLIX
Power Cord - CORD 14/3 SJTOW 6'3"	740X415	6150-01-618-0289 Army CLIX
*Power Switch *Switch not compatible with Pro-PC-6	740X411	6110-01-645-8549 Army CLIX
Plastic Plug Connector. Cable to charger casing.	740X458	5935-01-645-8488 Army CLIX

12V World Charger

NSN 6130-01-477-4703 Army CLIX
USMC NSN 6130-01-618-4572

- The PulseTech World Charger is a single channel 12V, 20 amp charger designed to charge any type or size 12V lead acid battery (AGM, VRLA, flooded, or Gel).
- **Authorized for any Army Maintenance shop, standard in all USMC maintenance shops, and authorized for AF GSE shops.**
- Can be connected to any type or size 12V lead acid battery; AGM, VRLA, Flooded, or Gel.
- Excellent charger for maintenance contact teams, small remote operations, or as a boost charger for highly sulfated batteries.

SC-2 Xtreme Dual station 12V Charger:

NSN: 6130-01-689-4211

Part # 746x814 - Army CLIX

Navy GSE NSN, but has been GCSS loaded for Army and USMC use.

The SC-2 is a 12V, 6.5 amp per-channel max output, 2-station charging unit. It uses universal electrical input (110Vac – 250Vac). The charger can be connected to any type or size of 24V lead acid battery (AGM, GEL or flooded cell). The 2 charge channels operate in isolation from one another, allowing any combination of batteries to be recharged at the same time.

The SC-2 Xtreme Dual-Station Charger also uses the same charging board, charge cables, AC power cord, and plastic plug as the Pallet Charger, Pro-PC Chargers, and the SC-6.

Dual 24V Charger

NSN: 6130-01-609-9818

Part # 746x840 - Army CLIX

USMC: LABM / TAMCN: K00382

Army and USMC Charger designed for the small, dense 3KW Gen Set Battery.

The Dual 24V Charger is a 24V, 3.5 amp per channel, 2-station charging unit. It uses universal electrical input (110Vac – 250Vac). The charger can be connected to any type or size of 24V lead acid battery (AGM, GEL or flooded cell). The 2 charge channels operate in isolation from one another, allowing any combination of batteries to be recharged at the same time.

Example: Dual 24V Charger in use on 3KW Gen set batteries.

Solar Charging & Maintenance Systems

DA Pam 750-1, Feb 2023, 9–13. Army Battery Program: Commanders will use approved solar maintainers for equipment in LUP, NCOMP or in outdoor storage.

HMMWVs with 7.2 watt panels.

BLUF, these system work, and have been tested and approved for use on most support equipment. Not approved for combat platforms.

- ❑ There are multiple approved 12V and 24V PulseTech solar maintenance systems with NSNs.
- ❑ These systems are specifically designed to offset naturally occurring self-discharge and prevent the build up of sulfate crystals.

Power generation systems with 7.2 watt panels.

Currently being used by:

- ❑ ARMY: In use on many platforms including Power Generation, HMMWVs, FMTVs, HEMTTs, HETs, LHS, PLS, etc.
- ❑ USAF: Tested and approved in TO 1-1A-15 for all GSE gear.
- ❑ USMC: Tested and approved, via TI 6115-OR. Mandated use (via MWO) for all power generation systems and light sets.

FMTV with 12 watt panel along with a Snorkel Mounting Kit.

Your FSR has a solar Excel spreadsheet tool that can be used by any unit for data driven decisions. The spreadsheet contains:

- ❑ Equipment nomenclature, batteries NSN and cost.
- ❑ CLIX solar application NSN and cost. Note: The 2 most widely used solar maintainers are CLIX and cost less than a single 6TAGM battery!
- ❑ Easy to read total costs to outfit any or all systems.

Preventive Maintenance: Solar Maintainers

PulseTech Solar Maintainer benefits:

- **Panels will not overcharge, nor draw energy when sunlight is insufficient.**
- **Equipment can be started and driven with hard mounted panels installed. Nato adapter plug type panels should be removed when equipment is operated.**
- **Works with any flooded, gel, AGM and VRLA lead-acid batteries.**
- **Decreases sulfate crystal buildup on battery plates, Increases battery's ability to accept, retain and release energy.**
- **Smaller sized rigid & strengthened aluminum substrate along with Higher efficiency / longer life crystalline silicon cells for a safe, reliable, and waterproof panel.**
- **Limited Warranty: PRU = 5 years and Panel = 10 years!**

24V Solar Pulse Chargers:

24V 7.2-Watt Panel with Nato Plug: NSN: 6130-01-558-5371 - Army CLIX
24V 7.2-Watt Panel (with install kit): NSN 6130-01-487-0035 - Army CLIX
24V 12-Watt Panel (with install kit): NSN 6130-01-688-4857 - Army CLIX
24V 7.2-Watt panel & AC Maintainer system kits:

- ❑ **NSN 6130-01-521-1387**
- ❑ **NSN 6130-01-540-3380 – has clips vs lugs and hard case.**
- ❑ **NSN 6130-01-685-4994 – USMC NSN**
- ❑ **NSN 6130-01-675-7257 – kit comes in a hard case.**

24V 25-Watt with clips: Part# 735X689, NSN Pending
24V 25-Watt with Nato: Part# 735X712, NSN Pending

12V Solar Pulse Chargers:

12V 2-Watt panel (with install kit): NSN 6130-01-546-8432
12V 3-Watt panel: NSN 6130-01-388-0245
12V 7-Watt panel: NSN 6130-01-446-7154
12V 12-Watt panel (with install kit): NSN 6130-01-688-4859
12V 3-Watt panel & 12V AC Maintainer Kit: NSN 6130-01-521-1317

Preventive Maintenance: AC powered Maintainers

Pro 12, Battery Maintainer System
NSN: 6130-01-535-2718
Army CLIX

This maintainer is lightweight and capable of operating from any mounting position.

- 12 outputs that can indefinitely maintain 12 different type 12V lead acid batteries at once.
- 12V - 750 mA dc per output.
- High frequency voltage pulsing to disulfate batteries.

24V AC Maintainer:
NSN 6130-01-521-1329
Army CLIX

12V AC Maintainer:
NSN 6130-01-521-1765
Army CLIX

The PCS 12 and 24-Volt Charger Maintainer Pulse Systems are ideal for maintaining 12 and 24-Volt lead-acid batteries stored indoors on a long-term basis. Colored lights indicate AC charge status and battery conditioning. The PCS systems prevent unused batteries from losing their charge and removes lead sulfate crystals that build up on battery plates. These Battery Charger / Maintainers have the capacity to maintain up to six batteries. Power supply is reverse polarity protected and the battery cannot be overcharged.

Additionally: There is also an optional compatible solar panel which can be used with the PCS systems when AC power is not available.

Do you have Controlled Humidity Preservation (CHP) or Long-Term Storage (LTS) buildings?

Issue: CHPs see much higher battery consumption rates unless batteries are charged regularly either on the platform or removed.

Fix: The PulseTech redesigned and updated Grid System & 24V Drop Pulse and Charge Reels are a proven option that eliminates high battery consumption rates and the requirement for periodic charging, removing of batteries, cables, etc.

See below example 12 pieces of equipment in storage. Just these 12 pieces have $12,088 worth of batteries alone. Add in manhours and it easy to see how the cost savings can be quite significant!

Model	Battery	# of batteries	Battery NIIN	Cost each	Veh Total Battery Cost	# of Equip type	Total Battery cost
FMTV	6TAGM	4	01-485-1472	$448	$1792	3 FMTVs	$5376
HMMWV	6TAGM	2	01-485-1472	$448	$896	4 HMMWVs	$3584
Skid Steer	Grp31	2	01-457-5469	$326	$652	2 Skid Steer	$1304
JLTV Primary	12V AGM	2	01-378-8232	$207	$414	2 JLTV (primary)	$828
JLTV Aux	12V AGM	2	01-450-0141	$249	$498	2 JLTV (auxiliary)	$996
					Totals:	12	$12088

Grid System: **NSN: 6130-01-497-0966 - Army CLIX**

This is a flexible system that comes standard with *most items needed to fit the shape / size of standard CHP / LTS buildings.

- VAC to VDC power supply (with standard 3 prong plug), junction box, wiring, conduits, wire connectors, mounting hardware, drop chains, and much more.
- Input power required, 85-265 VAC, Output 30Vdc.
- Capable of supporting up to 30 drop down reels.

* Some buildings may require additional mounting hardware.

24-Volt Drop Pulse & Charge Reel: NSN: 6130-01-497-0971 - Army CLIX

Charges & maintains 24-Volt lead-acid batteries

- Microprocessor controlled, monitors and charges as needed.
- Never overcharges, LEDs indicate charge status.
- Utilizes optimized high frequency Pulse Technology.
- Retractable 38’ cable with a quick disconnect connection.
- 3 options for connecting to batteries:
  > NATO connection, Clamps, or bolt on lug connection.

HD Jump Start – 24V

The HD Jump Start is a simple to use 24V jump start system that connects directly to any NATO slave receptacle. The battery pack can be easily removed from the cart for hard-to-reach equipment. USMC Approved for use on all equipment.

The system uses advanced AGM lead acid batteries that are non-hazardous and can be shipped safely via any transportation mode. The batteries in the Jump Start are designed to deliver high amperage for starting, and has a built-in charger. Charger can be left plugged into an AC source overnight and weekends. Recommend system be used to jump equipment at least once every week or two to exercise the batteries.

NSN 6130-01-564-9082

Part # 746x700

USMC: LABM / TAMCN: K00282

Replacement Parts for HD Jump Stater:

Troubleshooting info available:
Contact your supporting FSR

Item	Part#	NSN
Replacement Battery Pack	746X705 Army CLIX	6130-01-618-0951
Top Assembly Battery Charger	746X704 Army CLIX	6130-01-618-0970
Cable, 10' Nato	746X707 Army CLIX	6145-01-618-0725
Trolley, Jump Start	746X714 Army CLIX	6130-01-618-0683
Power Cord - CORD 14/3 SJTOW 6'3"	740X415 Army CLIX	6150-01-618-0289
Wheel and Tire Assembly	746X718 Army CLIX	2530-01-699-8219

Battery Rack and HD Cases:

HD Battery Rack: Part# 715X901

NSN: 4940-01-702-3055

Army CL2 Expendable – but can be ordered by most Army Maintenance shops.

USMC: LABM program Authorized

This heavy-duty free standing Battery Rack is ideal for organizing batteries safely out of the way while they are being stored, charged or maintained. The rack is large / strong enough to easily hold up to 12 large batteries. Constructed of durable powder coated tubular steel.

Battery Capacity:	12
Dimensions:	57.25” X 14” X 48”
Enclosure:	Black Steel
Weight:	200 lbs.
Ship Weight:	250 lbs.
Warranty	Five-Year Limited Warranty

HD Storage Cases:

White: NSN: 6160-01-461-6165

Part # 740x960 - Army CLIX

Green: NSN: 6130-01-513-5432

Part # 740x961 - Army CLIX

Store, carry or ship your BMMP equipment (or really any gear) in one of these durable transport cases with heavy-duty recessed rubber wheels and hardware. Great for shipping anything that needs HD protection.

- Two heavy-duty recessed rubber wheels
- Fracture & crack-resistant high-density polyethylene shell
- Solvent resistant, will not blister or peel
- 2” Shock absorbent foam lined interior
- Can support a weight of 250 pounds per square inch
- Oversized heavy-duty hardware
- Interior dimensions 35 1/4” L x 18” W x 20” H

We suggest periodic PM for your PulseTech Chargers. This can make their serviceable life longer & prevent system failure when you really need it. Forced air (lower pressure) is the easiest way to remove dust, dirt, etc.

Example, Pallet Charger:

1. Remove 2 Allen Head bolts.

2. Attached charging cord to one of the center ports.

3. Grasp charging port connection and slowly pull insert from housing. Watch fan power supply and AC wires on the left as it is removed. If wires catch use a tool (shim or screwdriver) to help guide them as the insert is removed.

4. Completely remove the insert, lay flat on a bench and use low pressure air to blow out any dust / dirt. Check connections for any damage, looseness, etc.

5. Reverse order to put back together.

6. Contact your FSR if you have any questions.

PM Reminders:

Check batteries on a regular basis to ensure:

- **> Batteries are clean, and connections are tight and clean.**
- **> Battery hold-down brackets are tight.**
- **> Conductance test, check each battery and charge as needed.**

Conclusion:

The information and maintenance practices described today will provide direct benefits in terms of:

- **> Increased readiness / Lower battery-related expenses**
- **> Reduce man-hours and the longest battery life possible**

Additional Info: Optima battery military discount for personal use is available. Go to the below link for more info:
http://milbatteries.com/optima-home/