

# POPULAR COMMUNICATIONS

AUGUST 2011

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# Charging Ahead: Eyes On Big Battery Maintenance

## IN REVIEW: A Look At PulseTech Pulse Charging and Its Impact on EmComm Battery Life

by Gordon West, WB6NOA

**B**oat owners and RVers are always looking for ways to extend the life of their 12-volt, lead acid and newer sealed AGM (absorption glass mat) batteries.

“Lead acid batteries work by releasing energy through an interaction that occurs between the positive and negative lead plates and the lead sulfates in the electrolyte,” said John Bell, the public relations consultant with PulseTech Products Corporation.

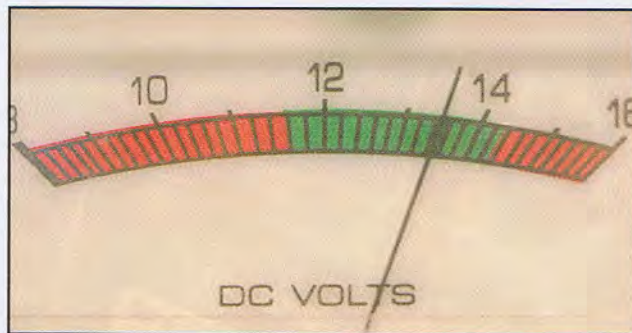
“Sulfation buildup occurs as lead sulfates form on the battery plates during the normal charge and discharge cycles,” he said.

“During the charge and discharge cycles, some of the sulfates enlarge to the point where they won’t accept energy, so they stay on the plate. Over time, these sulfates can build up until they reduce efficiency, and the battery dies,” Bell said. It’s a very common occurrence.

Emergency communications (EmComm) battery systems, receiving a small continuous maintenance charge, develop plate sulfation rapidly. Think of an athlete who gets food with almost no exercise, the system can no longer deliver peak output.

“Just like handheld Ni-Cad batteries, big battery systems also require regular exercise to keep them in top shape,” said Bill Alber, an emergency communications specialist who regularly works on mountain repeater back-up battery supplies.

Ever wonder why your RV starting battery lasts for five years,



An expanded voltmeter is used to detect small changes in starting voltage.

## Universities Evaluate Pulse Charging in Two-Year Test

by Gordon West, WB6NOA

For two years, Oakland University in Rochester, Michigan and Ohio State University in Columbus conducted separate evaluations of the patented PulseTech pulsing technology. During these studies, sulfation — crystalline buildup — was regularly charted using X-ray defraction methods.

“The X-ray defraction data confirms the positive effects of the application of pulse technology on battery plate morphology,” test data revealed.

“It shows a more even distribution of lead sulfate crystals over the surface area of the battery plates. It also revealed significant reduction in the size of the lead sulfate crystals. These microscopic changes, kind of an electromechanical or cleaning action of the plate surface, appears to improve a battery’s ability to accept and store more energy,” the report indicated.

These published results may reveal a reconditioning reforming process of the battery plates by continuous pulsation. Electron-scanning microscopy as well as X-ray spectroscopy shows the reasons for the preservation process.

During the storage of a battery without pulsation, a formation of large crystal graphic domains is observed on the surface of positive electrodes. This is in contrast to the morphology of the battery stored with pulses.

Significantly smaller crystals were formed during the storage process of the battery undergoing the pulsation effect.

Read more of the results at: < <http://bit.ly/jqstlp> >.



For a good, long life, big batteries need exercise and a smart charge cycle. (Photographs courtesy of WB6NOA).



Here's a 2-amp, marine-RV pulse charger.

yet the house batteries on constant charge in the storage yard last only a couple of years?

"As good as today's batteries are, including standard flooded as well as sealed AGM types, all lead-acid batteries suffer from the same main failure mode where 80 percent fail due to the damaging effects of sulfation buildup," Bell said. "The lifespan of today's lead-acid battery typically ranges from as little as a half year to four years, though only 30 percent survive for the entire four years." Sulfate found in the electrolyte will crystallize and root onto the battery plates, and eventually result in premature battery failure.

"This is especially true with seasonal-used vehicles and boats, or communi-

## Pulse Charging: What One Independent Test Reveals

Although not scientific, Steve Swartz, who enjoys battery technology, spent nearly a year testing pulse charging versus conventional equipment charging. Swartz made the assumption that 120 cycles would equal one year for an average battery.

"It took about a month and a half to achieve 120 cycles, per battery, cascaded from four batteries to zero batteries, done over eight months," reports Swartz.

"Fourteen-amp-hour batteries were first discharged with a 10-amp light bulb. Allowed to rest for 30 minutes, and then recharged using pulse charging on one, and conventional charging on another. Pulse charging did not leave the heavy sulfates that we see with conventional charging, over many cycles of charge and discharge," reports Swartz, as seen in this photograph.

— Gordon West, WB6NOA

### 4 Year Comparative - Battery Plate Testing - Pulse Technology vs Conventional Charging

**Batteries Used:** Exide # XT12N14-3A - 270 cca - 14 AH - Date Code 2-18-05 - 10 batteries with consecutive serial numbers

**Test Parameters:** 8 pcs cascading by 1 yr increments for evaluation / comparison : Load: All 8 pcs - resistive 5 amp load (light bulb)

**Discharge Cycle:** On alternate days - all 8 batteries discharged from 12.8 Vdc (full charge) down to 50% (voltage of 12.1 Vdc)

**Charge Cycle:** On alternate days, all 8 batteries were charged for up to 12 hours and / or up to 12.8 Vdc (full charge)

**Row 1:** Charged with Pulse Tech model # XC100 - fully automatic electronic charger - Rating at 2.5 amp actual / 5.0 amp effective output

**Row 2:** Charged with transformer type - Schumacher model # SE1020 - 4/10/20 amp selectable - all 4 pcs at recommended 4 amp charge rate.




This is a solar panel pulse charger status indicator, with added voltage monitors

cation system backup batteries that rarely see any action," Alber said.

About 10 years ago at a boat show, I attended some seminars from a company called PulseTech Products Corporation: < <http://bit.ly/jqstlp> >. It had all sorts of ongoing tests with battery cut-aways showing healthy new plates; three-year-old, relatively healthy plates; and very ugly, one-year-old sulfated plates where the battery was left on a constant trickle charge.

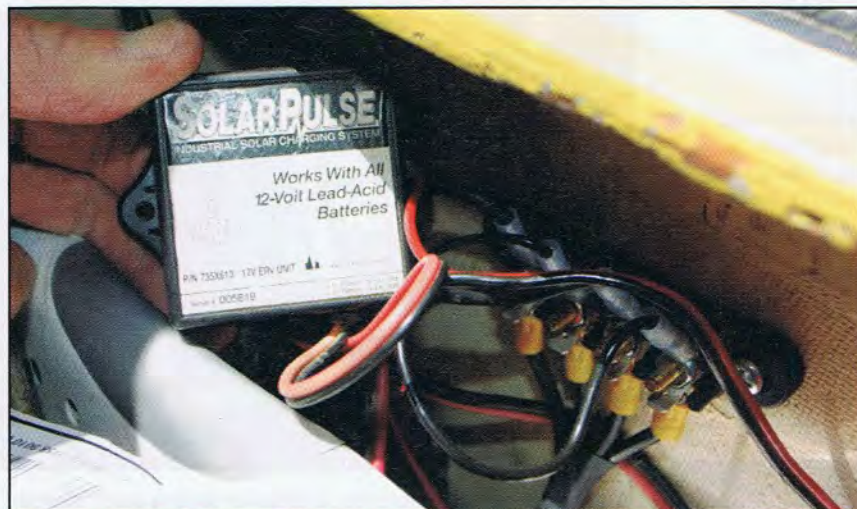
This is year four that I have been testing PulseTech products in our communications van, as well as my classic '76 communications wagon, along with the yellow dune buggy. All systems are still going strong, with some of the batteries at 5 years old.

I monitor battery health by observing

an analog, expanded-voltage voltmeter during engine cranking. A healthy battery may dip to 10 volts during repeated engine starts. When that voltage dips down to 9.5 volts and then 9 volts or lower on engine starting, I have either lost battery electrolyte from plain old evaporation or the well-watered battery has gone into sulfate occlusion.

On the van with a 454 engine, I use the PulseTech solar pulse industrial charging system. It only puts out 1 amp, but its pulse action keeps the entire van's battery system clean.

On the wagon, stored in the garage, I use the marine XTREME 5 stage maintenance charger, which offers bulk, saturation, float and maintenance stages. But unlike a nice smooth DC output, the



Small, 300-milliamp, solar pulse charger electronics are used in WB6NOA's dune buggy.

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## Pop'Comm August 2011 Reader Survey



A Solar Pulse charging system sits on top of a solar panel during the tests in Arizona.

fluctuations in the output voltage line. There is a five-second analysis period before the pulses settle in to their pattern.

I was concerned that the proprietary sealed microprocessor might be noisy on high frequency, but the system is very quiet — even with its almost narrow square wave pulses. My FM scanner didn't complain and there was no trace of square waves and their inherent harmonics on the HF receiver.

It takes an oscilloscope to see the pulse action. I have several other old technology chargers that produce every-two-second bursts of increased voltage, but the scope reveals PulseTech square wave action with the much higher voltage

amplitude.

The PulseTech Web site shows additional plots of their pulse action. The listing of their products gives you several links to additional scientific studies, PulseTech users, and a Society of Automotive Engineers technical paper on effective battery charging.

I like the solar charging system best, because I can take it with me when out in the communications van, totally unconnected to shore power, and watch the panel meter read out the pulse action. Best of all, the communications van starts with a voltage excursion like a nice fresh battery!



A pulse charger, battery and test gear help tell the story during testing at Quartzfest.

Your feedback is important to us at *Pop'Comm*. It helps guide us to make the magazine even more valuable to you each month.

Please take a few minutes to fill out this month's Reader Survey Card and circle the appropriate numbers corresponding to the questions below. We'll pick a respondent at random for a year's free subscription or an extension of an existing subscription as thanks for your participation — so don't forget to fill in your mailing address and other contact information.

We encourage your comments and suggestions in the space provided, as well. Thank you.

### Should *Pop'Comm* include more construction articles, similar to this month's DTV antenna?

- Absolutely. Challenge me. . . . . 1  
 Depends. If they're for beginners, OK... 2  
 No, I'm not interested in building things . . . . . 3  
 Only if you don't give up any other content. . . . . 4

### Have you ever built a piece of radio gear from scratch (not from a kit)?

- Yes, and it worked great. . . . . 5  
 Yes, it worked, but not well. . . . . 6  
 Yes, but it never worked. . . . . 7  
 No, but I'd like to . . . . . 8  
 No, I have no interest in building things. . . . . 9

### Have you ever made an antenna from scratch (not from a kit)?

- Yes, and it worked great. . . . . 10  
 Yes, it worked, but not well. . . . . 11  
 Yes, but it never worked. . . . . 12  
 No, but I'd like to. . . . . 13  
 No, I have no interest in making an antenna . . . . . 14

What kinds of construction articles would you like to see featured in *Pop'Comm*? (Use the comment line.)

### Take This Reader Survey Online

You can now participate in this reader survey via the Internet. Simply go to *Pop'Comm* On the Web: < <http://www.popcommmagazine.blogspot.com/> > and click the link to the *Pop'Comm* August 2011 Reader Survey. It's quick and easy.

### And the Winner Is . . .

For participating in the *Pop'Comm* Readership Survey, the winner of a free subscription or extension is **Robert Scott** of **Milwaukee, Wisconsin**. *Way to go, Robert!* And thanks for your suggestion about adding a *Guest Columnist* feature.